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ISRAEL & AFRICA

BENEFITS FROM STRONGER ECONOMIC RELATIONS

April 2022

TABLE OF CONTENTS

ABBREVIATIONS	2
1. INTRODUCTION.....	3
2. CURRENT ECONOMIC RELATIONS	4
2.1 Israel's foreign economic policy	4
2.2 Israel's economic relations with Africa	6
3. ISRAEL'S ECONOMIC STRENGTHS	10
3.1 Sustainable energy	11
3.2 Agriculture	13
3.3 Water solutions	14
3.4 Information and communication technology	16
3.5 Medical and education services.....	17
4. SOLUTIONS FOR CRITICAL ISSUES ACROSS AFRICA	19
4.1 Rife energy challenges, vast opportunities	20
4.2 Agriculture faces increasing climate risks.....	27
4.3 Water scarcity widespread across Africa.....	32
4.4 ICT bridging the gap to the unbanked	37
4.5 Africa in need of health and education services	42
5. MUTUALLY BENEFICIAL OUTCOMES	47
6. POSSIBLE CHALLENGES AND RISKS.....	51
7. CONCLUSION	53
SOURCES.....	54

ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interface
ARO	Agricultural Research Organisation
AUDA-NEPAD	African Union Development Agency
CAADP	Comprehensive African Agricultural Development Programme
CNG	Compressed Natural Gas
COP	Conference of Parties
CSP	Concentrating Solar Power
DPO	Development Policy Operation
EAF	Energy Availability Factor
EiE	Education in Emergencies
EV	Electric Vehicle
ETI	Energy Transition Index
FDI	Foreign Direct Investment
Fintech	Financial Technology
FTA	Free Trade Agreement
GHG	Greenhouse Gas
GW	Gigawatt
ICE	Internal Combustion Engine
ICT	Information and Communication Technology
IoT	Internet of Things
IPP	Independent Power Producer
MoU	Memorandum of Understanding
MITVIM	Israeli Institute for Regional Foreign Policies
MtCO ₂ e	Metric Tons of Carbon Dioxide Equivalent
MW	Megawatts
NWC	National Water Carrier
NDC	Nationally Determined Contribution
ODA	Official Development Assistance
PV	Photovoltaic
PHS	Pumped hydroelectric storage
QIZ	Qualifying Industrial Zone
R&D	Research and Development
SWRO	Seawater Reverse Osmosis
TWh	Terawatt Hours
UHC	Universal Health Coverage

1. INTRODUCTION

Broader ties between Israel and African countries are limited in general, but this does not mean that closer economic cooperation and relations will be without any advantages.

This is the main objective of this study, to investigate the potential benefits that may stem from stronger economic relations between Israel and Africa.

Firstly, the current economic relations between Israel and Africa are examined, considering factors such as trade, investment, the diaspora and development aid flows.

The next step involves identifying Israel's core business competencies and economic strengths. Israel's economy is underpinned by a strong entrepreneurial ecosystem and a highly educated and skilled workforce.

These fundamental factors have seen the country develop world-class capabilities in areas such as in energy, water, agriculture, information and communication technology, as well as in digital approaches to healthcare and education. These 'focus areas' are dissected in more detail to identify more granular areas of Israeli expertise. Aside from these more granular thematic areas, some of Israel's more overarching strengths are also assessed, referring to the country's expertise in Smart Cities, Israel's innovative and entrepreneurial ecosystem and the country's ability to identify innovative financing solutions.

Having identified Israel's key relevant strengths that complement Africa's weaknesses, the next step involves an investigation into whether these strengths can be leveraged to help overcome critical issues the African continent is faced with. The aim is to ascertain whether these problematic 'areas' indeed exist in an African context and if so, determine the magnitude of the problem. The assessment also incorporates country-specific case studies, to better illustrate examples of where countries either have significant challenges or where markets may offer opportunities in terms of benefitting from learnings, innovations, finance, and services from abroad.

Having established areas where Israel's core strengths and competencies could be leveraged to help overcome critical development issues in many African countries, the focus then shifts to an investigation regarding how all parties involved could benefit from closer cooperation and stronger economic ties.

The study then concludes by considering some of the challenges and risks which may constrain the actualisation of partnerships and closer economic ties, and which may also make joint partnerships and ventures less attractive.

2. CURRENT ECONOMIC RELATIONS

Israel is generally open to trade and foreign investment, and its closest trade partners are the United States (US) and the European Union (EU) and to a slightly lesser extent China and the United Kingdom (UK).

The vast majority of the Israeli diaspora population also resides in the US. In contrast, as is shown in the sections below, Israel's economic ties with Africa are very limited in general.

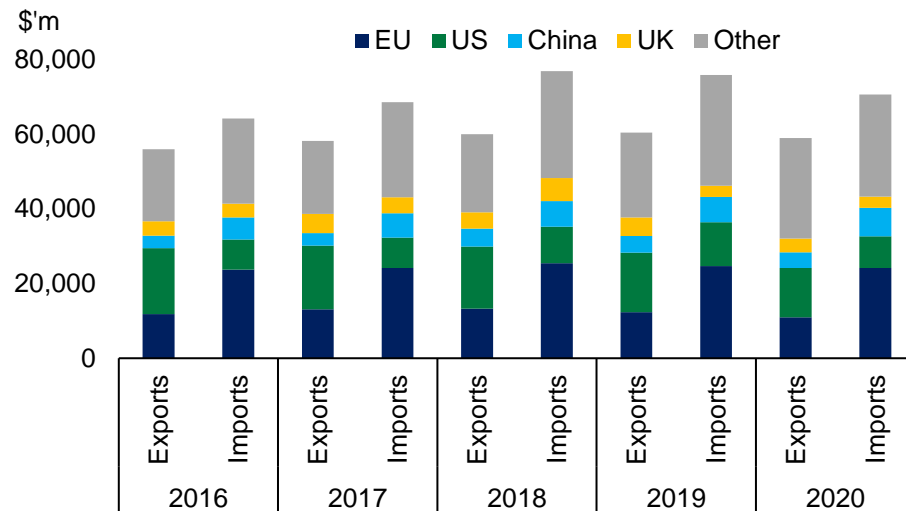
2.1 ISRAEL'S FOREIGN ECONOMIC POLICY

Israel's economy is underpinned by a strong entrepreneurial ecosystem and a highly educated and skilled workforce. Like many advanced economies, the services sector contributes the highest proportion of output, at almost 72% of GDP in 2019.

However, industry remains an important sector and is dominated by high-tech manufacturing. While the economy contracted by 2.2% in 2020, the rebound proved especially robust as the economy expanded by 7.8% in 2021.

Israel's main exports include high-value manufactured goods (electrical and technological equipment, machinery and appliances), diamonds, chemicals and pharmaceuticals.

Figure 1: Israel's trade in goods by country



Source: Israel Central Bureau of Statistics

The US and EU account for almost half of Israel's trade in goods

Services exports and tourism also fulfil vital roles, with the former including services related to engineering, software development and biomedical services, amongst others.

The main goods imports, meanwhile, relate to raw materials, fuel, manufacturing inputs and consumer goods. Israel's main trade partners include the US, the EU, China and the UK. The US and EU together accounted for 41% of goods exports and 46% of goods imports during 2020, according to the Israel Central Bureau of Statistics.

Israel is generally open to trade and foreign investment. The legal system protects the rights of both domestic and foreign entities in terms of establishing businesses and to engage in remunerative activities.

However, monopolies in certain sectors discourage competition and effectively contribute to trade and entry barriers. There are also generally no restrictions on investments abroad, except in cases where national security may be affected or if the Israeli government deems that such investments are not in the national interest.

Israel signed a free trade agreement (FTA) with the US back in 1985, which has contributed to the country's close economic ties with the US as well as the development of Israel's economy into one which is more advanced, open and diverse. Israel also has FTAs with the EU, the European Free Trade Association and various country-level agreements.

Israel furthermore has bilateral Qualifying Industrial Zone (QIZ) Agreements with Egypt and Jordan, which allow these countries to export goods to the US duty free if these products contain inputs from Israel, according to the US State Department.

Meanwhile, Israel signed an FTA with the UK in 2019 which took effect in 2021, but both countries have agreed to revise the agreement following the UK's decision to exit the EU.

More recent developments on the foreign economic policy front after the new government took office in June 2021 include efforts to strengthen relations with Jordan and the United Arab Emirates. According to the Israeli Institute for Regional Foreign Policies (MITVIM), the three countries signed an agreement to promote water and energy exchanges.

Other developments relate to engagements with Egypt, to strengthen trade, and efforts to deepen ties with the EU, Greece and Cyprus. Israel has also taken a firmer stance on climate change, with the new government setting targets to reduce greenhouse gas emissions by 27% by 2030 and by 85% by 2050 (compared to 2015 levels).

Israel's economic ties with Africa are limited in general

2.2 ISRAEL'S ECONOMIC RELATIONS WITH AFRICA

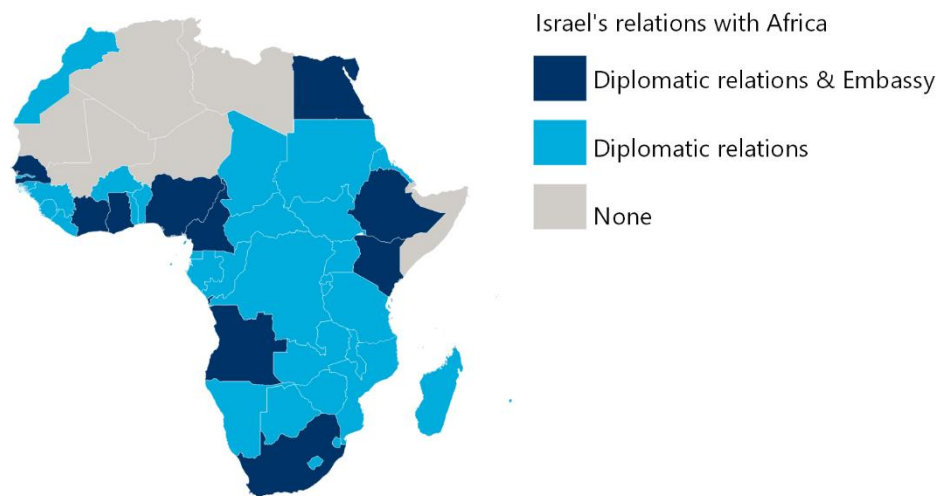
There have been certain developments more recently aimed at addressing and overcoming historical, ideological and political obstacles which, in some cases, continue to inhibit closer ties between Israel and Africa.

The Abraham Accords were signed by the US, the United Arab Emirates, Bahrain and Israel in September 2020, charting a new course in Israel-Arab relations.

Two North African countries, Sudan and Morocco, followed suit soon thereafter. The Abraham Accords, in addition to the new government taking office in Israel, also played a role in Israel being granted observer status at the African Union (AU), despite objections by a number of African countries.

Interestingly, Israel has bilateral diplomatic relations with 46 African countries, but these have yet to yield significant benefits, or the very least, reached close to the potential that deeper economic ties could bring about. Issues faced at the multilateral level may also directly or indirectly influence closer ties at the bilateral level.

Figure 2: Israel's diplomatic relations and embassy footprint across Africa



Sources: Israel Government, Moshe Dayan Center (MDC)

A large number of African economies remain very dependent on the mineral and extractive sectors. Hydrocarbons and metals are still the main exports, despite efforts aimed at diversification. China remains the dominant trade partner in general, but the US, EU, India and the UK also represent important trade partners.

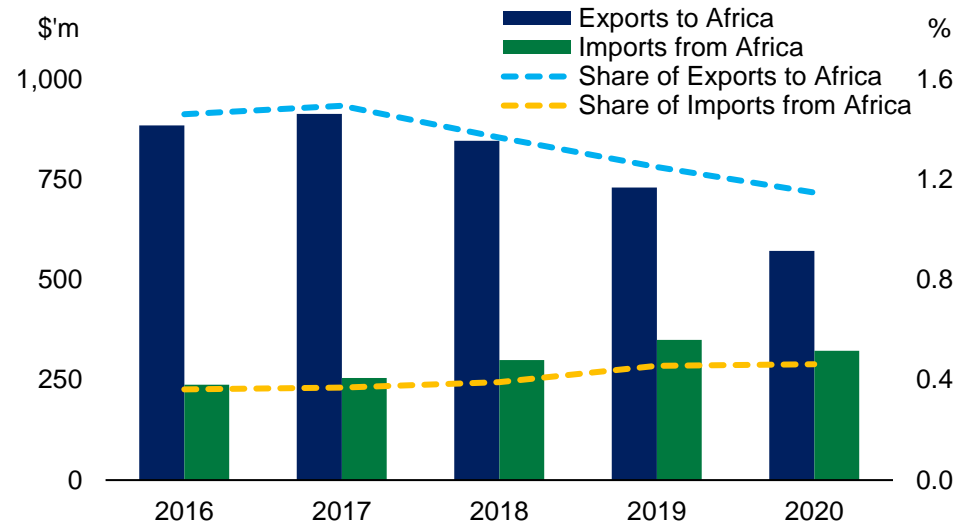
According to the United Nations Conference on Trade and Development (UNCTAD), the countries with the largest stocks of foreign direct investment across Africa include the Netherlands, UK, France, China, the US, Italy, Singapore and Switzerland.

In general, though, economic-related ties between Africa and Israel are very limited. This is elaborated on below by considering factors including trade, investment, development assistance and Israel's diaspora population.

2.2.1 Trade

Israel's trade with Africa is marginal. **More specifically, Africa's share of Israel's total goods exports averaged just above 1% in recent years, while Africa's share of Israel's total imports was less than 0.5%.**

Figure 3: Israel's trade with Africa



Source: Israel Central Bureau of Statistics

When considering a country-level view, it is clear that South Africa and Egypt account for the bulk of Israel's trade with the continent. South Africa accounted for roughly 30% of Africa's imports from Israel in 2020, while Egypt accounted for roughly 16%.

In terms of Africa's exports to Israel, Egypt held a share of 25% in 2020, slightly higher than South Africa's share of 23%.

These figures still have to be viewed against the backdrop of limited trade between Africa and Israel in general.

Israel's trade with Africa accounts for less than 1% of the total

Table 1: Top 10 African countries by total goods trade with Israel

\$ millions	2016	2017	2018	2019	2020
Egypt	136	151	184	186	171
Ethiopia	72	81	81	108	88
Ghana	50	41	36	28	35
Kenya	60	78	63	56	42
Morocco	56	38	13	14	22
Nigeria	85	152	218	172	39
Rwanda	13	8	2	3	17
South Africa	342	360	307	276	247
Tanzania	19	24	19	14	21
Uganda	7	14	15	22	17

Source: Israel Central Bureau of Statistics

2.2.2 Investment

Outward foreign direct investment (FDI) from Israel to the rest of the world declined from \$14.6bn in 2016 to \$8.6bn by 2019, according to the Organisation for Economic Co-operation and Development's (OECD) International Direct Investment Statistics.

OECD countries account for the bulk of Israel's FDI abroad, with the Netherlands in particular representing a key beneficiary in recent years.

Investments in Africa were insignificant with the exception of 2019, when Israel invested roughly \$200m into the continent – almost all of which went to Mauritius.

