United Nations
Economic Commission for Africa

RES4AFRICA FOUNDATION

IRENA
International Renewable Energy Agency

TOWARDS A PROSPEROUS AND SUSTAINABLE AFRICA

United Nations
Economic Commission for Africa

RES4AFRICA FOUNDATION

IRENA
International Renewable Energy Agency

TOWARDS A PROSPEROUS AND SUSTAINABLE AFRICA

MAXIMISING THE SOCIO-ECONOMIC GAINS OF AFRICA'S ENERGY TRANSITION

RES4Africa Foundation Flagship Publication 4th Edition
co-authored with IRENA and UNECA

The publication is developed with the support
of Enel Foundation as Knowledge Partner

enel Foundation

This document is a product of the staff of the three collaborating organisations, namely the RES4Africa Foundation, the International Renewable Energy Agency, the United Nations Economic Commission for Africa. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of these organisations, their governing bodies, members, or the governments they represent.

This publication and the material herein are provided "as is". All reasonable precautions have been taken by the collaborating organisations to verify the reliability of the material in this publication. However, the collaborating organisations do not guarantee the accuracy, completeness, or currency of the data included in this work and do not assume responsibility for any errors, omissions, or discrepancies in the information, or liability with respect to the use of or failure to use the information, methods, processes, or conclusions set forth.

The information contained herein does not necessarily represent the views of all Members, or parties, or agents of the collaborating organisations. The mention of specific companies or certain projects or products does not imply that they are endorsed or recommended by the collaborating organisations in preference to others of a similar nature that are not mentioned.

The boundaries, colours, denominations, and other information shown on any map in this work do not imply any judgment on the part of the collaborating organisations concerning the legal status of or sovereignty over any territory or the endorsement or acceptance of such boundaries.

RIGHTS AND PERMISSION

CITATION

RES4A, IRENA, and UNECA, 2022. Towards a prosperous and sustainable Africa: Maximising the socio-economic gains of Africa's energy transition. RES4Africa Foundation, Rome.

Via Ticino, 14 - 00198 Rome - Italy
www.res4africa.org

ABOUT

ABOUT
RES4AFRICA FLAGSHIP REPORT

Each year, RES4Africa Foundation releases a Flagship publication serving as a high-level resource and providing timely insights in support of dialogue and awareness-raising. The themes focus on key policy issues relevant to Africa's renewable energy market development. The publication seeks to:

- Shed light on specific issues to raise awareness and build consensus between, and within, the international development community and renewable energy business leaders;
- Convey high-level policy messages and calls for action to decision-makers on relevant and timely themes;
- Contribute to accelerating progress towards the achievement of universal electricity access in Africa by 2030, in line with Sustainable Development Goal #7 (SDG7).

ABOUT
RES4AFRICA FOUNDATION

Founded in 2012, RES4Africa (Renewable Energy Solutions for Africa) is a Foundation with a vision to support Africa's just energy transition. Its mission is to work towards creating favourable conditions for scaling up investments in clean energy technologies across the continent. Functioning as a bridge between Europe and Africa, RES4Africa envisions a sustainable transformation of the continent's electricity systems to provide reliable and affordable electricity access and enable socio-economic progress.

ABOUT
IRENA

The International Renewable Energy Agency (IRENA) serves as the principal platform for international cooperation, a centre of excellence, a repository of policy, technology, resource, and financial knowledge, and a driver of action on the ground to advance the transformation of the global energy system. A global intergovernmental organisation established in 2011, IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar, and wind energy, in the pursuit of sustainable development, energy access, energy security, and low-carbon economic growth and prosperity.

ABOUT
UNECA

Established by the Economic and Social Council (ECOSOC) of the United Nations (UN) in 1958 as one of the UN's five regional commissions, UNECA's mandate is to promote the economic and social development of its member States, foster intra-regional integration, and promote international cooperation for Africa's development. Made up of 54 member States, and playing a dual role as a regional arm of the UN and as a key component of the African institutional landscape, UNECA is well-positioned to make unique contributions to address the Continent's development challenges. UNECA's mission is to deliver ideas and actions for an empowered and transformed Africa, informed by the 2030 Sustainable Development Agenda and Africa's Agenda 2063.

ACKNOWLEDGEMENTS

PARTNERSHIP

The 4th edition of the RES4Africa Flagship publication is a product of the close collaboration between the RES4Africa Foundation, the International Renewable Energy Agency, and the United Nations Economic Commission for Africa.

RES4Africa is grateful for the generous support of Enel Foundation, which made this publication possible.

AUTHORSHIP

Technical leadership of this publication was the shared responsibility of Rabia Ferroukhi (IRENA), Roberto Vigotti (RES4Africa), and Robert Lisinge (UNECA).

- **Chapter 1** was developed by UNECA and authored by Yohannes G. Hailu.
- **Chapter 2** was developed by IRENA and authored by Carlos Guadarrama and Ulrike Lehr. The modelling and interpretation of results were provided by Xavier Casals and Álvaro López-Peña (consultants), as well as Ha Bui, Alistair Smith, and Jon Stenning (E3ME, Cambridge Econometrics).
- **Chapter 3** was developed by RES4Africa Foundation and authored by Iarina Ciceu, Andrea Renzulli, and Gus Schellekens.
- **Chapter 4** was jointly developed by the collaborating institutions.
- **The Visionary Statements** authored by Francesco Starace (ENEL Group), Vera Songwe (UNECA), Francesco La Camera (IRENA), Salvatore Bernabei (RES4Africa), Koen Doens (European Commission), and Maria Shaw-Barragan (EIB), are gratefully acknowledged.

Valuable inputs, support, and comments were provided by the following persons and entities:

- Chapter 1: Dr. John Kioli (Green Africa Foundation); Anne Songole (ACCESS Coalition), Ruse Moleshe (Energy Solutions Consulting), Tayeb Amegroud (GPower Consultants), Adey Getachew Robele, Linda Lapiso Dilebo, Sinafikish Lemma Anbesse, and Yemisrach Sisay Tebeje (EWiEn).
- Chapter 3: EDPR (António Ribeiro Da Cunha and Rocio Garcia Alvarez); Enel Group (Nicole Della Vedova and Giovanni Niero); Nedbank (Amith Singh and Hlatse Nkune); Schneider Electric (Amr Kandil and Zanelle Dalglish); Vestas (John Wawer).

The valuable comments and insights provided by David Lecoque (Alliance for Rural Electrification), Amy Todd and Colm Fay (Clean Cooking Alliance), Amith Singh and Hlatse Nkune (Nedbank), Amr Kandil (Schneider Electric), Kristian Heydenreich (Vestas) through interviews are also gratefully acknowledged.

Editorial support was provided by: Rence Events

The report was designed by: Gate44

The cover was designed by: Charles Crouzat

FOREWORD

By Francesco Starace, CEO Enel Group and Chairman, Enel Foundation

Dear Reader,

Africa is the greatest development frontier. A continent endowed with vast natural resources, arable lands, a young and thriving population and a basin of growing innovation. But Africa is also confronted with a historic challenge. For the first time, African countries are meant to avoid carbon intensive growth paths that could undermine the global fight against climate change and endanger local socio-economic development in the long term. Sustainable technologies, in particular renewable energy solutions have the potential to help Africa solve this challenge and to allow its economies to leapfrog towards a prosperous and sustainable future.

Indeed, all international agencies' long-term energy forecasts show a massive growth of renewables across Africa over the next three decades: according to the International Energy Agency's estimates, the installed renewable capacity will increase about 12 times by 2040, from the current 50 GW to more than 530 GW; both solar PV and wind energy will experience even greater growth, moving from 5 GW to 340 GW and from 6 GW to 90 GW, respectively. The benefits of accelerating the sustainable transformation of African energy systems are not only restricted to climate but are widely spread across the socio-economic realities of African countries.

This report sheds light on the benefits embedded in pursuing climate-friendly energy scenarios and their positive impact on Africa's GDP growth, employment, access to health, schooling, telecommunication and digital infrastructure, the sustainability of cities and megacities and local development of rural areas, and mobility. At the same time, the green energy revolution in Africa will create millions of new jobs. Indeed, eradicating poverty goes hand in hand with ending energy poverty, and achieving climate goals requires closing the energy access gap in a sustainable way. This is why achieving SDG7 is instrumental to accomplishing the entire Sustainable Development Agenda.

Acknowledging the social and economic spheres of a sustainable energy transition is therefore pivotal to its success and, indeed, the energy transition must be just and fair. This is a concept often reiterated by governments, international institutions and development partners and restated in the main conclusions of the UN High Level Dialogue on Energy, held in September 2021. In the African context this means no one should be left behind with regards to the opportunities embedded within the development of sustainable technologies but also that economies and societies relying on unsustainable technologies and polluting resources for their prosperity need to be supported in transitioning towards new economic opportunities, new production models, new consumption behaviours. Women and young people will be a driving force of these changes as their greater involvement in politics and the economy will be a main pillar of Africa's future prosperity.

Of course, it must always be noted that Africa is composed of 54 countries, all with different histories, cultures, societies, economies, ecosystems, and natural resources. There is no silver bullet that can solve Africa's socio-economic development challenges. Strategies adapted to each country's reality must be conceived, adopted, and implemented. Although there is no single path or solution for succeeding in the sustainable transformation of Africa's socio-economic systems, clean energy technologies and renewable energy can be the protagonists of every solution. These technologies already offer the most competitive, reliable, and sustainable option to generate and supply electricity to all African populations and businesses. Their decentralised and scalable nature make them the best technologies to solve energy access challenges for both the rural population and the fast-growing urban and peri-urban populations. Indeed, it is in cities and megacities where the bulk of Africa's future population will live and where defining sustainable growth paths will be key to ensuring the next generation's prosperity.

A set of other technologies will also be needed to ensure a smooth and successful energy transition in Africa. First, the extension, reinforcement, and digitalisation of grids are indispensable for the expansion of access to electricity, the improvement of service quality, and the enhancement of economic and industrial activities. Second, electricity storage solutions will be needed to increase system flexibility. Third, electrification of energy end uses must progress towards the deployment of electric heating and cooling systems, electric transport, and last but not least, electric cooking.

To achieve these goals and maximise the socio-economic gains embedded in the sustainable transformation of Africa's energy systems, electricity infrastructure expansion must be aligned with socio-economic development agendas. This report suggests actions to be taken at three fundamental levels: (i) at the macro-environment level, African countries need to address the challenges and constraints emerging from the instability of their macroeconomic and governance frameworks; (ii) at the industry value chain level, building competitive national economic capabilities requires addressing constraints stemming from a lack of integration in global value chains, limited research and development, restrictions on trade and limited availability of technical skills; (iii) at the business environment level, African countries must define fit-for-purpose measures that ensure a fair and attractive business environment to accelerate project implementation.

A strong cooperation between the public and private sectors, businesses and institutions is required. These collaborations will also aid the mobilisation of the required financial resources to support the investment effort. Here again, international cooperation and effective public-private partnerships represent the only path to success. This report is intended as a first sign of shared intent and common goals between African and international institutions, as well as renewable industry players in successfully advancing the sustainable transition of Africa's economies and building the road towards sustainable, resilient prosperity for all.

It is a generational challenge but the opportunity is unique. And we must all work together to make it happen.

TABLE OF CONTENTS

TABLE OF FIGURES

FIGURES

TABLES

ABBREVIATIONS

A2E	Access to Energy
ACBF	African Capacity Building Foundation
ACET	African Centre for Economic Transformation
AfCFTA	African Continental Free Trade Area
AFREC	African Energy Commission
AWEEF	African Women Entrepreneurs in the Energy Sector
BoP	Bottom of the Pyramid
CDC	Centre for Desease Control
CO_2	Carbon Dioxide
COP	Conference of the Parties
CPV	Concentrated Photovoltaic
CSP	Concentrated Solar Power
CSR	Corporate Social Responsibility
DBSA	Development Bank of Southern Africa
DC/AC	Direct Current/Alternating Current
DFIs	Development Finance Institutions
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
E3ME	Energy-Environment-Economy Model for Europe
EACREEE	East African Centre of Excellence for Renewable Energy and Efficiency
ECIU	The European Consortium of Innovative Universities
ECOSOC	Economic and Social Council (UN)
ESG	Environmental, Social, and Governance
ESIA	Environmental and Social Impact Assessments
ESMAP	Energy Sector Management Assistance Program
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GVCs	Global Value Chains
GWh	Gigawatt hours
HLDE	High-Level Dialogue on Energy
ICA	Infrastructure Consortium for Africa
IEA	International Energy Agency
IFC	International Finance Corporation
ILO	International Labour Organization
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer

IRENA	International Renweable Energy Agency
KPIs	Key Performance Indicators
LCOE	Levelized Cost of Electricity
LCRs	Local Content Regulations
LTWP	Lake Turkana Wind Power Project
MGA	Micro-Grid Academy
MW	Megawatt
NDCs	Nationally Determined Contributions
NOx	Nitrogen Oxides
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-operation and Development
PES	Planned Energy Scenario
RCREEE	Regional Centre for Renewable Energy and Energy Efficiency
REI4P	Renewable Energy Independent Power Producer Procurement Program
RES4Africa	Renewable Energy Solutions for Africa
SDG7	Sustainable Development Goal #7
SHS	Solar Home Systems
SMEs	Small and Medium-Sized Enterprises
SO2	Sulphur Dioxide
SSI	Schneider Sustainability Impact
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNECA/ECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNHCR	United Nations High Commissioner for Refugees
UNSD	United Nations Statistics Division
VRE	Variable Renewable Energy
WHO	World Health Organisation

UNDERSTANDING THE SOCIO-ECONOMIC BENEFITS OF SUSTAINABLE ENERGY ACCESS IN AFRICA

Visionary Statement

Vera Songwe, UN Under-Secretary-General and Executive Secretary of ECA

Under the Sustainable Development Goals (SDG) framework, Africa is pursuing broad-based development by addressing constraints to its long-term growth and transformation. The development vision of Africa is anchored on Agenda 2063, articulated through the Africa We Want, and the United Nations Agenda 2030. To meet these goals, by leveraging the immense potential of the continent, further bold steps are needed both in addressing barriers to growth and in adopting forward-looking policies to create new opportunities for improving livelihoods and increasing prosperity on the continent.

The infrastructure gap in Africa is among the greatest barriers to growth, impacting investment across sectors. Beyond the key tenets of SDG7 on bridging electricity access, agricultural, industrial, and service sectors development is tied to the ability to supply sufficient, affordable, and reliable energy. Based on 50 years of observation, we have learned that industrial output is elastic to electricity supply, and a 1 percent growth in GDP induces 0.5 percent additional demand for electricity services. Energy is, therefore, at the center of socio-economic transformation.
In the last few years, due to sustained investment to implement SDG7, more than 115 million people gained access to energy. With a goal of at least 75 million new access per year through 2030 to meet SDG7, further bold action is required. This translates into over $90 billion per year of investment to sustain progress. The current funding gap calls for a robust partnership with the private sector. Through UNECA studies, we have demonstrated that a 1 percent increase in private investment in the broader economy in Africa could boost GDP per capita by up to 1.6 percent in the long-run. Investment to bridge the infrastructure gap for transformation through robust private sector participation is also an investment into our future growth.

Energy transition and decarbonization goals further require thorough reflection about the future of Africa's energy system. Energy transition and sustainable energy development in Africa bode well with the renewable energy endowments of Africa. Estimates indicate that by 2040, the renewable energy capacity of Africa is expected to grow twelve fold. We need to make sure that Africa equally benefits from the associated economic, social, and environmental benefits. A recent ECA study shows that an energy transition under a 1.5°C climate scenario offers Africa the possibility of a 6.4 percent higher GDP from 2021 to 2050 with the implementation

of climate and energy-transition smart policies. It further showed that 8 million renewable energy jobs across the value chain are possible, with a 34 percent in manufacturing. Maximizing these benefits of the energy transition through bold actions is essential.

These assessments are consistent with the observation of the High-Level Dialogue on Energy (HLDE) of the UN in September 2021. The roadmap from the HLDE called for tripling investment in clean energy, accelerating progress on electricity access, improving access to social services, energy transition, and benefiting from at least 60 million new jobs globally in clean energy development.

How will member States, therefore, maximize the socio-economic benefits associated with sustainable energy development and clean energy transition in Africa? First, we must ensure that investment flows to Africa are commensurate with its potential returns. Beyond correcting the risk profile of Africa, we need an attractive regulatory and business environment. Through collateral investments in social infrastructure and by committing to leave no one behind, we face a better chance of increasing the socio-economic benefits of energy transition-related investments.
Second, we will need to focus on the manufacturing and value addition opportunities in green technologies, including recycling and repurposing of batteries. Clean energy technologies are dependent on components that rely on rare minerals from Africa. The energy-mining-industry cluster offers viable opportunities for value addition. Industrial strategies and local content policies compatible with national strategic advantages should support this value-addition drive.
Third, member States should explore de-risking instruments to mitigate the cost of investment in energy projects. Moving beyond risk perceptions, real risks need to be managed to sustain large-scale investments. This could be further supported by innovative financing schemes, such as the SDG7 bond initiative ECA is implementing. Fourth, partnerships are crucial in supporting not only financing needs, but also strengthening institutional and human capital gaps through exchange of experiences. The system of governance and institutional capacities should be brought to compatibility with ambitious clean energy transitions.

Finally, the potential costs of energy transition to segments of the society, such as in coal-dependent energy systems and oil-exporting countries, will need to be carefully evaluated, appreciated, and taken into consideration in devising transition plans.

Africa today has vibrancy, as a youthful continent, and a tradition of enterprise and resilience. The continent has in-built nimbleness enabled by mitigated lock on technologies of the past. In some areas, it is starting nearly afresh. This offers Africa an operational strategic edge to adopt and pursue sustainable solutions without substantial legacy costs. By accelerating progress, leveraging the immense potential of partnership with the private sector using strategies outlined in this report, Africa can leverage existing opportunities to accelerate its development, provide jobs and improve livelihoods.

1.1

INTRODUCTION

Energy supply has long been recognised as a crucial catalyst to advance economic and social development goals globally. Economic activities typically require the availability of sufficient, affordable, and reliable energy. Public institutions also need an adequate supply of electricity to efficiently provide public services. Health, education, and other social services rely on electricity to improve social wellbeing. Overall, the functioning of a country's economy and its social development is intricately related to its ability to supply reliable, sustainable, and affordable energy. Increasingly, the supply of energy is sought from sustainable and renewable energy sources aligned with climate objectives, and the long-term pursuit of decoupling growth from emissions.

It is the recognition of the crucial role that energy plays in socio-economic development that led to the global sustainable development goal articulation on energy, particularly SDG7 on sustainable energy for all. The UN High-Level Dialogue on Energy in 2021, through the theme report on Enabling SDGs through Inclusive Just Energy Transition stated that "energy is inextricably linked to virtually all the SDGs … [and] transforming the world's energy systems will create new jobs, advance gender equality, and empower people, communities, and societies" (UN, 2021a). Whilst this is encouragingly aspirational, Africa's infrastructure development gap remains a barrier and has presented a major obstacle to the potential achievement of numerous economic and social goals.

Increased levels of policy attention by governments on the development of the energy sector in the last decade, particularly since the adoption of the SGDs in 2015, and implementation of energy projects has led to some notable results. In the case of Africa, between 2014 – 2019, more than 115 million people gained access to electricity. This sounds impressive but remains insufficient, as the pace of electrification will need to increase to at least 75 million people per year from now through to 2030 to fully meet the SDG7 goal (UN, 2021b). The amounts of public investment in infrastructure have generally increased, leading to energy capacity improvement in the continent.

Closer examination reveals that lifting millions of people out of energy poverty was enabled by several factors, including the effect of SDG7 policy adoption at national levels; the ability to address some policy constraints; increased public investment into energy infrastructure, and to a limited degree the encouragement of increased private sector participation. Public finance played a major role in accelerating progress in the continent. African governments accounted for 37 per cent of direct infrastructure investment in 2018, with private sector finance accounting for 3 per cent, the remaining investment coming through the public sector via bilateral and multilateral financing schemes (ICA, 2018).

Even though these numbers are indicative of a remarkable commitment from African governments to advance energy development, in the context of the need to invest $1.3 trillion on all SDG goals per year in the continent, and $32 billion per year on universal electricity access alone (ICA, 2018), a significant gap remains. Sustaining the progress (and meeting the targets outlined) would require a much greater investment role to be played by the private sector. In the context of global energy investments, $1.9 trillion was invested in the sector in 2021 where emerging and developing countries attracted only 1/5th of such investment, and Africa captured an even smaller fraction (IEA, 2021a). Sustainable energy financing and a growing role of the private sector in infrastructure investment in Africa; therefore, needs to remain a crucial policy imperative.

The focus of African countries on encouraging further commitments and investment in sustainable energy development is linked to the socio-economic development goals and aspirations of the continent. It is in this context that understanding and assessing the socio-economic and environmental impacts of sustainable energy development becomes essential to provide a solid basis on which decisions can be made and actions towards sustainable development can be taken. The pursuit of a sustainable transformation of African energy systems to strengthen identified socio-economic outcomes could seem straightforward. In practice, however, there are considerable challenges to overcome before the benefits of the sustainable energy – socio-economic outcomes nexus can be leveraged at scale.

Looking at the state of the energy sector in Africa today, several challenges need to be overcome. These include the following:

- Despite the recognised progress in providing millions with access to electricity in the continent, more than 580 million people still lack access to electricity today. Electricity access rates are below 50 per cent in 24 countries. COVID-19 has also exacerbated the limited progress made, by reversing the positive trend and increasing the lack of access by 2 per cent in Africa (UN, 2021b). Indeed, Africa's most urgent challenge is speeding up electrification efforts and leveraging the energy-development links.

- About 60 per cent of Africa's population live in rural areas facing a lack of access to basic services, including modern energy. Rural electrification did improve from 14 per cent in 2010 to 27 per cent by 2018 (UN, 2019); and Cabo Verde, Ghana, Gabon, Comoros, Kenya, Mauritius, and Seychelles offer models to tackle the challenges of rural electrification. However, a significant urban-rural divide persists. Rural electrification gaps pose challenges to the maximisation of the energy-development nexus benefits.

- ECA, IRENA, RES4Africa, and other institutions advocate for sustainable technologies, both centralised and decentralised and on-grid and off-grid, as part of the solution for expanding access while ensuring affordability and long-term environmental sustainability. Gaps related to enabling policy environments, regulation, permissible business models, investment and finance, and others continue to limit scaled progress.

- While Africa's energy system has seen a major transformation, to date this has been with limited uptake of non-hydro renewables. As of 1990, half of the electricity supply of the continent was generated from coal. By 2017, this had declined to about 30 per cent, largely replaced by the rising share of natural gas from 14 per cent to 40 per cent. Non-hydro renewables currently account for less than 5 per cent of the energy mix. Had sustainable energy solutions played a greater role in this transition, there would have been the opportunity to significantly increase the socio-economic benefits that would have accrued with their development.

- Clean cooking has been and remains a formidable challenge, with nearly 900 million people lacking access to clean cooking facilities. As of 2018, 85 per cent of Africa's population lacked clean cooking technologies (UN, 2019). Various assessments have identified the same dire outcomes by 2030 if current trends persist. Unsustainable biomass harvesting, carbonisation, and use will trigger a major environmental crisis and undermine household welfare through rising wood and charcoal prices. Sustainable cooking solutions offer social and economic benefits, including health, education, and household income.

- Efficiency challenges within the electricity system, power supply reliability challenges, and resultant costs affect grid-connected customers. It also affects the competitiveness of businesses. In this light, the poor quality of electricity supply is also significantly constraining the achievement of all potential sustainable energy-development nexus benefits.

- These challenges are associated with how energy markets are organised, regulated, operated, and governed. Addressing these structural and systemic challenges will help leverage the sustainable energy-development nexus, while potentially delivering a range of environmental benefits.

The main purpose of this chapter is, therefore, to explore the sustainable energy-development linkages in further detail, assess the socio-economic benefits of sustainable (renewable) energy development, and offer broad recommendations. These recommendations focus on strengthening the linkages between an improved provision of sustainable energy solutions and associated socio-economic benefits in Africa.

1.2

THE SUSTAINABLE ENERGY-DEVELOPMENT NEXUS

Increasingly, the intricate links among people, planet, and prosperity are recognised in global policy circles as fundamental to securing sustainable development. Socio-economic development needs to be people-centred, and for it to be sustainable requires due balance with nature and protection of the planet, which in the long-term help secure a prosperous future. Within this broader framework, the positive links between economic development and investment in sustainable energy infrastructure at large are widely established (Akadiri et al., 2019; Anouri et al., 2014; Khobai and le Roux, 2017; Maji et al., 2019; Wolde-Rufael, 2005). Similarly, the effect of investment in sustainable energy on social development, including on reducing social inequality (Borowski, 2021) are well established. What is often not clear is the pathways through which sustainable energy provision impacts the socio-economic development process. Development planning should consider the different pathways through which energy infrastructure development facilitates growth and broad development.

Sustainable energy is an important input to agricultural, industrial, and services outputs and value addition. Growth across these sectors demand the supply of more energy. On energy demand and economic growth, there is sufficient evidence of their long-term relationships. Wolde-Rufael (2005) provides evidence on the long-term relationship between growth and demand for energy in eight African countries. Kahsai et al. (2012) empirically reviewed the growth-energy consumption nexus in Sub-Saharan Africa. They concluded that in the long run, there is evidence of energy consumption supporting economic growth, and growth increasing energy consumption. A recent study found that a 1 per cent increase in renewable energy consumption is expected to lead in Africa to a growth of 0.07 per cent in the short run, and a robust 1.9 per cent in the long-run (Qudrat-Ullah and Nevo, 2021). Similarly, the U.S. Energy Information Administration reviewed the energy implications of higher economic growth in Africa from 2015 to 2040. The review concluded that a 1.2 per cent higher GDP growth per year in the continent from the 5 per cent benchmark rate used in the International Energy Outlook of 2018 will imply a 30 per cent higher per capita energy consumption by 2040 (EIA, 2018). The complex interaction of people, planet, and prosperity requires closer attention. For example, Akadiri, et al. (2019) reviewed the interaction between energy

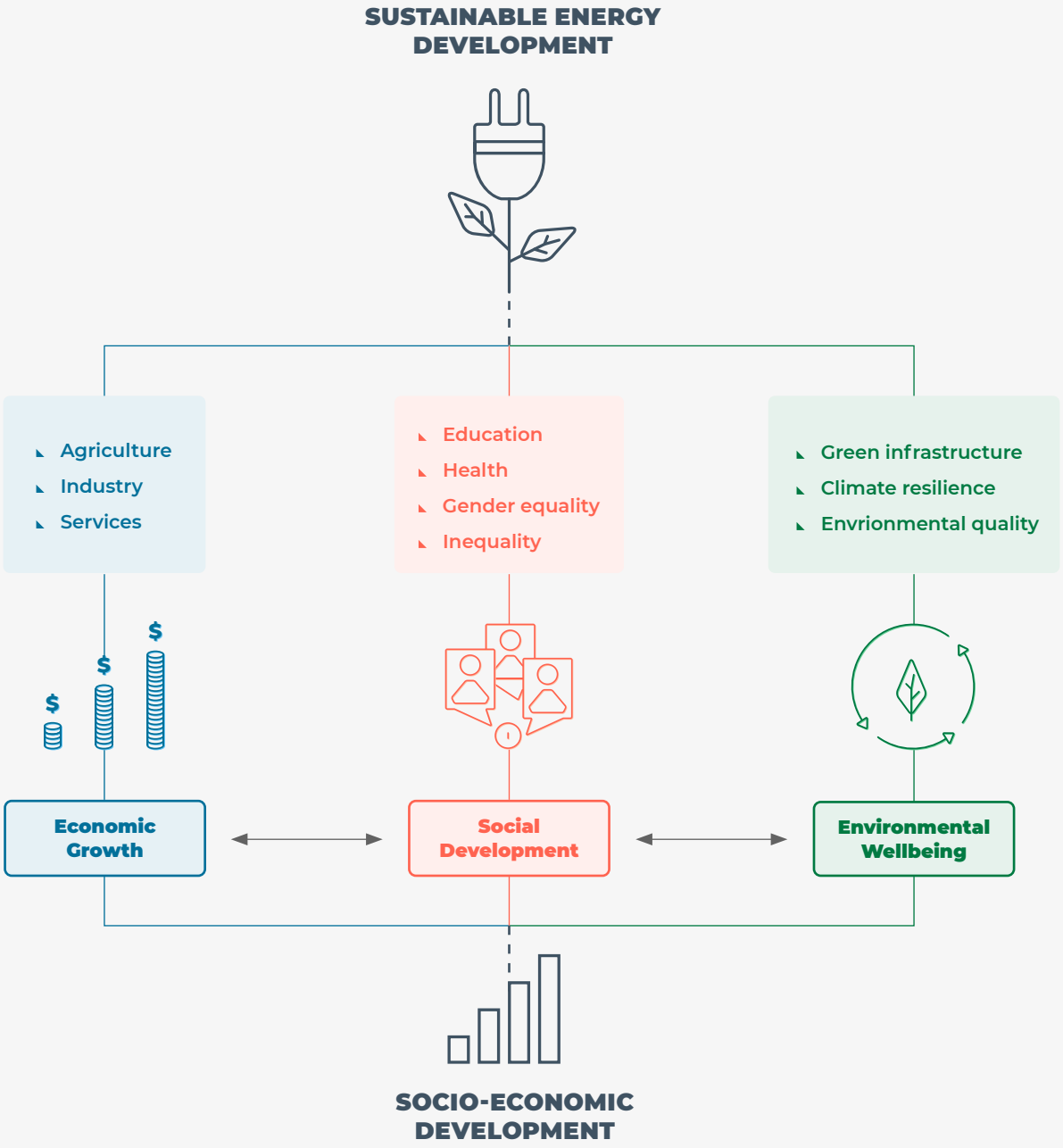
consumption, growth, and environmental sustainability in South Africa. They concluded that a 1 per cent increase in kg of oil equivalent energy consumption per capita and real income per capita led to a 0.54 per cent decrease and a 0.56 per cent increase in environmental quality in the short- and long-run, respectively. Therefore, the nexus and dual relationship between energy and growth in Africa is evident.

On social development, energy plays a key role in improving the quality of social services provided, such as in healthcare and education. Moreover, the effect of energy on social development could be subtler, such as by helping to narrow social inequalities through improved access to energy. For example, Sarkodie and Adams (2020) demonstrated that electricity access is associated with income inequality and human development. Similarly, greater use of clean energy technologies could have positive environmental benefits, by reducing the use of less sustainable sources or enabling cleaner energy transition. This could be in the area of clean cooking where biomass-based energy today accounts for notable negative environmental impacts in the continent, such as through deforestation. Growth prospects, social development, and environmental sustainability combined shape the overall development trajectory. Figure 1.1 summarises the relationship between sustainable energy development and socio-economic impacts.

Figure 1.1

Relationship between sustainable energy and socio-economic development

Source : UNECA, 2021



1.3

THE SOCIO-ECONOMIC IMPACTS OF SUSTAINABLE ENERGY DEVELOPMENT

Over the last 30 years, fundamental changes to the energy system of Africa have taken place. In the 1990s, coal accounted for nearly 52 per cent of power generation in the continent. The main renewable energy source was hydropower, accounting for 18 per cent of the energy mix. Other renewable energy sources were negligible. By 2017, the picture had changed dramatically. Coal was no longer a dominant generation fuel, dropping to about 30 per cent of power generation. It was largely replaced by natural gas, which accounted for 40 per cent of the generation. With a stable role of hydropower at 15 per cent, the accelerated development of electricity generation capacity was largely shaped by the role of natural gas. Renewable energy also saw a significant change in its importance in the energy mix. Though much progress is still expected in the coming years, non-hydro renewable energy sources account for nearly 5 per cent of the African electricity generation mix. Considering the vast renewable energy resource potential of Africa and the affordability and accessibility of renewable energy technologies, the share is expected to rise over time.

An energy transition in Africa to more renewable and sustainable energy is possible and has begun to take shape. Solar energy, for example, is playing a role in this transition as countries such as Morocco, Ethiopia, Kenya, and Zambia make significant investments. Djibouti has aimed to be the first in the continent to reach 100 per cent renewables with major investments in solar and wind projects. At the country level, Tanzania saw within 7 years a rapid transformation of the energy system from an almost exclusively hydropower system to a nearly 40 per cent hydro system, and over half of the generation mix coming from natural gas and renewables. Over a longer period, the same trend was observed in Nigeria, Cote d'Ivoire, Algeria, and Gabon. South Africa has a robust renewable energy procurement program leading to major uptake of wind and solar energy. At different scales, such transformations are taking shape across Africa.

Economic impacts of sustainable energy development

Globally, employment in the renewable energy sector in 2020 was estimated at 12 million, which grew by 500,000 from the level in 2019. Under IRENA's 1.5° climate target global pathway, the renewable energy sector is estimated to generate 38 million jobs by 2030, and 43 million by 2050 (IRENA and ILO, 2021). At the macro level in Africa, the effect of energy supply on economic growth and development was partly observed when African countries faced power cuts and outages over an extended period, such as in drought conditions. For example, in the case of Uganda, power shortages are demonstrated to have led to a 3 per cent decline in GDP growth under emergency drought conditions. In Tanzania, such conditions are associated with major budgetary challenges with the emergency supply of nearly double the energy in 2011. These incidents offer direct evidence of the impact of withdrawing existing power capacity on overall economic performance.

Evidence on the economic development impact of energy is also witnessed based on the increased power capacity. The works of Akadiri, et al. (2019), Qudrat-Ullah and Nevo (2021), Wolde-Rufael (2005), and others also provided a direct association of the economic growth dividends of sustainable energy development. There are numerous avenues as to how this could materialise. In the major sectors of the economy – agriculture, industry, and services – their performance and levels of productivity are tied to adequate, affordable, and reliable energy supply. There is evidence that industrialisation is a catalyst for economic growth, resulting in long-term prosperity (Franck and Galor, 2015). UNECA (2020) assesses that the industrial sector generates 6.2 million jobs in Africa, and contributes $56 billion to the continental GDP. Based on an analysis of 50 years of electricity-GDP elasticity in Africa, the Centre for Applied Macroeconomic Analysis (2017) posits that industrial output is slightly elastic to the electricity supply (1.06), and conversely a 1 per cent GDP growth induces 0.53 per cent additional demand for electricity services. Therefore, the increased electricity supply is associated with increased industrial output, and such growth itself places additional demand on electricity supply. In this positive chain reaction of electricity supply triggering industrial growth, which contributes to economic growth, which in turn places a further requirement on additional power supply, a major constraint in expanding sustainable energy supply will hinder this process and limit the potential of this nexus.

The effect of energy supply on employment is equally essential. Mensah (2018) provides evidence that the energy infrastructure gap reduces the likelihood of employability between 35-41 per cent in the industrial sector in Africa. In the context of the impact of COVID-19 in the continent, the International Labour Organization estimated that 19 million people have lost their jobs in 2020. The employment opportunities inherent in a sustainable energy transition are apparent.

At the micro-level, the economic effects of sustainable energy development are often felt through direct effects (employment and income gains, as well as expenditure in the local economy associated with initial project investment and subsequent operations). It is also felt through indirect effects (secondary employment and income generated as a result of the direct project activities), and induced effects (additional employment and income opportunities that arise as a result of the direct and indirect economic activities related to sustainable energy development). At this scale, it is helpful to look at individual country cases to uncover the economic effects of renewable energy, including in local value chains.

The Regional Centre for Renewable Energy and Energy Efficiency (RCREEE, n. d.) documented economic effects resulting from renewable energy and energy efficiency investments in the case of Egypt. These effects were measured based on the Jobs and Economic Development Impact (JEDI) model of the US National Renewable Energy Lab (NREL). Egypt expected the share of non-hydro renewables, which stood at 1 per cent in 2010, to increase to the approved scenario by 2034/35. The scenario foresaw wind energy to account for 14.6 per cent, solar PV 11.8 per cent, CSP for 7.6 per cent, and hydro 3.2 per cent of total generation by 2034/35. The assessment demonstrates the growing employment contribution of renewable energy and energy efficiency investments. The associated employment of 7,123 people by 2013 was projected to reach 8,823 by 2016. By 2030, in the benchmark scenario utilised, over 28,000 new jobs are expected, reaching over 65,000 jobs by 2030 under an ambitious sustainable energy transition scenario. These benefits are associated with manufacturing, construction, installation, and operation and maintenance activities. There are associated income benefits from a clean energy transition.

For a more regional look, Calzadilla, et al. (2014) did economic impact assessments associated with the DesertPower 2050 project by the Desertec Industry Initiative in the MENA region. They utilised a computable general equilibrium model, which is widely applied for macroeconomic impact assessments. Results suggest that the solar energy regional project is expected to generate 160,000 to 380,000 permanent jobs, with most of the benefits accruing to Egypt. The study notes that Egypt has 17-42 jobs/million in the PV sector, with 59 per cent indirect jobs. Furthermore, wind energy creates up to 82 jobs per million Euro investment, with 35 per cent indirect jobs.

