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Insight on Ghana Shift from Fossil Energy to Renewable Energy.

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Abstract
Fossil fuels emits harmful gases into the environment which over years may cause deadly diseases like asthma, cancer, pollute rivers and lands. As a result of the negative effects from fossil fuels usage, many developed nations are investing heavily till this moment on renewable energies. Some has the four kinds of renewable energies in full operations which makes their environment more friendly and safe. African countries lack the political wills or probably corruption has prevented them from harnessing free energies of nature. However, Ghana recently signed the usage of renewable into law and has started the construction of solar energy plants across her states with cost of about 2.0 Euros. Thou the amount is enormous but much long term gains. I'm looking forward to other African nations emulating Ghana is this right direction.

Keywords: Renewable Energy, Fossil Fuels, Technology, Biomass and Ghana.

1. Introduction

Even if the earth continues to evolve, the resources used by humans will eventually become scarce. Over decades, fossil fuels have been and are still being used as the major energy source for households, industries, and service providers. However, due to the limited amount of fossil fuels, energy is becoming more and more expensive, and the consequences of their consumption are having an impact on our environment and climate. The major impact is called the greenhouse gas effect, which is, in other words, "gases that trap heat in the atmosphere."(US Environmental Protection Agency, 2014).

The trapped heat does not leave the earth without severe consequences. Global warming is one of the terms often used to describe the reason for many natural catastrophes. One of the major consequences resulting from the greenhouse gas effect is called climate change, which causes the melting down of major glaciers and the poles, resulting in the rise of the sea level. Due to the trapped heat, extreme weather conditions occur, such as droughts and floods (British Geological Survey, 2014).

Many nations are investing in renewable energy sources like solar energy, windmills, hydropower and biomass energy as a result of these hazardous and potentially fatal conditions. By switching to "cleaner energy," we should be able to reduce greenhouse gas emission and so slow down global warming. The prerequisites for building renewable energy systems will be covered, along with explanations of terms and examples of renewable and fossil fuel energy. The overall benefits and drawback of renewable energy sources, as well as the initial expenses for both individual use and government investments, are discussed in the paragraphs that follow.

2. The Harmful Effects of Fossil Fuels on the Environment

Charles Darwin's theory of "survival of the fittest" (Encyclopedia Britannica, 2014) would aptly describe the continued battle between powerful and wealthy nations for the remaining fossil fuels, given the depletion of fossil fuel resources and the rising cost of those resources for both government and consumers. Due to their wealth in fossil fuels, many powerful nations would meddle politically and economically in lesser and poorer economies. What, though, are fossil fuel? The remains of dead plants and animals that accumulated over millions of years

are known as fossil fuels. Energy resources like "coal, fuel oil, or natural gas" were created from the remnants (Science Daily, Fossil fuel, 2014). They are easily processed, and pipes are primarily used for transportation. Many would rather have the readily ground's combustible and inexpensive resources, as even their extraction and processing are generally very affordable (Conserve Energy Future, 2014).

Many nations employ labourers who lack training or expertise in coal mines and neglect to make investment in the worker's appropriate safety gear and protection. This causes several explosions or labourers accidents that occur inside coal mines, killing multiple miners.(Conserve Energy Future. Fossil Fuels 2014).

Despite the direct impact on workers' health and safety, there are also indirect impacts on
humans and nature. The leading environmental impact is the effect of global warming caused by
greenhouse gas emissions. The trapping of many toxic gases is already becoming visible on
natural disasters caused by the heating of the earth. Farmers are often experiencing decay
of their crops due to unusually extreme weather temperatures or the fall of acid rain in some
areas (Ibid).

