



The impacts of Covid-19 on the power sector in sub-Saharan Africa, and the role of the power sector in socio-economic recovery

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The COVID-19 pandemic has had devastating impacts on economies and societies the world over, in a myriad of ways. In sub-Saharan Africa (SSA) the spread of the virus has not yet been as prolific as it has in some other parts of the world. However, with large parts of the population living under or close to the poverty line, fragile public health systems, inadequate infrastructure, and limited fiscal space, the region is more vulnerable to the health, social and economic impacts of the pandemic than many other parts of the world. These vulnerabilities are evidenced in the rapidly accelerating infection rates in the region. The power sector has a vital role to play in ensuring the resilience of societies in their response to COVID-19, in driving the recovery of economies and stimulating socio-economic development. Conversely, the impact of COVID-19 on the power sector has implications for the resilience of the sector itself which is dependent on the characteristics of power sectors and is becoming increasingly apparent the world around (RES4Africa, 2020; AU, 2020; Ozili, 2020).

Mapping our current understanding of COVID-19 and the power sector in SSA

The World Bank estimates that today approximately 594 million people in SSA lack access to electricity. Given the demographic profile of the region with a young population and the expected economic development rates, energy demand on the continent is expected to grow twice as fast as the global average in the coming decade. This stresses the importance of establishing resilient power systems and broadening access to drive economic development on the continent (RES4Africa, 2020).

However, the impact of the COVID-19 pandemic has highlighted the multiple vulnerabilities and risks of the power sector in SSA, that existed long before the pandemic and are only being worsened by its impacts. SSA is made up of 46 of Africa's 54 countries and therefore represents an extremely diverse region. Thus, the impact of COVID-19 on the power sector in SSA has been varied, and dependent on the characteristics of countries' power sectors, economies, and societies. On the other hand, an assessment of the region as a whole, can reveal risks and opportunities that the region needs to consider in its short and long term response to the pandemic. Throughout this publication, we ask the reader to keep in mind the tension between the regional and country perspective particularly for the purpose of identifying future areas of research.

Economic impacts of COVID-19 on the power sector value chain in SSA

The drop in demand for power has been one of the most universal trends of the impact of the COVID-19 pandemic the world over. Although the same downward trend is observable in SSA the drop in demand has not been as drastic as in other parts of the world, with drops in demand ranging between 4-15% for most of the region. Some of the proposed explanations for this is that residential demand makes up a larger portion of demand than in other parts of the world and has risen during the pandemic, and because economies in SSA are typically less energy intensive due to less production, manufacturing and consumption, and a dependence on imports (RES4Africa, 2020). Nevertheless, the reduction in demand for power has had a significant impact on the revenue of already struggling utilities in SSA.

On top of this, the ability of households to pay for power has also been negatively impacted by the COVID-19, further reducing the revenue for utilities. In places like Senegal requests for tariffs increases have been denied, and payment of electricity bills have been frozen for 3 months to protect vulnerable households. While the humanitarian crisis requires such drastic measures, they are expected to have knock-on effects on the financial sustainability of utilities in the medium to long term. This would compromise security of electricity supply, which would have severe implications for socio-economic recovery of the region. Furthermore, the vulnerabilities of the population of over 500 million in the region without access to electricity access have been exacerbated by the impact of the pandemic and imposed lockdown measures.

Given the precarious financial positions of state-owned utilities, in most countries the state has had to provide relief measures to support the continued operation of utilities. Given the tremendous strain under which the fiscus is, there is a limited amount that state can channel into the power sector, making the involvement of other players essential to enable the short term recovery and long term growth of the sector that is necessary for powering long-term socio-economic development in the region.

Similar to utilities, off grid suppliers have been hit by the impacts of the pandemic. Lockdown measures and the reduced ability for their customers to pay has endangered the survival of off-grid suppliers who play an important role in providing electricity to remote communities and to health facilities (EEG, 2020). The collapse of these suppliers would significantly increase the vulnerability of some of the most vulnerable communities in SSA and erode the progress in poverty reduction that has been made in recent decades. While these are the result of short-term measures, it is feared that vulnerable populations falling back into poverty will be unable to make their way out of it, leading to a longer term trend of increased poverty in the wake of the pandemic.

