UN Sustainable development goals for renewable energy solutions in Africa, Is the seventh UN goal achievable by 2030 in Sub-Saharan Africa?

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Contents

Introduction

The UN seventh goal is "Affordable and Clean Energy" and this goal focuses on Sub-Saharan Africa's need to improve energy access [1], which also includes encouraging clean, efficient, and affordable renewable energy by 2030 [1] because an estimated 573 million people [1]still lack access to electricity there.

The objectives of this research are to determine whether solar energy should be prioritised, by evaluating the history of renewable energy and solar panels in Sub-Saharan Africa. It will review the most effective electricity distribution network and how government and UN cooperation will impact this goal being achieved. Finally, it will conclude, which Sub-Saharan Africa countries are most likely to achieve this goal by 2030, by predicting the impact of solar renewable energy in Sub-Saharan Africa.

Background Research

History of renewable energy in Sub-Saharan Africa

In 2019 renewable energies used in Sub-Saharan Africa included Hydropower (excluding Pumped
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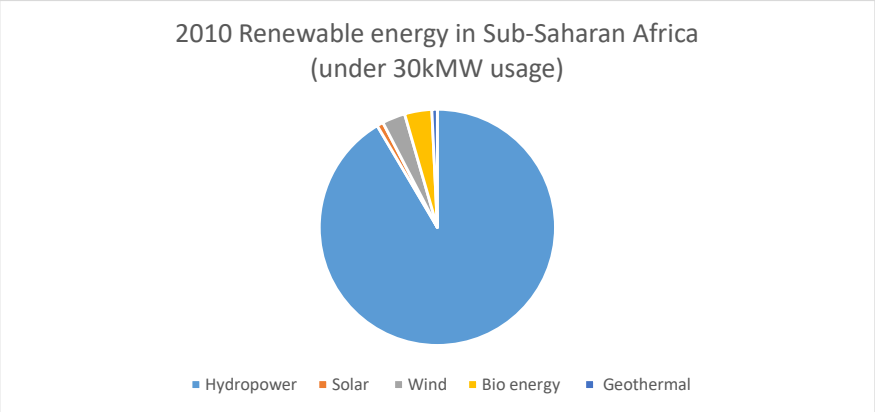

Pie Chart 1: Shows the Renewable Energy Sub-Saharan Africa usage and methods in 2010

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Pie chart 2, shows the results of renewable energy consumed in Sub-Saharan Africa, in the year 2018
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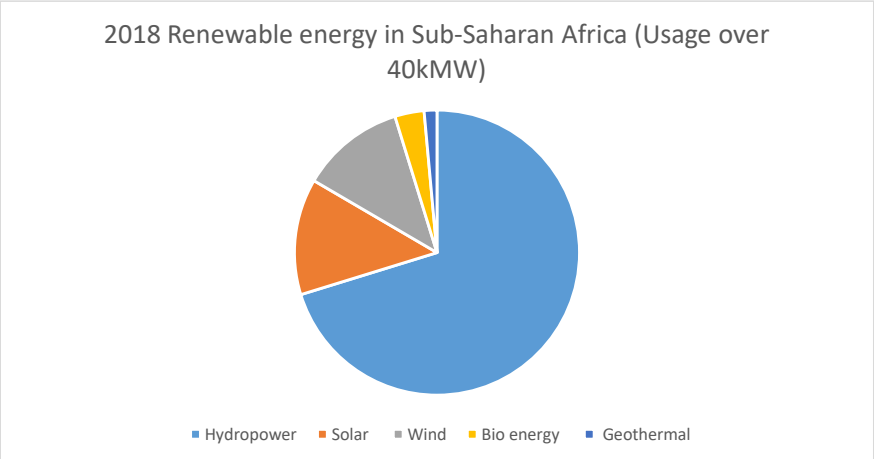

Pie Chart 2: Shows the Renewable Energy Sub-Saharan Africa usage and methods in 2018

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History of solar panels in sub-Saharan Africa

The history of solar energy usage in Sub-Saharan Africa was 240 MW in 2010 and 6,097 MW in 2018 [2]. This major increase occurred because solar energy became more cost-effective providing access to millions of people [4].

Figure 1, shows the amount of sunlight exposure in different Sub-Saharan African countries averaged between 1994-2015[5], which proves that solar panels are a viable option for the majority of the continent. It also shows which countries benefit more from solar renewable energy. For example, Namibia receives 2264-2556 kWh/m compared to South Africa, which receives 1534-2118 kWh/m[5]. Hence, making Namibia a better option for solar energy.

Figure 1: Global Horizontal Irradiation in Sub-Saharan Africa average between 1994-2015 [5].

