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The Africa Roundtable: The Green Economy

November 2022

This white paper is part of the preparatory materials for *The Africa Roundtable* – Africa and Europe: Together for a Just Green Transition, hosted by the Global Perspectives Initiative (GPI). While GPI is organizing and hosting this roundtable, McKinsey is supporting this initiative as a knowledge partner and, as such, authored the whitepaper at hand. The whitepaper outlines ideas that are intended to provide inspiration for the roundtable discussions. It synthesizes key insights from McKinsey's recent research on the green transition in Africa and the opportunities this could bring to revitalize economies and build a more sustainable future for the continent. Ideas are mostly drawn from the executive briefing: "Green Africa: A growth and resilience agenda for the continent." McKinsey is not responsible for the content of any discussions by the roundtable participants that occur before, during, or after this event.

Introduction

More than 900 million Africans could find themselves exposed to one or more climate hazards in a warming world over the next 30 years.[1] At the same time, shifting global consumption patterns as the world moves towards a low-carbon future—including a global fall in demand for oil—could further undermine African economies. This threatens human health and wellbeing and jeopardizes hard-won economic gains, which, in turn, could undermine societal stability on the continent.

Preparing for these risks is an increasing focus for many African governments. At the same time, many are realizing that there are opportunities to be seized in a net-zero world. If the continent can use its large renewable energy generation capacity and rich natural capital endowments responsibly and strategically, it could catalyze economic growth—helping to ensure a just transition—and make a substantial contribution to the global net-zero transition. There is also potential for African countries to tap into the global decarbonization agenda to access international support to pursue low-carbon development pathways in key sectors, such as agriculture, to build a safer, healthier, and more prosperous future.

Africa's development pathway is also important for the world. The continent will play a vital role in the global effort to reach net zero by 2050. While African per capita emissions are, on average, still less than half of those of Organisation for Economic Co-operation and Development (OECD) countries, the continent nonetheless accounts for roughly 10 percent of global annual greenhouse gas emissions when land-use emissions and all greenhouse gases are taken into account (see Box 1). By comparison, global aviation accounts for less than 2 percent.[2] With rapid population and economic growth expected, Africa's share of emissions is likely to increase if no action is taken.

While the continent is taking steps to galvanize climate resilience, for example, through the Africa Adaptation Acceleration Program,[3] significant additional resources and support will likely be required to enable the continent to build adaptive capacity, reduce emissions, and create new economic opportunities at the speed and scale required. Right now, investment needs typically are not able to tap private capital markets due to unfavorable risk-return profiles and African countries' public finances are often constrained. Additionally, there is a significant gap between climate funding needs and pledged climate funding by developed countries.

This white paper provides a high-level overview of some of the climate change risks that Africa is facing and describes potential opportunities available in the energy and agriculture sectors that could deliver growth and boost resilience while reducing emissions. It also sketches out potential options for stakeholders and decision-makers to consider at this critical juncture.

900mn

Africans who could be exposed to one or more climate hazards in a warming world over the next 30 years

[1] Some of the growth in exposed citizens is due to population growth (tempered by increasing urbanization) with intensifying climate hazards driving 25 percent increase in exposed populations.
[2] Emissions by Sector, Our World in Data, ourworldindata.org.
[3] Endorsed by the African Union, working with the Global Center on Adaptation, the African Development Bank, and other partners.

What does climate change mean for Africa? Physical risks and paths to decarbonization

The scientific consensus is that global warming of 2°C relative to pre-industrial levels will be exceeded during the 21st century unless rapid and deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades.[4] It is also clear that not all regions will be affected equally. Parts of Africa are warming faster than many other world regions, and there is a high probability that African countries will be among the most severely affected by intensifying climate hazards. At the same time, the continent's levels of adaptation and resilience are among the world's lowest. Around 80 percent of African countries have vulnerability scores in the lowest band, meaning that they are likely to be more sensitive to climate hazards and less able to adapt to or cope with climate change.[5] Low levels of insurance and savings in many African countries also mean that recovery after a disaster typically takes much longer.

Furthermore, the deep structural changes now underway in the global economy as countries gear up to transition to net-zero emissions by 2050 are resulting in another set of economic risks for economies in Africa, commonly referred to as transition risks. The main concern is that a move towards decarbonization globally could lead to a decrease in demand for fossil fuel exports and a prioritization of low-carbon-intensity production alongside cost by buyers of commodities, which could negatively affect the global competitiveness of African commodity exports. As African economies are generally more dependent on commodity exports than most regions, this could have adverse consequences for employment and fiscal health.[6]

These risks are amplified by the generally more constrained fiscal capacity of most African countries, which limits their ability to invest in structural countermeasures.

80%

African countries with vulnerability scores in the lowest band

4 Ibid.
5 McKinsey Climate Analytics; The Notre Dame Global Adaptation Initiative (ND-GAIN); UNDP subnational Human Development Index (SHDI).
6 State of Commodity Dependence 2021, United Nations Conference on Trade and Development, 2021, unctad.org.

Millions more Africans could be exposed to physical hazards as climate change intensifies

As a result of its high exposure and vulnerability to climate hazards, a third of the people considered most at risk in the world live in Africa.[7] About 370 million people—roughly 30 percent of the total population of the continent—live in areas which are likely to experience high levels of climate hazards and to have high vulnerability.

An analysis by the McKinsey Climate Analytics team suggests that if the world sees a 2°C increase in average temperature by 2050, the number of Africans exposed to one or more physical hazards related to climate could almost double from approximately 460 million people today to more than 900 million.[8] This increase is partly due to rapid population growth, tempered by increasing urbanization. The primary drivers, however, are the broader geographic reach and increasing intensity of climate hazards, with 45 percent of the population likely to be exposed to at least one climate hazard by 2050 compared to 36 percent today, although exposure to these hazards will not be evenly distributed across the continent. Hotspots of exposed populations are likely to be in Sahelian West Africa, North Africa, and East Africa (Exhibit 1).

