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Born in Asmara, Eritrea, I eventually moved to Canada, completing high school with honors, and receiving an Academic-Athletic scholarship to St. Bonaventure University (NY, USA). Graduating *Summa Cum Laude*, I received a B.A. in Sociology while also minoring in International Marketing and Spanish. At St. Bonaventure, I competed as a NCAA Division 1 scholarship athlete in football (soccer), receiving various awards, (academic and athletic), and afterwards I travelled to Europe and the Middle East to play professionally.

Currently, I am a PhD candidate in Sociology at Emory University (Atlanta, GA). As well, I am working towards completion of Emory's Graduate Certificate in Human Rights. My concentrations include Human Rights, Trafficking, Development, and Comparative Political Economy. Ultimately, I will use my education and experience to bring about tangible, sustainable social changes, while remaining positively involved in the lives of others.

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Electricity, Renewable Sources, and Development: A Glance at Eritrea
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Across the developing world and particularly within sub-Saharan Africa (SSA), energy deficiencies constitute immense challenges to development. The African Development Bank Group notes that, "...the entire installed generation capacity of Africa's 48 Sub-Saharan countries is just 68 gigawatts, no more than Spain's..," and that, "...as much as one quarter of that capacity is unavailable because of aging plants and poor maintenance."[i] Quite ominously, the International Electricity Agency (IEA) estimates that overcoming Africa's energy deficiencies will require an investment of approximately $300 billion.[ii]

Recently, energy has arisen as a topic of note in Eastern Africa. Kenya and Tanzania have discussed a partnership to exploit geothermal energy,[iii] while Sudan has sought to work with Turkey in areas of mining, power generation and hydrocarbons.[iv] In the Horn of Africa, the focus has been on the continued progress of Ethiopia's hydroelectric dam - the massive Grand Ethiopian Renaissance Dam on the Blue Nile - and the potential crisis that may develop with Egypt. The dam is projected to alleviate Ethiopia's debilitating internal energy issues – a large percentage of citizens lack access to electricity and outages remain frequent[v] - while helping Ethiopia emerge as a key exporter of power to the surrounding region.

Although several countries have been outlined as potential recipients of Ethiopian hydropower in the future, including Sudan, Djibouti, and Kenya, its northern neighbor, Eritrea, likely will not be one. Even with the latest Ethiopian offers of electricity to Eritrea - dismissed as a hollow political ploy[1] by Eritrea's Foreign Minister H.E. Osman Saleh - the continued illegal military occupation of Eritrean land and the fact Eritrea cannot afford to entrust such a strategic resource to the whims of Ethiopian leaders that have reneged on past international agreements, serve as stumbling blocks to any potential deals for future energy cooperation.[vi] Thus, with much of the Horn region's future energy capacities seemingly accounted for, Eritrea's own energy sector development deserves examination. This piece provides a brief glance at Eritrea's approach to energy, especially focusing on the country's development of alternative and renewable sources, and also notes challenges, recent achievements, and exciting possibilities.

First, the importance of access to electricity within socio-economic development cannot be overstated. Electricity is significant to development since basic activities like lighting, refrigeration, heating and air conditioning, cooking, running household appliances, and operating equipment are not easily or efficiently carried out via other forms of energy.[vii] For rural based countries such as Eritrea, sustainable, reliable provisions of electricity can prove especially crucial for economic progress and general development. For example, a farmer with access to electricity is able to chill milk to keep it from spoiling or a coastal fisherman can keep a catch fresher longer before eventually selling it in markets inland.

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[1] The offer is seen in many quarters as an Ethiopian attempt to re-open negotiations on territories that were awarded to Eritrea via the EEBC's final and binding international court decision.

As a result, electrified rural communities are better able to integrate into the larger national economy.
Additionally, general societal health services may improve since electrified medical facilities with reliable access to electricity can: remain open longer, thus servicing a larger number of patients; expand provisions of available services; and utilize better technical equipment. For education, electricity can be significant, since (better) lighting in classrooms eases reading activities for students, while it may lead to the incorporation of media, computers, and other modern technologies to enrich students' overall learning experiences (Obrecht 2010). As well, electricity is vital to telecommunications, helping to connect people, markets, and economies.