It is predicted that by 2030, solar energy will represent 50% (600 TWh) of the electricity sources in Africa for both renewable and non-renewable energy [6], therefore overtaking hydropower as the main renewable energy source. Example, the first solar farm in Rwanda, produces 6% [7] of the total electricity supply of the country, proving that this is achievable in Sub-Saharan Africa [7].

Solar Electricity Distribution Network

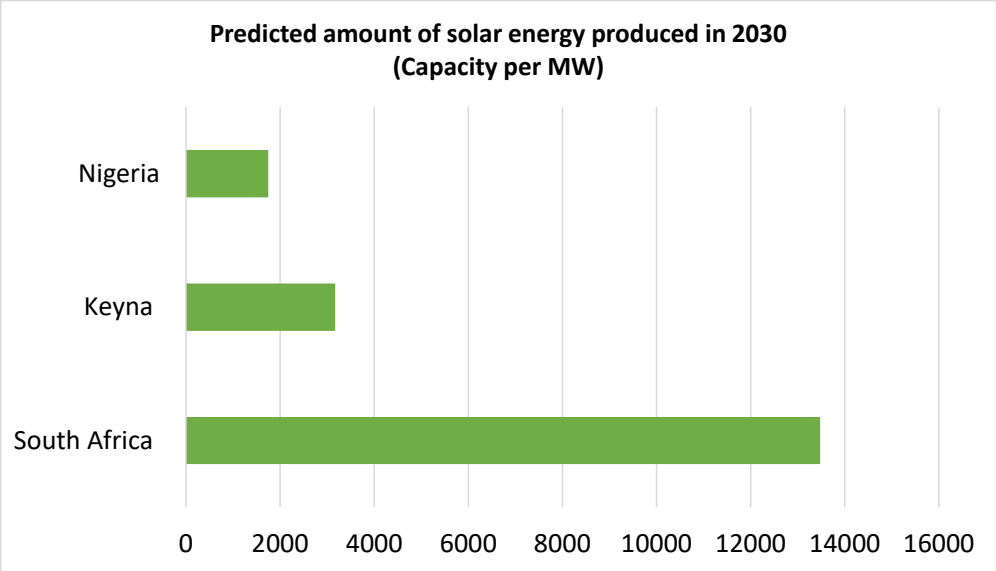
Mini-grids that are the options that the UN should consider to reach the 7th goal by 2030, as this would enable them to reach large populations quicker and useful in areas with very low infrastructure. Manufacturing of mini-grids is currently rapidly growing in Kenya because of projects such as Odyssey Energy Solutions, which has surpassed 550 mini-grids [8], this suggests that mini-grids could be very successful. Africa is predicted to have the largest share of the 210,000 planned mini-grids by 2030 [9]. This also ideal as a start-up as they require less space and have cheaper upfront costs. The estimated cost is $1,430 per customer connection [10].

Government and UN cooperation

Governmental and UN cooperation impacts the UN being able to achieve the seventh goal by 2030. The UN encourages governments and makes other countries aware that Sub-Saharan Africa may require funding or support of mini-grids in developing countries are challenging because banks are often reluctant or unable to offer to the funding. Therefore, some countries may consider borrowing money from other countries [11]. An example of this would be the Nigerian solar project a $30 billion Korean firm worked closely with the government to develop this project, which aims for 36 % of the energy mix by 2030[12]. If governments focus on private finance for investment in mini-grids they may need to lower the risk to investors to help ensure a sufficient return. The government is important as they create the regulation and laws that will help regulate the maintenance and understanding of renewable solar energy.

