RENEWABLE ENERGIES IN THE GULF: A PARADIGMATIC SHIFT

Habiba Al Marashi[1]

In an effort to protect the environment and reduce their ecological and CO2 emissions footprints as well as to lead global initiatives to reduce dependence on oil and gas as the sources for energy supply, a number of the Gulf States like the United Arab Emirates (UAE) and Qatar have begun to look at sustainable sources of energy to fulfil their burgeoning requirements. The companies leading the way are Qatar's Energy City, which is planned to be carbon-neutral and Abu Dhabi's zero-carbon Masdar city. Though these projects are still pilot projects, they are the forerunners to the gradual transition from traditional power sources to sustainable ones like wind, solar, hydrogen and geothermal sources.

In order to attract the attention of the local population towards renewable and alternative energy sources, international conferences and seminars seem to be the order of the day. The Dubai International Convention and Exhibition Centre organized the *Alter Energy 09 Convention* to educate people on how to develop and implement alternative and renewable energy sources in order to bring down their dependence on traditional sources of energy. Likewise, the annual World Future Energy Summits[2] in Abu Dhabi, concentrated on the concept of providing renewable energy and building environmentally sustainable *eco-cities* that would lead to a cleaner greener world.

Sustainability without sacrifice in the Gulf

The Gulf countries are huge consumers of energy per capita; however they are also major investors in green and sustainable sources of energy. The World Trade Centre in Manama is the first skyscraper in the world to use wind turbines, which is an impressive step forward. Abu Dhabi's commitment to produce 7% of its energy using renewable energy sources by 2020, and Kuwait's plan to produce 5%, is definitely a step in the right direction. The Dubai Municipality is looking into building regulations that will focus on green principles. Dubai prides itself on being the one place that has enforced green-building practices and made them mandatory on all new projects.

In Saudi Arabia, oil field lighting systems are being powered by solar energy, as are traffic signals and advertisement boards. The UAE has tried its hand at using solar power for water heaters and air conditioners in hotels, as well as to power parking metres and offshore buoys. The Masdar initiative, which will be discussed in detail, remains one of the UAE's proud commitments in sustainable energy use. The headquarters of the International Renewable Energy Agency

1 Co-Authored by Priyanka Menon and reviewed by Dr. Sadek Owainati (Emirates Environmental Group. Dubai – 7013. United Arab Emirates).

2 For more details cf. World Future Energy Summit: http://www.worldfutureenergysummit.com [Accessed September 2, 2010].

(IRENA) is located within Masdar City. It is to be the first global intergovernmental agency that finds itself fully committed to renewable energy, and it is hoped that it will play a major part in promoting the use of renewable energy across the world.

Most vital, however, is the initiative that needs to be taken to change the mindset of consumers across the board, many of whom are either not aware of the environmental and energy crises looming across the world, or are indifferent to the perils that future generations face. It is in this regard that educating people, making them aware of sustainable sources of energy, and instilling an environmental consciousness in them, is vital.

Oil concerns and the demand for electricity that is growing day by day seem to be powering the search for new sustainable energy sources. An added advantage in powering new industries with renewable energy would be to provide solutions for the era after oil, bring down carbon emission rates, and most importantly, provide new jobs in the process.

As much as there is a heavy dependence on oil in the Gulf, there is also a shift to a more sustainable way of life –renewable energy. As the world reels under the pressure of climate change and global warming, countries scramble to develop their renewable sources of energy.

The increase in oil prices has served as a wakeup call for a number of the Arab states, who are now working towards the diversification of their sustainable energy sources. The Gulf is blessed with an abundance of non-renewable sources such as oil, but as everyone knows, these will not last forever. Thus, renewable energy sources are the way forward as they also bring with them advantages such as the generation of large-scale employment and more importantly, the mitigation of climate change and global warming. The Middle East and North Africa (MENA) and Gulf regions are blessed with a high potential of solar energy. The global solar radiation annually has been measured from 4 to 8 kWh/m in the region. Countries such as Oman and Morocco have excellent wind energy resources as wind velocity in these regions has been measured between 8-11m/second. Biomass energy is also widely prevalent in the Middle East with it being used as a source for direct cooking in homes.

Expansion, Growth and Real Estate in the Gulf Cooperation Council Region (CCG)

The construction boom in the Middle East has resulted in some of the most famous and remarkable buildings and projects in the world. These include The Palm, the Burj Khalifa and the The World, to name a few. However, the construction industry in the UAE is also the most polluting sector in the country, resulting in grave environmental problems that have to be tackled soon.

Construction and real estate are undoubtedly the main contributors of the UAE's Gross Domestic Product (GDP). Growing cities such as Dubai must plan along sustainable lines in order to reduce their environmental impacts and natu-

ral resource depletion.

The «Miracle of the Middle East», Dubai, is one of the fastest growing cities in the world. Considered a truly international city, it has a population of 1.8 million, mostly consisting of expatriates from 180 nations. Its leap from a traditional economy to a modern one has been drastic. The most dynamic city in the world, the major contributor to the growth was its oil exports.

The UAE construction industry is under a lot of pressure to improve and better its environmental credentials. In 2006, the ecological footprint of the UAE was 11.9 global hectares per person[3], which has decreased to 9.5 global hectares in 2008[4]. The 2006 report of the *Trends Magazine* indicated that an excess of 120 million tons of waste is produced in the GCC countries each single year.