Access to electricity also frees vital amounts of time for individuals since they no longer must collect wood or kerosene to accomplish other important tasks, such as schooling or pursuing more productive activities to generate additional sources of income. Importantly, the use of electricity in place of firewood can serve to stem or reverse harmful deforestation; cutting trees for firewood and charcoal has historically been the main culprit for clearing wooded areas in Eritrea. Finally, the transition to electricity from traditional energy sources in the developing world, such as kerosene, is advantageous since kerosene can be expensive, at times costing families 30% of their income, extremely flammable, often leading to fires, and dangerous, frequently leading to indoor air pollution and health hazards (Obrecht 2010).

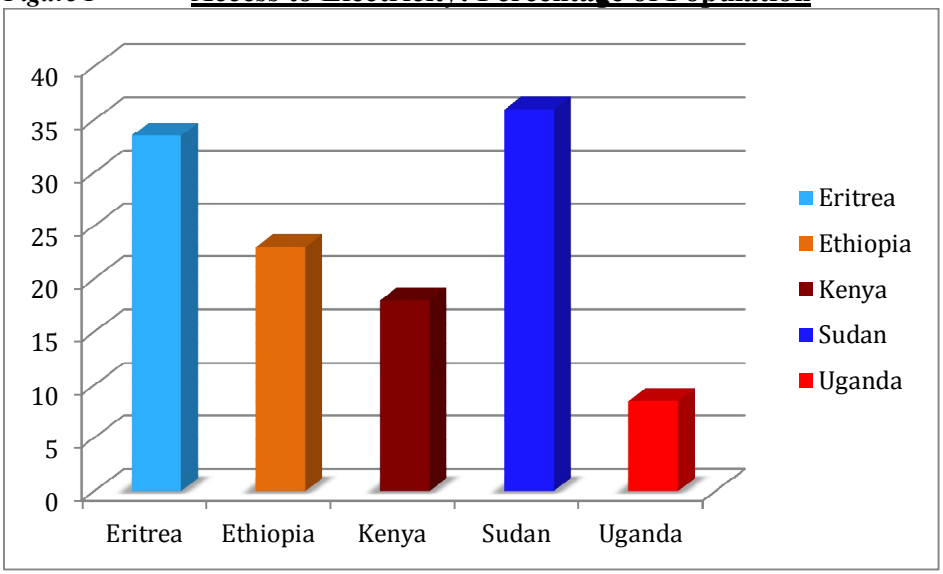
Eritrea's challenges to energy security relate to its low national income, challenging physical terrain, and post-war infrastructural destruction. Located within the volatile Horn of Africa, Eritrea was birthed after decades of war. Upon winning independence, it faced destruction upon a mass scale and, "...everything was destroyed [and there were]...no roads, no electricity, no water, no health, no education...nothing was there"; for all intents and purposes, Eritrea started from well "below zero."[viii]

While the immediate postwar years witnessed significant and positive developments within many sectors, the 1998-2000 war with Ethiopia represented a dramatic step back, coming with high human, economic, and infrastructural costs. These factors extended to negatively impact the development of the energy sector; for example, during the 1998-2000 war, Ethiopia bombed the Hirgogo power station, which was near the end of construction and close to operational.[ix]

For some perspective, in Eritrea the percentage of the population with access to electricity, although rising, has hovered at approximately 32-35%. By comparison, figures across the East African region show: Ethiopia at 23%, Kenya at 18%, Uganda at 8.5%, and Sudan at 36%, while figures for Djibouti, South Sudan, and Somalia remain unavailable.[x] Broadening the assessment, some 24% of the population of SSA has access to electricity.[xi]