Oil producing and exporting African countries have been worst hit due to the drop in the oil price, which could translate to as much as 60% decline in the national income of oil exporting countries in the region, and would have a drastic impact on the balance of payments and public debt of these countries. This has led the African Union Commission to forecast a -3% GDP growth rate for oil producing African countries in 2020, compared to -0.8% in all African economies. On the other hand, the drop in oil prices has led to substantial savings for African countries importing oil for thermal power stations, such as Eritrea, Senegal, Niger, Benin and the Sudan with over 40% reliance on thermal generation, freeing up fiscal space that can be directed towards the humanitarian crisis the pandemic has caused, or towards longer term, much-needed infrastructural development (AUC, 2020).

The impacts of the pandemic and lockdown measures imposed around the continent have further exacerbated the low capabilities of companies in the region to manufacture and add value to raw materials in the region. As a result despite the gap in markets caused by disruptions in the global value chain, not only has the region been unable to meet this demand with their own manufacturing but have been negatively impacted by these disruptions given their positions as importers in these value chains (AUC, 2020).

COVID-19 has also led to the reduction in energy sector investments in SSA, causing liquidity challenges for the financing of new power projects. Along with disruptions in supply chains, delays in maintenance and delays to the construction of new projects, together these factors are likely to postpone the coming online of much needed new capacity and could lead to further electricity supply shortages.

Related social consequences of the COVID-19 impact on the power sector

With the informal sector responsible for 89% of total employment in SSA, the majority of the population has very little protection against unemployment and are dependent on working every day for their living. The loss of employment brought on by the pandemic and lockdown responses has had and will continue to have a devastating impact for those working in the informal sector (ILO, 2018; Africa Pulse, 2020). It is estimated that at least 20 million jobs are threatened by COVID-19, and will disproportionately affect the youth on the continent (15-24 years). The first month of the pandemic led to an 81% drop in income for informal workers in Africa (AUC, 2020; ILO, 2020). Loss of employment opportunities compromises the ability of these households to pay for electricity, which can lead to them being cut off by their electricity supplier, thereby restricting their access to information and online learning, and limiting their ability to communicate via phone or internet. This is having damaging consequences on education of the youth in SSA, which is particularly concerning given the youth bulge in the region and skills shortage. The skills shortage and worsening of this skills shortage will be a major constraint in the ability of SSA to respond and recover from the crisis. In many cases, the livelihoods of those in the informal sector are dependent on access to electricity for productive use of electricity in micro-enterprises. Lack of ability to pay for electricity will lead to the closure of many small enterprises as well as the enterprises responsible for providing electricity (Africa Pulse, 2020).

Small and medium enterprises (SMEs) account for 90% of business in SSA and are responsible for 38% of GDP in the region (Africa Pulse, 2020). The majority of SMEs are cash-strapped and have limited resources to absorb shocks. Indeed, before COVID-19 the financing gap for SMEs was estimated to be USD 331 billion and is only likely to have grown in the midst of the pandemic (Africa Pulse 2020, IFC, 2018).

The limited access to electricity of healthcare facilities, particularly in rural areas, severely compromises the strength of public health services in normal times. The impact of COVID-19 has been felt most acutely in these healthcare facilities, highlighting the need for electricity access for healthcare facilities to be treated as a priority.

Related environmental consequences of the COVID-19 impact on the power sector

The reduction in electricity production, transport and other economic activities have led to roughly a 17% reduction in global emissions in April 2020, and depending on the extent and duration of lockdown measures are estimated to drop by 4-13% over the course of 2020 (Le Quere et al., 2020).

The reduction in activity has also led to reduced air pollution, particularly in cities. Although these are only expected to be temporary, they have demonstrated the potential benefits of certain policy choices going forward to reduce emissions in the power sector, introduce low carbon transport and implement more widescale remote working. A study by Stanford University found that air pollution was responsible for 22% of infant deaths in SSA in the period 2001 to 2015. Reduced air pollution through prioritising renewable energy development would significantly reduce the burden on the health system, freeing up resources for other health priorities (IRENA, 2020).

Access to clean water is imperative for healthcare facilities and households in times of pandemics and beyond times of pandemic. SSA is a water-stressed region, and susceptible to long periods of drought. The make up of the power sector has major implications for the availability and quality of water. Decisions made in the power sector, particularly with the impacts of climate change that are only expected to become more severe, need to make the region more, not less resilient to future droughts and pandemics alike.

