SUSTAINABLE CONSUMPTION

FOR BETTER RESOURCE MANAGEMENT IN ARAB COUNTRIES

2015 ANNUAL REPORT OF THE ARAB FORUM FOR ENVIRONMENT & DEVELOPMENT (AFED)

I.	Overview	10
II.	Regional Contexts of SCP	14
III.	Driving Forces for Demand on Energy, Water, and Food	15
IV.	The Water, Energy, Food, and Climate Nexus	24
	A. Energy for Water	25
	B. Water for Energy	28
	C. Energy for Food	28
	D. Water for Food	29
	E. The Nexus Approach	29
V.	Patterns of Consumption and Resources Efficiency	30
	A. Energy Consumption Patterns	30
	B. Water Consumption Patterns	34
	C. Food Consumption Patterns	36
VI.	Conclusion and Recommendations	43
	References	44

I. OVERVIEW

In 2009, an Arab Regional Strategy for Sustainable Consumption and Production (SCP) was adopted by the League of Arab States. This was one of the first such regional strategies to be developed before the RIO+20 summit, which had adopted the 10 Year Framework of Programs (10YFP) on SCP, in its main outcome document *The Future We Want*. Consequently, the Arab Region moved forward and became the first region to develop and adopt a Roadmap for Implementation of the 10YFP on SCP at the regional level in June 2013. However, as is the case in most Arab regional strategies, both the roadmap and the SCP regional strategy are far from being implemented at the national levels. Development and implementation of SCP strategies in most Arab countries are still lagging.

The determinants of demand on energy, water, and food in the Arab region include socio-economic contexts, level of development, population growth, rate of urbanization, scarcity of water resources, the harsh climate conditions, and pricing policies. However, the region is truly heterogeneous in terms of socio-economic contexts, level of development, and per capita income. Other factors contributing to variations of level of demand include governments' supply-oriented policies and lack of demand management. Thus, great disparities exist in per capita energy, water, and food consumption amongst different Arab countries according to differences in the preceding factors.

Over the past three decades, demand on water and energy in all Arab countries has increased dramatically as a result of increasing population and urbanization growth, improvements in the standard of living, changes in lifestyles, industrial development and efforts to increase food self-sufficiency. As most of the Arab region is among the most urbanized regions in the world, urbanization is another strong driver of demand on energy, water, and food due to changes in lifestyles and consumption behaviors.

These factors have made the Arab region one of the major energy demand centers in the world. Per capita energy consumption varies greatly between high-income group (oil producing countries) and medium and low-income group (non-oil producing countries). The per capita consumption in Qatar is 38.6 tons of oil equivalent (toe), which is the highest among Arab countries and twenty-fold the world average (1.9 toe). The per capita electricity consumption in Kuwait – the highest in the Arab region – is about seven folds the average Arab, and nearly five folds the world average. A Kuwaiti national would consume as much electricity as 13 Sudanese households of five persons each.

The AFED 2015 survey on sustainable consumption reveals, to some extent, the impacts of energy efficiency policies adopted by governments on consumers' purchasing decisions. Only 42 percent of the survey respondents considered electricity consumption as a criterion while purchasing an electrical appliance. The lowest percentage of those who buy electrical appliances based on efficiency was recorded in Qatar (9 percent) and the highest in Tunisia (57 percent) and Jordan (56 percent). These results clearly reflect the importance of adopting Minimum Energy Performance Standards (MEPS) for electrical appliance by governments. Similarly, 46 percent of the survey respondents consider fuel consumption while purchasing a new vehicle. Brand name and model of cars were the main purchasing factors in the GCC (countries with high income and very low fuel prices), at above 50 percent of the total. Fuel efficiency and price dominated as the main factors

for purchasing a car in Jordan, Egypt, Morocco, Lebanon, Iraq and Tunisia. The highest percentage of those who choose a car for its fuel efficiency was in Jordan (72 percent) and the lowest in Saudi Arabia (17 percent) and Qatar (16 percent), which reveals a clear direct relationship between car purchase decisions and fuel prices. The same survey results showed that the use of energy-saving lamps (like CFL and LED) is expanding in Arab countries, as 85 percent of the respondents use them. This indicates the wider availability of energy-saving lamps in the market with easy access to consumers due to governments' initiatives. Saudi Arabia and Qatar recorded low levels of domestic use of energy-saving lamps (35 percent) due to heavily subsidized electricity prices. On the other hand, high levels of penetration of efficient lamps came from Jordan and Syria (95 percent), Egypt (94 percent) and Lebanon (91 percent). Over the past few years, most of these countries have undertaken energy-saving initiatives, including price reforms.

The Arab region is one of the world's most water-stressed regions. However, the level of per capita consumption in many countries has inflated municipal/domestic water demands. The municipal water tariffs in the majority of the Arab countries are low, providing no incentive for the consumer to save water. Moreover, it seems that per capita municipal water consumption is closely related to the income levels of the countries as high-income GCC countries consume a significantly larger amount of water compared to other countries. The AFED survey results revealed that only 6 percent of the respondents consider low tariff as a main reason of excessive water consumption, whereas 77 percent are willing to pay more for their water consumption in return for better social benefits. Thus, governments' worries of water pricing need to be revisited if enhanced social benefits are considered.

The AFED survey results indicate, interestingly, that 72 percent of the respondents are aware of the facts concerning water scarcity in the region and 77 percent are aware that per capita water consumption is high as well. Furthermore, ironically, respondents from countries of the highest per capita water consumption have high level of awareness (UAE has a high awareness level of 92 percent, and Kuwait (90 percent)). Though 90 percent of respondents from the UAE are aware of the high levels of per capita water consumption, only 50 percent of them indicate that they use water-saving devices at home. This result raises questions on the reasons behind it – whether it is because of availability of those devices in the market, lack of awareness on their availability or economics of their use, or a combination of all – remains to be further investigated. These results show, as well, that public awareness is not enough to change consumption habits. Governments' interventions through demand side initiatives are inevitable to complement public awareness.

While many Arab countries are heavily dependent on food imports, the food consumption levels are generally in the upper middle range. Increased welfare is a major driver of food demand and changes in consumption habits in the region. So, Arab countries are experiencing a nutrition transition characterized by a shift away from a traditional, more seasonal, and more diverse diet, rich in whole grains, fruits, and vegetables, towards a 'westernized' diet that is high in refined cereals, animal protein, fats, sugar, and salt. Although the rate of under-nutrition and underweight, particularly among under-five years children, has been on the decline in some Arab countries, there has been a parallel dramatic increase in the prevalence of overweight, obesity, and diet-related non-communicable diseases such as diabetes, cardiovascular disease, and cancers.

Many harmful components of the Arab diet are also examples of foods that have a negative impact on the sustainability of the current food system and hence on food and nutrition security. For example, red meat is currently over-consumed which has negative impacts on both human health and sustainability of the food system, while fish and poultry are protective foods that are under-consumed although they have the potential to be produced in a sustainable manner with less impact on the environment. Thus, changing dietary habits is a crucial issue involving intricate social and cultural values and traditions. When asking the Arabs whether they are ready to change their dietary habits to protect the environment or the public health, the answers were surprisingly positive: 84 percent of the respondents were ready to do so to save the environment, while an astounding majority of 99 percent went for it if it would protect health, such as fighting obesity, diabetes and blood fats. Thus, a good approach to promote positive change in food consumption patterns in the region is to put more emphasis on the health benefits, as they are more easily noticed by the public.

For example, reducing consumption of red meat in the Arab region by only 25 percent, from about 17 kg per capita per year, would save about 27 billion cubic meters of water, considering that it takes about 16 cubic meters to produce 1 kg of red meat. With Arab population rising to about 650 million in 2050, water savings would amount to about 45 billion cubic meters.

Water security, energy security and food security are inextricably linked in the Arab region, perhaps more than in any other region in the world. The region is known to be energy rich, water scarce, food deficient, and one of the world's most economically and environmentally vulnerable regions to climate change. This calls for the adoption of the nexus approach when addressing the management of the three vital resources of energy, water, and food. In addition, climate change, which is mostly driven by energy use and land use changes, is another challenge that would exacerbate the scarcity situation of natural resources. With a high proportion of arid and semi-arid land and scarce water supplies, alongside in some cases poor and unsustainable agricultural practices, the Arab region finds itself facing a food security challenge. With the current limited cultivated land in the region and considering the dominant method of agriculture being rain-fed, the region's food supplies and agricultural needs are highly vulnerable to the adverse effects of climate change, especially incidents of extreme weather events such as droughts and floods that have been notably more prevalent in the region.

This strong interdependency between energy, water, food, and climate change makes it imperative that policy formulation becomes coordinated, particularly with respect to mitigation of and adaptation to climate change. Conventional policy-making in 'silos' therefore needs to give way to an approach that reduces trade-offs and builds synergies across sectors. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, and social systems. However, it is important to acknowledge that there has been weak or lack of real coordination in the Arab region in terms of policies and strategies for water, agriculture land, energy, and climate change. Climate change policies, in infancy stages in the Arab region, are still being fragmented between different entities.

Most of the Arab countries have had a long history of subsidizing energy, water, and food prices for different reasons. The long history of energy subsidy has been a major barrier to promoting energy efficiency and other sustainable energy options.

Pricing water has been a contentious issue in most of the Arab countries due to perceived cultural and religious considerations. For example, the average price charged for water in the Arab region is about 35 percent of the cost of production, and in the case of desalinated water it is only 10 percent. Setting proper pricing policies can convey to consumers the real value of water and motivate users to treat it as such, driving them to increase its productivity and rationalize its use. In addition, Arab governments maintain their obligations to the social contract by providing low-priced food and other goods and services to the population. As a result, food subsidies are perceived to be important in promoting political stability.

Experience shows that subsidies in the region only promote wasteful consumption behavior, and do not help to ease the burden on the poor, as over 90 percent of the general subsidies go to the rich. A recent study by the World Bank show that low-income households in Tunisia receive only 2 percent of energy subsidy while high income households receive about 67 percent of the subsidy on gasoline and 60 percent of the subsidy on diesel. The same World Bank study showed that for food subsidies in rural Upper Egypt, the richest quintile received about 48 percent more in per capita benefits than the poorest group.

AFED public survey results underline the fact that the rich are benefiting most from subsidies in the region. They showed that the cost of food constituted the largest portion of the family income – over 10 percent for 62 percent of the survey respondents. In contrast, only 4 percent of the respondents spent more than 10 percent of the family income on water and electricity. Those who paid the lowest percentages for electricity compared to family income were residents of the GCC (countries with high per capita income and heavy energy subsidies). Furthermore, when asked about the major causes of energy and water inefficiency, only 6 percent of the respondents consider heavy subsidy as the main reason, while 43 percent think it is a combination of harsh climate conditions, lack of public awareness, and subsidies.