20 per cent of all the waste produced in the GCC can be attributed to the UAE and 60 per cent to Saudi Arabia. However alarming these figures may be, it must be remembered that UAE is still a very young country compared to the developed nations around the world. Thus, it will take some time for the legal infrastructure to be stringent enough to ensure that environmental policies are set in place and followed effectively.

The energy policy of the UAE includes:

- Strategic planning and policies on alternative energy.
- Water management.
- Waste reduction and recycling.
- Cleaner production (CP).
- Mandating sustainable urban development.
- Ecological footprint accounting.
- Mitigating carbon dioxide emissions.
- Combating global warming and climate change.
- Revamping public transportation systems.
- Establishing protectorates over vulnerable natural habitats.
- Preserving endangered local species.

Harnessing the Power of the Sun

If there is one resource in the Gulf that is even more prevalent than oil, it is the energy that can be retrieved from the sun. It is said that on average the region has 310 sunny days in a single year. With climate change leaving damaging effects in the region, the countries have realized the importance of going green using solar initiatives. Governments in the Gulf are now looking to set long term sustainable goals that can help mitigate the global issues of climate change and

3 Jonathan Loh and Steven Goldfinger (ed.) (2006). *Living Planet Report 2006.* Suiza: WWF, p. 30.

4 Sarah Humphrey, Jonathan Loh and Steven Goldfinger (ed.) (2008). *Living Planet Reports 2008.* Suiza: WWF, p. 34.

global warming.

A number of International solar panel manufacturers are also beginning to see the potential in the Gulf. They believe this region has a strong market and are looking to establish themselves here.

In the UAE particularly, the northern Emirates are reeling under problems such as constant power outages. For these governments, solar power seems to be a strong and feasible solution. It is believed that by the year 2020, the UAE has the potential to be bigger than Europe and America in terms of the generation and use of solar power.

According to reports, Saudi Oil Minister, Ibrahim Al Naimi, has promised to include solar energy in the nation's energy system as «Saudi Arabia aspires to export as much solar energy in the future as it exports oil now.» However, in another report His Excellency states «We must be mindful that efforts to rapidly promote alternatives could have a "chilling effect" on investment in the oil sector. A nightmare scenario would be created if alternative energy supplies fail to meet overly optimistic expectations, while traditional energy suppliers scale back investment.»

Under the terms of an agreement signed last June, Saudi Aramco are to develop a pilot solar power plant that will have a capacity of 10 MW and is due to come on stream in 2011. Another 20 MW solar power plant is due to be built at King Abdullah University of Science and Technology, along with a center devoted to photovoltaic technology.

Oman has established a number of solar thermal plants on a large scale to ensure long lasting and clean energy sources for the generation of electricity.

A far reaching project in the wind energy sector is the Desertec transmission grid that would provide Europe with one sixth of its electric requirements. It involves the establishment of wind units in Middle East and North Africa.

There are a number of Gulf countries that have partnered with European nations for the development of solar energy. For example, King Abdullah of Jordan, in association with Solar Ventures of Italy, is giving 2 million square meters of land for the construction of the world's largest photovoltaic plant. This project will cost approximately $400 million.

Solar energy can be considered as one of the fastest growing energy technologies in the world today and the Middle East is no exception to the rule. As explained earlier, the potential of solar power in the region is enormous due to the continuous and strong solar radiation received.

In the United Arab Emirates, Abu Dhabi is being viewed as the «New Prince of Solar Technology». The Emirate has kept aside a fund of $10 billion just for the development of renewable sources of energy.

The tallest building in the world, the Burj Khalifa in Dubai, is now utilizing solar power for the water heating requirements of its residents and inhabitants. Through this initiative, the builders, Emaar, prove their commitment to the cause of sustainability being followed by the government. Countries around

the world are now following suit as the tallest building in the world goes green!

In January this year, an ambitious project for a Solar Island in the Emirate of Ras Al Khaimah was announced and will be built by the Swiss Centre for Electronics and Micro Technology (CSEM).

Recently, Masdar announced that it is partnering with Total and Abengoa Solar to build the world's largest solar power plant! This project will be complete by 2012, resulting in the generation of large scale employment and offsetting 17,000 tons of carbon dioxide every year. The solar project, known as Shams-1 is a part of Abu Dhabi's bid to achieve 7% renewable energy power generation by the year 2020. Shams-1 is also eligible for carbon credits as it is registered under the United Nations Clean Development Mechanism. It is estimated that the entire project will cost 600 million dollars[5]. Currently, Masdar has a 10mW photovoltaic solar panel farm in operation to serve their first project, Masdar Institute for Science and Technology in addition to installing thermal solar and PV solar panels at the roofs of its buildings to provide renewable power.

Solar Island (Ras Al Khaimah)

The Solar Islands, situated in the Emirate of Ras Al Khaimah, have a diameter and height of 5 kilometres and 20 meters, respectively. This platform of the island is designed to follow the course of the sun with the help of the hydrodynamic motors on the circumference of the island. The versatility of the island is evident in the fact that it can be set up anywhere –on the sea or at the coast!

Launched in 2005, the CSEM-UAE, a joint venture between the Swiss Research Centre CSEM and RAK government, is committed to developing new and innovative technologies in the field of renewable energy.