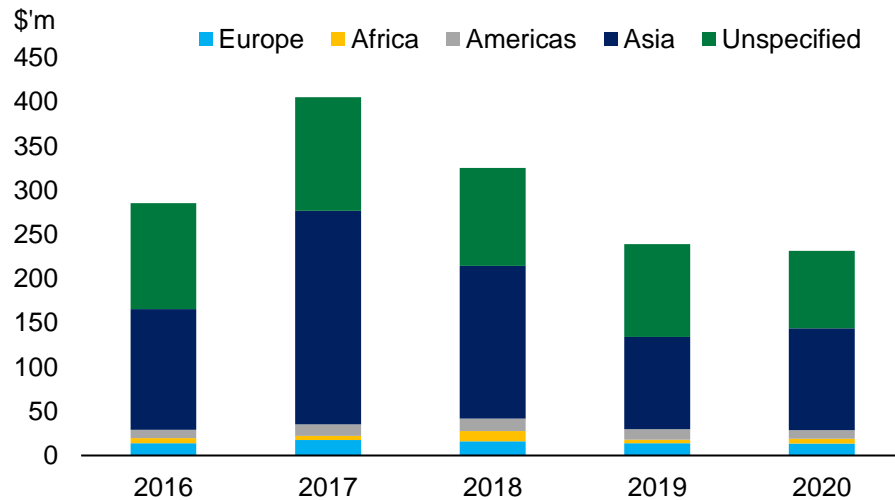
FDI flowing into Israel has actually increased from roughly \$12bn in 2016 to \$19bn by 2019. Again, though, direct investments stemming from Africa were largely insignificant.

2.2.3 Development assistance

According to the OECD, Israel's gross disbursements of Official Development Assistance (ODA) – defined as government aid that promotes and specifically targets the economic development and welfare of developing countries – declined slightly from \$286m in 2016 to \$232m by 2020.

**Israel's foreign
direct
investment in
Africa is
negligible**

Figure 4: Beneficiaries of Israel's development assistance



Source: OECD

Developing countries in Asia receive the bulk of ODA stemming from Israel. In fact, Asia accounted for 49.6% of Israel's ODA disbursements in 2020. **Africa, meanwhile, received only 2.3% of total disbursements in the same year.**

2.2.4 Diaspora

The distribution of a country's diaspora population usually serves an important role in factors such as remittance flows and may also provide an indication of existing businesses in a foreign country, or possibly reflecting the potential to leverage nationals living abroad to expand into those markets.

In its World Jewish Population report, the Berman Jewish Bank estimates that the core Jewish population amounted to 14.7 million people in 2019 – the core Jewish population is defined as those who consider Judaism as their mutually exclusive identification framework.

The diaspora accounted for 54.7% of this total, with the remainder of the population residing in Israel. The US accounts for the vast majority of the Jewish diaspora, or 70.9% in 2019 to be more precise. **Africa accounted for a mere 0.9% of the Jewish diaspora in 2019, with over 90% of these people residing in South Africa.**

Africa received only 2.3% of Israel's total ODA in 2020

Africa accounts for a mere 0.9% of the Jewish diaspora

3. ISRAEL'S ECONOMIC STRENGTHS

Israel has developed a range of core competencies over the years, supported by factors including a skilled workforce, technological progress, and supportive government policies along with an innovative and entrepreneurial ecosystem. Israel is often viewed as a global frontrunner in various economic aspects, especially in relation to the application of technologies to drive innovation in a range of sectors. These strengths, as they also align to Africa's weaknesses, include competencies in relation to sustainable energy, agriculture, water solutions, information & communication technologies (ICT), health and education. This said, one cannot discard some of Israel's more overarching competencies which encapsulate a number of the aforementioned strengths. These relate to 1) **Israel being a global leader in the development of Smart Cities**, 2) **the country's entrepreneurial ecosystem which can serve as a benchmark for other countries** and 3) **Israel's ability to identify innovative financing solutions**.

A **Smart City**, by definition, is a technologically advanced urban area, where digital technologies and innovations are used to collect data to better inform decisions, automate and improve systems used to manage city-wide services and areas such as improving the optimal usage of resources. This involves a wide range of technologies, like big data analytics and advanced software solutions, sensors, cameras, voice activation and recognition, to name just a few. These in turn are utilised to improve services related to powerplants, traffic management, utilities, waste management, crime detection and even in schools, hospitals and government services. In general, Israel is a global front runner on a number of these technologies in addition to the design and application thereof specifically for the purpose of developing Smart Cities. Hence, African countries can benefit greatly from these technologies in various ways as will be explored later in this paper.

As has been highlighted previously in this study, Israel's economy is underpinned, amongst other factors, by an **entrepreneurial ecosystem**. This is not a feat which is easily achieved, but other countries, especially in Africa where entrepreneurship underpins various strategies to create employment, can certainly gain insight and learnings from Israel in terms of the key drivers to accelerate successful entrepreneurial enterprises. Another overarching key competency relates to Israeli entrepreneurs and businesses' ability to find **innovative financing solutions** for business endeavours and projects. Again, this can be leveraged in cases where funds are often lacking or fiscal budgets are tight, as is the case in many African countries.

Against the background of these overarching competencies, the remainder of this section will consider some of Israel's key strengths from a more general perspective.

3.1 SUSTAINABLE ENERGY

The global energy landscape is changing rapidly towards a more environmentally sustainable system in which technically advanced, flexible, cost competitive, distributed, and low emission technologies increasingly displace conventional and centralised fossil fuel-based alternatives.

The most prominent of these include renewable energy, especially from solar and wind, and complementary technologies, such as energy storage systems, natural gas, and increasingly, hydrogen. The environmental and economic advantages of these technologies are further supported by energy efficiency measures, electric vehicles (EVs), embedded generation, off-grid solutions, and the digitalisation of the energy sector.

While Israel's energy sector is secure and the country is a net exporter of gas, it imports coal and petroleum products to meet primary energy demand. Israel had 20 gigawatts (GW) of installed capacity in 2020. Natural gas-based generation dominates the power supply with a share of 67%, followed by coal with a stake of 26% and renewable energy representing 7% – solar comprises 85.7% of total installed renewable capacity. Given that fossil fuels represent 93% of electricity supply, Israel's energy sector is carbon intensive, accounting for over 47.6% of total domestic greenhouse gas (GHG) emissions.

Despite its reliance on natural gas and other primary fuels, Israel is a key player in the global transition to environmentally sustainable energy systems. The country ranked 23rd out of 115 countries in the World Economic Forum's (WEF) Energy Transition Index (ETI) in 2021, outpacing the global average in 10 of the 12 ETI sub-indices.

Moreover, it has consistently ranked among the most innovative countries for 'clean' technologies. Israel is set to improve further on its comparative rankings given its forward-looking energy plans. Israel committed to "*transition to a low carbon economy*" and an environmentally sustainable energy system with its updated Nationally Determined Contribution (NDC) submitted under the Paris Agreement.

Relative to the 79 metric tons of carbon dioxide equivalent (MtCO₂e) emissions in 2015, the country's updated NDC includes an unconditional commitment to reduce GHG emissions by 27% by 2030 and by at least 85% by 2050. The 2050 GHG emissions reduction target is subject to further downward revisions if needed to support the international aim of moving to net-zero emissions and limit the global average temperature increase to 1.5°C.

The Israeli government is determined to phase out coal-fired electrical capacity by 2026 and has embarked on a drive to substantially raise the share of renewable energy-based electricity production to lower the country's carbon footprint.

Natural gas
accounts for
67% of Israel's
power
generation

**Strong
commitment to
shift to
renewables**

The Israeli Ministry of Environmental Protection also released a roadmap in February 2022 for renewable energy to represent 40% of total electricity production by 2030, higher than the Ministry of Energy's present target of 30%. Of this, solar energy should account for around 90% of total electrical output from renewables, which entails the installation of 18 GW - 23 GW from solar photovoltaic (PV) plants and 5.5 GW of energy storage. It would furthermore avoid the installation of new gas-fired electrical power stations and in turn save Israel up to US\$1.8bn in maintenance, fuel, capital, and externalities costs by 2030.

The accelerated uptake of non-dispatchable solar PV plants into the electricity system will be enabled by the availability of natural gas and dispatchable gas-fired power plants, which offers flexibility into the electricity system and helps to foster energy security and reliability, in addition to strengthening the national grid. Similarly, as fossil-fuel based generation is phased out, variable renewables can be progressively accommodated through the deployment of energy storage and hydrogen solutions. Moreover, Russia's war in Ukraine would likely restrict Israel's access to cheap coal imports from Russia, as well as oil. This may necessitate the country to look at alternative, more-costly, markets for coal and oil imports in the short-term should energy security be threatened and/or alternatively to accelerate the country's uptake of renewable energy and complementary technologies.

Remaining with fuel, the Israeli government further plans to prohibit the sale of new internal combustion engine (ICE) vehicles by 2030 and has introduced incentives for the progressive uptake of EVs, including through lower taxes and the rolling out of charging stations. **By 2030, EVs should comprise all new personal vehicle sales**, while a significant share of heavy transport should be propelled by electricity, compressed natural gas (CNG), and/or hydrogen fuel cells.

In summary, Israel's core strengths in the energy sector include the following:

- **Renewable energy:** Local manufacturing and deployment of solar PV technologies, both for utility-scale and embedded generation purposes.
- **Energy storage:** Local production and grid integration of batteries (i.e. electrochemical storage), inverters, 'green' hydrogen (i.e. chemical storage), and fuel cells to reduce a reliance on natural gas and maintain grid stability.
- **Natural gas:** Licensing, exploration, extraction, and production (upstream), transportation and storage (midstream), and gas-to-power and fuel (downstream) destined for transport and industrial applications. This includes gas-based industrialisation, supply-chain integration, and exports.
- **Grid management:** Strengthen the reliability of electrical power supply amid the progressive penetration of stochastic renewable energy resources.
- **Structural reform:** Industry restructuring for private participation, transitioning away from coal-fired electricity, natural gas regulation, pricing and policy, and competitive independent power producer (IPP) procurement practices.

**Progressive
uptake of solar
PV and EVs,
complemented
by natural gas**

3.2 AGRICULTURE

Faced with structural water challenges, agricultural innovation enabled Israel to attain one of the globe's highest crop-to-water ratios. Encompassing a wide range of technological tools to address agricultural challenges, such as smart farming (the use of sensors, imagery, and algorithm-based processing tools to collect data and provide decision support), biotech inputs (aimed at improving irrigation and supporting nutrient uptake via scientifically designed hardware) and the provision of digital market platforms, Israel distinguished itself as a world leader in Agritech.

A growing challenge across the globe is the establishment of a flourishing agricultural sector in the face of climate change and diminishing natural resources. This challenge has prompted scientists and engineers to come up with innovative green solutions, such as vertical farming (allowing for all-year production irrespective of climatic conditions and mindful of preservation for future generations) and sustainable practices.

The gathering of reliable information has been greatly aided by technological tools in this regard, and AgriTask is one example of an Israeli company aiming to provide a precision agronomy and an agricultural intelligence platform which uses smart farming to guide the growing and harvesting process in order to boost crop yield.

SupPlant represents another example of an Israeli company which uses smart irrigation (such as sensors to improve water utilisation efficacy) to boost crop yields, including other services such as continuous monitoring and extreme weather irrigation adjustments.

According to the Agricultural Research Organisation (ARO), the storing of grain has become less stable and less safe during the Covid-19 pandemic (amid supply-chain disruptions) and long-term storage elevates the risk of damage from abiotic factors. The latter relates to events such as extreme temperatures or high humidity, as well as damage caused by birds, rodents, insects and moulds.

The Volcani Centre estimates that grain loss during the storage phase can reach up to 30% in developing countries – a much larger margin than the estimated 2% in developed countries. Among the innovative solutions crafted to combat damage of stored soft commodities are integrated pest management which performs effectively while keeping nutritional integrity intact to satisfy consumers' demand for toxin- and additive-free natural foods.

With the integration of biological control to storage management, Israel has achieved a wheat loss ratio of less than 0.5%, according to the Volcani Centre.

Meanwhile, the Israeli Ministry of Agriculture and Rural Development signalled its ongoing commitment towards the development and implementation of new agriculture-focused technology, asserting in February 2022 that it will invest in

**Israel has
amongst the
highest crop-
to-water ratios
globally**

innovation and research & development (R&D) in order to strengthen the economy and improve food security prospects. Referring to the success of a similar programme in 2021, the ministry alluded to the production cost savings and increases in yield and quality of fruit with a vertical cultivation innovation ("fruit wall"). The Israeli Agritech industry is currently focused on utilising artificial intelligence (AI), image processing (IoT), multiple data processing ("Big Data") and robotics to guide the farming sector throughout the planning to execution phases.

In summary, Israel's core strengths in the agricultural sector include the following:

- **Smart farming:** The use of sensors, imagery, and algorithm-based processing tools to collect data and provide decision support;
- **Biotech inputs:** Aimed at improving irrigation and supporting nutrient uptake via scientifically designed hardware;
- **Vertical farming:** Allowing for all-year production;
- **Innovative storage solutions:** Reducing wheat loss ratio;
- **Utilising digital technologies:** Such as AI, IoT, Big Data and robotics;
- **Digital market platforms.**

3.3 WATER SOLUTIONS

Israel is located in a semi-arid climate zone, and over 60% of the country consists of desert. Therefore, the need for smart solutions pertaining to access to clean drinking water has always existed. Innovation in this regard has made Israel a pioneer in water solutions, and water management and technologies used in the country can serve as a blueprint for other nations across the globe which are faced with similar difficulties.

The standout technology on this front is Israel's desalination capabilities.

Water desalination is the process that removes mineral components from saline water, usually salt water from the ocean, which makes the water potable. This water can then be used for, inter alia, human consumption, cooking and hygiene purposes.

In 1997, the country opened its first reverse osmosis desalination plant following a prolonged dry season. In 1999, the Israeli government initiated the long-term, large-scale Seawater Reverse Osmosis (SWRO) desalination programme, which was designed to address the country's growing demand for scarce water resources. The programme followed a public tendering process, where private companies bid for the construction, maintenance, and operation of the desalination facilities.

The initial success of the programme prompted a swift and vast expansion, with government policy adapted around the aim of reducing Israel's reliance on seasonal and unreliable rainfall for potable water. As a result, the country's desalination technologies have improved notably over the past two decades, and has already spread to other parts of the world.

Israel has a long history of overcoming water scarcity

Israel a world leader in desalination and water recycling

Currently, Israel desalinates around 585 million m³ of water per year from five desalination plants situated on the Mediterranean coastline, which constitutes over 70% of total domestic water supply in the country.

While still an expensive solution, comparatively speaking, continued innovation in the field of desalination technologies will very likely reduce costs and improve efficiencies in the future. This means desalination may increasingly become a viable solution for more countries, more so if such endeavours are combined with Israeli expertise in other areas such as in energy, water and digital technologies.

Israel's reliance on desalination has also made it an expert in water recycling, transport, and quality management systems. Israel is ranked first in the world in terms of its water recycling capabilities, as it recycles nearly 90% of its municipal wastewater for agricultural use. The country's strong desalination and water recycling capabilities has underpinned the need for extensive water transport infrastructure.

The National Water Carrier (NWC) of Israel is the country's water transportation system that was completed in 1964. The purpose of the NWC is to transport water from desalination plants along the Mediterranean Sea and the Sea of Galilee – a freshwater lake in northeast Israel – to the populated central and arid southern regions of the country. The NWC stretches approximately 130 km in length and consists of pipes, canals, tunnels, reservoirs, and large-scale pumping stations. The longest tunnel transports desalinated water from Sorek to Jerusalem, and is 14 km in length. Operated by Mekorot – the national water company of Israel – the construction of the NWC was a significant technical challenge due to the terrain and elevations it had to traverse. It has the capacity to transport up to 72,000 m³ of water per hour, which equates to around 1.7 million m³ of water each day. Israel's ground-breaking water management system has transformed the country from water-stressed to a net exporter of water, and serves as a model for the rest of the world.

