

Local Wind Power Policy and Planning – An insight into The Sudan

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CHAPTER 1. INTRODUCTION:

According to the International Renewable Energy Agency (IRENA), the Eastern African region is endowed with rich renewable energy sources especially in wind power. Another common denominator shared by countries in this part of the world, which can act as a driver for the exploration and implementation of wind power, is that the region already suffers from low access to electricity along with insufficient and unreliable power supply. (Ashraf M. et al.,2016, p.1)

Like many other renewable energy sources, wind power can play a significant role in meeting the electricity demands of a country, support its economic development and nevertheless help reduce and mitigate its carbon emissions. For a country like The Sudan, where most people obtain their needed energy from firewood (Abdeen Mustafa O., 2009, p.6), the role of wind energy within Sudan's energy sector could be vital.

So far wind energy has not been significantly exploited in The Sudan. Use of wind energy goes back to the 1950's, where 250 wind pumps provided by the Australian government were installed at El Gezira Agricultural Scheme. Due to the high competition from the relatively cheap diesel pumps and lack of spare parts at the time, these pumps gradually disappeared from the service (Abdeen Mustafa O., 2015, p.251). The situation did not change much since then. In the last two decades, the Energy Research Institute (ERI) installed 15 Consultancy Services Wind Energy Developing Countries (CWD) wind pumps, each 5000 mm in diameter around three states, including the capital Khartoum (Abdeen Mustafa O., 2015, p.251). Another 60 wind pumps to be used in water pumping were to be introduced through a cooperation between the Sudanese Agricultural Bank (SAB) and the ERI, however due to lack of financial support, the pumps were not manufactured (Abdeen Mustafa O., 2015, p.251).

CHAPTER 2. POTENTIAL:

Though Sudan's past experience with wind power industry has not been successful or strictly speaking has not been exploited properly, the country still has very promising potential for using wind energy.

A wind measurement campaign in year 2002 investigated and identified the feasibility of electrical power generation by wind energy. Subsequent wind measurements have concluded that The Sudan has considerable wind energy sources. The study also identified three principal sites as having high wind energy potential. These include Darfur region, The Northern State and the Red Sea coast (see Figure 1 below).

The wind mean speed at 50m height in The Sudan varies between 5.1 to 7.1 m/s. Whereas in the high wind potential areas (i.e. Darfur, The Northern State and the Red Sea coast), wind speeds reach up to 7.1m/s at 50 m altitude. Most other areas in the country with similar altitude reach nearly to 5.9m/s.(Ashraf M. et al.,2016, p.1)

As part of the United Nations Development Programme (UNDP)-implemented, Global Environment Fund (GEF)-financed project, a more accurate wind map will be developed to help identify areas of high wind potential (United Nations Development Programme, 2014, p 14).

Figure 1 below reflects the annual mean wind speeds at 50m height for The Sudan.