These short-term environmental impacts demonstrate the importance of policy decisions to turn short term impacts into long-term trends and highlight the opportunities and risks that confront decision-makers as they respond to the crisis. Despite the fact that environmental impacts, particularly during strict lockdowns were stark, the literature review conducted for this study, found that relatively little has been written about the environmental impacts of COVID-19 and the potential long-term implications of these impacts. This is a gap that should be further explored, particularly to inform decision-making in the power sector with regards, to for example new build, as these will have long term implications, either costs or benefits depending on the decisions taken.

SSA's power sector and resilience during, after and beyond COVID-19

Power systems play a crucial in enhancing the resilience of societies to a pandemic such as COVID-19 by powering healthcare facilities, supplying clean water, supporting education, enabling communications and IT services, and sustained economic activity. Furthermore, the characteristics of power systems determine their resilience to shocks such as those caused by COVID-19. Power sectors with limited ability to absorb such shocks severely compromise the ability of societies to respond to a pandemic. Renewable energy technologies have shown greater resilience to the shocks of COVID-19 than other energy technologies (IRENA, 2020).

Resilience of the current power sector in SSA to the shocks of COVID-19

In SSA only 28% of healthcare facilities benefit from reliable electricity, and only 43% of the population is electrified at all. Two-thirds of schools do not have reliable electricity either making distance learning unfeasible. Furthermore, power is unreliable and expensive all over the region. The combined impact of these features has significantly compromised the resilience of countries in SSA to the pandemic (RES4Africa, 2020).

The lack of resilience of power systems in the region is caused by small power systems that are over-reliant on a few key power stations, often dependent on the same technology types and fuel and component imports. The lack of diversification of power systems, high costs and general lack of reliability make the power sectors and the associated utilities vulnerable to the shocks posed by COVID-19. The weak financial positions of utilities pose a longer term risk, in terms of the financial

sustainability of utilities which may further threaten security of supply in the long term. While the drop in the demand for power allowed some utilities to carry out overdue maintenance on their systems, in some cases disruptions in supply chains meant parts and equipment could not be delivered nor could the necessary skilled personnel could travel, further delaying maintenance. This poses an additional threat given the tremendous pressure power systems will be put under as countries try to rapidly ramp up economic activities to stimulate socio-economic recovery. A lack of resilience of power systems and an inability to provide security of supply, represents one of the major threats to countries' ability to contain the virus through their public health response and to stimulate economic recovery. Consequently, establishing robust power systems needs to be a priority both for the short and long term, and should heavily influence decision-making in the sector (Africa Pulse, 2020; RES4Africa, 2020).

Enhancing power sector resilience in SSA

There is a range of features to consider when thinking about enhancing resilience. Diversification of the energy mix is important for providing security of supply and reducing the risks associated with a single technology. Such risks could include, reduction in hydropower due to droughts, or increase in price due to reliance on volatile fossil fuel imports, or lack of supply due to disruptions in supply chains of imported fuels or power (IRENA, 2020).

Pursuing least cost electricity pathways and establishing competitive electricity markets, can enhance the financial resilience and sustainability of the sector through the involvement of diverse set of actors, including the private sector to reduce the burden on the state and improve the efficiencies of utilities and the power system and electricity market as a whole. The vulnerable financial positions of state-owned utilities and reliance on expensive power have been exposed by the shocks brought by the COVID-19 pandemic. The limited fiscal space available to governments in SSA limits their ability to allocate necessary resources to utilities amidst a health crisis, for which security of power supply is imperative (TIPS, 2020; IRENA 2020, RES4Africa, 2020).

The fall in renewable energy prices, massive investment in renewables and excellent renewable energy resource in SSA, provide opportunities for countries to enhance the resilience of their power systems through renewable pathways. They also provide longer term opportunities in terms of establishing local manufacturing and local value chains, to avoid the risks of being importers in long global supply chains and to unlock the opportunities that are associated with becoming exporters. Not only could this

enhance the resilience and competitiveness of their economies but could avoid future risks such as border adjustment taxes and stranded assets in a future world that is low carbon (TIPS, 2020).