Box 1.1

NOOR SOLAR COMPLEX – MOROCCO

The NOOR Solar Complex is located in the Ghassate commune, in the province of Ouarzazate. It was the first implementation of a solar program in Morocco, which aimed at producing at least 2,000 MW of solar energy by 2020. The complex total installed capacity is 580 MW, consisting of one solar power tower unit (150 MW), two parabolic trough-based solar units (160 MW and 200 MW), and one photovoltaic farm (70 MW).

The NOOR Solar Complex implementation was carried out over a period of 6 years (2012 – 2018) at the investment cost of 24.2 billion MAD (2.65 billion USD). The solar plants are expected to generate 1,800 GWh of electricity per year, which is more than 4.5 per cent of the national electricity supply in 2020.

The primary economic impact during the construction and operation phases was employment and the use of Moroccan businesses and contractors by the project developers and the main construction companies. More specifically, the construction phase created over 1,100 jobs for Moroccan workers at the peak of construction, out of which at least 550 were outsourced locally, i.e., from Ouarzazate localities. In addition, it is reported that at least 100 workers from nearby villages are now employed in the project during the operational phase. Given the unemployment levels within Morocco and the emigration rates in the province of Ouarzazate, the positive economic impacts of the program have been broadly felt in communities located throughout the regions of the province and beyond. There were also indirect economic benefits to local businesses in Ouarzazate, namely in the hospitality and catering as well as transport sectors.

The Moroccan Agency for Sustainable Energy (MASEN) required its main partners and contractors to maximise local content. It pursued this goal by imposing a minimum volume of services and equipment to be locally sourced. In practical terms, the share of total expenditures captured by Moroccan businesses ranged between 24 per cent (for photovoltaics (PV) projects) and 40 per cent (for concentrated solar power (CSP) projects). For instance, parts of the steel structure for solar collectors and heliostats were manufactured in Morocco. Local contractors were engaged in civil works, assembly, and mounting of major components of the power plants.

As part of the site purchase agreement and to ensure that the local population would not be negatively impacted by the construction works and the planned facilities, MASEN financed and constructed new roads to improve access to neighbouring villages. Another important impact of the project is the creation of a 200 ha solar R&D platform. It contributes to the development of applied research and the promotion of technological innovations in the operation of solar power plants. Furthermore, a training institute for renewable energy has also opened in Ouarzazate.

The solar complex is open for educational visits and promotion of green/renewable technologies amongst young generations. Equally, there are plans to use the solar fields as a tourist attraction, thereby contributing to boosting tourism in the region. The NOOR Solar Complex has played a role in promoting Morocco as a destination for global renewable energy investment. In November 2021, Morocco announced its interest to mobilise a global investment of $1.6 billion in a wind energy program, demonstrating its commitment to transition to sustainable energy solutions. Mahia and de Arce (2020) provide further evidence, based on analysis of what investment in renewables would mean in Morocco in the next 40 years. They concluded that such investment will lead to a 1.2 - 1.7 per cent additional GDP growth per year, and will add 42,000 new jobs in the value chain.

From the macroeconomic to the microeconomic project levels, the transition to renewable and sustainable energy in Africa is creating economic opportunities. Energy must be planned amidst the pursuit of other development goals, as recommended by the High-Level Dialogue on Energy 2021, theme report on Enabling SDGs through Inclusive Just Energy Transition to ensure that associated economic benefits can be maximised.

Social impacts of sustainable energy development

Energy plays a vital role in the provision of social services such as healthcare and education. Blimpo and Cosgrove-Davies (2019), in their assessment of the reliability and economic impacts of electricity access in Africa, indicated that 60 per cent of healthcare facilities in the continent lack access to electricity. This essentially undermines the full effect electricity access could have on health outcomes. On education, UNDESA (2014) established that 90 per cent of children in Sub-Saharan Africa go to primary schools that lack electricity. There has been considerable improvement in the last years; nonetheless, a significant share of schools remain without access to clean energy sources. These assessments indicate the major challenge of access to electricity for quality social services affecting the delivery of social goods.

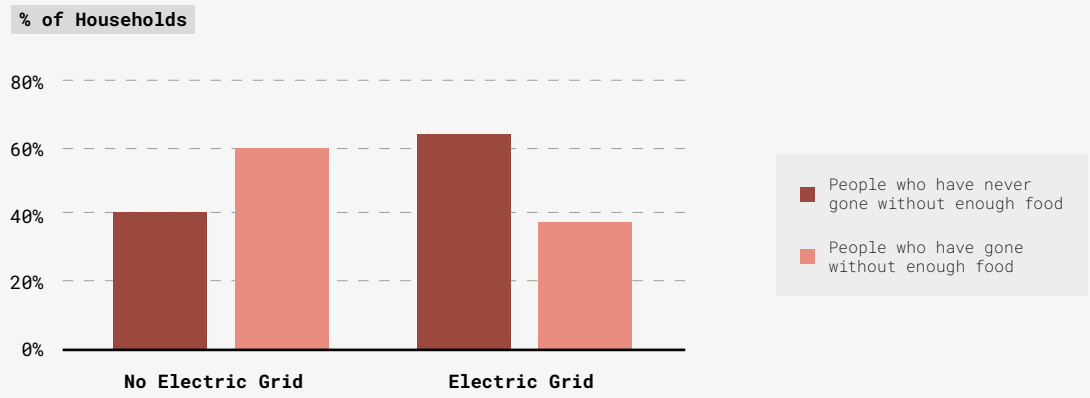
Social impacts are complex to trace, and with limited data, difficult to quantify. However, Mitullah, et al. (2016) assessed access to infrastructure services and household experience of poverty (using hunger as a proxy) in 35 African countries. The results were noteworthy. About 62 per cent of households with electricity access had never gone without food, compared with 40 per cent of households without access to electricity. Access to sustainable energy is fundamental to mitigating social problems and advancing social goods, such as healthcare, education, food security, and the reduction of poverty.

Recognising the social development implications of sustainable energy development, the High-Level Dialogue on Energy was called in September 2021 at the UN General Assembly. The meeting adopted global milestones to be achieved by 2030, which are aligned with SDG targets. Among the primary priorities, a target is set to connect all schools and healthcare facilities to electricity services by 2030. Accelerating the achievement of this goal would open immense opportunities to drive social development-oriented clean energy investments with implications for educational attainment and health outcomes. This is particularly essential considering the COVID-19 pandemic, the strain it put on health systems, and the importance of health centres accessing energy to deliver quality healthcare services.

Figure 1.2

Access to infrastructure services and household experience of poverty (hunger) in 35 African countries

Source: Mitullah et al. (2016).



Box 1.2

AREZA AND MAIDMA HYBRID SOLAR ENERGY AND SOCIO-ECONOMIC IMPACTS – ERITREA

In 2018, Eritrea commissioned a 2.25 MW hybrid solar energy plants in Areza (1.25 MW) and in Maidma (1 MW) with a TESLA battery and thermal hybrid backup system. The project, with an investment of $13.2 million, aimed to provide electricity access, encourage small business' development and create income and employment opportunities, improve food security, provide reliable social services, and reduce CO_2 emissions. The project was a result of cooperation and funding among the State of Eritrea, UNDP-Eritrea, and the European Union.

The project enabled electricity access to 6,964 households, constituted by 1,300 households in Areza town, 1,564 in Maidma, and 4,060 in 33 villages around the project site, providing electricity access to more than 30,000 people (UNDP-Eritrea, 2018). The hybrid solar plant with reliable backup allows uninterrupted power supply. The socio-economic impacts are palpable. The solar energy supplied electricity to 513 small enterprises, enabling economic activities. Furthermore, 15 schools in and around Areza and Maidma are electrified, along with two community hospitals and five health stations (ibid) leading to delivery of better social services. Community hospitals are able to upgrade services by ingegrating new equipment and expanding lab services.

The experience of the Areza and Maidma solar hybrid plants demonstrate that reliable, affordable, and clean energy access is feasible, has potential in peri-urban and rural settings, and have demonstrable economic and social impacts contributing to sustainable development.

Box 1.3

ARGEDA HARODINTU HEALTH CENTER – ETHIOPIA (LOKA ABAYA WOREDA, SIDAMA REGION)

Argeda Harodintu Health Centre is located in the Loka Abaya Woreda (district) of the Sidama Region of Ethiopia. The health centre is 8 km away from the Woreda town Hantate and 58 km away from the regional capital, Hawassa. The health centre provides basic medical services to about 21,869 people or 20 per cent of the Woreda population. During its establishment in 2010, a solar system was installed in the centre to provide lighting. The Centre was lacking adequate access to electricity to provide basic healthcare services for the last 10 years. As a result, its services were limited to providing physical diagnostics. Healthcare professionals at the centre mentioned that the lack of adequate electricity supply was limiting service provision to patients due to constraints to operate equipment such as microscopes, laboratory test kits, and refrigerators. In addition, hand batteries were used to assist women in labour during nighttime deliveries.

Patients at the centre stated that "the establishment of the health centre in our village created happiness and we celebrated; however, it was unable to fully address our healthcare needs for the last 10 years. We are supposed to travel 8 km for laboratory tests."

In March 2020, GIZ, partnering with a private company Sunlight Electrical Engineering Association, facilitated the installation of the solar system that generates a total of 1,200 Wp with an output voltage of 24V DC. The system is installed together with a 729 Ah battery bank, and a DC/AC inverter. The medical staff at the centre explained that the solar PV system has improved services by enabling the use of refrigerators for storage of medical supplies and vaccines, microscopic examinations in the laboratory, and computer-based administration of patients' records. The use of mobile phones and radio at the centre improved the working conditions as well as medical care since it made information exchange faster and easier.

In most cases, women visit healthcare facilities for family planning services, check-ups during pregnancy, and childbirth. About 66.7 per cent of patients and families of patients who were present at the health centre at the time this survey was administered claim to be very satisfied with how the services have improved after the installation of the solar system. This has led to time savings, reduction of costs, and better access to healthcare services. While 27.8 per cent of the interviewees claim they are moderately satisfied, the remaining 5.6 per cent were first-time visitors.

Furthermore, the community was motivated to use solar home systems, partly after noticing the benefit of the solar system at the health centre. About 88 per cent of the people who participated in the survey had already acquired solar home systems.

Environmental impacts of sustainable energy development

In 2021, two fundamental reports shaped global policy thinking around sustainable energy technologies and climate change. Firstly, the Intergovernmental Panel on Climate Change (IPCC) released its 6th assessment (IPCC, 2021), Climate Change 2021 – the Physical Science Basis. The assessment concluded that human-induced climate change is already affecting many weather and climate extremes in every region of the world. Fundamental changes to the global energy system are part of the required shifts to mitigate climate risks.

Secondly, IRENA (2021) released the World Energy Transition Outlook with a focus on a temperature rise capped at 1.5°C. The report concludes that an energy transition based on renewable sources and technologies offers a chance to limit global warming to 1.5°C by 2050. The energy transition is among the priority actions required to meet this goal. It is recognised that developing economies will need financial support and the sharing of technological know-how to build a sustainable energy system that will meet the needs of the population and the growing economy. International cooperation is expected to play a strategic role in facilitating the energy transition in Africa. Beyond technology and financial support, there is much scope for African member States to transition their energy systems towards a clean and sustainable future through addressing fundamental energy sector regulatory and policy reforms to encourage more investment and participation of the private sector.

Even though these fundamental global energies and climate change challenges will shape regional and national actions, African countries further face additional environmental and climate risks emanating from the structure of the current energy system. For example, a large share of the population relies on biomass energy for cooking, which is leading to forest cover deteriorating at alarming rates. As shown by a recent study, the rising demand for biomass energy and unsustainable practices are directly responsible for a loss in forest coverage of about 2 per cent per year in Burundi (or 34 per cent between 1009-2007), 36 per cent in Uganda between 1995-2005, and 11 per cent in Tanzania between 2000 and 2010 (EAC and UNECA, 2018). Such unsustainable practices lead to rising costs of biomass energy, undermining household economic welfare and environmental sustainability with a myriad of effects, including on climate change.

There are technologies within Africa that can improve this condition. First, the level of efficiency of carbonisation in the East African Community (EAC) is around 13 per cent, while there are technologies that could improve this efficiency to more than 75 per cent. Under such scenarios, it has been demonstrated that a 25 per cent adoption of such a high-

efficiency conversion technology could close the prevailing biomass demand and supply imbalance with one such policy measure alone (EAC and UNECA, 2018). Second, there are also efficient and clean cooking facilities already in the market in many African countries. By reducing the biomass demand, they help tame the widening demand and supply imbalance leading to higher prices. Beyond solutions within the current system, alternative cooking technologies are also available, including electric stoves, biogas, and liquefied petroleum gas (LPG). They have limited market penetration today in the continent; however, offer much potential. One creative solution in the experimental phase is the adoption of a pay-as-you-go system for LPG, which has similarly addressed financing challenges in solar home system adoption. It could potentially work in clean cooking markets. If left unresolved, the environmental and social consequences of unsustainable use of biomass resources would be dire. Measures that mitigate environmental impacts through sustainable energy technologies and solutions, therefore, contribute to environmental restoration and sustainability.

Box 1.4

SMART STOVES BY ENERGY4IMPACT: BUSINESS OPPORTUNITY WITH ENVIRONMENTAL BENEFITS – KENYA

Globally, 2.6 billion people lack access to clean cooking facilities. They use polluting fuels and technologies, using traditional stoves fuelled by charcoal, coal, crop waste, dung, kerosene, and wood. In Sub-Saharan Africa, 900 million people are expected to lack access to clean cooking by 2030, with women disproportionally affected. Urgent progress is needed to scale-up access to clean cooking (UN, 2021b).

About 81 per cent of the population of Kenya faces a clean cooking access deficit. From 2019 to 2020, a member of ACCESS Coalition, Energy 4 Impact, ran a project targeting women's production cooperatives and women entrepreneurs in Kenya for local production of modern and efficient stove models such as the "Jiko Smart". The stoves perform well related to standard parameters of thermal efficiency, durability, and heat output. A unit saves a family 20 per cent of its daily expenses by reducing the usage of charcoal by as much as 50 per cent.

The project was located in Homa Bay County. It targeted female stove manufacturers from Kabondo Pottery Organisation - a cooperative consisting of fourteen women involved in the manufacture of improved cookstoves. They were among 230 female entrepreneurs who received business coaching, technological training, and access to financial support from Energy 4 Impact. The program aims at making energy-efficient cookstoves available in energy-poor counties across Kenya.

The project extended technical support to stove entrepreneurs to produce advanced cookstove models and supply to communities with market development support. Such support developed improved cookstove markets, increased demand through awareness and marketing activities, and encouraged entrepreneurs to participate in trade shows and regional fairs.

Kabondo Pottery Organisation expanded its network of clients and retailers, increasing its sales by 11 per cent from August 2019 to January 2020. Having established new routes to markets, some stove entrepreneurs are also selling stand-alone solar products. Some 388 units of solar lanterns and 1,002 units of solar home systems have made their way into rural homes.

The wider overall impact of the programme in both Kenya and Tanzania is that these cooperatives sold over 265,000 improved cookstoves benefiting 782,000 people and contributing to reducing 170,000 tonnes of CO_2 from the atmosphere. The entrepreneurs have employed approximately 1,000 people, of whom 47 per cent are women.

A new phase of the project began in 2021 focusing on four counties on the coast of Kenya with highly underdeveloped improved cookstoves markets. About 80 women improved cookstoves entrepreneurs from Kilifi, Kwale, Taita Taveta, and Mombasa will have their capacity enhanced through technology, financial and business training, mentoring market development, and access to capital, benefitting more households in rural communities while contributing to sustainability.

1.4

MAXIMISING SOCIO-ECONOMIC AND ENVIRONMENTAL BENEFITS FROM THE ENERGY TRANSITION

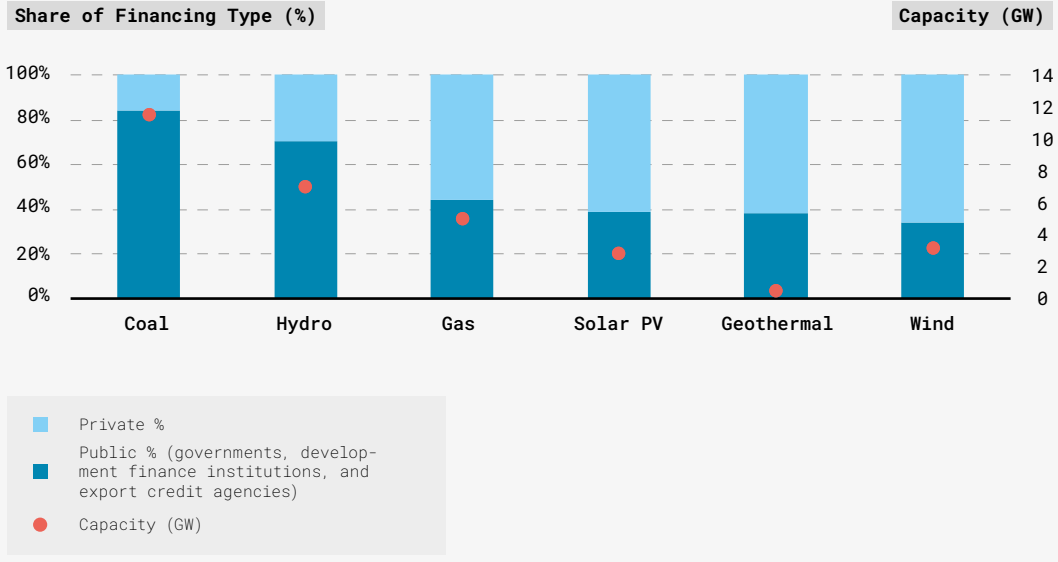
The previous sections have presented the socio-economic and environmental benefits of sustainable energy development. Such socio-economic impacts are substantial in the context of the energy transition, especially if Africa can accelerate the inclusive and sustainable energy transition endorsed at the Heads of State and Governments level by the High-Level Dialogue on Energy 2021. Traditional energy sources, such as coal and hydro investments between 2014-2018 saw about 70 per cent and more financing coming from public sources. Solar, geothermal, and wind energy sources in comparison have attracted over 60 per cent of private sector investment in such projects in the same period. This would imply that with greater effort in addressing private sector participation in the energy transition of Africa, greater private financing and investments could be mobilised for sustainable energy sources. Part of this effort needs to focus on strengthening the case on the economic, social, and environmental benefits of sustainable energy development.

There are already tangible examples demonstrating the benefits of the energy transition, in the context of the people, planet, and prosperity framework. South Africa's renewable energy program and its evolution lend a vivid case in point. In a constrained and coal-dependent energy system and economy, with an entangled sector political economy, South Africa adopted a renewable energy procurement program. The program saw the successful introduction of solar and wind energy capacity in the energy mix, with plans to further expand such capacities. The socio-economic and environmental benefits of the program associated with a clean energy transition have so far been notable.

Figure 1.3

Sources of finance for generation investments (2014-2018)

Source: Based on IEA data.



Box 1.5

MAXIMISING THE BENEFITS OF ENERGY TRANSITION SOUTH AFRICA

In 2010, the Department of Mineral Resources and Energy (DMRE) established a procurement programme aimed to enhance South Africa's generation capacity in response to the 2008 electricity supply constraints. The DMRE, National Treasury, and the Development Bank of Southern Africa (DBSA) established the Independent Power Producer (IPP) Office to implement procurement of power from the private sector, including the Renewable Energy Independent Power Producers Procurement Programme (REI4P). The REIPPP is aimed at adding power capacity to the national grid using PV, CSP, onshore wind, small-scale hydropower, biomass, and landfill gas technologies. The procurement process commenced in November 2013 with rolling rounds. IPPs were procured according to a specified technology mix and capacity targets/limits called bid windows. As of 31 March 2021, seven bid windows have been announced. The projects have been connected to the national utility's grid connection system. South Africa has thus benefited from using clean energy projects with associated improvement in the security of electricity supply.

Furthermore, the bid requirements impose a commitment to contribute to socio-economic development obligations. These are included in the Implementation Agreement which IPPs sign with the DMRE. These socio-economic development objectives include job creation, local content, enterprise development, preferential procurement, social uplifting (through healthcare facilities and access to education), and ownership structures involving previously disadvantaged groups (broad-based economic and women empowerment) and local communities.

By the end of March 2021, the REI4P had resulted in the following socio-economic impacts. The introduction of clean energy into the South African electricity supply system attracted a total of R209.7 billion of debt and equity investments in seven bid window rounds of procurement. In every bid, there had been a constant decline in average costs for the portfolio of projects for all technologies, contributing to relatively cheaper pricing. This will give impetus to further development of such projects in the country. The socio-economic gains achieved through the development of renewable energy projects have contributed to the improvement of the welfare of local communities, which reside within a 50 km radius of the facilities. Typical benefits are access to education, healthcare, and empowerment of previously disadvantaged local communities through enterprise development.

The Touwsrivier case study is an example of such initiatives and demonstrates the benefits to community welfare due to the development of renewable energy projects within their locality. Touwsrivier is a small railway town of 6,800 people in the Western Cape province of South Africa. It is located on the Touwsrivier river, about 160 kilometres northeast of Cape Town. The project was part of the REI4P, which developed a 36 MW CSP plant. It has been a catalyst for the development of a

Socio-Economic and Enterprise Development programme. The programme was launched in 2016. It is anchored on three pillars, namely the Experience Works programme, the Bursary Fund and Enterprise 4 South Africa/ Enterprise Starter Pack.

Furthermore, the REI4P has led to employment creation. About 59,591 job years have been created for the South African population, of which 79 per cent were during construction and 21 per cent in the operation phase. Socio-economic and enterprise development initiatives were created. They were worth approximately R1.5 billion and R465.5 million, respectively. Previously disadvantaged communities have also benefitted through ownership structures that imposed targets. The program has led to the participation of 34 per cent of the Black Economic Empowerment enterprises. Local communities (through Community Trusts) have a total of 8 per cent equity in the total projects developed up to 31 March 2021. Further procurement rounds and the development of renewable projects will increase such participation.

Since the first project became operational in November 2013, 5078 MW of the total 6,422 MW generation capacity procured has been connected to the national grid. About 67 of the 79 projects that are connected to the national utility network have been operational for longer than a year, generating a total of 11,679 GWh of clean electrical energy over the past 12 months. Twelve projects are still under construction.

On environmental benefits, coal is the dominant source of fuel in the South African power generation system. Coal combustion during power generation results in SO_2, NO_x, and CO_2 emissions.

Additionally, coal-fired power plants are very water-intensive. They use substantial amounts of water to condense steam in the power generation process. South Africa is a water-stressed country, thus the use of water in power generation processes competes with water consumption for households and other economically beneficial processes. Clean energy use in the country, therefore, contributes to greenhouse gas emissions reduction, mitigation of other pollutants such as SO_2, NO_x, and other particulate matter, as well as a reduction in water consumption. Since its inception, the REI4P has engendered a total emissions reduction of 60.7 million tons of CO_2 and a water-saving of 71.7 million kilolitres.

The energy transition agenda and clean energy development present a myriad of development opportunities. In this report, a framework is proposed to leverage the energy-development nexus to prioritise action to maximise the benefits of energy transition in an inclusive and just manner. Investments made so far in clean energy development demonstrably led to socio-economic and environmental benefits. Going forward, there are immense opportunities to link Africa's enormous clean energy potential with its development. In-built opportunities can be leveraged to maximise the social and economic development opportunities and meet environmental goals.

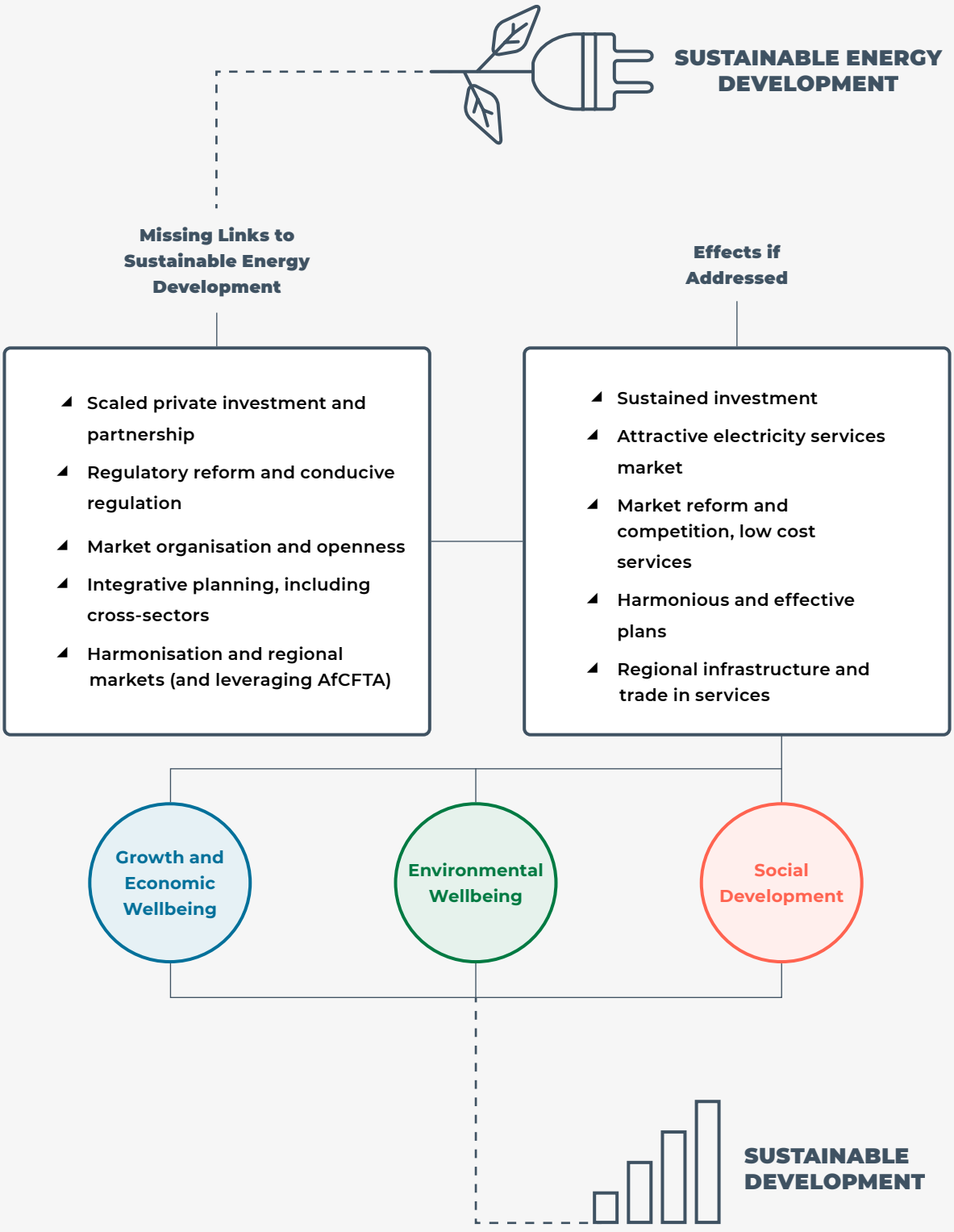
Doing so will require system-wide planning, development-conscious energy sector growth, and socially responsible investments. Partnership with the private sector is essential to meet the required investments. Maximising the benefits would require governments to support and guide private investment to leverage the myriad of economic, social, and environmental benefits inherent in energy investments.

To maximise the benefits of sustainable energy development, it is essential to address the missing links indicated in Figure 1.4. Africa will need to see a growing share of private sector investment in sustainable energy development to complement public resources. This would require reforming, or improving, energy market regulation and creating a conducive market environment. It would also require organising energy markets towards greater efficiency and participation of diverse market players. Planning is crucial to leverage benefits within and across sectors. Regional opportunities are also key, particularly within the context of the launch of the African Common Free Trade Area (AfCFTA), and efforts towards continental harmonisation of electricity regulations are expanding the scope of regional energy integration. Addressing these and other gaps will improve the sustained flow of infrastructure investment in Africa, and create a conducive business environment for energy investments. Harmonious and long-term plans communicate the direction of the sector, creating certainty, and fostering a better investment climate. Regional energy infrastructure integration and trade in services would expand the scope of impact. These improvements will strengthen the effect sustainable energy development would have on economic and social development, as well as on environmental wellbeing within the framework of sustainable development.

Figure 1.4

The sustainable energy-development nexus: addressing the missing links

Source: UNECA, 2021



1.5 CONCLUSIONS

As discussed so far, the future of the energy sector globally, and particularly in Africa, can deliver substantial benefits through the greater integration of sustainable energy solutions. It is essential to assess the broader socio-economic impacts of sustainable energy development to formulate policies and programs that help leverage these linkages. The relatively low absorption of renewable energy technologies in the broader energy mix of Africa today has also limited the potential positive socio-economic gains sustainable energy development entails. By taking concrete actions that bolster the growing role of renewable energy in Africa's energy mix, and leveraging social and economic development links, the scope of such benefits can be expanded. This report puts forth a framework for socio-economic impacts assessment of sustainable energy development to fill the policy information and knowledge gap in this area. It further contributes to policy insights and recommendations on viable pathways to maximise the socio-economic benefits of sustainable energy development in Africa.

Towards the goal of maximising these socio-economic benefits in the continent, two areas of broader policy consideration are required. Upscaling sustainable energy development in Africa, and leveraging this opportunity to build on the ongoing socio-economic development in the continent. Governments need to create a conducive environment through energy policy, legislative, regulatory, and market frameworks to enhance the uptake of sustainable energy solutions. Doing so would foster better scope for a public-private partnership for sustainable energy development through the implementation of diverse business models. The second set of policy considerations would then address how best the expanding sustainable energy capacity in Africa's future energy mix could be leveraged to enhance socio-economic benefits. This would require cross-sectoral integrative short-, medium-, and long-term planning, encouraging development-conscious energy investments, further encouraging productive use of energy in urban and rural settings, and promoting people-centred energy solutions.

More broadly, maximising the benefits from sustainable energy development and a clean energy transition would require an inclusive and just approach to transition that leaves no one behind, improved institutional capacity, aligning infrastructure development and socio-economic development goals, enhanced partnerships, reinforced investment in social infrastructure, instituting smart local content regulations to support value creation opportunities, and reinforcing technical and vocational training programs to build required skills for successful energy transition. This report provides evidence-based recommendations on how best to leverage opportunities and guide implementation.

Building on the overview provided in **Chapter 1**, **Chapter 2** focuses on the measurement of the socio-economic impacts associated with Africa's energy transition. **Chapter 3** then explores the role of the renewable energy industry in delivering development outcomes. And finally, **Chapter 4** provides insights, pathways, and recommendations towards maximising the socio-economic impacts of Africa's sustainable energy transition.

2

MEASURING THE SOCIO-ECONOMIC FOOTPRINT OF AFRICA'S ENERGY TRANSITION

Visionary Statement

POWERING AFRICAN DEVELOPMENT WITH RENEWABLE ENERGY

by Francesco La Camera, Director-General, IRENA

Energy is a cornerstone of socio-economic development, yet less than half of the population in Sub-Saharan Africa have access to it. Low energy access in Africa exacerbates the challenge of effectively fighting poverty despite an abundance of affordable and indigenous renewable energy resources. By 2019, about 20 per cent of electricity generated in Africa was based on renewable energy sources, including hydropower, letting the continent lag behind the global average of 26 per cent.

In 2020, installed renewable energy capacity in the continent represented just two per cent of global additions, yet forecasts indicate that energy demand could double by 2040. Renewables can cost-effectively meet this demand while generating a considerable social dividend, thanks to their scalability and replicability.

The analysis presented by IRENA on Maximising the Socio-economic Impact of Africa's Sustainable Energy Transformation indicates that Africa will be better off – in multiple dimensions – if it pursues an energy transition strategy that contributes to limiting temperature rise to 1.5°C. Under IRENA's 1.5°C Scenario, gross domestic product (GDP) is expected to be higher on average by 6.4 per cent by 2050, compared with the Planned Energy Scenario (PES). The difference is largely spurred by government spending across different pathways towards energy transition.

Africa is set to become the largest and youngest workforce by 2025, with more than 500 million people in the labour market. The employment dimension of the energy transition is, therefore, particularly relevant to governments seeking to increase economy-wide job creation. Under IRENA's 1.5°C Scenario, renewable energy jobs alone would rise from more than 300,000 today to 8 million by 2050. Furthermore, economy-wide employment is expected to be, on average, 3.5 per cent higher than under current plans.

Expanding renewables also support the immediate needs of healthcare facilities in the frontline of the COVID-19 pandemic. Distributed energy can power vital medical

appliances such as vaccine refrigerators and ventilators. Meanwhile, all welfare dimensions including economic, social, environmental, distributional, and access fare better under the 1.5°C Scenario.

This scenario and its assumptions; however rigorous and comprehensive, are merely an instrument to inform policy making. To translate this vision of the energy future into reality, we need to transcend the limits of the existing infrastructure created based on the fuels of the past. These decisions are not made in a vacuum. Economic and human development goals, environmental concerns, and financial returns must all be reconciled.

The choices we make in the coming years will have a far-reaching impact. They could bring us on a path towards the goals we set out in 2015 when countries adopted the highly consequential international agreements on sustainable development and climate change. Inaction could take us in the opposite direction to further warming, with profound and irreversible economic and humanitarian consequences. Africa needs to shift its current investments in fossil fuels to cleaner and more sustainable energy sources. By harnessing its huge potential of renewable energy, Africa's dynamically growing economies can ensure energy supply is generated in line with sustainable development and international climate goals.

The international community, multilateral organisations, investors, and other development partners should stand ready to partner with African countries on their path towards sustainable growth. By fostering cooperation among energy, health, and development partners, high-level political and financial support can be mobilised to scale up action on the ground.

It is in this context that IRENA brings its unique value. When we look beyond the narrow confines of energy supply, a renewables-based transition unlocks a range of valuable benefits. Our analysis and the 1.5°C scenarios present the policy frameworks necessary to advance a transition that is just and inclusive. They provide an improved understanding of required structural changes and offer a quantitative framework for transition impacts such as GDP, employment, and welfare.

We are entering an age of profound change that brings with it unprecedented opportunities to create a sustained period of sustainable and inclusive growth, leading to lifting millions of people out of poverty while balancing the relationship between economies and the environment. The task ahead is daunting. Our shared future will only be bright if we move together and with purpose towards a more resilient, equal, and just world. The energy transition is central to this future.

It is encouraging to see that 45 African Nationally Determined Contributions (NDCs) contain quantified renewable energy targets. Now is the time to act together. African countries must look beyond fossil fuels and choose a sustainable energy path to prosperity and stability.

2.1 INTRODUCTION

Africa's future can be bright. The continent is endowed with vast land, water, and energy resources. It also has a young, entrepreneurial, and increasingly well-educated population (UNECA, 2016). Demographic dividends are expected to be reaped. Demographic changes are also expected to increase the energy demand. Energy demand growth estimates indicate that Africa outpaces the global average twofold (RES4A and UNECA, 2020). At the same time, efforts to achieve universal access to energy must remain a top priority across Africa to effectively fight poverty, enable new economic opportunities, and promote equality. In these endeavours, Africa should take advantage of its renewable energy potential to respond to the growing electricity demand and avoid long-term fossil fuel technology lock-in. In doing so, Africa can simultaneously create opportunities for additional GDP and new jobs, social well-being and health, and climate resilience (KfW et al., 2021).

Africa's economic growth ranked second-highest globally over the last decade, only behind Asia. Growth was led partly by a long commodities boom that lasted until 2014 (The Economist, 2021a; ACBF, 2017), which then faded out in the second half of the decade. Commodity-dependent economies, including those in Africa, are vulnerable to price volatility in global markets (UNECA, 2019). Unexpected changes in global commodity prices, for example, oil prices, can result in revenue losses, increased public debt, and fiscal constraints on an already narrow public finance space (RES4A and UNECA, 2020). Moreover, protecting the continent's resources and biodiversity, as opposed to depleting non-renewable natural resources, and avoiding high energy and material intensities or waste generation, has increasingly become relevant (UNECA, 2016).

Future economic growth will also need to contribute to improving living standards, poverty reduction, and employment opportunities (ACBF, 2017). Pairing growth with jobs, lower absolute poverty, and lower inequality remains a major challenge in Africa (UNECA, 2016). Currently, overall progress towards achieving the SDGs is not fast enough and remains uneven across the continent (UNECA, 2019). More than 50 per cent of the global population living in extreme poverty is in Africa, almost half of the African countries (28) are classified as low-income, and around two thirds (37) have low human development (Begashaw, 2019).

