OPPORTUNITY AFRICA

POWERING THE FUTURE NOW

AFRICA PROGRESS PANEL

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ABOUT THE

AFRICA PROGRESS PANEL

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The Africa Progress Panel (APP) consists of ten distinguished individuals from the private and public sector who advocate for equitable and sustainable development for Africa. Kofi Annan, former Secretary-General of the United Nations and Nobel laureate, chairs the APP and is closely involved in its day-to-day work.

The life experiences of Panel members give them a formidable capability to access the worlds of politics, business, diplomacy and civil society at the highest levels in Africa and across the globe. As a result, the Panel functions in a unique policy space with the ability to influence diverse decision-makers.

The Panel builds coalitions to leverage and broker knowledge and to convene decision-makers to create change in Africa. The Panel has extensive networks of policy analysts and think tanks across Africa and the world. By bringing together the latest thinking from these knowledge and political networks, the APP contributes to generating evidence-based policies that can drive the transformation of the continent.

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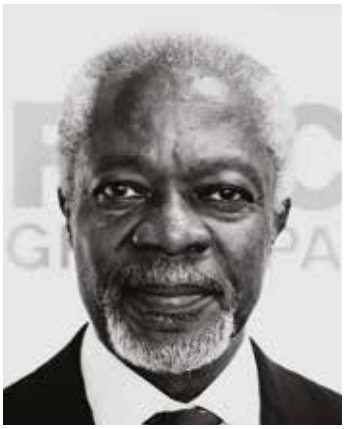

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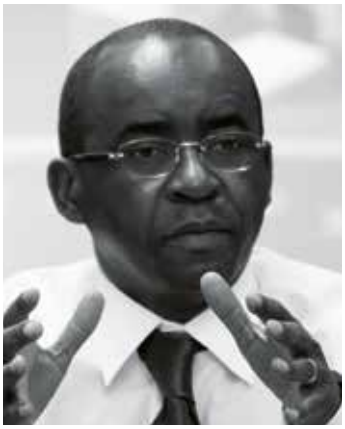

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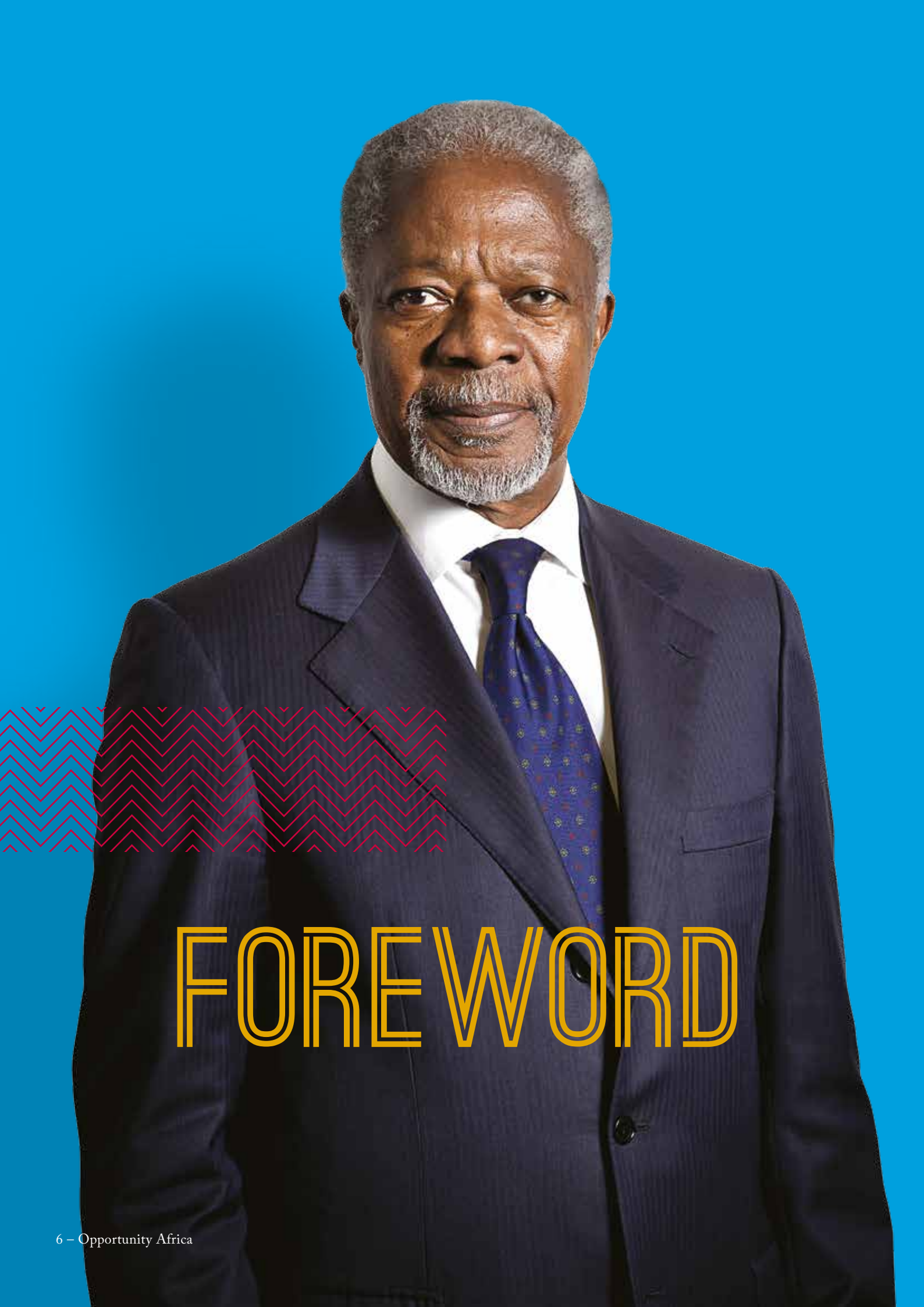

FOREWORD

BY

KOFI ANNAN

"There is good news. Over the past year, the momentum for powering up Africa has grown. Now we must scale up those efforts urgently."

Transforming Africa's energy systems would radically improve prospects for the kind of economic growth that reduces poverty and accelerates progress in improving people's lives. This policy paper, which draws from the Africa Progress Panel's 2015 report, *Power, People, Planet: Seizing Africa's Energy and Climate Opportunities*, sets out a path to the energy transformation that Africa needs. It calls for a ten-fold increase in power generation in Africa by 2030.

The need is urgent: 621 million Africans currently live without access to electricity, and 600,000 die each year from household air pollution because they rely for cooking on biomass. Restricted access to energy leaves some of the world's poorest people paying some of the world's highest prices for power.

To close those deficits, governments must address two distinct but related challenges. First, Africa needs

"Africa's potential to draw on low-carbon energy sources is not just a matter of doing what is right for the planet. It is also about economic common sense."

much more power generation to create the jobs and prosperity that its citizens have a right to expect. Second, Africa needs an accelerated drive to achieve universal access. It is intolerable that, in the second decade of the 21st century, so many Africans are living without even the most rudimentary benefits of modern energy.

There is good news. Over the past year, the momentum for powering up Africa has grown. Now we must scale up those efforts urgently.

To make Africa's energy transformation a reality, it is essential to pool resources and coordinate actions. I therefore applaud the Africa Renewable Energy Initiative launched at the COP21 climate conference in Paris. Under the leadership of President Akinwumi Adesina, the African Development Bank has already launched the New Deal on Energy for Africa, a timely, partnership-driven vision to achieve universal access to energy on the continent by 2025. Other key initiatives include Akon Lighting Africa, USAID's Power Africa, and DFID's Energy Africa.

Africa has to play its part in the global response to climate change, by breaking the links between energy generation and carbon emissions. This is no simple task: there are trade-offs in making the transition from high-carbon to low-carbon development.

In our 2015 report, we documented Africa's extraordinary potential to draw on low-carbon energy sources. This is not just a matter of doing what is right for the planet. It is also about economic common sense. The price of solar and other technologies will continue to decline. And renewable technologies can be deployed at speed and scale, if attached to the right business model. This is already happening in countries as diverse as Ethiopia, Kenya, Rwanda and South Africa.

Of course, as part of its transition strategy Africa will have to draw on its wealth of fossil fuels for some time to come, and it must ensure that in tackling the energy crisis, it makes the transition to renewable energy in ways that are sustainable.

Most African political leaders recognize that tackling climate change presents an opportunity that can help their countries develop along sustainable energy paths.

At the same time, achieving the energy transition in Africa requires that long-term national interest override short-term political gain, vested interests, and corruption. The Panama Papers have provided another reminder that there is a long way to go on this front.

It is a matter of a great concern to see so much of the foreign investment directed to Africa's energy sectors transiting through funds in the British Virgin Islands and other jurisdictions. That is why we at the Africa Progress Panel see an urgent need to establish rules requiring all offshore jurisdictions to establish public registries of beneficial ownership. But when it comes to domestic regulation, the buck stops with African governments.

"Regulatory, policy and sectoral reforms – especially in banking – are essential."

Ultimately, fighting corruption requires close international cooperation. The same goes for tackling climate change. Governments in the world's major greenhouse gas-emitting countries can help Africa meet the challenges and seize the opportunities that climate and energy present. That means placing a price on emissions of greenhouse gases. Instead of taxing emissions for the global public good, G20 countries continue to subsidize them by spending billions on subsidies for fossil fuel exploration.

Ambitious, efficient and properly financed multilateral cooperation is also vital to help Africa build its climate change resilience and to unlock the continent's low-carbon energy potential.

It is refreshing to see a rise in the number of forward-looking companies that are demanding a price on carbon, driving innovation, and seeking opportunities to fund low-carbon development across our continent.

I urge more investors to see Africa – both on and off-grid – as an opportunity, not a risk. African governments need to open up the energy market to drive investment in the sector. Regulatory, policy, and sectoral reforms – especially in banking – are essential. Investment needs to create jobs, build skills and promote innovation. Incredible new technologies are transforming the energy sector. Small-scale renewable energy can open up possibilities to a continent of entrepreneurs.

With decisive governance at home and support from the international and corporate communities, the continent can extend energy access to every African while avoiding the high-carbon pathway to development trodden by the rich world and emerging markets.

The time is right for Africa not only to unlock the potential of an energy transformation – for its people and its economies – but also to become a pioneering global low-carbon market.

Kofi A. Annan
Chair of the Africa Progress Panel


ENERGY L


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INTRODUCTION

"It always seems impossible until it's done"

Nelson Mandela

"It always seems impossible until it's done," Nelson Mandela once said. He was reflecting on the struggle to overturn apartheid, but his words have a powerful resonance today. The challenges are immense. To eradicate poverty, create jobs and sustain growth while limiting greenhouse gas emissions, we must fundamentally realign the energy systems that drive our economies with the ecological systems that define our planetary boundaries. The consequences if we fail are beyond estimation. Yet alongside the risks this is a moment of great opportunity for Africa and the world.

Low-carbon energy systems are at the heart of the opportunity. Climate change raises immensely complex financial, technological and political problems, all of which point towards a single solution. Over the next few decades, governments have to break the link between economic growth and greenhouse gas emissions. Making the transition to a low-carbon future is an imperative for the well-being of future generations. It is also an opportunity to develop green energy strategies that can underpin growth, job creation and shared prosperity.

African leaders have rightly highlighted the immense risks associated with climate change, but insufficient attention has been directed to the opportunities. No region has more abundant or less exploited low-carbon energy resources. Harnessed to the right strategies, these resources could resolve two of the most critical development challenges facing Africa: power generation and connectivity. Renewable energy could do for electricity what the mobile phone did for telecommunications: provide millions of households with access to a technology that creates new opportunities (See infographic: The energy leapfrog on pages 16 and 17).

Some countries in the region are emerging as global leaders in climate-resilient, low-carbon development. The world as a whole stands to gain from Africa avoiding the carbon-intensive pathway that has been followed by today's rich countries, China, India and other emerging markets. Policies to advance climate-resilient, low-carbon development are first and foremost the right policies for Africa. Increased agricultural productivity, land conservation, the development of renewable energy and low-carbon transport systems have the potential not only to reduce future greenhouse gas emissions, but also to reduce poverty, support economic growth and improve people's lives.

Energy provides the link between climate action and efforts to reduce poverty. Dependence on biomass for fuel contributes to land degradation and loss of forestry resources. The energy crisis is part of a vicious circle

Making the transition to a low-carbon future is an imperative for the well-being of future generations.

that is jeopardizing Africa's prospects for eradicating poverty and achieving the Sustainable Development Goals.

Climate risks reinforce the vicious circle. Africa has made the smallest contribution to global warming but it is experiencing the earliest and most damaging impacts of climate change. Governments around the world have pledged to limit global warming to less than 2°C above pre-industrial levels. Delivering on that pledge will require concerted action. We are currently on a trajectory that will raise average temperatures by 4°C and set the scene for unprecedented reversals in human development in the second half of the 21st century.

So great are the energy challenges and so severe the climate risks that it is easy to lose sight of the opportunities. Increasing power generation and accelerating progress towards energy for all could transform productivity in agriculture and industry, driving growth and creating jobs. Providing every African household with access to affordable electricity and clean cooking facilities would boost efforts to reduce poverty and create new market opportunities for investment.

