



Arab Forum For Sustainability Science (AFFSS)

The Arab Forum for Sustainability Science (AFFSS) is an information dissemination facility which operates as a body of excellence promoting Sustainability Science in the Arab region. It creatively combines natural and social sciences, with an Arab identity, addressing the challenges to sustainable development typical of the region, to promote scientific approaches to the critical issues of life support systems such as water, energy, food and agriculture, and human development (health, education, poverty and peace) for sustainable growth.

The mission of the AFFSS is:

- (a) To cultivate the Science of Sustainability in the Arab Region to support sustainable development.
- (b) To make efforts to utilize the regional, global and national educational and knowledge base and expertise in integrated natural resources management for sustainable development
- (c) To disseminate ideas, paradigms, methodologies on sound scientific footing to guide Arab Region development towards a sustainable future with focus on critical aspects such as water, energy, food and human development (health, education, poverty eradication etc)
- (d) To disseminate knowledge as a 'source of inspiration' and 'guide to thinking and planning' for enlightenment of people and institutions by influencing transformational initiatives in the Arab region to ensure sustainable development.
- (e) To promote scientific thinking for development on the basis of sustainability science for harmony and balance between the natural environment and the life of the Arab peoples.

AFFSS will be a non-profit, nongovernmental body of individuals with experience in the fields related to sustainable development.

AFFSS will strive to provide knowledge support towards development that meets the needs of the present Arab peoples without compromising the ability of their future generations to meet their own needs, in the spirit of the Brundtland report of 1987. Sustainable development is further described "as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potentials to meet human needs and aspirations". In broader sense, a strategy for sustainable development aims to promote harmony among human beings and between humanity, nature and life support systems. A life support system is any natural or human-engineered system that furthers the life of the biosphere in a sustainable fashion. Sustainable development implies wise use of land, water, air, energy, and other resources. These resources underpin life itself. However, life is a highly

complex set of interactive systems on which human existence is ultimately dependent.

The fundamental attribute of life support systems is that together they provide all of the sustainable needs required for continuance of life. These needs go far beyond biological requirements. Thus life support systems encompass natural environmental systems as well as ancillary social systems required to foster societal harmony, safety, nutrition, medical care, economic standards, and the development of new technology. The one common thread in all of these systems is that they operate in partnership with the conservation of global natural resources. Sustainable development ensures global security by eliminating the threats –military, economic, social or ecological. It ensures human security, in many dimensions: economic, food, health, environmental, personal, community, political and natural resource.

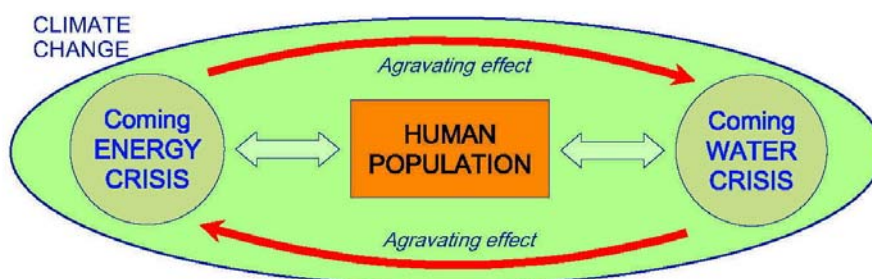
AFFSS is dedicated to serve the cause of sustainable development of the Arab Region through scholarly studies and by disseminating the knowledge generated by studies and research to promote informed decisions and policies for sustainable development of the Arab Region.

The studies of the AFFSS will be devoted to the understanding of the interactions between the Arab peoples and their natural environment by invoking studies based on natural sciences, social sciences and forging transdisciplinary pathways across the disciplines. They will focus on all dimensions of sustainable development including intra- and intergenerational equity, removal poverty and illiteracy, and conservation of life support systems of the Arab Region.

AFFSS encourages studies and discussions on Sustainability Science and its focus on interactions between natural and human systems, the complex mechanisms that lead to degradation of life support systems, and concomitant risks to human well-being.