In all these areas; however, considerable progress had been registered before the COVID-19 crisis. The current context demonstrates the need to speed up socio-economic transformation in the continent.

Indeed, the COVID-19 crisis has further strained the development challenges. It reversed progress on reducing acute hunger and affected the income of informal workers who are mostly women (IRENA, 2022, 2020a). Under these uncertainties, growth projections for Africa in 2021 range from 3.4 per cent (AfDB, 2021a) to 5 per cent (UNECA, 2020). Slower growth could undermine the gains of poverty reduction in the last decade (RES4A and UNECA, 2020).

In this context, for energy roadmaps to deliver on their promises, their links with society must be well-understood, clear, and transparent. More importantly, solutions will need to go beyond just technological aspects into structural changes that affect economies and societies at large. For example, measures to explicitly address the regressive effects of climate change, as well as the effects of other policies such as phasing out subsidies – i.e. the lost jobs and stranded assets –, are needed to help ensure political feasibility. When people and communities start to see the benefits of the transition, political acceptance and support can become robust and more sustained. Many countries are already moving along the pathway towards a 1.5°C target at various speeds, hence the global community can learn from each others' experience. There are a variety of different and complex ways in which societies and economies can respond to these transitions (IRENA, 2021a; KfW et al., 2021).

IRENA has incorporated this holistic thinking in its analysis of the socio-economic impacts of energy transition (IRENA, 2021a, 2020b, 2019a, 2016). The approach underpinning this work links the world's energy systems and economies within one quantitative framework to analyse the impacts of the energy transition on GDP, employment, and welfare. The outcomes of this analysis clearly show that globally, the **1.5°C Scenario** will affect GDP, jobs, and welfare more positively than the alternative, less ambitious **Planned Energy Scenario (PES)** (for a description of both, see Figure 2.1). Regionally, the magnitude of these effects will vary (IRENA, 2021a).

Figure 2.1

IRENA's Energy Scenarios

Source: (IRENA, 2021a)

PES

The **Planned Energy Scenario (PES)** is the primary reference case for this study, providing a perspective on energy system developments based on governments' current energy plans and other planned targets and policies, including Nationally Determined Contributions (NDCs) under the Paris Agreement.

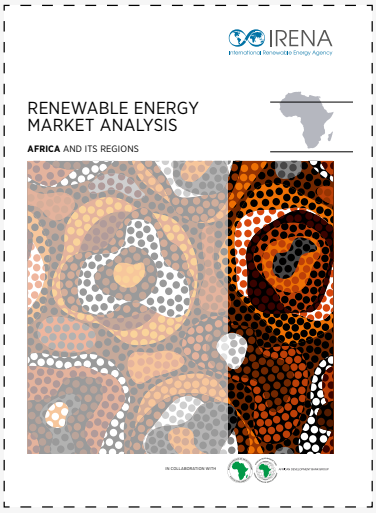
1.5-S

The **1.5°C Scenario (1.5-S)** describes an energy transition pathway aligned with the 1.5°C climate ambition - that is, to limit global average temperature increase by the end of the present century to 1.5°C, relative to pre-industrial levels. It prioritises readily available technology solutions, which can be scaled up at the necessary pace for the 1.5°C goal.

This chapter provides details of how a more ambitious pathway will lead to more benefits for the African continent. The analysis is based on (IRENA, 2022), which in addition to the continental analysis also explores the impacts on different African sub-regions (Box 2.1). This chapter begins with an overview of the **1.5°C Scenario** and the climate policy basket applied in IRENA's analysis and the macro-econometric model. It then discusses the impacts of the energy transition on GDP, jobs (economy-wide and energy sector-specific), and welfare. The chapter concludes with a brief outlook on the way forward.

Box 2.1

RENEWABLE ENERGY MARKET ANALYSIS: AFRICA AND ITS REGIONS



IRENA's new report, developed in collaboration with the African Development Bank (AfDB), shows that many of Africa's social, economic, health, and environmental problems can be solved transitioning to an energy system based on renewable energy. This shift is not only possible, but also necessary for a climate-safe future that meets sustainable development goals. Renewable energy sources are critical for alleviating energy poverty, delivering vital energy services without endangering human health or ecosystems, and enabling economic transitions to support development and industrialisation. Africa, however, is incredibly diverse, and no "one-size-fits all approach" can advance energy transitions. Indeed, average statistics often mask important differences. Across the African continent, for example, five economies (Algeria, Egypt, Morocco, Nigeria, and South Africa) accounted for 55 per cent of Africa's growth in 2019. That same year, East Africa was the continent's fastest growing region, followed by North Africa, West Africa, and Central Africa. Southern Africa observed a decline in annual growth (IRENA, 2022; AfDB, 2020a). Thus, tailored efforts must be made to build modern, resilient and sustainable energy systems that do not trap economies and society with stranded assets and restricted economic prospects. Recognising the continent's heterogeneity, IRENA (2022) analyses energy transitions in Africa in five sub-regions: Northern; Eastern; Central; Western; and Southern Africa.

The report highlights energy transition opportunities, while also addressing the obstacles that different African regions face. It lays out a path to a renewable-energy-based energy system, demonstrating that the transition will result in significant increases in GDP, employment, and human wellbeing across the continent. In GDP terms, for example, all five African sub-regions fare better under the **1.5°C Scenario**, including those with strong oil-producing countries. The GDP gains, however, vary among sub-regions. They range from an average higher GDP under the **1.5°C Scenario** of 15.4 per cent in Central Africa to 1.6 per cent in West Africa, from 2021 to 2050.

The capacity of different subregions (and countries) to carry out measures in different policy areas naturally varies, given different economic starting points and a wide range of existing constraints. These include varying dependencies on commodities, technology, or trade; diverse macro-economic dynamics and pre-existing industrial capacities; levels of informal employment in labour markets; or capability to draw on and expand programmes for skill-building. The shift away from carbon-intensive energy sources will not be easy. In particular, for Africa to maximise benefits from energy transitions, its countries will need to implement holistic policy baskets that integrate climate and environmental goals with economic development and job creation, as well as social equality and welfare for the entire society. Strong institutions, international cooperation (particularly South-South cooperation), and significant regional coordination will also be needed.

2.2

THE 1.5°C SCENARIO AND THE CLIMATE POLICY BASKET

Holding the line at 1.5°C implies achieving net zero emissions by 2050 while also ensuring a fast reduction in emissions. In line with the IPCC recommendations on reducing global warming to 1.5°C by 2050 (IPCC, 2018), IRENA has mapped a path to a 45 per cent reduction in carbon dioxide (CO_2) emissions by 2030, and a net-zero roadmap by 2050. The energy sector is responsible for over 80 per cent of anthropogenic CO_2 emissions; therefore, it plays a critical role in achieving the needed decarbonisation (IRENA, 2021a).

However, the pace of the energy transition falls far short of what is required to meet the Paris Agreement. Policies that are currently in place[01] – referred to here as the **Planned Energy Scenario (PES)** – would barely stabilise world emissions, leading only to a minor reduction by 2050. To remain below 1.5°C, existing global fossil fuel investments must be cut in half in the coming decades, and possibly even more. Planning needs to start in earnest to mitigate the effects of a much lower fossil fuel demand on sectors and services (IRENA, 2021a).

The sections that follow offer insights on potential socio-economic impacts in Africa if efforts were made to limit global temperature rise to 1.5°C and bring CO_2 emissions to net-zero globally by 2050. The analysis is based on two different base cases, namely the **1.5°C Scenario** and the **PES**, of exogenously determined energy mixes using the E3ME macro-econometric tool. These energy mixes are obtained from IRENA's global decarbonisation roadmap. The roadmap is designed to display possible pathways and priority actions to meet the 1.5°C targets together with improved energy access and efficiency (IRENA, 2021a, 2016). Furthermore, IRENA's socio-economic impact modelling for the **1.5°C Scenario** considers a diverse portfolio of measures to address transition-related social challenges. This method emphasises the benefits of the energy transition for society and the importance of leaving no one behind. The climate policy basket covers a wide range of fiscal policy tools, including

01. Based on governments' current energy plans and other planned targets and policies, including the first round of Nationally Determined Contributions under the Paris Agreement (as of 2019).

carbon pricing across sectors, subsidies, public infrastructure investment, and spending on initiatives to ensure a just energy transition. In addition, rules focusing on deployment, integration, and enabling factors are included in the basket (IRENA, 2021a).

Incorporating social aspects as a prerequisite to the energy transition is gaining traction (IRENA, 2021a, 2020b, 2019a, 2016). Such a framework is crucial to establishing collaboration to support climate change mitigation and adaptation efforts and to underpin the political feasibility of fundamental social changes. However, policy actions implemented worldwide are lagging in this regard. The traditional pledge of USD 100 billion/year in financial support from developed countries by 2020, included in the results of international climate negotiations since 2009, has likely been missed and was a key issue in the Conference of the Parties in Glasgow (COP26). According to Bhattacharya et al. (2020), an estimated USD 80 billion was mobilised in 2019.

In IRENA's policy basket, public expenditures are used to address the requirements of a just and fair energy transition, covering both domestic and international needs, based on international cooperation. The latter goes beyond the mobilisation of concessional climate financing from global funds such as the Climate Investment Funds, the Global Environment Facility, and the Green Climate Fund, which in any case would need to be increased to allow the energy transitions to materialise in Africa (UNECA, 2016; AfDB, 2015). In IRENA's policy basket, countries contribute to a joint effort according to their respective capability and responsibility. The financial flows from international cooperation are earmarked for three purposes in the IRENA analysis (IRENA, 2021a):

- Enabling the energy transition and addressing social challenges. This includes addressing potential misalignments from the energy transition, such as education and skills requirements to accommodate the transition. It also includes retraining of workers from industries that are phased out, social policies to address economic restructuring, and legacy dependencies on the fossil fuel economy.

- Ensuring a just transition across the globe. This includes providing support for countries with high socio-economic dependence on fossil fuel activity.

- International fair transition elements. Developing countries will need particular attention, based on the acknowledgement that fair emissions in many cases exceed necessary global emission reductions. Countries whose climate mitigation requirements surpass their fair share of the global mitigation burden require support to leapfrog to climate-consistent energy systems and reap their share of the transition benefits.

The importance of international cooperation in Africa is paramount. The outflow of capital in the continent surpasses the inflow of foreign aid (Piketty, 2014). The financing gap in infrastructure, food security, health, education, and climate change mitigation to meet the SDGs is also large (UNCTAD, 2020, 2014; The Sustainable Development Goals Centre for Africa, 2017). African countries should indeed improve the efficiency and efficacy of fiscal policy to narrow the gap (UNECA, 2019). One-fifth of African countries do not raise sufficient revenues to meet public sector needs. The number in Sub-Saharan Africa is one-third (Begashaw, 2019). As of 2018, over one-third of African countries were at high risk of debt distress (Begashaw, 2020). International cooperation can support countries in making the necessary transitions to build capacity in key areas and policy issues such as institutions, economic structures, risk management, social cohesion, research and innovation to achieve effective sustainable development (Vignolo and Van Rompaey, 2016).

When combined with the low domestic savings rates and tax revenues, many African countries cannot finance the required infrastructure domestically. Moreover, with weak domestic legal, structural, and economic frameworks found across the continent, investments in large renewable energy projects tend to be led by international finance and development institutions (UNECA, 2016; GIZ, 2014). Universal access to electricity and low-carbon power sectors, for example, are supported through various projects by the European Union and its Member States, amongst other development partners (KfW et al., 2021). But while overall levels of investment are rising, levels of official development assistance are declining in per capita terms, as is foreign direct investment (Begashaw, 2020). In that context, the development of a comprehensive and just renewable energy transition plan calls for immediate actions to be taken, which themselves will also require broader and more concerted efforts with the support of international cooperation to encourage and accelerate action in the continent (KfW et al., 2021). Indeed, international cooperation will also play a key role in supporting African countries in adopting policy frameworks that link energy transition pathways to more equitable economic opportunities (IRENA, 2022).

For the analysis of the two scenarios, namely the **PES** and the **1.5°C Scenario**, all other exogenous factors and policy measures are held constant. This assumption allows measuring the effects of different renewable energy shares, energy efficiency, and transition-related technologies as a result of the scenarios (IRENA, 2016).

2.3

SOCIO-ECONOMIC FOOTPRINT RESULTS

Economic growth as measured by gross domestic product

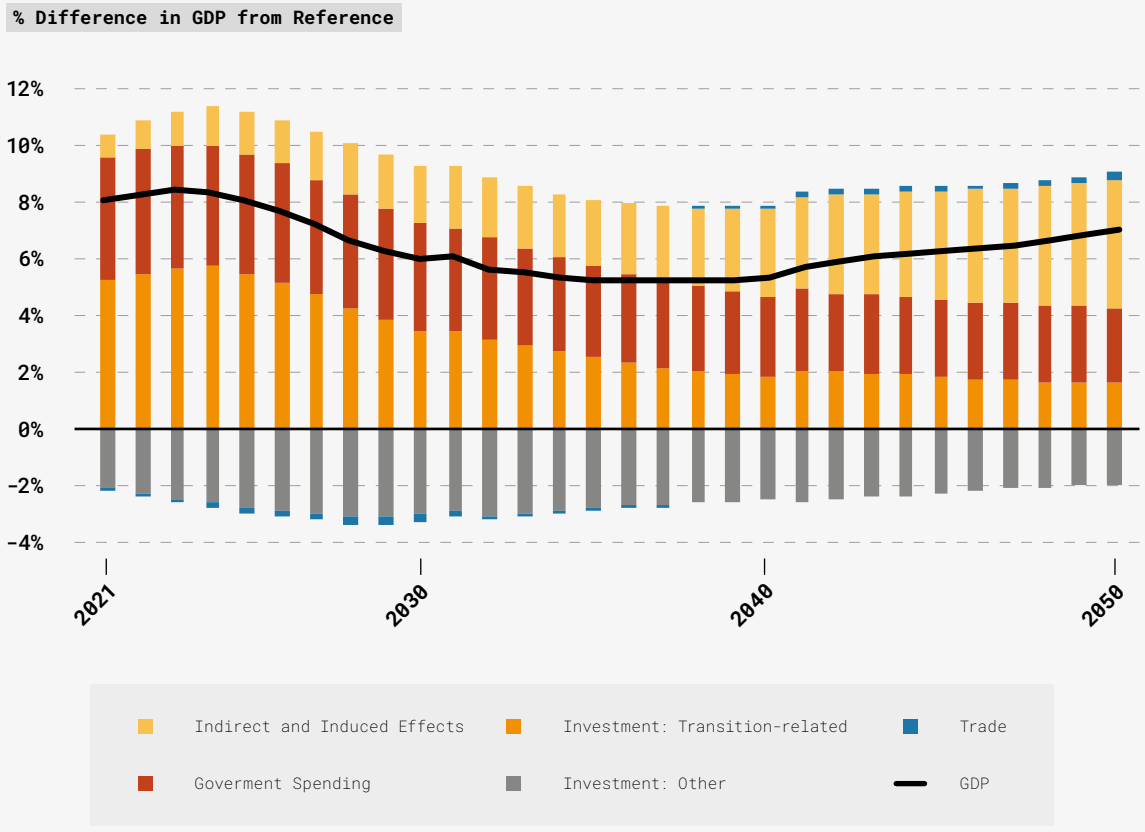
Economic growth and governance are measures of development needed to achieve high levels of human wellbeing (Pritchett, 2021). Stable economic growth, even if it is small, creates functions for which new skills are needed (Piketty, 2014). On average, African countries experienced strong GDP growth until the mid-2010s, following which growth slowed due to high commodity dependence and falling global prices as outlined in the introduction. Under COVID-19, African countries initially weathered the crisis well in economic terms. Half of the 24 countries that saw GDP growth in 2020 were in Sub-Saharan Africa. However, some institutions reckon that growth in Africa is going to stall in 2021 (AfDB, 2021a; IMF, 2021), although others expect a sound rebound (UNECA, 2020). Increased extreme poverty can also hit Africa the hardest. Over 23 million people can be pushed back into extreme poverty in Sub-Saharan Africa (IRENA, 2022; Gerszon Mahler et al., 2020).

The energy transition has the potential to help African countries recover and grow robustly. GDP sees higher growth under the **1.5°C Scenario** compared with the **PES**. From 2021 to 2050, the level of GDP is on average 6.4 per cent higher in the **1.5°C Scenario**. Figure 2.2 offers a detailed view of the drivers that cause the difference between the two scenarios. Government spending, supported by international cooperation, is the largest driver of the positive GDP effect over time in Africa.

Figure 2.2

GDP difference between the 1.5°C Scenario and PES and drivers

Source: IRENA's analysis



Note: Transition-related investments include the effects of differences in investments on transition-related categories such as renewables for power generation and end uses, energy efficiency, power grids and flexibility, electrification, and hydrogen and electric vehicle infrastructure. Other investments include fossil fuel supply, crowding-out and any endogenous responses in investment (for example, to changes in prices of production). Trade includes net trade-in fuels and any endogenous responses to other trade (for instance, as a response to price and wage changes). Induced and indirect effects include the effects of differences in taxes (income and value-added tax) such as those due to oil rent losses, revenue recycling through lump-sum payments, aggregate prices, and other differences in consumer expenditure (including reallocations and indirect effects).

Government spending impacts on GDP

The impact of government spending on public services under the two scenarios, shown in Figure 2.2, is significant and positive throughout the transition. Public spending plays a pivotal role in developing countries. Tight government budgets are often reflected in GDP. Countries in the bottom quintile of the GDP per capita distribution typically have only USD Purchasing Power Parity 322 per capita to commit annually to education, health, infrastructure (including power, but also roads, water and sanitation), law and order, justice, and regulation (Pritchett, 2021). Therefore, international support earmarked to alleviate constraints in government spending in Africa can help drive growth.

Fiscal policy is also important in accelerating economic diversification and structural transformation in Africa. Government spending plans could focus on boosting domestic demand for locally manufactured products. However, African governments have small tax bases to support higher levels of public spending. It is essential to widen the tax base to the extent possible to support growth (UNECA, 2019). Once again, international cooperation can help in relaxing this constraint. Lump-sum household subsidies (e.g., cash transfer programmes) can also be expensive. They can, however, be funded through revenue recycling from carbon prices or supported by international cooperation.

Induced and indirect impacts on GDP

Induced and indirect effects contribute to the positive relative difference of GDP between the two scenarios. Recycling from revenues due to carbon prices under the **1.5°C Scenario** plays a role, as does the receipt of social transfers partially based on international cooperation. Social transfers provide a stimulus for consumption, potentially in the lower segment of the income distribution.

Generally, the link between household consumption and GDP is strong. Economic growth that enables more consumption along with the choices of households to allocate it to their priority uses is likely to bring better outcomes (Pritchett, 2021). This can partly explain the growing impact of induced effects on GDP shown in Figure 2.2. However, prices can be higher under the **1.5°C Scenario**. This could be due to economic responses in the model such as stronger demand for goods and services, the introduction of carbon taxes, and fluctuations in energy prices. It could also be due to changes in labour markets, trade trends, and domestic output. Higher prices have a negative impact as they decrease the purchasing power of consumers. However, these negative impacts are relatively small and outweighed by the positive effect of lump-sum payments. Cash transfers generally increase food expenditures and rations, which improve nutrition. Findings show spending allocated towards schooling and healthcare (Banerjee and Duflo, 2019; Banerjee, 2015).

Investment impacts on GDP

The investment driver, which includes both transition-related and "other" investments, is higher and positive during the ongoing decade, then it decreases. Ultimately, renewable energy capital, like other types of capital, has a diminishing marginal return. The phase-out of fossil fuels pulls the investment figures down. In the short- to medium-term, investments in renewable energy resources can help close many of the supply-demand gaps in Africa. Renewables such as solar and wind energy can be deployed much faster than fossil fuels, as the former require much less basic infrastructure (UNECA, 2016). However, public funds alone are not sufficient to meet the growing demand on the continent. Annual investment needs in Africa are expected to double by 2030, reaching around USD 40 to 65 billion (KfW, et al., 2021). The private sector, therefore, should play a pivotal role in bridging the investment gap. A 1 per cent increase in private investment in the broader economy could boost GDP per capita by up to 1.6 per cent in the long run in Africa (UNECA, 2019). In this modelling exercise, the positive impact of private sector transition-related investment on GDP is led by renewable power generation, as well as grids, and energy flexibility.

Despite Africa's huge potential in renewable power generation, estimated to represent 1,000 times the expected demand for electricity by 2040 (KfW, et al., 2021), only around 1 per cent of the world's newly installed renewable capacity was added in Africa in 2020. Hydropower plays a dominant role in the renewable energy mix. It represented 63 per cent of the renewable installed capacity in the continent in 2020, compared to 20 per cent capacity from solar and 12 per cent from wind energy (IRENA, 2021b). Leveraging the immense renewable energy potential requires substantial investment, including from the private sector. However, private sector investments will need stable, predictable enabling frameworks, and targeted de-risking instruments to develop new projects and develop Africa's sustainable energy potential (KfW, et al., 2021).

Installed capacity is only part of the picture in ensuring affordable energy for all. Maintaining power stations, improving grid systems, and ensuring cost recovery need to be part of the energy transition agenda globally and in Africa (UNECA, 2016). Currently, much of the generated electricity does not reach final consumers due to transmission and distribution losses averaging 18 per cent, but in some countries could reach up to 80 per cent (Onyeji-Nwogu, et al., 2020; IEA, 2014). Partly, this is linked to the fact that grid infrastructure in many African countries is inadequate, resulting in high electricity losses and low supply quality. Such challenges constrain the introduction of large-scale intermittent renewable energy. It is, therefore, critical to improving the planning, operation, and maintenance of the grid infrastructure to move forward with the energy transition. In parallel, significant investments are needed in energy storage, and market solutions that improve system

flexibility, reduce greenhouse gas emissions, strengthen national and regional power systems, and reduce technical and commercial losses (KfW, et al., 2021). Improving electricity metering and billing will also be important. Smart meters can help address these challenges; however, they can be costly and some utilities are not able to take on these projects without financial support. Currently, smart meters are not a financially viable option for the majority of African countries (Onyeji-Nwogu et al., 2020). International cooperation can help make them viable.

The displacement of fossil fuels in the **1.5°C Scenario** derives from a reduction in fossil fuel investments. The additional energy sector investment needs of the energy transition will partially crowd-out investments from other economic sectors that would have taken place under the **PES**, thereby contributing to the negative, albeit small, impact on GDP from 2032 onwards (IRENA, 2021a).

Trade impacts on GDP

Trade does not differ much between scenarios, except for differences in fossil fuel trade. Over 80 per cent of the African countries are highly dependent on the export of commodities, making the continent the most commodity-dependent in the world (UNCTAD, 2019).[02] While not all commodities are energy ones, fossil fuels represent around 40 per cent of Africa's exports and around 16.4 per cent of imports. The export of hydrocarbons is typically associated with higher GDP per capita levels, though energy exporters are exposed to price volatility. In 2020, for example, as global trade declined and governments imposed lockdowns and travel restrictions, commodity prices collapsed. Fossil fuel exporting economies in Africa faced economic contraction by 1.5 per cent, while other African economies experienced a decline of 0.9 per cent (IRENA, 2022; AfDB, 2020a).

Fossil fuel exporting African countries are expected to face revenue losses in the first decade of the transition. Subsequently, the continent is expected to experience a significant reduction in fossil fuel imports, which will improve trade balances. Trade balances will also be affected by other (induced) import/export dynamics of non-energy products. Taking both into account, it appears that the potential of trade in African economies has not been fully exploited yet (Box 2.2).

02. UNCTAD (2019) considers a country to be commodity-dependent when commodities represent more than 60 per cent of its total merchandise exports in value terms.

Box 2.2

RESTRICTED TRADE POTENTIAL IN AFRICA

International trade is vital for countries when skills and capital need to be developed (Banerjee and Duflo, 2019). Africa's trade potential remains largely underexploited. In addition to a narrow production and export base dominated by low-value products, Africa also observes high trade costs, exemplified in both tariff and non-tariff barriers, which cripple intra-African trade, but also Africa's access to international markets (UNECA, 2015).

Africa trades more outside than within the continent (UNECA, 2016), heavily relying on trading partners in Asia and Europe (The Economist, 2021b). Imports of carbon-based energy drain the foreign exchange reserves in many African countries, and the price volatility creates disruptions in fuel supply and distribution systems (UNECA, 2016). Only 16 per cent of Africa's trade is intra-regional, compared with Asia's 60 per cent, or Europe's 68 per cent (The Economist, 2021b). The continent could do well to build much stronger domestic and regional linkages (UNECA, 2016).

Africa already has many regional trade agreements, but high tariffs hinder their implementation. The African Continental Free Trade Area (AfCFTA) can help develop productive capacities and boost intra-African trade (UNECA, 2017). The (World Bank, 2020a) estimates that the AfCFTA could boost Africa's GDP by 7 per cent by 2035, mainly by eliminating non-tariff barriers and reducing import tariffs. It can also improve income distribution, potentially lifting 30 million people out of extreme poverty, and 68 million out of moderate poverty (The Economist, 2021b).

In addition, the AfCFTA can support Africa's industrialisation (UNECA, 2015). But first, it will be important to overcome the constraints to industrialisation through trade. These include inadequate infrastructure, as well as border and local distribution deficiencies (UNECA, 2017).

For trade policy to promote industrialisation, a balance between the promotion of matured sectors and the protection and support of fragile ones should be kept. In the African context, the production of intermediate goods may better respond to developments in global value chains. Intra-regional trade provides the first opportunity to integrate and later move up in these value chains. Indeed, to facilitate Africa's industrialisation, intra-African trade can be a platform for learning and enabling economies of scale (UNECA, 2015). The gains from trade come mainly from the diffusion of knowledge and the productivity gained by opening borders, rather than from specialisation (Piketty, 2014).

Differences in economic structure

Despite impressive growth rates, structural transformation and economic diversification have been slow in Africa (ACBF, 2017). Basic agriculture and raw material extraction (with low value-added), along with services that do not generate substantial jobs prevail in the structures of most African economies (UNECA, 2016, 2015). Diversification will require extensive capacity building. Except in primary agricultural commodities and extractives, it is challenging for some countries to compete in global markets (IRENA, 2022). As a result, African economies are mainly connected to global value chains (GVCs) as suppliers of raw materials, or other low-end products (Fofack, 2019; Yadav and Moore, 2019; UNECA, 2015; ACET, 2014). Prioritising local and regional supply chains is, therefore, one of the main strategic priorities in the pursuit of development (IRENA, 2022).

Despite being small, intra-African trade in intermediate goods is considerably more diversified than with the rest of the world (see Box 2.1) (UNECA, 2015). Thus, intra-Africa trade has the potential to add value and further expand manufacturing in the continent (ACBF, 2017). In South Africa, for instance, renewable energy auctions helped boost local manufacturing. Imports of solar PV and wind turbine components declined and a small export industry started to develop (IRENA, 2019b). To maximise value creation from a domestic wind industry, for example, capacities in industries such as concrete, steel, polymers, and fibreglass need to be leveraged. This includes providing expertise, as well as the raw materials and intermediary products needed to manufacture wind components such as blades and towers (IRENA, 2017a).

Industrialisation, integration into global value chains, as well as potential regional supply chains in Africa are crucial for rapid economic growth (and recovery) and creating jobs (Rodrik, 2021). To date, incomplete and unreliable electricity supply remains one of the critical bottlenecks to industrialisation in Africa (IRENA, 2022; UNECA, 2016). Industrialisation will further increase the use of and need for, energy resources. Strategies to "green" this process will be needed to create a competitive and resource-efficient industrial sector. One capable of providing jobs, while being climate-resilient, and preventing environmental degradation (UNECA, 2016). This is the economic transformation that IRENA envisions.

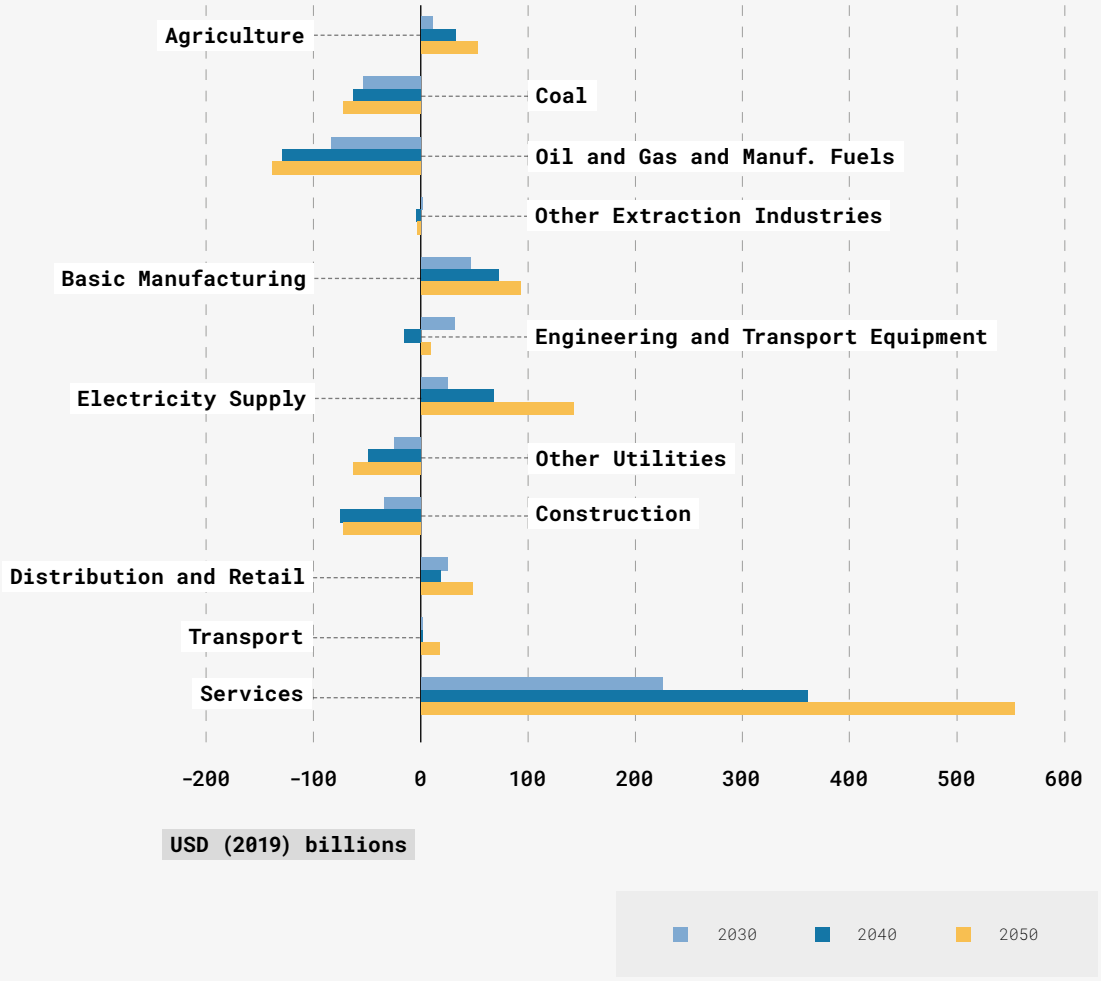
There are differences in output between scenarios for different economic sectors. They indicate how the overall economic structure can be affected by the energy transition. Most impacts are amplified over time, independent of the direction (IRENA, 2021a). The oil and gas and manufactured fuels sectors experience the most negative impacts, with a difference in output between the **1.5°C Scenario** and **PES** that reaches USD (2019) – 138 billion by 2050. This reflects the growing gap between the scenarios concerning fossil fuels. Since

global demand for fossil fuels decreases starkly over time, the difference to **PES** with its remaining fossil fuel uses is widening. Manufacturing grows over time, as it provides the equipment and technologies for the energy transition (IRENA, 2021a). Increasing access to electricity in Africa will increase productivity and output (Figure 2.3).

Figure 2.3

Differences in economic output between 1.5°C Scenario and PES

Source: IRENA's analysis



Agriculture will still play a role in Africa's just and inclusive energy transition. The value-added in manufacturing and services in Africa's GDP is indeed higher than in agriculture. However, most of Africa's workforce is employed in agriculture, and their productivity and income must be boosted for growth to be inclusive. This will require affordable and reliable energy inputs at each step of the agricultural value chain, from primary production to processing, storage, and consumption (IRENA and FAO, 2021). Beyond policies focusing on broader labour-intensive sectors, they could initially prioritise the agriculture sector to bring social upgrading and strengthened livelihoods (IRENA and SELCO Foundation, 2021; ACBF, 2017; UNECA, 2015). Agriculture (including forestry) benefits from a higher biomass demand and biofuel inputs under the **1.5°C Scenario** (IRENA, 2021a), reaching a difference in annual output, compared to the **PES**, of USD (2019) 53 billion by 2050.

Services will also play a pivotal role in Africa's economic transformation, making a direct contribution to GDP and job creation (see below). Moreover, there is a reciprocal link between services and manufacturing. Growth in value-added services is strongly correlated with growth in manufacturing value-added (UNECA, 2015). Under the **1.5°C Scenario**, the largest benefits accrue in the three aggregated categories of services. The **1.5°C Scenario** has a higher demand for consulting, planning, financial, legal, administrative, health, and education services. Higher consumption pathways also drive additional demand for leisure activities and related services (IRENA, 2021a). Output in construction is lower, as fossil fuel plants are no longer being built.

A wider energy transition provides the opportunity to add value to products and start production lines in Africa at the regional level as well as opportunities to join global value chains. However, this would need technology transfer, as well as regional, South-South, and international cooperation (ACBF, 2017).

2.4 JOBS IN THE ENERGY TRANSITION

In 2019, the total labour force participation rate in Africa of 63.1 per cent was higher than the global average of 60.7 per cent. This is an indication of a high labour supply. A large share of the working-age population, however, struggles to make ends meet and can mainly find informal employment opportunities, as formal job opportunities are scarce (ILO, 2020, 2018). High levels of vulnerable and informal employment translate into high poverty levels. An increased share of the labour force in formal employment is needed to transform African economies (ACET, 2014).

Moreover, unemployment is high across Africa, standing at 6.8 per cent compared to the global average of 5.0 per cent. Around 34 million people were unemployed in 2019; with youth in the 15-24 years age group accounting for more than a third (36 per cent) of the unemployment (ILO, 2020). The business as a usual scenario is not optimistic. It is estimated that Africa will lose 19 million jobs due to closures from the COVID-19 crisis (RES4A and UNECA, 2020; ILO, 2020).

This is worrying. Africa will have the largest and youngest workforce by 2025, with more than 500 million people in the labour market (AfDB, 2019). Thus, employment opportunities offered by the energy transition are important as governments aim to create jobs and manage misalignments in labour markets (IRENA, 2021a). Indeed, a focus on labour markets is needed to promote shared growth. For the poor, labour is the firmest endowment and income source (ACBF, 2017). In a comprehensive policy framework for a just and inclusive energy transition, labour market policies must be designed in tandem with education and skills policies to train both the skilled and unskilled labour (IRENA, 2021a; UNECA, 2015).

The analysis finds that the energy transition creates larger net employment gains than the **PES**. The investment associated with the **1.5°C Scenario** helps generate an economy-wide gain of jobs compared to the **PES** (IRENA, 2021a). The following sections present impacts on economy-wide jobs, followed by those in the energy sector as a whole, and finally those most directly affected by the energy transition. The analysis provides insights on the evolution of conventional and energy transition-related jobs as well as on the structure of renewable energy employment, its distribution across the value chain, and the skills or occupational requirements needed to support this shift in the labour market.