In their search to reverse these trends, Arab countries have varying price reform experiences. During the period of 2013-2015, six Arab countries implemented subsidy reform efforts: Egypt, Jordan, Tunisia, Sudan, Yemen, and the UAE. In addition, four countries – Morocco, Jordan, Tunisia, and the UAE – have implemented price adjustment mechanisms where domestic fuel prices are periodically reviewed and adjusted in accordance with international levels. An interesting response of the AFED survey, worth to consider while planning to reform energy and water pricing in the region, shows that 77 percent of the respondents agree to pay more for water and energy if compensated with additional social benefits such as education, health insurance and adequate pensions. Thus, if accompanied by effective mitigation measures, reforming subsidy regimes in the Arab region could be a powerful tool for governments to simultaneously address those very profound socio-economic grievances that have contributed to the outbreak of social unrests known as the “Arab Spring”.

In order for the Arab countries to gradually shift to SCP, every country, based on its respective socio-economic circumstance, needs to identify priority actions and enabling conditions necessary to facilitate that transition. These enabling conditions include: good governance, integrated policy planning, sound regulatory regime, use of market-based instruments, capacity development, access to finance and investments, research and development, public awareness, and green procurement.

II. REGIONAL CONTEXT OF SCP

Sustainable consumption and production (SCP) was defined by the Norwegian Ministry of Environment during the Oslo Symposium in 1994 as: "The use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations" (UNEP, 2010).

It was first recognized during the UN Conference on Environment and Development (UNCED) held in 1992 in Rio de Janeiro. The conference's major outcome, Agenda 21, identified in its chapter 4 unsustainable consumption and production patterns as a major cause of the persistent deterioration of the global environment (UNCED, 1992). Ten years later at the World Summit on Sustainable Development (WSSD) in 2002 in Johannesburg, Chapter 3 of the Johannesburg Plan of Implementation (JPOI) was on "Changing Unsustainable Patterns of Consumption and Production", and it called for the development of a 10-Year Framework for Programs (10 YFP) to accelerate the shift towards sustainable consumption and production (SCP).

The JPOI emphasized the need to accelerate the shift towards SCP, to promote social and economic development within the carrying capacity of ecosystems by addressing and, where appropriate, delinking economic growth and environmental degradation by improving efficiency and sustainability in the use of resources and production processes, and to reduce resource degradation, pollution and waste (WSSD, 2002). A global multi-stakeholder initiative, the so-called Marrakech Process, was launched in 2003. As a global effort to promote progress on the implementation of Sustainable Consumption and Production, it responded to the call of the JPOI by supporting the implementation of SCP programs, projects and policies and helping to construct the 10 YFP. In addition, seven task forces have been launched voluntarily in the context of Marrakech Process. These task forces support the development of SCP tools, capacity building and the implementation of SCP projects on some specific issues such as sustainable products, sustainable lifestyles, sustainable public procurement, sustainable tourism, sustainable buildings and construction, and education for sustainable consumption (UNEP, 2010).

The council of Arab Ministers Responsible for the Environment (CAMRE) organized in 2008 in Al-Ain, UAE, a roundtable meeting of experts on sustainable consumption and production, in cooperation with international organizations. The main objectives of the meeting were to identify key regional priorities on sustainable consumption and production, present ongoing initiatives on SCP in the Arab region, contribute to the Marrakech Process and provide regional feedback on the elaboration of the 10-Year Framework of Programs on SCP, and build more cooperation between the region and Marrakech's stakeholders such as development agencies, business and NGOs. The meeting called for preparing a draft regional sustainable consumption and production strategy in the Arab region as a contribution to the Marrakesh 10 Year Framework process (10YFP). The main outcome of the roundtable included the identification of the Arab regional SCP priorities as energy, water, waste, rural development and poverty eradication, education, sustainable lifestyles and tourism. Those regional priorities address a set of major development challenges facing the Arab region including scarcity of water

and land resources, food security, unsustainable consumption patterns, rapid urbanization, inadequate waste management, and the urgency of promoting the concepts and tools of sustainable tourism in order to preserve cultural and natural heritages.

Consequently, in 2009 an Arab Regional Strategy for Sustainable Consumption and Production was adopted by the League of Arab States to "promote the concept of sustainable consumption and production in the Arab region through encouraging the utilization of products and services that ensure environmental protection conserve water and energy as well as other natural resources, while contributing to poverty eradication and sustainable lifestyle" (LAS, 2009). The Arab Strategy on SCP was among the first such regional strategies to be developed and adopted at the regional level prior to the RIO+20 summit in 2012, of which the outcome was the 10 Year Framework of Programs on Sustainable Consumption and Production. This was consequently adopted by the main outcome document of Rio+20, entitled "The Future We Want" and was a major step to enhance international and regional cooperation, and to accelerate the shift towards SCP in both developed and developing countries.

The implementation of SCP as an integrated approach helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty. One of the SCP's main goals is to 'decouple' economic growth and environmental degradation by improving resources efficiency in the production, distribution and use of products, and aiming to keep the energy, material and pollution intensity of all production and consumption activities within the carrying capacities of the natural ecosystems. Further, SCP promotes "lifecycle thinking" to enhance sustainable management of resources. With this lifecycle approach, SCP would accelerate the transition to an eco-efficient economy and turn environmental and social challenges into business and employment opportunities, while decoupling economic growth from environmental degradation.

The Arab region moved forward and became the first region to develop a Roadmap for the Implementation of the 10YFP on SCP at the regional level, during the 4th Arab Roundtable on SCP in June 2013. During the same year the Roadmap was adopted by CAMRE. However, as is the case in most Arab regional strategies, both the roadmap and the SCP regional strategy are far from being implemented at the national levels. SCP policies are not identified as such at the national level in most Arab countries, and development and implementation of SCP strategies in all Arab countries are still lagging. Some elements of SCP policies are integrated in national development plans or strategies aimed at achieving economic sustainability, as in the case of the Tunisia Sustainable Development Strategy, Bahrain's Vision 2030, and others. Many Arab countries, according to their respective circumstances, have adopted policies that focus on energy, water, food, waste, and poverty eradication. For example, the National Cleaner Production Centers (NCPCs) in Egypt, Morocco, UAE, Jordan, and Lebanon have been supporting industries by generating knowledge on resource-efficient practices and providing technical assistance to small and medium enterprises (SMEs). NCPCs contribute to improved resource efficiency through the implementation of cleaner production methods, by providing technical assistance to enterprises, training for national experts, information dissemination and technology transfer, policy advice, and Cleaner Production technology and investment promotion. Civil society organizations (CSOs), such as AFED, have also played a key role in making sure that SCP remains on both government and business agendas. AFED's flagship reports on energy, water, food security, climate change, green economy and sustainable consumption shed light on SCP priorities of the Arab region and contribute to achieving the objectives of Arab regional strategy on SCP.

III. DRIVING FORCES FOR DEMAND ON ENERGY, WATER, AND FOOD

Arab countries are truly heterogeneous in terms of socio-economic contexts, level of development, and per capita income. Human development indicators vary dramatically between the rich hydrocarbons-endowed countries such as the GCC and the least developed countries as in Yemen, Sudan, and Mauritania. Thus, the

determinants of demand on energy, water, and food, as well as lifestyles and patterns of consumption, vary accordingly. In the Arab region, one can generally summarize the drivers of demand on energy, water, and food as follows:

A. Economic structure and growth

Since 2005, the Arabs' GDP increased from nearly US$1.2 trillion to about US$1.6 trillion, with a compound annual growth rate of 4.7 percent, which surpassed the population growth (2.2 percent) leading to a growth of per capita income at 2.8 percent annually (Table 1). The growth of income is typically a strong driver of demand on resources, goods and services. It is worth to note, however, that economic performance of Arab countries in 2011 was affected by the historic political transition in a number of countries such as Tunisia, Egypt, Libya, Syria, and Yemen. This political turmoil has led to unprecedented decline in total output, exports, tourism inflows, foreign direct investment (FDI) and decline in workers' remittance, leading in turn to economic recession in most of these countries.

In terms of energy consumption, the economic structures of Arab countries also vary between energy intensive economies as in the GCC, and more diversified economies as in Egypt, Tunisia, and Sudan. Great disparities exist in energy consumption per capita amongst different Arab countries according to their levels of income. Energy poverty is strongly correlated to per capita income, with more than 30 million Arabs lacking access to modern energy services.

Domestic water consumption per capita varies considerably in the Arab region as well, both among and within countries. In the GCC countries, it ranges from 300 to 750 liters per day, which ranks among the highest in the world. These differences are attributable to many factors, including government subsidies, lack of demand management, and governments' supply-oriented policies.

In addition, whilst many of the Arab countries are heavily dependent on food imports, they span a wide range of income levels ranging from low income (e.g. Sudan), through those in middle-income range (e.g. Egypt) to the high-income range (e.g. GCC).

While extraction and manufacturing represent more than 50 percent of the Arab economy, the majority of water resources in the region are being used for agriculture (85 percent), which contributes 5.6 percent to the total GDP (JAER, 2012). In addition, municipal and the industrial sectors consume about 8 percent and 7 percent of the total water use, respectively (Figure 1).

B. Population growth

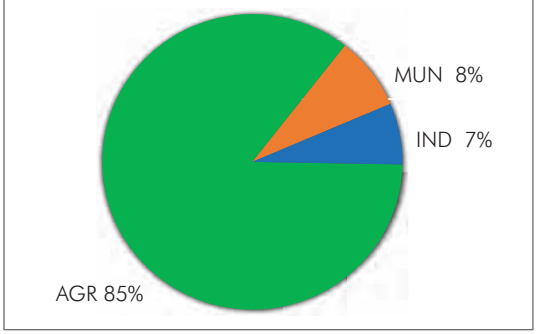
Table 1 shows that population of the Arab countries grew by 2.2 percent annually between 2005 and 2012, which represents another major

TABLE 1 **GROWTH OF PRIMARY ENERGY, POPULATION, INCOME, AND GDP IN THE ARAB REGION**

	2005	2006	2007	2008	2009	2010	2011	2012*	CAGR
Primary Energy (MTOE)	2,477	2,473	2,558	2,603	2,909	2,965	2,782.14	2,856.4	2.05
Population (million)	309	317	326	337	344	352	361	360	2.22
GDP (billion US$)**	1,161	1,245	1,315	1,363	1,386	1,456	1,508	1,602	4.70
Per capita income (US$)	3757.3	3927.4	4033.7	4044.5	4029	4136.4	4178.8	4443.8	2.84

*Figures of 2012 exclude South Sudan. UN Population Prospects Revision shows that the Arab population reached over 370 million in 2013. In 2015, the figure is about 392 million and is projected to reach about 659 million in 2050 (Medium Variant). **Source: GDP (constant 2005US$), World Bank, WDI

FIGURE 1 **SECTORIAL WATER DEMAND**



driving force for energy, water, and food demand. During the past three decades, water and energy demands in all Arab countries have increased dramatically as a result of increasing population and urbanization growth, improvement in the standard of living, industrial development and efforts to increase food self-sufficiency. The total primary energy consumption has increased from nearly 2.5 billion ton oil equivalent (TOE) in 2005 to about 2.9 billion TOE in 2012 (5.7 percent annually). Similarly, total water use for all sectors in the Arab region increased dramatically from about 190 billion cubic meters (BCM) in the mid 1990s (ACSAD, 1997) to about 255 BCM in 2010 (UNDP, 2013), while during the same period the population increased from about 260 million to about 360 million (UNDESA, 2012).