One of the main greenhouse gases is carbon dioxide (CO_2), which when exposed to over an extended period of time can lead to lung cancer or many other respiratory ailments. China is a prime illustration of the catastrophic levels of harmful gases. Numerous industrial sites are concentrated of CO_2. Many poisonous chemical hidden in this seemingly innocuous fog prevent individuals from breathing without masks covering their mouths and **noses (**Beech, H. (2014)**).**

The search for oil is not without a negative impact as well. Whether the drilling is onshore or
Offshore turned out to be successful, and a big reservoir of oil was discovered.

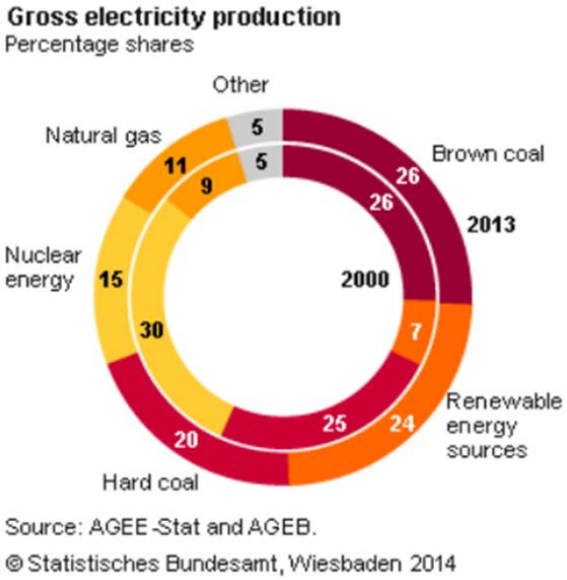
Natural life would be destroyed either way. Offshore drilling will also affect underwater life
of many animals either by reducing the livestock due to the operation of the oil rig or polluting
the sea and poising the livestock due to oil spills. The fishing quota would be reduced. Small-scale
Fishers would catch fewer or even poisoned fish, resulting in a reduction in income. (Supra. n.4)

This poorer group of society would probably sell the poisoned fish to the customers in order to maintain their livelihood; therefore, it could also have negative health implications for a larger group of society.

Despite those negative effects, it is important to mention that many resource-rich countries
"develop more slowly, are less diversified, more corrupt, less transparent, and subject to greater
economic volatility, more oppressive, and more prone to internal conflict than non-endowed
countries at similar income levels."(Siegle, J., and Khodeli, I. 2009). Many people refer to this as the "natural resource curse (Lawson-Remmer, and T. 2012) and give examples of the situation in African oil-rich countries like Nigeria, Sudan, and the Republic of Congo.

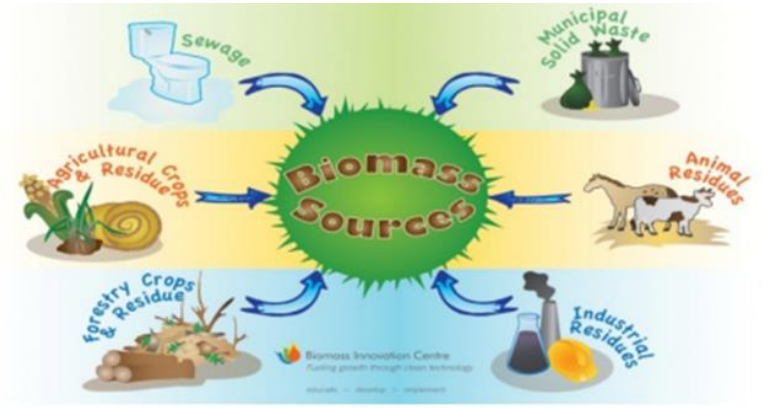
3. Renewable Energy: Definitions and Examples