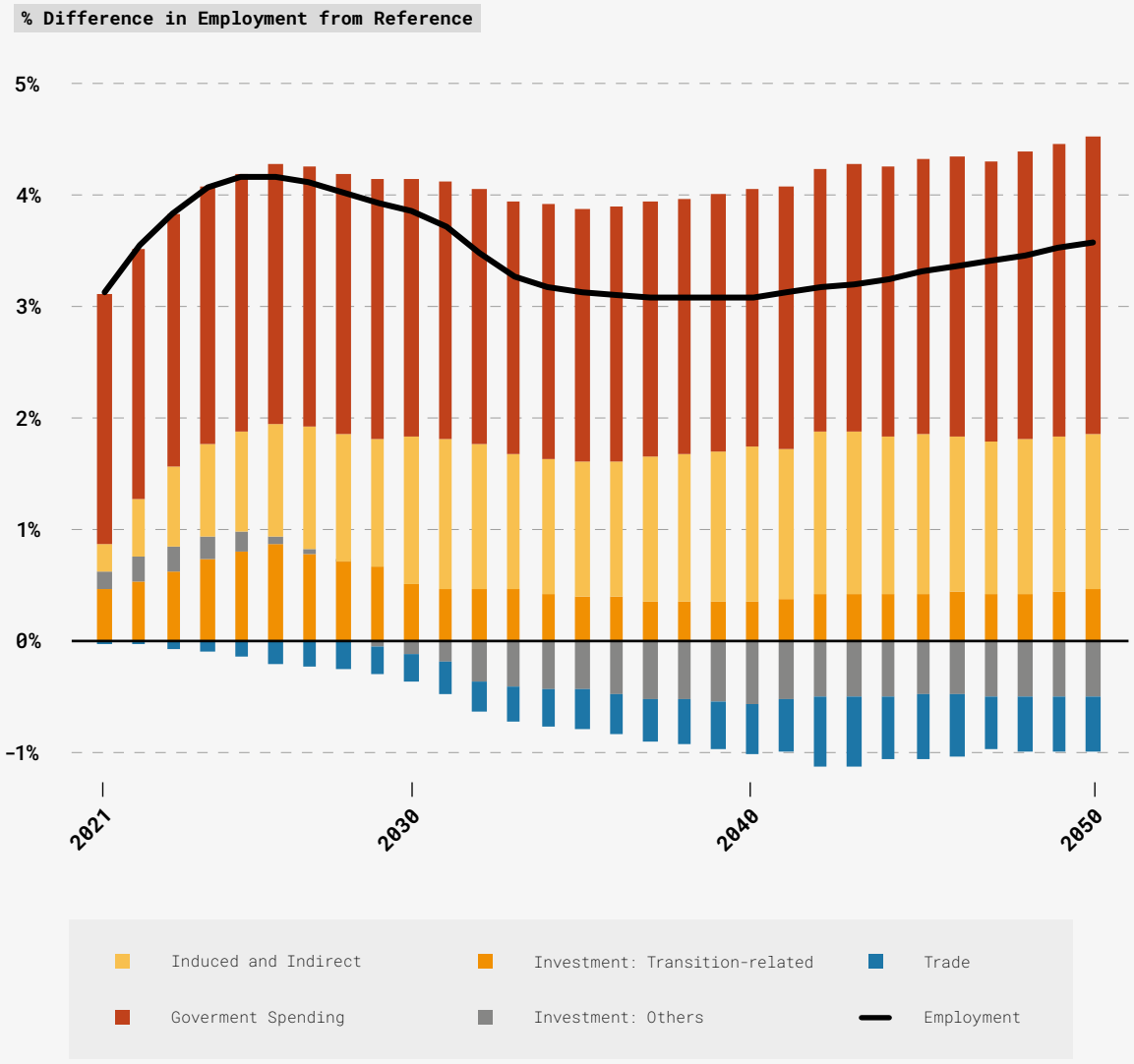
The impacts of the energy transition on economy-wide jobs

Additional economic activity leads to more jobs under the **1.5°C Scenario** compared to the **PES**. As in GDP, the main positive impact on employment comes from government spending in the energy transition (Figure 2.4). New government services require more people employed in the public sector. The impact that investments have on GDP is smaller in employment, while the negative impact of trade is greater in employment than in GDP. In particular, trade effects on employment are negative during the entire transition, though relatively small during the first years and increasing thereafter. This is mainly driven by the differences in trade in fossil fuels, even though non-energy trade also contributes to this negative result. Investment shifting from fossil fuels towards the energy transition and the investments that are crowded out from other sectors in the wider economy ("Investment: Other" in Figure 2.2) lead to less labour demand in those sectors and along their value chains. That said, the net impact of investment on employment is positive during the first 15 years and becomes negative in 2036. This is a result of lower investment in sectors with greater employment intensity (IRENA, 2021a).

Figure 2.4

Employment difference between the 1.5°C Scenario and PES by driver

Source: IRENA's analysis



The differences between induced and indirect effects on economy-wide employment are positive throughout the transition. These positive contributions come from wage effects, consumer expenditure, and dynamic labour market responses (IRENA, 2021a). Households with greater incomes spend their money going to restaurants, getting haircuts, or going shopping, creating jobs mainly for less qualified people (Banerjee and Duflo, 2019).

Differences in economic structure

In 2015, there were fears about "premature deindustrialisation" in Africa, which would have meant losing an opportunity to boost productivity, create jobs, and allow millions of Africans to escape poverty (Rodrik, 2015). However, recent studies show that these fears were misplaced. The number of factory workers and factory output in Africa have risen solidly since 2010 (The Economist, 2021c). Industrialisation is viable in Africa (The Economist, 2021d). That said, manufacturing industries will need local skills to be trained and developed, including for new industries. Currently, a shortage of skilled workers is limiting the potential of Africa's industries (UNECA, 2017; ACET, 2014).

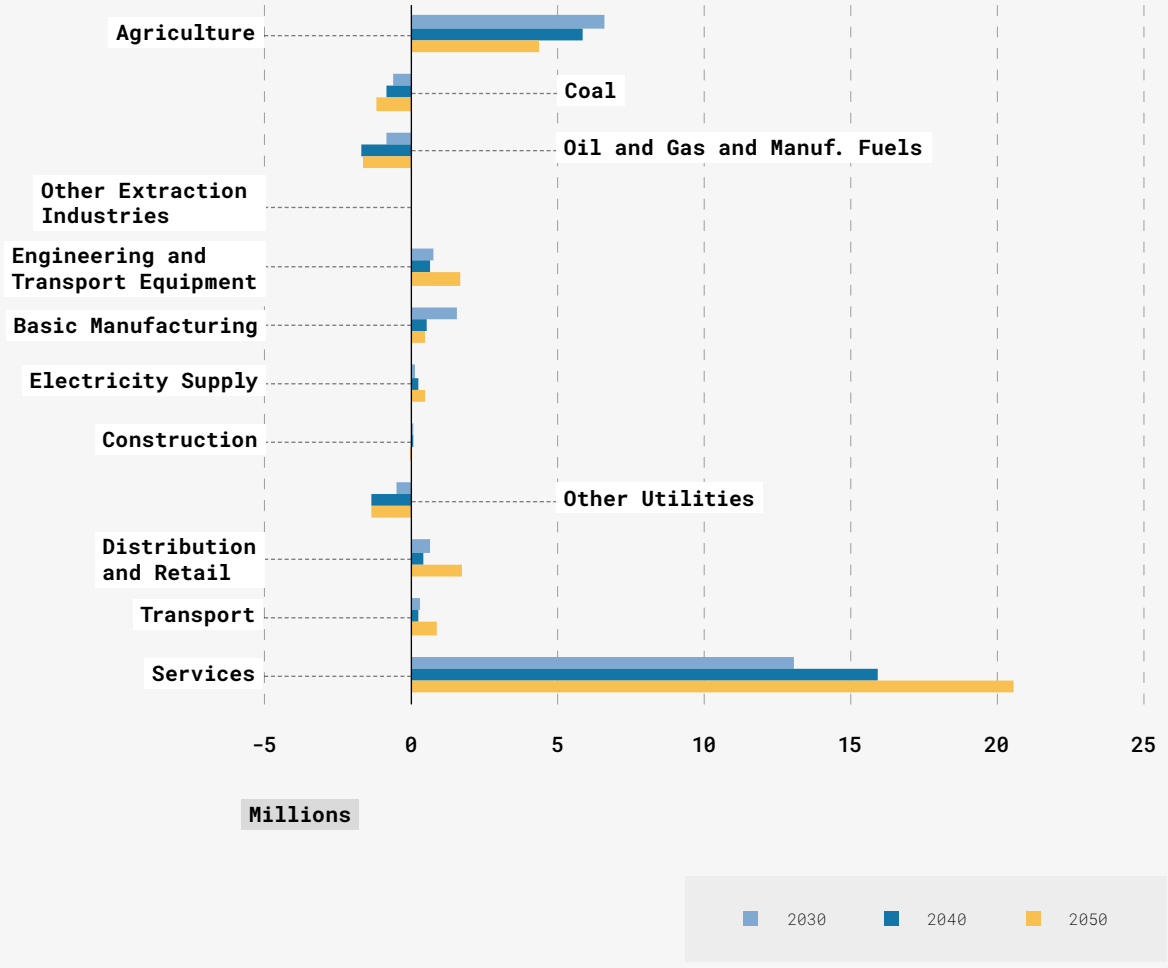
Moreover, despite industrialisation making some progress in Africa, few good, modern, formal, and productive jobs are being created (Rodrik, 2021). The productivity gap can be explained by African industries relying on and requiring the latest machines to compete in global markets. However, these machines require fewer workers and do not create the millions of annual jobs needed in Africa (The Economist, 2021d). With an abundant (low-skilled) workforce, it may seem illogical for industries to use capital intensive production. The number of formal jobs from large firms has stagnated (Rodrik, 2021).

The above-mentioned issues currently limit the level of additional job creation in manufacturing in the energy transition. Indeed, structural transformation in Africa might not be initially led by industry. Instead, given Africa's current conditions, industries without smokestacks may generate better jobs across the continent (Page, 2019). This is consistent with the difference in jobs between scenarios across different economic sectors for 2030, 2040, and 2050. There is a shift away from mining and manufactured fuels towards services and agriculture (Figure 2.5).

Figure 2.5

Employment difference by sector between the baseline and the 1.5°C Scenario

Source: IRENA's analysis



Most of the labour market new entrants in Africa will be self-employed, work in microenterprises, or the services sector (Page, 2019). Under the **1.5°C Scenario**, the enhanced aggregate economic activities contribute to the increase in service jobs, which provide about 20.5 million jobs more than under the **PES** by 2050.

Agriculture currently generates most of the employment opportunities in Africa. It is responsible for nearly half of the total employment. However, incomes and working conditions do not fare better than in other sectors (IRENA, 2022; ILO, 2020). However, this does not need to be the case. The agriculture and forestry sector fares well especially during the first decades of the transition, when more than 6.6 million jobs are created by 2030 than under the **PES**, benefitting from the provision of biomass feedstock.

Jobs in the energy sector

Jobs in the energy sector include workers in coal mining, oil and gas extraction, processing of fossil fuels, as well as electricity generation, and O&M of electricity grids (IRENA, 2021a). This sub-section analyses jobs in the energy sector, and takes a closer look at the renewable energy sector.

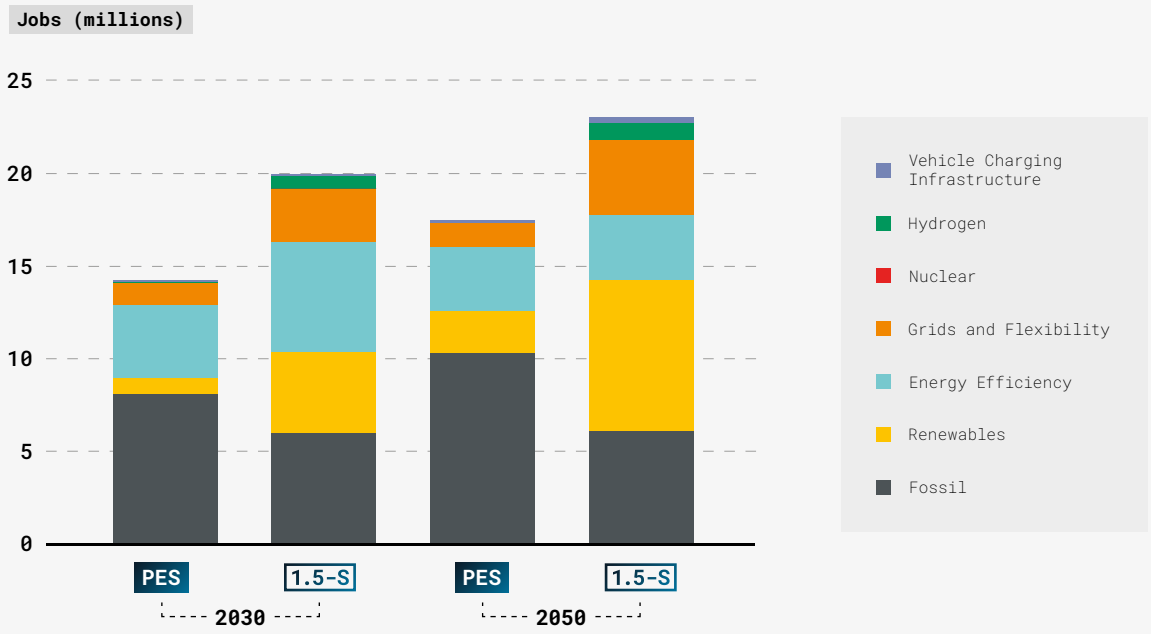
Jobs in the overall energy sector

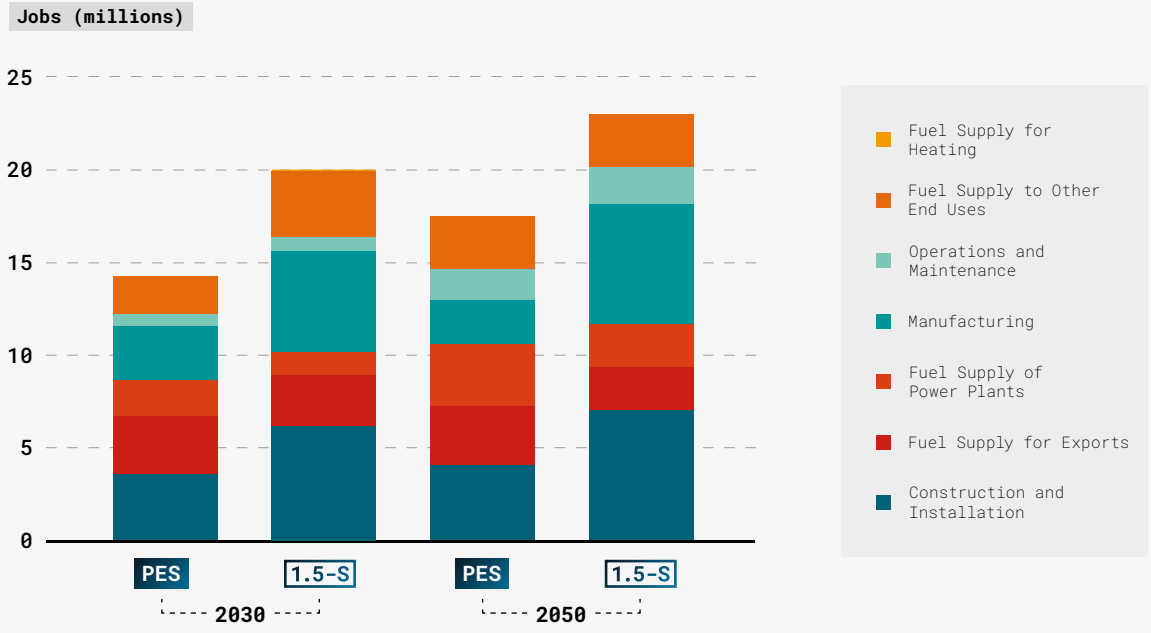
The **1.5°C Scenario** creates more jobs in the energy sector than the **PES**. By 2050, under the **1.5°C Scenario**, the energy sector employs 23 million people. About 73 per cent (16.8 million jobs) are transition-related. Renewables contribute about 8.1 million jobs. Notably, the decrease of fossil fuel jobs in the **1.5°C Scenario** is more than compensated by gains in renewables, energy efficiency, power grids and flexibility, and vehicles jobs. Construction and installation, together with manufacturing account for the majority of jobs under the **1.5°C Scenario** (Figure 2.6).

Figure 2.6

Energy sector jobs by technology and segment of value chain under PES and 1.5°C Scenario in Africa

Source: IRENA's analysis





Jobs in renewables

In 2020, renewables employed about 12 million people worldwide, and around 324,000 in Africa, accounting for a global share of less than 3 per cent (IRENA, 2021c). Renewables are normally more employment-intensive than fossil fuels (IRENA, 2019a, 2011; ILO, 2016; UNECA, 2016). Services, for example, are needed at each stage of renewable energy deployment. Planning projects, licensing and carrying out audits, issuing permits, supporting financing, conducting O&M, and decommissioning are examples of these activities. The planning of a wind farm, for instance, involves legal, energy regulation, real estate and taxation experts, financial analysts, logistics experts, environmental experts, health and safety experts, geotechnical experts, and engineers (IRENA, 2017a). Ideally, the renewable energy industry can be serviced by the local workforce. For that, a re-skilling plan framework will need to be developed for the new jobs in renewables to be occupied, for instance, by former fossil fuels workers. In South Africa, for example, the workforce transfer from coal regions to potential solar and wind sectors is feasible (RES4A, 2018).

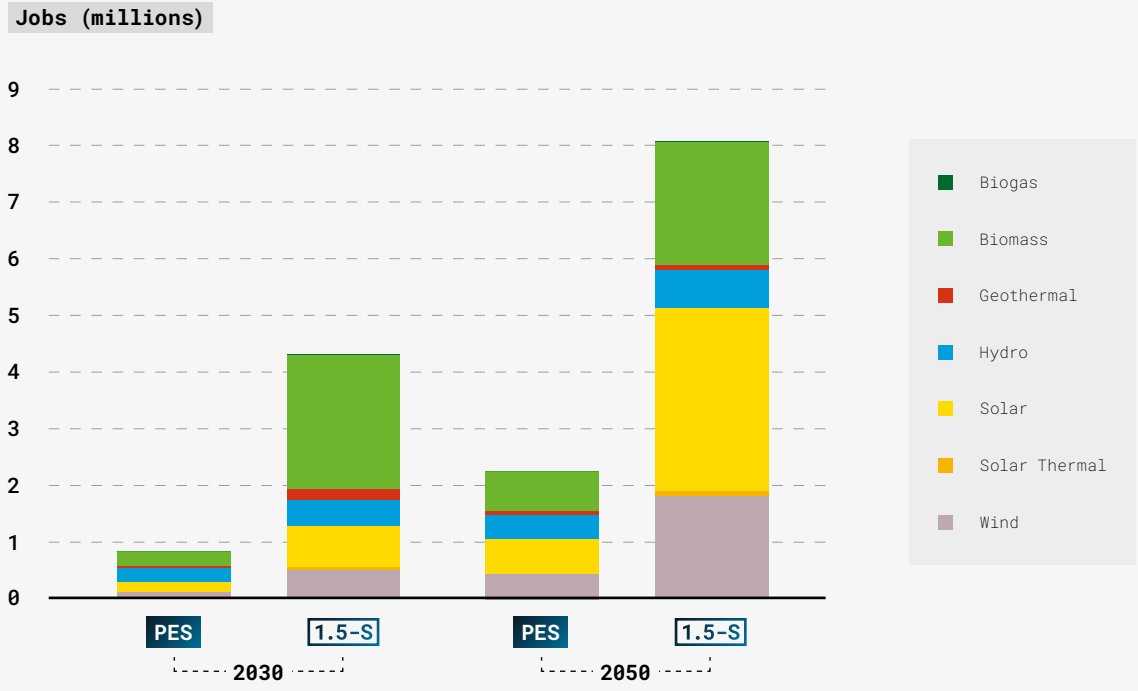
To date, few African countries have integrated into high value-added segments of renewable energy value chains and their associated employment. A small renewables market offers few incentives for the industry to grow. Consequently, Africa remains a consumer rather than a producer of renewable technologies, forfeiting jobs and other socio-economic benefits in construction, operations and maintenance of solar PV panels and wind turbines. Therefore, while the creation of regional supply chains in the renewable energy sector holds massive potential, their benefits depend on the capacity to leverage and enhance other local industries. It will also depend on the design and implementation of adequate education and training programmes, and the adoption of suitable labour market policies (IRENA, 2022).

Focusing on the renewable energy segment, the **1.5°C Scenario** creates significantly more jobs than the **PES** with about 5.9 million additional renewable energy jobs by 2050. Bioenergy and solar PV are the largest sources of jobs in both scenarios, albeit with different shares in 2030 and 2050 (Figure 2.7).

Figure 2.7

Jobs in renewable energy, by technology, in the 1.5°C Scenario and PES

Source: IRENA's analysis

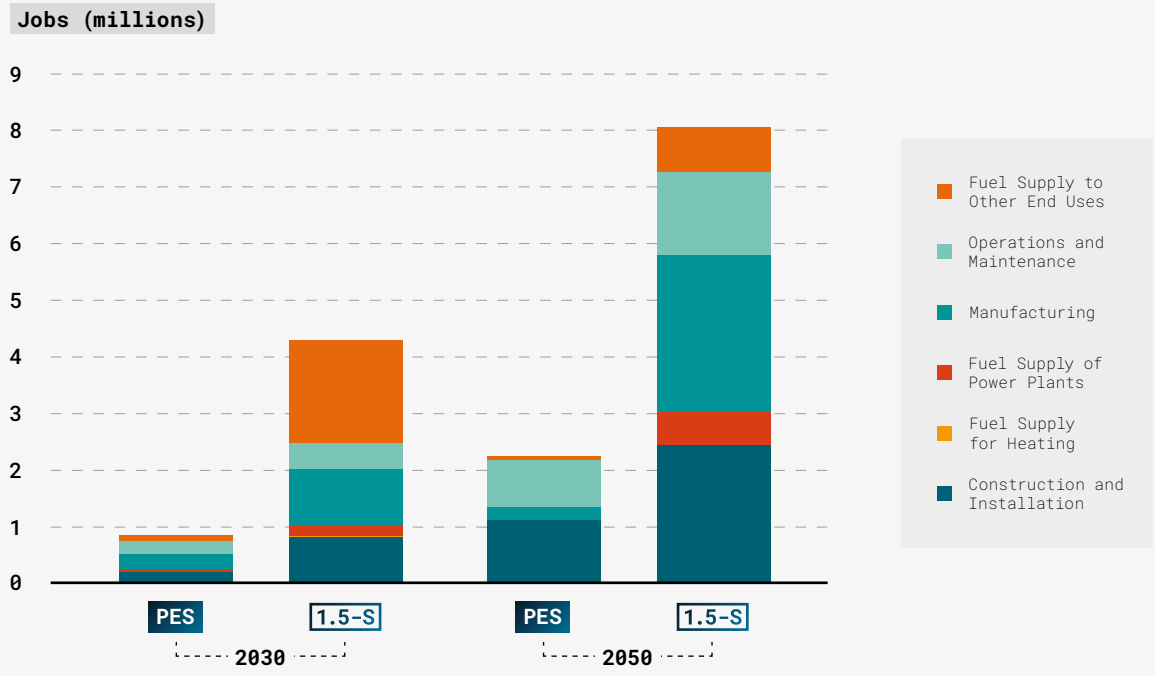


Bioenergy has a high labour intensity for biofuels supply. It does not differ largely over time in the **1.5°C Scenario**, due to the sustainability boundary for biomass use (IRENA, 2021a). In Africa, countries such as Côte d'Ivoire can exploit their high biomass potential to have a higher share than solar PV in the power mix by 2030 (Sterl, 2021; JICA, 2019). By 2050, solar PV employment's share will be higher. Labour intensity varies depending on the scale of the installation. Globally, large-scale installations require less labour per megawatt than off-grid, rooftop, or any other small-scale installation. Further analysis on the labour intensity of off-grid solutions in Africa in the context of closing the access gap by 2030 is needed. IRENA will explore this topic in future publications. Wind energy also plays an important role. The manufacturing of wind turbine blades is labour intensive, while other components of turbines are less so. Installation is akin to the labour intensity of other types of large, construction-heavy infrastructure projects (IRENA, 2021a). Given the largely underexplored potential for hydropower in Africa,

Figure 2.8

Renewable energy jobs by segment of the value chain in the 1.5°C Scenario and PES

Source: IRENA's analysis



the continent will see more jobs in this technology. Hydropower in countries such as Ghana and Ethiopia can support the uptake of variable renewable energy (VRE) (Danso, et al., 2021; Sterl, 2021; Sterl, et al., 2021).

Analysis by IRENA on the different segments of renewable energy value chains provides further insights. Jobs in O&M, for example, are permanent and increase gradually as capacities grow. Jobs in planning and installation require a steady and far-sighted pipeline of projects (IRENA, 2021d, 2018, 2017a, 2017b). Renewable jobs in the **1.5°C Scenario** are boosted by construction and installation, as well as manufacturing. As the transition advances, there are relative gains in O&M jobs. By 2050 and under the **1.5°C Scenario**, the 8 million renewable energy jobs are distributed across the value chain with 34 per cent in manufacturing, 31 per cent in construction and installation, 17 per cent in biofuel supply, and 18 per cent in O&M (Figure 2.8).

2.5

ENERGY TRANSITION WELFARE INDEX

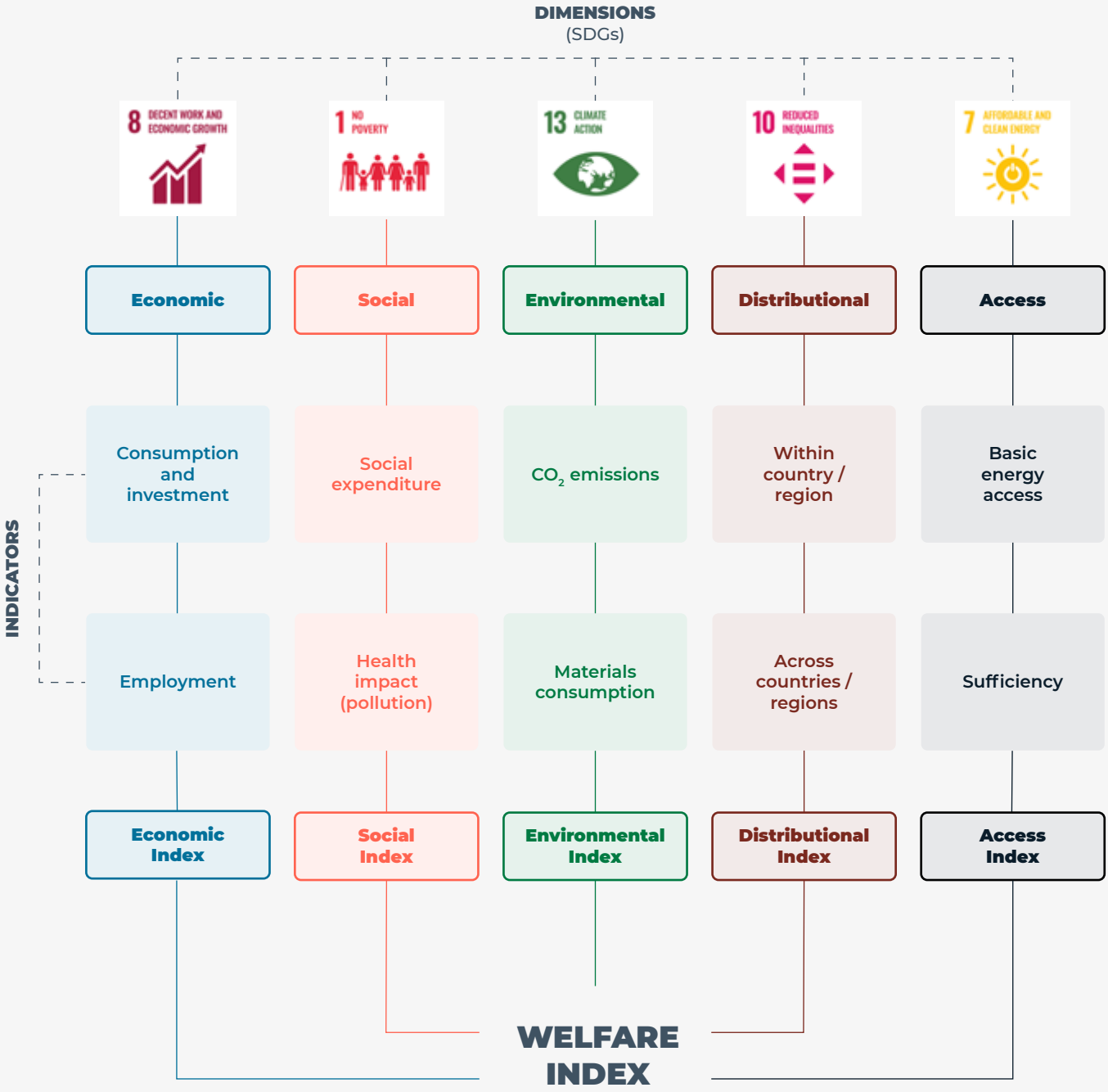
Welfare can be analysed through different dimensions. IRENA's Energy Transition Welfare Index captures five dimensions, namely economic, social, environmental, distributional, and energy access (Figure 2.9). The index allows for comparisons between scenarios both in overall terms and along each of the five dimensions (IRENA, 2021a).

The performance on SDGs 12 and 13 (sustainable production and consumption as well as climate action) by African countries is satisfying (IRENA, 2022), while the performance on SDGs relating to human welfare (SDGs 1 to 7 and 11) leaves ample room for improvement (Sustainable Development Goals Centre for Africa, 2019). Nonetheless, the continent has made progress in education, health, and other social outcomes. Progress in poverty reduction had been steady, but the pace is slow and growth has largely not been inclusive (UNECA, 2019). From this starting point, the energy transition improves African welfare significantly.

Figure 2.9

Structure of IRENA's Energy Transition Welfare Index

Source: adapted from (IRENA, 2021a)



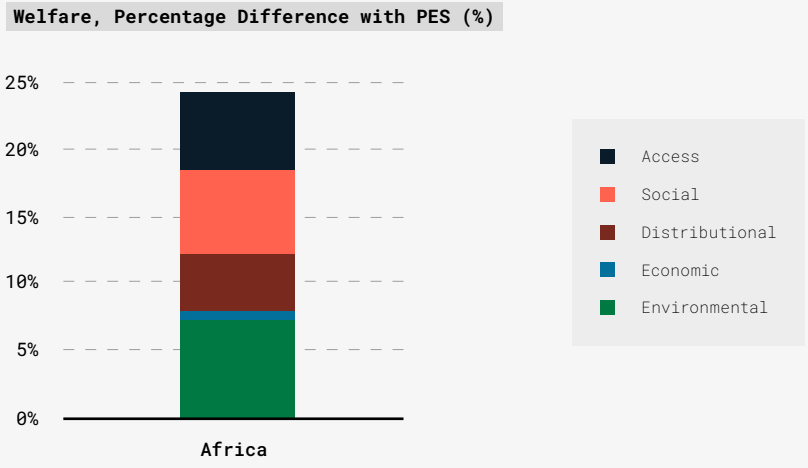
Relative welfare results of the 1.5°C Scenario and the PES[03]

Under the **1.5°C Scenario**, the overall welfare index improves by 24 per cent by 2050, compared to the case under the **PES**. The environmental, social, access and distributional dimensions are the main contributors to this improvement (Figure 2.10).

Figure 2.10

Relative improvement of Africa's Energy Transition Welfare Index and its dimensional contributions by 2050

Source: IRENA's analysis



03. The results can be presented in absolute terms for each scenario, or in relative terms based on differences between scenarios. This section presents the contributions from each dimension to the difference in overall Welfare Index between the 1.5°C Scenario and PES. For all indexes, values range from zero (the worst) to one (the best). This chapter analyses the unidimensional representation. To understand more on the differences between different welfare index representations, see (IRENA, 2021a).

Environmental dimension

The greenhouse gas emissions indicator drives the improvement of the **1.5°C Scenario** over the **PES** in this dimension. The continent currently accounts for only around 4 per cent of the total CO_2 emissions, and 8 per cent of the total greenhouse gas emissions (Our World in Data, 2019). Cumulatively and by 2020, Africa had been responsible for only 2.8 per cent of the CO_2 emissions (Our World in Data, 2021). However, it is one of the most vulnerable to climate change. Biofuels and electrification of end uses, if based on renewables, can contribute to the improvement of the environmental welfare dimension. They also offer opportunities for local innovation and job creation along the value chain. Africa's vehicle fleet, for example, is old and highly polluting, propelling negative impacts both on the environment and human health (IRENA, 2022).

Both scenarios have the same values in the materials consumption index. Indeed, given Africa's low per-capita consumption of materials, the difference in welfare between the **PES** and **1.5°C Scenario** is unaffected by this consideration. The analysis in IRENA (Forthcoming) for Southeast Asian countries explains why a rise in material consumption in emerging economies is expected and how it can be explained by two factors. One, the construction of new infrastructure; and two, the outsourcing of the material (and energy) intensive processes from developed countries. Furthermore, industrialisation and urbanisation increase the use of materials and energy, as well as waste and emissions. Resource productivity measures will become increasingly relevant to enable some decoupling between economic growth and environmental resources (UNEP and International Resource Panel, 2017).

Access dimension

Nearly half of Africa's population (46 per cent) lack access to electricity (KfW, et al., 2021). In Sub-Saharan Africa, the share of people with access to electricity between 2000 and 2019 almost doubled from 26 per cent to 47.7 per cent. Nevertheless, close to 600 million people did not have access to electricity by 2018 (IEA, IRENA, UNSD, World Bank, and WHO, 2021). This accounted for more than half of the world's total. Modern renewable energy can help increase access to electricity supply and reduce the need for polluting diesel generators widely used in Sub-Saharan Africa (IRENA, 2022). Similarly, more than 900 million people in that region are still without access to clean cooking fuels and technologies (IEA, IRENA, UNSD, World Bank, and WHO, 2021). Electrification based on modern renewables, along with improved access to clean fuels and technologies can further reduce the widespread use of kerosene and other liquid fuels for cooking and heating (IRENA, 2022). Given current trends, African regions, except North Africa are unlikely to meet SDG 7 (Begashaw, 2019; Sustainable Development Goals Centre for Africa and Sustainable Development Solutions Network, 2020).

Universal energy access remains a top priority in Africa, as it is key for resilient and prosperous economies and societies (KfW et al., 2021). But people should also have access to sufficient energy that is reliable, convenient, safe, and affordable, as well as of good quality (Bhatia and Angelou, 2015). In the aftermath of the COVID-19 crisis, gains in energy access were reversed in the continent. It was estimated that the number of people lacking access to electricity increased in 2020 and that basic electricity services became unaffordable for up to 30 million people who previously had access (IEA, IRENA, UNSD, World Bank, and WHO, 2021). Efforts to achieve universal access to affordable, reliable, and sustainable electricity by 2030 must, therefore, be at the forefront of energy transition strategies to effectively fight poverty, enable new economic opportunities, and promote equality (KfW, et al., 2021).

The access dimension of the Energy Transition Welfare Index has a basic access component (i.e., the share of the population with access to electricity and clean cooking) and a sufficiency component (i.e., progression along the energy ladder). This enables a discussion beyond the binary achievement of basic universal access by 2030. It helps account for opportunities to link energy access with income-generating services pegged to socio-economic benefits (IRENA, 2021a). In Africa, even when basic access is reached, energy consumption is low (Onyeji-Nwogu, et al., 2020).

Basic access brings more welfare gains than sufficiency in Africa under IRENA's **1.5°C Scenario**, relative to the **PES**. The **1.5°C Scenario** achieves full basic energy access in the continent by 2030, whereas the **PES** fails to achieve full basic energy access even by 2050. Progress in climbing up the energy access ladder is slower, but also impactful. Energy sufficiency can impact several welfare dimensions discussed in this chapter, namely economic (through higher incomes, consumption, and employment), social (through lower health impacts of traditional fuels), and distributional (IRENA, 2021a). Off-grid access through renewables supports greater social inclusion, beyond the security of supply (UNECA, 2016).

Social dimension

IRENA's **1.5°C Scenario** leads to improvements in both social indicators: social expenditure and health impact. However, the health impact indicator, with improvements in outdoor and indoor air pollution, dominates. Health improvements are a result of phasing out fossil fuel combustion and transitioning away from traditional fuels for cooking (IRENA, 2021a). Indeed, renewable energy solutions have tremendous potential to minimise the negative health effects of liquid fuels and traditional biomass. Inefficient equipment for indoor cooking, space heating and lighting, diesel and kerosene, as well as inferior combustion technologies for traditional fuels, which are ubiquitous in Africa, are highly polluting. They all contribute

to the spread of respiratory and obstructive pulmonary diseases in low-income and rural households (IRENA, 2022; WHO, 2021).

The social expenditure indicator under the **1.5°C Scenario** provides a much smaller contribution to the welfare index in Africa. The climate policy basket focuses on increasing social expenditure, leading to relative improvements in this indicator over the **PES**. However, per capita, social expenditure in Africa remains, even under the **1.5°C Scenario**, well behind the global average. Thus, increasing social spending can significantly improve the Energy Transition Welfare Index in Africa (IRENA, 2021a).

Public services, particularly health and education, are valuable as they allow households to save these often large amounts on private health and education. A country that privatises health and education can see its GDP rise, but not provide superior service quality (Piketty, 2014).

Over the last decades, Africa has improved health outcomes and increased primary education enrolment. However, adult literacy rates remain low. Similarly, Africa faces relatively low life expectancy and high mortality rates (IRENA, 2022; AfDB, 2021a). Accessing healthcare services through hospitals and clinics remains a challenge due to financial constraints (Begashaw, 2019).