The general objectives of the studies and discussion will be to identify the fundamental character of the interactions between humans, their technologies, and their environment and to make the resultant knowledge available for application to attainment of sustainability goals in respect of essential life support issues such as water, energy, health, food, agriculture, biodiversity, and ecosystem management. Of these, solar energy as an alternative renewable source of energy will be considered because of its abundance on the Arab Region. See Figure 1 and Boxes 1 and 2.

Figure 1



Interrelationship of the major problems expected to face mankind in the 1st half of the 21st century

Box 1: The True Abundance of Water and Energy in the Arab Region

Average solar radiation potential for the desert surfaces in the Arab Region (*Equivalent Electric Energy*) = $2.35 \times 0.15 = 0.3525$ TWh/km²/year

Total Solar Thermal Energy Equivalent falling on the Arab land = $14 \times 10^6 \times 0.87 \times 2.35$ TWh/km²/year= 28.62 million TWh/year or 17889 billion barrels of oil annually. This ANNUAL value (RENEWABLE) is about 27.5 times the TOTAL existing Arab oil reserves (about 650 billion barrels, OAPEC, 2007) WHICH ARE NON RENEWABLE!

One km² can also produce desalinated water of about 193,150 m³ daily or 70.5 million m³ annually, assuming average electric energy consumption for desalinated water to be about 5 kWh/m³.

There are three major rivers in the Arab Region, Nile in Egypt, Euphrates and Tigris in Syria and Iraq. These rivers are all originating outside Arab territories. The total flow of these rivers = 84 km³/year (Nile) + 30 km³/year (Euphrates) + 21.2 km³/year (Tigris) = 135 km³/year

The energy required to produce desalinated water equivalent to the total water flowing in all these rivers = 135×10^9 m³/year x 5 kWh/m³ = 675 TWh/yr. The total surface area is about 1915 km². According to a study conducted by the Institute of Technical Thermodynamics, Germany in 2007, the water deficit in the Arab Region will be about 150 km³ in 2050. According to the analysis, this deficit will tend to increase from presently 50 billion m³ per year, which is almost the annual flow of the Nile River allocated to Egypt, to 150 billion m³ in the year 2050. Almost all Arab countries, Egypt, Saudi Arabia, United Arab Emirates, Kuwait, Bahrain, Qatar, Yemen, and Syria, etc are the countries that will experience serious water deficits. If we assume roughly the water deficit is likely to be equivalent to 150 km³ and solar powered desalination will be used to produce this quantity, then the energy will be about = 150×10^9 m³ x 5 kWh/m³ = 750 TWh/year

Let us consider the total energy (electricity) demand of 623.148 TWh in the Arab Countries (OAPEC, 2007)
The total electric energy demand for the Arab Region is expected to be about 2286 TWh/year in 2050 assuming a reasonable growth of about 3% annually.

Table 1: Direct normal and global horizontal irradiance on the Arab Region (Sources DLR and NASA)

Country	Direct normal irradiance kWh/m ² /y (for Concentrated Solar Power Systems)	Global horizontal irradiance kWh/m ² /y (for Photovoltaic Systems)
Algeria	2700	1970
Bahrain	2050	2160
Comoros	2252	2161
Egypt	2800	2450
Eritrea	2371	2179
Iraq	2000	2050
Jordan	2700	2310
Kuwait	2100	1900
Lebanon	2200	1920
Libya	2700	1940
Morocco	2600	2000
Oman	2000	2050
Qatar	2000	2140
Saudi Arabia	2500	2130
Somalia	2152	2136
Sudan	2489	2226
Syria	2200	2360
Tunisia	2400	1980
UAE	2200	2120
Yemen	2200	2250
Average	2330	2121

Table 2: Water stress (<1700m³/person/year) in selected countries of the Arab Region (ESCWA)

Country (ies)	Level of Water Stress
Lebanon, Egypt, Oman	SEVERE
Saudi Arabia, Yemen	CRITICAL
Bahrain Jordan, UAE, Qatar, Kuwait	ACUTE

