

THE **NEW** CLIMATE **ECONOMY**

The Global Commission on the Economy and Climate

Africa's New Climate Economy

ECONOMIC TRANSFORMATION AND SOCIAL
AND ENVIRONMENTAL CHANGE

SET SUPPORTING
ECONOMIC
TRANSFORMATION



THE NEW CLIMATE ECONOMY

The Global Commission on the Economy and Climate

About this paper

This paper was jointly prepared by the New Climate Economy, flagship project of the Global Commission on Economy and the Climate, and the Supporting Economic Transformation Programme at the Overseas Development Institute. The work has been led by Milan Brahmbhatt (lead author) and Russell Bishop. Research assistance was ably provided by Xiao Zhao. Contributors have included Alberto Lemma, Ilmi Granoff, Nick Godfrey, and Dirk Willem te Velde. All views expressed are those of the authors alone, and not those of the organisations they represent. This material has been funded by UK aid from the UK government however the views expressed do not necessarily reflect the UK government's official policies.

Citation

Brahmbhatt, M., Bishop R., Zhao, X., Lemma, A., Granoff, I., Godfrey, N., and te Velde, D.W., 2016. *Africa's New Climate Economy: Economic Transformation and Social and Environmental Change*. New Climate Economy and Overseas Development Institute. London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.

Partners:



Cover photo credit: Flickr/James Anderson

New Climate Economy
c/o World Resources Institute
10 G St NE
Suite 800
Washington, DC 20002, USA
+1 (202) 729-7600

Overseas Development Institute
203 Blackfriars Road
London, SE1 8NJ, UK
+44 (0) 20 7922 0300

www.newclimateeconomy.report
www.newclimateeconomy.net
www.odi.org
set.odi.org

Foreword: Africa's New Climate Economy

Africa stands at the threshold of a tremendous opportunity: its economies are seeking to shift to higher-productivity sectors which can boost prosperity and drive developmental goals. At the same time, the right kind of economic transformation can also ensure that Africa's growth is sustainable and resilient in the face of the increasing impacts of climate change. Initial indicators of economic transformation are positive. By one estimate, shifts in employment from lower to higher productivity sectors have already added about 1% to productivity growth across the region since 2000, rising as high as 4% for Rwanda, and 2-3% for Nigeria, Tanzania and Uganda.

We hope this report will offer key insights for policy makers seeking to deliver better growth and a better climate in African countries. It aims to help decision-makers take stock of the region's recent experiences and draw lessons for the future. In particular, it seeks to crystallise ideas on how to harness the forces of economic, social and environmental change to accelerate inclusive and sustainable development across the region.

The overall framing draws from the core proposition of the New Climate Economy, that economic growth and action on climate change can not only be achieved together but that, in fact, actions taken to tackle climate risk can often generate better economic growth while helping to deliver on the Sustainable Development Goals. It also draws from insights working with policymakers across the region, including through dedicated work in Ethiopia and Uganda.

For Africa to achieve this better growth, the report identifies five action areas for governments to consider as they formulate development strategies and action plans for the future. These are:

- Getting the fundamentals right, namely by: ensuring macroeconomic stability, better governance with greater voice and accountability, and policies to drive social and human development and improve natural resource management.
- Transforming agriculture and land use through, for instance, climate smart agriculture and landscape management approaches.
- Diversifying into high-productivity sectors, like industry and services, while investing in much-needed infrastructure.
- Unleashing the power of urbanization to accommodate the further 800 million people who will be living in its cities by 2050.
- Fostering a modern energy transition, especially through investments in renewable energy generation and improving efficiency, in order to provide access to the 620 million people who currently lack it and to power the transformation of its economies.

These are not a one-size-fits-all set of recommendations. They will need adjustment and application depending on different national circumstances. But together they can help an economic transformation for Africa that is better for people, the economy and the planet.

The choices that African leaders make in the next few years have major implications for economic growth, human well-being and resilience in the decades ahead. Getting it right is an opportunity we must not miss.



Carlos Lopes,
Former Executive Secretary,
Economic Commission for Africa



Ngozi Okonjo-Iweala,
Former Finance Minister
of Nigeria



Photo credit: Flickr/James Anderson

About The New Climate Economy

The Global Commission on the Economy and Climate, and its flagship project The New Climate Economy, were set up to help governments, businesses and society make better-informed decisions on how to achieve economic prosperity and development while also addressing climate change.

In September 2014, the Commission published *Better Growth, Better Climate: The New Climate Economy Report*. Since then, the project has released a series of country reports on the United States, China, India and Ethiopia, and sector reports on cities, land use, energy and finance. In July 2015, the Commission published *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. In Oct 2016, it released its third major report, *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*. It has disseminated its messages by engaging with heads of governments, finance ministers, business leaders and other key economic decision-makers in over 50 countries around the world.

About the Overseas Development Institute and Supporting Economic Transformation Programme

ODI is the UK's leading independent think tank on international development and humanitarian policy. Founded in 1960, it has made major contributions to research, dissemination and policy change, on all aspects of development and humanitarian policy. ODI's mission is to inspire and inform policy and practice which lead to the reduction of poverty, the alleviation of suffering and the achievement of sustainable livelihoods in developing countries. This is done by locking together high-quality applied research, practical policy advice, and policy-focused dissemination and debate. ODI works with partners in the public and private sectors, in both developing and developed countries.

ODI's Supporting Economic Transformation (SET) programme is supported by the UK Department for International Development. SET is supporting economic transformation in developing countries through analysis, policy advice and convening. It aims to provide practical policy support to country governments including donors and the private sector.

Table of Contents



Summary Report 6



Chapter 1 33
Sub-Saharan African Growth and Poverty Reduction in the 2000s: Accomplishments and Emerging Challenges



Chapter 2 43
Economic Transformation in Africa: Experience and Strategic Directions



Chapter 3 63
Economic Transformation and the Climate Challenge in Sub-Saharan Africa



Chapter 4 77
Agriculture and Land Use Change as a Foundation for Economic Transformation



Chapter 5 85
Diversification and Economic Transformation



Chapter 6 95
Urbanisation and Economic Transformation in Africa



Chapter 7 103
Economic Transformation and Africa's Energy Transition

Summary Report

On its 50th anniversary in 2013, the African Union unveiled *Agenda 2063: The Africa We Want*, which envisions “a prosperous Africa based on inclusive and sustainable development”. Pan-African institutions such as the African Union, the African Development Bank and the UN Economic Commission for Africa have found that achieving and sustaining inclusive, robust growth in the region will require economic transformation as well as keen attention to the challenges of climate change. This view is in line with the approach that many African governments are taking in their own national development plans, and with the global commitments made in 2015 with the adoption of the Sustainable Development Goals, the 2030 Development Agenda and the historic Paris Agreement on climate change.

Sub-Saharan Africa has experienced a “Growth Miracle” in the past 15 years, combined with significant progress on poverty reduction and human development. But due to rapid population growth, per capita income growth has been more modest, while human development indicators remain well below developing-country averages. At the same time, climate change and other environmental stresses are taking an increasing toll on many countries.

The choices that African leaders make in the next few years have major implications for economic growth, human well-being and resilience in the decades ahead. This report aims to help decision-makers take stock of the extraordinarily rich experience of recent years and draw lessons for the future. In particular, it seeks to crystallise ideas on how to harness the forces of economic, social and environmental change to accelerate inclusive and sustainable development across the region.

Understanding the opportunities and challenges for better development are central to the work of both the Overseas Development Institute (ODI) and the New Climate Economy (NCE), the flagship project of the Global Commission of the Economy and Climate. The conclusion of the Commission’s work in *Better Growth, Better Climate* (2014) and *Seizing the Global Opportunity* (2015) is that countries at all levels of development have the opportunity to build lasting economic growth while at the same time reducing the risks of climate change and wider environmental degradation. Many of the policy and institutional reforms needed to boost growth and reduce poverty over the next 15 years will also contribute to better management of climate risk.

The report draws on a large body of work done in recent years on key aspects of development important to sub-Saharan Africa. This includes research on macroeconomics, growth and economic transformation, poverty reduction, human development, demographic transition and other social trends, and the impact of climate variability and change, deforestation, pollution and other aspects of environmental degradation, as well as trends in key socio-economic systems and sectors such as cities, agriculture, industry and energy. While the term sub-Saharan Africa comes with a complex historical legacy, this report uses the term as it is deployed by international organizations, including the UN and the World Bank, to refer geographically to countries south of the Sahara desert.

Efforts to elaborate the extensive links, trade-offs and synergies across these economic, social and environmental subjects have been relatively limited. This report surveys and synthesises the existing evidence within a common analytical framework, to provide a clearer overview for decision-makers. This report seeks to make three main contributions:

- To provide an integrated approach for thinking about and tackling economic, social and environmental concerns, taking into account both trade-offs and synergies;
- To tailor that approach to the sub-Saharan African context, taking account of the diversity of conditions and challenges across different countries; and
- To provide a decision-making lens that meets the practical needs of policy-makers.

The report is aimed at policy-makers as well as the broader development community in sub-Saharan Africa. It also seeks to frame and guide future New Climate Economy work in sub-Saharan Africa and in developing countries more broadly, including country analyses and programmes. It builds on the Global Commission’s analytical work to date at both the global and regional levels, combined with the expertise of the Supporting Economic Transformation (SET) Programme at ODI.

The section that follows provides an overview of the strategic context for development in sub-Saharan Africa, providing an assessment of the gains and limitations of the region’s recent “Growth Miracle”; trends and challenges in the economic transformation of the region; and risks and concerns related to climate change. The section also presents a simple conceptual framework of the major links between economic transformation and major social and environmental forces.

The summary report then presents an overview of four priority areas: modernising and improving agriculture and land use; diversifying economies into manufacturing and other high-productivity sectors; managing urbanisation; and accelerating the transition to modern, sustainable energy. A final section presents a five point Action Plan to promote economic transformation and social and environmental progress across sub-Saharan Africa. Detailed references are provided in the relevant sections of the main body of the report.

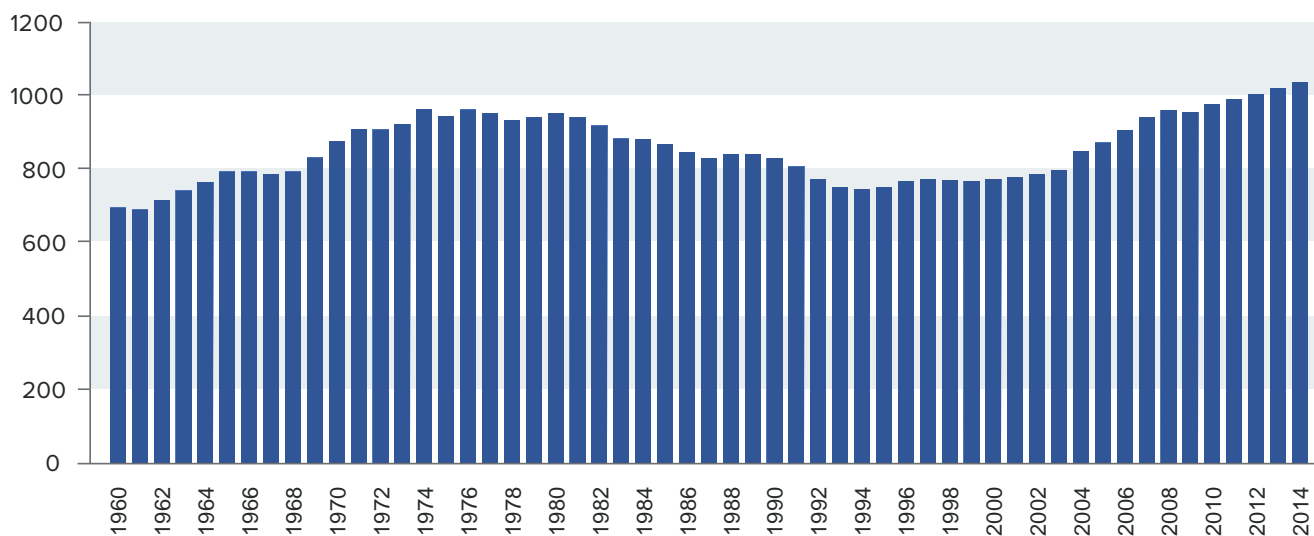
The strategic context for development in sub-Saharan Africa

Sub-Saharan Africa has grown at an impressive pace in recent years. After peaking in 1974, then declining and stagnating for two decades, real per capita GDP reached a new high in 2010, the culmination of a decade of economic growth for the region as a whole (see Figure S1). This huge turnaround, sometimes called “Africa’s Growth Miracle”, has been accompanied by a substantial decline in extreme poverty and improvement on many development indicators. But although the recovery has reversed long-standing pessimism about sub-Saharan Africa’s outlook and emboldened hope for the future, great challenges remain. As discussed further below, and in Chapter 1 of the main report, the region still lags behind on most measures of human development and welfare, often by a wide margin.

The recovery of the 2000s reflects persistent reform efforts by many countries over recent decades, as well as the benefits of a global boom in primary commodity prices that favoured the region’s many natural resource-rich economies. In 2014–2015, however, the region’s economies experienced a significant shock, caused by plunging commodity prices and an economic slowdown around the world. This has raised questions about the durability of the “Growth Miracle”.

It is in this context of slowing growth and an uncertain global environment that African policy-makers are increasingly looking to a strategy of economic transformation: to boost the productivity of the economy as a whole by fostering opportunities for workers and entrepreneurs to shift from lower-productivity to higher-productivity sectors - *structural change* - as well as through faster productivity growth within major sectors of the economy. We discuss sub-Saharan Africa’s progress on economic transformation below and in Chapter 2 of the main report. Next we take up the implications of rapid environmental change in the region – in particular climate change, which is already taking a toll on sub-Saharan Africa and threatens to cause serious harm. We discuss challenges and opportunities in tackling climate risks at length in Chapter 3 of the main report. The section closes with a simple analytical framework of the major links between economic transformation and major social and environmental forces.

Figure S1
Sub-Saharan Africa: real per capita GDP 1960-2014 (constant 2005 US\$)



Source: World Bank World Development Indicators database.

The gains and limitations of the 'Growth Miracle'

In the 1980s and 1990s, real GDP in sub-Saharan Africa grew by only 1–2% per year, far more slowly than the population, resulting in a cumulative per capita GDP drop of almost 20%. Real GDP growth accelerated to almost 5% in 2001–2014, but, given the region's extraordinarily high population growth, per capita GDP for the region as a whole rose by just 2.1% per year. This was enough to reverse the losses of the prior decades, but fell short of the average growth rate for developing countries overall (Figure S2). While there was much variation in growth outcomes for individual countries, overall the growth acceleration benefited low-income as well as middle-income African countries, but not so much as to enable the poorest countries as a group to catch up to their wealthier neighbours.

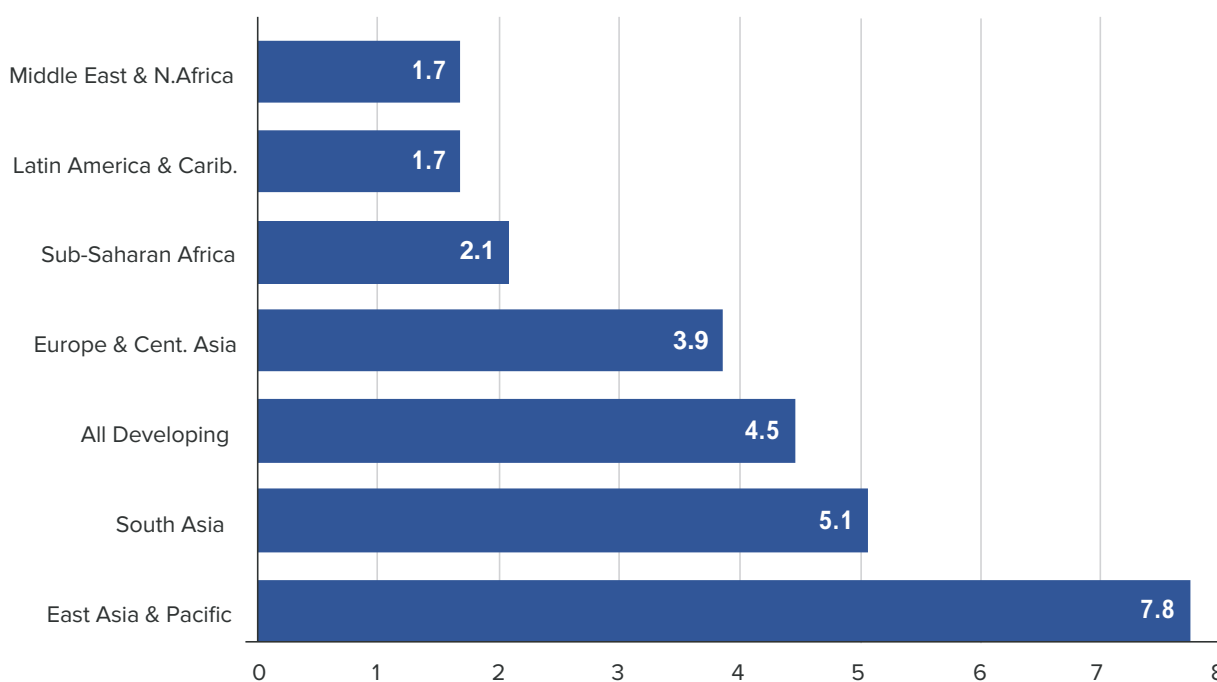
Faster growth contributed to quicker poverty reduction. After stagnating at near 60% of the population, the rate of extreme poverty fell from 57% in 2002 to 43% in 2012 (Figure S.3). Nevertheless, due to rapid population growth, the absolute number in extreme poverty in sub-Saharan Africa increased by over 100 million between 1990 and 2012, from 284 to 388 million. The pace of poverty reduction was

similar in low- and middle-income economies, and in landlocked and coastal countries, though much slower in fragile and conflict-affected countries.

The inclusivity of African growth has been limited in some respects. Poverty rates appear to be less responsive to growth in sub-Saharan Africa than in other regions, likely for several reasons. First, the inclusiveness of growth depends on the *pattern* of economic transformation. In developing countries in general, growth in agriculture, manufacturing and construction appears to have a bigger poverty reduction effect than growth in services or mining. Yet in sub-Saharan Africa, the most dynamic recent growth has been in services, while manufacturing in particular has remained modest, its growth sluggish. Second, poverty rates tend to be less responsive to growth in economies rich in natural resources, of which Africa has a particularly high number. We return later to why this may be so. Third, sub-Saharan Africa is already experiencing more significant climate change and variability than many other regions, and it is the poor who are most affected. A fourth factor is that African countries tend to have a relatively high level of income inequality and this also reduces the responsiveness of poverty to growth.

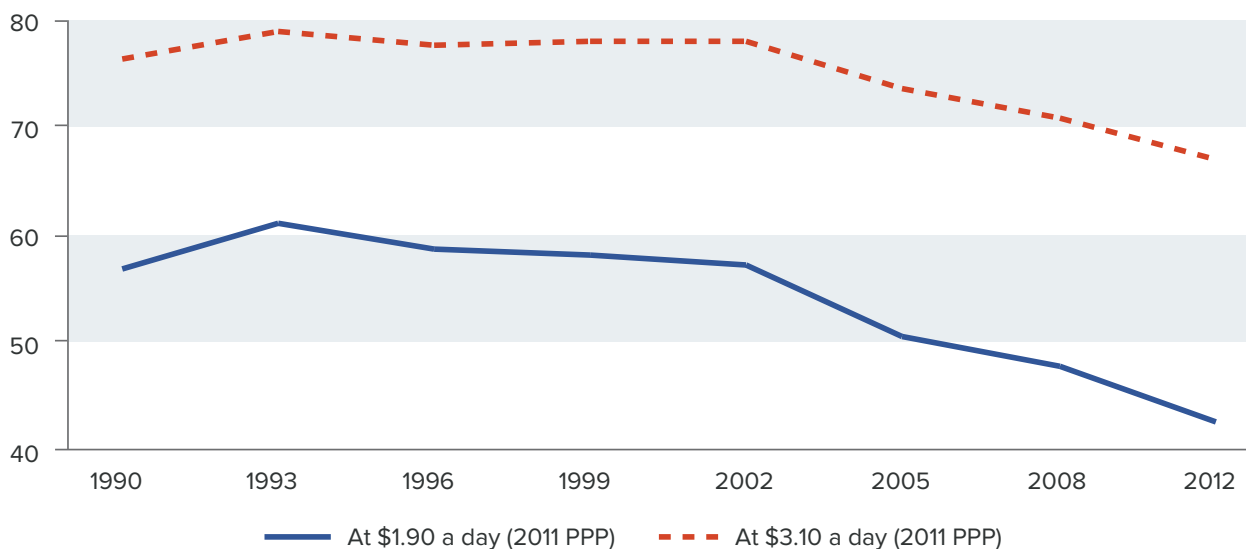
Figure S2

Developing countries: real per capita GDP growth 2001-14%



Source: World Bank World Development Indicators database and author calculations.

Figure S3

Sub-Saharan Africa: Poverty headcount rate (% of population)

Source: World Bank World Development Indicators database.

Outcomes for non-monetary aspects of well-being, such as education and health, have generally improved, but there is much variation across African countries, and, in general, these outcomes are still much worse than in developing countries overall. Adult literacy, for example, only increased from 54% in 1995 to 58% in 2012, well below the 80% rate for developing countries overall. Primary and secondary school enrolment, life expectancy, under-5 mortality, and many aspects of gender equality also improved, but continued to lag well below developing-country averages. It is likely that demographic change has been a key factor in these trends, as it affects the pace and social inclusivity of growth, human development and environmental change (see Box S1).

Looking ahead, a key question is whether sub-Saharan Africa can keep growing as it has in recent years, and even accelerate that growth. The evidence here is mixed. Analysts point to policy reform efforts over several decades as a key driver of growth: more prudent fiscal and monetary policies, external debt relief, more pro-poor public spending. Governance has also become more participatory and accountable on the whole, although this trend is hardly uncontested, and has sometimes been

reversed. Greater voice and accountability appear to have sharpened the political incentives to pursue more inclusive and pro-growth policies. These benefits can continue to accrue for years to come.

The extraordinary boom in world primary commodity prices since the late 1990s is also likely to have boosted growth in 2000-14 in many countries in the region, although research suggests that in natural resource-rich countries with weak institutions, such booms tend to reduce long-term growth – the “natural resource curse”. And in late 2014 and in 2015, the boom came to a halt, with sharp declines in world oil and other commodity prices, as well as in world output and trade growth. Those external shocks helped slow real GDP growth in sub-Saharan Africa from a little over 5% in 2014 to 3.3% in 2015, with only 1.6% projected for 2016, according to the International Monetary Fund (IMF). The region’s per capita GDP is expected to fall in 2016, for the first time since the 2009 global crisis. Oil- and mineral-exporting countries have been hit especially hard. From African policy-makers’ perspective, these trends are a powerful reason to try to accelerate their countries’ economic transformation.

Sub-Saharan Africa's delayed fertility transition: Unlocking a demographic dividend

As countries develop, infant mortality rates tend to decline and women tend to start having fewer children. In sub-Saharan Africa, however, this demographic transition has been delayed. Infant mortality rates have indeed fallen significantly, but the decline in fertility that typically follows is occurring only slowly, with much variation across countries. One result of the very slow decline is that the population has grown rapidly, to almost 1 billion in 2015, and it is projected to rise to 2.1 billion in 2050 and 3.9 billion in 2100 (under the UN's medium variant scenario). Sub-Saharan Africa also now has an extraordinarily high youth age bracket (43% of the population aged 14 or younger) and an extremely low share of working-age people – 54%, compared with 72% in East Asia and 65% in South Asia.

Greater gender equality and more education for girls can have a powerful effect on fertility rates. A more rapid moderation of fertility, in turn, would have broad long-term benefits for growth, poverty reduction and, with some qualifications, the environment, provided that – and this is a crucial qualification – overall economic policies support rising employment and investment. This is the so-called “demographic dividend”.

Most simply, having a larger share of employed workers in the population boosts output per capita. With smaller families, more women can join the labour force. Worker productivity also increases: with a smaller youth cohort to support, more resources can be devoted to investment per worker, and to spending on health and education. With more workers in the population needing to save for old age, saving rates also rise, fostering investment and further boosting productivity. Positive feedback loops kick in. Better child and maternal health reduce infant mortality, which encourages further fertility decline, since women need fewer pregnancies to achieve the desired number of surviving children. Also, as noted, more education for girls and greater gender equality in general has a powerful effect in moderating fertility.

The implications for the environment are complex. We can be relatively confident that a more rapid demographic transition would strengthen resilience to climate change, as there would be fewer people exposed to climate shocks, particularly poor people in rural areas. Also, as we note below, adaptive capacity tends to rise with per capita income. Pressures to expand agricultural land and cut down forests would tend to decline as more capital- and technology-intensive methods are adopted in agriculture, and as productivity gains help the food supply keep up with population growth.

The impact of a more rapid demographic transition on greenhouse gas emissions is more difficult to predict. To the extent that the demographic transition raises per capita incomes, it would tend to boost emissions per person, particularly as countries move from low to middle income, as we discuss later. But this would be offset to some extent because, all else being equal, a smaller population would emit less carbon than a larger. This is not a well-studied area and the net impact on emissions is unclear. Nevertheless, it seems reasonable to suggest that a more rapid demographic transition would be a relatively *clean* road to development in that it is based on forces that tend to have offsetting effects on GHG emissions.

Economic transformation as an engine of inclusive growth

Economic transformation holds great potential as an engine for inclusive growth in sub-Saharan Africa, as the result of two linked trends: growth in overall economic productivity as a result of structural change, as workers and entrepreneurs shift from low-productivity sectors such as subsistence agriculture to higher-productivity sectors, such as in industry and services; and more rapid productivity growth *within* major sectors of the economy.

The history of economic transformation experiences worldwide provides a useful indication of potential pathways for economic transformation in sub-Saharan

Africa. The world economy has continued to evolve, of course, and African economies have distinctive characteristics, but there are still insights to be gained from the past. Today's high-income countries followed roughly a common pattern of economic transformation, though with wide variations in the pace and emphasis of the transition. At first, most employment and output is in agriculture, a sector with relatively low labour productivity. As a country develops, agriculture's relative importance declines, ultimately to less than 5% of jobs and activity. This is accompanied by a rise and then, at a more advanced stage of development, a decline in the share of manufacturing, in an “inverted U” pattern. The share of services rises throughout, and the pace

of increase appears to accelerate at later stages. The shift of jobs from low- to high-productivity sectors boosts the overall productivity of the economy, and is accompanied by large increases in productivity within each sector as well.

The deeper forces underlying this pattern include changes in consumer preferences and spending priorities that occur as incomes rise, such as a long-term decline in the share of consumer budgets spent on food. Different rates of productivity growth across sectors also have an effect.

Today’s developing countries appear to be mostly following the historical pattern, but with some distinctive differences. Per capita incomes in most developing countries today are far from converging to those in developed countries. Observers note that the limited number of countries that have made this convergence since 1950 have generally done so accompanied by rapid growth in production and exports of manufactures (leaving aside some economies with abundant natural resource wealth). But more recently, many developing countries have faced a problem of “premature de-industrialisation”, struggling to sustain growth in manufacturing, perhaps due to sharply increased competition in global and domestic markets.

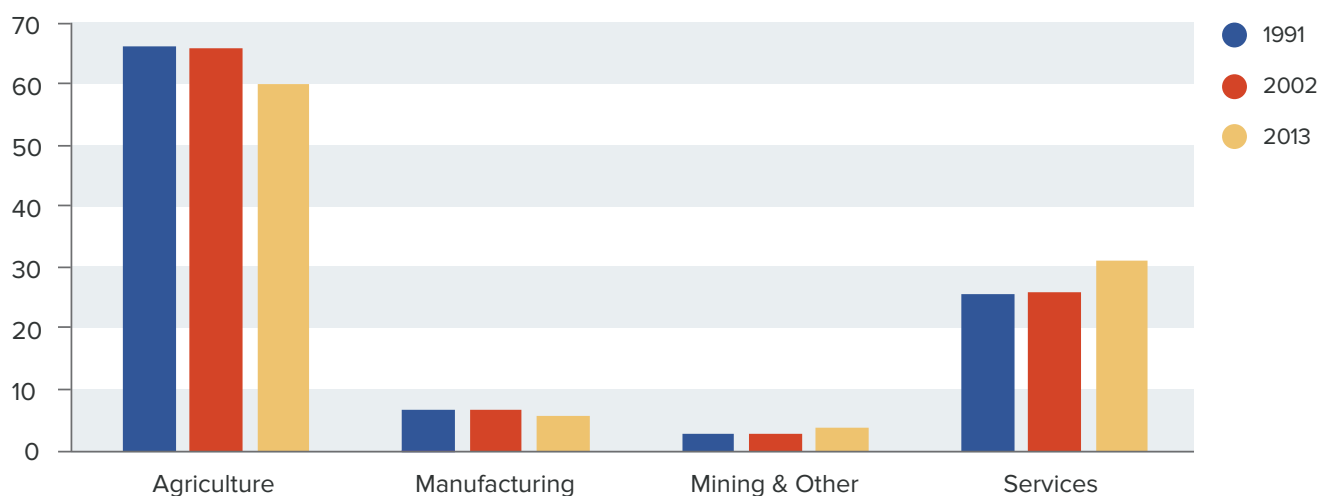
Sub-Saharan Africa has experienced relatively limited economic transformation so far. Notably, around 60% of employment is still in agriculture, much higher than in other regions, while the share

of employment in manufacturing is only about 5%, the lowest in the world (Figure S4). The *potential* for economic transformation is nonetheless very large, for two reasons. First, there continue to be huge gaps in productivity across sectors. The fact that so many workers remain in agriculture indicates a considerable scope for growth through structural change (see Figure S5). Sectors with significant job growth potential such as manufacturing, construction, and wholesale and retail trade are five or more times more productive than agriculture. Labour productivity in mining and utilities, the highest-productivity sector, is almost 30 times greater than in agriculture, although it generates relatively few jobs. Second, productivity within sectors also remains far lower than in advanced countries, or even other developing regions. This indicates a large potential for within-sector growth, by absorbing more advanced ideas and technologies from abroad.

Fortunately, economic transformation is already beginning to play a more significant role in African development. By one estimate, structural change – changes in the share of employment in different sectors – added about one percentage point to economy-wide productivity growth in recent years, mostly as a result of a shift in the share of employment from agriculture to services. The contribution of structural change was as high as 4 percentage points for Rwanda, and 2–3 points for Nigeria, Tanzania and Uganda. Faster within-sector productivity growth added another percentage point to overall productivity growth.

Figure S4

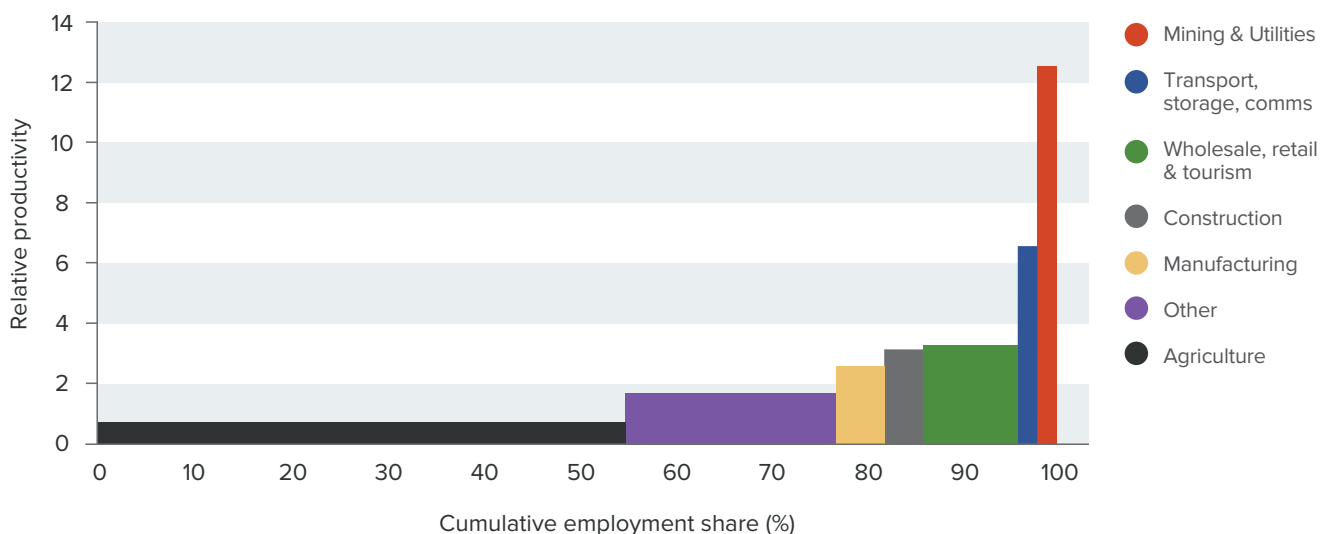
Sub-Saharan Africa: Sectoral shares in employment (% of population)



Source: Martins (2015) and author calculations.

Figure S5

Sub-Saharan Africa: Relative sectoral labor productivities - 2013



Source: ODI (2016).

Sub-Saharan Africa's miniscule role in world trade provides further insight into the extent of economic transformation in these countries. The region accounted for only 1.9% of global exports of goods and services in 2014. Three quarters of merchandise exports in 2011–2013 were primary commodities (mostly fuel and minerals, together with lesser amounts of food and agricultural raw materials), a proportion that has not changed much in recent years. Sub-Saharan Africa's share of global manufactures exports, meanwhile, was only 0.9% in 2012–2014. An optimistic view is that the global manufactures export market is so large (US\$13 trillion in 2014) that an increase in sub-Saharan Africa's share even by a few tenths of a percentage point could provide a significant boost to these countries' economic transformation and growth.

The climate challenge in sub-Saharan Africa

Economic transformation in sub-Saharan Africa is occurring in a context of increasing climate change. Sub-Saharan Africa is already experiencing more significant impacts of climate variability and change than many other regions, a trend which is expected to continue and intensify.

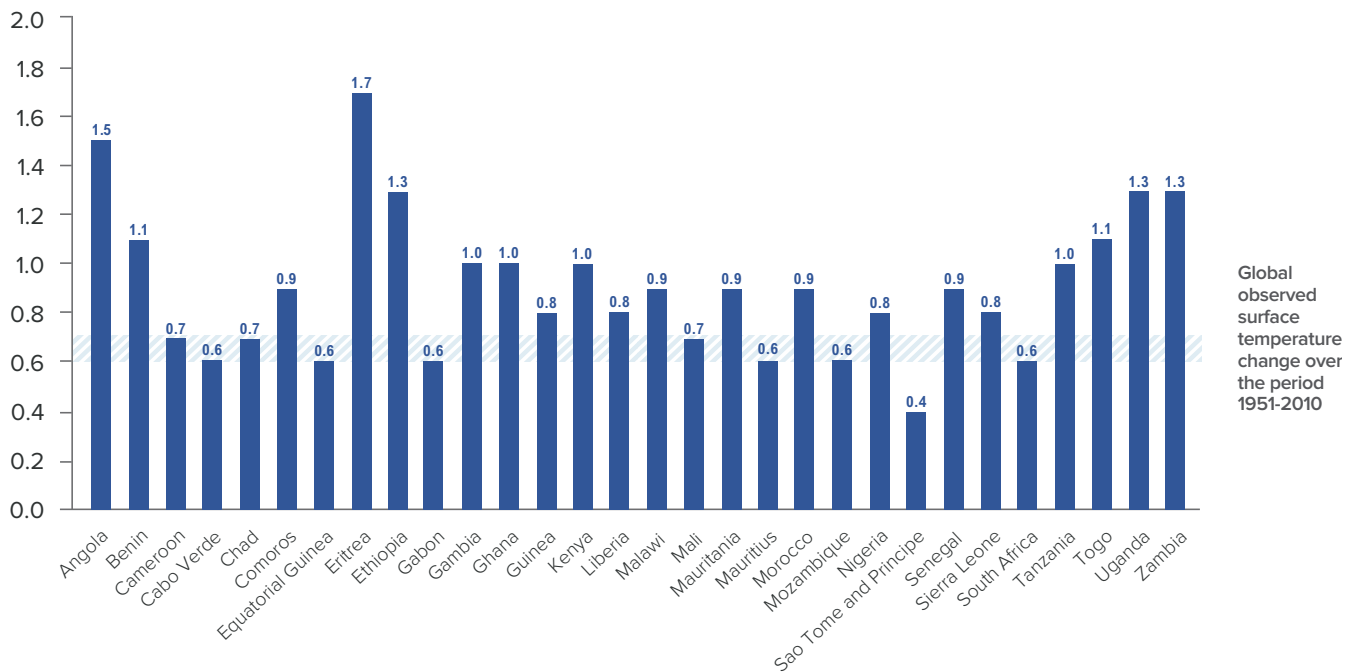
African climates have historically been highly variable, on scales that can be seasonal, inter-annual, decadal, and longer, driven by complex natural processes and, increasingly, by the impact of human activities at the

global level. And the region is warming faster than the world as a whole. Already, warming in two thirds of a sample of 30 sub-Saharan African countries exceeds the global mean surface annual temperature increase of 0.6–0.7°C above pre-industrial levels. Over a third of the sample have seen increases of 1°C or more (see Figure S6). This pattern of above-average warming is expected to continue. Under a high-emission pathway in which the Intergovernmental Panel on Climate Change (IPCC) foresees world average warming of 4°C above pre-industrial levels by 2100, warming in parts of western and southern Africa could be as much as 6°C. Projections for rainfall are highly uncertain, but many parts of the region are expected to experience more frequent and intense droughts and floods.

How climate impacts are felt in sub-Saharan Africa varies greatly by location. The region has three very different major climate types: arid climates, including desert and steppe subtypes, which are found in parts of west, east and southern Africa; tropical climates, including rainforest, monsoon and savannah subtypes, which cover large parts of west, central and east Africa; and temperate climate zones, found primarily in southern parts of the region. This means there can be no "one size fits all" strategy for adapting to climate change (or economic transformation) in sub-Saharan Africa, particularly in agriculture. Widely varying regional and local conditions must be taken into account.

Figure 6

Observed mean annual temperature change in selected African countries since 1960



Source: UNDP Climate Change Country Profiles (various dates).

The economic impacts of climate change in sub-Saharan Africa are generally expected to be significant, both because of the extent and severity of the physical impacts, and because of the region's high vulnerability to climate change. The latter, in turn, is due both to the region's greater exposure and sensitivity to climate change, and to its relatively low adaptive capacity. As noted earlier, a large share of employment is in agriculture, which is most exposed to climate change and, in sub-Saharan Africa, is mostly rainfed and has a weak technical basis. The region also has high poverty, and the poor are very vulnerable to shocks such as droughts that ruin crops or extreme events that destroy their meagre assets. Closely related to this is the region's low adaptive capacity, both within households and in terms of countries' institutional, technological and financial capacity to take actions to limit the damage from climate change.

Model-based studies of the global impacts of climate change thus often find Africa to be the worst-affected region in terms of economic impacts. A survey of such studies – which often vary considerably in their coverage, assumptions and techniques – indicates a median loss in sub-Saharan Africa's GDP or welfare of around 4%, although with a very wide range, including

significantly worse outcomes. These scenarios typically do not consider the possibility of the climate system being pushed past a tipping point, unleashing irreversible and catastrophic changes. The economic implications of catastrophic climate scenarios are not well understood, but needless to say, they would be severe for Africa and the world.

The largest economic impacts of climate change in sub-Saharan Africa are expected to be on agricultural crop yields and output, especially in the poorest countries. Rainfed agriculture is particularly vulnerable, as it is highly sensitive to changes in rainfall and to droughts and floods. Many crops, for example wheat and soybeans, are also already close to their thermal tolerance limits, so that even a few days of extreme heat can lead to significant output losses. More sustained heat waves and droughts can reduce the growing season or even force some areas out of production. Estimates suggest that yield and output losses for major crops could be 20–30% or more by 2050. The impact of these losses on the overall economy are magnified by the large share of agriculture in African employment and output.

High temperatures also affect mortality, prenatal health and human health generally, through such avenues as heat stress and worsening of pre-existing respiratory and cardiovascular conditions. The incidence and severity of water-borne diseases such as cholera and vector-borne diseases such as malaria are expected to increase in some places. A study of 28 African countries found that climatic conditions increase infant mortality through two channels: temperature and rainfall conditions that encourage malaria, and droughts, which increase maternal malnutrition. Another study found 10 of 20 countries most at risk from extreme weather events such as storms, floods, heat waves and droughts are in sub-Saharan Africa, as are eight of the 20 countries most at risk from sea-level rise, which can affect water supply, among other impacts.

All these impacts are expected to be felt disproportionately by the poor, and with large numbers of people in sub-Saharan Africa living near the poverty line, even relatively small shocks can push people back into poverty and keep others from rising out of it. Chapter 3 reviews evidence on the extent to which the poor are more seriously affected by a range of weather- and climate-related shocks. For example, research shows that reduced nutrition and health care spending during droughts have short- and long-term impacts, particularly on children, affecting height, body mass and other health characteristics. School enrolments and school starting and completion rates are also adversely affected, with long-term impacts on earnings.

Notably, while sub-Saharan Africa is the region likely to be worst affected by climate change, it is itself the smallest regional contributor to global greenhouse gas (GHG) emissions. Although in 2012, the region housed 12.5% of the world's population, its GHG emissions (including those from land use change and deforestation) were about 3 billion tonnes of CO₂ equivalent (Gt CO₂e) – around 6.5% of global emissions.

The composition of sub-Saharan Africa's GHG emissions is closely tied to the structure of its economy and level of development. Emissions from agriculture, wastes, land use change and forestry make up 64% of total GHGs in the region, versus 21% globally. A large share of GHG emissions in sub-Saharan Africa involves methane and nitrous oxide emissions from livestock, waste and agricultural processes, as well as carbon emissions from land use change and deforestation.

The latter are driven by expansion of agricultural lands, logging, and widespread use of wood as fuel.

Given sub-Saharan Africa's low industrial development and low per capita energy consumption – a little over one third of the average for the world as a whole – its share of emissions from energy and industrial processes is also relatively low: around one third, compared with 80% globally. However, sustained business-as-usual economic growth could drive up emissions in coming decades, particularly if the region gets locked into high-emission infrastructure in the course of economic transformation.

Linking economic, social and environmental transformations

The past 15 years' economic, social and environmental developments in sub-Saharan Africa provide countries with extensive new insights and lessons, both positive and negative. Given the significant external shocks and the growth slowdown experienced in 2015–2016, and the continued volatility in the global economy, this is an excellent time for leaders in the region to take stock, survey emerging challenges, and formulate new policies to boost sustainable, inclusive growth. We suggest focusing on three broad objectives: to achieve robust long-term growth by accelerating economic transformation; to promote rapid poverty reduction and social inclusion; and to strengthen resilience to climate and other environmental shocks and to better manage human impacts on the environment, including GHG emissions.

As African leaders draw lessons from experience and formulate policies for the future, it is important to take account of the close links between economic, social and environmental priorities, rather than addressing each separately. As we stress throughout this report, there are numerous opportunities to design policies that can help manage trade-offs and yield benefits across multiple areas. Given that some of the most important trends – economic transformation, demographic transition, urbanisation and climate change – will also continue to play out over decades, if not longer, good policies can set off “virtuous circles” that yield major cumulative benefits over the long run.

Box S2 and Exhibit S1 provide a simple conceptual framework to visualise some of the key links between economic transformation and social and environmental change in sub-Saharan Africa.

Box S2:

A framework for understanding economic transformation and social and environmental change

Exhibit S1 visualises key links between major economic, social and environmental changes. It distinguishes between economic and social change, on the left, and environmental change on the right. Environmental change is driven both by human actions and by natural processes, such as seismic and volcanic activity and changes in the seasons. Over time, the relative role of human activity in environmental change has grown enormously.

As shown in Exhibit S1, *economic transformation*, and its connection to *inclusive growth*, is at the heart of our discussion of economic and social change. Structural change and within-sector productivity growth determine the pace of labour productivity growth in the economy as a whole. That, in turn, is a major factor in the pace of poverty reduction. Further, the relatively low responsiveness of poverty rates (“elasticity”) to growth in sub-Saharan Africa appears to be related to limited structural change, natural resource dependence in many countries, high inequality, and more severe climate change impacts.

Policies and institutions are crucial to the success of economic transformation and inclusive growth, and in managing their interaction with social and environmental changes. These include both fundamental (“non-selective”) policies with economy-wide effects, and specific (“industrial”) policies which target key market failures and support the emergence of new modern sectors. We focus in particular on successfully leveraging agriculture as a foundation for economic transformation, and on diversifying economies into manufacturing and other high-productivity modern sectors, as discussed further below (and in Chapters 4 and 5, respectively, of the main report).

We highlight two other socio-economic processes deeply linked with economic transformation and inclusive growth. The first is *demographic change*. As noted in Box S1, a more rapid moderation of fertility, accompanied by policies that support rising employment and investment, could have significant benefits for growth, poverty reduction and the environment. The second process is *urbanisation*. Although sub-Saharan Africa is still among the least urbanised regions, at only 38%, by 2050 it is expected to be almost 55% urban. As discussed below (and in Chapter 6), just how this urbanisation occurs will have profound implications for the region’s economic transformation, energy consumption, GHG emissions, and ability to adapt to climate change.

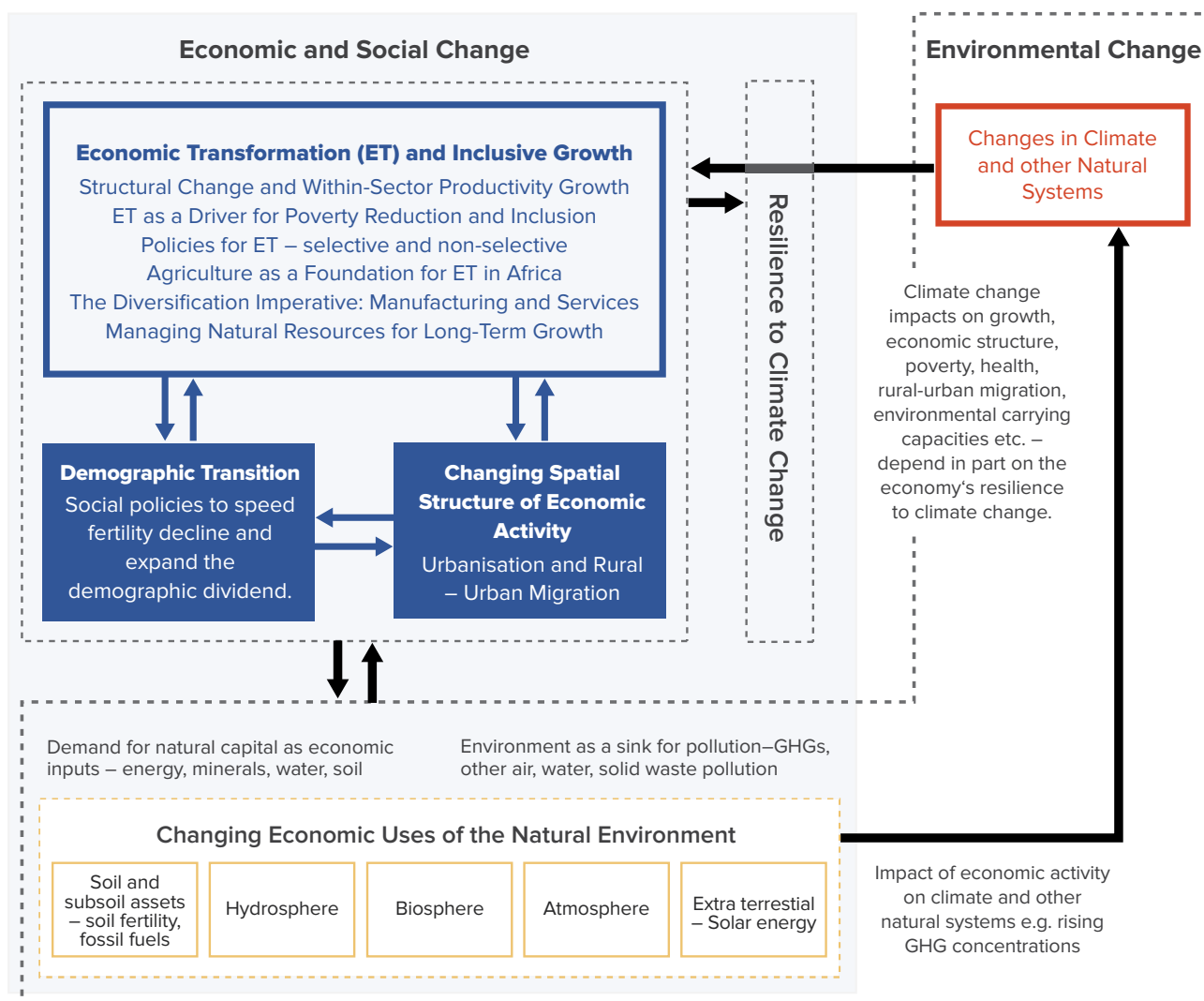
As Exhibit S1 indicates, all these economic and social changes are occurring in the context of increasing climate change impacts. The economic and social implications of those impacts depend both on the magnitude of physical impacts and on people’s – and economies’ – resilience to climate change. Resilience, in turn, depends to a great extent on whether economic transformation and inclusive growth are able to reduce climate sensitivity and strengthen adaptive capacity; targeted policies and investments will also be needed to address other drivers of vulnerability.

The last link of Exhibit S1 is the impact of economic and social change on natural capital, that is, on the capacity of the natural environment to provide an array of resources and services that are vital for the economy and human welfare. These include resources and services that we directly consume or use as inputs in production (soil, water, energy and mineral resources, biodiversity, clean air and so on); the use of the environment as a sink to absorb various kinds of pollution, including GHG emissions; and as a source of amenity values, for example enjoyment of natural beauty. Many economic interactions with the environment are subject to market and institutional failures, resulting in wasteful or inefficient outcomes that reduce human welfare, for example excessive air pollution, GHG emissions or biodiversity loss.

Economic transformation and growth tend to increase demands on natural capital, although the extent of this impact depends greatly on the structure of the economy, on income levels and consumer preferences, and on the level and pace of technological progress. Economic policies and institutions can have a large impact in either alleviating or exacerbating environmental damage. Major stresses on natural capital in sub-Saharan Africa today include expanding agricultural land use, deforestation, land degradation, and water scarcity, among others. We discuss the potential for economic transformation, technological progress and better policies to alleviate several of these stresses later in the report. Looking ahead, more rapid economic transformation and growth are likely to sharply increase demand for energy services in sub-Saharan Africa, which, unless it is well managed, could drive a rapid rise in harmful spillovers from energy consumption, such as local air pollution and GHG emissions. As we discuss below and in Chapter 7 of the report, policy and institutional reforms can help manage these trade-offs, by increasing incentives for energy efficiency and by exploiting sub-Saharan Africa’s abundant clean energy resources.

Exhibit 1.

A framework for understanding economic transformation and social and environmental change



We apply the conceptual framework summarised in Box S2 and Exhibit S1 throughout this report. Here we sketch a few examples of how it is important to take into account the close links between economic, social and environmental trends and policies in framing the overall development strategy.

Take, for example, the importance of economic transformation for adaptation to climate change. Because of long lags in the climate system, even strong global action to reduce GHG emissions would have little impact on climate change over the next 10–20 years. This means sub-Saharan Africa should expect impacts to escalate over the next two decades, and prioritise efforts to reduce its vulnerability to those changes that are already “in the pipeline”.

Africa’s high exposure to climate change and low adaptive capacity are both closely tied to its high poverty levels and heavily agrarian economies. Thus, there is a strong argument that the best way to strengthen resilience to climate change is to foster rapid economic transformation and strong, inclusive growth, provided that it is sustainable and buttressed by targeted public investments and adaptation programmes.

Rapid economic transformation can set in motion many virtuous circles or positive feedback loops. Technological advances and productivity growth in agriculture reduce rural poverty and vulnerability to climate shocks. They also stimulate growth

in industry and services and release labour from agriculture (the sector most vulnerable to climate change) into these higher-productivity and more resilient sectors. Social policies to accelerate the demographic transition help reduce poverty without increasing overall pressure on natural resources. Rising incomes strengthen adaptive capacity, enabling farmers, for example, to adopt more productive and resilient “climate-smart” agricultural techniques.

With faster growth, governments also have more resources to undertake key adaptation investments. Although adaptation is primarily undertaken by private actors, to reduce their own vulnerability to climate risks, market failures can hinder those actions, and some measures – such as ensuring that infrastructure is robust to climate impacts, or raising awareness of adaptation options for local farmers – require public investment. Government actions to tackle these issues can advance both adaptation and development. For example, public investments to increase agricultural research and development, extension services and rural infrastructure can boost productivity while also reducing vulnerability to climate change.

Similarly, although sub-Saharan Africa contributes relatively little to global GHG emissions, countries have good reasons to adopt a low-carbon and sustainable growth pathway. This is because many policy and investment options would advance economic transformation and development while also reducing GHG emissions and reducing stress on natural resources. These are actions countries can take for purely self-interested reasons. For example, urban policy and infrastructure choices can help make cities more compact, well-connected and coordinated, and thus bolster productivity in industry and services while also achieving greater energy efficiency, improved air quality, better health and lower GHG emissions. Similarly, energy subsidy reforms and well-designed energy taxes can promote multiple objectives in addition to moderating GHG emissions growth, such as greater economic and energy efficiency, reduced local air pollution and more government revenue to help fund high-priority projects, cut other taxes, reduce deficits, and provide social protection measures to shield the poor and most vulnerable from the impact of higher energy prices.

A third example of how multiple goals can be achieved together involves social policies that increase gender equality. Such an outcome directly raises women’s inclusion and welfare, and also benefits economic

productivity – for example by breaking down barriers to education. Greater female education and gender equality have an important effect in moderating fertility, which helps generate a demographic dividend for growth.

Priority sectors for action

Along with looking comprehensively at economic transformation and social and environmental change in sub-Saharan Africa, this report focusses more closely on four priority areas: modernising and improving agriculture and land use; diversifying economies into manufacturing and other high-productivity sectors; managing urbanisation; and accelerating the transition to modern, sustainable energy. In this section, we briefly summarise our analyses.

Modernising and improving agriculture and land use

Agriculture may be the least productive sector in sub-Saharan African economies, but it is still vitally important. It provides around 60% of employment. Over 60% of the population – more than 600 million people – lives in rural areas, and the proportion grows at close to 2% a year. Poverty is disproportionately concentrated in rural areas, which are also the areas most affected by climate change. Boosting the productivity and climate resilience of agriculture is thus crucial to the well-being of the majority of people in sub-Saharan Africa. Agriculture, land use change and deforestation are also the largest source of GHG emissions.

Sub-Saharan African governments and donors engaged in the region increasingly recognise the importance of agriculture, and have given it greater priority since the early 2000s, after a long period of neglect. This is reflected, for example, in the African Union’s adoption of the Comprehensive African Agricultural Development Programme (CAADP) in 2003. Donor aid flows, public investment and civil society outreach efforts have picked up.

Yet recent trends in African agriculture present a mixed picture. Productivity remains far below other regions: cereal yields are a quarter of those in developed countries, and only half those in South Asia, the second-least productive region (see Figure S7). Cereal production growth did almost double in 2001–2013 compared with the previous two

decades. However, while some of that was due to yield improvements (Figure S8), about half of cereal production growth continues to derive from an expansion in cropland of about 2% a year, much faster than the global rate. Growth in livestock herds has also accelerated, to around 3% a year in the 2000s from 2% in 1981–2000.

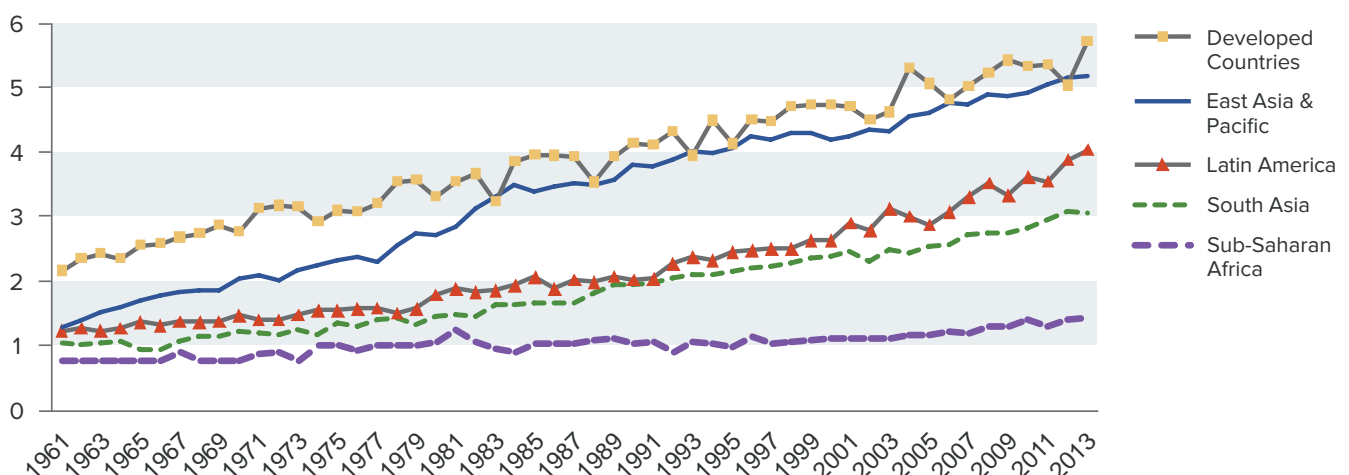
Key drivers for the expansion of agricultural land include rapid population growth, low yields, and soil degradation and depletion of nutrients, which requires farmers to fallow their fields and shift to other land. The impacts on the environment can be severe. First, expansion of land for arable and pastoral uses accounted for 70% of deforestation in sub-Saharan Africa between 2000 and 2010. In addition to loss of biodiversity and ecosystem services, the net loss of forest carbon due to deforestation and forest degradation is the biggest source of GHG emissions in the region, over 30% of the total. Worldwide, five of the top 10 countries with the fastest acceleration in tree cover loss in 2001–2014 were in sub-Saharan Africa, and the region is already a notable contributor to global GHG emissions from deforestation and land use change. It is important to protect what remains; tropical rainforests in Central and West Africa and Madagascar contain 90% of the region’s terrestrial stock of carbon.

Agricultural land expansion also exacerbates vulnerability to climate change and puts pressure on the fragile natural resource base in the region’s vast drylands. Drylands – defined as arid, semi-arid and dry sub-humid zones – account for three quarters of sub-Saharan Africa’s cropland, including two thirds of cereal production and four fifths of livestock production. These areas already suffer frequent and severe climate shocks, including droughts. With rapid population growth, the number of people living in the drylands of West and East Africa is expected to increase substantially by 2050, while dryland area itself is expected to increase by 20% due to climate change.

Agriculture’s role in economic transformation has been described as a paradox. Even as the share of agriculture in employment and output shrinks in the long run, productivity growth in this sector and rising rural prosperity have historically played an important role in stimulating the growth of the non-agricultural and urban sectors, and in economic transformation overall. Rising output and income in agriculture provides food, agricultural raw materials, labour and savings as inputs for the non-agricultural sectors, as well as growing markets for the output of those sectors.

Agricultural growth plays an especially powerful role in poverty reduction; surging agricultural productivity

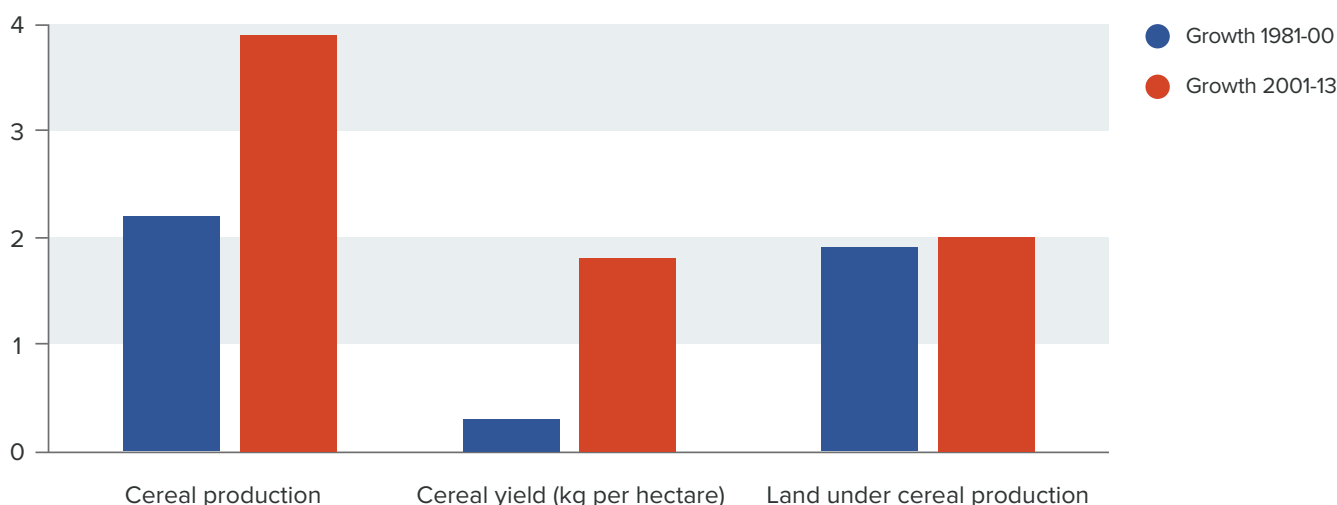
Figure S7
Cereal yields 1961 - 2013. Tons per hectare



Source: World Bank World Development Indicators.

Figure S8

Sub-Saharan Africa: cereal production growth (annual average percent change)



Source: World Bank World Development Indicators.

helped kick-start China’s rapid growth and poverty reduction after 1979.

Drawing on this historical experience, African countries need to build on recent positive trends to sustain robust growth in agricultural output and incomes as a powerful foundation for poverty reduction and economic transformation. This should be achieved through intensification to boost yields per hectare, combined with climate-smart agriculture techniques. Progress in bioscience and agronomics provides substantial opportunities for sub-Saharan Africa countries to achieve “triple wins”: higher farm incomes, increased resilience to climate change, and reduced GHG emissions (including greater carbon storage in soil, plants and trees).

New, more productive drought- and pest-resistant crop varieties and better practices for soil, water and nutrient management are already improving productivity – for example, the System of Rice Intensification (SRI) developed in Madagascar. In addition to these farm-level innovations, there are also broader “landscape” approaches based on cooperative actions to better manage soil and water across many farms. Many of these interventions involve planting trees on farmland (“agroforestry”), which not only provide valuable products such as fruit and timber, but also help to hold and restore soils, retain water, provide windbreaks, and help sequester carbon. Better grassland management practices, improved

livestock diets and better breeding practices help raise livestock productivity while moderating animal GHG emissions growth.

Diversifying economies into high-productivity modern sectors

Although economic transformation in sub-Saharan Africa has been slow to get started and is still at an early stage, there are some reasons to think that countries in the region are now well positioned to make robust advances into manufacturing, and to diversify their economies more generally. Thanks to changes in technology and the rise of global production networks, countries can now achieve many of the benefits of traditional export-oriented manufacturing through a wider range of activities, including internationally tradable services and high-value-added agriculture. Rising wages in China create a competitive opportunity for manufactures exporters in less developed, lower cost economies.

As noted above, rising agricultural productivity, backed by supportive policies, can help build a more vibrant domestic market for manufactures and services. Macroeconomic stability, a basic precondition for strong investment and innovation, has also improved in the region. The manufacturing sector is smaller than it used to be, but it is more productive and has demonstrated its ability to operate in a more competitive post-liberalisation environment. Examples

of significant successes in manufactured exports are starting to appear, albeit from very small starting positions, – for example, in Ethiopia (Figure S9) and Tanzania.

The sharp devaluation of real exchange rates in many African countries in 2015 and 2016 should provide a large boost for manufacturing competitiveness and exports. While global economic conditions are volatile and uncertain, Africa’s share of world manufactured export markets is so tiny – less than 1% – that even modest increases in its world market share can have a big impact on the sector’s growth, even in an uncertain or sluggish overall global economy.

A more diversified economy will also be more resilient to climate change, with fewer poor people and less dependence on agriculture, the most climate-vulnerable sector. As we discuss below, these structural changes will boost the economy’s demand for energy. But there is much that can be done to moderate potential increases in GHG emissions, local air pollution and other adverse side effects from energy use in ways that improve economic efficiency and yield other co-benefits for welfare. Especially important in this regard will be efforts to promote compact cities with energy-efficient urban infrastructure, and to transition over time to clean power sources.

