

Bankable and sustainable solar projects as a panacea for environmental pollution and unemployment for millions of African youths¹

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Introduction

A conference to enhance the knowledge of project management among African entrepreneurs, businesses, and professionals took place in Yaounde, Cameroon, in May 23rd to 25th 2018. This was the 2nd Pan- African Conference on Project Management. The theme was: “Successful Preparation of Bankable Projects in Africa.” The objective could be summarised as: To provide African entrepreneurs and businesses with information on how to prepare bankable projects to enable them to attract funding for industrial and infrastructure projects that will accelerate the economic transformation of the continent.

In this article, necessity for bankable solar projects is discussed with a view to achieving the following objectives:

- Discussing alternative power supply to Sub-Saharan Africa
- Reviewing some of the relevant events resulting from the Paris Conference on Climate
- Exploring employment for African youths through collateral products of, and applications from, solar power.

In order to achieve these objectives, the topics to be considered in this paper are as follows:

1. Unemployment among African youths
2. Sub-Saharan economic development constrained and retarded by poor power supply
3. Environmental damage created by fossil fuel, greenhouse effect, Paris Conference Agreement, some resulting events, and campaign for renewable energy
4. Renewable energy, solar power supply,
5. Achieving bankable projects and bankable solar projects, products, applications and jobs
6. Conclusion and going forward

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1. Unemployment among African youths

The necessity to provide employment for millions of youths in Africa cannot be over emphasised.

Despite being a leading economy in Sub-Saharan Africa, with almost 50% unemployed youths in 2014, and 52.4% in first quarter of 2018, South Africa has one of the highest levels of youth unemployment in the region [1]. Moreover, according to Mr. Kelvin Balogun, President of Coca-Cola for Central, East and West Africa, “Almost half of the 10 million graduates churned out of the over 668 universities in Africa yearly do not get job” [2]. In June 2017, it was reported that 61.6 percent of Nigerian youths were unemployed. This was as contained in a report released on Monday, June 5, 2017, by the National Bureau of Statistics (NBS)[3].

In some advanced nations where youths' unemployment may occur, it may be seen as an aberration, an unusual feature, a spike from the normal because such countries already have stable politico-economic systems that facilitate economic stability and growth. As a result, in a few years, the relevant national government could introduce measures that should help eliminate or at worst, reduce the unemployment. While, it may be overly optimistic to accord such ability of turning around their national economy to an African government, it is the case that in course of conducting the research for this paper, a number of commendable programmes and projects for the youths, and by the youths, in many African countries on solar power supply have been discovered. These have been initiated in some cases by banks, national government agencies, and African youths both in Africa and in Diaspora. In spite of these efforts, a lot still remains to be done to engage more unemployed youths. The thrust of this paper is the necessity to establish sustainability of solar programmes in Sub-Saharan Africa; this requires effective investments for the long-term solution to the problems of youths' unemployment and our grossly inadequate power supply.

2. Economic development constrained and retarded by poor power supply

In the paper, Powering Africa, the authors stated that there is a direct correlation between economic growth and electricity supply [4]. Sub-Saharan Africa is very deficient in its supply of electricity such that the poor power supply engenders poor economic growth. The region's power sector is significantly underdeveloped whether in terms of energy access, installed capacity, or in terms of overall consumption. Providing economic and social requirements of the region is determined by the ability of governments and investors to develop the continent's huge electricity potential.

It is reported that the region is worst in the world from an electricity-access point of view. It has

13 percent of the world's population, but 48 percent of the share of the global population without access to electricity. Another region with poor electricity access but better than Sub-Saharan Africa is South Asia. It has 23 percent of the world's population and 34 percent of the people without access to electricity [4].