C. Rate of urbanization

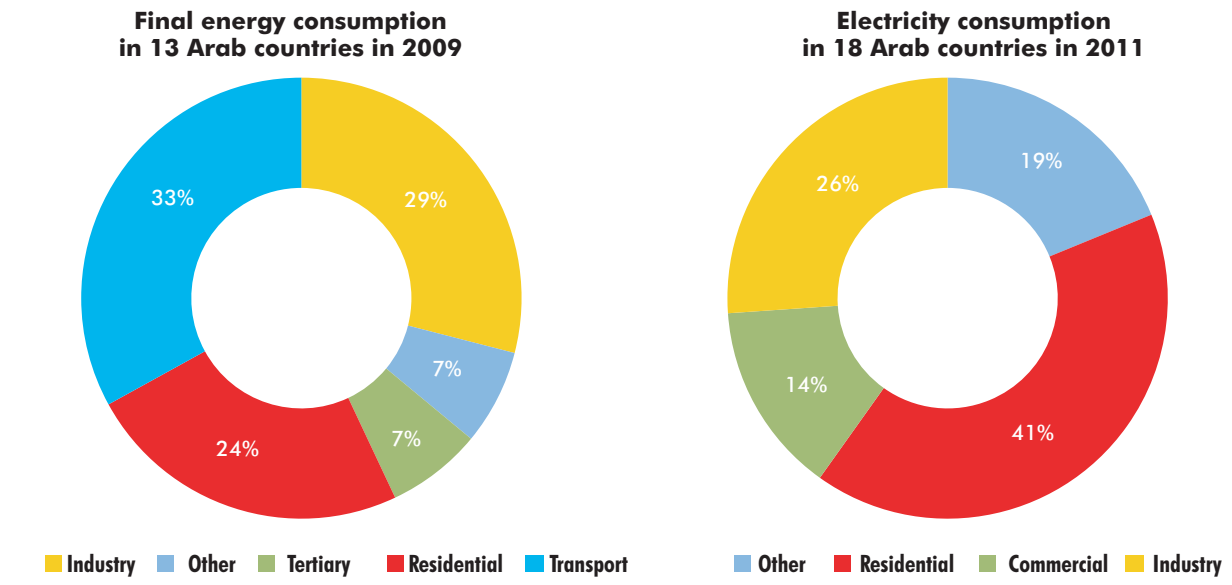
The Arab region is one of the most urbanized regions in the world. In 2010, the Arab population reached 352 million, with 56 percent living in cities. By 2050, the population will reach 646 million, of which 68 percent will live in urban areas. Disparities exist across sub-regions such as the GCC, where urbanization levels reach 80 percent, and the least developed Arab countries, which are characterized by rapid urbanization based on conflict, environmental degradation, severe droughts, and rural poverty (Habitat, 2013). Urbanization is another strong driver of demand on energy, water and food due to changes in lifestyles and consumption behaviors.

D. Welfare

According to the World Bank, the average per capita income of the Arab countries has increased from US$3,796 in 2005 to US$4,449 in 2013 with an annual growth rate of 2.56 (World Bank, 2015). A huge difference exists in the income of Mauritania of US$1,189 and Qatar of US$107,427. Increase in income would drive households to buy more electrical appliances or cars, and thus induce growth of energy demand. Empirical data of car and appliances ownerships in the region rarely exists. Home surveys need to be done in different countries to collect this data, as a crucial pre-requisite to energy demand analysis at the end use. This is especially important in the region as the residential sector consumes more than 40 percent of the total electricity (Figure 2).

Generally, enhanced welfare is a major driver

FIGURE 2 ENERGY DEMAND



Source: RECREEE & Plan Bleu study (2012); AUE (2011)

of food demand as well. Arab countries are experiencing a nutrition transition characterized by a shift away from a traditional, more seasonal, and more diverse diet, rich in whole grains, fruits, and vegetables, towards a 'westernized' diet that is high in refined cereals, animal protein, fats, sugar, and salt (Johnston et al., 2014). Factors driving this transition include economic growth and increased incomes, globalization of trade and marketing, and rapid urbanization.

E. Scarcity of water resources

Though the Arab region is energy rich, it is one of the most water-scarce regions in the world. Most of the Arab countries cannot meet current water demand, and the situation is likely to get worse due to changes of precipitation patterns as a result of climate change. Some 60 percent of the region's water flows across international borders, further complicating the water resource management situations. Drinking water services will become more erratic than they are already, cities will come to rely more and more on energy intensive desalination, driving more energy demand and producing more GHG emissions. Water and energy are also strongly interdependent in the whole value chain of both water and energy, such as pumping and transferring underground water or use of water resources to produce hydropower, and using fresh water for cooling of thermal power plants. Furthermore, agriculture uses 85 percent of the water consumption with a very low level of water productivity (Fig 1). The different nexus between energy, water, food, and climate change in the region is evident, an issue that is further elaborated in the energy background paper.

F. Harsh climate conditions

Most of the Arab region is characterized by harsh climate conditions of arid and semi-arid areas. This necessitates the use of air-conditioning during a prolonged time of the year. For example, the air-conditioning load in buildings in the UAE constitutes more than 60 percent of the total energy consumption (Afshari et al., 2014). Water demand in the GCC depends mainly on seawater desalination, which is an energy-intensive process. Thus, harsh climate is a major cause of increased energy and water demands in the region, a situation that will worsen due to projected global warming.

G. Urban planning, and communication technology

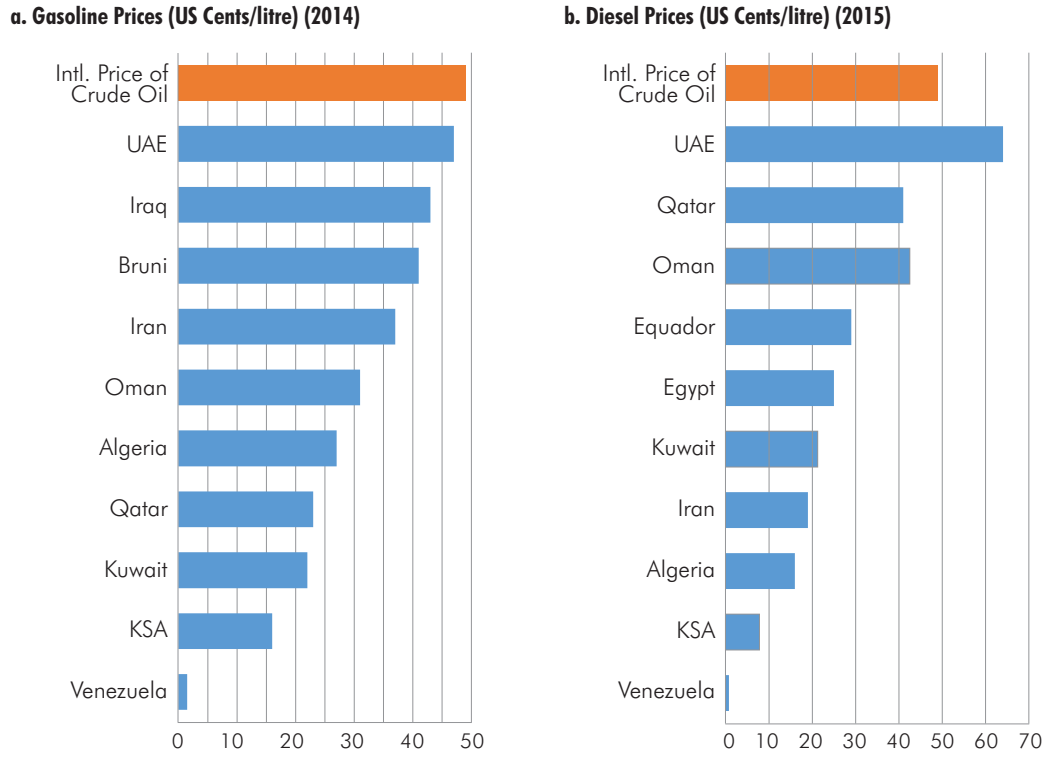
Urban planning is an important determinant of demand on transport fuels. Proper urban planning would reduce travel needs by changing land-use patterns and improving communications. Land-use, transport, and fuel demand are closely related. Some parts of the Arab region, as is the case in the GCC, have the unique advantage of their urban expansion with appropriate incentives for more efficient and environmentally sound patterns. Old Arab cities such as Cairo, Damascus, and Baghdad have limited opportunities for proper urban expansions, leading to traffic congestions and deteriorated air quality. In addition, recent advances of communication and information technology (ICT) offer a range of modern user services for increasing efficiency of travel and transportation of freight, leading to dramatic fuel savings. For instance, Dubai Transport Corporation (DTC) provides taxi services using an automatic vehicle location (AVL) and tracking system based on Global Positioning System (GPS) technology.

H. Pricing policies

Most of the Arab countries have had a long history of subsidizing energy, water, and food prices for different reasons. Governments rely on subsidies as a form of social protection to meet several objectives including fighting poverty. Moreover, subsidies are used to shield the population from shocks caused by large swings in commodity prices, particularly in fuel and food importing countries. They are also being used to distribute natural resource wealth among the population, especially in oil-producing countries, as is the case in the GCC. Some governments also use producers' subsidies to boost certain industries in order to address social issues such as unemployment. Producers' subsidies of some energy-intensive industries, such as petrochemicals, are also being used to enhance economic competitiveness and diversification in the GCC sub-region.

