Implications for Africa and the world

5.1 Introduction

How the African energy system evolves over the next two decades, and what it will look lik in 2040, are vitally important questions not only for Africa but also the rest of the world. The future pathway is far from certain but, whatever the policy choices, the implications of those choices will resonate throughout Africa and beyond. We have outlined possible pathways for the continent's energy development to 2040 as described in de Chapters 2, 3 and 4. These pathways are based on an in-depth, sector-by-sector an country-specific analysis of Africa's energy sector opportunities: to the best of our knowledge, this is the most comprehensive such analysis undertaken to date.

The chapter consists of two secti

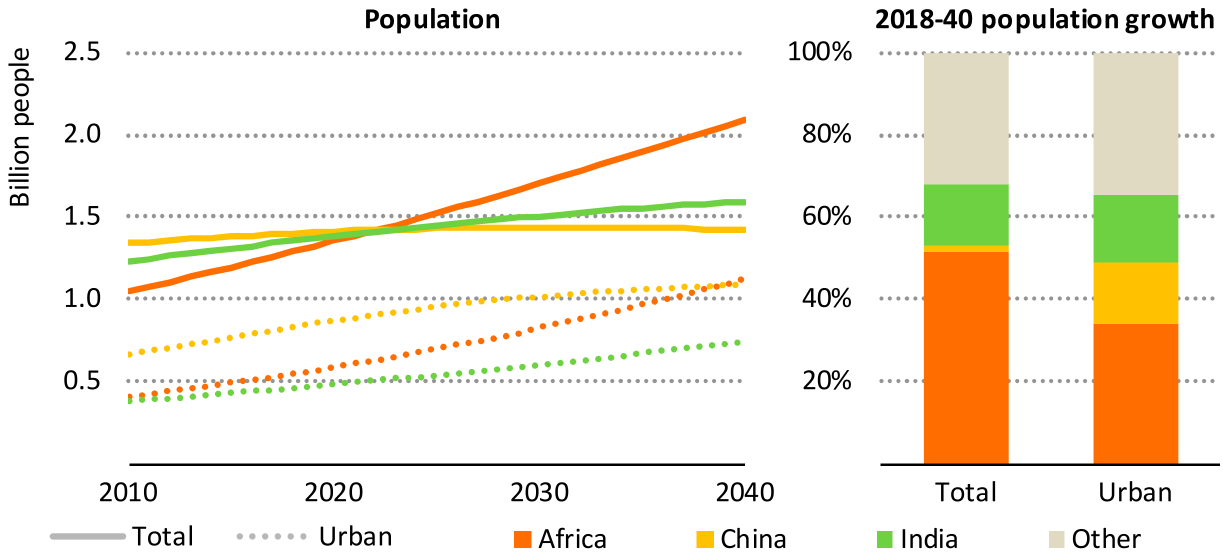
- **A discussion of the policy implications and outcomes of the analysis in the global context**: This section provides a brief summary of what the future might hold for Africa's energy sector, and what it might mean for global energy and emissions trends, looking in particular at two scenarios. The first is the Stated Policies Scenario, which takes account of existing plans and announced intentions, and the second is the Africa Case, which is based on the Agenda 2063 vision agreed by African leaders (see Box I.2 in the introduction).
- **Detailed regional and country energy profiles**: The second part presents the results of the Stated Policies Scenario and Africa Case for sub-Saharan Africa as a whole as we as for eleven countries in this region: Angola, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Senegal, South Africa and Tanzania. The countries covered represent three-quarters of sub-Saharan Africa gross domestic product (GDP) and energy demand today, and two-thirds of population. The profiles aim to provide decision makers with a data-rich set of information on the potential energy pathways for each country, considering their unique energy demand and supply needs and stages of development.

5.2 Implications for the wor

Africa's population is among the fastest growing and youngest in the world, and this tren is set to continue in the period to One-in-two people added to the world populatio by 2040 are African, and a third of global urban population growth occurs in Afric (Figure 5.1).

Over the next 20 years, total population growth in Africa is more than double the combined population growth of China, India and Southeast Asia. In the coming years, Africa overtakes both China and India in terms of total population. This large increase (mostly occurring in cities) will be a major force driving Africa's energy demand growth.

Figure 5.1 ▷ Total and urban population in Africa, China and India, and share in global growth, 2018-2040



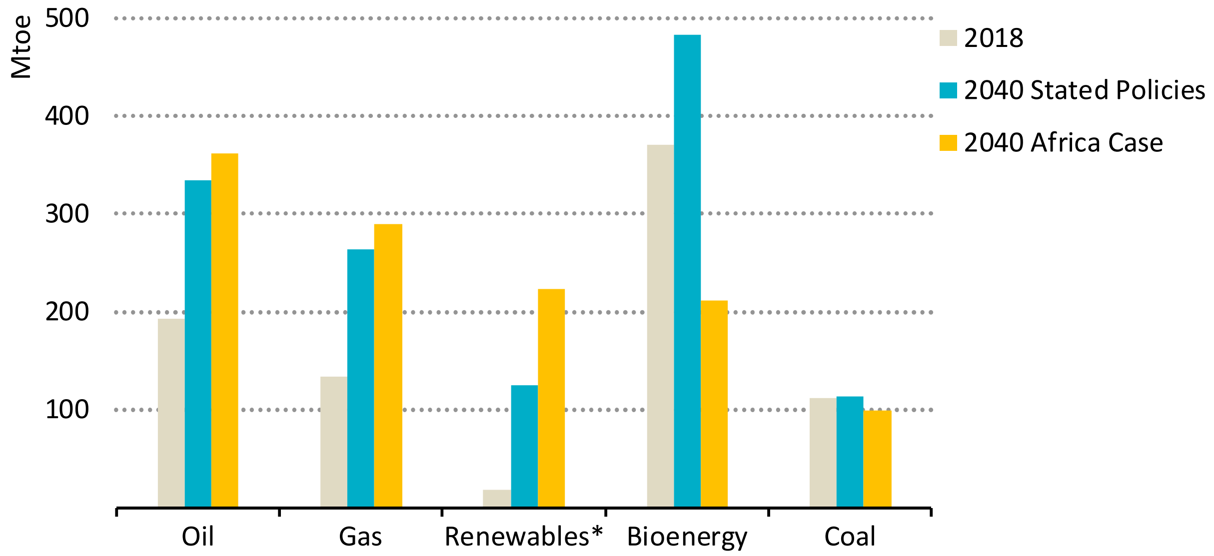
One-in-two people added to the world population and one-in-three people added to urban populations in the period to 2040 are frican

5.2.1 Africa as a key driver for global energy demand growth

A rapidly rising population and growing pace of urbanisation make Africa a key driver of global energy demand growth. In the Stated Policies Scenario, total primary energy demand in Africa grows by 2% per year between 2018 and 2040, double the pace of global demand growth. At the same time, the composition of energy consumption in Africa increasingly moves away from the traditional use of biomass to modern and more efficient energy sources, notably electricity, natural gas and oil produ

Effective energy policy choices are essential not only to bring to fruitio growth ambitions (including those contained in Agenda 2063), but also to support economic and developmental goals. These goals include building a sustainable energy system, managing the rapid pace of urbanisation, scaling up industrial capacity and maximising the value of the continent's natural resources. As a tangible representation of the Agenda 2063 vision, the Africa Case incorporates policies to build the African energy sector in a way that allows higher economic growth to be sustainable and inclusive. It shows that achieving the goals of Agenda 2063 does not necessarily require more energy-intensive economies, compared with the Stated Policies Scenario. There is a considerable reduction of bioenergy use in the Africa Case, and growth in demand for other sources o energy is moderated by strong efficiency improvements. There is also a significant increase in electricity demand, but additional demand is mostly met by renewables. As a result, overall primary energy demand in 2040 in the Africa Case is 10% less than in the Stated Policies Scenario (Figure 5.2).