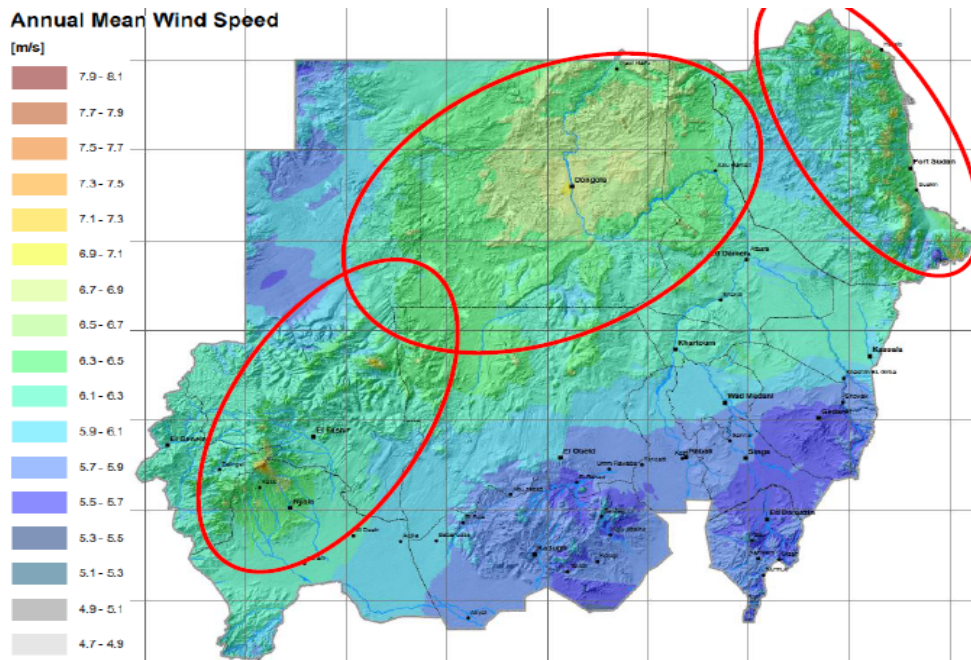


Figure 1 Calculated annual average wind speed at 50 m height in Sudan (Red ovals show areas with the highest potential)(United Nations Development Programme, 2014, p 11).

With the average of electrification rate in Sudan being only 35% (Ashraf M. et al.,2016, p.6), the country still has great opportunity to exploit wind power to supply electricity to the remote areas through off-grid systems.

In addition to the generation of electricity, a number of conducted studies over wind pump systems in The Sudan have concluded to the huge potential these pumps can play in fulfilling the water lifting needs both in the capital Khartoum and the rural areas for both irrigated agriculture and water supply (Abdeen Mustafa O., 2015, p.252).

CHAPTER 3. CHALLENGES:

Sudan may have huge potentials in using the available rich wind resources it possesses, however in order to turn this potential into a reality and a success story, overcoming many challenges becomes a necessity. Some typical key potential barriers that would definitely need be addressed at some point down the process of wind technology application, include the following:

- Lack of consistent policies
- Unstandardized and time-consuming regulatory and permitting processes
- Concerns of utilities related to integration of distributed or variable power on the grid
- Public concerns related to visual, sound, land use, and other environmental impacts that may be associated with wind

- Need for post-installation and ongoing skilled labor for turbine maintenance.(Clean Energy Solutions Center, 2015, p.1)

Other than the above mentioned challenges, Sudan in particular would need to exert more efforts simply because the country has so far been limited only to small-scale mechanical (wind) water pumping and nevertheless the country has no experience in applications of wind turbines at any scale for the generation of electricity (United Nations Development Programme, 2014, p 14)

Understanding the planning and operational requirements of wind power is a key step for The Sudan in order to employ right policies and choices that would promote wind energy development in the country's promising sites.

CHAPTER 4. WIND POWER POLICIES:

One good start where both Sudan decision makers and any respective stakeholders may want to begin with and adopt for any potential Wind Power project, would be the Planning Policy Statement 18 "Renewable Energy" (PPS 18). The objectives of the policy include:

- Ensuring environmental, landscape, visual and amenity impacts of renewable energy development are adequately addressed
- Ensuring adequate protection of the region's built and natural, and cultural heritage features
- Facilitating the integration of renewable energy technology into the design, siting and layout of new development. (Guide, 2015 p.2)

The policy also states the importance of the following:

- *Proposals should be located at, or as close as possible to, the source of the resource needed for that particular technology*
- *If a project is likely to result in unavoidable damage during its installation, operation or decommissioning, the planning application will need to indicate how this will be minimised and mitigated e.g. through a habitat management plan or the creation of a new habitat. This should be agreed before planning permission is granted*
- *Significant weight will be given to the wider environmental, economic and social benefits of all proposals for renewable energy in deciding whether planning permission should be granted.*(Guide, 2015 p.2)

Wind Energy Development Policy – PPS 18:

PPS 18 provides more specific criteria with regards to wind energy development. These criteria could act as a base for any potential projects in the Sudan.