In the hydrocarbon–rich countries (e.g. GCC, Libya, Iraq), fuel subsidies are reflecting the low cost of domestic extraction. On average, diesel and gasoline prices in the Arab region are lower than in any other region. Gasoline and diesel prices are below the lowest price in the European

FIGURE 3 **GASOLINE AND DIESEL PRICES (US CENTS/LITRE)**



Source: GTZ, 2010

Union, and in a majority of countries, prices at the pump are lower than the prices in the United States (Figures 3a & 3b)

Electricity subsidies are wide spread in the region, but their magnitude is difficult to be accurately estimated, due to lack of data. The International Energy Agency (IEA) estimated that energy subsidies amount to more than 10 percent of the GDP in some Arab countries (Table 2)

Pricing water has been a contentious issue in most of the Arab countries due to perceived cultural and religious considerations. While water pricing has been advocated for a long time, particularly in irrigation, it is seldom enacted even though it is central to increased investment in the sector. Artificially low prices for water services (and sometimes no pricing at all) are a major cause of inefficiency, overuse, and excessive environmental degradation. Yet most of the Arab countries continue to resist water pricing and phasing out of subsidies, arguing that the poor cannot afford to pay (AFED, 2012). For example, the average price charged for water in the Arab region is about 35 percent of the cost of production, and in the case of desalinated water it is only 10 percent. However, setting proper pricing policies can convey to consumers the real value of water and motivate users to treat it as such, driving them to increase their productivity and rationalize their use. The attachment of economic value to water, based on the perception that water is a marketable commodity, whose value is set by the law of demand and supply, would promote conservation, efficiency, and encourage privatization in the development, treatment, and distribution of water resources. A progressive water tariff ensures that basic human needs for fresh water are met at a low price, while excessive use is priced at a tariff that reflects cost.

The provision of food subsidies in many Arab countries is a powerful symbol of the broader social contract between governments and the population, in a system where political

participation is limited and governments maintain their obligations to the social contract by providing low-priced goods and services to the population. As a result, food subsidies are perceived to be important in promoting political stability. On the other hand, food subsidies in the Arab region have mostly been seen as biased against farmers and in favor of urban consumers. The downward pressure on agricultural prices leads to low agricultural revenue, which increases rural to urban migration, with all the adverse socioeconomic consequences. For all these reasons, poverty in the Arab region is usually associated to rural areas or slum urban areas, where population is of a rural origin.

Generally, the most common type of subsidy in the Arab countries is the generalized price subsidy, whereby goods and services are made available at artificially low prices to the entire population. Across-the-board food-subsidy programs, which are wide spread in the region, create a substantial fiscal burden, especially during the food-price shocks. In countries such as Syria, Jordan, and Egypt, which have across-the-board subsidies, the food subsidies exceed one percent of the GDP and could become a major fiscal problem in the event of future price shocks (Figure 4).

Despite food subsidies in the region, according to the AFED public survey results, cost of food constituted the largest portion of the family income, compared to water and energy, as it was over 10 percent for 62 percent of the respondents. In contrast, only 4 percent of the respondents spent over 10 percent of the family income on water and electricity.

Subsidized foods that are made available to all sectors of the population may encourage overconsumption by those above the poverty line. For example, subsidies on unhealthy foods such as sugar and cooking oil can make a balanced diet less attractive because unhealthier alternatives become more affordable. Obesity, high intake of animal fat, and low intake of dietary fiber are risk factors for chronic non-communicable diseases such as coronary disease, diabetes mellitus, and colon and breast cancer.

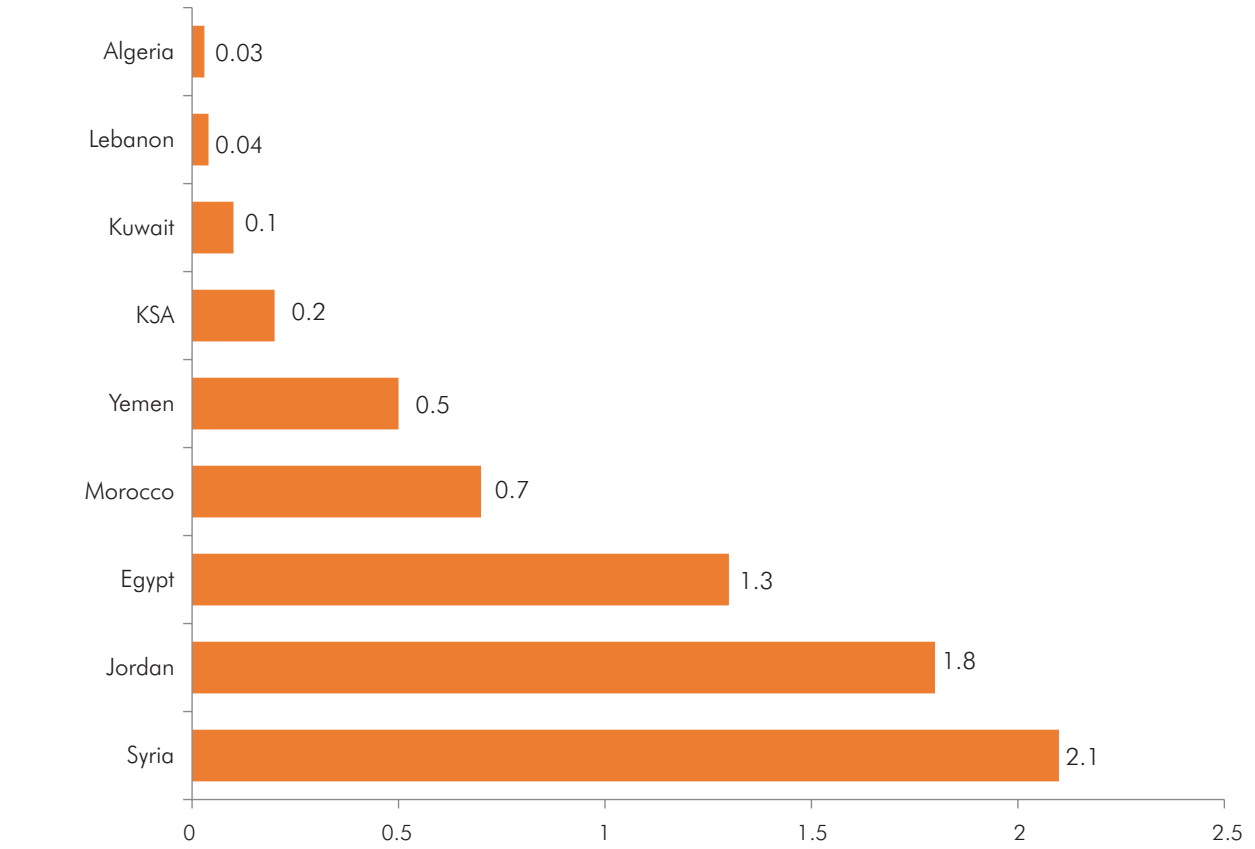
The experience of subsidies in the region only promotes waste, and does not help to ease the burden on the poor, as over 90 percent of the general subsidies go to the rich (AFED, 2014). A recent study by the World Bank showed that low-income households in Tunisia receive only 2 percent of energy subsidy while high-income households receive about 67 percent of the subsidy on gasoline and 60 percent of the subsidy on diesel. In Egypt, inflatable subsidies (9 percent of GDP) have kept Egypt's fiscal deficit at an exceptionally high 13.7 percent of GDP. The same

TABLE 2 **ESTIMATES OF ENERGY SUBSIDIES IN SELECTED ARAB COUNTRIES, 2010**

	Average Rate of Subsidization (%)	Subsidy ($ per person)	Total Subsidy (% of GDP)	Subsidy by Fuel			Total Subsidy (US$ bn)
				Oil	Gas	Electricity	
Algeria	59.80	298.40	6.60	8.46	0.00	2.13	10.59
Libya	71.00	665.00	5.70	3.17	0.26	0.78	4.21
Egypt	55.60	250.10	9.30	14.07	2.40	3.81	20.28
Saudi Arabia	75.80	1,586.60	9.80	30.57	0.00	12.95	43.52
Iraq	56.70	357.30	13.80	8.87	0.28	2.16	11.31
Kuwait	85.50	2,798.60	5.80	2.81	0.90	3.91	7.62
Qatar	75.30	2,446.00	3.20	1.15	1.41	1.59	4.15
UAE	67.80	2,489.60	6.00	2.65	9.99	5.51	18.15

Source: IEA

FIGURE 4 **FOOD SUBSIDIES AS PER CENT OF GDP IN SELECTED COUNTRIES (2007)**



Source: World Bank, FAO, IFAD (2009)

World Bank study showed that for food subsidies in rural Upper Egypt, the richest quintile received about 48 percent more in per capita benefits than the poorest group (World Bank, 2014).

It is thus evident that subsidies have been a major cause of over consumption of the three resources of energy, water, and food in the Arab region. Though subsidies are generally considered a crucial element of the social safety nets, experience proves that they encourage wasteful consumption behavior while they are not benefiting the targeted poor population.

On search for reversing these trends, different Arab countries have a variety of price reforms experiences. During the period of 2013-2015, six Arab countries implemented subsidy reform efforts: Egypt, Jordan, Tunisia, Sudan, UAE and Yemen. In addition, four countries, Morocco, Jordan, UAE and Tunisia, have implemented price adjustment mechanisms where domestic fuel prices are periodically reviewed and adjusted in accordance with international market levels. Very recently, the UAE announced that a fuel committee would review local fuel prices against average international levels every month, and make adjustments accordingly. Given the current relatively low price of oil, it would seem to be an opportune time to reform fuel subsidies without causing a sharp spike in inflation or the cost of living in the short term. In addition, increases in fuel prices will make public transport more viable, and would push people to change their transportation habits such as encouraging the use of public transportation or use of more efficient vehicles. Overall, lower car use will translate into less congestion and reduced pollution, and is a key part of meeting the country's environmental goals. Furthermore, successful implementation in

OPINION

USING THE ECOLOGICAL FOOTPRINT INITIATIVE TO DRIVE SUSTAINABLE CONSUMPTION AND PRODUCTION IN THE UAE

Razan Khalifa Al Mubarak

We all consume resources every day, some directly and some unseen as a result of the full life cycle of goods. In general, wealthier individuals tend to consume more, meaning that the growth of the middle class and an increase in the overall population leads to consumption accelerating at an unsustainable rate. This produces a vicious circle with economic growth leading to increased consumption of raw materials and energy, increased emissions, pollution and generation of waste.

The starting point to break this circle is to understand patterns of consumption and then try to decouple consumption and emissions from growth. In 2006, the Living Plant Report ranked the UAE as the country with the highest per capita ecological footprint when compared to 150 countries. In response, a federal project, the Ecological Footprint Initiative, was launched to fully investigate our footprint, to verify the data that goes into the calculation of the footprint value, understand the impacts of a high footprint, and to develop science-based policies that will result in a measurable reduction in the UAE's footprint. This made the UAE only the third country to conduct a detailed ecological footprint investigation after Japan and Switzerland.