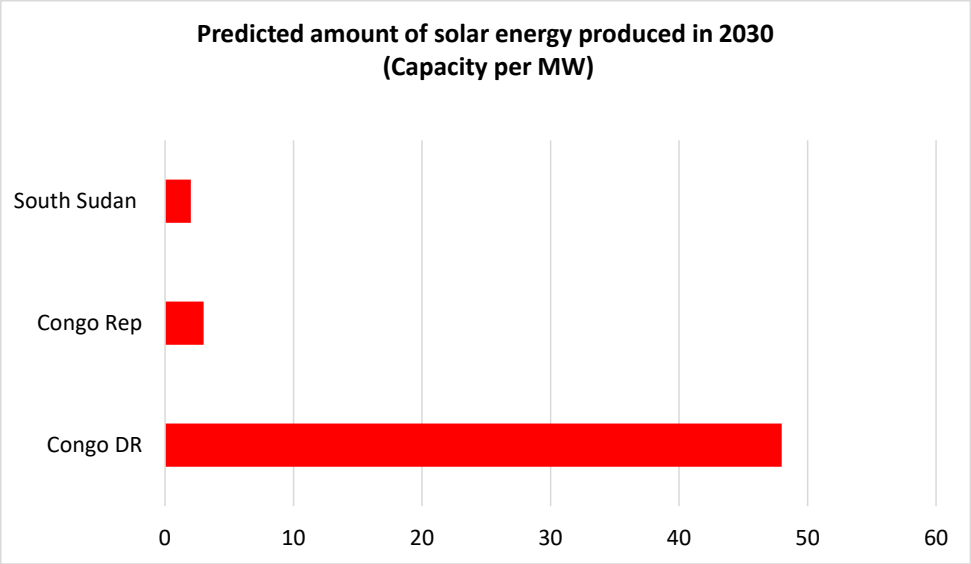
UN predicted achievement by 2030

This section will predict whether the UN seventh goal, can be achieved by 2030 and which countries are most likely to succeed. It is predicted that by 2030, solar energy will represent 50% (600 TWh) of the electricity sources in Africa for both renewable and non-renewable energy [13], proving how significant solar energy's impact could be. Some of the sub-Saharan African countries that are likely to achieve the seventh goal are Kenya, South Africa and Nigeria [14] because they already had an existing solar electricity distribution network before the UN creating this goal; therefore, they have the necessary infrastructure and financial support from the government. Bar chart 1, represents the predicted amount of solar energy produced in these countries by 2030(Appendix A, shows the calculations used).



Bar chart 1: shows the predicted amount of solar energy produced in Kenya, South Africa and Nigeria by 2030

However, countries such as the Democratic Republic of the Congo [15], South Sudan and the Republic of the Congo are least likely to succeed as this is not their highest priority, because of lack of sunlight and political demise. Bar chart 2, represents the predicted amount of solar energy produced in these countries by 2030.



Bar chart 2: shows the predicted amount of solar energy produced in the Democratic Republic of the Congo, South Sudan and the Republic of the Congo by 2030

Comparison of these charts shows that solar energy growth in those countries in bar chart 1 is more promising and therefore UN should focus on building up the infrastructure in these countries whereas the countries in bar chart 2 should prioritise other UN goals such as "No poverty" and "No hunger" [1]as electricity generally is still uncommon.

ESI-Africa article suggests that the seventh UN goal is more achievable by 2050 to obtain 100% renewable energy [16]. This article does not specify which African countries would achieve the fastest growth. Conversely, Bill Gates (well-known philanthropist [17]), believes this UN goal can never be achieved via solar energy alone [18]. However, this statement was made in 2016 and Sub-Saharan Africa solar energy data was scarce then and has since become easier to access and the cost of a solar home system has reduced from US$991 in 2009 to US$193 in 2020 [19], making solar energy more affordable option in Sub-Saharan Africa.

Conclusion

This essay has proven renewable energy via solar energy is possible in Sub-Saharan Africa by 2030,

History of solar panel electricity production in Sub-Saharan Africa has shown an overall increase between 2010-2018, and a decline in the price of solar energy, making this energy more affordable and effective. It has also revealed that countries such as Rwanda have been very successful by contributing to 6% [7] of the country's overall electricity. Solar electricity distribution networks prove that many countries already have the infrastructure needed and many projects are taking place with mini-grids due to the upfront cost being cheaper.

The importance of UN relationships with the countries' governments and how these governments can impact the timeline/success of the project is important, for example in creating policies and regulation that encourage and enhance renewable energy.

UN solar energy achievement by 2030 was estimated with countries such as the Democratic Republic of the Congo, South Sudan and Republic of the Congo most likely not achieving this. However, estimations reveal that solar energy would be achievable by 2050 in these countries because it would give the country more time to build the economy and resolve the problems in the country. An alternative could be countries such as South Africa or Nigeria, who have excess renewable energy that could be distributed to neighbour countries that may have fewer resources.

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Appendix A

The formula used to show the predicted amount of solar energy different Sub-Saharan Africa by 2030 in capacity per MW.

Nigeria:

$$\left(\frac{175.0}{10}\right) \times 10 = 1750$$

Kenya:

$$\left(\frac{317}{10}\right) \times 10 = 3170$$

South Africa :

$$\left(\frac{1347.6}{10}\right) \times 10 = 13476$$

Congo DR :

$$\left(\frac{4.8}{10}\right) \times 10 = 48$$

Congo Rep :

$$\left(\frac{3}{10}\right) \times 10 = 3$$

South Sudan :

$$\left(\frac{2}{10}\right) \times 10 = 2$$