According to PPS 18, certain criteria/issues need be achieved and addressed prior to any application of any wind energy development in an area. Key criteria include:

- The development will not have any an unacceptable impacts on visual amenity or landscape character through: the number, scale, size and siting of turbines;

- The cumulative impact of existing and proposed wind turbines are taken into account;
- The development will not create a significant risk of landslide or bog burst
- No unacceptable electromagnetic interference to communications installations; radar or air traffic control systems; emergency services communications; or other telecommunication systems
- No part of the development will have an unacceptable impact on roads, rail or aviation safety
- The development will not cause significant harm to the safety or amenity of any “sensitive receptors” through noise; shadow flicker; ice throw; and reflected light (“sensitive receptors” are: habitable residential accommodation including future residents, hospitals, schools and churches)
- Above-ground redundant plant (including turbines), buildings and associated infrastructure shall be removed and the site restored to an agreed standard appropriate to its location.
- No permission should be granted if there is any development on an active peatland, not unless there are reasons and justifications for overriding public interest
- Wind farms to be separated from any occupied property by a distance of 10 times the rotor diameter of the wind turbines (and be at least 500 m away). (Guide, 2015 p.3)

CHAPTER 5. EXAMPLES AND GOOD PRACTICES TO BE LEARNT FROM:

As discussed earlier, Sudan’s past experience with wind energy has been quite limited however not far away, in Kenya, more specifically in Lake Turkana Wind Farm project-the largest wind farm project in the African continent, many good practices and examples can be learnt from and referred to for any of Sudan’s future projects.

Recommended Policies and Strategies:

Although not many details have been available or closely studied about the nature of earlier mentioned high wind potential sites in The Sudan with regards to any wind development; however many policies and strategies being initiated in the neighboring country Kenya could actually be very helpful and somehow align with the Sudanese sites conditions, requirements and nevertheless opposing interests. However, site specifics and exact requirements can only be identified through a detailed comprehensive Environmental Social Impact Assessment (ESIA) carried on the targeted potential site.

The following table summarizes wind energy policies and strategies provided in Kenya's Energy Policy issued Nov 2013:

No.	Policies and Strategies	Implementation		
		Short Term (2014-2017)	Medium Term (2014-2022)	Long Term (2014-2030)
1	Enhance the institutional capacity to promote wide spread use of wind energy while enforcing the existing regulations and standards	√		
2	Designate an entity to promote, undertake data acquisition, accelerate exploitation of wind energy and provide a one stop shop for information and guidance to investors in wind energy projects	√		
3	Provide incentives to promote the local production and use of efficient wind systems		√	
4	Promote the use of hybrid power generation systems involving wind and other energy sources		√	
5	Provide a framework for connection of electricity generated from wind energy to national and isolated grids, through direct sale or net meeting	√		
6	Formulate and enforce minimum standards for wind energy technologies	√		
7	Plan transmission lines to facilitate evacuation of power from areas with high wind potential to major load centers	√		
8	Undertake Research Development and Dissemination (RD&D) through the National Energy Institute		√	
9	Enhance capacity building on wind technologies to provide support services		√	
10	Provide fiscal incentives on wind energy equipment		√	
11	Collect and compile wind energy data and update the wind atlas		√	
12	Facilitate development of wind power generation of at least 500MW by 2017 and 1,000 by 2022 and 3,000MW by 2030	√	√	√

Table 1: Policies and Strategies (Republic of Kenya, 2013, p.63)

Stakeholders' involvement:

It is important that all stakeholders are equally valued and acknowledged by the government and concerned developers. Non Government Organizations (NGOs), local community representatives and various other environmental and social organizations shall always be invited and listened to during the initial stages of any development. Addressing issues and concerns raised by any of the stakeholders at early stages would definitely help prevent conflicts, complications, extra costs and nevertheless delays to the project.

Participatory approach and interaction between the various stakeholders can take different shapes and forms depending what suits best. Holding formal or public meetings, debates, conducting questionnaires and carrying out focus group discussions are all forms which can be used.

In addition to the collective involvement of stakeholders, it is quite important that results concluded for instance from a conducted ESIA or other surveys; are always shared with the public, concerned habitants and nevertheless all stakeholders. A good example of this was noted in Lake Turkana Project, where draft copies of the ESIA were made available to the public for three weeks for any comments or suggestions.

On top of this, the Lake Turkana Wind Project (LTWP) company developed a Community Engagement Plan (CEP) and information disclosure programme in the project's vicinity. Stakeholder disclosure pamphlets have been translated and distributed in the entire project area (including the associated transmission line route) (Kenya Lake Turkana Wind Power Project, 2011, p.8). Such initiatives and methods would without doubt increase the transparency and consequently the trust amongst the stakeholders.