A major advantage of this project is that simple EFC panels can be used in its construction. Precision mechanics can be avoided in its working as the alignment of the island takes place by simply turning it. It is strong enough to face winds, without any effects on the construction or working. Based on the thermal principle, the solar island can store energy for continuous use at night too.

When constructed at sea, the solar island offers more advantages. The abundance of water is its main advantage as it is required for cooling and the production of hydrogen. When at sea, a suitable location can be chosen which will be advantageous to all nations surrounding it.

The main project partners are RAKIA (Ras Al Khaimah Investment Authority), CSEM (Main contractor), CSEM-UAE (Subcontractor) and Nolaris SA (Subcontractor).[6]

Channeling the High Winds

5 Cf. *Gulf News*, June.

6 Cf. Solar Islands, http://www.solar-islands.com [Accessed September 15, 2010)].

Despite the popularity and abundance of solar power in the Gulf, wind energy is slowly gaining importance as it is one of the most cost effective renewable energy sources in the market today.

In 2009, Iran conducted the 1st International Conference on Investment Opportunities in wind energy. Organized by ABIC Group and Iran Renewable Energies Organization, this conference discussed the Iranian wind energy market thoroughly.

The largest wind turbine in the Middle East is situated on Sir Bani Yas Island off the coast of Abu Dhabi. This turbine stands tall with a height of 65 meters and a rotor blade span of 52 meters and can produce 850KW of power in an hour. The island's electric requirements are being met by this wind turbine along with the power from the national grid. This is also the first wind power plant in the region.

Another ambitious wind energy project is the establishment of a $1 billion wind farm in Dubai. The research for this project is being undertaken now and if built, will provide for 10% of all the electric requirements of the city.

In the year 2008, Masdar purchased equity stakes in WinWinD Oy, a wind turbine manufacturer in Finland. This proves Masdar's commitment to all sources of renewable energy.

The most recent of the wind energy advancements are the contracts won by Lamprell from Fred Olsen Windcarrier for the construction and design of two wind turbine installation vessels in Dubai.

Creating Waves of Change

With the vast deserts in the Gulf region, there is not too much potential for hydro power. Unreliable rainfall and dry, arid conditions have forced a large number of countries to downsize their hydro power plans.

In Jordan, only 0.68% (7 MW) of the nation's electric capacity is generated by hydro power. Preliminary studies were conducted for a mega project of a canal connecting the Red Sea with the Dead Sea which will have a huge potential for hydro power generation considering the very low level of the water at the Dead Sea (the lowest point on land more than 400 m below sea level). This Red-Dead sea canal, however, has other environmental concerns not to mention the serious politics that surrounds its feasibility.

A proposal has also been put forth by engineers and scientists for the construction of the world's largest dam known as the Red Sea dam in the region. In the proposal, it is claimed that a total of 50 gigawatts of power can be generated in the dam!

Biomass in the Gulf

Biomass is highly popular in the MENA region as a source for direct cooking in household and commercial applications. The main source of biomass in the region is municipal waste.

An announcement for the first biodiesel plant in the UAE and GCC regions was made in 2008. The plant was constructed in Al Ain Industrial City and is a source of commercial grade bio fuels in the region. It was constructed and is managed by Emirates Biodiesel LLC (EmBio).

Recently, a proposal was put forward for a project that would involve the agriculture of energy crops for renewable jet fuel in the UAE. This project would utilize seawater in its process. It is headed by the Masdar Institute and will witness the cultivation of mangroves and salicornia along with fish and shrimp farming.

Joseph and Gionis (J&G), a California-based technology firm, has also spent a whopping 100 million dollars in Dubai for the production of EFR *(ethos fuel reformulating liquid).* This will drastically help reduce emissions from diesel engines, which is a huge contributor of pollution.

In Jordan, the pilot biomass plant resulted in the generation of 3.0 MW of power, which was used to meet the electric requirements of homes.

Saudi Arabia also has a national plan to establish waste to energy plants for the conversion of organic and un-organic waste into electricity for residential and commercial applications.

Despite all the renewable energy projects discussed in the previous sections, the most ambitious project in the world is undoubtedly the Masdar City, which is discussed in detail in the next section.

Masdar: The City of the Future

The first carbon neutral city in the world, Masdar City, has a projected overall investment of $22 billion and is being built by the Abu Dhabi Future Energy Company. The main goals of this remarkable project are energy security and sustainable development. This waste-free city will have all the most advanced technologies that will ensure drastic reduction of the emission of greenhouse gases. With a focus on efficient waste management and renewable sources of energy, it is said that Masdar City will use 75% less electricity than traditional requirements. The state of the art architecture for the City is being designed by London based Foster and Partners.

Masdar City hopes to save $2 billion in oil costs over the next 25 years. It is also the headquarters for the prestigious International Renewable Energy Agency (IREA). A specialized Masdar Institute of Science and Technology , in association with the Massachusetts Institute of Technology (MIT) has been established at the City. This Institute provides students with the unique opportunity to gain in-depth knowledge of sustainable technology and renewable energy, and to interact with the world's biggest names in the field through workshops and seminars.

Masdar City is designed for a total of 50,000 residents and inhabitants. The main focus of the project is renewable technology, carbon management and desalination. This project is being completed in association with some of the biggest names in the energy sector including Shell, BP, Rolls Royce, Total Exploration and Production, EFC, Imperial College London, Occidental Petroleum,

General Electric, Mitsui, and Mitsubishi.