Lastly given the millions of people in SSA who live in remote areas without access to grid electricity, off-grid, decentralised renewable energy systems could improve rates of energy access and support livelihoods through the productive use of energy. These require small investments that can be rapidly scaled and tailored to the specific needs of a context, and at the same time spread the risk of investment. Given the number of livelihoods that have been negatively impacted by the pandemic, the power sector has a key role to play in protecting livelihoods from the shocks of future pandemics.

The role of the power sector in driving socio-economic recovery in SSA

Over the last decades renewable energy has become increasingly cost competitive, now represents the least cost power development pathway in many parts of the world and is forecast to become even cheaper in the coming years (IRENA, 2020). Investment in renewables now doubles new investments in fossil fuel-based power. Renewable energy is growing faster in developing countries than developed countries and bringing development benefits, given the imperative of a just transition to address poverty and inequality in developing countries.

Transforming the power sector in SSA to drive socio-economic recovery

The fall in the price of renewables, scaling up of investment in renewables and the slowing of investment in fossil fuels, provide excellent conditions for rapidly scaling up renewables. Investing in renewable energy and supportive policy environments can allow access to a broader range of players such as the private sector at utility scale, and households for embedded generation to offer financing opportunities for renewables and reduce the burden on the state. Given the extreme burden on the fiscus in the wake of the COVID-19 pandemic, states in SSA have to carefully prioritise their spending. Competitive programmes that crowd in the private sector can play a key role on reducing the burden on the state for power development, and bring efficiencies, reduction in price and job creation all of which are crucial for stimulating socio-economic recovery (RES4Africa, 2020; TIPS, 2020).

Renewable energy offers an effective form of post-recession stimulus in that it has the effect of employing the largest number of unemployed as quickly as possible (high short term multiplier), enables rapid construction of new capacity and investments that create assets required in the future (high long-term multiplier) for the Paris Agreement and leads to socio-economic spill-over effects.

Renewable energy is also capable of decarbonising certain industries that are currently high carbon such as iron and steel sectors. Powering these sectors by renewable energy can bring down the cost of production through lower electricity prices, minimise volatility by reducing reliance on fossil fuels and increase the competitiveness of these industries in a future world in which a price on carbon and border adjustment taxes are expected to be imposed on imported high carbon products such as iron and steel (IRENA, 2020).

Decentralised renewables can provide cost-effective solutions for expanding energy access, and enabling productive uses of energy in remote and marginalised communities and to strengthen health facilities, allow opportunities for remote learning and communication (IRENA, 2020). The vulnerability of remote communities due to the lack of access to electricity and the detrimental impact this has on

health facilities, access to remote learning and work opportunities has been highlighted by COVID-19. Access to reliable, cost-effective electricity is a crucial enabler for health and education, and for economic activities in the formal and informal sector alike. Small-scale decentralised renewable energy systems offer advantages over other technologies in that their modular nature makes upfront costs relatively low, there are no fuel costs and can provide a reliable supply. These features make them powerful enablers for remote and vulnerable communities, as well as for SMEs that require electricity for their economic activities. From a funding perspective, investing in off-grid renewables provides a basket of small investments, thereby diversifying the investment and spreading risk.

The pandemic has also illustrated the vulnerable positions of African countries in value chains and the need to address this vulnerability. One of the key sectors for this is the agriculture sector. The sector employs more people on the continent than any other sector and yet many farmers lack any access to power for pumping water, irrigation, and refrigeration. This means crop yields are often low, food wastage is high and access to markets is challenging. Access to electricity would improve yields, reduce wastage, allow farmers to process and add value to their agricultural products, thereby enhancing the productivity and profitability of the sector. Highlighting these vulnerabilities has also demonstrated the imperative of rapidly scaling up access to electricity, with renewable energy off grid solutions particularly suitable for these contexts (RES4Africa, 2020).

The role of Green stimulus packages in SSA

Given the limited fiscal space of all states in SSA albeit to varying degrees, the feasibility of large green stimulus packages targeted at the power sector is seen by many to be unrealistic. The state does have a key role to play in creating an enabling environment for harnessing global developments to stimulate the development of the power sector, which will need to play an instrumental role in driving socio-economic recovery. This needs to include removing regulatory bottlenecks, speeding up the deployment of funding and technologies, and enabling the participation of the private sector that are able to bring in capital, expertise, introduce competition and reduce the price of power, as well as bring new capacity online rapidly. This would be applicable both for utility scale and off-grid.