The UAE Ecological Footprint Initiative is a partnership between the Ministry of Environment and Water, Environment Agency – Abu Dhabi, Emirates Authority for Standardisation and Metrology, Emirates Wildlife Society in association with WWF (EWS-WWF), and the Global Footprint Network. It is a collaborative effort that involves both government and civil society. The Initiative is governed by a Steering Committee chaired by HE Dr Rashid bin Fahad, the UAE Minister of Environment and Water, and includes representatives from the partnership as well as those from other key energy and environment agencies – both federal and emirate-level.

With over 6,000 data points for each country, the Ecological Footprint approach developed by the Global Footprint Network is comprehensive. At a global level there has been a shift in the trends over time. In the 1960s cropland represented approximately 50 percent of humanity's footprint, yet by 2008 this had dropped to 10 percent. In contrast, in the 1960s the carbon footprint component represented approximately 10 percent, but by 2008 this had risen to 50 percent. The differences between the footprint of high, medium and low-income countries is also evident. Carbon represents 25 percent of the footprints of low-income countries while it represents 46 percent of middle and 76 percent of high-income countries in 2005. At a global level it is clear where we need to focus our efforts. We need to significantly reduce the carbon emissions of high-income countries and take the appropriate action to prevent middle and low-income countries following the same trajectories that will also lead to them becoming high carbon emitters. The profile of the UAE footprint is consistent with that of high-income countries and is dominated by carbon emissions, and we have found that our per capita consumption of electricity and water is very high compared to other countries.

In terms of greenhouse gas emissions, we find that in Abu Dhabi in 2010 the biggest contributing sector is energy, contributing 72.6 percent of emissions. After energy, the other contributing sectors are industrial processes (18.1 percent), waste (6.9 percent) and agriculture (2.4 percent). According to the UAE GHG Inventory 2013, electricity and water contribute 33 percent of the total GHG emissions, followed by road transportation at 22 percent.

Armed with this knowledge, we have started to take appropriate actions to reduce our carbon emissions.

On the electricity supply side, the UAE is diversifying away from 100 percent fossil fuels to reduce carbon emissions and enhance security of supply by including nuclear and renewables in the mix. By 2021, we aim to have 24 percent from these sources. In March 2013, His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the United Arab Emirates and Ruler of Abu Dhabi, officially inaugurated Shams 1, at the time the largest concentrated solar power plant (CSP) in operation in the world. Located in the Western Region of Abu Dhabi, the 100-megawatt, grid connected power plant is generating enough clean energy to power 20,000 homes in the UAE. Work on the nuclear power plants is well underway with the first of four units due to be operational by 2017.

On the demand side we have also made progress

and are targeting cooling, lighting, overall building design, transport, and consumer behaviour change, by increasing awareness and the introduction of more cost reflective tariffs.

The Emirates Authority for Standardisation and Metrology (ESMA) has an energy efficiency rating system for air conditioning systems. ESMA's scheme is targeted at improving the quality of air conditioners available in the market and moving consumer choices towards more efficient products. In Abu Dhabi, based on the results of the 2010 Air Conditioning Maintenance Pilot Project, the Executive Affairs Authority was given a mandate in 2012 to develop a comprehensive cooling plan for the Emirate. This plan reflects five key activities including chiller maintenance, system balancing, and isolation of excess chiller capacity. The pilot study found that there was a potential to reduce electricity use for cooling by approximately 31 percent if appropriate measures are taken. A full-scale implementation is now being planned.

Energy used for lighting has also been targeted with the introduction of the UAE indoor lighting regulation, which came into force on 1st January 2014. This standard bans the import and sale of inefficient and low quality light bulbs, leading to significant energy reductions and cost savings. A retail ban on inefficient lighting products that do not meet the standard was enforced in January 2015.

Sustainability of buildings and community design has been improved through the implementation of ESTIDAMA and the Pearl Rating System (PRS). The PRS encourages water, energy and waste minimization, local material use and aims to improve supply chains for sustainable and recycled materials and products. In Abu Dhabi there are now over 12,000 villas that have a pearl rating, with the majority achieving two pearls. The aim is for more buildings to be brought within the pearl rating system in the future and to encourage developers to achieve a higher pearl rating.

We have also reduced carbon emissions related to transport by progressing mass transport options. In Abu Dhabi, the first phase of the Etihad Rail network for freight transport is now operational on a testing basis. A single freight train can carry the load of 250 trucks, and results in a 60 percent reduction in carbon emissions. The metro in Dubai also transports over 500,000 passengers per day, leading to a significant reduction in car journeys. Next we aim to focus on the emissions

from road vehicles by developing a UAE vehicle fuel economy policy, which has the theoretical potential to reduce carbon emissions by ten times more than the lighting standard.

WHAT HAVE WE LEARNT FROM THE ECOLOGICAL FOOTPRINT INITIATIVE?

Embarking on the federal project to fully assess the UAE footprint has enabled us to verify and refine data where necessary, to better understand the detailed breakdown of the overall footprint and carbon emissions, and to target our response. The verification of UAE National Footprint Accounts has aimed at ensuring that the most accurate and locally representative data is used for the calculation of the country's footprint. Also, the footprint has directed our focus on reduction in carbon emissions. The activities undertaken as part of the Ecological Footprint Initiative, in conjunction with other efforts such as the annual compilation of the UAE GHG Inventory, have enabled us to forecast the potential benefits of different policy options and enabled more informed decision making.

The UAE's per capita ecological footprint remains high. We will continue to use the ecological footprint as a tool and a framework to help us to identify key initiatives to reduce our consumption as we strive to decouple economic growth from consumption, emissions and waste.

Razan Khalifa Al Mubarak, Secretary General, Environment Agency – Abu Dhabi (EAD).

the UAE while oil prices are low could increase public acceptance of subsidy reform elsewhere in the region. Exchanging success and failure stories of those price reform efforts could be a good learning tool for Arab-Arab cooperation. Furthermore, if accompanied by effective mitigation measures, reforming energy subsidies in the Arab region could be a powerful tool for governments – addressing those very profound socio-economic grievances that have contributed to the outbreak of social unrest in various countries (El-Katiri and Fatouh, 2015).

IV. THE WATER, ENERGY, FOOD, AND CLIMATE NEXUS

A better understanding of the interdependence of water, energy, food, and climate policy in the Arab region would provide an informed framework for determining trade-offs and synergies that meet demand on resources without compromising sustainability. Water security, energy security and food security are inextricably linked in the Arab region – perhaps more than in any other region in the world. Generally, the region is known to be energy rich, water scarce, food deficient, and one of the world's most economically and environmentally vulnerable regions to climate change. This calls for adoption of the nexus approach when addressing the management of the three vital resources of energy, water, and food. Fortunately, this was recently well recognized in the Arab Strategic Framework for Sustainable Development (ASFSD) adopted by the League of Arab States in 2013. The ASFSD aims at addressing the key challenges faced by the Arab countries in achieving sustainable development during the period 2015-2025. It asserts the commitment of the Arab countries to implement Agenda 21 and the development objectives included in the Millennium Declaration, the Millennium Development Goals, and the outcomes of the World Summit on Sustainable Development and Rio+20, taking into consideration the principle of common but differentiated responsibilities, and other principles. The strategic framework seeks to enhance the participation of the Arab countries with the aim of strengthening their efforts to realize sustainable development in light of emerging challenges.

The interactions between water, energy and food security sectors can be easily seen across the Arab region. The region's population is currently over 390 million and is expected to increase by 50 percent by 2050 ("Food security and nutrition in the Arab region: key challenges and policy options," FAO, WFP, UNICEF and AOAD, 2012). Poverty, resource depletion and degradation are present throughout the region. Despite containing 43 percent of the world's oil reserves and having an immense potential for renewable energy, more than 50 million people in the region remain without access to modern energy services, mainly electricity (AFED, 2013). Additionally, the region merely contains 0.3 percent of the world's freshwater sources, making it the most water scarce region in absolute and relative terms (Siddiqi & Anadon, 2011). Over 50 percent of Arab countries are already below the water stress level of 500 cubic meters per capita per year and water availability is expected to decrease by 50 percent by 2050, while demand will continue to grow. The Arab region is the world's largest importer of wheat and recent economic instability has left its population even more vulnerable to food insecurity (World Bank, 2009). Utilizing the nexus approach in the Arab region has the potential to benefit all three sectors and reduce poverty through the improvement of livelihoods and job creation.

Climate change, which is mostly driven by energy use and land use changes, is an additional challenge that would exacerbate the scarcity situation of water and food resources. Climatic variability adds further pressures such as accelerating the deterioration of dry lands, more frequent and intense extreme weather events (such as droughts or floods), and less reliable water supplies, as well as less reliable agricultural productivity. Worldwide, the food sector alone contributes to about a third of the global greenhouse gas emissions through energy use, land use change, methane emissions from livestock and rice cultivation, and nitrous oxide emissions from fertilized soils (Sachs J. et al., 2010). With a high proportion of arid and semi-arid land and scarce water supplies, alongside in some cases poor and unsustainable agricultural practices, the Arab region finds itself facing a food security challenge. The current cultivated land in the region accounts for nearly 5 percent of the global cultivated land, and the dominant

method of agriculture is rain-fed. This makes the region's food supplies and agricultural needs highly vulnerable to the adverse effects of climate change, with a great emphasis on the incidents of extreme weather such as droughts and floods that have been notably rising in the region.

At the same time, climate change mitigation places new demands on water and land resources, such as production of biofuels, carbon sequestration and carbon capture and storage (CCS). Climate adaptation measures, such as intensified irrigation or additional water desalination, are often energy intensive. Further, increased groundwater use and water storage may require additional pumping. Thus climate policies can have an impact on water, energy and food security, and adaptation action can in fact be maladaptive if not well aligned in a nexus approach and implemented by appropriately interlinked institutions (SEI, 2011).

Furthermore, this interdependency has manifested itself over the past few years in new and increasingly interconnected crises (the food, energy, and financial crises, together with extreme climate events such as droughts and floods). These crises had impacted the Arab population heavily on varying degrees, hitting the poor the hardest. The vulnerabilities highlighted above can impact directly on people's lives and livelihoods. A clear example of climate change migration is that which took place in Syria in recent years. In the period of 2006-2011 nearly 60 percent of Syria suffered the worst drought and severe failure crop in the country's modern history. This drought and crop failure has set a vast social and economic strain on the population susceptible to such events. In 2009 over 800,000 Syrians lost their entire livelihood as a result of the droughts, with a further exposure of nearly one million people in 2011 to food insecurity. In 2010, an estimated 200,000 people migrated from their agricultural farmlands to urban areas due to such weather events.