The top four physical hazards confronting Africa in a 2°C increase by 2050 world are likely to be:

— **Heat stress:** Over 90 percent of the population in West Africa and 70 to 75 percent in East Africa could be exposed to heat stress, with upwards of 640 million Africans experiencing more days with high levels of heat and humidity.

— **Agricultural droughts:** About 175 million people in agricultural regions could experience an average of seven to eight droughts per decade, making it much harder for smallholder farmers to maintain a livelihood in rainfed agriculture. In East Africa, approximately 40 percent of the population could be affected. A UN report published in 2020 estimated that by 2050, overall agricultural yield in that region could be reduced by 8 percent.[9]

— **Flooding:** In North Africa, 40 to 50 percent of the population could be exposed to water stress or flooding. Nearly 130 million more people could be exposed to severe riverine and/or coastal flooding driven by rising sea levels and intense rainfall events, which could breach existing defenses.

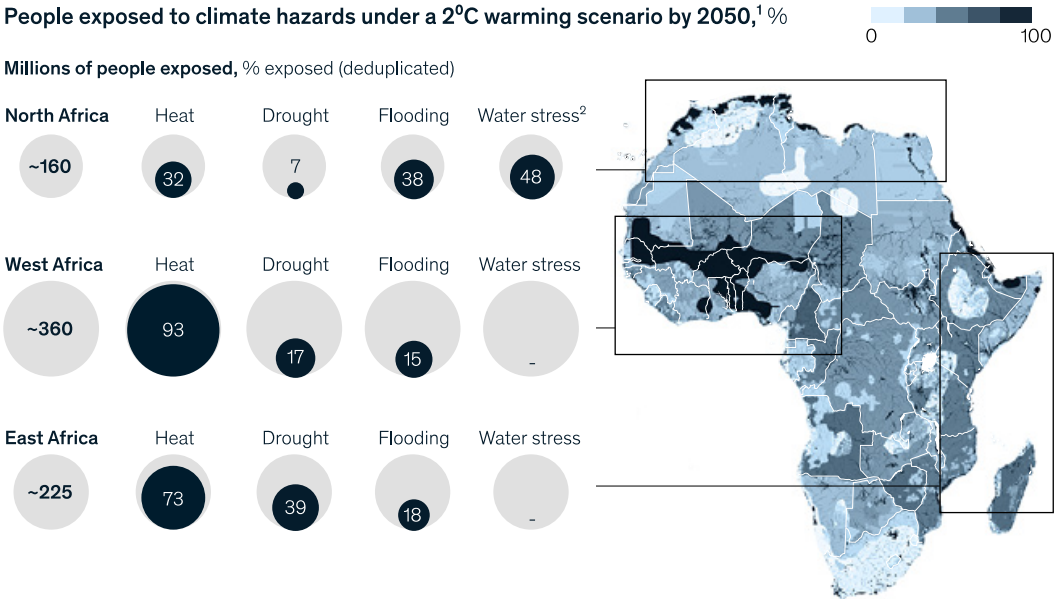
— **Urban water stress:** About 20 million more people living in urban areas could experience water stress, meaning they may not have access to adequate water supplies for drinking, washing, and maintaining industrial operations. This situation is likely to be exacerbated by continued unplanned urbanization.

The direct economic impacts of these events could intensify the hardships. Rising temperatures may reduce the amount of time it is possible to work outside by a quarter, cutting productivity, particularly for those employed in outdoor occupations, while increased droughts throughout the growing season could impact crop yields. External research suggests that staple crops such as rice and wheat could be hardest hit, with possible yield losses of 12 percent and 21 percent, respectively, by 2050.[10]

[7] McKinsey Climate Analytics; The Notre Dame Global Adaptation Initiative (ND-GAIN); UNDP Human Development Index (HDI).
[8] Because it is still unclear which macro scenario will manifest, we consider two main scenarios in this article; the first assuming continued high emissions, leading to an expected 2°C warming by 2050, the second assuming an orderly global transition to limit warming to 1.5°C. Approximate mean change in global temperature in both scenarios (1.5°C and 2°C) is relative to pre-industrial average (1850-1900). Stakeholders need to evaluate and prepare for risks under both of these scenarios.
[9] "Climate change is an increasing threat to Africa", United Nations Climate Change, October 27, 2020, unfccc.int.
[10] "Climate change is an increasing threat to Africa," United Nations Climate Change, October 27, 2020, unfccc.int. 2°C warming is relative to pre-industrial average (1850-1900).

Exhibit 1:

Africa's climate-exposed populations are mainly in the Sahel region in West Africa, with pockets of high exposure in North and East Africa.



Note: The boundaries and names shown on maps do not imply official endorsement or acceptance by McKinsey & Company.
[1]Global mean temperature increase is relative to pre-industrial average from 1850–1900 and is estimated based on mean warming across 21 CMIP5 models under the RCP 8.5 emissions scenario (IPCC, 2013).
[2]All water stress exposure is considered to be severe. Urban water stress increases due to increased demand from population growth and urbanization as well as decreased supply from climate change. Increased demand, rather than climate change, is the dominant factor in increased water stress exposure.
Source: IHS Markit; International Labor Organization; NASA NEX; NCAR IAM; SEDAC; Woodwell Climate Research Center; World Resources Institute; McKinsey

What's more, as severe climate change effects take hold, they could trigger migration, social and political unrest, and potentially even conflict in affected regions, which in turn may have global repercussions. The Stanford Environmental Assessment Facility estimates that the impact of climate change on conflict may double compared to today if the world warms by 2°C by 2050, with about 13 percent of conflicts influenced by climate change.[11] The World Bank projects that by 2050, climate change may be a driving force for over 100 million Africans to migrate within their countries, away from areas with lower water availability and crop productivity or rising sea level and storm surges. While climate change is often not the sole factor in migration decisions, it may amplify other factors such as poverty and conflict.[12]