Collated information shows that almost 600 million people in Sub-Saharan Africa lack access to electricity. Only seven countries—Cameroon, Côte d'Ivoire, Gabon, Ghana, Namibia, Senegal and South Africa—have electricity access rates exceeding 50 percent. The rest of the region has an average grid access rate of just 20 percent. Moreover, even when there is access to electricity, it is not enough to meet all the needs. Hence, it is reported that in Sub-Saharan Africa, the electric utility infrastructure necessary for large-scale energy power plants is lacking. For example, in Kenya, at least 50 power outages occur each year. With all due respect, it is relevant to comment that within the past twenty or more years, such number of outages could occur in a month in some countries in sub-Saharan Africa, such as Nigeria. This information is based on this writer's personal experience as a Nigerian.

Millions of Africans without electricity turn to kerosene lamps, candles, or flash lights for lighting. It is estimated that about 70 percent of us live in rural areas. Electricity access is limited and substantially confined to the urban areas, even then, power utilities are struggling to expand access and improve reliability of their supply. The electrification rates of public institutions like schools and health centres, and water pumping and irrigation facilities are also low. This statistic shows the enormity of our problem and underscores the need for alternative power supply sources.

Our problems in developing countries and Africa could be summarised as follows:

1. **Low generating capacity:** We have some active electricity generating stations or plants but their overall output is much smaller than our requirements. As already stated, our generation capacity is so low that it is a major drawback to our economic development. For example, Spain with a population of about 46 million has an installed generation capacity of about 101,000 MW while some major countries of Sub-Saharan Africa with a population of over 600 million have a total capacity of about 70,000 MW.
2. **Ageing transmission and distribution equipment:** Some of the transmission and distribution lines are old and need being replaced.
3. **Ageing and overloaded transformers:** Most of the grid and distribution transformers are old and are in use longer than their designed duration of service. To worsen the

situation, the transformers, especially distribution transformers are often overloaded due to illegal connections which make them carry more current than they are designed to carry. This is also true in Nigeria. Sometimes, these explode and cut-off power supply to their consumers. The costs of building new electricity generators, grid lines, substations and transformers are quite high.

These failures contribute greatly to Africa being in darkness. It is therefore necessary to resort to renewable energy sources which do not contain some of the problems listed in the foregoing paragraphs. It is also the case that fossil fuels such as oil, coal, and natural gas used for electricity generation cause much pollution due to the emission of carbon dioxide. This is why even developed nations are resorting to renewable energy sources which create little or no pollution.

It needs to be stressed that it is of vital importance that entrepreneurs and professionals understand the factors, some of which have been described, that are driving the demand for solar products and services in Africa. This will help us appreciate the necessity for an alternative source of power supply, such as renewable energy sources, necessary for our economic development.

3. Environmental damage created by fossil fuel, Paris conference agreement, greenhouse effect, global warming and campaign for renewable energy

Fossil fuels are so called because they come from the chemical remains of prehistoric plants and animals. For hundreds of millions of years, plants and animals lived and died. Their remains were buried deep beneath Earth's surface. For these millions of years, this material has been squashed and cooked by much pressure and heat. As a result, it turns into various materials which can be processed to obtain respective fossil fuels such as oil, coal, and natural gas. These carbon-rich fuels are burnt in cars, trucks, planes, trains, power plants, heaters, speed boats, barbecues, and many other facilities, equipment or items that require energy and produce greenhouse gases such as Carbon dioxide, CO₂. As a greenhouse works so CO₂ in the atmosphere works to trap heat close to Earth. It helps Earth to hold on to some of the energy it gets from the Sun so the energy does not all leak back out into space. CO₂ is so good at holding in heat from the Sun that even a small increase in CO₂ in the atmosphere can cause Earth to get even warmer. It is suggested that throughout the history of the Earth, whenever the amount of CO₂ in the atmosphere has gone up, the temperature of Earth has also gone up. And when the temperature goes up, the CO₂ in the atmosphere goes up even more causing some damages. Tentatively assessed, the lower limit of quantifiable climate-induced damages at \$30 to \$35 per

ton of “CO₂ equivalent”, worldwide, with the major damages being concentrated in regions most adversely affected by sea-level rise [5].