Figure 5.2 ▷ Total primary energy demand by fuel and scenario in Africa



Achieving the outcome of the Africa Case ad only marginal amounts to demand for oil and gas relative to the Stated Policies Scenario while reducing the use of bioenergy

* Excludes bioenergy.

Africa emerges as a key source of **global oil demand** growth in our projections. At present, car ownership levels in Africa – especially in sub-Saharan Africa – are very low (in Ethiopia, for example, less than 2-out-of-1 000 people own a car). Oil demand grows as the size of the car fleet expands, and as liquefied petroleum gas (LPG) is increasingly used for clean cooking.

In the Stated Policies Scenario, the size of the car fleet in Africa more than doubles by 2040. This contributes to an increase of oil demand by 3.1 million barrels per day (mb/d) over the period, higher than the projected growth in China and second only to that of India. However, average car ownership levels in sub-Saharan Africa (excluding South Africa) 2040 are still equivalent only to 60% of the level in India today. The lack of policies both for new and second-hand vehicles means that most cars have low fuel efficiency and a subject to emissions standards that are common in many parts of the world.

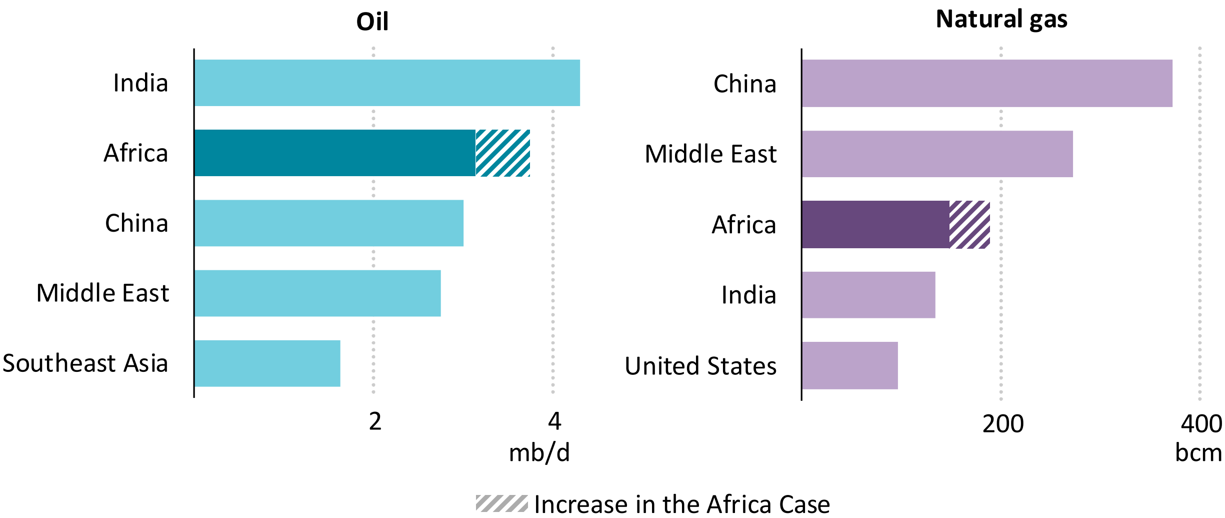
In the Africa Case, the number of cars increases further to nearly 80 million by 2040, but improved vehicle efficiency offsets the expansion of car stocks and the numbers of kilometres driven. An increase in oil demand in this scenario relative to the Stated Policies Scenario is rather driven by the residential sector, where progress towards clean cooking creates additional demand for LPG.

Africa's growing weight is also felt in **natural gas markets**. The combination of renewables and natural gas provides a good fit for the development vision that African leaders signed up to in Agenda 2063. In the power sector, natural gas can help satisfy the growing appetite for baseload electricity and complement the rapid expansion of renewables, especially in those countries with large gas resources. There are also many energy uses that are hard electrify (for example, industrial processes such as steel making) that are likely to see demand growth as African industry supports the continent's growth in urbanisation and infrastructure. In many cases, the choice for these uses is between gas and other (polluting) fossil fuels rather than between gas and renewables.

The challenges for natural gas development relate to infrastructure, affordability and business models. A number of major gas discoveries (representing over 40% of global gas discoveries between 2011 and 2018) have been made in recent years, but the extent to which they will provide fuel for African development, as well as revenue from export, is uncertain. Making the most of these resources would require new pipeline infrastructure, although small-scale liquefied natura LNG) technologies are allowing a new approach to distribute gas to consumers. Much will depend on the strength of Africa's policy push to displace polluting fuels from its energy mix, or to prevent them gaining a stronger foothold, and on the availability of finance to support the expansion of gas infrastructure.

In the Stated Policies Scenario, the share of gas in sub-Saharan Africa's energy mix ris from 5% today (one of the world's lowest) to just under 10% in 2040. In the Africa Case, it reaches almost 20% in 2040. In both scenarios, Africa becomes the third-largest source of additional gas demand globally between today and 2040, following China and the Middle East (Figure 5.3). Thanks to the emergence of new producers, notably Mozambique, Tanzania, Senegal and Mauritania, Africa also strengthens its position in global export markets.

Figure 5.3 ▷ Growth in oil and natural gas demand by region in the Stated Policies Scenario and Africa Case, 2018-2040



Africa emerges as a key source of demand growth for oil and natural gas. The growth in oil demand is second only to India; the growth in gas demand is the largest in the world

Reliable electricity supply plays a central role in meeting rising energy deman Electricity demand in Africa is set to increase strongly, more than doubling from 700 terawatt- TWh) today to over 1 6 TWh in 2040 in the Stat Policies Scenario and to 2 300 TWh in the Africa Case. Renewables make a major contribution to the additional generation required. Falling costs drive the fast deployment of utility-scale and distributed solar photovoltaics (PV), and deployment of geothermal and wind also picks up sharply: in the Stated Policies Scenario, the combined contribution of these non-hydro renewable resources increases from less than 5% today to around 30% of Africa's tota power generation in 2040. Hydropower also remains a cornerstone of sub-Saharan Africa's power system – notably in the Democratic Republic of the Congo (DR Congo), Ethiopia and Mozambique – and generation almost triples by 2040. Better regional co-operation and integration of power networks is instrumental in unlocking hydropower's huge potential

The scale of deployment of non-hydro renewables is even more significant in the Africa Case. A large part of this comes from solar PV, which overtakes hydropower and natural gas to become the largest electricity source in Africa in terms of installed capacity (and the second-largest in terms of generation output). Sola PV deployment between today and 2040 amounts to almost 15 gigawatts (GW) a year, equivalent to the amount of solar PV capacity the United States adds every year over the same period. Wind also expands rapidly in several countries benefiting from high quality wind resources, notably Ethiopia, Senegal and South Africa, while Kenya is at the forefront of geothermal deployment. The growth in overall renewable-based electricity generation in African countries is higher than in the European Union (Figure 5.4).