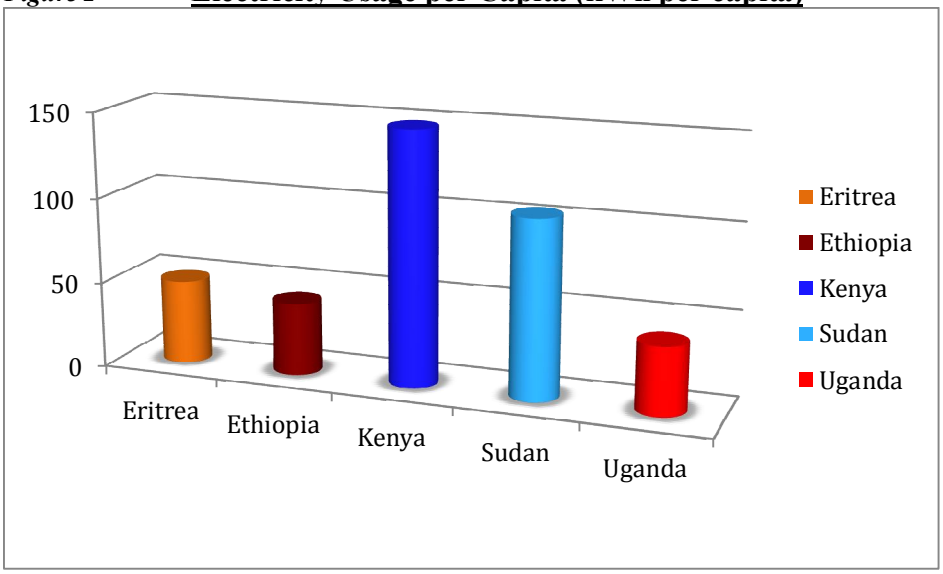
Turning to electricity use per capita (2008 data), Eritrea's figure stands at approximately 49 kWh per capita, while for the same indicator, Ethiopia is at 42, Sudan is at 104, Uganda's is 40, Somalia is at 33, Djibouti is at 394, and Kenya's is 148.[xii] These figures illustrate that Eritrea and other countries in the region have significant room for growth and improvement in terms of energy.

Figure 1 **Access to Electricity: Percentage of Population**



(World Bank 2013)

Figure 2 **Electricity Usage per Capita (kWh per capita)**



(IRENA 2013)

Like most developing countries, Eritrea's major sources of energy have traditionally been biofuels, such as wood, charcoal, and animal waste. As an importer of a large amount of oil and petroleum – in 2008 it imported 4790 bbl/day[xiii] and nearly all electricity power is generated from imported sources (Yohannes 2009) – Eritrea must be cognizant and wary of the dangers of a long-term dependence on foreign sources. Accordingly, the country has long focused on assessing the viability of alternative energy, often working closely with international partners to research and develop the exploitative capacity of these sources. The pursuit of alternative, efficient energy sources is but one element of Eritrea's broader development strategy, which champions sustainable practices and environmentally friendly approaches.[xiv] Notably, Eritrea's commitment to this position was exemplified through the country's ratification, in 2010, of the International Renewable Energy Agency Statute.

National surveys of alternative energy, geothermal capabilities, and resource development in Eritrea date back to the early twentieth century under Italian colonization, when research was conducted in several regions.[xv] More contemporarily, in 1973, when Eritrea was still in the throes of its war for independence, the United Nations Development Programme (UNDP) identified the Alid volcanic area, approximately 120 km south of Massawa, as "[t]he most favourable location for geothermal energy in Eritrea." Subsequent explorations conducted in 1996 outlined 11 more areas in the region as potentially promising for geothermal production;[xvi] recently, Yohannes (2009) presented the latest geothermal developments, including ongoing examinations of geological mapping and possible drill sites at the Alid and Nabro-Dubbi sites.