The Paris Conference Agreement

The Paris Agreement is designed to enable the international community to respond more effectively to the threat of climate change in order to enhance sustainable development and efforts to eradicate poverty. The Agreement was reached at the 2015 United Nations Climate Change Conference, COP 21 held in Paris from 30th November to 12th December 2015. It was the 21st yearly session of the [Conference of the Parties](#) (COP) to the 1992 [United Nations Framework Convention on Climate Change](#) (UNFCCC). It is relevant to note that the COP is the supreme decision-making body of the Convention. All countries that are Parties to the Convention are represented at the COP.

The conference negotiated the [Paris Agreement](#), its text is a consensus of views of the representatives of the 196 parties in attendance. The national governments agreed to the following:

- A long-term goal of keeping the increase in global average temperature to **well below 2°C** above pre-industrial levels and to aim to limit the increase to **1.5°C**, since this would significantly reduce risks and the impacts of climate change;
- Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
- Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

As stated in the third statement of the Agreement, the final text pledges financial support from rich, developed nations to developing countries as they adopt changes needed to meet the temperature targets. “Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development” is the third statement of the The Agreement of the 2015 United Nations Climate Change Conference, COP 21, Paris, 30th November to 12th December.

Some Economic Implications

As explained earlier, the use of fossil fuels, such as oil and coal, is the major cause of greenhouse

gases. These fossil fuels also are resources that constitute the main source of revenue for developing economies. Eliminating their use and switching to renewable energy sources, such as wind and solar power, could be very costly for developing countries.

For example, Nigeria's national budget has been completely based on oil revenue. The 2016 budget was proposed to be funded on oil price of \$38 per barrel. After reviewing the trends in the global oil industry, the government set a benchmark price of \$38 per barrel and a production estimate of 2.2 million barrels per day for 2016. The budget presented by President Buhari amounted to [N6.08trillion \(US\\$ 0.03 trillion, that is US\\$30billion\) on](#) December 22, 2015. It is therefore difficult to contemplate the survival of the country if revenue from oil is completely removed.

EU announces €9bn in funding for climate action

The European commission has announced funding of €9bn (£8bn) for action on climate change, one of the measures from governments, businesses and investors aimed at achieving the goals of the 2015 Paris agreement. The EU funds will form part of the bloc's External Investment Plan, and will be focused on sustainable cities, clean energy and sustainable agriculture. The announcement was made at the One Planet Summit in Paris on Tuesday, 12th December, 2017 held to mark the second anniversary of the landmark 2015 pact [6].

French president Emmanuel Macron praised the progress made at the event and said it was possible to create alternatives to the fossil-fuel driven economy, but that more effort was needed globally.

Miguel Arias Cañete, commissioner for climate action and energy for the EU, observed that the Paris agreement was already resulting in more investment flowing to combat global warming. He said: "These kinds of investments are of critical importance if we are to move from aspirations to action. The EU's plan will scale up much-needed investments across Africa and the EU neighbourhood region." He explained that new jobs would be created to facilitate poverty reduction, improved health and better access to technology in poorer regions.

The EU and its member states are the world's biggest providers of climate finance, with a total of more than €20bn provided to developing countries in 2016. Other measures unveiled at the conference included large companies, such as Axa, a French insurance company, and the ING bank, partially divesting from fossil fuels, and local governments from across the world signing up to improved goals on cutting greenhouse gas emissions.

Theresa May, the UK prime minister, said developed countries had a responsibility to help the

world's poor adapt to the expected ravages of climate change, and pledged £140m to poor countries to help them do so.

The World Bank promised to phase out most of its finance for oil and gas by 2019, and publish more data on the impacts of its investments on climate change. The group also formed a partnership with the Global Covenant of Mayors aimed at providing \$4.5bn for cities to adapt to the effects of climate change.

Bill Gates, one of the world's richest men, also joined the pledges, making a commitment that his philanthropic foundation would devote \$300m (£225m) to helping the world's poorest farmers adapt to the effects of climate change. The Bill and Melinda Gates Foundation will spend the sum over the years, 2018 – 2020, providing smallholders in sub-Saharan Africa and Asia with the means to protect their farms from the droughts, heat waves and floods that are expected to be the result of a changing climate. The money will be spent through governments and direct grants.