Governments also have a role to play in creating the conditions in which local manufacturing and industrialisation becomes feasible, through local content requirements in renewable energy programmes accompanied by skills development programmes. The finalisation of agreements such as the African Continental Free Trade Area (ACFTA) has the potential to strengthen regional trade and skills transfer, particularly from parts of the continent that have already had some success in developing renewable energy industries to others that have less experience. Establishing a regional or continental initiative could significantly strengthen African countries' positions in global renewable energy value chains, by becoming exporters of certain components, and minimising imports thereby creating employment and economic opportunities and enhancing resilience to future shocks.

An additional important focus for stimulus packages is targeting SMEs given that they have been hardest hit by the pandemic and employ most of the labour force in SSA. In the power sector SMEs play a key role both as providers of electricity, in off-grid sectors, and the use of electricity by SMEs for productive uses. Bringing down the cost of electricity through promoting renewables can significantly reduce the cost of doing businesses for these enterprises. Furthermore, off-grid solutions allow for smaller modular investments that are easier to finance and can be tailored to the specific needs of a context. Targeting SMEs would direct support to the largest portion of the labour force in the region and support the most vulnerable groups.

Lastly, the crash in the oil and gas prices, presents a unique opportunity for countries to phase out fossil fuel subsidies and direct the savings to the development of renewable energy sources, in order to reduce the reliance of countries' on volatile fossil fuels and increase the development of renewable energy (Africa Pulse, 2020). Such decisions would lead to short and long term benefits, and a generally more sustainable and resilient trajectory in the face of future shocks.

Potential risks as countries seek to recover from COVID-19

There are signs in some parts of the continent that the economic impacts of COVID-19 will be used to motivate for protecting business as usual centred around the use of fossil fuel-based power supply, given the constraints on the fiscus and job losses, with the economy already in a precarious position. This would pose major risks of lock-in and stranded assets.

A growing number of investors are no longer willing to fund coal, countries insistent on pursuing a coal-based path may have to rely on public finances to fund new coal, currently there is little fiscal space to allow for this

Following a fossil fuel-based pathway would lock countries into higher electricity prices which would have damaging economic consequences and dampen the effects of the efforts to stimulate socio-economic recovery. Investing in high-carbon investments would leave economies vulnerable to global dynamics such as border adjustment taxes on high carbon goods and harm the competitiveness of local industries in global markets.

Exogenous and endogenous effects on SSA

The following statement from the African Union Commission outlines the importance of considering the impacts of COVID-19 driven by developments both inside and outside our borders.

*The **exogenous effects** come from direct trade links between affected partner continents such as Asia, Europe and the United States; tourism; the decline in remittances from African Diaspora; Foreign Direct Investment and Official Development Assistance; illicit financing flows and domestic financial market tightening, etc.*

*The **endogenous effects** occur as a result of the rapid spread of the virus in many African countries. On one hand, they are linked to morbidity and mortality. On the other hand, they lead to a disruption of economic activities. This may cause, a decrease in domestic demand in tax revenue due to the loss of oil and commodity prices coupled with an increase in public expenditure to safeguard human health and support economic activities. (AU, 2019: 5)*

A consideration of both exogenous and endogenous factors should inform how we think about impacts and longer term implications as the region endeavours to build back better.

The vulnerable positions SSA countries occupy in global value chains has been demonstrated. As the region invests in build back better, strengthening their positions in value chains should be a long term priority which is capable of having wide multiplier effects. Establishing local manufacturing and processing capacities, skills development and the establishment of the African Continental Free Trade Area would assist in stimulating domestic activities and reducing the risks of heavy reliance on imports. This could be done in the power sector itself, through renewable energy manufacturing. The power sector can also act as an enabler for a similar trend in other sectors such as agriculture and food

processing. Longer term trends may present exogenous risks for SSA's economies should measures like border adjustment taxes be implemented as part of green economic stimulus packages. This demonstrates the necessity to decarbonise the production of goods aimed for the export market.