Transition risks could impact key economic pillars

As the rest of the world moves forward in the race to net zero, Africa could also see a drop in global demand for fossil fuel and its exports could become less competitive as carbon intensity of commodity production becomes more important. Africa has a much higher dependence on commodities than any other region in the world, with commodity exports—notably oil and minerals—accounting for about 16 percent of the continent's GDP. In addition, the production of Africa's commodities is often more carbon intensive than in other regions.[13] African producers' cost of production would likely be in the bottom decile for some of the continent's largest commodity exports if a robust shadow carbon price is applied, and as buyers of commodities are increasingly prioritizing lower carbon intensity of production, high-emission African players may lose market share.

[11] "Stanford-led study investigates how much climate change affects the risk of armed conflict," Stanford News, June 12, 2019.
[12] "Millions on the Move in Their Own Countries: The Human Face of Climate Change," The World Bank, September 13, 2021.
[13] "Countries dependent on commodities hit 20-year high, says UN," May 15, 2019.

Shifting global demand patterns could have additional implications for the continent's economy, impacting oil and gas players in particular. At a global level, the demand for oil could decline by about 50 percent by 2040 under a 1.5°C scenario.[14] This could render more than 80 percent of African production uncompetitive by 2040, because African countries tend to be at the expensive end of the global supply cost curve. Furthermore, because African producers often have a higher carbon intensity of oil production than global peers—about 40 percent higher carbon dioxide equivalent (CO_2e) per barrel—these impacts could be exacerbated by shifting purchasing behavior. Petroleum products account for more than 50 percent of export revenues and more than 60 percent of government revenues for more than half of African oil and gas producers.[15] Without strategic countermeasures, highly oil- and gas- dependent countries may find themselves under severe fiscal stress as global demand for fossil fuels continues to decline.

Further risks stem from declining global demand for thermal coal. Under a 1.5°C scenario, coal-fired power generation would need to decline by 80 percent by 2030 and drop to close to zero by 2050.[16] While some South African mines have relatively advantageous cost-curve positions, with about 50 percent of production concentrated in the lower half of the export cost curve, the inevitable decline in demand for export coal in a net-zero world could put all direct coal jobs—more than 90,000—at risk.[17]

Without strategic action to mitigate these risks, up to $150 billion of commodity revenue and more than one million jobs in Africa could be at risk. This in turn could have knock-on impacts, for example, on fiscal health.

To limit and delay the impacts of transition risk described here, and raise Africa's levels of adaptation and resilience to meet future physical hazards, a decisive response from governments and other stakeholders would be needed. Compared to their global peers, however, African countries have limited means to respond and are constrained by competing priorities. This situation has been exacerbated by the COVID-19 pandemic; Africa faced its first recession in 25 years during 2020, threatening to push 40 million people into extreme poverty. More than 50 percent of the African population currently experiences food insecurity and public debt in sub-Saharan Africa increased to more than 66 percent of GDP in 2020, the highest level in almost 15 years.[18,19] Inclusive economic growth, therefore, remains the priority.

1mn

African jobs could be at risk from the global transition away from fossil fuels

[14] McKinsey Energy Insights Global Energy Perspective 2021, December 2020.
[15] McKinsey Energy Insights; Stanford OPGEE; IOGP; OGCI; API; IEA Methane Tracker; EI emissions benchmark; operator annual reports.
[16] The 1.5-degree Challenge, McKinsey Sustainability.
[17] AME database.
[18] "State and Trends Report 2020," Global Center on Adaptation, 2020.
[19] Abebe Aemro Selassie and Shushanik Hakobyan, "Six charts show the challenges faced by sub-Saharan Africa," IMF News, April 15, 2021.

Box 1:

Africa's current emissions and pathways to decarbonization

The data landscape on emissions in Africa is relatively more fragmented and diverse than in other regions. McKinsey has analyzed and triangulated detailed emissions data from multiple sources, which indicate the following emissions breakdown for the continent:[20]

- Land use, land-use change and forestry (LULUCF): ~2.2 Gt CO_2e, about 40 percent of total.[21]
- Agriculture: ~1.1 Gt CO_2e, about 20 percent of total.
- Industry: ~0.8 Gt CO_2e, about 15 percent of total.[22]
- Power: ~0.5 Gt CO_2e, about 10 percent of total.
- Transportation, waste, and buildings: ~0.8 Gt CO_2e, about 15 percent of total.

At a total of 5.4 Gt CO_2e, these numbers suggest Africa currently contributes just under 10 percent of global greenhouse gas emissions—a somewhat higher share than often cited, as this includes non-energy emissions and all greenhouse gases.[23] However, it is worth noting that at 4.5 t CO_2e per annum, the average per capita emissions in Africa are much lower than the annual OECD average of 10.0 t CO_2e.[24] The emissions mix on the continent is skewed more towards agriculture and LULUCF and less towards industry, power, and transportation compared to the typical emissions profile of a developed country. By comparison, over three-quarters of European emissions come from industry, power, and transport.[25]

Because of the continent's different emissions profile and economic development trajectory, the decarbonization pathways of African countries will likely differ—in some respects significantly—from those of developed countries. Africa's sectoral composition, which includes a high economic focus on basic materials production, faster population growth and urbanization rates, constrained government budgets and capabilities, and last but not least, the imperative of continued inclusive growth to advance living standards and health, will also affect its decarbonization choices. While generalizations are difficult, key differences in typical African decarbonization journeys will likely include a strong focus on decentralized renewable power solutions alongside grid-scale renewables to enable universal energy access; some build-out of gas power capacity to provide near-term flexibility to balance renewables' intermittency; and a greater emphasis on advances in agriculture, land-use change, and clean cooking. In some sectors the transition will be slower; for example, the speed of renewables build-out will likely be lower due to institutional capabilities in the power sector, and the slower onset of second-hand electric vehicle availability may delay the transition in the transportation sector until the late 2030s at least.