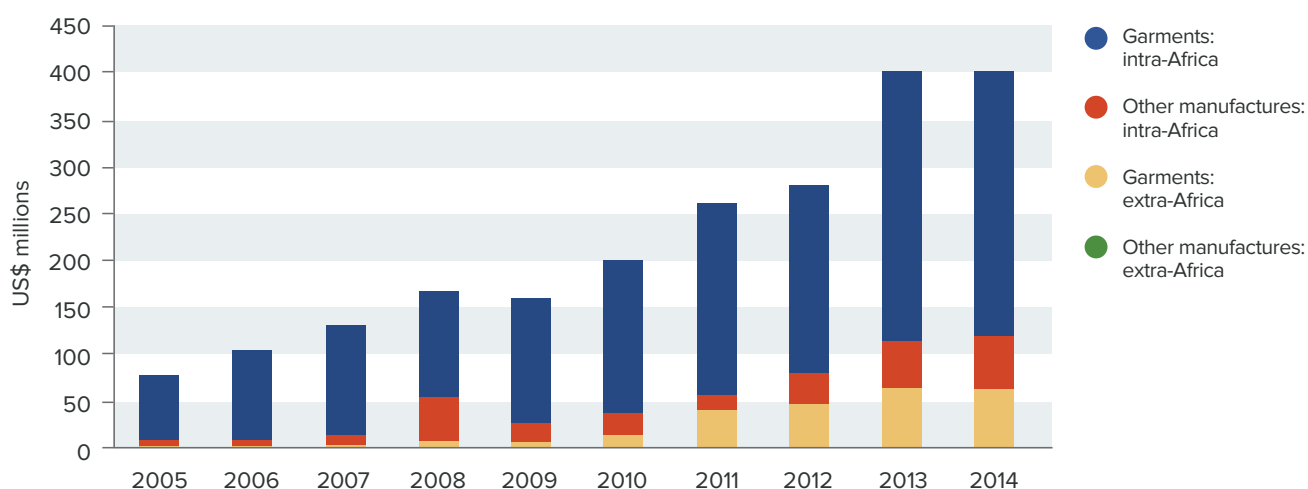
Empirical studies using firm-level data document the significant underperformance of sub-Saharan Africa manufacturing firms relative to firms in other regions in terms of productivity, exports and

investment. But they also suggest that such gaps are quite well explained by Africa’s weaknesses in basic fundamentals such as infrastructure, access to finance, the business environment and skills. The most important infrastructure constraint is commonly found to be electrical power.

Productivity in manufacturing and other modern sectors in sub-Saharan African countries is also held back by significant resource misallocation *within* these sectors. Such misallocation is reflected in large differences in firm productivity within sectors, and a typical market structure in which a few large firms dominate market share, accompanied by a “long tail” of many very small, low-productivity firms. Reforms to increase competition could significantly increase productivity by encouraging greater entry and expansion of high-productivity firms, combined with exit of low-productivity ones.

Important as they are, such broad-based policies do not necessarily tackle all of the obstacles to diversification, which also include key market and coordination failures, such as information gaps and failures in credit, insurance, labour and other markets. As a result, it is increasingly accepted that there is a case for more selective industrial policies which target such market failures and support the emergence of new, modern economic sectors, although there are often significant practical difficulties in implementing such policies successfully.

Figure S9
Ethiopia manufactured exports, 2005-2014 (\$millions)



Source: Ansu et al. (2016).

A key area for more focused policy action is to promote geographical agglomeration and clustering of firms as a way to increase exports of manufactures and boost productivity. Competitive real exchange rates are important to help development of tradable goods industries. Transaction costs for exporters need to be cut. This can be done through reform of customs and tax procedures, for example, and by cutting logistics costs. In Africa, with its many small economies, efforts to cut regional trade barriers take on special importance.

More focused instruments to foster agglomeration, such as Special Economic Zones (SEZs), have been tried before, but without much success, because countries failed to put in place the essential infrastructure and policies needed to attract a critical mass of investors, including foreign investors. Past failures with SEZs and programs to promote foreign direct investment (FDI) need to be analysed and fixed. Specialised R&D and technical extension services can help overcome market failures that discourage firms from searching for and adapting new foreign technologies to local conditions.

Still, African economies can face considerable problems in implementing selective industrial support policies, because of their limited administrative capacity and challenging political economy conditions. They may have difficulties identifying which sectors to support, and such policies may be captured by private interests through corruption and rent-seeking. Since such problems can affect governments even in developed countries, a cautious approach is warranted. Nevertheless, there is a growing body of experience on ways to address these issues, such as by insisting on high levels of transparency and accountability, establishing clear market-based performance criteria, ensuring competition, and building strong networks including government, the private sector and civil society to identify targets and policies.

Making the most of urbanisation

As noted above, sub-Saharan Africa is still among the least urbanised regions, with 37% of the population living in cities – although this is up from 22% in 1980 and is expected to breach 50% by 2050. More striking is the rapid absolute growth in the urban population, which grew at 4.4% a year in 1980–2014, much faster than in other regions. By 2050, sub-Saharan Africa's cities will increase by almost 800 million people, nearly half of the projected rise in numbers of urban dwellers globally.

Ideally, economic transformation and urbanisation are mutually reinforcing. When economic transformation is under way, the growth of industry and services generally favours urbanisation, since these sectors are much less dependent on land as an input than is agriculture. They are also more able to benefit from *agglomeration effects*, the large increases in productivity that can come from clustering together economic activity in cities. But this is not automatically the case; opportunities can be missed due to inadequate governance, planning or critical public goods.

Urbanisation in sub-Saharan Africa has been something of a missed opportunity so far. Urban growth has not, for the most part, been accompanied by economic transformation – a phenomenon sometimes called “urbanisation without growth”. This appears to be due to policy and institutional weaknesses that failed to provide an enabling environment for rapid economic growth in cities, even as other factors encouraged rapid growth in urban population.

In particular, the rapid growth in sub-Saharan Africa's urban population is linked to a sharp decline in mortality rates in cities, particularly infant mortality, without an accompanying decline in fertility rates. As a result, urban youth dependency is very large and the urban working age population relatively small. Natural population increase contributed close to three quarters of overall urban population growth in a sample of African countries in 1960–2010. Migration from rural areas, driven in part by climate-related shocks such as droughts, has also increased the urban population.

The result is that many cities now have large numbers of unemployed youth. And with limited structural change, around 60% of urban employment and over 90% of new jobs are in informal activities. Analysts also note that primary commodity booms and government policies have channelled the spending of natural resources revenues to urban areas, creating “consumption cities” rather than “production cities”.

Cities in sub-Saharan Africa also have features that hinder agglomeration effects and economic transformation. For example, many have low population density and a large amount of sprawl, due in part to lack of governance and urban planning capacity, as well as rapid urban population growth itself. Population density in a sample of 12 African cities is only around half that in Southeast Asian cities. In many cases, cities' physical footprints are growing faster than their populations. The footprint of Kampala, for instance, has been growing by more than 10% a year, while population has grown by 4.3%.

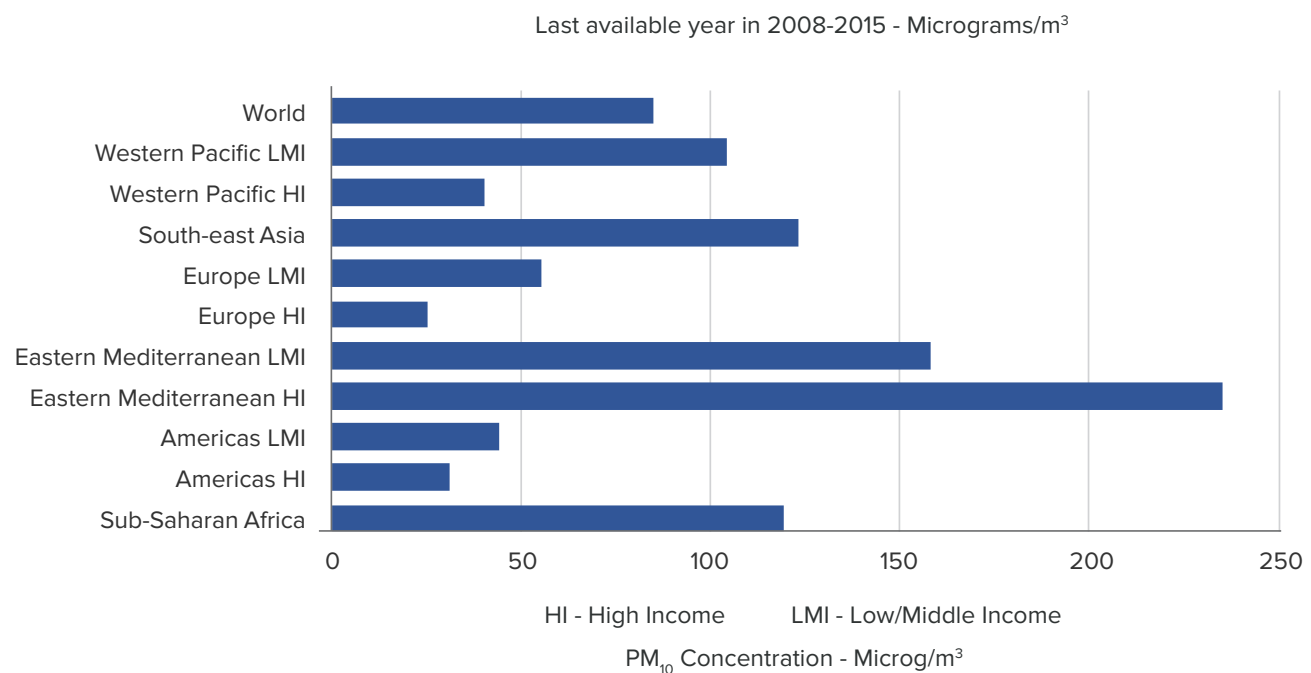
Haphazard land regulation, insecure land tenure arrangements and weak housing finance institutions lead to dysfunctional housing markets and lack of affordable, multi-story housing. More than 60% of Africa’s urban population lives in informal settlements or slums, often far distant from city centres. Although car ownership is low, public transit options are also limited, so people rely commonly on private minibus services for transport. Many cities already suffer from severe congestion, long travel times, high road fatality rates, low energy efficiency, rising outdoor air pollution, and rising GHG emissions. The WHO notes that urban air pollution data for the region remain sparse, covering only about 20% of countries. However, the available data reveal particulate matter (PM) pollution already higher than the world median (Figure S10). Premature deaths attributable to outdoor air pollution are still relatively low in Africa – around 176,000 in 2012, or 20 per 100,000 population, compared with around 100 per 100,000 in developing countries of East Asia, but they are rising.

Urban sprawl also magnifies the cost of providing urban infrastructure, which has to be built over larger

areas per inhabitant served. Weak city governments lack the fiscal resources to tackle deficits in urban infrastructure and public services. Even capitals such as Nairobi and Dakar have only US\$10–15 per year per inhabitant for capital expenditures, and most cities have much less. Given the very limited budgets available to cities, sprawl means some areas will get only inadequate basic services, or none at all. Across the region, 60% of urban populations lack access to improved sanitation services, and 28% lack access to electricity; even those with power connections experience frequent outages.

With climate change, more intense and variable rainfall is also increasing the threat of flooding in cities – a problem exacerbated by the growing number of people living in slums in peri-urban areas. Poorly planned coastal cities are also particularly vulnerable to sea-level rise. Migration from rural areas to cities will increase as climate stresses increase in agriculture and rural areas, increasing pressure on inadequate services and stimulating more slums and urban sprawl.

Figure S10
Outdoor air pollution –PM₁₀ concentration by region



Source: WHO Global Urban Ambient Air Pollution Database (Update 2016).

Accelerating sub-Saharan Africa's modern energy transition

More rapid economic transformation, growth and poverty reduction in sub-Saharan Africa will generate a substantial increase in demand for energy services, to meet the fast-rising needs of households, industry and the broader economy. Sub-Saharan Africa now accounts for less than 5% of the world's primary energy demand, compared with the OECD and China's respective 37% and 22% shares. Sub-Saharan Africa's per capita energy consumption is 15% of that in OECD countries.

Electricity consumption is even more limited – 512 kWh per capita in 2012, 17% of the world average and only 6% of OECD levels. This is less than needed to power a 50-Watt light bulb continuously. More than 620 million people lack access to electricity altogether, and nearly 730 million rely on the traditional use of solid biomass for cooking.

The African growth recovery in the 2000s has driven faster energy consumption growth, 3.2% a year in 2001–12, up from 2.3% in the 1990s. Going forward, sub-Saharan Africa's energy consumption growth is likely to accelerate, not only in line with faster economic growth, but also because of structural

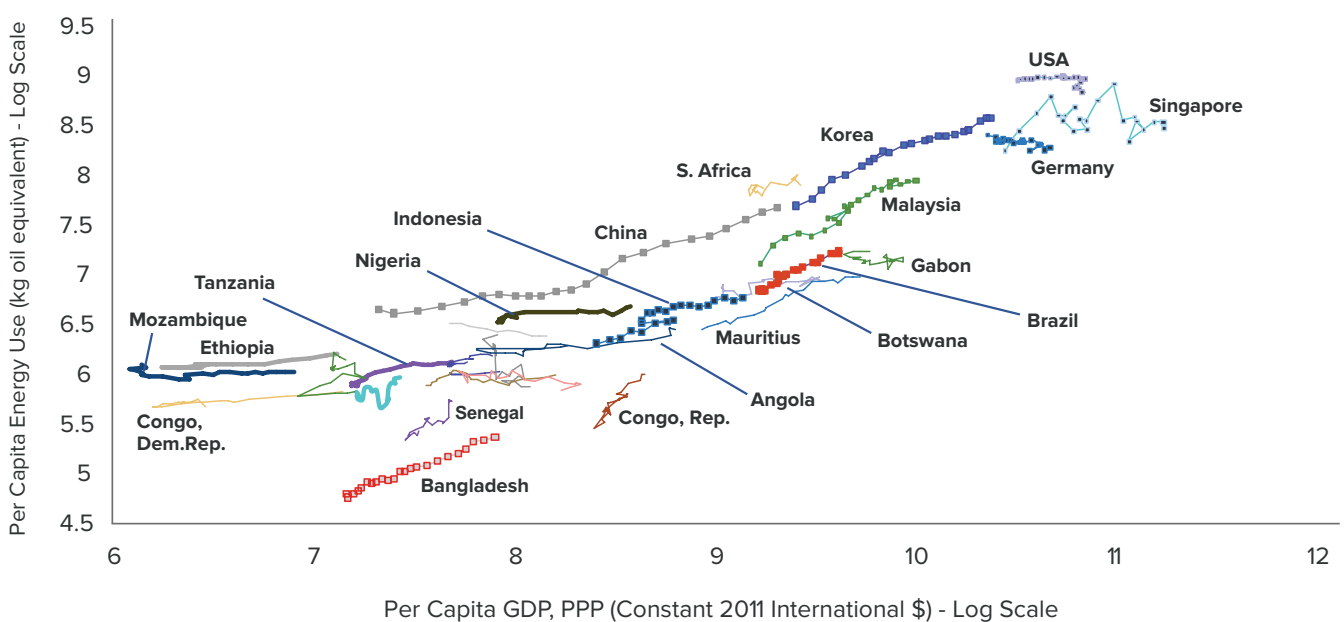
changes in the economy. Historically, energy demand in low-income countries has tended not to be very responsive (elastic) to income growth, but as countries rise to the middle-income level, energy demand rises more rapidly, sometimes even faster than the economy itself. It only begins falling off again when countries reach high income levels.

As sub-Saharan Africa's economic transformation gathers strength, households that lacked access to modern energy services are likely to increasingly expect them, and a growing manufacturing sector and other businesses will need reliable energy supplies to operate and grow. Figure S11 illustrates the patterns of economic and energy demand growth in sub-Saharan Africa and selected countries in other regions, while also showing the wide variations in per capita energy use across countries at the same per capita income level.

Two key factors that are likely to bolster energy demand during sub-Saharan Africa's economic transformation are the shift from less energy-intensive traditional agriculture into more energy-intensive industry and (to a lesser extent) services, and urbanisation. Urbanisation entails a generally more energy-intensive pattern of life than rural life. Energy consumption also rises with more inclusive growth: demand for energy grows especially rapidly

Figure S11

Sub-Saharan Africa and comparator countries – per capita energy use versus per capita real GDP – 1990–2012



Source: World Bank World Development Indicators and author calculations.

when formerly poor people gain access to electricity and undertake first-time purchases of a whole array of household electrical appliances.

Since sub-Saharan Africa is presently the least industrialised and least urbanised region, and the one with the largest pool of poor people without access to electricity, energy demand growth is likely to be quite strong. In a region that has struggled to provide even the modest demand for energy today, meeting that new demand will be no small task. The goal should be to increase the energy supply (especially electricity) in a rapid and cost-effective manner consistent with development goals, while also moderating potential trade-offs and harmful spillovers such as air pollution and GHG emissions.

A key factor that can work in countries' favour is improved energy efficiency as a result of global technological progress. With technological diffusion, this creates the potential for developing countries to "leapfrog" to much more energy efficient processes and products than were available to other countries as they developed decades ago. In sub-Saharan Africa, as in most places, energy efficiency in many sectors is well below economic levels because of policy distortions and market failures, due for example to wasteful energy subsidies or inefficient urban forms. Thus, while economic transformation in Africa is on balance likely to boost energy demand, there is much that countries can do to moderate this trend by improving energy efficiency.

From a GHG emissions perspective, sub-Saharan Africa is not under the same pressure as many other regions to decarbonise its energy supply, because its CO₂ emissions from energy use are very low: only 2.1% of the world total in 2014, and only 0.8% when South Africa is excluded. This is due both to the region's very low energy use, and to the fact that around 60% of primary energy still comes from wood and other traditional biomass. Only about 37% of primary energy comes from fossil fuels, compared with 80% in the OECD and in developing countries overall. To the extent that biomass use for energy does not exceed the rate at which forests can regrow, it is considered carbon-neutral, since it is releasing CO₂ previously accumulated by plants during their life cycle. This also helps explain sub-Saharan Africa's very low CO₂ emissions.

Yet as sub-Saharan African countries transform their economies, they are likely to follow a typical pattern. With development, countries tend to shift from traditional biomass to modern energy sources that

provide greater energy density, constancy of flow, flexibility, transportability and ease of control. This shift has meant a massive rise in electricity use, and, at least historically, much greater reliance on fossil fuels as a source of primary energy, resulting in a rising CO₂ to energy intensity and higher CO₂ emissions.

To the extent that the transition to modern energy can be effectively supplied with zero-carbon options, however – hydropower, solar, wind, geothermal, nuclear – the rise in CO₂ intensity can be moderated. Sub-Saharan Africa is particularly well placed to exploit this opportunity. First of all, it is undertaking its economic transformation at a time of rapid technological advances and fast-falling costs in renewable energy technologies, so it has options that might not have been viable even a few decades ago. Second, sub-Saharan Africa has an enormously rich portfolio of clean energy assets: about 1,100 gigawatts (GW) of solar capacity, 350 GW of hydro, and 109 GW of wind, plus large natural gas reserves to fuel another 400 GW of power. Off-grid and mini-grid electricity distribution options provide a way to harness clean energy sources to help expand electricity access for the poor, particularly where consumers are widely dispersed. New energy infrastructure needs to be built in ways that are resilient to climate change impacts. Climate change could seriously reduce hydropower production and revenues, for instance, but these costs could be substantially reduced by modifying existing investment plans to explicitly handle the risks of large climate swings.

A 5-point action plan for economic transformation and social and environmental progress in sub-Saharan Africa

There is no single "right" way for sub-Saharan African countries to achieve economic transformation and positive social and environmental change. Any policy recommendations will need to be weighed, evaluated and applied according to each country's circumstances.

The experience of policy implementation will also often yield new or unexpected results – all the more when policy-makers consider all the complex economic, social and environmental implications of policy actions. Steady policy experimentation, careful evaluation of outcomes, learning, and adjustment of policies in the light of new experience are all crucial. The idea is not to apply a "best practice" across sub-Saharan Africa, but to find the "best fit" of good practices for each country.



Photo credit: Flickr/James Anderson

That said, the report's analysis of the close links between economic, social and environmental forces suggests that there are five broad sets or clusters of policy issues for governments in sub-Saharan Africa to consider as they formulate development strategies and action plans for the future. This results in a five-point action plan:

- Getting the fundamentals right;
- Transforming agriculture and land use as a foundation for economic transformation;
- Diversification into manufacturing and other high-productivity modern sectors;
- Unleashing the power of urbanisation; and
- Promoting sub-Saharan Africa's modern energy transition.

The first element, getting the fundamentals right, refers to cross-cutting policies and institutions with broad economy and society-wide effects. The fundamentals are designed to ensure the effective functioning of markets, foster innovation and investment, and pursue public goals. Because these fundamental policies and institutions are already discussed extensively in the development policy literature, in the report they are treated relatively briefly.

The other four elements refer to key socio-economic systems or sectors that have important implications for economic transformation and for social and environmental change. Trends and key issues in each area were discussed in more detail earlier in this summary report.

Exhibit 2 at the end of this section summarises the report's discussion of these policy recommendations in terms of implications for economic transformation and growth; poverty reduction and social inclusion; and environmental change. The latter considers both how policies affect the impact of environmental change on the economy and society (in particular by strengthening resilience to climate change), as well as the impact of economic change on the environment (in particular by mitigating pollution and GHG emissions).

1. Getting the fundamentals right

We highlight four elements in getting the fundamentals right in sub-Saharan Africa: macroeconomic stability and financial sector development; voice and accountability; social and human development policies; and policies and institutions to improve natural resource management.



Photo credit: Flickr/James Anderson

Policy recommendations:

- **Macroeconomic stability and financial sector development:** Better macroeconomic policies – for example, more sustainable fiscal policies, lower inflation, and external debt reduction – are widely credited with helping drive sub-Saharan Africa’s growth recovery in the 2000s. Maintaining macroeconomic stability remains a fundamental priority, given both the uncertain and volatile global economic environment in the near term, and the growing development challenges going forward, in particular the need for a major increase in the region’s infrastructure stock.

Sub-Saharan Africa has a substantial infrastructure deficit, estimated at around US\$90 billion per year, with roughly one third each needed for national, urban and rural infrastructure. Filling this gap will require not only more foreign development assistance, and higher foreign and domestic private investment, but also increased domestic public investment

and domestic resource mobilisation, while maintaining fiscal sustainability. This, in turn, will require big improvements in public investment management capacity, improved tax effort, and keen attention to where funds are spent, to reallocate them from low-priority or wasteful areas, such as fuel subsidies, to high-priority areas. Financial sector development is crucial as well, given its central role in mobilising domestic savings and financial intermediation.

- **Voice and accountability:** Improvements in governance and institutions have helped underpin better policies and economic performance in sub-Saharan Africa. The end of the Cold War created room for more democratic and accountable governance, the spread of competitive elections, and the emergence of independent media and civil society organisations. These gradual shifts since the early 1990s have given voice to large sections of the population, such as the rural poor, whose demands had hitherto been ignored. Governments now have stronger political incentives to adopt

more inclusive growth policies rather than serving mainly a narrow elite or crony interests, and to appoint more competent technocrats to design and implement such policies.

Still, the shift towards more voice and accountability is hardly uncontested, and has sometimes been reversed. But rather than go backwards, it is important to extend and deepen the shift. Not only is it a worthy aim in itself, but voice and accountability are essential in the fight against corruption and cronyism and in the push for more effective and inclusive management of public budgets and investments, natural resources, and sectoral or industrial policies.

- **Social and human development policies:** Human development indicators have generally improved in sub-Saharan Africa during the 2000s. However, there is much variation in the speed of improvement, and the indicators remain much lower than in developing countries overall. This means governments need to prioritise social policies, with an emphasis on public health, education and gender equality. Not only do these investments help build a stronger work force, but they directly address social vulnerability and strengthen resilience to climate change and other shocks. Education for girls and women not only benefits individuals and their families, but can also accelerate the region's demographic transition when combined with good reproductive care, as women's education drives down fertility rates. Strengthening of comprehensive family planning programmes, combined with information and civil society outreach will also be needed to influence and change social norms. Similarly, improved prenatal and children's health care will reduce infant mortality (and stunting), while also contributing to the demographic transition.
- **Policies and institutions for natural resource management:** More than half the countries in sub-Saharan Africa are classified as rich in exhaustible natural resources such as fossil fuels, ores and minerals. Research suggests that the so-called "natural resource curse" – the negative impact of oil and mineral abundance on long run growth – occurs largely in countries with poor governance. So-called "Dutch disease" effects, rising real exchange rates, and misallocation of resources due to corruption and rent-seeking all harm the economy, and tend to

squeeze profitability in and curb diversification into new tradable sectors. Better macroeconomic management of natural resource revenues is thus crucial, and there is ample evidence of how to do it best, from around the world and within Africa. Attention needs to be paid to the entire natural resource management "value chain", from sector organisation and contract awards, to regulation and monitoring of operations, to how taxes and royalties are set and collected. At least equally important is to manage and allocate the revenue effectively, to achieve broad-based benefits and help build a diversified, high-productivity economy for the long run.

2. Transforming agriculture and land use as a foundation for economic transformation

Boosting agriculture's productivity and climate resilience needs to be a key aspect of sub-Saharan African countries' development and poverty reduction efforts. The point is not to push one particular technological "fix" or another, however, but to put in place a broad package of reforms and public investments to encourage and facilitate the adoption of new methods and practices by hundreds of millions of low-income African smallholders in a context of low information, market failures, lack of public goods, and high risks.

Policy recommendations:

- **Accelerate implementation of the African Union's Comprehensive African Agricultural Development Programme (CAADP)** as a template to boost public investment, strengthen institutional capacity, and improve the enabling environment for private investment in agriculture. Priority should be given to strengthening agricultural and livestock R&D and extension services, increasing investments in rural transport and logistics infrastructure, building up rural credit and insurance institutions, and undertaking reforms to achieve more secure land tenure and property rights.
- **Further expand CAADP and other flagship programmes to mainstream climate-smart agriculture and landscape management approaches in national agricultural plans.** Accelerate on-farm uptake of climate-smart agriculture, with the aim of reaching the African Union's goal of 25 million farm households practicing it by 2025.

- **Substantially boost international financing for Reducing Emissions from Deforestation and Forest Degradation (REDD+), and accelerate African countries' participation in the REDD+ agenda.** Activities should include landscape-scale programmes that address trade-offs and synergies between forest, crop, livestock, water and household energy needs, such as through the pan-African, country-led AFR100 Initiative, which aims to restore 100 million ha of degraded and deforested landscapes by 2030.

3. Diversification into manufacturing and other high-productivity, modern sectors

Sub-Saharan Africa has only a tiny share of global manufactures exports, but with much-improved macroeconomic stability, it is now well poised to make robust gains in manufacturing. Technological advances and the rise of global production networks also provide new opportunities to diversify these countries' economies into new, high-productivity, modern sectors.

Policy recommendations:

- **Strengthen the investment climate, in particular for critical energy and other types of infrastructure, as well as access to finance.** Firm levels surveys highlight weak electricity infrastructure as a major constraint on manufacturing performance in sub-Saharan Africa. Other aspects of the business environment may also need to be addressed in this context, depending on the country. The infrastructure build-out needs to mesh closely with urban reforms to build more compact, productive and energy-efficient cities as the primary locations for manufacturing and other modern sectors. It also needs to fully exploit sub-Saharan Africa's abundant clean energy resources and be designed for resilience to growing climate change impacts.
- **Undertake focused efforts to promote manufactured and tradable service exports,** including reforms to improve logistics efficiency and reduce regional trade barriers, as well as carefully designed measures to promote Special Economic Zones and foreign direct investment inflows, analysing and correcting past failures with such initiatives.
- **Undertake practical governance reforms adapted to African conditions to improve**

transparency and public accountability in administration of export promotion and other industrial promotion policies.

- **Undertake policy reforms to promote greater market competition** in order to reduce resource misallocation and boost overall sector productivity in manufacturing and other modern sectors.

4. Unleashing the power of urbanisation

Urbanisation in sub-Saharan Africa has been a missed opportunity so far. Economic transformation and urbanisation often reinforce each other, but as noted above, in African cities, around 60% of urban employment and over 90% of new jobs are in informal activities, and large numbers of young people are unemployed.

Good policies and institutions will be crucial to seize the opportunity of urbanisation. A shift towards more compact, well-connected and well-coordinated cities is needed to yield a more inclusive and clean urbanisation, one that fosters economic transformation and is resilient to climate change, with relatively low pollution and GHG emissions. No single policy or initiative will be enough to pursue this multifaceted objective. Multiple reforms on many fronts will be needed.

Policy recommendations:

- **Develop national urban development strategies coordinated with the broad fundamental reforms noted above,** substantially increasing domestic and foreign resource mobilisation for urban infrastructure, governance and planning programmes.
- **Empower and increase the capacity of sub-Saharan Africa city governments, which are closest to and best informed about the needs of residents,** but which usually have only very meagre resources. Increase the fiscal capacity of city governments with more central revenue transfers and strengthening of the local tax base. Stronger local governments can begin to bring to bear basic urban planning tools to curb urban sprawl and foster more compactness.
- **Greatly expand urban infrastructure provision for transport, water and sanitation, waste management and**

energy, as well as “soft” infrastructure for education, health and housing. Use investment decisions to foster more compact, connected and coordinated city forms, with a strong emphasis on public transit systems over major road investments serving private motorisation, or through co-location of housing and public service delivery initiatives.

- **Fully exploit new emerging technologies and institutions to provide decentralised, agile, low-cost and low-carbon modes of infrastructure provision** of the types already emerging in many African cities. Examples include the growing popularity of household scale solar installation for electricity, or city scale electricity generation using landfill waste and gases. New technologies for composting toilets and bio-digesters are providing affordable solutions for sanitation needs while also creating biogas for energy needs.
- **Clarify land rights and strengthen land regulation to foster more vigorous urban housing markets** that are capable of delivering affordable, modern, multi-story housing on a large scale in more densely developed multi-use neighbourhoods.

5. Fostering sub-Saharan Africa’s modern energy transition

Sub-Saharan Africa’s economic transformation will require a large increase in energy supply to meet the growing needs of households, industry, transport, and power generation. The challenge is how to meet this new demand while managing the negative impacts associated with fossil fuels, in particular the health costs of air pollution related to fossil fuel use. The key is to make the most of the region’s ample clean energy resources, and to work to improve energy efficiency.

Policy and institutional reforms are critical to achieving a successful energy transition. In particular, existing policy distortions, institutional weaknesses and market failures are often very large, creating significant opportunities for policy reforms that can yield multiple benefits in terms of greater energy efficiency and more reliable and expanded supply, improved economic efficiency and better environmental outcomes.

Policy recommendations:

- **Reforming energy subsidies and making more effective use of energy taxes should be top priorities.** This will encourage energy efficiency, boost revenue for high-return development programmes, increase energy security, and help curb local air pollution and GHGs. Governments in sub-Saharan Africa are increasingly able to draw on their own and international experience in framing politically feasible reforms, including ensuring social protection measures for the poor. Trade and investment policy reforms can support “energy leapfrogging” and the adoption of energy-efficient technologies and products.
- **Public and private investment in power generating capacity and distribution networks needs to be dramatically increased to keep up with development and expand energy access.** Countries should take advantage of low-cost clean energy technologies to exploit their abundant clean energy resources, and use off-grid and mini-grid distribution options to rapidly increase access for the poor. The IEA’s African Century scenario calls for a fivefold increase in power generating capacity by 2040, the Africa Progress Panel for a tenfold rise. Meeting ambitious power sector goals will require a vast scaling-up of the levels of financing and investment in the region’s power sector, drawing on domestic and foreign resource mobilisation, from public and private sources.
- **Utility reform is at the heart of any high-ambition power scenario in sub-Saharan Africa,** both to raise the present very low levels of efficiency in electricity generation and distribution in the region, and to attract large new investment inflows. Efforts to improve planning, development and operational efficiency need to be combined with more realistic tariff-setting, as well as structural reforms to boost competition and unbundle generation from distribution activities. South Africa, Nigeria, Kenya, Uganda, and Ghana have already taken important steps with structural reforms in the power sector.

Exhibit 2

Implications of policy recommendations for economic transformation and social and environmental change

| | Economic transformation (ET) | Social change | Environmental change | |
|---|--|---|---|---|
| | Economic transformation and growth | Poverty reduction, jobs, and social inclusion | Impact of economy on environment | Resilience to environmental change |
| GETTING THE FUNDAMENTALS RIGHT | | | | |
| Macroeconomic stability and financial sector development | <ul style="list-style-type: none"> • Macroeconomic stability and financial sector development promote private investment and innovation. • More resource mobilisation and public infrastructure investment is possible within an overall fiscal sustainability framework. • Fuel subsidy reform creates room for more pro-growth public spending. • Competitive real exchange rate fosters growth of manufactures and other non-traditional exports. | <ul style="list-style-type: none"> • Macro instability hurts the poor most. • Growth accelerates poverty reduction. • ET raises poverty reduction elasticity and inclusivity of growth. • More pro-poor spending possible within overall fiscal sustainability framework • Fuel subsidy and natural resource management reforms boost budget envelope for pro-poor spending. | <ul style="list-style-type: none"> • Macro stability and financial depth encourage long-term private investments in clean energy infrastructure. • Subsidy reforms boost energy efficiency and the competitiveness of clean fuels, mitigate air pollution, health damage and GHG emission growth. | <ul style="list-style-type: none"> • Rising incomes and poverty reduction boost adaptive capacity • ET and shift out of agriculture reduce climate change exposure • Stronger budget envelope for targeted public investments in resilience. |
| Voice and accountability | <ul style="list-style-type: none"> • More voice and accountability increase political incentives for pro-growth policies. • More public scrutiny over collection and use of public revenues • More demand for transparency and more public scrutiny over corruption and elite capture of policies. | <ul style="list-style-type: none"> • More political incentives for pro-poor policies • More scrutiny and pressure for effective broad-based public service delivery. • More incentives and scrutiny for use of natural resource revenues for pro-poor health, education and social protection objectives. | <ul style="list-style-type: none"> • More political pressure and incentives to tackle immediate environmental damages, such as air pollution, with co-benefits for reduced GHG emissions. | <ul style="list-style-type: none"> • More political pressure and incentives for policies to help reduce exposure and increase adaptive capacity to climate change impacts. |
| Social and human development policies | <ul style="list-style-type: none"> • Social policies to speed demographic transition yield growth “dividend”. • More gender equality boosts growth and speeds demographic transition • Better education and health support stronger growth. | <ul style="list-style-type: none"> • “Demographic dividend” for growth boosts poverty reduction. • With smaller families more health and education spending per child. • Positive feedback loops – less infant mortality, more female education boosts fertility decline. | <ul style="list-style-type: none"> • Reduced population pressure for expanding agricultural land use, deforestation. • Faster demographic transition helps offset rising emissions that accompany rising per capita incomes. | <ul style="list-style-type: none"> • “Demographic dividend” for growth and poverty reduction increases adaptive capacity, of the poor especially. |

| | | | | |
|------------------------------------|---|--|--|--|
| Natural Resource Management | <ul style="list-style-type: none"> • Stronger governance of natural resource sector boosts long term growth by moderating “natural resource curse” pressures. • Reduced ‘Dutch Disease’ pressures encourage growth of manufactures and other tradable goods and services. • Better management of natural resource revenues funds more infrastructure and other higher priority development spending. • Transparency, voice and accountability to combat elite capture of natural resource wealth. | <ul style="list-style-type: none"> • Faster long term growth reduces poverty • Reduced elite capture of revenues provides more resources for pro-poor growth • Less civil strife and wars to control natural resource wealth. | <ul style="list-style-type: none"> • More natural resource revenues available to fund mitigation investments, including clean energy. | <ul style="list-style-type: none"> • More natural resource revenues available to fund adaptation investments. |
|------------------------------------|---|--|--|--|

FOCUSED POLICY AREAS

| | | | | |
|--|---|---|--|---|
| Agriculture and Land Use | <ul style="list-style-type: none"> • Accelerate implementation of CAADP as a template for reforms and investments to improve agricultural R&D and extension services, rural infrastructure and credit systems – speed uptake of new CSA agronomic technologies and farming practices. • More secure land tenure rights to speed uptake of new technologies. • Stronger agricultural productivity growth and more rural prosperity stimulate growth in non-agricultural sectors, urban areas and in ET overall. | <ul style="list-style-type: none"> • Agricultural growth has the biggest impact in reducing poverty, which remains predominantly a rural phenomenon. • Reforms of property rights, financial inclusion, extension services etc. must target specific problems of the poor, to ensure their inclusion in rural growth. | <ul style="list-style-type: none"> • More intensive agricultural growth eases pressure for land use change and deforestation – reduces GHG emissions, soil degradation, ecosystem damage. • “Climate smart” technologies and land management practices further ease agricultural GHG emissions. | <ul style="list-style-type: none"> • More intensive agricultural growth eases pressure for expansion into climate vulnerably drylands. • “Climate smart” technologies and land management practices increase resilience of crops and livestock to climate stress. |
| Diversification and Industrialisation | <ul style="list-style-type: none"> • Reforms to improve core investment climate “fundamentals” – infrastructure, access to finance and overall business environment – relax key constraints on manufacturing and other non-traditional sector firms. • More focused policies to boost exports and benefits of clustering – cut red tape and logistic costs, renew efforts to succeed with SEZs, FDI promotion and technology extension services – further encourage growth of manufactures and non-traditional sectors. • More transparency, voice and accountability to promote policy learning and guard against elite capture. • Reforms to increase competition in product and input markets help boost productivity growth within sectors. | <ul style="list-style-type: none"> • More rapid job growth in labour intensive manufacturing and other higher productivity sectors generates income gains and poverty reduction. • Strengthen growth in good jobs through focused policy efforts to improve prospects of informal workers and businesses – reduced regulation burden, stronger skills development and credit programs | <ul style="list-style-type: none"> • Shift from agriculture to industry and services boosts energy demand. • Structural change induces shift from traditional biofuels to electricity and modern primary energy sources: fossil fuels as well as low carbon sources such as hydro, renewables etc. • Heightened need for shift to more energy efficient, productive urban forms, and to clean energy sources. | <ul style="list-style-type: none"> • Reduced dependence on agriculture, the sector most vulnerable to climate change. • Strong industrial and service sectors better able to absorb increased flow of migrants from rural areas due to climate change. |

| | | | | |
|--|---|--|---|--|
| <p>Urbanisation and the changing spatial structure of the economy</p> | <ul style="list-style-type: none"> • Develop national urban development strategies closely coordinated with overall national resource mobilisation and infrastructure policies. • Strengthen city government and finance • Boost investment in urban infrastructure – public transit, sanitation and water, waste management, power. • Policies to foster more “compact, connected and coordinated” cities. • Fully exploit innovative, decentralised low-carbon approaches to infrastructure service provision. • More compact cities and better infrastructure boost agglomeration based productivity gains and ET. | <ul style="list-style-type: none"> • More rapid urban industrial and service growth generates more rapid growth in good jobs. • Basic infrastructure investments improve living conditions in informal slum settlements. • Reform of land regulation and tenure to help growth of affordable high density formal housing. | <ul style="list-style-type: none"> • More compact, connected and coordinated cities promote energy efficiency, reduce local air pollution, related health damage and GHG | <ul style="list-style-type: none"> • Vibrant industrial and services growth in cities allows better absorption of increased migrant inflows due to climate change. • Better urban planning, infrastructure and housing allow greater resilience to floods and other climate shocks in cities |
| <p>Energy Transition</p> | <ul style="list-style-type: none"> • Growth and structural change create more rapid energy demand growth, plus a shift in fuel types: away from traditional biofuels to electricity, fossil fuels and modern low carbon sources. • Major investments in power generating and distribution capacity are needed. • Major efficiency improvements are needed in the electricity sector. • Fuel subsidy reform to incentivise energy efficiency. | <ul style="list-style-type: none"> • Rapid poverty reduction creates especially rapid electricity and energy demand growth. • Major investments in power generating and distribution capacity are needed to reach electricity access for all, exploiting grid, mini-grid and off-grid options. | <ul style="list-style-type: none"> • Fuel subsidy reforms to promote energy efficiency and induce a shift to clean energy sources, curbing local air pollution and GHGs. • Step up investment in huge untapped renewable, hydro and geothermal power resources as technological progress brings down clean energy costs | <ul style="list-style-type: none"> • Adaptation investments to tackle possible adverse climate change impacts on hydropower resources |



Photo credit: Flickr/James Anderson

CHAPTER 1

Sub-Saharan African growth and poverty reduction in the 2000s: Accomplishments and emerging challenges

The strong rebound in sub-Saharan Africa's economic growth in the 2000s has been hailed as a miracle. After steep falls in the 1980s and 1990s, the region's per capita income is now higher than ever before, poverty rates have fallen, and many indicators of human development have improved. Yet, even so, sub-Saharan Africa remains among the lowest-scoring developing regions on most measures of human welfare. The recovery of the 2000s was in part the payoff for policy reforms by many African countries over recent decades. It also reflected the stimulus of the 2000s global boom in primary commodity prices for the region's many natural resource-rich economies. In 2015, however, the region experienced a significant external shock, mainly from a plunge in global commodity prices, but also from a sharp slowdown in world trade and volatility in capital flows to developing countries, throwing into question the sustainability of the region's recovery.

In this situation, African countries would do well to take stock of their accomplishments and failings during the recovery of the 2000s. This is a good time to survey emerging challenges and formulate policies to both boost and sustain inclusive growth and poverty reduction over the long haul.

There is a strong case to buttress existing reforms with a stronger focus on *economic transformation*. At one level, such a focus seeks to boost the productivity of the economy as a whole by fostering opportunities for workers and entrepreneurs to shift from lower- to higher-productivity sectors (structural change), as well as through more focused efforts to boost productivity within major sectors of the economy. The direction and quality of economic transformation has implications not only for the pace, but also for the inclusivity of growth, for the ability of the economy to generate jobs and rapid poverty reduction. In a broader setting, the issues of economic transformation engage deeply with wider societal changes and trends that will have a critical impact on the success of the region's long-term development – notably demographic transition, urbanisation and the growing environmental and climate risks facing the region. It is important to encourage approaches that yield large co-benefits, both for economic development and environmental sustainability.

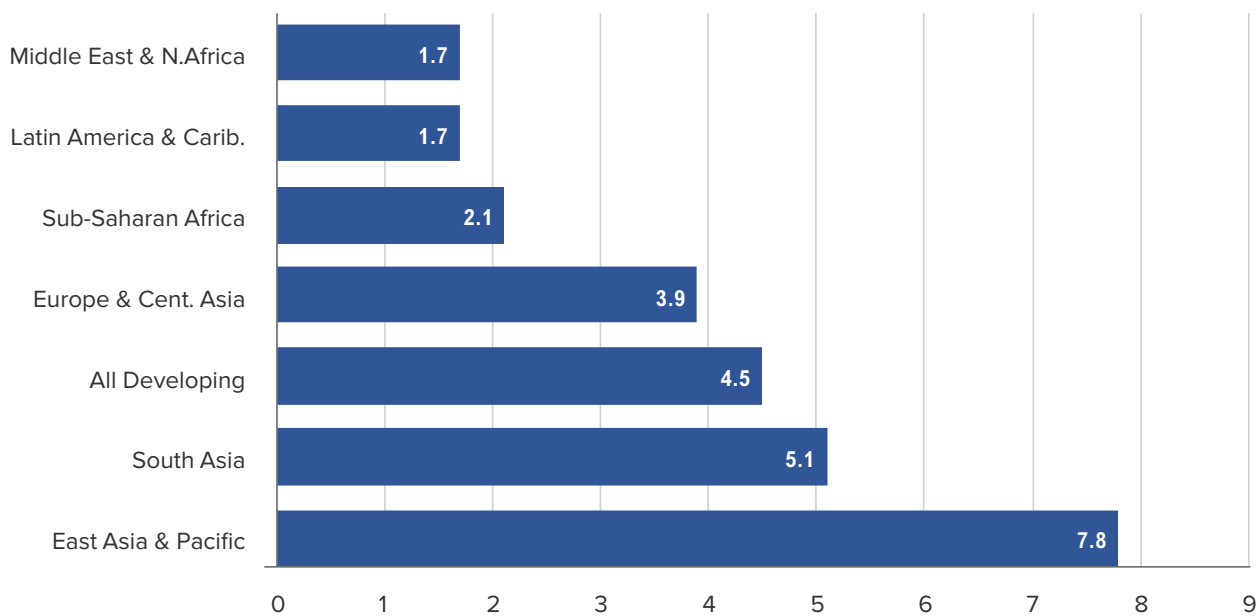
1.1 African growth in the 2000s: 'miracle' or 'return to normalcy'?

After increasing by only 1–2% a year in the 1980s and 1990s, sub-Saharan Africa's real GDP growth accelerated to almost 5% in 2001–2014.¹ Per capita GDP grew at slightly over 2% a year in this period, more than reversing a cumulative fall of almost 20% in the 1980s and 1990s: this was a huge turnaround that has brought with it widespread improvements in human welfare, reversed a long-standing narrative of pessimism about Africa's outlook, and emboldened hope for the future.

Welcome as it is, viewed from an international perspective, the African recovery was still less than half the pace of per capita GDP growth for developing countries in aggregate in 2001–2014. (Figure 1.1). It was also less than the long-run 3% per capita growth of developing countries in aggregate between 1960 and 2014. Sub-Saharan Africa per capita growth excluding South Africa averaged 3.1% in 2001–2014, about the same as the long-run developing country trend. In this sense, the African recovery is less a miracle than a "return to normalcy".

The growth acceleration was about as widespread among low-income as middle-income sub-Saharan African countries. Figure 1.2 shows there was no correlation between a country's growth in 2001–2014 and its initial level of per capita GDP in 2000. This result can be seen in a positive light – that the low-income countries in the region were not excluded from the recovery, although it also means that these countries were *not converging* or catching up to the incomes of richer African countries.

Figure 1.1
Developing countries: real per capita GDP growth 2001-14%



Source: World Bank World Development Indicators and author calculations.

Figure 1.2
Sub-Saharan Africa: log per capita GDP in 2000 versus real per capita GDP growth 2001-14



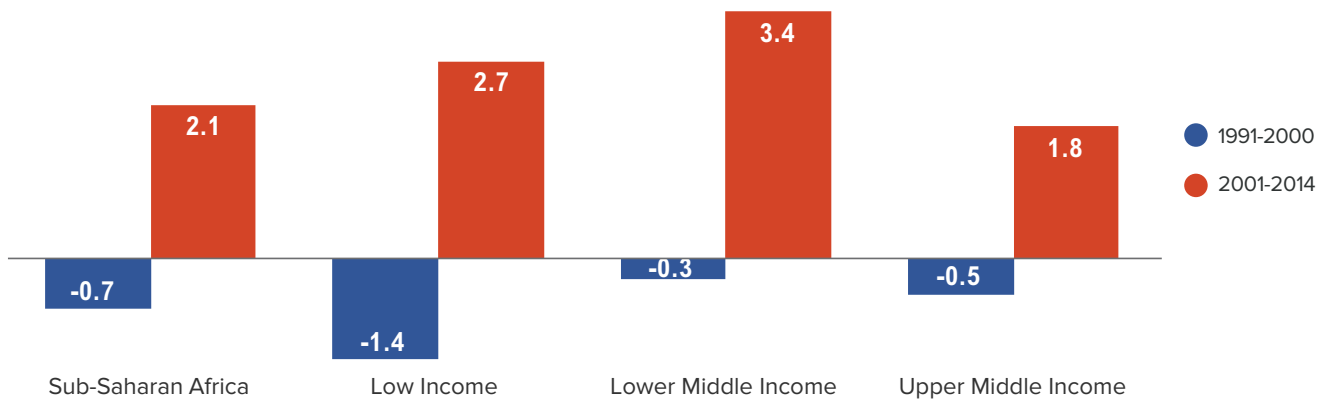
Source: World Bank World Development Indicators and author calculations.

There are some wrinkles to this picture if we consider growth for countries grouped according to the standard World Bank income classification scheme (using population weights to calculate group growth). By this measure, 2001–2014 growth in the low- and lower-middle-income country groups was notably higher than in the upper-middle-income group. (Figure 1.3). This result reflects the fact that several

low-income countries with large populations (e.g. Ethiopia, Tanzania) grew much faster than many low-income countries with small populations. Similarly, Nigeria, with its big population, grew much faster than many other lower-middle-income countries, while South Africa, which dominates population in the upper-middle-income group, grew at only sluggish rates.

Figure 1.3

Sub-Saharan Africa: real per capita GDP growth by income groups 2001-14

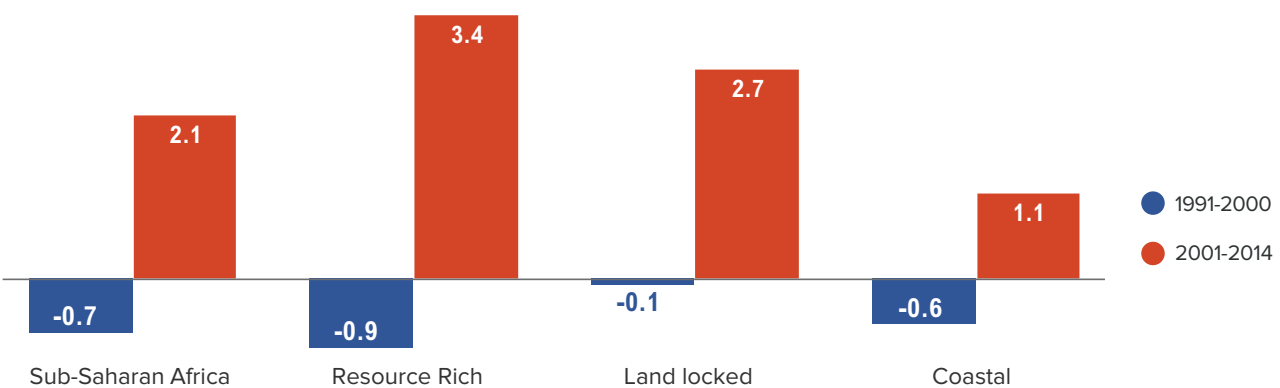


* Total group GDP divided by group total population.

Source: World Bank World Development Indicators and author calculations.

Figure 1.4

Sub-Saharan Africa: real per-capita GDP growth by country types 2001-14



* Total group GDP divided by group total population.

Source: World Bank World Development Indicators and author calculations.

There was also a significant change in the structure of growth, as we discuss more fully in Chapter 2. Not only was there higher growth in labour productivity in agriculture, manufacturing and important segments of the services sector, but there was also a boost from structural change – from workers moving from low- to higher-productivity sectors, in particular from agriculture to services.

1.2 Gains in poverty reduction and inclusiveness

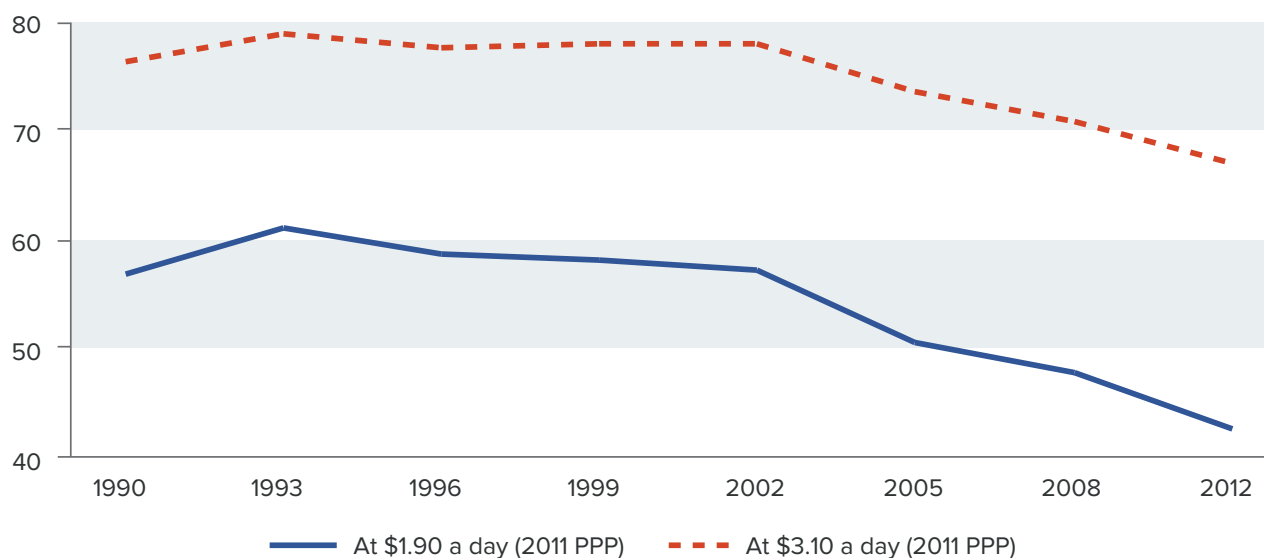
Gratifyingly, the acceleration of growth in sub-Saharan Africa in the 2000s was accompanied by a faster pace of poverty reduction. The share of the population living in extreme poverty hardly changed between 1990 and 2002, at 57%, but then it fell to 43% by 2012 (Figure 1.5).² Still, due to rapid population growth, the absolute number in extreme poverty increased by over 100 million between 1990 and 2012, from 284 to 388 million. Poverty at the new higher US\$3.10 a day benchmark also fell in the 2000s, although somewhat less rapidly than extreme poverty. There were also significant declines in the depth and severity

of poverty.³ Nevertheless, two thirds of the population were still living on less than US\$3.10 in 2012.

Digging into the profile of the recent fall in poverty more deeply, there do not appear to have been systematic differences in poverty reduction between low- and middle-income countries, nor between landlocked and coastal countries. Poverty reduction was much less rapid in fragile and conflict-affected states than in non-fragile states, as might be expected, underlining the importance of political outreach, accommodation and inclusion in strife-torn societies. The proportion of the poor who are chronically poor – not just episodically, but over a longer time period – varies a lot across countries, but appears to average close to 60%.

Extreme poverty remains largely a rural phenomenon. Around 63% of the region’s population lives in rural areas, and of this number, a little under 50% remain in extreme poverty, while somewhat under 20% of the urban population are in this condition. Poverty rates have fallen in both rural and urban areas since the mid-1990s, with the rural-urban poverty differential becoming smaller over this period.

Figure 1.5
Sub-Saharan Africa: poverty headcount rates (% of population)



Source: World Bank World Development Indicators.

Outcomes for non-monetary aspects of well-being such as education and health have also generally improved, although there is much variation in the speed of improvement and, in general these indicators remain much lower than in the developing countries as a whole. Adult literacy, for example, increased slowly, from 54% in 1995 to 58% in 2012, but remained well below the 80% rate for developing countries in aggregate. Gross primary enrolment rates have increased rapidly, but school quality is poor, and the primary school completion rate is less than 70%, compared with over 90% for developing countries in aggregate. Life expectancy at birth rose from 51 years in 2000 to 58 years in 2013, the most rapid gain in any region, but well below the 71-year world average. Under-5 mortality has fallen sharply, aided by increased immunisation and reduced incidence of malaria. Gender inequality has fallen on many dimensions, but remains higher than elsewhere in the world, as measured by the UNDP's Gender Inequality Index in 2014.⁴

Poverty has fallen in response to faster economic growth, but there is also a lot of variation in the responsiveness of poverty reduction to growth – the so-called poverty elasticity of growth – both across African countries and between Africa and other regions. A number of studies find that the poverty elasticity in sub-Saharan Africa appears to be lower than in other developing regions. Fosu (2011), for example, finds the highest poverty elasticities of income growth in the Europe and Central Asia region, followed by the Middle East and North Africa, Latin America, East Asia and South Asia, with sub-Saharan Africa bringing up the rear.⁵

Among reasons why poverty elasticities might be lower in some countries than in others, there is much cross-country evidence for the intuitive idea that high income inequality will reduce the amount of poverty reduction generated by a given amount of growth. Sub-Saharan Africa's relatively high income inequality profile goes some, though not all, the way to explaining its relatively low poverty elasticity.⁶

A second important set of factors has to do with the structural composition of growth. There is evidence, for example, that poverty elasticity is lower in natural resource-rich economies, of which sub-Saharan Africa has unusually many.⁷ More research is needed to identify the channels through which natural resource riches might reduce the poverty reduction effect of growth, but they may include "Dutch disease" effects that curb growth in tradable goods sectors such as

agriculture and manufacturing that have strong poverty reduction effects (see below). Political economy factors are also important, such as the ability of political elites to retain more of the revenues from concentrated natural resources than they could from broader-based economic activities, limiting the benefits to the population as a whole and especially the poor.

The structural composition of growth also appears to have a more general impact on poverty reduction. Loayza and Raddatz (2010) document that growth in agriculture has the greatest poverty reduction effect, followed by manufacturing and construction and then services; mining and utilities have the weakest poverty reduction impact.⁸ They link this ranking with the greater intensity of and demand for unskilled labour employment in agriculture, manufacturing and construction.

Christiaensen et al. (2011) show the much greater impact of agricultural growth in reducing extreme poverty, especially among low-income countries, and where this effect is not offset by severe inequality or natural resource wealth.⁹ These findings are pertinent in sub-Saharan Africa, where, as we discuss more fully in Chapter 2 below, some 60% of employment is still in agriculture, a sector with extremely low levels of productivity by international standards. Agricultural productivity growth, which had been stagnant in the 1980s and 1990s, picked up significantly in the 2000s, and this was undoubtedly a reason for faster poverty reduction. Manufacturing is a relatively insignificant sector, despite its high poverty reduction potential.¹⁰

Finally, as we discuss more fully in Chapter 3, high levels of climate variability and change in sub-Saharan Africa are already having their most severe impacts on the poor. They are often the most exposed and always the most vulnerable to climate shocks and stresses, lacking the financial and other resources to prevent and cope with these pressures. Worsening climate change threatens not only to reduce growth, but also to reduce the impact of growth in reducing poverty.

1.3 Sources of the African recovery, the shock of 2015 and global uncertainties

Among the main drivers of the African growth recovery, analysts generally point to improvements in both broad policy fundamentals and in external conditions, notably the primary commodity price boom of the 2000s. (The relative importance of these

factors continues to be debated, both overall and in the very heterogeneous circumstances of different African economies.¹¹)

Macroeconomic policies in particular have substantially improved since the mid-1990s in many African economies. Fiscal deficits were reduced and became more sustainable, which, combined with more credible monetary policies, contributed to a significant decline in inflation. The Heavily Indebted Poor Countries (HIPC) Initiative and the Multilateral Debt Relief Initiative (MDRI) reduced external debt to more sustainable levels in return for credible reform commitments, including shifts in public spending in more pro-development and pro-poor directions. Better macroeconomic policies and conditions have bolstered confidence among investors and businesses, including farmers.

Analysts point to deeper improvements in political economy, governance and institutions that have underpinned better policies. The end of the Cold War created greater room for more democratic and accountable governance, based on the spread of competitive elections, the emergence of independent media and civil society organisations, and the mass uptake of modern communications, notably mobile phones. The gradual shift towards democracy since the early 1990s has given voice to large sections of the population, such as the rural poor, whose demands had hitherto been ignored. This has created political incentives for governments to adopt more inclusive growth policies rather than caring mainly about narrow elite or crony interests, and to appoint more competent technocrats to design and implement such policies.¹²

The extraordinary rise in primary commodity prices since the late 1990s is also likely to have boosted African growth, at least temporarily. About half of sub-Saharan Africa's low-income countries are resource-rich (using the International Monetary Fund classification, which focuses on energy and mineral resources), as are two thirds of its lower-middle-income and half of its upper-middle-income countries. Resource-rich countries comprise 65% of sub-Saharan Africa's population and GDP. Major new oil, natural gas and mineral discoveries and rising production volumes in a number of countries also contributed to the commodity boom in the region.

As a result of the prolonged surge in commodity prices, we estimate the sub-Saharan Africa region's terms of trade – export relative to import prices – in

2012–2014 were about 40% higher than the average for the second half of the 1990s. The impact on growth in resource-rich countries is not entirely clear-cut, however. Research suggests that commodity booms have significant positive short-term impacts on growth in resource-rich countries, but that in the long term, the effects on growth are negative (the so-called “natural resource curse”) in the case of countries with bad governance and weak institutions. These negative effects appear to work through macroeconomic channels such as real exchange rate appreciation and “Dutch disease” effects, and political economy channels, such as more incentives for excessive government consumption relative to investment and increased rent-seeking and civil strife to control natural resources.¹³

Resource-rich African countries are therefore likely to have enjoyed a sequence of positive short-term impacts on growth as their terms of trade generally rose over the period since 2000. However, offsetting negative longer-term effects may also have started to set in towards the end of the period. This would be consistent with evidence of appreciating real exchange rates and some decline in sub-Saharan Africa's competitiveness in recent years.¹⁴ While electoral democracy has spread and macroeconomic policies have improved, corruption, transparency and other aspects of governance continue to perform poorly in many countries. A recent study of governance in the natural resource sector finds that while some countries – Ghana, Liberia, Zambia – have improved to reach a “Partially Satisfactory” quality rating for resource governance, most African countries (13 in a sample of 16) are still rated as only “Weak” or “Failing”.¹⁵

On a population-weighted basis, per capita GDP growth in resource-rich African economies was indeed significantly faster in 2001–2014 than in non-resource-rich economies (Figure 1.4 above). However, this may mainly reflect the exceptionally strong growth over this period in the largest resource-rich economy, Nigeria, and only sluggish growth in the largest non-resource-rich economy, South Africa. On an unweighted basis simple average growth in resource rich economies (2.2%) was only modestly higher than in non-resource-rich economies (1.8%).

There was a sharp worsening in the global economic environment for sub-Saharan Africa after mid-2014, with a plunge in oil and other commodity prices, and a tightening in global financial conditions, accompanied by large capital outflows from developing countries.

Growth in world trade and foreign direct investment (FDI) flows slowed sharply. Growth has decelerated sharply. The International Monetary Fund (IMF) estimates that GDP growth in sub-Saharan Africa fell to 3.3% in 2015, and forecasts that it will drop to only 1.6% in 2016, implying a fall in per capita GDP. Oil-exporting countries have been especially hard hit, and to some extent other natural resource-exporting countries as well. Climate shocks are playing a role – drought is expected to hold back growth in Ethiopia and Zambia. Elsewhere, though, growth is expected to hold up well, in countries such as Cote d’Ivoire, Kenya, Rwanda, Senegal and Tanzania.¹⁶

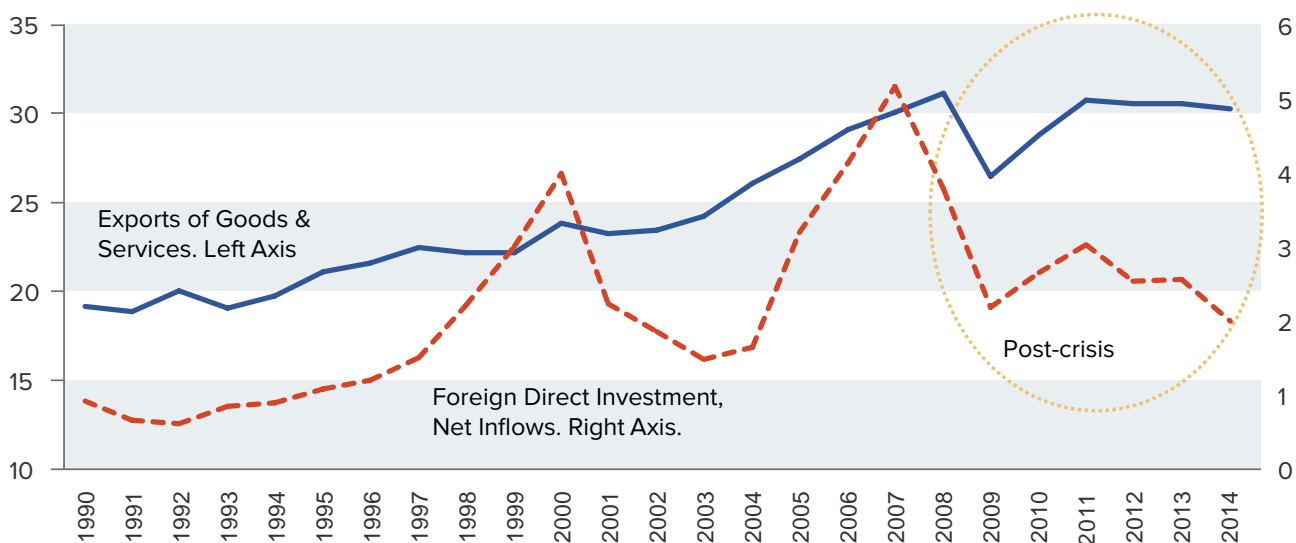
There is considerable uncertainty as to whether the slowdown and turbulence in the world economy reflect mainly a short-term cyclical downturn, or are part of more profound structural changes in the world economy ongoing since the global economic crisis in 2008/09. In particular, while the period from the late 1980s to the outbreak of the crisis saw a major increase in many key indicators of globalisation, the period since the crisis has seen mostly stagnation or decline in these measures.