Many countries are nowadays investing in renewable energy sources. There are several methods in order to gain heat and electricity. Germany increased the annual production of renewable energy from 7% (2000) to 24% (2013) of the national gross electricity production. Germany was even able to turn off several nuclear power plants in the past years (Statistisches Bundesamt, 2013). This firstly brought in a lot of skeptical opinions and fears of power shortages due to the infrequent amount of renewable energy sources. Yet however, due to the high amount of energy created, Germany is even able to export its energy to other countries, proving many theories about energy shortages wrong. This mainly shows that when energy is being used and stored properly, using renewable energy can be highly efficient and to an advantage for producers, consumers and nature (Birkenstock, G. 2012). However, it is important to also mention that the need for sufficient infrastructure is a major steppingstone for the productive path of using renewable energy resources. Many developing countries lack the strong power net other countries have, and hence cannot distribute the energy to the households. Renewable Energy Sources are usually referred to energy produced through sun, wind or water power. There are special ways in capturing the mentioned natural energy and transforming it into energy we can actually use at home.



3.1. Biomass Energy

Biomass is one of the renewable energy resources many countries have been using for a
long time, since its energy is provided through the process of photosynthesis in plants. Energy is generated in biomass power plants by burning down crop residues, manure, forest residues, or even urban waste. Biomass resources can come in the form of solids, liquids, and
even gases. The burning of methane, for example, as a source of energy reduces landfill
gases and is hence considered a cleaner alternative than fossil fuels (Union of Concerned Scientists, 2014). However, if bio power is not properly managed, the energy generated through biomass can have a negative impact on our environment. The amount of water consumed and the air pollution produced through biomass resources can become very damaging. (Ibid) (Germany Energy). The process of generating energy through biomass is generally easier than the other types already discussed. Photosynthesis is one of the key players in the materials used to generate energy, since it captures the sun's energy and hence releases this energy when it is burned in biomass power plants (Ibid).



Prices and Coverage	
Years to use[37]	As long as there are materials to use, lifetime of plant 20 years
Coverage of households	e.g. approximately 25.8% of households in Germany alone (several plant)
Price for government investment	Several million € (depending on size of plant)

Pays off in	Between 5.4 years and 7 years[38]
Capacity/Full-load hours[39]	Between 5000 hours/year and 8000 hours/year[40]

Advantages	Disadvantages
Resources (if well maintained) are infinite and will not extend regardless of the amount of consumption	Produces a small amount of CO2 emission
Low cost	Increases the price for wheat and corn
Well utilized resource	Land needed to produce biomass
Most plentiful resource	High cost of transportation
Can be used in different forms (liquid, solid or gas)	Competition for land use
Not weather dependant	
Reduction of landfill disposals	
10 MW biomass power project can create approximately employment for 100 workers during the 18-month construction phase, 25 full-time workers employed in the operation of the facility, and 35 persons in the collection, processing, and transportation of biomass material.	

Referring back to Ghana, it is obvious that the intention exists to use renewable resources
and the needed energy is available. Installing the tools for generating electricity for many
households and companies through solar energy, wind, water, or biomass need close
observation, however, on where to appropriately install the panels, mills, turbines, and power
plants. Considering the high state of mismanagement and inefficient funds, it will probably be
not easy to finance this eco-friendly technology and hence provide people with electricity. The
Installation of the renewable resource tools would not only cost a fortune for the object itself,
but also the deployment. The first step in observing different areas for different types of
potentials is already being conducted by the Ghana Energy Commission with support from the
United Nations Environment Program (UNEP) for on- and off-shore wind energy (Arrakis Group, Ghana's wind power potentials, 2014). After Ghana's Parliament passed the Renewable Energy Bill in November 2011, many people became enthusiastic about the future of Ghana regarding electricity and the environment. According to the Solar and Wind Energy Resource Assessment (SWERA), solar energy technologies to produce hot water throughout the year became a very useful equipment in Ghana. "The Ministry of Energy estimates that over 6,000 solar systems have been installed in the country."

4. General Advantages and Disadvantages of Renewable Energy

Knowing the use of renewable energy is a rather new development, it carries the weight of critics
and careful, long-term observation.
Many advantages and disadvantages have already been pointed out under each section of
renewable energy resources discussed above. Below are a few general advantages and
disadvantages, which are related to all the types of resources mentioned with biomass as an example of focus.

