SAPEC-ECO

Consultants Environmental Engineers, Scientists

Proposal for Commonwealth Environmental Investment Platform

LONDON UK

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ENVIRONMENTAL ENGINEER

Air/Water Harvester

Operated with Renewable Energy

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SAPEC-ECO

Company Background.

The management of SAPEC-ECO consists of specialized team having considerable knowledge and experience in air, water, pollution prevention, and renewable energy. SAPEC-ECO's main focus of business is ecology, environmental and sustainability projects. Our partners bring a diverse range of expertise able to develop solutions to multi-dimensional challenges. We deliver quality at a fraction of at a substantially lower cost compared to larger companies. We can bring communities together; achieving goals, bringing resources despite scarcity. We are committed to increasing the life span of the individual lives in these communities through engineering associated projects with sustainable management by improving the health and quality of life of people in undeveloped counties.

Our experience has lead us to projects in America, Europe, the Gulf, North Africa, and the Middle East. In addition Mr Abela, an Environmental Engineer born in Malta, resides in the State of Texas, USA. Mr. Abela brings twenty one years of Environmental Science and engineering experience on different levels. His dedication and expertise in various projects has contributed to several successes; clients include the US Government, the USAF, US army, industrial and Oil & Gas clients. Mr. Abela was responsible for all base closures (environmental) before the departure of all US forces from Iraq. In addition, Mr Abela has worked on several water projects in the private sector in Malta, the US, and other counties. Projects include the design of water supply, remediation of soil and ground water.

Mr Mario Xerri is a Mechanical Engineer from Malta. Mr. Xerri has over twenty five years' experience in the design, installation, and commissioning of Reverse Osmosis (RO), and Sea Water Reverse Osmosis (SWRO) to several entities, as well as several private industries. Mr. Xerri assists with the installation and commissioning of the Air/Water Harvesters.

Mr. Yannis Vasilopoulos, is an Electro Mechanical Engineer/ Solar Expert is- from Greece. Mr Yannis accumulated ten years of successful experience in the commission and supervision projects of in Greece, ranging from 10KW to 500 KW. Projects included the erection of solar panels with two axis solar trackers. Mr. Yannis is a subject material expert in electronic, mechanical and controls. Mr Yannis has designed and supervised solar projects in Greece and the Gulf and will design and supervise the installation of solar panels, inverters, and trackers. Mr Yannis will also assist with all the electrical connections that is necessary to power the Air/Water Harvester equipment.

Project Overview

The purpose of this proposal is to provide clean drinking water to people around the world where water is scarce, utilities do not exist and people are drinking water from unhealthy sources. We want to provide a new, innovative technology in the production and supply of clean drinking water to small villages and towns in urban areas where infrastructure is not supported. Alternatively, the proposal discusses how such technology can reduce millions of dollars and other related costs for small communities in third world countries. Building desalination plants require large Capital investments. Costs for constructing such a project require funding and as civil projects are constantly increasing, thus becoming an issue. Some of the borrowers are unable to pay for large sums of money, and the project ends abandoned or unfinished.

We have the solution to provide clean potable (drinking) water, utilizing the same high standards of western nations. The advantage of the proposed project is to provide drinking water for urban small communities, where infrastructure does not exist. Our equipment does not generate large amounts of water, because the technology requires time to produce high quality drinking water and the process is based on quality rather than quantity.

The air/water harvester machine can be easily transported and set-up anywhere in the world and is able to perform perfectly in countries where humidity is above a consistent 30%. The Air/Water Harvester is able to work on two renewable technologies - solar and wind.

The second part of the project is to provide innovative wind energy that would support local infrastructure and will produce electricity to local villages without the need of installing grid power that would be impossible to construct in remote areas. The proposal is to install air/water harvester machines for the production of potable water, operating the equipment on solar and wind energy, thus providing constant energy production, whereby the equipment requires little cost if any and with low maintenance.