[20] Global Energy Perspective (McKinsey Energy Insights); EDGAR - Emissions Database for Global Atmospheric Research (Crippa, M., Guizzardi, D., Solazzo, E., Muntean, M., Schaaf, E., Monforti-Ferrario, F., Banja, M., Olivier, J.G.J., Grassi, G., Rossi, S., Vignati, E., *GHG emissions of all world countries - 2021 Report,* EUR 30831 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-41547-3, doi:10.2760/173513, JRC126363); The Food and Agriculture Organization (FAO) of the United Nations; UNFCCC.

[21] Land use, land-use change, and forestry emissions including net forest conversion, drained organic soils (CO_2), fires in humid tropical forests, fires in organic soils, and forest fires.

[22] Cement, mining, metals, oil and gas, and chemicals.

[23] When only considering CO_2 emissions from energy, Africa accounts for just under 4 percent of global emissions, but when including non-energy emissions and all greenhouse gases, Africa's emissions share is almost 10 percent.

[24] McKinsey Sustainability EMIT database.

[25] McKinsey Net-Zero Europe Report.

Building resilience and identifying opportunities for growth

While the global conversation on climate change in Africa tends to be focused on physical risks and adaptation, there are also clear opportunities for the continent to meet its economic development goals and enhance resilience in a world transitioning to net zero, especially in the high-emitting energy and agricultural sectors.

Expanding access to, and the affordability of, renewable energy

Achieving energy access for the 600 million people in Africa who are still without it is a key development objective for most African countries; and keeping grid power costs low as demand increases is critical for continued economic growth. Renewable power can help provide a solution to both challenges while also creating new jobs. McKinsey analysis shows that expanding utility-scale renewables and building out distributed generation renewables across the continent could create 190,000 direct and 160,000 indirect jobs in solar by 2030—even if manufacturing does not happen in Africa—and 60,000 direct and 50,000 indirect jobs in the wind industry.

Accelerating the deployment of grid-scale renewables

Solar and wind energy costs have fallen considerably over the last few decades, to the point where new-build renewables are now more competitive than existing coal-fired and gas generation in many regions.[26] The global average solar unit capital expenditure declined by 76 percent in the last ten years, while for wind it declined by 56 percent.[27] Electricity demand in Africa is expected to at least double over the next two decades. This increase will be higher in a scenario that sees substantial decarbonization of the economy, where demand currently supplied by thermal fuels is shifted to renewable electricity.[28]

Accelerating the deployment of utility-scale renewables could be critical and is economically compelling. The switch to renewables is also likely to benefit the wider economy. For example, in South Africa, a faster transition of the power sector to renewable sources, along with the accelerated decommissioning of coal plants, could be cost effective while also creating jobs and contributing to carbon neutrality (Exhibit 2). However, ensuring a positive economic and social impact from an accelerated transition would require that manufacturing opportunities of new value chains are localized, and that workers are reskilled and shifted into new industries as coal-fired powered plants are decommissioned and coal mines retired.

76%

Decline in global average solar unit capital expenditure over last ten years

[26] McKinsey Energy Insights Global Energy Perspective 2021, December 2020, mckinsey.com.
[27] Ibid.
[28] Ibid.

In the long term, achieving this transition to a largely renewable energy supply will require the build-out of long-term energy storage through green hydrogen or grid-scale batteries; technologies that are not yet fully commercially viable at scale in Africa. McKinsey analysis shows that to reach net zero in Nigeria, nearly 15 percent of capacity in 2050 would need to come from new long-term energy storage technologies, with another 5 percent coming from hydroelectric assets.[29] In South Africa, approximately 30 percent of capacity would need to come from long-term storage assets.

In the medium term, to support ongoing economic development, most of the continent would need to build out additional dispatchable assets. Where economically viable—as in East Africa—geothermal plants could play this role. In most countries, however, gas will likely play a role as a transition fuel to allow for flexible and dispatchable power. The long-term risk associated with stranding these assets can be mitigated if they are built with the ability to burn hydrogen as a fuel in the future.

In addition to ensuring sufficient storage and flexible capacity, this transition would require the upgrading and strengthening of transmission and distribution infrastructure across the continent, as well as the strengthening of grids across borders to enable international trading. USAID has identified ten major opportunities for regional electricity trading that could better balance power surpluses and deficits, provide export opportunities for a range of countries, and lower the average cost of power for most importing countries.[30]

Options to achieve the acceleration of grid-scale renewables include launching large scale procurement programs that bring in waves of renewable capacity. Experience from Morocco and South Africa shows that each wave results in greater investor confidence and improved economics being offered to the country.

A central challenge in these programs is to appropriately manage the various risks. Governments may need to accept ownership for the counter-party risk such as default or non-payment by the distribution company. Alternative approaches to consider for scaling up renewable capacity include allowing for more targeted contracting of renewable technologies to individual distribution companies or to franchise areas within distribution companies, and establishing a framework that allows for a feed-in tariff for new developers.

Beyond standard renewables procurement, countries could consider utility-scale "fossil to renewables" transformation programs, starting with decarbonizing coal-dependent grids. An integrated approach that includes plant decommissioning and land restoration could help build out new renewable capacity while protecting the livelihoods of affected workers and communities through reskilling efforts, direct support, and regional economic diversification measures. These programs could combine different funding sources, including catalytic donor capital, cash flow from carbon credits, impact investors, and capital market funding.