The Masdar City project has been in the limelight since its announcement. The world now looks at the Emirates in a different light as the project proves that the UAE is highly conscious of its carbon footprint and is doing everything in its power to mitigate climate change.

Apart from utilizing solar power, the project is also making strides in innovations in solar power. A new type of «beam-down» plant is being tested for the optimum utilization of solar power. The solar park at the City will produce 17,500 megawatt-hours of power annually and consist of 87,000 photovoltaic panels. These panels are manufactured by leaders such as China's Suntech and US-based First Solar.

Masdar has also initiated the prestigious Zayed Future Energy Prize. It is an international award amounting to 1.5 million dollars to encourage advancements and innovations in the clean and renewable energy sectors. In 2010, it was awarded to Toyota Motor Corporation for its tangible clean energy solutions.

Masdar is also working towards the establishment of hydrogen-fuelled power plants with a budget of $100 million.

Economist Woertz endorses the Masdar initiative saying, «This is one of the most significant RE projects in the GCC thus far. It seems that the government of Abu Dhabi has taken up the Saudi initiatives of the 1980s on a much larger scale, in order to take advantage of the technological progress and the improved economics that have taken place in RES since then.»

Masdar City also promotes vehicle free neighbourhoods as they are introducing the use of electric cars through PRT System (Personal Rapid Transit System), which will reduce the demand for fossil energy otherwise needed for transportation within the city.

Similar projects are now being considered in other countries such as Jordan, Qatar and Saudi Arabia.

Energy City Qatar

Energy City Qatar is located at Lusail Development, north of Doha and will be completely carbon-neutral. There will be 92 plots of land with buildings that will be constructed according to stringent United States Green Build Council LEED Certification requirements.

Energy City Qatar will be the first integrated energy hub in the region with a focus on hydro carbons. It will consist of state of the art facilities for the oil and gas industries. With it all-green design, the site will also consist of advanced solar cooling and panelling systems.

Launched under the patronage of His Highness the Emir of the State of Qatar, Sheikh Hamad Bin Khalifa Al Thani, Energy City Qatar was the first hydrocarbon industry business centre in the Gulf. Apart from business and entertainment facilities, the Lusail development block will house 200,000 residents. In order to provide state-of-the-art facilities to the international energy commu-

nity, Energy City Qatar has also partnered with Qtel to develop a world class data centre for effective and robust communication solutions.

Going green in the Gulf

There are 17 LEED Certified green buildings constructed in the Gulf and more than 600 buildings are registered with the USGBC to be certified under the LEED rating system.

Pacific Control Systems LLC in Dubai (UAE) was the Middle East's first «Green Building». Situated at Techno Park, Dubai, it utilizes solar energy generated from thermal and PV solar panels for its air-conditioning and lighting needs. The 5-storey building spans an area of over 100,000 square feet, which is aesthetically designed to use solar energy for most of its energy consumption requirements.

Designed using an integrated approach, the green building promotes energy efficiency taking into consideration environmental impacts and waste minimization. The building is engineered to minimize energy loads so that most of its electrical needs can be met by solar power. This, apart from resulting in reduced operation and maintenance costs, also helps in creating a healthy, safe and comfortable environment.

Simulation studies were used to optimize the energy usage, indoor quality, water efficiency and material sustainability of the building. The wood used in the building is also 100% certified.

Tallest and Yet Green: Burj Khalifa

Easily one of the most famous and recognized buildings in the world, the Burj Khalifa utilizes renewable sources of energy to power its facilities. Solar panels on the building are used to heat 140,000 litres of water every day. These panels save about 690MWh of energy annually. Developed by Emaar Properties, the Burj Khalifa perfectly complements the sustainability efforts of the UAE.

The solar panels utilized in the tower are installed and managed by SOLE UAE Solar Systems. The 387 panels act as solar collectors and can heat up the water in seven hours of sunlight!

Another energy efficient measure undertaken at the Burj Khalifa is the use of the condensate from the AC system to cool potable water. The condensate is also used for landscaping purposes. With water flow restrictors and low water volume toilets, there is a high focus on the conservation of water.

Energy consumption is also drastically reduced with the incorporation of energy saving control systems in the water and AC systems. The Fresh Air Handling Units are also equipped with economizer modes and thermal wheels to save power and energy. The water and air circulating systems are fitted with variable speed drives to avoid wastage and contribute to energy efficiency.

Estidama Building Rating System

Estidama[7], which means (sustainability) in Arabic, was established by the Abu Dhabi Urban Planning Council (UPC) in tandem with the Environment Agency – Abu Dhabi (EAD)[8] and Masdar. It is an initiative to establish a building rating system that works for the building of sustainable communities in Abu Dhabi. Under the initiative, sustainable building designs are devised that will aid in the construction of green buildings and green communities in the Emirate.

This initiative was been conceptualized based on the vision of His Highness Sheikh Mohamed bin Zayed Al Nahyan Crown Prince of Abu Dhabi Deputy Supreme Commander of the UAE Armed Forces and Chairman of the Abu Dhabi Executive Council. Estidama guidelines have been used in Abu Dhabi Building Code, Abu Dhabi Environment Health and Safety Management System, Abu Dhabi Surface Transport Master Plan, Coastal Development Guidelines, Community Facility Guidelines, Sustainable Urban Design Principles and Abu Dhabi Development Code. Under the Estidama initiative, the citizens of Abu Dhabi will have facilities that will ensure they live in harmony with the environment. The four pillars of the Estidama initiative are environment, economy, society and culture. The initiative will be a guideline for Abu Dhabi to achieve its sustainability goals of 2030.