Current State of the Issue

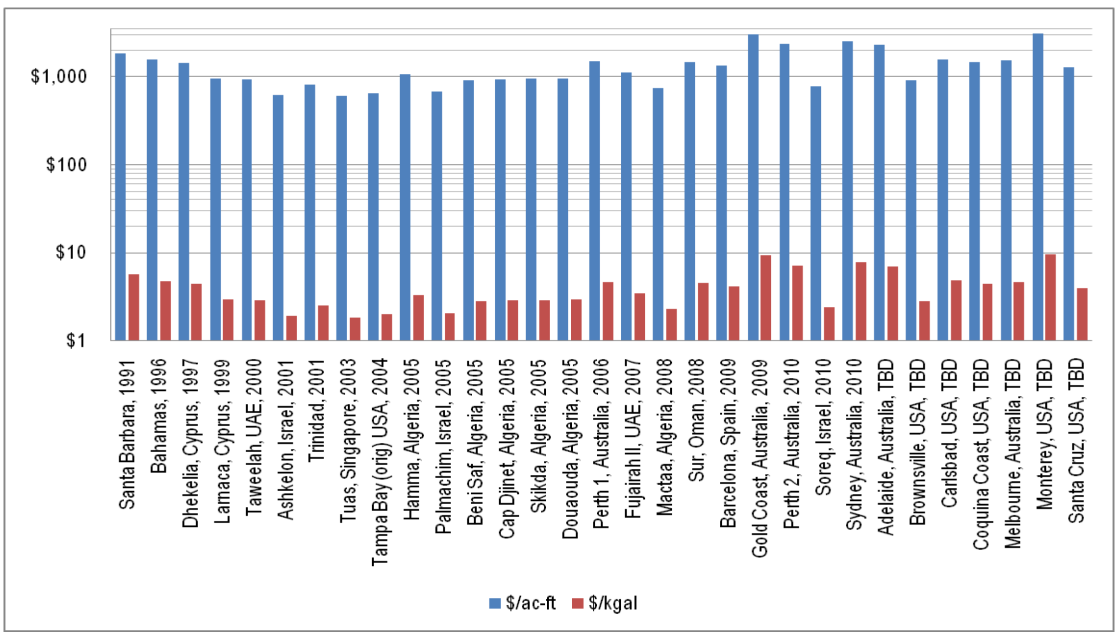
Large infrastructure projects make it difficult to provide clean drinking water to its citizens. According to the latest estimates of the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) released in early 2013 (collected in 2011) 36 percent of the world's population – 2.5 billion people – lack improved sanitation facilities, and 768 million people still use unsafe drinking water sources. See Appendix I - Inadequate access to safe water and sanitation services, coupled with poor hygiene practices, kills and sickens thousands of children every day and leads to impoverishment and diminished opportunities for thousands more (UNICEF, 2014).

We are in the middle of a world crisis in terms of a shortage of drinking water and lack of infrastructure to support water projects. Increased global population and high cost for large infrastructure projects makes it hard to provide adequate clean water in remote impoverished countries. Alternatively, countries surrounded by seas or oceans are investing and building large desalination plants. The desalination technology has proven to be highly effective, but very costly. An example is Huntington Beach, CA Desalination Project. It is a 50-million gallon per day facility currently in late-stage development. The desalination plant will be located adjacent to the Huntington Beach Power Station and is scheduled to be operational by 2018. (http://poseidonwater.com, 2014). The privately financed project will produce enough drinking water to serve 300,000 San Diego residents and provide the county with approximately 7 % of its total water supply by 2020. (http://poseidonwater.com, 2014). Carlsbad California desalination project in conjunction with the San Diego County Water Authority (SDCWA could approach $ 1.3B to $1.9 B (2009) for Phase 1 and would incorporate intake and outfall structure of 2 miles offshore and 23 miles of pipeline. (Water Reuse Assocation, 2012). Providing large quantity of water in San Diego is extremely important due to the number of people living in southern California. The purpose of this paper is to briefly outline the current costs of sea water reverse osmosis technology and compare them to the costs associated with the proposed installation of Air /Water Harvester Equipment.

Desalination Water Quality Standards.

Desalination plants are not all economical even if they are using Renewable Technologies (RE). An example would be a desalination plant far from the sea that would require transportation of water via trucks, thereby increasing costs. Further, hydro-geological studies must be conducted to ensure that there is enough ground water at the site water is being produced. Desalination plants must be constructed close to the sea - beside the power plant. Desalination plant requires large amount of energy to separate salts from the sea water. This technology is proven to be great but highly expensive, and requires high maintenance costs. Combining Renewable Energy and the production of water without the need of desalination would be the best feasible and economical way to provide clean drinking water to many people. Sea water contains about 24-45 part per thousand of total disolved solids. Sea water salinity must be reduced by one hunded fold in order to be considered as fresh drinking water, which means that it will require a large amount of energy and work to produce clean potable water. (Frericks J, 2010). Cost Contributing factors to sea water reverse osmois SWRO, depends on factors such as feed water intake, which costs about $ 05. To 1.% Million per MGD to $ 3.0 million for tunnel and offshore intake - these figures are without land acquistion needed and easment required for the project, which would increase project cost by 40-50%. (Water Reuse Assocation, 2012). Figure 1 illustrates the costs associated with Sea Water Reverse Osmois (SWRO). On the other hand if the population resides further inland, the costs associated to provide drinking water is expensive, most often it is transported in town.