The building of regional "super grids" could also contribute to improving energy access, affordability, and decarbonization by optimizing the use of existing generation capacity, realizing lowest-cost renewables potential, and improving grid balancing. Since transboundary regional interconnections face a complex set of regulatory, financing, technical, and execution challenges, a coordinated multi-stakeholder effort to identify high-priority transmission projects, resolve bottlenecks, and mobilize financing—including model innovations such as Build Operate Transfer (BOT) with private sector operators—could be required.[31]

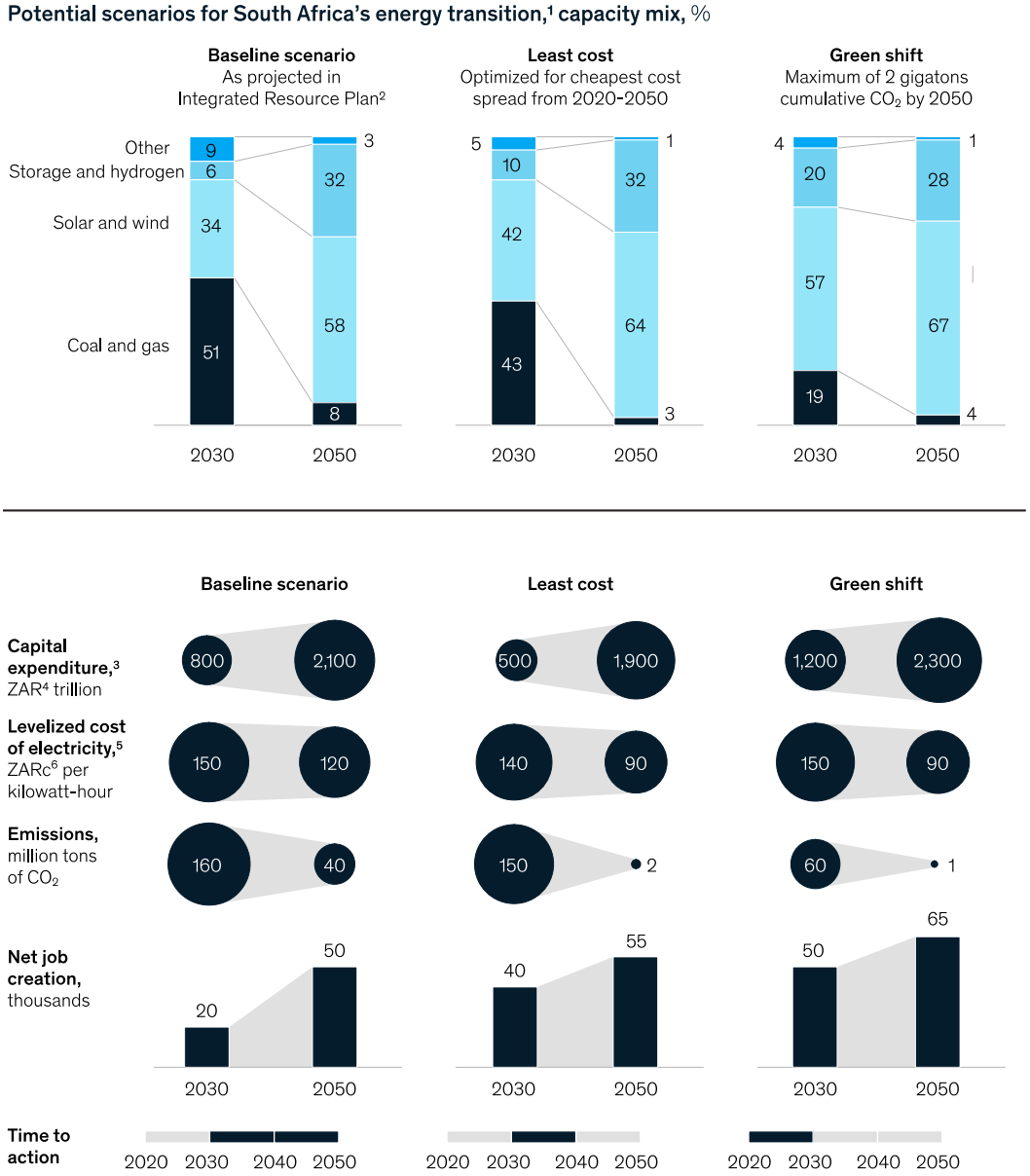
[29] In a growing economy, it is critical that electricity can be dispatched when needed, but wind and solar are intermittent and considered to be non-dispatchable power. To balance the grid, investments in additional technologies, including dispatchable renewables such as hydro and geothermal, battery storage solutions, and green hydrogen would be required.

[30] Power Africa Transmission Roadmap to 2030: A practical approach to unlocking electricity trade, USAID, November 2018.

[31] BOT is a type of public/private financing model typically used in infrastructure projects where the private sector designs, builds, and operates the assets to meet certain agreed outputs, and after a set time frame control over the project is returned to the public entity.

Exhibit 2:

An accelerated transition of South Africa's power sector could be more cost-effective, while also having a positive net effect on employment.



[1]Figures may not sum to 100%, because of rounding. [2]Renewable energy build limits, capacity expansion, decommissioning as per IRP with technology cost evolution per conservative McKinsey Power model outlook. [3]Cumulative capital-expenditure requirement up until 2030 and 2050, including written-off capital expenditures du the early decommissioning of coal plants. [4]South African Rand. [5]Considers a combination of annual system costs for new assets calculated by the model and annual system cost of existing assets determined through team analysis. [6]South African Rand cents.
Source: McKinsey Power Model

Expanding the build-out of distributed generation renewables

Renewables are not only cost-competitive, but also highly modular and scalable—from off-grid rooftop solar to commercial and industrial installations, and mini-grids to utility-scale solar and wind farms. Thus, they could provide affordable power to both consumers who are connected to the grid and those who are not connected, while also helping to provide universal rural energy access. To achieve universal access, about 60 percent of African households could be served by urban and

rural grids, and about 40 percent by off-grid solutions and mini-grids.[32] An integrated utility model, where the off-grid and mini-grid sector complements new connections through the main grid, could result in cost-effective service and higher access rates.