In summary, Israel's core strengths in terms of water solutions include the following:

- **Desalination:** Innovation led to finding cost-effective solutions for an otherwise expensive technology, and reduced dependence on irregular and insufficient rainfall for water supply.
- **Water recycling:** Created a circular economy where recycled water is used for agricultural purposes, again increasing the country's autonomy with regards to its precipitation patterns.
- **Water transport:** Strong desalination capabilities highlighted the need for sufficient water transport infrastructure to ensure access to water in all regions of the country.

3.4 INFORMATION AND COMMUNICATION TECHNOLOGY

While originally driven due to geopolitical needs and defence-related investment in R&D, a skilled workforce, supportive government policies along with an innovative and entrepreneurial ecosystem have contributed to a highly developed information and communication technology (ICT) industry.

Israel's ICT sector benefits from a significant amount of investment, with multinational technology firms setting up R&D centres in the country to leverage the highly skilled workforce.

Technology-related services rendered to countries abroad also constitute a substantial share of Israel's total services exports, which in turn fulfils a vital role in supporting the country's external balances.

According to the Israel Central Bureau of Statistics, exports of services related to 'computer programming, consultancy & related activities, data processing, hosting & related activities and web portals' already accounted for 33% of total services exports in 2016, and this figure has since increased sharply to 49% by 2020.

Israel's ICT landscape, again in line with the country's entrepreneurial spirit, is also characterised by a significant number of large and internationally recognised enterprises as well as start-ups which are successful in raising substantial amounts of venture capital.

According to the World Bank, Israel ranked 3rd globally in terms of the number of venture capital deals (per billion PPP\$ GDP) in 2019 after occupying the top spot during the preceding three years.

Israel has managed to develop key competencies in fields such as AI, IoT, Big Data, telecommunication digitalisation, cybersecurity, business intelligence, cloud computing, virtualisation, internet applications, financial technology (Fintech), insurance technology (Insurtech) and software development.

The Fintech scene, in particular, is characterised by established firms and start-ups specialising in a wide range of services, ranging from digital payment solutions, mobile banking, e-commerce, insurance services and enterprise solutions, amongst many others.

Israel is also a frontrunner in cyber security-related technologies. In 2021, Mastercard, in collaboration with Italy's Enel X, established the Finsec Innovation Lab in Beersheba following a successful bid in response to a tender by the Israel Innovation Authority. The Finsec Innovation Lab will focus on enhancing technologies related to API (application programming interface) security, vulnerability management, ransomware, digital identity and authentication, virtual payment wallets, and fraud prevention.

ICT services exports fulfil vital role to boost external balances

The so-called Insurtech phenomenon has also gained significant traction in recent years, with Israel again boasting some of the leading innovations in this field. Insurtech essentially involves digitalising the insurance industry, both through improving customer experience by using artificial intelligence applications and through applying big data analytics to analyse risks and offer innovative insurance packages and solutions.

In summary, Israel's core strengths in the ICT sector include the following:

- **Artificial intelligence;**
- **Internet of Things;**
- **Big Data;**
- **Telecommunication digitalisation;**
- **Cybersecurity;**
- **Business intelligence;**
- **Cloud computing;**
- **Virtualisation;**
- **Internet applications;**
- **Financial technology (Fintech);**
- **Insurance technology (Insurtech);**
- **Software development.**

3.5 MEDICAL AND EDUCATION SERVICES

Like in many other facets of the Israeli economy, technological innovations have also been geared towards improving health. Innovations in life sciences have resulted in significant advances in medical devices and digital healthcare.

Advances in medical devices relate to the application of technologies aimed at improving surgical equipment and practices such as through the use of artificial intelligence and automation, laser technology and digital imaging.

Digital healthcare, meanwhile, relates to what has broadly become known as eHealth, which refers to the delivery of healthcare services using electronic information and communication technologies when healthcare providers and patients are not in direct contact, but rather through electronic means such as through mobile phones.

eHealth has also seen developments in utilising existing devices (such as mobile phones) and new wearables that collect more real-time information on a specific individual's health condition, often allowing for remote monitoring of patients – such developments are especially relevant where rural populations live in areas far removed from required healthcare services. Big data and analytics are also used in medical applications on mobiles and other technological devices to collect and analyse information, providing healthcare practitioners and policy makers with additional insight.

**Israel driving
technological
innovation in
digital health
and learning**

Israel is also recognised globally for its expertise in first aid, field and ‘intensive care unit’ (ICU) services due to its fragile security situation – these services are especially relevant to rural areas across Africa which usually lack basic health services, and even more so in such areas which are prone to conflict.

Meanwhile, Israel’s core strengths in relation to education relate to alternative educational frameworks and solutions (as applied for instance in youth villages, boarding schools, programmes for gifted children and job training during high school). Technology is also increasingly being applied to improve educational outcomes, and Israel’s high-tech capabilities mean it is well placed to play a significant role in this space (so-called EdTech) on a more global scale. Innovations in this field could not only serve to better align educational programmes and techniques with a changing global environment, but also serve to improve educational attainment in areas where access to learning facilities is lacking. Israel is already home to a number of education-focused companies, start-ups and investment accelerators. One such example is MindCET, an organisation established in 2012 by Israel’s Center for Educational Technology (CET). MindCET creates a collaborative environment between innovators, investors and educators, ultimately aiming to leverage Israel’s high-tech expertise to drive educational innovations. The organisation facilitates a variety of education-focused initiatives, including entrepreneurship programmes, hosting community dialogues with teachers and educators in addition to initiatives aimed at accelerating R&D spending in educational technologies and leveraging funding for new ventures.

Certain Israeli companies and start-ups have already made significant strides in the educational technology space, using virtual reality, gaming applications and artificial intelligence to create innovative educational products.

In summary, Israel’s core strengths in the health and education sectors include the following:

- **eHealth:** Utilisation of technological devices to collect real-time information on individual health conditions and allowing for remote monitoring of patients;
- **Big data and analytics:** Used in medical applications to collect and analyse information, providing healthcare practitioners and policy makers with additional insight;
- **First aid, field and ICU services:** Especially relevant to rural areas across Africa which usually lack basic health services;
- **Alternative educational frameworks and solutions:** As applied for instance in youth villages, boarding schools, programmes for gifted children and job training during high school;
- **EdTech solutions:** The use of virtual reality, gaming applications and artificial intelligence to create innovative educational products.

4. SOLUTIONS FOR CRITICAL ISSUES ACROSS AFRICA

Having identified Israel's key strengths, the next step involves an investigation into whether these strengths can be leveraged to help overcome critical issues the African continent is faced with. The aim is to ascertain whether these problematic 'areas' indeed exist in an African context and if so, what is the magnitude of the problem. The assessment also incorporates country-specific case studies, to better illustrate examples of where countries either have significant challenges or where markets may offer opportunities in terms of benefitting from learnings, innovations and services stemming from abroad. Before delving deeper into the more granular thematic themes, it is again worth investigating the broader and overarching Israeli competencies and to ascertain if Africa could benefit from these – referring to 1) Smart Cities, 2) Israel's innovative and entrepreneurial ecosystem and 3) the country's ability to identify innovative financing solutions.

Firstly, urbanisation across vast parts of Africa is accelerating. This places additional pressure on infrastructure, resources and service delivery. To complicate matters further, many African countries face severe fiscal pressures, constraining authorities' ability to address these challenges through public works enhancement and through increasing civil servants to improve service delivery. Thus, smarter solutions have to be considered. In this regard, **a substantial number of African cities and also new developments can benefit from Smart City solutions**, an area in which Israel is viewed as a global leader. Secondly, generating employment opportunities is crucially important from an African perspective, and **boosting entrepreneurship and incentivising innovation** are often viewed as key pillars in strategies aimed at addressing job shortages. This is no easy task, but Africa can certainly leverage lessons from a country such as Israel to identify the most important drivers to create environments conducive to innovation and successful entrepreneurial endeavours. While there are many factors at play, education and financing are certainly priority areas. The latter ties in with another key overarching Israeli competency, relating to the country's **ability to identify innovative financing solutions**. This represents a key area where African entrepreneurs often face obstacles, and possibly signals an opportunity for joint ventures or collaboration, where African entrepreneurs can benefit from Israeli counterpart innovation and access to finance while the latter could gain a foothold in a potentially lucrative market. Financing solutions also span much wider than this micro level, and there are also opportunities in project and even government-level partnerships.

The remainder of this section will now delve deeper into the more granular Israeli strengths, as they also pertain to Africa's weaknesses, to ascertain whether these can be leveraged to help overcome critical issues the African continent is faced with.

4.1 RIFE ENERGY CHALLENGES, VAST OPPORTUNITIES

Africa has stark challenges in the continental energy sector, inclusive of electricity. However, the real and perceived weaknesses present immense opportunities for the continent to bypass traditional fuels and infrastructure to leapfrog into a just and sustainable energy transition. **Africa has the lowest electrical generation capacity in the world and experiences acute forms of energy poverty.**

While Africa is inhabited by over 16% of the world's population, it merely accounts for 6% of global energy consumption, 3% of global electricity demand, and 2% of global GHG emissions. **Even so, it is disproportionately affected by climate change, yet encompasses mineral deposits and renewable resources that can aid its own and the world's transition to environmental sustainability.**

Moreover, the continent requires major investment in its power system to meet rising demand. According to the International Energy Agency (IEA), electricity consumption across Africa was 700 terawatt hours (TWh) in 2019 (70% consumed by North African countries and South Africa), but is projected to rise to over 2,300 TWh by 2040.

While African countries have similar energy characteristics, the continent is highly diverse in many respects, with each country having distinct traits, weaknesses, and prospects in the energy sector. Given its enormity, the continent is endowed with varying degrees of natural resources, regionally and nationally, spanning coal, gas, solar, wind, hydro, geothermal, and a multitude of mineral sources.

Moreover, Africa's 54 countries are also at different levels of social and economic development, which affects the local industrialisation capacity of countries and the prevailing electrical and energy demand and supply requirements.

Regardless of its diversity, fundamentally, Africa's energy challenges mainly relate to access, affordability, reliability, project bankability, and environmental sustainability, coupled with policy and regulatory aspects. However, the continent's energy sector weaknesses can in many respects be alleviated by drawing on Israel's core strengths: renewable energy, energy storage, natural gas, grid management, and structural reform.

One way to illustrate the sharp inequalities in Africa's energy landscape is to consider access to electricity, a basic human right. North Africa's population experiences the highest electrification rates: 88.2% of the total population has access to electricity.

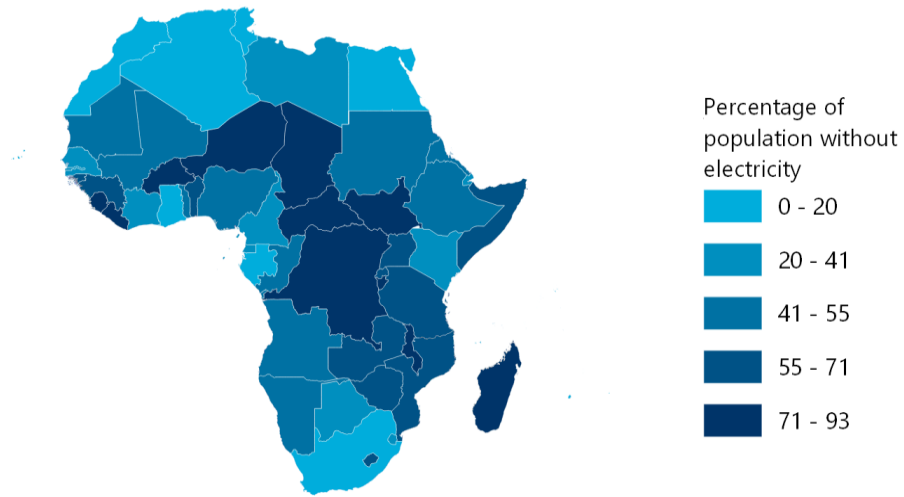
East Africa has the lowest electricity access, with 43.6% of the population connected to the electricity grid. The figure below illustrates the proportion of each country's total population without access to electricity, which should be viewed in consideration of the stark inequities between urban and rural electrification. Furthermore, access does not necessarily imply supply reliability.

IEA sees Africa's energy demand rise more than threefold by 2040

Almost half of Africa's population does not have access to electricity

Africa produces less than 1% of global solar output

Figure 5: Percentage of the population without access to electricity



Sources: *Oxford Economics Africa, World Bank*

There are numerous weaknesses contributing to the grossly inadequate electricity and broader energy access. At a high-level, the following are among the most practical challenges to be addressed to improve energy security and access across the continent, whilst mitigating against the impacts of climate change:

- **Inadequate electrical generation capacity:** Coupled with rapidly rising demand, this constrains economic growth prospects and is largely a function of poor long-term energy sector planning, project preparation to reach financial close, and implementation.

Africa's generation plants are also ageing, with low energy availability factors and frequent breakdowns due to substandard maintenance and a lack of investment in new, low-carbon generation and storage capacity.

- **Deficient diversification and environmental sustainability:** Many African countries rely on carbon-intensive technologies, fossil-fuels and/or drought-exposed hydropower, while the uptake of solar, wind and complementary technologies, including gas-fired generation and energy storage, has been inadequate, despite the continent's vast renewable energy potentials.

On average, African countries perform poorly on the WEF's ETI in comparison to its global and regional peers.

- **Lack of private sector participation:** This is generally a result of weak electrical energy procurement frameworks and institutions, inferior energy sector planning, excessive government intervention, fiscal constraints, and limited funding.

\$100bn per year is needed to develop Africa's energy sector

- **Insufficient electricity and energy supply infrastructure:** This curbs the uptake of electrical generation and energy export capacity, as well as EVs, coupled with a high degree of grid congestion and electricity transmission and distribution losses.

It is furthermore costly to expand the electric grid over large distances, particularly to impoverished rural areas, requiring investments in mini- and off-grid solutions.

- **Dragging digitalisation:** The general unavailability of digital technologies limits the transformation of energy systems by preventing the two-way communication between energy producers, consumers, and prosumers, as well as restrains energy efficiency and the accelerated incorporation of distributed generation.

Examples of digital technologies include energy management systems, micro- and off-grid solutions, smart meters and sensors, automated demand response applications, and the internet of things.

- **Dearth of credible electricity off-takers:** Highly indebted national utilities within a context where such utilities are the sole off-takers of electricity hamper investor interest and limit project implementation.
- **Lacking local value addition and exploitation of minerals:** Africa largely relies on imported technologies to meet domestic energy needs, while it does not adequately process, utilise, beneficiate, and export key minerals and rare earths that are integral to the energy transition.
- **Fragile finance:** Constraining the resolution of the above weaknesses, is Africa's highly limited financial resources needed to fund the investments for climate change mitigation and adaptation, whilst ensuring electrical and energy affordability, reliability, and security.