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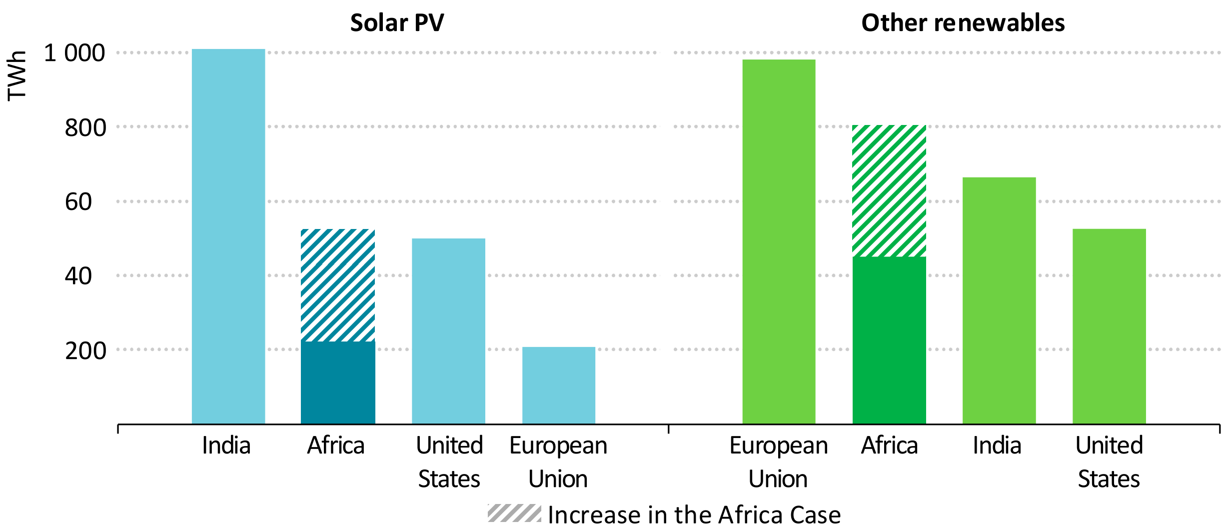
Figure 5.4 ▷ Growth in renewables-based electricity generation in selected regions, 2018-2040



Renewables account for three-quarters of additional electricity generation in the Africa Case, and bring Africa to centre stage in global renewables markets

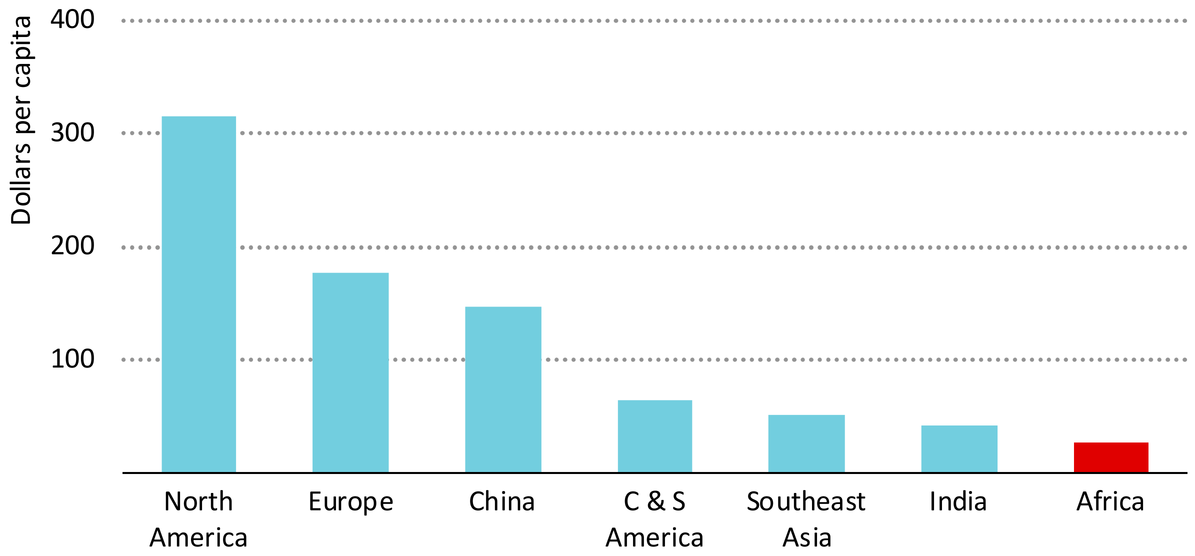
Note: Other renewables include hydro, wind, geothermal, concentrating solar power and biomass.

Achieving this level of deployment would require the development of efficient supply chains and the physical infrastructure necessary to facilitate smooth trade in goods and technologies between countries (as envisaged in the African Continental Free Trade Area). A favourable regulatory environment which reduces risks and the cost of finance would also be essential, as would the technical capacity to underpin a large-scale installation and maintenance sector.

5.2.2 Mobilising investment for reliable power: challenging but achievable

Africa needs to expand its energy infrastructure, especially in the power sector, to serve its growing population. Despite being home to 17% of the world's population, Africa currently accounts for just 4% of global power supply investment. On a per capita basis, power supply investment in Africa ranks among the lowest in the world (Figure 5.5). In sub-Saharan Africa, power generation capacity per capita has shown little or no growt since 1990 while that of India and Southeast Asia has grown fourfold.

Figure 5.5 ▷ Per capita power supply investment by region, 2018



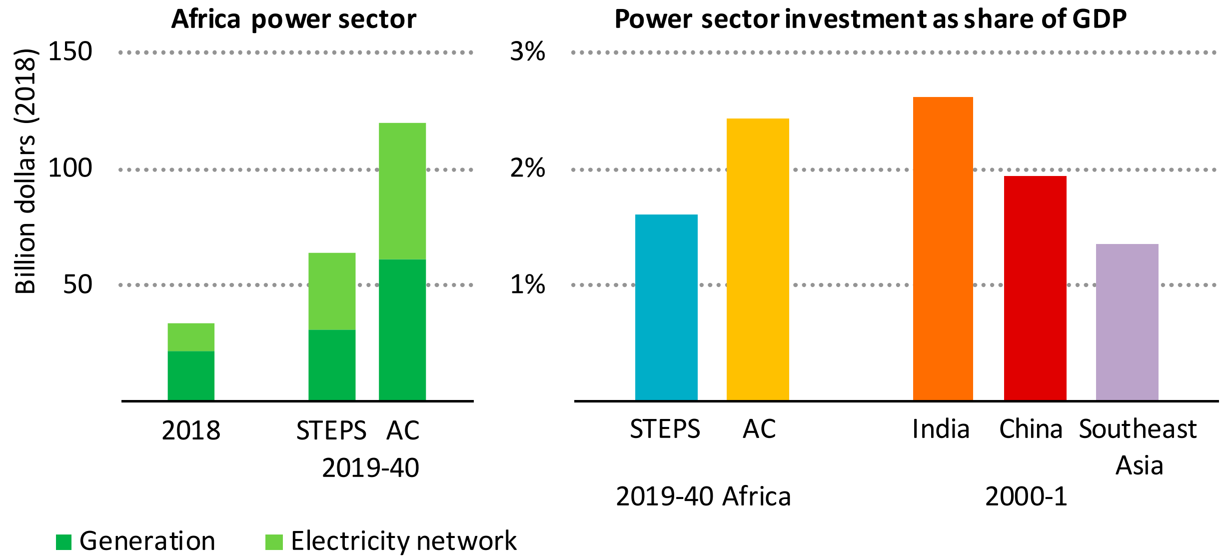
Africa's per capita investment in power pply ranks among the lowest in the world

Note: C & S America = Central and South America.