Commercial and Industrial (C&I) solar installations are already rapidly scaling up. Inconsistent performance of grid electricity, coupled with a desire to adopt affordable green inputs, has resulted in businesses building C&I solar assets linked directly to their operations. Solar C&I installations have doubled annually for the past five years, reaching more than 200 MW of capacity excluding the North African region and South Africa, and more than 370 MW for the whole continent. C&I plays a critical role in scaling up distributed renewables for residential areas because it builds local photovoltaic (PV) capabilities and supply chains within a country, and helps build credibility and a track record for solar in new markets.[33]

Several barriers are currently hampering the scale-up of distributed renewables in Africa, including regulation—for example, the inability to sell energy produced back to the grid is an issue in Nigeria and South Africa—insufficient project development capabilities, and lack of access to finance, especially for large off-grid systems and solar home systems. An idea to address this could be to set up a dedicated mechanism for renewable distributed generation development, such as the recently announced Rockefeller Foundation and IKEA Foundation $1 billion fund, which aims to provide technical assistance and project development, and to catalyze additional development finance and commercial capital for investments in distributed renewables.[34]

Investigating new green export commodities

The net-zero transition also creates new export opportunities, perhaps most notably in green hydrogen and its derivatives, and voluntary carbon markets (VCMs).

As the world accelerates in its transition towards a low-carbon future, global demand for clean energy, notably green hydrogen and its derivatives, is expected to rise significantly within the next two decades. Industrialized countries will require ready supplies of clean energy to fully decarbonize; the EU, for example, estimates that by 2050 it will require between 65 and 70 million tons of green hydrogen per annum to achieve its climate neutrality goal, accounting for about 25 percent of its total energy demand.[35] For some industrialized countries, building out renewable energy assets at the scale and speed required may prove challenging due to land-use conflicts in more densely populated areas and other complications. Hence, competitive clean energy exports from regions with excess low-cost renewables to supply-constrained industrial centers could be a critical enabler for achieving global climate neutrality while also creating economic value in the exporting regions. And with its abundant wind and solar renewable resources, many parts of the continent, especially in the north and south, are well-placed to meet this potential.[36]

65-70mn tons

Amount of green hydrogen required by Europe p.a. by 2050

[32] Sustainable Energy Investments in Africa, McKinsey & Company, IEA numbers.
[33] "Solar for Businesses in Sub-Saharan Africa," BloombergNEF, January 24, 2019; Africa solar outlook 2021: A country-by-country review of the status of solar in Africa, Africa Solar Industry Association, February 2021.
[34] "Ikea Foundation and The Rockefeller Foundation Join Forces to Set up a Historic $1 Billion Initiative to Catalyze Investments in Distributed Renewable Energy," Rockefeller Foundation, 21 June, 2021.
[35] McKinsey Net-Zero Europe Report and "Green Hydrogen: Bridging the Energy Transition in Africa and Europe" (EU Africa Hydrogen Partnership, pp. 21), The Africa-EU Partnership, September 2020, africa-eu-energy-partnership.org.
[36] Lyes Bouchene, Ziyad Cassim, Hauke Engel, Kartik Jayaram, and Adam Kendall, "Green Africa: A growth and resilience agenda for the continent," McKinsey & Company, October 28, 2021.

Similarly, global demand for VCMs, which plays an important role in complementing direct decarbonization efforts, has grown strongly in the last five years. As companies increasingly look to buy carbon credits that reflect avoidance or removal of emissions to help them meet their climate pledges, this creates an opportunity for Africa to develop carbon projects that could channel investment from developed countries to address environmental challenges at home.[37] Currently, while carbon market activity on the continent is growing, it represents only a small proportion of its potential. Boosting its supply of credits for sale in the global market could enable much-needed sustainable investment in sectors ranging from renewable energy and clean cookstoves to agriculture and forestry. Regional initiatives like the Great Green Wall, African Forest Landscape Restoration Initiative (AFR100), and Great Blue Wall, although not focused on carbon credits, also have significant potential to tap carbon credits as a partial source of funding.

Increasing resilience and agricultural productivity

Increasing productivity and diversifying economies into segments that provide high-quality jobs and value creation are central ingredients of sustainable economic development. A low-carbon pathway can meet these goals, with clear opportunities in the high-emitting agricultural sector to achieve this. As a major contributor to methane and nitrous oxide emissions, transforming agriculture is key to fighting climate change. What's more, agriculture in Africa has a massive social and economic footprint. More than 60 percent of the population of sub-Saharan Africa is smallholder farmers, and about 23 percent of sub-Saharan Africa's GDP comes from agriculture. Yet, Africa's full agricultural potential remains untapped.[38]

McKinsey analysis finds that Africa could produce two to three times more cereal and grains if it intensified its agricultural productivity, which could add 20 percent more cereals and grains to the current worldwide 2.6 billion tons of output. Similar increases could be seen in the production of horticulture crops and livestock. (Exhibit 3). Increasing agricultural productivity in Africa has been central to the development agenda for decades, and the way this is executed is also very important in the decarbonization context. Agriculture currently directly accounts for about a fifth of the continent's greenhouse gas emissions and is also an important driver of land-use change emissions, which account for another two-fifths of Africa's emissions (see Box 1).