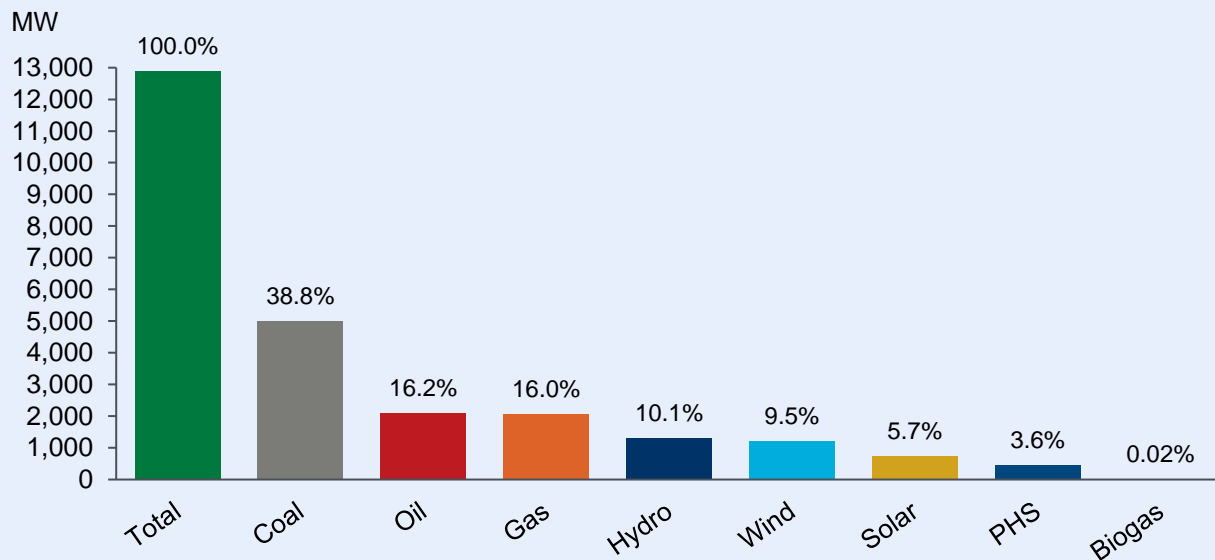
According to the IEA, around \$100bn per year or a cumulative \$2trn between 2019 and 2040 is required to develop Africa's energy sector in a way that allows sustainable economic growth, development, and full access to electricity. Moreover, perceived risks raise the cost of finance for energy-related projects on the continent.

CASE STUDY 1

BENEFITTING FROM MOROCCO'S SOLAR ENERGY TRANSFORMATION

Morocco's electricity industry is highly carbon intensive, with over 70% of electricity produced by fossil fuels, especially from coal and oil. The country is also exceedingly reliant on imported oil, gas, coal, and diesel for primary fuels and electricity production. This has been recognised by the government, which committed to reduce the country's GHG emissions by 42% below 'business-as-usual' levels by 2030. Moreover, the latest energy strategy approved by the Moroccan government aims to increase the share of renewable energy in the country's total installed electricity mix, from around 29% of nominal capacity in 2019 to 52% by 2030, 70% by 2040, and 80% by 2050. The figure below illustrates the composition of Morocco's installed electricity generation fleet by type of fuel.

Figure 6: Nominal installed capacity in 2019 (MW)



Source: Oxford Economics Africa, US Energy Information Administration (EIA), BloombergNEF

The government plans to meet its renewable energy targets by reducing its reliance on fossil fuels and accelerating the uptake of solar and wind energy, energy storage, and renewable energy-based hydrogen. Of these technologies, solar energy presents the largest opportunity given Morocco's vast solar irradiation potential – with solar resources sufficient to accommodate around 6,800 GW – which has also driven down costs and improved capacity factors. As a result, solar PV and concentrating solar power (CSP) with thermal storage is expected to play the largest roles, while small-scale solar PV is also seen as playing an integral part in realising the country's solar ambitions. Examples of small-scale solar applications include self-consumption and grid-tied solar PV electrical energy installations to produce and supply electricity to homes, businesses, and public buildings. Morocco's immense renewable energy

potential further suggests that the country can not only become an exporter of solar powered electrical energy, but it could also be a key global player in the production and exports of 'green' hydrogen over the longer term. These traits are ideal given Morocco's proximity to Europe, complemented by an existing connection to the European electricity grid via Spain.

The country is open to private sector participation and has run a series of highly successful solar and wind energy auctions. This has demonstrated Morocco's commitment to achieve its stated renewables targets and has provided the needed investor confidence in the energy sector through a successful energy auction track record, strong political buy-in, and government guarantees to contracts signed with private electrical generators. As of 2019, the country has procured over 1.8 GW of renewable energy capacity to the value of \$9.1bn, by far the majority of which has been sourced from international development finance institutions. In 2010, a law was also passed that allows IPPs to sell electrical energy derived from renewables directly to end-users, mainly by way of transmission lines.

In that regard, Morocco's solar industry offers a significant opportunity for Israeli companies to enter the Moroccan energy market. At the utility-scale, Israeli energy firms can participate in forthcoming solar energy auctions to secure winning project bids and earn long-term revenues based on the degree of equity participation. This would be supported by Israel's ability to integrate innovative financial and technical solutions to complex problems, as well as by Morocco's well-developed financial ecosystem. In addition, Israel's strengths in solar technology deployment, digitalisation, electricity grid infrastructure and management, and capital raising will bolster the country's ability to partake in the Moroccan energy market and reduce any cost differentials between the two countries.

The Moroccan government is also in the process of completing legislation and regulations to enable self-generation facilities to supply electrical energy over distribution and low-voltage transmission lines. This provides fertile ground for Israeli solar and battery energy storage firms to position themselves in the small-scale solar market, especially at the commercial and industrial level. In that regard, Israeli technical and regulatory practitioners in the energy sector can offer advisory services to the Moroccan government on improving the regulatory environment and thereby help remove any barriers to self-generation, which will in turn accelerate investment opportunities in the deployment of solar PV and complementary technologies.

Israel's energy firms can furthermore establish a local footprint by investing in the production and exports of solar and related technologies, such as battery energy storage, natural gas, and 'green' hydrogen. This will help to bolster both Morocco and Israel's related industries and strengthen geostrategic collaboration in the energy sector. Given the rapid uptake of non-dispatchable solar PV, the gas sector would benefit from activities related to natural gas imports, the development of floating storage and regasification units, the management of gas terminals, and the commercialisation of natural gas. Hydrogen is similarly a strategic sector over the longer-term with investment opportunities likely in production, storage, and related infrastructure development, especially through seawater desalination for electrolysis – an area in which Israel has noteworthy expertise.

Israeli executives, venture capital sources, and government can help to realise the above opportunities through advocating and strengthening relations with the Moroccan government, the hosting of joint business summits, strategically targeted conferences, bilateral engagements, and knowledge sharing seminars on Israel's financial, technological, and broader energy sector capabilities. Critical stakeholders in this regard include the The Ministry of Energy, Mines, and Environment, and the Moroccan Agency for Sustainable Energy (Masen).

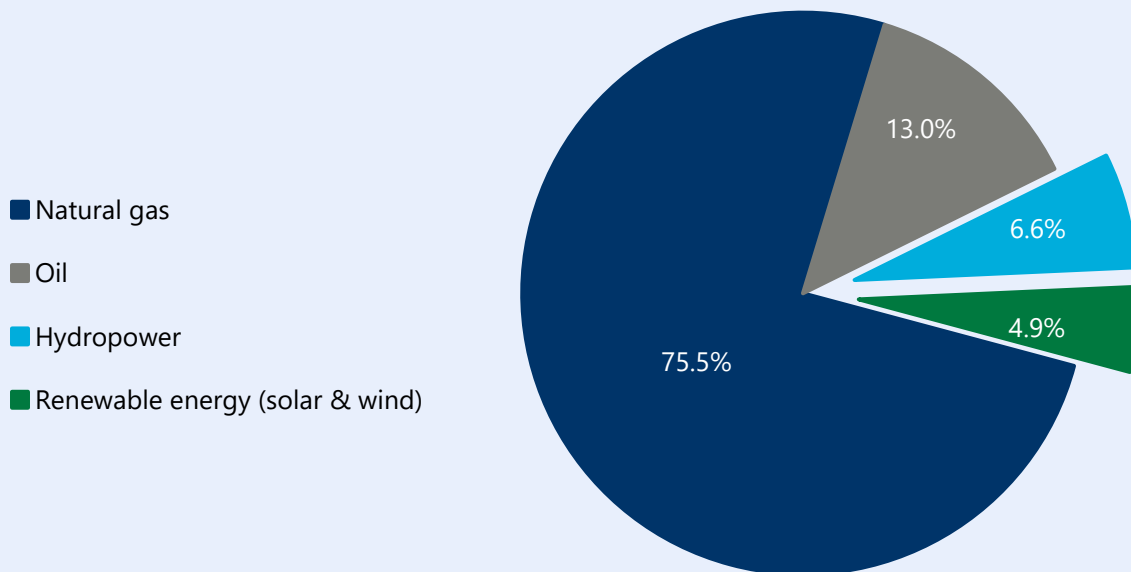
CASE STUDY 2

BOLSTERING EGYPT'S GAS, SOLAR, AND HYDROGEN RESOURCES

Egypt is Africa's second largest economy, yet it is classified as lower middle-income due to its population of over 100 million. It is also the largest non-OPEC oil producer in Africa and the continent's third largest producer of dry natural gas, after Algeria and Nigeria. The North African country borders Israel, with whom it has formal diplomatic and trade relations. The country's economy is diversified, with hydrocarbons playing a leading role. While there is heavy state involvement in oil, gas, and electricity, private sector participation is growing steadily.

Egypt has several weaknesses that correspond to Israel's strengths as outlined above. Its economy is highly carbon-intensive and has struggled to meet growing local oil and gas demand. Moreover, electricity load curtailments are frequent amid inadequate electrical power generation and transmission infrastructure, as well as natural gas shortages. The government has, however, focussed on attracting investment into, and diversifying, its energy sector. The figure below illustrates the composition of Egypt's electricity generation by fuel type.

Figure 7: Electricity production share



Source: BP

Egypt will host the 27th session of the Conference of the Parties (COP27) on climate change in November 2022, where it intends to launch the 'energy transition in Africa' initiative. COP27 will, among others, focus on strengthening international collaboration and action to address barriers to clean energy investment and promote capital deployment across the continent.

This provides a ripe opportunity for Israel to further strengthen its existing ties with the North African country and demonstrate how mutually beneficial collaboration can support Africa's transition to environmentally sustainable energy systems and alleviate global GHG emissions.

Egypt and Israel already have strong commercial ties in the energy sector, particularly in the production, import, export, and re-export of natural gas via Jordan. Israel sells 5.5 billion cubic meters (bcm) of gas to Egypt per year, of which the pipeline between Israel, Jordan, and Egypt supplies 63.6%. Most of this gas fuels Egyptian industry and energy markets, although a significant portion is liquefied in Egypt for re-export to European and Asian markets, while gas re-export prospects are also opening up in Lebanon by way of Jordan.

Demand for Israeli gas is set to grow amid international efforts to reduce a reliance on Russian energy supplies, which could also accelerate existing plans for a direct onshore pipeline between Israel and Egypt, valued at around US\$200m, that would increase annual Israeli gas exports to the country by between three and five bcm.

The countries could extend the gas relationship to electrical energy, particularly in the form of solar technology and electrical energy plants investment and trade. Israel's goal of raising electrical output from solar plants to 90% of total renewable sources by 2030 as part of its plans to reduce GHG emissions and expand its renewable technology industries could, however, be limited by its relatively small size and dense population.

The opportunity therefore exists for Israel to provide technical expertise and invest in solar PV plants in Egypt for export to Israel as a way of lowering both countries' carbon footprints. Electricity trade between the two countries would, however, require an interconnection of their transmission networks, which has recently been supported by the Israeli energy minister and would, in turn, open additional avenues for infrastructure cooperation and investment. Moreover, the Israeli solar technology industry can supply solar panels, equipment, and key balance of plant components to Egypt, as well as contribute to Egyptian industry by investing in related local manufacturing activities in the North African country.

In addition to natural gas and solar energy, the production and use of 'green' hydrogen, fuel cells, and electrolyzers are expected to increase rapidly amid environmental shifts in global energy, industry, and heavy transport. Africa has enormous potential for hydrogen production given the abundance of land and renewable energy sources, which can also be exported to other regions where demand for the energy carrier will grow rapidly. Egypt labelled 2022 as "*a year for green hydrogen*" and is expected to launch a US\$40bn low-carbon hydrogen strategy in 2022, possibly at COP27, which will include the production of 1,400 MW of hydrogen capacity by 2030. Egypt is already developing five green hydrogen projects and is planning several other hydrogen schemes, including a 1 GW liquid organic hydrogen carrier hub and a 40 MW to 100 MW electrolyser facility for green ammonia production. Similarly, Israel emphasises hydrogen in its national strategy, "*Israel 2050*", to help reduce emissions by 80%. The country also has several innovative firms exploring hydrogen opportunities. Given their proximity and relationship in the gas industry, the prospect therefore exists for the countries to collaborate on the production, storage, transport, and trade of hydrogen via electrolysis, particularly by harnessing solar energy, including on Egyptian soil by way of Israeli technologies. Such a geostrategic partnership will go a long way to reduce the carbon intensity of both countries, lessen their reliance on imported fossil-fuels, and help the world economy transition to environmental sustainability.

4.2 AGRICULTURE FACES INCREASING CLIMATE RISKS

In recognition of the economic and socio-political importance of the agricultural sector, the Comprehensive African Agricultural Development Programme (CAADP), a continental initiative that falls under the strategic Agenda 2063, seeks to increase public investment in agriculture and boost agricultural productivity. The African Union Development Agency (AUDA-NEPAD), through the CAADP, encourages African countries to allocate a minimum of 10% of their national budgets to agriculture.

The CAADP was borne from the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods, signed in July 2003, which formalised an agreement to create a pan-African flagship programme aimed at establishing food security and improving agricultural production.

The Declaration included a commitment to ending hunger by 2025, partly through "*at least doubling*" productivity of the sector via a specific focus on irrigation, mechanisation, and input procurement.

Furthermore, the Agricultural Growth and Transformation initiative is aimed at halving poverty by 2025 through various channels. These include

- (i) The establishment or strengthening of inclusive public-private partnerships (PPPs) within priority agricultural commodity value chains "*with a strong linkage to smallholder agriculture*";
- (ii) The creation of job opportunities for at least 30% of the youth within the agricultural value chain; and
- (iii) Sustaining annual sector growth in agricultural GDP at a rate of at least 6%.

The agricultural sector is of great importance from an employment point of view, with the International Labour Organisation's (ILO) modelled estimate placing the share of the sector at a sizeable 52.9% of total employment in 2019.

The World Bank, meanwhile, estimates that agricultural land in Sub-Saharan Africa (SSA), as a proportion of total land area, spanned 42.5% in 2018, while arable land equated for 9.4% of the total land area in the same year.

Cereal production in SSA rose to 161.6 million tonnes in 2018 from 130.2 million tonnes in 2010, but cereal yield declined to 1,224.2kg/hectare (ha) over this period from 1,456.9kg/ha, testament to the challenge that expansion in the land under production (89.3 million ha in 2010 to 111.8 million ha) does not necessarily transmit to higher economies of scale.

**Agriculture
accounts for
52.9% of
employment
across Africa**

The share of agriculture, forestry & fishing to SSA's total gross value added (GVA) reached 18.5% in 2020 from 15.7% in 2010, according to World Bank data. Over this period, the percentage annual growth in SSA's agriculture, forestry & fishing sector was quite volatile, falling from 5% in 2010 to 2.4% in 2011 (amid a severe drought) before ranging between 2% and 5% in the ensuing decade.

Annual growth in this sector rose to 3% in 2020 from 2.3% in 2019, as various countries within SSA grappled with adverse weather conditions, underlining the vulnerability of the region to the vagaries of weather.

Delivering on Africa's agricultural potential will require significant investment across the spectrum of inputs (fertiliser and hybrid seed), infrastructure (irrigation, storage and freight) and markets (improvement in regional trade flows and policies), according to McKinsey & Company.

Supply-chain disruptions across the globe – emanating from the Covid-19 pandemic and the Russia-Ukraine war – underscored the challenges related to procurement of fertiliser.

This challenge of vulnerability to external markets is exacerbated by downward pressure on the value of local currency units in tandem with a positive long-term inflation differential to foreign trading partners, and structural pressure on the aggregated current account. Oxford Economics Africa estimates that the continental current account deficit stood at \$5.8trn in 2021 (2.8% of GDP) and is set to rise to \$10.8trn by 2025 (4.5% of GDP).