Rural and agricultural populations often have a higher vulnerability to volatile weather variation and extreme weather events, ranging from droughts to floods, and migration is one of the solutions at the disposal of many rural and agricultural populations in the Arab region. This migration however is not only limited to such communities. While many are expected to migrate due to the effects of climate change on water resources and agricultural capacities, many others are at the same level of risk based on inundation and sea level rise. This remains as a matter of integral significance to the region, with dwindling resources highly vulnerable to climate change and highly congested urban centers, while farmlands are under threat of low rainfall and weak crop productivity. Urban centers are at risk of further population concentration, resource stress and an unsustainable development path.

In addition, the social impact will be severe as many workers will lose their jobs in agriculture, fishing, and some oil industries as a result of a world shift toward renewable energy sources. The economic impact in the oil producing countries will be more severe, as they mainly depend on revenues from oil and gas exports. If the world shifts fast to other low-carbon renewable sources of energy, those countries will suffer seriously.

The different relationships between energy, water, and food in the Arab region are discussed below.

A. Energy for water

A large amount of energy is needed to extract, convey, treat, and deliver potable water. Additionally, energy is required to collect, treat, and dispose of wastewater. Due to water scarcity, the region hosts more than 50 percent of the world desalination capacity. Desalination is an energy intensive industry; specific energy consumption depends on technology used and ranges from 5-9 Kwh/m^3 for less intensive reverse osmosis (RO) technology up to 15-25 Kwh/m^3 for energy intensive multi-stage flash distillation (MSF) technology, which is prevailing in the region (ESCWA, 2001). Energy is being used in pumping and distributing ground and surface water. The actual energy consumption can vary significantly for each process due to a host of geographical, physical, and technological factors. A key feature of energy consumption in the water value chain is that desalination and long distance conveyance are one of the most energy intensive (per unit volume) processes. These are increasingly the most common options that are being explored for expanding water supplies in many Arab countries (WW, 2007). The large difference in

THE ARAB REGIONAL STRATEGY ON SUSTAINABLE CONSUMPTION AND PRODUCTION

Fareed Bushehri

The Arab Regional Strategy on Sustainable Consumption and Production (SCP) was launched in September 2009, in a joint initiative of the League of Arab States (LAS), the United Nations Economic and Social Commission for Western Asia (ESCWA) and the United Nations Environment Programme (UNEP). The strategy was subsequently endorsed by the Council of Arab Ministers Responsible for the Environment (CAMRE) in November 2009.

The strategy aims to promote the concept of a sustainable consumption and production in the Arab region through encouraging the utilisation of products and services that ensure environmental protection and conserve water and energy as well as other natural resources, while contributing to poverty eradication and a sustainable lifestyle.

The strategy was the Arab region's contribution to the Marrakesh process, which highlighted the priority action areas to achieve the objectives of alleviating poverty, while using goods and services which conserve natural resources.

The strategy's main priority areas include:

- Energy for sustainable development
- Water resources management
- Waste management
- Rural development and eradication of poverty
- Education and sustainable lifestyles
- Tourism

In terms of energy for sustainable development, the document emphasized that the Arab energy sector has played and will continue to play an important role in the region and globally. Oil revenue is the main driver for economic development in most Arab countries, and Arab economies are heavily dependent on oil and gas to meet their domestic energy demand. On the other hand, the region also enjoys good potential of renewable energy resources which have not been fully utilized yet. The strategy recommends enabling policies to improve energy efficiency, particularly in energy intensive industries, transport, and power; promote the wide use of cleaner fuels; develop and wide use of renewable energy technologies; and support the promotion of cleaner production in the energy sector and encourage private sector participation in the energy sector.

Another key priority area is sustainable management of the region's water resources. Water scarcity is one of the major development challenges in the Arab region. The region accounts for about 3 percent of the world's population, 10 percent of its land, but only 1.2 percent of the renewable water resources. The ten most water stressed countries in the world are Arab countries and about 50 million Arab people lack access to safe drinking water. Water use efficiency barely exceeds 40 percent in most of the Arab countries. The strategy recommends enabling policies to adopt integrated water resources management (IWRM) taking into account socio-economic goals to achieve sustainable development; advancement and wide use of new desalination technologies; enhancing the role of civil society and NGOs to improve water efficiency; enhancing regional cooperation and integration in water resources management to achieve water and food security; and water demand management to improve water use efficiency in different consuming sectors.

The strategy recommends the adoption of the Integrated Solid Waste Management (ISWM) strategy (cradle-to-grave), and aims at achieving a 'cradle-to-cradle' approach. It also advances the promotion of waste avoidance and minimization practices, thus utilising waste as a resource wherever possible. Emphasis is also placed on the importance of developing policies for the sustainable management of hazardous waste, including E-waste.

Agricultural development constitutes another major core area for development in the region, where it remains the primary user of freshwater, consuming about 85 percent of available resources. Poverty in the Arab region can be found mostly in the rural areas and rural development is inevitable for poverty eradication.

In order to facilitate sustainable rural development and to eradicate poverty, the strategy suggests implementing policies promoting sustainable agriculture practices to achieve food security. Another issue is the importance of improving access to water and sanitation in rural areas in line with the Millennium Development Goals (MDGs). Enhancing access to modern energy services to foster economic and social development in rural areas is also emphasized, alongside the improvement of access to education and health services.

The strategic plan also highlights the inter-linkages between education and sustainable development in the Arab region.

Considering that the Arab world has the largest share of youth among developing regions, a key initiative in this regard is the Youth-Xchange initiative which shows young people how sustainable consumption directly relates to quality of life, efficient use of resources, reduction of waste, and ethical issues such as child labor, for example.

Recommended policies included in the strategy focus on the inclusion of internationally agreed upon objectives on education in national development plans. More specifically, they focus on supporting the development of strategies and national programs for education and illiteracy eradication and introducing SCP issues and sustainable lifestyle into education (formal and non-formal).

In this regard policy recommendations revolve around the promotion of eco-labels, fuel efficiency standards and energy efficiency standards for appliances, in relation to public procurements, green building standards and public transport systems.

Sustainable Tourism is the last of the priority sectors identified by the strategy. It promotes sustainable eco-tourism through development of sustainable ecotourism strategies: policies and guidelines including disseminating and adapting existing tools and policies to the local context. The strategy also promotes mainstreaming sustainability in the tourism sector by adopting sustainable management practices for the hospitality sector and integrated costal zones management and capacity building for small and medium enterprises (SME's) and government institutions at all levels.

The strategy emphasises the importance of approaching SCP from a multi-stakeholder perspective including governments, business and industry, media, non-governmental organizations (NGOs) and civil society, individuals and regional and international intergovernmental organizations.

Finally the strategy concludes by emphasizing the importance of monitoring and evaluation. It highlights that indicator-based monitoring is one of the most effective forms of monitoring and evaluation, and demonstrates how the indicators are valuable tools for tracking progress on set priorities and targets. It calls for Arab indicators for SCP to be incorporated within broader sets of development, poverty reduction, environment or sustainable development indicators. It lists a set of recommended indicators which include those within the Arab framework that are relevant to sustainable consumption and production, in addition to 'decoupling' growth from consumption and other indicators relevant to the sustainable consumption and production priorities outlined above.

The Arab Strategy on SCP was among the first such regional strategies to be developed and adopted by the countries of the region before the RIO+20 summit and before the adoption of the 10 Year Framework of Programs (10YFP) on Sustainable Consumption and Production (SCP) by the Summit in 2012. The Arab Strategy provided an excellent enabling tool for the Arab countries to move forward and become the first region to develop a roadmap for the implementation of the 10YFP on SCP at the regional level, based on the Arab Strategy on SCP, during the 4th Arab Roundtable on SCP in June 2013. During the same year the roadmap was adopted by CAMRE.

The priority sectors identified in Arab Strategy on SCP enable countries to select and focus on any combination of these sectors that meet their respective national sustainable development priorities for transforming existing unsustainable consumption and production patterns to more sustainable patterns. These sectors are common to most countries of the region and were developed through a consultative process involving all relative stakeholders, including government representatives.

Despite the Arab Strategy being a comprehensive document supported by a roadmap for the implementation of 10YFP programs, the adoption and implementation of the Arab Strategy on SCP at the national level has been very weak. The majority of Arab countries have appointed 10YFP National Focal Points, but SCP has not become a priority area for most of them. Jordan has been leading the region in its quest to integrate SCP policies into its national development plan. It has identified priority sectors and is developing its roadmap for the implementation of its SCP strategy accordingly. Egypt is also progressing with its national roadmap, alongside Morocco, Lebanon and Palestine.

UNEP is working with the countries of the region to integrate SCP policies into their national development plans and policies, by adopting the Arab Strategy on SCP at the national level and utilising the roadmap as a guide towards active involvement under the global agenda for the 10YFP on SCP.

Dr. Fareed Bushehri, Regional Resource Efficiency Officer, United Nations Environment Programme (UNEP), Regional Office for West Asia (ROWA).

energy requirements for wastewater treatment and desalination is significant. From an energy standpoint, wastewater treatment and reuse can be much more efficient than desalination (Siddiqi and Anadon, 2011).

B. Water for energy

In addition to hydropower, water use in the energy sector primarily occurs in three areas: hydrocarbon extraction, oil refining and electricity generation. Cooling of thermal power stations and oil refining, hydropower, energy mineral extraction and mining, fuel production (including fossil fuels, biofuels, and other non-conventional fuels), and emission controls all rely on large amounts of water. In the Arab region, thermal electricity generation constitutes more than 90 percent of the total installed capacity. Water consumption in oil extraction is much lower than what is consumed through evaporation in cooling processes in power plants. The Arab region is a large producer of oil and petroleum products, so the collective effects on water consumption can be significant.

Table 3 provides a summary of the water consumption values. Empirical data on how much water is used in energy production in the region is rarely found.

C. Energy for food

Production of food depends on energy resources. Fossil fuels have increased farm mechanization, boosted fertilizer production and improved food processing and transportation. Energy is used mainly for pumping water, housing livestock, cultivating and harvesting crops, heating protected crops, drying and storage. In addition, indirect energy demands include fuels for operating farm machinery as well as for fertilizer manufacturing. In addition, energy is consumed in the food processing industries. The total amount of energy needed for food processing and packaging is estimated to be between 50-100 mega joule (MJ) per kg of total retail food product. The food processing industry requires energy for heating, cooling, and electricity. Energy is also embedded in the packaging, which can be relatively energy-intensive due to the use of plastics and aluminum. For processing fish, the direct energy demand for ice, canning, freezing, drying or curing and producing fish meal and fish oil by-products is around 0.5 pet joule (PJ) per year. Finally, energy is needed for food storage and cooking for households and food retailers. It is estimated that the total energy used to put food on the table in the USA represents 16 percent of the nation's total energy consumption (FAO, 2011).