FIGURE 1



Courtesy of Water Desalination Report. Presented at the Texas Innovative Water Workship San Antonio Texas Octber 11 2010

Air/Water Harvester Generation Technology.

The Air/Water Harvester equipment harvests air and produces water. The air is passed through a filter, which traps air contaminants then, the air is condensed to become water droplets. The equipment can operate in many parts of the world, with the exception of cold climates or areas where humididty is very low or absent. What makes the Air/Water Harvester unique compared to the reverse osmosis process is the operating cost, as well as the fact that no water pipes are required to generate clean drinking water. The Air/Water Harvester's filters must be washed every two weeks, the machine has four granulated filters with a final ultra violet light used to kill and destroy bacteria residues.

The Air/Water Harvester does not use any form of chlorination in it's process. The water units are equipped with an electronic control system that turns the machine on & off when full and circulates the water to maintain clean drinking water 24 hours a day, 365 days a year. Humidity levels and filter changing requirements are indicated with digital displays. Air/Water Harvesters can be installed in permanent locations or can be mobilized on short notice. There are several advantages that the Air/Water Harvester has over a esalination equipment. The system offers a unique design of clean potable water based on humidity and atmospheric pressure, thereby creating water. Cost estimates can vary depending on the amount of water generated. An Air/Water Harvester machine can produce 1200 liters per day. Ideally a normal person consumes about 30 liters of water per day. We propose to have a multiple of machines in different locations in order to reach the required consumptions. This will ensure that all village inhabitants can access water from several locations. Plus in case one machine is not operating, the other machine willstill continue to produce water. Figure 2, illustrate the Aquacube that produces 1200 liters/day, while Figure 3 illustrate the machine capable of delivering 3000 liters per day.

Air/Water Harvester machines will work in climates ranging between 20-23.8 degrees Celsius and with relative humidity. Figure 4 illustrate the process of the Air/water harveter machines.

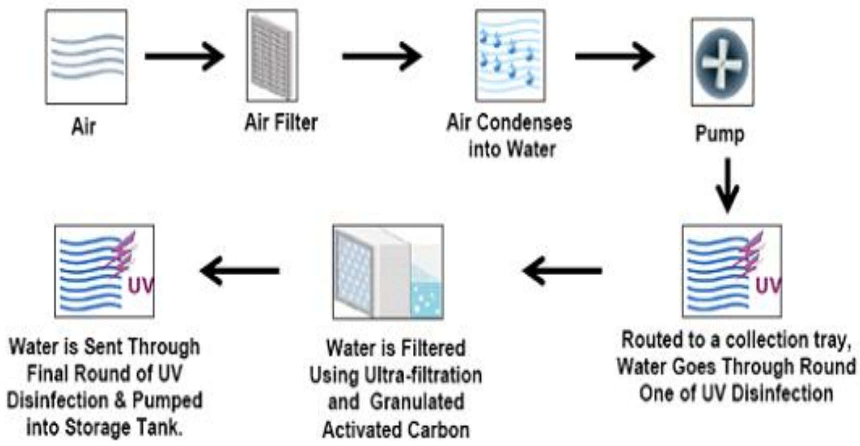
FIGURE 2

The Aquacube 1200 is an Air/Water Harvesting machine that is capable of producing up to 1200 liters of safe drinking water everyday depending on humidity and temperature levels

FIGURE 3

The Aquacube 5000 is an air to water harvesting machine that is capable of producing up to 3000 liters of safe drinking water everyday depending on humidity and temperature levels.

FIGURE 4



Courtesy of Splash water Inc 2014

The Air/Water Harvester machine can be powered by a generator, however our proposal is to install and power these machines off the grid using Renewable Energy. This would eliminate the need for permits and the wait to build infrastructure.

Solar Technology.