More importantly, there is a stark difference between opportunity and outcome. In Africa, economic growth has increased access (or opportunities) to both education and healthcare. Ultimately, for growth to be inclusive, citizens need access to health and skills (education) to participate in income generation activities (Olumuyiwa, et al., 2013).

Especially for those who lose their jobs due to the energy transition, governments should pursue a concerted effort to get displaced workers back into employment. Training can be expanded beyond short-term options to more advanced programmes in universities or vocational schools (Banerjee and Duflo, 2019). In the end, the main driver for greater equality is the diffusion of knowledge and skills. If countries allowed broader segments of the population to have access to advanced educational opportunities, i.e., if they pursue an egalitarian and inclusive educational system, both wages and total income at lower ends of the distribution should increase (Piketty, 2014).

Distributional dimension

Measured by the Gini coefficient, the average income inequality in Africa is high (0.44), despite being on the decline (UNECA, 2019). Economic growth does not guarantee that all persons will benefit. It can both improve or worsen income distribution depending on how progressive it is. In the African industrialisation context, one can expect inequalities to increase in the early stages if only a minority can reap the benefits (Piketty, 2014).

In Africa, economic growth alleviated inequalities until the early 2010s. The poorest quartile saw annual household per capita consumption grow substantially in three of four high-growth countries (Ghana, Tanzania, and Uganda). In low-growth countries, the poorest quartile observed low (Cameroon) and even negative (Zambia) changes in consumption (Garcia-Verdu, et al., 2011). More recently, having observed slower growth, inequality gaps have widened (UNECA, 2019). Growth projections in 2020 estimated that between 5 million and 29 million Africans could fall back into extreme poverty. For the majority, this could be transient, but some can stay in extreme poverty for longer than a decade (RES4A and UNECA, 2020). African governments must design policies that create opportunities and ease access for the poor to benefit from the growth process (Olumuyiwa, et al., 2013).

Globally, the distribution of benefits of IRENA's **1.5°C Scenario** is not uniform, indicating that the energy transition alone cannot resolve income and wealth inequalities (IRENA, 2021a). Since the transition is capital intensive, and the return of capital is higher than the economy's growth rates (Piketty, 2014), one can expect inequalities to widen, more so in wealth than in income. With that in mind, Africa's **1.5°C Scenario** relies on a climate policy basket that includes foreign transfers (international cooperation) and lump-sum payments to redirect additional government revenues to the lowest income quintiles. These would improve both inter-and intra-inequality.

Economic dimension

The economic index is very similar for both the **PES** and **1.5°C Scenario**. This reflects the relatively small share of the energy sector in the overall economy and labour force (IRENA, 2021a). Nonetheless, the economic index does improve and has a balanced contribution from its two components: consumption and investment and employment.

Even under the **1.5°C Scenario**, consumption and investment per capita are particularly low when compared globally. In 2021, for example, it is only USD 1,600/per year. Both consumption and investment need to increase to progress along with the prosperity and welfare ladders.

2.6 CONCLUSIONS

Until the mid-2010s, economic growth in Africa was supported by high commodity prices, macroeconomic reforms, and improved business environments (ACET, 2014). In the late-2010s, governments improved the infrastructure, the enabling environment, and regulatory frameworks (ACBF, 2017). Economic transformation, however, requires much more. African countries need to diversify their economies, increase productivity, and upgrade production technologies. Through more productive jobs and higher incomes, economic growth could improve wellbeing (ACET, 2014). This is increasingly important today, as the COVID-19 crisis reversed some of the multi-dimensional progress made in Africa.

In Agenda 2063, the Africa We Want, African leaders committed to inclusive and sustainable economic growth and development (KfW, et al., 2021). Previously, the 2030 Agenda for Sustainable Development and the Addis Ababa Action Agenda of 2015 provided a framework for financing sustainable development, guided by economic, social, and environmental priorities. These plans underscored the role of domestic public resources, but also of international assistance, in achieving the SDGs (UNECA, 2019).

Renewables have promoted inclusive economic growth, for example in Morocco, Kenya, and South Africa. These countries have strengthened the participation of small and medium-sized enterprises, creating local jobs and community benefits, while simultaneously fostering local manufacturing of renewable energy technologies (UNECA, 2016). Morocco's Noor-Ouarzazate solar complex and South Africa's Renewable Energy Independent Power Producer Procurement Programme (REI4P) have used renewable energy auctions that included socio-economic benefits, going beyond just procuring electricity at the lowest price (IRENA, 2019b). Morocco funded communities surrounding the Noor complex to make amends for the land lost for its construction. This included basic amenities and social services, including drinking water facilities, community centres, and mobile health units (ESMAP, 2018). The REIPPP in South Africa was aimed at local jobs, industries, and businesses. However, a major lesson was that most of the labour was short-term, and training, education, and development needs were perhaps not sufficiently prioritised (McDaid, 2016). A just and inclusive energy

transition should look to compensate the affected communities, whether it be on a social, health or gender equality level (KfW, et al., 2021; IRENA, 2019b).

Despite the benefits, only a few African countries have integrated into high value-added segments of renewable energy value chains. For African economies to integrate and join the global economy, as envisioned in the Agenda 2063 (African Union, 2013), they will need to develop human capital through education and training (ACET, 2014). They should scale up investments in science, technology, and innovation to promote rapid and inclusive growth as visualised in Agenda 2063 (UNECA, 2019). Industrialisation will increase the uptake of resources. However, green industrialisation can create good jobs, enhance climate resilience, and decouple growth from environmental degradation (UNECA, 2016).

In that context, the analysis of socio-economic impacts presented in this chapter shows that Africa will be better off, across multiple dimensions, if the **1.5°C Scenario** route is pursued. Led by government spending, GDP will be higher, by an average of 6.4 per cent to 2050, than in the **PES**. Similarly, economy-wide employment is 3.5 per cent higher on average in the **1.5°C Scenario** compared to the **PES**. The energy sector will have at least 28 million jobs in 2050, with renewable energy jobs rising from more than 0.3 million today to 8 million by 2050. The five welfare dimensions analysed – economic, social, environmental, distributional, and access – fare better under the **1.5°C Scenario**.

In pursuing these benefits, however, it is important to recognise the starting point of many African countries. In fragile countries, for example, the capacity to pursue socio-economic enhancing policies is compromised. Relatively weak institutions, lack of financial resources, as well as economic and social insecurities are still prevalent in Africa (Begashaw, 2020). Institution-building will be essential to pursue inclusive growth (ACBF, 2017).

Building institutional capacity to increase policy implementation should be a cross-cutting priority of the energy transition. For transitions to succeed, they must be tailored to each national and local context, championed and owned by countries themselves. Previously, ambitious electricity sector reforms failed partly because they neglected the national political economy (KfW, et al., 2021). Ethiopia and South Africa, for instance, have demonstrated how political will, reinforced by enabling partnerships, can mobilise and leverage domestic and foreign investments for energy transitions (UNECA, 2016).

Importantly, there is no single model that can address the variety of challenges (UNECA, 2015). With that in mind, all African countries should aim to 1) increase state capacity; 2) improve business environments; 3) develop skills for a green economy; 4) boost domestic private savings and investments; 5) attract private foreign investments; 6) build infrastructure;

7) diversify economic activities and build local/regional supply chains; 8) ease technology acquisition and diffusion; and 9) develop and implement an industrial policy (ACET, 2014). Meanwhile, global inequalities in the current international economic system should be addressed.

IRENA's socio-economic modelling captures the implications of a myriad of factors while envisioning an international collaborative framework to address climate change. In Africa, a renewables-based energy transition can maximise socio-economic benefits by improving energy access, creating jobs, and boosting energy security. To reach these benefits and to leapfrog from fossil fuels, international cooperation is essential. African countries may, therefore, consider to (KfW, et al., 2021):

- Leverage the abundance and competitiveness of renewables;
- Align ambitious renewable targets in energy and climate plans;
- Continue supporting the development of regional markets;
- Leverage renewables and distributed energy resources to achieve universal energy access;
- Develop tailored power sector transformation plans based on a systemic innovation approach;
- Develop policy frameworks for just and inclusive transitions.

3

EXPLORING THE ROLE OF THE RENEWABLE ENERGY INDUSTRY IN DELIVERING DEVELOPMENT OUTCOMES

Visionary Statement

A GLOBAL ENERGY TRANSITION IN AFRICA

by Salvatore Bernabei, President, RES4Africa and CEO, Enel Green Power

The socio-economic benefits expected as a result of the rapid deployment of renewable energy and other clean energy technologies in Africa are monumental. According to IRENA forecasts, pursuing the transformation of African energy sectors in alignment with the 1.5 C° climate target will result in the creation of more than 16 million jobs in clean energy technologies and services by 2050, of which about 6 million will be in the renewable energy sector. IRENA's Energy Transition Welfare Index shows a positive impact on the general welfare of African societies by about 24 per cent compared to the stated policy scenario. At the same time, countries, notably oil and gas exporters, will need to adjust to the reduction of international and local demand for fossil fuels and manage the phase-out of carbon intensive technologies. Then, if from one side the social dimension of the Africa's energy transition represents a once-in-a-generation opportunity, from the other side it also entails challenges.

The private renewable energy industry is uniquely positioned to drive this transition and has an extraordinary opportunity, and responsibility, to contribute to the achievement of Africa's development goals and aspirations. In a global context of accelerating the fight against climate change before it's too late, as articulated in the COP-26 discussions and outcomes, we must not forget the socio-economic implications of our commitments and actions, especially in developing economies.

Achieving climate goals and maximising local development to support Africa's socio-economic progress requires dedicated efforts to capitalise on the opportunities of clean energy transitions. Renewable energy companies need to enhance their commitments towards the expansion of electricity access. Renewable technologies and products, coupled with digital innovation and financing solutions, provide viable options to provide reliable, affordable, and sustainable access to energy to all in Africa. Their delivery to current and new markets, both on- and off-

grid, is a fundamental contribution towards ending poverty and the electrification of Africa will be the backbone of its future economic growth and prosperity.

To maximise the positive impact of the energy transition on local communities, the renewable energy industry should find a skilled workforce prepared to implement projects at scale. To match the needs of the industry with the skill-set and competencies of a growing young labour force, dedicated efforts to upskill African human capital are required. Renewable energy businesses have the capacity and knowledge to contribute to building-up Africa's educational and training infrastructure and transfer vital know-how. This is key to ensure that no one will be left behind the notable employment opportunities emerging from the energy transition. Private-led initiatives in re-skilling of the local workforce, as well as vocational and technical training programs, are fundamental components of successful energy transition strategies. In this regard, the industry is showing a growing commitment. A fruitful collaboration between private and public institutions will contribute to closing the gap between available competencies and future needs of the job market, enabling Africa to benefit from the green energy revolution.

Succeeding in this transformative process would have a great impact on the empowerment of African youth. Africa is the youngest continent on Earth and its youth is the protagonist of its future prosperity. The youth is the most engaged in pushing the world towards sustainable growth pathways and climate resilience. The youth are drivers of energy transition choices, they are also enablers of innovation and creativity and it is our duty to put them in a position to lead changes in pursuit of sustainable development goals.

Aware of these opportunities and of the challenges we will face ahead, the RES4Africa Foundation, its members, and partners are convinced that the future prosperity of the continent depends on the ability to leverage its immense renewable energy potential towards a sustainable transformation of its energy and productive systems. Realizing this process requires considerable effort but, unlike other times in human history, Africa can count on the technologies, processes and knowledge capable of activating virtuous sustainable development cycles. The renewable energy industry is ready to cooperate and work together with international development partners, national and local authorities, and all interested stakeholders to succeed in making this century the one of Africa's sustainable prosperity.

3.1 INTRODUCTION

IRENA's modelling captures the multiple socio-economic benefits of a renewables-based energy transition in Africa. The results show that clean technology deployment aligned with the 1.5°C target of the Paris Agreement not only offers a sustainable way to provide reliable and affordable energy access to all, but it also maximises development outcomes in terms of economic growth, job creation, and general welfare. On the other hand, continuing on the current path would deprive Africa of most of the socio-economic benefits associated with a sustainable transformation of its energy systems. It would also require the continent to implement more costly and complex solutions later down the road.

Africa and its decision-makers do not have the luxury of time (AFREC, 2019). Africa faces rapid population growth, declining but high levels of poverty, and a general lack of access to basic services. Combined with the intensifying effects of climate change, these challenges are putting pressure on African governments and economies, making swift action all the more important. As highlighted during the UN High-Level Dialogue on Energy (HLDE) held in September 2021, ending energy poverty and providing sustainable, affordable, and reliable access to modern energy is a fundamental prerequisite for ending poverty and realising the Sustainable Development Agenda (UN, 2021c).

African countries have already demonstrated commitment to the energy transition, but progress remains slow and behind the target to achieving SDG7 by 2030 (IEA, IRENA, UNSD, World Bank, and WHO, 2021). Despite being home to over 17 per cent of the global population, Africa represents less than 2 per cent of global installed renewable energy capacity (RES4Africa, 2020a). As a result, most of the associated national benefits of clean energy technology expansion have yet to materialise at scale. While some countries may be wary of the possible trade-offs associated with transformational economic changes, the results of IRENA's socio-economic projections show that the net outcome is positive.

Another takeaway from the projections is that preventing challenges further down the road and maximising the benefits require a scaling up of efforts from stakeholders. International cooperation and effective disbursement of financial commitment from wealthier nations

are needed to support the introduction of policies. Beyond international cooperation and support, engagement of the private sector should also be sought to materialise the transition. Investors and private companies, both international and domestic, have the potential and capacity to bring vital resources and know-how to complement public sector efforts. Indeed, global mega challenges, including climate change and energy poverty, are so far-reaching and expansive that addressing them requires international cooperation and effective engagement of the private sector to fashion solutions locally (Kramer, 2020; Kramer and Pfitzer, 2016).

The importance of the private sector to help deliver sustainability targets is globally acknowledged. Commitment from private businesses continues to grow. Since its launch, more than 14,000 private entities have joined the UN Global Compact. More recently, the UN HLDE launched its Energy Compacts to support progress towards the achievement of SDG7. More than 50 international energy companies submitted their targets and commitments on their planned actions. Beyond simple commitments and targets, what is even more important is that private sector players are already showing their leadership in integrating sustainable practices incorporate strategies and business models. These are clear demonstrations that business growth can be delivered while contributing to social and environmental progress in Africa and around the world.

This chapter focuses on the pivotal role that the private sector can, and should, play to enable Africa's sustainable energy transition and deliver on the associated benefits. By looking to successful experiences and case studies from organisations in the international and African private sector, the chapter focuses on the potential impact associated with the scale-up of these models. It also reviews challenges that may prevent change. Barriers are highlighted as a way to support the identification of fit-for-purpose measures. These measures could enable the unlocking of investment and achievement of results towards sustainable development, aligned with the SDGs and Agenda 2063.

3.2

THE INTEGRATION OF SUSTAINABILITY INTO CORPORATE STRATEGIES

The incorporation of sustainability-linked considerations into the agenda of businesses is already taking place under numerous principles: corporate social responsibility (CSR); the triple bottom line (people, planet, profit); environmental, social, and governance (ESG) criteria; creating shared value (CSV); or the all-encompassing 'sustainability' practice. All these approaches share the common goal of combining economic benefits with social and environmental responsibilities or at the very least minimising the negative impacts associated with a simplistic economic return approach to doing business.

SUSTAINABLE BUSINESS THEORIES

Theory	Definition
Corporate social responsibility	Corporate social responsibility covers a wide range of actions. It has been described as a philanthropic program, an internal management system or code, as well as a form of self-regulation (Sheehy, 2012). It is generally understood to mean a commitment to improving community well-being through discretionary business practices and contributions of corporate resources (Kotler and Lee, 2011).
The triple bottom line (people, planet, profit)	The triple bottom line represents a sustainability framework that examines a company's social, environmental, and economic impact to take full account of the cost of doing business. The framework posits that companies should be working simultaneously on three bottom lines: profit, people, and the planet. It has also been described by its creator, John Elkington, as a triple helix for value creation; a genetic code for tomorrow's capitalism' (Elkington, 2018).
Environmental, social, and governance criteria	ESG criteria are a way for investors to evaluate investments based not solely on financial returns but also environmental, social, and governance factors (MSCI, n.d.). ESG investing is sometimes referred to as sustainable, or socially responsible, investment.
Creating shared value	Creating shared value is a concept encompassing policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates (Porter and Kramer, 2011). Shared value creation focuses on identifying and expanding the connections between societal and economic progress.

Regardless of the terminology, the shift towards the consideration of societal and environmental benefits is becoming pervasive. A 2019 survey by Deloitte found that 93 per cent of the surveyed business leaders believed that companies are more than mere employers, that they are also stewards of society (Deloitte, 2019). Indeed, the last few years have seen emblematic changes in corporate strategies around the world and across sectors, from consumer goods to finance. The year 2020 marked a turning point. Larry Fink, the CEO of BlackRock – the world's largest asset manager with about USD 10 trillion under management – famously announced that sustainability would become the company's new standard for investment. In 2021, he asked companies to disclose net-zero emissions strategies and publicly stated that "the more [a] company can show its purpose in delivering value to its customers, its employees, and its communities, the better able [it] will be to compete and deliver long-term, durable profits for shareholders" (Fink, 2021).

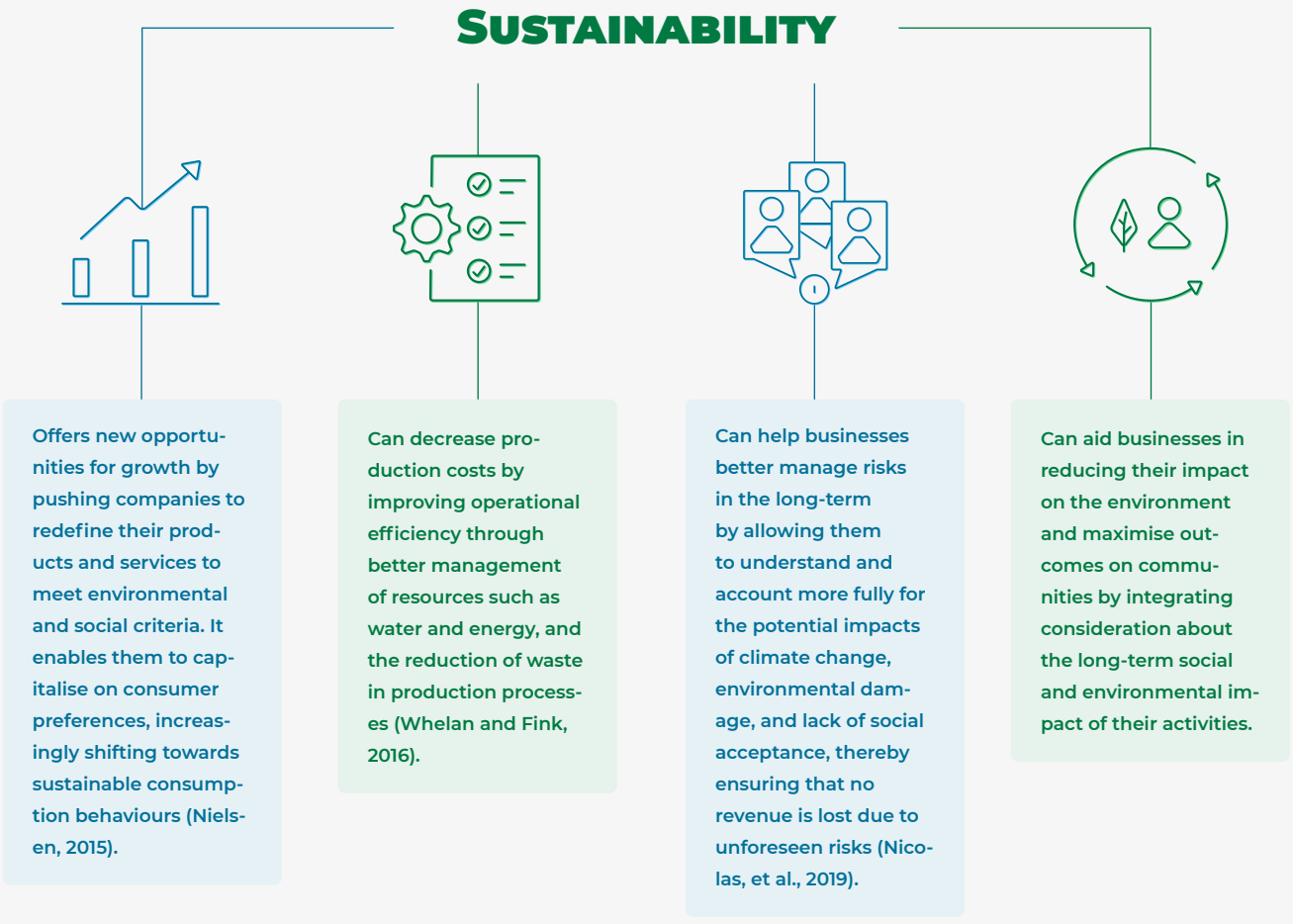
Indeed, many businesses have begun integrating sustainability into their day-to-day practices. The first step, the recognition and measurement of a company's own positive and negative impacts through sustainability reporting, has become nearly universally adopted. About 80 per cent of companies worldwide today report on sustainability (KPMG, 2020). Going beyond just reporting on impacts, many companies have improved the sustainability of their practices. They are doing so by committing to predefined key performance indicators (KPIs) such as emissions reduction or recycling targets. Net-zero targets in particular have grown over the last years, and now over one-fifth of the 2,000 largest publicly listed companies have such targets (ECIU and Oxford Net Zero, 2021).

Businesses are understanding that sustainability is valuable and sustainable strategies have a sounder business case than business-as-usual (Serafeim, 2020). The success of the most forward-looking companies is also pushing competitors to pursue a similar path. After decades of unsustainable economic growth and unequal development, pursuing sustainable principles is no longer perceived as forgoing profits for a greater good, but rather as an opportunity to maximise gains and minimise risks.

Sustainable practices allow businesses to (i) explore new markets, and increase profits; (ii) operate more efficiently and create opportunities for cost savings; (iii) reduce share price volatility and long-term risk exposure; and (iv) positively impact communities and the environment.

Figure 3.1

The opportunities associated with sustainable business practices



In these terms, the renewable energy industry is a good example of the successful integration of sustainability principles in a key industrial sector for economies and societies. Founded upon these principles, the renewable industry has demonstrated in the last three decades its ability to offer sustainable and long-term opportunities to grow. This is demonstrated through lower electricity production costs, activated technological development, and reduced risk exposure of energy companies. At the same time, renewable energy companies are leading players in advocating for the integration of sustainability into the global economic agenda and in business strategies and operations.

Indeed, many renewable energy companies have pioneered sustainable growth pathways and have become a fundamental pillar of the transformational process. Most countries are benefitting from what has been called the "green energy revolution", and others, notably developing countries, are in a position to benefit from it (Mathews, 2016; Zhenmin, et al., 2021). In Africa, renewable energy companies are already providing innovative solutions to meet the energy needs of African businesses and societies. They are also adopting value propositions and strategies that contribute to sustainable development. Their success confirms the added value created by implementing environmentally-friendly and socially-conscious approaches adapted to the local context. It also shows the potential of scaling up these approaches soon.

3.3

ENHANCING SOCIO-ECONOMIC BENEFITS IN THE RENEWABLE ENERGY INDUSTRY

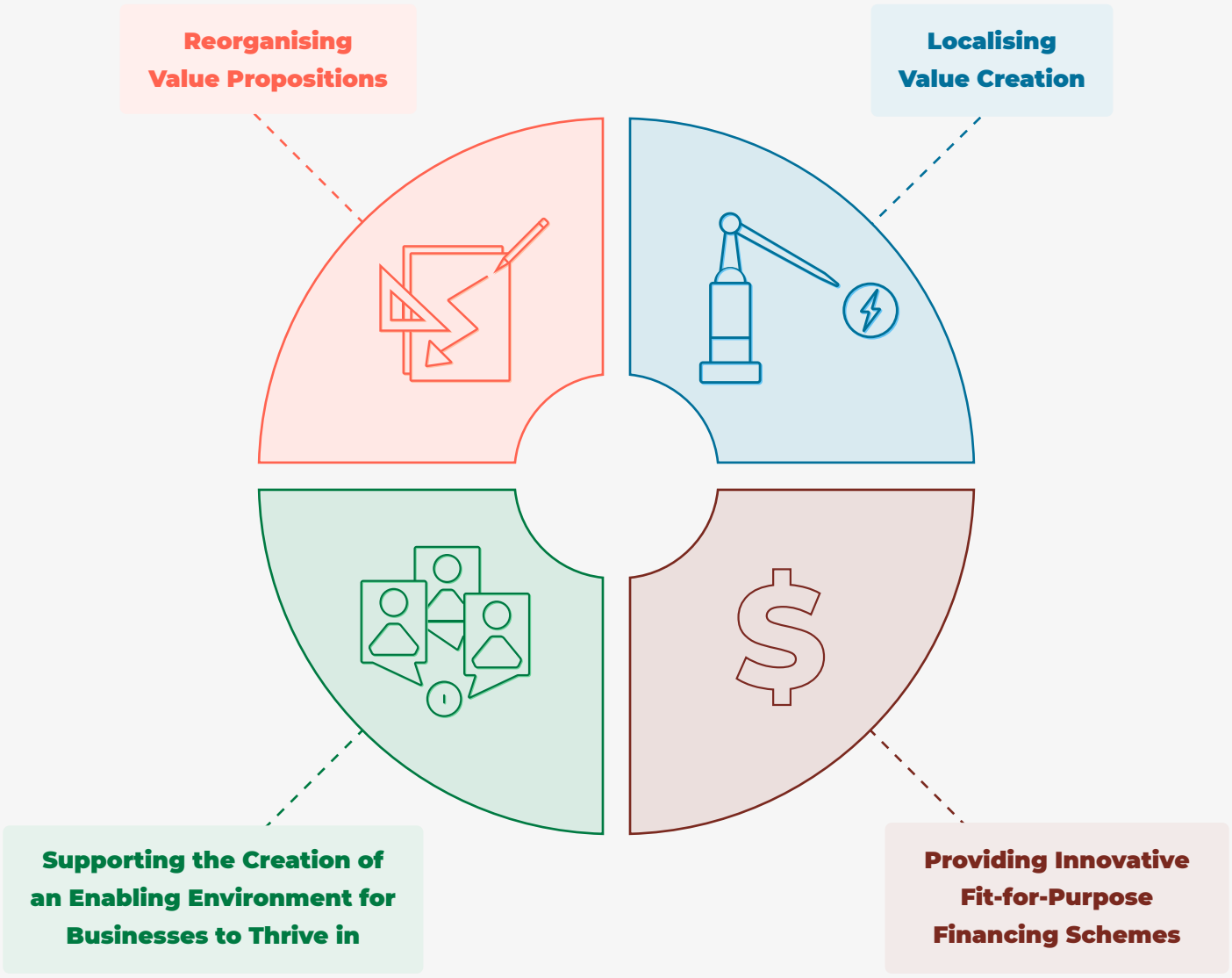
Chapters 1 and 2 of this report reminded and confirmed that energy is crucial to socio-economic growth and development in Africa. Indeed, the lack of universal access to sustainable, affordable, and reliable electricity remains a major barrier to the economic development and social welfare on the continent (World Bank, 2018). The recent electricity crisis in South Africa and Zambia demonstrated this fact. Renewable-based solutions have a tremendous potential to address Africa's current and future energy needs due particularly to abundant resources and viable technologies.

Most importantly, the renewable energy industry is adjusting its business strategy and modus operandi to generate cascading socio-economic benefits and augment positive impacts by:

- Reorganising value propositions to address customer needs;
- Localising value creation;
- Supporting the creation of an enabling environment for businesses to thrive in;
- Providing innovative fit-for-purpose financing schemes.

Figure 3.2

Business' approaches to maximising socio-economic gains



Reorganising value propositions to address customer needs

Renewable technologies are becoming the most competitive option for large-scale electricity generation. Their levelised cost of electricity (LCOE) is often lower than the cheapest and most polluting coal plants, as shown by the recent analysis of the evolution of electricity generation technologies' LCOEs (IRENA, 2021e). In Africa, auction prices of utility-scale renewable energy plants showed the potential of such technologies in providing cost-competitive and secure electricity supply in countries with transparent and competitive procurement frameworks. For example, a Scaling Solar bid in Senegal reached a continental record low of EUR 3.80 cents/kWh (IFC, 2018).

Building renewable utility-scale power plants represents one aspect of expanding electricity services. Countries are investing to extend grid infrastructure to connect more customers and improve access to sustainable energy. However, millions in Africa continue to live in rural and remote areas where grid expansion remains economically challenging. As a result, about 138 million households living on less than US $2.50 a day spend US $10 billion annually on energy-related products, including charcoal, candles, and kerosene (Yeboa and Adom-Opare, 2018). Providing access to modern energy systems to this segment of the population is not only necessary to close the energy access gap, but it is also a way to cut household expenses and release resources for investment in health and education.

Due to the ability to decentralise and scale up renewable technologies – pico-solar products, solar home systems, and renewable-based mini-grids – they represent the best solution for providing a reliable electricity supply to communities that are distant from the main grid. Decentralised renewable technologies already play an important role in providing electricity access in Africa. Their growth is expected to accelerate in the future (IEA, 2019a), with a growing customer base of households and small and medium enterprises (SMEs). Large corporations and start-ups are taking steps to address the needs of what is often defined as the bottom-of-the-pyramid (BoP) market in the energy access space. They are tapping into opportunities to supply sustainable energy to hundreds of millions of unserved customers.

Prahalad and Hart (2002) argued that the 4 billion people at the bottom of the economic pyramid represent a largely untapped market. Accessing these markets, however, presents challenges to businesses in terms of accessibility and profitability, as well as consumer behaviour in terms of willingness to pay. Nevertheless, businesses are rising to the challenge, rethinking how products and services are created and delivered (IFC, 2014) to better fit the needs of bottom-of-the-pyramid markets. They are doing so through:

- Improving their knowledge and understanding of the needs of these markets;
- Defining value propositions based on market reality and local needs; and
- Increasing affordability and ensuring the delivery of quality services.

Thanks to a better understanding of market expectations and the level of purchasing power of low-income customers, companies are redefining their value proposition to better fit local needs. In the energy sector, this has been achieved by offering new categories of products and services to customers in areas without electricity access (see Box 3.1). The affordability of these products is ensured by the development of new payment schemes suited to the low and unstable income of the bottom-of-the-pyramid customers. These schemes include pay-as-you-go models (CGAP and CDC, 2018; IRENA, 2020c). Indeed, digital finance and 'fintech' solutions such as mobile money and data risk analytics are facilitating the development of new and scalable low-carbon energy business models (UNDP, 2019). With these new products and services, renewable energy companies have been able to expand electricity access, complementing centralised grid-connection efforts, and contributing to sustainable development with positive welfare impact (CDC, 2020).

Box 3.1

ACCESS TO CLEAN ENERGY FOR THE BOTTOM-OF-THE-PYRAMID MARKET – SCHNEIDER ELECTRIC

Electrifying low-income customers in bottom-of-the-pyramid markets require impactful, affordable, and scalable solutions. Ensuring the long-term sustainability of projects is also crucial, both in terms of economic viability and community buy-in and uptake. To respond to these challenges, Schneider Electric, the leading global specialist in energy management and automation, has developed a holistic approach to expanding access to reliable, safe, efficient, and sustainable energy. Its Access to Energy (A2E) business line develops products and solutions that meet a wide range of needs for individuals and communities. The business is complemented by financial support to start-ups with innovative energy access solutions and comprehensive training programmes for aspiring entrepreneurs and energy specialists.

Through its Access to Energy (A2E) Programme, Schneider Electric contributes to holistically addressing the complex challenge of electrifying rural communities. Ensuring the financial sustainability of energy access solutions for off-grid households is the most difficult challenge, but innovative financing models have emerged to overcome this barrier. Additionally, projects are more successful, and therefore more sustainable, when communities are actively engaged in their operation. Partnering with a wide range of local stakeholders including governments, entrepreneurs and businesses, and NGOs allows the development of sustainable and scalable business and distribution models. These models are essential to overcome the logistical challenges of operating in off-grid rural communities.

The Programme comprises three complementary pillars, each one addressing a different facet of energy access expansion. The first pillar is related to the company's core business and consists of a comprehensive portfolio of products and solutions for stand-alone systems and mini-grids. These solutions are tailored to the needs of individuals, households, businesses, and communities. The socio-economic needs of these stakeholders are an important driver of Schneider's R&D activities. The second pillar represents the training and entrepreneurship program aimed at developing skills in the electricity trades and supporting entrepreneurs, in particular women. This is considered a necessary condition for sustainable and inclusive local development. Training creates opportunities for income generation for trainees and empowers local communities to acquire long-term competencies to maintain and develop A2E solutions. The third pillar supports innovation and entrepreneurial activities that contribute to sustainable development through investment in companies dedicated to bringing electricity to the bottom of the pyramid.

To date, the A2E Programme has provided energy access solutions to more than 30 million people, has provided energy management training to more than 281,000 underprivileged people, and supported nearly 2,900 entrepreneurs. Through its new Schneider Sustainability Impact (SSI) 2021-2025 program, the company aims to enable 50 million people to access electricity by 2025, and 80 million by 2030. It also aims to train 1 million people and support 10,000 entrepreneurs.

Adjusting the value proposition and aligning it with the local needs has also enabled forward-looking companies to tap into new markets and expand their growth opportunities relative to the business-as-usual scenario (see Box 3.2). These markets today represent additional ways of doing business in the renewable energy industry and offer additional revenue streams to private companies while maximising their impact on the least privileged populations.

Box 3.2

WALKING THE ACCESS TO ENERGY TALK – EDPR

EDP Group, the leading Portuguese energy utility, has been walking the talk of energy access since 2009. That year, the Group signed a partnership agreement with the United Nations High Commissioner for Refugees (UNHCR). The aim was to bring renewable energy and sustainable environmental solutions to the Kakuma Refugee Camp and the surrounding areas in Kenya, which were remote and not served by the national power grid. The utility started to look to the energy access challenge from the perspective of its social and environmental commitments. Access to energy (A2E) projects was, therefore, considered as part of the broader CSR strategy. Projects were implemented with a philanthropic approach, mostly managed through its corporate Foundation. In the following years, several initiatives were implemented ranging from the installation of micro-generation renewable installations to the provision of solar furnaces, solar flashlights and water purifiers, as well as vocational training programs. The implementation of these activities was expected to contribute to sustainable development in rural communities, empower the beneficiaries, and cover their basic energy needs. These projects benefitted about 6,000 people directly and had a positive impact on more than 70,000 people indirectly.

Between 2009 and 2018, the Group has invested about EUR 5 million in A2E projects. In 2018, however, the utility redefined its strategic approach to A2E, moving from CSR to a business-oriented philosophy. With the launch of its "A2E – Access to Energy for Development" Program, EDP envisioned the promotion of sustainable energy for all and the alleviation of energy poverty by supporting sustainable and clean energy projects in developing countries. These projects are designed as profitable A2E operations in the off-grid rural emerging markets. The roll-out of this vision was to be backed up by:

- Equity investments in A2E companies with the target of investing €12 million by 2025; and
- Establishment of the A2E CSR Fund aimed at alleviating energy poverty by supporting sustainable and clean energy projects in remote rural areas.

In subsequent years, EDP commenced implementing its strategy with the acquisition of minor stakes in SolarWorks! for about EUR 2 million, and Resource for about EUR 2.6 million. The investment in SolarWorks!, a company engaged in the marketing of pay-as-you-go decentralised solar energy solutions for off-grid domestic and business customers in Mozambique, was meant to support its expansion in Southern African markets, notably Malawi. The other company, Rensource, develops and manages decentralised solar energy systems and micro-grids to serve communities focusing on small businesses and micro-companies, with about 10,000 micro, small, and medium enterprises in eight economic clusters (markets) across Nigeria. In parallel, EDP has run three rounds of its A2E Fund Program aimed at alleviating energy poverty by supporting sustainable and clean energy projects in developing countries. The projects focused on impactful areas such as water and agriculture, community businesses, health, and education. The project selection criteria included social impact, partnerships, sustainability, scalability, and several beneficiaries. The funding for each project ranges from EUR 25,000 to EUR 100,000.

Since its launch, the A2E Program benefitted about 65,000 people directly and over 1 million indirectly, financing about 13 projects in over 5 countries. In its new 2021-2025 business plan, EDP foresees the upgrade of its A2E Program and a more ambitious commitment.

Due to such innovations in business models and decentralised RE technologies, the private renewable energy sector demonstrated its ability to expand electricity access in the most remote areas. Complementing centralised grid-connection efforts, decentralised renewable companies are actively contributing to sustainable development with a positive welfare impact. The increasing interest of international utilities in these markets further confirms the potential of such markets and lends support to the positive outlook for the decentralised renewable energy market in Africa.