Addressing the deficit of power infrastructure in Africa will require a significant ramp-up in spending. Investments in power supply need to double through to 2040 in the Stated Policies Scenario to around $65 billion per year. The Africa Case requires a further doubling to around $120 billion per year to ensure reliable and affordable power for all and to serve an economy growing at over 6% a year. Nigeria, South Africa, DR Congo and Ethiopia are among the countries with the highest investment needs. Half of the investment is needed to expand and upgrade electricity networks – including mini-grids – and most of the rest is needed to increase low-carbon generation capacity where solar PV plays an important role. Investment needs in solar PV in sub-Saharan Africa amount to almost $25 billion per year on average in the Africa Case – almost double the level of investment in the European Union today.

The cumulative investment in Africa's power supply between 2019 and 2040 reaches $1.4 trillion in the Stated Policies Scenario (1.6% of the cont P over the same period) and $2.6 trillion in the Africa Case (2.4% of GDP). Mobilising these levels of investment is a significant undertaking, but it is achievable if concerted efforts are made by African governments and the global community. There are some precedents. India, for example, has invested the equivalent of 2.6% of GDP in the power sector since 2000 and China has invested 1.9% of GDP over the same period (Figure 5.6).

Figure 5.6 ▷ Average annual power supply investment in Africa by scenario and historical power sector investment in selected regions



Scaling up power supply investment is challenging but achievable if concerted efforts are made to establish a favourable investment climate and reduce investment risks

Notes: STEPS = Stated Policies Scenario; AC = Africa Case.

To date, investment in power supply in Africa has relied largely on state budgets with significant contributions from development finance institutions (DFIs). The prominent role of these public sources is likely to continue. Against a backdrop of growing fiscal deficits in many countries and tightening donor resources, however, it is critical that public spending is supplemented by private capital and that funding from DFIs is used to catalyse private financing.

Mobilising private capital requires concerted efforts from both African governments and international DFIs. A large number of countries in Africa limit private participation in the power sector: 16-out-of-43 sub-Saharan African countries do not allow private participation in both generation and electricity networks. Establishing a framework for private capital is clearly a necessary first step. Many of the utilities are loss-making and have low operational efficiency: 19-out-of-39 utilities in sub-Saharan Africa are not able to recover enough cash to cover operational expenses (Kojim Together with below-cost tariffs a collection rates, this raises investment risks and makes it difficult to secure financing at

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affordable costs. Improving the financial and operational performance of utilities and moving towards cost-recovery are therefore essential to attract financing. R procurement frameworks (using competitive auctions, for example) and well-designed contracts are also crucial to enhance project bankability.

There is scope for international DFIs to help scale up investment and catalyse more private capital. Between 2013 and the first half of 2018, power sector investments based on private participation in infrastructure models in sub-Saharan Africa amounted to around $4.5 billion per year on average (less than 10% of the annual power sector investment needs between today and 2040), with South Africa accounting for more than half. Outside South Africa, each dollar of public funding (from DFIs and state budgets) attracted $0.6 of private capital either directly (via equity and direct loan) or indirectly (via guarantee) – the figure is $0.4 for renewables. This compares unfavourably with $0.9 for Southeast Asia and more than $4 for South Africa. It is therefore important for international DFIs not only to scale up direct investments but also to encourage private sector investment through targeted interventions (such as risk sharing, liquidity support and take-out financing). There is also a need to nurture the local financial sector to provide a sustained flow of long-term financing to infrastructure projects.

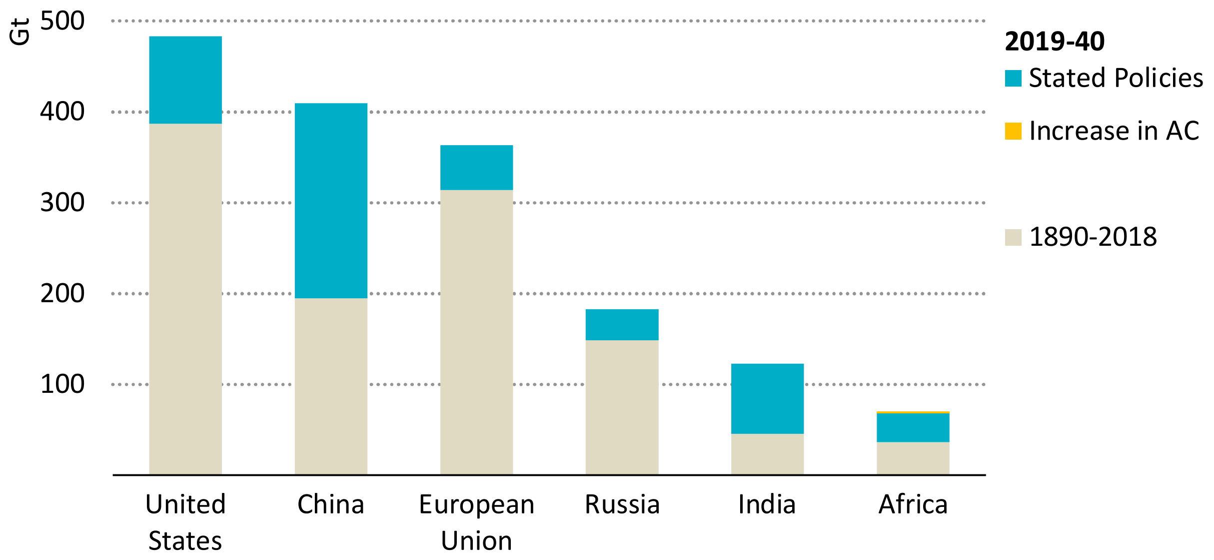
The prospects for Africa's power supply investment will be stronger if governments in African countries take account of what have worked well (and what have not) in other countries. India provides some instructive les In the 2000s, the Indian government introduced a number of measures to establish a policy and regulatory framework to attract private capital, including model architecture for public-private partnerships (PPP) and financial instruments (such as an on-lending facility) to induce local financial institutions to invest in infrastructure. This contributed to a significant scale-up of private investment in power infrastructure and India was recognised as the highest recipient of PPP investments worldwide (World Bank, 2015). However, scrutiny of the commercial viability of project was sometimes insufficiently rigorous, there were frequent construction delays, and the availability of fuel was often limited: this led to many projects performing less well than expected, and emphasises that there are potential pitfalls to manage even where the overall framework is a strong one.