In a separate move, Microsoft will spend \$50m on artificial intelligence technology aimed at protecting the planet against climate change, the company said on Tuesday. Brad Smith, president of Microsoft, told the Guardian the investment would spur technological change that would help deliver clean energy and cuts in global greenhouse gas emissions.

He gave the example of using artificial intelligence to create “smart” buildings that would use less energy by responding to and anticipating their occupants’ behaviour. It could also be used in agriculture to increase crop yields in the face of the effects of global warming, which is expected to cause droughts, floods and heat waves across the globe. [7]

4. Renewable energy and solar power supply,

Renewable energy resources are widely available and should be exploited. They include solar, wind, geothermal, hydropower, etc. For example, off-grid solar energy products offer a better solution than fossil fuel supply for a number of reasons, which include the following:

- With advancement in solar technologies, stand-alone off-grid solar now has the potential to provide competitively priced electricity access in Sub-Saharan Africa, in particular for consumers who are far from the grid network. The capital cost of the power generating stations, and the erection or extension of grid network is high and not easily affordable such that one cannot predict the number of years when grid supply will be connected to them.

- Even those who are expected to get access to grid network in couple of years' time can use stand-alone solar systems and not burn kerosene, wood, standby diesel generators, and candles, or live in darkness as they wait for their grid connection. This is because dependence on these contributes to over 600,000 deaths annually from household air pollution.
- Millions of Africans, including those in oil-rich Nigeria, live in economies where per capita electricity supply is just sufficient to light a single 100 watt light bulb continuously for 60 days a year. This is said to be equivalent to the average power consumed per person in Africa every year. This is according to a World Bank report, “The World Bank: Fact Sheet: Infrastructure in Sub-Saharan Africa, 2013”. It therefore makes sense to invest in affordable solar power.

Solar and renewable energy jobs may be created when investors are willing to inject their money into such a business development programme. This requires that the projects generating the jobs are bankable. For, no investor would like to throw their money down the drain. Investments should yield values and rewarding results to be a motivation for investors to support the projects.

5. Achieving bankable projects

Features of bankable projects are explored in this section. This is followed by some examples of solar projects that could be investigated for their bankability, and feasibility of being established in developing nations in Africa and other tropical regions. Actually, some are already implemented and in use in Africa.

Features of a bankable project: A bankable project could be defined as one that has sufficient collateral, future cashflow, and high probability of success, to be acceptable to lenders for financing. It has to be demonstrated to be viable and rewarding to meet social, economic, financial, environmental, and administrative requirements. There are a number of important strategic, technical and organizational questions that the project needs to answer to prove its bankability. They include the following analysis:

Economic and strategic analysis and questions include:

- Is the need identified for the objective of the project real and can this option be implemented to best serve that need? This could require a market research to quantify the need and then decide how much the planned output of the project fulfils the need.
- Can this project provide financial income that will justify and recoup the capital and operational expenditures (Capex and Opex) for the pre-development and capital costs and

for the ongoing operational commitment?

- Where could be the best potential sites/location of the proposed business?

Technical and Financial Analysis and Questions include:

- Is there likely to be capital funding available for the project within the expected time frame? From which sources?
- Is financing likely to be made available to bridge or fill gaps in the capital budget? From which sources?
- Is the project likely to be able to carry no or low capital debt in order to ensure operational affordability?
- What is the capital financing and fundraising capacity right now?
- Is the project likely to have a sufficiently attractive cashflow to attract investors?
- Is the project likely to have a sufficiently compelling message to attract the support of philanthropists?

Organizational Resources Analysis and Questions include:

- Do we have the resources, organizational capacity and commitment for this project?
- What skills do we need and how can they be provided immediately to support project development?
- Do we need to hire a project manager, for example, to manage the day-to-day design and development process?
- Among the directors, do we have experts in engineering, development, the law and finance to support our work?
- Have we done the work to start bringing a range of stakeholders, partners and potential investors around the project vision?
- Do we have the capacity to manage and operate the finished project?