Localising value creation

The deployment of renewable technologies at a large scale, as foreseen by IRENA's energy transition scenarios, presents benefits in terms of competitiveness and sustainability of electricity supply. Furthermore, it represents the opportunity for African countries to create thousands of new jobs in energy transition-related sectors such as R&D, manufacturing, services, and O&M. As highlighted in the previous chapters, renewable technologies are generally more employment-intensive than fossil fuels (ILO, 2016). Therefore, their development represents an opportunity for African countries to create more jobs in the

face of a growing working-age population and tight labour markets (Sumberg, et al., 2020). IRENA's socio-economic footprint analysis based on a **1.5°C Scenario** demonstrates that about 28 million energy sector jobs could be created by 2050, of which 22 million jobs (nearly 80 per cent) are transition-related. Renewables contribute about 8.1 million jobs by 2050, compared to 324.000 jobs in Africa in 2020 (IRENA and ILO, 2021).

The lesson behind these numbers is that energy transition scenarios and the development of associated technologies – renewables, energy efficiency, networks, digitalisation, and flexibility services – offer huge opportunities in terms of industrialisation and job creation. Yet, Africa has not fully benefited from this opportunity. This is explained both by the slow rollout of these technologies across the continent and the difficulties experienced in localising value creation in most African countries. As a result, Africa remains a consumer, rather than a producer, of clean energy technologies to date.

However, sustained market demand combined with appropriate industrial policies can support the creation of local value and employment, both direct and indirect. Construction and installation, manufacturing, and operations and maintenance are the main areas where local value and direct jobs can be created (IRENA, n.d.). These can be complemented with indirect jobs in supplier industries, raw materials, and services. There have been positive results in Africa where renewable energy companies have been able to find appropriate conditions. For instance, positive outcomes in Morocco and South Africa emerged as a result of fruitful collaboration between governments and the renewable private sector. Due to such cooperation, both countries are continental leaders in deploying renewable solutions and have been able to increasingly integrate local value creation.

In the case of Morocco, the government set ambitious targets for RE capacity development since 2009 (IEA, 2019b). This was followed by targeted implementation programs and public tenders to crowd-in private investors. Beyond the development of large-scale RE projects, national industrial capacities were augmented. Notable results were achieved in both wind and solar value chain localisation. Well-defined industrial, labour, and financial policies, as well as well-organised tender processes, were contributing factors to the success Morocco was able to reap. It managed to source 30-35 per cent of components and services locally in the first Noor-Ouarzazate concentrated solar power tender. Morocco achieved a 70 per cent local employment rate in the fourth auction round (KfW, et al., 2021). Similar results were obtained in the wind energy value chain, where the first rotor blade manufacturing facility on the African continent was built by Siemens Gamesa as a result of winning a tender for 850 MW.

Similar to Morocco, South Africa embarked on an ambitious plan to deploy RE capacity already in 2011. The Renewable Energy Independent Power Producer Procurement Programme (REI4P) is the largest, and most successful, renewable energy procurement program in Africa (Ferreira Pinto, 2021). The Programme was managed and implemented by the IPP Office of the Department of Energy (DoE). REI4P tenders are meant to promote the diversification of the electricity generation mix and promote private sector participation in the electricity sector. It is also closely connected to the wider national green economy strategy. Since the first auction round, tenders were structured to promote the creation of jobs, economic inclusion, and local value anchored by ambitious targets through well-designed requirements (McDaid, 2016). According to the DoE statistics, REI4P tenders were able to successfully deliver on, and sometimes even exceed, the national socio-economic targets. Examples include local ownership, local procurement rate, and job creation, with about 50 per cent of generated jobs being sourced locally (Eberhard and Naude, 2017; IRENA, 2019b). Nevertheless, the halt of the REI4P auction rounds between 2016 and 2021 caused strains to the nascent national renewable energy industry. Some of the jobs, especially for unskilled labour, did not last (Leigland and Eberhard, 2018).

The positive results obtained by Morocco and South Africa in localising RE value creation show the potential of the industry in terms of industrial development, job creation, public-private partnership, and well-managed local and international cooperation. As early movers, both countries are today regional and continental leaders in the renewable energy industry. Both are well-positioned to use their competitive advantages, in terms of local manufacturing capacity and knowledgeable and skilled workforce, to move further up in the RE value creation and drive further growth. However, the renewable industry is today primarily global and becoming internationally competitive. This essentially poses a challenge to new entrants. Local demand in Africa is still too low to support the building of large and competitive manufacturing capabilities. The nascent local industries continue to depend on government support and remain vulnerable to disruptions in national markets.

On the opposite spectrum of the industry, other important opportunities for local value creation are emerging from the off-grid industry. In markets where off-grid renewable technologies experienced strong growth, such as in Kenya and Nigeria, the off-grid sector is estimated to employ an equivalent or higher number of people than the traditional power sector (Power for All, et al., 2019). Solar home systems (SHS) and pico-solar appliances have been the largest employers in the off-grid space. Meanwhile, renewable-based mini-grids have the potential to become a major employer in the years to come. Another relevant element related to the potential of the off-grid market in terms of job creation and local value creation is the dominance of small and medium enterprises (SMEs) operating in this space. Indeed, local SMEs represent the main actors in project development and installation,

operations and maintenance, sales and distribution, and after-sales services for off-grid products. If some off-grid providers are present at the regional level, all of them procure most of their workforce within the national markets they operate in, with consequent effects on direct employment creation. While manufacturing and assembly of off-grid appliances are still limited in Africa, demand growth could also open new possibilities. Some countries, such as Nigeria, have already seen private companies beginning operations in this segment of the off-grid value chain (Africa Clean Energy and WRI, 2021).

Supporting the creation of an enabling environment for businesses to thrive in

The success of a business, as well as its ability to bring long-term and sustainable benefits for all its stakeholders, depends on several factors, including some outside of its direct control. These include the availability of human capital, political will, and favourable macroeconomic, policy, and regulatory environments. The economic literature often refers to these indispensable factors as an 'enabling environment', which can be defined as "the combination of conditions that affect an enterprise's ability to start, grow, and create decent jobs; and are of political, economic, social, and environmental nature" (ILO, n.d.). The strength of such enabling conditions determines the success of businesses and the ability of societies to benefit from this success.

If some African countries have embraced energy transition strategies, broad acceptance and hard commitment are still lagging across the continent (REN21, 2020). Concerns about the need to ensure fair and just transition paths that leave no one behind persist. Fostering social acceptance and consensus is key to overcoming potential resistance (REN21, 2020). The renewable industry is becoming more proactive in this regard, focusing on enhancing socio-political, market, and community acceptance.

Public awareness contributes to broader social acceptance of renewable energy projects and reduces project risks (REN21, 2020). Renewable energy companies have pioneered international global awareness campaigns focusing on spreading information and data on renewable energy benefits in terms of economic, social, and market aspects. The RE industry has been among the first signatories and the most active participants of international flagship initiatives such as the UN Global Compact (UN, n.d.), SEforAll, and the UN High-Level Dialogue on Energy and its targets (UN, n.d.). Extensive efforts in this area have led to a wider acceptance of renewables on a global scale. At the regional level, the establishment of regional renewable energy associations played an important role in supporting African countries in sharing knowledge and experiences about renewable energy development opportunities and benefits. These include the ECOWAS Regional Centre for Renewable

Energy and Energy Efficiency, the East African Centre for Renewable Energy and Energy Efficiency, SADC Centre for Renewable Energy and Energy Efficiency, as well as other regional and national associations in many countries.

These initiatives contributed to the widespread adoption of RE targets at national levels across Africa. However, they did not prevent the surge of NIMBY (not in my backyard) movements. These phenomena, not peculiar only to the African context, originate from several factors including land acquisition and occupation protests and concerns related to social and economic exclusion. Their surge was behind the halting of several renewable energy projects. Developers are increasingly aware of such risks. To effectively counter it, they have adjusted their approaches and are increasingly engaging communities at the macro and micro levels from project scouting to development and operations. A concrete example is the wide adoption of environmental and social impact assessments (ESIA) and social due-diligence approaches during the project development phase (CDC, 2016). Thanks to the support from DFIs and IFIs, ESIAs are today common industry practice and represent powerful instruments to better reflect expectations and requirements of communities throughout the project lifecycle (see Box 3.3).

Community engagement and support can also be strengthened by complementing renewable energy project development with CSR initiatives and shared ownership approaches. In Africa, renewable developers and investors have been able to considerably grow their engagements in terms of CSR initiatives, targeting a wide range of activities to improve the quality of life of local communities. This typically includes building infrastructure (e.g., roads, schools, and medical centres), implementing water, health, and sanitation projects, and supporting entrepreneurship and income-generation opportunities. In the meanwhile, new asset ownership models are emerging such as community energy, where local stakeholders own a majority share and the voting rights of the project through a community-based organisation. These models demonstrated their ability to enhance local socio-economic benefits of renewables and garner public support for projects (IRENA, 2020d, 2020e).

Box 3.3

BUILDING A CLEAN ENERGY FUTURE WITH COMMUNITIES IN AFRICA – VESTAS

Vestas is among the consortium of partners who own, with a 12.5 per cent equity stake, the 310 MW Lake Turkana Wind Power Project (LTWP) located east of Lake Turkana in Northern Kenya. Being Africa's largest wind energy project, LTWP started injecting power into the national grid in 2018, after over a decade of preparatory works and construction.

Behind the success of this project, which today is a fundamental pillar of Kenya's electricity system – accounting for 17 per cent of Kenya's installed capacity and averaging capacity factors of above 70 per cent – is the design of an effective socio-economic impact program. This program was indispensable to earning LTWP its social license to operate from the local communities. This license to operate is essential to Vestas and was initially identified by the social due diligence process. It resulted in the development of a project-specific social management plan. The social due diligence process is informed by international industry practices and social safeguards standards.

Due to its remote location and the rural/pastoral communities living in the area, LTWP faced exceptional logistical and stakeholder challenges. Through close collaboration with community members, three main areas of action were identified to increase project benefits for local communities: road rehabilitation; support for local job creation; and capacity building.

Discussions with the county government were essential to identify the lack of road infrastructure among the main challenges to local development. This infrastructure gap resulted in high transport costs and reduced cross-border and in-country trade, and adversely affected the provision of essential services such as education and health. The USD 30 million investment in upgrading the project road from the sub-counties Laisamis to Loyangalani (207 km), and from an earth surface to a standard engineered gravel road delivered cascading socio-economic benefits to the local project area. The rehabilitation of the road shortened the journey from 1-2 days (or over 6 during the wet season) to only 4 hours. Following the road rehabilitation, the number of bus trips to local markets increased nine-fold. Furthermore, a favourable investment environment was created for new fishing equipment, boats, cold storage, and trucks. Local fishermen gained access to better inputs for fresh fish production and were able to shift from less-valuable dried fish to a higher-value fresh fish trade.

Moreover, local employment and capacity building programs were set up during both the construction and operational phases. During the construction phase, LTWP employed more than 2,500 people; about 75 per cent came from within Marsabit County. During construction, Vestas hired community members from the project area as traffic marshals, community educators, liaison officers, and patrol teams around the project site. Today, of the 449 people who are currently employed in operation, 341 (76 per cent) are from Marsabit County, 94 (21 per cent) are from other parts of Kenya, and 14 (3 per cent) are expatriates.

Vestas has ambitions to grow in Africa. It already has 2 GW of wind power capacity installed. The company is focused on learning from LTWP. The group social due diligence processes have been updated to ensure that the lessons are captured, including on value creation for communities during future projects.

Raising awareness and building acceptance can come hand-in-hand with private-led initiatives. Indeed, the renewable energy industry, much like other industries in Africa, must contend with the chronic weaknesses of the African business environment: the low availability of skilled workers; an unfavourable policy and regulatory environment; infrastructure inadequacies; and others (AfDB, et al., 2017). Addressing these impediments is a prerequisite for operating and succeeding in Africa. To this end, renewable energy companies have initiated a wide range of activities. These activities range from training the local workforce to partnering with local companies for building ancillary infrastructures (e.g. ports, roads, and telecommunication), and from advocating for better public-private dialogue in policy and regulatory reform processes to investing in social infrastructures such as schools and hospitals.

Skills development and knowledge transfer from experienced industry players are indispensable to the establishment and growth of competitive national markets and local industries. In Africa, several companies in the renewable energy sector have established comprehensive training programmes dedicated to the local workforce. These efforts focus on various aspects ranging from technical skill development to business and regulatory know-how. Several initiatives from international companies (e.g., the Schneider Electric University and Enel Green Power's Open Africa Power programme) have led to training hundreds and enabling the local workforce to benefit from RE job opportunities. These efforts have become more pervasive as CSR initiatives become linked to specific project development. Often through the mediation of corporate Foundations and corporate social investment agents (Heitmann, et al., 2020), corporations are investing in training facilities across Africa, complementing and often partnering with public institution programs, to provide fit-for-purpose vocational and professional training (see Box 3.2). These initiatives are meant to take direct action to build the workforce of the future to support the growth of sectors such as clean energy and digitalisation.

Box 3.4

THE ROLE OF VOCATIONAL TRAINING IN FORGING LOCAL SKILLS – MICRO-GRID ACADEMY

An important facet of maximising the socio-economic impact of the renewable energy industry in Africa is greater employment of the local population across project stages. A prerequisite to this is the availability of a skilled local workforce, which in turn hinges upon the existence and quality of appropriate education infrastructure and training programs. Capacity building becomes particularly relevant for social categories with acute unemployment rates, such as women and the youth. Capacity development is also crucial for reskilling purposes in countries where fossil-fuel industries' development may be jeopardised by energy transition strategies. The main goal of technical and vocational education and training (TVET) programs are a contribution to the development of skilled workers and the alignment of skills to market needs.

The Micro-Grid Academy (MGA) represents an interesting case study of successful TVET actions in the sustainable energy sector in Africa. Born in 2018, the MGA started as a private sector-led initiative, managed by RES4Africa Foundation, to train the African workforce, mainly the youth, to professions in the renewable off-grid sector. The MGA quickly evolved into a multi-stakeholder vocational capacity building programme, rooted in an extensive partnership between the private and public sectors, as well as academia. In less than 3 years, the MGA was able to establish a stable and long-term partnership with AVSI Foundation, AWEEF, EACREEE, Enel Foundation, UNEP, and Kenya Power. The training also facilitates experience sharing from the private sector.

MGA's partnership with Strathmore University and the St. Kizito Vocational Training Institute enabled the development of a standard curriculum, certified by local education authorities. The training is delivered in 4 week-long modules comprising lectures, interactive working groups, and hands-on activities on the field. Trainers are provided by local and international public utilities and agencies, private industry players, and academia.

With an initial goal of training at least 200 participants each year mostly from East Africa, the MGA provided a free-of-fees TVET program to about 1,100 African students, entrepreneurs, technicians, managers, and engineers from 38 different countries since its launch. Some of these results were made possible by the adoption of digital training methodologies and delivery systems, mainly as a consequence of COVID-19 pandemic restrictions. Moving to digital and hybrid systems enhanced MGA capability to reach African students and transfer valuable technical and soft skills, increasing the yearly enrolments from 200 to 400. A sample survey of 111 MGA trainees from 13 African countries conducted in 2021 found that 98 per cent believed the training improved their skills and ability to add value to their work. Over 93 per cent benefitted from durable networking, and 40 per cent found new job opportunities.

During its four years of operation, the MGA contributed to expanding access to sustainable electricity by empowering local young entrepreneurs and technicians to deploy decentralised renewable energy solutions in their communities and beyond. It also supported trainees in adding value to their current jobs and finding new employment opportunities. Its success shows the potential of TVET for delivering sustainable energy solutions. It also demonstrated the potential of fruitful collaboration between the private and public sectors in the important area of training and skills development.

The industry is also increasing its efforts to build effective and open public-private dialogue to advocate for policy and regulatory reforms with the intent to increase market preparedness to crowd-in private investments. Reducing policy and regulatory risks and increasing market openness, attractiveness, and readiness still represent a major challenge in Africa. But the sharing of experiences, open consultative processes, and successful collaboration between private and public stakeholders present opportunities to contribute to a supportive and enabling regulatory environment. In this regard, the activities of sectoral business associations such as Alliance for Rural Electrification, GOGLA, Clean Cooking Alliance, and others play a crucial role in building bridges between industries and public decision-makers.

Another meaningful way of contributing to the creation of an enabling environment is encouraging entrepreneurship and innovation. The proliferation of off-grid energy solution start-ups, for instance, is a testament to the potential of bottom-of-the-pyramid segments in the energy access space. Established energy industry players are supporting them through knowledge transfer and with financial resources. Supporting the growth of such start-ups can contribute to wider job creation and the establishment of a more competitive environment to drive further innovation.

Providing innovative fit-for-purpose financing mechanisms

According to the projections carried out by IRENA, pursuing measures under the **1.5°C Scenario** would result in about 6 per cent higher GDP growth than in the **PES**. The increase in energy-transition related investments contributes largely to this growth, especially in the short- to medium-term. Investments in the energy system would need to double by 2030, reaching around USD 40 to 65 billion (KfW et al., 2021). Investment in renewable energy capacities is a major component. However, investments in clean energy fall short of the continent's needs.

About 50 per cent of investments in electricity infrastructure are financed by public budgets (IEA, 2021) directly or indirectly through state-owned utilities. However, national budget constraints and the critical financial condition of several African utilities (Kojima and Trimble, 2016) limit the resources available for financing energy infrastructure. Limited fiscal space for additional tax collection and concerns about debt distress leave little room for taking on more public debt (Gaspar, et al., 2019). Succeeding in the energy transition of the African energy system requires urgent solutions to fill this financing gap.

Development finance and international cooperation have an important role to play; however, they are unlikely to be sufficient (Probst, et al., 2020). The financing gap can only be bridged

with the participation of the private sector, which so far has played a limited role. The achievement of SDG 7 depends both on the ability to decrease the cost of capital for investing in clean energy technologies in emerging and developing economies as well as on the ability of investors in raising capital for their investments in these geographies (IEA, 2021). However, the business environment in most of Africa does not yet match the expectation of lenders, and the current design of financing instruments is not fit-for-purpose (UN, 2021d). In this regard, progress has been made over the last few years. Innovative financial instruments and de-risking products have been launched in the market with the purpose of increasing available capital to finance sustainable investment opportunities in Africa, and mitigating risk exposure and capital costs for investors.

Sustainable finance products offer the possibility to mobilise new resources towards high-impact geographies such as Africa. The last decade has seen substantial strides in launching new financial products meant to mobilise capital towards impactful and sustainable projects. Impact investing, an approach to investment aiming to achieve both financial returns and social or environmental goals, experienced significant growth in recent years reaching an estimated market size of USD 228.1 billion to 1.3 trillion (IFC, 2019). The wide range of this estimate is related to the different definitions of impact investment.

Green bonds are among the most successful financial products. They refer to "any type of bond instrument where the proceeds will be exclusively applied to finance, or refinance, new or existing projects that provide clear environmental benefits" (IFC, 2019). The renewable energy industry is among the first and leading users of these products. The green bond market has experienced consistent growth in the last decade. It boomed in the last five years, moving from less than USD 50 billion to about 300 billion in annual issuances between 2015 and 2020 (Fatin, 2021). Most recently, the market has seen innovation with the launch of SDG-linked bonds and general-purpose corporate financing products linked to sustainability targets (see Box 3.5). The Sustainability-Linked Bond Market accommodates more flexible usage of financing than the use-of-proceeds products such as green bonds. As a result, they offer more flexibility to issuers in defining the most valuable actions to achieve their defined sustainability targets.

Box 3.5

THE VALUE OF A SUSTAINABILITY-LINKED FINANCIAL STRATEGY – ENEL

Enel, the multinational energy group, is among the leaders in adapting business practices to the energy transition. Its corporate strategy is built around value creation in three key dimensions of the energy transition: the decarbonisation of generation capacity, electrification and digital platform development. The group fully embraces the UN Sustainable Development Agenda and adopts sustainability as its main driver of future growth. Around 90 per cent of the group's total capital expenditure (CAPEX) for 2021-2023 addresses SDGs, and views SDGs 7, 9, 11, and 13 as the cornerstone of corporate strategy.

To finance its progress on this commitment, the company was an early explorer of innovative sustainable finance products. Enel was an early issuer of green bonds, becoming one of the largest corporate issuers of such instruments. Recently, the company launched its sustainable finance strategy. Going beyond use-of-proceeds instruments such as green bonds, Enel aimed to define innovative general-purpose financing products aligned with its sustainable corporate goals.

In September 2019, the group launched an innovative and first-of-its-kind general corporate purpose financing product in the form of a USD 1.5 billion SDG-Linked Bond, marking the beginning of the Sustainability-Linked bond market. These bonds create financial incentives for Enel to fulfil specific Sustainability Performance Targets (SPTs) within a pre-determined timeframe. The failure of Enel to meet the SPTs would trigger a step-up margin, corresponding to an increase in the interest rate applicable after the reference date.

Sustainability-Linked bonds have a series of merits:

- The link to the issuer's sustainable strategy, with core, representative, transparent and ambitious KPIs and targets;
- The presence of a financial incentive to pursue a sustainable strategy, with (typically) a step-up mechanism;
- Structures that reflect the financial value of sustainable choices, with a lower cost of funding if sustainability targets are achieved;
- Flexibility in the use of the funds as a general-purpose product;
- Transactions that could be performed by a wider range of issuers that rely on the overall sustainability strategy (i.e., asset-light companies);
- Ideal to support transition strategies as KPIs and targets apply to the whole company instead of a specific transaction (i.e., hard-to-abate industries).

The Sustainability-Linked bond market accommodates a more diverse range of corporate contributions to sustainable investment. The market links sustainability targets to the terms of general corporate purpose debt, complementing the use-of-proceeds model. This is the reason behind the exponential growth of this new asset class, which experienced almost USD 90 billion of global issuance in just two years. This is an impressive 530 per cent growth if compared to the previous year.

After the issuance of the world's first Sustainability-Linked bond back in 2019, Enel issued a total of USD 17 billion of Sustainability-Linked bonds. Out of these investments, nearly USD 12 billion are in 2021, linked to SDG 7 and SDG 13, catalysing around USD 60 billion of investment demand.

With these last Sustainability-Linked transactions, Enel accelerated the achievement of targets announced at the end of 2020. Sustainable financing sources on total gross debt is set at 48 per cent by 2023 and more than 70 per cent by 2030. It is currently at around 50 per cent, simultaneously reducing the cost of the group's debt.

Moreover, Enel extended this Sustainability-Linked approach to all its debt instruments by publishing the "Sustainability-Linked Financing Framework", an all-encompassing document that governs the link between sustainability and loans, credit lines, commercial papers, and bond issuances.

The success of Enel confirms the interest of investors in such products and their financial results. Sustainability-Linked financing has the potential to improve credit metrics and lower the cost of debt.

Enel was also rewarded by the International Financing Review (IFR), the world's leading provider of intelligence on the global capital market, as "Sustainable Issuer of the Year", as part of the 2020 IFR Awards. The award, which Enel won for the second consecutive year, recognised the group's commitment to a sustainable strategy that has translated into innovation in the financial market. This is demonstrated through a new range of financing instruments related to the corporate Sustainability-Linked approach.

Although still limited, these instruments are increasingly being used in Africa. African governments and local financial institutions see them as an opportunity to increase capital availability and sponsor infrastructure projects across the continent (EIB, 2021). Capacitating and enhancing African financial systems is key to increasing capital availability for low-carbon and clean energy technologies. Indeed, Africa's green bond market has been developing rapidly over the last 10 years, since Nedbank issued the continent's first green bond back in 2012 (Kidney, 2012). The use of proceeds of African green bonds has grown every year since 2015. In 2020, two green bonds were launched in Africa, one by the Egyptian government and the other by Standard Bank in South Africa for a total amount of over USD 1 billion (EIB, 2021). These green bonds have been used to cover projects in the energy, water, waste, construction, transport, and manufacturing sectors, signalling the flexibility of these instruments in supporting green economy development in Africa.

Capacitating and enhancing African financial systems is key to increasing capital availability for low-carbon and clean energy technologies. Enhancing domestic financial institutions and improving market liquidity will be necessary to create a balanced financing mix that is sustainable in the long term (UNDP, 2019) and deliver on the defined targets. Although still limited, sustainable finance instruments are increasingly used by African governments and local financial institutions as an opportunity to increase capital availability and sponsor infrastructure projects (EIB, 2021).

African banks are also increasingly considering climate risk in their investment decisions and are integrating sustainability principles in their strategies (see Box 3.6). In this context, green bonds and other sustainability-linked products offer the opportunity to explore new pathways of growth for local financial institutions while supporting the socio-economic development of countries. More diversified and innovative investment models will continue to emerge and evolve (Warren, 2019), considering the immense need for capital for supporting energy transition strategies and plans.

Box 3.6

ENERGY TRANSITION FINANCING IN AFRICA – NEDBANK

Nedbank, a leading bank in the Southern-Africa region, has been recognised as the Best Sustainable Finance Bank in Africa by Euromoney in 2021. The accolade was awarded to Nedbank for its successful structuring and arrangement of R2 billions of tier-2 green subordinated capital instruments (SDG-linked bonds) that were listed on the green segment of the Johannesburg Stock Exchange (JSE) on 30 June 2020, with one of the development banks in Africa (as the sole investor). The recognition of Nedbank also highlights its far-reaching and ongoing efforts to support and drive sustainable development in the continent. The finance raised from domestic and foreign investors were channelled in support of solar and wind renewable energy projects, of which Nedbank was an early supporter. This support is demonstrated with commitments of about R50 billion since the beginning of the South Africa Renewable Energy Independent Power Producer Procurement Programme (REI4P) and participation in the funding of 42 of the 105 projects to date. In the last years, the bank has enhanced its climate-related innovative funding bringing this total to R8,5 billion as of 30 June 2021.

Innovative sustainable financing is meant to boost Nedbank's ability to fund impact-based assets that will not only promote sustainable development but also ensure the long-term sustainability of the bank's balance sheet. In this context, the bank took one step further in its journey towards a purpose-led business. In 2021, it has issued a Climate Change Position Statement and adopted a new corporate Energy Policy.

Climate change is recognised as one of the defining systemic issues of the 21st century, alongside poverty and inequality, which are themselves exacerbated by climate change. Guided by its Sustainable Development Framework and by the objectives and principles of the Paris Agreement, Nedbank recognises its role in driving sustainable socio-economic development for the benefit of all stakeholders. The Bank aims to be at the forefront of managing climate change risks and financing innovative solutions in ways that are sensitive and flexible to the specific contexts and markets in which it operates towards the ambition of achieving net-zero by 2050. Accordingly, Nedbank has adopted its new Energy Policy aligning its financing strategy and mandate to energy-sector related activities with the Paris Agreement.

In its Energy Policy, Nedbank recognises that meeting the Paris Agreement objectives will require an orderly exit from fossil fuel financing well before 2050 and sets the goal to have zero exposure to all activities related to fossil fuels by 2045. To achieve this target, stringent rules and disclosure of related data are defined. Among others, such rules include:

- Terminating project finance to thermal coal mines outside of South Africa and new thermal coal mines regardless of the jurisdiction from 1 January 2025.

- No new oil exploration projects finance directly and terminate new financing for oil production from 2035.
- Terminating new gas exploration finance directly but to continue to finance natural gas production only where it will play an essential role in facilitating the transition to a zero-carbon system.
- Terminating finance to any new coal-fired power stations and new utility-scale or embedded oil-fired power generation, unless integrated as a backup supply to renewable generation projects.
- Terminating finance to new utility-scale or embedded gas-fired power generation from 1 January 2030, unless:
  - For renewable generation projects with integrated gas-fired backup supply; or
  - For the conversion of existing coal- or oil-based generation to gas and mid-merit or peaking capacity, to the extent that these are necessary to facilitate the transition to a zero-carbon energy system.

On the opposite spectrum, Nedbank aims at enabling the transformation of the energy system by associating financial flows with a low-emission and climate-resilient future. Nedbank will continue to scale up its historical commitment towards the fast-growing utility-scale renewable energy sector across Africa. It aims to further commit R2 billion of financing by 2022 in renewable-based embedded generation projects to support clients who are working towards generating their own secure, reliable, and affordable renewable-energy supplies.

Innovative approaches are also being tested to de-risk investments and improve investment conditions. Businesses exploring investment opportunities in African markets are often discouraged by the high cost of capital in most of the continent's markets (RES4Africa and PwC, 2021). The first reason behind such high costs is investors' high risk perception related to African markets. This is due to a range of factors including macroeconomic uncertainty, low creditworthiness of commercial counterparts, inadequate policy and regulatory frameworks, institutional weaknesses, and a lack of track records in similar operations (RES4Africa, 2020b).

To overcome these barriers, de-risking products and mechanisms are essential, including insurances and guarantees, to lower the cost of capital and launch competitive projects. Innovative solutions to de-risk investments are being already tested in Africa, built upon an improved collaboration between private developers, commercial banks, and development finance institutions (DFIs). The collaboration between these actors is crucial in maximising blended finance opportunities to decrease the cost of private capital. Especially in Africa, these solutions have demonstrated their potential in attracting private finance under better conditions and at lower interest rates. In 2018-2019, development finance interventions mobilised USD 13.8 billion from the private sector (OECD, 2021). The development of electricity infrastructure was one of the main beneficiaries of these instruments.

The clean energy sector, for instance, saw the emergence of several de-risking initiatives focusing on increasing private investments through dedicated public-private approaches. Successful examples include IFC's Scaling Solar initiative and KfW's GETFiT programme, both having already successfully supported renewable energy capacities development in several African countries. The European Guarantee for Renewable Energy, an EU's DFI-led initiative focused on promoting private sector renewable energy generation in Sub-Saharan Africa through a comprehensive package of guarantees, is another example.

Market potential and needs are, however, much larger. The Climate Policy Initiative (2018) estimates that the 46 emerging markets meeting the criteria for clean energy set by its Blended Finance Taskforce represent an investment opportunity of over USD1 trillion. Accelerating progress to meet the SDGs and improve clean energy technology deployment will require scaling up the blended finance market and defining more comprehensive, flexible, and fit-for-purpose de-risking programs and products. Foremost, leverage and mobilisation ratios will need to increase from the current low levels, as estimated by the Overseas Development Institute which found that for every $1 of DFI resources invested in low-income countries, only $0.37 private finance is being mobilised (Attridge and Engen, 2019; Blended Finance Taskforce, n.d.).

3.4

BARRIERS TO SCALING UP PRIVATE SECTOR IMPACT

A look at successful experiences from private sector companies active on the ground demonstrates how the renewable energy industry is firmly engaged in advancing SDG 7 targets in Africa. Such engagement supports the maximisation of national development outcomes. Therefore, scaling up these approaches offers unique opportunities to advance the sustainable development agenda in Africa and to engender socio-economic changes. Unfortunately, the amount of investments and associated projects is still too low and private sector involvement remains limited (IEA, 2021b).

Interviews with some of the companies and associations actively engaged in Africa helped to identify major bottlenecks and barriers that are preventing scaled deployment of renewable energy technologies in Africa and broader participation of the private sector. These barriers emerge from a multitude of factors and can be structured around three main interconnected levels. First, macro-environment level constraints relate to the instability of economic fundamentals and of the governance frameworks affecting the ability of countries to conceive and enact policies. It also refers to insufficient institutional capabilities and human capital development limiting the reaping of full benefits related to energy transitions. Second, constraints emerge within industrial value chains, as a consequence of limited integration in GVCs, limited R&D, as well as trade limitations. Third, at the business environment level, lack of transparency and poor implementation of policies and regulations continue to hamper effective private sector participation.

Constraints emerging at the macro-environment level

The macroeconomic context of most African markets remains worrying. The evolution of fundamental factors such as public debt, currency stability, and inflation still represent major investment risks. Despite a decade of economic growth, numerous African countries face challenges related to macroeconomic stability, healthy debt-to-GDP ratio, and stable inflation. The pandemic has further weakened the fundamentals of many economies. Fiscal deficits doubled in Africa to a historical high of 8.4 per cent of GDP in 2020 due to heavy

stimulus spending, and debt burdens are expected to rise by 10 to 15 percentage points in the short- to medium term (AfDB, 2021b). Moreover, continued currency depreciation was observed throughout 2020, with particularly high exchange rate volatility in resource- and tourism-dependent economies. Although inflation remained stable during 2020, the inflation rate across the continent has consistently outstripped the global average over the past decade (IMF, 2021). Acting as barriers to investments, high external debt, currency volatility, and inflation all serve to weaken the investment climate. Their worrying recent evolution risks to deteriorate investors' appetite towards investment in Africa.

Fragile governance frameworks, often with overlapping institutional mandates and insufficient capabilities, limit the involvement of the private sector. Institutional frameworks are often constrained by competencies and capabilities. The overlap of competencies amongst several institutions, redundancy, gaps, and possible administrative red-tape due to bureaucracy dissuade the private sector from entering African markets and undermine successful project implementation. Poor planning and conflicting government priorities prevent political ambitions and engagement from evolving towards firm commitment and defined policies.

A lack of reporting and monitoring systems prevents effective management and review of target implementation. In the absence of clear and transparent strategies, targets and detailed longer-term roadmaps, private sector actors are unable to implement long-term business strategies. Instead, they could be compelled to adopt shorter-term solutions to respond to opportunities. Finally, insufficient internal human resources and competencies are still major barriers preventing African institutions from fulfilling their mandate. Examples of this can be found by observing the governance framework of electricity sectors in some African countries. Competencies are still distributed across different Ministries. National regulators lack the necessary powers and capacities to regulate fundamental aspects for sector stability (i.e. tariffs) and their independence from political interference remains limited (AfDB, 2020b).

The lack of investments in human capital, from health to education, prevent the development of national value creation. A well-educated, healthy, and trained workforce is the backbone of building sustainable local value creation and for developing lasting national industries and job opportunities. However, the continent faces a lack of adequate investments in human capital development. Despite the progress achieved in the last decade, Sub-Saharan Africa continues to show the lowest human capital development levels (World Bank, 2020b). The COVID-19 pandemic further exacerbated this condition, while confirming at the same time the fundamental role of human capital investments for economic competitiveness (Manlan, 2021).

Governments trying to support local manufacturing and value creation tend to enforce it, for instance, through local content requirements embedded in infrastructure procurement schemes. These schemes at times do not properly consider national competitive advantages as well as local workforce skills and technical knowledge. As a result, private companies are forced to pay penalties or build local capacities that are not sustainable in the long term. Project and overall economic competitiveness decrease without the emergence of long-term benefits for national economies and populations. The lack of human capital and skills availability prevent the development of lasting national industries and job opportunities. They also limit advancements from low-skilled (maintenance, security, and construction) to high-skilled jobs (manufacturing, engineering, operations, and specialised services).

Constraints emerging at the industry value chain level

The marginal integration with global supply-chains and low levels of intra-African trade (15 per cent) inhibits the development of competitive national industrial and service providers champions. Africa lingers at the margin of global supply chains, engaging with them mainly through the provision of primary goods (UNCTAD, 2019). Intra-regional trade has been restricted by a lack of harmonised standards, complex and cumbersome procedural requirements, and deficient transport and communication infrastructure (Mbekeani, 2013). However, building competitive national industries requires stable supply chains, which should not be disrupted at any level, including inputs supply. Greater regional integration could create a large and stable market for renewable energy products and services among others, therefore enabling African countries to build national industries to serve these markets. To this end, the launch of the African Continental Free Trade Area (AfCFTA), which represents a market of about 1.3 billion people and officially commenced trading on 1st January 2021, will eliminate 90 per cent of tariffs, creating a single market with free movement of goods and services (Kende-Robb, 2021). The World Bank estimates that the AfCFTA will boost regional output by USD211 billion by 2035, with most of the gains coming from the services sector (World Bank, 2020a).

The lack of innovation, limited technology adoption and deployment remain major impediments to enable the sustainable transformation of Africa's energy systems and to increase local value creation. Insufficient investments in R&D and attention to social and technological innovation remain major impediments to clean energy adoption and deployment across Africa (UN, 2021a). Furthermore, there has been a lack of investment in Africa in systemic innovation to integrate the higher-value of clean energy technologies value chains from which it has been excluded so far (KfW, et al., 2021). There is a need to shift the focus on industrial development in areas where national competitive advantages

can be achieved. Technology uptake has often been challenging due to social resistance, misalignments between products and services provision and social needs, and socio-economic conditions (Blimpo and Cosgrove-Davies, 2019).