5.2.3 Not a major emitter, but climate change matters greatly for Afric

Africa has not been a significant contributor to global greenhouse gas (GHG) emissions during the age of industrialisation. Energy-related carbon dioxide (CO_2) emissions in Africa accounted for only 2% of global cumulative emissions from 1890 to today (Figure 5.7). Although Africa experiences rapid economic growth in the Stated Policies Scenario (by tw and-a-half times from today to 2040), its contribution to global energy-rel CO_2 emissions increases to just 4.3% over the period to 2

Realising the outcomes in the Africa Case would increase total CO_2 emissions over the period to 2040 by around 2 gigatonnes (Gt (or 100 million tonnes (Mt) per year) relative to the Stated Policies Scenario, raising Africa's contribution to 4.5%. Although this is not a major increase globally, it is highly desirable – and in line with the vision in Agenda 2063 – that they are attained in a way which takes full account of the importance of sustainability, with a very strong role for clean energy sources. Looking beyond CO_2, the transition away from the inefficient combustion of biomass for cooking in the Africa Case leads to same levels of GHG emissions as in the Stated Policies Scenario as the increase in CO_2 emissions offset by reductions in other GHGs (methane and nitrous oxide).

Figure 5.7 ▷ Cumulative energy-related CO_2 emissions by region and scenario



Africa has accounted for a very small share of global CO_2 emissions to date, and that does not change to 2040

Note: AC = Africa Case.

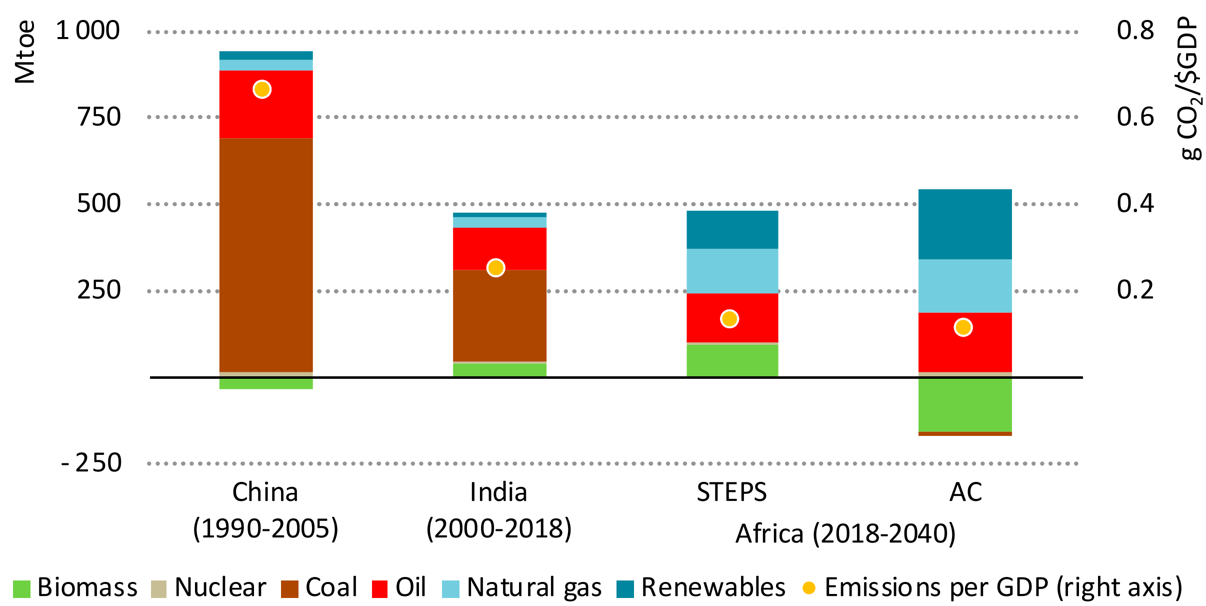
Thanks to technology improvements and resource endowments, Africa has the opportunity to pursue a much less carbon-intensive model of development than seen in many other parts of the world. For example, China relied heavily on coal (and oil to a lesser extent) to replace bioenergy and meet rapidly growing energy demand between 1990 and 2005 when its economy registered a fourfold growth. This resulted in cumulative emissions of around 50 Gt CO_2, meaning that China incurred around 660 grammes of carbon dioxide O_2) emissions to generate one dollar of GDP over this period. India has similarly relied on coal, oil and (to a lesser extent) natural gas to serve its expanding economy over the two decades since 2000. This was accompanied by cumulative emissions of around 28 Gt O_2 or 250 g CO_2 per dollar of P.

In our projections, however, Africa follows a different pathway, with much stronger shares of renewables and natural gas in the energy mix. In the Stated Policies Scenario, the share of renewables (excluding bioenergy) and natural gas grows significantly to 10% and 20% respectively by 2040, while the reliance on traditional uses of bioenergy and coal diminishes. As a result, only 130 g of O_2 emissions are incurred to generate one dollar of GDP between today and 2040, while the economy grows at a rate of 4% per year.

In the Africa Case, the size of the economy almost quadruples in the period to 2040, but the continent consumes less energy overall with a higher share of cleaner energy sources. The shares of renewables and natural gas expand further to 20% and 25% by 2040, while the share of traditional uses of bioenergy declines. The emissions associated with economic growth are 15% lower in this case, at around 110 g CO_2 per dollar of GDP (Figure 5.8). These emissions relative to economic growth are lower than the figures observed in advanced economies between 2000 and 2018.

With the appropriate policies to support a strong expansion of clean energy and sufficient emphasis on energy efficiency improvements, Africa could be the first continent to achieve a significant level of industrialisation with cleaner energy sources playing a prominent role, requiring much less energy and emissions to deliver economic growth than other economies in the past.

Figure 5.8 ▷ Changes in primary energy demand by fuel and associated emissions per GDP in China, India and Africa



Africa ould be the first continent where renewa les and gas play a prominent role in supporting a shift away from bioenergy and underpinning economic and industr l growth

Notes: STEPS = Stated Policies Scenario, AC: Africa Case. Emissions per GDP = cumulative CO_2 emissions / cumulative GDP during the indicated period. Renewables exclude bioenergy

While Africa is responsible for a relatively small portion of globa O_2 emissions, its ecosystems already suffer disproportionately from global climate change, and future impacts are expected to be substantial. The continent therefore not only needs to adapt to the warming already experienced but also to prepare for the intensification of climate change impacts (World Bank, 2018). Temperatures in Africa are likely to rise faster than the global average during the 21st century. Climate change and climate variability are likely to multiply existing threats and pose increased risks to food, health and economic security in Africa (IPCC, 2014).