The oil and gas industries provide an additional example. Africa only owns roughly 7% of oil and gas reserves, so African countries are not able to dictate the direction of these industries. Because of this oil producing African countries occupy vulnerable positions given the volatility of the oil and gas markets and would not be able to survive at the current low prices should they persist. The severe impacts of COVID-19 on oil producing African nations have demonstrated the vulnerability of these economies and the need for diversification of these economies to be central to their recovery efforts (AUC, 2020).

Analysis and Findings

COVID-19 has impacted power sectors, societies and economies in SSA in a multitude of ways, the long-term implications of which are still uncertain. Table 1 provides an overview of the findings from the mapping conducted by this research and is followed by a discussion about some of the key findings that should be taken forward by future research.

Table 1: Consolidation of findings from mapping our current understanding of COVID-19 and the power sector in SSA

	Short term	Long term
Impacts		
Economic	<ul style="list-style-type: none"> - The drop in demand has placed electricity providers under increasing financial stress - The ability of customers to pay for electricity has further exacerbated this pressure and has led to some customers being cut off, thereby endangering livelihoods - Reduction in investment in the power sector has added to financial stressors - The fall of the oil price drop has led to massive losses for exporting nations but savings for importers - Limited manufacturing and reliance on imports from global value chains has left countries in vulnerable positions 	<ul style="list-style-type: none"> - The loss of revenue has highlighted the risks of lack of financial sustainability of utilities and off-grid providers - Lack of financial sustainability is expected to compromise security of supply, which would dampen efforts to stimulate socio-economic recovery - Struggling utilities have demonstrated the need for broadening participation to drive development of the power sector - Lack of investment, disruption to imports, and delays to construction will lead to delays of new generation coming online - Limited fiscal space, the health costs of the pandemic and loss of tax revenue dictate that governments will have to prioritise spending of limited resources
Social	<ul style="list-style-type: none"> - Lack of access to electricity has constrained the effectiveness of 	<ul style="list-style-type: none"> - All these social impacts have the potential to become longer term trends

	<p>the response of healthcare facilities</p> <ul style="list-style-type: none"> - Lack of access to electricity has impacted education, livelihoods, communication and access to information - Those working in the informal sector have been worst hit - Lockdowns have led to the closure of SMEs - SSA's youth population has been worst hit by the decline in work opportunities 	<ul style="list-style-type: none"> - This will lead to the most vulnerable slipping back into poverty and undoing the progress of recent decades - The low skills base is expected to be a major inhibitor to socio-economic recovery - Policy and investment decisions have a key role to play in averting these long term risks
Environmental	<ul style="list-style-type: none"> - Lockdowns have led to reductions in emissions and air pollution - Decline in economic activities has reduced the pressure on water resources - Some governments have relaxed environmental protections in a response to COVID-19 	<ul style="list-style-type: none"> - COVID-19 has demonstrated the opportunities and benefits of investing in power systems that are low carbon and low water use - For these benefits to materialise they need to be factored in by long-term power planning - This is a gap in the literature
Resilience	<ul style="list-style-type: none"> - COVID-19 has demonstrated the vulnerabilities of power sectors in SSA - Renewables have proved to be a more resilient energy technology and investment class during the pandemic than fossil fuels - COVID-19 has demonstrated the importance of power sectors for the resilience and performance of other sectors 	<ul style="list-style-type: none"> - Enhancing resilience will depend on, diversification of supply, least cost technologies, involvement of a wide range of actors beyond the state - Reducing dependence on imports, volatile commodities and exposure to transition risks are also key features of resilience - Electricity access needs to be a priority to enhance the resilience of COVID responses
Socio-economic recovery	<ul style="list-style-type: none"> - In much of SSA renewables are cheaper and receiving more investment than fossil fuels, SSA has an excellent RE resource - RE provides an effective form of post-recession stimulus through long and short term multiplier effects - RE crowds in private sectors and other actors beyond the state - Decentralised RE can enhance access and support a diverse range of economic activities by SMEs - RE requires smaller modular investments than are required 	<ul style="list-style-type: none"> - Local manufacturing of RE components can drive local development and job creation, reduce imports and increase exports - RE can enhance the productivity of small-scale agriculture - The role of stimulus packages is constrained by limited fiscal space, but the state can create enabling environments for the development of the sector - Returning to business as usual presents stranded assets, lock in, and transition risks - RE can reduce long-term risks and enhance the resilience and competitiveness of industries in SSA