These are not idle ambitions. The Global Commission on Economy and Climate, headed by Felipe Calderón, the former president of Mexico, has documented the potential that renewable technologies could unleash. The world is on the cusp of a green energy revolution. Africa has some of the world's most abundant and least utilized renewable energy assets and is well placed to join that revolution. Through the African Union Assembly, governments have pledged their political will at the highest level to accelerating the deployment of renewable energy. The focus now is on the honouring of commitments. We have not yet built two-thirds of the energy infrastructure that will be in operation by 2030 and investment decisions made today could lay the foundations for a competitive low-carbon energy system.

The idea that countries in Africa have to choose between low-carbon development and economic growth is becoming increasingly anachronistic. Making the early investments needed to support a low-carbon transition has the potential to boost growth and expand power generation. However, realism is required. Recommendations that Africa abandon fossil fuels in favour of a leap into renewable energy are unrealistic. Fuels such as coal will represent a shrinking share of the region's energy portfolio. The smart money for the future is on natural gas and green-energy sources. But African governments are rightly concerned by the double standards of some aid donors and environmental groups who, having conspicuously failed to decarbonize their own energy systems, are urging Africa to go green at an implausibly rapid rate.

An energy revolution is already under way. Utilities are being reformed, independent power providers have emerged as a dynamic new force and companies have developed innovative new business models to reach people who are not yet connected. Renewable energy sources are bringing light to rural communities living far beyond the grid. Planned urbanization could take the energy revolution to the next level through investment in low-carbon transport and energy provision.

The reforms need to be deepened. As a priority, governments should be converting the US$21 billion wasted annually on energy subsidies into productive investment. They should also be attaching far more weight to equity, giving everyone an equal opportunity to obtain energy. Africa's energy systems have been designed and operated to provide subsidized power to small, predominantly urban elites, with scant regard for the poor. Unequal access to energy has reinforced the wider inequalities linked to wealth, gender and the rural-urban divide that have accompanied the economic growth of the past 15 years. Yet here, too, there are encouraging signs of change.

As well as posing risks, climate change provides Africa with opportunities to play a global leadership role. Several countries

are pioneering climate-resilient growth strategies that hold out the prospect for "triple-win" scenarios. To take one example, restoring degraded land and preventing deforestation could increase agricultural productivity, cut poverty and reduce Africa's contribution to global warming. One-fifth of global emissions associated with land-use changes originate in Africa and cutting these emissions is vital to international efforts aimed at avoiding dangerous climate change.

Responsibility for seizing the opportunities associated with energy and climate rests primarily with African governments. These governments will be answerable to their citizens – and to future generations – for the decisions they make at this critical juncture.

National responsibility does not detract from the critical role of international cooperation.

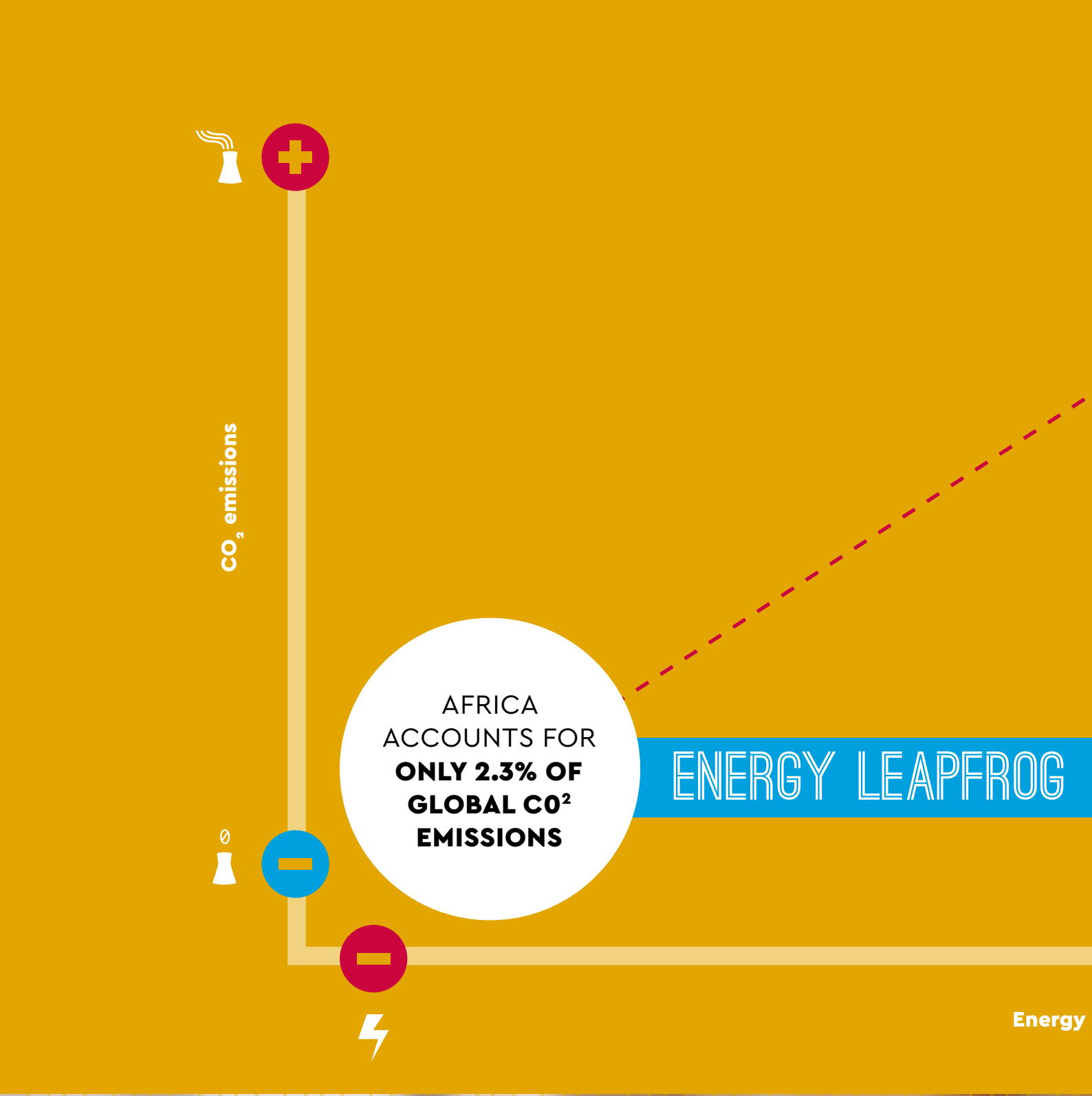
Effective international cooperation will transform what is possible in Africa. Increased support for investment in renewable energy and more sustainable land use could greatly expand the scope for development of low-carbon energy, forest conservation and the restoration of degraded land. Reforming a hopelessly fragmented, underfinanced and poorly governed set of climate-finance institutions could enhance Africa's prospects for managing climate risk and delivering energy for all.

International cooperation is a two-way street. Now, as never before, Africa must be part of an international community that delivers multilateral solutions to shared global problems. It is time to move the debate on Africa and international cooperation well beyond the restrictive confines of aid.

Confronted by challenges of the magnitude of those associated with Africa's energy crisis and climate change, it is easy to slip into fatalism. Yet fatalism is a luxury that Africa and the world cannot afford. The tasks ahead are daunting. Turning the principles of sustainable development into practical national policies and multilateral cooperation may seem impossible.

But it always seems impossible until it's done.

Effective international cooperation will transform what is possible in Africa.



THE ENERGY

TRANSITIONING TO A L

Share of total CO_2 emissions from the consumption of energy

EU-27	US	CHINA
12%	**16%**	**25%**

Energy rich countries have put the world on

A DANGEROUS HIGH-CARBON TRAJECTORY

Africa's energy systems can leapfrog onto low-carbon pathways where renewables replace fossil fuels.

Africa could become the

GLOBAL LEADER IN LOW-CARBON DEVELOPMENT

production

Y LEAPFROG

OW-CARBON ECONOMY


OPPORT


TUNITY

The region's vast untapped energy potential

OPPORTUNITY AFRICA

"Access to electricity is the lifeline for families to meet their most basic needs, and it's the connection that's needed to plug Africa into the grid of the global economy."

Barack Obama,
President of the United States of America

Africa's energy systems stand at a crossroads. For countries across the region, this is a moment of great opportunity. Two-thirds of the energy infrastructure that should be in place by 2030 has yet to be built. Demand for energy is set to surge, fuelled by economic growth, demographic change and urbanization. Cities could emerge as hubs of innovation. As concerns over climate change spur innovation that is driving down costs for low-carbon energy, Africa could seize the opportunity to leapfrog into a new era of power generation. No region has more abundant or less utilized renewable energy potential. Decentralized power generation and distribution systems are opening up new possibilities for reaching populations currently bypassed by national grids (See infographic: Energy demand).[1]

But such positive outcomes are not guaranteed. Power-generation capacity could fail to keep pace with demand, creating an increasingly restrictive energy bottleneck. The energy gap between Africa and other developing regions could widen, with damaging consequences for Africa's place in increasingly interdependent and competitive global trading systems. Energy planning in Africa has suffered from a backward-looking conservatism that could leave the region on the sidelines of the global low-carbon energy revolution. Even if power generation increases, there is a danger that large numbers of people will be left behind, especially in rural areas and urban informal settlements.

The stakes could hardly be higher. Transformation of Africa's energy systems would transform prospects for inclusive growth that reduces poverty and accelerates progress in improving people's lives. Perpetuating the limited and unequal access to small amounts of power that characterizes much of Africa today is a prescription for inequality and restricted opportunity.

There are two fundamental requirements for changing this picture. First, the quantity of power generation has to undergo a step increase. Current scenarios for the region developed by the IEA and others lack ambition and are not aligned with developments in Africa. Second, far more attention has to be paid to the most disadvantaged. Too many energy plans focus on generating more gigawatts, with insufficient regard to equity and access to electricity.

This is inconsistent with the commitment to deliver energy for all by 2030. Devolved power generation, coupled with more flexible approaches to grid development, could bring electricity to every household in Africa. However, success will require strong political leadership to overhaul the governance of power utilities.

Devolved power generation, coupled with more flexible approaches to grid development, could bring electricity to every household in Africa.

A POWERFUL CURRENT
IS SWEEPING ACROSS AFRICA'S ENERGY SYSTEMS

THE UNTAPPED POTENTIAL
of Africa's primary energy resources
(excluding South Africa) is estimated to be

260 TIMES

THE CURRENT GRID-BASED CAPACITY

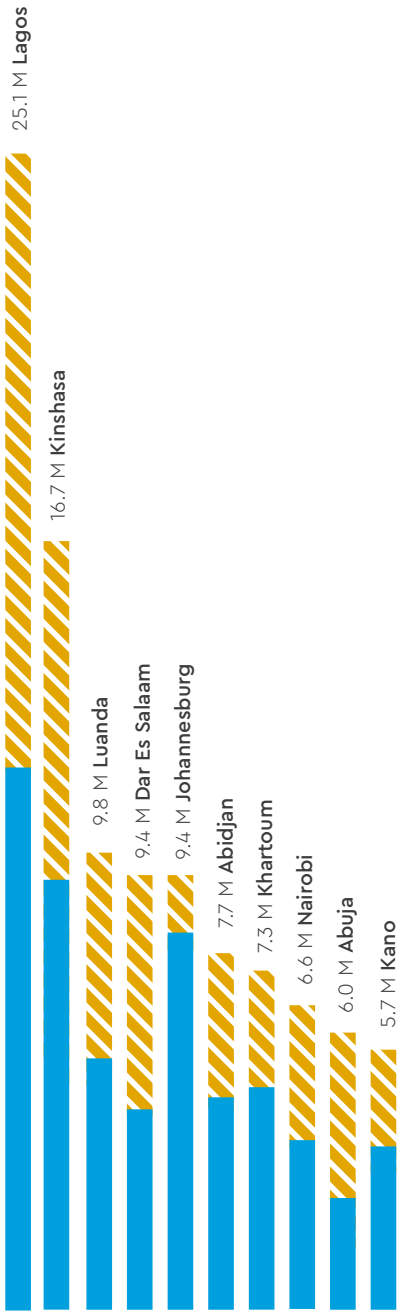
ELECTRIFICATION

POPULATION GROWTH

ARE DRIVING AN
INCREASE IN
ENERGY DEMAND

URBANISATION

ECONOMIC GROWTH



Africa's expanding cities (Projected population growth to 2030)

2012 2030

Data source: Godfrey, N and Zhao, X. (2015). The Contribution of African Cities to the Economy and Climate: Population, economic growth, and carbon emission dynamics.

ENERGY DEMAND IS RISING AND SET TO SURGE

Energy systems across Sub-Saharan Africa are struggling to cope with rising demand for power generation. That struggle is set to intensify. Four powerful drivers of demand are evident:

Economic growth: Each percentage point in GDP growth in developing countries tends to be accompanied by growth in energy demand of 1.2-2.3 per cent.[2] Africa has been an exception to the rule. Sustained economic growth at 4-5 per cent would change this picture, generating demand for electricity among companies and an emerging middle class.

Population growth[3]: Between 2015 and 2040, the population of Sub-Saharan Africa is expected to increase by 755 million, or 81 per cent. Electricity generation will have to almost double by 2040 simply to maintain per capita provision. Similarly, access rates will have to increase by more than population growth to achieve energy for all.