This underlines the importance of ensuring that new infrastructure in Africa is climate-resilient. For example, only 30% of the buildings that are likely to exist in 2040 have already been built. If building codes are implemented for new buildings to optimise the use of natural light and ventilation for passive cooling, this could reduce the need for cooling systems (fans and air conditioners) and avoid the potential heat islanding effects that could occur in cities (see Spotlight in Chapter 2). Today, a quarter of the global population living in areas that are hot enough to require cooling systems live in Africa, and this share increases to 30% by 2040 in all scenarios. As new cities are built or existing cities grow larger, smart planning is essential to ensure that buildings are highly energy efficient and to facilitate sustainable modes of public transport.

Climate change is also likely to affect the availability of hydro resources. Detail analysis in this report shows the negative impacts of climate change on the availability and variability of hydropower outputs in a number of countries. While hydropower remains an essential element of sub-Saharan Africa's electricity supply, diversifying the electricity mi would help to mitigate the risk of power disruptions during droughts and strengthe resilience to changing climate conditions.

In contrast to many other regions, the energy sector is not the biggest contributor to total GHG emissions in Africa. It represents around a third of total GHG emissions (compared to more than two-thirds at the global level). In sub-Saharan Africa (excluding South Africa), land use and forestry[1] (LULUCF), agriculture and waste contribute most towards total GHG emissions. The reduction in the size of Africa's forests, which are natural carbon sinks, is the primary reason for the growth of GHG emissions in Africa: some countries have seen their forest area decrease by more than half over the last 25 years (Box 5.1), highlighting the importance of deforestation for climate policies.

While the ecological and environmental toll of reliance on fuelwood for cooking cannot be exactly quantified, the traditional use of solid biomass for cooking comes at a large cost to human health and wellbeing. Air pollution in Africa is one of the leading causes of premature deaths. Around 500 000 premature deaths are attributed to smoky indoor air arising from the use of solid biomass for cooking while 300 000 premature deaths are linked to outdoor pollution in cities.

In the Stated Policies Scenario, premature deaths owing to household air pollution decrease slightly over the outlook period as a consequence of efforts to bolster access clean cooking through LPG stoves, improved biomass stoves or biodigesters. There is a much greater adoption of these cleaner technologies in the Africa Case: over 1.1 billion people move away from traditional use of solid biomass by 2030, and the number of premature deaths from household air pollution falls by two-thirds.

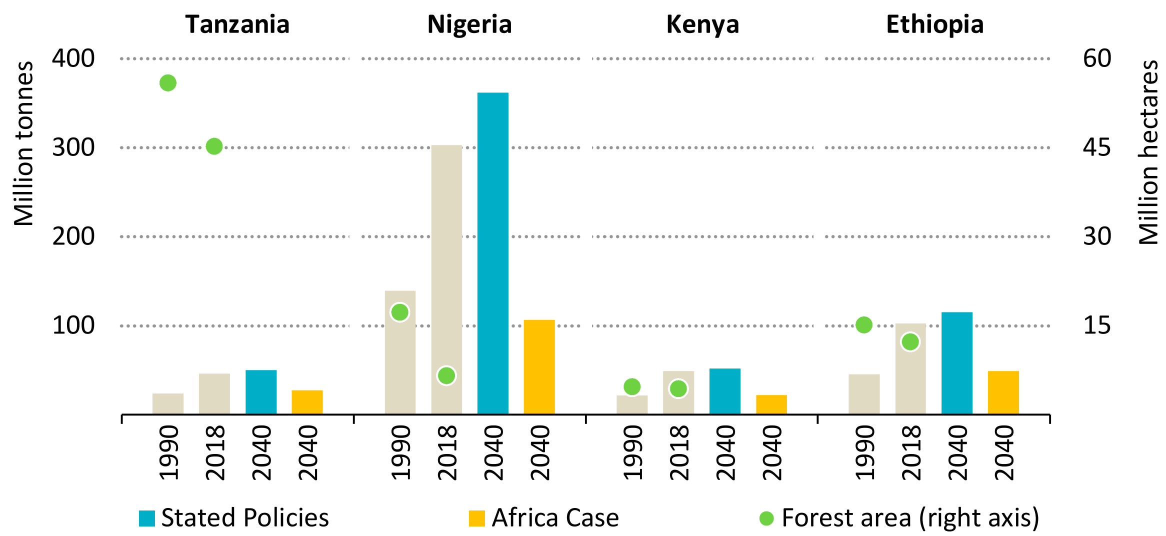
[1] LULUCF refers to land use, land-use change and forestry.

Box 5.1 ▷ Implications of unsustainable bioenergy use

Since 1990, the total forest area in Africa has fallen by 85 million hectares (ha), which is more than the total land area of Mozambique (Figure 5.9). Some countries have been more affected than oth For instance, Nigeria has lost 60% of its forest cover since 1990, while Tanzania and Ethiopia have lost almost 20% of their forest areas FAO, 2019).

Conversely, fuelwood consumption (directly used by households for cooking or to produce charcoal) has doubled in sub-Saharan African countries (excluding South Africa) over the same period. While the relationship between deforestation and growing demand for fuelwood is difficult to quantify, efficiency improvements across the various bioenergy value chains could play a significant role in protecting forest biodiversity and carbon sinks.

Figure 5.9 ▷ Fuelwood consumption in the Stated Policies Scenario and the Africa Case, and forest area in selected African countries



Making fuelwood consumption more sustainable is key to tackling deforestation in many sub-Saharan African countries

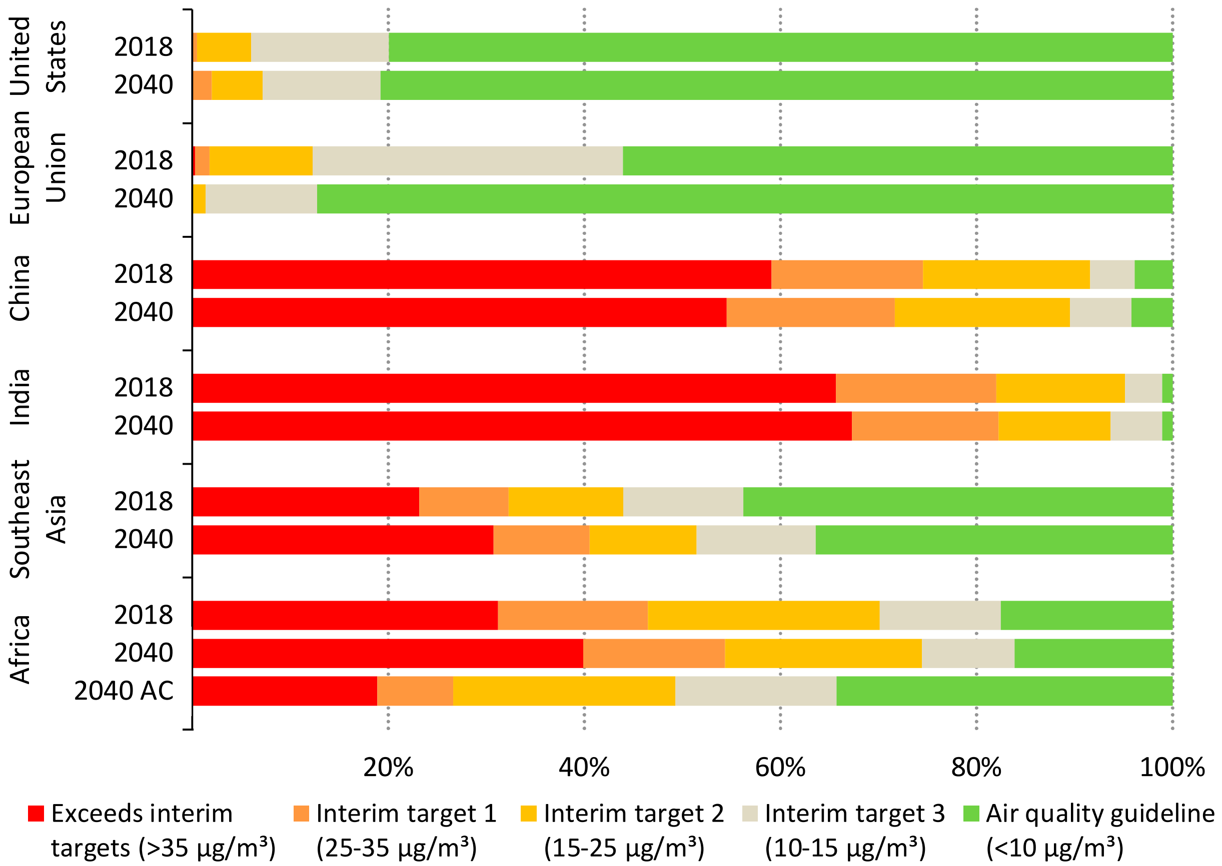
A number of countries have already made commitments to address deforestation in their updated Nationally Determined Contributions. Nigeria acknowledges the need to halt deforestation, conserve remaining natural forests and reverse forest degradat Others, including DR Congo, have pledged to commit efforts to reforestation activities. Converting these ambitions into actions and extending them across the continent would make the African biomass industry more sustainab