Most of these Air/Water Harvester machines can run on solar or wind energy. High production Air/Water Harvester machines require a higher electrical consumption and large amount of solar panels. In order to convert alternating current (AC) to direct current (DC), would require the installation of inverters, and on the AQ 3000 we would need to have all solar panels rotating to the sun to continue absorbing energy. Solar energy eliminates the need for the Air/Water Harvester machines being tied to a grid. The capital cost would be justified as solar energy would provide enough power to the equipment, as well as additional uses. The initial calculation would be based on water usage, per person per day, the village population, the model of the Air/Water Harvester units to be installed, and the power consumption to power the equipment. The project will alleviate the problem of drinking water in remote areas where infrastructure is nonexistent or too expensive to build. The production of contaminated drinking water within small communities in Africa, Central America and South America, where water is contaminated from farming or drought exist throughout the entire region. Most of the third world population drinks unfiltered water from the rivers, or wells that are contaminated with nitrates and other minerals, which increase mortality and birth defects. If water is generated from the air, using solar energy, the operating and efficiency to recover costs would be lower, as maintenance is much lower than the traditional Reverse Osmosis (RO) plants. In order for us to use solar energy effectively, we would need to install Photo Voltaic PV that converts solar energy to direct electricity (DC). This technology can provide power for the Air/Water Harvesters and eliminate the need to install the equipment on an electrical power grid.

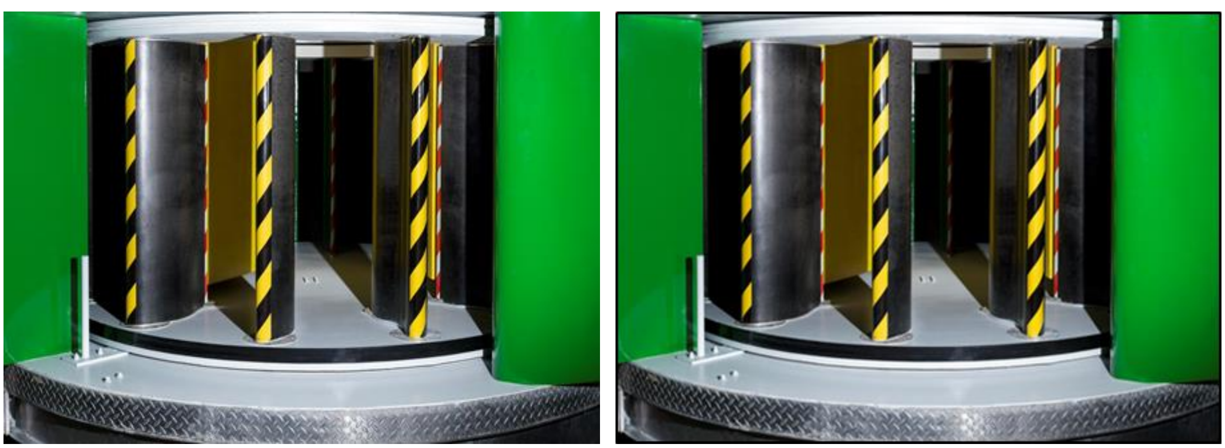
Many small desalination plants are already working using PV systems. Rural populations can range from a few hundred inhabitants to a few thousand. The average rural village is from low three hundreds up to eight or nine thousands. (United Nations Depatment of Economic and Socal Affairs, 2011). See Appendix 1. Plus, most of the rural villages do not have plumbing or electrical power; the abundance of sunshine and humidity is a unique situation that combines both technologies.

Innovative Wind Technology

Several wind turbines offer a unique alternative to produce renewable energy. In particular, a new technology has been developed by Regenedyne LLC. The technology being introduced offers several advantages versus the current wind turbine technology. The Regenedyne unit has vertical axis wind turbine blades, it has no moving parts, it operates at lower speed and it does not have the large blades that are normally associated with wind farms. (Abela S. and Ghemras, 2014). The technology offers a new concept of producing energy without requiring a large parcel of land, large concrete foundation to support the turbines. In fact, we believe that this technology not only provides enough electricity to operate these Air/Water Harvester units, but also provides electricity and power for other community uses. Here are some points about the wind technology: Coastlines & Islands – Past: unsightly for tourism (most islands), Noise levels unacceptable in small island community. The Regenedyne technology offers coastlines & islands the use of wind energy that is more attractive as it blends with the natural habitat and the country landscape. The Regenedyne technology offers a low profile and a reduced environmental footprint preserving the land on the island for tourism use. High wind speed operability is better, and there is little or no airport interference; it allows remote isolated and undeveloped areas to have access to power at all times.