	with fossil fuels, and can be tailored for their application	- Reallocation of fossil fuel subsidies could be directed to renewables
Exogenous & Endogenous	<ul style="list-style-type: none"> - Exogenous effects have demonstrated the interconnected and global nature of the power sector - COVID-19 has demonstrated the need for oil and gas exporters to diversify their economies 	<ul style="list-style-type: none"> - COVID-19 has demonstrated the need for SSA to strengthen their positions in global value chains by becoming exporters - Local manufacturing is needed to strengthen positions in value chains - COVID-19 has demonstrated the types of risks that SSA could be exposed to in the future such as border adjustment taxes

Table 1 and the preceding sections demonstrate some of the unique ways in which the COVID-19 pandemic is playing out in SSA. These findings demonstrate how important it is to acknowledge the fundamentally different starting point from which SSA encountered this pandemic. This includes the access rates to electricity, levels of poverty and informality, state of public health and infrastructure, and limited fiscal space. These features demonstrate the vulnerability of the region to the impacts of COVID-19, the social and economic consequences of which are proving to be devastating. This has shone a light on the urgency of the need to address the pressing development challenges that have long confronted the region to limit the devastation the pandemic has on the region.

In terms of the role of the power sector, COVID-19 has demonstrated the centrality of the power sector in societies and economies and in their resilience. At the same time, it has highlighted the consequences of the vulnerabilities of the current power sectors in the region as well as that of its societies and economies. The shock of the pandemic has brought into focus the imperative of establishing resilient power sectors, to catalyse long term socio-economic recovery and socio-economic resilience.

Renewables-led power sector development in the region offers a variety of avenues for enhancing resilience and for catalysing socio-economic recovery. For this to happen, a multitude of actors need to be involved. While power sector development has historically been state-led in SSA, dominated by state-owned utilities, the vulnerabilities and risks of this approach are now clear to see. The state does have an imperative role to play, in promoting the access to electricity for its societies, it is also the only actor that can lay a foundation and create an enabling environment that allows for the private sector to play a role as well as municipalities, industries and households. Encouraging entry of a diverse range of players, would remove the burden from the state, and crowd in expertise and capital that can unlock a transition. Part of this would be to capitalise on the global trends in renewable energy investments and their drop in prices to establish local manufacturing.

While SSA's youth population has been worst hit in terms of unemployment caused by the pandemic, the young age profile of the region, makes the population more resilient to a pandemic, and provides a young workforce that could be instrumental in driving renewable energy development. Establishing a regional renewables industry could also offer opportunities for skilling up its youth population through training programmes and using agreements such as the ACFTA to establish a competitive advantage in the region and strengthen its position in global value chains.

The prevalence of SMEs and informality in SSA, make them well-suited to on-grid and off-grid renewable energy solutions. Furthermore, the size of SMEs means they require smaller scale investments, which allows governments and funders to invest in a diverse range of economic activities that are capable of stimulating a multi-pronged, broad-based economic recovery that includes the most vulnerable, and spreads investment risk.

More broadly, COVID-19 has amplified and exacerbated the vulnerabilities of SSA, visible in the short term impacts the pandemic is having. These impacts could well play out as long term trends which would have devastating consequences. Alternatively, the improved understanding of these risks and vulnerabilities could inform long term planning in the region to address these risks, enhance resilience and unlock opportunities of a transition. The downside risks of returning to business as usual have been starkly represented during the recent months, and should the region fail to pivot, could be just a small indication of the types of long term impacts that lie ahead. With this in mind, the following section explores priority areas for future research.

Future research areas

It is clear that the situation with COVID-19 is unfolding rapidly as are the impacts. While the short term impacts are becoming clearer, whether these evolve into long term impacts, or longer term opportunities, is in a large part determined by the decisions that are taken at this critical juncture. Table 2 below outlines some key research areas that should be considered at this time.

Table 2: Future research areas

COVID-19 has highlighted the centrality of power sectors for socio-economic development and resilience, and represented the vulnerabilities and risks associated with existing power sectors in SSA.