The increase in demand for energy services brought about by the fast-growing and rapidly urbanising population across the continent will have significant implications for air quality in cities. The increase in the overall level of air pollutant emissions in the Stated Policies

Scenario is not a surprise, given the exceptionally low baseline for current energy consumption. The mix of technologies and fuels chosen by consumers can however play an important part in mitigating the increase of pollutant emissions, which will ultimately have wide-ranging implications for the health and wellbeing for millions of people.

In the Stated Policies Scenario, sulfur dioxide (SO_2) emissions decrease by a quarter across Africa by 2040. There is an increase in industrial emissions but this is more than offset by a significant decrease in emissions from coal-fired power plants, mainly in South Afric Emissions of nitrogen oxides (NO_X) increase by one-quarter, mainly from the incomplete combustion of fuels in cars, despite a significant fall in emissions in the power sector during the period to 2040. In the Africa Case, improved emissions standards for passenger vehicles result in emissions from this segment falling, despite the increased number of cars road.

Figure 5.10 ▷ Population exposed to fine particulate pollution ($PM_{2.5}$) in selected regions in the Stated Policies Scenario and Africa Case



Proportion of the population in Africa exposed to high levels of $PM_{2.5}$ pollution drops in the Africa Case and remains lower than in some Asian countries in the Stated Policies Scenario

Notes: AC = Africa Case; µg/m^3 = micrograms per cubic metre. Interim targets and Air Quality Guideline refer to World Health Organization exposure thresholds.

Source: International Institute for Applied Systems Analys

Higher emissions of NOx and $PM_{2.5}$ also take a considerable toll on health and wellbeing. In the Stated Policies Scenario, the increasing concentration of $PM_{2.5}$ by 2040 means that th number of premature deaths associated with outdoor air pollution increases by almost 60%, reaching 480 000 in 2040. In the Africa Case, emissions of the three major air pollutants decline sharply from the current levels. Reduced exposure to $PM_{2.5}$ is particularly important: despite a significant increase in energy services, the number of premature deaths associated with outdoor air pollution in 2040 is almost 30% lower than in the Stated Policies Scenario.

5.2.4 Achieving sustainable development goals requires Africa's success

In many areas, global energy transition goals are closely linked to successful growth and development in Africa. The continent's economic and social prosperity are in turn closely linked to successful global energy transitions. Two examples highlight the interlinkages between the world and Africa: first, access to modern energy services; and second, Africa's role as a major supplier of the minerals necessary to achieve the global energy transition.

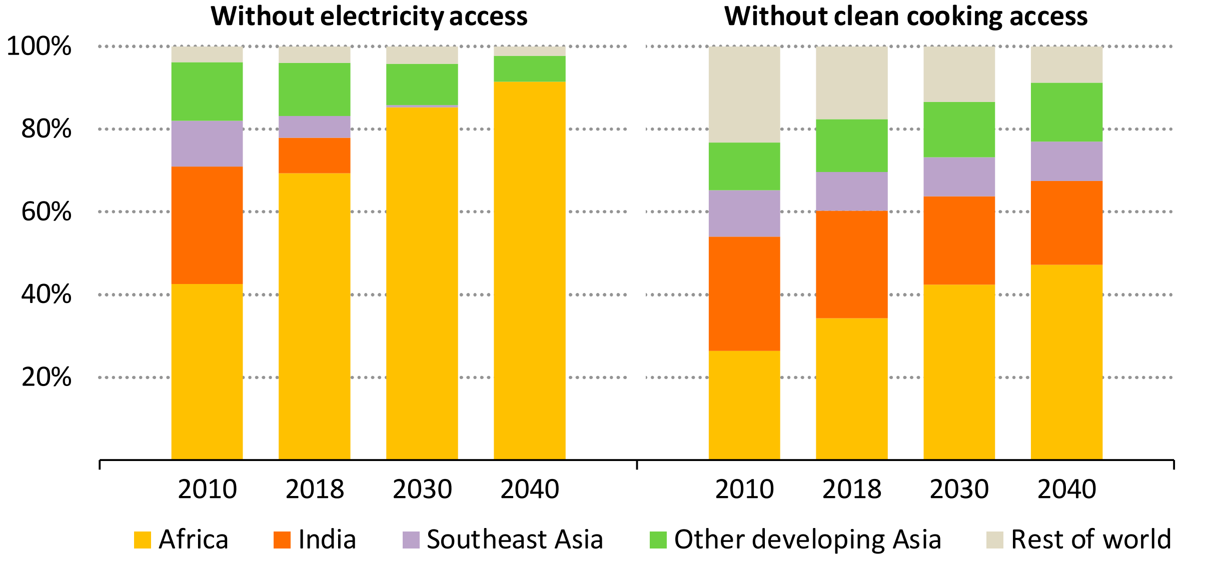
More than two-thirds of the world's population without access to electricity and around a third of the population without access to clean cooking live in Africa. By 2030 in the Stated Policies Scenario, most of the remaining population without access to electricity and clean cooking remain concentrated in Africa. Addressing energy access in Africa is therefore of paramount importance to solving this global concern.