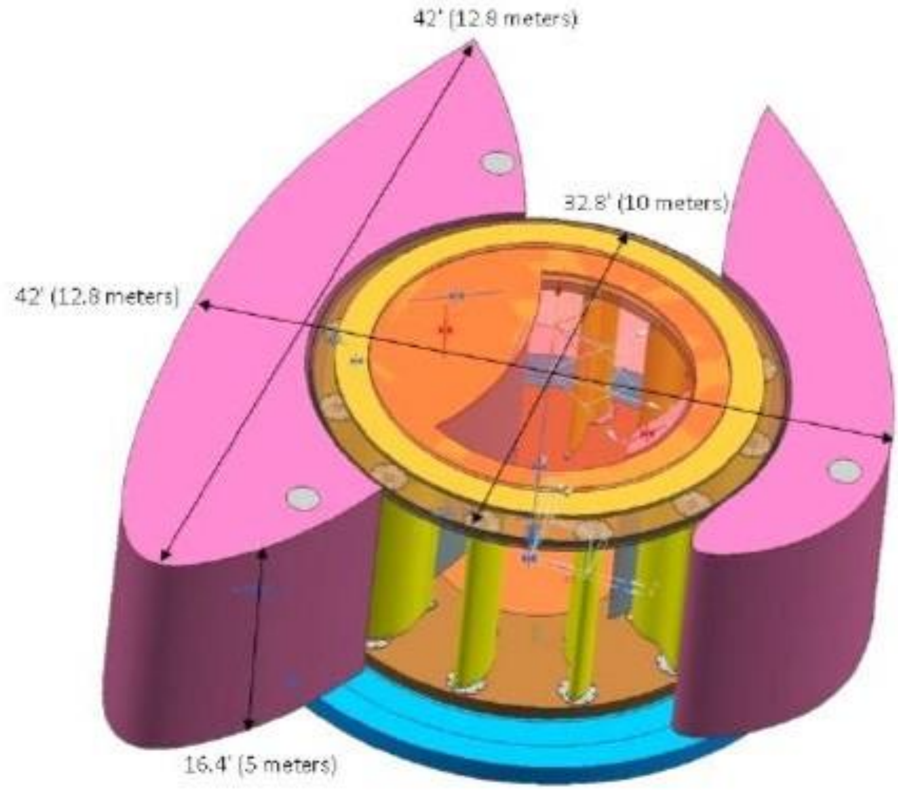
It is important to note that the wind turbine can be a standalone energy source; high wind areas (ex: mountains, coastal, etc.) cannot use traditional turbines. The Regenedyne turbine operates up to twice the normal maximum wind speed under high speed conditions.

FIGURE 5



Courtesy of Regenedyne LCC 2014

FIGURE 6



Weights and Amounts	
Turbine Blade Count	7
Turbine Blade Weight	198
Total Turbine Blade Weight	1,386
Individual Rotor Weight	1,214
Top & Bottom Rotors	2,428
Levitation Magnets	220
Generator	1,984
Total Weight (lbs)	**6,018**

Courtesy permission from Regenedyne LLC. 2013

Comparison Table of Solar Energy to Wind

REGENEDYNE		SOLAR
711,720	Annual Total (KW)	115,200
800	Total Area (m^2)	800
8,611	Total Area (ft^2)	8,611
420 (2 x 210Kw)	System Size (KW)	86
$2,500,000	Estimated Cost	$516,277

*annual mean speed of 6m/s

** Solar Radiance : 4.63 KWh/m^2/day

REGENEDYNE		SOLAR	
1,051,176	Annual Total (KW)	1,051,176	
800	Total Area (m^2)	7,294	912%
8,611	Total Area (ft^2)	78,512	
420 (2 x 210Kw)	System Size (KW)	785	
$2,500,000	Estimated Cost	$4,710,922	188%

*annual mean speed of 7m/s

** Solar Radiance : 4.63 KWh/m^2/day

REGENEDYNE		SOLAR	
1,454,482	Annual Total (KW)	1,454,482	
800	Total Area (m^2)	10,092	1262%
8,611	Total Area (ft^2)	108,629	
420 (2 x 210Kw)	System Size (KW)	1,087	
$2,500,000	Estimated Cost	$6,518,377	261%

*annual mean speed of 8m/s

** Solar Radiance : 4.63 KWh/m^2/day

REGENEDYNE		SOLAR	
1,743,490	Annual Total (KW)	1,743,490	
800	Total Area (m^2)	10,553	1319%
8,611	Total Area (ft^2)	113,592	
420 (2 x 210Kw)	System Size (KW)	1,303	
$2,500,000	Estimated Cost	$7,813,534	313%

*annual mean speed of 9m/s

** Solar Radiance : 4.63 KWh/m^2/day

Courtesy permission from Regenedyne LLC. 2013

Project Assumption and Constrains

Constrains for such would be a strike, or an epidemic that will impede us to move forward with the project. The project consists of two phases; initial planning phase and the execution phase. Part of the planning phase would require that all necessary permits from the host country are in place before any work is carried out. Once we receive the permits, all Air/Water Harvesters can be shipped to the destination, along with the solar panels, the wind turbine and any other tools and materials. Local authorities must be informed about a project, in order to avoid litigation and unnecessary delays in a project.