Urbanization: By 2050 around one half of Africans will live in cities, compared with just over one-third today – an increase in the urban population of 800 million people (See Focus on: Africa's Urban Future). The implications for energy provision are far-reaching. Today, urban consumers in Africa use on average three times more electricity than their rural counterparts. Urbanization also lowers the cost of connectivity. The cost of connecting a new household to the grid typically ranges from US$500 in high-density urban areas to US$1,500 for sparsely populated areas that are far from the grid.[4]

Electrification rates: As more households and firms are connected to the grid, demand for energy will rise. The rate of increase will be determined by price, the degree to which firms replace generator-fired power with grid-based power and consumption levels among newly connected households and companies.

MAINSTREAM SCENARIOS FALL FAR SHORT OF THE AMBITION NEEDED

Scenarios developed by the IEA and others provide an insight into some of the energy challenges facing policymakers in Africa, as well as the potential costs of meeting higher levels of demand.

The results of these exercises are instructive. The two core scenarios of the IEA, the new policies scenario and the more ambitious African century case, envisage a substantial increase in power but neither achieves universal

FOCUS ON:

AFRICA'S URBAN FUTURE

RISKS AND OPPORTUNITIES

Sub-Saharan Africa is home to some of the world's fastest-growing cities (See figure on page 24). Unplanned urbanization on the current model will lead to cities marked by high levels of pollution, restricted access to services and rising greenhouse gas emissions. There is an alternative that will benefit Africa and the world. Research carried out for the Africa Progress Panel's 2015 report, *Power, People, Planet: Seizing Africa's Energy and Climate Opportunities*, tracked urbanization and the economic prospects of Sub-Saharan Africa's 69 largest cities across 35 countries. The results show:

– Half of the world's fastest-growing cities are in Sub-Saharan Africa; 13 cities will double their population between 2012 and 2030; and Lagos will be home to 25 million by 2030.

– The GDP of the 69 African cities is set to increase by US$750 billion, or 167 per cent, by 2030, based on "business as usual" economic growth. While these cities currently represent less than a fifth of the population, they already generate 36 per cent of GDP.

– The number of low-income cities is set to decrease from 15 to 4 between 2012 and 2030.

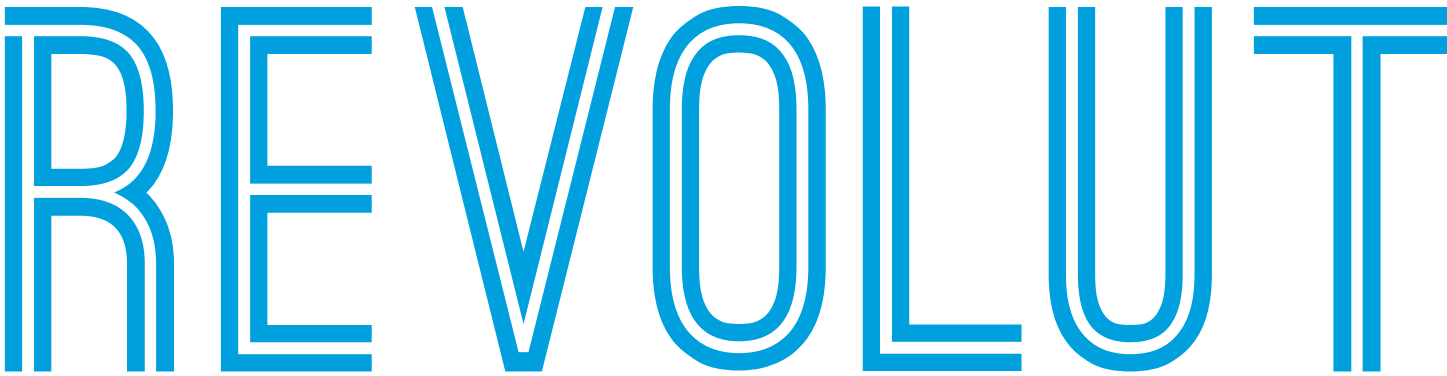
Across the world, urbanization has created hubs of innovation, vibrant new markets and productivity gains. But the "urban dividend" is not automatic. Africa's urbanization has been a largely unplanned consequence of rural poverty. The rise of a new high-income elite has deepened already pronounced social divides. The sprawling slum of Kibera in Nairobi, for example, is separated from the homes of Kenya's super-rich by a single road. Urban sprawl is pushing settlements into agricultural areas and onto increasingly precarious sites susceptible to flooding. Cities built in this fashion haemorrhage economic opportunities and amplify social and environmental stress. Lacking access to modern energy, poor households resort to burning charcoal. Emissions of soot, traffic fumes and smoke have created dangerously high levels of particulate matter, which is linked to premature death, asthma, heart attacks and respiratory diseases. Road-traffic problems reinforce the costs of pollution. Sub-Saharan Africa has the world's lowest levels of car ownership, but the highest levels of road death (322 road deaths per 100,000 cars) and some of the world's most congested cities. One study in Lagos estimated that commuters lost 3 billion hours annually to congestion and that a 20 per cent reduction in congestion would save US$1 billion every year. There is an alternative. City authorities can work with utilities and the private sector to expand access to affordable electricity. Renewable-energy technologies offer opportunities to leapfrog grid-based systems through solar and wind power.

Similarly, Africa's urban transport crisis could become an economic opportunity if managed in the right way. Cities such as Lagos and Abuja in Nigeria and Addis Ababa in Ethiopia have developed bus rapid transit and light rail systems, modelled on best international practices. Some governments are also responding to the emerging crisis of air pollution. The five member states of the East African Community have committed to a shared target for lowering sulphur emissions in fuel. Other opportunities can be created by allowing entrepreneurs access to the urban waste-stream and by devolving sanitation services to communities. Compact, cohesive and connected African cities could bring benefits in terms of economic growth, jobs and less pollution, while reducing transport-related emissions.[5]

access. IEA's demand modelling suggests that electricity generation will need to increase by a factor of four to six by 2040. Over the next 15 years, under these scenarios, electricity generation would increase from 440TWh in 2012 to between 974TWh and 1124TWh by 2030. A scenario developed by McKinsey is also within this range. The unifying conclusion is that power generation will increase by around 4 per cent a year.

Measured against the record of the past 15 years, a 4 per cent annual increase in electricity generation would mark a step increase.

Viewed against a higher level of ambition, the projected increases look less impressive. In the IEA's standard scenario, per capita electricity availability for Sub-Saharan Africa, excluding South Africa, would amount to around 830kWh in 2040. This is well below the level in India today and around one-third the current level in Thailand. To raise the entire region of Sub-Saharan Africa to the average current per capita electricity access of South Africa would require a 33-fold increase in installed capacity.[6] One recent study has shown that even a less ambitious 10-fold increase would require a 13 per cent per annum average growth rate.[7]



Many people could be left behind

The standard energy scenarios also serve to highlight concerns over equity. Even with a fourfold increase in power generation, millions of Africans would literally be left in the dark.

Universal access to electricity does not imply high levels of consumption. The IEA provides an initial threshold for energy access in rural areas at 250kWh for rural households and 500kWh for urban households, assuming a five-person household. At this level, access is sufficient to power a couple of light bulbs for a few hours a day, charge a mobile phone and, in urban areas, perhaps run a fan. The IEA thresholds equate to 50-100 kWh per person annually, or around 0.5 per cent of consumption in the United States and 5 per cent of average consumption in Latin America. These are hardly ambitious targets.

Yet neither the IEA nor the McKinsey scenarios anticipate universal access to energy by 2040, let alone by the 2030 target date envisaged under the Sustainable Development Goals. The IEA scenarios would leave between 595 million and 635 million people without access in 2030, or between 43 per cent and 46 per cent of the region's population. The McKinsey scenario envisages 70-80 per cent access by 2040.[8]

These numbers imply that populations now without access will account for

*Received wisdom is dissolving in the face of an extraordinary wave of innovation in low-carbon technologies.

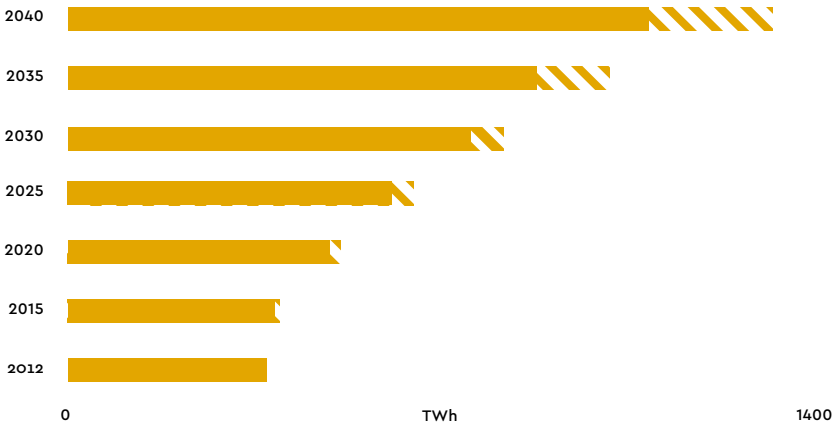
Concern over climate change will strengthen that wave, with potentially revolutionary consequences.

IONARY*

a very small share of the additional electricity consumption. If these scenarios become reality, the direct benefits of connectivity will trickle down at a desperately slow pace (See figure on the right).

Policymakers need to raise the bar for ambition

The projected access figures for 2030 raise important questions for policy makers. The IEA is one of the world's most influential bodies in energy policy and its Africa Energy Outlook is rightly seen as an authoritative source of data and analysis.[9] Yet the core scenarios developed by the agency question not just the region's capacity



More power, unequally shared (Projected electricity demand by source, IEA scenario, 2012-2040)

Data source: Derived from IEA scenario data.

There is no shortage of evidence to demonstrate what is possible.

to make an energy transformation, but also the credibility of international commitments to achieve energy for all by 2030.

While recognizing the evidence that can be marshalled to support the claim, the Africa Progress Panel rejects the conclusion. Financing, political will and effort are not fixed parameters; they can be changed through strong political leadership and effective international cooperation. Africa cannot afford a level of ambition that leaves the region without the power needed to support economic growth, and millions of the region's citizens without access to even the most basic level of electricity.

If more ambitious goals are to be achieved, policymakers have to abandon the traditional incremental approaches and assumptions that underpin the IEA scenarios and focus on transformational change in two areas. First, overall power generation needs to increase at least 10-fold by 2040 if Africa's energy systems are to support the growth in agriculture, manufacturing and services needed to create jobs and raise living standards. Second, if governments are serious about the 2030 commitment of "energy for all", they must adopt the strategies needed to extend provision through the grid and beyond the grid. This is an area in which technological choice matters. Households lacking access to electricity cannot afford to wait 15-20 years until large-scale, capital-intensive projects come on stream. The speed of deployment matters and new technologies are dramatically increasing the speed at which initial access can be provided.

There is no shortage of evidence to demonstrate what is possible. Brazil, China and Indonesia have achieved rapid electrification over short time periods.[10] Vietnam went from levels of access below those now prevailing in Africa to universal provision in around 15 years (See Lessons from: Vietnam's drive towards universal access). The country expanded electricity consumption fivefold between 2000 and 2013. Bangladesh has increased electricity consumption by a factor of four over the same period.

In each case, the transition to universal modern energy access was based on a transformation in ambition, allied to the adoption of new technological systems, institutional reform and finance. Equity has figured prominently, as poor households and rural areas were accorded a high priority.[11]

Given the pace of technological change, past experience may not provide a guide to future options. Electrification has tended to progress slowly at access rates below 20 per cent, accelerate between 20 per cent and 80 per cent, and then slow down as energy systems are extended into more remote and poorer areas.[12] With the emergence

LESSONS FROM:

VIETNAM'S DRIVE TOWARDS UNIVERSAL ACCESS

The experience of Vietnam cautions against adopting a low level of ambition in transforming energy systems. In 1990, only 14 per cent of the population had access to electricity. Today, Vietnam nearly has universal coverage. Electricity production rose by a factor of ten between 1990 and 2010. Fossil fuels have increased their share in the primary energy mix but renewable energy provision increased fivefold.

Whether measured in terms of power generation, access or average consumption, Vietnam has attained indicators for electricity far in excess of those that would be predicted on the basis of the country's income levels. The extension of the transmission and distribution grid played a critical role in facilitating Vietnam's transition to energy for all. Public investments in the 1990s created a network of high-voltage and medium-voltage transmission lines, including a national North-South line, allowing power produced by major hydropower projects to be transmitted across the country.

Universal access to electricity has been attained at relatively low levels of consumption. Most households in the poorest 40 per cent consume less than 100kWh. However, the poorest households also benefit indirectly from the electricity utilized by small enterprises for agro-processing.

What are the factors behind Vietnam's success?
Beyond sustained political leadership, three factors stand out:

The development of a central grid and a decentralized system

Despite the presence in the 1990s of a state electricity monopoly, reforms allowed local communes and groups of households to play a role in distribution through the purchase of electricity. By 2010, local distribution utilities (LDUs) were operating in almost two thirds of the country's 9,087 communes.