Advantages	Disadvantages
No dangerous work places for workers anymore (such as coal mines, oil drilling stations etc…)	High cost of equipment, tools and machines
Resources are infinite and will not finish regardless of the amount of consumption	Equipment has to be spread on wide areas
No political and economical conflicts regarding rare fossil fuels (petroleum, coal, etc…)[44]	Competition for land and empty areas[45]
Does not produce toxic gases, reduction of smog	Structural change [46]

5. Ghana Renewable Energy

As earlier mentioned, Ghana has already started investing in renewable energy, even if it is still in a slow process. Aside from the Bui, Kpong, and Akosombo Dams in Ghana, the first solar power plant was introduced at Navrongo, in the Upper East Region of Ghana, in May 2013. (Volta River Authority, 2013).
The Navrongo Solar Power Plant cost the Volta River Authority an estimated 8 million US dollars as budget (Ibid). It has already been reported that the plant is not working efficiently. Problems have occurred in the aspect of storing energy and delivering same to households.
Another big investment planned is the Pwalugu Multipurpose Hydropower Dam in the Upper
East region at the White River in Ghana. The construction of this project will start in 2017 and is
planned to finish in 2022. (Government of Ghana., 2013). The Pwalugu Dam is considered to function as a multipurpose dam for several purposes, such as generating electricity as the major function and for flood control. The construction and operation of the dam will provide many job opportunities, as planned. It will, however, also affect the surrounding environment with traffic noise, dust, and exhaust emissions. Many people might feel threatened by that and have to relocate, for which the Volta River Authority plans on consulting the public and raising awareness of the project, its benefits, and its effects. (Volta River Authority, 2014).
Renewable energy is one arguable topic about whether it could succeed in Ghana or not. However, many steps are being taken, and using renewable energy would mean the prices of electricity
and heat would decrease since the energy comes from an infinite source. Electricity would not
only become cheaper but also more regularly provided than in the current state. It is in fact an
expensive investment for the government and the investor companies, but with the financial
support coming from developed countries, it is not farfetched. Even solar street lights are being
used in several areas in Ghana and are seen as a step forward to an eco-friendly country. (Ministry of Energy and Petroleum 2013).
To encourage the use of renewable energy source and protect our climate, a number of nations give to or assist other governments in providing funding and training to help them make the transition to a more environmentally friendly state. Germany is a signicant investor in Ghana. Following the passage of the Renewable Energy Act in 2011, Germany provided Ghana's energy sector with 1.8 million Euros through the Deutsche Gasellchaft fur Internationale Zusammenarbeit (GIZ) in the previous year (Ministry of

Energy and Petroleum 2013). The regular financial investment in biomass projects and climate change opportunities further strengthens the bonds between Germany and Ghana, (Spy Ghana,2012). It is crucial to note that without awareness campaigns and projects, financial support and investments by themselves would not be able to improve the environment and the climate in Ghana. People need to understand how harmful fossil fuels are over time and how crucial it is to gradually switch to renewable energy source.

6. Conclusion

As science and technology continue to advance, it is equally crucial to take the necessary steps to apply them to the benefit of our planet. The possibility for clean resource extraction and consumption that is already available is provided by nature; it never ends up being compared to fossil fuels and does not hurt people or animals. Developed nations are already leading the way in the use of renewable energy sources and are developing variety of instruments that will cost millions, if not billions, of euros to protect the environment and climate from harmful gases.