Sustainably maximising local content and establishing local production capacity and service provision requires not only a skilled workforce but also sustained long-term demand and a steady pipeline of projects. However, many African countries wrestle with low electricity consumption per capita, low levels of access to electricity, as well as low levels of industrialisation and penetration of residential electric appliances (IEA, 2019a) resulting in lower demand for new electricity infrastructure capacities. These challenges place constraints on the ability of governments to institute and maintain sustained investment plans and consequent procurement mechanisms. They also hamper the development of sustainable local industries and services. As demonstrated by the experience of South Africa's REI4P (Leigland and Eberhard, 2018), the localisation of value creation beyond the duration of individual projects is fundamental. The current limits undermine the ability of most African countries to integrate higher value segments of the renewable industry and fully benefit from its employment potential.

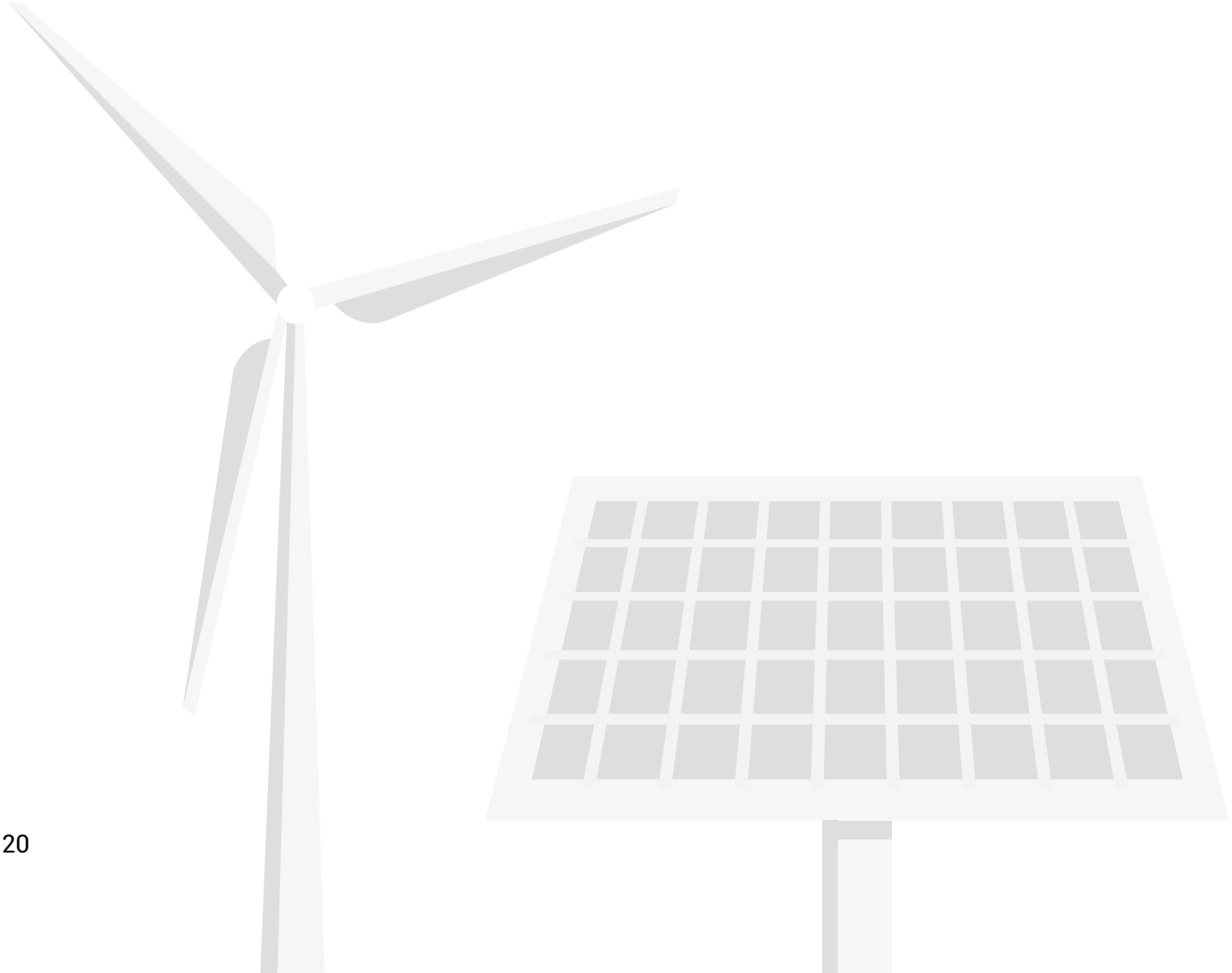
Constraints emerging at the business environment level

Unstable, non-transparent, and poorly implemented policies and regulations continue to limit private investments. Policy and regulatory environments play a key role in enabling effective private sector participation and investments. When evaluating the investment environment of Africa's electricity sector, investors and financiers assign the greatest importance to policy and regulatory risks (Probst et al., 2020). Policy and regulatory weaknesses continue to limit the openness, attractiveness, and readiness of Africa's electricity markets to the private sector (UNECA and RES4Africa, 2021). Beyond the degree of advancements in electricity market governance, structure, and design, African countries have gaps in the regulatory capacity to efficiently oversee the implementation of regulations, as well as ensure the stability and transparency of rules (AfDB, 2020b). The continent has among the least developed energy regulatory frameworks (ESMAP, 2020). When combined with red-tapes and administrative burdens, the instability and lack of transparency of electricity sector-related policy and regulatory instruments stifle effective private sector participation.

High-risk perception reduces the bankability of electricity infrastructure projects and increases the cost of capital for investors. Despite the considerable market potential, interest from private investors remains elusive, and projects often fail to reach the investment stage due to the effect of the mentioned challenges. The mistrust of investors is directed particularly towards political risk, counterparty/sovereign risk, transparency, and fairness of

market mechanisms (RES4Africa and PwC, 2021). These challenges have a direct impact on the availability and cost of capital, both equity and debt. As a consequence, the bankability of clean energy projects remains challenging and existing de-risking instruments fail to appropriately cover all technologies and all stages of the project life cycle (RES4Africa, 2020b). End-to-end solutions, such as the one-stop-shop instrument proposed by the renewAfrica initiative will prove crucial in creating a pipeline of bankable projects, easing private investment (RES4Africa, 2021).

The long-term economic viability of electricity infrastructure investments remains further challenged by the structural instability of revenue streams. Only profitable businesses stand a chance of scaling up impact. Although the potential for clean energy technology deployment, both centralised and decentralised, is tremendous, long-term viability of business models remains a major challenge in Africa (IEA, 2021b). Both public and private off-takers and customers, including the ones from the bottom-of-the-pyramid market segments, do not offer proper guarantees for the stability of project revenue streams and expose investors to a multitude of revenue-related risks, on both volume and price. Addressing these risks requires entrepreneurial innovation on business models and payments modalities, as well as support from governments and development partners (IFC, 2012).



3.5 CONCLUSION

In the face of a growing population and declining but still high levels of poverty, providing sustainable, affordable, and reliable access to modern energy to all in Africa is crucial to enable socio-economic development. The pursuit of energy development strategies aligned with the 1.5C° climate target is beneficial for achieving SDG7 by 2030. However, progress towards the SDG7 targets is far from being on track. Energy access is stagnating after two decades of constant improvements, mainly as a consequence of COVID-19. Clean technology deployment in Africa remains marginal, with the continent currently home to only 2 per cent of global installed renewable energy capacity, despite representing 17 per cent of the global population (RES4Africa, 2020a). As a result, most of the associated benefits of clean energy technology expansion have yet to materialise at scale.

To see IRENA's projection materialise in Africa and enable the maximisation of the socio-economic benefits of the energy transition, a rethink and scale-up of current efforts is needed. Cooperation and contribution will be fundamental from all sides including governments, societies, development partners, the public sector, and private sector investors. The latter particularly has the capacity, both in financial and technical terms, to become a key driver of energy transition in Africa and mobilise investment resources. As highlighted in this chapter, businesses are increasingly integrating sustainability in their value propositions and exploring new ways to provide value to all their stakeholders. The rationale for adopting sustainable approaches and investing in sustainable production processes, final products, and services is no longer limited to reputational benefits but also to the opportunities that sustainability offers: new growth opportunities; improvement in operational efficiency; cost reduction, and risk mitigation and profitability.

The renewable energy industry is a perfect example of an industry built upon sustainability principles. As such, the RE industry has become a leading advocate for the integration of sustainability into global economic agendas, including in Africa. By providing innovative solutions to meet global energy needs in a competitive and climate-friendly way, renewable energy companies have become a fundamental pillar of the transformational process of

economies worldwide. Africa has the opportunity to benefit from similar transformations. Indeed, pioneer initiatives across the continent are already demonstrating the potential of clean energy deployment to answer African energy needs, create jobs, and support local communities. At the same time, the renewable energy industry is adjusting its business strategies and modus operandi to the African context to maximise positive impacts.

Some energy companies are reorganising their value propositions to better address African customer needs. They are doing so by taking on challenging projects to meet the energy needs of bottom-of-the-pyramid markets and expand electricity access in remote areas. This consists of developing and offering new categories of products and services to provide electricity access to an unserved customer base of hundreds of millions of potential customers. Other companies are finding solutions to localise value creation and to enable Africa to better benefit from the industrialisation and job opportunities of the energy transition. Through carefully designed infrastructure procurement programs and local content regulations, countries such as Morocco and South Africa have been able to define fruitful public-private collaborations to kick-start national renewable industries and manufacturing capacities. Similarly, the burgeoning off-grid renewable energy market has provided opportunities to countless SMEs and has created substantial direct employment. For example, employment in the off-grid market of Kenya is equivalent to its traditional power sector.

These successes have been made possible by complementary efforts to create an enabling environment for businesses to thrive in. Forward-looking private companies have taken bold steps. Private-led technical and vocational training programs have been key to enhancing local workforce skills. Awareness-raising campaigns, about the benefits of renewable energy deployment, have shown results in strengthening the participation and support of local communities. Investments in social infrastructure help garner social acceptance. Effective public-private dialogue drives positive impacts on local communities. Maximisation of the socio-economic benefits resulting from energy transition has been facilitated by the development, and increasing adoption, of innovative fit-for-purpose financing mechanisms. New de-risking instruments from international and development financial institutions, such as insurances and guarantees, are available to private investors. New corporate finance instruments, such as green bonds and SDG-linked financing products, managed to increase the financial capabilities of private companies to invest in clean energy technologies, while also enhancing their accountability towards investors and societies.

Despite such endeavours, accomplishments and success stories remain limited in scope and scale. The macroeconomic context of most African markets remains worrying and stands out as a major barrier to private investment. Poor governance frameworks and the low

capacity of national institutions reduce African countries' ability to conceive, adopt, and implement policies. These are needed to provide long-term signals to private players to plan investments. Moreover, limited human capital infrastructure can damage the outlook for project implementation and local gains. Africa continues to face marginal integration into global supply chains, coupled with inadequate investments in innovation and technology adoption. Low or intermittent demand for electricity services further limits market size and stability of demand for renewables. Finally, at the business environment level, inadequate or poorly implemented policies and regulations, as well as the high-risk perception associated with the African business environment impact the bankability of project pipelines. The combination of these elements with the structural instability of revenue streams associated with most of the current business models for clean energy development in Africa reduce the appetite of investors and hamper scaled-up renewable energy deployments.

However, successful stories demonstrate that a sustainable transformation of African energy and economic systems is feasible and the renewable energy industry is ready to play its role. A better understanding of Africa's local realities and needs is needed to scale up the adoption and deployment of innovative, sustainable, and close cooperation among key stakeholders. The next chapter offers recommendations from the three institutions involved in developing this report on the way forward. Having these recommendations adopted by a wider business community would be useful to shore-up commitments from the international community, development partners, and the private renewable energy industry to succeed in the goal of sustainable energy transition and maximised socio-economic gains in Africa.

4

MAXIMISING THE SOCIO-ECONOMIC IMPACT OF AFRICA'S SUSTAINABLE ENERGY TRANSITION

4.1

THE THREE DRIVERS OF SOCIO-ECONOMIC IMPACT

The next ten years will be key for sustainable development in Africa. Both the UN HLDE and the COP26 recalled that actions that governments decide to take in the coming years will shape both the possibility of achieving the SDGs and the preparedness of the continent to tackle the consequences of climate change.

The engagement with, and actions of, the international community will have significant repercussions in Africa, as the continent is considered the most vulnerable to the vagaries of climate change. African governments, supported by the international community, must define new pathways to sustainable prosperity. The best way forward globally is to adopt and implement changes that can help deliver a 1.5°C scenario and find solutions that simultaneously enhance equality, justice, and social inclusion.

A growing number of studies and macro-economic forecasting, including those covered in this report, show that pursuing energy transitions based on clean energy development at scale offer wide benefits. These benefits would be realised in terms of economic growth, job creation, and improved social welfare. While most of the literature has focused on these positive impacts globally, the previous chapters showcased that the African continent would also benefit from accelerating the energy transition in terms of economic growth and socio-economic progress.

In the African context, energy access is a crucial requirement. Eradicating poverty goes hand in hand with ending energy poverty. The fight against climate change demands closing the energy access gap sustainably. Nevertheless, achieving SDG7 presents considerable challenges. With current stated policies, Africa will fall behind its targets. Constraints and barriers, highlighted throughout the report, are present at different levels and need to be addressed through improved collaboration from all stakeholders. The private sector is particularly essential in catalysing energy transition investments.

Achieving sustainable energy transition in Africa and maximising socio-economic benefits and value creation will require a systematic approach. To succeed in this effort, coordinated and well-defined actions are needed at three levels:

Actions at the macro-environment level

African countries need to address the challenges and constraints emerging from the instability of their macroeconomic and governance frameworks. These affect the ability of countries to conceive and enact decisions at all levels. The design of effective policies and their implementation is essential, along with institutional and human capacity development.

Actions at the renewable energy industry value chain level

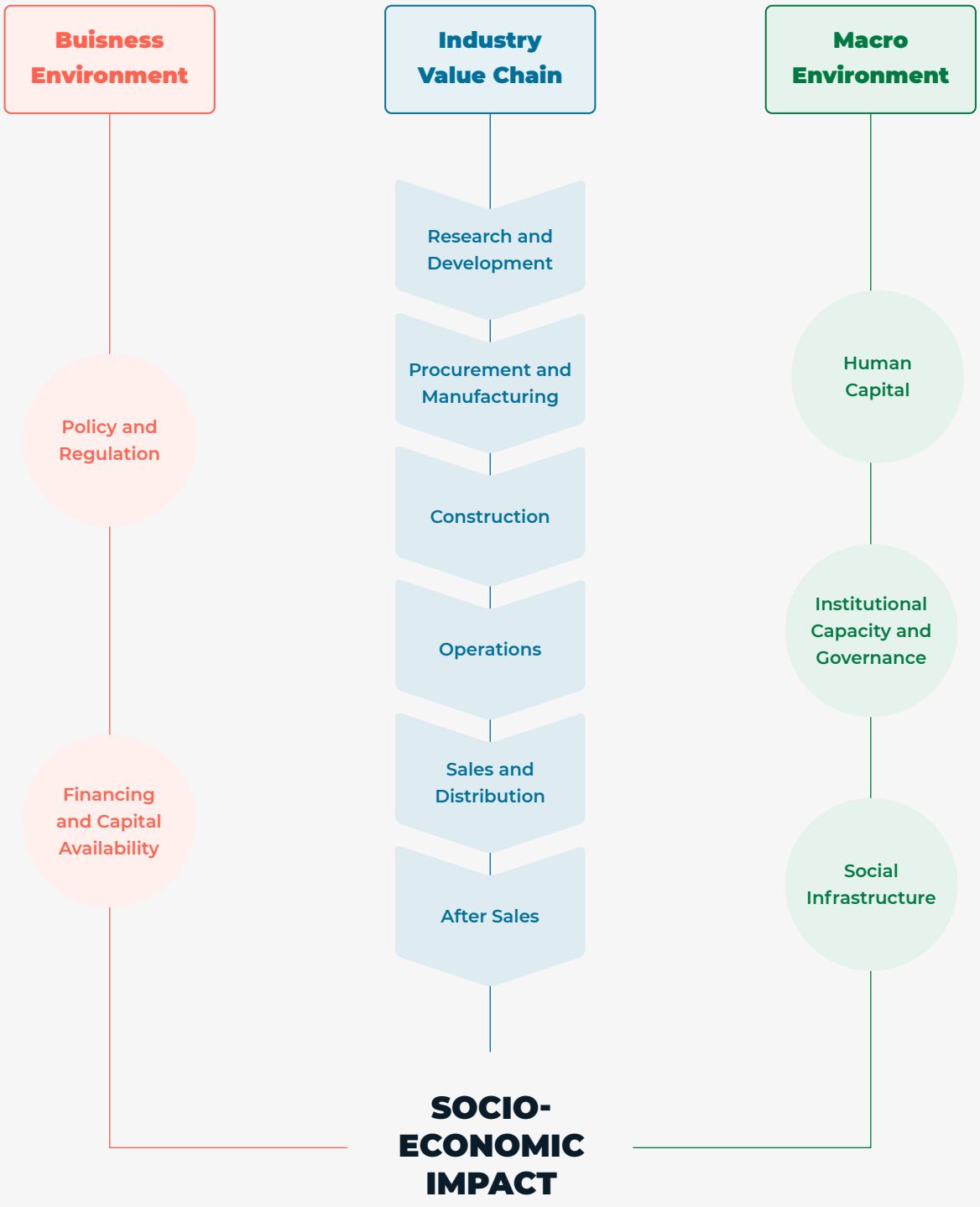
Success in building competitive national economic capacity that can generate long-term value is essential. Towards this end, African countries should address current industrial constraints stemming from a lack of integration in GVCs, limited R&D, as well as limitations in trade.

Actions at the business environment level

As barriers emerge – especially in innovative and fairly new business sectors such as clean energy – and hinder the ability of policies and regulations to address the requirements of investors, African countries need to define fit-for-purpose measures that ensure a fair and attractive business environment to accelerate project implementation.

Figure 4.1

The three drivers of socio-economic impact



AS JOINT AUTHORS OF THIS REPORT, UNECA, IRENA, AND RES4AFRICA CALL FOR ENHANCED COOPERATION AMONG COUNTRIES, PUBLIC AND PRIVATE SECTORS, AND THE INTERNATIONAL COMMUNITY TO ACCELERATE SUSTAINABLE DEVELOPMENT GOALS IN AFRICA AND SUPPORT A JUST AND INCLUSIVE ENERGY TRANSITION. THE IMPORTANCE OF COLLABORATION AMONG STAKEHOLDERS IS ONE OF THE KEY MESSAGES OF THIS JOINT PUBLICATION, ALSO IN LIGHT OF POST-COVID RECOVERY EFFORTS. JOINT RECOMMENDATIONS ARE PRESENTED BELOW TO SUPPORT THE SUSTAINABLE TRANSFORMATION OF AFRICA'S ENERGY SYSTEM AND MAXIMISE ITS CONSEQUENT SOCIO-ECONOMIC GAINS.

4.2 RECOMMENDATIONS

Actions at the macro-environment level

1 Integrate inclusiveness and social justice principles in the definition of energy strategies to leave no one behind.

The transition and sustainable transformation of energy systems in Africa would contribute to overall socio-economic development and sustainable and shared prosperity. Indeed, energy transition needs to be just and fair to garner wide national acceptance and secure trust in the changes to come. To avoid perpetuating injustices from the conventional energy system or creating new inequities, a wide set of just transition policies is needed. The SDGs framework could provide useful guidance. The consideration of SDGs in the definition of energy strategies will help advance the achievement of the overall sustainable development agenda. These just policies for sustainable socio-economic development comprise industrial policies for viable supply chains and education policies for a skilled and capable workforce, including retraining and re-certification of fossil fuel workers with relevant skill sets. Active labour market policies are needed for adequate employment services and the facilitation of labour mobility. To address potential misalignments, social protection programmes, including increased financial inclusion, could help affected workers and communities in coping with a sometimes lengthy and difficult transition period. Globally, as intensely discussed at COP26 in Glasgow in November 2021, international financial support needs to be increased significantly. International climate change finance also needs to address just transition in developing countries and hence on the African continent. To turn energy transition into a means for development, international finance needs to go into energy access and social development, renewable energy deployment, energy efficiency, and addressing overall energy infrastructure gaps. Ultimately, the success of energy transition strategies would depend on their ability to reflect national and local contexts, and the degree to which countries champion them.

2

Establish sound governance and capacitate institutions to deliver on inclusive energy transition and sustainable development goals.

African countries are making significant efforts to improve their governance frameworks and institutional capacity. However, political instability and consequences of conflicts are still a threat in some geographies. Gaps remain between political commitments and consequent policies and national implementations. Building political support for sustainable energy development and energy transition makes a significant difference. To boldly chart forward, political commitment needs to be carefully secured, backed by policies and roadmaps that set concrete and achievable targets. Instruments to facilitate delivery of projects should be shared, progress towards targets should be monitored and evaluated, and follow-up to address implementation challenges should link to desired outcomes. Accountable institutional champions should be capacitated. Indeed, even when policies are enacted, effective implementation is often slowed or stalled by limited institutional capacities. Building capable institutions should become a cross-cutting priority for the successful implementation of policies. Development aid in the form of technical assistance should be channeled towards supporting public institutions and authorities deliver on policies and targets.

3

Align energy infrastructure development planning to socio-economic development agendas and priorities.

A reliable, competitive, and sustainable access to modern forms of energy is a precondition for the realisation of almost all socio-economic development policies. As such, energy infrastructure development must be prioritised by national development agendas. Comprehensive SDG7 achievement action plans should be adopted or reviewed, at national levels and their implementation should be well-coordinated and closely overseen. A clear and shared articulation of the challenges that need to be overcome in all the major SDG7 goal areas should be undertaken and consensus should be secured to design, or review, the proposed action plan. Governments need to include energy considerations in their recovery plans and consider upgrading their economic models to reflect parameters and inputs associated with increased sustainable energy access. The adoption of policies for the deployment of clean energy technologies needs to move from single-project approaches to project pipelines. Backing from international development partners could be useful in supporting the development of sustainable energy infrastructure.

4

Define and create appropriate multi-stakeholder consultative platforms and partnerships for policy definition and target implementation.

While governments will play a crucial role in promoting energy transition, they cannot achieve this outcome alone. A right balance between the public and private sectors will need to be struck. The involvement of local communities and civil-led initiatives should be encouraged to increase the uptake and support by communities. Stable and long-term plans can help kick-start and sustain the changes that are needed across the economy and society. Successful transitions are inclusive, and towards this end, planning should be consultative, at both national and sub-national levels. Collaborative approaches can be strengthened following three objectives. First, getting inputs from stakeholders, including businesses, on national plans. Second, establishing feedback channels on how policies affect businesses and local communities. Third, monitoring the initiatives. Governments should indeed guide these processes and ensure firm engagement from all stakeholders to secure commitments and support for sustainable economic transformation processes and outcomes.

5

Reinforce investments in the social infrastructure needed to deliver on sustainable economic and energy transition priorities.

Educated, trained, and well-prepared human capital is the backbone of a prospering society. While industrial policies will be needed to support the creation of sustainable and competitive local supply chains, active social and labour market policies will be key to supporting human capital development. It is also essential to prepare African communities and workers to benefit from the opportunities of sustainable energy strategies. Building functioning national education infrastructure, from primary schools to graduate institutions, is a key prerequisite for Africa's prosperity and for localising value creation. Reskilling of the local workforce, professional and technical training programs and enhanced mobility of workers are also crucial to develop skills for a green economy and successful energy transition. Private and business-led educational initiatives could complement national education programs. Collaboration between public and private institutions in this regard should receive encouragement and support. Finally, other social infrastructures such as healthcare facilities are also instrumental in building human capital in Africa.

6

Enhance public awareness about the benefits of green industrialisation to build social support and acceptance.

Green industrialisation and clean energy technology deployment can create good jobs, support climate adaptation and mitigation, and could decouple economic growth from environmental degradation. However, there remain many of myths and rumours at societal level about the possible negative adjustments driven by sustainable economic transformation. Open and inclusive advocacy and information campaigns about the potential advantages of energy transition strategies are constructive in creating public awareness about the benefits of green industrialisation. The perceptions of societies and other stakeholders about the advantages and disadvantages of sustainable energy development could be improved through the transparent sharing of information about the risks and the structural changes needed. Collaborative approaches to estimating negative externalities and assessing compensation could help diminish resistance and NIMBY reactions, and build trust and engagement. Just and inclusive policies looking to compensate the affected communities, whether it be on a social, health, or gender equality level, will ensure that there is broad commitment and support for longer-term transition plans.

Actions at the industry value chain level

7

Leverage South-South economic and industrial integration to build competitive African supply chains and manufacturing capacities.

African governments need to look beyond their national market potential and explore opportunities for regional integration to boost industrialisation and local manufacturing capacities. In alignment with Agenda 2063, Africa's integration with global supply chains will play a key role in supporting the industrialisation of the continent. To do so, African countries must continue supporting the development of regional markets to encourage the development of regional and continental supply chains. Minimising trade barriers and supporting the free movement of people and workers across Africa is fundamental. The trade-industrialisation nexus in Africa holds tremendous potential. Implementation of the Africa Continental Free Trade Area will play a pivotal role in this regard. Complete implementation has to be prioritised as a way to build effective continental economic integration and industrial competitiveness. Logistic infrastructure – such as airports, seaports, and border crossings – need to be expanded and their efficiency increased, while customs procedures need to be simplified to ease integration into GVCs. To facilitate trade in services, visa procedures and other barriers to free movement need to be mitigated and addressed.

8

Scale up investments in science, technology, research, and innovation to promote sustainable technology uptake and local production.

To successfully localise value creation, it is important to use first-mover advantages in technology research and innovation. African countries will benefit from channelling financial support, in terms of fiscal incentives and subsidies, towards emerging industrial sectors where they could secure competitive advantages (i.e., hydrogen, batteries, etc.). Over time, this must be complemented by upscaled support to localised R&D infrastructure and facilities by identifying promising sectors and solutions into which public investment should be channelled. Easing technology acquisition, contextualisation, and diffusion would play a major role in pursuing sustainable energy transition. Efforts should also be taken to increase pilot and demonstration projects implementation across Africa through better collaboration between public, private, and international organisations. Socio-economic and cultural consideration is also fundamental to overcome resistances that are holding-back sustainable technology uptake. Towards this end, ensure that all social groups can participate in the sustainable transformation of energy systems and benefit from its opportunities.

9

Set up smart local content regulations to support local value creation opportunities aligned with national competitive advantages.

If set properly, local content or local value creation regulations (LCRs) could help African countries in creating national manufacturing capabilities, supporting them in becoming progressively more competitive and integrating into global value chains. A pre-assessment of national competitive advantages is needed to inform the design of LCRs. Collaborating with the national and international private sector and development partners is crucial starting from the pre-assessment phase of national competitive advantages. The participation of small- and medium-sized enterprises must be considered. Their development through participation in industrial district creation could be considered. Lasting support and the ability to ensure long-term stable demand, at the national and regional levels, is key to guaranteeing the reliability of supply and sustainable, long-term value creation.

10 **Reinforce technical and vocational training programs to build the skillsets required to develop energy transition sectors.**

Energy transition strategies offer significant direct employment opportunities across sustainable energy sectors, both in manufacturing and services. They also boost indirect job creation. To enable African countries to benefit from this potential, workers and the future workforce need to have the right skill set. An integrated approach to labour and educational policy and planning will be needed to address this challenge. Technical and professional training institutions will need to coordinate and align with private sector requirements. An integrated approach to labour and educational policy and planning will be needed to address this challenge. Moreover, identifying transversal skills – skills that are not exclusively related to a particular job or task but rather apply to a wide variety of work settings and roles– would help to keep the workforce more agile. African countries are especially challenged by gaps at higher skills levels, whereas vocational training could provide useful resources to integrate the African workforce in energy transition sectors. Keeping up with innovation and technical change requires train-the-trainers programs, also to ensure quality and dependable performance of the energy system.

Actions at the business environment level

11 **Expand the innovative project and corporate financing schemes, such as green and SDG bonds, to increase capital availability for sustainable and impactful projects.**

Public spending will remain a significant driver of the energy transition investments, but significant private sector investment will be needed to deliver on SDG7. Development assistance and public spending, notably in a post-COVID 19 scenario, are required to support social programs and infrastructure. Increasing private and market-driven financing to investment-ready sectors such as energy infrastructure is necessary. Innovative instruments – such as green bonds, SDG bonds, and sustainability-linked corporate financing products – are surging in financial markets and are increasingly accessible by investors. So far, these schemes have been used mainly to finance projects in wealthier nations. African markets represent a promising destination for impact investors. These instruments help increase the available capital to support the deployment of clean energy technologies. They enable the provision of private financing aligned with positive long-term socio-economic impact. African governments should look into developing common measurement systems to track the economic, social, and environmental benefits of projects. Private sector organisations willing to engage in Africa could support the uptake of these financing products, also with the support of international and local financial institutions. The private sector can be involved in developing consistent approaches to due diligence, development, construction, and operation to shore-up socio- economic impacts while improving financial returns.

12

Increase the participation of domestic financing and local financial institutions in support of sustainable energy projects.

International financing and FDIs play and will continue to play, a relevant role in supporting energy transition investments. However, the continent has resources to increase domestic finance. The participation of local financial institutions in sustainable infrastructure development should be encouraged. Structuring local capital markets will allow the issuance of financing instruments such as corporate and sustainability bonds, in local currencies, thus reducing foreign currency exposures. Domestic financial institutions are also best positioned to increase financing to national SMEs, which are at the heart of all efforts to localise value creation. Their capacity in this regard needs to be improved to enhance their ability to address bankability requirements. The channelling of savings towards domestic investment and local market opportunities could be increased, also thanks to the development of domestic banking and financial inclusion.

13

Expand the availability and accessibility of de-risking tools and products to decrease the cost of capital for sustainable projects.

Untapped markets, such as those in Africa, provide significant investment opportunities. However, perceived risks may make investors hesitant and decrease their investment appetite. Across the continent, projects struggle to attract private capital due to political, legal, and economic risks. While the perception of these risks is not accurate, mitigation strategies can be adopted to ensure that renewable energy transactions are closed. First, DFIs should continue efforts in attracting finance from private equity partners and commercial debt providers. They have the institutional experience and understanding of the risks involved in energy projects. They also have developed a set of risk mitigation instruments such as guarantees and insurances against expropriation and payment defaults. Indeed, the usage of risk mitigation tools is becoming more common in Africa. Furthermore, states can also assist in the mobilisation of private capital by enacting regulatory instruments, fiscal incentives, and other policies and initiatives aimed at reducing risk and promoting market development. Through public finance, governments can take steps to de-risk projects and mobilise private capital via blended finance and other emerging business models. They can also foster an enabling environment with appropriate policies and strategies to attract local and global investors. Accessibility of risk mitigation products and tools to private investors should also be improved through one-stop-shop solutions providing end-to-end support across project stages to create a pipeline of bankable projects.

14

Improve the openness, attractiveness, and readiness of electricity markets through fit-for-purpose policies and regulatory reforms and improvements.

Building investment-friendly policy and regulatory frameworks is key to crowd-in private sector investment. While there is no single model or a silver bullet, that can address the variety of challenges African countries face, developing national power sector transformation plans is crucial for a just and inclusive energy transition. Efficient electricity market design is essential to address the endemic barriers to private participation in Africa's electricity markets. Furthermore, regional harmonisation of rules and regulations is pivotal to ensure reliable and competitive electricity supply, while electricity market integration will increase sustainable energy development and reduce electricity costs. Active engagement of the private sector is essential to support the development of Africa's national and regional electricity markets. Technical assistance programs from development partners could be leveraged to enhance electricity market openness, attractiveness, and readiness towards effective private sector participation.

15

Redirect public support such as incentives and subsidies to sustain fragile populations and sustainable energy consumption behaviours.

The presence of market-distorting subsidies still hinders sustainable investments in Africa and support polluting energy consumption. Improving reporting and transparency on the allocation of subsidies could facilitate the phase-out of non-targeted measures. It could also offer opportunities to align subsidies with sustainable and inclusive energy development and climate-friendly consumption. The introduction of carbon pricing frameworks could improve market signals to investors and channel increased resources towards clean energy investments. Better cost-reflectiveness of energy prices is needed, along with progressive removal of direct and indirect subsidies. Simultaneously, where necessary, assistance and support to the most vulnerable customers should be extended through dedicated subsidies on connection costs. These measures are needed to increase the long-term financial viability of the energy sector and enhance its attractiveness to credible investors. Finally, the improvement in accounting methods for environmental externalities may help in holding back financing from polluting energy investments.

RECOMMENDATIONS

Figure 4.2 The recommendat

Calibration and tailoring

6 Enhance public awareness about the benefits of green industrialisation to build social support and acceptance.

8 Scale-up investments in science, technology, research, and innovation to promote sustainable technology uptake and local production.

9 Set up smart local content regulations to support local value creation opportunities aligned with national competitive advantages.

10 Reinforce technical and vocational training programs to build the skills set required to develop energy transition sectors.

11 Expand the innovative project and corporate financing schemes, such as green and SDG bonds, to increase capital availability for sustainable and impactful projects.

13 Expand the availability and accessibility of de-risking tools and products to decrease the cost of capital for sustainable projects.

Condition for joint efforts

3 Align energy infrastructure development planning to socio-economic development agendas and priorities.

4 Define and create appropriate multi-stakeholder consultative platforms and partnerships for policies definition and targets implementation.

7 Leverage South-South economic and industrial integration to build competitive African supply chains and manufacturing capacities.

12 Increase the participation of domestic financing and local financial institutions in support of sustainable energy projects.

14 Improve the openness, attractiveness, and readiness of electricity markets through fit-for-purpose policies and regulatory reforms and improvements.

15 Redirect public support such as incentives and subsidies to sustain fragile populations and sustainable energy consumption behaviours.

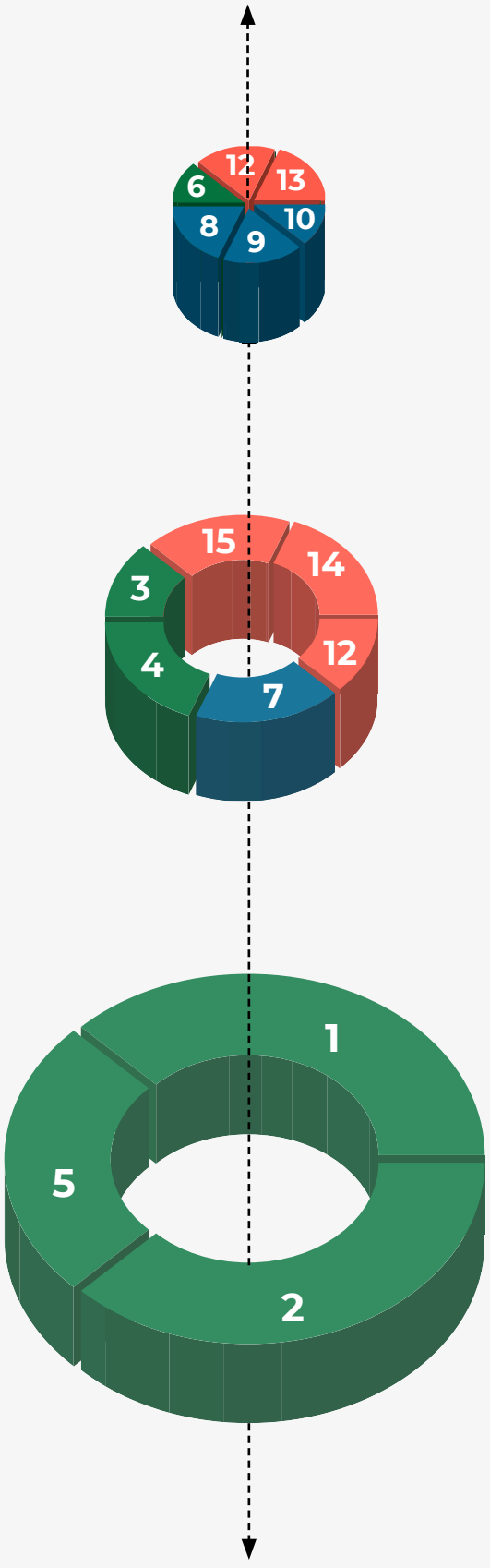
The Base

1 Integrate inclusiveness and social justice principles in the definition of energy strategies to leave no one behind.

2 Establishing sound governance and capacitate institutions to deliver on inclusive energy transition and sustainable development goals.