Pragmatic market reform with strong regulation

Vietnam has undertaken far-reaching energy-sector reforms, which are moving the country towards the creation of competitive generation and wholesale markets where sellers (power plants) and buyers (distributors and large consumers) will operate in a competitive power pool. Average tariffs are set and collected at levels sufficient to generate a profit for reinvestment and maintenance.

Financing provisions

Targets for electrification have been linked to finance. Public investment has dominated the drive towards universal access and expanded power generation. Community-level contributions have also played a key role, accounting for around one-third of overall financing. Aid played an important role in financing energy infrastructure, but had a residual role in rural electrification.[13]

2080 YEAR IN WHICH AFRICA WILL ACHIEVE UNIVERSAL **ACCESS TO ELECTRICITY IF ON CURRENT TRENDS**

621 MILLION

AFRICANS DO NOT HAVE ACCESS TO **ELECTRICITY**

60%

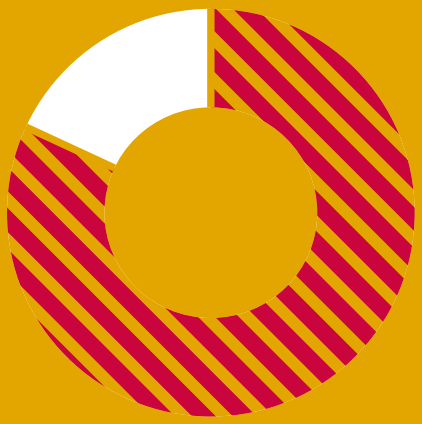
OF SSA'S ENERGY IS **CONSUMED BY SOUTH AFRICA**

2080

YEAR IN WHICH AFRICA WILL ACHIEVE UNIVERSAL **ACCESS TO ELECTRICITY ON CURRENT TRENDS**

X20

IN AFRICA, THE POOREST HOUSEHOLDS **SPEND 20 TIMES MORE PER UNIT OF ENERGY THAN THE WEALTHIEST HOUSEHOLDS** WITH A CONNECTION TO THE GRID



IN 9 AFRICAN COUNTRIES

MORE THAN 80%

OF PRIMARY SCHOOLS
HAVE NO ELECTRICITY

600,000 AFRICANS ARE KILLED

EVERY YEAR BY AIR POLLUTION CAUSED BY THE USE OF
SOLID BIOMASS FOR COOKING

93

MILLION

NIGERIANS
LACK ACCESS TO ELECTRICITY

89 BILLION

US DOLLARS

OF PETROLEUM
EXPORTED BY NIGERIA

IN 2013

4/5

OF THE POPULATION
(727 MILLION)
RELY ON SOLID BIOMASS,
MAINLY FUELWOOD
AND CHARCOAL, FOR
COOKING


UNTAPPED


POTENTIAL

of new renewable technologies that can deliver affordable decentralized power to households, both the take-off and the "last mile" could see accelerated progress.

Several African countries are already in the early stages of what may be an energy transformation. In some cases the starting point is a very low level of access and per capita provision. Even so, countries as diverse as Ethiopia, Kenya, Rwanda and South Africa are pushing back the boundaries of what appears possible.

AFRICA'S ENERGY ASSETS – VAST BUT UNDER-EXPLOITED

Sub-Saharan Africa may be starved of electricity, but the region is extraordinarily rich in energy assets. Measured in terms of technical potential, the power-generation capacity of gas, coal and hydropower resources vastly exceeds existing levels of power generation. Adding solar and wind power to the mix dramatically increases the potential.

Exploiting that potential requires finance, technology and institutional capabilities that are missing in many countries. Moreover, energy planners are making decisions in a fast-moving environment. Received wisdom is dissolving in the face of an extraordinary wave of innovation in low-carbon technologies. Concern over climate change will strengthen that wave, with potentially revolutionary consequences.

There is no roadmap to guide the decisions that African governments have to make. Every government has to determine what constitutes a judicious mix of energy sources in the light of its natural resources, financial and technological capabilities, and where the country is starting from. But no government can afford to ignore the emerging opportunities associated with low-carbon technologies.

The starting point – small grids dominated by hydro-power and coal

Regional energy figures for Sub-Saharan Africa are distorted by the size of South Africa's grid. Coal is the dominant primary energy resource for the region, accounting for 45 per cent of total electricity supply. However, hydropower is by some distance the main source of energy for most countries. Taking South Africa out of the equation, hydropower accounts for around 70 per cent of power generation.

To summarize a complex picture:

Southern Africa: The 46GW grid in South Africa is dominated by coal. The remaining three-quarters of the population

Ethiopia is set to achieve zero net emission status by 2027. No developed country has matched this level of ambition.

accounts for one-fifth of installed capacity, with hydro-power and oil dominating. South Africa is one of the world's major coal producers and exporters.

West Africa: Around half of the subregion's 20GW grid is gas-fired, with oil accounting for another one-third of capacity and hydropower for 20 per cent. The high share of oil results in average costs of generation more than double the costs for southern Africa.

East Africa: Total grid capacity has tripled since 2000 as a number of major hydropower projects have come on stream, including the Merowe dam in Sudan and Ethiopia's Beles II and Gilgel Gibe II dams. Hydropower accounts for around half of grid capacity, with oil-fired generation accounting for over 40 per cent of the remainder.

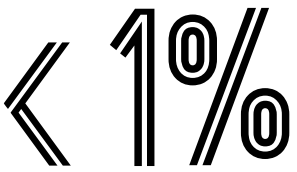
Central Africa: The subregion has the most limited grid capacity of 4GW and the growth of that capacity has been very slow. Hydropower dominates, accounting for around two-thirds of output.

One of the standout features of the current primary-energy mix is the limited role of renewable energy other than hydropower. There has been a marked increase in generation of geothermal energy in East Africa over the past decade and generation is increasing using both solar photovoltaic and wind-power technologies. However, renewable-energy sources currently represent around 1 per cent of total grid-based capacity.

Regional trade in energy is weakly developed. Sub-Saharan Africa has four operating power pools but all are operating well below optimal levels.[14] Less than 8 percent of power crosses the region's borders, despite the capacity needs of many countries. The southern African power pool is the most developed and electricity exchanges from Cahora Bassa in Mozambique to South Africa dominate trade within the subregion. In central and eastern Africa, less than 1 percent of power crosses international borders. The West African gas pipeline, first mooted in the mid-1980s, is a case study in failed regionalism.[15]

Primary energy potential – a snapshot of the inventory

Measuring energy potential is inherently difficult. Even so, Africa has rich primary-energy resources in the form of reserves of fossil fuel and resources for hydro, solar and wind power. Tapping into even a fraction of the technical potential would transform the region's energy systems. Estimates developed by McKinsey put the untapped potential at 1.2TW, excluding solar power. To put this number in context, it represents 26 times the current grid-based capacity (excluding South Africa). Adding



Renewable energy sources currently represent less than 1 per cent of total grid-based capacity.

solar potential to the equation would multiply the potential by a factor of 10.

Africa currently utilises a fraction of the region's technical **hydropower** potential. Overall potential capacity has been estimated at 1,844TWh a year, three times the current total electricity consumption for the entire region.[16] The untapped potential for large rivers is mainly concentrated in the Upper Nile and the Congo.

The Democratic Republic of the Congo alone accounts for around half of the region's technically exploitable hydropower potential. The Grand Inga project (See Focus on The Grand Inga a transformative but delayed project) could add around 44GW to Africa's grid. While large hydro-projects capture the headlines, small-scale hydropower plants represent very large potential. Sub-Saharan Africa currently has 588 small plants in operation with an average size of less than 10MW.[17]

Hydropower will remain the primary source of non-fossil fuel energy. Major investments have been put in place. The Grand Ethiopian Renaissance Dam (GERD), now being built in the Benishangul-Gumuz region near the border with Sudan, will be one of the world's largest dams. Five other major hydro-projects with a capacity in excess of 1GW are under development, two in Ethiopia, two in Angola and one in Mozambique. The Niger, Orange and Senegal river systems have large potential for hydropower.

Realizing that potential creates development challenges that go beyond power generation. The up-front costs of designing and constructing big dams are very high; investment in GERD absorbs around 10 per cent of Ethiopia's budget. Harnessing water for energy can mean a loss of river irrigation for smallholder farmers. Impacts on local people can be very severe, especially in communities subject to forced displacement. Few governments have put in place the mechanisms needed to protect human rights and provide adequate compensation. Large dams also have social, environmental and economic consequences for downstream countries.

Sub-Saharan Africa has abundant reserves of **coal** and **oil**. At current production levels, coal reserves are sufficient to meet demand for around 141 years. Most of the reserves are concentrated in South Africa. However, Mozambique has the potential to emerge as a major producer, with estimated reserves of 25 billion tonnes. Recoverable resources of oil are placed at around 65 billion barrels, enough for another century of production at current levels. New discoveries are expanding the reserve levels. Sub-Saharan Africa has accounted for around 60 per cent of new oil discoveries since 2000, with traditional West African countries being joined by new suppliers. The Jubilee field in Ghana and the Kingfisher field in Uganda have raised prospects of wider discoveries, with intensive exploration under way in Kenya's Rift Valley and Ethiopia's Ogaden Basin. Madagascar has emerged as a potentially significant producer of unconventional oil.

Natural gas has emerged as a regional energy game-changer. West Africa dominates production, with Nigeria's exports having quadrupled since 2000. But the major news story is in East Africa. Ten years ago, neither Mozambique nor Tanzania would have figured among the major gas producers of Sub-Saharan Africa. Today they account for about half of gas-fired power potential.[18] Mozambique's estimated reserves are the fourth largest in the world. Only a small group of countries – Cameroon, Côte d'Ivoire, Nigeria, South Africa and Tanzania – currently use their gas resources for domestic consumption. This could change. McKinsey estimates a regional potential of about 400GW of gas-generated power to 2040 and Mozambique, Nigeria and Tanzania account for 60 per cent of the total. Ongoing exploration is likely to produce further discoveries of natural gas, partly because exploration in Sub-Saharan Africa remains underdeveloped by comparison with the rest of the world.

FOCUS ON:

THE GRAND INGA

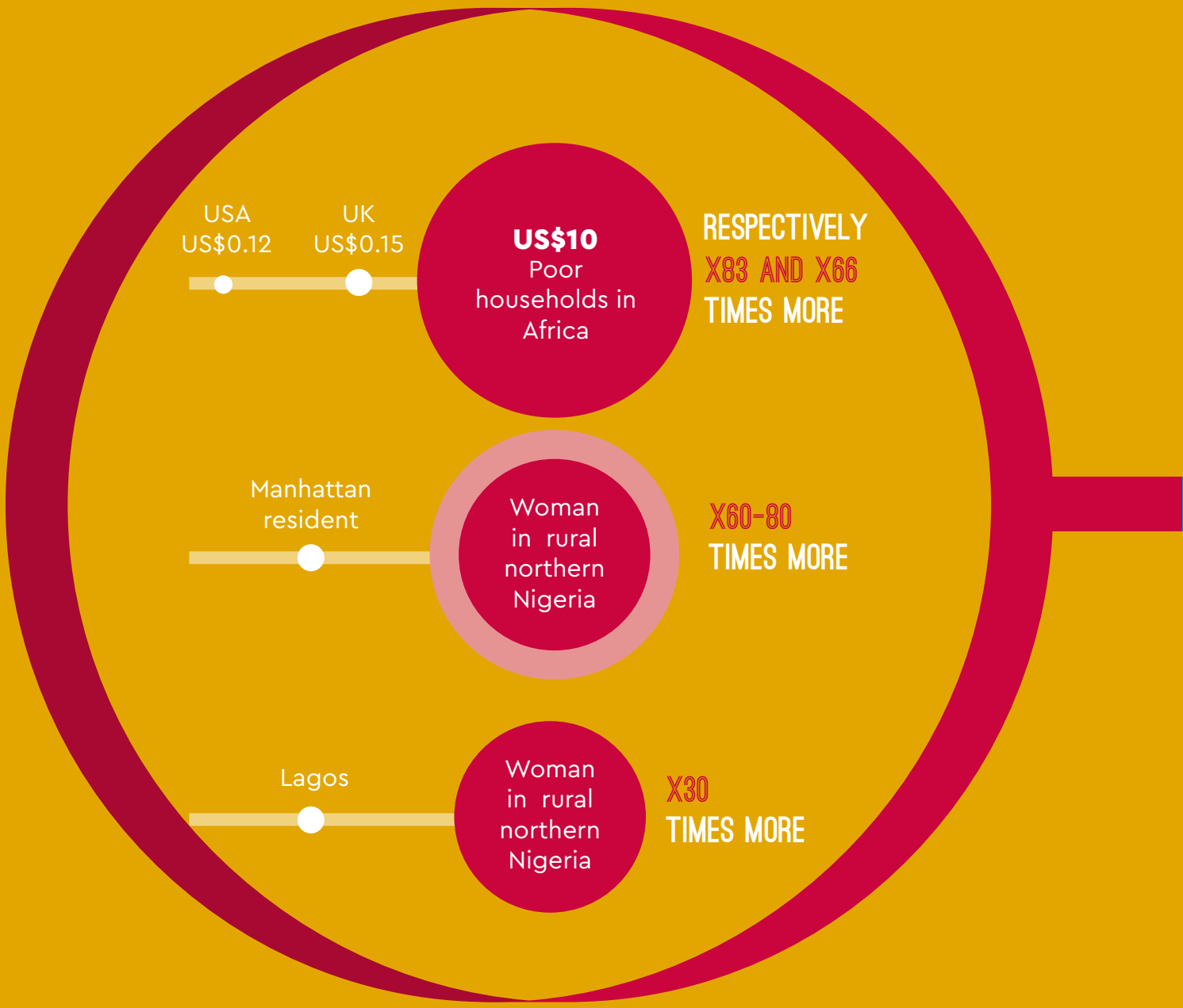
A TRANSFORMATIVE BUT DELAYED PROJECT

Nothing better illustrates the gulf between Africa's power potential and current provision than the Grand Inga project. This envisages the construction of the world's largest hydropower complex in the west of the Democratic Republic of Congo. If constructed, the 44GW plant would double the electricity production capacity of Africa in one stroke. Grand Inga could generate more power than the Three Gorges Dam in China, making it the world's largest infrastructure project.