As Figure 1.6 indicates, world exports and imports each increased by around 10 percentage points of world output during the globalisation boom, while world FDI flows increased from less than 1% of world GDP in the

late 1980s to a cyclical peak of over 5% in 2007. These increases reflected in part big changes in the structure of world production, particularly in manufacturing. These changes included the creation of global value chains or production networks by multinational corporations and the outsourcing of large parts of more labour-intensive parts of the production chain to China, most notably, but also to select other emerging market countries with relatively low production costs and good infrastructure. This was a period of booming export opportunities for countries with the capabilities to participate in the “trade in tasks” of global value chains, but also of sharply heightened competitive pressure from these newly emerging producers. African countries benefited from high natural resource prices for their commodity exports, especially during the 2000s, but by and large, their manufacturing firms were unable to exploit the boom in world manufactures trade and suffered from heightened competition, as we discuss further in Chapter 2.

The period after the crisis shows some distinct changes in the pace and drivers of globalisation. Growth in world trade has slowed, and trade is no longer rising as a share of world GDP. FDI flows fell sharply after the crisis, have never recovered and drifted below 2% of world GDP in 2014. World trade slowed further in 2015 and fell again as a share of GDP. The slowdown

Figure 1.6
World exports and foreign direct investment 1990-2014 (% of GDP)



Source: World Bank World Development Indicators.



Photo credit: Flickr/James Anderson

no doubt partly reflects continued cyclical shocks in the wake of the financial crisis, such as the Eurozone crisis and the sharp economic deceleration in China in 2015. But analysts also point to possible structural factors such as major technological improvements in automation, robotics, artificial intelligence and connectivity (the “Fourth Industrial Revolution”) that would reduce demand for low-skilled labour in developing countries and facilitate shortening of value chains and “inshoring” of some production activities.¹⁷

More positive for low-income countries is another major ongoing change in the world economy, China’s efforts to restructure its economy from an export to a domestic market orientation, and to shift from lower-skilled to more skill- and technology-intensive products. In this context “reshoring” of lower-skilled industrial segments from China to lower-cost locations could create important opportunities for manufactured export growth in low- and lower-middle-income countries, including those in sub-Saharan Africa.

1.4 Time to take stock: the case for economic transformation in sustaining the 2000s recovery over the long haul

The present volatile and uncertain international environment provides a good moment for African countries to take stock of their accomplishments and failings during the recovery of the 2000s, survey emerging challenges, and evaluate how to adjust economic strategies so as to boost the pace of inclusive growth and poverty reduction over the long haul.

Based on broad international experience with “growth miracles” and “growth failures”, the statistical odds of the African recovery running out of steam are not insignificant. Empirically, high growth that is sustained over several decades is rare. It is much more common for developing countries to experience “spells” of both high and low growth lasting 5–15 years, with high-growth episodes commonly followed by “a regression

to the mean”.¹⁸ By these metrics, the African recovery has already reached a fairly advanced “old age” in the typical life-cycle of high growth spells. A sharp deterioration in the terms of trade, such as that recently experienced by many African countries, has historically been a significant factor in the ending of growth miracles.¹⁹

How might African countries aim to sustain the recovery of the 2000s, and the social progress that has come with it? At a minimum, it is clearly essential that African countries maintain and strengthen the broad fundamental policies that have supported the recovery this far, such as prudent and stable macroeconomic policies, investments in human capital and infrastructure, and efforts to strengthen governance. However, it is not clear that these alone would be enough.

There is therefore widespread interest and a solid case for policies that would complement macroeconomic stability and broad fundamental policies by focusing more directly on *economic transformation*. At one level, economic transformation refers to processes that boost the productivity of the economy as a whole by fostering opportunities for workers and entrepreneurs to shift from lower-productivity to higher-productivity sectors (structural change), as well as through productivity growth *within* major sectors of the economy. In a broader setting, economic transformation engages deeply with wider societal changes and trends that will have a critical impact on the success of the region’s long-term development, notably demographic change, the inclusivity of growth, urbanisation, and the growing climate risks facing the region. This encourages approaches that yield large co-benefits, both for economic development and environmental sustainability.

An economic transformation perspective is valuable for African policy-makers for several reasons. First, there is a large *potential for economic transformation to boost economic growth*, as Chapter 2 discusses more fully. Productivity gaps across sectors are large, and around 60% of workers are still employed in agriculture, the sector with the lowest productivity. Further, productivity within sectors is generally very low by international standards, creating additional potential to boost growth by “catching up”.

Second, as noted, there are important *linkages between economic transformation, the inclusiveness of growth and the pace of poverty reduction*. Poverty reduction will be faster if there is vibrant growth in sectors with a high demand for unskilled labour, such as agriculture, manufacturing and construction.

Third, and closely linked to the second point, an economic transformation perspective is particularly helpful for policy-makers to think concretely about the *central issue of generating rapid growth in jobs*, given Africa’s delayed demographic transition (see Box 2.1 below) and the resulting extraordinarily rapid growth in the region’s overall population and working age population.

Fourth, the strategy of economic transformation takes on a particular importance in natural resource-rich economies, where strong *governance of the natural resource sector* can help avert harmful economy-wide effects on growth, poverty reduction and employment.

Fifth, an economic transformation perspective brings to the fore opportunities for *policies which combine significant economic with climate co-benefits*: which strengthen structural change and productivity growth within sectors and also help countries *better tackle growing climate risk*. This is important because sub-Saharan Africa is among the regions likely to be the most seriously affected by climate change, in particular through its impact on agriculture.

Sixth, *sub-Saharan Africa is urbanising fast*, a trend linked intimately with economic transformation, with migration of people from rural areas to cities and the growth of the urban industrial and services sectors. But just how urbanisation occurs will have profound implications for the region’s development, for productivity, employment and incomes, for the pace of poverty reduction and the health and well-being of city dwellers, for countries’ resilience to climate change and for their ability to curb pollution, including greenhouse gas emissions.



Photo credit: Flickr/James Anderson

CHAPTER 2

Economic transformation in Africa: Experience and strategic directions

The idea of *economic transformation* has recently come to the forefront in development discussions, although not necessarily with a single widely agreed definition.²⁰ In this report, the term refers to the combination of two processes that together drive the labour productivity of the economy as a whole.²¹ One is *structural change*, or shifts of employment and economic activity between sectors, focusing especially on gains in economy-wide productivity that occur as employment shifts from low- to high-productivity sectors – for example, from agriculture to manufacturing. The other is growth in labour productivity *within sectors*, such as through adoption of new technologies or business practices by firms *within* manufacturing or services.

The rest of this chapter focuses on economic transformation in this sense. However, economic transformation is also deeply linked with – is affected by and affects – other key economic, social and environmental forces and trends which will have a critical impact on Africa’s long-term development, and which we also discuss in other chapters of this report. These include the inclusivity of growth, demographic change, and the changing spatial structure of the economy, notably urbanisation. These broad societal changes are, in turn, intimately connected to long-run environmental change, climate change in particular, which is already affecting and threatens to wreak its greatest damage in sub-Saharan Africa. The Summary at the start of this report presents an analytical framework for thinking about these economic, social and environmental linkages (see especially Exhibit S1).

To get a sense of the potential pathways for economic transformation in sub-Saharan Africa, it is useful to look at historical patterns of economic transformation worldwide (Section 2.1). Countries that have reached high-income status display a broadly characteristic pattern of structural change: a steady fall in the share of agriculture in employment and output, a rising share of services, and first a rise in the share of industry, then a decline. The forces underlying this pattern include changing consumer preferences and spending priorities, and differential rates of productivity growth across sectors. New trends in globalisation might modify earlier patterns, however; for example, there is a risk of “premature de-industrialisation” among today’s developing countries.

Turning to economic transformation in sub-Saharan Africa, (Section 2.2), the most striking features of the region’s economic structure are the extraordinarily high share of employment in the lowest-productivity sector, agriculture, and the relative unimportance

of manufacturing. The region has only around 2% of world exports and 0.9% of world manufactured exports. Nevertheless some promising trends have emerged in the 2000s. Both structural change – notably a more rapid shift of employment out of agriculture into services – and faster within-sector productivity growth contributed significantly to Africa’s growth recovery in the last 15 years. Economic transformation in Africa has barely started, but the potential is large.

What strategic direction(s) might African economic transformation take in the future? (Section 2.3). These will depend in part on the region’s distinctive conditions, including its delayed demographic transition and rapid population growth; the especially large impact of climate change; and the outsized importance of the natural resource sector. They will depend also on the changing global economic environment, including a slowdown in the pace of globalisation compared with the two decades before the global financial crisis, structural trends towards greater automation, and structural change in China, including its movement out of low-skilled, export-oriented manufacturing. We argue that, under these complex and uncertain conditions, sub-Saharan Africa will not benefit from pursuing transformation strategies that focus unduly on one major sector or another. While Africa will no doubt conform to the broad historical pattern noted above, countries will need to seize opportunities to boost productivity wherever they arise, according to their national circumstances. There are large opportunities to strengthen performance in all major sectors – manufacturing, natural resources, services, even in agriculture, which in many countries will need be the foundation for economic transformation as a whole.

2.1 Importance of economic transformation in development

Historical patterns of structural transformation – the reallocation of economic activity across broad sectors – are conveniently summarised in a recent survey paper by Herrendorf et al. (2013) for the *Handbook of Economic Growth*.²²

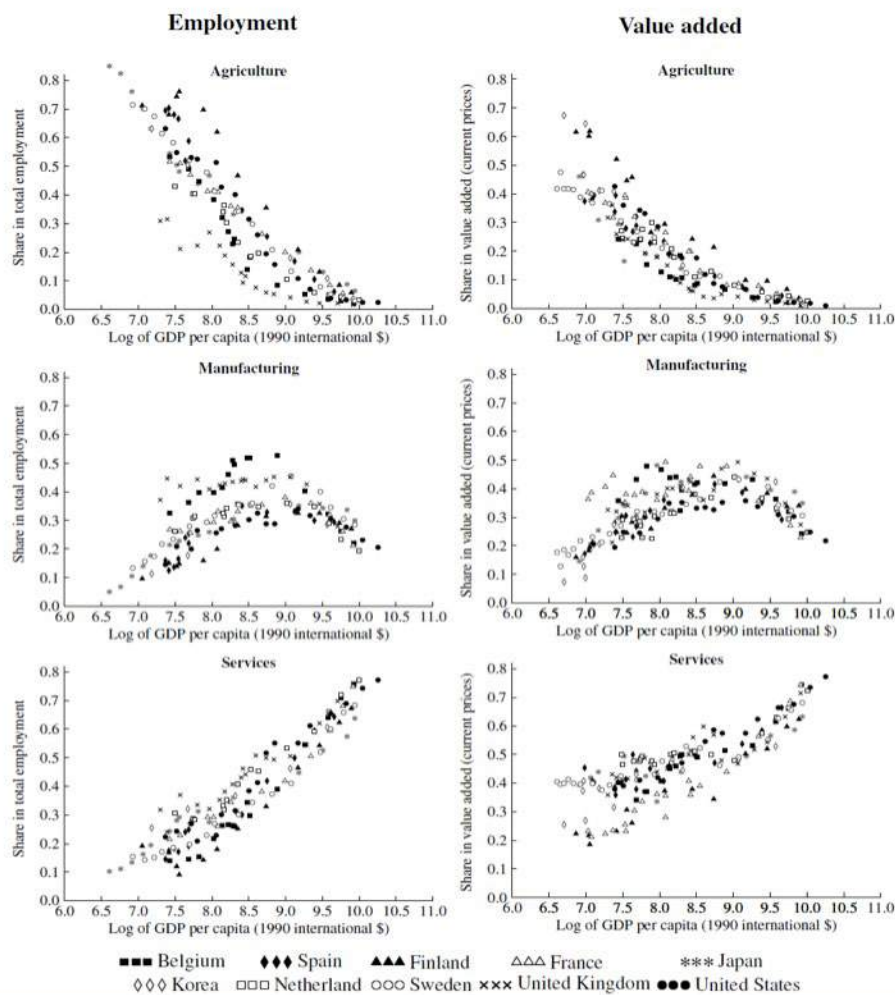
Stylised facts of structural transformation

Figure 2.1 summarises major structural transformation trends for today’s developed countries over the last 200 years. These countries have broadly followed a typical pattern of economic transformation, although

often with wide variations in the pace and emphasis of the transition. At the earliest stages of development, most employment and value added is in agriculture, a sector with low productivity per worker compared with industry or services, which at this stage contribute only a small share of economic activity. With development there is a steady decline in the share in employment and value added of agriculture. This is accompanied by a rise and then, at a more advanced stage of development, a decline in the share of manufacturing, describing an “inverted U” pattern. The share of services rises throughout structural transformation, and the pace of increase appears to accelerate at later stages. The movement of labour and other factors from low-productivity agriculture to higher-productivity manufacturing and services sectors boosts growth in the overall productivity of the economy.

Research emphasises two underlying forces driving structural change. First, consumer preferences and spending patterns change as incomes rise with underlying technological progress. There is a fall in the share of income spent on food, with rising shares going to manufactured goods and services. At higher income levels there is also a decline in spending shares going to manufactures, in favour of services. A second, complementary explanation refers to differential rates of sectoral productivity growth. High rates of labour productivity growth in agriculture relative to services, in particular, further contribute to a release of labour from agriculture into services. (Specific patterns of productivity and demand growth can also help explain the “inverse U” pattern typically seen for manufactures.²³)

Figure 2.1
Sectoral shares of employment and value added in selected developed countries, 1800–2000



Source: Herrendorf et al., 2013.²⁴

Imbs and Wacziarg (2003) provide a related perspective on structural change, noting that development is also characterised by *sectoral diversification*: countries enter and succeed in a growing number of economic sectors and activities. Only at a relatively late stage in development is there a renewed trend towards greater specialisation and sectoral concentration. This pattern can be seen at a very aggregate level, in that economies start heavily concentrated in agriculture, become more diversified across agriculture, industry and services, and finally become heavily concentrated in services.

Structural transformation in developing countries and concerns about ‘premature deindustrialization’

The main long-term patterns of structural transformation seen over the last 200 years for today’s developed countries are also seen more broadly, including among today’s developing countries. There is considerable heterogeneity in developing-country experiences, however, and some distinctive differences in how some structural transformation trends are playing out compared to the historical developed countries, particularly as regards manufacturing.

Many empirical studies of growth have noted that over sufficiently long time periods there is no evidence of “unconditional convergence”, that is, of a tendency for developing countries to grow more rapidly than developed countries, and thus for their per capita incomes to converge to developed country levels.²⁵ Only a limited number of countries have achieved sustained, rapid growth, defined as real per capita income growth of at least 4.5% sustained over at least 3 decades.²⁶ Since 1950 there have only been 24 such cases. Leaving out some cases of natural resource rich economies that enjoyed prolonged booms in commodity prices, the remainder of these growth miracles were economies that achieved rapid structural change through rapid industrialisation and growth in manufactured exports.

Rodrik (2013) argues that, globally, the manufacturing sector is distinctive in that it the only sector that shows unconditional convergence: manufacturing productivity in poor countries does tend to grow faster than in rich countries and to converge towards rich country levels.²⁷ Poor countries that succeed in establishing a competitive manufacturing sector enjoy an “escalator” towards higher productivity in this sector even if their overall institutional quality is still low. (They can enjoy even faster manufacturing growth with better overall institutional quality.)

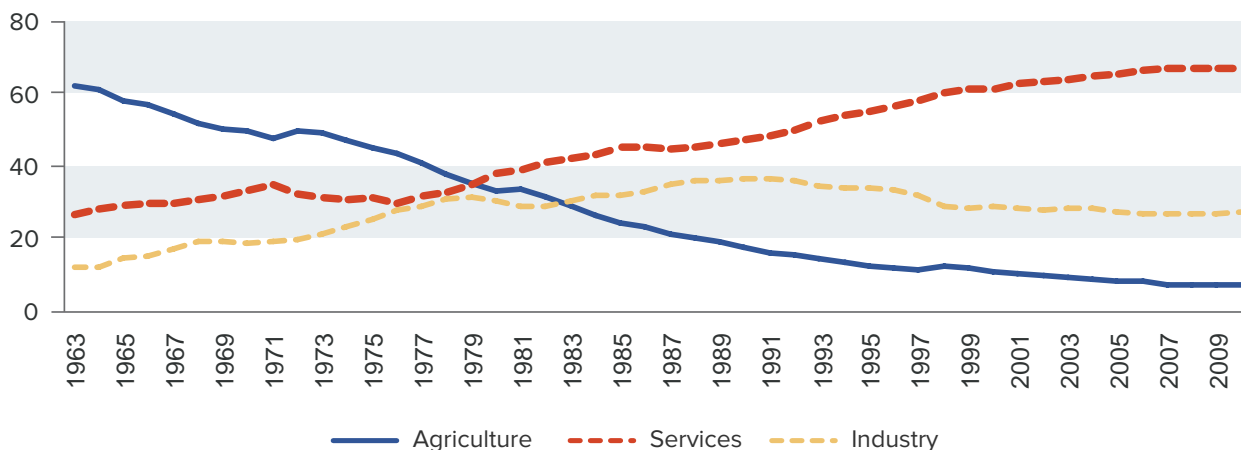
The Republic of Korea provides an example of a poor country that achieved very rapid productivity growth over many decades, accompanied by major structural transformation and industrialisation. Figure 2.2 shows the transformation in Korea’s production structure over the five decades between the early 1960s and 2010. At the start of the 1960s, Korea had a per capita GDP about the same as the average today for sub-Saharan Africa as a whole, or for countries such as Cameroon, Cote d’Ivoire or Zambia. Over the next three decades, Korea increased its per capita GDP almost nine fold, an annual average growth rate of 7.5%. This remarkable achievement was driven by both rapid within-sector productivity growth, and major growth-enhancing structural change, with the share of employment in lower productivity agriculture falling by some 45 percentage points, while the share of workers in higher-productivity industry and services each rose by more than 20 percentage points.²⁸ The shift to industry had a particularly powerful impact on overall economic growth, because within-sector productivity growth in industry was much higher than in services.²⁹

The Korean experience, with strong growth of industry, and manufacturing in particular, may have become less accessible to late industrialising developing countries, due a trend that Rodrik (2015) calls “premature deindustrialisation”.³⁰ As noted above, the path of industrialisation typically follows an “inverted U” shape. After the 1980s, however, developing countries on average are reaching lower levels of peak manufacturing (as a share of employment and value added), and this peak is occurring at earlier per capita income levels. Since 1990, countries have reached their peak manufacturing employment shares at income levels only a third as high as before 1990. Countries in Latin America and Africa appear to have been the most significantly affected, while those in Asia have held up better. Rodrik (2015) argues that “premature deindustrialisation” in recent decades is likely to reflect the impact of globalisation and increased international competition.³¹

Contribution of structural transformation to global growth

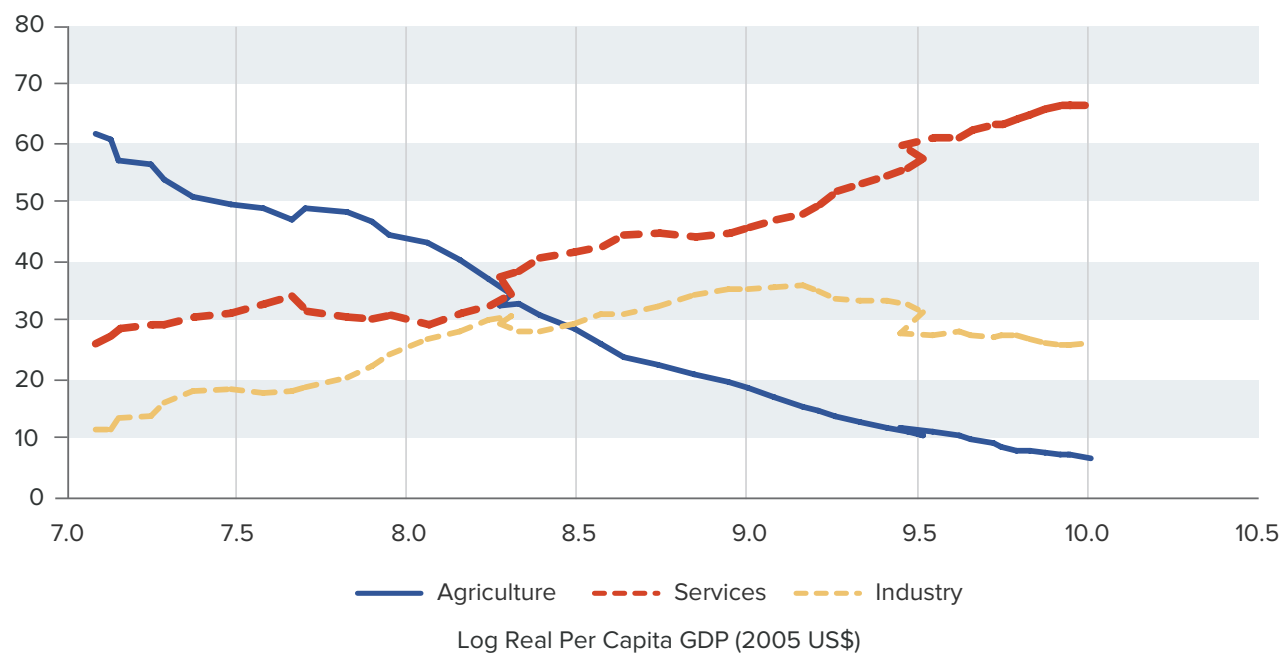
Despite the evidence that manufacturing growth has become more difficult in recent decades, structural transformation overall continues to make a significant contribution to world growth. A recent assessment decomposes growth in economy-wide output per worker into the components due to structural transformation (“between sectors”) and to within-

Figure 2.2
Korea: sectoral employment shares (%) 1963-2010



Source: Groningen Growth & Development Centre Database

Figure 2.3
Korea: sectoral employment shares (%) versus real per capita GDP 1963-2010

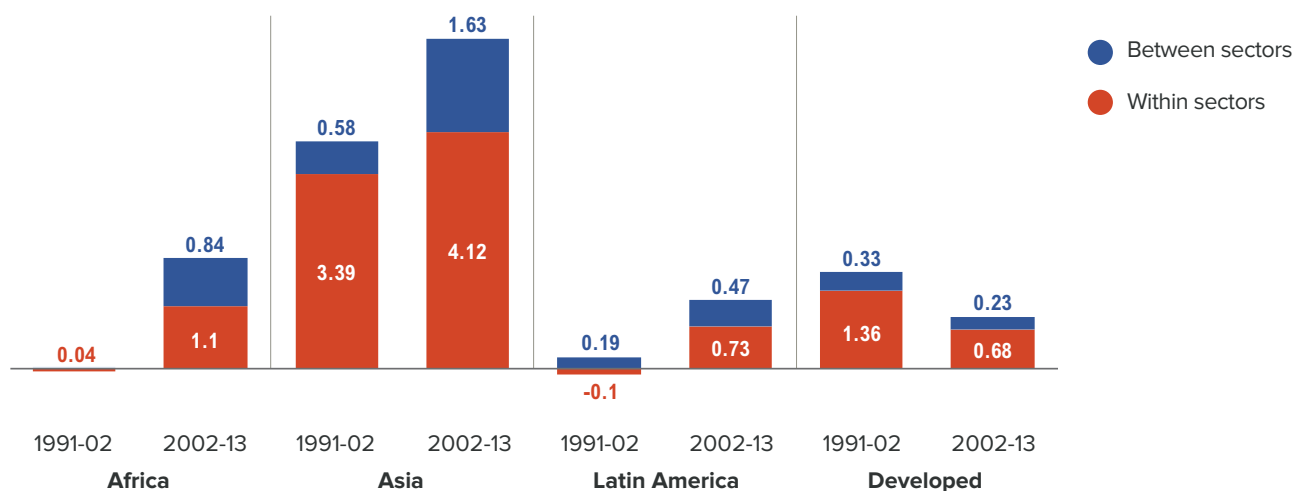


Source: Groningen Growth & Development Centre Database

sector productivity growth (“within sectors”), for a sample of 169 countries.³² In 2002–2013, structural transformation is estimated to have contributed about one third of overall output per worker growth on average across four major world regions, ranging from

about one quarter in developed countries to a little over 40% in Africa (Figure 2.4). This suggests the need for a balanced approach to economic policy that promotes both types of productivity growth.

Figure 2.4
Growth in economy-wide output per worker (%)



Source: Martins, 2015.³³

Role of policies in promoting structural transformation

There is an emerging body of evidence on the role of policies and other conditions in fostering structural transformation. Cross-country econometric studies note the role of factors such as financial depth, maintenance of a competitive exchange rate, greater labour market flexibility, liberalisation of the agricultural sector, and reforms of network industries such as electricity and telecommunications. Factor endowments and other initial conditions also affect structural transformation trends. Mineral resource abundance, in particular, is often found to hamper structural transformation and long run growth because of macroeconomic effects such as Dutch disease and the incentives it creates for rent-seeking and redistributive struggles. Managing natural resource wealth to foster rather than hamper structural transformation is a key policy challenge in many low-income countries. While there is less systematic cross-country evidence on the role of industrial policies, detailed country case studies make a plausible case for their significant potential contribution when accompanied by adequate institutional capacity.³⁴

2.2 Economic transformation in Africa

This section looks at main structural transformation trends in sub-Saharan Africa in recent decades. It then considers productivity gaps across sectors in

sub-Saharan Africa, which determine the potential for growth enhancing structural change, and looks at the actual contribution of structural change to growth in the region, relative to within-sector productivity growth. We also discuss structural transformation in the region's international trade, including measures of the economic complexity of exports.

Main structural transformation trends in sub-Saharan Africa

The most striking feature of sub-Saharan Africa's economic structure is that 60% of employment is still in agriculture, far more than in any other region, although this proportion did fall modestly in the 2000s (Figure 2.5). Despite a lower share, the absolute numbers employed in agriculture have continued to rise, because of fast population and labour force growth, reaching an estimated 197 million in 2013, up from 155 million in 2002, growing by an average 2.2% a year.³⁵ As we discuss further below, the continued relatively rapid growth in absolute numbers in agriculture is accompanied by growth in agricultural output on the extensive margin – that is through increased agricultural acreage, which contributes to the region's greenhouse gas emissions, as a result of land use change and deforestation.

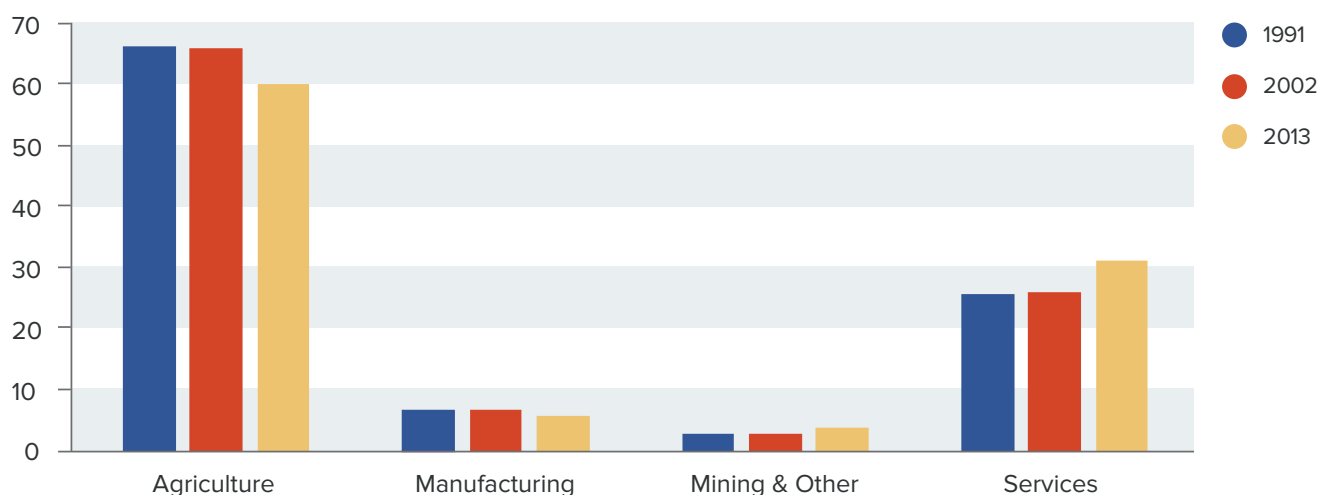
Services are the second largest source of employment, with a share of 31%. Wholesale and retail trade is by far the largest service sector, followed at some distance by transport, communications and storage, hotels and accommodation and various other services

sectors. The share of services in employment is rising, almost exactly offsetting the declining share of agriculture. Absolute numbers employed in services are growing rapidly, at 4-5% a year, although much of this can be in precarious informal employment or self-employment. All other sectors provide less than 10% of total sub-Saharan African employment. The share of employment in manufacturing, in particular, has declined to 5-6%, an indicator of “premature de-industrialisation”, and less than half the 12-14%

range in Asia, Latin America and developed countries. Employment in mining, utilities and construction has been growing, but employment in these sectors is too small to affect the overall picture much.

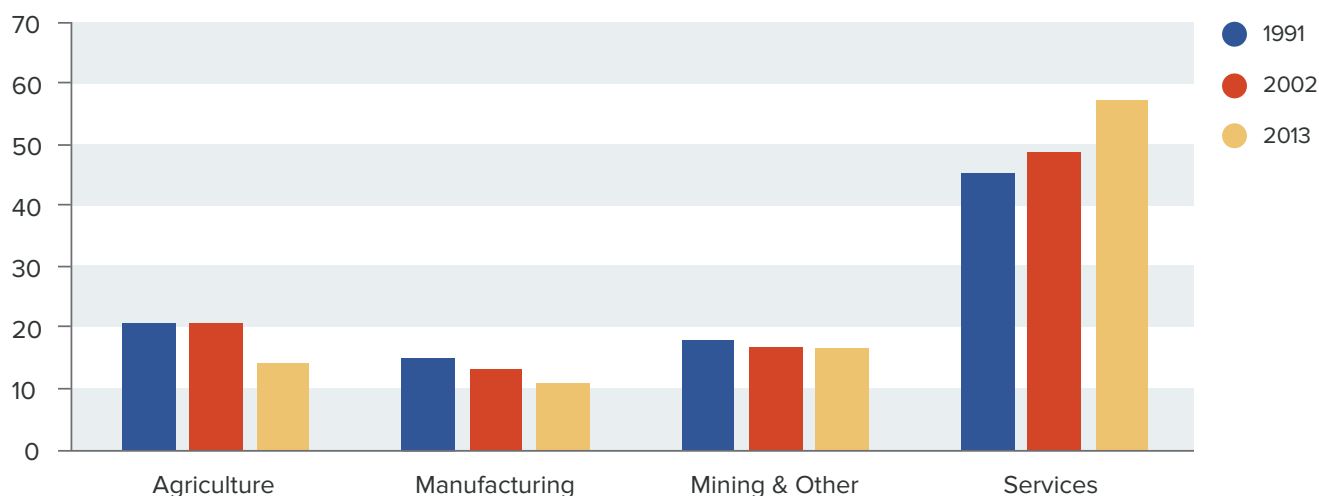
The share of sub-Saharan African agriculture in GDP – around 14% – is much lower than its share in employment, reflecting relatively low labour productivity (Figure 2.6). The situation is the reverse in other sectors of the economy: the shares in GDP

Figure 2.5
Sub Saharan Africa: sectoral shares in employment (%)



Source: Martins (2015)³⁶ and author calculations.

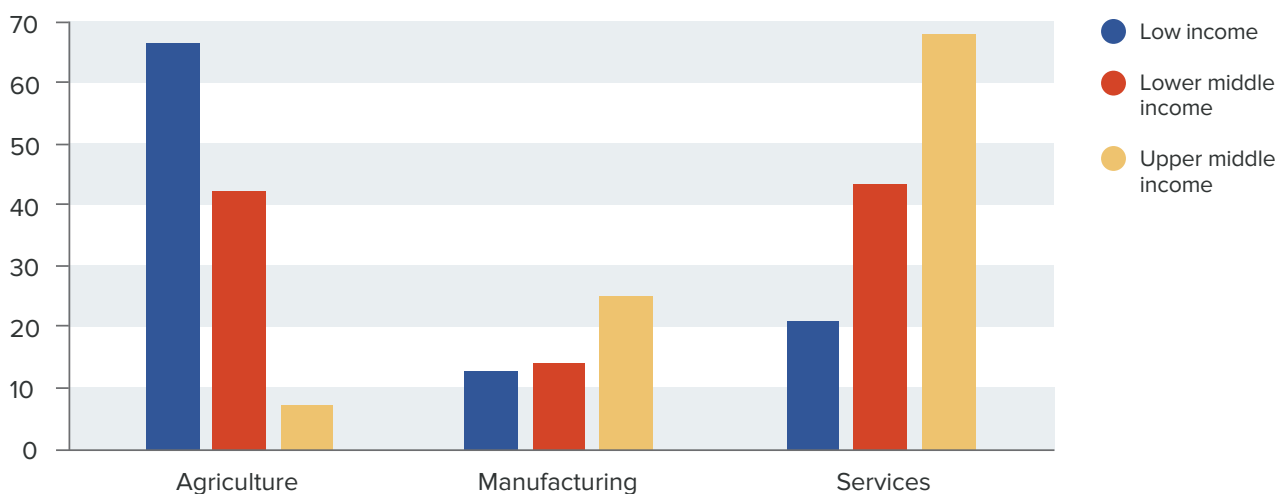
Figure 2.6
Sub Saharan Africa: sectoral shares in GDP (%)



Source: World Bank World Development Indicators.

Figure 2.7

Sub Saharan Africa: sectoral shares in GDP (%) by income group



Source: World Bank World Development Indicators. Numbers for low- and lower-middle-income country groups are simple averages.

of services, manufacturing and mining, utilities and construction are all significantly higher than their shares in employment, reflecting the fact that labour productivity in these sectors is significantly higher than the average labour productivity for the economy as a whole. The fact that most of the labour force is in the lowest-productivity sector of the economy creates the potential for growth-enhancing structural change.

There is also considerable diversity in the economic structure of African countries – for example, between countries at different income levels. Numbers for the region’s aggregate economic structure are sometimes much affected by South Africa, a large upper-middle-economy with a very different composition from the typical African country, with much lower shares of employment and GDP in agriculture, and much higher shares in services. Thus, while 60% of employment is in agriculture for sub-Saharan Africa as a whole, in South Africa this share is less than 5%, while at the other extreme, it exceeds 70% in low-income countries such as Ethiopia and Uganda, and is over 90% in Burundi. Similarly, while the share of agriculture in GDP is only around 2% in South Africa, it is over 35% (simple average) in low-income African economies (Figure 2.7).

Structural transformation and growth in sub-Saharan Africa

The potential for growth-enhancing structural change in sub-Saharan Africa arises because of large gaps

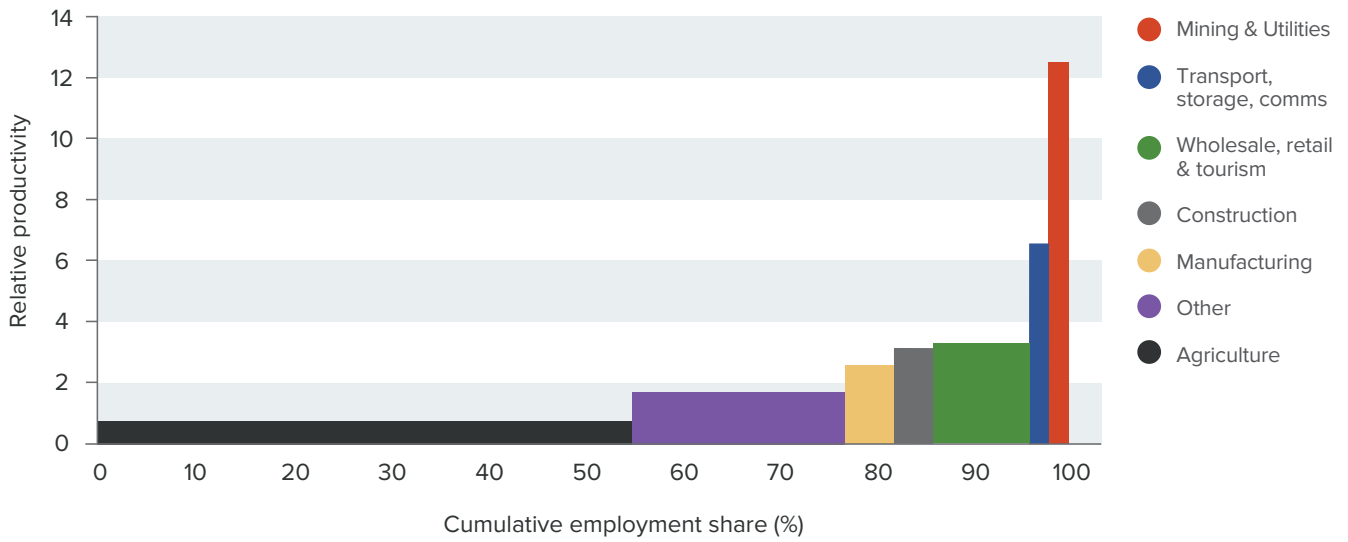
in productivity across sectors, and the fact that large numbers of workers remain concentrated in the lowest-productivity sector, agriculture. Figures 2.8 and 2.9 show productivity gaps in 2013 in sub-Saharan Africa and the OECD, respectively. In sub-Saharan Africa, labour productivity in mining and utilities, the highest-productivity sector, is almost 30 times greater than in agriculture, although the former generates only a small volume of employment. However, other sectors that generate more employment such as construction, manufacturing and wholesale and retail trade also have productivity levels five or more times larger than in agriculture.

By contrast, labour productivity gaps are much smaller in OECD countries. The ratio of productivity in the highest vs. the lowest sector is only about 5:1. Even more strikingly, the largest amount of employment is the highest productivity “other services” sector.

To illustrate the potential for growth-enhancing structural change, McMillan et al. (2014) calculate how much overall productivity in African countries would increase simply as a result of the distribution of employment across sectors becoming the same as in developed countries, even assuming unchanged productivity levels within sectors.³⁷ They estimate Ethiopia’s productivity would increase sixfold, Malawi’s sevenfold, and Senegal’s eleven times.

Figure 2.8

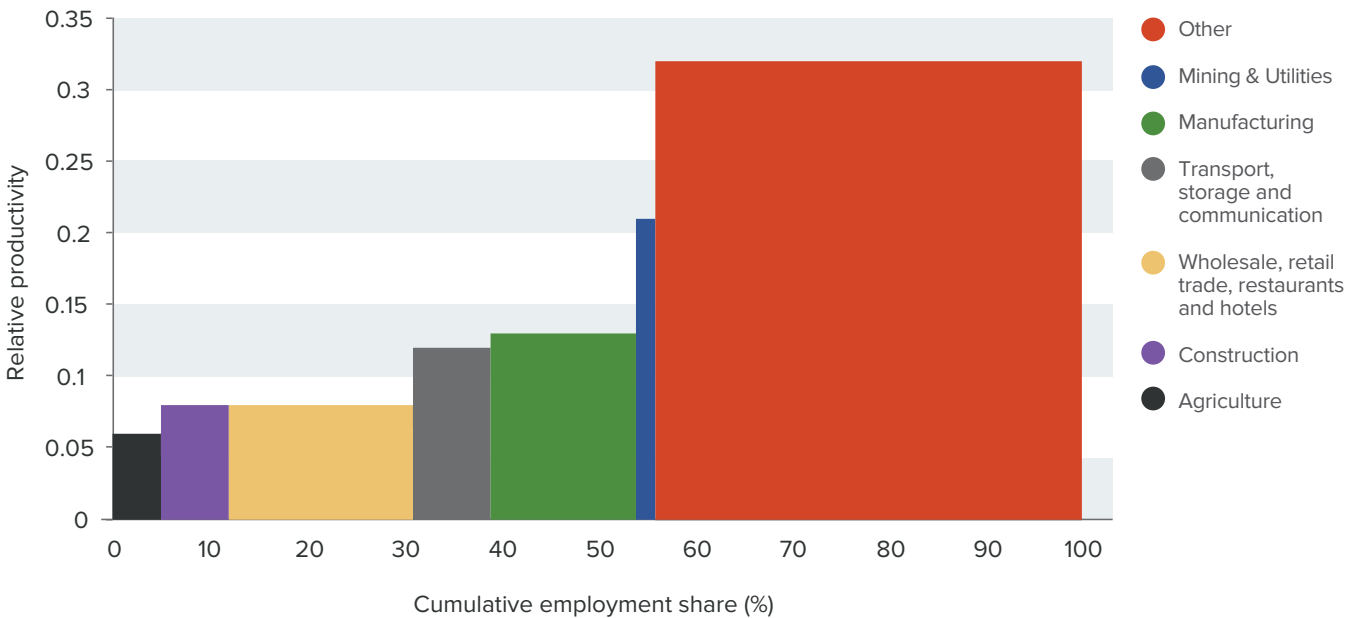
Sub Saharan Africa: relative sectoral labour productivities –2013



Source: ODI (2016).

Figure 2.9

OECD: relative sectoral labour productivities –2013



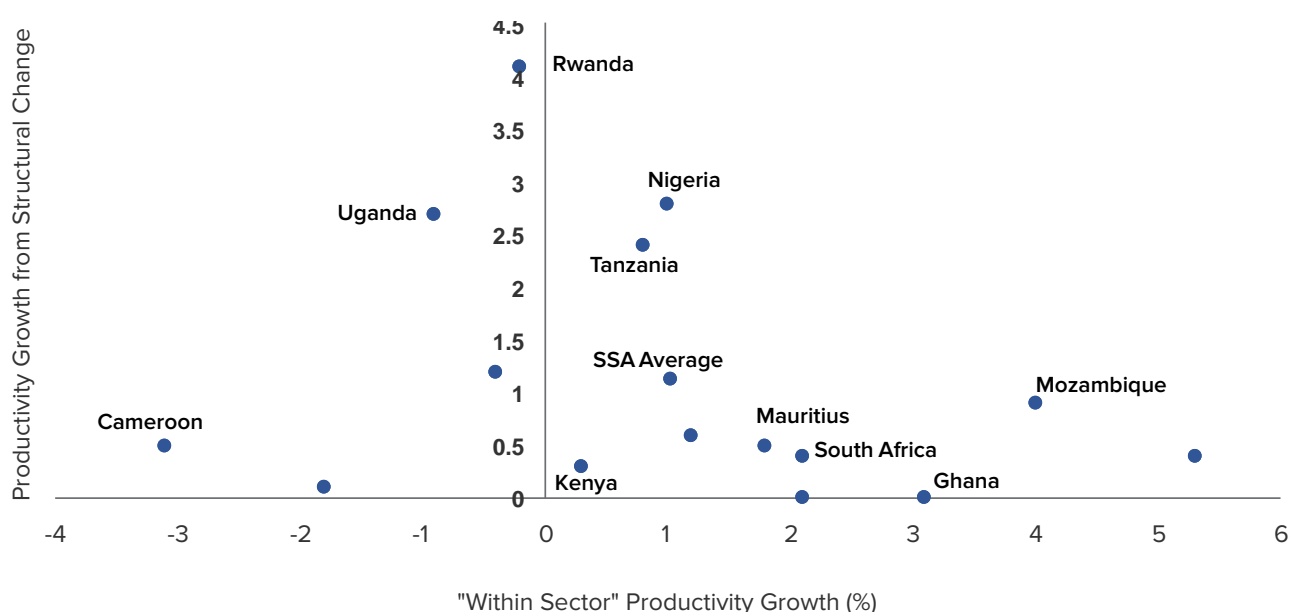
Source: ODI (2016).

However, the existence of large productivity gaps alone is not sufficient to ensure that structural change, when it occurs, will be growth-enhancing. That also requires that employment move from low- to high-productivity sectors rather than in the other direction. McMillan et al. (2014) find a significant break in patterns of structural change in their sample of nine African countries before and after 2000. To the extent that structural change occurred before 2000, it was generally *growth-reducing* rather than growth-enhancing. Labour was moving from higher- to lower-productivity sectors, alongside stagnation or contraction in within-sector productivity. In Nigeria and Zambia, for example, the share of employment in relatively high-productivity sectors such as manufacturing, construction and transport fell, while it rose in low-productivity sectors such as agriculture and community services. Since 2000, structural change has tended to be growth-enhancing, and there has also been an acceleration in within-sector productivity growth. Structural change is estimated to have added 0.4 percentage points to unweighted growth in the sample of African countries in the period 2000–2005, or 1.4 percentage points to the weighted average. The bulk of structural change after 2000 appears to be the result of labour shifting from agriculture to services, but with a limited increase in the share of manufacturing so far.

McMillan and Harttgen (2014) confirm these results with a larger sample of African countries.³⁸ The share of employment in agriculture in the post-2000 period fell by about 10 percentage points, offset by 8- and 2-percentage point increases in the shares of services and manufacturing respectively. Figure 2.10 decomposes overall labour productivity growth for 15 sub-Saharan countries in the post 2000 period into the components contributed by structural change and by within-sector productivity growth. Each component contributed about 1 percentage point to overall annual productivity growth, with the contribution of structural change rising as high as 4 percentage points for Rwanda, and 2–3 points for Nigeria, Tanzania and Uganda.

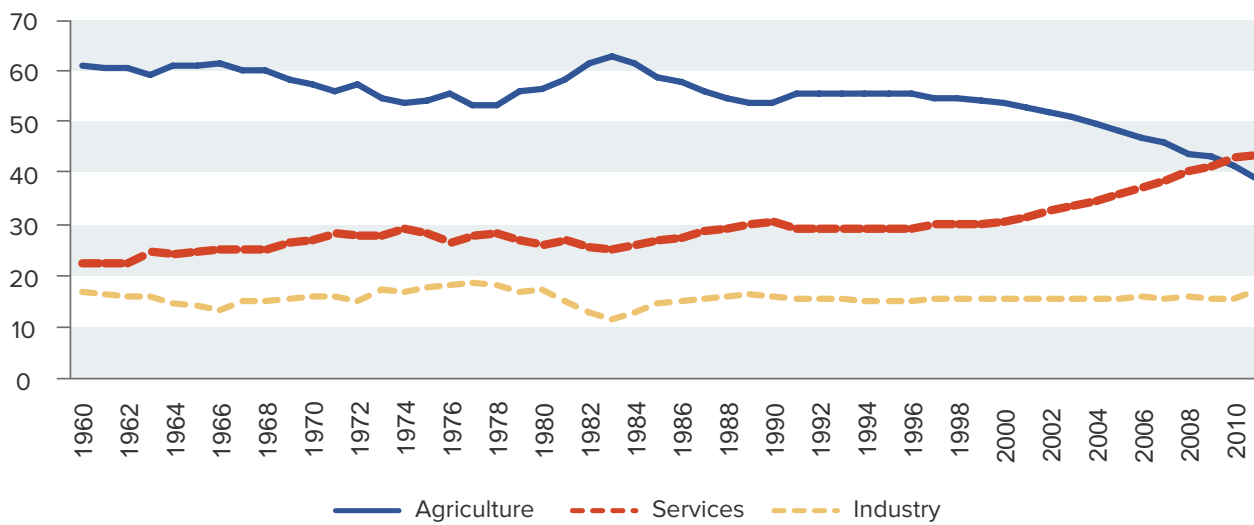
A look at individual countries confirms these broad patterns but also adds interesting twists, Ghana, for example, saw only modest structural change between 1960 and the mid-late 1990s, a period of economic turmoil and major contraction in per capita GDP, followed by economic stabilisation and only modest growth in the 1990s (Figures 2.11 and 2.12). After 2000, however, more significant structural change set in, primarily from agriculture to services, accompanied by more significant per capita growth of a little over 3% a year. Kenya, on the other hand (Figures 2.13 and 2.14), saw the most rapid structural change (with significant increases in the labour share of industry

Figure 2.10
Decomposition of productivity growth in sub Saharan Africa post-2000 (%)



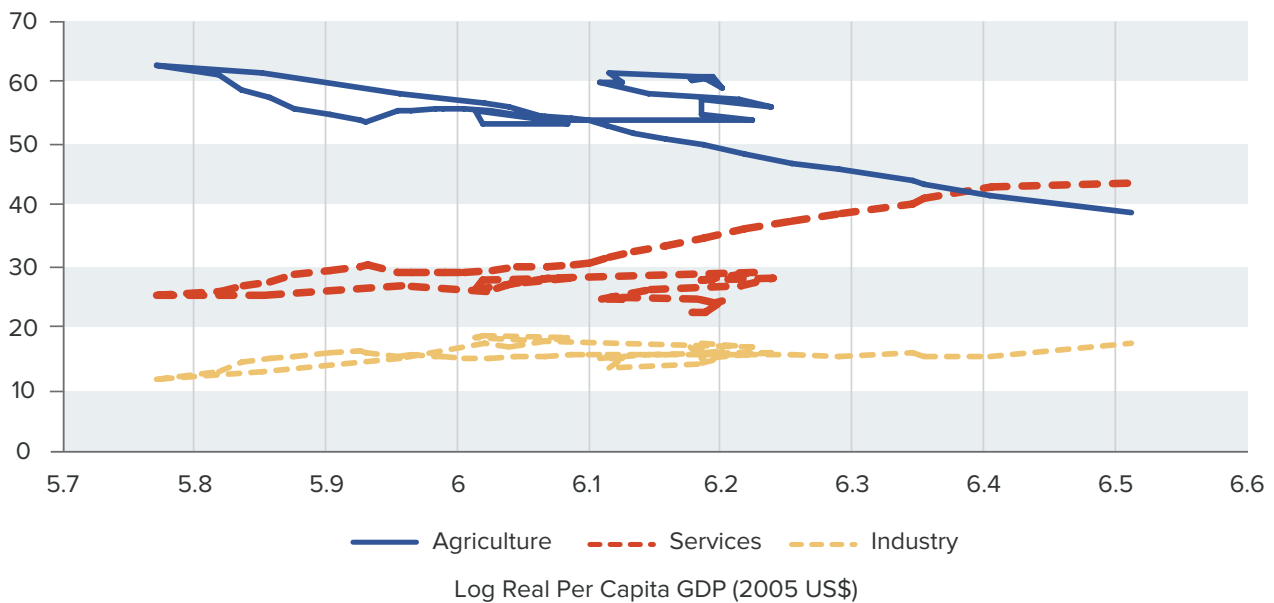
Source: McMillan and Harttgen (2014)³⁹ and author calculations.

Figure 2.11
Ghana: sectoral employment shares (%) 1960-2011



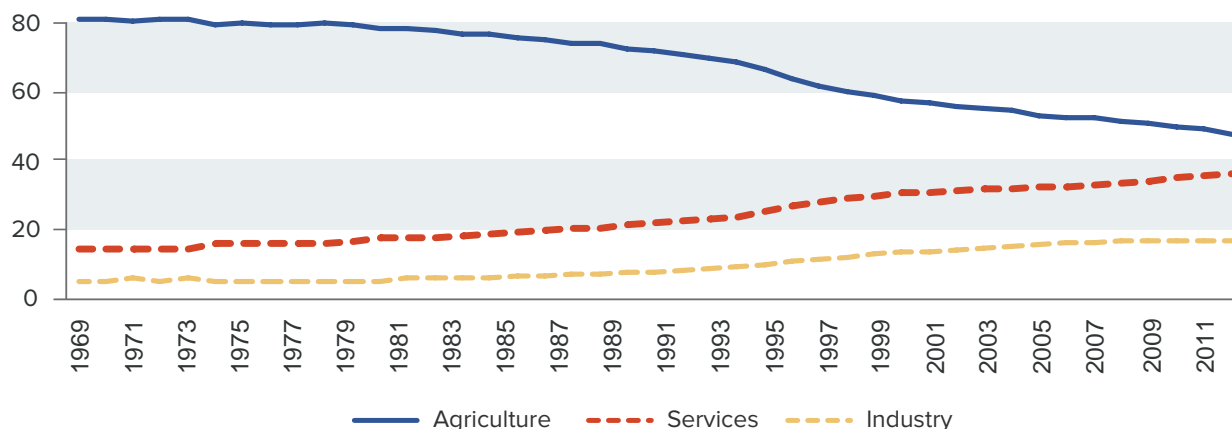
Source: Groningen Growth & Development Centre Database.

Figure 2.12
Ghana: sectoral employment shares (%) versus real per capita GDP 1960-2011



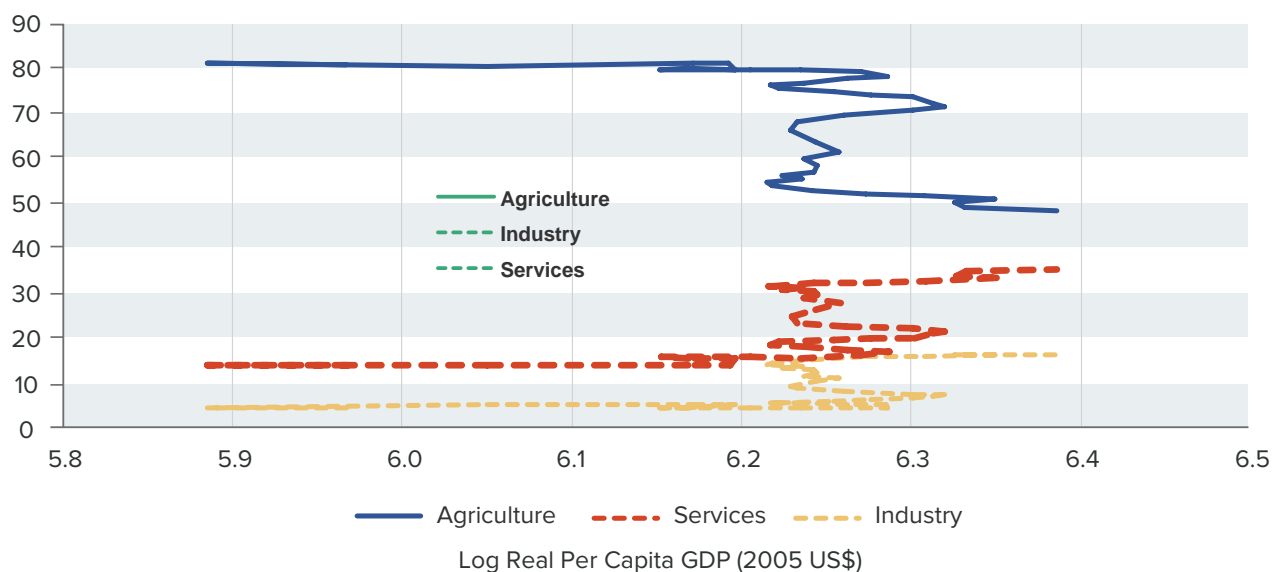
Source: Groningen Growth & Development Centre Database.

Figure 2.13
Kenya: sectoral employment shares (%) 1969-2011



Source: Groningen Growth & Development Centre Database.

Figure 2.14
Kenya: sectoral employment shares (%) versus real per capita GDP 1969-2011



Source: Groningen Growth & Development Centre Database.

and services) precisely in the period of the 1980s and 1990s, when per capita GDP was stagnating or contracting.

This preliminary look at the evidence suggests that economic transformation is now *beginning* to play an important role in African development. However, as the still only moderate per capita GDP growth rates indicate, the twin engines of economic transformation

are still running at half-throttle at best: within-sector productivity levels are generally low compared with global standards, growing at only modest rates, and the growth impact of structural change is also fairly modest, with most labour shifts occurring from agriculture to services, with only limited impact on growth in manufacturing.

International trade and evolving economic complexity

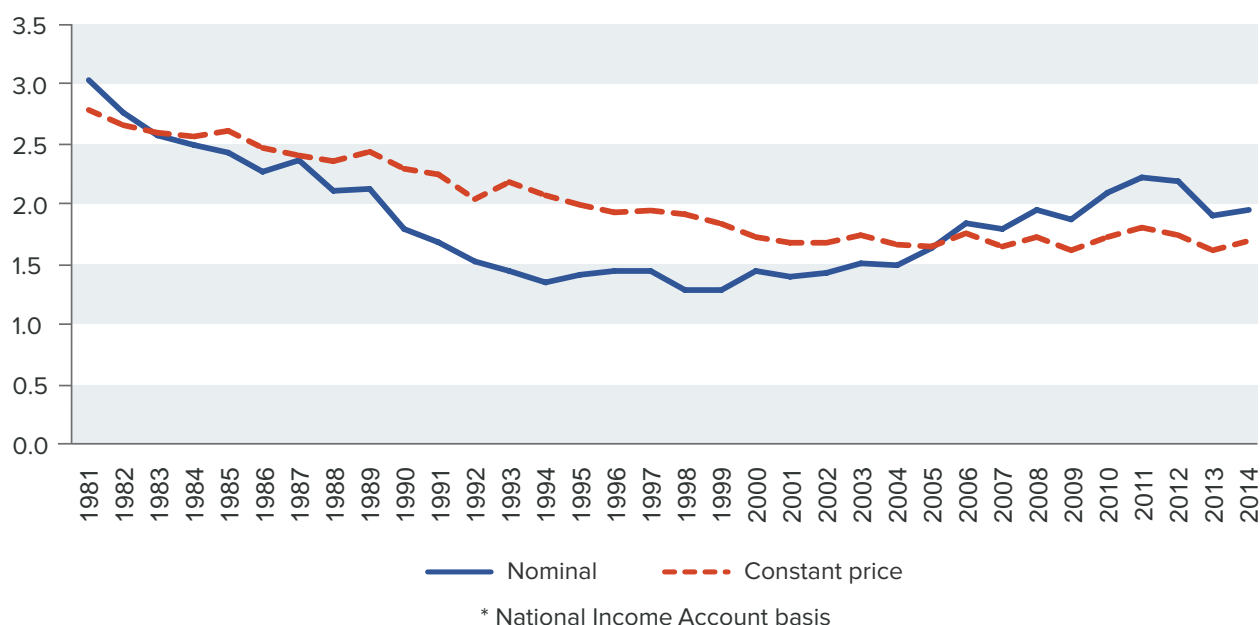
The extent and nature of sub-Saharan Africa's engagement in world trade provides further useful insights into economic transformation in the region, or the lack thereof.

The world share of sub-Saharan Africa's exports of goods and services (measured in nominal terms) fell significantly between the early 1980s and the mid-1990s, followed by a partial recovery after the early 2000s, although the region's exports in 2014 were still only a minuscule 1.9% of world exports (Figure 2.15). Moreover, the 2000s recovery in the region's nominal world export share appears to have been mostly due to a boom in world primary commodity prices, which lifted the price of Africa's export basket relative to the world – not to an underlying improvement in competitiveness. Higher commodity prices were not the only reason for the modest rise in the region's nominal export share, however. Sub-Saharan Africa's share of world manufactured exports, while still only a tiny 0.9% in 2013, had risen modestly from around 0.4% in the late 1990s. Taken as a whole, though, the region's world export share, measured in constant price or real terms, does not show any recovery in the 2000s. The most that can be said is that the region's real share in world trade is no longer falling (Figure 2.15).

Sub-Saharan Africa's exports continue to be dominated by primary commodities: fuel alone accounted for 40% of merchandise exports in 2011–2013, while agricultural raw materials, food and ores and metals contributed 32%, with manufactures making up 26% (Figure 2.16). These shares had not changed much over the preceding decade. Among the more noticeable shifts, the share of ores and metals has risen, as major new mining projects have come online, while the share of manufacturing in the export basket slipped.

Is manufactures' 26% share of total exports from sub-Saharan Africa high or low? One way to evaluate this is to compare it with the share of manufactures in world exports as a whole, which is close to 70%. Dividing Africa's manufactured export share by the world share creates an index called the Revealed Comparative Advantage (RCA). A manufactured export RCA of 1 would mean a country or region has a manufacturing orientation in its exports equal to the world average. For sub-Saharan Africa, the manufactures RCA is well below 0.5, indicating a distinct revealed comparative disadvantage in manufactures (Figure 2.17). Sub-Saharan Africa's strongest RCA is in ores and metals, followed by fuel and agricultural raw materials as joint seconds.

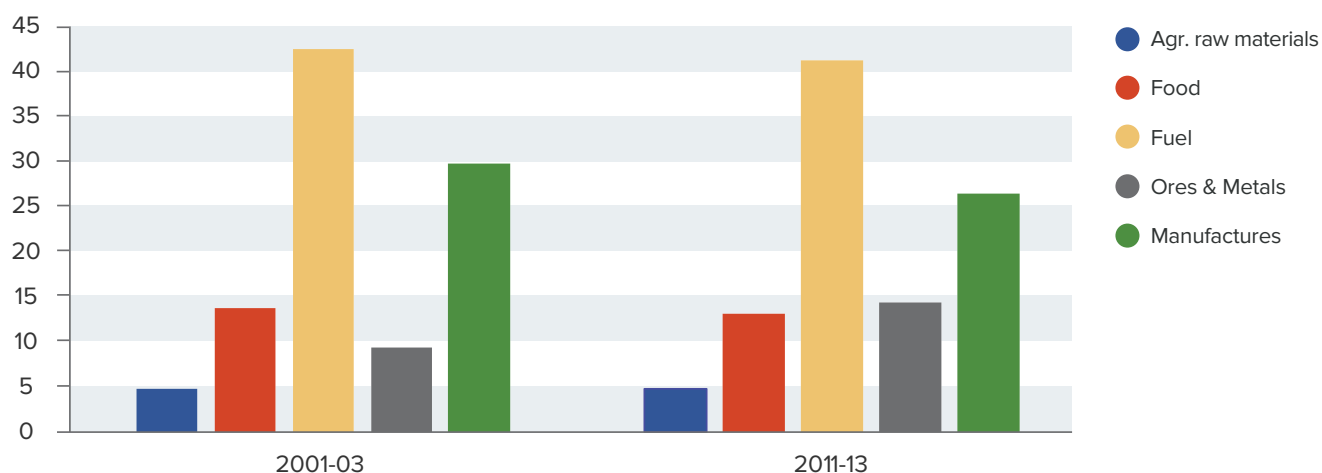
Figure 2.15
Sub Saharan Africa: exports of goods and services* as share of world (%) 1981-2014



Source: World Bank World Development Indicators.

Figure 2.16

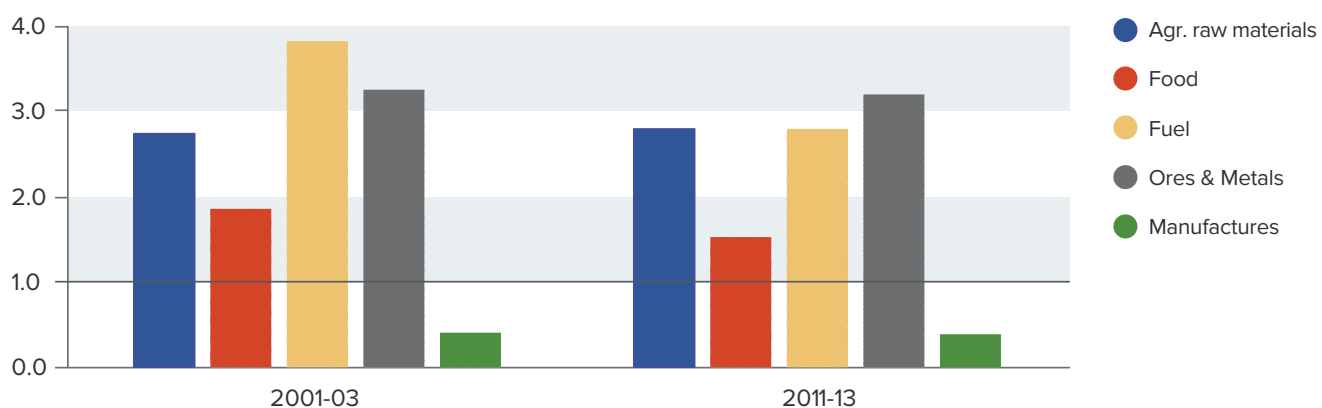
Sub Saharan Africa: merchandise export shares (%) 2001-03 and 2011-13



Source: World Bank World Development Indicators.

Figure 2.17

Sub Saharan Africa: revealed comparative advantage indexes 2001-03 and 2011-13



Source: World Bank World Development Indicators and author calculations.