- What are the key features compromising the resilience of power systems in SSA?
 - How have these been exacerbated by COVID-19?
 - What are the key features needed to enhance the resilience of our power systems to the impacts of COVID-19, to future, unknown shocks, and to enhance their performance in a shifting global energy landscape?
- What are the roles of different actors in driving resilient, renewable-based power sector development?
 - What is the role of the state in creating enabling conditions for broader participation from the private sector, municipalities, and households?
 - What role do the private sector, municipalities and households have to play in this transition?
 - How can the involvement of these actors improve the long term sustainability and performance of the sector?
- What is the potential role of renewable energy in driving socio-economic recovery? In terms of,
 - Security of supply
 - Price of power
 - Job creation & enterprise development
 - Local manufacturing potential

COVID-19 has demonstrated SSA's vulnerable position in global value chains. SSA's renewables resource, in combination with the raw materials needed for renewable energy, places SSA in a strong position for a renewable energy transition.

- What are some of the key factors to consider to enable a renewable energy transition in SSA?
 - How can an understanding of the key vulnerabilities SSA experience given their current positions within global value chains in the power sector, as demonstrated by COVID-19, inform how SSA establish a regional renewable energy industry?
 - How can governments in SSA enable local manufacturing for renewable energy components to establish a competitive advantage over other regions, and incentivise export of value-added goods and promote intra-regional trade?
 - What is the role of the African Continental Free Trade Area to enable the region to produce value-added added goods and export these and protect local manufacturing?

SMEs and the informal sector are crucial drivers of economic activity in SSA but have been hardest hit by COVID-19.

- How can investing in renewable energy solutions best support SMEs and those working in the informal sector?
 - What sectors should be treated as a priority for investment of renewable energy solutions to stimulate socio-economic recovery?
 - How can investing in renewables enhance productivity, competitiveness and profitability of these sectors?

Air pollution is a cause of death and places a burden on health sectors and the fiscus more generally. COVID-19 has provided a glimpse into the possibilities and benefits of living with clean air.

- What are the current causes and costs of air pollution in countries in SSA?
 - What are the options in the power sector to address the causes of air pollution?
 - What economic savings would this bring? And what could these savings translate into in terms of power sector investment?
- What are other positive environmental impacts that have been caused by COVID-19 and lockdown measures? How could these be promoted by long term power sector planning?
- How have the impacts of COVID-19 translated into environmental risks?

The short term impacts of COVID-19 have demonstrated the vulnerabilities of the current power sector and the risks they pose to socio-economic development and resilience in SSA.

- How can an understanding of these short term impacts provide insights into long term vulnerabilities and risks of the power sector?
 - What are these short term and long term vulnerabilities and risks and how are they related?
 - How can this understanding inform long term planning in the region to address these risks, enhance resilience and unlock opportunities of a transition?

The extent of the impact of COVID-19 and its implications for SSA

Given the drastic and diverse ways COVID-19 has impacted societies and economies in SSA, it is tempting to attribute all the devastation that is currently being experienced to the pandemic. However, it is necessary to further interrogate this assumption to more accurately characterise the extent to which COVID-19 has impacted the region. First, there are those challenges that existed before the pandemic and have only been highlighted by its impacts. Efforts to address these challenges are long overdue and should be implemented as a matter of priority. Second, there are those challenges that have been exacerbated and accelerated by the impacts of COVID-19, and therefore require adapted response measures that are able to rapidly address the short term impacts as well as address long term dimensions of these challenges. Third, there are instances where COVID-19 has caused new challenges and risks, that require completely new responses.

While this is a simplification, that requires further research, it provides an indication of how to engage with the extent of impact of the pandemic and to tailor response efforts according. This should be an important consideration for all actors endeavouring to implement an impactful response. This could be used to provide guidance for governments, funders, researchers and other actors as they contemplate how best to adapt their responses to the crisis in ways that address short and long term risks. Depending on who engages with it, it may require a reprioritisation of funding allocation, a reallocation of funding, an acceleration of disbursement or dedicating funding to completely new response efforts.

In order to determine these changes, a granular understanding of the area of involvement is required. Outlining this understanding is beyond the scope of this brief, however this is a key gap identified by this research which would warrant a more comprehensive characterisation of the extent of the impacts of COVID-19, and the implications for involved actors. This is particularly important for governments and funders wanting to understand how best to respond to the pandemic and to identify ways to prioritise and maximise the impact of their funding.

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