Over the decades many plans for the development of Grand Inga have been drawn up and consigned to the dustbin. Two dams, Inga 1 and Inga 2, were built more than 30 years ago. Utilization rates are desperately low, however, because of poor maintenance, under-investment and political instability. Rehabilitation is underway, although repeatedly delayed by financing constraints and governance concerns.

Strengthened governance in the Democratic Republic of the Congo is one condition for development to proceed. Another is prior agreement on a cross-border network of transmission lines, cooperation between utilities, and critically a financially viable buyer to make the project bankable. Grand Inga can only work with the development of a regional grid. The AfDB continues to play a crucial role in the development of Inga III.[19]

AFRICA'S POOREST PEOPLE ARE PAYING AMONG **THE**



AFRICA'S BILLION DOL

REDUCING PRICES, INCREASING AC

WORLD'S HIGHEST PRICES FOR ENERGY PER KWH

US$ 10 BILLION

THE AMOUNT SPENT ON ENERGY BY AFRICANS LIVING ON LESS THAN US$2.50 A DAY.

The size of the energy market points to significant opportunities for investment and household savings

REDUCING ENERGY COSTS

by investing in modern energy could

- CREATE INVESTMENT OPPORTUNITIES
- INCREASE HOUSEHOLD SAVINGS
- REDUCE POVERTY

Non-hydro renewable energy capacity is extraordinarily rich:

- **Geothermal** capacity is estimated at 7GW to 15GW, with a concentration in East Africa. The Rift Valley's very large geothermal potential is already being exploited by Kenya and developed by Ethiopia. In Kenya, geothermal's contribution to the national energy mix is now over 50 per cent.

- **Solar power** is Africa's most abundant but least utilized source of energy generation. Potential capacity has been placed as high as 10 terawatts (TW).[20] Most of the region enjoys more than 300 days of bright sunlight and irradiance levels twice the average for Germany, where a thriving solar industry has developed. Estimates of prospective solar photovoltaic (PV) electricity supply by 2030 range from 15GW to 62GW.[21]

- **Wind-power deployment** is limited but the potential is large. Technical potential has been put at 1,300GW.[22] Several countries have zones with wind speed and reliability meeting high-efficiency standards, including the Rift Valley, South Africa, Chad and Mauritania, where technical capacity has been estimated at four times annual energy consumption in terms of oil equivalence. Kenya is developing utility-scale wind-power generation in the Turkana region. Angola, Mozambique, Namibia, Tanzania and South Africa have potentially large offshore resources.[23]

TECHNOLOGICAL CHOICES – AND ENERGY FUTURE SCENARIOS

For policymakers concerned to convert potential into real energy, mapping resources is just one part of a complex equation. Solar irradiation only becomes a viable source of modern energy when it is harnessed to technology. Fossil fuels such as gas and coal have to be transported and transformed into thermal energy through combustion. The critical considerations facing governments are the locations of primary energy resources and the costs of putting in place the infrastructure, technology and finance needed to exploit those resources.

The IEA has estimated costs for power generation across a range of technological options. These costs are expressed in comparable – or "levelized" – terms. In the case of on-grid provision, coal has a distinctive cost advantage in the IEA estimates, with solar PV at the top end of the "levelized" cost range.[24] Solar PV and other renewable options, including small hydro- and small wind power,

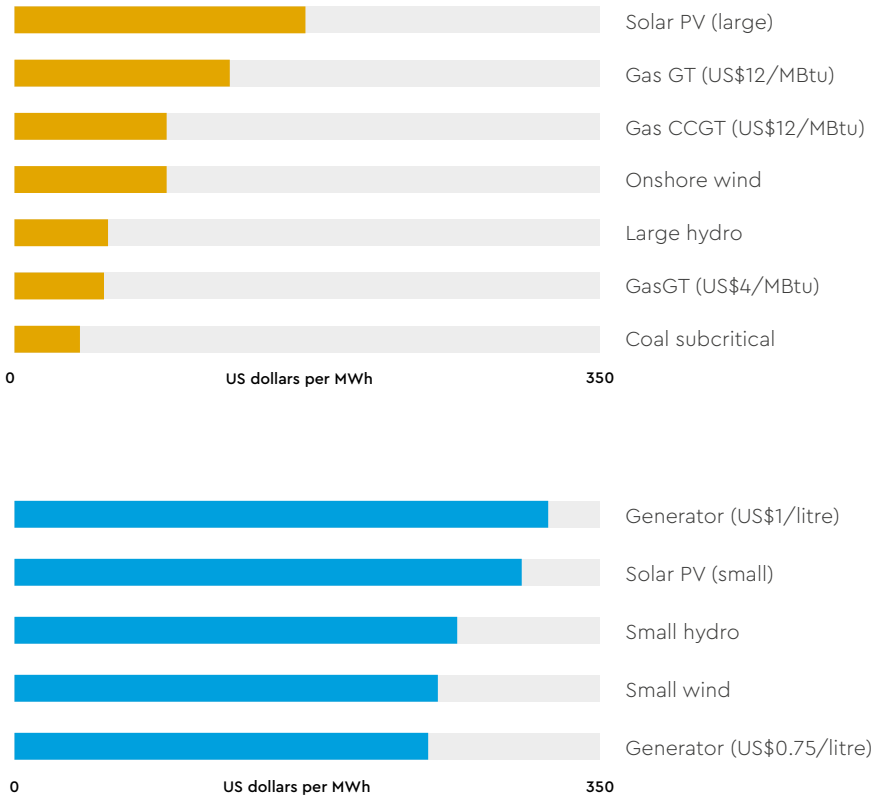
MOMENTU

are more competitive than diesel generators in off-grid or mini-grid applications (See figure on the right).

The scenarios outlined earlier are acutely sensitive to assumptions about future costs and technological change. Both the IEA (See figure on page 42) and the McKinsey scenarios anticipate that the expansion of power generation will be associated with a shift in the energy mix and that the share of coal will shrink and the shares of renewable energy and natural gas will rise:

- Coal accounts for 23-27 per cent of the regional electricity mix by 2030 according to the IEA scenarios and 21 per cent under the McKinsey scenario.

- Gas-fired power dominates the 2040 electricity mix predicted by McKinsey, accounting for 40-50 per cent of capacity; the IEA scenarios point to a share of around one-quarter.



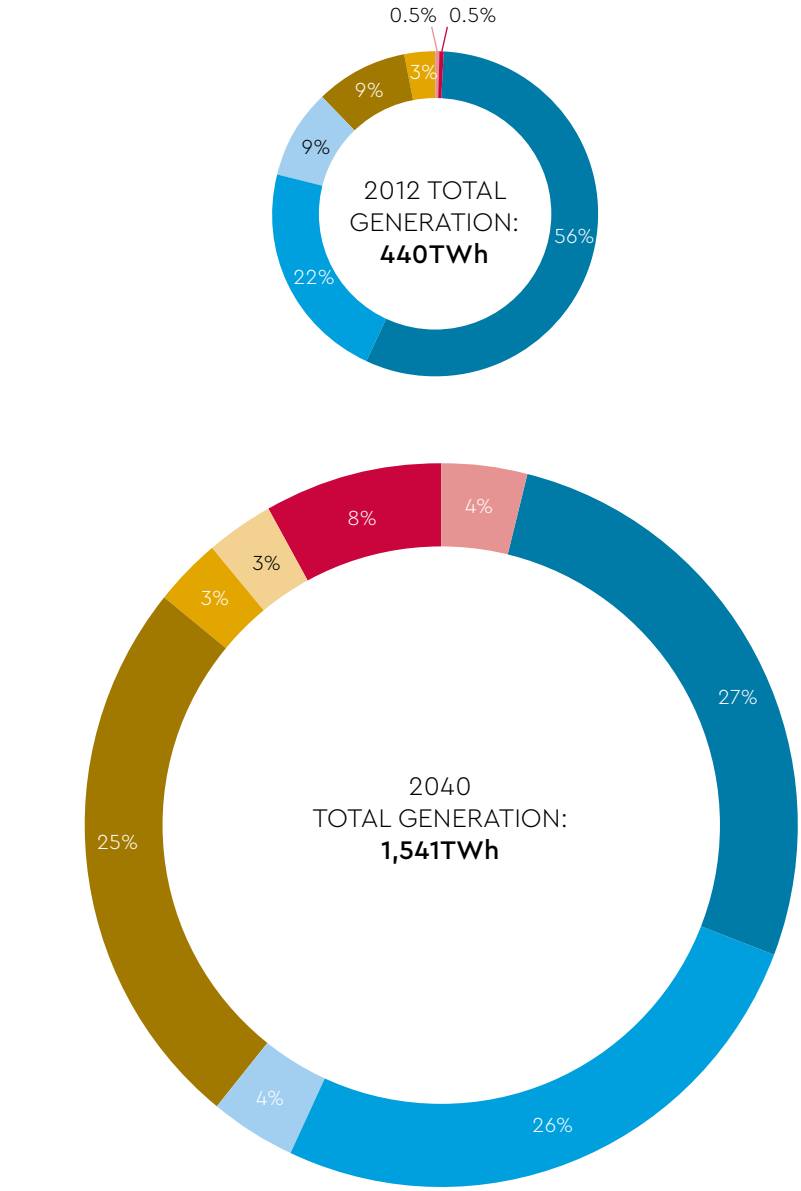
Electricity costs vary for on-grid and off-grid sources: Indicative levelised costs for Sub-Saharan Africa (2012)

On-grid Off-or mini-grid

Notes: Costs are indicative and figures for specific projects could vary significantly, depending on their detailed design. GT = gas turbine; CCGT = combined-cycle gas turbine; MBtu = million British thermal units.

Data source: International Energy Agency. (2014). Africa Energy Outlook: A focus on energy prospects in Sub-Saharan Africa.

*Over the past year, the momentum for powering up Africa has grown. Now we must scale up those efforts urgently. To make Africa's energy transformation a reality, it is essential to pool resources and coordinate actions.



Africa's energy profile is set to change, with the share of coal shrinking: electricity generation by fuel in sub-Saharan Africa in the new policies scenario (2012 and 2040)

Data source: International Energy Agency. (2014). Africa Energy Outlook: A focus on energy prospects in Sub-Saharan Africa.

- Under the McKinsey scenario, solar would comprise 17 per cent of capacity by 2040, but not take off until 2030. In the IEA scenarios, solar represents just 4 per cent of 2040 capacity.

- The IEA scenarios envisage hydropower accounting for between one-quarter and one-third of 2040 capacity, compared with 11 per cent in the McKinsey scenario.

We cite these comparisons to illustrate two points that should figure prominently in the calculations of policymakers. First, the broad direction is away from coal and towards natural gas, hydropower and other renewables. Projections by McKinsey point to solar as the lowest or second-lowest source of energy by 2030, pointing to a strong case for investment in this area.[25] Second, the marked variations between the scenarios illustrate the uncertainties associated with the underlying price trends and technological change. Any scenario using today's costs may be overtaken by events.

The challenge for African policymakers is to devise investment strategies that deliver early results while recognizing that decisions taken today will shape mid-century energy infrastructures. Global climate-change imperatives point to a compelling case for

avoiding "high-carbon lock-in" through building carbon-intensive energy systems that will undermine international efforts to contain global warming. More immediately, the economics of energy provision are moving strongly in a direction that favours the development of a low-carbon infrastructure. The Global Commission on the Economy and Climate concluded: "Renewable energy sources have emerged with stunning and unexpected speed as large-scale, and increasingly economically viable, alternatives to fossil fuels."[26] Even without climate-change considerations, Africa cannot afford to miss out on the opportunity of low-carbon energy.

Key sources of renewable energy have gone from being prohibitively expensive to being cost-competitive in less than a decade. Wind and solar, in particular, are increasingly competitive with energy systems based on fossil fuels. The results are reflected in the global demand patterns. In 2013, renewable energy sources excluding hydropower accounted for 44 per cent of new installed capacity worldwide, creating significant benefits for climate change.[27]

Regional, weighted average costs of generating electricity from biomass, geothermal sources, hydropower and onshore wind are all now in the range of, or even lower than, estimated costs of fossil fuel-fired electricity generation costs. Solar PV-generation costs also increasingly fall within that range.