Box 2: The True Abundance of Energy in the Arab Region

World (EIA, 2010) net electricity generation increases by 87 percent in the Reference case, from 18.8 trillion kWh in 2007 to 25.0 trillion kWh in 2020 and 35.2 trillion kWh in 2035. World energy-related carbon dioxide emissions rise from 29.7 billion metric tons in 2007 to 33.8 billion metric tons in 2020 and 42.4 billion metric tons in 2035—an increase of 43 percent over the projection period. Renewables are the fastest growing energy source. The total electric energy CSP potential in MENA (Trieb, 2005) amounts to 630000 TWh/y excluding energy potential of Sudan and Somalia which has been estimated to be about 200,000 TWh/year making the total electric energy potential of about 83000 . World net electricity generation will be about 35200 TWh/year in 2035. The total energy for meeting power demand will require an area of about of about **99858** km² which is **0.7** % of the Arab Region surface area. **Therefore it is vital that Arab countries or world regions within the Sun Belt should immediately start to establish the necessary political and technological conditions for efficient energy management.**

The annual global consumption of oil is approximately 31.16 billion barrels (EIA, 2010), which is equivalent to 50,282 TWh/year, primary energy for the year 2007. It is clear, therefore, that the total energy recoverable from renewable resources is perfectly adequate to supply the total energy needs of humanity. In fact just the total potential recoverable (direct solar energy) is more than 122 times the net electricity generation for the world in 2035 .considering the Arab Region total potential is equivalent to 4.3 million TWh/year, assuming efficiency of conversion about 15%.

Activities of AFFSS

AFFSS will begin its knowledge dissemination activity with the an online publication

“Annals of Sustainability Studies of the Arab Region (ASSAR)”

carrying scholarly articles and reports related to sustainable development of the Arab Region. It will include invited articles from prominent scholars and also submitted articles that are subjected to peer review for quality assurance and freedom from political bias.

Certain issues of ASSAR will be devoted exclusively to some major issues of sustainability.

Details of organization of the publication activity will be presented in a separate document on the ASSAR. Prizes can be considered for best papers in ASSR.

Neither AFFSS nor ASSAR holds responsibility for the materials presented or opinions expressed by the authors.

The details of other activities will be available in due course.

Immediate needs:

Formation of the AFFSS Honorary Executive Council with Chairman, Co-Chairman, Secretary General, and Members. Suitable persons may be nominated by the Chairman additionally.

Suggested membership:

Chairman: **Mustafa El-Tayeb**, Former Director, Division for Science Policy & Sustainable Development, UNESCO

Co-Chairman: **Mostafa K. Tolba**, President, Arab Forum for Environment and Development and former Director-General, United Nations Environment Programme (UNEP)

Secretary: General, **Elias Baydoun**: Secretary General, Arab Academy of Sciences

Members (about 25 prominent persons to be nominated):

Abdalla A. Alnajjar, (United Arab Emirates)
Abdallah Al-Dabbagh (Saudi Arabia)
Abdin Saleh (Sudan)
Adil Al-Radif, (Canada)
Adnan Badran (Jordan)
Adnan Hamwi (Syria)
Ali Al-Shamlan (Kuwait)
Ali El-Nashar, (USA)
Attia Ashour (Egypt)
Bahloul Eliagoubi (Libya)
Bushara Makawi Ahmed. (Sudan)
Darwish Al-Gobaisi (United Arab Emirates)
Driss Bensari (Morocco)
Farouk El-Baz (Egypt)
Fawzi Mantoura (Palestine)
Isam Zabalawi (Jordan)
Laurence Rahme (Lebanon)
Mohamed El-Deck (Egypt)
Mohamed Hassan (Sudan)
Najia Kbir-Ariguib (Tunisia)
Omran Sultan Al Hallami, (United Arab Emirates)
Sameer Damak (Canada)
Talal Younes (France)

See: AFFSS Intellect Bank (IB)