The Estidama New Building (ENB) consists of guidelines that can be utilized by developers, builders and contractors for the construction of sustainable homes and communities. The tools devised under this initiative include the Pearl Community Rating system, Pearl Building Rating system and Pearl Rating Villa system. The Pearly Rating system is customized for the hot and arid temperatures of the UAE. This system also keeps in mind the cultural and social heritage of the Emirate.

The main goal of Estidama is to achieve the vision of Abu Dhabi 2030 also known as the Abu Dhabi 2030 Urban Structure Framework Plan, which is basically a 25-year plan for the sustainable development of the Emirate. By 2030, the Emirates will have sustainable infrastructure, with a strong focus on culture and heritage too.

Paving the way for a better tomorrow: NOG in the Gulf

Along with the government and the private sector, the community also plays a very important role towards leading the way in sustainability. Community based organizations help build and sustain the drivers for a greener future. UAE, being a young country, does not have many active NGOs, but one organization that stands apart is the Emirates Environmental Group, a leading non-government organization based in Dubai that has emerged as one of the most active civil society organizations in the UAE and the GCC region as a whole.

7 For more details about Estidama cf. http://www.estidama.org [Accessed September 15, 2010)].

8 For more details cf. Environment Agency – Abu Dhabi http://www.ead.ae/en/default.aspx [Accessed September 15, 2010)].

Emirates Environmental Group

The Emirates Environmental Group (EEG) is a professional working group devoted to protecting the environment through means of education, action programs and community involvement. EEG is actively encouraged and supported by concerned local and federal government agencies. It is the first environmental NGO in the world to be ISO 14001 certified and the only organization of its kind in the UAE with accredited status to the United Nations Convention to Combat Desertification (UNCCD), the United Nations Environment Programme (UNEP)'s Governing Council, and the International Union for Conservation of Nature (IUCN). EEG successfully formed the United Nations Global Compact Local Network for the GCC States. EEG is open to men and women of all nationalities, as well as to public and private organizations, academic establishments and international institutions.

EEG started in September 1991 and has since grown considerably in members and range of programs. EEG's membership is composed of students, individuals, corporate members, federal and local government agencies, universities, colleges and schools, as well as reputed regional and international institutions.

EEG inculcates the concept of environmental protection and sustainable development in the UAE through sound waste management techniques, community involvement and adequate support from federal and local agencies.

EEG's recycling programs cover Aluminium Cans, Paper, Glass, Plastic, Toners & Cartridges, Batteries, Mobile and TetraPak containers.

As students are *Tomorrow's Environmentalists,* they will have to deal with the heavy burden of mitigating and combating the issue of global warming. We, at EEG, aim to equip these students with the right attitude and knowledge to fight against climate change, which is a result of our ongoing actions.

EEG organizes drawing competitions, environmental public speaking competitions and workshops on issues such as climate change for school and university level students. For academicians and teachers, EEG holds special workshops so that they are well equipped to teach environmental issues to their students, fulfilling EEG's aim to bring about «Environmentalism across the Curricula».

EEG's community-based activities include monthly Community Lectures, CleanUp UAE and the Million Tree Campaign. This has now expanded into the MytreeinDubai.com campaign, which offers participants to plant trees exclusively in their name in Dubai. Till date, EEG has planted over 1.6 million trees in the UAE!

Specifically for the corporate sector, EEG's sister organization, the Arabia CSR Network, works closely with companies for the implementation of their CSR policies. It organizes regular workshops and seminars for these companies who would like to do their bit for the society and environment.

Emirates Green Building Council

Another organization working tirelessly for the promotion of sustainability in the UAE is the Emirates Green Building Council (EGBC). It was established in 2006 for the promotion of renewable energy, green building and sustainable education in the country.

A member of the World Green Building Council and the first council in the Middle East, the EGBC acts as a source of information to the professionals and governments in the region too. It is one of the 14 established green building councils in the world.

The EGBC has also promised its support to turn the UAE into one of the five global leaders who actively work towards the reduction of the ecological footprint by 2015.

Targeting the grassroot: sustainable education in the Gulf

Sustainable Development for Education (ESD) strives to meet the needs of the present day, without making any compromises as far as the future is concerned. Current problems need to be addressed in the present, problems that concern both society and the environment, and it is up to us to learn to live sustainably. This will ensure a better quality of life and a healthier one for all living beings. The international NGO, Forum for the Future, defines sustainable development as, «A dynamic process which enables all people to realize their potential and improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems.…» However, the more used definition today is that quoted from the United Nations' Our Common Future document – «Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.»

The Gulf countries realize the importance of sustainable education for a sustainable future. In this regard, there are a number of universities who offer specialized courses in the countries and region.

The King Abdullah University for Science and Technology in Saudi Arabia is beginning a new program for the development of renewable energies and sustainable technologies. This program has been conceived in partnership with established universities in United Kingdom, Italy, the Netherlands and the United States.