References

1. Arrakis Group. Renewable Energy- what is Ghana's wind power potential? Available on, http://www.arrakisgroup.com/energy/renewable-energy-what-is-ghanas-wind-power-potential/ [accessed 19th May 2014].
2. Beech, H. (2014). "China's Smog Is So Bad They're now Calling it a `Nuclear Winter´. Time. Available on, http://time.com/9802/beijing-air-pollution-nuclear-winter/ [accessed 19th May 2014]
3. Birkenstock, G. (2012). "Power exports peak, despite nuclear phase-out", Deutsche-Welle. Available on, http://www.dw.de/power-exports-peak-despite-nuclear-phase-out/a-16370444 [accessed 19th May 2012].
4. British Geological Survey. Consequences of greenhouse-effect temperature rises. Available on, http://www.bgs.ac.uk/discoveringGeology/climateChange/CCS/consequencesOfTemperatureIncrease.html [accessed 16th June 2014].
5. Conserve Energy Future. Fossil Fuels. Available on, http://www.conserve-energyfuture.com/ Disadvantages Fossil Fuels. php [accessed 14th May 2014].
6. Conserve Energy Future. Fossil Fuels. Available on, http://www.conserve-energyfuture.com/Advantages Fossil Fuels. php [accessed 14th May 2014].
7. Encyclopedia Britannica. Animal Behaviour. Available on, http://www.britannica.com/EBchecked/topic/25597/animal-behaviour#ref497943 [accessed 13th May 2014].
8. Government of Ghana. (2013). Construction of Pwalugu Dam Begins In 2017. Available on, http://www.ghana.gov.gh/index.php/2012-02-08-08-32-47/general-news/4154-construction-of-pwalugu-dambegins-in-2017 [accessed 30th June 2014]
   Ibid.
9. Lawson-Remmer, T. (2012) "Beating the Resource Curse in Africa: A Global Effort". Council on Foreign Relations. Available on, http://www.cfr.org/africa-sub-saharan/beating-resource-curse-africa-global-effort/p28780 [accessed 22th May 2014].
10. Ministry of Energy and Petroleum. (2013). Energy Sector in Retrospect: 2013 Achievements and Challenges. Available on http://www.energymin.gov.gh/?p=2001 [accessed 25th June 2014].
11. Ministry of Energy and Petroleum. (2013). Renewable Energy Sector Gets 1.8M Euro from Germany. Available on, http://www.energymin.gov.gh/?p=1854 [accessed 27th May 2014]
12. More information on biomass energy provided by the German Government can be found here: http://www.bmel.de/SharedDocs/Downloads/EN/Publications/BiomassActionPlan.pdf?__blob=publicationFile.
13. Science Daily, Fossil fuel. Available on, http://www.sciencedaily.com/articles/f/fossil_fuel.htm [accessed 13th May 2014].
14. Siegle, J., and Khodeli, I. (2009). „Governance strategies to remedy the natural resource curse". From Curse to Blessing? Using Natural Resources to Fuel Sustainable Development. Blackwell Publishing Ltd, Oxford. p.45.
15. Spy Ghana. (2012). German Bank to invest $40m in Ghana renewable energy. Available on, http://www.spyghana.com/german-bank-to-invest-40m-in-ghana-renewable-energy/ [accessed 28th May 2014]
16. Statistisches Bundesamt. Bruttostromerzeugung 2013. Available on https://www.destatis.de/DE/ZahlenFakten/ImFokus/Energie/ErneuerbareEnergien2013.html [accessed 16th June 2013]
    Supra. n.4
17. Union of Concerned Scientists. How Biomass Energy Works. Available on, http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/how-biomass-energy-works.html [accessed 20th June 2014].
18. United States Environmental Protection Agency. Greenhouse Gas Emissions. Available on, http://www.epa.gov/climatechange/ghgemissions/ [accessed 19th May 2014].
19. Volta River Authority. (2013). VRA Inaugurates first Solar Power Plant. Available on, http://www.vraghana.com/media/2013/may/news_04.php [accessed 30th June 2014]
20. Volta River Authority. Pwalugu Multipurpose Dam. Available on, http://vraghana.com/about_us/images/pmd_project_brochure.pdf [accessed 30th June 2014.