Image 1 **Alid Volcano**

Steam escaping at the boiling point of water (~98°C at this elevation) from Alid's summit.[xvii]

In the late 1990s, Rosen, Buskirk, and Garbesi (1999) assessed 13 years worth of wind data for Eritrea, finding the Eritrean coastline to be an "outstanding wind resource, particularly in the Aseb area" and - especially important for a poor, emerging country - that "the cost of wind-generated electricity at Aseb will almost certainly be lower than the current diesel-generated electricity" (1999: 9-13).[xviii] These projections were confirmed during the 1999-2000 installation of 25 meteorological stations across Eritrea,[xix] followed shortly thereafter by the *Eritrea Wind Energy Application Pilot Project*. This project, a collaboration between the Eritrean government, the Global Environment Facility, and the UNDP, saw the creation of a windmill park near Assab to provide energy to the city and surrounding villages. The windmill park currently produces 18-20 per cent of Assab's energy needs, has reduced annual diesel power generation costs by over 30 per cent, significantly cut carbon emissions, and promoted a host of social and economic benefits,[xx] especially for the local fishing industry.[xxi]

Eritrea's focus on alternative energy sources has also extended to efforts at better utilizing solar energy, which can prove beneficial within a wide range of developmental activities. Generally, the especially significant benefits of solar panels and energy include renewability, a reduction in electric expenses over time, a great decrease in pollution or harmful methods of energy production, versatility, and improved efficiency.[xxii]

In 2004, cooperation between *Ökozentrum Langenbruck*, *myclimate*, and the Eritrean company, *Tesinma Sh. Co*., saw the production and installation of 200 plants for solar

water heating, which ultimately led to hot water access for citizens. Importantly, through local production processes, Eritrea has been able to provide all the required technical products without additional imports, which has led to savings in import costs. In addition, human capital and local technical capacity were greatly improved[xxiii] via the project's training of numerous Eritrean technicians.

Solar panels have subsequently been installed throughout the country,[xxiv]and they now power public buildings, streetlights[xxv], clinics[xxvi], hospitals,[xxvii] and schools. In 2008, the Ministry of Education began the *Solar Powered Instructional Computer Technology (ICT) in Rural Schools Project*, which sought to address the problem of lack of reliable electric power supply in many rural schools. The first pilot project was implemented in Gogne junior secondary school, a remote school in the western lowlands of the country (within the Gash Barka region). With the pilot's broad success, the project soon expanded and witnessed the installation of solar powered ICT labs in 24 schools. Further, in order to increase the efficiency of the solar panels, laptop computers were installed in the labs powered by the solar panels, thus enabling the schools to utilize a large number of low powered computers (laptops) rather than a few high-powered computers (desktops with CRT monitors).[xxviii]

In spite of the many outstanding development challenges, progress within the energy sector is expected to continue to grow and expand. Encouragingly, the UN Strategic Partnership Cooperation Framework, involving the UN Country Team and the Government of Eritrea, will mobilize approximately US$188 million seeking to replicate the successful renewable energy technologies in solar and wind-rich areas.[xxix]As well, the biomass, geothermal, and hydropower sectors, which each possess vast untapped capabilities, will continue to be subjects of study, with an eye on fully corralling their immense potential. Ultimately, the goal is to build upon the successes of the UN Millennium Development Goals,[xxx]and continue to promote effective mechanisms to enhance the general well being and development of citizens.

Many of the aforementioned developments suggest that Eritrea has improved its energy capabilities. According to government officials, whereas during the initial period of post-independence, the entire power generation within Eritrea was at a feeble 15 megawatts, today it hovers at 160 megawatts. However, that figure is still miniscule, and the energy sector must continue to remain a key focus. Most immediately, government officials point out that Eritrea has ordered generators that produce an extra 50 megawatts, and improvements continue at the Hirgogo plant as part of a multi-million dollar 2*23MW deal signed with China's SFECO Group company.[xxxi]Additionally, the development of a second power plant is currently in the research and planning stages. Finally, Eritrea continues to invest in expansions and enhancements of its solar power capabilities; a capacity of close to 10 megawatts of solar power is to be added to what has already been installed, beginning in early 2014.

In summary, for an emerging, developing country such as Eritrea, alternative, renewable sources of energy represent an extremely effective component within broader national development goals, and they directly and positively impact the lives of individual citizens. The international community and developmental organizations can play critically constructive roles by supporting new projects or augmenting existing ones, working cooperatively with Eritrean companies and ministries, and - quite importantly - promoting peace and stability in the region.