The Masdar Research Institute will be a common platform for researchers from around the UAE to share their ideas. Also, Scientists and engineers from around the world will visit the post graduate program and share their skills. The six partners of the Masdar Research Network are the United Kingdom's Imperial College London, RWTH Aachen University in Germany, Canada's University of Waterloo, Columbia University in the United States, the German Aerospace Centre and the Tokyo Institute of Technology in Japan.

The decade of education for sustainable development: 2005-2014

There is no doubt that education will play an extremely vital role in changing the perceptions of the young minds, who are the citizens of tomorrow, impressing upon them the message that it is in their hands to safeguard the environment and make the world a better place for their descendents to live in. In many countries, including those in the Gulf, Environmental Science has become a key subject in all schools, and even from a young age, children are being taught ways to address environmental changes and energy saving techniques.

Colleges too are not lagging behind. The Higher Colleges of Technology (HCT) in Abu Dhabi has decided to collaborate with a leading architectural firm to create a state-of-the-art project in HCT Innovation City, wedding the most updated technology to the art of sustainability, which will be the guiding principle for its form and function. In fact, today sustainability has turned into a focal strategy, and one that creates immense value for both companies and their customers.

The Gulf Environment Forum 2010, held in Jeddah Saudi Arabia, put forward an interesting presentation which spoke about «Sustaining the Gulf for a Brighter Future», which was formulated by the United Nations Development Programme (UNDP). It proposed a strategic partnership between the Gulf States, and aimed at reducing greenhouse gases by vital investments in clean and sustainable energy technologies. It supported the theory that future growth in countries, both developed and developing, will depend on sustainable technologies and renewable energy, like solar and wind energy which are part of nature's bounty.

Changeover to renewable sources of energy

UNDP figures indicate that around 3 billion people around the globe still resort to using old outdated methods like the burning of coal for heating and cooking purposes. 1.5 billion live without the benefits of electricity. The only way to cut down on the poverty and use of traditional sources of energy would be to provide basic affordable electricity to the poorest countries which, in turn, will greatly benefit the world in totality by bringing down poverty, improving general health conditions and raising standards of living, all vital factors in bringing down carbon emissions and greenhouse gases. The Gulf States are turning to green energy options, incorporating solar and wind technologies as alternative methods of producing electricity.

How the Gulf States can contribute positively to cleaner energy initiatives in the future

By investing in clean and green innovations and help to expand clean markets in countries nearest to them: (a) Build up institutions, frameworks and use education for human research and development. (b) Carry out field studies and compile information and data to assess major technical parameters and baseline studies as well as investigate the challenges specific to the region. (c) Take forward strategic partnerships with neighbouring countries to help similar growth in developing countries. And (d) play a leadership role in the world and help to

bring about agreements on clean technologies and climate change, thus, aiding the transition towards a sustainable society.

Focus areas

Corporate responsibility

Major companies too have a responsibility towards sustainability and need to look for methods to bring down their carbon footprint and control their greenhouse gas (GCG) emissions. Today, more care is being taken in the social, safety and the environmental fields. Directives on how to improve performance by reducing the use of hazardous materials, and promoting the recycling of products is a vital step in increasing efficiency. The proper handling of waste materials is also as important as its disposal, especially when it comes to outdated electronic devices. The best companies are those that fulfill their corporate responsibility towards society, and achieve a high profit as well.

Energy Efficiency

There is a general tendency for waste in the region. Every household can help to conserve energy and practice energy efficiency by following a few simple rules, like learning to switch off electrical appliances when not in use, and changing to energy saving and fluorescent light bulbs. These are two important ways of conserving energy and being responsible, as well as meeting today's needs without compromising tomorrow's. Every unit, from a small home to a large company can incorporate sustainability on a daily basis in their life, a simple step that can affect the country and the world positively.

Green Buildings

Green buildings are making their presence felt in a world that has started looking upon sustainable development as their birthright. Green buildings are known to help reducing demand for energy. In the Gulf, where air conditioning may account up to 70% of the electricity, green buildings with enhanced orientation and efficient insulation can lead to major conservation in energy. There is an undeniable connection between green buildings and the higher productivity of their occupants due to improved indoor air quality, as well as a link to a cleaner and more protected environment. These buildings have a number of features that make them stand out from all others. They are constructed with materials that are sustainable, in a manner that makes them environment friendly. Often renewable energy sources are used within and without to power the entire building, with rain water harvesting facilities as well. Usually there is also a waste recycling procedure that the occupants are taught to follow.

Standby Power and Green Computing

Standby power is also known as *vampire* power and refers to the power consumed by electrical and electronic appliances which cannot be switched off

unless they are unplugged, something which people do not bother to do very often. The microwave oven is another culprit, and they also emit standby power even when not in use. Even though every household loses a small amount of power in this manner, when it is a case of cumulative power, with all the households in the world contributing to this wastage, the power lost becomes very significant. According to the International Energy Agency (IEA), 1% of the world's carbon dioxide emissions come out of this standby power. The solution to this problem is to unplug the appliance or use a power strip. Battery chargers should also be unplugged after batteries are charged completely, or when the charger is not being used. Another solution is to make use of the «smart» electronic switch that cuts off power when there is no load, and starts again only when needed.

There is also a relatively new concept known as green computing, which basically refers to «the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems –such as monitors, printers, storage devices, and networking and communications systems– efficiently and effectively with minimal or no impact on the environment»[9]. There is a lot of ongoing research today to make computers and other devices more environmentally friendly with lesser use of hazardous material and maximisation of energy efficiency.