The pace of change is accelerating. Technological development, in-country learning and capacity development continue to drive down costs. Real prices for solar PV power have fallen by half since 2010.[28] The most competitive utility-scale solar PV projects are now regularly delivering electricity for just US$0.08 per kilowatt-hour (kWh), which is well below the average level (US$0.14 per kWh) for Sub-Saharan Africa.[29]

This backdrop does not provide policymakers in Africa with a roadmap to guide the choice between renewable and fossil-fuel energy sources. Despite the convergence in costs of renewable technologies, there are wide variations not only within each country but also between countries. It would be folly to interpret current cost data as evidence to support a "renewables only" approach.

By the same token, Africa cannot afford to turn a blind-eye to the renewables opportunity. Solar energy in particular provides a vast untapped source of energy and solar PV technologies are increasingly cost-effective off-grid as well as on the grid. Fast-growing emerging markets including India and China

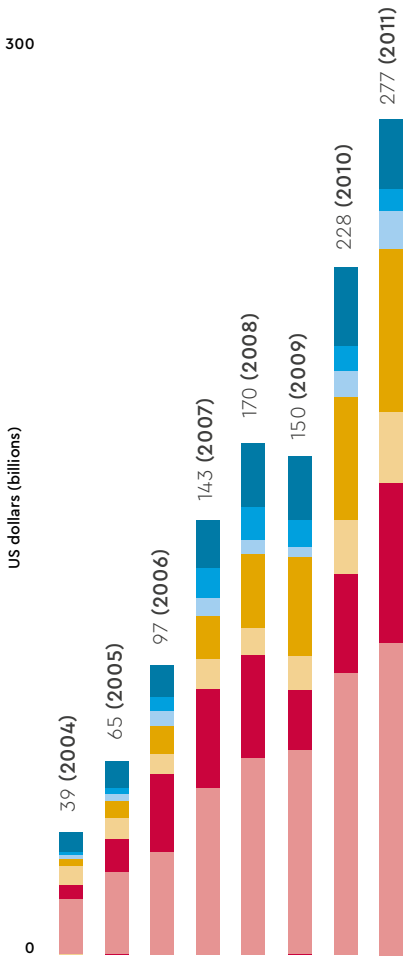
The share of coal in Africa's electricity mix will shrink from

56%

in 2012 to

27%

in 2040.



The rising tide of renewable ENERGY investment by major countries (US$ billion, 2004–2011)

Other developing
Brazil
India
China
Other Developed
United States
Europe

Data source: Sustainable Energy For All. (2013). Global Tracking Framework.

are using wind and solar power to diversify their energy mixes and reduce reliance on coal-fired power generation. In recent government tenders in Brazil, wind-power outcompetes fossil-fuel alternatives (See figure on the left).[30]

Experience in Sub-Saharan Africa itself is also informative. From hydro-power in Ethiopia to geothermal in Kenya, and solar power in Ghana, recent years have seen a surge of investments in renewable power generation.

In South Africa, coal overwhelmingly dominates power generation and energy investment, but in 2013, the state provider Eskom contracted for wind power at prices 17 per cent below those projected for the country's two massive new coal-fired power plants.[31] South Africa's recent experience in renewable energy sources has implications for the continent. Its Renewable Energy Independent Power Producer Procurement (REIPPP) programme has successfully channelled substantial private-sector expertise and investment into grid-connected renewable energy at highly competitive prices. To date, 64 projects have been awarded to the private sector under the REIPPP.

These projects will generate 3,922MW of renewable power – and the first projects are already online. Private-sector investment has totalled US$14 billion. Prices have dropped over the three bidding phases with average solar PV tariffs decreasing by 68 per cent and wind by 42 per cent, in nominal terms.

There are compelling grounds for African governments to put in place the policies and investments needed to launch a low-carbon energy take-off. Recent scenarios developed by the International Renewable Energy Agency (IRENA) suggest that by 2030 renewable energy sources (including hydropower) could reach a 50 per cent share of Sub-Saharan Africa's electricity mix.[32] That projection is highly plausible, provided that governments put in place the policies needed to promote investment in renewable sources, build technological capacity and expand regional trade in energy.

There is more to the energy-investment calculus than simple price comparisons. Factoring in the environmental and health impacts of fossil fuels – especially coal – changes the relative price equation. The ongoing public-health crises in Chinese and Indian cities highlight that coal-fired power generation carries very high costs in terms of health financing, days lost through sickness and premature death. This is a future that African policymakers should seek to avoid.

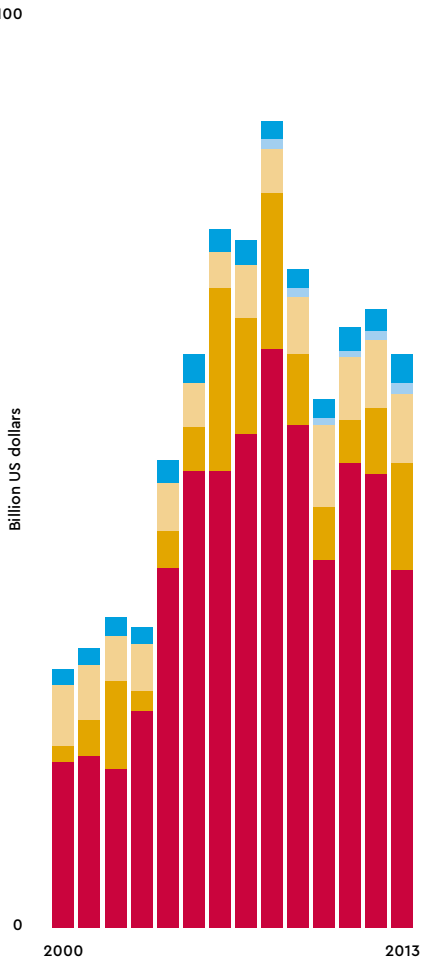
Fossil fuels will remain an important part of the fuel mix

Africa cannot afford to stand on the sidelines of the low-carbon energy revolution. Nor can it embark on a "green energy" agenda that jeopardizes prospects for achieving the increased power generation and access needed to sustain inclusive growth, reduce poverty and create jobs. The pace and sequencing of decarbonization has to take into account countries' starting points and the policy choices available, along with considerations of fairness and equity related to climate justice.

Fossil-fuel reserves provide Africa with the foreign exchange and revenue streams needed to finance imports of energy technology and public investment. They also provide primary energy resources for domestic energy consumption. Far too much of the investment activity in the energy sector has been geared towards exploration, extraction and export and too little towards domestic energy needs (See figure on the right). For every US$1 invested in power generation in 2012, another US$5 was invested in export activity, principally in oil.

Natural gas has a vital role to play in meeting Sub-Saharan Africa's rising demand for energy. It can be utilized as a fuel for combined-cycle power plants. It offers an alternative to biomass in cooking and to gasoline or diesel in transport. Natural gas can also be used to produce nitrogenous fertilizers, substituting domestic production for imports. Putting in place the facilities to gather and process gas, and developing the gas networks, markets and pricing strategies needed for cost-effective exploitation, are major tasks for African governments. Nigeria's Gas Master Plan envisages the development of an ambitious integrated US$15-20 billion investment in gas processing, petrochemicals, fertilizer production and a gas-fired power plant. Mozambique and Tanzania have also developed strategies aimed at rebalancing gas production by expanding the domestic sector (See "Lessons from: Shifting priorities in Tanzania" on page 46).

Modelling exercises have captured the great potential associated with natural gas. Developing a regional gas grid in eastern and southern Africa could bring gas to 263 major urban areas across eight countries: Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania and Uganda. The headline costs are large, at US$57 billion. But the costs could be spread over several years and this infrastructure would benefit 185 million people in urban areas. In addition to power, gas would also allow cleaner cooking and cleaner fuel for public transport vehicles. The wider benefits of power and industry would reach up



Most of Africa's energy investment is geared towards exploration, extraction and export: investment in fuel and for power generation (US$ billion, 2000–2013)

Coal
Biofuels
Domestic power generation
Gas
Oil

Data source: International Energy Agency. (2014). Africa Energy Outlook: A focus on energy prospects in Sub-Saharan Africa.

LESSONS FROM:

SHIFTING PRIORITIES IN TANZANIA

A STRONGER EMPHASIS ON DOMESTIC MARKETS

With power demand rising by over 10 per cent a year and perennial electricity shortages acting as a brake on growth, Tanzania is reorienting its natural gas priorities. There is a growing emphasis on developing the country's huge natural gas reserves in the Ruvuma Basin to supply local industry and create jobs at home.

While foreign investors and several donor governments have been unsympathetic to the policy shift, there has been some initial success. The Songas gas-to-power project now provides Tanzania with around one-fifth of its grid-based electricity, reducing dependence on imported fuels and seasonal unreliability associated with hydropower. Around 30 industrial companies receive electricity from Songas.

Songas has a 20-year power purchase agreement with the state-owned Tanzania Electric Supply Company (TANESCO), signed in 2004. The electricity is sold for around US$0.055/kWh, which is well below the equivalent costs of electricity generated using imported fuel. Songas has saved Tanzania a reported US$1.8 billion since it began operations.[33]

to 600 million people in eastern and southern Africa.[34]

One cautionary note has to be sounded on natural gas. Developing a gas infrastructure is highly capital-intensive and building infrastructure from scratch takes time. Estimates by the IMF place the cost of building the infrastructure for Mozambique's gas at US$40 billion (or 2.7 times the GDP of 2012). Moreover, even if the project is developed early and the finance is in place, it would take until 2035 to develop the full infrastructure.

Falling oil prices have generated a wide-ranging international debate over future market prospects. As noted earlier, oil-fired power generation figures with some prominence in the energy mix of many countries. However, these countries should avoid premature investments in expanded capacity. Oil-fired power generation has been expensive in Sub-Saharan Africa and countries that invested in plant capacity during the last era of low oil prices have faced high import bills and high energy costs. Moreover, gambling on a continuation of low prices in a volatile market may provide unwise.

The share of coal should shrink – and so should Western double standards

The role of coal is diminishing fast, though it will continue to play a significant role under any credible scenario for achieving universal access to energy by 2030. Several countries across the region are scaling-up coal-fired power projects in response to power shortages. Many of these projects involve foreign investors, with part of the planned generation geared towards mining activities. Among the cases at various stages of the project pipeline are:

- In 2013, **Nigeria** entered into a memorandum of understanding with a Chinese energy company to build a US$3.7 billion coal power project that is expected to add 1,200MW of electricity to the national grid.[35]

- In **South Africa**, two of the world's largest super-critical coal-fired power stations are scheduled to enter commission, Medupi and Kusile. Each will generate 4.8GW of electricity.[36]

- By 2023, **Kenya** plans to produce 2.7GW of power from coal, with new power stations planned at Kitui and Lamu.[37]

- **Mozambique** has approved a 25-year concession for the construction of a 600MW coal-fired power plant in Moatize, Tete province.[38]

- **Tanzania** already produces coal from two mines, mainly for power generation. China's Sichuan

US$5

For every US$1 invested in power generation in 2012, another US$5 was invested in export activity, principally in oil.

IS SPENT PER YEAR BY

AFRICAN GOVERNMENTS ON ENERGY SUBSIDIES

(US$11 billion to cover utility losses)
(US$10 billion on kerosene and other oil based products)

US$21 BILLION

US$88 BILLION

WAS PROVIDED BY

G20 GOVERNMENTS IN 2013 FOR FOSSIL FUEL EXPLORATION/PRODUCTION

(Instead of taxing emissions G20 countries are effectively **subsidizing them**)

REDIRECT SUBSIDIES INTO ENERGY INVESTMENT, SOCIAL PROTECTION AND TARGETED CONNECTIVITY FOR THE POOR

PHASE OUT FOSSIL FUEL SUBSIDIES FAST

Hongda signed a US$3 billion deal with Tanzania in 2011 to mine coal and iron ore and to build a coal-fired power plant that is to be completed in 2018/19.[39]

- **Senegal** has signed a contract with locally registered Africa Energy SA company to build a coal-fired power plant with a capacity of at least 300MW by 2017.[40]

International concern over coal focuses on the high carbon content of the energy it generates. On a per unit basis, coal generates roughly twice as much CO_2 as natural gas. Globally, it represented 29 per cent of primary energy supply in 2012 but accounted for 44 per cent of energy-related CO_2 emissions.[41] There are compelling grounds for eliminating coal from energy systems as early as possible.

In the case of Sub-Saharan Africa, the elimination date is likely to be well after 2040. Prohibiting investment in coal before then would limit power generation in countries that do not have readily available and affordable alternatives, and would produce modest benefits for climate change. If current trends continue, the region's share in energy-related CO_2 emissions will increase from 2 per cent to just 3 per cent by 2040.

This should not deflect attention from the global benefits of low-carbon development in Africa. As coal's share of the region's primary energy mix reduces, the carbon intensity of Africa's power generation is declining. With the aggressive promotion of renewables, it would decline more rapidly. On one estimate, increasing installed grid capacity of renewables by 24 per cent through to 2040 would reduce CO_2 emissions from 625 megatonnes (Mt) to 495 Mt a year – a 21 per cent reduction. However, this would increase the capital cost of power generation by around US$108 billion. Given the investment constraints faced by governments in Africa, such figures point to a compelling case for international cooperation to expand the choices available to energy planners through incentives rather than penalties.