Researchers at the MIT Media Lab and Harvard University have used information on the detailed composition of a country’s exports to create an Economic Complexity Index (ECI), which aims to reflect a society’s ability to hold and use productive knowledge.⁴⁰ The ECI has two components, the diversity of a country’s exports and the uniqueness or sophistication of its exports. As might be expected, sub-Saharan countries generally rate quite low, although – again as expected – upper-middle-income countries such as South Africa and Mauritius do much better than lower-income countries in the region.

More interestingly, the ECI analysis shows a strong historical pattern: when a country’s ECI (its knowledge ability) is high relative to its per capita income, then this is reflected in a period of subsequent rapid growth. There are a number of sub-Saharan Africa countries whose ECI – while low in absolute terms – is high relative to their per capita incomes, and which should therefore be expected to grow rapidly in the next 10 years. This leads to projections that of the 10 fastest-growing countries in the world in the decade to 2024, seven will be in sub-Saharan Africa: Uganda, Kenya, Tanzania, Madagascar, Senegal, Malawi and Zambia.



Photo credit: Flickr/James Anderson

2.3 Strategic directions for economic transformation in Africa

As African policy-makers ponder how to step up the pace of development, an important question they face is: What should be the strategic direction for economic transformation going forward? In this section, we summarise the broad historical patterns and forces to which sub-Saharan Africa's future transformation will likely conform, as well as specific local and global factors that will affect the distinctive opportunities and challenges for countries in the region. We briefly review the potential contribution to Africa's economic transformation of four sectors: agriculture and agro-processing, manufacturing, natural resources and services.

Economic transformation under African conditions, in a changing global context

The preceding discussion has documented how most of today's developed countries have followed a characteristic path of economic transformation. Beginning as overwhelmingly agrarian economies, they have today reached a structure in which, generally, less than 5% of employment remains in agriculture, with 10–20% in industry and over 70% in services. This structural transformation has also been accompanied by enormous gains in productivity within sectors. Economists have identified the underlying forces driving this transition as the changes in consumption patterns that occur with rising incomes, as well as differential rates of productivity change in various sectors.

Today's developing countries also appear to be at varying stages in this broad pattern of structural

change, with some, including low-income countries in Africa, still at an early stage. As noted earlier, 60% or more of employment in the region is still in agriculture. Nevertheless, while structural change in today's countries continues to reflect the deeper underlying forces that economists have identified, it is also occurring under very different global and local conditions. Thus there may well be significant variations in the pace and emphasis of transformation in today's developing countries as compared with earlier developers; an example is the premature deindustrialisation trend identified by Rodrik (2015).⁴¹

Structural changes in the world economy that may shape African economic transformation were discussed in Chapter 1 above. Here it is worth noting in addition several local or regional conditions that will help determine the direction and scope of economic transformation in sub-Saharan Africa in coming decades. First, it is among the regions expected to be most seriously affected by climate change, as discussed in more detail in Chapter 3 below, with especially adverse potential impacts on productivity in agriculture. Second, demographics – continued rapid growth of the working age population – will put a premium on directions for economic transformation that can create vast numbers of new jobs (Box 2.1). Third, the expansion of sectors requiring high skills will be constrained by the low levels of education and skills in the region, conditions that can change only relatively slowly, through steady investment in human capital. Finally, more than half of sub-Saharan African countries are rich in natural resources,⁴² a condition which poses unique institutional challenges if the resulting wealth is to be used to support broad-based, inclusive growth rather than merely to enrich narrow elites.

Box 2.1: Sub-Saharan Africa's delayed demographic transition

Africa is experiencing a delayed version of the demographic transition that occurs in all developing countries. Africa's infant mortality rates have fallen significantly, although they still remain higher than other regions. The under-5 infant mortality fell from 307 per 1000 in 1950–1955 to 99 per 1000 in 2010–2015, primarily due to public health interventions, and more recently in the 2000s likely also due to rising incomes. As in other countries, the fall in infant mortality is the first step in the demographic transition.

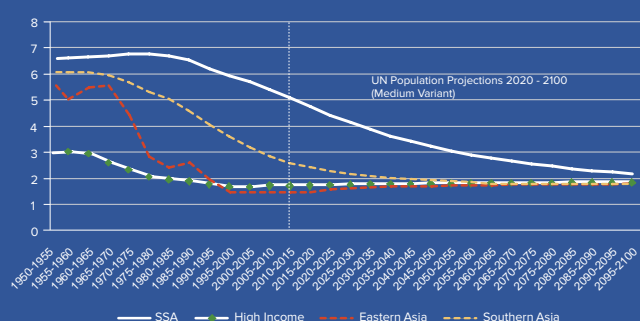
The next step is typically a decline in fertility (children born per woman), but this has occurred unusually slowly in Africa. Figure 2.18 shows that fertility rates in South Asia and sub-Saharan Africa were similar in 1950–1955, at 6–7 children per woman. But by 2010–2015, the number had fallen to under 3 in Asia, but was still around 5 in Africa. There is a lot of variation across countries: fertility rates are already less than 3 in upper-middle-income countries such as Botswana, Mauritius and South Africa, but still over 6 in low-income countries such as Burundi, Democratic Republic of Congo, Niger and Somalia.

Typically, of the factors that influence the fertility rate, the most important is infant mortality. The fewer children die, the fewer births are needed to achieve a desired family size. The education of women and girls is another key determinant of fertility rates. Urbanisation, access to family planning services, and social norms are also important.⁴³

One of the results of the delayed demographic transition in sub-Saharan Africa is continued rapid population growth: 2.7% per year, more than twice the pace for developing countries in aggregate. This pace has barely slowed since the 1980s and 1990s, and is higher than population growth in other regions when they were at sub-Saharan Africa's current per capita income level. Sub-Saharan Africa's population is expected to rise from just under 1 billion in 2015 to 2.1 billion in 2050 and 3.9 billion in 2100 (under the UN's medium variant scenario). The proportion of Sub-Saharan Africans in the world population would rise from 13% today to 35% in 2100.

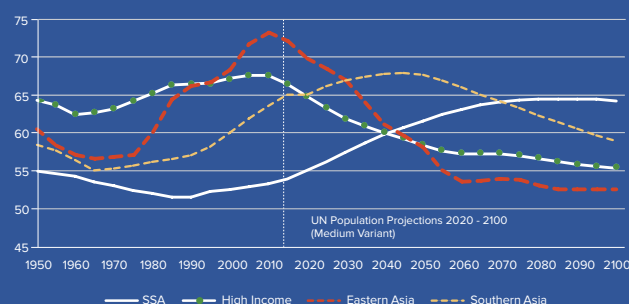
Another result of the slow demographic transition is an extraordinarily large youth age bracket (43% of the population aged 14 or younger) and a low share of people of working age – only 54%, compared with 65% in South Asia and 72% in East Asia. As Figure 2.19 shows, the share of the working-age population in sub-Saharan Africa has begun to rise, but only slowly, due to the slow pace of fertility decline. The UN projections see the working-age share in Africa only exceeding those in East Asia and developed countries around 2045, and that in South Asia, only around 2070.

Figure 2.18
Fertility - children per woman 1950-2100



Source: UN World Population Projections 2015 Revision (medium variant).

Figure 2.19
Working age population – 15-64 age group as % of population 1950-2100



Source: UN World Population Projections 2015 Revision (medium variant).

Box 2.1:

Sub-Saharan Africa's delayed demographic transition (cont.)

A more rapid moderation of fertility in sub-Saharan Africa could have significant long-term benefits for growth, poverty reduction and, with some qualifications, the environment if – and this is a crucial condition – overall economic policies support rising employment and investment. Most simply, having a larger share of working-age people in the population boosts output per capita, provided these workers find employment. With smaller families, more women can join the labour force. Worker productivity also increases: with a smaller youth cohort to support, more resources can be devoted to investment per worker, and to spending on health and education per child (provided, again, that economic policies encourage such productive investment). These effects have been called a “first demographic dividend”.

With more workers in the population needing to save for old age, saving rates also rise, allowing more investment and a further boost to productivity. This has been called a “second demographic dividend”. Positive feedback loops also kick in. Better child and maternal health reduce infant mortality, which encourages further fertility decline, since families need to have fewer children to achieve a desired number of surviving children. More education for girls and greater gender equality in general have a powerful effect in moderating fertility, as noted previously.

A fast demographic transition, combined with supportive economic policies, can generate a very substantial demographic dividend. In East and Southeast Asia, for example, it is estimated to have contributed 45% of that region's rapid 4.2% per year per capita GDP growth in 1965–2005 (medians for both). In South Asia, the demographic dividend was estimated to have contributed 42% of per capita GDP growth in 1970–2000. The IMF recently calculated a number of scenarios for the possible future demographic dividends in sub-Saharan Africa. In the scenario with the fastest fertility decline, better policies and more job creation, per capita incomes in 2050 were almost 50% higher than in the scenario with the least progress on these fronts. The difference grows to 120% by 2100.⁴⁴

The implications of a more rapid demographic transition for the environment are complex. We can be relatively confident that it would strengthen resilience to climate change: there would be fewer people exposed to climate shocks, particularly poor people in rural areas, while, as we note below, adaptive capacity tends to rise with per capita income. Pressures for deforestation and expansion of agricultural land would decline as agriculture switches from more extensive to more capital- and technology-intensive methods of production. However, the implications for overall GHG emissions are not clear. Other things equal, a smaller population would tend to reduce emissions, but to the extent the demographic transition raises per capita incomes, that would tend to boost emissions per person. This is not a well-studied issue and the net impact on emissions is unclear. Nevertheless, it seems reasonable to suggest that a more rapid demographic transition would be a relatively clean road to development in that it is based on forces that tend to have offsetting effects on GHG emissions.

Policies to magnify and reap Africa's demographic dividend must aim both to speed fertility decline, and to create the economic conditions that would allow countries to reap the benefits of that decline. Reducing infant mortality should be the first priority where that is still relatively high, both for its own direct benefits and for the impact it has in encouraging fertility decline. Improved gender equality and education for women and girls also have multiple benefits. Expansion of comprehensive family planning programs can be combined with information and civil society outreach to address and change social norms. Obviously, both the broad economy-wide and the more focused sectoral economic policies to encourage rapid output and employment growth that are discussed throughout this report are also crucial if the demographic transition is to be turned into a demographic dividend. Improving education and human capital, and policies to encourage female employment outside the home are particularly important.⁴⁵

Viewing the distinctive characteristics of sub-Saharan Africa and the high uncertainty as to future cyclical and structural trends in the world economy, one can share the scepticism of Rodrik (2014) about development strategies that focus largely on a single major sector, be it manufacturing, services, natural resources or agriculture.⁴⁶ Page (2012) arrives at a similar conclusion, arguing that industrialisation is essential for African development, but due to changes in technology and in the structure of the world economy, a much wider set of activities can also deliver the growth benefits associated with traditional manufacturing – for example, high-value-added agricultural sectors, agro-industry and high-value-added tradable services.⁴⁷ In this telling, Africa needs to follow industrialisation both “with smokestacks” and “without smokestacks”. It is possible that Africa’s economic transformation path will be unique, reflecting its distinctive circumstances and comparative advantages.

Here we add some brief comments on the scope for economic transformation in sub-Saharan Africa to draw on potential opportunities in the major economic sectors. Many of these issues are dealt with in more detail in Chapters 4–7.

Agriculture and agro-processing

It has been called “the paradoxical role of agriculture in structural transformation”. Even as the share of agriculture in employment and output continues to shrink in the long run, rapid productivity growth in this sector and rising rural prosperity have historically played a vital role in stimulating the growth of the non-agricultural and urban sectors, and in economic transformation overall.⁴⁸ Rising output and income in agriculture provide food, agricultural raw materials, labour and savings as inputs for the non-agricultural sectors, as well as growing markets for the output of those sectors.

Agricultural growth plays an especially powerful role in poverty reduction. The role of agricultural reforms and surging agricultural productivity in kick-starting China’s rapid growth after 1979 is well known. In developed countries with a comparative advantage in agriculture, such as Denmark and New Zealand, even though agriculture now contributes only 5% of GDP, it remains a major contributor to exports, while agro-processing is an important element in these countries’ manufacturing industries.

For all these reasons, and given that – with 60% of employment currently in this sector – agriculture

will remain a major source of jobs for decades yet, policies to bolster agricultural productivity are a critical component of overall economic transformation strategies in sub-Saharan Africa. Fortunately there are many positive signs. After a long period of neglect, both donors and sub-Saharan Africa governments have strengthened their policy focus on agriculture since the early 2000s. Although cereal yields remain far below those in other developing regions, growth in yields accelerated sharply in the 2000s, with significant output gains in countries such as Rwanda, Cameroon, Ethiopia, Ghana, Kenya and Zambia, among others. In a number of countries, African farmers have successfully developed production of new high-value-added fruits, vegetables and flowers for export markets.

Looking ahead, these positive trends need to be consolidated and expanded, and to increasingly factor in responses to the looming threat of climate change, which has the potential to seriously restrain or reduce Africa’s agricultural productivity in coming decades. Farming methods and technologies that deliver so-called “triple wins” – higher agricultural productivity, stronger resilience to climate change and reduced greenhouse gas emissions from agriculture and land use change – are increasingly feasible. Promotion and widespread adoption of such approaches will be an important plank in sub-Saharan Africa’s overall economic transformation strategy in coming decades. These issues are discussed more fully in Chapter 4.

Manufacturing

The most obvious gap in Africa’s economic transformation is manufacturing. In the past and in other regions, manufacturing has provided rapid, large-scale job creation, even for masses of low-skilled workers leaving agriculture. In today’s developed countries, manufacturing at its peak provided jobs for up to 40–50% of the labour force, while in China and Korea it has at times provided 20–30% of employment. As Rodrik (2013) notes, manufacturing also appears to be the only sector that enjoys unconditional convergence towards high-income productivity levels.⁴⁹ Yet, as noted, manufacturing in sub-Saharan Africa has struggled, with its share in employment falling to only 5–6% by 2013, buffeted by severe macroeconomic instability in earlier decades, economic reforms that reduced trade protection of domestic markets, and growing global competition, most notably from emerging-market producers such as China.



Photo credit: Flickr/James Anderson

Nevertheless, there are reasons to think that manufacturing can play a larger role in sub-Saharan Africa's future than in its recent past. Macroeconomic stability is much improved. The current manufacturing sector, while smaller than before, is also more productive and has demonstrated an ability to operate in a more competitive post-liberalisation environment. And, while sub-Saharan Africa's share in world manufactured exports is still only a miniscule 0.9%, this does appear to have increased modestly since the late 1990s.

It is true that the international outlook post-financial crisis is uncertain. World trade and FDI flows are growing more slowly than before the crisis. On the other hand, it is likely that rising wage costs and offshoring of low-wage manufacturing from China could create notable opportunities for African manufactured exports. The sharp devaluation of real exchange rates in many sub-Saharan African countries in 2015 and early 2016 will provide a large boost for the region's manufacturing competitiveness. As we discuss more fully in Chapter 5, African manufacturers' poor performance relative to international competitors is well explained by weaknesses in factors such as infrastructure, access to finance and the business climate. A determined policy push by governments to

tackle these weaknesses could have a major impact in fostering a strong revival of manufacturing activity and exports.

The region's share in the enormous world market for manufactures is currently so small that there are likely to be large opportunities for more competitive African manufacturers to increase market share, even in a slower-growing world market. If the region's share of world manufactured exports were to increase by only 1 percentage point, from 0.9% to 1.9%, that would represent about a 40% increase in the region's manufacturing output, and 7 million additional manufacturing jobs.

Natural resources

Many African countries have rich reserves of exhaustible natural resources such as oil, natural gas and various minerals. The mining sector contributes around 55% of sub-Saharan Africa's merchandise exports, and is typically the most productive in the economy, with output per worker more than 10 times the labour productivity of the economy as a whole.

The problems with this sector are also well known. It generates little direct employment – just over 1% of regional jobs. Ensuring that natural resource wealth

benefits the whole population, not just narrow elites, requires strong governance and institutions – features commonly lacking in the region, which take time to develop. Without strong governance, natural resource wealth can turn into a “natural resource curse”. It can drive up the real exchange rate, hindering structural transformation towards tradable goods sectors such as manufacturing, agriculture and tradeable services. Through political economy channels, it can also lead to the diversion of resources into wasteful public spending, rent-seeking, corruption and civil strife.

Strengthening governance of the natural resource sector should be a key priority for resource-rich African countries, as we discuss in more detail in Chapter 5. History provides several examples of countries that have successfully integrated natural resource riches into a broad-based economic transformation. Australia and Canada provide useful examples, as do developing economies such as Indonesia and Malaysia. Within the region, Botswana provides a good example of a country that has made strong efforts to convert mineral wealth into more broad-based and inclusive growth.

If well managed, Africa’s rich natural resource base can provide a major stream of revenues to support investment in human and physical capital, and in economic transformation and development more generally. Over time, global efforts to mitigate greenhouse gas emissions will also reduce international demand and prices for fossil fuels, tending to limit the time horizon and expected revenue streams from this important component of Africa’s natural resources. Within this more limited “window”, then, it becomes even more important that natural resources be well managed and these revenues be well invested in diversification.

Services

Services is the fastest-growing sector in sub-Saharan Africa, as noted, which historical experience suggests will ultimately comprise most of employment and output. Service activities are diverse. On the one hand there are internationally tradable, highly capital- and skilled-labour-intensive service sectors with high labour productivity, such as finance,

information technology, communications and other business services. These are typically highly productive activities which also provide key inputs to other sectors and are therefore important for overall economic development. But the size of employment in these sectors is constrained by the availability of skills, which is typically low in sub-Saharan Africa. Countries that have been more successful in developing these sectors are also those with higher availability of skilled labour, at least in absolute numbers – for example, South Africa, Mauritius, Nigeria and Kenya.

In an intermediate range, tourism is an important service sector in several African countries, providing significant employment and drawing on valuable renewable natural resource stocks, such as wilderness and exotic fauna. At the other extreme are a vast array of low-productivity individual or micro-enterprise activities in the informal sector, such as kiosks or street peddling, household or domestic services, and day labourers. These informal activities are typically the ones taking up large scale flows of unskilled labour flowing out of agriculture, from rural areas to cities.

There are at least four ways in which African countries can promote service-sector development as a major element in economic transformation. First, countries they can reduce institutional barriers and improve the overall regulatory and business environment for the growth of modern commercial services that serve as key inputs to the rest of the economy, such as financial and business services, IT and communications. Second, they can boost investment in education and skills-building, which is important for development in general and specifically for increasing employment in high-productivity modern services sectors. Third, they can exploit significant opportunities in tourism. Fourth, they can work to improve productivity and incomes in informal activities – for example, by reducing regulatory burdens that prevent informal entrepreneurs from engaging more fully in and with the formal economy, and by increasing training, skills development, business development, credit and other programmes and services for these activities.



Photo credit: Flickr/James Anderson

CHAPTER 3

Economic transformation and the climate challenge in sub-Saharan Africa

Economic transformation in sub-Saharan Africa is occurring in the context of increasing climate change. The region is already experiencing more significant climate variability and climate change impacts than other regions, and this trend is expected to continue and intensify in the coming decades. Africa is also more vulnerable to climate change, as a result of greater exposure to climate shocks and limited adaptive capacity – that is, capacity to make institutional, technological and other changes to limit the negative effects of climate change. As a result, sub-Saharan Africa is generally expected to experience the largest overall GDP or welfare losses from climate change, with especially severe impacts on agricultural yields, as well as on health and on labour productivity, among others. The poor are already the hardest-hit, being often the most exposed and always the most vulnerable to climate shocks and stresses. Worsening climate change threatens not only to reduce growth but also to reduce the impact of growth in reducing poverty.

How should sub-Saharan Africa tackle its already serious and growing climate risks? A priority is to reduce vulnerability to climate change, particularly to current impacts and those likely to occur over the next two decades. Rapid, inclusive income growth is a crucial element in reducing climate vulnerability, if it is underpinned by a pattern of economic transformation that reduces exposure and sensitivity to climate hazards and strengthens adaptation capacity. This, in turn, needs to be buttressed with targeted policies and investments to foster greater climate resilience in important economic sectors and systems. Many of these targeted interventions will amount to “good development” policies, valuable even without climate change. Among other targeted interventions, public investment to strengthen agricultural R&D, extension services and rural infrastructure is urgently needed in most African countries, not only for development but also to overcome market failures that hamper farmers from adopting new, more resilient “climate-smart” practices. Public policies that affect urban form, urban infrastructure and governance will have large consequences for the climate vulnerability of fast-growing urban populations in Africa, as well as for urban productivity and quality of life.

Despite sub-Saharan Africa’s small share of current greenhouse gas emissions, there are good reasons for countries to be proactive in shifting towards a low-carbon pathway. In particular, there are numerous opportunities to adopt policies and make investments

with multiple benefits –for economic transformation and development on the one hand, and for reducing GHG emissions on the other. Chapters 4-7 discuss opportunities for such “no-regrets” actions in agriculture and land use, cities, and energy.⁵⁰

3.1 Climate variability and change in sub-Saharan Africa

Climate in sub-Saharan Africa is both highly variable across major geographical zones, and highly variable over time. Climate variability here refers to changes in climate beyond individual weather events: for example, if the amount of rainfall varies significantly from year to year, or across provinces. Climate variability is the result of natural processes internal to the climate system, or to external drivers such as volcanic eruptions or changes in solar radiation, or human activities such as GHG emissions. Climate change refers to longer-term shifts in the climate that go beyond natural variability, typically over decades or longer (see Box 4.1 for a glossary of key terms from the Intergovernmental Panel on Climate Change).

Sub-Saharan Africa has three major climate types, according to the Koppen-Geiger climate classification, with many gradations within the major zones (Figure 3.1). These include arid climates, including desert and steppe sub-types, which are found in parts of west, east and southern Africa. The Sahel region south of the Sahara desert is an example of the arid hot steppe climate. Tropical climates, including rainforest, monsoon and savannah sub-types, cover large parts of west, central and east Africa, while various temperate climates are found primarily in southern parts of the region. Climate regimes are differentiated in particular by amounts, duration and seasonality of rainfall, which can vary from 100 mm/year in northeastern Ethiopia to 2,500 mm/year in parts of northern Tanzania, with a regional annual average precipitation of 920 mm/year.⁵¹

The large spatial variability of climate is one reason why there are few “one size fits all” strategies for economic transformation or climate adaptation in sub-Saharan Africa, particularly in agriculture, and why such strategies need to account for widely varying local or sub-regional conditions.

Box 3.1:
Climate – a glossary of key terms⁵²

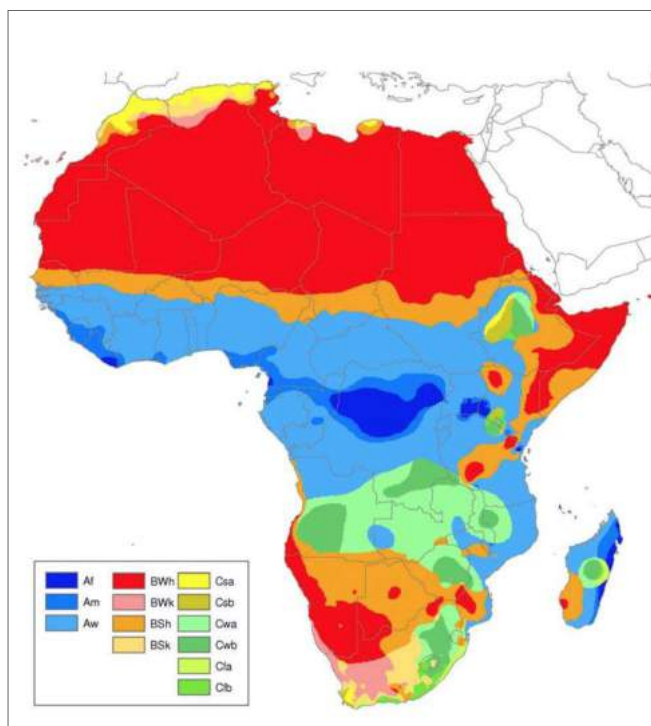
Climate system: The climate system consists of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, and anthropogenic forcings such as GHG emissions from human activity.

Climate: Climate in a narrow sense is usually defined as the ‘average weather’, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period of time for averaging these variables is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate variability: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, statistics of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

Climate change: Climate change refers to any change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Figure 3.1
Sub-Saharan Africa – major climate zones



| 1st | 2nd | 3rd | Description | Criteria* |
|-----|-----|-----|--------------------------|---|
| A | f | | Tropical - Rainforest | $T_{cold} \geq 18$ $P_{dry} \geq 60$ |
| | m | | - Monsoon | $\text{Not (Af) \& } P_{dry} \geq 100 - \text{MAP}/25$ |
| | w | | - Savannah | $\text{Not (Af) \& } P_{dry} < 100 - \text{MAP}/25$ |
| B | | | Arid | $\text{MAP} < 10 \times P_{threshold}$ |
| | W | | - Desert | $\text{MAP} < 5 \times P_{threshold}$ |
| | S | | - Steppe | $\text{MAP} \geq 5 \times P_{threshold}$ |
| C | | h | - Hot | $\text{MAT} \geq 18$ |
| | | k | - Cold | $\text{MAT} < 18$ |
| | | | Temperate | $T_{hot} > 10 \text{ \& } 0 < T_{cold} < 18$ |
| | s | | - Dry Summer | $P_{sdry} < 40 \text{ \& } P_{sdry} < P_{wwet}/3$ |
| | w | | - Dry Winter | $P_{wdry} < P_{swet}/10$ |
| D | | | - Without dry season | Not (Cs) or (Cw) |
| | | a | - Hot Summer | $T_{hot} \geq 22$ |
| | | b | - Warm Summer | $\text{Not (a) \& } T_{month} \geq 4$ |
| | | c | - Cold Summer | $\text{Not (a or b) \& } 1 \leq T_{month} < 4 \text{ \& } T_{hot} > 10$ |
| | | | Cold | $\text{\& } T_{cold} \leq 0$ |
| E | s | | - Dry Summer | $P_{sdry} < 40 \text{ \& } P_{sdry} < P_{wwet}/3$ |
| | w | | - Dry Winter | $P_{wdry} < P_{swet}/10$ |
| | | | - Without dry season | Not (Ds) or (Dw) |
| | | a | - Hot Summer | $T_{hot} \geq 22$ |
| | | b | - Warm Summer | $\text{Not (a) \& } T_{month} \geq 4$ |
| F | | c | - Cold Summer | Not (a, b or d) |
| | | d | - Very Cold Winter | $\text{Not (a or b) \& } T_{cold} < -38$ |
| | | | Polar | $T_{hot} < 10$ |
| T | | | - Tundra | $T_{hot} > 0$ |
| | | | - Frost | $T_{hot} \leq 0$ |

*MAP = mean annual precipitation, MAT = mean annual temperature, T_{hot} = temperature of the hottest month, T_{cold} = temperature of the coldest month, T_{month} = number of months where the temperature is above 10, P_{dry} = precipitation of the driest month, P_{wet} = precipitation of the wettest month in summer, P_{sdry} = precipitation of the driest month in winter, P_{swet} = precipitation of the wettest month in winter, P_{wwet} = precipitation of the wettest month in winter, P_{wwet} = varies according to the following rules (if 70% of MAP occurs in winter then $P_{wwet} = 2 \times \text{MAT}$, if 70% of MAP occurs in summer then $P_{wwet} = 2 \times \text{MAT} + 28$, otherwise $P_{wwet} = 2 \times \text{MAT} + 14$). Summer (winter) is defined as the warmer (cooler) six month period of ONDJFM and AMJJAS.

Source: Peel et al. (2007).⁵³

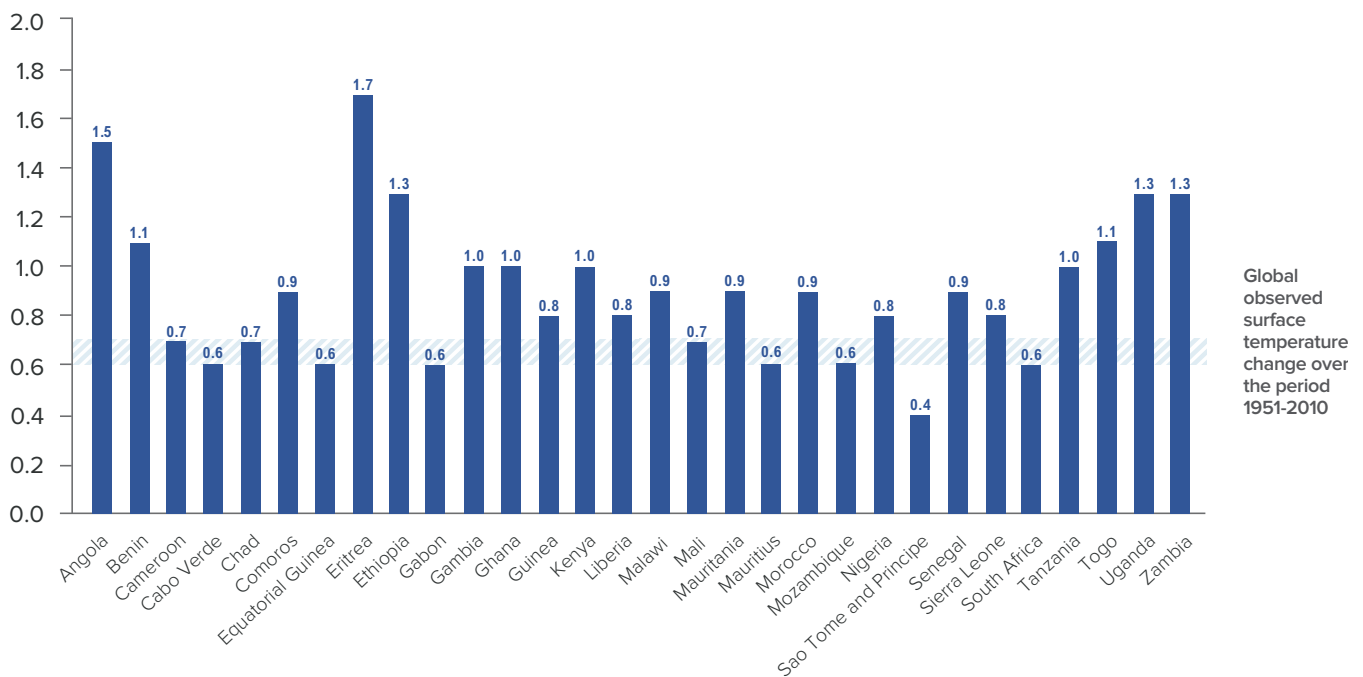
African climates also exhibit high variability over time, on scales that can be seasonal, inter-annual, decadal, and longer. The Sahel, for example, has experienced multi-decadal swings between drought and periods of greater rainfall since the last ice age; it is currently in a drought period. Climate variability in sub-Saharan Africa is driven by the complex interaction of natural processes that are not always well understood, such as tropical convection and the movement of the Intertropical Convergence Zone (ITCZ), monsoons, and the El Niño-Southern Oscillation (ENSO), which also interact in uncertain ways with the effects of climate change.⁵⁴

Temperature

Although it can be difficult to distinguish between the effects of climate variability and climate change, there

is already evidence of climate change occurring in sub-Saharan Africa at a pace faster than in the world as a whole, a trend which is expected to continue.⁵⁵ Across most parts of Africa, average land surface temperatures have increased noticeably over the last 50–100 years, warming faster than the global average. Two thirds of a sample of 30 sub-Saharan African countries have seen a mean annual temperature increase faster than the global average of 0.6–0.7°C, and over a third have seen an increase of 1°C or more (Figure 3.2). Mean annual temperature in Eritrea, for example, increased by 1.7°C – an average of 0.37°C per decade – since 1960.⁵⁶ More anomalies were also observed in the period 1995–2010 than the previous 15 years.

Figure 3.2
Observed mean annual temperature in selected African countries since 1960



Source: UNDP Climate Change Country Profiles (various dates).

Looking ahead, average surface temperatures over much of sub-Saharan Africa are expected to continue to increase by more than the global average over the course of the 21st century. Figure 3.3 shows the expected median global temperature increase to the end of the century under low- and high-GHG emission pathways defined by the IPCC, as well as expected temperature increases in Africa under these two scenarios. Under the high-emission pathway, for example, global mean surface temperature is expected to rise by a median 4°C by 2100, with a range of 2.6–4.8°C, but temperature increases in most parts of Africa are expected to exceed 4°C, with increases of as much as 6°C in parts of western and southern Africa.

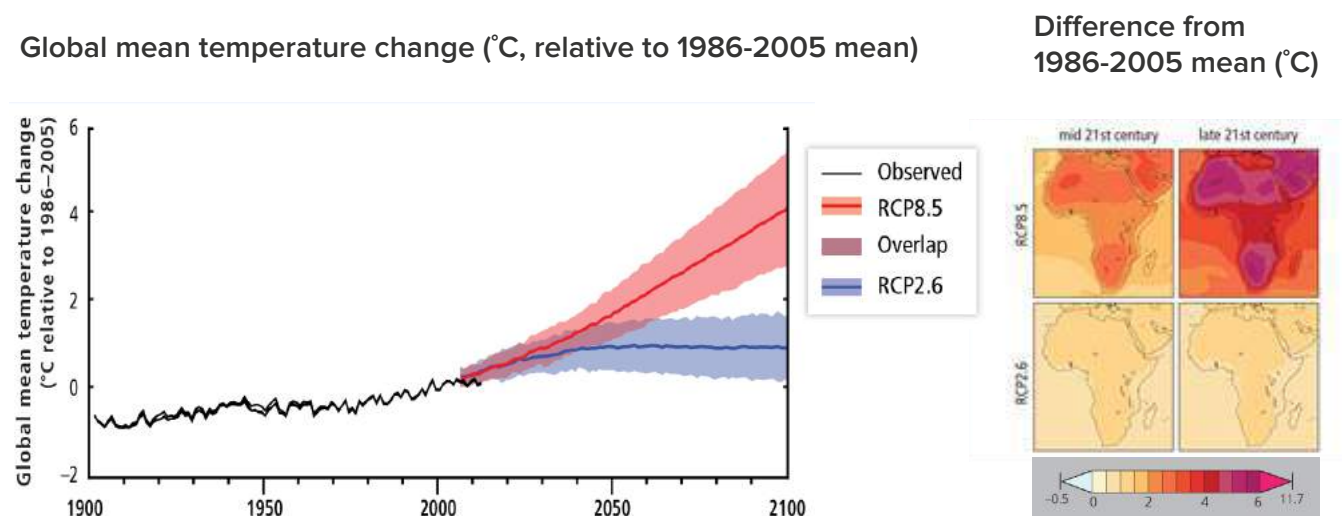
Precipitation

In most areas of Africa it is difficult to draw conclusions about the trends in annual precipitation over the past century because of lack of observational

data. However, where there are sufficient data, the picture appears mixed, with less annual rainfall over time in some areas and more in others. Increasing variability of rainfall is already apparent over most of Africa, particularly year-to-year.⁵⁷ Looking ahead, projections for precipitation are highly location-specific, with some regions expected to see more and some less rainfall. They are also highly uncertain: in many places, different climate models yield a wide range of predictions for the same area, including both less and more rainfall. However, there is a general expectation that many parts of the region will experience droughts and floods of greater frequency and intensity. One third of people in sub-Saharan Africa live in drought-prone areas, and the proportion of arid and semi-arid lands is expected to rise. The intensity of high rainfall events is also expected to increase, exacerbating the risk of flooding even in drier regions.

Figure 3.3

Observed mean annual temperature in selected African countries since 1960



Source: IPCC (2014) and Niang et al. (2014).⁵⁸

3.2 Economic impacts of climate change in sub-Saharan Africa

Sub-Saharan Africa is expected to suffer some of the largest economic damages from climate change over the decades to come, for at least three reasons. First, as discussed, the region is expected to experience some of the most severe physical changes in climate, such as in terms of warming and in the frequency and intensity of droughts and floods. Second, the structure of economic activity in the region makes it more sensitive to the physical impacts of climate change, notably through the large share of agriculture in output and employment, the vast extent of poverty, and the particular vulnerability of the poor to climate impacts. Third, many low- and lower-middle-income sub-Saharan African countries have only limited *adaptive capacity*, both within households and in terms of countries' institutional, technological and financial capacity to take actions to limit the negative effects of climate change.

Recent years have seen a wealth of careful empirical analyses on the historical economic impact of climate change in both developed and developing countries.⁵⁹ These findings provide an increasingly strong empirical basis on which to ground estimates of future climate change damages.

Impacts on agriculture

Because of the close links between plant growth and climatic factors such as temperature and precipitation, research finds climate change to have especially clear and severe impacts on crop yields and agricultural output, especially in developing countries. Globally, climate trends are estimated to have already reduced maize and wheat production by 3.8–5.5% in 1980–2008.⁶⁰ A well-known study by Cline (2007) estimates that climate change could reduce world agricultural output by 18% by the 2080s. This effect could be significantly lower if rising CO₂ concentrations enhance photosynthesis in plants, the so-called carbon fertilisation effect. However, there are many scientific uncertainties about this effect, and it is likely to be limited by water scarcity.

Agriculture in sub-Saharan Africa is especially vulnerable to climate change because it is almost entirely rainfed and thus highly sensitive to large fluctuations in rainfall, which are likely to increase. Many crops are also already close to their thermal tolerance limits, so that even a few days of high temperatures can lead to significant output losses for crops such as wheat and soybeans. More sustained

heat waves and droughts could lead to reduced growing seasons, or even force large regions of marginal agriculture out of production.⁶¹

Cline (2007) estimates a 28% drop in agricultural output in Africa by 2050 without carbon fertilisation, and a 17% fall with it. Of the 10 regions expected to suffer the largest agricultural output losses by 2050, five are expected to be in sub-Saharan Africa: Central Africa, southern Africa, Sahelian Africa, coastal West Africa and Madagascar (Wheeler, 2011a). Summarising a wide range of research for the IPCC *Fifth Assessment Report*, Niang et al. (2014) find that simulations for sub-Saharan Africa consistently find negative effects of climate change on the yields of major cereal crops, ranging from 2% for sorghum, to 22% for maize, to 35% for wheat by 2050. Increased stress on and loss of livestock under drought conditions is a critical risk. Existing severe stresses on water resources are likely to worsen. Yield losses in South Africa and Zimbabwe could exceed 30%. Climate change impacts on fisheries could impose losses on coastal West African countries of around US\$300 million by 2050.⁶²

Other major impacts

Among other climate change impacts on the economy, rising temperatures tend to reduce labour productivity, especially in the absence of air conditioning, and this is likely an important channel through which rising temperatures reduce industry and services sector output, especially in developing countries. Just 1°C of warming is estimated to reduce industrial value added in developing countries by 2.4%, for example.⁶³

There is growing evidence on the impact of high temperatures on human health, through such channels as heat stress, increased mortality and morbidity from pre-existing respiratory and cardiovascular conditions, and increased prevalence of vector-borne diseases. These effects tend to be much larger in developing than in developed countries. Studies in Ghana, Burkina Faso and Kenya corroborate the impact of high ambient temperatures on increased mortality. The incidence of water-borne diseases such as cholera also increases with high precipitation and temperature, as indicated by studies in Ghana, Senegal, South Africa, Tanzania and Zambia. A cholera outbreak erupted in Zimbabwe in the rainy season in 2008, claiming over 4,000 lives. Such outbreaks are likely to increase with projected increases in precipitation in many areas of Africa.

Insect and other vector-borne diseases are particularly susceptible to changes in temperature, rainfall patterns

and humidity. *Anopheles arabiensis*, a malaria-carrying species of mosquito, has been found in the central highlands of Kenya for the first time. There is an increased likelihood of malaria epidemics in East African highland areas, where temperatures have increased by 0.5°C since 1980. A study of 28 African countries finds that climatic conditions increase infant mortality through two channels: temperature and rainfall conditions that encourage malaria, and droughts, which increase maternal malnutrition.⁶⁴

Sea-level rise will increase risks of inundation and storm surges in coastal areas, as well as saltwater intrusion into groundwater, affecting both natural ecosystems and human systems such as cities, ports, other infrastructure and agriculture in coastal areas. The list of top 20 countries with the largest absolute populations at risk from sea-level rise is concentrated in South and East Asia (e.g. India, Bangladesh, China, Indonesia, Philippines), but also includes Nigeria and Mozambique. And many smaller African countries are high in the list of countries most at risk from sea level rise after adjusting for population size and lack of adaptive capacity – for example Liberia, Guinea Bissau, Togo, Cote d’Ivoire, Benin, Mauritania, Mozambique and Senegal. Using the same methodology, 10 of the top 20 countries most at risk from extreme weather events such as storms, floods, heatwaves and droughts are in sub-Saharan Africa.⁶⁵ Extreme weather events also have significant

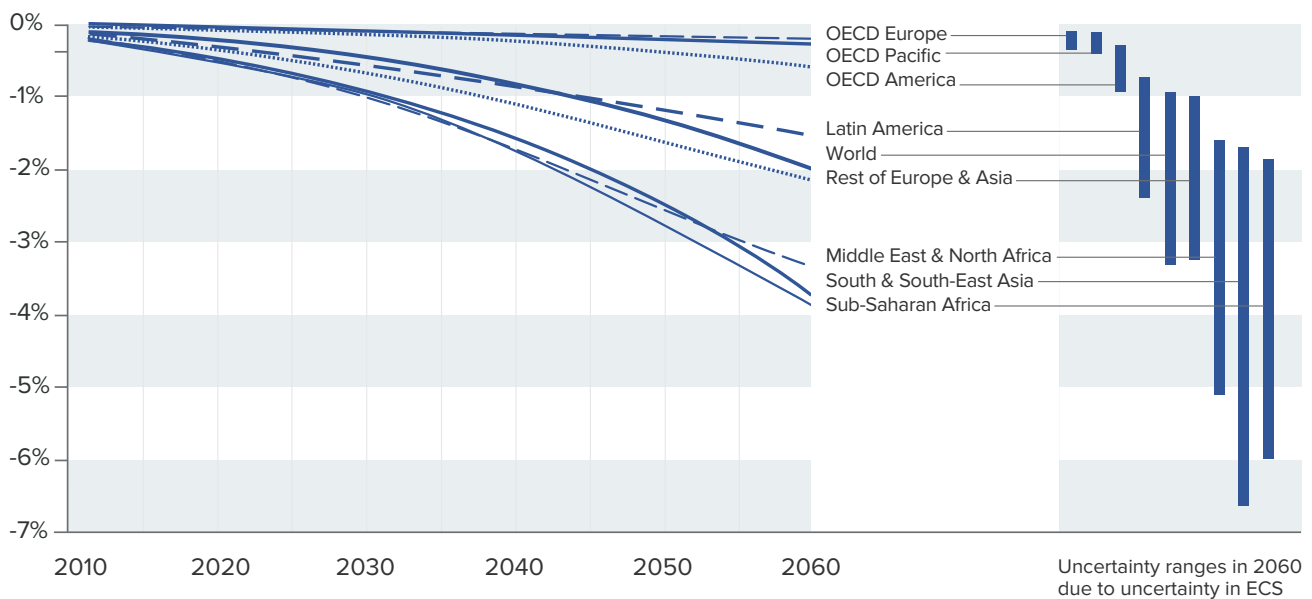
effects through damage to physical capital, including infrastructure.

There is some evidence that links weather shocks and climate variability to increased risks of civil conflict – for instance, by provoking conflicts over scarce water and arable and pastoral lands. African countries provide prominent examples in this evidence. While the results of studies on climate and civil conflict are not always clear-cut, a meta-analysis of 21 studies finds persuasive evidence for this link overall, with, on average, one standard deviation in weather variables generating a 14% change in the risk of group conflict.⁶⁶

3.3 Aggregate economic costs of climate change and catastrophic risks

Studies of the aggregate economic costs of climate change commonly find sub-Saharan Africa as the region likely to be the most seriously affected. One survey finds Africa to be the most seriously affected region in five out of nine global studies that had a sufficient level of regional detail. The median GDP loss for Africa was 4.1%, though with a very wide range, from -24% on one side to -3.6% on the other.⁶⁷ A recent detailed OECD report estimates climate-related economic losses for sub-Saharan Africa at close to 4% of GDP by 2060, the highest among all regions, with

Figure 3.4
Economic damage from selected climate change impacts (% change in regional GDP)



Source: OECD (2015).⁶⁸

a range from 1.9% to 5.9% of GDP (Figure 3.4). This study looks at climate change impacts on agriculture, on coastal zones due to sea-level rise, the impacts of extreme events and the impacts on health, energy demand and tourism, among others, although it is careful to caveat that it does not cover all likely impacts. In sub-Saharan Africa by far the largest economic impacts of climate change are expected to be those on agriculture and health, which together make up about 90% of the total.⁶⁹

Climate policy is an exercise in risk management. Because of multiple layers of uncertainty, the economic costs could be less than the central model estimates discussed above, but they could also be much bigger. Because people tend to be risk-averse, it is the potential for these much larger or catastrophic climate change impacts that provides the best case for strong climate action. The OECD study discussed above takes account of one layer of scientific uncertainty, regarding the equilibrium climate sensitivity – that is, the long-run change in the global mean surface temperature caused by a doubling in the atmospheric CO₂ concentration above pre-industrial levels. The IPCC provides quite a wide range of estimates for this key parameter, 1.5–4.5°C.⁷⁰ At the higher end of this range, global average temperature rise could readily exceed 3°C by 2060 and could reach 6°C by 2100.

The impacts of such warming are also subject to large uncertainties. For one thing, higher temperatures in this range increase the likelihood of reaching “tipping points” in natural systems, setting off powerful, self-reinforcing and irreversible climatic impacts, such as the thawing of permafrost, which could lead to a large release of methane, driving additional temperature increases. The economic impacts of such catastrophic climate changes have not been studied in detail and are themselves subject to high uncertainties. A recent study notes that in a 6°C scenario, one can generate estimates of world GDP losses of 10%, 30% or 50%, from simple, equally plausible technical changes in the economic damage function used.⁷¹

3.4 Climate change and poverty reduction in sub-Saharan Africa

High levels of climate variability and change in sub-Saharan Africa are already having their most severe impacts on the poor, who are often the most exposed and always the most vulnerable to climate shocks and stresses, since they lack financial and other resources to prevent and cope with these pressures. Worsening

climate change threatens not only to reduce growth but also to reduce the benefits of growth for poverty reduction. Not only does Africa have many people living in poverty, but it also has many more living just above the poverty line. Thus, even a fairly small shock can push people back into poverty. Annual net changes in poverty are the result of quite large gross flows of people both into and out of poverty. Climate shocks that have even modest effects on gross flows can have large effects on the net pace of poverty reduction.⁷²

Most of the poor in sub-Saharan Africa live in rural areas and depend on agriculture for their livelihood. The most important way in which climate shocks affect poverty is through their direct impact on the agricultural output and incomes of poor producers, as well as through effects on food prices. In Uganda a 10% drop in water availability due to less rainfall was found to reduce the crop income of the poorest 40% of farmers by around 20%, while reducing that of the top 60% by 14.5%.⁷³

Food price increases can occur not only because of agricultural shocks within Africa but also at the global level, as with the global food price hikes in 2008 and 2010–2011. The impact of rising food prices on the welfare of poor consumers is likely to be large, as close to two thirds of poor households’ budgets go to food. The situation is complicated because in rural areas, net producers of food also benefit from higher prices. Overall, however, climate shocks are likely to increase poverty, taking into account both higher food prices and reductions in local agricultural output. In a model-based analysis of a significant reduction in worldwide agriculture productivity due to climate change, sub-Saharan African countries were found to experience the largest increases in poverty.⁷⁴

Climate change also worsens poverty by increasing the frequency and severity of natural hazards such as heatwaves, droughts, floods or storms that damage or destroy the limited assets owned by the poor. The poor are often more exposed to these hazards because of where they live (e.g. in peri-urban areas without proper infrastructure, and on marginal land). They also tend to suffer relatively more damage to their assets: while someone wealthier might have savings in the bank, for example, the poor may have just the contents of their home, or perhaps livestock and land. When they lose their assets, it may take them years to recover. In Ethiopia, for example, it took poor farmers a decade on average to rebuild their livestock holdings after the drought of 1984–1985.⁷⁵

Health shocks, meanwhile, are a major reason why households become poor, as people cannot work because they are sick or tending to family members, and medical costs add up. These shocks are also likely to become more frequent and severe with climate change. The incidence of diseases such as malaria and diarrhoea that the poor are more exposed to is likely to increase. The limited availability of public health services and/or insurance also imposes greater relative financial burdens on the poor. Loss of income due to climate shocks further exacerbates health risks. Evidence from Africa shows that when people reduce nutrition and health care spending during droughts, there are short- and long-term ill effects, particularly on children, affecting height, weight and overall health. School enrolments, school starting and completion rates are also adversely affected, with long-term impacts on earnings.⁷⁶

More subtly but perhaps more profoundly, increasing climate risks also induce the poor to adopt less risky but also less productive economic strategies, such as to grow lower-risk but less productive crops. This is a form of spontaneous adaptation to climate risk, the effect of which is, nevertheless, to slow the pace at which the poor are able to move out of poverty. In Ethiopia, for example, rainfall risk induces farmers to curtail fertiliser application, leaving some households trapped in low-return activities.⁷⁷

3.5 Sub-Saharan Africa as a source of greenhouse gas emissions

While sub-Saharan Africa is the region likely to be worst affected by climate change in coming decades, at present it is itself the smallest contributor to greenhouse gas emissions, the principal driver of climate change.

The region's total GHG emissions (including those from land use change and deforestation) were around 3 billion tonnes (Gt) of CO₂ equivalent in 2012 – only about 6.5% of total global emissions.⁷⁸ These emissions also appear to have been growing more slowly than world emissions in the recent past: 1.1% a year in 2001–12 compared with 2.2% a year for the world as a whole.

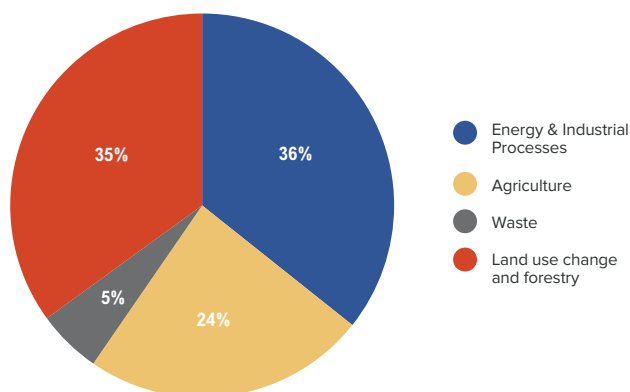
The composition of sub-Saharan Africa's GHG emissions is closely tied to the structure of its economy and level of development, with striking differences from the pattern of emissions in upper-middle-income and high-income countries, and from the pattern for the world as a whole. As a result of the low level of industrial development and per capita energy consumption in sub-Saharan Africa (discussed further in Chapter 7), the share of emissions from energy and industrial processes in the region is only slightly over one third, compared to 80% in the world as a whole (Figures 3.5 and 3.6).

Emissions from agriculture, wastes, land use change and forestry instead make up 64% of sub-Saharan Africa's GHG emissions, compared with only 20% for the world as a whole. These emissions are the result of methane (CH₄) and nitrous oxide (N₂O) emissions related to livestock digestion and waste and various agricultural processes, as well as carbon emissions related to land use change and deforestation, which is driven by expansion of agricultural lands, logging, and the use of wood for household energy.

The predominance of agriculture, wastes and land use change and forestry as a source of GHG emissions in Africa is even clearer if one excludes South Africa, an upper-middle-income country with an atypically energy-intensive industrial economy. Tanzania's GHG emissions, inclusive of land use change, were estimated at 172 million tonnes CO₂e in 2012, of which only 12% came from energy consumption and 88% from agriculture, wastes and land use change. The latter share was as high as 95% in the Democratic Republic of Congo. Contrast this to Korea, an industrialised high-income country where virtually all of GHG emissions were related to energy use.

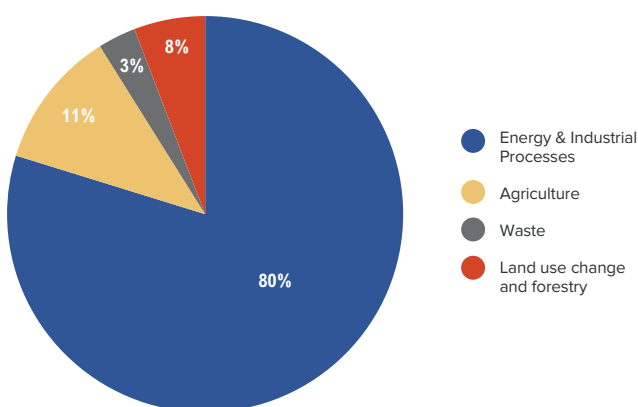
While sub-Saharan Africa currently contributes little to global GHG emissions, it cannot afford to neglect questions about its future emissions which could rise significantly in the absence of deliberate action. We take up this point immediately below, and in more detail in subsequent chapters.

Figure 3.5
Sub-Saharan Africa – sectoral composition of GHG emissions in 2012



Source: CAIT Climate Data Explorer, FAOSTAT Emissions Database.

Figure 3.6
World – sectoral composition of GHG emissions in 2012



Source: CAIT Climate Data Explorer, FAOSTAT Emissions Database.

3.6 Economic transformation and policies to tackle climate risk in sub-Saharan Africa

We emphasise three points: Africa’s interest in strong international collaboration to reduce global GHG emissions; the crucial importance of integrating adaptation and building resilience to climate change into the region’s overall economic transformation

strategies; and the benefits for African countries in taking a proactive stance towards mitigating their own GHG emissions.⁷⁹

Global proactivity on climate action

First, African countries have a clear interest in proactively fostering the strongest international cooperation to mitigate global emissions of GHGs, as it is their region that will benefit the most. The vast majority of global GHG emissions occur outside Africa, but the region can help advance climate action by showing leadership and supporting climate ambition under the United Nations Framework Convention on Climate Change (UNFCCC) and other multilateral and regional forums.⁸⁰

Rapid, inclusive growth as a foundation for building resilience

Africa is already experiencing and will continue to experience greater climate variability and change than other regions. Yet because of long lags in the climate system, even strong global action to mitigate GHG emissions will have little impact on the extent of climate change over the next 10–20 years. Central to Africa’s climate response in the next two decades, then, must be efforts to reduce its *vulnerability* to climate change that are already “in the pipeline”.

Africa’s high vulnerability to climate change, in turn, is driven by two factors that can be affected by policy efforts.⁸¹ The first is the region’s high *sensitivity to climate impacts*, for several reasons, including the high concentration of employment in agriculture, the low technological development of agriculture (for example, lack of irrigation and high dependence on rainfall), and the large share of the population living below or near the extreme poverty line.

The second factor is the region’s low adaptive capacity – both within households and in terms of weak institutional, technological or financial capacities that hinder countries from taking action to limit the damage caused by climate change. This lack of capacity results in large adaptation deficits in low-income economies in particular, which are exacerbated by market failures that hamper autonomous adaptation by private actors, and by weak governance and institutions that hamper public adaptation actions.

There is a strong positive correlation between *adaptive capacity* and per capita income, or development more generally.⁸² This suggests that rapid growth and development can play a key role in reducing



Photo credit: Flickr/James Anderson

vulnerability, by strengthening adaptive capacity. Not any kind of growth will do, however. While growth generally strengthens adaptive capacity, it can either decrease or increase the sensitivity of a country's economy to climate change, and the net impact of these effects is difficult to predict. Diversification away from agriculture into manufacturing and services is likely to reduce the climate sensitivity of the economy, for example. By contrast, expansion of agriculture into more arid areas with poor soils, a common trend in many sub-Saharan African countries, is an example of growth that *increases* climate sensitivity.⁸³

What the region needs, then, is a pattern of economic growth and transformation that raises living standards while reducing climate vulnerability, ideally by both increasing adaptive capacity and reducing sensitivity to climate change. A recent World Bank study describes this pattern as a “rapid, inclusive and climate-informed development” path that would prevent most of the potential impacts of climate change on poverty in the period to 2030, especially if backed with targeted policies and investments to foster greater climate resilience in important economic sectors.⁸⁴ The study evaluates the impact of climate change on poverty in two scenarios: “Poverty” and

“Prosperity”. The latter entails more rapid growth in per capita incomes, slower population growth, greater access to basic services, less inequality, and more rapid poverty reduction. Before accounting for climate change, worldwide extreme poverty in the Prosperity scenario falls to 142 million by 2030, compared with 900 million in the Poverty scenario. The study then evaluates the impact of climate change on poverty in these two scenarios. Given severe climate change, the study projects extreme poverty to rise globally by 16 million in the Prosperity scenario and by 122 million in the Poverty scenario, with sub-Saharan Africa among the worst-affected regions. While the study does not detail the structural change underpinnings of its two scenarios, it is useful to develop more explicitly the contrast between a rapid economic transformation scenario with one of sluggish or no transformation.

In a “No Economic Transformation” scenario in sub-Saharan Africa, much of the labour force would remain in low-productivity agriculture. The economy does not receive a boost from growth-enhancing structural change, as a result of workers moving from agriculture into high-productivity industrial and services jobs. Within-sector productivity growth rates are also low. With the demographic transition delayed, a growth-



Photo credit: Flickr/James Anderson

enhancing demographic dividend is missing. With fast population growth, agricultural growth tends to occur mostly through the expansion of the agricultural footprint into increasingly unsuitable lands. Per capita income growth and poverty reduction are sluggish. African economies remain highly vulnerable to climate change. Large numbers remain in the sector most sensitive to climate shocks, agriculture, and many remain in poverty, the most vulnerable state. With slow income growth, there is little increase in adaptive capacity. Rural-urban migration accelerates as rural residents seek refuge in the cities. Given the lack of dynamism in industry and services, however, migrants are forced mostly into insecure, low-income informal employment, or get no jobs. Social tensions and conflict increase.

A “Fast Economic Transformation” scenario reverses many of these vicious circles into positive feedback loops. The “paradox of agriculture” takes hold: robust productivity growth in agriculture reduces rural poverty, stimulates growth in industry and services, and releases labour from agriculture into these higher-productivity sectors. Within-sector productivity growth rates are high. A faster demographic transition generates a significant demographic dividend, while easing pressures to expand agriculture into

environmentally fragile areas. Economies become substantially less vulnerable to climate change. Rising rural incomes strengthen adaptive capacity, encouraging adoption of climate-smart” farming methods that are more resilient to climate shocks. A smaller share of employment in agriculture and less poverty reduce vulnerability to climate shocks. Faster growth and higher tax revenues allow governments to undertake more targeted interventions to reduce vulnerability. Importantly, many of these interventions amount to “good development”, which would make sense even if climate change were not a factor.

Collier et al. (2008) note that, while adaptation to climate change will be primarily undertaken by private actors for self-interested reasons, such private action is often hindered by market failures.⁸⁵ But these market failures typically also hinder development itself. Government actions to tackle these problems thus have multiple benefits for development and reducing climate vulnerability. Other interventions will be a more specific response to climate change, such as changes in road construction methods to make them more resilient to extreme rainfall and floods, housing codes requiring buildings more resilient to extreme events, or zoning regulation restricting development in climate-vulnerable areas.

Agriculture is a key sector where public interventions are likely to have multiple benefits. As climate change occurs, sub-Saharan African farmers have a direct interest in adopting new seed varieties and farming methods and technologies that both increase productivity and are more resilient to climate stresses. But such private investment in adaptation is hampered by lack of information, disincentives created by the free rider problem, and credit market failures. As we discuss more fully in Chapter 4 below, government action to overcome these problems by strengthening agricultural R&D, extension services and rural infrastructure is urgently needed in most African countries, for both development and climate reasons.

Policies to strengthen financial systems and increase financial inclusion are important not only in agriculture, but across the whole economy, to enable people to hold assets in forms less vulnerable to climate change and to undertake productive new investments (including in adaptation). Efforts to strengthen public health systems are an urgent development priority as well in most sub-Saharan African countries, and will improve ability to tackle the health issues that are likely to increase with climate change. Public policies on urban form, urban infrastructure provision and governance will have large consequences for the climate vulnerability of fast-growing African cities, as well as for urban productivity and quality of life, as we discuss further in Chapter 5.

A proactive approach to mitigating Africa's own GHG emissions

Sub-Saharan Africa contributes only a small fraction of global GHG emissions, and has been responsible for an even more negligible share of the historically accumulated concentration of GHGs in the atmosphere. Still, sub-Saharan African countries have good reasons to work proactively to shift their economies onto lower-carbon pathways. There are numerous opportunities for African countries to adopt policies and investments with substantial benefits for both economic transformation and development, and for moderating GHG emission growth.⁸⁶

“Climate-smart agriculture”, for instance, can reduce GHG emissions from the sector, but also boosts productivity and makes farms more resilient to climate change, as we discuss further in Chapter 4. Social policies to speed up Africa's demographic transition,

meanwhile, can have large benefits not only for growth but also for emission reduction, by easing pressures to expand the agricultural footprint and cut down forests. Another key set of opportunities to achieve multiple benefits is in sub-Saharan Africa's cities, many of which are still at an early stage of development. This means that basic policy and infrastructure choices can have a significant effect in shaping urban form, as we discuss in Chapter 6. More compact, well-connected and coordinated cities are not only more productive settings for industry and services, they also foster greater energy efficiency, reduce GHG emissions and local air pollution, and improve public health.⁸⁷

Rising incomes and economic growth are likely to substantially increase energy demand across sub-Saharan Africa. This means countries need to seize opportunities for policy reforms that yield multiple benefits in terms of greater energy efficiency and supply, improved economic efficiency, and better environmental outcomes. Better fiscal policies are a priority in this regard, including reform of energy subsidies and the use of energy taxes to promote national priorities such as improved air quality, boost revenue for high-return development programmes, and greater energy security. There are major opportunities to improve efficiency in electricity generation and distribution in sub-Saharan Africa. Trade and investment policy reforms can promote “leapfrogging” to energy-efficient technologies and products. Given the vast mostly untapped renewable resources that are available – excellent solar across the whole region, hydropower in many countries, wind in coastal areas and geothermal in the Rift Valley – and given rapid technological progress and cost declines in many renewables technologies, there also appears to good scope for low-carbon energy sources to supply a growing proportion of Africa's energy needs over time. We discuss this in Chapter 7.

Over time, as the region achieves sustained rapid development, countries can consider further ambitious actions to move onto a lower-carbon path, bolstered by financial and technical support from developed countries. Box 3.2 looks at African countries' pledges under the recent Paris Agreement, which provide an indication of how they are thinking about climate action.

Box 3.2

African countries lay out their plans to tackle climate risk

All 46 developing countries in sub-Saharan Africa submitted pledges – “intended nationally determined contributions” (INDCs) – under the recent Paris Agreement on climate change. Some 34 countries have put forward targets to reduce GHG emissions (mostly relative to a business-as-usual scenario), and almost all have also communicated actions on adaptation. The INDCs of the other countries contains specific mitigation and adaptation actions in different sectors, such as energy supply and land use. The proposed measures include unconditional pledges and proposals that are conditional on international financial and technical support.

For example, the Gambia’s INDC includes an unconditional pledge on renewable energy that could yield emission reductions of 0.079 Mt CO₂e, together with conditional pledges on energy efficiency and in other sectors that could yield another 1.34 Mt CO₂e in emission reductions. Taken together, these actions could achieve a 44.4% emission reduction in 2025 relative to a low business-as-usual scenario. Ethiopia’s conditional pledge aims to limit GHG emissions (including from land use and forestry) to 145 Mt CO₂e by 2030, a 64% reduction relative to business as usual.⁸⁸

The African Union’s Agenda 2063 – *the Africa We Want*⁸⁹ also envisions significant climate action in Africa. For instance, it looks forward to an Africa that is acknowledged globally as a low-carbon and eco-friendly continent with environmentally sustainable and climate-resilient economies and communities, drawing on cleaner energy systems, low-carbon cities and better land use. Specific targets include a renewable energy share of more than 50% in both energy production and consumption by 2063, energy-smart buildings, low- to zero-carbon transport systems in urban areas, forest conservation, and an end to land degradation.

The African Union’s Agenda 2063 is also coherent with the 2030 Agenda for Sustainable Development, which was adopted by heads of state and government at the United Nations Sustainable Development Summit in September 2015. The 17 Sustainable Development Goals (SDGs) tackle a broad range of issues, including addressing climate change, cleaner energy, sustainable cities and better land use. The SDGs incorporate Africa’s strategic vision and concerns, which were formulated in a Common African Position on the post-2015 Development Agenda.⁹⁰



Photo credit: Flickr/James Anderson

CHAPTER 4

Agriculture and land use change
as a foundation for economic
transformation

Agriculture remains central to many aspects of sub-Saharan Africa's economy. As noted earlier, it employs about 60% of the work force, mostly as smallholders operating farms of less than 5 hectares. Over 60% of the population – over 600 million people – live in rural areas, and despite rising urbanisation, the rural population is growing by almost 2% a year. A large majority of the poor live in rural areas. Agriculture is the sector worst affected by climate change, and rural populations are the most vulnerable to it. Agriculture, land use change and deforestation are also the largest source of GHG emissions.