The World Bank warned that *"the lack of robust agricultural productivity growth"* is a crucial factor behind *"pervasive poverty"* in SSA, cautioning that the region has failed to keep up with increased agricultural production in other regions.

McKinsey & Company identified Ethiopia, Nigeria and Tanzania as countries with the highest potential for substantial increases in agricultural productivity, but the level of government involvement in the agricultural system (moderate to high), irrigation- and infrastructural shortfalls, and security challenges pose considerable risk to exploiting this potential.

Furthermore, overcoming the myriad of challenges, partially via infrastructural development in partnership with private companies, would be crucial to address the large import requirements of cereals. Trade Map data shows that Africa imported cereals worth \$1.2bn in Q4 2021, with the largest importers being Ethiopia, Mozambique and South Africa.

Set against a modest aggregated export value (\$240m), the balance of cereal trade reached \$919m in Q4 2021, with the largest deficit belonging to Ethiopia (\$507.2m). As all countries have not released data for 2021 as yet, it is worth looking at the continental aggregate for 2020. Trade Map data shows that cereals trade reached a substantial deficit (worth \$23.6bn).

**Low
agricultural
productivity
contributing to
poverty**

Climate change a key threat to food security

Looking ahead, the threat of climate change may worsen food security, deepen resource-related conflict, exacerbate pressure on the healthcare system and fiscal finances, and raise structural inflation. The World Bank's climate change initiative seeks to address the numerous challenges associated with long-term weather disruptions, and the COP26 Climate Brief outlined clear mitigation and adaptation targets as well as policy measures spanning from adjustments to countries' regulatory frameworks, finance mobilisation, technology transfer, institutional capacity building and "*meaningful participation*" of stakeholders.

Various African countries cited their commitment to the World Bank's initiative and announced the urgent adoption of some mitigation measures such as reforestation. The emphasis on climate change, coupled with strain on government finances, creates opportunity for cost-effective joint partnerships with private sector companies in order to improve crop yields and boost employment in the agricultural sector despite a more challenging external backdrop.

In summary, the key challenges Africa's agricultural landscapes are faced with are as follows:

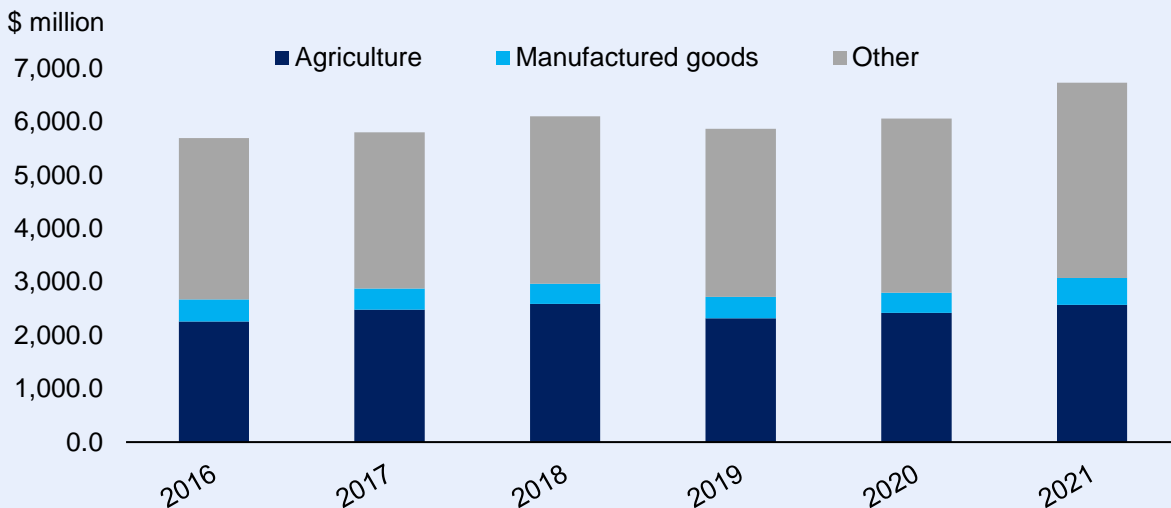
- **Increased food insecurity:** Lower agricultural output will stoke food shortages.
- **Loss in employment:** Agriculture employs a substantial share of Africa's labour force, and these jobs may be more at risk.
- **Physical risks and damage:** Climate change may result in an increase in extreme weather events which may cause widespread damage.
- **Slower diversification:** Climate-related disruptions to agricultural production will affect downstream activities – such as for example agro-processing – which are important for diversification purposes. The same applies for a lack of implementation of more advanced farming techniques.
- **Low productivity:** The failure to implement more advanced farming techniques will lower productivity and decrease output.
- **Security risk:** Security risks in some parts adversely affect agricultural output.
- **Lack of access to funding:** Many African farmers, especially subsistence farmers, lack access to financing to scale up operations, to acquire equipment or farming inputs.

CASE STUDY 3

AGRICULTURE KEY TO KENYA'S FUTURE DEVELOPMENT

Kenya identified the agricultural sector as a priority for development under its Fourth Medium-Term Plan (MTP, 2023-27), which in turn comprises the second-last phase of 'Kenya Vision 2030'. The latter is Kenya's long-term development programme which aims to transform the East African nation into an industrialised middle-income country with the ultimate goal of improving the country's standard of living. Agricultural exports (tea and coffee especially) are a key generator of foreign earnings, and Kenya identified this avenue to boost trade, economic growth, and employment.

Figure 8: Kenya's main export categories



Source: Central Bank of Kenya

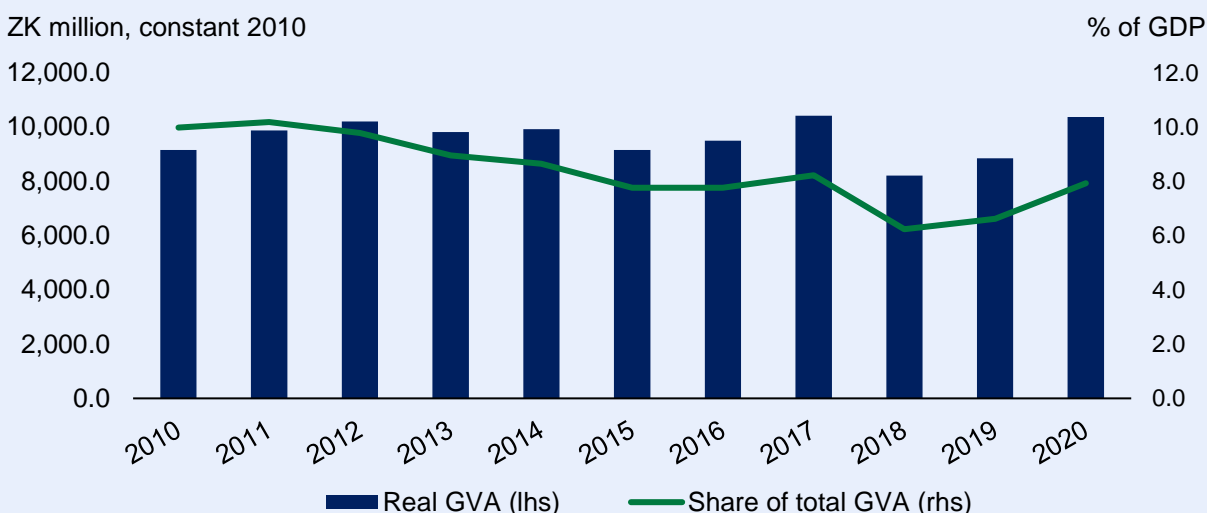
The sector faces severe challenges including climate change, pest invasion, the lack of infrastructure (notably irrigation), limited access to productive and financial resources, as well as the impact of weak policies. That said, Kenya is keen to reverse the erosion in FDI appeal. The East African nation has also taken commendable steps towards improving the business environment. Local AgriTech start-ups have already started to take off, with Twiga Foods and Apollo Agriculture amongst the leading companies. Twiga Foods, offering digital value chain solutions, secured \$50m in funding in 2021 provided by IFC Ventures and Goldman Sachs spinoff Juven, among others. Meanwhile, Apollo Agriculture, facilitating digital solutions to drive the commercialisation of agriculture, raised \$40m in 2022 from a number of investors, including the Chan Zuckerberg Initiative. Israel-based SupPlant also recently entered the market after Kenya's president declared the drought of 2021 to be a national disaster. SupPlant, in collaboration with Penn State University, launched a project to help bring precision irrigation to around half a million smallholder farmers in Kenya. Funding was facilitated from Red Dot Capital Partners and Menomadin Foundation, among a number of other organisations.

CASE STUDY 4

AGRICULTURE IN ZAMBIA FACES SEVERE CLIMATE RISKS

The Zambian agricultural sector endured severe drought-induced strain over the 2015-20 period as a heavy reliance on rainfall for irrigation and a narrow energy base were exposed by climate disruptions. Following successive droughts, higher precipitation allowed for an expansion in the area planted and a recovery in yields, resulting in a record crop during the 2020/21 season. Nevertheless, the underlying structural challenges associated with a vulnerability to weather factors remain unaddressed, exposing the sector to climate change risks. This vulnerability worsens the burden on the fiscal position, as weak harvests (due to poor precipitation or pest outbreak) necessitate emergency food imports.

Figure 9: Agriculture sector performance



Source: Zambia Central Statistical Office

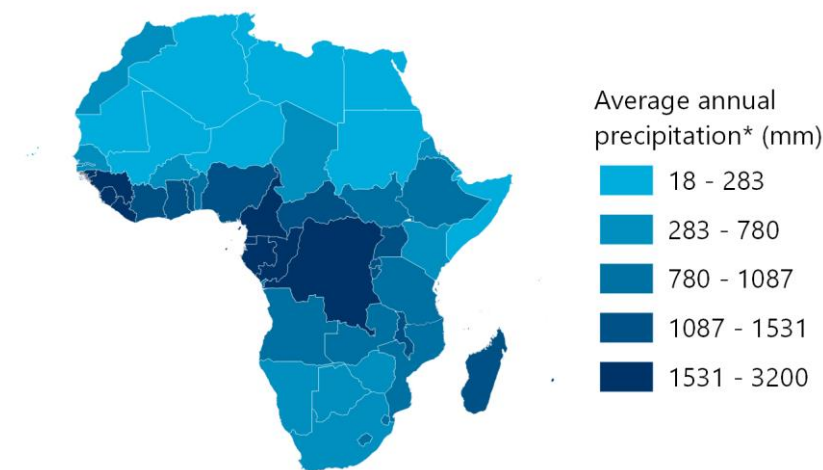
The IMF has long lamented that a subsidy-based approach to agricultural support is a high-cost, poorly targeted mechanism. The government has subsequently outlined proposals to replace the expensive Farmer Input Support Programme (FISP) with a comprehensive programme aimed at improving access to markets, encouraging multi-cropping practices, reducing vulnerability to rainfall via the establishment of irrigation infrastructure, and developing value chains. This shift signals an opportunity for firms, including Israeli companies, to enter the market towards mutually beneficial outcomes. Funding towards innovative agricultural solutions are often made available by multilateral organisations (such as the World Bank) and Development Fund Institutions (DFIs). For instance, in 2021, the Dutch Fund for Climate and Development (DFCD) provided a €180,000 grant to KASCOL (a cooperative of sugar growers in Zambia) to implement climate-smart irrigation systems. Other avenues which may be explored include partnerships with multinationals procuring raw agricultural produce. Foreign companies often receive benefits (such as lower excise taxes) for sourcing from local farmers and thus often drive initiatives to boost output and improve quality in order to reduce the need for imports.

Africa is the second-most arid continent after Australia

4.3 WATER SCARCITY WIDESPREAD ACROSS AFRICA

Sub-Saharan Africa has a larger number of countries that are considered water-scarce than any other region in the world. Over half of the region's population does not have access to clean water. Africa is the second-most arid continent after Australia. Moreover, much of Africa depends fully on rainfall and surface water for drinking and agricultural requirements. Though, water pollution is a severe issue on the continent, with much of the freshwater sources contaminated to the point where it is no longer suitable for human or even animal consumption. **As a result, the UN estimates that up to 250 million African inhabitants will live in water-stressed areas by 2030.** It also estimates that as much as 700 million people can be displaced as living conditions worsen due to insufficient water supply. **Water scarcity has also been earmarked as a potential reason for future conflict as it will become more valuable as its availability declines.** This highlights the need for drastic measures, from both private and public sectors in Africa, to ensure reliable and sustainable water supply on the continent.

Figure 10: Many African nations have below average annual precipitation



*2017

Source: World Bank

Seawater desalination has been identified as a viable solution to the region's problem, as 39 of Africa's 54 countries have a coastline. Some nations have already started to introduce this technology, with Algeria and South Africa the leaders on the continent in this regard. Oran, the capital of Algeria, has the largest desalination plant on the continent, which supplies drinking water to five million residents daily.

In terms of the African regions, North Africa holds about 80% of the continent's desalination capacity. This market dominance is anticipated to be maintained, as sub-Saharan Africa is still seeking to overcome the high capex associated with desalination.

39 of Africa's 54 countries have a coastline

That said, water scarcity issues in the region are set to worsen over the coming decades as rainfall patterns continue to change. This means that alternative water supply solutions will have to be explored, with desalination the most apparent option. While still an expensive solution, comparatively speaking, continued innovation in the field of desalination technologies will very likely reduce costs and improve efficiencies in the future.

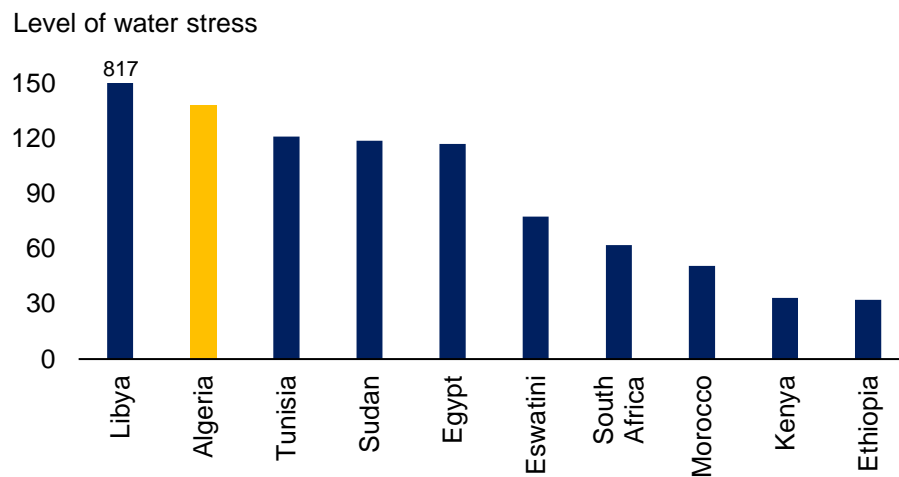
This means desalination may increasingly become a viable solution for more countries, more so if such endeavours are combined with Israeli expertise in other areas such as in energy, water and digital technologies.

There are also various positive externalities associated with the introduction of desalination technology. In addition to creating a new industry, investing in desalinated seawater can generate revenues, create employment opportunities, boost economic growth, and aid social stability, especially in Africa. These externalities are not limited to the water industry, as many other economic sectors need a consistent and reliable supply of fresh water to operate.

For example, ISI Water, a US-based water treatment, engineering, and consultation firm, built a desalination plant in Mauritania to supply water to a large-scale gold mine.

In South Africa, the Mossel Bay Desalination Plant supplies water to a local refinery, while Skikda Desalination Plant in Algeria provides sufficient drinking water for the entire city, as well as the water required by the local petrochemical plant.