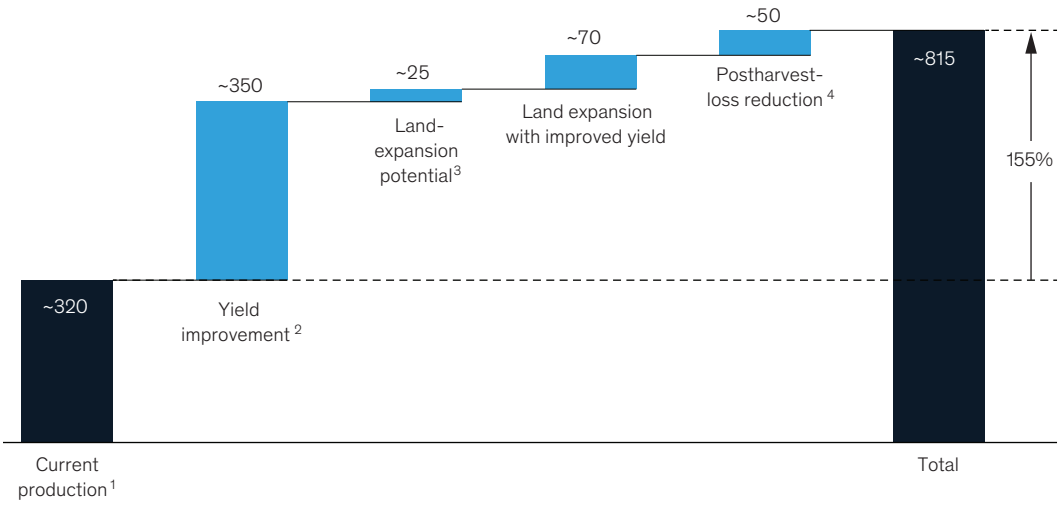
Africa could continue to pursue efforts to boost agricultural productivity and increase agricultural yields in a sustainable way through, for example, improving access to state-of-the-art inputs, training, and financing, and reducing supply chain losses through improved transport, storage, and refrigeration. Supply chains for agriculture in sub-Saharan Africa are currently fragmented. In analyzing major agricultural-input chains in eight countries, McKinsey found that inputs changed hands at least three times before they reached the farmer, moving from national importers to regional distributors to "agro-dealers" (which are typically small, rural shops). Of nearly 1,000 agro-dealers surveyed, 68 percent purchased from local distributors, and only 23 percent purchased directly from manufacturers. On average, this fragmented supply chain led to a 20 to 50 percent markup over import price across major agricultural inputs, with about one-third to one-half of that captured as margin by the distributors and retailers in the chain.[39]

[37] McKinsey Vivid Economics Carbon Credit Database, drawing on Verra, GoldStandard, ACR, CAR, PlanVivo (2022).
[38] Lutz Goedde, Amandla Ooko-Ombaka, and Gillian Pais, "Winning in Africa's agricultural markets," McKinsey & Company, February 15, 2019.
[39] Ibid.

The restoration of degraded land through conservation farming practices and targeted landscape interventions such as terracing could also be vital, both to increasing overall production and restoring carbon sinks. However, land expansion is unlikely to play a major role.

A large amount of the estimated 480 to 840 million hectares of untapped agricultural land is in unreachable areas because of a lack of infrastructure within countries and across regions, or it is in conflict zones, under forest cover, or part of a conservation area.[40]

Exhibit 3:
Cereal and coarse-grain production potential Africa, millions of tons



1 Cereal and coarse-grain production in 2014, from FAOSTAT (latest year available).

2 Economic-yield improvements without irrigation for main cereal crops for sub-Saharan Africa only, excluding South Africa; some discounts made for less "commercializable" crops, such as sorghum and millet; based on Global Yield Gap Atlas.

3 Assumes 20-million-hectare land-expansion growth, based on McKinsey analysis.

4 Based on sub-Saharan Africa moving from 14% agricultural and postharvest loss to 10% (Latin America benchmark).

Source: FAO; Global Yield Gap Atlas; McKinsey analysis

On the demand side there could be opportunities to invest in farmer engagement through traditional and nontraditional methods to drive improvements. McKinsey research found that most farmers in regions where companies had invested in demand-creation efforts were largely aware of the value of using improved inputs. For example, hybrid seed adoption rates in southern Tanzania—where efforts had been made by private companies to build demand—were greater than 60 percent versus a 20 percent average national hybridization rate.[41]

A better understanding of farmer segmentation so that local preferences can be tailored to needs, along with investments into salesforce and promoter networks, and innovations to address the farmer working-capital challenge, could also help to increase engagement and drive greater productivity.

40 Awakening Africa's sleeping giant: Prospects for commercial agriculture in the Guinea Savannah Zone and beyond, World Bank, January 1, 2009, documents.worldbank.org; "How good the earth: Quantifying land resources in developing countries—FAO's agro-ecological zones studies," FAO.

41 Lutz Goedde, Amandla Ooko-Ombaka, and Gillian Pais, "Winning in Africa's agricultural markets," McKinsey & Company, February 15, 2019.