Recent trends in African agriculture present a mixed picture. Agricultural output growth has accelerated during the 2000s, mainly due to faster growth in yields, albeit from very low levels. Public policies have become more supportive of agriculture, including through efforts to increase public investments in the sector. Rising agricultural productivity has had positive effects on growth and poverty reduction. At the same time, agricultural growth continues to rely heavily on rapid expansion of the agricultural footprint. That in turn, contributes to deforestation, increased vulnerability to climate change as more people live on drylands, and growing GHG emissions from land use change and deforestation.

4.1 Recent trends

Agriculture has played a significant role in the sub-Saharan African recovery of the 2000s. As Figure 4.1 indicates, cereal output growth almost doubled, from a little over 2% a year in 1980–2000, to 3.9% a year in 2000–2013. The main driver of faster recent growth in output was an acceleration in the growth of yields per hectare, to 1.8% a year from merely 0.3% a year in 1980–2000. Some of the recent strongest performers were low-income countries. The Central African Republic, Ethiopia, Malawi, Mali, Rwanda, Sierra Leone and Zambia achieved at least 4% trend rates of growth in cereal yields, for example, although there were disappointments too, such as in Zimbabwe, where yields fell sharply. Growth in livestock production also picked up to around 3% a year in the 2000s from 2% in 1981–2000. Total numbers of cattle, sheep and goats rose from 714 million in 2000 to 981 million in 2013.⁹¹

Farmers in a number of countries also made progress in diversification to higher-value-added fruits, vegetables and flowers, for domestic and export markets. Kenya, for example, has become the world's

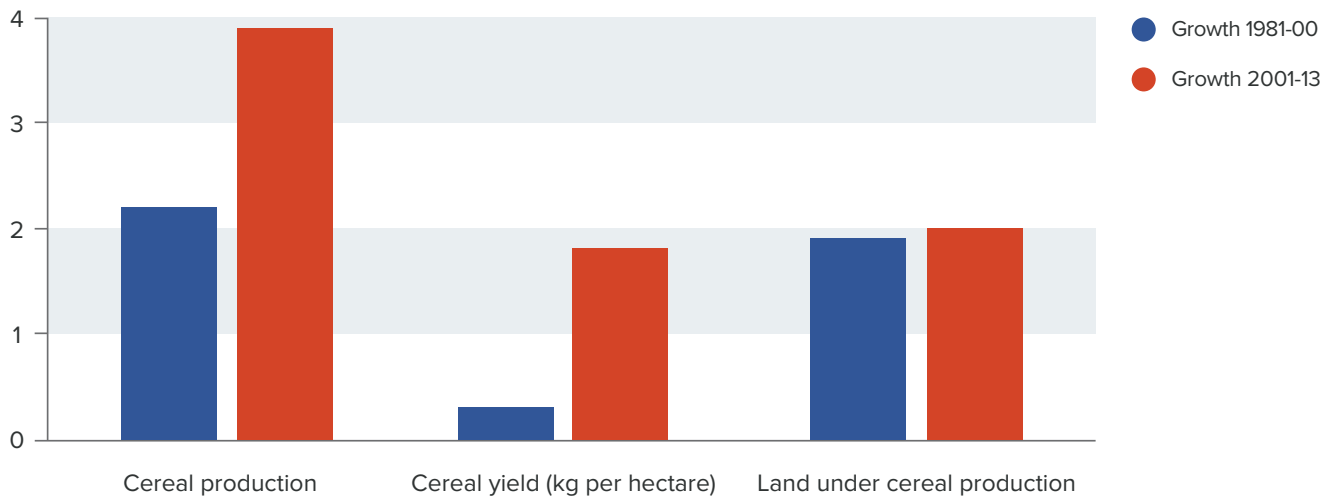
third biggest exporter of cut flowers, with 360 tonnes of flowers flown out to global markets every day. This is a commercial enterprise that uses state-of-the-art cultivation methods and provides jobs for thousands of well-trained workers. Good transport links and reliable supplies of electrical power and water have been critical for the success of this agribusiness.⁹²

The pickup in agriculture has occurred alongside a growing recognition of the importance of this sector. Sub-Saharan African governments and donors have strengthened their policy focus on agriculture since the early 2000s, after a long period of neglect. The African Union's launched the New Partnership for Africa's Development (NEPAD) in 2002, and the associated Comprehensive African Agricultural Development Programme (CAADP) in 2003. The CAADP commits governments to invest at least 10% of their budgets in agriculture, to strengthen their institutional capacity to support agriculture, and to create a good enabling environment for more private investment in agricultural input supply, marketing and agro-processing. While progress on implementing the CAADP has inevitably been mixed, more than 40 countries had launched CAADP implementation processes by 2012. Some 30 countries had signed national CAADP compacts, which are based on broad stakeholder engagement and define the role of agriculture in national development strategies. Some 23 countries had formulated CAADP-based agricultural investment plans. As of 2012, only 6–10 countries had met or exceeded the 10% agricultural budget target, though more had moved in the desired direction. The African Union reaffirmed its commitment to the CAADP vision in 2014 and has established a CAADP Results Framework for 2015–2025.⁹³

Donor aid flows for agriculture have also picked up, increasing from around US\$1.5 billion per year in 1997–2005 (in US\$ 2012) to over US\$4 billion by 2012. Civil society activity has also increased – for example, to work with farmers and private companies to develop and more widely distribute new hybrid seeds adapted for African conditions.⁹⁴ Andersen (2012) argues that policy-induced price distortions created an anti-agricultural bias that had a significant negative impact on growth in sub-Saharan Africa over the period 1960–2005.⁹⁵ Reforms to reduce these anti-agricultural price distortions and policy biases in recent years are likely to have given a significant boost to agricultural and GDP growth.

Figure 4.1

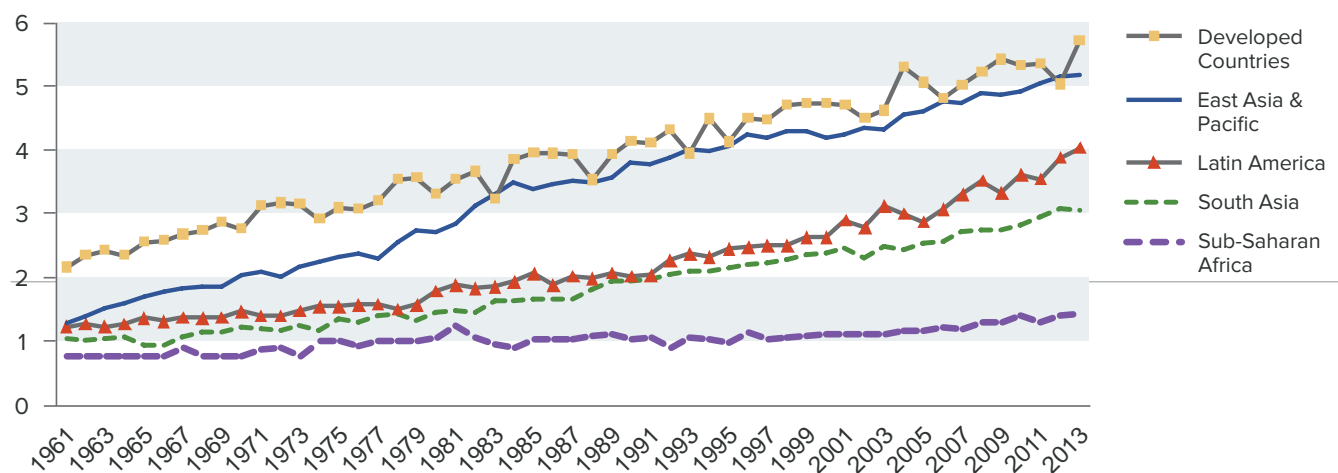
Sub-Saharan Africa: cereal production growth (annual average percent change)



Source: World Bank World Development Indicators.

Figure 4.2

Cereal yields 1961 - 2013. Tons per hectare



Source: World Bank World Development Indicators.

The road ahead remains challenging, however, and not all recent trends have been positive. While agricultural yields are growing, they are still very low. Sub-Saharan Africa cereal yields per hectare in 2013 were only 25% of those in developed countries and half those in the second least productive region, South Asia (Figure 4.2). These ratios are significantly lower than they were in 1980, which is a measure of the extent to which the region has missed out on global technological progress

in agriculture over the past several decades. Growth in sub-Saharan Africa’s agricultural output also continues to be heavily dependent on an expansion of cropland. Land use for cereal production has been growing at around 2% a year for some decades, much faster than the 0.5–0.7% pace of the world as a whole. As Figure 4.1 indicates, cropland expansion contributed virtually all of Africa’s cereal output growth in 1980–2000, and a little over half of it in 2000–2013.

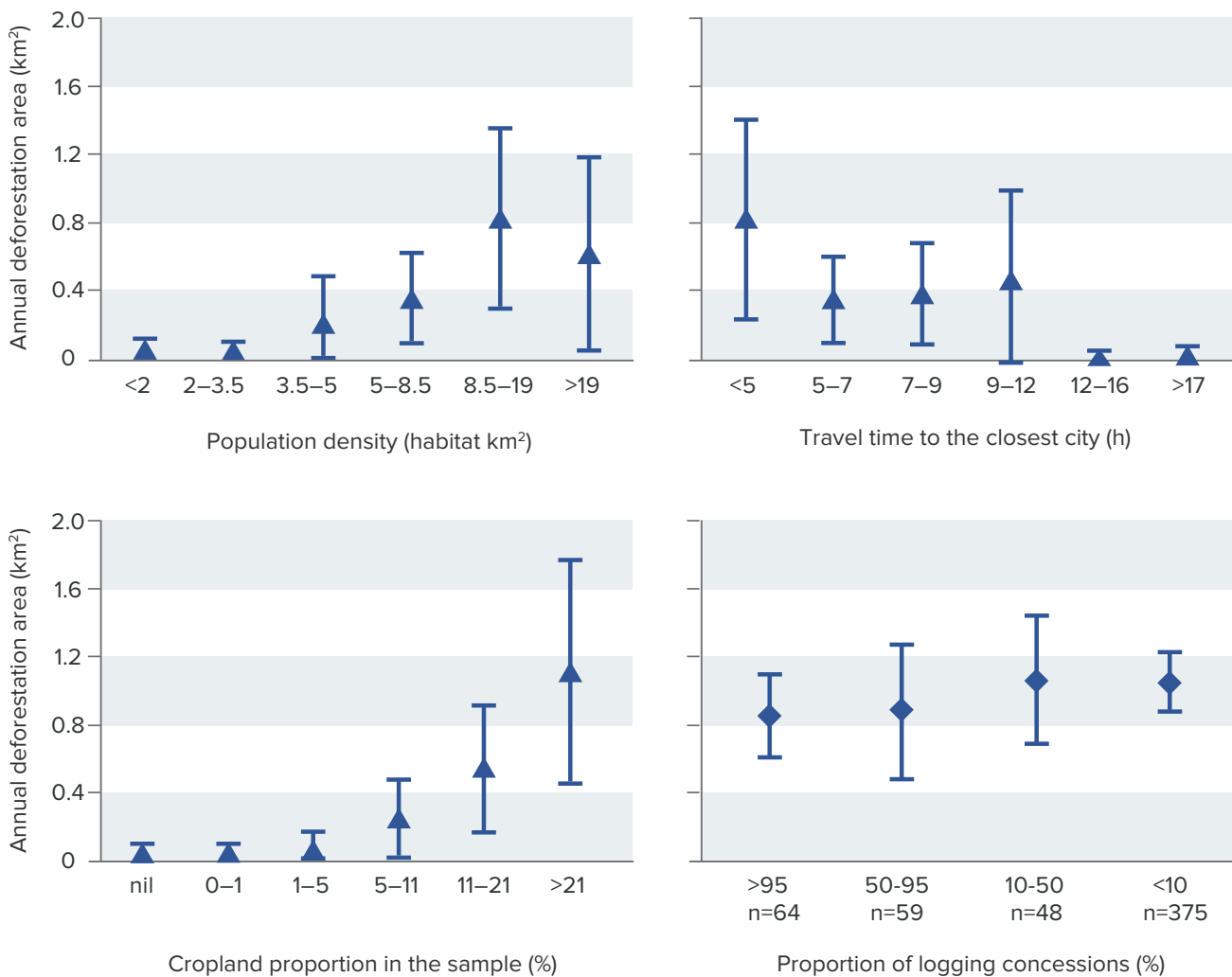
This mode of agricultural expansion, with heavy reliance on growth in area (“growth on the extensive margin”), has a number of negative impacts on the environment. First, expansion of land for arable and pastoral uses is estimated to have accounted for 70% of deforestation in sub-Saharan Africa between 2000 and 2010.⁹⁶ Rapid population growth and low yields are key drivers for agricultural growth on the extensive margin, as well as for deforestation. Traditional shifting cultivation practices that are used to regenerate soils further magnify the impact of population growth. Demand for firewood and lack of access to modern energy sources adds to the pressure.

Studies find that the rate of deforestation in different areas is well explained by differences in population

density. Deforestation increases dramatically when rural population density exceeds 8.5 people per km² (Figure 4.3). Deforestation rates also increase sharply when cropland exceeds 10% of the area in a location. They also increase with proximity to urban areas. A study using satellite-based mapping of sub-Saharan African forests in West Africa, the Congo Basin and Madagascar did not find logging concessions to have much impact on deforestation so far, which may be due to a shift towards sustainable forest management policies in the 2000s.⁹⁷ Other sources note growing deforestation pressure not only from smallholder agriculture, but also from large-scale commercial farming, notably for palm oil plantations.⁹⁸

Figure 4.3

Relationship between deforestation and underlying factors in sub-Sahara Africa



Source: Mayaux et al. (2013), Figure 5a.⁹⁹

Deforestation is a major source of increased GHG emissions in sub-Saharan Africa, as well as of loss of biodiversity and ecosystem services. Tropical rainforests (in Central and West Africa and Madagascar) contain 90% of the region's terrestrial stock of carbon. The net loss of forest carbon due to deforestation and forest degradation is the biggest source of GHG emissions in the region, over 30% of the total. Satellite-based data indicate that five of the 10 countries with the fastest acceleration in tree cover loss in 2001–2014 were in West Africa: Sierra Leone, Madagascar, Liberia, Guinea and Guinea-Bissau.¹⁰⁰

The current model of agricultural growth through increased land use is also creating increasing vulnerability to climate change and putting pressure on the fragile natural resource base in the region's vast drylands. Drylands – defined as arid, semi-arid and dry sub-humid zones – account for three quarters of sub-Saharan Africa's cropland, two thirds of cereal production and four fifths of livestock production. These areas already suffer frequent and severe climate shocks, including droughts. With rapid population growth, the number of people living in the drylands of West and East Africa is expected to increase substantially by 2050, while dryland area itself is expected to increase by 20%, due to climate change.¹⁰¹

GHG emissions from livestock digestion and manure, meanwhile, are large, not only because of the large size of Africa's livestock herd, but also because of poor animal diet. Livestock GHG emissions (methane and nitrous oxide) amount to 9 tonnes of CO₂ equivalent per tonne of milk produced in sub-Saharan Africa, compared with 1.6–1.9 tonnes in Europe and North America.¹⁰²

4.2 Robust productivity growth in agriculture as a foundation for economic transformation

While a significant long-run fall in the relative share of agriculture in output and employment is a universal feature of sustained economic transformation, this by no means entails stagnation or neglect of agriculture and the rural economy. This has been referred to as “the paradox of agriculture”. An influential body of thought in development economics has long emphasised the importance of agricultural productivity growth in stimulating the growth of the non-agricultural and urban sectors, and in supporting overall economic transformation and development.¹⁰³ These analyses cite the key contribution of agriculture to many of the most successful economic

transformations, such as those in East Asia, providing food, raw materials, labour, savings and domestic markets to support the process of industrialisation and urbanisation. For example, the role of agricultural reforms and surging agricultural productivity in kick-starting China's rapid growth after 1979 is well known.¹⁰⁴

A survey of a large number of structural model-based studies of the interactions between agriculture and non-agricultural sectors finds that an extra dollar of income in agriculture generates an extra 30–80 cents of income in non-agricultural sectors.¹⁰⁵ An econometric study of causal links between agriculture and non-agriculture also finds clear evidence that faster per capita agricultural growth stimulates faster non-agricultural growth in low-income sub-Saharan African countries, although not in middle-income countries, where the relative size of the agricultural sector is much smaller.¹⁰⁶ McMillan and Hartgen (2014) argue that rising agricultural productivity growth in sub-Saharan Africa in the 2000s was a likely contributor to the faster pace of growth-enhancing structural change in the region, as noted in Chapter 2.¹⁰⁷

There is also strong evidence that growth in agricultural productivity has an especially strong impact on poverty reduction compared with growth in other sectors. A significant part of the impact on poverty appears to derive from the stimulus that higher agricultural incomes provide to locally produced labour-intensive goods and services from small-scale enterprises.¹⁰⁸ Christiaensen et al. (2011) find that agricultural growth is especially powerful in reducing extreme poverty (at the US\$1 a day level) in low-income countries. The poverty-reducing effect of agricultural growth was especially large – 11 times as large as non-agricultural growth – in low-income, resource-poor countries in sub-Saharan Africa. These effects tended to be lower in countries with high income inequality, however. Non-agricultural growth had a greater impact in reducing non-extreme poverty, especially in middle-income countries.

These considerations suggest a case for economic transformation strategies that explicitly aim to support agricultural development. Given the diversity of sub-Saharan African economies, however, including different levels of development, structural characteristics and agricultural systems, the appropriate level of emphasis on agricultural development and the level of public investment committed to this sector will vary a lot depending

on country and local conditions. The level of emphasis on agriculture will likely be significantly greater in low-income countries with high extreme poverty, in particular those which are resource-poor. The role of agricultural development strategy may differ according to whether a country is landlocked and natural resource-poor; coastal and natural resource-poor; or natural resource-rich. Even more finely grained heterogeneity within countries may need to be taken into account.¹⁰⁹

4.3 Achieving ‘triple wins’ in African agriculture

Sub-Saharan African countries need to build on recent positive trends in agriculture. Stronger policies for agricultural development will help provide a powerful foundation for poverty reduction and overall economic transformation, especially in low-income countries. But, given the context of climate change, this needs to be achieved increasingly through intensification and rising yields, easing pressure for expanded land uses, deforestation, expansion into climate-vulnerable drylands, and GHG emissions from agriculture and land use change. Rapid progress in bioscience and agronomics suggests there may be substantial opportunities for sub-Saharan Africa countries to intensify agriculture and to adopt climate-smart agriculture practices that can achieve “triple wins”: higher farm incomes, increased resilience to climate change, and reduced GHG emissions (including greater carbon storage in soil, plants and trees).¹¹⁰

Many new, more productive crop varieties are emerging, which are also more resilient to drought and pests, less demanding of water and fertiliser inputs. Better practices for soil, water and nutrient management are also having dramatic impacts on productivity – for example, the System of Rice Intensification (SRI) developed in Madagascar. In addition to these innovations, which operate at the farm level, there are also broader “landscape” approaches that entail collective actions to improve soil and water management across many farms. Many of these interventions involve planting trees on farmland, which not only provide valuable products, such as fruit and timber, but also help to hold and restore soils, retain water, provide windbreaks and help sequester carbon. Similarly, better grassland management practices, improved livestock diets and better breeding practices can help raise livestock productivity while lowering animal GHG emissions.¹¹¹

The task ahead for African policy-makers is thus not to push one particular technological “fix” or another, but

rather to put in place a broad package of reforms and public investments. The goal is to create incentives for improved agricultural practices, and encourage and facilitate their adoption by hundreds of millions of low-income African smallholders in a context of low information, market failures, lack of public goods and high risks. Strengthening of agricultural and livestock R&D and extension services is a high priority, to close knowledge gaps and help farmers to adapt new agronomic methods to the widely varying soil and climatic conditions across Africa.

Public investments in rural transport and logistics infrastructure can vastly strengthen incentives by linking farmers to international markets and supply chains. More secure land tenure and property rights are also strengthen incentives for farmers to invest in improvements and to collaborate with others for landscape management. Improvements in property rights played a key role in encouraging a widely successful landscape management intervention in Niger, for example (Box 4.1). Rural credit and insurance institutions need to be strengthened to provide poor farmers with a wider array of financing and saving options. Governments may consider carefully designed fiscal subsidies to encourage rapid uptake of key productive inputs such as fertiliser – taking care, however, to define a clear exit strategy and avoid capture by vested interests. The specific mix of reforms and investments will depend on the circumstances of the country.¹¹²

There is an important role for regional and international cooperation initiatives to further the uptake of climate-smart agriculture, including, notably, the African Union’s CAADP. The African Union’s 2014 Malabo Declaration includes among its seven commitments “enhancing resilience of livelihoods and production systems to climate variability and other shocks”, with a target of ensuring that by 2025 at least 30% of farm/pastoral households are resilient to shocks. Several of the CAADP’s current Flagship Programmes aim to strengthen the ability of governments to mainstream climate-smart agriculture into their agricultural plans, and to strengthen links between the public sector, research organisations, the private sector and farmer organisation to promote on-farm uptake of these practices. The aim is to have 25 million farm households practicing climate-smart agriculture by 2025.¹¹³ Allied initiatives include the Africa CSA Alliance, which is led by the Consultative Group for International Agricultural Research (CGIAR) and works in a number of sub-Saharan Africa partner countries.

Box 4.1

Lessons from a landscape management success in Niger¹¹⁴

Niger offers a prime example of a successful landscape-level intervention combining improved land and water management with agroforestry. Roughly 60% of Niger's population lives on less than US\$1.25 (2005\$) a day, and most farms are very small. Since the 1990s, farmers in the Maradi and Zinder regions have interplanted nitrogen-fixing trees on cropland, or allowed roots and stumps to regenerate, increasing tree and shrub cover 10- to 20-fold.

The strategy has significantly increased agricultural productivity on 5 million ha of farmland, and helped restore at least 250,000 ha of severely degraded land that had been of little use for agriculture or forestry. Sustainability also increased, as at least a quarter of producers in the area adopted improved natural resource management techniques. Biodiversity was increased, and soil fertility improved measurably in the entire area.

Thus, some of the world's poorest people became substantially better off. Recent evaluations have found that farmers in the affected regions of Niger now regularly produce at least 100 kg/ha more grain than previously, other things equal, about a 20% increase from 2010 grain yields in the zone; with micro-dosing of fertiliser, yields can even double. Gross real annual income in the region has grown by US\$1,000 per household for over a million households, more than doubling real farm incomes and stimulating local non-farm services. Yet all of this required only modest additional government spending or business investment. The main driver was revised legislation on tree ownership. Giving farmers more control of the resource provided them with incentives for better care of the trees and sustainable partial harvesting of branches, which allowed the trees to keep growing.

Technical estimates suggest that the agroforestry and water harvesting approaches that have done so well in Niger could be scaled up to cover another 300 million ha in sub-Saharan Africa. The World Resources Institute estimates that this scale-up could provide 285 million people an additional 615 kcal per day per person in the zones concerned. It is already starting to occur in the Sahel as news of Niger's success begins to spread.¹¹⁵

A shift towards more intensive and climate-smart agriculture will reduce pressure for deforestation. Another key factor is increased electricity access and a shift towards modern energy sources from sub-Saharan Africa's present heavy reliance on traditional biomass, as discussed in Chapter 7. Over the longer term, a more rapid demographic transition and slower rural population growth will also help.

Nevertheless, more focused policies are also needed to tackle deforestation and forest degradation, addressing both governance and market failures. At the level of national institutions, countries need to strengthen land use planning frameworks, working in consultation with local people and stakeholders, backed by strong enforcement. Better land use planning will, in turn, often require land tenure reforms to establish property rights, taking into account the rights of women, who make up 70% of the region's farmers, as well as of indigenous peoples.

Sustainable land use requires dealing with the market failures that prevent farmers and others from fully valuing the numerous ecosystem and other benefits

provided by forests. Some of these external benefits are local or national in scope, but others, such as the carbon sequestration benefit provided by forests, are global. International aid is therefore justified to provide incentive and resources for developing countries to conserve and expand their forests.¹¹⁶

The 2015 UN Climate Change Conference in Paris recognised and included a framework for Reducing Emissions from Deforestation and Forest Degradation (REDD+) financing as an integral part of global efforts to mitigate GHG emissions and tackle climate risks. Earlier financial commitments for REDD+ received a significant boost, with pledges by Germany, Norway and the UK in 2015 to provide REDD+ financing of US\$5 billion over the period to 2020, an important milestone towards the even larger financing flows that are needed. Sub-Saharan African countries are increasingly taking on the REDD+ agenda (see Box 4.2). Some 18 sub-Saharan Africa countries are now REDD+ Country Participants, having signed agreements to participate in the World Bank's Forest Carbon Partnership Facility.

Box 5.2

Examples of REDD+ in Africa¹¹⁷

In Mozambique the Zambezia Integrated Landscape Management Program covers 3.8 million ha, including 2.3 million ha of forest. The programme aims to increase sustainable farming of cashew and sesame, combined with a new cashew processing unit, established in partnership with the private sector, which means more local jobs. Community mapping efforts and registration of farmers and land dwellers promotes better forest management at the local level.

Ethiopia recently launched its Oromia Forested Landscape Program, a 10-year initiative which aims to reduce deforestation and greenhouse gas emissions from land use in the forested areas of Oromia state. An integrated landscape approach seeks to address trade-offs and synergies among forest, crop, livestock, water, and household energy needs. The program includes payments for ecosystem services, where farmers or landowners are offered incentives to manage their lands in ways that provide an ecological service, such as climate regulation, fresh water or cleaner air.

The Republic of the Congo is seeking to improve forest management practices by building public-private partnerships with companies that produce or trade forest commodities. The global agri-business Olam has partnered with the government to make cocoa farming more forest-friendly through initiatives such as intensification of shade-grown cocoa production with communities in degraded forests to avoid slash-and-burn practices in the primary forest.

Rwanda's National Land Use and Development Master Plan seeks to expand agro-forestry to 85% of farmland by 2020 through the promotion of multi-purpose trees in all farming systems, the provision of improved seeds, and the introduction of innovative financing mechanisms, including carbon crediting and payments for ecosystem services.

Allied initiatives to tackle deforestation include the AFR100 (African Forest Landscape Restoration Initiative), which is a pan-African, country-led effort to restore 100 million hectares of degraded and deforested landscapes by 2030. So far 10 African countries have agreed to join AFR100 and committed at least 31.7 million hectares of land for forest landscape restoration.¹¹⁸ The European Union's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan aims to reduce illegal logging by strengthening sustainable and legal forest management, improving governance and promoting trade in legally produced timber. The Tropical Forest Alliance 2020 (TFA 2020) brings together the private sector (including major consumer goods producers and retailers), governments and civil

society to support the elimination of deforestation-related commodities from companies' supply chains ("zero-deforestation supply chain models"). TFA 2020 members are committed in particular to reducing the deforestation in tropical forests that is driven by production of four major global commodities: palm oil, soy, beef and paper and pulp. The TFA's Africa Palm Oil Initiative (POI) seeks to reduce deforestation in sub-Saharan Africa by supporting sustainable models for palm oil development in the region. Six palm oil producing countries – Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia and Nigeria – are actively engaged, and more producer countries are expected to join.



Photo credit: Flickr/James Anderson

CHAPTER 5

Diversification and economic transformation

Economic transformation in sub-Saharan Africa has been slow to take off, but there are good reasons to think the region is now well placed for a more robust advance in manufacturing and economic diversification more generally. As discussed in Chapter 2, changes in technology and the rise of global production networks mean that a wider range of activities, such as high-value-added agriculture and internationally tradable services, can deliver many of the same benefits as export-oriented manufacturing. As Page (2012) puts it, countries can now seek industrial diversification opportunities both with and without smokestacks.¹¹⁹

Sub-Saharan Africa’s agricultural productivity is growing, as noted in Chapter 4, contributing to a more vibrant domestic market for manufactures and services. Macroeconomic stability is much improved, a basic precondition for stronger investment and innovation. The current manufacturing sector, while smaller than before, is also more productive and has demonstrated its ability to operate in a more competitive post-liberalisation environment. Examples of significant successes in manufactured exports are starting to appear, albeit from small starting positions: for example, in Ethiopia (Figure 5.1) and Tanzania. The sharp devaluation of real exchange rates in many African countries in 2015 and early 2016 should provide a large boost for manufacturing

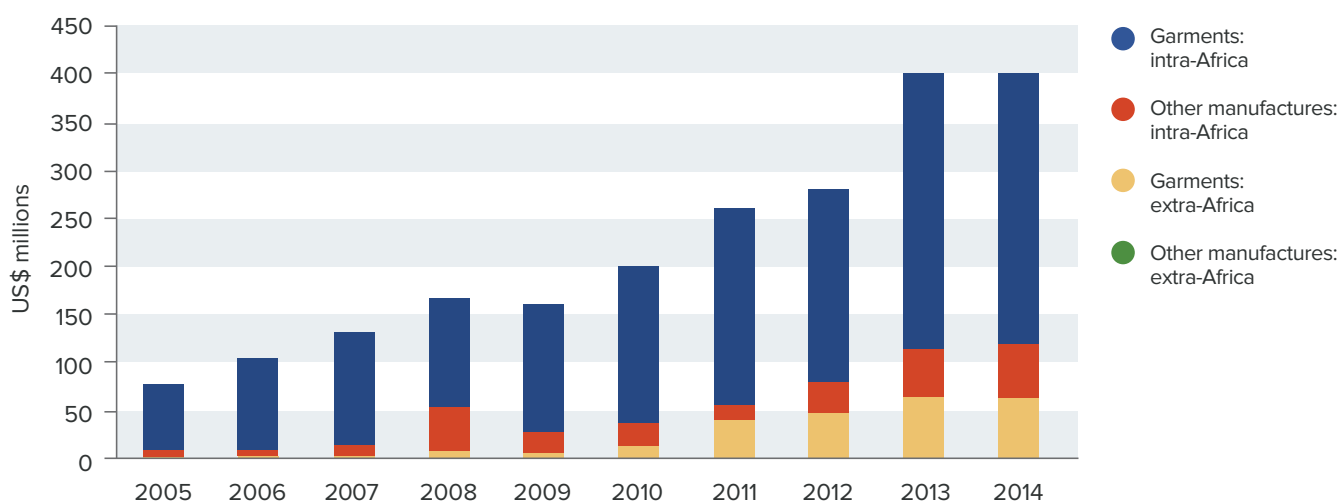
competitiveness and exports. Though global economic conditions are volatile and uncertain, Africa’s share of world manufactured export markets is so tiny – around 1% – that a modest increases in global market share could have a big impact on growth, even in an uncertain or sluggish global economy.

A more diversified economy will also be more resilient to climate change, with fewer poor people and less dependence on agriculture, the most climate-vulnerable sector. As we discuss in Chapter 7 below, these structural changes will boost energy demand, but there are ways to limit the resulting impact on GHG emissions.

5.1 Policies to foster diversification and industrialisation

There is now a growing body of evidence on the challenges to be overcome as sub-Saharan African countries seek to diversify their economies and boost manufacturing in particular. Empirical studies using firm-level data show African manufacturers now significantly underperform relative to firms in other regions. For example, one study finds significant performance deficits in terms of total factor productivity, labour productivity, the share of exports in sales, and investment intensity, compared with firms in countries at a comparable per capita income

Figure 5.1
Ethiopia manufactured exports, 2005-2014



Source: Ansu et al. (2016).¹²⁰



Photo credit: Flickr/James Anderson

levels.¹²¹ However, the study also finds the gaps are reasonably well explained by objective measures of sub-Saharan Africa’s weaknesses in fundamentals such as infrastructure, access to finance, and aspects of the business environment. Once these factors are controlled for, the study finds African manufacturing firms are (conditionally) more productive than firms in other regions.¹²²

Firm-level surveys also provide useful insights. Results from the World Bank Enterprise Surveys show that manufacturing and services firms in sub-Saharan Africa most frequently cite inadequate electricity as the most important obstacle or constraint on their operations, followed by lack of access to finance (Figure 5.2). It is possible that these results do not necessarily reflect the most serious problems faced by firms in sub-Saharan Africa. For example, there could be another factor which causes many firms to go out of business and prevents many others from even being formed. The firms responding to the survey are then the ones that have been able to adapt to this factor, so they do not mention it as an obstacle.¹²³ Still, the top two obstacles cited – electricity (i.e. infrastructure) and access to finance – are notably also identified as important in studies that use objective measures of the economic environment.¹²⁴ Figure 5.3 shows that it is firms in low-income countries that most

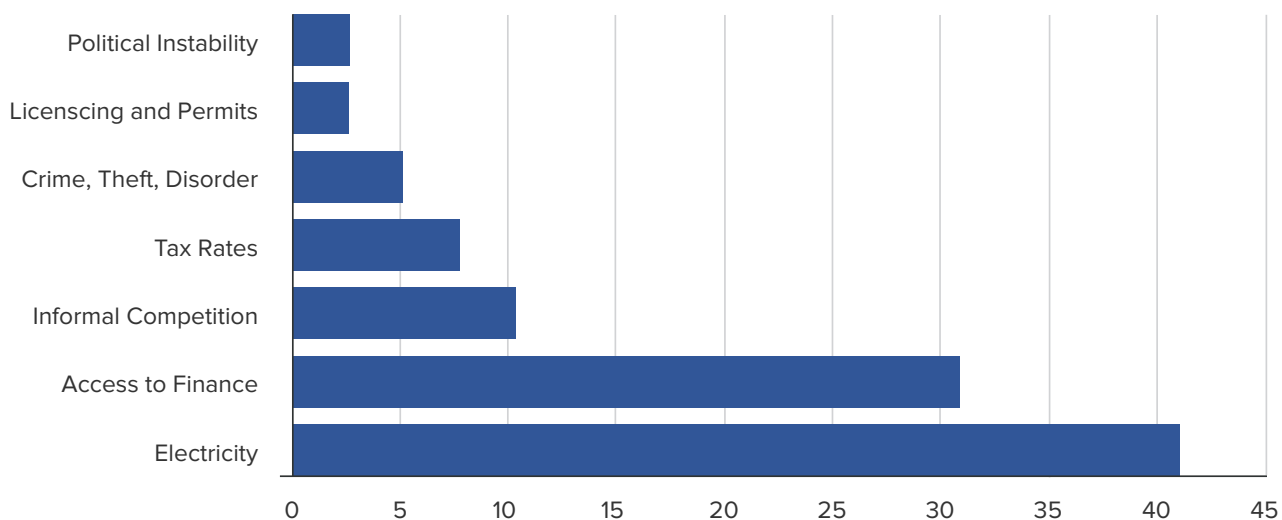
report inadequate electricity supply as their biggest problem.¹²⁵

These findings suggest that, in addition to maintaining macroeconomic stability, policy-makers need to tackle key weaknesses in the business environment that hinder the performance of manufacturing, and diversification more generally. The tricky question is *which* of the many important cross-cutting, economy-wide or non-selective potential reforms to prioritise. The answer will differ from country to country. However, the evidence discussed above suggests that two will be particularly important in many countries: building infrastructure – electricity generating and distribution capacity in particular, discussed further in Chapter 7 – and improving access to finance.¹²⁶

In sub-Saharan Africa, as elsewhere, the productivity of manufacturing is also significantly affected by *resource misallocation within that sector*. Such misallocation is reflected in large productivity gaps among firms in the same sector. These large gaps, which have been found to varying degrees in both developed and developing countries, suggest the potential for large gains in overall efficiency if labour and other resources that are currently “bottled up” in low-productivity firms can be shifted to firms operating at higher productivity levels. A study

Figure 5.2

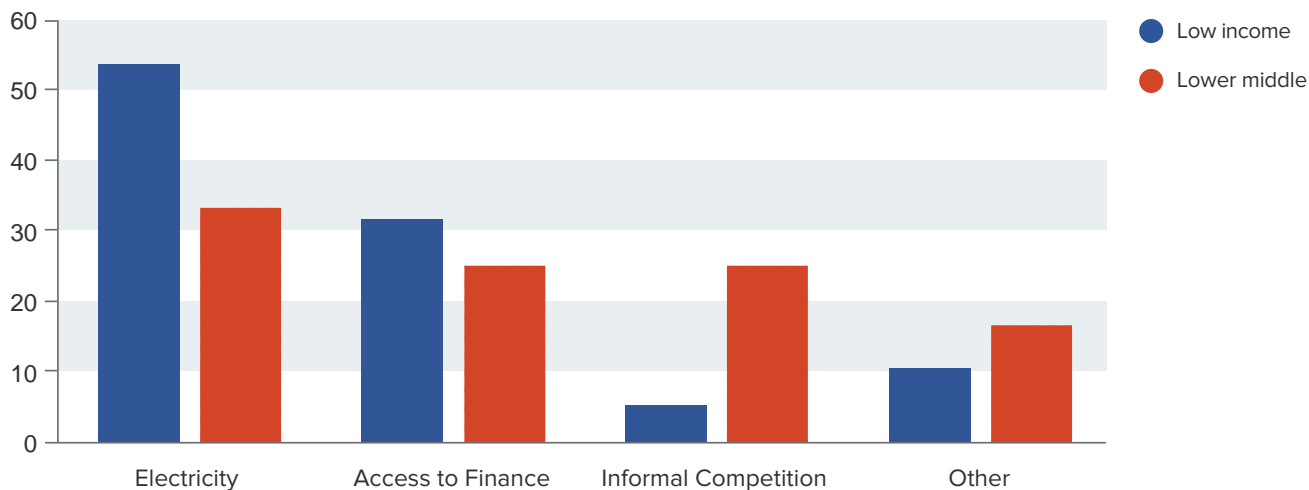
Sub-Saharan Africa: Biggest obstacle reported by firms (% of firms reporting)



Source: Dinh and Clarke (2012).¹²⁷

Figure 5.3

Sub-Saharan Africa: Biggest obstacle reported by firms (% of countries in income group)



Source: Dinh and Clarke (2012) and author calculations.¹²⁸

in the United States found the average total factor productivity (TFP) of manufacturing firms at the 90th percentile was twice as high as that of firms at the 10th percentile.¹²⁹ Even larger productivity differences have been found in China and India, averaging a 5:1 ratio;¹³⁰ both countries could achieve substantial overall productivity gains if they could reduce the extent of

their within-sector resource misallocation to the lower level of the United States.¹³¹

In sub-Saharan Africa, there appear to be very large within-sector productivity differences, though available estimates seem to focus on differences in labour productivity, which are not strictly

comparable to differences in total factor productivity (TFP).¹³² Nevertheless, within-sector gaps in labour productivity in sub-Saharan Africa are large enough to suggest very substantial differences in efficiency across firms and, with it, the potential for large overall efficiency gains through a better allocation of resources within sectors.¹³³ In Senegal, the ratio of labour productivity between a garments and textiles plant at the 90th percentile of productivity and one at the 10th percentile was 10:1. It was 79:1 in Ethiopia and 698:1 in Mozambique.¹³⁴ Large labour productivity differences have also been found across firms in the leather sector in Kenya, among other examples.¹³⁵

The characteristic market structure in many sub-Saharan Africa countries is that a few high-productivity firms control a large share of the market in any given sector, accompanied by a “long tail” of many very small, low-productivity firms. (There are typically not many mid-size or mid-productivity firms, a feature often described as Africa’s “missing middle”). According to World Bank Enterprise Survey data, in Kenya the five largest firms in the formal sector accounted for 58% of total value added, while in Mozambique, even after excluding the five largest firms, the next five accounted for 47% of the residual value added.¹³⁶

A second policy priority, then, should be to reduce resource misallocation within sectors through policy reforms which reduce barriers to competition in product and input markets. More competition can make a substantial contribution to aggregate sector productivity through increased “churning” – the entry or expansion of high-productivity firms and the exit of low-productivity ones.¹³⁷

Important as they are, such broad-based policies do not necessarily tackle all of the obstacles to diversification, which include key market and coordination failures, such as lack of information and failures in credit, insurance, labour and other markets. As a result, it is increasingly accepted that there is a case for more selective industrial policies which target such market failures and support the emergence of new modern economic sectors.¹³⁸

Key areas for targeted policy action include creating conditions for strong export performance – focusing especially on increasing the diversity and technological sophistication of exports – and to exploit productivity gains from geographical agglomeration and clustering of firms.¹³⁹ Maintaining a competitive real exchange

rate generally plays an important role in promoting the international competitiveness of the tradable sectors in the economy. Such a policy can have costs, however, for example by requiring countries to maintain a high level of savings at the expense of current consumption, and not all countries may find such policies beneficial on balance.¹⁴⁰ Most sub-Saharan African countries can nonetheless do much to reduce the transaction costs faced by exporters, for example by reform of customs and tax procedures, and by cutting logistics costs. Reducing regional trade barriers is particularly important, given the many small economies in Africa.

More focused instruments to foster agglomeration, such as Special Economic Zones (SEZs), have been tried before in sub-Saharan Africa, but without great success. This is because countries failed to put in place the critical infrastructure and policies needed to attract a critical mass of investors, including foreign investors. Past failures with SEZs need to be analysed and corrected. Past efforts to promote foreign direct investment (FDI) also need to be reviewed and refurbished. Specialised technical R&D and extension service institutions can help overcome market failures that discourage firms from searching for and adapting new foreign technologies to local conditions.¹⁴¹

Low-income countries can face considerable problems in implementing more focused or selective industrial policies because of their limited administrative capacity and difficult political economy conditions. These problems include difficulties in identifying which sectors to support, due to lack of information, and the potential for industrial policies to be captured by private interests through corruption and rent-seeking. However, countries can learn from a growing body of experience on practical approaches to these issues, such as insisting on high levels of transparency and public accountability in government agencies, establishing clear market-based performance criteria, ensuring competition, and building strong networks that include government, the private sector and civil society to identify targets and policies.¹⁴² Importantly, sub-Saharan Africa countries are able to draw on key global and regional initiatives and partnerships for knowledge and other kinds of support in framing and implementing strategies for industrial development and diversification (Box 5.1).

Box 5.1

Key global and regional initiatives to support industrialisation and diversification

The UN Industrial Development Organisation (UNIDO)'s **Inclusive and Sustainable Industrial Development (ISID)** initiative aims to promote industrial development consistent with poverty reduction, environmental sustainability and equitable distribution of the benefits of industrialisation. UNIDO's Africa Bureau covers 45 sub-Saharan countries and focuses on priority areas such as agribusiness and rural entrepreneurship, industrial policy development, trade capacity-building, and youth employment, among others. Ethiopia and Senegal were selected as the first pilot countries for implementation of the ISID Country Partnership Programmes.

The African Union's **Accelerated Industrial Development for Africa (AIDA)** also seeks to accelerate industrial development in Africa, focusing on industrial policy and institutional direction; upgrading production and trade capacities; promoting infrastructure and energy for industrial development; human resource development for industry; industrial innovation systems, R&D and technology development; financing and resource mobilisation; and sustainable development.

The **African Agribusiness and Agro-industries Development Initiative (3ADI)**, meanwhile, aims to enhance the productivity and profitability of sub-Saharan Africa countries' agribusinesses and agro-industries. It is currently implementing projects in Burkina Faso, the Comoros, the Democratic Republic of Congo, Ethiopia, Ghana, Liberia, Madagascar, Niger, Nigeria, Rwanda, Sierra Leone, Sudan and Tanzania.

Another example is the **LAPSSET (Lamu Port-Southern Sudan-Ethiopia) Corridor Project**, which seeks to promote regional socio-economic development by strengthening transport links between Kenya's northern provinces, South Sudan and Ethiopia. This project highlights the importance of building cross-border intra-regional trade and economic cooperation in sub-Saharan Africa,

5.2 Reforms to strengthen natural resource management

Natural resources – particularly fossil fuels, ores and minerals – play an outsized role in the political economy of sub-Saharan African countries. These types of resources usually yield large economic rents: that is, they generate returns greater than is needed to keep the production unit in operation. This makes such assets highly desirable to control, either as a source of government revenues, or for private gains. They are also “point source” resources, which are produced in a concentrated geographical area and can be controlled and operated as an enclave, in relative autonomy from the rest of the economy. Both these features make natural resources a lucrative target for rent-seeking and attempts at elite capture, especially in the context of developing countries with weak governance.

Sub-Saharan Africa derived 55% of export revenues from fuels, ores and minerals in 2010–2013, second only to the Middle East and North Africa, and at least twice as high as all other regions (Figure 5.4). Within sub-Saharan Africa, over half the countries, across all income levels, have been classified as natural resource-rich (Figure 5.5).¹⁴³

Sub-Saharan Africa's share in world production and reserves of oil and minerals is also large and rising. In 2011–2012, the region contributed around 11% of world oil production, 77% of cobalt, over 60% of platinum group metals, close to 50% of diamonds and 20% of gold. Large new oil and mineral discoveries are adding to the numbers of resource-rich countries in the region, and adding to the reserves and production of already established players. These include oil discoveries in Ghana, Kenya, Liberia and Uganda, natural gas in Tanzania and Mozambique, iron in Sierra Leone and Liberia, and rare earths in Kenya, among many others. Estimates of potential undiscovered reserves are also very large.¹⁴⁴

While commodity prices have slumped since late 2014, they are expected to remain highly volatile and unpredictable, continuing to generate new natural resource booms and slumps over the medium to longer term, offering both opportunities and risks for low carbon development.¹⁴⁵ That, plus the rapid pace of oil and mineral discoveries in sub-Saharan Africa, suggests that improving natural resource management should be a high priority in many countries in the region.



Photo credit: Flickr/James Anderson

As noted in Chapter 1, it is the quality of governance and institutions that largely determines whether an abundance of natural resources is positive for a country's long-run growth, or the source of a "natural resource curse".¹⁴⁶ Due to inadequate information or bad incentives, poorly governed countries may strike deals with private (usually foreign) extraction companies that are disadvantageous for the country (though, possibly, very advantageous for well-connected insiders). Countries with weak governance are more likely to adopt poor economic policies to manage commodity booms. For example, politicians may expand public spending and employment too much and too fast, with the aim of increasing their patronage networks and improving their chances of staying in power. Natural resource rents are diverted into private hands through corruption. Competition to capture rents wastes resources and even fuels political and social strife.¹⁴⁷

Natural resource booms can create complex problems for macroeconomic management even in economies with good governance –much more so in countries with poor institutions for economic management. These include so-called "Dutch disease" effects, where increased spending of natural resource revenues pushes up the real exchange rate and squeezes the profitability of the tradable sectors of the economy,

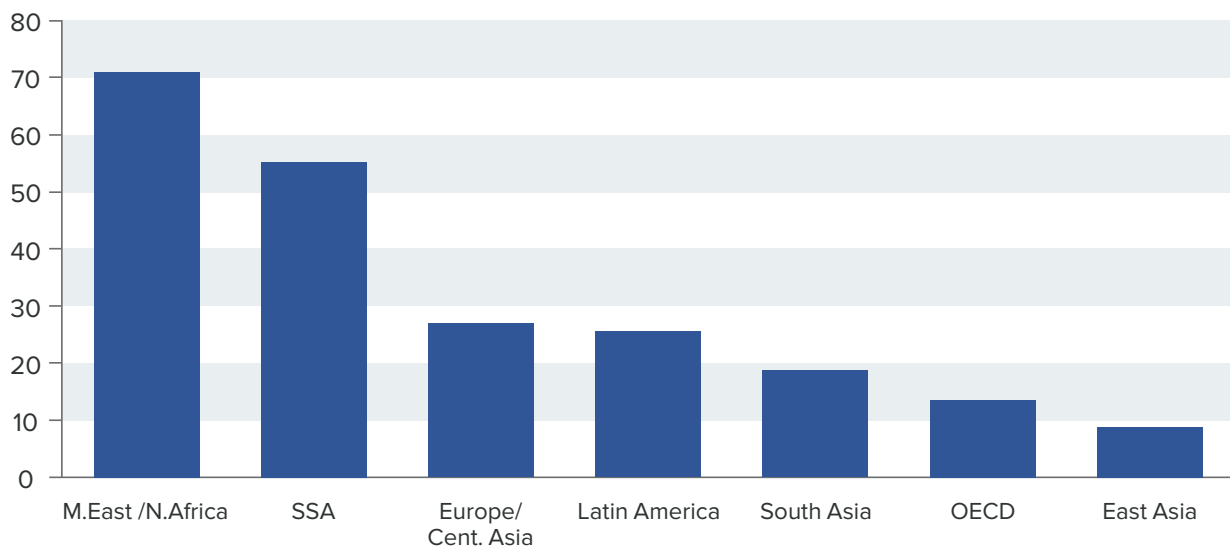
such as agriculture, manufacturing and tradable services. There are also problems because volatility of primary commodity prices and revenues can drive volatility in government spending and real exchange rates, with the resulting uncertainty damaging investment and growth.¹⁴⁸

Reforms to strengthen natural resource management may be needed at some or all points along the natural resource management value chain. This includes the organisation of the natural resource sector and the process by which contracts are awarded to mining companies; regulation and monitoring of operations; setting and collection of taxes and royalties; secure administration of revenues; allocation of revenues to uses that best improve the welfare of present and future generations; and careful management of the investments and other uses to which revenues have been allocated.¹⁴⁹

This is a challenging agenda, especially in low-income countries with weak institutional capacity, but there are pragmatic reforms that can be helpful at all levels of development.

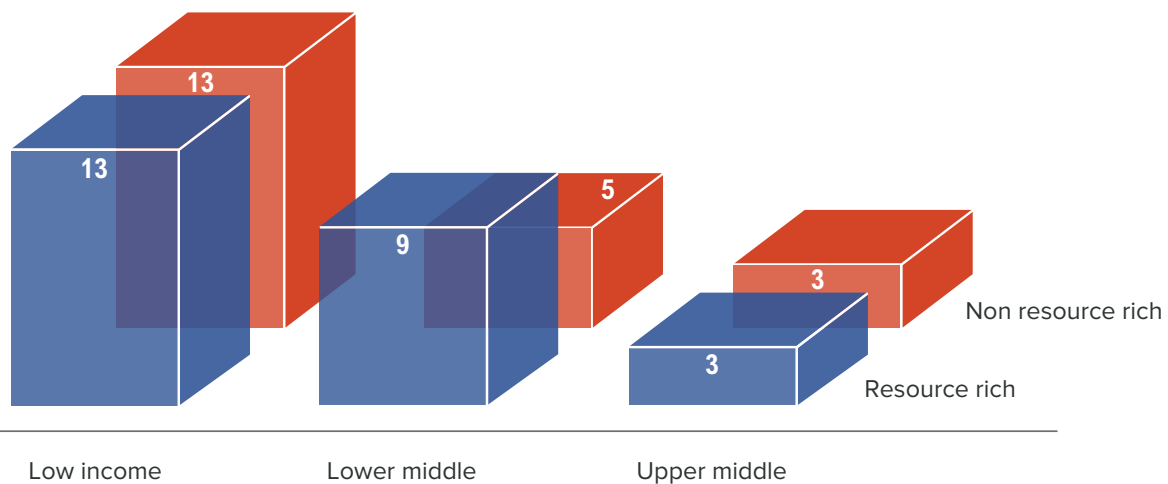
First, given that governance problems are at the root of economic problems associated with natural resource abundance, efforts to increase transparency, public

Figure 5.4
Natural resource exports 2010-13 (as % of merchandise exports)



Source: World Bank World Development Indicators.

Figure 5.5
Sub-Saharan Africa: number of resource rich and non resource rich economies



Source: Appendix Table 1.

accountability and civil society engagement are crucial and can help improve outcomes all along the natural resource value chain. A public that is well informed and concerned about how the nation's natural resource wealth will be used creates powerful political incentives for policy-makers to manage that wealth for the broader public interest. Policy-makers should make relevant

information more freely available, and invite debate and scrutiny by civil society, media and parliament, while also strengthening formal procurement, audits and other anti-corruption rules and institutions. Global efforts such as the Extractive Industries Transparency Initiative (see below) can play a part. Equitable sharing



Photo credit: Flickr/James Anderson

of benefits across regions and ethnic groups can help reduce the danger of civil strife over resources.

Second, there are key fiscal policy decisions about the allocation of natural resource revenues between consumption and savings of various kinds. These decisions will help determine how well the country is able to handle the macro-management problems associated with natural resource abundance, such as the Dutch disease and commodity price volatility, as well as the impact of natural resources on the country's longer-run growth and poverty reduction efforts.¹⁵⁰

Figure 5.6 provides a simple schematic of basic ways that the government can allocate natural resource revenues. Radical though it sounds, there is a good case that some part of natural resource revenues should be paid directly to the public, either as cash transfers targeted at the poor, or as a “national dividend” for all citizens. There is now a growing body of evidence on the effectiveness of cash transfers as a tool for poverty reduction,¹⁵¹ but, as Devarajan and Giugale (2015) argue, an even more important reason may be its effectiveness as tool to fight corruption, by giving citizens a direct interest in monitoring and demanding accountability from politicians and government officials for the good management of natural resource prices revenues.¹⁵²

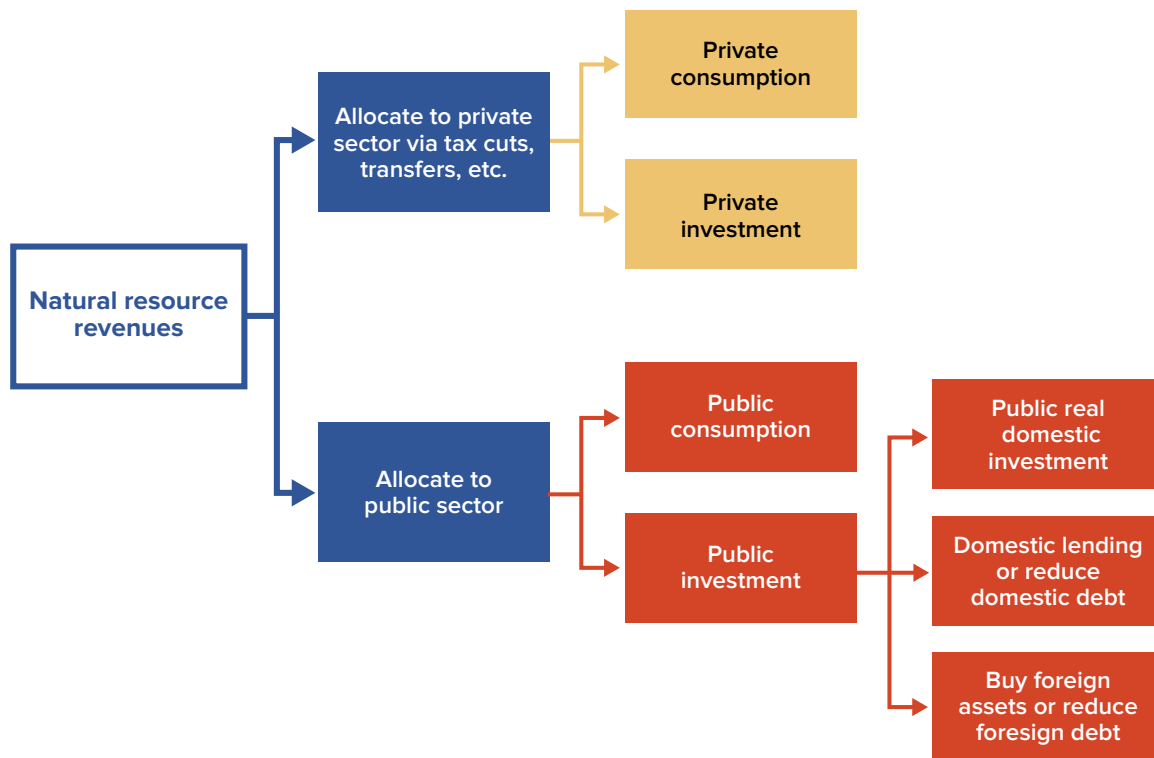
Beyond this, it has long been recommended that governments save a significant portion of natural

resource revenues, typically through a Natural Resource Fund or Sovereign Wealth Fund. The fund can then invest a large part of its portfolio in foreign assets, the returns from which support the government budget over the long term. Such an approach tackles several of the issues associated with natural resource fiscal management. It promotes sustainability by converting a temporary, exhaustible stock of natural resources into a stock of financial assets that generates a permanent income stream. Since a substantial proportion of natural resource revenues are saved, there is less pressure from rising domestic demand that leads to real exchange rate appreciation and Dutch disease effects. By smoothing expenditures, the policy also moderates the problems caused by volatility in natural resource prices and revenues.

More recently the development consensus has shifted towards the view that – while a large part of resource revenues should continue to be saved – there is a case for developing countries to invest a significant part of savings in critical public goods such as infrastructure and education. Much of the success of such a strategy will depend on how efficiently public investment funds are allocated and managed. Therefore, reforms to strengthen public investment management, cost-benefit analysis, monitoring and evaluation, and budget processes and institutions are another crucial element of a successful natural resource-based development strategy.¹⁵³

Figure 5.6

Government choices in allocating natural resource revenues



Source: Brahmhatt and Canuto (2010).¹⁵⁴

How are resource-rich sub-Saharan Africa countries doing with the natural resource management agenda in practice? As noted in Chapter 1, some systematic ratings of natural resource governance in sub-Saharan Africa find many countries still at only a “weak” or “failing” grade.¹⁵⁵ Yet there are also examples of countries making significant efforts to reform their natural resource governance. After the discovery of oil, the government of Ghana undertook an outreach to better inform the public about the new development potential created by oil, but also about the pitfalls and harmful effects of oil wealth that have been seen in other countries.¹⁵⁶ Ghana’s Petroleum Revenue Management Act of 2011 embodies international best

practice in terms of transparency and accountability, with mechanisms to track the inflow and use of revenues, including to separate funds for stabilisation and for future generations. A number of sub-Saharan Africa countries have also signed up to the principles of the Extractive Industries Transparency Initiative (EITI), a global partnership of governments, private companies and civil society organisations to promote open and accountable management of natural resources.¹⁵⁷ Some 25 sub-Saharan Africa countries have committed to EITI principles, and some 20 are judged to be compliant with them.



Photo credit: Sarine Arslanian / Shutterstock.com

CHAPTER 6

Urbanisation and economic transformation in Africa

Sub-Saharan Africa is still among the least urbanised regions in the world, with only about 37% of the population living in cities in 2014, up from 22% in 1980.¹⁵⁸ The regional average masks a wide range of urbanisation experiences: while only 12% of people in land-locked, low-income, non-resource-rich Burundi lived in urban areas in 2014, the share was 87% in resource-rich, upper-middle-income Gabon. Still, the overall pace of urbanisation in sub-Saharan Africa, while substantial, has been less than half the pace in East Asia and about the same as in Latin America (Figure 6.1). Where sub-Saharan Africa is exceptional, however, is in how quickly the absolute numbers living in its cities are rising, 4.4% a year in 1980–2014, much faster than any other region.

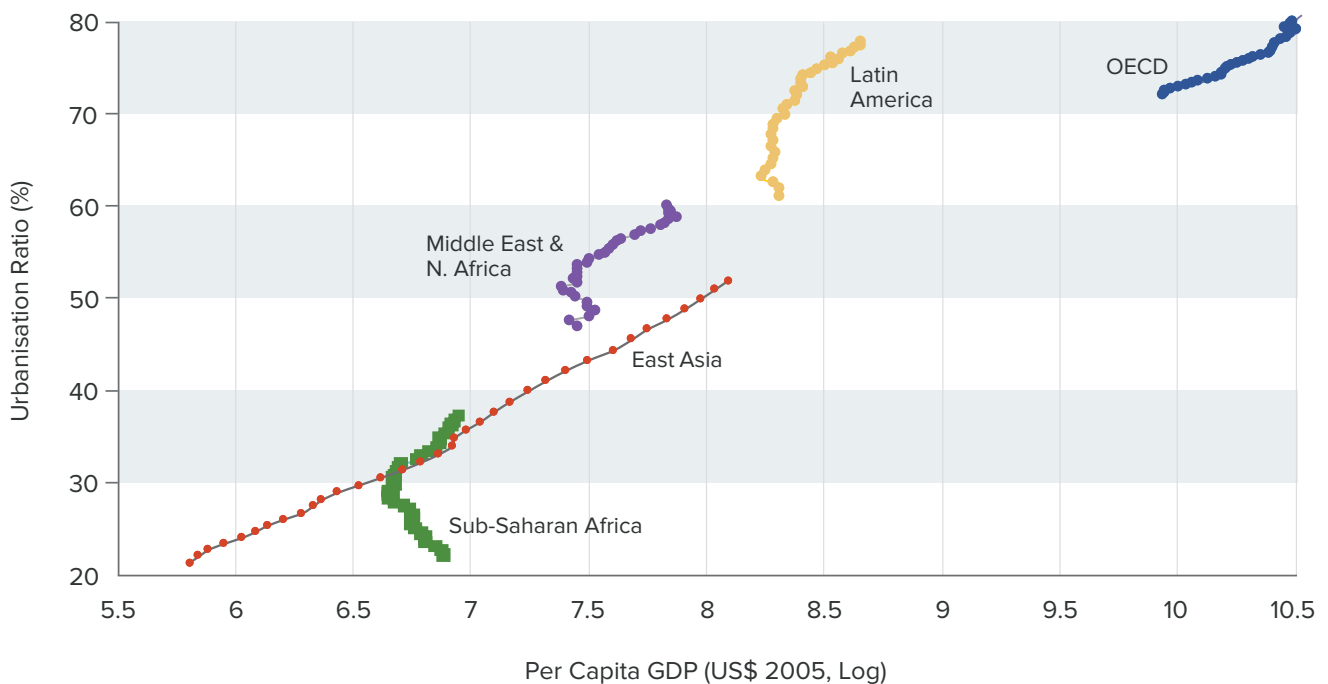
Looking ahead, 55% of sub-Saharan Africa’s population is expected to live in urban areas by 2050 – an increase of almost 800 million, or almost half the projected rise

in urban dwellers worldwide.¹⁵⁹ How this urbanisation occurs will have profound implications for the region’s economic transformation, energy consumption, greenhouse gas (GHG) emissions and ability to adapt to climate change.

6.1 Urbanisation and economic transformation

There is an important but complex relationship between urbanisation and economic development. As Figure 6.2 shows, urbanisation and per capita GDP are tightly correlated. While this relationship is far from well understood, there do appear to be important causal forces running in both directions between development and urbanisation.

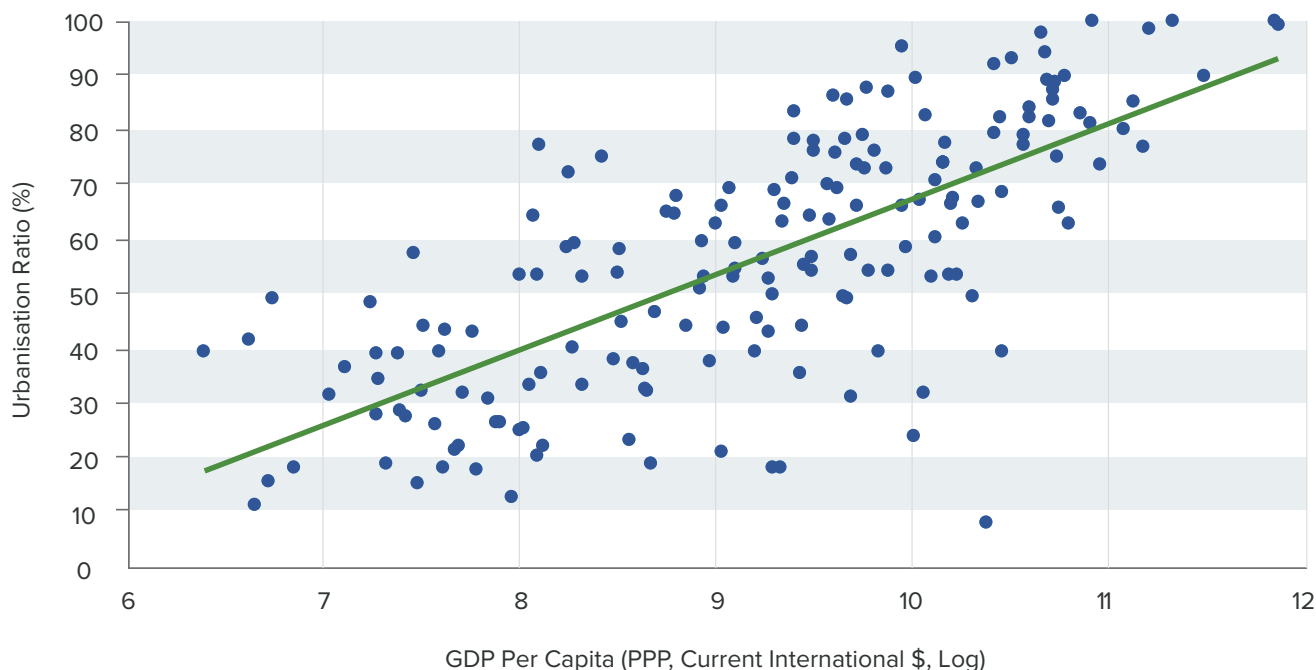
Figure 6.1
Urbanisation and per capita GDP 1980-2014



Source: World Bank World Development Indicators.