Some questions certainly have to be asked about approaches to fossil fuels in international cooperation. There has been a long-running battle within multilateral development banks between mainly European and North American advocates of a move away from supporting fossil-fuel energy investments, and middle-income and low-income countries seeking investment for power infrastructure. The former group have a discernible upper hand. The World Bank Group has adopted guidelines allowing for coal investment only in rare circumstances.[42] The US Overseas Private Investment Corporation, which backstops companies investing in developing countries, is effectively prohibited from investing in energy projects involving fossil fuels.[43] Aid agencies such as Britain's Department for International Development (DFID) and other EU donors provide no support for coal-fired power development.

It is striking that there has been little debate over whether limiting development finance for fossil fuels, including coal, in the name of cutting greenhouse gas emissions might hamper efforts to achieve universal access to energy for all.

Viewed from a Sub-Saharan African perspective, it is difficult to avoid being struck by some marked double standards. Coal-fired generation occupies an important share in the energy mix of countries such as Germany, the United Kingdom and the United States, where it has a far greater share than in most countries of Sub-Saharan Africa. Yet the same countries are able to use their shareholder domination of the World Bank to limit support to Africa. One perverse side-effect is to leave African governments without the finance that might enable them to invest in more efficient coal-fired power plants with lower emissions.

The most obvious alternative to coal or natural gas in most countries is large-scale hydropower. Yet here too there are financing constraints. Concern over the displacement of populations has prompted most Western donors to shun support

LESSONS FROM:

IGNITING POWER IN RWANDA

Renewable technologies are transforming what is possible through decentralized provision. One example comes from a private initiative to extend Rwanda's power into areas beyond the grid.

Ignite Power, the first part of an ambitious plan aimed at achieving universal access to clean energy coverage, brings together the combined capabilities of many organizations, including Bloomberg New Energy Finance, the Milken Institute, a Rwandan government partner and several private actors. The first pillar is off-grid solar technology: a pre-paid system that can power four lights, a radio and television, and charge cell phones. The total cost for a household would start at just over US$1 per week under a "rent-to-own" model.

In September 2014, Ignite Power signed an agreement to install the technology for 250,000 to 1 million households. Less than three months later a pilot phase of 1,008 units was completed. The company is now gearing up to provide 750,000 units in the next two years.

The project has lessons that are of wider application. First, it has demonstrated the potential for speedy delivery, going from vision to plan and deployment in less than two years. Second, the active participation of government has been critical to the success of the project. The Rwandan government has provided credit guarantees and, most importantly, a stable planning environment for private investors.[44]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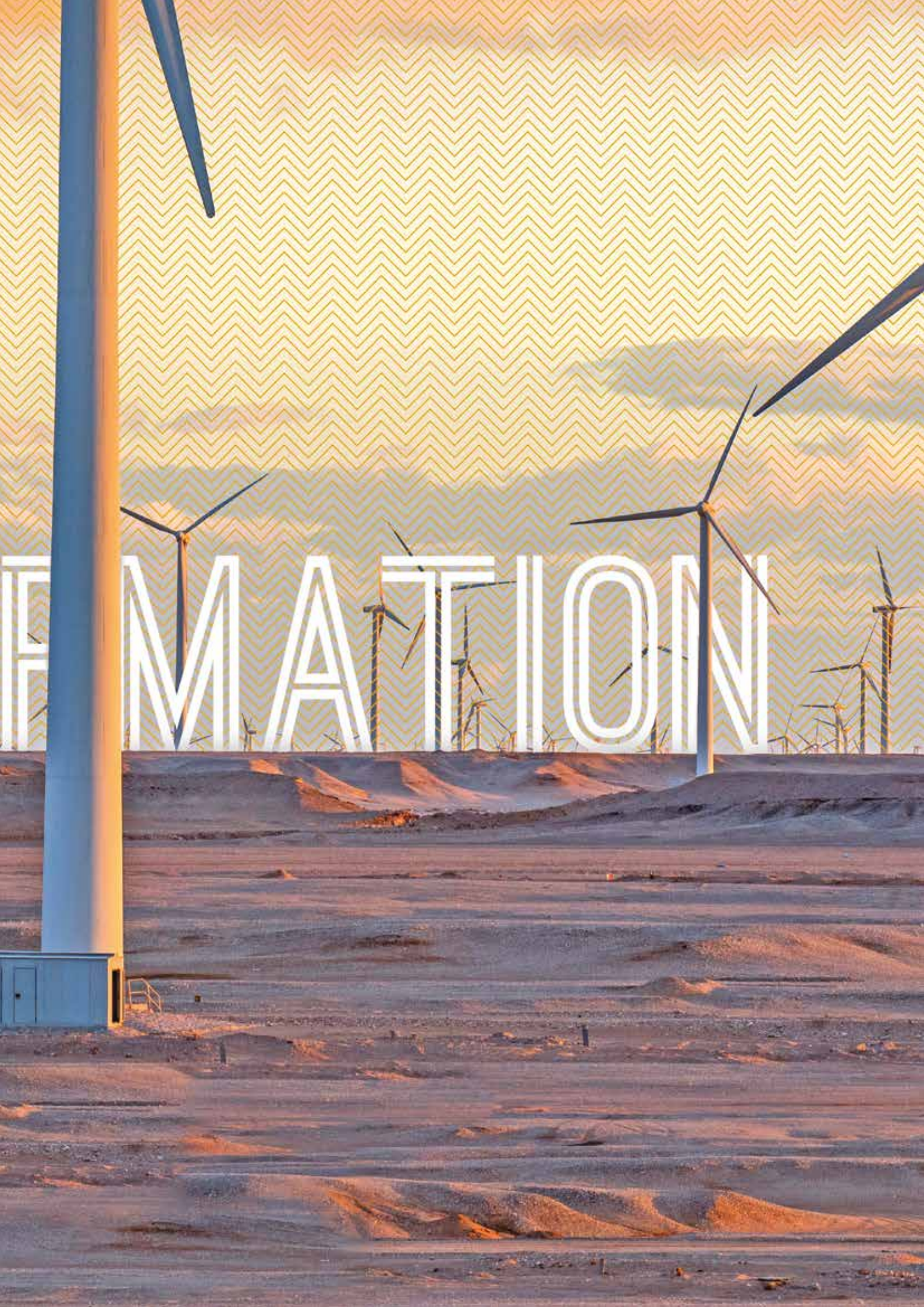

MATION

RENEWAB

for dams. The perception in Africa is that the preference of the donor community would be for the region to embrace solar power and wind-power on a scale and at a pace of change that no rich country would consider. The frustration has been powerfully captured by Donald Kaberuka, the former President of the African Development Bank:

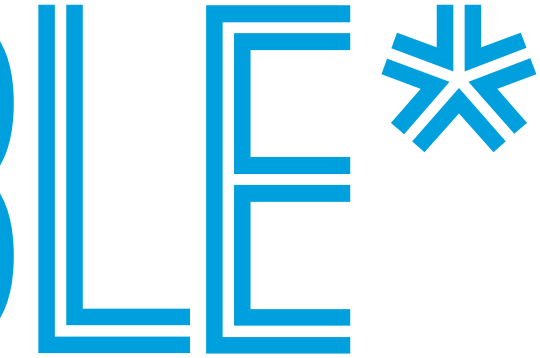
"It is hypocritical for Western governments who have funded their industrialization using fossil fuels, providing their citizens with enough power, to say to African countries, 'You cannot develop dams, you cannot develop coal, just rely on these very expensive renewables'… To every single African country, from South Africa to the north, the biggest impediment to economic growth is energy, and we don't have this kind of luxury of making this kind of choice."

Double standards aside, there are compelling grounds for African governments to review their investment plans for coal. International evidence strongly suggests that the competitive position of coal-fired power generation is deteriorating.[45] Unlike renewable energy and gas-fired generation, the costs of coal-fired electricity generation are not falling. Given the Paris climate change agreement, it is likely that countries will impose taxes on CO2 emissions and the pace of technological change in coal will slow relative to low-carbon technologies.

***Renewable energy markets across much of Africa are being transformed from below. Unconnected, low-income households are increasingly tapping into new decentralized technologies, especially in solar, to secure entry-level lighting. New business models are emerging to support this development.**

Several emerging markets are already adjusting their priorities. Chinese government policy is aimed at reducing the share of coal in the energy mix and investment in renewable energy is growing. Coal accounted for around half of new electricity generation in 2013 – down from 85 per cent a decade earlier.[46] One-fifth of all global investment in renewable energy in 2011 took place in China.[47]

Evidence from within Africa also provides a cautionary tale for coal enthusiasts. Coal-fired power-plant projects are subject to notorious delays and cost overruns. The experience of the Medupi and Kiseli plants in South Africa is instructive. The plants have brought large capital



outlays and are set to produce high-cost electricity several years later than scheduled.

Moreover, an abundance of reserves should not be confused with commercial capacity. One of the major constraints in Sub-Saharan Africa's coal development, both for domestic consumption and export, is a lack of infrastructure. This was illustrated in January 2013 when Rio Tinto Zinc announced a US$3 billion write-down of its coal-mining investment in Mozambique, citing the slow pace of infrastructure development.[48]

Gas-turbine power generation may be a viable alternative to coal in many countries. Several developed countries are using natural gas as a potential "bridge technology" in the transition to a lower-carbon economy.[49] For Africa, investments in natural gas development could dislodge the preference for coal as the default new option for new power supply. The flexibility of gas in electricity generation makes it a potentially important enabler of higher levels of penetration of variable renewable energy sources.

ENERGY FOR ALL – THE GRID AND BEYOND

Increased power generation is a necessary condition for delivering on the commitment of universal energy for all – but it is not a sufficient condition. As the IEA and McKinsey scenarios discussed earlier graphically illustrate, expanded power generation can go hand-in-hand with limited gains in access. An important question for policymakers is how to extend opportunities for access to affordable energy while increasing overall consumption of electricity.

Large-scale electricity generating plants will continue to dominate the energy landscape in Sub-Saharan Africa. These plants permit economies of scale, but they require transmission and distribution networks to connect customers. The cost of transmission rises with distance. Reaching remote rural areas in Tanzania, for example, can cost US$2,300 per household, almost five times the connection costs in urban areas.[50] Connecting to the "last mile" can be even more costly.

It can often also take 7-10 years (or more) between the initial investment decision for a large plant and the

US$ 2,300

The cost of transmission rises with distance. Reaching remote rural areas in Tanzania, for example, can cost US$2,300 per household, almost five times the connection costs in urban areas.

LESSON FROM:

RWANDA'S ENERGY TRANSFORMATION

Rwanda has put in place ambitious plans to increase power-generation and expand access to electricity. Sustained engagement by the country's leaders and reform of the electricity utility has opened the door to wide-ranging investment opportunities.

Current plans envisage that 70 per cent of the population will have access to electricity by the end of 2017, up from 12 per cent in 2012. Over the same period, the strategy aims at increasing electricity generation from about 100MW to 1,160MW. The increase would come from a range of sources. Hydropower will be the main technology, but solar PV, geothermal, biogas and peat will also be used as new sources of energy.

Total investment requirements for 2013–2017 are estimated at US$4.2 billion, or US$845 million a year under a proposed accelerated plan. Public financing will cover around 40 per cent of the cost. However, the financial viability of the strategy depends on public-private partnerships.[51]

time it starts generating power. If the aim is to deliver energy for all by 2030, then large, capital-intensive plants will not achieve the goal.

Energy strategies aimed at reaching populations without access to electricity have to consider a range of options. One option is to extend the grid or to connect populations to the existing grid. Another option is to develop mini-grids. These might comprise a single generator and low-voltage distribution network, often serving a single community or small town. The generator might be powered by diesel, solar PV, a small-scale hydropower scheme or by a combination of sources. Mini-grids are not connected to the national grid, though they can be designed to facilitate future connectivity, and they may be owned by a private business, a utility or a community. A third option is the deployment of stand-alone decentralized systems in the form of a generator or solar home system that can be adopted by individual households.

The IEA estimates that around half of the population who currently lack access to electricity would be best served by grid extension.[52] The Joint Research Council puts the figure lower, estimating that around 70 per cent of rural populations who now lack access could be supplied through mini-grid and off-grid systems.[53] In practice, detailed energy-sector mapping is required to identify the most cost-effective route to delivery. One such exercise in Senegal found that 20 per cent to 50 per cent of the unconnected rural population could be most efficiently reached through investments in grid extension.[54]

Providing people with electricity as their first step on the energy ladder can transform households and the energy requirements are modest. Using the IEA's threshold consumption figures, the additional electricity generation required for universal access in rural areas is 35TWh by 2030 – a 4 per cent increase over the IEA's baseline projection. Mini-grids and stand-alone systems would together supply just under half of this total.

Renewable energy markets across much of Africa are being transformed from below. Unconnected, low-income households are increasingly tapping into new decentralized technologies, especially in solar, to secure entry-level lighting. New business models are emerging to support this development.