Reimagining protein production

The role of livestock as a major contributor to methane emissions has come under increasing scrutiny in recent years. According to the UN Food and Agricultural Organization (FAO), domesticated animals emit about 5.0 percent of total human-caused greenhouse gas emissions, rising to 14.5 percent when feed production, transport, and other factors are taken into account.[42] McKinsey research shows that the agricultural industry could reduce methane emissions at a manageable cost, with measures ranging from new feed supplements and selective breeding, to reduce methane produced in the stomachs of ruminants.[43] Improving animal health monitoring and illness prevention could reduce emissions by meeting the world's projected animal protein demand with fewer, healthier animals.[44]

Health and environmental concerns around meat production are also opening up a new market for alternative protein sources that offers Africa an important opportunity. With the lowest protein intake per capita in the world—just 55 grams per person per day, according to the FAO—there is room to grow the African market for meat substitutes, especially as the population grows. Plant-based meat substitutes are around 85 percent less carbon-intensive than beef per gram to produce while providing the same nutritional content, and are becoming cost competitive too.[45] Additionally, the plant-based protein manufacturing process is not capital intensive. It can easily be scaled up, making it an attractive prospect for investors and small- and medium-sized enterprises. Recent McKinsey research demonstrates that this is a potential new market for the continent that could deliver around $470 million in revenue per year by 2030 while helping to reduce emissions by 4.3 $MtCO_2$ e.[46]

Investing in agricultural resilience

A McKinsey case study found that more localized planning (for example to modernize systems, build better roads, and improve the functioning of seed production systems) and financial mobilization could help African agriculture counter climate-induced volatility in the yields of major African food crops. In turn, this would help stabilize price volatility for both farmers and consumers.[47]

For example, digital technologies could aid the efforts of agricultural planners to spot and adjust to the effects of climate change. In 2019, the Kenyan government introduced a digital "food balance sheet," integrating data on corn stocks and trade to help planners see how much corn the country has at any one time and to make informed decisions about trade policies and emergency planning.[48]

On the financial mobilization side, wider access to agricultural financial instruments, such as crop insurance, could enable individual farmers and households to better manage climate-related risks. However, expanding crop insurance schemes may require support because most farmers are not able to pay the full premium. Based on previous programs, McKinsey estimates that for the 12 million farmers in Ethiopia, a total of approximately $800 million of assets would need to be insured.[49] Although greater access to insurance might encourage farmers to prepare for risks resulting from extreme weather events, it would need to be supported by other risk reduction measures, because insurance cannot cover some climate-related losses driven by long-term changes in temperatures, precipitation patterns as well as sea level rise.

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42 "Key facts and findings," Food and Agricultural Organization of the United Nations.

43 "Curbing methane emissions: How five industries can counter a major climate threat," McKinsey & Company, September 23, 2021; Natasha Doyle et al., "Use of lactic acid bacteria to reduce methane production in ruminants, a critical review," 1 October 2019, Frontiers in Microbiology.

44 "Agriculture and climate change: reducing emissions through improved farming practices," April 2020.

45 "Meat: The future series—alternative proteins," World Economic Forum white paper, January 2019.

46 Lyes Bouchene, Kartik Jayaram, Adam Kendall, and Ken Somers, "Africa's green manufacturing crossroads: Choices for a low-carbon industrial future", McKinsey & Company, September 2021.

47 "Climate risk and response | Case study: Agriculture in Africa," McKinsey Global Institute, May, 2020.

48 Ibid.

49 For example, the World Food Programme established the R4 Rural Resilience Initiative in 2011 in Africa to compensate for climate-related losses; roughly 87,000 farmers took part in it in 2018. In Ethiopia, the initiative reached 29,300 farmers, with a total insured sum of approximately $2 million. World Food Programme and Oxfam America, R4 Rural Resilience Initiative Annual Report January–December 2018, April 2019.

The continent could also look to tap into international development support to build resilience in the sector. Overseas development aid currently amounts to about $150 billion per year.[50] And increasingly, donors target problems related to climate change. These interventions could be critical in helping to ensure food security and stabilize the incomes of smallholder farmers who currently make up more than 50 percent of sub-Saharan Africa's working population.[51]

Climate financing and collaboration are key

Africa is on the cusp of a new era. On the one hand, it faces physical and transition risks as climate change hazards increase in a warming world and the world economy undergoes deep structural changes as it transitions to net zero. On the other hand, it has considerable potential to turn its natural assets to its advantage and to make sure it is part of and contributing to the global transition towards net zero.

The next decade will be decisive, as decision-makers fundamentally rethink the infrastructure, assets, and systems of the future, and the world collectively sets a path to manage the risk of climate change and ensure a just transition. For African stakeholders, recognizing physical climate risk, understanding the landscape of opportunity, and integrating these perspectives into decision-making and strategy can help build a strong position.

Countries would also need to attract substantial amounts of additional finance. The current climate funding gap for adaptation and mitigation on the continent is estimated to be in the region of $200 billion per annum.[52] Developed countries have pledged $100 billion per annum for decarbonization and adaptation initiatives in developing countries, although only a fraction of this is currently flowing, with current public climate funding for Africa estimated to be $20 billion per annum.[53] More public funding and private capital is therefore required to close the climate funding gap.

To achieve a step-change in mindset and impact, a "new deal on climate finance" could see African countries develop ambitious and detailed climate action plans with specific initiatives and near-term milestones translated into bankable projects. Based on this, industrialized countries, development finance institutions, and philanthropic institutions could provide at-scale financing and in-kind support for these concrete projects, tying the financing flows to decarbonization milestones achievement.

Collaboration will be key here. The climate agenda creates an opportunity for collaboration between countries, which is potentially more powerful than competition. The transition to net zero offers the continent an opportunity to work together to capitalize on its assets, mobilize finance, and build a low-carbon economy that protects and enhances lives and livelihoods while safeguarding natural capital and contributing to the global decarbonization agenda.

[50] OECD, Official Development Assistance.
[51] "Employment in agriculture (% of total employment) (modeled ILO estimate) – Sub-Saharan Africa", January 29, 2021 International Labor Organization ILOSTAT database, The World Bank.
[52] Climate Policy Initiative, 2020 Joint Report on Multilateral Development Banks' Climate Finance, World Economic Outlook, IEA World Energy Outlook, Statista, Cefic, World Steel.
[53] "Post-2020 climate finance – a much needed response to multiple crises," German Watch, April 21, 2021, germanwatch.org; "UN Climate Chief Urges Countries to Deliver on USD 100 Billion Pledge," United Nations Climate Change, June 7, 2021, unfccc.int.