Figure 6.2

World: Urbanization ratio and per capita GDP 2014



Source: World Bank World Development Indicators.

Once economic transformation is under way, the growth of the industrial and services sectors encourages urbanisation, because these sectors are less dependent on land as an input than is agriculture. They are also more able to benefit from the productivity enhancements (agglomeration economies) that arise from the clustering together of firms and workers in urban areas.¹⁶⁰ There is growing evidence of how city size and urban density facilitate innovation, productivity increases and income gains through a variety of agglomeration economies. Such effects include spillovers and diffusion of knowledge across firms; increased productivity due to a wider variety of specialised inputs and types of labour; better risk-sharing; better matching of workers to firms; and greater feasibility of infrastructure projects with economies of large scale. The evidence on the positive impacts of urban density on productivity and agglomeration economies points to the benefits of more compact cities for economic development. Employment density is found to explain over half of the variation in labour productivity across US states, for example. Combes, Demurger and Shi (2013) find unusually large agglomeration effects in China: a worker moving from a low-density city (at the first

decile of density) to a high-density one (at the last decile) would experience a wage gain of 53%.¹⁶¹

That said, while urbanisation is likely a *necessary* condition for economic transformation and development, it is difficult to argue that it is *sufficient*. There are numerous examples of urbanisation without much in the way of economic transformation, particularly in sub-Saharan Africa, as we discuss below. Urbanisation can be driven by factors that have little to do with economic transformation. And there are few automatic guarantees that urban form will necessarily evolve in ways that maximise agglomeration effects and productivity. Instead, market failures and bad policies – in particular failures to provide critical public goods – often contribute to unmanaged sprawl as the dominant urban form, curb industrial and services productivity, encourage massive growth of slums, and lead to severe congestion, local air pollution, inefficient energy use, high GHG emissions, and other negative spillovers. Policies and institutions are therefore crucial in managing urbanisation.¹⁶²



Photo credit: Flickr/James Anderson

6.2 Urbanisation and (lack of) economic transformation in sub-Saharan Africa

To a great extent, urbanisation in sub-Saharan Africa has been a missed opportunity so far. There has not been much correlation between rising urbanisation and economic transformation, which, as noted in Chapter 2, has been rather limited – a paradigm which has been described as “urbanisation without growth”.¹⁶³ Urbanisation continued to rise both during the long decline and stagnation of per capita GDP in 1980–2000, and during the period of rising incomes after 2000 (Figure 6.1 above).

Standard structural transformation models of urbanisation and rural-urban migration models identify two sets of drivers. “Rural push” factors, such as rising agricultural productivity, release labour and other inputs into urban areas. “Urban-pull” factors, such as much higher and rising non-agricultural productivity and wages, attract migrants from rural areas into cities. However, the African urbanisation experience does not fit easily into the standard models. In earlier stages, urban populations grew even though agricultural productivity was falling or stagnant, and there was little or no industrialisation creating urban jobs. In

fact, rural-urban migration in sub-Saharan Africa has generally made a relatively small contribution to urban population growth. Even in the more recent recovery period of the 2000s, when agricultural productivity growth has picked up, growth in industrial output and employment has remained muted. The bulk of employment growth has occurred in services, particularly in informal activities, in lower-productivity sectors such as trade, hotel and restaurant services.¹⁶⁴

We look first at three factors that appear in fact to have driven sub-Saharan Africa’s rapid urban population growth – demographics, the impact of natural resource booms, and climate change – before considering the features of sub-Saharan African cities that have worked against economic transformation, focusing on weak policies and institutions.

Demographic factors provide one explanation for the weak connection between urbanisation and economic transformation in sub-Saharan Africa. Jedwab et al. (2016) point to rapid natural growth of urban population (which they label “urban push”) as a major independent factor in overall urban population growth in developing countries over the period 1960–2010, and in sub-Saharan Africa in particular.¹⁶⁵ Urban mortality (especially infant mortality) rates have fallen sharply, while urban fertility rates have remained high.

As a result, close to three quarters of overall urban population growth in a sample of African countries in 1960–2010 was due to growth of the existing urban population, far more than from rural-urban migration. One result of this delayed demographic transition in African cities is a strikingly high urban child dependency ratio – around 70 children per 100 working-age adults, compared with 42 in Asia.¹⁶⁶

In addition, in many developing countries it is natural resource dependence that has driven urbanisation, without a significant increase in the share of manufacturing and tradable services. Such resource-rich countries are numerous in sub-Saharan Africa. Studies find a large and significant relationship between urbanisation and the share of natural resources in exports.¹⁶⁷ There are also significant differences between the “consumption cities” that arise in natural resource-dependent countries and “production cities” in resource-poor countries. Consumption cities depend more on jobs in non-tradable services such as commerce and transportation or personal and government services, while production cities are more reliant on manufacturing and tradable services such as finance. Cities in resource-exporting countries tend to have higher poverty and more slum residents, after controlling for income levels and urbanisation rates.

The underlying mechanism driving these effects appears similar to the Dutch disease problem discussed in Chapter 5. Spending of natural resource rents appreciates the real exchange rate and causes an expansion of the non-tradables sector – primarily non-tradable services produced in cities – and a contraction of the tradables sector, which includes agriculture. Workers are drawn out of the contracting agriculture sector and rural areas, into the booming cities and non-tradable services.¹⁶⁸

A third important explanation for “urbanisation without growth” in sub-Saharan Africa is that climate shocks such as poor rainfall and droughts have driven people from rural areas to cities as a refuge. Several investigators find a significant link between lower rainfall and urbanisation in sub-Saharan Africa, though not in other regions. Africa is more vulnerable to such shocks for several reasons: a much larger proportion of the labour force still depends on agriculture; a larger proportion of agriculture is rainfed; soil productivity is more affected by drought conditions; and geographical and climatic conditions are more liable to water shortages.¹⁶⁹ Looking ahead, it is likely that the adverse impacts of climate change on agricultural productivity and incomes will encourage

larger and more rapid rural-urban migration. The challenge for African cities to provide dynamic growth in industrial and service sector jobs, housing and infrastructure will only mount over time.

What about the features of sub-Saharan African cities that tend to restrain agglomeration effects and economic transformation?

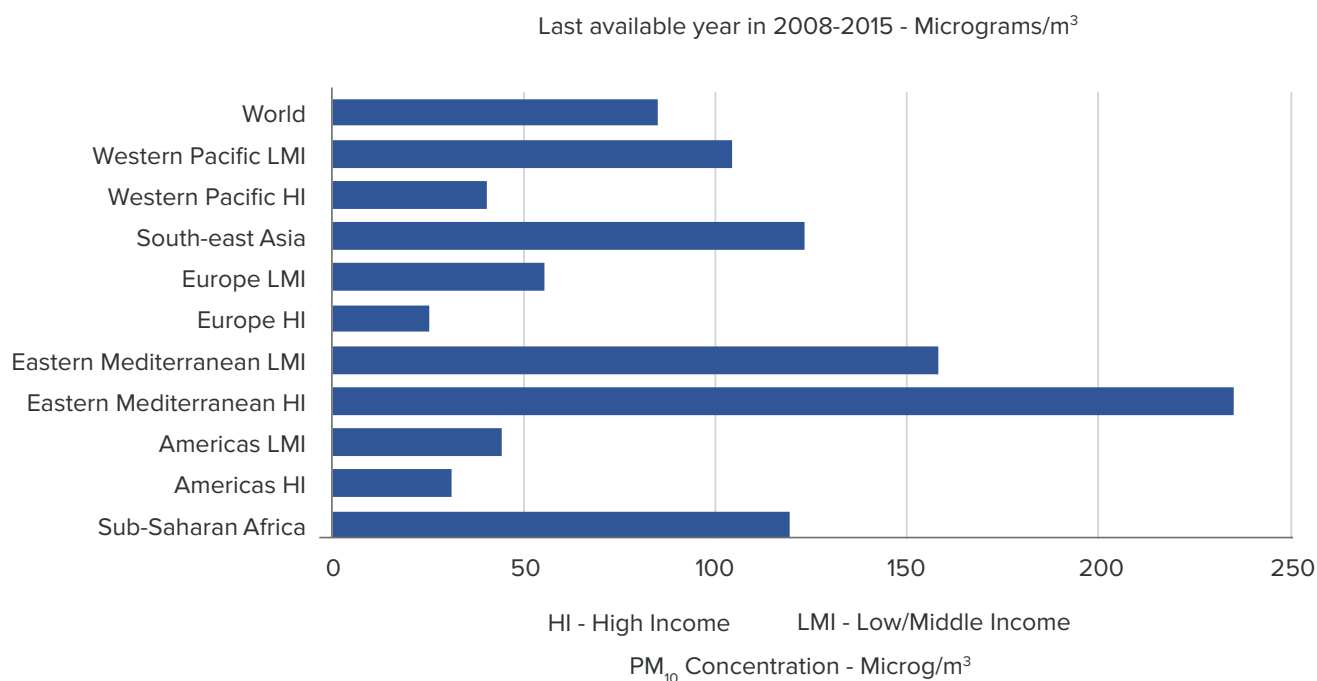
Cities in the region tend to display low population density and fast-growing, urban sprawl. This is due in part to poor governance and urban planning capacity, and in part to rapid urban population growth. Population density in a sample of 12 African cities was found to be only about half that in Southeast Asian cities. In many cases the urban footprint is growing faster than the population, so urban density is falling. Kampala’s footprint has been growing by over 10% a year while population has been rising at 4.3%. Accra’s urban density was falling at an average rate of close to 2.5% a year in 2000–2010.¹⁷⁰ Low and falling urban density means that manufacturing and service activities in these African cities are less able to benefit from agglomeration economies. Further, the rapid expansion of city areas into surrounding farmland and forest damages ecosystem services and adds to GHGs from land use change.¹⁷¹

Haphazard land regulation, insecure land tenure arrangements, weak housing finance institutions, high input costs and lack of coordinated public infrastructure service provision (water, sanitation, waste collection, power) lead to dysfunctional housing markets and lack of affordable, multi-story housing. A staggering 70% of Africa’s urban population lives in informal settlements or slums, sometimes far from city centres, with poor or no access to basic services such as water, sanitation and power.¹⁷²

Although car ownership is low, public transit options are also limited, so people rely heavily on private minibuses. Many cities already suffer from severe congestion, long travel times, high road fatality rates, low energy efficiency, rising outdoor air pollution and high GHG emissions. The World Health Organization (WHO) notes that urban air pollution data for the region remain sparse, covering only about 20% of countries. However, the available data reveal particulate matter (PM) pollution already higher than the world median. (Figure 6.3). Premature deaths attributable to outdoor air pollution are still relatively low in Africa – around 176,000 in 2012, or 20 per 100,000 population, compared with around 100 per 100,000 in developing countries of West Asia.

Figure 6.3

Outdoor air pollution – PM 10 concentration by region



Source: World Bank World Development Indicators.

Urban sprawl also magnifies the cost of infrastructure, which has to be built over larger areas per person served. Weak city governments lack fiscal resources to tackle the deficits in urban infrastructure and public services. Even well-placed capital cities like Nairobi and Dakar have only US\$10–15 per capita per year for capital expenditures, and in most cities it is much less.¹⁷³ Given the very limited budgets available to African cities, higher infrastructure costs result in inadequate or no provision of many basic services. Only 40% of urban populations have access to improved sanitation services; 28% lack access to electricity, and those who have it often endure frequent power outages.¹⁷⁴ With climate change, more intense and variable rainfall is increasing the threat of flooding in cities. Poorly planned coastal cities will be more vulnerable to sea level rise. Migration from rural areas to cities will increase as climate stresses increase in agriculture and rural areas, increasing pressure on inadequate services and stimulating more slums and urban sprawl.

6.3 Strategies to enhance urban productivity, reduce pollution and strengthen resilience

Good policies and institutions will be crucial to seize the opportunity of urbanisation. A shift towards more compact, well-connected and well-coordinated cities is needed to yield a more inclusive and clean urbanisation – one that fosters economic transformation and is resilient to climate change, with relatively low pollution and GHG emissions.¹⁷⁵ No single policy or initiative will suffice; multiple reforms on many fronts will be needed, drawing on urban reform experiences and lessons from throughout the region and around the world (Box 6.1).

Broad economy-wide reforms discussed elsewhere in this report are a good start. Reform of fuel subsidies, for example, will free up revenue for urgently needed urban public investments. Such reforms can also encourage less urban sprawl, more energy efficiency,



Photo credit: Flickr/James Anderson

greater reliance on public transport, reduced local air pollution and lower urban GHG emissions. Social policies to speed the demographic transition will reduce pressures for urban sprawl and its ill-effects. Stronger management of natural resource revenues to ease Dutch disease would slow the growth of “consumption cities”, and improve incentives for urban manufacturing and tradable service sectors.

At an institutional level, a long-term but important priority is to empower and increase the capacity of city governments, which are closest to and best informed about the needs of residents, but which usually have only very meagre resources. The fiscal capacity of city governments needs to be increased, with more central revenue transfers and strengthening of the local tax base. Stronger local governments can start using basic urban planning tools to curb sprawl and foster more compactness. For example, they can favour public transit systems over major road investments that incentivise private car use, or prioritise housing development and public service delivery initiatives within cities rather than in the periphery. Reforms to clarify land rights and strengthen land regulation are important to foster more vigorous urban housing markets that can deliver affordable modern multi-story housing on a large scale in more densely developed, multi-use neighbourhoods.¹⁷⁶

Cities in sub-Saharan Africa also urgently need greatly improved and expanded urban infrastructure for transport, water and sanitation, waste management and energy, as well as “soft” infrastructure for education, health and housing – hugely challenging as this will be to finance and sustain. Sub-Saharan Africa’s infrastructure deficit has been estimated at around US\$90 billion per year, with roughly one third each needed for national, urban and rural infrastructure. This will require greatly strengthened domestic resource mobilisation, better public private partnerships, and growing international financial support and development cooperation.¹⁷⁷

However, it would be a mistake to focus solely on centralised approaches to infrastructure. African cities also need to make full use of emerging technologies and institutional innovations that are already providing more decentralised, agile, low-cost and low-carbon options. Examples include home solar power systems and water heaters, which are increasingly popular, and city-scale electricity generation using landfill waste and gases. New technologies for composting toilets and bio-digesters are providing affordable solutions for sanitation needs, while also creating biogas for energy needs.¹⁷⁸

Box 6.1

How African cities are tapping into global and regional networks and initiatives

Sub-Saharan African cities are increasingly tapping into global and regional city networks and initiatives to share experience and learning. Some 54 cities from across the region are members of the **Compact of Mayors**, a global coalition of city leaders dedicated to addressing climate change that was launched at the UN Climate Summit in 2014. The Compact encourages ambitious climate action by providing a common platform for standardised measurement of emissions and climate risk and for consistent public reporting of city-level climate actions.

- Accra, Addis Ababa, Johannesburg and Lagos are members of the **C40 Cities Climate Leadership Group (C40)**, a network of more than 80 megacities around the world, representing over 600 million people and one quarter of the global economy. C40 provides a platform for knowledge transfer and mutual learning on city-level climate action and collectively aims to reduce emissions by 3 Gt CO₂e by 2030.
- The **Cities Alliance** is a partnership of governments (including Ethiopia, Ghana and South Africa), multilateral organisations, local authorities, NGOs and others. It is undertaking programmes to tackle urban poverty and promotes the role of cities in sustainable development, including in several sub-Saharan African countries.
- Among regional initiatives, the **Africa Urban Agenda Program** is a partnership of UN-Habitat, the UN Economic Commission on Africa (UNECA), the African Union Commission, and United Cities and Local Governments of Africa (UCLGA). It aims to raise the profile of urbanisation in the structural transformation of African countries, guided by the African Union's Agenda 2063.
- The **Smart Cities Initiative** under the Smart Africa Alliance is spearheaded by Rwanda and aims to leverage information and communications technology (ICT) solutions to improve the efficiency of cities. Some 11 African countries have joined the initiative, with more expected to join.
- The **Future Cities Africa** is a partnership of the Cities Alliance and the UK Department of International Development (DFID) to support urban development programmes in Ghana, Ethiopia, Uganda and Mozambique.



Photo credit: Flickr/James Anderson

CHAPTER 7

Economic transformation and Africa's energy transition

Historical experience suggests that more rapid economic transformation and poverty reduction in sub-Saharan Africa will generate a substantial increase in demand for energy services, to meet the fast-growing needs of households, industry and the broader economy.¹⁷⁹ The challenge is how to scale up and modernise the region's energy supply in a way that is not only fast, cost-effective and aligned with development and poverty reduction goals, but also enables African economies to thrive in a low-carbon future.

7.1 Energy demand and scenarios for the future

By global standards, sub-Saharan Africa's energy consumption is currently low, in both absolute and per capita terms. Primary energy consumption was an estimated 640 million tonnes of oil equivalent (mtoe) in 2012, less than 5% of total global energy consumption; for comparison, the OECD and China, with populations only about a third larger, had shares of 37% and 22%, respectively.¹⁸⁰ Sub-Saharan Africa's per capita energy consumption was 694 kg of oil equivalent, 15% of the per capita level in OECD countries. It is important to note, though, that such aggregate measures for sub-Saharan Africa tend to be dominated by just two countries, South Africa and Nigeria, which each contribute a little over one fifth of the region's total energy use. Median per capita energy use in sub-Saharan Africa is only 10% of the OECD level, while in low-income countries it is merely 9% of the OECD level (Figure 7.1).

Electricity consumption is even more limited compared with international levels – 512 kWh per capita in 2012, 17% of the world average and only 6% of OECD levels. Electricity consumption per capita is, on average, less than that needed to power a 50-watt lightbulb continuously for a year. Electricity consumption in low-income African countries is even more limited, a mere 57 kWh, in Ethiopia, for example. More than 620 million people in sub-Saharan Africa have no access to electricity, and nearly 730 million rely on the traditional use of solid biomass for cooking. The overall electrification rate in the region was only 32% in 2012, and just 16% in rural areas. Investment in the power sector has stagnated, and generating capacity across the whole region is a mere 80 gigawatts (GW), no more than in South Korea. Leaving out South Africa, capacity is a mere 34 GW, and as much as a quarter of that is non-operational due to age and lack of maintenance. Power costs average double those in

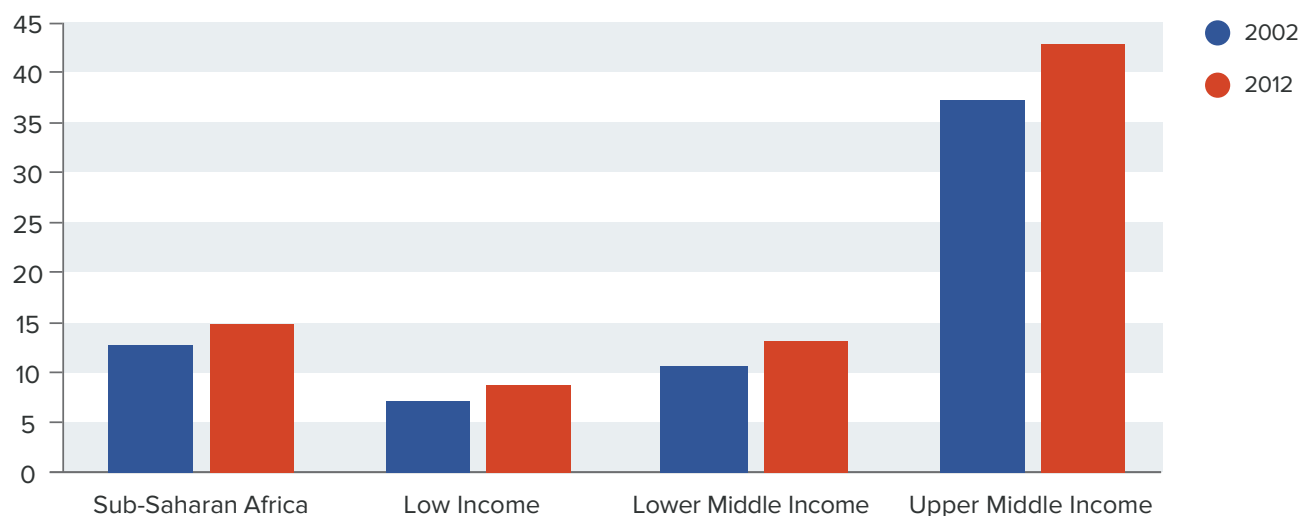
other developing countries.¹⁸¹ Power interruptions and shortages are a significant problem in many countries. By some estimates, these disruptions cost 1–4% of GDP per year. All told, it is accurate to say that the region is in the midst of a power crisis. Overall, the International Energy Agency (IEA) concludes that “the current state of the energy system represents a major threat to the realisation of the region's economic hopes”.¹⁸²

These international comparisons suggest that, as sub-Saharan Africa develops, demands for energy services and electricity are likely to rise substantially. The extent of the increase will depend on factors such as the changing production structure of the economy, the form of urbanisation, consumer preferences, energy pricing policies, and the availability and uptake of energy efficiency technologies. Growth in sub-Saharan Africa's energy consumption accelerated in the 2000s, rising to a compound annual average rate of 3.2% in 2000–2012 from 2.3% in the 1990s. An annual growth rate of 3.2% represents a doubling of energy consumption every 22 years, and is similar to the pace across non-OECD countries other than China. By contrast, energy consumption in OECD countries actually contracted slightly in the 2000s.

We can calculate growth in sub-Saharan Africa's energy consumption in a simple way as the sum of growth in real GDP (a key driver of energy demand), and growth in the energy intensity of GDP (the amount of energy consumed per dollar of real GDP). Following this approach, Africa's 3.2% annual growth in energy consumption in 2000–2012 can be broken down into 5.7% annual GDP growth minus a 2.5% annual decline in the energy intensity of GDP. Looking across income groups, the pace of decline in energy intensity was rather more rapid in low- and lower-middle-income African countries than in the upper-middle-income group (dominated by South Africa) (Figure 7.2). It is also notable that the pace of decline in sub-Saharan Africa's energy intensity was fairly high by international standards. The median pace of decline across all countries was only 1.4% a year in the 2000s, with fully a quarter of countries actually experiencing an increase in energy intensity. Thus, if this recent cross-country experience has some relevance for the future, it may not be easy for sub-Saharan Africa as a whole to achieve a much more rapid pace of decline in energy intensity than it has already seen in the recent past.

Figure 7.1

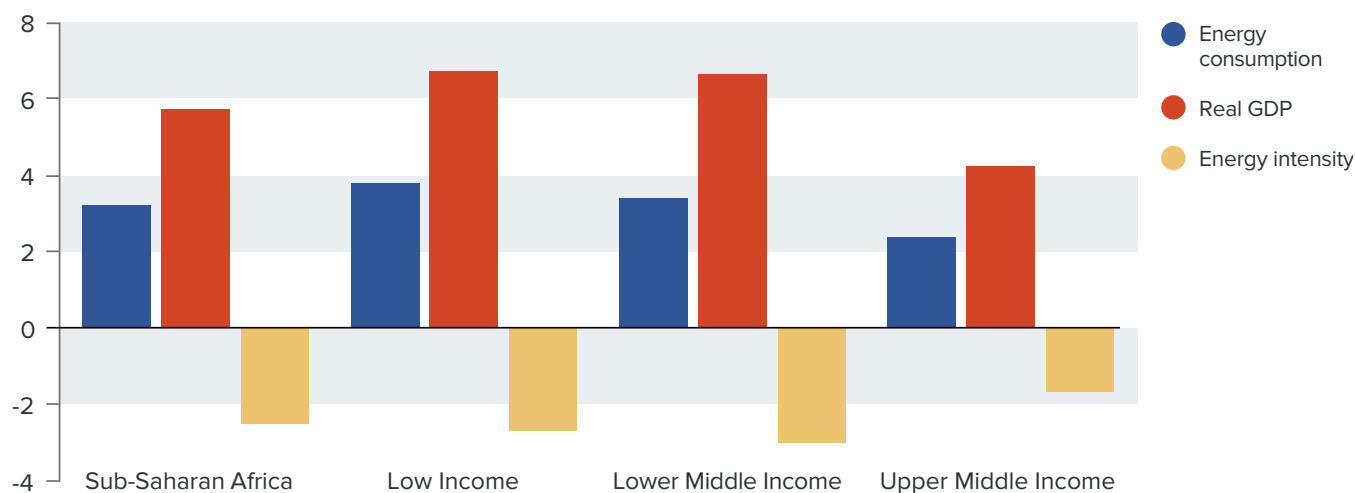
Energy consumption relative to OECD (% of OECD in 2000 and 2012)



Source: World Bank World Development Indicators and author calculations.

Figure 7.2

Energy consumption growth and drivers (annual average growth - % - 2001-12)



Source: World Bank World Development Indicators and author calculations.

The energy intensity of GDP is therefore a key variable in Africa’s energy outlook. However, it is not easy to analyse or predict, because it is itself a complex result of structural, technological, behavioural and policy factors. Research on energy economics provides some guidance: in particular, in low-income countries, per capita energy use tends to rise relatively slowly with

incomes. In other words, the so-called income elasticity of energy demand is relatively low (well below 1), so the energy intensity of GDP tends to fall rapidly. As countries move into and through the middle-income level, however, the income elasticity of demand for energy rises, approaching or exceeding 1, so the energy intensity of GDP

falls more slowly (or even rises). Later, at high income levels, the energy elasticity falls once more, approaching zero.¹⁸³

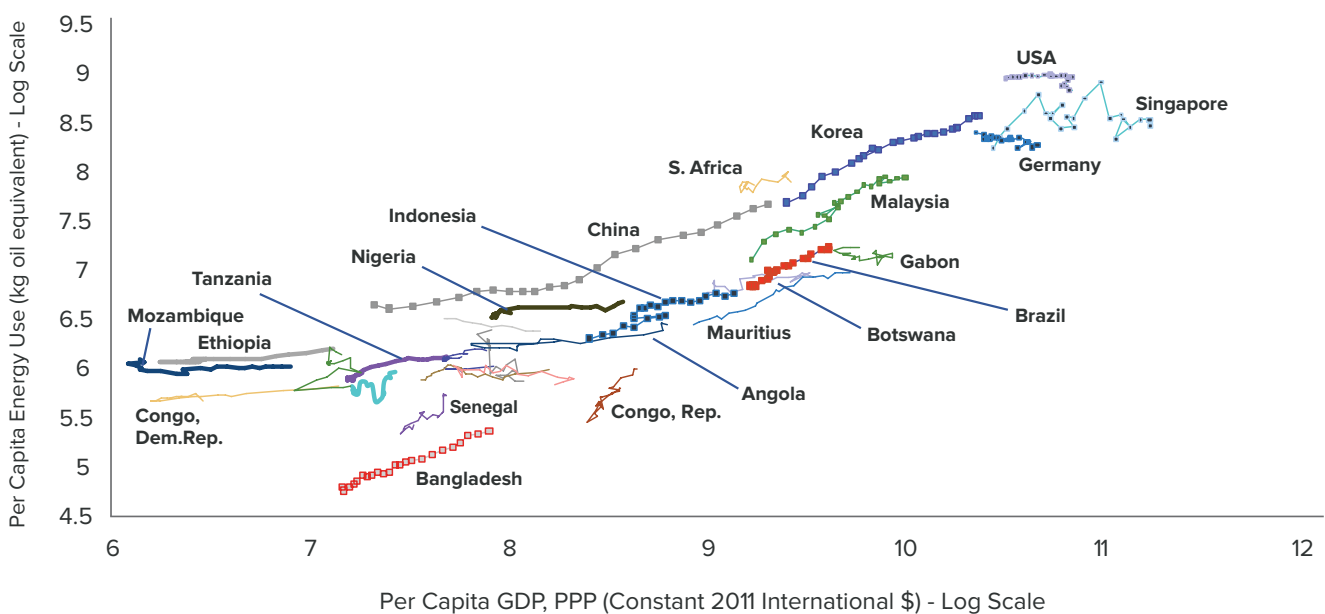
These patterns yield a characteristic “S-shaped energy ladder” in the relation of per capita energy use to per capita income, as illustrated in Figure 7.3 for sub-Saharan African countries and a number of comparators in other regions. We note the tendency for countries at higher income levels to consume more energy per capita, and for the largest increases in energy use to occur in the middle-income range. However, the figure also shows that these broad tendencies do not, on their own, fully determine a country’s energy outcomes. There are wide variations in energy use across countries at the same per capita income level. Thus, for example, when China attained a per capita GDP of around US\$8,500 (PPP, international constant 2011 \$), its per capita energy use was more than 2.5 times as large as that of Mauritius at the same income level.

Both the broad patterns in energy use relative to income and the wide variations across countries likely reflect a mix of factors. On the one hand, energy demand is bolstered by structural change: as countries move into and through the middle-income

level, economic activity will shift, to varying degrees, out of less energy-intensive traditional agriculture into more energy-intensive industry and (to a lesser extent) services; at the same time, energy demand for transport and household use is likely to rise. The share of industry and (especially) manufacturing in GDP in sub-Saharan Africa is presently the lowest among all developing regions. Going forward, even if sub-Saharan Africa pursues a development path that is less industry-focused than, say East Asia, it is unlikely that its path will be less industry-oriented than at present, and it may very well be more.

Second, urbanisation entails a generally more energy-intensive pattern of life than in rural areas. As discussed in Chapter 6, sub-Saharan Africa is among the least urbanised developing regions, but the urban share of the population is projected to rise from 37% in 2014 to 55% in 2050. A related factor is that growth that is more inclusive and successful in reducing poverty is also likely to be more energy-intensive. Residential demand for energy grows especially rapidly when formerly poor people gain access to electricity and undertake first-time purchases of appliances such as electric lighting, refrigerators, cookers, fans, air conditioners and TVs.¹⁸⁴ Here again, sub-Saharan Africa is home to the largest pool of people living in

Figure 7.3
Sub-Saharan Africa and comparator countries – per capita energy use versus per capita real GDP – 1990-2012



Source: World Bank World Development Indicators and author calculations.

absolute poverty and without modern energy access; thus, if countries succeed at promoting inclusive growth, the energy intensity of the economy is likely to increase.

Cutting in the opposite direction are ongoing improvements in the technical efficiency of energy use for production processes and for consumer goods, as a part of global technological progress. With technological diffusion, this creates the potential for developing countries to “leapfrog” to much more energy-efficient processes and products than were available to today’s developed countries when they were at comparable income levels. For example, a refrigerator purchased by an African urban middle-class family today is considerably more efficient than those available in the US 40 years ago.¹⁸⁵

Finally and crucially, in Africa as in most countries, energy efficiency in many sectors is often well below economically efficient levels because of policy distortions and a variety of market and institutional failures, the so-called energy efficiency gap. As discussed in Chapter 6 above, more compact and better-connected cities can have a large impact on energy efficiency while improving economic productivity and quality of life. As we discuss further in Section 7.3, there are numerous opportunities for African economies to bolster energy conservation in economically efficient ways – for example, through reform of fuel subsidies, increased energy taxation to reflect the harmful spillovers of fossil fuels, and improved efficiency in power generation, and reduced transmission losses.

Pulling these considerations together, there are several factors – greater industrialisation, urbanisation and poverty reduction – that will tend to slow the pace of decline in the energy intensity of GDP in sub-Saharan Africa from the pace seen since 2000 – which, as already noted, was already quite high by international standards. Set against these factors are the potential for African countries to “leapfrog” to modern, energy-efficient technologies, and the potential for policy reforms to increase energy efficiency. It is not easy to say what the net result will be, but it seems prudent to assume that the pace of decline in Africa’s energy intensity is unlikely to be any faster than in the recent past.

Looking ahead, African countries will no doubt want to maintain or increase the more rapid rate of economic growth that they achieved over the last 15 years. Given

projections of 2.4% annual population growth until 2040, a 6.5% real GDP growth rate would imply a 4.1% per capita GDP growth rate for sub-Saharan Africa, which would raise the region’s per capita GDP in 2040 to about US\$10 000 (in PPP, 2011 constant \$). That is about the current income of Indonesia – a very worthwhile outcome, were it to be achieved.

Using the simple decomposition outlined above, a 6.5% GDP growth rate would imply a 4% annual average growth rate in energy use, if we assume that the energy intensity of GDP continues to fall by 2.5% a year, as it did in the 2000s. This would imply the region’s energy consumption increasing by two and a half times by 2040, bringing it to about the current total energy consumption of OECD European countries.

It is instructive to compare this simple “6.5% GDP growth” scenario with the IEA’s energy projections to 2040 for sub-Saharan Africa in its 2014 *Africa Energy Outlook*. Under the baseline New Policies Scenario, the IEA projects a much lower 2.2% per year rise in energy consumption to 2040. This difference is driven mostly by a lower 5.1% annual GDP growth rate assumption, as well as a slightly more optimistic 2.9% a year decline in the energy intensity of GDP.¹⁸⁶ Strikingly, this scenario projects sub-Saharan Africa’s already low per capita primary energy consumption to fall somewhat by 2040, and to remain far below levels in the rest of the world. The IEA’s cautious GDP growth assumption for Africa may of course be realistic. Nevertheless, to the extent that the continent succeeds in achieving more ambitious growth targets, it is also likely to experience considerably stronger energy consumption growth.

7.2 CO₂ emissions and scenarios for the future

Sub-Saharan Africa’s share of global CO₂ emissions from energy use is even smaller than its share of energy consumption – a mere 2.1% in 2014. Leaving out South Africa, which emits over half the regional total, sub-Saharan Africa contributed an even more miniscule 0.8% of global GHGs from energy use. Regional per capita emissions are a little over 7% of those in the OECD, but again that is inflated by South Africa, where per capita emissions are 80% of the OECD. In low and lower-middle-income African countries, per capita emissions are much lower, around 1% and 4% of the OECD (Figure 7.4).

Figure 7.4

Per capita CO₂ emissions relative to OECD (% of OECD in 2000 and 2014)

Source: World Bank WDI and author calculations.

We can decompose CO₂ emissions from energy use in sub-Saharan Africa as the product of two factors: energy consumption, and the CO₂ intensity of energy (units of CO₂ emitted per unit of energy consumed). As discussed above, sub-Saharan Africa has very low energy consumption per capita. It also has exceptionally low CO₂ intensity of energy: about half the level in OECD countries, and two thirds the level in all developing countries. The comparisons are much lower if South Africa is excluded.

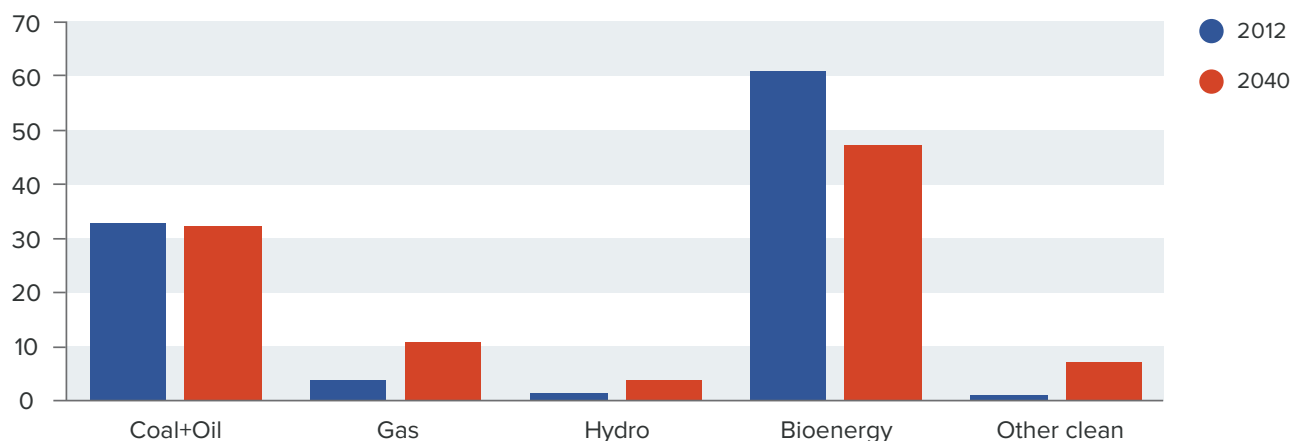
The main reason for such low carbon intensity is that a large share of the energy used in much of sub-Saharan Africa comes from burning wood, agricultural residues, and other traditional biomass in rural areas (and charcoal in urban areas). The burning of biomass only releases CO₂ accumulated by plants during their life-cycle. Protocols and guidelines by the IPCC and other standard-setting bodies therefore treat biomass use for energy as neutral with respect to CO₂ emissions to the extent it does not exceed the rate at which forests can regrow. In low-income African countries such as the Democratic Republic of Congo and Ethiopia, the share of traditional biomass in total primary energy supply exceeds 90%, while in lower-middle-income countries such as Cameroon, Congo, Côte d'Ivoire and Kenya, it is still in the range of 60–75%. For comparison, biomass provides 14% of primary energy consumption across all non-OECD countries and 10% worldwide.¹⁸⁷

As the region continues to develop, the share of biomass in the primary energy supply is likely to fall substantially. Cross-country historical evidence strongly documents an “energy ladder” in the source of energy, with rising per capita incomes being accompanied by a fall in traditional biomass use and a sharp rise in the importance of modern energy sources, which provide much greater energy density, constancy of flow, flexibility, transportability and ease of control.¹⁸⁸

Historically, the shift to modern energy has meant a much greater reliance on electricity and, in terms of primary energy, on fossil fuels, resulting in a rising CO₂ to energy intensity and higher CO₂ emissions. At present, both the OECD and developing countries as a group derive around 80% of their primary energy from fossil fuels, compared with a median 28% in sub-Saharan Africa. It should be noted, however, that the historical shift to fossil fuels has been far from uniform. Carbon intensities of energy vary widely at similar levels of per capita income. They are high in China and India, for example, because of the exceptionally high proportion of coal in these countries’ energy mixes. To the extent that the transition to modern energy can be supplied through modern non-CO₂-emitting options – hydropower, geothermal, nuclear, solar, wind – the rise in CO₂ intensity can be moderated. For example, Brazil, an

Figure 7.5

Sub-Saharan Africa – IEA scenario for Primary energy fuel mix – 2012 and 2040 (% of total)*



* New Policies Scenario with 2.2% annual growth in Total Primary Energy 2012-2040

Source: IEA (2014).¹⁸⁹

upper-middle-income country, has a lower CO₂ -intensity of energy than other countries at its level of development because of plentiful hydropower.

According to World Bank data, sub-Saharan Africa’s aggregate CO₂ emissions from energy were rising at a modest pace of 2.5% a year in 2001–2012. That is less than the pace for developing countries overall, which was boosted by rapid growth in emissions in the 2000s from emerging economies such as China and India. The relatively slow pace of emissions growth for sub-Saharan Africa in aggregate was mainly the result of slow emissions growth in the two largest economies, South Africa and Nigeria. Median growth in emissions across sub-Saharan Africa countries was a more significant 5% a year, providing a broader sense of emission trends in the region. The median increase in the CO₂-intensity of energy, for the limited set of countries for which we have estimates, was close to 2% a year.

Looking ahead, the New Policies Scenario in the IEA’s *Africa Energy Outlook* projects sub-Saharan Africa’s aggregate CO₂ emissions to continue to grow by 2.5% a year until 2040. Using the simple framework noted above, this emissions growth is equal to the sum of 2.2% a year growth in energy consumption and a 0.3% a year increase in the CO₂ to energy intensity.

At least two points are worth noting about this scenario. First, as discussed above, a stronger GDP growth rate assumption would translate into more rapid energy consumption growth and, other things equal, faster CO₂ emissions growth. With 6.5% GDP growth, holding other key intensities the same, emissions growth would be close to 4% a year. Second, as the IEA’s scenario shows, the CO₂ intensity of energy in the region is likely to rise even with rapid growth in the share of clean energy sources such as hydropower, solar and wind. The reason is that Africa’s energy mix is currently dominated by traditional biomass, which is considered “clean” in CO₂ accounting, but whose share is expected to fall sharply as energy-users switch to modern energy forms. In the IEA’s scenario for sub-Saharan Africa, as shown in Figure 7.5, the share of hydropower and other clean sources such as solar, wind and nuclear is expected to rise by almost 8 percentage points by 2040, but this is more than offset by a 14-percentage-point fall in the share of biomass. The gap is met by a rise in share of fossil fuels, notably natural gas. As sub-Saharan Africa shifts to modern energy sources over coming decades, a key question facing the region is the extent to which it can meet this growing demand through cost-effective, modern clean fuels, or must it rely on fossil fuels.

7.3 Managing the energy transition and GHG emissions in sub-Saharan Africa

Policy and institutional reforms are critical in managing the potential trade-offs between rising demand for energy services, and the harmful spillover effects that have historically accompanied rising energy consumption, such as air pollution and GHG emissions. In particular, existing policy distortions, institutional weaknesses and market failures provide significant opportunities for policy reforms that yield multiple benefits in terms of expanded energy supply, greater energy efficiency, improved economic efficiency, and better environmental outcomes.

Better fiscal policies are a priority, including reform of energy subsidies and the use of energy taxes to promote national aims. Another priority is to rapidly expand investment in power generating capacity and distribution networks. This is crucial to meet development needs and improve energy access, and will need to be backed by scaled-up financing from both international sources and strengthened domestic resource mobilisation and financial capacity. Support for cost-effective, low-carbon energy sources needs to be a key part of long-term, external, concessional financing. Countries will have to take a pragmatic approach to the mix of low-carbon sources and fossil fuels they use to meet fast-rising energy demands – and effective policies to promote energy efficiency will also be crucial.¹⁹⁰ Still, given the vast, mostly untapped renewable resources available – excellent solar across the whole region, hydropower in many countries, wind in coastal areas, and geothermal in the Rift Valley – and given rapid technological progress and cost declines in many renewables technologies, there appears to be good scope for low-carbon energy sources to supply a growing share of Africa's energy needs over time.¹⁹¹

Fossil fuel subsidy reform

Tax and subsidy policies and energy prices should not encourage wasteful energy use. Energy prices should reflect all the costs of energy use. Recent estimates by the International Monetary Fund (IMF) indicate that fossil fuel subsidies in 30 sub-Saharan countries totalled about US\$75 billion in 2015, or around 5% of regional GDP (Figure 7.6). Of this total, pre-tax consumer subsidies, which arise when consumer prices for energy are kept below its supply cost, were estimated at US\$26 billion. Countries spending over US\$1 billion on pre-tax fossil fuel subsidies in 2015 included Angola, Côte d'Ivoire, Mozambique, Nigeria, South Africa, Tanzania, Zambia and Zimbabwe. Post-

tax consumer subsidies, which arise when consumer energy prices fail to reflect the environmental damages caused by energy consumption, are estimated at US\$49 billion. Of the subsidy total, about 40% is on petroleum, a third on coal, a quarter on electricity, and a small amount of natural gas.¹⁹²

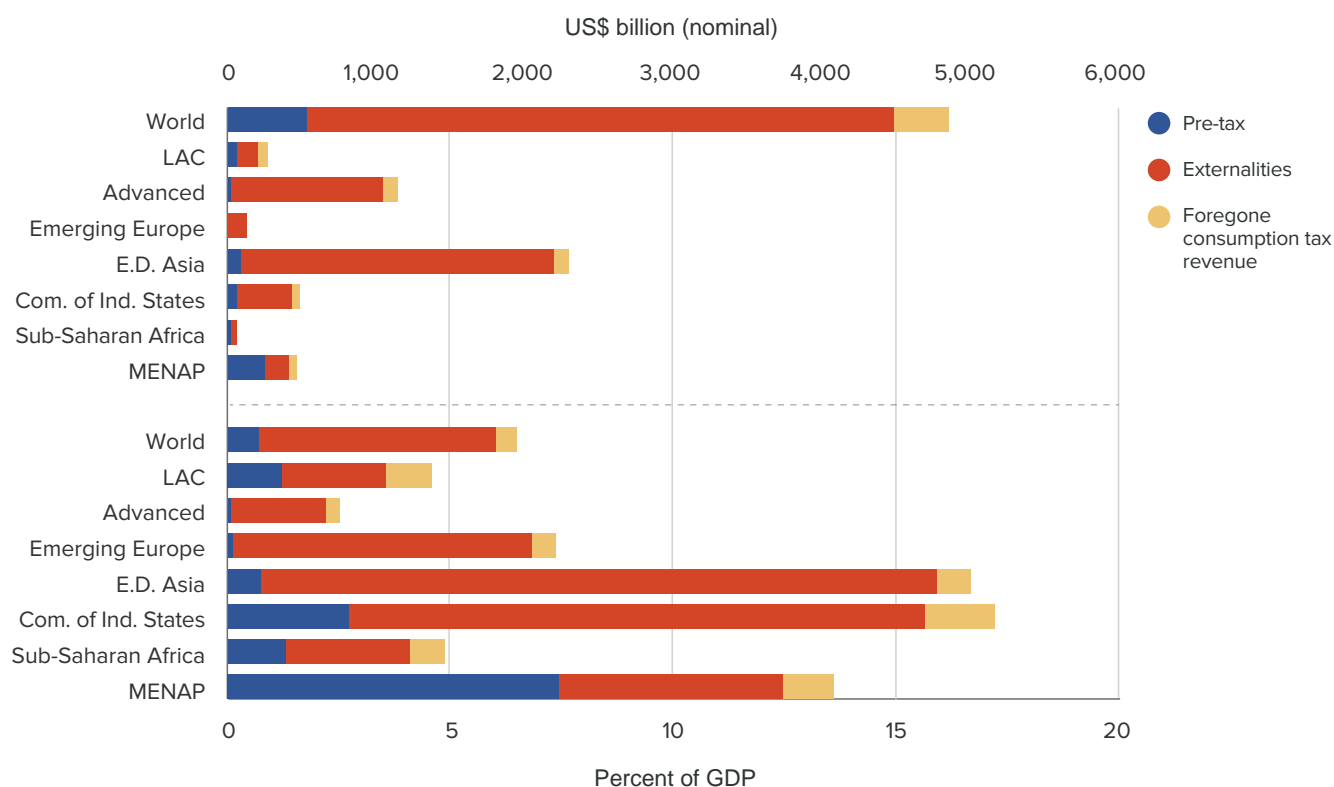
Fossil fuel subsidies in sub-Saharan Africa are lower than in most other developing regions (Figure 7.6), but, at around 5% of GDP, they still represent a significant misallocation of resources. As elsewhere, fuel subsidies in African countries may have arisen from a desire to protect poorer consumers from high and volatile energy costs. It is now recognised that such subsidies are an inefficient way to protect the poor, while imposing significant costs on the economy and harm to the environment. Energy subsidies in developing countries, including sub-Saharan Africa, are typically highly regressive, and benefit mainly the rich. By one estimate, only 7% of the benefits went to the poorest quintile of the population in developing countries, with over 40% going to the top.¹⁹³ Economic inefficiencies include wasteful use of energy at all levels, whether in production or final consumption, excessive consumption of goods and services that use energy intensively, and inefficient concentration of capital and labour in sectors producing such goods.

Subsidies also foster higher fiscal deficits and a diversion of public expenditure away from more productive uses, such as infrastructure, education or health. Pre-tax fossil fuel subsidies in Zimbabwe account for over 40% of total public spending, for example, while in Zambia, they are over four times larger than public health expenditures. By one estimate, a full reform of fossil fuel subsidies in sub-Saharan Africa would generate public-sector resources worth over 15% of government revenues.¹⁹⁴

By boosting fossil fuel use relative to clean energy, fuel subsidies also increase environmental and social damage. This includes illnesses and premature deaths caused by local air pollution from fine particulate matter generated by the burning of fossil fuels; broader environmental costs of using road fuels in vehicles, such as traffic congestion and road accidents; and CO₂ emissions from fossil fuel combustion. The IMF estimates that removal of energy subsidies in sub-Saharan Africa would reduce premature deaths from air pollution in the region by over 50%, while also reducing CO₂ emissions by around 15%. To take into account wider social costs, targeted carbon pricing could be a longer term possibility to promote low carbon growth. (There is only limited carbon pricing in sub-Saharan Africa at present, however, with only South Africa having a recognized policy in place).¹⁹⁵

Figure 7.6

Fossil fuel subsidies in US\$ billion and as percent of GDP by region



Source: Coady et al. (2015) and van der Burgh (2015).¹⁹⁶

A growing number of sub-Saharan African countries have attempted reform of energy subsidies in recent years, including Angola, Ghana, Kenya, Namibia, Niger, Nigeria and Uganda. Such reforms are often politically contentious, and have sometimes had to be partially reversed, as influential incumbent groups who benefit most from subsidies may mobilise to oppose reforms. The poor, even though they benefit the least, may also still suffer absolute declines in their living standards as a result of higher energy prices. A growing body of international experience offers lessons on how to formulate reform strategies. It is important to mobilise all branches of government to help implement the reform; conduct careful preparatory research and analysis, in particular to identify key potential winners and losers; ensure extensive communication and consultation at all stages of the reform; and prepare complementary measures to provide financial support of varying duration for those most likely to be hurt by the reform, in particular social protection measures for the poor.¹⁹⁷

Expanding power generation capacity

A major increase in electricity generation capacity will be needed to support faster growth, a structural shift towards more energy-hungry sectors, and expanded energy access. Under the IEA's New Policies Scenario, power generating capacity in sub-Saharan Africa countries increases fourfold (5% per year) by 2040, with power consumption growing by 4.6% a year. This would be much higher than the 2.6% growth rate experienced in 2000–2012. However, according to estimates by the Africa Progress Panel, under this scenario, per capita electricity consumption in sub-Saharan Africa countries other than South Africa in 2040 would still be less than the meagre per capita level in India today, or less than one third the current level in Thailand. And it would still leave some 530 million people (30% of the population) without access to electricity, notwithstanding the IEA's spare definition of access as 250 kWh for rural and 500 kWh for urban households.¹⁹⁸

Many have therefore called for an even more rapid expansion in power generation. The IEA's Africa Century Case Scenario analyses a fivefold increase in generating capacity by 2040, while the Africa Progress Panel calls for at least a tenfold increase by 2040, together with universal energy access by 2030.¹⁹⁹ Rather than delve into the details of these scenarios, all of which would represent much greater progress than the actual historical experience in sub-Saharan Africa, we briefly review some critical factors that will determine the ability of the region to achieve these more ambitious scenarios while also beginning to move towards a low-carbon energy future.

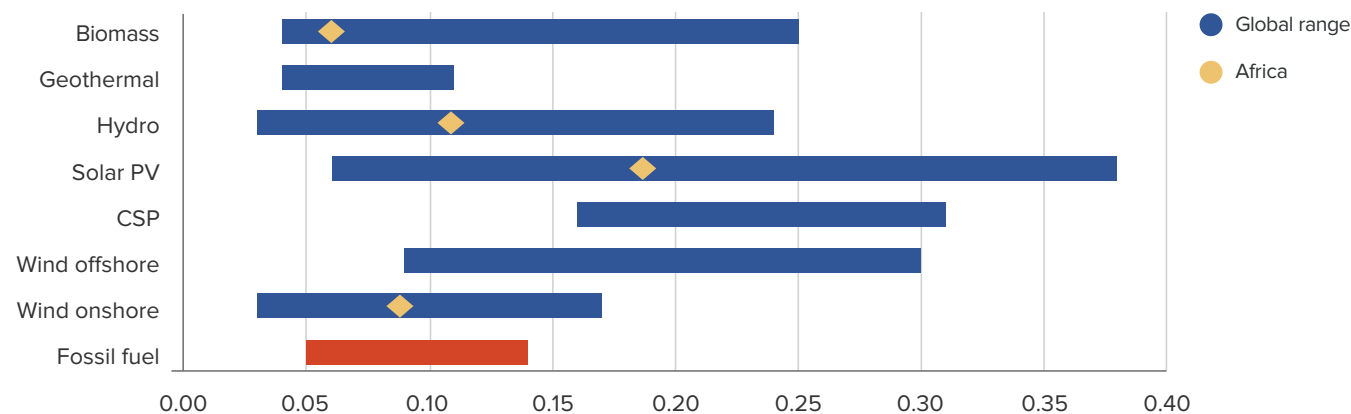
Sub-Saharan Africa's abundant energy resources and improving technological options

Sub-Saharan Africa's economic transformation is taking place in a context of rapid change in

renewable energy technologies. The region can draw on low-carbon options to meet its power needs that were not available to other developing regions even a few decades ago.

The costs of exploiting sub-Saharan Africa's abundant renewable energy resources are falling at unprecedented rates. The levelised cost of energy (LCOE) for utility-scale photovoltaic (PV) energy has fallen by 50% during 2010–2014 and has continued to fall thereafter.²⁰⁰ In mature markets such as the US, the numbers are even more staggering: between 2009 and 2015, LCOE for solar PV declined by 82%, and for onshore wind, by 60%.²⁰¹ Figure 7.7 shows the LCOE ranges of various power sources in 2014, both globally and for Africa, where information is available. By some estimates, solar power will be the cheapest power source, or second-cheapest after gas, in more than half of sub-Saharan African countries by 2030.²⁰²

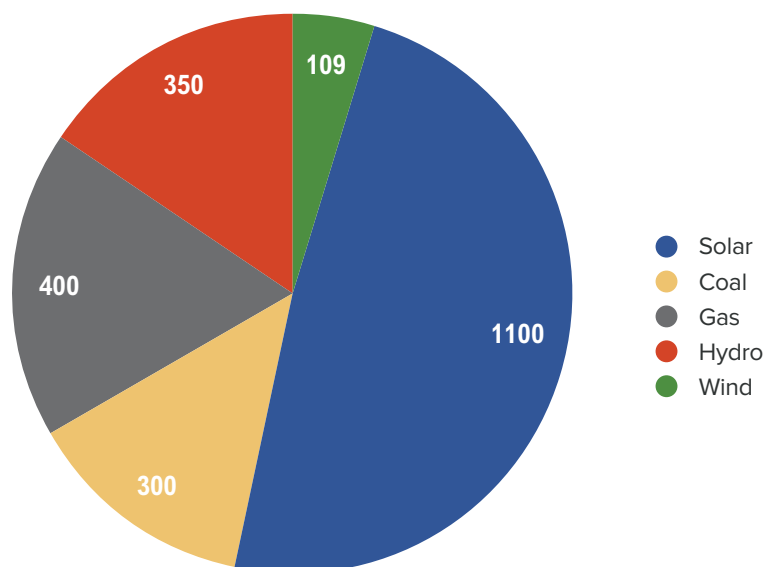
Figure 7.7
Levelised cost of energy for renewables and fossil fuels (2014, US\$/KWh)



Source: Linklaters (2016), based on IRENA data.²⁰³

Figure 7.8

Sub-Saharan Africa's Power Potential by Source (GW)



Source: Castellano et al. (2012).²⁰⁴

Sub-Saharan Africa has an enormously rich portfolio of energy assets, not only traditional coal and oil, but also natural gas, hydropower, solar, wind, geothermal and other low-carbon resources. Figure 7.8 summarises McKinsey estimates for potential power generating capacity in sub-Saharan Africa by fuel. Natural gas, hydro, solar, and wind comprise near 2 terawatts (TW) of potential, over half of which is solar. Coal fired-power has 300 GW of potential, but 95% of this supply is concentrated in only three Southern African countries: Botswana, Mozambique and South Africa.²⁰⁵

The availability of these renewable resources and technologies creates the potential for Africa to ramp up its power generation in a cleaner, less carbon-intensive manner than was the case in other recent examples of rapid power expansion, such as China or Vietnam, where fossil fuel use and CO₂ emissions also soared. Off-grid and mini-grid options provide a way to harness clean energy sources to help expand electricity access for the poor.²⁰⁶ IEA and International Renewable Energy Agency (IRENA) scenarios do anticipate a material increase in fossil fuel-powered generating capacity of 85–135 GW by 2030, although

the bulk of this would be natural gas, and the share of coal would fall substantially.²⁰⁷ Meanwhile the share of renewables is generally expected to increase rapidly, though from a low base. The IEA's relatively conservative New Policies Scenario sees sub-Saharan Africa's renewable energy based generating capacity (including hydro) growing at least fivefold, to 128 GW by 2030, or 27% of total capacity, up from 16% in 2012.²⁰⁸ It is interesting that scenarios with more ambitious overall power capacity targets generally see the bulk of the extra capacity coming from renewable sources. More ambitious scenarios for pricing and policy see renewables capacity at between 167 and 377 GW by 2030.²⁰⁹

New energy infrastructure needs to be built in ways that are resilient to climate change impacts. Climate change could seriously reduce hydropower production and revenues, for instance, but these costs could be substantially reduced by modifying existing investment plans to explicitly handle the risks of large climate swings.²¹⁰

Whither coal?

While all scenarios see a substantial decline in the share of coal in sub-Saharan Africa's power generation, most still see some rise in absolute coal consumption in the coming decades. The trajectory of coal in the region will largely depend on South Africa, which has large domestic coal supplies and currently holds most of sub-Saharan Africa's coal-fired generating capacity. South Africa is seeking to diversify its power mix with renewables, regional hydropower projects, natural gas and eventually nuclear energy. Its Renewable Energy Independent Power Producer Procurement (REIPP) programme has seen US\$10 billion in total committed investment in its five years of operation. The state-owned utility Eskom is able to purchase renewable power, on average, at 17% less than the price expected from its two new coal-fired power plants, Medupi and Kusile.²¹¹

Outside of Southern Africa, the expansion of coal-fired power in the rest of the region may be restrained because it would require significant coal imports, raising concerns about the balance-of-payments, energy security and price volatility. Aggregate imports of coal in 47 sub-Saharan Africa countries more than tripled between 1998 and 2008.

Expanding power-sector financing and investment

While real investment in sub-Saharan Africa's energy sector has doubled, from around US\$30 billion a year in the early 2000s to around US\$60 billion a decade later, the bulk of this went into the oil sector. Investment in power generation was only US\$8 billion per year, or 0.5% of GDP, much less than the 1.3% invested in this sector in developing countries overall.

Meeting ambitious power-sector goals will require a vast scaling up of the levels of financing and investment in the sub-Saharan Africa power sector, drawing on domestic and foreign resource mobilisation, from public and private sources. The IEA's New Policies Scenario envisions investments of US\$45 billion per year till 2040 in sub-Saharan Africa's power generation, transmission and distribution systems. The more ambitious Africa Century Case looks to boost that to a little over US\$60 billion per year.

Many of the hurdles to ambitious power-sector investment are general to infrastructure financing rather than specific to energy or clean energy. Low

levels of installed capacity in sub-Saharan Africa reflect the generally poor business environment for public and private investment, regardless of source and the sector being invested in. Public utilities have weak revenue bases to finance expanded supply, distribution and connection. Despite some notable exceptions, electricity sectors in most countries are insufficiently open or well-regulated to facilitate large amounts of private investment. Even in countries that have opened the sector to private generation, macroeconomic and political instability makes foreign direct investment challenging in all but high-yield sectors such as natural resources. The tide is shifting in some notable cases, but region-wide transformation will require much broader underlying changes in both electricity-sector governance and in the overall business environment.

Utility reform: the heart of any high-ambition power scenario in sub-Saharan Africa

Electricity sectors in most sub-Saharan Africa countries remain vertically integrated, with generation, transmission and distribution owned and operated by state-owned utilities. In most cases these utilities suffer from poor management, lack of technical and institutional capacity, lack of competition, weak regulation, high costs, serious transmission and distribution losses, and poor financial results. Poor power-sector performance generates hidden ("quasi-fiscal") costs to sub-Saharan African government budgets of 1.8% of GDP, on average, and for some up to 4%.²¹² A quarter of all generation capacity is inoperable.²¹³ These limitations make it difficult for utilities to plan and execute expansion of generation, transmission and distribution.

For these reasons, utility reform is at the heart of any high-ambition power scenario. At its most basic, this requires better linking planning, procurement and contracting.²¹⁴ Power project development needs to reflect actual demands, rather than other political objectives. Sector planning and contracting must be aligned with tariff reform to ensure that utilities are able to meet long-run marginal costs. Around half of the fiscal losses cited above arise from under-pricing of services.²¹⁵ A combination of politically expedient tariff-setting, and the low incomes of many electricity consumers makes it challenging for vertically integrated utilities to plan and finance new power projects and expansion. Rarely do commercial, industrial or residential users in sub-Saharan Africa pay the full cost of electricity. While subsidies are often justified

in terms of poverty alleviation, they mostly accrue to wealthier households, and by definition favour those with electricity connections over those with none. Tariff reform is thus important to increase efficiency and promote investment in the power sector.²¹⁶

Continued sector ‘unbundling’

Opening generation markets to private independent power producers (IPPs) on fair, market terms will be critical to scaling up power-sector investment. Efforts to open sub-Saharan Africa to private electricity generation date back to the 1990s, when the first wave of concerted deregulation took place globally. As elsewhere, the process was only partially completed, and this has been the slowest region to implement reforms. Nonetheless, South Africa, Nigeria, Kenya, Uganda, and Ghana have taken important steps to unbundle generation from transmission and distribution in recent years, opening the door for IPPs.²¹⁷

Beyond enacting legislation to permit IPPs, what are needed are credible policy packages that enable competitive open markets for private investment in generation. Early IPP frameworks allowed for commercialisation of the sector through management contracting by state utilities, but failed to open the market to competitive tenders. This makes it difficult to manage project financing risks and to make deals “bankable”. Partial policy frameworks fail to bring about viable markets.

Facilitating renewables investment

In addition to the broader electricity sector reforms outlined above, there are some specific steps that can be taken to facilitate renewable energy investments.

First, there is a need to target renewables. A 2012 UNEP survey found that investors saw government target-setting as the most significant intervention to spur investment.²¹⁸ Some 41 countries in sub-Saharan Africa now have some form of renewable energy target, up from eight in 2012.²¹⁹ More credible targets and complimentary enabling policies are needed.

Second, IPP frameworks need to be suitable for small as well as large generators. Early IPP policies tended to favour procurement of large, centralised facilities, and were mainly focused on thermal generation. These frameworks effectively precluded the entry of smaller IPPs and, therefore, a large part of a fledgling renewables market. South Africa’s REIPP and Uganda’s GET FIT programmes are notable exceptions, and were able to mobilise high levels of investment on small renewables transactions. South Africa and Uganda now have the highest number of IPPs in the region.

Third, power-sector reforms will need to take account of advances in low-carbon innovation. Off-grid renewables and energy efficiency can change the structure of electricity demand, jeopardising conventional utility revenue models. Market pricing for wholesale electricity on the basis of short-run marginal costs, an important part of sector liberalisation, can stumble when the short-run marginal cost of renewable electricity generation is near zero. Developed-country economies are now reviewing how they manage their own power sectors in light of changing technologies.

A fourth, crucial issue is how to ensure the “bankability” of a project. If the policy environment is reasonable for independent power production, transaction bankability comes down to the adequacy of debt and equity arrangements, including any credit enhancement and security arrangements made available. Many sub-Saharan countries lack robust domestic financial sectors, so financing can be challenging, and transactions will often require credit enhancement mechanisms from government, bilaterals or multilaterals. The success of Uganda’s GET-FIT, for instance, depended on substantial support from bilaterals. South Africa’s more mature financial sector has enabled it to attract extensive private-sector finance for the REIPPP programme.²²⁰

Appendix Table 1

Sub-Saharan Africa country classification

| | Low-income | Lower-middle-income | Upper-middle-income |
|--|--|--|--------------------------------------|
| Resource-rich | Central African Republic Chad Congo, Dem. Rep. Guinea Liberia Madagascar Mali Mozambique Niger Sierra Leone Tanzania Togo Uganda | Cameroon Congo, Rep. Côte d'Ivoire Ghana Mauritania Nigeria Sao Tome and Principe Sudan Zambia | Angola Botswana Gabon |
| Voice and accountability | Burkina Faso Burundi Ethiopia Malawi Rwanda South Sudan Zimbabwe | Lesotho Swaziland Uganda | |
| Social and human development policies | Benin Comoros Eritrea Gambia Guinea-Bissau Somalia | Cabo Verde Kenya Senegal | Mauritius Namibia South Africa |

Notes: 1. Each year on July 1, the World Bank revises analytical classification of the world's economies based on estimates of gross national income (GNI) per capita for the previous year. The updated GNI per capita estimates are also used as input to the World Bank's operational classification of economies that determines lending eligibility. As of 1 July 2015, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of US\$1,045 or less in 2014; middle-income economies are those with a GNI per capita of more than US\$1,045 but less than US\$12,736; high-income economies are those with a GNI per capita of US\$12,736 or more. Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of US\$4,125. (Source: World Bank, 2015. New Country Classifications.)