There is a link between food prices and energy prices. Between 2007 and 2008, world oil prices dramatically increased, reaching close to US$150 per barrel at its highest peak. According to FAO, the higher fuel costs heavily increased the cost of producing and transporting agricultural commodities. Recent studies have further established that energy was one of the key drivers that caused food prices to surge to their highest levels in nearly 50 years. Because climate change will likely reduce agricultural yields globally, world market prices for major food commodities are projected to rise. Given the high dependence of Arab countries on imported food (combined with relatively limited agricultural potential), these global dimensions are particularly important for the Arab world (World Bank, 2012).

TABLE 3 WATER CONSUMPTION IN ENERGY PRODUCTION

Process	Min.	Max.	Average
Primary–secondary range (oil extraction) (gal/MMBtu)	1.4	62	31.7
Oil refining (gal/MMBtu)	7.2	13.4	10.3
Steam turbine - once through cooling (gal/MWh)	300	330	315
Hydro power - evaporative losses (gal/MWh)	1429	6882	4500

Source: (Siddiqi, A. and Anadon, L., 2011)

D. Water for food

Food and water are strongly linked. The Arab region is water scarce with annual renewable water resources per capita about 800 m^3, compared to a world average of about 7240 m^3. This regional average masks the disparities that exist with 13 Arab countries classified in the severely water scarce category, at less than 500 m^3 per capita. Agriculture consumes about 85 percent of total water withdrawals in the Arab region, which is characterized by low irrigation efficiency and crop productivity. Water scarcity is a critical constraint to agriculture. This will be exacerbated over the coming years by rising populations and the potential impacts of climate change.

Average irrigation efficiency in 19 Arab countries is below 46 percent. It is estimated that raising this figure to 70 percent would save about 50 billion m^3 of water annually. Producing more agricultural outputs with less water is an option of significant importance for enhancing food security in the Arab region by utilization of more efficient irrigation methods, such as sprinkler and drip irrigation. The application of drip irrigation in most parts of the Arab region has proved to reduce water losses and increase agricultural productivity; for instance, its application in the Jordan Valley to irrigate 60 percent of the area has increased average yields of vegetables and doubled fruit yields. In most of the Arab region there is still a lack of economic and fiscal incentives based on cost recovery for irrigation improvement. Thus, high priority should be given to improved management of irrigation water demand by encouraging farmers to invest in water-saving technologies and to cultivate crops with low water demand. In addition to increasing irrigation efficiency, water productivity can be increased in either economic or physical terms, through the allocation of water to higher value crops or by achieving 'more crop per drop' of water, respectively. In addition, water productivity can be further improved by shifting consumption habits towards less water-intensive crops of similar nutritional value (AFED, 2014).

E. The nexus approach

The nexus approach is meant to integrate management and governance across sectors. Additionally, it can boost resource efficiency and productivity by addressing externalities across sectors. Productivity and availability of water, energy and land vary enormously between regions and production systems. There is a large potential to increase overall resource use efficiency and benefits in production and consumption, e.g. by addressing intensive agriculture (which often has higher water productivity but lower energy productivity than other forms of agriculture). Similarly, the nexus thinking would address energy intensity of desalination, water demand on hydropower, or land demand in renewable energy production (e.g. solar and wind). 'No regret' adaptation actions, including Integrated Water Resource Management, (IWRM), as an adaptation tool, and up scaling decentralized renewable energy technologies are crucial to help build resilience to the increasing number of extreme weather events. Mitigation options with adaptation co-benefits such as water conservation, solar desalination, and better management of livestock are all good opportunities to capture the benefits of the nexus approach.

This strong interdependency between energy, water, food, and climate change makes it imperative that policy formulation becomes coordinated, particularly with respect to mitigation of and adaptation to climate change. Conventional policy- and decision-making in 'silos' therefore needs to give way to an approach that reduces trade-offs and builds synergies across sectors. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, and social systems.

It is important to recognize that there has been weak or lack of real coordination in the Arab region in terms of policies and strategies for water, agriculture land, energy, and climate change. Climate change policies, in infancy stages in the Arab region, are still being fragmented between different entities. However, the nexus thinking offers real opportunities for synergies such as coordinated investments in infrastructure related to water, food and energy, and innovation to improve resource use efficiency. This should be coupled with the use of economic instruments for stimulating investment, including: pricing of resources and ecosystem services, maximizing the beneficial uses of water and energy amongst

other competing demand, applied and adaptive research to enhance adaptation to climate change in the agricultural sector to ensure its resilience, capacity building and sharing of experiences and good practices at national and regional levels, and finally bridging the present science-policy gap.

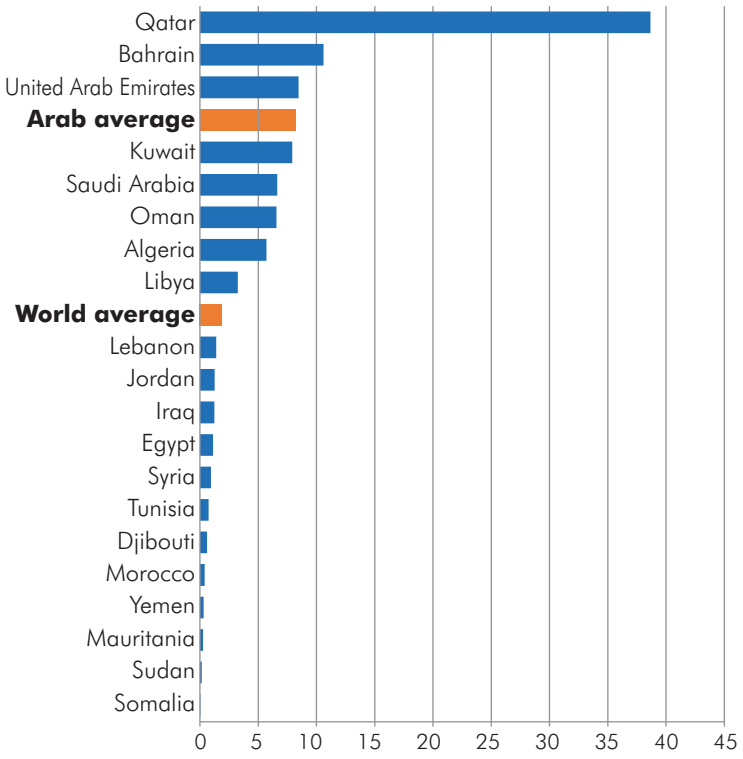
V. PATTERNS OF CONSUMPTION AND RESOURCES EFFICIENCY

Consumption patterns of energy, water, and food in the Arab countries are strongly affected by a myriad of socio-economic factors as discussed in section 3. These patterns will be further examined below in conjunction with the results of the public opinion survey on consumption patterns undertook by AFED.

A. Energy consumption patterns

Economic growth, growing population, high rate of urbanization, and dramatic changes in lifestyle have made the Arab region one of the major energy demand center in the world. Due to differences in those socio-economic factors, per capita energy consumption varies greatly between high-income group (oil producing countries) and medium and low-income group (non-oil producing countries). The per capita consumption in Qatar is 38.6 tons of oil equivalent (toe), highest among Arab countries and twenty fold the world average (1.9 toe). Per capita energy consumption of the oil rich GCC, Libya and Algeria is higher than the world average, while the rest of the Arab countries have a per capita primary energy consumption lower than the world average (Figure 5).

FIGURE 5 ENERGY CONSUMPTION PER CAPITA (TOE)



Source: OAPEC, 2015

The same disparity can be observed in the per capita electricity consumption between different Arab countries. Figure 6 shows that while the average Arab per capita electricity consumption is less than the world average, the per capita electricity consumption in the GCC countries and Libya exceeds the world average. The per capita electricity consumption in Kuwait, the highest in the Arab region, is about seven folds the average Arab, and nearly five folds the world average. Such a large disparity exists among different Arab countries to the extent that a Kuwaiti national would consume as much electricity as 13 Sudanese households of five persons each.

Although some Arab countries are rich in energy resources, about 50 million Arabs have no access to electricity, especially in the least developed countries Yemen, Sudan, Mauritania, Comoros, Djibouti, and Somalia (World Bank, 2010 and AFED, 2012). These wide disparities in access to affordable modern energy services between different countries and between urban and rural populations within the same country aggravate inequality, worsen poverty, and threaten social stability. The majority of Arab people with no access to electricity live in least developed countries such as Yemen, Sudan and Mauritania (Figure 7).

The high level of energy consumption in most Arab countries and the inefficiency of use can be attributed to, among other factors, the historically pervasive adoption of energy subsidies. However, through the AFED public opinion survey, only 6 percent of the respondents considered heavy subsidy as the main reason,

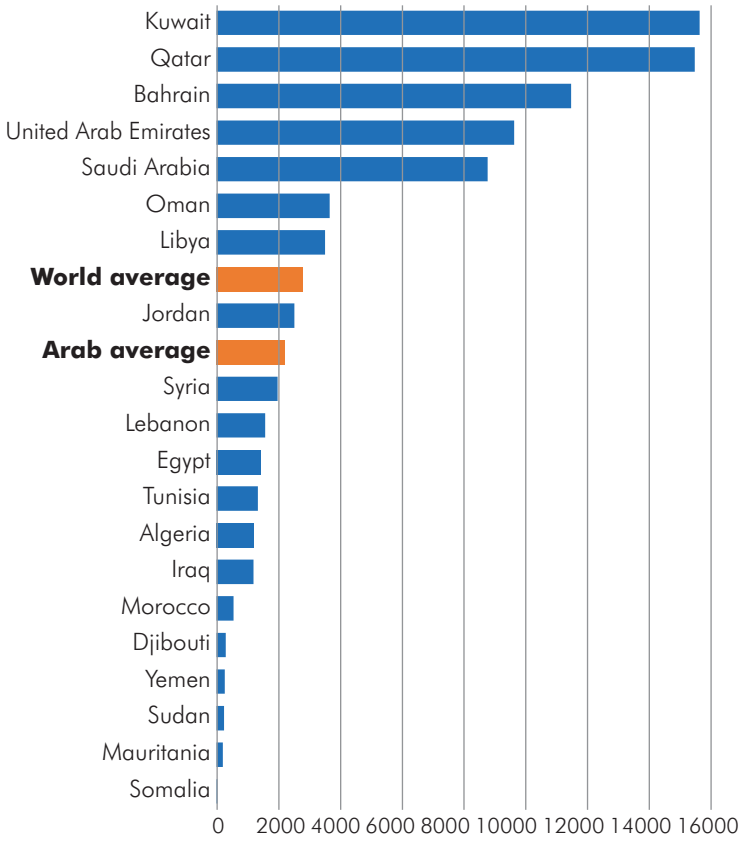
while 43 percent thought it was a combination of harsh climate conditions, lack of public awareness, and subsidies.