5 Reinforce investments in the social infrastructure needed to deliver on sustainable economic and energy transition priorities.

tion implementation journey



OUTCOMES

Calibration and tailoring

- Planning is fit-for-purpose
- Resources are allocated more efficiently toward energy transition goals
- African regional markets are consolidated
- Favourable business conditions are ensured
- Stakeholders are included in decision-making

Condition for joint efforts

- The availability of skills matches demand
- Innovation and finance are tailored to local needs
- Stakeholders take ownership of projects

The Base

- Policies integrate socio-economic considerations
- Institutions are prepared to lead the transition
- Education and health of the population is ensured

WAY FORWARD

This report covers the status quo, future opportunities, and the role of public and private sectors in achieving the socio-economic benefits that will result from a transition by African countries to greater use of sustainable energy solutions. As with any undertaking that involves building new, while also operating existing infrastructure, it is a complex challenge with many moving parts and players. However, the size of the prize and the tools that are already available should leave the reader with a sense of optimism. There is a large and feasible opportunity to "get it right" in the coming years and avoid what can often happen – which are poorly planned or executed programmes that then need to be "made right" afterwards, often incurring substantial additional costs.

Africa's future can be bright. An ambitious energy transition can help pave the way to full access to clean and affordable energy, yield new economic opportunities, and promote sustainable development. The renewable energy potential of Africa is substantial. Its development can lead to supply meeting increasing demand. The scaling up of this process could reposition the future of non-fossil fuel markets. An ambitious energy transition strategy will help to pair growth with jobs and find solutions going beyond the additional megawatt towards inducing structural changes in economies and societies. The policy framework required addresses technology deployment, skills, social security, and job security, and provides the necessary built, institutional, educational, and societal infrastructure for a prosperous and climate-resilient future.

Governments and other players need to stop "running alongside their bicycles" in their attempts to try and address socio-economic challenges. Instead, they should plan appropriately for the longer term, and leverage all the values inherent in international cooperation, including South-South cooperation frameworks. Faster, more focused and more successful progress can be made with well-designed strategies and dedicated implementation, supported by appropriate instruments to maximise the socio-economic benefits of the energy transition in Africa. IRENA, UNECA, and RES4Africa stand ready to support the energy transition efforts of African countries. We encourage all players to move forward better by committing to the recommendations and partnering for their implementation.

An energy system centred on renewable energy can help resolve many of Africa's social, economic, health and environmental challenges. Africa can resolve these challenges by working together inclusively with a wide range of stakeholders to expand energy access, create decent jobs, eradicate poverty, and improve the welfare of all its citizens. While this may seem like a daunting task, African nations have already demonstrated their capacity to confront such formidable challenges with impressive results. By acting together, and acting now, we can ensure that Africa's bright future lives up to its potential.

Visionary Statement

THE ROLE OF ENERGY ACCESS FOR A JUST TRANSITION IN AFRICA

by Koen Doens, Director-General, European Commission Directorate-General for International Partnerships

The best way of assessing the importance of energy is to imagine your life without it. Access to energy is crucial for economic and social development and improved access to healthcare and education. It is key for individuals and societies as a whole. Africa's potential in hydropower, solar, biomass, wind and geothermal energy could allow the continent to play a leading role in shaping a sustainable energy future. Unlocking that potential is a pivotal ambition.

Today, most of the continent's huge renewable energy resources remain untapped, while Africa has the potential to leapfrog into modern technologies that are not only compatible with the future energy transition, but also make economic sense. Finding a sustainable way to meet growing energy needs, with the adoption of innovative and sustainable technologies, and the promotion of an energy transition that fights inequalities and generates inclusive growth, is one of the core development challenges, as it creates opportunities for women, youths, and children in both urban and rural areas.

The EU is fully committed to playing a key role as a partner for Africa in this great endeavour by actively supporting the uptake of sustainable energy through our programmes and in all our policy dialogues. We want to support large-scale renewable energy infrastructure in urban conglomerations as well as local, decentralised renewable energy solutions in smaller cities, and especially in underserved remote rural areas, to achieve a just and inclusive transition.
These can be best accomplished through locally placed solar, hydro or renewable biomass schemes, avoiding the costly transport of fossil fuels. Off-grid decentralised renewable energy schemes are emerging as part of the solution to bridge the energy access gap and open up wider economic opportunities that offer indirect job creation in a wide range of sectors such as agro-processing, healthcare, communications, business and trade.

While promoting clean energy businesses, it is also key to ensure that the local workforce has the skills to match the needs of sustainable energy industries and therefore it is important

to invest in building or enhancing capacities that can create such added value. This means that vocational training, better-skilled teachers and better-targeted curricula in technical, marketing, financial, and managerial subjects are needed. It also means harnessing the potential of digital learning to bridge the digital divide and supporting women and young people's increased participation and ownership. We must ensure that no one is left behind and that the most vulnerable will also benefit from the dividends of improved energy access.

Between 2014 and 2020, the EU allocated more than EUR3 billion euros for energy-related actions in Africa. We supported capacity building, policy reforms and private investments, providing energy access to 22 million people. Moreover, European Commission President Ursula von der Leyen recently announced the mobilisation of additional EUR4 billion euros for climate finance until 2027.

Under our current external action budget, which runs until 2027, we plan to do even better. With raised ambitions, we are increasing our available funding to climate action from the current 20 per cent to -at least- 30 per cent. To further scale up the impact of our commitment, we are joining forces with the EU Member States in a "Team Europe" approach.

During the next EU-African Union Summit, we propose to launch an Africa-EU Green Energy Team Europe Initiative to increase clean energy access for households and businesses, including in rural areas. Accompanied by a substantial investment package, the initiative will also boost renewable energy generation and energy efficiency. We aim to support domestic supply chains and ensure that local communities benefit broadly from a growing clean energy sector through capacity development, technology transfer, training, education and employment. We intend to crowd-in private sector investments and substantially increase the flow of capital to Africa's clean energy sector. We are looking to maximise the positive impact of a decarbonised future, focusing on the goals of decent work for all, social inclusion, and poverty eradication.

We firmly believe that Africa can become a major global player in renewable energy. Through our revived partnership and enhanced opportunities of working together, we can jointly facilitate a sustainable energy transition that benefits us all, environmentally, socially and economically.

Visionary Statement

ENSURING A RAPID, SUSTAINABLE, INCLUSIVE AND GREEN RECOVERY IN AFRICA

by Maria Shaw-Barragan, Director of Lending in Africa, Caribbean, Pacific, Asia, and Latin America, European Investment Bank

The COVID-19 pandemic has been disastrous for the people and economies of Africa and aside from the lost lives and livelihoods, the crisis has also led to increased unemployment, inequality and poverty, threatening peace and stability. There is a real risk that years of economic progress may be lost to the pandemic, jeopardizing the timely achievement of the Sustainable Development Goals.

Pandemic response and economic recovery must come quickly and it must be inclusive so that no one is left behind, sustainable, in terms of strong economic fundamentals that bring lasting benefits for generations to come, and green if we are to "build back better". We must bear in mind that Africa contributes very low greenhouse gas emissions, and yet it is highly impacted by climate change. Its rapidly growing population and development pace call for a rapid increase in electricity supply, yet we must ensure that this supply is generated from clean energy sources to ensure long-term prosperity.

EIB has been a partner to African countries since 1963. In 2020, we achieved record lending levels, providing more than EUR 4.5 billion of new financing for the continent which backs more than EUR 12 billion of new investment to improve agriculture, access to off-grid renewable energy and accelerating rural electrification, affordable housing, communications, climate resilience and climate insurance for smallholders, healthcare, and private sector access to finance. Over half of our investment was in the private sector, and over 70 per cent of investment in Sub-Saharan Africa went to the Least Developed Countries and fragile states.

During the past year, the EIB also responded quickly to Covid-19 relief efforts, helping to roll out affordable vaccines in Africa through the COVAX initiative and ensuring that financial institutions and entrepreneurs continued to have access to much-needed funding. To date, the EIB continues to support the local manufacturing and distribution of vaccines and strengthening of health systems which will be essential for Africa's economic recovery.

Looking at the next seven years, the EIB's activities in Africa will continue to address the major common challenges with a strong focus on Climate Action and policy priorities as part of "Team Europe". The EIB's efforts, with a dedicated set-up for development activity, will concentrate on delivering more development impact and promote sustainable and inclusive growth, climate and environment objectives, poverty eradication and the fight against inequalities, therefore strengthening resilience, which will be crucial for peace and stability and human development. The EIB, as the EU's development bank, will be instrumental in delivering the EU-Africa partnership in a manner that is centred on people and their livelihoods.

EIB will focus on high impact investments that enable additional private sector investments and act as accelerators to spur further economic growth. Our technical and financial support addresses investment gaps, particularly in infrastructure that facilitates universal access to essential services such as water and sanitation, energy, mobility, digital networks, health and education. Similarly, the EIB will continue to support private sector access to finance - from micro-entrepreneurs to large corporations - so that these can grow and create jobs, with special attention to women entrepreneurs. The EIB will continue to place a strong emphasis on climate finance, from clean energy generation, transmission and distribution to climate change adaptation, and protection of the environment and biodiversity.

To increase the impact of climate operations in Africa and their attractiveness to clients, the EIB is also strengthening its collaboration with providers of concessional climate financing and widening opportunities for co-financing including through upstream project preparation and capacity-building. Blended finance will be essential to help overcome some of the hurdles hampering infrastructure development, particularly in remote or underserved regions.

The EU-Africa collaborative approach includes partnerships such as renew Africa, an innovative platform with European public and private stakeholders covering the whole renewable energy value chain in 48 African countries. It is partnerships like this, where we join forces for our common goal, that make us more efficient. Similarly in the Sahel, the EIB is partnering with the AfDB on the flagship Desert to Power initiative and earlier in 2021 committed EUR 1 billion in support of the Great Green Wall. By drawing on our decades-long expertise and further expanding our presence on the ground, we remain committed and engaged with African and international partners, as part of Team Europe, to support Africa's efforts to build a stronger and more resilient future for its people.

BIBLIOGRAPHY

ACBF, 2017. Drivers of economic growth in Africa: opportunities, financing, and capacity issues.

ACET, 2014. 2014 African Transformation Report.

AfDB, 2021a. African Economic Outlook 2021 (Text). African Development Bank Group.

AfDB, 2021b. African Economic Outlook 2021. African Development Bank Group.

AfDB, 2020a. African Economic Outlook 2020 (Text). African Development Bank Group.

AfDB, 2020b. Electricity Regulatory Index for Africa 2020. African Development Bank Group.

AfDB, 2019. Industrialize Africa [WWW Document]. Afr. Dev. Bank - Build. Today Better Afr. Tomorrow. URL https://www.afdb.org/en/the-high-5/industrialize-africa (accessed 8.26.21).

AfDB, 2015. Climate Finance: On the Road to COP21.

AfDB, World Economic Forum, World Bank, 2017. Africa Competitiveness Report 2017. World Economic Forum, Geneva.

AFREC, 2019. Designing the African Energy Transition: An approach for social and economic transformation in a climate-compatible manner.

Africa Clean Energy, WRI, 2021. Assessment of Local Manufacturing of Off-Grid Solar in Sub-Saharan Africa, Policy Brief.

African Union, 2013. Agenda 2063: The Africa we want (Popular Version) | African Union.

Akadiri, S.S., Bekun, F.V., Sarkodie, S.A., 2019. Contemporaneous interaction between energy consumption, economic growth and environmental sustainability in South Africa: What drives what? Sci. Total Environ. 686, 468–475. https://doi.org/10.1016/j.scitotenv.2019.05.421

Anouri, M.E.H., Youssef, A.B., M'Henni, H., Rault, C., 2014. Energy Use and Economic Growth in Africa: a Panel Granger-Causality Investigation (No. No. 4844), CESifo Working Paper Series.

Attridge, S., Engen, L., 2019. Blended finance in the poorest countries: The need for a better approach. ODI.

Banerjee, A., 2015. Policies for a Better-fed World (Working Paper No. 21623), Working Paper Series. National Bureau of Economic Research. https://doi.org/10.3386/w21623

Banerjee, A.V., Duflo, E., 2019. Good Economics for Hard Times.

Begashaw, B., 2020. Strategies to deliver on the Sustainable Development Goals in Africa. Brookings. URL https://www.brookings.edu/research/strategies-to-deliver-on-the-sustainable-development-goals-in-africa/ (accessed 8.25.21).

Begashaw, B., 2019. Africa and the Sustainable Development Goals: A long way to go. Brookings. URL https://www.brookings.edu/blog/africa-in-focus/2019/07/29/africa-and-the-sustainable-development-goals-a-long-way-to-go/ (accessed 8.26.21).

Bhatia, M., Angelou, N., 2015. Beyond Connections: Energy Access Redefined (Working Paper). World Bank, Washington, DC.

Bhattacharya, A., Calland, R., Averchenkova, A., Gonzalez, L., Martinez-Diaz, L., van Rooij, J., 2020. Delivering on the $100 billion climate finance commitment and transforming climate finance.

Blended Finance Taskforce, n.d. Why Blending [WWW Document]. Blended Finance Taskforce. URL https://www.blendedfinance.earth/why-blended-finance (accessed 10.18.21).

Blimpo, M., P., Cosgrove-Davies, M., 2019. Electricity Access in Sub-Saharan Africa: Uptake, Reliability, and Complementary Factors for Economic Impact. World Bank, Washington, DC.

Borowski, P.F., 2021. Significance and Directions of Energy Development in African Countries. Energies 14, 4479. https://doi.org/10.3390/en14154479

Calzadilla, A., Wiebelt, M., Blohmke, J., Klepper, G., 2014. Desert power 2050: Regional and sectoral impacts of renewable electricity production in Europe, the Middle East and North Africa (Working Paper No. 1891). Kiel Working Paper.

CDC, 2020. What is the impact of investing in power?: Practical thinking on investing for development (Impact Study No. 008).

CDC, 2016. Environmental and social due diligence: mitigating risks, identifying opportunities.

Centre for Applied Macroeconomic Analysis, 2017. The Price Elasticity of Electricity Demand in the United States: A Three-Dimensional Analysis (No. CAMA Working Paper 50/2017).

CGAP, CDC, 2018. Taming the Strange Beasts: Servicing and the Future of PAYGo.

Climate Policy Initiative, 2018. Blended Finance in Clean Energy: Experiences and Opportunities.

Danso, D.K., François, B., Hingray, B., Diedhiou, A., 2021. Assessing hydropower flexibility for integrating solar and wind energy in West Africa using dynamic programming and sensitivity analysis. Illustration with the Akosombo reservoir, Ghana. J. Clean. Prod. 287, 125559. https://doi.org/10.1016/j.jclepro.2020.125559

Deloitte, 2019. Deloitte Global societal impact survey [WWW Document]. Deloitte. URL https://www2.deloitte.com/global/en/pages/about-deloitte/articles/societal-impact-survey-deloitte-global.html (accessed 10.13.21).

EAC, UNECA, 2018. EAC Energy Security Policy Framework.

Eberhard, A., Naude, R., 2017. The South Africa Renewable Energy IPP Procurement Programme: Review, Lessons Learned & Proposals to Reduce Transaction Costs.

ECIU, Oxford Net Zero, 2021. Taking Stock: A global assessment of net-zero targets.

EIA, 2018. Energy Implications of Higher Economic Growth in Africa." U.S. Department of Energy.

EIB, 2021. Finance in Africa for green, smart and inclusive private sector development.

Elkington, J., 2018. 25 Years Ago I Coined the Phrase "Triple Bottom Line." Here's Why It's Time to Rethink It. Harv. Bus. Rev.

ESMAP, 2020. Regulatory Indicators for Sustainable Energy 2020: Sustaining the Momentum. World Bank, Washington, DC.

ESMAP, 2018. Beyond Electricity: How Morocco's Solar Plant Is Benefiting Communities and Women and Shaping the Region's Future | ESMAP.

Fatin, L., 2021. $1Trillion Annual Green Bond Milestone Tipped for end 2022 in Latest Survey: Sean Kidney calls for $5Trillion per year by 2025 [WWW Document]. Clim. Bonds Initiat. URL https://www.climatebonds.net/2021/10/1trillion-annual-green-bond-milestone-tipped-end-2022-latest-survey-sean-kidney-calls (accessed 12.9.21).

Ferreira Pinto, A., 2021. REIPPP: One of the world's best renewable energy tenders, but there's room for improvement. Pv Mag.

Fink, L., 2021. Larry Fink's 2021 letter to CEOs [WWW Document]. URL https://www.blackrock.com/us/individual/2021-larry-fink-ceo-letter (accessed 10.17.21).

Fofack, H., 2019. Africa's quest for a bigger role in global markets [WWW Document]. URL https://www.intracen.org/news/Africas-quest-for-a-bigger-role-in-global-markets/ (accessed 11.23.21).

Franck, R., Galor, O., 2015. Is Industrialization Conducive to Long-Run Prosperity? (No. No. 5354), CESifo Working Paper Series.

Garcia-Verdu, R., A.A. Selasse, A. Thomas, 2011. How Inclusive Has Africa's Recent High-Growth Episode Been?

Gaspar, V., Amaglobeli, D., Garcia-Escribano, M., Prady, D., Soto, M., 2019. Fiscal Policy and Development: Human, Social, and Physical Investments for the SDGs (Staff Discussion Notes No. 19/03).

Gerszon Mahler, D., Lakner, C., Castaneda Aguilar, R.A., Wu, H., 2020. The impact of COVID-19 (Coronavirus) on global poverty: Why Sub-Saharan Africa might be the region hardest hit. URL https://blogs.worldbank.org/opendata/impact-covid-19-coronavirus-global-poverty-why-sub-saharan-africa-might-be-region-hardest (accessed 9.13.21).

GIZ, 2014. Financing Green Growth: A review of green financial sector policies in emerging and developing economies.

Heitmann, K., Roza, L., Boiardi, P., Serneels, S., 2020. The Rise of the Corporate Social Investor. Stanf. Soc. Innov. Rev. 18, 42–49. https://doi.org/10.48558/89XH-2K02

ICA, 2018. Infrastructure Financing Trends in Africa 2018.

IEA, 2021a. World Energy Investment 2021.

IEA, 2021b. Financing clean energy transitions in emerging and developing economies.

IEA, 2019a. Africa Energy Outlook 2019.

IEA, 2019b. Morocco Renewable Energy Target 2030 – Policies [WWW Document]. IEA. URL https://www.iea.org/policies/6557-morocco-renewable-energy-target-2030 (accessed 12.9.21).

IEA, 2014. Energy in Africa today 433–481. https://doi.org/10.1787/weo-2014-15-en

IEA, IRENA, UNSD, World Bank and WHO, 2021. Tracking SDG 7: The Energy Progress Report (2021).

IFC, 2019. Creating Impact: The Promise of Impact Investing.

IFC, 2018. Senegal Scaling Solar tender produces one of the lowest electricity costs in Africa [WWW Document]. URL https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=24503 (accessed 10.17.21).

IFC, 2014. Shared Prosperity through Inclusive Business: How successful companies reach the base of the pyramid. International Finance Corporation.

IFC, 2012. From Gap to Opportunity: Business Models for Scaling Up Energy Access.

ILO, 2020. Report on employment in Africa (Re-Africa): Tackling the youth employment challenge (Publication).

ILO, 2018. World Employment and Social Outlook – Trends 2018.

ILO, 2016. Green jobs and renewable energy: low carbon, high employment.

ILO, n.d. Enabling Environment for Sustainable Enterprises [WWW Document]. URL https://www.ilo.org/empent/units/boosting-employment-through-small-enterprise-development/eese/lang--en/index.htm (accessed 10.17.21).

IMF, 2021. Regional Economic Outlook for Sub-Saharan Africa, April 2021.

IPCC, 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

IPCC, 2018. Global Warming of 1.5°C: An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change.

IRENA, 2022. Renewable Energy Market Analysis Africa and its sub-regions.

IRENA, 2021a. World Energy Transitions Outlook: 1.5°C Pathway.

IRENA, 2021b. Renewable Energy Statistics 2021.

IRENA, 2021c. Renewable Energy and Jobs - Annual Review 2021.

IRENA, 2021d. Renewable Energy Benefits: Leveraging Local Capacity for Solar Water Heaters.

IRENA, 2021e. Renewable Power Generation Costs in 2020.

IRENA, 2020a. post-COVID recovery: An agenda for resilience, development and equality [WWW Document]. Publ.-COVID-Recovery. URL https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery (accessed 9.5.21).

IRENA, 2020b. Global Renewables Outlook: Energy transformation 2050.

IRENA, 2020c. Pay-as-you-go models: Innovation Landscape Brief.

IRENA, 2020d. Stimulating investment in community energy: Broadening the ownership of renewables. International Renewable Energy Agency, Abu Dhabi.

IRENA, 2020e. Innovation landscape brief: Community-ownership models. International Renewable Energy Agency, Abu Dhabi.

IRENA, 2019a. Global energy transformation: A roadmap to 2050 (2019 edition).

IRENA, 2019b. Renewable energy auctions: Status and trends beyond price.

IRENA, 2018. Renewable Energy Benefits: Leveraging local capacity for offshore wind.

IRENA, 2017a. Renewable Energy Benefits: Leveraging Local Capacity for Onshore Wind.

IRENA, 2017b. Renewable Energy Benefits: Leveraging Local Capacity for Solar PV.

IRENA, 2016. Renewable Energy Benefits: Measuring the Economics [WWW Document]. Publ.-Energy-Benefits-Meas.--Econ. URL https://www.irena.org/publications/2016/Jan/Renewable-Energy-Benefits-Measuring-the-Economics (accessed 9.5.21).

IRENA, 2011. Renewable Energy Jobs: Status, Prospects & Policies. Biofuels and Grid-connected Electricity Generation 32.

IRENA, forthcoming. Measuring the socio-economic footprint of energy transitions in Southeast Asia.

IRENA, n.d. Local Value Creation [WWW Document]. URL https://www.irena.org/benefits/Local-Value-Creation (accessed 10.17.21).

IRENA, FAO, 2021. Renewable energy for agri-food systems: Towards the Sustainable Development Goals and the Paris Agreement. IRENA and FAO, Rome, Italy. https://doi.org/10.4060/cb7433en

IRENA, ILO, 2021. Renewable Energy and Jobs – Annual Review 2021. International Renewable Energy Agency, International Labour Organization, Abu Dhabi, Geneva.

IRENA, SELCO Foundation, 2021. Fostering Livelihoods with Decentralised Renewable Energy: An Ecosystems Approach.

JICA, 2019. Diagnostic du Secteur de l'Energie en Côte d'Ivoire Rapport final de l'étude de collecte des données relatives au secteur de l'énergie électrique.

Kahsai, M.S., Chali, N., Schaeffer, P.V., Gebremedhin, T.G., 2012. Income level and the energy consumption–GDP nexus: Evidence from Sub-Saharan Africa. Energy Econ. 34, 739–746. https://doi.org/10.1016/j.eneco.2011.06.006

Kende-Robb, C., 2021. 6 reasons why Africa's new free trade area is a global game-changer [WWW Document]. World Econ. Forum. URL https://www.weforum.org/agenda/2021/02/afcfta-africa-free-trade-global-game-changer/ (accessed 10.18.21).

KfW, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), International Renewable Energy Agency (IRENA), German Federal Ministry for Economic Cooperation and Development (BMZ), 2021. The Renewable Energy Transition in Africa.

Khobai, H., le Roux, P., 2017. The Relationship between Energy Consumption, Economic Growth and Carbon Dioxide Emission: The Case of South Africa. Int. J. Energy Econ. Policy 7, 102–109.

Kidney, S., 2012. SA's Nedbank $490m retail green bonds offer [WWW Document]. Clim. Bonds Initiat. URL https://www.climatebonds.net/2014/05/sas-nedbank-490m-retail-green-bonds-offer (accessed 12.9.21).

Kojima, M., Trimble, C., 2016. Making Power Affordable for Africa and Viable for Its Utilities. World Bank, Washington, DC. https://doi.org/10.1596/25091

Kotler, P., Lee, N.R., 2011. Corporate Social Responsibility: Doing the Most Good for Your Company and Your Cause. John Wiley & Sons.

KPMG, 2020. The Time Has Come: The KPMG Survey of Sustainability Reporting 2020 63.

Kramer, M., 2020. Creating shared value to tackle climate change [WWW Document]. Enel. URL https://www.enel.com/company/stories/articles/2020/05/creating-shared-value-climate-change (accessed 10.18.21).

Kramer, M.R., Pfitzer, M.W., 2016. The Ecosystem of Shared Value. Harv. Bus. Rev.

Leigland, J., Eberhard, A., 2018. Localisation barriers to trade: The case of South Africa's renewable energy independent power program. Dev. South. Afr. 35, 569–588. https://doi.org/10.1080/0376835X.2018.1487829

Mahia, R., de Arce, R., 2020. On the Economic Effects of a Res Local Industry Deployment in Morocco: A Case of Study Defining Scenarios from a Survey to Stakeholders. Sustainability 12, 6811. https://doi.org/10.3390/su12176811

Maji, I.K., Sulaiman, C., Abdul-Rahim, A.S., 2019. Renewable energy consumption and economic growth nexus: A fresh evidence from West Africa. Energy Rep. 5, 384–392. https://doi.org/10.1016/j.egyr.2019.03.005

Manlan, C., 2021. Africa's Human-Capital Imperative [WWW Document]. Proj. Synd. URL https://www.project-syndicate.org/onpoint/africa-public-health-investment-in-development-strategies-by-carl-manlan-2021-06 (accessed 11.9.21).

Mathews, J.A., 2016. Developing countries and the renewable energy revolution [WWW Document]. URL https://www.oecd.org/fr/dev/developing-countries-and-the-renewable-energy-revolution.htm (accessed 11.28.21).

Mbekeani, K.K., 2013. Understanding the Barriers To Regional Trade Integration In Africa. African Development Bank.

McDaid, L., 2016. Renewable Energy: Where are the jobs? A critique of the government's socio-economic programme.

Mensah, J.T., 2018. Jobs! Electricity Shortages and Unemployment in Africa (No. 8415), Policy Research Working Paper Series. World Bank.

Mitullah, W.V., Samson, R., Wambua, P.M., Balongo, S., 2016. Building on progress: Infrastructure Development Still a Major Challenge in Africa (Afrobarometer Dispatch No. No. 69).

MSCI, n.d. ESG 101: What is Environmental, Social and Governance? [WWW Document]. URL https://www.msci.com/esg-101-what-is-esg (accessed 10.15.21).

Nicolas, C., Rentschler, J., Potter van Loon, A., Oguah, S., Schweikert, A., Deinert, M., Koks, E., Arderne, C., Cubas, D., Li, J., Ichikawa, E., 2019. Stronger Power: Improving Power Sector Resilience to Natural Hazards, Lifelines: The Resilient Infrastructure Opportunity. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-1430-3

Nielsen, 2015. The Sustainability Imperative: New insights on consumer expectations.

OECD, 2021. Amounts mobilised from the private sector by official development interventions in 2018-2019 [WWW Document]. URL https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/mobilisation.htm (accessed 10.18.21).

Olumuyiwa S, A., Du, H., Maxwell, O.-A., 2013. Inclusive Growth: An Application of the Social Opportunity Function to Selected African Countries.

Onyeji-Nwogu, I., Bazilian, M., Moss, T., 2020. Big data and the electricity sector in African countries. World Dev. Perspect. 17.

Our World in Data, 2021. Cumulative CO emissions [WWW Document]. Our World Data. URL https://ourworldindata.org/grapher/cumulative-co-emissions (accessed 12.5.21).

Our World in Data, 2019. CO Data Explorer [WWW Document]. URL https://ourworldindata.org/explorers/co2?facet=none&country=OWID_WRL~Africa&Gas=CO per centE2 per cent82 per cent82&Accounting=Production-based&Fuel=Total&Count=Per+country

Page, J., 2019. How industries without smokestacks can address Africa's youth unemployment crisis. Brookings. URL https://www.brookings.edu/research/how-industries-without-smokestacks-can-address-africas-youth-unemployment-crisis/ (accessed 10.13.21).

Piketty, T., 2014. Capital in the Twenty-First Century. Harvard University Press.

Porter, M.E., Kramer, M.R., 2011. Creating Shared Value. Harv. Bus. Rev.

Power for All, Schneider Electric Foundation, Rockefeller Foundation, 2019. Powering Jobs Census 2019: The Energy Access Workforce.

Prahalad, C.K., Hart, S.L., 2002. The fortune at the bottom of the pyramid [WWW Document]. strategy+business. URL https://www.strategy-business.com/article/11518 (accessed 10.17.21).

Pritchett, L., 2021. National Development Delivers: And How! And How?

Probst, B., Holcroft, R., Huenteler, J., Balabanyan, J., Tipping, A., Robinson, P., 2020. Attracting Private Solutions and Participation in the Power Sector in Sub-Saharan Africa: Findings from a Survey of Investors and Financiers (Policy Research Working Paper No. 9299). World Bank.

Qudrat-Ullah, H., Nevo, C.M., 2021. The impact of renewable energy consumption and environmental sustainability on economic growth in Africa. Energy Rep. 7, 3877–3886. https://doi.org/10.1016/j.egyr.2021.05.083

RCREEE, n. d. The Socio-Economic Impacts of Renewable Energy and Energy Efficiency in Egypt Local Value and Employment.

REN21, 2020. Renewables 2020 Global Status Report.

RES4A, 2018. A Just Energy Transition in South Africa: Socio-economic needs and the positive impacts of a future low-carbon economy.

RES4A, UNECA, 2020. The Impact of Covid-19 on Africa's energy sector and the role of Renewable Energy to empower a long term and sustainable recovery | United Nations Economic Commission for Africa.

RES4Africa, 2021. A European Multi-Stakeholder Initiative Promoting Clean Energy Investments in Africa.

RES4Africa, 2020a. Connecting the Dots: Why only 2 per cent of global RE in Africa?

RES4Africa, 2020b. Scaling Up Africa's Renewable Power.

RES4Africa, PwC, 2021. Investor Survey on Sub Saharan Africa: A survey on the risks to renewable energy investments.

Rodrik, D., 2021. Poor Countries' Technology Dilemma | by Dani Rodrik [WWW Document]. Proj. Synd. URL https://www.project-syndicate.org/commentary/poor-countries-technology-dilemma-by-dani-rodrik-2021-02 (accessed 8.26.21).

Rodrik, D., 2015. Premature Deindustrialization (Working Paper No. 20935), Working Paper Series. National Bureau of Economic Research. https://doi.org/10.3386/w20935

Sarkodie, S.A., Adams, S., 2020. Electricity access, human development index, governance and income inequality in Sub-Saharan Africa. Energy Rep. 6, 455–466. https://doi.org/10.1016/j.egyr.2020.02.009

Serafeim, G., 2020. Social-Impact Efforts That Create Real Value. Harv. Bus. Rev.

Sheehy, B., 2012. UNDERSTANDING CSR: AN EMPIRICAL STUDY OF PRIVATE REGULATION 38, 25.

Sterl, S., 2021. A Grid for all Seasons: Enhancing the Integration of Variable Solar and Wind Power in Electricity Systems Across Africa. Curr. Sustain. Energy Rep. https://doi.org/10.1007/s40518-021-00192-6

Sterl, S., Fadly, D., Liersch, S., Koch, H., Thiery, W., 2021. Linking solar and wind power in eastern Africa with operation of the Grand Ethiopian Renaissance Dam. Nat. Energy 6, 407–418. https://doi.org/10.1038/s41560-021-00799-5

Sumberg, J., Fox, L., Flynn, J., Mader, P., Oosterom, M., 2020. Africa's "youth employment" crisis is actually a "missing jobs" crisis. Dev. Policy Rev. 39, 621–643. https://doi.org/10.1111/dpr.12528

Sustainable Development Goals Center for Africa, 2019. 2019 Africa SDG Index and Dashboards Report [WWW Document]. URL https://www.sustainabledevelopment.report (accessed 9.13.21).

Sustainable Development Goals Center for Africa, Sustainable Development Solutions Network, 2020. 2020 Africa SDG Index and Dashboards Report [WWW Document]. URL https://www.sustainabledevelopment.report (accessed 11.24.21).

The Economist, 2021a. The pandemic could undercut Africa's precarious progress. The Economist.

The Economist, 2021b. What is the African Continental Free Trade Area? The Economist.

The Economist, 2021c. The right way for Africa to promote manufacturing. The Economist.

The Economist, 2021d. African industry is doing better than previously thought. The Economist.

The Sustainable Development Goals Center for Africa, 2017. SDG Financing for Africa: Key Propositions and Areas of Engagement 21.

UN, 2021a. Theme Report on Enabling SDGs through Inclusive, Just Energy Transitions: Towards the Achievement of SDG 7 and Net-Zero Emissions. United Nations.

UN, 2021b. Policy Briefs in Support of the High-Level Political Forum: Leveraging Energy Action for Advancing the Sustainable Development Goals.

UN, 2021c. Global Roadmap for Accelerated SDG7 Action in Support of the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change.

UN, 2021d. Theme Report on Finance and Investment: Towards the Achievement of SDG7 and Net-Zero Emissions, High-Level Dialogue on Energy.

UN, 2019. Accelerating SDG7 Achievement: SDG 7 Policy Briefs in Support of the High-Level Political Forum 2019.

UN, n.d. The Ten Principles of the UN Global Compact [WWW Document]. URL https://www.unglobalcompact.org/what-is-gc/mission/principles (accessed 12.9.21a).

UN, n.d. Energy Compacts [WWW Document]. U. N. URL https://www.un.org/en/energycompacts (accessed 10.17.21b).

UNCTAD (Ed.), 2020. Tackling illicit financial flows for sustainable development in Africa, Economic development in Africa report. United Nations, Geneva.

UNCTAD, 2019. Economic Development in Africa Report 2019: Made in Africa – Rules of Origin for Enhanced Intra-African Trade.

UNCTAD, 2014. World Investment Report 2014.

UNDESA, 2014. Electricity and education: The benefits, barriers, and recommendations for achieving the electrification of primary and secondary schools.:. Sustainable Development Knowledge Platform.

UNDP, 2019. Policy Brief 3: Financing SDG 7.

UNDP-Eritrea. 2018. Solar powered mini-grids to light up Areza and Maidma in Eritrea. URL https://www.er.undp.org/content/eritrea/en/home/presscenter/articles/2018/Areza-Maidma.html (accessed 15.9.21)

UNECA, 2020. Innovative Finance for Private Sector Development in Africa.

UNECA, 2019. Economic Report on Africa 2019: fiscal policy for financing sustainable development in Africa. Economic Report on Africa 2019.

UNECA, 2017. Smart industrialization through trade in the context of Africa's transformation. ECA Policy Brief.

UNECA, 2016. Economic Report on Africa 2016: Greening Africa's Industrialization.

UNECA, 2015. Economic Report on Africa 2015: Industrializing Through Trade. Economic Report on Africa 2015.

UNECA, RES4Africa, 2021. Regulatory Review of the Electricity Market in Africa Towards Crowding-in Private Sector Investment: Methodology.

UNEP, International Resource Panel, 2017. Resource Efficiency: Potential and Economic Implications - International Resource Panel Report.

Warren, B., 2019. How companies can fund the next wave of green generation [WWW Document]. EY.com. URL https://www.ey.com/en_uk/power-utilities/how-companies-can-fund-the-next-wave-of-green-generation (accessed 10.18.21).

Whelan, T., Fink, C., 2016. The Comprehensive Business Case for Sustainability. Harv. Bus. Rev.

WHO, 2021. Indoor air pollution and household energy [WWW Document]. WHO. URL https://www.who.int/heli/risks/indoorair/indoorair/en/ (accessed 9.13.21).

Wolde-Rufael, Y., 2005. Energy demand and economic growth: The African experience. J. Policy Model. 27, 891–903. https://doi.org/10.1016/j.jpolmod.2005.06.003

World Bank, 2020a. The African Continental Free Trade Area: Economic and Distributional Effects.

World Bank, 2020b. The Human Capital Index 2020 Update: Human Capital in the Time of COVID-19. World Bank, Washington, DC. https://doi.org/10.1596/34432

World Bank, 2018. Access to Energy is at the Heart of Development [WWW Document]. World Bank. URL https://www.worldbank.org/en/news/feature/2018/04/18/access-energy-sustainable-development-goal-7 (accessed 10.26.21).

Yadav, P., Moore, W.G., 2019. Value Chains as Vehicles for Development: Gloomy Global Trends, Optimism in Africa, and Some Ideas for Action [WWW Document]. Cent. Glob. Dev. URL https://www.cgdev.org/blog/value-chains-vehicles-development-gloomy-global-trends-optimism-africa-and-some-ideas-action (accessed 11.23.21).

Yeboa, S., Adom-Opare, K.B., 2018. Optimizing innovative finance in Africa's energy sector [WWW Document]. AfDB. URL https://blogs.afdb.org/industrialisation-and-trade-corner/post/optimizing-innovative-finance-in-africas-energy-sector-18064 (accessed 10.26.21).

Zhenmin, L., Steiner, A., Ogunbiyi, D., 2021. The energy revolution has arrived – here's how to be a part of it [WWW Document]. UNDP. URL https://www.undp.org/blog/energy-revolution-has-arrived-heres-how-be-part-it (accessed 11.28.21).

United Nations
Economic Commission for Africa

RES4AFRICA FOUNDATION

IRENA
International Renewable Energy Agency