Project Benefits and Cost

As previously discussed the construction of water desalination plants or reverse osmosis can be very expensive. Building such plants would require millions of dollars - this would take months and even years before local population is able to have clean drinking water. Small towns and villages with population less than 1000 would not be eligible to have water source unless the water pipe is diverted from another village that is close by. Often governments take years to provide funding for the installation of infrastructure to smaller communities. The cost for providing water to smaller villages outweigh the benefits: water is a commodity and a necessity. The objective of this project is to ensure safe drinking water is available all the time. We intend to provide training local personnel in maintaining the equipment, this will reduce unnecessary costs in future maintenance. The community will have a peace of mind knowing they have clean drinking water at high standards that is free from any toxins or contaminates found in untreated water source. It is important that these machines are periodically checked, and serviced. We also recommend that these machines will be installed inside a building to be protected from any weather conditions. Maintaining these machines in accordance with the manufacture's specifications is important to continue providing clean drinking water. The community would take pride and interest in the project, a positive way of delivering and maintaining clean drinking water for the entire village.

Project Location

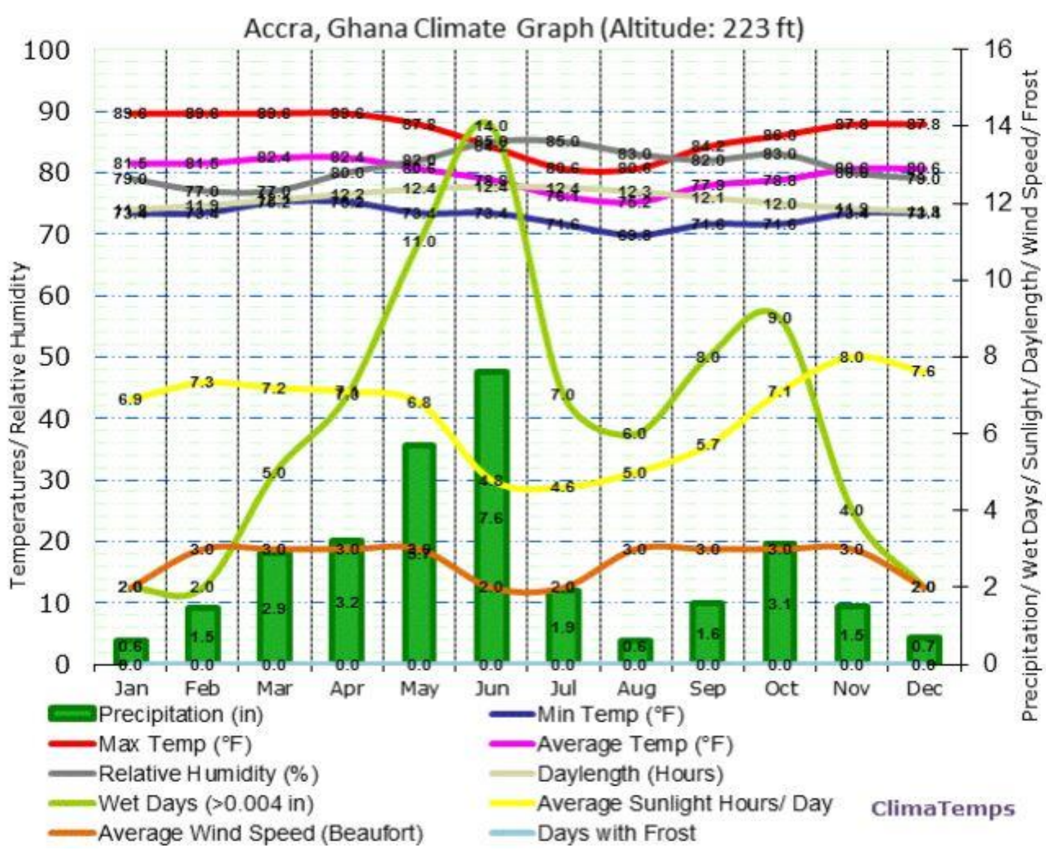
The country selected for our initial project is Ghana in the Amasan district located in the outskirts of Accra the capital city of Ghana. The district is made of several small towns within the municipality these town consists of the following towns. Amasaman, Amanfrom, Ablorman, Havorkope, Donyuikope, Kpobikope, Kuntunse, Odumase, Onyaben, Opah, Sarpeiman, Railway Village, Achiaman, Afuaman, Kwashiekumaman, Donkorman, Akwatsri Medie, Papase, Abaman, Amaoaman, Kwarteiman, Okaiman, Mpehuasem, Abese, Ofankor, Alhaji, New Achimota, Tantra Hills, Omanjor, Chantan, Amamoley and Pokuase The town choses for this project is the town of OPAH. The population of Ghana is divided into some 75 ethnic groups. The estimated population of Ghana in 2012 is 24,652,402 (females-51%, males 49), giving the country an overall population density of 78 persons per sq km (201 per sq mi). The most densely populated parts of the country are the coastal areas, the Ashanti region, and the two principal cities, Accra and Kumasi.