References

[i] http://www.infrastructureafrica.org/key-msg/sector/africa%E2%80%99s-chronic-power-problems-have-escalated-crisis-affecting-30-countries-crisis--1

[ii] http://www.africaammagazine.com/tag/international-energy-agency/

[iii] http://www.businessdailyafrica.com/Kenya+and+Tanzania+in+partnership+to+exploit+geothermal+energy/-/539546/1943966/-/41f6px/-/index.html

[iv] http://www.hurriyetdailynews.com/sudan-and-turkey-to-cooperate-in-energy.aspx?pageID=238&nid=47727

[v] http://newswatch.nationalgeographic.com/2013/07/24/geography-in-the-news-ethiopias-dam-projects/

[vi] http://www.tesfanews.net/ethiopia-offers-electricity-in-exchange-for-dialogue-to-eritrea/

[vii] (1) Obrecht, *Andreas J.(Ed.) 2010. "Soft Transformation in the Kingdom of Bhutan. Socio-cultural and Technological Perspectives." Böhlau Verlag Wien, Köln, Weimar.*
(2) World Bank. 2010. "Addressing the Electricity Access Gap." Background Paper for the World Bank Group Energy Sector Strategy." *World Bank Operational Studies.*

[viii] http://www.youtube.com/watch?v=fQJVMpFRKxg#t=2m46s

[ix] http://www.energyrecipes.org/reports/genericData/Africa/061129%20RECIPES%20country%20info%20Eritrea.pdf

[x] http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS

[xi] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:21935594~pagePK:146736~piPK:146830~theSitePK:258644,00.html

[xii] http://www.irena.org/menu/index.aspx?mnu=cat&PriMenuID=47&CatID=99

[xiii] http://www.afriways.com/Countries/Eritrea/OilandGas.html
[xiv] http://www.tesfanews.net/?s=fikrejesus&x=0&y=0
[xv] Yohannes, E. 2009. "Geothermal Exploration in Eritrea: Status Report." Eritrea Ministry of Energy and Mines. Report presented at Short Course IV on Exploration for Geothermal Resources. Lake Naivasha, Kenya: November 1-22.
[xvi] http://www.afribiz.info/content/renewable-energy-potential-in-eritrea
[xvii] http://volcano.oregonstate.edu/alid
[xviii] Rosen, K., R. Van Buskirk and K. Garbesi. 1999. "Wind Energy Potential of Coastal Eritrea: An Analysis of Sparse Wind Data." *Solar Energy*. 66 (3): 201-213.
[xix] http://www.er.undp.org/energy&environment/docs/Wind%20Energy%20Brochure.pdf
[xx] http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2013/02/07/achieving-sustainable-growth-at-core-of-renewed-undp-support-for-eritrea/
[xxi] http://www.tesfanews.net/eritreas-success-story-in-renewable-energy-development/
[xxii] Foroudastan, S. and O. Dees. 2006. "Solar Power and Sustainability in Developing Countries." *Proceedings of the International Conference on Renewable Energy for Developing Countries.*
[xxiii] http://www.myclimate.org/carbon-offset-projects/pioneer-projects/details/mycproject/25.html
[xxiv] http://www.tesfanews.net/eritreas-success-story-in-renewable-energy-development/
[xxv] http://www.youtube.com/watch?v=WGDOGarr6V4
[xxvi] http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Eritrea%20Full%20PDF%20Country%20Note.pdf
[xxvii] http://allafrica.com/stories/201202291227.html
[xxviii] Education Eritrea. 2008. "ICT in Education in Eritrea: An Overview." *Eritrea Ministry of Education.* September 2008.
[xxix] http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2013/02/07/achieving-sustainable-growth-at-core-of-renewed-undp-support-for-eritrea/
[xxx] http://www.scribd.com/doc/144609012/Eritrea-and-the-MDGs
[xxxi] http://www.madote.com/2013/07/martin-plaut-allergic-to-truth-about.html#ixzz2bx5ezuBo