The role of the media

According to Malcolm X, «The media's the most powerful entity on earth. They have the power to make the innocent guilty and to make the guilty innocent, and that's power. Because they control the mind of the masses.» Maybe in today's day and time –this might seem a little exaggerated and even convoluted–, but the truth is the Media have the power to shape society.

It is unfortunate, however, that Media around the world focuses on every topic possible –politics, entertainment, sports, weather– but fails to treat environmental issues as a priority unless there is a dire situation at hand.

The various types of Media in the Gulf can help in internalizing the process of environmental awareness. The role of the Media is three-fold: (a) Educate the people about potential threats of global warming and climate change. (b) Suggest steps to correct the situation and be more sustainable. (c) Promote those who are doing their bit in spreading environmental awareness.

Radio

One of the radio stations in the region that analyses green issues from a consumer and business point of view is CNBC Arabiya. Arabic and English radio

9 San Murugesan (2008). «Harnessing Green IT: Principles and Practices», *IEEE IT Professional* 10 (1), pp. 24-33.

stations must take it upon themselves to send out little reminders frequently about environmental tips or solutions.

Internet

Social networking sites are thronged by millions of people of all age groups every single day. There are also specialized groups created on Facebook and YouTube that specifically deal with environmental issues. An example of one such group is the Water crisis Group Facebook, which provides information of the water crisis in the Gulf.

Another would be the Facebook page for EEG's Mytreeindubai.com campaign. Social networking seems to be the order of the day and environmental groups and governments in the Gulf must take advantage of this situation.

Newspapers

This type of Media is still a favorite among a large section of society. Newspapers can educate people of environmental issues, ask them for their views and promote causes looking for a change. Adverts on green tips can also be featured on a daily basis with interviews of environmentalists in the region.

Television

Documentaries on channels such as National Geographic are highly effective as they reach out to a large number of people and have a hard hitting effect due to the visual advantage. It is commendable that the National Geographic channel is now being dubbed for the Gulf region.

Others

Other effective means of spreading awareness using the Media is the production of commercials, animated movies, posters, billboards and signboards. Books and magazines with environmental message, slogans, pictures and articles can shape the minds of people too.

Thus, the Media must begin looking at environmental issues with a higher sense of urgency. It must remember that their primary goal is to spread awareness and educate the world and that one of the biggest global crises we are undergoing now is climate change.

Conclusion

The adoption of renewable energy in an economy is a huge task and requires vision, planning and commitment at all levels of society. The government in the Gulf has done its duty by providing the necessary impetus for strengthening the future of the Emirates.

It was startling, however, to examine a recent survey by Accenture, according to which two-thirds of the Arabic-speaking population in the Gulf have no interest or inclination in being more energy efficient. It was ironic that in the

same survey 90 per cent of the participants wanted their governments to stop being so dependent on oil and other non-renewable sources of energy.

This kind of an attitude in consumers' minds can be a huge disadvantage for nations trying to be more sustainable. Sustainability begins at home –with simple tips such as switching off electrical appliance that are not in use, planting more trees and conserving water. However, if the citizens are uninterested in taking up these measures, how far can the government go to achieve their goal of environmental preservation and sustainability?

Several Gulf States hope to make use of renewable and alternative energy sources to meet their enormous energy needs, instead of overusing the traditional sources of energy. Countries such as UAE, Bahrain and Qatar are looking at the ambitious plan of realizing 70% of their energy needs through renewable sources by the year 2030. Most of these countries are wealthy enough to finance projects like environmentally sustainable «eco-cities», without having to seek the aid of the World Bank. They also realize that they need to conserve their oil reserves, which will not last forever.

On October 9th, 2010, a Ministerial level Conference will be held in Brussels, on renewable energy cooperation between the EU, the Mediterranean and the Gulf countries to bring about closer support and cooperation in this field. The European Commissioner for External Relations and European Neighbourhood policy, Benita Ferrero-Waldner has this to say:

> Renewable energy cannot provide all the answers to our climate change and energy security challenges –but it will be an indispensable element in any successful strategy. Therefore, we need a renewable energy partnership with the countries of the Mediterranean and the Gulf regions. These partners have enormous potential to produce renewables, while the EU has a lot of technological knowhow and expertise to contribute. I hope this conference will take us a step closer to realizing a fully-fledged green energy market, and help us to explore together the potential for joint efforts to launch new technologies, particularly in the field of solar power.

Leaders in the Gulf countries mentioned above are now in the process of investing billions of dollars in the research and technology of green energy through renewable energy research parks across their respective regions. However, that is not sufficient. The rest of the world too needs to react positively and look for ways and means to conserve traditional sources of energy and, instead, opt for renewable sources.

«Climate Change» and «Global Warming» –two terms looming over the world that need to be taken very seriously by every nation in the world. With human activity heating up the planet consistently, it is for all of us, collectively, to take up the steps possible to make the world a safe, less polluted place for future generations to live in. Humans must learn to adapt ways to protect the human race by making them less vulnerable to climate change, but at the same time, they need

to protect the environment by slowing down the process of climate change, and bringing down the impact of the greenhouse effect drastically.