About 70 percent of the total population lives in the southern half of the country. The most numerous peoples are the coastal Fanti, and the Ashanti, who live in central Ghana, both of whom belong to the Akan family. The Accra plains are inhabited by the Ga-Adangbe. Most of the inhabitants in the northern region belong to the Moshi-Dagomba or to the Gonja group. (http://www.ghanaembassy.org/index.php?page=about-ghana, 2014).

Climate Conditions

There is very little variation in temperature throughout the year. The mean monthly temperature ranges from 24.7 °C (76.5 °F) in August (the coolest) to 28 °C (82.4 °F) in March (the hottest), with an annual average of 26.8 °C (80.2 °F). It should be noted, however, that the "cooler" months tend to be more humid than the warmer months. As a result, during the warmer months and particularly during the windy harmattan season, the city experiences a breezy "dry heat" that feels less warm than the "cooler" but more humid rainy season. As Accra is close to the equator, the daylight hours are practically uniform during the year. Relative humidity is generally high, varying from 65% in the mid-afternoon to 95% at night. The predominant wind direction in Accra is from the WSW to NNE sectors. Wind speeds normally range between 8 to 16 km/h. High wind gusts occur with thunderstorms, which generally pass in squall along the coast. The maximum wind speed record in Accra is 107.4 km/h (58 knots). Strong winds associated with thunderstorm activity often cause damage to property by removing roofing material. Several areas of Accra experience micro-climatic effects. Low-profile drainage basins with a north-south orientation are not as well ventilated as those orientated east-west.

FIGURE 7



Reference Climatemps.com 2014

The above table illustrate relative humidity in the region averages between 65to 95 %. This means that the Air/water harvester is able to produce large amount of water. The graph also illustrate that the average Sunlight hours ranges as high as 6-8 hours of sunlight which would be ideal for solar power. Average wind speeds 8 to 16 km/h would generate enough power generation for the air water harvester to operate.

Scarcity of water

Several organizations have published reports of water scarcity in Africa, including Ghana. According to the Wooddale Church the water scarcity has been a long term issue. The church provides construction of wells and drilling for wells to supply clean drinking water. (wooddale.org, 2014).

Such organization have provided safe drinking water for many years. However with climate change in effect many wells are not providing the amount of water required. It is also important to note that well water would still have minerals and nitrates deposits that can only be removed via filtration system. Most water rivers and other water bodies in Ghana are contaminated. Even Ghana has the lowest mortality rate amongst other African countries. Last month a study found that high level of Fluoride level contribute to water scarcity in Bongo. Mr Nicholas Atubiga, Bongo District Crop Officer, has said underground water in the district contained a high concentration of fluoride, thus causing dental fluorosis, a disease of bones and teeth. According to the article most parts of the district are overlaid by granitic rocks which have fluoride ions in them, and that the excessive amounts of fluoride found in ground water, cause the disease Mr Atubiga made these disclosures at a workshop aimed at helping find ways to accelerate water and sanitation coverage to meet Millennium Development Goal Seven on Water and Sanitation, said

the fluoride level had contributed to the water scarcity in the area. He said other water and sanitation challenges in the district include, successive droughts, huge accumulated water deficit, ineffective usage of irrigated water, large population increase, and pollution of ground and surface water, and added that these are major issues affecting the people. He said about 80 per cent of the populace also engage in open defecation, thereby pollution the water bodies. The district has few public places of convenience, made up five Septic Tank Latrines, six KVIP Latrines, one Environloo, nine urinals, 110 house-hold water closets, 874 VIPs, and 87 institutional latrines. Mr Atubiga pointed out that poor sanitation has direct impact on water sources, including pollution of water bodies, unpleasant odor and water turbidity, while the aesthetic beauty of the environment is affected adversely, leading to water and sanitation diseases.
(http://www.ghananewsagency.org/, 2014).