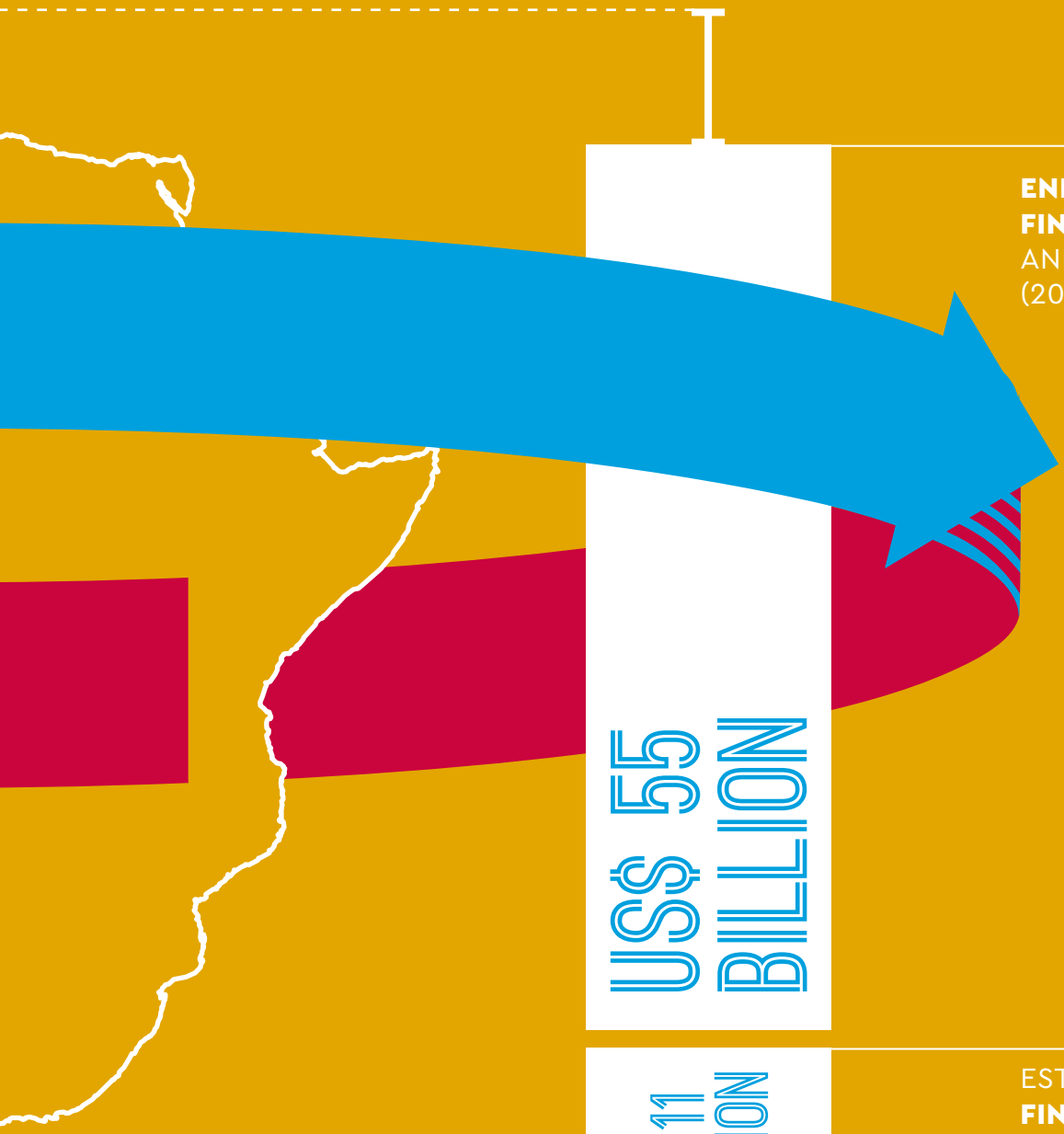
As we highlighted above, consumers and investors stand to gain from substituting biomass and kerosene with modern energy.

There is also an international interest. In the IEA scenario, diesel generators would generate 12,520GWh of electricity a year to 2030. One corollary of that output would be 12,520 kilotonnes of CO2. These emissions could be diminished or altogether avoided through the expansion of renewable energy, underscoring the case for international cooperation to secure complementary gains in access to energy and the global benefits that come with lower greenhouse gas emissions.

ILLICIT OUTFLOWS ARE HIGHER THAN THE FINANCING GAP FOR BOTH ENERGY ACCESS AND CLIMATE ADAPTATION

US$ 69 BILLION

SUB-SAHARAN AFRICA'S **LOSS IN ILLICIT FINANCIAL FLOWS** IN 2012



US$ 55 BILLION

ENERGY SECTOR FINANCING GAP, ANNUAL AVERAGE (2015-2030)

CUT ILLICIT FINANCIAL FLOWS AND NARROW THE CHANCES FOR TAX EVASION

US$ 11 BILLION

ESTIMATED ANNUAL **FINANCING REQUIRED FOR CLIMATE ADAPTATION** (TO 2020)

THE GAPS

RECOMMENDATIONS

The Africa Progress Panel's recommendations identify a range of practical measures for expanding power generation, accelerating progress towards universal access to energy, and supporting low-carbon development.

Many of the specific proposals are directed to African governments. In the absence of ambitious African leadership, opportunities for an energy transformation will be wasted. By the same token, without strengthened international cooperation the opportunities available will be only partially exploited.

Core recommendations for African governments:

Raise the ambition of Africa's energy strategies.
Governments should aim at a 10-fold increase in power generation by 2040, while laying the foundations for a low-carbon transition. Public spending on energy should be raised to 3-4 per cent of gross domestic product (GDP), supported by measures aimed at raising the tax-to-GDP ratio and avoiding excessive reliance on bond markets. Given the US$55 billion until 2030 per annum gap in energy financing, governments should prioritize the development of balanced public-private partnerships and create the conditions for expanded private investment. Governments should look beyond national borders to accelerate the development of regional grids.

Seize the low carbon opportunity.
Governments should strengthen the market for low-carbon energy through predictable off-take arrangements, utility purchase arrangements, feed-in tariffs and auctions. Recognising that the initial capital costs of renewable energy investment can be prohibitive, governments and regulators should seek to reduce risks and support the development of the market through appropriately subsidized loans.

Leave no one behind.
Africa's energy systems combine inequity with inefficiency. They provide subsidized electricity for the wealthy, unreliable power supplies for firms and very little for the poor. National strategies should act on the commitment to achieve universal access to energy by 2030, which means providing access for an additional 645 million people through connections to the grid or decentralized mini-grid or off-grid provision. Every government should map the populations that lack access and identify the most effective routes for delivery. Better and more accessible energy can also power up Africa's agriculture. Governments should work with the private sector to develop the innovative business models needed to deliver affordable energy to the US$10 billion market of people who live on incomes of less than US$2.50 a day.

Cut the pro-rich subsidies.
National strategies should include a roadmap and schedule for phasing out the US$21 billion in energy subsidies geared towards the rich. Subsidizing connections for the poor is more efficient and equitable than subsidizing energy consumption by the rich and subsidizing kerosene is of limited value as a tool for achieving universal access.

Deepen reform of energy governance.
Governments across the region need to step up the pace of reform. Unbundling power generation, transmission and distribution is a starting point. But effective governance also requires the creation of robust, independent regulatory bodies empowered to hold utilities to account. Utilities themselves should be required to publish the terms of all off-take arrangements and emergency power-purchase agreements and they should prohibit tendering through offshore listed companies. While encouraging legislation has been introduced, the record on implementation is patchy. Establishing predictable off-take agreements is critical for attracting high-quality, long-term investment.

Adopt new models of planned urbanization.
As the world's most rapidly urbanizing region, Africa has opportunities to develop more compact, less polluted

cities, alongside safer and more efficient public transport systems. Economies of scale and rising urban incomes have the potential to expand opportunities for providing renewable energy and achieving universal access to basic services. Linking African cities to the growing range of global city networks, including the "C40" group of cities, could unlock new opportunities for knowledge exchange, capacity building and financing. Governments, multilateral agencies and aid donors should work together to strengthen the creditworthiness of cities, while developing innovative partnerships for clean energy.

Engage fully in negotiations on the Intended Nationally Determined Contributions (INDCs).
Many African governments have been reluctant to engage in the INDC process in the light of Africa's limited contribution to greenhouse gas emissions. However, the INDCs provide an opportunity to set out policies that could promote growth and reduce poverty in Africa, while limiting global greenhouse gas emissions. The INDCs could be used to identify opportunities for international cooperation, linked to additional financing. To cite some examples:

- Eliminate within five years of gas flaring, which is a potent source of global warming and a waste of Africa's energy resources.
- Identify opportunities for combating soil erosion, conserving land, avoiding deforestation and restoring degraded forests and land.
- Highlight current actions aimed at reducing greenhouse gas emissions and the costs of reducing future emissions by scaling up renewable energy.

Proposals for action by the international community:

Create a "global connectivity fund" under the auspices of the Sustainable Energy for All (SE4All) partnership.
The SE4ALL remit includes supporting universal access to energy and increasing the share of renewables in the energy mix but it lacks a bridge to financing mechanisms. Universal access costs are estimated at US$20 billion annually to 2030. These costs could be co-financed by African governments and the wider international community in the form of concessional development finance, supplemented by aid. The SE4All governance framework would be reformed to require governments to submit comprehensive national action plans setting out strategies for universal access, with an understanding that credible plans will secure an appropriate mix of financing for their implementation. SE4All financing would help support innovative business models delivering affordable off-grid energy through risk and credit guarantees, subsidized loans and electricity-purchase agreements.

Unlock private finance.
Development finance could play a more catalytic role through increased risk-guarantee provisions and strengthened coordination between international financial institutions, development finance agencies and bilateral donors. The World Bank and African Development Bank (AfDB) should lead an international effort to unbundle risk, structure guarantees and align Africa's risk premium with market realities. The exercise should aim also at reducing the transaction costs associated with financing energy projects. Risk instruments such as the World Bank's Multilateral Investment Guarantee Agency (MIGA) and foreign-currency risk mechanisms should be scaled up.

Strengthen the role of AfDB and World Bank financing.
Development finance agencies, the World Bank and donors should commit US$10 billion to the capitalization of the Africa '50' Fund of AfDB, which has the potential to leverage up to US$100 billion in private finance.

More African governments should be drawing on the World Bank's non-concessional borrowing windows, taking advantage of low interest rates to finance energy infrastructure.

Overhaul the climate finance architecture:
Africa is poorly served by the current climate-finance architecture. The separate multilateral agencies offering facilities to support adaptation should be merged into a single Transformative Adaptation Facility, perhaps under the auspices of the Green Climate Fund. Facilities for mitigation finance and support mechanisms for low-carbon development – notably the Clean Technology Fund and the Scaling Up Renewable Energy in Low Income Countries Programme – should be structured to be more responsive to Africa's mitigation potential and the opportunities to back low-carbon development. The broader concern is that the increasingly fragmented global financing architecture is doing little to provide strategic direction in leveraging private investment.

Phase out fossil fuel subsidies:
Eliminating subsidies for fossil-fuel exploration and production – especially coal – should be a priority. Developed countries should withdraw by 2018 all tax concessions, royalty relief and fiscal transfers, and all state aid to fossil-fuel industries by 2020. The G20 countries should set a timetable for acting on their commitment to phase out fossil-fuel subsidies, with early action on coal.

Redouble efforts to combat tax evasion:
In 2012, Africa lost US$69 billion from illicit financial flows. G8 and G20 countries must act on past commitments to strengthen tax-disclosure requirements, prevent the creation of shell companies and counteract money laundering. Implementation of the G20/OECD's planned actions on base erosion and profit shifting should be accelerated; and the international community should support African efforts to strengthen tax and customs administration and reduce illicit financial outflows, especially via trade misinvoicing. Other priority actions to mitigate illicit financial flows include public registries of beneficial ownership of companies and, with the assistance of the IMF, agreeing on how to define, measure and track such flows, especially trade misinvoicing.

For private investors and multinational companies:

Accelerate the exit from carbon through divestment:
Institutional investors should urgently review their portfolios with a view to progressively eliminating carbon-intensive assets, starting with equity stakes in coal. Regulatory authorities, investors and stock exchanges should require companies and institutional investors to fully disclose the carbon exposure of their assets. The World Business Council on Sustainable Development should review and report upon the misleading claims made by multinational mining companies with respect to the benefits of coal for reducing poverty.

Engage with governments:
Lead the development of new low-carbon energy partnerships and identify the conditions for increasing investment in energy sector infrastructure.

Drive innovation for greater access:
Energy investors should develop innovative business models aimed at lowering market-entry costs for electricity and the costs of efficient cooking-stoves. Working with governments, banks and aid donors, they should seek to broaden and deepen emerging mechanisms, such as pay-as-you-go financing, mobile payments, extended repayment periods and low-interest credit, to serve the "bottom of the pyramid" market. Given the limited ability of poor households to meet maintenance costs, governments should link public support to the provision of post-installation servicing.

Stop the secrecy:
Foreign investors and African companies should provide full disclosure of their beneficial ownership structures and report transparently on energy-related contracts, including electricity off-take arrangements. Multinational corporations must also recognise that the tax and transparency revolution continues to move ahead at a rapid pace. New G20/OECD reporting standards for multinational companies will require companies to report on their activities more transparently. Companies that keep up with the pace of change are more likely to be able to influence the changes.

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