Examples of solar products and applications to be investigated for implementation

It is essential that they are sustainable. From market research, solar products and applications include the following:

1. Decentralized, non-grid or grid, solar energy solutions providing consistent power supply to:

- Internet café
- Secondary Schools
- Community Hospital and health centres
- Solar water pumps
- Solar food driers

- Industrial estate or business park
2. Solar torches, battery chargers, and solar-powered LED lighting, pico-pv lanterns up to 15W,
 3. Plug and play solar home systems (SHS) up to 350W, which can power appliances such as fans, radios, and televisions sets, in addition to providing light and mobile phone charging.
 4. Solar cooker allows its user to cook meals in a cleaner and more economical way for themselves and their family, but it can also be a powerful income generation tool. For example, individuals have opened solar restaurants and bakeries as well as businesses to build solar cookers in and for their community. Starting a solar cooking business is an effective way to generate income and improve one's community in the process.
 5. Solar restaurants and bakeries
 6. Solar food drying is a form of solar food processing which uses airflow and solar energy to dehydrate food for consumption and storage. One of the simplest methods is to place thinly sliced food outdoors on a well-ventilated surface to dry in warm air. More advanced options, such as enclosed drying racks which utilize solar-powered fans to move air across the food, can be constructed or purchased.

Conclusion and going forward

Issues discussed in this paper may be summarised as follows:

Firstly, the persisting problem of unemployment among youths in Africa; it is reported that 60% of unemployed Africans are youths. Secondly, unlike developed nations where national problems could be addressed and resolved or minimised, as necessary, by their governments, African nations do not have governments with the resources to turn around national problems as and when required. As a result, the problem of youth unemployment may not be easily resolved. Thirdly, it has been observed that large national unemployment results from the poor economic growth caused by the underdeveloped and scanty electricity supply in Sub-Saharan Africa.

Currently, the bulk of the inadequate electricity supply is from fossil fuels whose use should not be encouraged because of greenhouse effect as highlighted in the Paris Conference Agreement. Therefore resorting to renewable energy, especially solar power supply, provides helpful contributions in resolving the economic problems in Africa as discussed below:

- The provision of solar power may help to provide electricity where there is none. Such

solar electricity could be used to power some industrial enterprises and domestic problems.

- The elimination of the use of fossil fuels and other unhealthy power resources such as diesel generators, use of kerosene, wood, etc., which have been causing a lot of deaths.
- Solar power encourages the production of necessary lighting and heating products and applications both for domestic and industrial applications.

Going forward: From the research, alluded to earlier in this paper, it has been found that various useful efforts are currently being made in almost every country in Sub-Saharan Africa to use solar lighting and products. However, sustainability remains an issue because most of these, if not all the products, are imported. There is hardly any product made in Africa, not even the solar panels. Therefore, going forward, there remains the necessary business development initiative of bringing the production of solar products to Africa in order to help guarantee sustainability of the power supply and the ancillary products that spin off from it. One of the main drawbacks of industrial development in Sub-Saharan Africa has been the fact that most of the industrial plants and infrastructure are imported from outside Africa. When they fail and cannot be maintained because of unavailability of replacement spares, the plants are abandoned.

As a result, many African cities are littered with scrapyards of abandoned and failed projects. There is therefore the business and economic justification of seeking to develop in Africa, factories and plants for the manufacture of solar panels. This should constitute the bedrock of our solar industry and a guarantee of its sustainability. It certainly should be addressing the problems of poverty and poor economic growth if some of the funds discussed as being voted by nations and organisations as a follow-up to the Paris Conference Agreement could be invested to enhance sustainability of solar power and other renewable energy sources in Africa.

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Before embarking on a career in consulting, he worked for thirteen years in industry rising to the position of a chief engineer with specialisation in industrial controls and instrumentation, electronics, electrical engineering and automation. During those 13 years, he worked on every aspect of projects of new industrial plants including design, construction and installation, commissioning, and engineering operation and maintenance in process industries. Chima sponsored and founded the potential chapter of the Project Management Institute (PMI®) in Port Harcourt, Nigeria, acting as president from 2004 to 2010.

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