2. "Resource-rich countries" here refers to countries whose exhaustible natural resources (e.g., oil, gas and minerals) comprised at least 20 percent of total exports or 20 percent of government revenues, based on a 2006–10 average. (Source: IMF, 2012. Macroeconomic Policy Frameworks For Resource-Rich Developing Countries.)

ENDNOTES

¹ All GDP data are from the World Bank's World Development Indicators database, available at <http://databank.worldbank.org>.

² Using the World Bank's new benchmark of US\$1.90 per day in 2011 international purchasing power parity dollars.

³ The discussion in this and the next three paragraphs draw on: Beegle, K., Christiaensen, L., Dabalen, A. and Gaddis, I., 2016. *Poverty in a Rising Africa*. Africa Poverty Report. The World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/22575>.

The depth of poverty captures the shortfall in consumption among the poor as a share of the poverty line. Severity of poverty adds more weight to the consumption shortfall among the poorest of the poor and thus captures inequality among the poor.

⁴ UNDP, 2015. *Human Development Report 2015: Work for Human Development*. United Nations Development Programme, New York. Available at: <http://hdr.undp.org/en/2015-report>.

⁵ Fosu, A.K., 2011. *Growth, Inequality, and Poverty Reduction in Developing Countries: Recent Global Evidence*. WIDER Working Paper 2011/001. United Nations University World Institute for Development, Helsinki. Available at: <https://www.wider.unu.edu/publication/growth-inequality-and-poverty-reduction-developing-countries>.

See also: Fosu, A.K., 2014. *Growth, Inequality, and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context*. CSAE Working Paper WPS/2014-17. Center for the Study of African Economies. Oxford. Available at: <http://www.csae.ox.ac.uk/workingpapers/pdfs/csae-wps-2014-17.pdf>.

Page, J., 2015. Structural change and Africa's poverty puzzle. In *The Last Mile in Ending Extreme Poverty*, L. Chandy, H. Kato and H. Kharas (eds.). Brookings Institution Press, Washington, DC. 219–248. Available at: <https://www.brookings.edu/book/the-last-mile-in-ending-extreme-poverty/>.

Christiaensen, L., Chuhan-Pole, P., and Sanoh, A., 2013. *Africa's Growth, Poverty and Inequality Nexus – Fostering Shared Prosperity*. Presented at the Centre for the Study of African Economies (CSAE) Conference 2014: Economic Development in Africa, 23–25 March 2014, St. Catherine's College, University of Oxford, UK. Available at: https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2014&paper_id=381.

⁶ Ravallion, M., 2001. *Growth, Inequality, and Poverty: Looking Beyond Averages*. Policy Research Working Paper No. WPS 2558. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/141211468766471051/Growth-inequality-and-poverty-looking-beyond-averages>.

Page, J., 2015. Structural change and Africa's poverty puzzle.

⁷ Christiaensen et al., 2013. Africa's Growth, Poverty and Inequality Nexus.

Christiaensen, L., Demery, L. and Kuhl, J., 2011. The (evolving) role of agriculture in poverty reduction – an empirical perspective. *Journal of Development Economics*, 96(2). 239–254. DOI:10.1016/j.jdeveco.2010.10.006.

⁸ Loayza, N. V. and Raddatz, C., 2010. The composition of growth matters for poverty alleviation. *Journal of Development Economics*, 93(1). 137–151. DOI:10.1016/j.jdeveco.2009.03.008.

⁹ Christiaensen et al., 2011. The (evolving) role of agriculture in poverty reduction.

¹⁰ Page, 2015. Structural change and Africa's poverty puzzle.

¹¹ Aryeetey, E., Devarajan, S., Kanbur, R., and Kasekende, L., 2012. Overview. In: *The Oxford Companion to the Economics of Africa*. Oxford University Press.

Hostland, D. and Giugale, M. M., 2013. *Africa's Macroeconomic Story*. Policy Research Working Paper No. WPS 6635. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/487751468192550042/Africas-macroeconomic-story>.

Collier, P., 2015. Africa: New opportunities, old impediments. *Economic Affairs*, 35(2). 169–177. DOI:10.1111/ecaf.12119.

Leipziger, D. and Yusuf, S., 2014. *Growth Strategies for Africa in a Changing Global Environment*. The Growth Dialogue. Working Paper No. 4. Available at: <http://www.growthdialogue.org/growth-strategies-africa-changing-global-environment>.

Okonjo-Iweala, N., 2012. *Reforming the Unreformable: Lessons from Nigeria*. MIT Press, Cambridge, MA, US.

¹² Devarajan, S., 2015. Reconciling two views of Africa's economic boom. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.

Bates, R.H. and Block, S., 2015. The political origins of Africa's economic revival. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.

¹³ Collier, P. and Goderis, B., 2008. *Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum*. SSRN Scholarly Paper 1473716. Social Science Research Network. Available at: <http://dx.doi.org/10.2139/ssrn.1473716>.

¹⁴ IMF, 2015. *Regional Economic Outlook: Sub-Saharan Africa. Dealing with the Gathering Clouds*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/sreo1015.htm>.

IMF, 2016. *Regional Economic Outlook: Sub-Saharan Africa. Time for a Policy Reset*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2016/afr/eng/sreo0416.htm>.

¹⁵ See the Worldwide Governance Indicators database at: <http://www.govindicators.org>.

Also see: Kaufman, D. 2015. Evidence-based reflections on natural resource governance and corruption in Africa. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.

¹⁶ IMF, 2015. *Regional Economic Outlook: Sub-Saharan Africa*.

IMF, 2016. *Regional Economic Outlook: Sub-Saharan Africa*.

IMF, 2016. *World Economic Outlook Update July 2016: Uncertainty in the Wake of the U.K. Referendum*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/weo/2016/update/02/>.

¹⁷ Donnan, S. and Leahy, J., 2016. World trade records biggest reversal since crisis. *Financial Times*, 26 February. Available at: <https://www.ft.com/content/9e2533d6-dbd8-11e5-9ba8-3abc1e7247e4>.

Donnan, S., 2016. Global trade: structural shifts. *Financial Times*, 2 March. Available at: <http://www.ft.com/cms/s/0/0e0e6960-da17-11e5-98fd-06d75973fe09.html>.

UBS, 2016. *Extreme Automation and Connectivity: The Global, Regional, and Investment Implications of the Fourth Industrial Revolution*. UBS White Paper for the World Economic Forum Annual Meeting 2016. Available at: https://www.ubs.com/global/en/about_ubs/follow_ubs/highlights/davos-2016.html.

¹⁸ Jones, B. F. and Olken, B. A., 2008. The anatomy of start-stop growth. *Review of Economics and Statistics*, 90(3). 582–587. DOI:10.1162/rest.90.3.582.

Pritchett, L. and Summers, L., 2014. *Asiaphoria Meets Regression to the Mean*. NBER Working Paper 20573. National Bureau of Economic Research, Cambridge, MA. Available at: <http://www.nber.org/papers/w20573>.

¹⁹ See, for example, Berg, A., Ostry, J. D. and Zettelmeyer, J., 2012. What makes growth sustained? *Journal of Development Economics*, 98(2). 149–166. DOI:10.1016/j.jdeveco.2011.08.002.

The authors find that a deterioration in the terms of trade significantly increases the probability that a high growth spell comes to an end. Increases in US interest rates also increase the probability of ending a high-growth spell – an important point given the start of US monetary policy tightening in December 2015.

²⁰ The discussion in this section draws on Lemma, A. 2016. *Economic Transformation in Africa*. A background paper for this report.

For discussion of economic transformation in an African context, see:

African Union, 2013. *Agenda 2063: The Africa We Want*. African Union Commission, Addis Ababa. Available at: <http://www.au.int/en/agenda2063>.

ACET, 2014. *2014 African Transformation Report: Growth with Depth*. African Center for Economic Transformation, Accra. Available at: <http://africanTransformation.org/>.

Dercon, S., Kennedy, D., Clark, A., Lea, N. and Waddell, N., 2014. *Inclusive and Transformational Growth*. Unpublished DFID internal working paper. Page, J., 2012. Can Africa industrialise? *Journal of African Economies*, 21(suppl 2). ii86–ii124. DOI:10.1093/jae/ejr045. See also the Supporting Economic Transformation website maintained by the Overseas Development Institute: <http://set.odi.org>.

Theoretical work to incorporate issues related to economic transformation into the theory of economic growth is reviewed in:

Acemoglu, D., 2009. *Economic Growth*. Princeton University Press, Princeton, NJ, US.

Herrendorf, B., Rogerson, R and Valentinyi, A. 2013. Growth and structural transformation, in *Handbook of Economic Growth*, Vol. 2. P. Aghion, and S. Durlauf (eds.), Elsevier.

Seminal early studies on the theory and empirics of structural change include:

Lewis, W. A., 1954. Economic development with unlimited supplies of labour. *The Manchester School*, 22(2). 139–191. DOI:10.1111/j.1467-9957.1954.tb00021.x.

Kuznets, S. 1966. *Modern Economic Growth*. Yale University Press, New Haven, CT, US.

Chenery, H. B., 1960. Patterns of industrial growth. *The American Economic Review*, 50(4). 624–654.

For recent assessments of empirical trends in economic transformation, see, for example:

De Vries, G., Timmer, M., and de Vries, K. 2013. *Structural Transformation in Africa: Static Gains, Dynamic Losses*. GGDC Research Memorandum No. 136, October 2013. Groningen Growth and Development Centre. Available at: <http://www.ggdc.net/publications/memoabstract2.htm?id=136>.

De Vries, G., Timmer, M., and de Vries, K., 2014. *Patterns of Structural Change in Developing Countries*. GGDC Research Memorandum No. 149, July 2014. Groningen Growth and Development Centre. Available at: <http://www.ggdc.net/publications/memoabstract2.htm?id=149>.

Rodrik, D., 2013. *Structural Change, Fundamentals and Growth: An Overview*. Institute for Advanced Study, Princeton, NJ, US. Available at: https://www.sss.ias.edu/files/pdfs/Rodrik/Research/Structural-Change-Fundamentals-and-Growth-An-Overview_revised.pdf.

Rodrik, D., 2013. *The Past, Present, and Future of Economic Growth*. Global Citizen Foundation Working Paper 1. Global Citizen Foundation, Switzerland. Available at: http://www.gc.fch/?page_id=5758.

Rodrik, D., 2014. *An African Growth Miracle?* Economics Working Papers, No. 102. Institute for Advanced Study, Princeton, NJ, US. Available at: <https://www.sss.ias.edu/files/papers/econpaper102.pdf>.

McMillan, M., Rodrik, D. and Verduzco-Gallo, Í., 2014. Globalization, structural change, and productivity growth, with an update on Africa. *World Development*, 63. 11–32. DOI:10.1016/j.worlddev.2013.10.012.

McMillan, M., and Harttgen, K., 2014. *What is Driving the 'African Growth Miracle'?* AfDB Working Paper Series, No. 209. African Development Bank, Tunis. Available at: <http://www.afdb.org/en/documents/publications/working-paper-series/>.

²¹ This approach follows McMillan, M., Page, J., Booth, D., and te Velde, D.W., forthcoming. *Supporting Economic Transformation: An Approach Paper*. To be available at: <http://set.odi.org>. June 2016 draft provided by authors.

²² Herrendorf et al., 2013. Growth and structural transformation.

²³ Acemoglu, 2009. *Economic Growth*.

Herrendorf et al., 2013. Growth and structural transformation.

²⁴ Herrendorf et al., 2013. Growth and structural transformation.

²⁵ For a summary of this evidence see, for example, Acemoglu, 2009, *Economic Growth*, and Barro, R., and Sala-i-Martin, X., 2003. *Economic Growth*. MIT Press, Cambridge, MA., US.

²⁶ Rodrik, 2013. *The Past, Present, and Future of Economic Growth*.

²⁷ Rodrik, D., 2013. Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1). 165–204. DOI:10.1093/qje/qjs047.

²⁸ Demographic change also made an important contribution to rapid per capita GDP growth, due to a rise in the share of the working age population.

²⁹ Figure 2.3 maps sectoral employment shares against real per capita GDP. In the Korean case this looks similar to sectoral shares over time, because per capita GDP was also rising pretty steadily over time.

³⁰ Rodrik, D. 2015. *Premature Deindustrialization*. NBER Working Paper No. 20935. National Bureau of Economic Research. Available at: <http://www.nber.org/papers/w20935>.

³¹ In an interesting historical comparison, Williamson (2011) argues that the first great wave of globalisation in the 19th century contributed to a widening gap between an industrialising “core” and a deindustrialising “periphery”.

See: Williamson, J., 2011. *Trade and Poverty: When the Third World Fell Behind*. MIT Press, Cambridge, MA, US.

³² Martins, P., 2015. *Sub-regional Perspectives on Structural Change*. Centre for Research in Economic Development and International Trade (CREDIT) Research Paper 15/03, University of Nottingham. Available at: <https://www.nottingham.ac.uk/credit/news/papers/1503.aspx>.

³³ Martins, 2015. *Sub-regional Perspectives on Structural Change*.

³⁴ Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., and Chen, Y. 2013. *Benchmarking structural transformation across the world*. IMF Working Paper 13/176. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=40847.0>.

Rodrik, D., 2008. *Normalizing Industrial Policy*. Commission on Growth and Development Working Paper No. 3. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/524281468326684286/Normalizing-industrial-policy>.

McMillan et al., 2014, Globalization, structural change, and productivity growth. Industrial policy and natural resource management are discussed further in Chapter 5 of this report.

³⁵ Author calculations based on Martins, 2015, *Sub-regional Perspectives on Structural Change*.

³⁶ Martins, 2015. *Sub-regional Perspectives on Structural Change*.

³⁷ McMillan et al., 2014. Globalization, structural change, and productivity growth, with an update on Africa.

³⁸ McMillan and Harttgen, 2014. What is Driving the ‘African Growth Miracle’?

³⁹ McMillan and Harttgen, 2014. What is Driving the ‘African Growth Miracle’?

⁴⁰ See: Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., Simoes, A. and Yildirim, M. A., 2014. *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. Revised edition. The MIT Press, Cambridge, MA.

The project website, which includes a download of the book, is: <http://atlas.cid.harvard.edu>.

⁴¹ Rodrik, 2015. *Premature Deindustrialization*.

⁴² According to the IMF’s definition. See Appendix Table 1 for details.

⁴³ Canning, D., Raja, S. and Yazbeck, A. S., 2015. *Africa’s Demographic Transition: Dividend or Disaster?* Africa Development Forum. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-0489-2>.

Casterline, J. B., 2010. *Determinants and Consequences of High Fertility: A Synopsis of the Evidence - Portfolio Review*. 63069. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/389381468147851589/Determinants-and-consequences-of-high-fertility-a-synopsis-of-the-evidence-portfolio-review>.

Bongaarts, J. and Casterline, J., 2013. Fertility transition: is Sub-Saharan Africa different? *Population and Development Review*, 38. 153–168. DOI:10.1111/j.1728-4457.2013.00557.x.

⁴⁴ Bloom, D. E. and Finlay, J. E., 2009. Demographic change and economic growth in Asia. *Asian Economic Policy Review*, 4(1). 45–64. DOI:10.1111/j.1748-3131.2009.01106.x.

Lee, R. and Mason, A., 2006. What is the demographic dividend? *Finance & Development*, 43(3). 16–17.

IMF, 2015. How can sub-Saharan Africa harness the demographic dividend? In: *Regional Economic Outlook: Sub-Saharan Africa: Dealing with the Gathering Clouds*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/sreo1015.htm>.

Ahmed, S. A., Cruz, M., Go, D. S., Maliszewska, M. and Osorio-Rodarte, I., 2014. *How Significant Is Africa's Demographic Dividend for Its Future Growth and Poverty Reduction?* WPS7134. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/842031468193780495/How-significant-is-Africas-demographic-dividend-for-its-future-growth-and-poverty-reduction>.

45 Canning et al., 2015. Africa's Demographic Transition: Dividend or Disaster?

IMF. 2015. How can sub-Saharan Africa harness the demographic dividend?

46 Rodrik, 2014. An African Growth Miracle?

47 Page, 2012. Can Africa industrialise?

48 Timmer, P. 2010. *A World Without Agriculture? The Historical Paradox of Agricultural Development*. American Enterprise Institute, Washington, DC. Available at: <https://www.aei.org/publication/a-world-without-agriculture/>.

Timmer, P. and Akkus, S., 2008. *The Structural Transformation as a Pathway out of Poverty: Analytics, Empirics and Politics*. Working Paper 150. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/publication/structural-transformation-pathway-out-poverty-analytics-empirics-and-politics-working>.

Gollin, D., Parente, S. L. and Rogerson, R., 2007. The food problem and the evolution of international income levels. *Journal of Monetary Economics*, 54(4). 1230–1255. DOI:10.1016/j.jmoneco.2006.04.002.

49 Rodrik, 2013. Unconditional convergence in manufacturing.

50 The discussion in sections 3.1–3.3 draws on: Zhao, X., 2016. *Climate Variability and Change in Sub-Saharan Africa*. A background paper for this report.

See also: Global Commission on the Economy and Climate, 2014. *Better Growth, Better Climate: The New Climate Economy Report*. The Global Report. Washington, DC. Available at: <http://newclimateeconomy.report>.

51 AMCEN, 2011. *Addressing Climate Change Challenges in Africa; A Practical Guide Towards Sustainable Development*. African Ministerial Conference on Environment. Available at: http://www.unep.org/roa/amcen/docs/publications/guidebook_CLimateChange.pdf.

52 Definitions are reproduced from the Glossary of: IPCC, 2014. *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, R. K. Pachauri, and L. A. Meyer (eds.). Intergovernmental Panel on Climate Change, Geneva. Available at: <http://www.ipcc.ch/report/ar5/syr/>.

53 Peel, M. C., Finlayson, B. L. and McMahon, T. A., 2007. Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences*, 11(5). 1633–1644. DOI:10.5194/hess-11-1633-2007.

54 Conway, G., 2009. *The Science of Climate Change in Africa: Impacts and Adaptation*. Grantham Institute for Climate Change, Imperial College. Available at: https://workspace.imperial.ac.uk/climatechange/public/pdfs/discussion_papers/Grantham_Institutue_-_The_science_of_climate_change_in_Africa.pdf.

55 This discussion draws extensively on:

Niang, I., Ruppel, O. C., Abdrabo, M. A., Essel, A., Lennard, C., Padgham, J. and Urquhart, P., 2014. Africa. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel of Climate Change. V. R. Barros, C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. 1199–1265. Available at: <https://www.ipcc.ch/report/ar5/wg2/>.

56 See the United Nations Development Programme (UNDP) country profiles (various dates), available at: <http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/>

57 Conway, G., 2009. *The Science of Climate Change in Africa*.

58 IPCC, 2014. Summary for Policymakers. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. 1–32. Available at: <https://www.ipcc.ch/report/ar5/wg2/>.

Niang et al., 2014. Africa.

- ⁵⁹ See, for example, this survey: Dell, M., Jones, B. F. and Olken, B. A., 2014. What do we learn from the weather? The new climate-economy literature. *Journal of Economic Literature*, 52(3). 740–798. DOI:10.1257/jel.52.3.740.
- ⁶⁰ Lobell, D. B., Schlenker, W. and Costa-Roberts, J., 2011. Climate trends and global crop production since 1980. *Science*, 333(6042). 616–620. DOI:10.1126/science.1204531. The comparison is to a counter-factual without climate trends.
- ⁶¹ Challinor, A.J., Wheeler, T.R., Osborne, T.M., and Slingo, J.M., 2006. Assessing the vulnerability of crop productivity to climate change thresholds using an integrated crop-climate model. In *Avoiding Dangerous Climate Change*, H. J. Schellnhuber and W. P. Cramer (eds.). Cambridge University Press. 187–194.
- Conway, G., 2009. *The Science of Climate Change in Africa*.
- ⁶² Schlenker, W. and Lobell, D. B., 2010. Robust negative impacts of climate change on African agriculture. *Environmental Research Letters*, 5(1). 14010. DOI:10.1088/1748-9326/5/1/014010.
- Lam, V. W. Y., Cheung, W. W. L., Swartz, W. and Sumaila, U. R., 2012. Climate change impacts on fisheries in West Africa: implications for economic, food and nutritional security. *African Journal of Marine Science*, 34(1). 103–117. DOI:10.2989/1814232X.2012.673294.
- ⁶³ Dell, M., Jones, B. F. and Olken, B. A., 2012. Temperature shocks and economic growth: evidence from the last half century. *American Economic Journal: Macroeconomics*, 4(3). 66–95. DOI:10.1257/mac.4.3.66.
- Dell et al., What do we learn from the weather?
- ⁶⁴ Niang et al., 2014. Africa.
- Dell et al., What do we learn from the weather?
- Chen, H., Githeko, A. K., Zhou, G., Githure, J. I. and Yan, G., 2006. New records of *Anopheles arabiensis* breeding on the Mount Kenya highlands indicate indigenous malaria transmission. *Malaria Journal*, 5. 17. DOI:10.1186/1475-2875-5-17.
- Conway, G., 2009. *The Science of Climate Change in Africa*.
- Kudamatsu, M., Persson, T., and Strömberg, D., 2012. *Weather and Infant Mortality in Africa*. Institute for International Economic Studies, Stockholm University. Available at: http://perseus.iies.su.se/~dstro/Weather_Mortality.pdf.
- ⁶⁵ Wheeler, D., 2011. *Quantifying Vulnerability to Climate Change: Implications for Adaptation Assistance*. Working Paper 240. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/publication/quantifying-vulnerability-climate-change-implications-adaptation-assistance-working>.
- Wheeler, D., 2011. Mapping the impacts of climate change. Web feature. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/page/mapping-impacts-climate-change>.
- ⁶⁶ Hsiang, S. M., Burke, M. and Miguel, E., 2013. Quantifying the influence of climate on human conflict. *Science*, 341(6151). 1235367. DOI:10.1126/science.1235367.
- Dell et al., 2014. What do we learn from the weather?
- ⁶⁷ Tol, R. S. J., 2009. The economic effects of climate change. *Journal of Economic Perspectives*, 23(2). 29–51. DOI:10.1257/jep.23.2.29.
- ⁶⁸ OECD, 2015. *The Economic Consequences of Climate Change*.
- ⁶⁹ OECD, 2015. *The Economic Consequences of Climate Change*. Organisation for Economic Co-operation and Development, Paris. Available at: <http://dx.doi.org/10.1787/9789264235410-en>.
- The report studies the economic impact of climate change in a “business as usual” scenario with no further GHG emission mitigation measures, compared to a scenario without climate change. The atmospheric concentration of CO₂ is expected to rise from 390 ppm in 2010 to 590 ppm in 2060, resulting in a central projection of about 2.5°C global average surface temperature increase by 2060 (with a range of 1.6–3.6°C), and one of 4°C by 2100 (with a range of 2.4–5.5°C).
- ⁷⁰ IPCC, 2013. Summary for Policymakers. In *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. T. F. Stocker, D. Qin, G.-K. Plattner, M. M. B. Tignor, S. K. Allen, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. Available at: <https://www.ipcc.ch/report/ar5/wg1/>.

⁷¹ Wagner, G., and Weitzman, M.L., 2015. *Climate Shock: The Economic Consequences of a Hotter Planet*. Princeton University Press, Princeton, NJ, US. Available at: <http://press.princeton.edu/titles/10414.html>.

⁷² Hallegatte et al. (2014; 2016). Hallegatte et al. (2016) give a numerical example based on Andhra Pradesh in India: every year some 14% of households come out of poverty while 12% fall into poverty, giving a net 2% reduction in poverty. A climate shock that reduces gross outflows by 1 percentage point and increases gross inflows by 1 percentage point would reduce net poverty reduction to zero. See:

Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Narloch, U., Rozenberg, J. and Vogt-Schilb, A., 2014. *Climate Change and Poverty – an Analytical Framework*. WPS7126. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/275231468331203291/Climate-change-and-poverty-an-analytical-framework>.

Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg, J., Treguer, D. and Vogt-Schilb, A., 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Climate Change and Development. The World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/22787>.

⁷³ Hill, R., and Mejia-Mantilla, C., 2015. *Welfare and Shocks in Uganda*. Background Paper prepared for the Uganda Poverty Assessment. The World Bank, Washington, DC.

⁷⁴ Hertel, T. W., Burke, M. B. and Lobell, D. B., 2010. The poverty implications of climate-induced crop yield changes by 2030. *Global Environmental Change*, 20(4). 577–585. DOI:10.1016/j.gloenvcha.2010.07.001.

⁷⁵ Dercon, S., 2004. Growth and shocks: evidence from rural Ethiopia. *Journal of Development Economics*, 74(2). 309–329.

Hallegatte et al., 2016. *Shock Waves*.

⁷⁶ Dercon, S. and Porter, C., 2014. Live aid revisited: long-term impacts of the 1984 Ethiopian famine on children. *Journal of the European Economic Association*, 12(4). 927–948. DOI:10.1111/jeea.12088.

Hallegatte et al., 2014. *Climate Change and Poverty*.

⁷⁷ Dercon, S. and Christiaensen, L., 2011. Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia. *Journal of Development Economics*, 96(2). 159–173.

⁷⁸ All data in this discussion of GHG emissions is from the World Resources Institute's CAIT Climate Data Explorer, <http://cait2.wri.org>. Data related to agriculture and land use change and forestry are from the UN Food and Agriculture Organization's FAOSTAT Emissions Database, <http://faostat.fao.org/site/705/default.aspx>.

⁷⁹ UNECA, 2016. *Greening Africa's Industrialization: Economic Report on Africa 2016*. United Nations Economic Commission on Africa, Addis Ababa. Available at: <http://www.uneca.org/publications/economic-report-africa-2016>.

Dercon (2014) emphasizes trade-offs in the nature of green growth that may reduce the effectiveness of growth in reducing poverty. See: Dercon, S. 2014. Is green growth good for the poor? *The World Bank Research Observer*, Vol.29 No. 2. (August).

⁸⁰ Global Commission on the Economy and Climate, 2015. *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. The Global Report. Washington, DC. Available at: <http://newclimateeconomy.report>.

⁸¹ Barr, R., Fankhauser, S. and Hamilton, K., 2010. Adaptation investments: a resource allocation framework. *Mitigation and Adaptation Strategies for Global Change*, 15(8). 843–858. DOI:10.1007/s11027-010-9242-1.

⁸² Fankhauser and McDermott (2014) have made perhaps the most systematic recent effort to specifically identify adaptive effort and its determinants, using information on damages from floods and cyclones in 200 countries in the period 1980–2008. After controlling for the intensity of climate shocks and sensitivity or exposure to climate shocks, they find per capita income to have a large, significant positive effect on adaptive effort. Wheeler (2011) also finds per capita GDP to have a strong significant effect in reducing the risk of being affected by an extreme weather event, although it is not clear whether this identifies the impact on adaptive capacity specifically or on vulnerability more generally. See:

Fankhauser, S. and McDermott, T. K. J., 2014. Understanding the adaptation deficit: Why are poor countries more vulnerable to climate events than rich countries? *Global Environmental Change*, 27. 9–18. DOI:10.1016/j.gloenvcha.2014.04.014.

Wheeler, 2011. *Quantifying Vulnerability to Climate Change*

⁸³ Bowen, A., Cochrane, S. and Fankhauser, S., 2011. Climate change, adaptation and economic growth. *Climatic Change*, 113(2). 95–106. DOI:10.1007/s10584-011-0346-8.

⁸⁴ Hallegatte et al., 2016. *Shock Waves*

- ⁸⁵ Collier, P., Conway, G. and Venables, T., 2008. Climate change and Africa. *Oxford Review of Economic Policy*, 24(2). 337–353. DOI:10.1093/oxrep/grn019.
- ⁸⁶ The nature and scope of such opportunities for policy actions that generate both economic development and emission reduction benefits is discussed at length in the Global Commission's flagship report:
Global Commission on the Economy and Climate, 2014. *Better Growth, Better Climate: The New Climate Economy Report*. The Global Report. Washington, DC. Available at: <http://newclimateeconomy.report>.
- ⁸⁷ Rydge, J., Jacobs, M. and Granoff, I., 2015. *Ensuring New Infrastructure is Climate-Smart*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Bhattacharya, A., Oppenheim, J., & Stern, N. (2015). Driving sustainable development through better infrastructure: Key elements of a transformation program. *Brookings Global Working Paper Series*.
- ⁸⁸ This information is drawn from the UNFCCC website (http://unfccc.int/focus/indc_portal/items/8766.php), Climate Action Tracker (<http://climateactiontracker.org>), and the Paris Contribution Map on the World Resources Institute CAIT Climate Data Explorer (<http://cait.wri.org/indc/>).
- ⁸⁹ See: <http://agenda2063.au.int/en/about>.
- ⁹⁰ African Union, 2014. *Common African Position on the Post-2015 Development Agenda*. Addis Ababa. Available at: <https://sustainabledevelopment.un.org/content/documents/1329africaposition.pdf>.
- A detailed overview of the SDGs is available at: <http://www.undp.org/content/undp/en/home/sdgooverview/post-2015-development-agenda.html>.
- ⁹¹ Data from the World Bank World Development Indicators, available at <http://databank.worldbank.org>.
- ⁹² The Economist, 2016. Coming up roses. 16 April. Available at: <http://www.economist.com/news/special-report/21696791-kenyas-flower-export-business-rare-success-coming-up-roses>.
- See also: Hogarth, R., Haywood, C., and Whitley, S., 2015. *Low-Carbon Development in Sub-Saharan Africa: 20 Cross-Sector Transitions*. Overseas Development Institute and German Development Institute (DIE). Available at: <https://www.odi.org/publications/9523-low-carbon-development-sub-saharan-africa-20-cross-sector-transitions>.
- ⁹³ African Union. 2012. *CAADP – Sustaining the Momentum into the Next Decade*. Implementation Report, July 2012. NEPAD Planning and Coordinating Agency. New Partnership for Africa's Development, Johannesburg. Available at: http://www.nepad-caadp.net/sites/default/files/Sustaining_CAADP_Momentum_Implementation_Report_July_2012_0.pdf.
- African Union. 2016. *The CAADP Results Framework 2015–2025*. NEPAD Planning and Coordinating Agency. New Partnership for Africa's Development, Johannesburg. Available at: <http://www.nepad-caadp.net/content/caadp-results-framework-2015-2025-english-0>.
- ⁹⁴ Badiane, O., and Makombe, T., 2014. *The Theory and Practice of Agriculture, Growth, and Development in Africa*. UNU-WIDER Working Paper 61/2014. United Nations University World Institute for Development Economics Research, Helsinki. Available at: <https://www.wider.unu.edu/publication/theory-and-practice-agriculture-growth-and-development-africa>.
- McArthur, J.W., 2015. Taking stock of Africa's Green (Shoot) Revolution. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- The Economist, 2016. A green evolution. 12 March. Available at: <http://www.economist.com/news/briefing/21694521-farms-africa-are-prospering-last-thanks-persistence-technology-and-decent>.
- ⁹⁵ Anderson, K. and Brückner, M., 2012. *Distortions to Agriculture and Economic Growth in Sub-Saharan Africa*. Policy Research Working Papers. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/1813-9450-6206>.
- ⁹⁶ Africa Progress Panel, 2015. *Power, People, Planet: Seizing Africa's Energy and Climate Opportunities*. Africa Progress Report 2015. Geneva. Available at: <http://www.africaprogresspanel.org/publications/policy-papers/2015-africa-progress-report/>.
- ⁹⁷ Mayaux, P., Pekel, J.-F., Desclée, B., Donnay, F., Lupi, A., et al., 2013. State and evolution of the African rainforests between 1990 and 2010. *Philosophical Transactions of the Royal Society B*, 368(1625). 20120300. DOI:10.1098/rstb.2012.0300.

- ⁹⁸ Hogarth et al., 2015. Low-Carbon Development in Sub-Saharan Africa.
 Mayaux et al., 2013. State and evolution of the African rainforests between 1990 and 2010.
- Petersen, R., Sizer, N., Hansen, M., Potapov, P., and Thau, D., 2015. Satellites discover 5 surprising hotspots for tree cover loss. WRI Insights Blog, 2 September. World Resources Institute, Washington, DC. Available at: <http://www.wri.org/blog/2015/09/satellites-uncover-5-surprising-hotspots-tree-cover-loss>.
- The Economist, 2014. Palm oil in West Africa: Grow but cherish your environment. 16 August. Available at: <http://www.economist.com/news/middle-east-and-africa/21612241-companies-wanting-make-palm-oil-face-angry-environmentalists-grow-cherish>.
- ⁹⁹ Mayaux et al., 2013. State and evolution of the African rainforests between 1990 and 2010.
- ¹⁰⁰ Petersen et al., 2015. Satellites discover 5 surprising hotspots for tree cover loss.
- ¹⁰¹ Cervigni, R. and Morris, M., 2016. Confronting Drought in *Africa's Drylands: Opportunities for Enhancing Resilience*. Africa Development Forum. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/978-1-4648-0817-3>.
- ¹⁰² Hogarth et al., 2015. Low-Carbon Development in Sub-Saharan Africa.
- ¹⁰³ See, for example:
- Johnston, B. F. and Mellor, J. W., 1961. The role of agriculture in economic development. *The American Economic Review*, 51(4). 566–593.
- The World Bank, 2007. *World Development Report 2008: Agriculture for Development*. Washington, DC. Available at: <http://hdl.handle.net/10986/5990>.
- Timmer, P. 2002. Agriculture and economic development. In: *Handbook of Agricultural Economics*, B. Gardner and G. Rausser (eds.). Elsevier Science, Amsterdam.
- Timmer. 2010. A World Without Agriculture?
- ¹⁰⁴ See, for example, Naughton (2006) on the role of agriculture in China's reforms. However, Dercon and Gollin (2014) caution against assuming that all successful countries must necessarily pass through a phase of rapid agricultural growth as the engine for overall economic growth. They also point to the methodological and empirical challenges that attend efforts to develop evidence for a "grand development narrative" about agriculture.
- Naughton, B., 2006. *The Chinese Economy: Transitions and Growth*. MIT Press, Cambridge, MA, US. Available at: <https://mitpress.mit.edu/books/chinese-economy>.
- Dercon, S., and Gollin, D., 2014. *Agriculture in African Development: A Review of Theories and Strategies*. CSAE Working Paper WPS/2014-22. Center for the Study of African Economies, Oxford, UK. Available at: <http://www.csae.ox.ac.uk/workingpapers/pdfs/csae-wps-2014-22.pdf>.
- ¹⁰⁵ Haggblade, S., Hazell, P., Dorosh, P., 2007. Sectoral growth linkages between agriculture and the rural nonfarm economy. In: *Transforming the Rural Nonfarm Economy – Opportunities and Threats in the Developing World*. S. Haggblade, P. Hazell, and T. Reardon (eds.). Johns Hopkins University Press, Baltimore, US.
- ¹⁰⁶ Christiaensen et al., 2011. The (evolving) role of agriculture in poverty reduction.
- ¹⁰⁷ McMillan and Harttgen, 2014. What is Driving the 'African Growth Miracle'?
- ¹⁰⁸ Mellor, J., 2003. *Faster, More Equitable Growth – The Relation between Growth in Agriculture and Poverty Reduction*. Agricultural Policy Development Project Research Report No.4, prepared by Abt Associates for the US Agency for International Development.
- Datt, G. and Ravallion, M., 1998. Why have some Indian states done better than others at reducing rural poverty? *Economica*, 65(257). 17–38. DOI:10.1111/1468-0335.00112.
- Christiaensen et al., 2011. The (evolving) role of agriculture in poverty reduction.
- ¹⁰⁹ Collier, P., and Dercon, S., 2009. *African Agriculture in 50 Years: Smallholders in a Rapidly Changing World?* Prepared for UN Food and Agriculture Organization Expert Meeting on How to Feed the World in 50 Years. Available at: <http://www.fao.org/3/a-ak983e.pdf>.
- Dercon and Gollin, 2014. Agriculture in African Development.

- ¹¹⁰ FAO, 2010. "Climate-Smart" Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Food and Agriculture Organization of the United Nations, Rome. Available at: <http://www.fao.org/docrep/013/i1881e/i1881e00.htm>.
- UNECA, 2016. Greening Africa's Industrialization.
- ¹¹¹ Hogarth et al., 2015. Low-Carbon Development in Sub-Saharan Africa.
- Global Commission on the Economy and Climate, 2014. *Better Growth, Better Climate*.
- ¹¹² Delgado, C., Wolosin, M. and Purvis, N., 2015. *Restoring and Protecting Agricultural and Forest Landscapes and Increasing Agricultural Productivity*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Cervigni and Morris, 2016. Confronting Drought in Africa's Drylands.
- Lovo, S., Bezabih, M., and Singer, G., 2015. *Green Agricultural Policies and Poverty Reduction*. Policy brief. Grantham Research Institute on Climate Change and the Environment and Global Green Growth Institute. Available at: <http://gggi.org/15370/>.
- ¹¹³ These Flagship Programmes include the Agriculture Climate Change Programme, Gender Agriculture Climate Change, the Climate Smart Agriculture Alliance and the NEPAD Climate Change Fund. See: <http://www.nepad-caadp.net/flagship-programmes#programmes-97>.
- ¹¹⁴ This box is drawn from Global Commission on the Economy and the Climate, 2014, *Better Growth, Better Climate*.
- ¹¹⁵ Winterbottom, R., Reij, C., Garrity, D., Glover, J., Hellums, D., McGahuey, M. and Scherr, S., 2013. *Improving Land and Water Management*. Creating a Sustainable Food Future, Installment Four. World Resources Institute, Washington, DC. Available at: <http://www.wri.org/publication/improving-land-and-water-management>.
- ¹¹⁶ Hogarth et al., 2015. Low-Carbon Development in Sub-Saharan Africa.
- Delgado et al., 2015. Restoring and Protecting Agricultural and Forest Landscapes and Increasing Agricultural Productivity.
- ¹¹⁷ The information in this box is drawn from:
- The World Bank, 2015. Showcasing the link between forests and climate change: three examples of REDD+ in Africa. Web feature. Available at: <http://www.worldbank.org/en/news/feature/2015/12/04/showcasing-the-link-between-forests-and-climate-change-three-examples-of-redd-in-africa>.
- And: Hogarth et al., 2015. Low-Carbon Development in Sub-Saharan Africa.
- ¹¹⁸ World Resources Institute, 2015. African countries launch AFR100 to restore 100 million hectares of land. Press release, 5 December. Available at: <http://www.wri.org/news/2015/12/release-african-countries-launch-afr100-restore-100-million-hectares-land>.
- ¹¹⁹ Page, J., 2012. Can Africa industrialise?
- ¹²⁰ Ansu, Y., McMillan, M., Page, J., and te Velde, D.W., 2016. *Promoting Manufacturing in Africa*. Paper for the African Transformation Forum 2016. Kigali, Rwanda.
- ¹²¹ Harrison, A.E., Lin, J., and Xu, L.C., 2013. *Explaining Africa's (Dis)Advantage*. World Bank Policy Research Working Paper No. 6316. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/800821468192849217/Explaining-Africas-Dis-advantage>.
- ¹²² Other studies which document or discuss the impact of weaknesses in infrastructure, access to finance, skills and the business environment on sub-Saharan Africa firm performance include:
- Ansu et al., 2016. *Promoting Manufacturing in Africa*.
- Balchin, N., Gelb, S., Kennan, J., Martin, H. and te Velde, D.W., 2016. *Developing Export-Based Manufacturing in Sub-Saharan Africa*. Draft report, 18 February.
- Newman, C., Page, J., Rand, J., Shimeles, A., and Soderbom, M., 2016. *Made in Africa: Learning to Compete*. Brookings Institution Press, Washington, DC.
- ACET, 2014. 2014 African Transformation Report.
- AfDB, OECD, UNDP and UNECA, 2013. *African Economic Outlook 2013: Structural Transformation and Natural Resources*. African Development Bank, Development Centre of the Organisation for Economic Co-operation and Development,

United Nations Development Programme, and United Nations Economic Commission for Africa. Available at: <http://dx.doi.org/10.1787/aeo-2013-en>.

Dinh, H. T. and Clarke, G. R. G., 2012. *Performance of Manufacturing Firms in Africa*. Directions in Development. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-9632-2>.

Escribano, A., Guasch, J. L. and Pena, J., 2010. Assessing the Impact of Infrastructure Quality on Firm Productivity in Africa: Cross-Country Comparisons Based on Investment Climate Surveys from 1999 to 2005. WPS5191. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/792371467990385370/Assessing-the-impact-of-infrastructure-quality-on-firm-productivity-in-Africa-cross-country-comparisons-based-on-investment-climate-surveys-from-1999-to-2005>.

Foster, V. and Briceno-Garmendia, C. M., 2009. *Africa's Infrastructure: A Time for Transformation*. Africa Development Forum, 52102. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/246961468003355256/Africas-infrastructure-a-time-for-transformation>.

Ramachandran, V., Gelb, A., and Kedia Shah, M., 2009. *Africa's Private Sector: What's Wrong with the Business Environment and What to Do About It*. Center for Global Development. Available at: <http://www.cgdev.org/publication/9781933286280-africas-private-sector-whats-wrong-business-environment-and-what-do-about-it>.

Yoshino, Y., 2008. *Domestic Constraints, Firm Characteristics, and Geographical Diversification of Firm-Level Manufacturing Exports in Africa*. Policy Research Working Paper; No. WPS 4575. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/115861468212383773/Domestic-constraints-firm-characteristics-and-geographical-diversification-of-firm-level-manufacturing-exports-in-Africa>.

¹²³ In technical terms, the subjective perceptions of firms as to obstacles are endogenous variables.

¹²⁴ See, e.g., Harrison et al., 2013. *Explaining Africa's (Dis)Advantage*.

¹²⁵ On the impact of electricity insecurity on firm performance, see also:

Scott, A., Darko, E., Lemma, A., and Rud, J., 2014. *How Does Electricity Insecurity Affect Businesses in Low and Middle Income Countries?* Overseas Development Institute, London. Available at: <https://www.odi.org/publications/9184-electricity-energy-security-sme-economic-growth>.

¹²⁶ McMillan et al., forthcoming, *Supporting Economic Transformation*, provides a useful 2x2 framework to classify relevant policies. They distinguish, first, between, on the one hand, broad (non-selective) economy wide policies, and, on the other, selective, sector-focused policies. Second, they distinguish between policies that mostly support productivity-enhancing structural change and those that support within-sector productivity growth.

¹²⁷ Dinh and Clarke, 2012. *Performance of Manufacturing Firms in Africa*.

¹²⁸ Dinh and Clarke, 2012. *Performance of Manufacturing Firms in Africa*.

¹²⁹ Syverson, C., 2004. Product substitutability and productivity dispersion. *Review of Economics and Statistics*, 86(2). 534–550. DOI:10.1162/003465304323031094.

¹³⁰ Hsieh, C.-T. and Klenow, P. J., 2009. Misallocation and manufacturing TFP in China and India. *The Quarterly Journal of Economics*, 124(4). 1403–1448. DOI:10.1162/qjec.2009.124.4.1403.

¹³¹ See also:

Bartelsman, E., Haltiwanger, J. and Scarpetta, S., 2013. Cross-country differences in productivity: the role of allocation and selection. *American Economic Review*, 103(1). 305–334. DOI:10.1257/aer.103.1.305.

Syverson, C., 2011. What determines productivity? *Journal of Economic Literature*, 49(2). 326–365. DOI:10.1257/jel.49.2.326.

Foster, L., Haltiwanger, J. and Syverson, C., 2008. Reallocation, firm turnover, and efficiency: selection on productivity or profitability? *American Economic Review*, 98(1). 394–425. DOI:10.1257/aer.98.1.394.

¹³² Differences in TFP refer to differences in output for a combined bundle of labour, capital and other inputs. Labour productivity, on the other hand, can differ because firms use more or less capital per worker.

¹³³ Ansu et al., 2016. *Promoting Manufacturing in Africa*.

134 Newman et al., 2016. Made in Africa: Learning to Compete.

135 Lemma, A., forthcoming. Productivity and Economic Transformation: Policies, Donor Activities and the Role of Kaizen. Overseas Development Institute, London.

136 Gelb, A., Meyer, C.J., and Ramachandran, V., 2014. *Development as Diffusion: Manufacturing Productivity and Sub-Saharan Africa's Missing Middle*. WIDER Working Paper 42/2014. Available at: <https://www.wider.unu.edu/publication/development-diffusion>.

Studies published by the International Growth Centre to create Enterprise Maps for a number of sub-Saharan African countries also highlight the dominant role a few firms in every sector. See:

Sutton, J., and Kellow, N., 2010. *An Enterprise Map of Ethiopia*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.

Sutton, J., and Kpentey, B., 2012. *An Enterprise Map of Ghana*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.

Sutton, J., and Olomi, D., 2012. *An Enterprise Map of Tanzania*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.

Sutton, J., and Langmead, G., 2013. *An Enterprise Map of Zambia*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.

137 Foster, L., Haltiwanger, J., and Krizan, C.J., 2001. Aggregate productivity growth: Lessons from microeconomic evidence. In: *New Developments in Productivity Analysis*, C. R. Hulten, E. R. Dean and M. J. Harper (eds.). National Bureau of Economic Research and University of Chicago Press.

Ansu et al., 2016. Promoting Manufacturing in Africa.

Gelb et al., 2014. Development as Diffusion.

138 Ajakaiye, O. and Page, J., 2012. Industrialisation and economic transformation in Africa: introduction and overview. *Journal of African Economies*, 21(suppl 2). ii3-ii18. DOI:10.1093/jae/ejr049.

Altenburg, T. 2011. *Industrial Policy in Developing Countries: Overview and Lessons from Seven Country Cases*. Discussion Paper 4/2011. German Development Institute (DIE). Available at: <https://www.die-gdi.de/en/discussion-paper/article/industrial-policy-in-developing-countries-overview-and-lessons-from-seven-country-cases/>.

Harrison, A. and Rodriguez-Clare, A., 2010. Trade, foreign investment, and industrial policy for developing countries. In: *Handbook of Development Economics*, Vol. 5, D. Rodrik and M. Rosenzweig (eds.). Elsevier.

Rodrik, D., 2009. Industrial policy: don't ask why, ask how. *Middle East Development Journal*, 01(01). 1–29. DOI:10.1142/S1793812009000024.

Rodrik, 2008. Normalizing Industrial Policy.

139 UNIDO, 2009. *Industrial Development Report 2009*. United Nations Industrial Development Organization, Geneva.

140 Page, 2012. Can Africa industrialise?

Rodrik, D., 2008. *The Real Exchange Rate and Economic Growth*. Brookings Papers on Economic Activity, No. 2/2008. Brookings Institution, Washington, DC. Available at: <https://www.brookings.edu/bpea-articles/the-real-exchange-rate-and-economic-growth/>.

141 Farole, T., 2011. *Special Economic Zones in Africa: Comparing Performance and Learning from Global Experience*. 60059. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/996871468008466349/Special-economic-zones-in-Africa-comparing-performance-and-learning-from-global-experience>.

Ansu et al., 2016. Promoting Manufacturing in Africa.

Page, 2012. Can Africa industrialise?

UNIDO, 2009. Industrial Development Report 2009.

142 Altenburg, T. and Melia, E., 2014. Kick-starting industrial transformation in sub-Saharan Africa. In: *Transforming Economies – Making industrial policy work for growth, jobs and development*. J.M. Salazar-Xirinachs, I. Nübler and R. Kozul-

Wright (eds.). International Labour Organization, Geneva.

Aryeetey, E. and Moyo, N., 2012. Industrialisation for structural transformation in Africa: appropriate roles for the state. *Journal of African Economies*, 21(suppl 2). ii55-ii85. DOI:10.1093/jae/ejr043.

Altenburg, 2011. Industrial Policy in Developing Countries.

Rodrik, 2008. Normalizing Industrial Policy.

Rodrik, 2008. The Real Exchange Rate and Economic Growth.

¹⁴³ The definition of resource rich follows IMF (2012), being a country whose exhaustible resources comprised at least 20% of exports or 20% of government revenues, based on a 2006-10 average. See Appendix Table 1.

¹⁴⁴ Elhiraika, A. and Sloan, J.R. 2015. Can Africa move from resource dependence to structural transformation? In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.

Gelb, A., Kaiser, K., and Vinuela, L., 2012. *How Much Does Natural Resource Extraction Really Diminish National Wealth? The Implications of Discovery. Working Paper 290.* Center for Global Development. Available at: <http://www.cgdev.org/publication/how-much-does-natural-resource-extraction-really-diminish-national-wealth-implications>.

¹⁴⁵ Klevnäs, P., Stern, N., and Frejova, J. *Oil Prices and the New Climate Economy.* Global Commission on the Economy and Climate briefing paper. Available at: <http://newclimateeconomy.report/workingpapers/>.

¹⁴⁶ Collier, P. and Goderis, B., 2012. Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6). 1241–1260. DOI:10.1016/j.euroecorev.2012.04.002.

Collier and Goderis, 2008. Commodity Prices, Growth, and the Natural Resource Curse.

¹⁴⁷ Mehlum, H., Moene, K. and Torvik, R., 2006. Institutions and the resource curse. *The Economic Journal*, 116(508). 1–20. DOI:10.1111/j.1468-0297.2006.01045.x.

Robinson, J. A., Torvik, R. and Verdier, T., 2006. Political foundations of the resource curse. *Journal of Development Economics*, 79(2). 447–468. DOI:10.1016/j.jdeveco.2006.01.008.

¹⁴⁸ Brahmabhatt, M. and Canuto, O., 2010. *Natural Resources and Development Strategy After the Crisis.* 53164. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/262471468313835336/Natural-resources-and-development-strategy-after-the-crisis>.

Brahmbhatt, M., Canuto, O. and Vostroknutova, E., 2010. *Dealing with Dutch Disease.* 54867. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/794871468161957086/Dealing-with-Dutch-disease>.

Corden, W. M. and Neary, J. P., 1982. Booming sector and de-industrialisation in a small open economy. *The Economic Journal*, 92(368). 825–848. DOI:10.2307/2232670.

¹⁴⁹ Barma, N. H., Kaiser, K., Minh Le, T. and Vinuela, L., 2011. *Rents to Riches? The Political Economy of Natural Resource-Led Development.* The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/545221468150583397/Rents-to-riches-The-political-economy-of-natural-resource-led-development>.

¹⁵⁰ Brahmabhatt and Canuto, 2010. Natural Resources and Development Strategy After the Crisis.

Brahmbhatt et al., 2010. *Dealing with Dutch Disease.*

Gelb, A. 2010. *Economic Diversification in Resource Rich Countries.* Center for Global Development, Washington, DC.

Gelb, A. and S. Grassman. 2010. *How Should Oil Exporters Spend their Rents?* Working Paper 221. Center for Global Development, Washington, DC.

Morris, M., Kaplinksky, R., and Kaplan, D., 2012. *One Thing Leads To Another: Promoting Industrialisation* by Making the Most of the Commodity Boom in Sub-Saharan Africa. Available at: <http://www.prism.uct.ac.za/Downloads/MMCP%20Book.pdf>.

¹⁵¹ See, for example: The Economist, 2013. Cash to the poor: Pennies from heaven. 26 October. Available at: <http://www.economist.com/news/international/21588385-giving-money-directly-poor-people-works-surprisingly-well-it-cannot-deal>.

¹⁵² Devarajan, S. and M. Giugale. 2011. How Africa can extract big benefits for everyone from natural resources. *The Guardian*, 29 June. Available at: <http://www.theguardian.com/global-development/poverty-matters/2011/jun/29/africa-extracting-benefits-from-natural-resources>.

153 Rajaram, A., Minh Le, T., Kaiser, K., Kim, J.-H. and Frank, J., 2014. *The Power of Public Investment Management: Transforming Resources into Assets for Growth*. Directions in Development; Public Sector Governance. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/461121468164052711/The-power-of-public-investment-management-transforming-resources-into-assets-for-growth>.

IMF. 2012. *Macroeconomic Policy Frameworks for Resource Rich Developing Countries*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/np/pp/eng/2012/082412.pdf>.

Collier, P., Ploeg, R. V. D., Spence, M. and Venables, A. J., 2009. Managing resource revenues in developing economies. *IMF Staff Papers*, 57(1). 84–118. DOI:10.1057/imfsp.2009.16.

154 Brahmabhatt and Canuto, 2010. Natural Resources and Development Strategy After the Crisis.

155 Kaufman, 2015. Evidence-based reflections on natural resource governance and corruption in Africa.

156 Acquah, P. 2015. Past the resource curse: The “new normal” of African economics and politics. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.

157 EITI, 2016. EITI Factsheet. Extractive Industries Transparency Initiative. Available at: https://eiti.org/files/document/eiti_factsheet_en.pdf.

158 Data from the World Bank, World Development Indicators, available at: <http://databank.worldbank.org>.

159 A recent study of 69 cities in 35 sub-Saharan countries concludes that their urban population and GDP would rise by 76% and 167%, respectively, between 2012 and 2030. In a business-as-usual scenario, these cities’ CO₂ emissions are also projected to rise by 65% by 2030. See:

Godfrey, N. and X. Zhao. 2015. *The Contribution of African Cities to the Economy and Climate: Population, Economic Growth and Carbon Emission Dynamics*. Technical Note. New Climate Economy.

160 Michaels, G., Rauch, F. and Redding, S. J., 2012. Urbanization and structural transformation. *The Quarterly Journal of Economics*, 127(2). 535–586. DOI:10.1093/qje/qjs003.

161 Combes, P., Démurger, S., and Li, S., 2013. *Urbanisation and Migration Externalities in China*. CEPR Discussion Paper No. 9352. Centre for Economic Policy Research, London. See also:

Bloom, D., Canning, D., and Fink, G., 2008. *Urbanization and the Wealth of Nations*. Harvard Program on the Global Demography of Aging. Working Paper No. 30. Harvard University, Cambridge, MA, US.

Brühlhart, M. and Sbergami, F., 2009. Agglomeration and growth: Cross-country evidence. *Journal of Urban Economics*, 65(1). 48–63. DOI:10.1016/j.jue.2008.08.003.

Ciccone, A., 2008. Urban production externalities. In: *The New Palgrave Dictionary of Economics*, S.N. Durlauf and L.E. Blume (eds.). Macmillan. Available at: <http://www.dictionaryofeconomics.com/dictionary>.

Durantón, G., 2014. *Growing Through Cities in Developing Countries*. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/1813-9450-6818>.

Durantón, G. 2014. The urbanization and development puzzle. In: *The Buzz in Cities: New Economic Thinking*, S. Yusuf (ed.). The Growth Dialogue.

Durantón, G. 2008. *Cities: Engines of Growth and Prosperity for Developing Countries?* Working Paper No.12. Commission on Growth and Development.

Durantón, G. and Puga, D., 2004. Micro-foundations of urban agglomeration economies. In *Handbook of Regional and Urban Economics*. J. V. H. and J.-F. Thisse (ed.). Cities and Geography, Vol. 4. Elsevier. 2063–2117. Available at: <http://www.sciencedirect.com/science/article/pii/S1574008004800051>.

Spence, M., Annez, P. C. and Buckley, R. M., 2008. *Urbanization and Growth: Commission on Growth and Development*. 47061. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/298101468176683270/Urbanization-and-growth-commission-on-growth-and-development>.

162 Jedwab, R. and Vollrath, D., 2015. Urbanization without growth in historical perspective. *Explorations in Economic History*, 58. 1–21. DOI:10.1016/j.eeh.2015.09.002.

Polese, M., 2014. Why do cities in poor nations not create more wealth? Three simple statements and a window of opportunity. In: *The Buzz in Cities: New Economic Thinking*, S. Yusuf (ed.). The Growth Dialogue.

Gouldson, A., Colenbrander, S., Sudmant, A., Godfrey, N., Millward-Hopkins, J., Fang, W. and Zhao, X., 2015. *Accelerating Low-Carbon Development in the World's Cities*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.

Litman, T., 2015. *Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl*, Victoria Transport Policy Institute, Contributing Paper for Better Growth Better Climate: The New Climate Economy Report. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.

¹⁶³ Fay, M. and Opal, C., 1999. *Urbanization without Growth: A Not-So-Uncommon Phenomenon*. Policy Research Working Paper 2412. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-2412>.

¹⁶⁴ Aryeetey et al., 2012. Overview.

de Brauw, A., Mueller, V. and Lee, H. L., 2014. The role of rural–urban migration in the structural transformation of Sub-Saharan Africa. *World Development*, 63. 33–42. DOI:10.1016/j.worlddev.2013.10.013.

Henderson, J. V., Roberts, M. and Storeygard, A., 2013. *Is Urbanization in Sub-Saharan Africa Different?* Policy Research Working Paper; No. WPS 6481. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/309811468194345036/Is-urbanization-in-Sub-Saharan-Africa-different>.

¹⁶⁵ Jedwab, R., Christiaensen, L. and Gindelsky, M., 2016. Demography, urbanization and development: Rural push, urban pull and ... urban push? *Journal of Urban Economics*, in press. DOI:10.1016/j.jue.2015.09.002.

¹⁶⁶ AfDB, OECD and UNDP, 2016. *African Economic Outlook 2016: Sustainable Cities and Structural Transformation*. African Development Bank, Organisation for Economic Co-operation and Development, and United Nations Development Programme, Available at: <http://dx.doi.org/10.1787/aeo-2016-en>.

¹⁶⁷ Gollin, D., Jedwab, R. and Vollrath, D., 2015. Urbanization with and without industrialization. *Journal of Economic Growth*, 21(1). 35–70. DOI:10.1007/s10887-015-9121-4.

Jedwab, R., 2011. *Why is African Urbanization Different? Evidence from Resource Exports in Ghana and Ivory Coast*. Available at: <http://www.colorado.edu/Economics/seminars/SeminarArchive/2012-13/jedwab.pdf>.

¹⁶⁸ A similar but older argument is that urbanization in many developing countries has been driven by policy distortions which create a strong pro-urban bias, which redistributes income from rural to urban areas, stimulating migration to the cities. See:

Lipton, M., 1977. *Why Poor People Stay Poor: A Study of Urban Bias in World Development*. Temple Smith, London.

¹⁶⁹ Annez, P., Buckley, R. and Kalarickal, J., 2010. African urbanization as flight? Some policy implications of geography. *Urban Forum*, 21(3). 221–234. DOI:10.1007/s12132-010-9085-6.

Barrios, S., Bertinelli, L. and Strobl, E., 2006. Climatic change and rural–urban migration: The case of sub-Saharan Africa. *Journal of Urban Economics*, 60(3). 357–371. DOI:10.1016/j.jue.2006.04.005.

Henderson, J. V., Storeygard, A. and Deichmann, U., 2014. *50 Years of Urbanization in Africa: Examining the Role of Climate Change*. Policy Research Working Paper; No. WPS 6925. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/861451468192245824/50-years-of-urbanization-in-Africa-examining-the-role-of-climate-change>.

Waldinger, M., 2015. *The Effects of Climate Change on Internal and International Migration: Implications for Developing Countries*. Working Paper No. 192. Grantham Research Institute on Climate Change and the Environment. Available at: <http://www.lse.ac.uk/GranthamInstitute/publication/the-effects-of-climate-change-on-internal-and-international-migration-implications-for-developing-countries/>.

Waldinger, M., and Fankhauser, S., 2015. *Climate Change and Migration in Developing Countries: Evidence and Implications for PRISE Countries*. Policy paper. Grantham Research Institute on Climate Change and the Environment. Available at: <http://eprints.lse.ac.uk/64526/>.

¹⁷⁰ AfDB, OECD and UNDP, 2016. *African Economic Outlook 2016*.

171 Recall Figure 5.3(b) in Chapter 5 above, which documents the link between deforestation and shorter travel time to the nearest city.

172 Moretti, E., 2014. *Cities and Growth: Evidence Paper*. International Growth Centre. Available at: <http://www.theigc.org/publication/igc-evidence-paper-cities/>.

Collier, P. and Venables, A. J., 2013. *Housing and Urbanization in Africa: Unleashing a Formal Market Process*. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/148561468191968959/Housing-and-urbanization-in-Africa-unleashing-a-formal-market-process>.

Kariuki, R. M., Bakalian, A. E., Lall, S., Wheeler, S., White, R., et al., 2013. *Harnessing Urbanization to End Poverty and Boost Prosperity in Africa: An Action Agenda for Transformation*. Africa Region Sustainable Development Series. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/710431468191672231/Harnessing-urbanization-to-end-poverty-and-boost-prosperity-in-Africa-an-action-agenda-for-transformation>.

173 AfDB, OECD and UNDP, 2016. *African Economic Outlook 2016*.

174 Cartwright, A. 2015. *Better Growth, Better Cities: Rethinking and Redirecting Urbanization in Africa*. Background paper for Africa Progress Report 2015. Africa Progress Panel and New Climate Economy. Available at: <http://newclimateeconomy.report/workingpapers/>.

175 Floater, G., Rode, P., Robert, A., Kennedy, C., Hoornweg, D., Slavcheva, R. and Godfrey, N., 2014. *Cities and the New Climate Economy: the transformative role of global urban growth*. New Climate Economy Cities Paper 01. LSE Cities. London School of Economics and Political Science.

For an example of such an assessment in an African country, see: Woldeyes, F. and Bishop, R., 2015. *Unlocking the Power of Ethiopia's Cities*. Report by Ethiopia's New Climate Economy Partnership. Ethiopian Development Research Institute and Global Green Growth Institute, Addis Ababa.

176 Collier and Venables, 2013. *Housing and Urbanization in Africa*.

Venables, A., 2015. *Making Cities Work for Development*. Growth Brief, May 2015. International Growth Centre. Available at: <http://www.theigc.org/publication/making-cities-work-for-development/>.

Kariuki et al., 2013. *Harnessing Urbanization to End Poverty and Boost Prosperity in Africa*.

177 AfDB, OECD and UNDP, 2016. *African Economic Outlook 2016*.

178 Cartwright, A. 2015. *Better Growth, Better Cities*.

179 There is an important distinction between energy services and physical energy consumed. Energy services provided per unit of physical energy have increased over time historically as a result of technological progress and resulting gains in energy efficiency. Increased *energy efficiency* reduces the total amount of energy needed to meet growing demand for energy services. Shifting the composition of actual energy consumed to low-carbon sources, in turn, reduces the GHG emissions per unit of energy used. Both measures are crucial to a low-carbon transition.

180 The World Bank, World Development Indicators database. Available at: <http://databank.worldbank.org>.

181 Eberhard, A., Rosnes, O., Shkaratan, M. and Vennemo, H., 2011. *Africa's Power Infrastructure: Investment, Integration, Efficiency*. 61309. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/545641468004456928/Africas-power-infrastructure-investment-integration-efficiency>.

182 IEA, 2014. *Africa Energy Outlook: A Focus on Energy Prospects in Sub-Saharan Africa*. World Energy Outlook Special Report. International Energy Agency, Paris. Available at: <http://www.worldenergyoutlook.org/africa/>.

See also: Oliver, C., Kitchlu, R. and Morella, E., 2013. *Turning the Lights on Across Africa: An Action Agenda for Transformation*. Africa Region Sustainable Development Series, 76991. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/712791468194329656/Turning-the-lights-on-across-Africa-an-action-agenda-for-transformation>.

183 Van Benthem and Romani (2009) and van Benthem (2015). Van Benthem (2015) estimates the income elasticity of energy demand to be around 0.8 for economies with a per capita income (in 2005 PPP dollars) in the US\$0-3,500 range, rising to approximately 1 for economies with per capita income in the US\$3500-10000 range. The elasticity is estimated to fall to about 0.6 in the US\$10,000-20,000 range and then to fall to around zero for higher per capita incomes.

van Benthem, A. and Romani, M., 2009. Fuelling growth: what drives energy demand in developing countries? *The Energy Journal*, 30(3). 91–114. Available at: <http://www.jstor.org/stable/41323369>.

van Benthem, A.A., 2015. Energy leapfrogging. *Journal of the Association of Environmental and Resource Economists*, 2(1). 93–132. DOI:10.1086/680317.

¹⁸⁴ Gertler et al. (2013) and Wolfram et al. (2012). Gertler et al. (2013) estimate that the income elasticity of energy demand is almost twice as high in countries with pro-poor growth, pro-poor growth being defined as growth accompanied by a fall in the Gini coefficient of inequality.

Gertler, P., Shelef, O., Wolfram, C., and Fuchs, A., 2013. *How Pro-Poor Growth Affects the Demand for Energy*. NBER Working Paper 19092. National Bureau for Economic Research, Washington, DC. Available at: <http://www.nber.org/papers/w19092>.