Figure 11: Algeria is the second-most water-stressed country in Africa



Source: World Bank

Africa stands to benefit greatly from increased water recycling capabilities

In addition to desalination, water recycling technology for agriculture (and consumption) has great potential in Africa. That said, the stringent treatment that wastewater needs to go through before it is fit for human consumption means that it is largely used for agricultural purposes.

Various water-stricken nations in Africa, such as Morocco, already recycle water for agricultural activities, while Namibia treats wastewater to the point where it is suitable to drink. **The implementation of these technologies has the potential to move countries closer to a circular economy model, which is particularly beneficial for environment preservation.**

With water scarcity set to worsen as global warming advances, Africa stands to benefit greatly from investing in water recycling facilities. This issue is particularly pressing when considering the rapid population growth that the continent is experiencing, and will continue to experience in the coming decades.

In summary, the African continent has various vulnerabilities in terms of securing a reliable water supply, including:

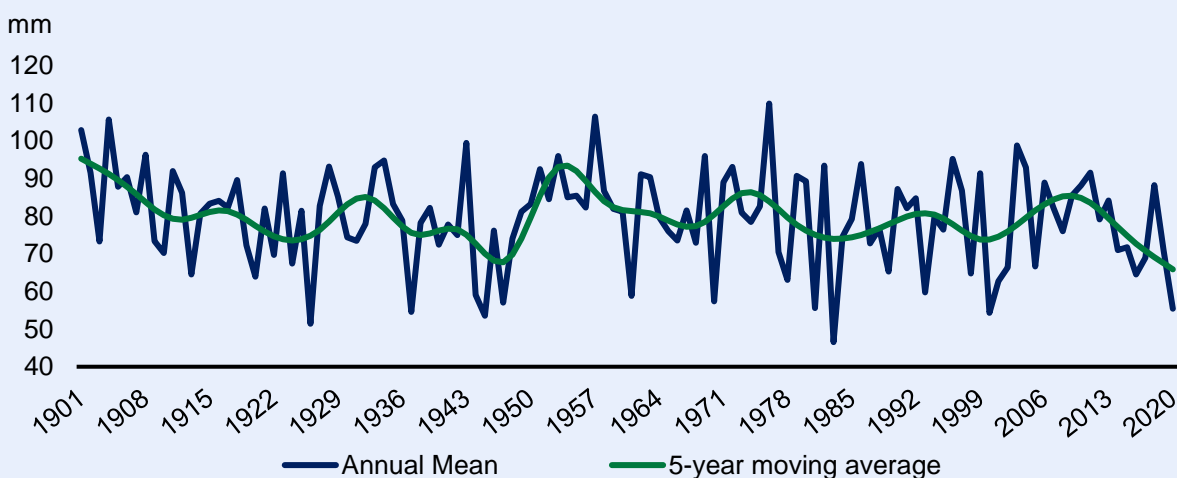
- **Declining rainfall patterns:** many African nations are experiencing downward-trending precipitation patterns. This, coupled with weak catchment capabilities and a lack of alternative water sources increases the susceptibility of the continent to future water crises.
- **Future water-related conflict:** as water shortages on the continent worsen further, the value of water will continue to rise. This is likely to cause conflict in the future, which will exacerbate the many existing issues Africa face.
- **Insufficient water transport infrastructure:** even in regions where there is a sufficient supply of water, there is often a lack of water transport infrastructure, which means that more remote and less water-rich areas suffer as a consequence.
- **Poor water recycling capabilities:** on a water-stressed continent, the creation of a circular economy will have a significantly positive impact on maximising the utility gains from the limited amount of water that is available.

CASE STUDY 5

ALGERIA DESALINATION, INFRASTRUCTURE PROVIDES OPPORTUNITY

According to the World Bank, Algeria is the second-most water-stressed country on the African continent. More than 80% of the country is made up of desert, with very low annual precipitation (just over 55 mm in 2020 compared with the global average of nearly 1,000 mm). This has forced Algeria to find innovative ways of supplying water to its rapidly increasing population. The country has significantly increased the amount of drinking water it supplies from reservoirs and desalination plants, which is then transferred via long-distance water transfers. Algeria's considerable oil and gas reserve revenues mean that government has been able to offer subsidies on water, which has made these unconventional water sources much more cost-effective than in many other African nations. Although Algeria has made great strides in improving its supply of drinking water, it continues to face challenges. Per capita water availability is below 300 m³ per annum, which puts it well below the World Bank's theoretical annual water scarcity threshold of 1,000 m³ per capita. With freshwater sources declining, the main alternative source of drinking water is the Mediterranean Sea. Although desalination is already utilised in the country, there is significant scope to expand these capabilities. This will create business opportunities for experts in the desalination field. This has been demonstrated by public-private-partnerships (PPPs) in the industry. General Electric (GE) and the Algerian Energy Company (AEC) formed a joint venture to build the Hamma Seawater Desalination Plant, which provides drinking water to 1.5 million Algerians. It was the first desalination plant that was funded by a PPP, of which 70% is owned by GE and the remaining 30% by the AEC. Furthermore, the Overseas Private Investment Corporation (OPIC) provided \$200m in financing towards the project. The nature of the agreement allowed the national energy utility to tap the expertise of GE, while maintaining a considerable share in the desalination plant.

Figure 12: Rainfall in Algeria has been declining over the last decade



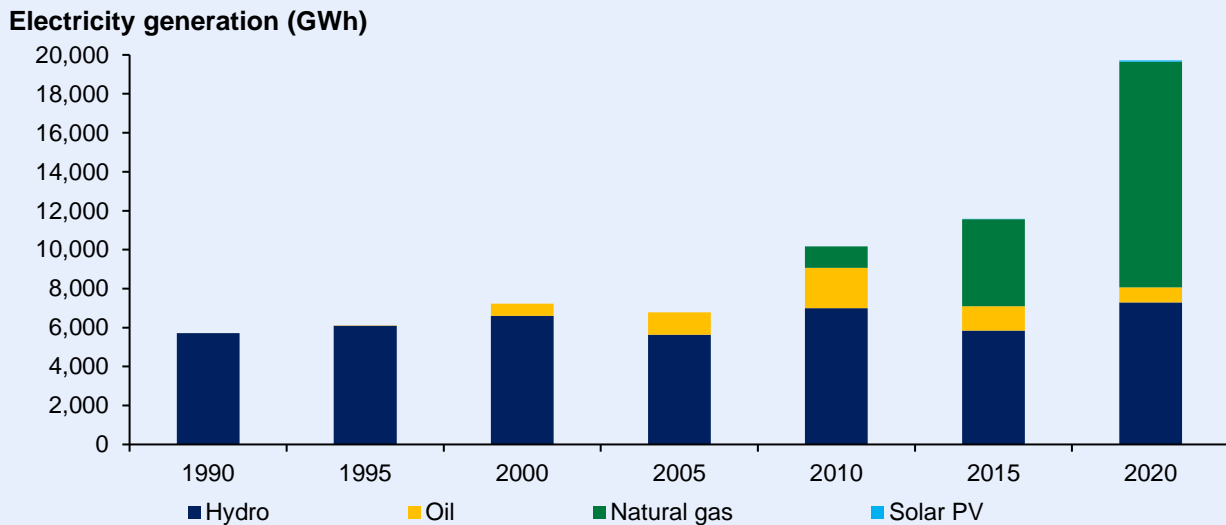
Source: World Bank

CASE STUDY 6

GHANA: THE GATEWAY INTO WEST AFRICA

While Ghana has above-average precipitation, rainfall only occurs for a few months of the year. Moreover, the country's energy grid is highly dependent on hydroelectric power. This means that, during prolonged dry seasons where dams run dry, power cuts need to be implemented. A possible solution to the risk of fluctuating dam levels is improving the country's water recycling capabilities. This may create a circular economy where wastewater is recycled and fed back into hydroelectric dams, supporting the constant supply of energy. Ghana's relatively favourable business environment adds to the viability of investing in water recycling in the country. Israel, as a world leader in water recycling technologies, possesses the intellectual property and resources to pursue successful ventures on this front.

Figure 13: Electricity generation in Ghana relies heavily on hydropower



Source: IEA

Additionally, Ghana stands to benefit from expanding its desalination capabilities. The country's capital, Accra, has over 2.6 million inhabitants and borders the Atlantic Ocean. With the country's first and only desalination plant commissioned in 2015 supplying drinking water to over 300,000 people in the greater Accra area, the scope to expand on this front is considerable, and the country could also leverage Israel's expertise on this front. Abengoa, a Spanish multinational company in the green infrastructure, energy, and water sectors, built the desalination plant in Ghana. The desalinated water is sold to the Ghana Water Company under a 25-year build-own-operate-transfer (BOOT) model for distribution to households and businesses. A BOOT model is a PPP project model in which a private firm conducts the development project under contract to a public-sector partner, such as a government agency. The 60,000m³/day plant cost roughly \$125m to build, and is anticipated to generate over \$1.3bn in revenues from water sales over the 25-year period.

4.4 ICT BRIDGING THE GAP TO THE UNBANKED

Around 69% of adults globally had an account, either with a financial institution or through a mobile money provider, by 2017 according to the World Bank. This represents an improvement from 51% in 2011 and 62% in 2014.

The Sub-Saharan Africa region continues to lag behind the global average in this regard, with 43% of adults having an account by 2017. That said, this still represents an improvement from 23% in 2011 and 34% in 2014.

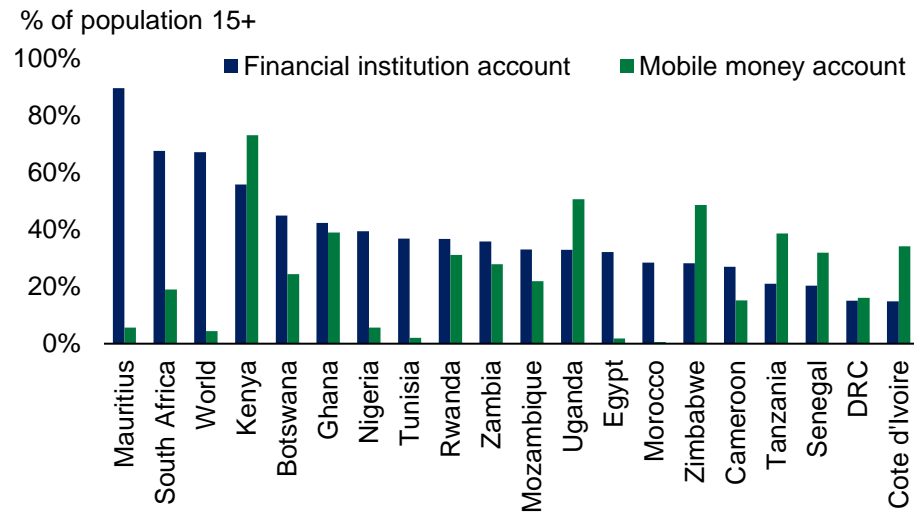
Gains achieved in terms of financial inclusion by the Sub-Saharan Africa region is mainly ascribed to the effective utilisation of technology in the form of mobile money services. In fact, the World Bank states:

“The power of financial technology to expand access to and use of accounts is demonstrated most persuasively in Sub-Saharan Africa, where 21% of adults now have a mobile money account – nearly twice the share in 2014 and easily the highest of any region in the world.”

This phenomenon was most visible in East Africa, with likes of services such as M-Pesa in Kenya. However, mobile money applications have also become more popular in other regions across the continent, especially in West Africa.

Regardless, financial inclusion across Africa remains low, and the degree of access to financial services varies significantly between countries. Mauritius, South Africa and Kenya fare comparatively well in terms of access to formal financial services through traditional financial institutions such as banks.

Figure 14: Access to financial services



Source: World Bank

Financial inclusion remains low across many parts of Africa

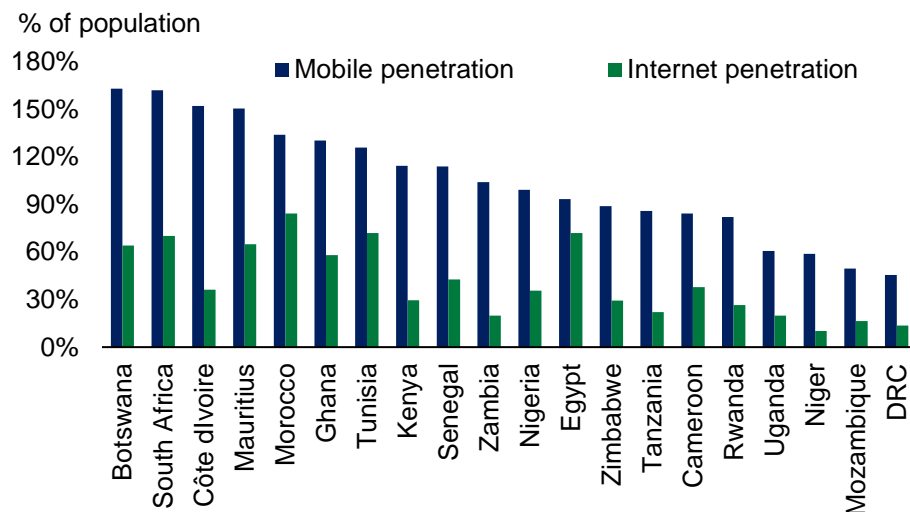
However, a vast number of African countries still lag significantly behind the global average. In some cases, however, mobile money services have resulted in significant improvements in access to finance.

Countries such as Kenya, Uganda, Tanzania, Senegal, Zimbabwe and Côte d'Ivoire all have more mobile money subscribers than individuals with accounts at formal financial institutions.

The fact that Africa still has a substantial unbanked population presents great opportunities. This also stems from a marked improvement in mobile and internet penetration rates – a significant number of African countries now boast mobile penetration rates in excess of 80%.

This, in turn, could be leveraged to drive further gains in financial inclusion across the continent.

Figure 15: Mobile and internet penetration rates



Source: International Telecommunication Union

ICT has also been amongst the best performing sectors across the continent during the Covid-19 pandemic, accelerating the uptake of digital technologies and services.

The scope of opportunities is broad, including new and innovative Fintech solutions, payment systems, digital insurance services and the need for improved cyber security applications.

Higher mobile and internet penetration could help drive financial inclusion

Aside from services aimed at using mobile technologies to improve financial inclusion, applications related to artificial intelligence could also assist in improving user experience.

Furthermore, big data analytics hold the potential to improve financial sector oversight and regulation and assessing credit risks more broadly, amongst a host of other possibilities.

In summary, the key challenges Africa's ICT landscapes are faced with are as follows:

- **Low internet penetration:** Internet penetration remains low in a number of African countries, while costs also constrain increased consumer demand due to affordability issues.
- **Infrastructure deficiencies:** In many African countries, ICT infrastructure is insufficient to allow services to reach large shares of the population.
- **Large State participation in some cases:** Although trends have been positive in this regard more recently, in some African countries State-owned ICT companies still crowd out private sector development.
- **Regulatory and policy constraints:** In certain African countries, regulations are still not conducive enough to boost private sector participation and market expansion, while restrictive policies and indecisiveness inhibits growth and innovation.
- **Low financial inclusion:** Despite the significant advances in this regard through mobile money applications, a significant number of Africans still do not have access to more formal financial services.

CASE STUDY 7

RWANDA LEVERAGES LEARNINGS FROM ABROAD

One of the main goals of Rwanda's Vision 2050 is to leverage digital transformation and innovations to lift the country's citizens out of poverty through improving financial inclusion and access to credit. According to the World Bank, only 37% of the population aged 15 and older had an account at a financial institution in 2017. Mobile money accounts weren't lagging far behind. The World Bank estimates that 31% of the population aged 15 and older had a mobile money account in 2017.