Renewable energy use and technologies are on the increase, but renewable power is still not a main source for power across the world. A reform in the energy sector is needed, and to aid this reform, governments in the region must allow renewable energy supplies be connected to the national electric grid and also provide suppliers with financial incentives. With government subsidies contributing to conventional power grids and methods of supply, it is difficult from a business point of view to compete in the market and offer a renewable energy supply, which will likely come at a higher cost. The majority of the public still choose saving the pennies as a priority over saving the planet.

At present many governments in the region subsidise energy produced by using oil and gas supplies to the extent that it is extremely difficult for private enterprises engaged in renewables to launch new, unfamiliar energy alternatives to compete fairly. Subsidies and incentives from the governments are one way to effectively aid the energy shift and alleviate people's fears about buying into new products. Furthermore, giving incentives in support of the industry could potentially bring new technologies to the market at a quicker pace and cheaper rate, which will also assist in developing a country's economy. However, some people fear that investments into renewable energy solutions could create another unstable economic boom, as private enterprises jump on the «green» wagon.

It is the view of some, that an alternative option is for governments to stop subsidizing or at least reduce subsidies given to all energy and energy related industries. This would create a truly free market, offering the best new start-ups in renewable energies a chance to triumph over all other energy providers.

Nonetheless, it is still the belief of the majority, that governments should offer variety of incentives for renewable energy projects to initiate the switch over. In some countries, tax breaks are being discussed as an incentive to those home owners who install solar panels and efficient appliances. These can also be offered to private and publicly owned businesses.

The final question, however, will be what do you offer to a region that is already tax-free? And more importantly, whose role is it to drive the switch?

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AUTHOR'S BIOGRAPHY

Habiba Al Marashi is the Chairperson of Emirates Environmental Group, a pioneering organization based in Dubai in the United Arab Emirates. Under her guidance, EEG became the first environmental NGO in the world to receive an ISO 14001 certification in 2001. She initiated the CSR movement in the UAE, which soon evolved into the Arabia CSR Network. She is a founder of the Emirates Green Building Council (EmiratesGBC) and a board member of the UN Global Compact since 2006 and President of the UN Global Compact Local Network for the GCC States.

ABSTRACT

This paper analyses the slow but steady shift from traditional energy sources to renewable energy sources within the Gulf States. With problems such as global warming and climate change looming over us, the region is working hard towards mitigation. Lower dependence on oil, bigger budgets for renewable energy, green building principles and spreading awareness among the general public are some of the ways in which the Gulf will achieve its goal of being «greener» in the coming years. It is believed now that the world has entered the beginning of the end of the oil era. The Gulf must take advantage of the situation and be pioneers in looking for green opportunities. The paper also analyses what each section of society – individual, corporate and government– can do to play their part in achieving sustainability.

KEY WORDS

Renewable energy in the Gulf, green buildings, solar energy in the UAE, environmental NGO, Green initiatives in the Middle East

RESUMEN

Este artículo analiza el lento pero firme cambio, en los países del Golfo, de las fuentes tradicionales de energía hacia las fuentes renovables. Con problemas como el calentamiento global y el cambio climático pesando sobre nuestras cabezas, toda la región se está empleando a fondo en la lucha contra los mismos. Algunas de las vías para alcanzar su objetivo de una mayor sostenibilidad futura consisten en reducir la dependencia del petróleo, aumentar los presupuestos para energías renovables, establecer principios de edificación ecológica y concienciar al público general sobre estas cuestiones. Parece que el mundo ya ha entrado en el comienzo del final de la era del petróleo; los países del Golfo no deben dejar escapar esta oportunidad y deben ser pioneros en la búsqueda de nuevas soluciones más sostenibles. El artículo también analiza qué puede aportar cada estamento social – ciudadanos, empresas, administraciones– para participar en el logro de la sostenibilidad.

PALABRAS CLAVE
Energías renovables en el Golfo, edificios verdes, energía solar en los EAU, ONGs ecologistas, iniciativas ecológicas en Oriente Medio.

الملخص
يقوم هذا المقال بتحليل التحوّل، البطيء لكن الراسخ في الوقت نفسه، من مصادر الطاقة التقليدية إلى المتجدّدة في دول الخليج. فقد دفعت المشاكل المترتّبة عن الإحتباس الحراري و التغيّر المناخي إلى تعبئة المنطقة بأسرها ضد هذه الأخطار. و من بين السبل المؤدّية إلى تحقيق هدفها في إنجاز قدر أكبر من الإستدامة المستقبلية هناك: تخفيض التبعية للبترول؛ الرفع من ميزانية الطاقات المتجدّدة؛ إقامة مبادئ إعمار إيكولوجية و تحسيس الجمهور بأهمية هذه القضايا. و ما دام يبدو أن العالم قد دخل في بداية نهاية عصر البترول، فإنّه يتعيّن على دول الخليج أن لا تضيع الفرصة و أن تلعب دورا رياديّا في البحث عن حلول مستدامة. و يتطرق المقال كذلك إلى المساهمات التي يمكن أن تقدمها مختلف المكونات الإجتماعية (المواطنون، المقاولات و الإدارة) للمشاركة في إنجاز متطلبات الإستدامة.

الكلمات المفتاحية
الطاقات المتجدّدة في الخليج، الأبنيّة الخضراء، الطاقة الشمسيّة في الإمارات العربية المتّحدة، المنظّمات الغير الحكومية المهتمّة بالبيئة، المبادرات البيئيّة في الشرق الأوسط.