Developers' checklist:

No doubt that developers bear a heavy burden in making sure that both social and environmental aspects concerning their project are always being addressed. Similarly, they also need to ensure the profitability of the project and hence address all the logistics and economic aspects as well.

Following are few key points that formed part of LTWP ESIA's framework and methodology. These could inevitably be part of any developer's checklist and points to address:

- *Technology, procedures and processes to be used in the implementation of the project;*
- *Materials to be used in the construction and implementation of the project;*
- *Products, by-products and wastes generated by the project;*
- *Description of the potentially affected environment*
- *Environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;*
- *Alternative technologies and processes available and reasons for preferring the chosen technology and processes*
- *Analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies*
- *ESMP proposing the measures for eliminating, minimising or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures*
- *Provision of an Action Plan for the prevention and management of foreseeable accidents and hazardous activities caused by carrying out activities or major industrial and other development activities*
- *Measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies*

- *Identification of gaps in knowledge and uncertainties which were encountered in compiling the information*
- *Economic and social analysis of the project*
- *Indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures.*(Kenya Lake Turkana Wind Power Project, 2011, p.7)

CHAPTER 6. STAKEHOLDER’S CONCERNS:

No matter how beneficial a project development can be, there will always be concerns raised by the stakeholders. Typical concerns that one can imagine being raised by stakeholders (mainly local habitants) in the Sudan could be:

- Increase in accidents related to the siting, installation and operation of the wind turbines
- Loss of grazing land for livestock
- Having foreign labour intrusion into the area may result into conflicts (culture conflicts etc.)

As discussed earlier, addressing stakeholder’s concerns at early stage would save time and efforts down the process.

CHAPTER 7. CONCLUSION:

Sudan may truly have huge potentials from available wind resources and with further studies and surveys the optimum sites either for electricity generation or wind mechanical pumping could easily be located.

Learning from the neighboring Kenya through the LTWP project would be a great chance for the Sudan and its potential sites. Both policies and strategies set by the LTWP may serve as a solid guideline for the Sudanese wind development projects.

Having enough enabling wind policies, proper planning and permission processes fully supported by all stakeholders under a cooperative and transparent umbrella would be the ultimate key for the success of any of Sudan’s wind development projects.

REFERENCES

Abdeen Mustafa O., 2009. Sustainable energy: Challenges of implementing renewable technologies, *Journal of Agricultural Biotechnology and Sustainable Development*, Vol. 1(1), p.1-23.

Abdeen Mustafa O., 2015. Evaluation of sustainable development and environmentally friendly energy systems: case of Sudan, *E3 Journal of Environmental Research and Management*, Vol. 6(3), p.237-261.

Ashraf M. et al.,2016. Wind Power Harnessing in Sudan, Opportunities and Challenges, *University of Khartoum Engineering Journal*, Vol. 6 Issue 2, p.1-6.

Clean Energy Solutions Center. (2015) [ONLINE] *Policies to support wind power deployment. Key considerations and good practices.* Available from: <http://www.nrel.gov/docs/fy15osti/64177.pdf> [Accessed: 24th January 2017].

Guide. (2015) [ONLINE] *Wind Turbines and Wind Farms-Guide to Planning Policies.* Available from: <https://www.communityplaces.info/sites/default/files/Wind%20Turbines%20and%20Wind%20Farms,%20Guide%20to%20Planning%20Policies,%20Jan%202015.pdf> [Accessed: 24th January 2017].

KENYA LAKE TURKANA WIND POWER PROJECT. (2011) *Updated Environmental and Social Impact Assessment Summary.* Kenya: African Development Bank Group. (P-KE-FZ0-001). Available from: <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Environmental-and-Social-Assessments/Kenya%20-%20Lake%20Turkana%20Wind%20Power%20Project%20-%20ESIA%20Summary.pdf> [Accessed: 25th January 2017].

Republic of Kenya, 2013, National Energy Policy-Final Draft. *Ministry of Energy and Petroleum.* Nov.2013, p.1-150

United Nations Development Programme. (2014) [ONLINE] *Promoting Utility Scale Power Generation from Wind Energy.* Available from: <https://www.thegef.org/project/promoting-utility-scale-power-generation-wind-energy> [Accessed: 24th January 2017].