Various policies, strategies and organisations have been established to drive this ambition. The Kigali International Financial Centre (KIFC) aims to transform Rwanda into an international financial destination for investors seeking opportunities across the African continent. In 2020, the KIFC announced the launch of the Fintech-focused Africa Fund, which is aimed at raising funds for Fintech projects.

The National Bank of Rwanda (BNR, the central bank), meanwhile, has implemented a range of measures aimed at removing regulatory hurdles that served to constrain innovation and entrepreneurial activity in the Fintech space. The Rwanda Payment System Strategy 2018-24 also strives to establish an enabling environment to introduce more innovation into payment modes, channels and technologies, while also aiming to boost collaboration between the public and private sectors. Furthermore, Rwanda is in the process of drafting its Start-up Act, with it having a strong focus on government's policies aimed at supporting Fintech innovation.

Rwanda and Israel signed a Memorandum of Understanding (MoU) towards the end of 2020 to promote cooperation on technological developments. Rwanda's Minister of ICT and Innovation stated:

"The leading innovations that Israel have are in the areas of health, agriculture and many others, and we look forward to borrowing some of these innovations to transform our country."

Other specific areas which the MoU attempts to enhance cooperation on include telecommunications, cybersecurity, space technology and artificial intelligence. While this represented a positive signal from a bilateral perspective, there is limited evidence that this development has resulted in significant gains to date. That said, it does signal that there is an acknowledgement of mutually beneficial outcomes through bilateral cooperation.

Aside from bilateral-level engagements, opportunities exist for Fintech companies to leverage possible relationships with large and multinational banks and telecom operators active in Rwanda or to engage these organisations to collaborate on expanding Fintech services or to introduce new innovations.

One such example is the recent partnership between Bank of Kigali and Swiss-based Temenos – a banking software company. Through implementing the Temenos solution, the Bank of Kigali aims to substantially increase its customer base through increased automation, new digital services and enhanced mobile offerings.

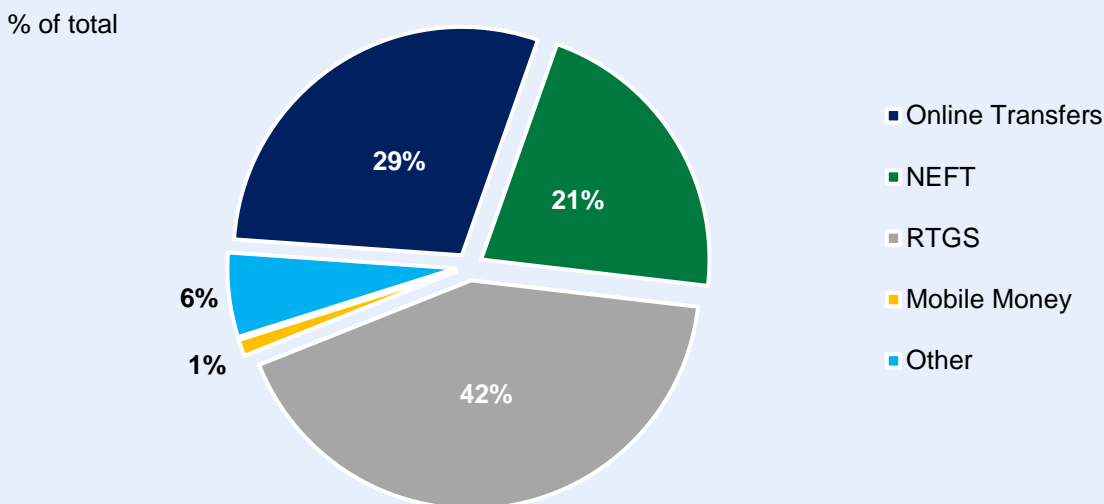
CASE STUDY 8

THE SLEEPING GIANT NIGERIA SLOWLY AWAKENS

The Nigerian economy had to endure an especially challenging period ever since global oil prices fell towards the end of 2014. As a result, regulators held a firm grip on the monetary system, frequently issuing regulations aimed at curbing what authorities deemed to be fraudulent activities – these actions were in most cases also aimed at safeguarding foreign reserves which came under immense pressure as oil revenues slumped.

According to the World Bank, only 39% of Nigeria’s population of over 200 million people (of which roughly 115 million are aged 15 and older) has an account at a financial institution, which means that more than half of Nigerians remain largely unbanked. Furthermore, only 6% of the adult population had a mobile money account. Data from the Central Bank of Nigeria (CBN) – spanning the January - August 2020 period – indicates that mobile money made up a mere 1% of total E-payment transaction values.

Figure 16: Distribution of E-payment values (January – August 2020)



Source: Central Bank of Nigeria

However, the Nigerian Fintech scene looks set to experience marked growth following the central bank’s decision to grant ‘approval in principle’ to large foreign-based telecommunication companies MTN and Airtel – these organisations now need to fulfil certain regulatory requirements to attain final approval to operate as payment service banks in Nigeria and offer mobile money services. It is also worth noting that certain local operators have already been granted licenses. The more liberal stance adopted by regulators mean that the broader digital market may become increasingly more vibrant moving forward. Access to the market for Fintech companies may be similar to that mentioned in the Rwanda case study, through partnering with large banks and telecom operators to expand service offerings and introduce new innovative solutions.

4.5 AFRICA IN NEED OF HEALTH AND EDUCATION SERVICES

Africa is still faced with substantial health-related obstacles. The continent frequently ranks as the poorest performing region globally on a number of health indicators.

In its latest World Health Statistics 2021 report, the World Health Organization (WHO) highlights that Africa had the lowest average life expectancy at 64.5 years in 2019, compared to the global average life expectancy of 73.3 years.

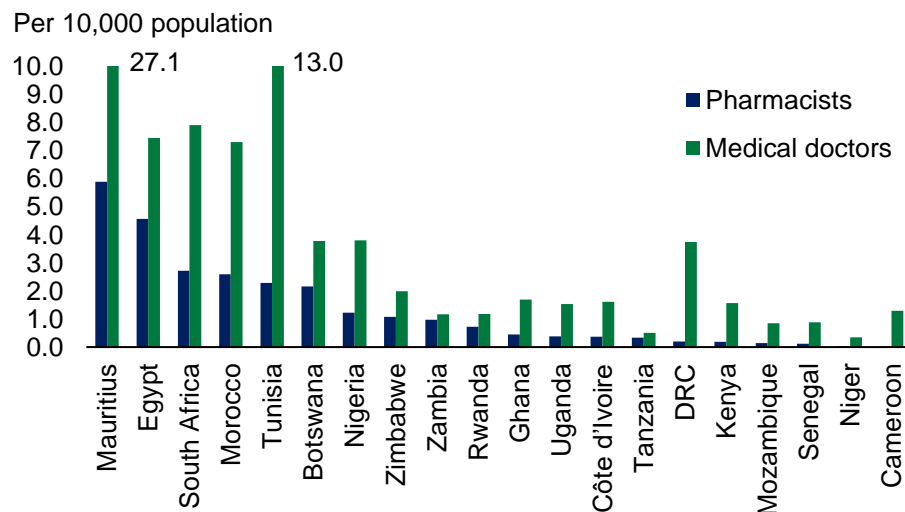
A still-high prevalence of communicable diseases plays a significant role in this regard. According to the WHO, communicable diseases accounted for 52.9% of all deaths across the African region in 2019.

Another key contributor to Africa's health-related issues relates to poor access to universal health coverage (UHC). While progress is evident in recent years, Africa is still the worst performing region on the WHO's UHC service coverage index (SCI) – in 2017, Africa's UHC SCI value stood at 46 compared to a global average of 66.

The continent also fares poorly on indicators relating to the number of doctors and pharmacists per 10,000 people, where the vast majority of African countries record ratios weaker than the global average – the global average is 4.7 pharmacists per 10,000 people (0.8 average for Africa) and 16.4 doctors per 10,000 people (2.9 average for Africa).

Africa is still faced with substantial health obstacles

Figure 17: Access to medical services (2020 or latest)



Source: World Health Organization

Aside from disease burdens, various other factors also contribute to Africa's health challenges. These include:

- Hygiene-related infrastructure and resource deficiencies;
- Inadequate public healthcare spending
- Household income constraints and affordability considerations;
- Large distances for rural populations to access healthcare.

That said, technological innovations are showing increasing signs of finding innovative solutions to address some of these challenges, such as the shift towards digital health.

Furthermore, Israel is recognised globally for its expertise in first aid, field and ICU services. These services are especially relevant to rural areas across Africa which usually lack basic health services, and even more so in such areas which are prone to conflict.

Education represents yet another key challenge for Africa. The challenge is multidimensional. In many African countries, spending directed at education, either to provide adequate infrastructure or to pay the wages of educators, is insufficient.

The cost and quality of education represent two additional challenges, with the minority more affluent households able to afford private schools and institutions offering educational programmes more in line with international standards, as well as access to more advanced learning tools and materials.

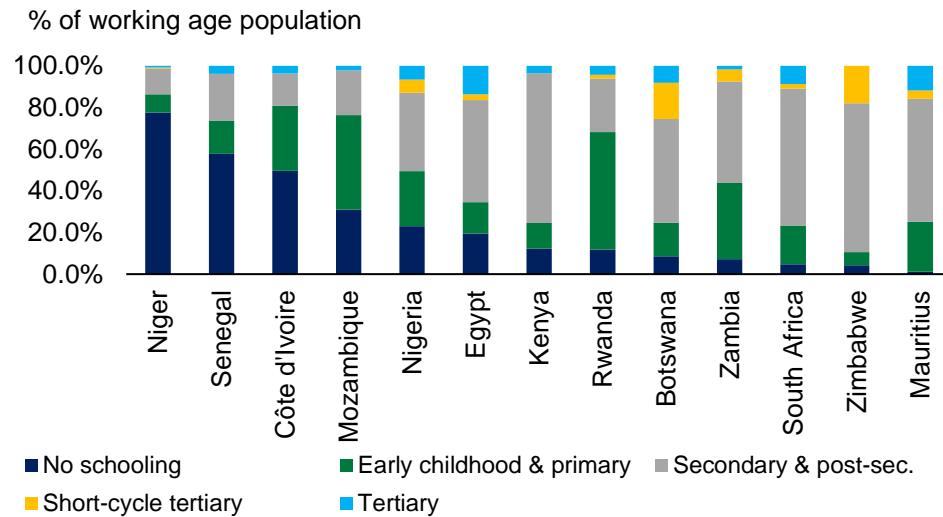
Simply gaining access to education is yet another problematic area, arising due to a variety of reasons, ranging from proximity to educational institutions (a problem for more rural populations) to cultural considerations.

According to data from the International Labour Organization (ILO), a number of African countries are characterised by a situation where more than half of their working age populations have not attained any secondary-level education – for example Niger, Senegal, Côte d'Ivoire, Mozambique and Rwanda.

Other countries fare significantly better, such as South Africa, Egypt, Kenya, Botswana and Mauritius, where more than half of their working age populations received at least some secondary-level education.

African countries generally perform poorly in terms of tertiary educational attainment, especially when compared to more advanced economies such as the US and the UK where 34% and 22% of their respective working age populations received tertiary-level education.

Figure 18: Educational attainment by working age population (2020 or latest)



Source: *International Labour Organization*

Educational improvements across Africa are crucially important, especially in light of many countries pushing strategies aimed at boosting entrepreneurship and also ensuring education is aligned with changing future labour market demands. Again, technological innovations hold significant promise in this regard.

In summary, the key challenges Africa's health and education sectors are faced with are as follows:

- **Generally poor health:** A still-high prevalence of communicable diseases plays a significant role in this regard.
- **Poor access to health coverage:** This problem is even more prevalent in rural areas.
- **Low levels of educational attainment:** A multidimensional, but critical important, challenge driven by various factors including government spending constraints, infrastructure deficiencies, low quality education services, difficulty in gaining access to education services in addition to cultural considerations.

Africa performs poorly in terms of tertiary educational attainment

CASE STUDY 9

RWANDA EXPANDS DIGITAL HEALTH OFFERINGS

Rwanda has made astonishing progress since the genocide ravaged the country in 1994. Economic production halved in 1994, which was followed by a 35.2% recovery in GDP the following year. Since then, real GDP growth has averaged just over 7.2% p.a., reaching 9.5% in 2019.

Effective governance has been key in Rwanda's success, with accountable political and inclusive economic institutions creating an environment conducive to private sector development.

The reform-minded government has decided to play more of a supporting role in the economy's development, putting policies in place that promote entrepreneurial activities and that attract foreign investment. Like in many other sectors of the economy, these policies aimed at supporting investment and creating a conducive business environment also likely played a role in getting Rwanda's digital health sub-sector off the ground.

UK-based firm Babylon, with support from the Bill & Melinda Gates Foundation, entered into an agreement with the Rwandan government in 2016 to start offering digital health services through a local subsidiary called Babyl Rwanda.

According to the company, Babyl is *"integrated into Rwanda's National Health Insurance Scheme and is the largest digital health provider in the country."* It also reports as having 2.5 million registered users and that 2.9 million consultations have been processed.

Babyl offers a range of digital health solutions. First, registered individuals can arrange telephonic consultations with a network of doctors by scheduling an appointment and being called back by the general practitioner. Calls and texts are received through a call centre operated by qualified nurses. The information attained by the nurses acts as a first screening, allowing them to relay the information back to the medical doctor.

Payment is also facilitated digitally using mobile money platforms. Payment is required before a booking with a medical doctor is confirmed with the patient.

Any prescriptions are also submitted digitally, directly to the phone and accepted as such at pharmacies. The same process applies when laboratory tests need to be carried out – test codes are sent to the registered person's phone and results sent to the doctor.

Babyl has now also launched a new service relying on artificial intelligence (AI) applications. Effectively, the company has implemented an AI triage platform at the call centre receiving the inbound queries from registered persons.

The AI tool combines a potential patient's records with medical information to allow the nurses interacting with the person to ask the right questions to get the right feedback which also allows for making faster decisions – this then ultimately assists in choosing the correct treatment path.

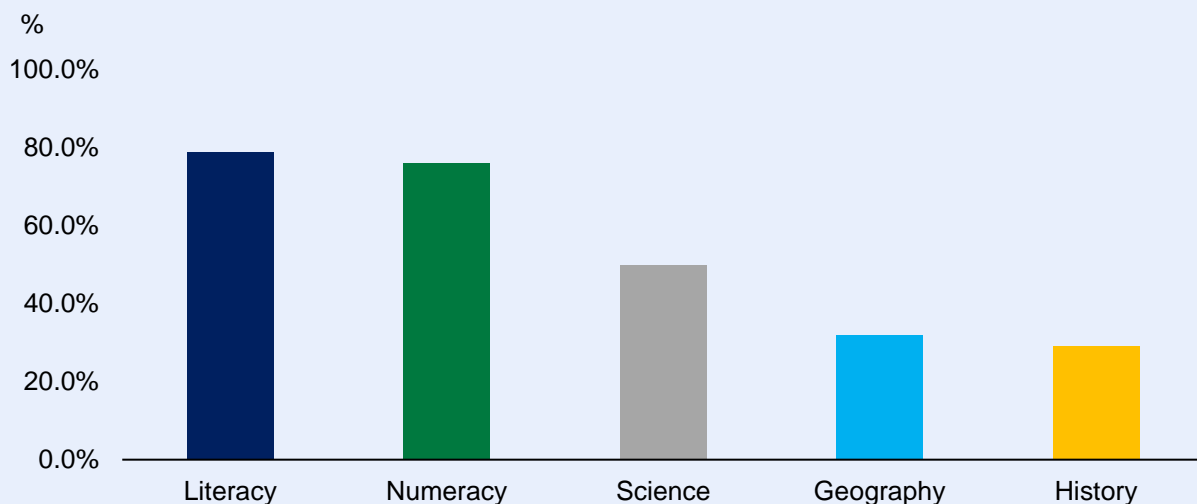
CASE STUDY 10

UGANDA SHOWS ED-TECH MAY BE ON THE MOVE

A report by the Education in Emergencies (EiE) Working Group for Uganda reviewed 36 Ed-Tech solutions being offered in the country by 29 different organisations in 2019. The authors highlight that authorities view Ed-Tech “both as a way to develop digital literacy and to drive overall (economic) literacy.” Furthermore, “there is also significant interest from private sector and education donors to contribute resources to the Ed-Tech space in Uganda and steering these resources towards areas of need is critical.”