Boosting energy access rates in Africa brings huge benefits in terms of reduced poverty, lower air pollution and increased economic prosperity. Access to electricity is crucial to the provision of essential services: in health centres, for instance, it is vital for the use of efficient modern equipment, the storage and preservation of vaccines and medicines, and the ability to conduct emergency medical procedures, for example during child birth. Access to clean cooking is essential to reduce the health impacts and the number of premature deaths related to household air pollution

In the Stated Policies Scenario, around 20 million people are connected to the electricity network each year, which is less than a third of what would be needed to reach full access by 2030. By 2030, 85% of all people without access to electricity live in Africa (Figure 5.11). In DR Congo, for example, the projected number of people without access to electricit increases by 30% in this scenario, as policies fail to keep pace with population growth. Reaching full electricity access by 2030 as envisaged in the Africa Case requires a tripling of efforts to extend connection to over 60 million people each year. Reaching this level of access would need an additional push for decentralised renewables in the context of a comprehensive set of policies and investments that makes use of all available solutions, with mini-grids and stand-alone systems providing power to more than half of those gaining access by 2030. Energy efficiency also has an important part to play.

Delivering access to clean energy in an integrated way would also support economic growth and overall development. Research suggests that access could bring new avenues of productive employment to remote populations, particularly for women. In addition to freeing up time by speeding up domestic chores and giving women more time to engage in paid jobs, access to electricity can have a particular impact on female-owned businesse helping them to transition from extreme poverty to near middle-class status, as shown recently in Ghana (Power Africa, 2019).

Figure 5.11 ⊳ Share of population without access to electricity and clean cooking by region in the Stated Policies Scenario



Those without access to electricity and clean cooking are increasingly concentrated on the African continent

Moreover, electricity can also play an important role in improving agricultural productivity through advanced irrigation techniques, as several successful examples of stand-alone solar water pumps have demonstrated. Cold storage powered by renewable electricity could also reduce post-harvest losses of agricultural outputs, which are currently estimated at 20-50% of the food produced in sub-Saharan Africa (depending on the food type).

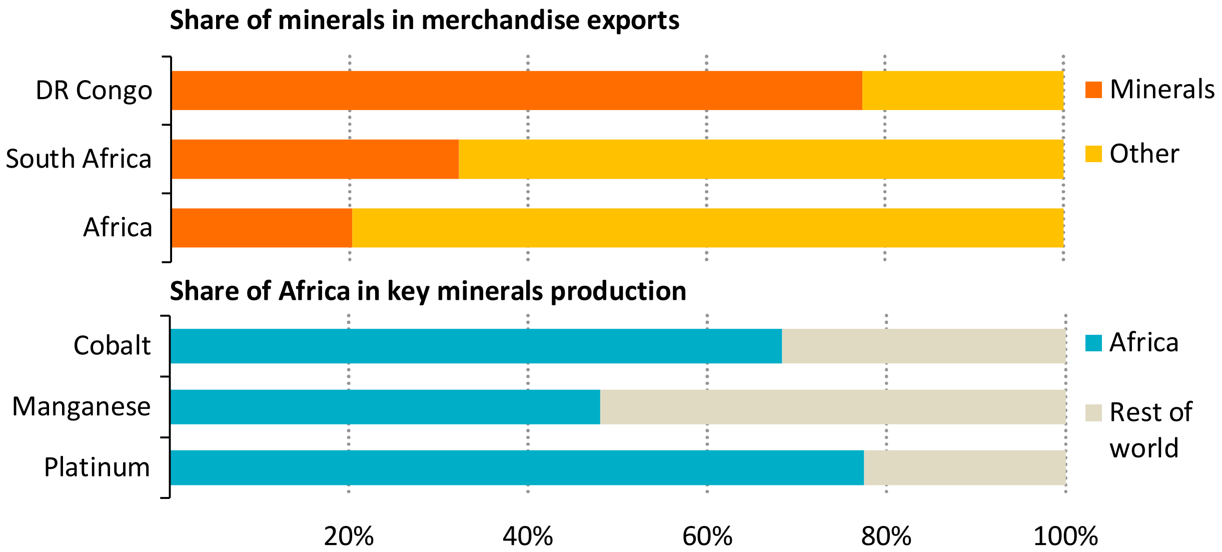
In the Stated Policies Scenario, Africa is one of the few regions where the number of people without access to clean cooking increases, as the expansion of clean cooking is unable to keep pace with rapid population growth, and around half of the global population without access to clean cooking in 2040 lives in Africa. There are exceptions: Ghana sees a visible improvement in this area, but many other countries are not set to emulate this example. While urbanisation increases the use of alternative options such as LPG and natural gas in many regions, solid biomass (in the form of charcoal) remains the preferred option for cooking in African cities. The Africa Case sees all households across the continent gain access to clean cooking by 2030. This reduces significantly the number of premature deaths linked to indoor air pollution.

Resource development, minerals in particular, is another area where Africa and the world share a common interest. From cobalt and manganese for batteries to chromium and neodymium for wind turbines, and to platinum for hydrogen fuel cells, minerals are a critical component in many clean energy technologies. As energy transitions accelerate, demand for minerals is set to grow significantly. For example, demand for cobalt from deployment of electric vehicles increases to around 170 kilotonnes per year (kt/year) in 2030 in the Stated Policies Scenario, higher than today's supply capacity, and to almost 360 kt/year in the case of higher electric vehicle uptake (IEA, 2019). Africa is a major producer of many of these minerals: DR Congo accounts for two-thirds of global cobalt production and South Africa produces 70% of the world's plati

In 2017, net income from mineral production was equivalent to around 2% of sub-Sahara Africa's GDP and minerals accounted for some 20% of total merchandise exports in Africa (77% in the case of DR Congo). Rising demand for minerals means that successful global energy transitions offer an opportunity for economic growth in mineral-rich countries in Africa. For example, if DR Congo were to maintain today's share in global production, growing global demand for cobalt would bring additional revenue of $4-8 billion to the country in 2030 (based on today's prices), equivalent to around 3-6% of the country's projected GDP in that year.

However, there are large question marks over whether African countries can keep up with rising global demand in a timely and sustainable manner. Current practices are often inefficient, polluting and subject to social protests. Given that African countries account for a large proportion of the global production of key minerals, failure to keep up with demand could not only hamper Africa's economic outcomes but also hold back the pace of global energy transitions (Figure 5.12).

Figure 5.12 ▷ Composition of Africa's merchandise exports, 2017, and key minerals production, 2018



Responsible and sustainable development of Africa's mineral resources is vital for Africa's economic prosperity and global energy transitions

Source: IEA analysis based on UNCTAD Stats (2019) and USGS (2019).

Putting in place structures and governance arrangements to ensure responsible minerals development would help guard against a range of potential problems. Robust regulatory and oversight mechanisms would be needed to ensure that impacts on local environments are minimised and that revenues are used in a transparent manner. There is also a need for careful scrutiny of how minerals are sourced and how supply chains are managed. Those who use minerals can play a helpful role, as can international financial institutions. For example, BMW, BASF and Samsung recently launched a pilot initiative to support sustainable and fair cobalt mining in DR Congo, which aims to improve working and living conditions for small-scale mining operations and surrounding communities. The World Bank has launched the Climate-Smar Mining Facility to help minimise the environmental and climate impacts of mining activities. As in so many other areas, the future of Africa's development and the prospects for global sustainable growth are closely interlinked.