Water Accessibility and Transportation

Many churches and other organizations have provided support of well drilling and operations throughout the years. One of the main issue that remains is water transportation. In fact most women and children have to carry water on their head an Average 5 gallon water container 42 lbs.(18.93Kg). Considering that they have to travel to bring their water to their home this would not only in cumbersome but almost very difficult at time. Majority of women to travel far to fetch water. This is something of the 4th century not of modern society and must be changed. We developed a way to transport water using water buggies and reduce the burden of women and children to carry water for long periods of time on their heads for long distances. The buggies would be built in local towns, they would be designed to terrains such as soil or mud so with only little effort these could be pulled by a person or even a dog in many cases.

Figure 8

Wooddale Church 2014

Funding Proposal

During this Presentation at the Water Resources Commission (WRC. Mr Atubiga informed the r delegates that high fluoride concentration, lack of ground water and lack of sanitation was the culprit from not having enough drinking water Apart from bring clean drinking water to the area our expertise will be able to provide solution to reduce sanitation issues resulting from this problem through the design and engineering control to treat and reduce waste water effluent and able to develop a system to reduce health risk associated with sewage water. The project would Although there are existing wells, and water bottling companies smaller communities are not getting the required drinking water required dues to long distance to the water station. The project will provide the following services for the local community.

- Clean Drinking water at a fraction of the competition costs.
- Provide methods of transportation (water buggies) to anyone transporting water to their homes.

- Water Buggies would be made locally using local talent, adding job growth.
- Reduce and re use plastic recycle bottles for other products.
- Excessive energy generated from wind and solar energy would be sold below market rate to provide basic need to local residents.
- Design built a small town center to be used by local residents, this would be used as a library and ways as café internet and town hall meetings for residents.
- Provide conceptual water designs, to reduce waste water effluent from being dumped into rivers and lakes, reduce contamination.
- Purchase and payment of all equipment, shipping and customs duties to the country port of entry.
- Transportation of all equipment to its final destination.
- Traveling and lodging expenses for all personnel.
- Training of local personnel in maintenance and repairing of all the equipment.
- Energy source would provide basic communication with other communities that would able to communicate especially since no cell phone or other ways to communicate.
- Town center would be an education and entertainment center for the community.

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Conclusion

This project will tremendously reduce infant, child, and adult severe health conditions by providing clean drinking water to small villages where water and utility infrastructure is non-existent. As we previously outlined earlier the Sea Water Reverse Osmosis (SWRO) process can be extremely expensive unless the county has access to great revenues from oil or other forms of energy like Saudi Arabia and the Gulf States. (Frericks J, 2010)**.** Villages with less than 1000 inhabitants end up drinking, cooking and bathing from contaminated water sources. These are unacceptable standards, as this increases chances of cholera and typhoid occurring at a much faster pace due to lack of hygiene and sanitation. The risk to children and adults are being diagnosed with chronic long term health effects - action must be taken immediately to correct the epidemic. Appendix II, illustrates a complete cost for the project. Solar panels and materials have been sought from the EU countries. We will utilize other competitive vendors to reduce costs and labor appropriately. These estimates can increase or decrease depending on availability and labor cost respectively. Alternatively solar costs are higher when compared with the Regenedyne new wind technology, as other Air/water Harvesters can be added without compromising loss of energy. It is very evident that the wind technology will reduce overall initial cost while producing more energy than solar. Alternatively, the excess energy shall be used to power other community needs, such as lights in a library or residential areas. The ideal situation would be to have two Air/Water Harvester units installed in two separate locations. This will prevent over-crowding, and plenty of water to the community. Project funding shall provide the following services:

This project will reduce child deformation and chronic health effects, by providing clean drinking water for human consumption compatible to International Standards. We understand the importance of clean drinking water, where impediments of infrastructure projects are not always feasible due to design and financial constraints, or structurally impossible to build. We are working to provided renewable energy to power these industrial air water machines We will sell and market water at a much reduce rate, to compete with local water bottling company. We will reduce the cost of the project by introducing new technology to reduce power input requirement and reduce the overall cost of the project. We will also sell the renewable energy to other communities that would be interested in providing clean water to their communities.

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