The landscape scoping exercise focused on three broad areas: 1) learning, 2) teacher development and 3) school management. However, the vast majority of the solutions were found to be focused on learning. Meanwhile, the main learning solutions focused on improving literacy skills, followed by numeracy and science.

Figure 19: Main themes of focus for Ed-Tech solutions



Source: EiE Working Group for Uganda

In general, the Uganda case study does not suggest that the market is particularly well developed, with very few of the firms being classified as having matured solutions. Nonetheless, it does highlight that the space is indeed showing signs of development and innovation.

While more lucrative commercial avenues will certainly exist such as through offerings to more affluent educational institutions, the most pressing need lies in providing innovative educational solutions to less affluent segments of the population (market size is a positive consideration in this regard). In this respect, funding through multilateral organisations and DFIs may be leveraged by companies wanting to venture into this space. Partnerships with local universities and educational institutions may also prove fruitful.

5. MUTUALLY BENEFICIAL OUTCOMES

Establishing fruitful and lasting economic ties between Israel and African countries would ultimately require such engagements to prove beneficial for all parties concerned. Throughout this assessment, various areas where Israel's core strengths and competencies could be leveraged to help overcome critical development issues in many African countries have been identified, in addition to areas where certain African markets may offer significant opportunities in the future.

Potential mutually beneficial outcomes are immediately evident even when considering some of Israel's broader and overarching strengths, referring to 1) Smart Cities, 2) Israel's innovative and entrepreneurial ecosystem and 3) the country's ability to identify innovative financing solutions. Firstly, urbanisation across vast parts of Africa is accelerating, which places additional pressure on infrastructure, resources and service delivery. Thus, smarter solutions have to be considered. In this regard, a substantial number of African cities and also new developments can benefit from Smart City solutions, an area in which Israel is viewed as a global leader. Secondly, generating employment opportunities is crucially important from an African perspective, and boosting entrepreneurship and incentivising innovation are often viewed as key pillars in strategies aimed at addressing job shortages. In this regard, Africa can certainly leverage lessons from a country such as Israel to identify the most important drivers to create environments conducive to innovation and successful entrepreneurial endeavours. The latter ties in with another key overarching Israeli competency, relating to the country's ability to identify innovative financing solutions. This represents a key area where African entrepreneurs often face obstacles, and possibly signals an opportunity for joint ventures or collaboration, where African entrepreneurs can benefit from Israeli counterpart innovation and access to finance while the latter could gain a foothold in a potentially lucrative market. Financing solutions also span much wider than this micro level, and there are also opportunities in project and even government-level partnerships.

The more granular themes, and the means through which engagements may prove beneficial to all parties, are described below:

1) ENERGY

Africa has stark challenges in the energy sector: the continent has the lowest electrical generation capacity in the world and experiences acute forms of energy shortages. Africa's energy challenges mainly relate to access, affordability, reliability, project bankability, and environmental sustainability, coupled with policy and regulatory aspects. The continent's energy sector weaknesses could, however, in many respects be alleviated by drawing on Israel's core strengths: renewable energy, energy storage, natural gas, grid management, and structural reform.

Significant mutual benefits in renewable energy

Leveraging Israel’s expertise in terms of electrical power generation through natural gas can benefit a number of African countries with significant untapped reserves which can be utilised as a transitional power source amid the accelerated uptake of non-dispatchable renewable energy plants. Aside from improving electricity supply in these markets, the opportunity for wider benefits exists in some cases where electrical power can be exported through regionally connected grids or pipelines – the latter already being in place between Israel and Egypt. The benefit to Israel, in turn, could stem from potential investments in natural gas projects or through the export of services.

The renewable energy space also represents significant opportunity. Israel’s objective to increasingly shift towards solar power generation is particularly relevant in this case. As was illustrated by the Egyptian case study, there is an opportunity for Israel to provide technical expertise and invest in solar PV plants in Egypt for export to Israel as a way of lowering both countries’ carbon footprints. Electricity trade between the two countries would, however, require an interconnection of their transmission networks, which has recently been supported by the Israeli energy minister. **Moreover, the Israeli solar technology industry could supply solar panels, equipment, and key balance of plant components to Egypt and other African countries, thereby not only boosting electricity supply in those markets, but also contributing to lower global GHG emissions.** The case study on Morocco demonstrated how Israeli firms and financial institutions could invest in the country’s renewable energy, natural gas, energy storage, and hydrogen sectors. In that regard, solar technologies offer the largest potential, both at the utility-scale through partaking in Morocco’s established energy auctions and in the self-generation space. Additionally, Israeli manufacturers could invest in the Moroccan solar PV, gas, and energy storage industries, given limited domestic competition coupled with the ongoing roll-out of renewable energy projects, which provides an opportunity to lower transport costs, utilise Israeli technical expertise, and supply technologies to plants with Israeli equity participation in the broader African region.

Furthermore, the production and use of ‘green’ hydrogen, fuel cells, and electrolyzers are expected to increase rapidly amid structural shifts to environmental sustainability. Africa has enormous potential for hydrogen production given the abundance of land and renewable energy sources, which could also be exported to other regions where demand for the energy carrier will grow rapidly. Meanwhile, Israel emphasises hydrogen in its national strategy, and the country also has several innovative firms exploring hydrogen opportunities.

2) AGRICULTURE

Agriculture remains central to Africa’s diversification efforts and to boost production and alleviate food insecurity. The sector is also a major source of employment across the continent. However, commercialisation of agricultural production remains a challenge, and climate change is posing increasing risks to the sector in general. **Nonetheless, Africa still boasts immense agricultural potential, but**

Commercial agriculture utilising advanced tech could hold immense benefits

significant investment across the spectrum of inputs (fertiliser and hybrid seed), infrastructure (irrigation, storage and freight) and markets (improvement in regional trade flows and policies) is required.

Israel's core strengths in the agricultural space, including vertical farming, smart farming, biotech inputs (improving irrigation and supporting nutrient uptake) and the provision of digital market platforms are generally well aligned to bridge the challenges faced by agricultural sectors in many African countries. Applying these techniques and technologies could ultimately have a significant impact towards boosting agricultural output and food production. The most direct routes for Israeli participation, apart from service offerings and potential equipment sales, is direct investment in strategically important markets or through leveraging funding from multilateral organisations or DFIs. Other avenues which may be explored include partnerships with multinational companies procuring raw agricultural produce. Foreign companies often receive benefits (such as lower excise taxes) for sourcing from local farmers and thus often drive initiatives to boost output and improve quality in order to reduce the need for imports.

The benefits to be attained stems from profits generated through local and regional sales (bearing in mind factors such as the Africa Continental Free Trade Area Agreement) and also through exports to other markets abroad (possibly also positioning certain African countries as key agricultural produce suppliers to Israel itself).

3) WATER

Sub-Saharan Africa has a larger number of countries that are considered water-scarce than any other region in the world. **Over half of the region's population does not have access to clean water.** Africa is also the second-most arid continent after Australia.

Furthermore, the UN estimates that up to 250 million African inhabitants will live in water-stressed areas by 2030, and unfavourable climate change developments may only exacerbate the situation.

Hence, African countries, the majority of which have a coastline, may increasingly look towards investments in desalination to boost water supply – the case studies considered in this paper highlight that PPP agreements are often leveraged in these cases along with build-own-operate-transfer (BOOT) models.

Water recycling technologies and techniques also hold significant potential, for agricultural and other purposes. Israel is also a global leader in these fields, and Israeli firms could benefit from positioning themselves as preferred suppliers of these services, be it in the form of consulting, engineering or advisory services or selling related equipment, parts and intangibles such as intellectual property.

Large market
opportunities
not only
limited to
Fintech

4) INFORMATION AND COMMUNICATION TECHNOLOGY

Israel is well-known as a global front-runner in high-tech industries. In the ICT space specifically, the country boasts world-class competencies in fields such as Fintech, software development, cybersecurity, artificial intelligence and big data applications, amongst many others.

The Fintech scene specifically has gained significantly more attention across Africa in recent years, with mobile operators utilising mobile money solutions to improve access to financial services. Yet, financial inclusion remains very low in the majority of African countries. **This suggests significant opportunity for both established and start-up Israeli firms to target current and future product offerings aimed at a vast African market**, with some countries still being in the infancy stage of adopting newer technologies. Nigeria represents a good example in this case, with regulations gradually being eased to allow for increased mobile money transactions. In general, prospects exist for Fintech companies to leverage possible relationships with large and multinational banks and telecom operators within African countries or to engage these organisations to collaborate on expanding Fintech services or to introduce new innovations.

It must be highlighted that the opportunity stretches far beyond mobile money, also incorporating digital payment solutions more broadly. A number of African countries could also benefit immensely from Israel's expertise in cybersecurity to strengthen for instance payroll management, curtail tax avoidance and broader 'security software' applications in the regulatory (monetary, fiscal, customs, etc.) and public administration spaces. Artificial intelligence and big data solutions could also fill vital market gaps in these broader areas.

5) MEDICAL AND EDUCATION SERVICES

Africa is still faced with substantial health-related obstacles, with the continent frequently ranking as the poorest performing region globally on a number of health indicators. The African health landscape in general could benefit immensely from Israel's strengths in areas such as eHealth. Access to health services is also very problematic, especially in more rural settings, and in this case Israel's expertise in first aid, field and ICU services may prove very beneficial.

Education also represents a key challenge for Africa. In many African countries, spending directed at education is insufficient. The cost and quality of education represent two additional challenges, and simply gaining access to education is yet another major problematic area.

Again, this presents opportunities for Israeli firms in the digital health and education fields to target solutions towards the African market. Israeli companies are already very successful in raising venture capital and identifying financing solutions, and offerings aimed at improving health, education and social inequality outcomes may unlock additional funding from donor and development assistance organisations globally.

6. POSSIBLE CHALLENGES AND RISKS

Having established areas where Israel's core strengths and competencies could be leveraged to help overcome critical development issues in many African countries, and that there exists significant potential for mutually beneficial outcomes, the investigation now turns to a focus on some of the challenges and risks which may constrain the actualisation of partnerships and closer economic ties, and which may also make joint partnerships and ventures less attractive.

These potential challenges and risks are considered below:

1) Political factors

In some cases, country-level disagreements regarding political and ideological views may prevent bilateral agreements from being implemented. This may also have an adverse effect on more micro-level engagements such as between organisations due to concerns about client-base perceptions if collaboration with a counterparty will be interpreted in a negative sense.

2) Multilateral challenges

Israel was recently granted observer status at the AU, but a number of African countries expressed their objections to the decision. It is also worth noting that Israel is not amongst the 28 non-African member countries of the African Development Bank (AfDB).

This adversely affects the country's ability to leverage funding through one of the continent's leading development fund institutions, to partner with the AfDB on important projects and to leverage the Bank's partnerships and networks towards identifying and engaging in potential mutually beneficial endeavours.

Interestingly, Israel has bilateral diplomatic relations with 46 African countries, but these have yet to yield significant benefits, or at the very least, reached close to the potential that deeper economic ties could bring about.

Issues faced at the multilateral level may also directly or indirectly influence closer ties at the bilateral level as African countries may not want to sour relations with existing trade partners.

3) Financing and bankability

While Israeli companies and entrepreneurs are well known for finding innovative financing solutions, securing funding for projects and ventures may prove more difficult in an African context.

This stems from factors such as broader financing constraints across the continent, many African governments being faced with tight fiscal finances in addition to political, security and commercial risks adversely affecting financing decisions – corruption in certain countries may also affect access to finance.

On the other hand, donor and development fund organisations are often more willing to finance projects aimed at improving health, education and social inequality outcomes.

Bankability of projects and ventures also need to be considered. In general, Africa's population is considerably less wealthy than compared to for instance some of Israel's key trading partners.

That said, this does not detract from the fact that the right opportunities combined with appropriate solutions tailored to the relevant African market will likely still yield significant returns.

4) Security risks

Various African countries face elevated security risks in the form of terrorism, cultural conflicts, ethnic clashes and social unrest. The risk of government's being overthrown through coup d'états is also elevated in some cases.

5) Regulatory and policy risks

The risk of sudden changes to regulations, incentives, property rights and government policy more generally is also elevated in certain parts of the continent, often driven by political agendas. Furthermore, in certain African countries, regulations are still not conducive enough to boost private sector participation and market expansion, while restrictive policies and indecisiveness inhibit growth and innovation.

6) Infrastructure deficiencies

Inadequate and deteriorating infrastructure represents a key challenge across various parts of the African continent, slowing expansion, lowering productivity and raising business input costs – power supply shortages are also an issue.

7) Crowding out by the State

In some African countries, State-owned enterprises still hold monopoly power or very dominant market shares in certain sectors, which discourages competition and crowds out private sector participation.

7. CONCLUSION

**Stark synergy
between
Israel's
strengths and
Africa's
challenges**

This study clearly highlights **the stark synergy between Israel's key strengths and some of the major challenges African countries are faced with.**

Israel's key competencies in relation to energy (natural gas and renewables), agriculture (smart farming, irrigation, agri-tech applications, etc.), water (desalination and recycling), ICT (Fintech, cybersecurity, etc.) and medical & educational technologies hold significant potential to overcome some of the major difficulties African countries are faced with, and in turn, also support economic and social development in general.

Israel also stands to benefit from closer economic ties with Africa through various different channels, including the export of services, strategic investments in lucrative projects with local and export market potential, and also exposing Israeli firms to large untapped markets across Africa.

Having established areas where Israel's core strengths and competencies could be leveraged to help overcome critical development issues in many African countries, and that there exists significant potential for mutually beneficial outcomes, the investigation concluded with a focus on some challenges and risks which may constrain the actualisation of partnerships and closer economic ties. These include political factors, multilateral challenges, financing and bankability, security, regulatory and policy risks, infrastructure deficiencies and significant State control over certain sectors.

While these risks and challenges are certainly relevant, it does not detract from the fact that there remains significant scope and mutual benefit to be gained from closer collaboration and economies ties between African countries and Israel.

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US State Department
Volcani Centre
World Bank
World Economic Forum
World Health Organization
Zambia Central Statistical Office



OXFORD ECONOMICS

AFRICA

Global headquarters

Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London

Broadwall House
21 Broadwall
London, SE1 9PL
UK
Tel: +44 (0)203 910 8000

Frankfurt

Marienstr. 15
60329 Frankfurt am Main
Germany
Tel: +49 69 96 758 658

New York

5 Hanover Square, 8th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Singapore

6 Battery Road
#38-05
Singapore 049909
Tel: +65 6850 0110

Cape Town

Cecilia Square
2nd Floor, Unit 46
100 Cecilia Street, Paarl, 7646
Cape Town, South Africa
Tel: +27 (0)21 863 6200

Europe, Middle East and Africa

Oxford
London
Belfast
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Americas

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Philadelphia
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Mexico City

Asia Pacific

Singapore
Hong Kong
Tokyo
Sydney
Melbourne

Email:

mailbox@oxfordeconomics.com

Website:

www.oxfordeconomics.com

Further contact details:

[www.oxfordeconomics.com/
about-us/worldwide-offices](http://www.oxfordeconomics.com/about-us/worldwide-offices)