Wolfram, C., Shelef, O. and Gertler, P., 2012. How will energy demand develop in the developing world? *Journal of Economic Perspectives*, 26(1). 119–138. DOI:10.1257/jep.26.1.119.

¹⁸⁵ Voigt et al. (2014) document the importance of energy efficiency improvements in driving lower energy intensity within specific industrial sectors. See:

Voigt, S., De Cian, E., Schymura, M. and Verdolini, E., 2014. Energy intensity developments in 40 major economies: Structural change or technology improvement? *Energy Economics*, 41. 47–62. DOI:10.1016/j.eneco.2013.10.015.

¹⁸⁶ IEA, 2014. *Africa Energy Outlook: A Focus on Energy Prospects in Sub-Saharan Africa*. World Energy Outlook Special Report. International Energy Agency, Paris. Available at: <http://www.worldenergyoutlook.org/africa/>.

The IEA's New Policies Scenario assumes not only the relevant policies that had been adopted and implemented by mid-2015, but also that policies that were only proposals in mid-2015 would also be adopted or implemented.

¹⁸⁷ IEA, 2015. *World Energy Outlook 2015*. International Energy Agency, Paris. Available at: <http://www.worldenergyoutlook.org/weo2015/>.

¹⁸⁸ Stefanski, R., 2012. *Structural Transformation and Pollution*. Available at: http://cowles.econ.yale.edu/conferences/2012/sum12/ma_stefanski.pdf.

¹⁸⁹ IEA, 2014. *Africa Energy Outlook*.

¹⁹⁰ Bishop, R., 2015. *Raising Energy Efficiency Standards to the Global Best*. Contributing paper for Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.

¹⁹¹ Africa Progress Panel, 2015. *Power, People, Planet*.

Oliver et al., 2013. *Turning the Lights on Across Africa*.

Scott, A., 2015. *Building Electricity Supplies in Africa for Growth and Universal Access*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.

¹⁹² Coady, D., Parry, I., Sears, L., and Shang, B., 2015. *How Large Are Global Energy Subsidies?* IMF Working Paper WP/15/105. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=42940.0>.

Whitley, S., and van der Burgh, L., 2015. *Fossil Fuel Subsidy Reform in Sub-Saharan Africa: From Rhetoric to Reality*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.

A third, smaller component of the subsidy estimates in Coady et al. (2015) is for the application to energy of a uniform consumption tax on all goods for the purpose of raising government revenue.

¹⁹³ Arze del Granado, J., Coady, D. and Gillingham, R., 2010. *The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries*. International Monetary Fund, Washington, DC.

¹⁹⁴ Coady et al., 2015. *How Large Are Global Energy Subsidies?*

Whitley and van der Burgh, 2015. *Fossil Fuel Subsidy Reform in Sub-Saharan Africa*.

¹⁹⁵ Coady et al., 2015. *How Large Are Global Energy Subsidies?*

Rydge, J., 2015. Implementing Effective Carbon Pricing. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/misc/working-papers/>.

¹⁹⁶ Coady et al., 2015. How Large Are Global Energy Subsidies?

Whitley and van der Burgh, 2015. *Fossil Fuel Subsidy Reform in Sub-Saharan Africa*.

¹⁹⁷ Alleyne, T. S. C., ed., 2013. *Energy Subsidy Reform in Sub-Saharan Africa: Experiences and Lessons*. African Department, 13/2. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=40480.0>.

Clements, B., Coady, D., Fabrizio, S., Gupta, S., Alleyne, T. and Sdravovich, C., 2013. *Energy Subsidy Reform: Lessons and Implications*. International Monetary Fund, Washington, DC. Available at: <http://www.elibrary.imf.org/page/120>.

Whitley, S. and van der Burgh, L., 2015. *Fossil Fuel Subsidy Reform in Sub-Saharan Africa*.

¹⁹⁸ IEA, 2014. Africa Energy Outlook.

Africa Progress Panel, 2015. *Power, People, Planet*.

¹⁹⁹ IEA, 2014. Africa Energy Outlook.

Africa Progress Panel, 2015. *Power, People, Planet*.

²⁰⁰ IRENA, 2016. *REmap: Roadmap for A Renewable Energy Future*. International Renewable Energy Agency, Abu Dhabi. Available at: <http://irena.org/remap/>.

²⁰¹ Lazard, 2015. Lazard's Levelized Cost of Energy Analysis – Version 9.0. Available at: <https://www.lazard.com/perspective/levelized-cost-of-energy-analysis-90/>.

²⁰² IRENA, 2016. *REmap: Roadmap for A Renewable Energy Future*.

Lazard, 2015. Lazard's Levelized Cost of Energy Analysis.

Linklaters LLP, 2016. *Renewables in Africa: Trending Rapidly Towards Cost-Competitiveness with Fossil Fuels*. Available at: <http://www.linklaters.com/Insights/ThoughtLeadership/Renewables-Africa/Pages/Index.aspx>.

²⁰³ Linklaters LLP, 2016. *Renewables in Africa*.

²⁰⁴ Castellano, A., Kendall, A., Nikomarov, M., and Swemmer, T., 2012. *Brighter Africa: The Growth Potential of the Sub-Saharan Electricity Sector*. McKinsey & Co. Available at: http://www.mckinsey.com/~media/mckinsey/industries/retail/our%20insights/east%20africa%20the%20next%20hub%20for%20apparel%20sourcing/brighter_africa_the_growth_potential_of_the_sub%20saharan_electricity_sector.ashx.

²⁰⁵ Castellano et al., 2012. *Brighter Africa*.

See also Oliver et al., 2013. Turning the Lights on Across Africa.

Africa Progress Panel, 2015. *Power, People, Planet*.

Scott, 2015. Building Electricity Supplies in Africa for Growth and Universal Access.

²⁰⁶ Hogarth, R., and Granoff, I., 2015. *Speaking Truth to Power: Why Energy Distribution, More Than Generation, Is Africa's Poverty Reduction Challenge*. ODI Working Paper No. 418. Overseas Development Institute, London. Available at: <https://www.odi.org/publications/9406-truth-power-energy-poverty-ambition-africa>.

²⁰⁷ Linklaters LLP, 2016. *Renewables in Africa*.

²⁰⁸ IEA, 2014. Africa Energy Outlook.

²⁰⁹ IRENA, 2016. *REmap: Roadmap for A Renewable Energy Future*.

²¹⁰ Cervigni, Raffaello; Liden, Rikard; Neumann, James E.; Strzepek, Kenneth M.. 2015. Enhancing the Climate Resilience of Africa's Infrastructure: The Power and Water Sectors. Africa Development Forum; Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/21875> License: CC BY 3.0 IGO .

²¹¹ IEA, 2014. Africa Energy Outlook.

Linklaters LLP, 2016. *Renewables in Africa*.

²¹² Eberhard, A. A., Foster, V. and Briceno-Garme, 2008. *Africa – Underpowered: The State of the Power Sector in Sub-Saharan Africa*. Africa Infrastructure Country Diagnostic (AICD) Background Paper. No. 6, 48214. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/142991468006934762/Africa-Underpowered-the-state-of-the-power-sector-in-Sub-Saharan-Africa>.

²¹³ UNEP Finance Initiative, 2012. *Financing Renewable Energy in Developing Countries: Drivers and Barriers for Private Finance in Sub-Saharan Africa*. A study and survey by the UNEP Finance Initiative on the views, experiences and policy needs of energy financiers. United Nations Environment Programme Finance Initiative, Geneva. Available at: http://www.unepfi.org/fileadmin/documents/Financing_Renewable_Energy_in_subSaharan_Africa.pdf.

²¹⁴ Eberhard, A, and Gratwick, K , 2013. *Contributing Elements to Success of IPP's in Sub-Saharan Africa*. Private Sector and Development, No 18. Available at: http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/YAC_chpt_21.pdf.

²¹⁵ Eberhard et al., 2008. *Africa – Underpowered*.

²¹⁶ UNECA and UNEP. 2007. *Making Africa's Power Sector Sustainable: An Analysis of Power Sector Reform in Africa*. United Nations Economic Commission for Africa and United Nations Environment Programme, Addis Ababa. Available at: <http://repository.uneca.org/handle/10855/15059>.

Africa Progress Panel, 2015. *Power, People, Planet*.

²¹⁷ Linklaters LLP, 2016. *Renewables in Africa*.

²¹⁸ UNEP Finance Initiative, 2012. *Financing Renewable Energy in Developing Countries*.

²¹⁹ IRENA, 2016. *REMap: Roadmap for A Renewable Energy Future*.

UNEP Finance Initiative, 2012. *Financing Renewable Energy in Developing Countries*.

²²⁰ Eberhard, A., Kolker, J. and Leigland, J., 2014. *South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons*. Public-Private Infrastructure Advisory Facility, The World Bank, Washington, DC. Available at: <https://ppp.worldbank.org/public-private-partnership/library/south-africas-renewable-energy-ipp-procurement-program-success-factors-and-lessons>.

REFERENCES

- Acemoglu, D., 2009. *Economic Growth*. Princeton University Press, Princeton, NJ, US.
- ACET, 2014. *2014 African Transformation Report: Growth with Depth*. African Center for Economic Transformation, Accra. Available at: <http://africanTransformation.org>.
- Acquah, P. 2015. Past the resource curse: The “new normal” of African economics and politics. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- AfDB, OECD and UNDP, 2016. *African Economic Outlook 2016: Sustainable Cities and Structural Transformation*. African Development Bank, Organisation for Economic Co-operation and Development, and United Nations Development Programme, Available at: <http://dx.doi.org/10.1787/aeo-2016-en>.
- AfDB, OECD, UNDP and UNECA, 2013. *African Economic Outlook 2013 : Structural Transformation and Natural Resources*. African Development Bank, Development Centre of the Organisation for Economic Co-operation and Development, United Nations Development Programme, and United Nations Economic Commission for Africa. Available at: <http://dx.doi.org/10.1787/aeo-2013-en>.
- Africa Progress Panel, 2015. *Power, People, Planet: Seizing Africa’s Energy and Climate Opportunities*. Africa Progress Report 2015. Geneva. Available at: <http://www.africaprogresspanel.org/publications/policy-papers/2015-africa-progress-report/>.
- African Union, 2016. *The CAADP Results Framework 2015–2025*. NEPAD Planning and Coordinating Agency. New Partnership for Africa’s Development, Johannesburg. Available at: <http://www.nepad-caadp.net/content/caadp-results-framework-2015-2025-english-0>.
- African Union, 2014. *Common African Position on the Post-2015 Development Agenda*. Addis Ababa. Available at: <https://sustainabledevelopment.un.org/content/documents/1329africaposition.pdf>.
- African Union, 2013. *Agenda 2063: The Africa We Want*. African Union Commission, Addis Ababa. Available at: <http://www.au.int/en/agenda2063>.
- African Union, 2012. *CAADP – Sustaining the Momentum into the Next Decade*. Implementation Report, July 2012. NEPAD Planning and Coordinating Agency. New Partnership for Africa’s Development, Johannesburg. Available at: http://www.nepad-caadp.net/sites/default/files/Sustaining_CAADP_Momentum_Implementation_Report_July_2012_0.pdf.
- Ahmed, S. A., Cruz, M., Go, D. S., Maliszewska, M. and Osorio-Rodarte, I., 2014. *How Significant Is Africa’s Demographic Dividend for Its Future Growth and Poverty Reduction?* WPS7134. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/842031468193780495/How-significant-is-Africas-demographic-dividend-for-its-future-growth-and-poverty-reduction>.
- Ajakaiye, O. and Page, J., 2012. Industrialisation and economic transformation in Africa: introduction and overview. *Journal of African Economies*, 21 (suppl 2). ii3-ii18. DOI:10.1093/jae/ejr049.
- Alleyne, T. S. C., ed., 2013. *Energy Subsidy Reform in Sub-Saharan Africa: Experiences and Lessons*. African Department, 13/2. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=40480.0>.
- Altenburg, T. and Melia, E., 2014. Kick-starting industrial transformation in sub-Saharan Africa. In: *Transforming Economies – Making industrial policy work for growth, jobs and development*. J.M. Salazar-Xirinachs, I. Nübler and R. Kozul-Wright (eds.). International Labour Organization, Geneva.

- Altenburg, T. 2011. *Industrial Policy in Developing Countries: Overview and Lessons from Seven Country Cases*. Discussion Paper 4/2011. German Development Institute (DIE). Available at: <https://www.die-gdi.de/en/discussion-paper/article/industrial-policy-in-developing-countries-overview-and-lessons-from-seven-country-cases/>.
- AMCEN, 2011. *Addressing Climate Change Challenges in Africa; A Practical Guide Towards Sustainable Development*. African Ministerial Conference on Environment. Available at: http://www.unep.org/roa/amcen/docs/publications/guidebook_CLimateChange.pdf.
- Anderson, K. and Brückner, M., 2012. *Distortions to Agriculture and Economic Growth in Sub-Saharan Africa*. Policy Research Working Papers. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/1813-9450-6206>.
- Annez, P., Buckley, R. and Kalarickal, J., 2010. African urbanization as flight? Some policy implications of geography. *Urban Forum*, 21(3). 221–234. DOI:10.1007/s12132-010-9085-6.
- Ansu, Y., McMillan, M., Page, J., and te Velde, D.W., 2016. *Promoting Manufacturing in Africa*. Paper for the African Transformation Forum 2016. Kigali, Rwanda.
- Aryeetey, E., Devarajan, S., Kanbur, R., and Kasekende, L., 2012. Overview. In: *The Oxford Companion to the Economics of Africa*. Oxford University Press.
- Aryeetey, E. and Moyo, N., 2012. Industrialisation for structural transformation in Africa: appropriate roles for the state. *Journal of African Economies*, 21(suppl 2). ii55-ii85. DOI:10.1093/jae/ejro43.
- Arze del Granado, J., Coady, D. and Gillingham, R., 2010. *The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries*. International Monetary Fund, Washington, DC.
- Badiane, O., and Makombe, T., 2014. *The Theory and Practice of Agriculture, Growth, and Development in Africa*. UNU-WIDER Working Paper 61/2014. United Nations University World Institute for Development Economics Research, Helsinki. Available at: <https://www.wider.unu.edu/publication/theory-and-practice-agriculture-growth-and-development-africa>.
- Balchin, N., Gelb, S., Kennan, J., Martin, H. and te Velde, D.W., 2016. *Developing Export-Based Manufacturing in Sub-Saharan Africa*. Draft report, 18 February.
- Barma, N. H., Kaiser, K., Minh Le, T. and Vinuela, L., 2011. *Rents to Riches? The Political Economy of Natural Resource-Led Development*. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/545221468150583397/Rents-to-riches-The-political-economy-of-natural-resource-led-development>.
- Barr, R., Fankhauser, S. and Hamilton, K., 2010. Adaptation investments: a resource allocation framework. *Mitigation and Adaptation Strategies for Global Change*, 15(8). 843–858. DOI:10.1007/s11027-010-9242-1.
- Barrios, S., Bertinelli, L. and Strobl, E., 2006. Climatic change and rural–urban migration: The case of sub-Saharan Africa. *Journal of Urban Economics*, 60(3). 357–371. DOI:10.1016/j.jue.2006.04.005.
- Barro, R., and Sala-i-Martin, X., 2003. *Economic Growth*. MIT Press, Cambridge, MA., US.
- Bartelsman, E., Haltiwanger, J. and Scarpetta, S., 2013. Cross-country differences in productivity: the role of allocation and selection. *American Economic Review*, 103(1). 305–334. DOI:10.1257/aer.103.1.305.
- Bates, R.H. and Block, S., 2015. The political origins of Africa’s economic revival. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- Beegle, K., Christiaensen, L., Dabalen, A. and Gaddis, I., 2016. *Poverty in a Rising Africa*. Africa Poverty Report. The World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/22575>.

- Berg, A., Ostry, J. D. and Zettelmeyer, J., 2012. What makes growth sustained? *Journal of Development Economics*, 98(2). 149–166. DOI:10.1016/j.jdeveco.2011.08.002.
- Bhattacharya, A., Oppenheim, J., and Stern, N. (2015). Driving sustainable development through better infrastructure: Key elements of a transformation program. *Brookings Global Working Paper Series*.
- Bishop, R., 2015. *Raising Energy Efficiency Standards to the Global Best*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Bloom, D. E. and Finlay, J. E., 2009. Demographic change and economic growth in Asia. *Asian Economic Policy Review*, 4(1). 45–64. DOI:10.1111/j.1748-3131.2009.01106.x.
- Bloom, D., Canning, D., and Fink, G., 2008. *Urbanization and the Wealth of Nations*. Harvard Program on the Global Demography of Aging. Working Paper No. 30. Harvard University, Cambridge, MA, US.
- Bongaarts, J. and Casterline, J., 2013. Fertility transition: is Sub-Saharan Africa different? *Population and Development Review*, 38. 153–168. DOI:10.1111/j.1728-4457.2013.00557.x.
- Bowen, A., Cochrane, S. and Fankhauser, S., 2011. Climate change, adaptation and economic growth. *Climatic Change*, 113(2). 95–106. DOI:10.1007/s10584-011-0346-8.
- Brahmbhatt, M. and Canuto, O., 2010. *Natural Resources and Development Strategy After the Crisis*. 53164. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/262471468313835336/Natural-resources-and-development-strategy-after-the-crisis>.
- Brahmbhatt, M., Canuto, O. and Vostroknutova, E., 2010. *Dealing with Dutch Disease*. 54867. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/794871468161957086/Dealing-with-Dutch-disease>.
- Brühlhart, M. and Sbergami, F., 2009. Agglomeration and growth: Cross-country evidence. *Journal of Urban Economics*, 65(1). 48–63. DOI:10.1016/j.jue.2008.08.003.
- Canning, D., Raja, S. and Yazbeck, A. S., 2015. *Africa's Demographic Transition: Dividend or Disaster?* Africa Development Forum. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-0489-2>.
- Cartwright, A. 2015. *Better Growth, Better Cities: Rethinking and Redirecting Urbanization in Africa*. Background paper for Africa Progress Report 2015. Africa Progress Panel and New Climate Economy. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Castellano, A., Kendall, A., Nikomarov, M., and Swemmer, T., 2012. *Brighter Africa: The Growth Potential of the Sub-Saharan Electricity Sector*. McKinsey & Co. Available at: http://www.mckinsey.com/~media/mckinsey/industries/retail/our%20insights/east%20africa%20the%20next%20hub%20for%20apparel%20sourcing/brighter_africa_the_growth_potential_of_the_sub%20saharan_electricity_sector.ashx.
- Casterline, J. B., 2010. *Determinants and Consequences of High Fertility: A Synopsis of the Evidence - Portfolio Review*. 63069. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/389381468147851589/Determinants-and-consequences-of-high-fertility-a-synopsis-of-the-evidence-portfolio-review>.
- Cervigni, Raffaello; Liden, Rikard; Neumann, James E.; Strzepek, Kenneth M., 2015. *Enhancing the Climate Resilience of Africa's Infrastructure: The Power and Water Sectors*. Africa Development Forum; Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/21875> License: CC BY 3.0 IGO.
- Cervigni, R. and Morris, M., 2016. *Confronting Drought in Africa's Drylands: Opportunities for Enhancing Resilience*. Africa Development Forum. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/978-1-4648-0817-3>.

- Challinor, A.J., Wheeler, T.R., Osborne, T.M., and Slingo, J.M., 2006. Assessing the vulnerability of crop productivity to climate change thresholds using an integrated crop-climate model. In *Avoiding Dangerous Climate Change*, H. J. Schellnhuber and W. P Cramer (eds.). Cambridge University Press. 187–194.
- Chen, H., Githeko, A. K., Zhou, G., Githure, J. I. and Yan, G., 2006. New records of *Anopheles arabiensis* breeding on the Mount Kenya highlands indicate indigenous malaria transmission. *Malaria Journal*, 5, 17. DOI:10.1186/1475-2875-5-17.
- Chenery, H. B., 1960. Patterns of industrial growth. *The American Economic Review*, 50(4). 624–654.
- Christiaensen, L., Chuhan-Pole, P., and Sanoh, A., 2013. *Africa's Growth, Poverty and Inequality Nexus – Fostering Shared Prosperity*. Presented at the Centre for the Study of African Economies (CSAE) Conference 2014: Economic Development in Africa, 23–25 March 2014, St. Catherine's College, University of Oxford, UK. Available at: https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2014&paper_id=381.
- Christiaensen, L., Demery, L. and Kuhl, J., 2011. The (evolving) role of agriculture in poverty reduction – an empirical perspective. *Journal of Development Economics*, 96(2). 239–254. DOI:10.1016/j.jdevec0.2010.10.006.
- Ciccone, A., 2008. Urban production externalities. In: *The New Palgrave Dictionary of Economics*, S.N. Durlauf and L.E. Blume (eds.). Macmillan. Available at: <http://www.dictionaryofeconomics.com/dictionary>.
- Clements, B., Coady, D., Fabrizio, S., Gupta, S., Alleyne, T. and Sdravovich, C., 2013. *Energy Subsidy Reform: Lessons and Implications*. International Monetary Fund, Washington, DC. Available at: <http://www.elibrary.imf.org/page/120>.
- Coady, D., Parry, I., Sears, L., and Shang, B., 2015. *How Large Are Global Energy Subsidies?* IMF Working Paper WP/15/105. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=42940.0>.
- Collier, P., 2015. Africa: New opportunities, old impediments. *Economic Affairs*, 35(2). 169–177. DOI:10.1111/ecaf.12119.
- Collier, P., and Dercon, S., 2009. *African Agriculture in 50 Years: Smallholders in a Rapidly Changing World?* Prepared for UN Food and Agriculture Organization Expert Meeting on How to Feed the World in 50 Years. Available at: <http://www.fao.org/3/a-ak983e.pdf>.
- Collier, P. and Goderis, B., 2012. Commodity prices and growth: An empirical investigation. *European Economic Review*, 56(6). 1241–1260. DOI:10.1016/j.euroecorev.2012.04.002.
- Collier, P. and Goderis, B., 2008. *Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum*. SSRN Scholarly Paper 1473716. Social Science Research Network. Available at: <http://dx.doi.org/10.2139/ssrn.1473716>.
- Collier, P. and Venables, A. J., 2013. *Housing and Urbanization in Africa: Unleashing a Formal Market Process*. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/148561468191968959/Housing-and-urbanization-in-Africa-unleashing-a-formal-market-process>.
- Collier, P., Ploeg, R. V. D., Spence, M. and Venables, A. J., 2009. Managing resource revenues in developing economies. *IMF Staff Papers*, 57(1). 84–118. DOI:10.1057/imfsp.2009.16.
- Collier, P., Conway, G. and Venables, T., 2008. Climate change and Africa. *Oxford Review of Economic Policy*, 24(2). 337–353. DOI:10.1093/oxrep/grn019.
- Combes, P., Démurger, S., and Li, S., 2013. *Urbanisation and Migration Externalities in China*. CEPR Discussion Paper No. 9352. Centre for Economic Policy Research, London.
- Conway, G., 2009. *The Science of Climate Change in Africa: Impacts and Adaptation*. Grantham Institute for Climate Change, Imperial College. Available at: https://workspace.imperial.ac.uk/climatechange/public/pdfs/discussion_papers/Grantham_Institutue_-_The_science_of_climate_change_in_Africa.pdf.

- Corden, W. M. and Neary, J. P., 1982. Booming sector and de-industrialisation in a small open economy. *The Economic Journal*, 92(368). 825–848. DOI:10.2307/2232670.
- Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., and Chen, Y. 2013. *Benchmarking structural transformation across the world*. IMF Working Paper 13/176. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/cat/longres.aspx?sk=40847.0>.
- Datt, G. and Ravallion, M., 1998. Why have some Indian states done better than others at reducing rural poverty? *Economica*, 65(257). 17–38. DOI:10.1111/1468-0335.00112.
- de Brauw, A., Mueller, V. and Lee, H. L., 2014. The role of rural–urban migration in the structural transformation of Sub-Saharan Africa. *World Development*, 63. 33–42. DOI:10.1016/j.worlddev.2013.10.013.
- Delgado, C., Wolosin, M. and Purvis, N., 2015. *Restoring and Protecting Agricultural and Forest Landscapes and Increasing Agricultural Productivity*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Dell, M., Jones, B. F. and Olken, B. A., 2014. What do we learn from the weather? The new climate-economy literature. *Journal of Economic Literature*, 52(3). 740–798. DOI:10.1257/jel.52.3.740.
- Dell, M., Jones, B. F. and Olken, B. A., 2012. Temperature shocks and economic growth: evidence from the last half century. *American Economic Journal: Macroeconomics*, 4(3). 66–95. DOI:10.1257/mac.4.3.66.
- Dercon, S. 2014. Is green growth good for the poor? *The World Bank Research Observer*, Vol.29 No. 2. (August).
- Dercon, S., Kennedy, D., Clark, A., Lea, N. and Waddell, N., 2014. *Inclusive and Transformational Growth*. Unpublished DFID internal working paper.
- Dercon, S., and Gollin, D., 2014. *Agriculture in African Development: A Review of Theories and Strategies*. CSAE Working Paper WPS/2014-22. Center for the Study of African Economies, Oxford, UK. Available at: <http://www.csae.ox.ac.uk/workingpapers/pdfs/csae-wps-2014-22.pdf>.
- Dercon, S. and Porter, C., 2014. Live aid revisited: long-term impacts of the 1984 Ethiopian famine on children. *Journal of the European Economic Association*, 12(4). 927–948. DOI:10.1111/jeea.12088.
- Dercon, S. and Christiaensen, L., 2011. Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia. *Journal of Development Economics*, 96(2). 159–173
- Dercon, S., 2004. Growth and shocks: evidence from rural Ethiopia. *Journal of Development Economics*, 74(2). 309–329.
- Devarajan, S., 2015. Reconciling two views of Africa’s economic boom. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- Devarajan, S. and M. Giugale. 2011. How Africa can extract big benefits for everyone from natural resources. *The Guardian*, 29 June. Available at: <http://www.theguardian.com/global-development/poverty-matters/2011/jun/29/africa-extracting-benefits-from-natural-resources>.
- De Vries, G., Timmer, M., and de Vries, K., 2014. *Patterns of Structural Change in Developing Countries*. GGDC Research Memorandum No. 149, July 2014. Groningen Growth and Development Centre. Available at: <http://www.ggdc.net/publications/memoabstract2.htm?id=149>.
- De Vries, G., Timmer, M., and de Vries, K. 2013. *Structural Transformation in Africa: Static Gains, Dynamic Losses*. GGDC Research Memorandum No. 136, October 2013. Groningen Growth and Development Centre. Available at: <http://www.ggdc.net/publications/memoabstract2.htm?id=136>.
- Dinh, H. T. and Clarke, G. R. G., 2012. *Performance of Manufacturing Firms in Africa*. Directions in Development. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-9632-2>.

- Donnan, S. and Leahy, J., 2016. World trade records biggest reversal since crisis. *Financial Times*, 26 February. Available at: <https://www.ft.com/content/9e2533d6-dbd8-11e5-9ba8-3abc1e7247e4>.
- Donnan, S., 2016. *Global trade: structural shifts*. Financial Times, 2 March. Available at: <http://www.ft.com/cms/s/0/oe0e6960-da17-11e5-98fd-06d75973fe09.html>.
- Duranton, G., 2014. *Growing Through Cities in Developing Countries*. The World Bank, Washington, DC. Available at: <http://dx.doi.org/10.1596/1813-9450-6818>.
- Duranton, G. 2014. The urbanization and development puzzle. In: *The Buzz in Cities: New Economic Thinking*, S. Yusuf (ed.). The Growth Dialogue.
- Duranton, G. 2008. *Cities: Engines of Growth and Prosperity for Developing Countries?* Working Paper No.12. Commission on Growth and Development.
- Duranton, G. and Puga, D., 2004. Micro-foundations of urban agglomeration economies. In *Handbook of Regional and Urban Economics*. J. V. H. and J.-F. Thisse (ed.). Cities and Geography, Vol. 4. Elsevier. 2063–2117. Available at: <http://www.sciencedirect.com/science/article/pii/S1574008004800051>.
- Eberhard, A. and Gratwick, K., 2013. *Contributing Elements to Success of IPP's in Sub-Saharan Africa*. Private Sector and Development, No 18. Available at: http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/YAC_chpt_21.pdf.
- Eberhard, A., Kolker, J. and Leigland, J., 2014. *South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons*. Public-Private Infrastructure Advisory Facility, The World Bank, Washington, DC. Available at: <https://ppp.worldbank.org/public-private-partnership/library/south-africas-renewable-energy-ipp-procurement-program-success-factors-and-lessons>.
- Eberhard, A., Rosnes, O., Shkaratan, M. and Vennemo, H., 2011. *Africa's Power Infrastructure: Investment, Integration, Efficiency*. 61309. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/545641468004456928/Africas-power-infrastructure-investment-integration-efficiency>.
- Eberhard, A. A., Foster, V. and Briceno-Garme, 2008. *Africa – Underpowered: The State of the Power Sector in Sub-Saharan Africa*. Africa Infrastructure Country Diagnostic (AICD) Background Paper. No. 6, 48214. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/142991468006934762/Africa-Underpowered-the-state-of-the-power-sector-in-Sub-Saharan-Africa>.
- EITI, 2016. *EITI Factsheet*. Extractive Industries Transparency Initiative. Available at: https://eiti.org/files/document/eiti_factsheet_en.pdf.
- Elhiraika, A. and Sloan, J.R. 2015. Can Africa move from resource dependence to structural transformation? In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- Escribano, A., Guasch, J. L. and Pena, J., 2010. *Assessing the Impact of Infrastructure Quality on Firm Productivity in Africa: Cross-Country Comparisons Based on Investment Climate Surveys from 1999 to 2005*. WPS5191. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/792371467990385370/Assessing-the-impact-of-infrastructure-quality-on-firm-productivity-in-Africa-cross-country-comparisons-based-on-investment-climate-surveys-from-1999-to-2005>.
- FAO, 2010. *“Climate-Smart” Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*. Food and Agriculture Organization of the United Nations, Rome. Available at: <http://www.fao.org/docrep/013/i1881e/i1881e00.htm>.
- Fankhauser, S. and McDermott, T. K. J., 2014. Understanding the adaptation deficit: Why are poor countries more vulnerable to climate events than rich countries? *Global Environmental Change*, 27. 9–18. DOI:10.1016/j.gloenvcha.2014.04.014.

- Farole, T., 2011. *Special Economic Zones in Africa: Comparing Performance and Learning from Global Experience*. 60059. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/996871468008466349/Special-economic-zones-in-Africa-comparing-performance-and-learning-from-global-experience>.
- Fay, M. and Opal, C., 1999. *Urbanization without Growth: A Not-So-Uncommon Phenomenon*. Policy Research Working Paper 2412. The World Bank, Washington, DC. Available at: <http://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-2412>.
- Floater, G., Rode, P., Robert, A., Kennedy, C., Hoornweg, D., Slavcheva, R. and Godfrey, N., 2014. *Cities and the New Climate Economy: the transformative role of global urban growth*. New Climate Economy Cities Paper 01. LSE Cities. London School of Economics and Political Science.
- Foster, V. and Briceno-Garmendia, C. M., 2009. *Africa's Infrastructure: A Time for Transformation*. Africa Development Forum, 52102. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/246961468003355256/Africas-infrastructure-a-time-for-transformation>.
- Foster, L., Haltiwanger, J. and Syverson, C., 2008. Reallocation, firm turnover, and efficiency: selection on productivity or profitability? *American Economic Review*, 98(1). 394–425. DOI:10.1257/aer.98.1.394.
- Foster, L., Haltiwanger, J., and Krizan, C.J., 2001. Aggregate productivity growth: Lessons from microeconomic evidence. In: *New Developments in Productivity Analysis*, C. R. Hulten, E. R. Dean and M. J. Harper (eds.). National Bureau of Economic Research and University of Chicago Press.
- Fosu, A.K., 2014. *Growth, Inequality, and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context*. CSAE Working Paper WPS/2014-17. Center for the Study of African Economies. Oxford. Available at: <http://www.csae.ox.ac.uk/workingpapers/pdfs/csae-wps-2014-17.pdf>.
- Fosu, A.K., 2011. *Growth, Inequality, and Poverty Reduction in Developing Countries: Recent Global Evidence*. WIDER Working Paper 2011/001. United Nations University World Institute for Development, Helsinki. Available at: <https://www.wider.unu.edu/publication/growth-inequality-and-poverty-reduction-developing-countries>.
- Gelb, A. 2010. *Economic Diversification in Resource Rich Countries*. Center for Global Development, Washington, DC.
- Gelb, A. and S. Grassman. 2010. *How Should Oil Exporters Spend their Rents?* Working Paper 221. Center for Global Development, Washington, DC.
- Gelb, A., Meyer, C.J., and Ramachandran, V., 2014. *Development as Diffusion: Manufacturing Productivity and Sub-Saharan Africa's Missing Middle*. WIDER Working Paper 42/2014. Available at: <https://www.wider.unu.edu/publication/development-diffusion>.
- Gelb, A., Kaiser, K., and Vinuela, L., 2012. *How Much Does Natural Resource Extraction Really Diminish National Wealth? The Implications of Discovery*. Working Paper 290. Center for Global Development. Available at: <http://www.cgdev.org/publication/how-much-does-natural-resource-extraction-really-diminish-national-wealth-implications>.
- Gertler, P., Shelef, O., Wolfram, C., and Fuchs, A., 2013. *How Pro-Poor Growth Affects the Demand for Energy*. NBER Working Paper 19092. National Bureau for Economic Research, Washington, DC. Available at: <http://www.nber.org/papers/w19092>.
- Global Commission on the Economy and Climate, 2014. *Better Growth, Better Climate: The New Climate Economy Report*. The Global Report. Washington, DC. Available at: <http://newclimateeconomy.report>.
- Global Commission on the Economy and Climate, 2015. *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. The Global Report. Washington, DC. Available at: <http://newclimateeconomy.report>.

- Godfrey, N. and X. Zhao. 2015. *The Contribution of African Cities to the Economy and Climate: Population, Economic Growth and Carbon Emission Dynamics*. New Climate Economy Background Paper.
- Gollin, D., Jedwab, R. and Vollrath, D., 2015. Urbanization with and without industrialization. *Journal of Economic Growth*, 21(1). 35–70. DOI:10.1007/s10887-015-9121-4.
- Gollin, D., Parente, S. L. and Rogerson, R., 2007. The food problem and the evolution of international income levels. *Journal of Monetary Economics*, 54(4). 1230–1255. DOI:10.1016/j.jmoneco.2006.04.002.
- Gouldson, A., Colenbrander, S., Sudmant, A., Godfrey, N., Millward-Hopkins, J., Fang, W. and Zhao, X., 2015. *Accelerating Low-Carbon Development in the World's Cities*. Contributing paper for *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Haggblade, S., Hazell, P., Dorosh, P., 2007. Sectoral growth linkages between agriculture and the rural nonfarm economy. In: *Transforming the Rural Nonfarm Economy – Opportunities and Threats in the Developing World*. S. Haggblade, P. Hazell, and T. Reardon (eds.). Johns Hopkins University Press, Baltimore, US.
- Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., Rozenberg, J., Treguer, D. and Vogt-Schilb, A., 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Climate Change and Development. The World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/22787>.
- Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Narloch, U., Rozenberg, J. and Vogt-Schilb, A., 2014. *Climate Change and Poverty – an Analytical Framework*. WPS7126. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/275231468331203291/Climate-change-and-poverty-an-analytical-framework>.
- Harrison, A. and Rodriguez-Clare, A., 2010. Trade, foreign investment, and industrial policy for developing countries. In: *Handbook of Development Economics*, Vol. 5, D. Rodrik and M. Rosenzweig (eds.). Elsevier.
- Hausmann, R., Hidalgo, C. A., Bustos, S., Coscia, M., Simoes, A. and Yildirim, M. A., 2014. *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. Revised edition. The MIT Press, Cambridge, MA.
- Henderson, J.V., Roberts, M. and Storeygard, A., 2013. *Is Urbanization in Sub-Saharan Africa Different?* Policy Research Working Paper; No. WPS 6481. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/309811468194345036/Is-urbanization-in-Sub-Saharan-Africa-different>.
- Henderson, J.V., Storeygard, A. and Deichmann, U., 2014. *50 Years of Urbanization in Africa: Examining the Role of Climate Change*. Policy Research Working Paper; No. WPS 6925. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/861451468192245824/50-years-of-urbanization-in-Africa-examining-the-role-of-climate-change>.
- Herrendorf, B., Rogerson, R and Valentinyi, A. 2013. Growth and structural transformation, in *Handbook of Economic Growth*, Vol. 2. P. Aghion, and S. Durlauf (eds.), Elsevier.
- Hertel, T. W., Burke, M. B. and Lobell, D. B., 2010. The poverty implications of climate-induced crop yield changes by 2030. *Global Environmental Change*, 20(4). 577–585. DOI:10.1016/j.gloenvcha.2010.07.001.
- Hill, R., and Mejia-Mantilla, C., 2015. *Welfare and Shocks in Uganda*. Background Paper prepared for the Uganda Poverty Assessment. The World Bank, Washington, DC.
- Hogarth, R., Haywood, C., and Whitley, S., 2015. *Low-Carbon Development in Sub-Saharan Africa: 20 Cross-Sector Transitions*. Overseas Development Institute and German Development Institute (DIE). Available at: <https://www.odi.org/publications/9523-low-carbon-development-sub-saharan-africa-20-cross-sector-transitions>.
- Hogarth, R., and Granoff, I., 2015. *Speaking Truth to Power: Why Energy Distribution, More Than Generation, Is Africa's Poverty Reduction Challenge*. ODI Working Paper No. 418. Overseas Development Institute, London. Available at: <https://www.odi.org/publications/9406-truth-power-energy-poverty-ambition-africa>.

- Hostland, D. and Giugale, M. M., 2013. *Africa's Macroeconomic Story*. Policy Research Working Paper No. WPS 6635. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/487751468192550042/Africas-macroeconomic-story>.
- Hsiang, S. M., Burke, M. and Miguel, E., 2013. Quantifying the influence of climate on human conflict. *Science*, 341(6151). 1235367. DOI:10.1126/science.1235367.
- Hsieh, C.-T. and Klenow, P. J., 2009. Misallocation and manufacturing TFP in China and India. *The Quarterly Journal of Economics*, 124(4). 1403–1448. DOI:10.1162/qjec.2009.124.4.1403.
- IEA, 2015. *World Energy Outlook 2015*. International Energy Agency, Paris. Available at: <http://www.worldenergyoutlook.org/weo2015/>.
- IEA, 2014. *Africa Energy Outlook: A Focus on Energy Prospects in Sub-Saharan Africa*. World Energy Outlook Special Report. International Energy Agency, Paris. Available at: <http://www.worldenergyoutlook.org/africa/>
- IMF, 2016. *Regional Economic Outlook: Sub-Saharan Africa*. Time for a Policy Reset. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2016/afr/eng/sreo0416.htm>.
- IMF, 2016. *World Economic Outlook Update July 2016: Uncertainty in the Wake of the U.K. Referendum*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/weo/2016/update/02/>.
- IMF, 2015. *Regional Economic Outlook: Sub-Saharan Africa. Dealing with the Gathering Clouds*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/sreo1015.htm>.
- IMF, 2015. How can sub-Saharan Africa harness the demographic dividend? In: *Regional Economic Outlook: Sub-Saharan Africa: Dealing with the Gathering Clouds*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/sreo1015.htm>.
- IMF, 2012. *Macroeconomic Policy Frameworks for Resource Rich Developing Countries*. International Monetary Fund, Washington, DC. Available at: <https://www.imf.org/external/np/pp/eng/2012/082412.pdf>.
- IPCC, 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Core Writing Team, R. K. Pachauri, and L. A. Meyer (eds.). Intergovernmental Panel on Climate Change, Geneva. Available at: <http://www.ipcc.ch/report/ar5/syr/>.
- IPCC, 2014. Summary for Policymakers. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastandrea, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. 1–32. Available at: <https://www.ipcc.ch/report/ar5/wg2/>.
- IPCC, 2013. Summary for Policymakers. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. T. F. Stocker, D. Qin, G.-K. Plattner, M. M. B. Tignor, S. K. Allen, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. Available at: <https://www.ipcc.ch/report/ar5/wg1/>.
- IRENA, 2016. *REmap: Roadmap for A Renewable Energy Future*. International Renewable Energy Agency, Abu Dhabi. Available at: <http://irena.org/remap/>.
- Jedwab, R., Christiaensen, L. and Gindelsky, M., 2016. Demography, urbanization and development: Rural push, urban pull and ... urban push? *Journal of Urban Economics*, in press. DOI:10.1016/j.jue.2015.09.002.
- Jedwab, R. and Vollrath, D., 2015. Urbanization without growth in historical perspective. *Explorations in Economic History*, 58. 1–21. DOI:10.1016/j.eeh.2015.09.002

- Jedwab, R., 2011. *Why is African Urbanization Different? Evidence from Resource Exports in Ghana and Ivory Coast*. Available at: <http://www.colorado.edu/Economics/seminars/SeminarArchive/2012-13/jedwab.pdf>.
- Jones, B. F. and Olken, B. A., 2008. The anatomy of start-stop growth. *Review of Economics and Statistics*, 90(3). 582–587. DOI:10.1162/rest.90.3.582.
- Kariuki, R. M., Bakalian, A. E., Lall, S., Wheeler, S., White, R., et al., 2013. *Harnessing Urbanization to End Poverty and Boost Prosperity in Africa: An Action Agenda for Transformation*. Africa Region Sustainable Development Series. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/710431468191672231/Harnessing-urbanization-to-end-poverty-and-boost-prosperity-in-Africa-an-action-agenda-for-transformation>.
- Kaufman, D. 2015. Evidence-based reflections on natural resource governance and corruption in Africa. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- Klevnäs, P., Stern, N., and Frejova, J. *Oil Prices and the New Climate Economy*. Global Commission on the Economy and Climate briefing paper. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Kudamatsu, M., Persson, T., and Strömberg, D., 2012. *Weather and Infant Mortality in Africa*. Institute for International Economic Studies, Stockholm University. Available at: http://perseus.iies.su.se/~dstro/Weather_Mortality.pdf.
- Kuznets, S. 1966. *Modern Economic Growth*. Yale University Press, New Haven, CT, US.
- Lam, V. W. Y., Cheung, W. W. L., Swartz, W. and Sumaila, U. R., 2012. Climate change impacts on fisheries in West Africa: implications for economic, food and nutritional security. *African Journal of Marine Science*, 34(1). 103–117. DOI:10.2989/1814232X.2012.673294.
- Lambe, F., Jürisoo, M., Wanjiru, H., and Senyagwa, J., 2015. *Bringing clean, safe, affordable cooking energy to households across Africa: an agenda for action*. Prepared by the Stockholm Environment Institute, Stockholm and Nairobi, for the New Climate Economy. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Lazard, 2015. Lazard’s Levelized Cost of Energy Analysis – Version 9.0. Available at: <https://www.lazard.com/perspective/levelized-cost-of-energy-analysis-90/>.
- Lee, R. and Mason, A., 2006. What is the demographic dividend? *Finance & Development*, 43(3). 16–17.
- Leipziger, D. and Yusuf, S., 2014. *Growth Strategies for Africa in a Changing Global Environment*. The Growth Dialogue. Working Paper No. 4. Available at: <http://www.growthdialogue.org/growth-strategies-africa-changing-global-environment>.
- Lemma, A. 2016. *Economic Transformation in Africa*. Background paper for this report.
- Lemma, A., forthcoming. *Productivity and Economic Transformation: Policies, Donor Activities and the Role of Kaizen*. Overseas Development Institute, London.
- Lewis, W. A., 1954. Economic development with unlimited supplies of labour. *The Manchester School*, 22(2). 139–191. DOI:10.1111/j.1467-9957.1954.tb00021.x.
- Linklaters LLP, 2016. *Renewables in Africa: Trending Rapidly Towards Cost-Competitiveness with Fossil Fuels*. Available at: <http://www.linklaters.com/Insights/ThoughtLeadership/Renewables-Africa/Pages/Index.aspx>.
- Lipton, M., 1977. *Why Poor People Stay Poor: A Study of Urban Bias in World Development*. Temple Smith, London.
- Litman, T., 2015. *Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl*, Victoria Transport Policy Institute, Contributing Paper for *Better Growth Better Climate: The New Climate Economy Report*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>

- Loayza, N. V. and Raddatz, C., 2010. The composition of growth matters for poverty alleviation. *Journal of Development Economics*, 93(1). 137–151. DOI:10.1016/j.jdeveco.2009.03.008.
- Lobell, D. B., Schlenker, W. and Costa-Roberts, J., 2011. Climate trends and global crop production since 1980. *Science*, 333(6042). 616–620. DOI:10.1126/science.1204531.
- Lovo, S., Bezabih, M., and Singer, G., 2015. *Green Agricultural Policies and Poverty Reduction*. Policy brief. Grantham Research Institute on Climate Change and the Environment and Global Green Growth Institute. Available at: <http://gggi.org/15370/>.
- Martins, P., 2015. *Sub-regional Perspectives on Structural Change*. Centre for Research in Economic Development and International Trade (CREDIT) Research Paper 15/03, University of Nottingham. Available at: <https://www.nottingham.ac.uk/credit/news/papers/1503.aspx>.
- Mayaux, P., Pekel, J.-F., Desclée, B., Donnay, F., Lupi, A., et al., 2013. State and evolution of the African rainforests between 1990 and 2010. *Philosophical Transactions of the Royal Society B*, 368(1625). 20120300. DOI:10.1098/rstb.2012.0300.
- McArthur, J.W., 2015. Taking stock of Africa's Green (Shoot) Revolution. In: *Africa at a Fork in the Road: Taking Off or Disappointment Once Again?* E. Zedillo, O. Cattaneo and H. Wheeler (eds.). Yale Center for the Study of Globalization. Available at: <http://www.ycsg.yale.edu/assets/downloads/africa.pdf>.
- McMillan, M., Page, J., Booth, D., and te Velde, D.W., forthcoming. *Supporting Economic Transformation: An Approach Paper*. To be available at: <http://set.odi.org>. June 2016 draft provided by authors.
- McMillan, M., Rodrik, D. and Verduzco-Gallo, Í., 2014. Globalization, structural change, and productivity growth, with an update on Africa. *World Development*, 63. 11–32. DOI:10.1016/j.worlddev.2013.10.012.
- McMillan, M., and Harttgen, K., 2014. *What is Driving the 'African Growth Miracle'?* AfDB Working Paper Series, No. 209. African Development Bank, Tunis. Available at: <http://www.afdb.org/en/documents/publications/working-paper-series/>.
- Mehlum, H., Moene, K. and Torvik, R., 2006. Institutions and the resource curse. *The Economic Journal*, 116(508). 1–20. DOI:10.1111/j.1468-0297.2006.01045.x.
- Mellor, J., 2003. *Faster, More Equitable Growth – The Relation between Growth in Agriculture and Poverty Reduction*. Agricultural Policy Development Project Research Report No.4, prepared by Abt Associates for the US Agency for International Development.
- Michaels, G., Rauch, F. and Redding, S. J., 2012. Urbanization and structural transformation. *The Quarterly Journal of Economics*, 127(2). 535–586. DOI:10.1093/qje/qjs003.
- Moretti, E., 2014. *Cities and Growth: Evidence Paper*. International Growth Centre. Available at: <http://www.theigc.org/publication/igc-evidence-paper-cities/>.
- Morris, M., Kaplinsky, R., and Kaplan, D., 2012. *One Thing Leads To Another: Promoting Industrialisation by Making the Most of the Commodity Boom in Sub-Saharan Africa*. Available at: <http://www.prism.uct.ac.za/Downloads/MMCP%20Book.pdf>.
- Newman, C., Page, J., Rand, J., Shimeles, A., and Soderbom, M., 2016. *Made in Africa: Learning to Compete*. Brookings Institution Press, Washington, DC.
- Niang, I., Ruppel, O. C., Abdrabo, M. A., Essel, A., Lennard, C., Padgham, J. and Urquhart, P., 2014. Africa. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel of Climate Change*. V. R. Barros, C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, et al. (eds.). Cambridge University Press, Cambridge, UK, and New York. 1199–1265. Available at: <https://www.ipcc.ch/report/ar5/wg2/>.

- OECD, 2015. *The Economic Consequences of Climate Change*. Organisation for Economic Co-operation and Development, Paris. Available at: <http://dx.doi.org/10.1787/9789264235410-en> Okonjo-Iweala, N., 2012. *Reforming the Unreformable: Lessons from Nigeria*. MIT Press, Cambridge, MA, US.
- Oliver, C., Kitchlu, R. and Morella, E., 2013. *Turning the Lights on Across Africa: An Action Agenda for Transformation*. Africa Region Sustainable Development Series, 76991. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/712791468194329656/Turning-the-lights-on-across-Africa-an-action-agenda-for-transformation>.
- Page, J., 2015. Structural change and Africa's poverty puzzle. In *The Last Mile in Ending Extreme Poverty*, L. Chandy, H. Kato and H. Kharas (eds.). Brookings Institution Press, Washington, DC. 219–248. Available at: <https://www.brookings.edu/book/the-last-mile-in-ending-extreme-poverty/>.
- Page, J., 2012. Can Africa industrialise? *Journal of African Economies*, 21(suppl 2). ii86–ii124. DOI:10.1093/jae/ejr045.
- Peel, M. C., Finlayson, B. L. and McMahon, T. A., 2007. Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences*, 11(5). 1633–1644. DOI:10.5194/hess-11-1633-2007.
- Petersen, R., Sizer, N., Hansen, M., Potapov, P., and Thau, D., 2015. Satellites discover 5 surprising hotspots for tree cover loss. WRI Insights Blog, 2 September. World Resources Institute, Washington, DC. Available at: <http://www.wri.org/blog/2015/09/satellites-uncover-5-surprising-hotspots-tree-cover-loss>.
- Polese, M., 2014. Why do cities in poor nations not create more wealth? Three simple statements and a window of opportunity. In: *The Buzz in Cities: New Economic Thinking*, S. Yusuf (ed.). The Growth Dialogue.
- Pritchett, L. and Summers, L., 2014. *Asiaphoria Meets Regression to the Mean*. NBER Working Paper 20573. National Bureau of Economic Research, Cambridge, MA. Available at: <http://www.nber.org/papers/w20573>.
- Rajaram, A., Minh Le, T., Kaiser, K., Kim, J.-H. and Frank, J., 2014. *The Power of Public Investment Management: Transforming Resources into Assets for Growth*. Directions in Development; Public Sector Governance. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/461121468164052711/The-power-of-public-investment-management-transforming-resources-into-assets-for-growth>.
- Ramachandran, V., Gelb, A., and Kedia Shah, M., 2009. *Africa's Private Sector: What's Wrong with the Business Environment and What to Do About It*. Center for Global Development. Available at: <http://www.cgdev.org/publication/9781933286280-africas-private-sector-whats-wrong-business-environment-and-what-do-about-it>.
- Ravallion, M., 2001. *Growth, Inequality, and Poverty: Looking Beyond Averages*. Policy Research Working Paper No. WPS 2558. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/141211468766471051/Growth-inequality-and-poverty-looking-beyond-averages>.
- Robinson, J. A., Torvik, R. and Verdier, T., 2006. Political foundations of the resource curse. *Journal of Development Economics*, 79(2). 447–468. DOI:10.1016/j.jdeveco.2006.01.008.
- Rodrik, D. 2015. *Premature Deindustrialization*. NBER Working Paper No. 20935. National Bureau of Economic Research. Available at: <http://www.nber.org/papers/w20935>.
- Rodrik, D., 2014. *An African Growth Miracle?* Economics Working Papers, No. 102. Institute for Advanced Study, Princeton, NJ, US. Available at: <https://www.sss.ias.edu/files/papers/econpaper102.pdf>.
- Rodrik, D., 2013. *Structural Change, Fundamentals and Growth: An Overview*. Institute for Advanced Study, Princeton, NJ, US. Available at: https://www.sss.ias.edu/files/pdfs/Rodrik/Research/Structural-Change-Fundamentals-and-Growth-An-Overview_revised.pdf.
- Rodrik, D., 2013. *The Past, Present, and Future of Economic Growth*. Global Citizen Foundation Working Paper 1. Global Citizen Foundation, Switzerland. Available at: http://www.gcf.ch/?page_id=5758.

- Rodrik, D., 2013. Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1). 165–204. DOI:10.1093/qje/qjs047.
- Rodrik, D., 2009. Industrial policy: don't ask why, ask how. *Middle East Development Journal*, 01(01). 1–29. DOI:10.1142/S1793812009000024.
- Rodrik, D., 2008. *Normalizing Industrial Policy*. Commission on Growth and Development Working Paper No. 3. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/524281468326684286/Normalizing-industrial-policy>.
- Rodrik, D., 2008. *The Real Exchange Rate and Economic Growth*. Brookings Papers on Economic Activity, No. 2/2008. Brookings Institution, Washington, DC. Available at: <https://www.brookings.edu/bpea-articles/the-real-exchange-rate-and-economic-growth/>.
- Rydge, J., 2015. *Implementing Effective Carbon Pricing. Contributing paper for Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Rydge, J., Jacobs, M. and Granoff, I., 2015. *Ensuring New Infrastructure is Climate-Smart. Contributing paper for Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*. New Climate Economy, London and Washington, DC. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Schlenker, W. and Lobell, D. B., 2010. Robust negative impacts of climate change on African agriculture. *Environmental Research Letters*, 5(1). 14010. DOI:10.1088/1748-9326/5/1/014010.
- Scott, A., 2015. *Building Electricity Supplies in Africa for Growth and Universal Access*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Scott, A., Darko, E., Lemma, A., and Rud, J., 2014. *How Does Electricity Insecurity Affect Businesses in Low and Middle Income Countries?* Overseas Development Institute, London. Available at: <https://www.odi.org/publications/9184-electricity-energy-security-sme-economic-growth>.
- Spence, M., Annez, P. C. and Buckley, R. M., 2008. *Urbanization and Growth: Commission on Growth and Development*. 47061. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/298101468176683270/Urbanization-and-growth-commission-on-growth-and-development>.
- Stefanski, R., 2012. *Structural Transformation and Pollution*. Available at: http://cowles.econ.yale.edu/conferences/2012/sum12/ma_stefanski.pdf.
- Sutton, J., and Langmead, G., 2013. *An Enterprise Map of Zambia*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.
- Sutton, J., and Kpentey, B., 2012. *An Enterprise Map of Ghana*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.
- Sutton, J., and Olomi, D., 2012. *An Enterprise Map of Tanzania*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.
- Sutton, J., and Kellow, N., 2010. *An Enterprise Map of Ethiopia*. International Growth Centre, London. Available at: <http://www.theigc.org/project/the-enterprise-map-series/>.
- Syverson, C., 2011. What determines productivity? *Journal of Economic Literature*, 49(2). 326–365. DOI:10.1257/jel.49.2.326.
- Syverson, C., 2004. Product substitutability and productivity dispersion. *Review of Economics and Statistics*, 86(2). 534–550. DOI:10.1162/003465304323031094.
- The Economist, 2016. Coming up roses. 16 April. Available at: <http://www.economist.com/news/special-report/21696791-kenyas-flower-export-business-rare-success-coming-up-roses>.

- The Economist, 2016. A green evolution. 12 March. Available at: <http://www.economist.com/news/briefing/21694521-farms-africa-are-prospering-last-thanks-persistence-technology-and-decent>.
- The Economist, 2014. Palm oil in West Africa: Grow but cherish your environment. 16 August. Available at: <http://www.economist.com/news/middle-east-and-africa/21612241-companies-wanting-make-palm-oil-face-angry-environmentalists-grow-cherish>.
- The Economist, 2013. Cash to the poor: Pennies from heaven. 26 October. Available at: <http://www.economist.com/news/international/21588385-giving-money-directly-poor-people-works-surprisingly-well-it-cannot-deal>.
- The World Bank, n.d. World Development Indicators database. Available at: <http://databank.worldbank.org>.
- The World Bank, 2015. Showcasing the link between forests and climate change: three examples of REDD+ in Africa. Web feature. Available at: <http://www.worldbank.org/en/news/feature/2015/12/04/showcasing-the-link-between-forests-and-climate-change-three-examples-of-redd-in-africa>.
- The World Bank, 2007. *World Development Report 2008: Agriculture for Development*. Washington, DC. Available at: <http://hdl.handle.net/10986/5990>.
- Timmer, P. 2010. *A World Without Agriculture? The Historical Paradox of Agricultural Development*. American Enterprise Institute, Washington, DC. Available at: <https://www.aei.org/publication/a-world-without-agriculture/>.
- Timmer, P. and Akkus, S., 2008. *The Structural Transformation as a Pathway out of Poverty: Analytics, Empirics and Politics*. Working Paper 150. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/publication/structural-transformation-pathway-out-poverty-analytics-empirics-and-politics-working>.
- Timmer, P. 2002. Agriculture and economic development. In: *Handbook of Agricultural Economics*, B. Gardner and G. Rausser (eds.). Elsevier Science, Amsterdam.
- Tol, R. S. J., 2009. The economic effects of climate change. *Journal of Economic Perspectives*, 23(2). 29–51. DOI:10.1257/jep.23.2.29.
- UBS, 2016. *Extreme Automation and Connectivity: The Global, Regional, and Investment Implications of the Fourth Industrial Revolution*. UBS White Paper for the World Economic Forum Annual Meeting 2016. Available at: https://www.ubs.com/global/en/about_ubs/follow_ubs/highlights/davos-2016.html.
- UNDP, 2015. *Human Development Report 2015: Work for Human Development*. United Nations Development Programme, New York. Available at: <http://hdr.undp.org/en/2015-report>.
- UNDP, Various Dates. UNDP Climate Change Country Profiles. Available at: <http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/>
- UNECA, 2016. *Greening Africa's Industrialization: Economic Report on Africa 2016*. United Nations Economic Commission on Africa, Addis Ababa. Available at: <http://www.uneca.org/publications/economic-report-africa-2016>.
- UNECA and UNEP. 2007. *Making Africa's Power Sector Sustainable: An Analysis of Power Sector Reform in Africa*. United Nations Economic Commission for Africa and United Nations Environment Programme, Addis Ababa. Available at: <http://repository.uneca.org/handle/10855/15059>.
- UNEP Finance Initiative, 2012. *Financing Renewable Energy in Developing Countries: Drivers and Barriers for Private Finance in Sub-Saharan Africa*. A study and survey by the UNEP Finance Initiative on the views, experiences and policy needs of energy financiers. United Nations Environment Programme Finance Initiative, Geneva. Available at: http://www.unepfi.org/fileadmin/documents/Financing_Renewable_Energy_in_subSaharan_Africa.pdf.
- UNIDO, 2009. *Industrial Development Report 2009*. United Nations Industrial Development Organization, Geneva.

- van Benthem, A.A., 2015. Energy leapfrogging. *Journal of the Association of Environmental and Resource Economists*, 2(1). 93–132. DOI:10.1086/680317.
- van Benthem, A. and Romani, M., 2009. Fuelling growth: what drives energy demand in developing countries? *The Energy Journal*, 30(3). 91–114. Available at: <http://www.jstor.org/stable/41323369>.
- Venables, A. 2015. *Making Cities Work for Development*. Growth Brief, May 2015. International Growth Centre. Available at: <http://www.theigc.org/publication/making-cities-work-for-development/>.
- Voigt, S., De Cian, E., Schymura, M. and Verdolini, E., 2014. Energy intensity developments in 40 major economies: Structural change or technology improvement? *Energy Economics*, 41. 47–62. DOI:10.1016/j.eneco.2013.10.015.
- Wagner, G., and Weitzman, M.L., 2015. *Climate Shock: The Economic Consequences of a Hotter Planet*. Princeton University Press, Princeton, NJ, US. Available at: <http://press.princeton.edu/titles/10414.html>.
- Waldinger, M., 2015. *The Effects of Climate Change on Internal and International Migration: Implications for Developing Countries*. Working Paper No. 192. Grantham Research Institute on Climate Change and the Environment. Available at: <http://www.lse.ac.uk/GranthamInstitute/publication/the-effects-of-climate-change-on-internal-and-international-migration-implications-for-developing-countries/>.
- Waldinger, M., and Fankhauser, S., 2015. *Climate Change and Migration in Developing Countries: Evidence and Implications for PRISE Countries*. Policy paper. Grantham Research Institute on Climate Change and the Environment. Available at: <http://eprints.lse.ac.uk/64526/>.
- Wheeler, D., 2011. *Quantifying Vulnerability to Climate Change: Implications for Adaptation Assistance*. Working Paper 240. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/publication/quantifying-vulnerability-climate-change-implications-adaptation-assistance-working>.
- Wheeler, D., 2011. Mapping the impacts of climate change. Web feature. Center for Global Development, Washington, DC. Available at: <http://www.cgdev.org/page/mapping-impacts-climate-change>.
- Whitley, S., and van der Burgh, L., 2015. *Fossil Fuel Subsidy Reform in Sub-Saharan Africa: From Rhetoric to Reality*. New Climate Economy Working Paper. Available at: <http://newclimateeconomy.report/workingpapers/>.
- Winterbottom, R., Reij, C., Garrity, D., Glover, J., Hellums, D., McGahuey, M. and Scherr, S., 2013. *Improving Land and Water Management*. Creating a Sustainable Food Future, Installment Four. World Resources Institute, Washington, DC. Available at: <http://www.wri.org/publication/improving-land-and-water-management>.
- Williamson, J., 2011. *Trade and Poverty: When the Third World Fell Behind*. MIT Press, Cambridge, MA, US.
- Woldeyes, F. and Bishop, R., 2015. Unlocking the Power of Ethiopia's Cities. Report by Ethiopia's New Climate Economy Partnership. Ethiopian Development Research Institute and Global Green Growth Institute, Addis Ababa.
- Wolfram, C., Shelef, O. and Gertler, P., 2012. How will energy demand develop in the developing world? *Journal of Economic Perspectives*, 26(1). 119–138. DOI:10.1257/jep.26.1.119.
- World Resources Institute, 2015. African countries launch AFR100 to restore 100 million hectares of land. Press release, 5 December. Available at: <http://www.wri.org/news/2015/12/release-african-countries-launch-afr100-restore-100-million-hectares-land>.
- Yoshino, Y., 2008. *Domestic Constraints, Firm Characteristics, and Geographical Diversification of Firm-Level Manufacturing Exports in Africa*. Policy Research Working Paper; No. WPS 4575. The World Bank, Washington, DC. Available at: <http://documents.worldbank.org/curated/en/115861468212383773/Domestic-constraints-firm-characteristics-and-geographical-diversification-of-firm-level-manufacturing-exports-in-Africa>.
- Zhao, X., 2016. *Climate Variability and Change in Sub-Saharan Africa*. A background paper for this report.

Acknowledgements

The paper has benefitted from valuable input from the UK Department for International Development (DFID), German Development Institute (DIE), Green Growth Institute (GGGI), Norwegian Government, Organisation for Economic Co-operation and Development (OECD), London School of Economics and Political Science (LSE), Overseas Development Institute (ODI), Swedish Government, United Nations Development Programme (UNDP), World Bank, and World Resources Institute (WRI).

The authors would like to thank the following individuals for comments on the report: Pedro Conceicao, Ian de Cruz, Patrick Curran, Chris Delgado, Sam Fell, Kitty van der Heijden, Sonia Hoque, Helen Mountford, Michael Jacobs, Wilfried Lütkenhorst, Jonathan Mazliah, Arthur Minsat, Thang Nguyen, John Page, Anna Pegels, Cory Rand, Mark Robinson, James Rydge, and Daniel Yeo.

The work has also been enriched from ongoing collaboration and discussions with the Ethiopian Development Research Institute and the Economic Policy Research Centre, Uganda - particularly Gebrehiwot Ageba, Sarah Ssewanyana Firew Woldeyes, and Madina Guloba.

Many thanks to Marion Davis for editing, Jenna Park for design, Catlyne Haddaoui for translation, and Ferzina Banaji, Filippo Rodriguez, and Joel Jaeger for production.

THE **NEW** CLIMATE **ECONOMY**

The Global Commission on the Economy and Climate

SET SUPPORTING
ECONOMIC
TRANSFORMATION



New Climate Economy

c/o World Resources Institute
10 G St NE
Suite 800
Washington, DC 20002, USA
+1 (202) 729-7600
www.newclimateeconomy.net
www.newclimateeconomy.report

Overseas Development Institute

203 Blackfriars Road
London, SE1 8NJ
+44 (0) 20 7922 0300
www.odi.org
set.odi.org

978-0-9906845-9-6



This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivative Works 3.0 License. To view a copy of the license, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/>