In most countries of the region, fuel and electricity are subsidized at rates averaging in excess of 50 percent of the cost of supply (see section 3).The AFED survey reveals that 64 percent of the respondents pay between 5 and 10 percent of the family income on electricity bills. Those who paid the lowest percentages compared to family income were residents of Qatar, UAE, Saudi Arabia, Bahrain and Kuwait (countries with high per capita income and heavy energy subsidies). These results underline the fact discussed earlier, that the rich are benefiting most from energy subsidies in the region. An interesting response of the survey, worth to be considered while planning to reform energy and water pricing in the region, is that 77 percent of the respondents agree to pay more for water and energy if compensated with additional social benefits, such as education, health insurance and adequate pensions.

The availability of fossil fuels at low production costs encouraged oil-producing countries to invest in energy-intensive industries such as desalination, petrochemicals, and aluminum smelting. This has led, in addition to the harsh climate conditions and poor energy efficiency, to high-energy intensity. Primary energy intensity is measured as the ratio between the total primary energy consumption and the country's Gross Domestic Product (GDP). It measures the amount of energy input required to generate one unit of GDP. In other words, it is a proxy to energy productivity in an economy. By expressing at Purchasing Power Parity (PPP), GDP is adjusted to reflect the differences in the cost of living in different countries.

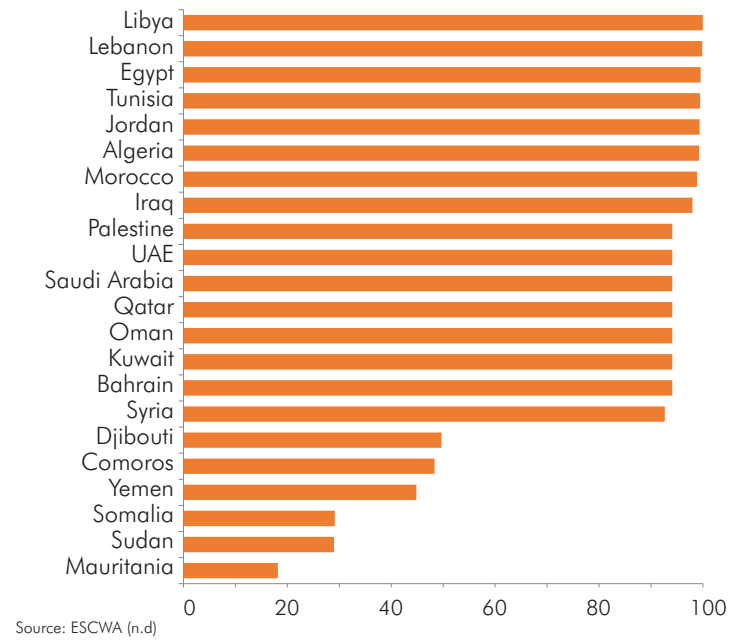
Figure 8 indicates that in 2010 the average primary energy intensity in the region was nearly 8.7 MJ/ US$ 2005 (PPP) compared to a world average of 7.7 MJ/US$ 2005 (PPP) and the energy intensities of all the GCC countries are higher than the world average. It is also clear that only seven countries have improved energy intensity between 1990 and 2010, which are Tunisia, Syria, Sudan, Mauritania, Iraq, Egypt, and Bahrain. Whether these improvements occurred due to efficiency improvement or

FIGURE 6 ELECTRICITY CONSUMPTION kWh PER CAPITA (2012)



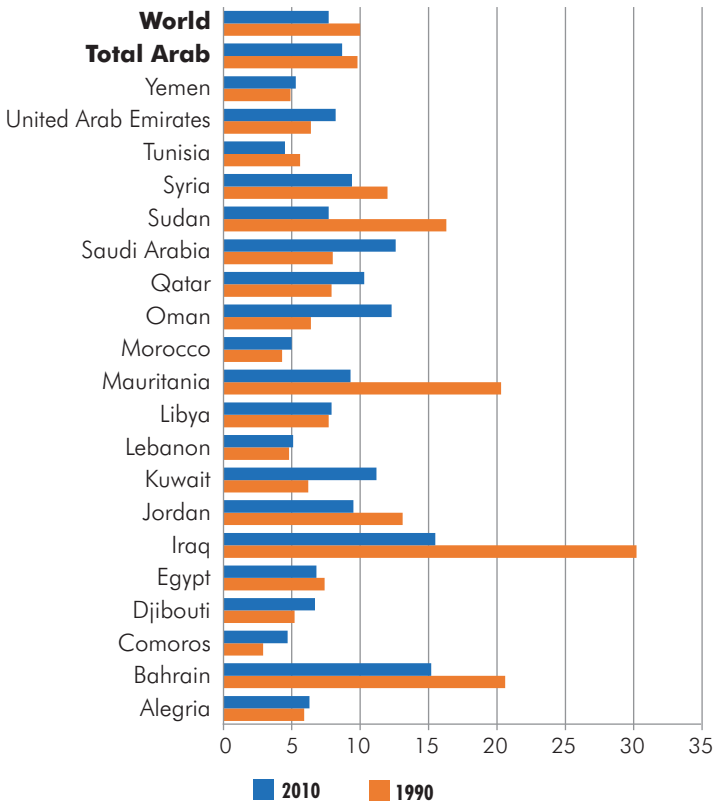
Source: OAPEC

FIGURE 7 ACCESS TO ELECTRICITY (%)



Source: ESCWA (n.d)

FIGURE 8 ENERGY INTENSITY (MJ/$2005 PPP)



Source: SE4ALL

structural changes in the economy remains to be clarified by more analysis. Within the Arab group, results are widely divergent, separating Iraq on the high end and Tunisia on the low end of energy intensity.

As the region relies almost entirely on fossil fuel for meeting its energy demands, and as most countries are heavily subsidizing energy prices, the region continues to be one of the most energy-intensive regional economies in the world, resulting in an increase of associated greenhouse gas (GHG) emissions. Figure 9 indicates the high level of per capita carbon emissions of the GCC countries and Libya, with the level in Qatar exceeding the world average by eight folds.

Energy consumption in the Arab region continues to be dominated by fossil fuels. In 2013, the primary energy consumption mix was dominated by oil products (47 percent) and natural gas (51 percent). As can be observed in Figure (10), the situation has not changed significantly since 2005. The main trend is the increasing use of natural gas, with a relative reduction in share amongst all other sources.

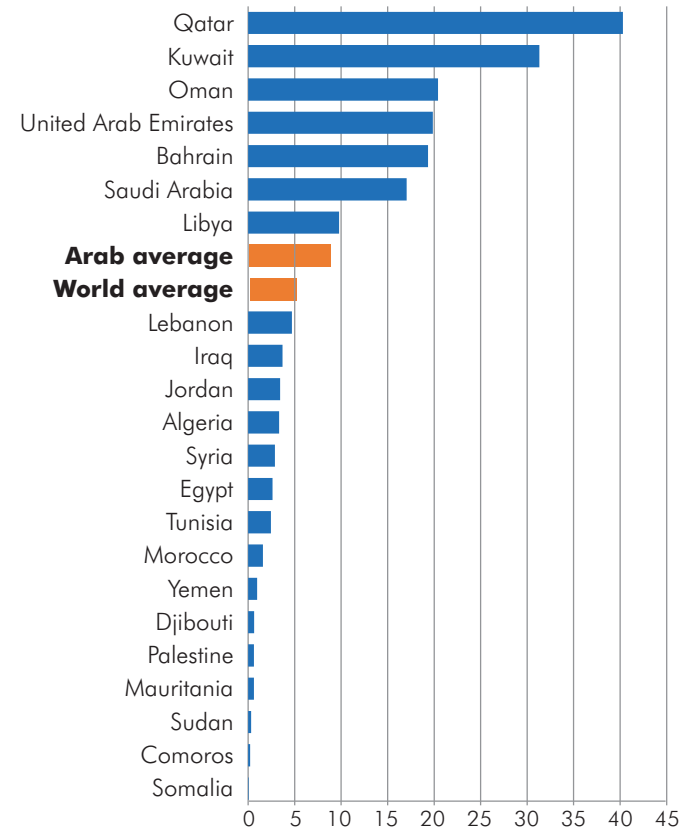
The current level of energy intensity as described in Figure 8 and the large share of residential and commercial consumption of electricity (Figure 10) indicate a low level of energy efficiency. The results of the AFED 2015 survey on sustainable consumption reveals, to some extent, the impacts of energy efficiency policies adopted by governments on consumers' purchase decisions. Only 42 percent of the survey respondents consider electricity consumption as a criterion while purchasing an electrical appliance (Figure 11). The lowest percentage of those who buy electrical appliances based on efficiency was recorded in Qatar (9 percent) and the highest in Tunisia (57 percent) and Jordan (56 percent). These results clearly reflect the importance of adopting Minimum Energy Efficiency Standards (MEPS) for electrical appliance by governments. Tunisians ranked high in considering energy efficiency because of the rigorous energy efficiency policies adopted by the government, and probably a higher level of public awareness. Similarly, 46 percent of the survey respondents consider fuel consumption while purchasing a new vehicle (Figure 12). Brand name and model of cars were the main purchasing factors in Qatar, Saudi Arabia, Bahrain, Kuwait and the UAE, well above 50 percent of the total (countries with high income and very low fuel prices). Fuel efficiency and price dominated as the main factors in Jordan, Egypt, Morocco, Lebanon, Iraq and Tunisia. The highest percentage of those who choose a car for its fuel efficiency was in Jordan (72 percent) and the lowest in Saudi Arabia (17 percent) and Qatar (16 percent), which is a clear direct relationship with fuel prices (see detailed results of AFED consumption survey per country on www.afedonline.org).

The same survey results showed that the use of energy-saving lamps (like CFL and LED) is expanding in Arab countries, as 85 percent of the respondents use them. This indicates the wider availability of energy-saving lamps on the market with easy access to consumers due

to governments' initiatives. Saudi Arabia and Qatar recorded low levels of domestic use of energy-saving lamps (35 percent) due to heavily subsidized electricity prices. On the other hand, high levels of penetration of efficient lamps came from Jordan and Syria (95 percent), Egypt (94 percent) and Lebanon (91 percent), countries that undertook energy-saving initiatives, including price reforms, in the past years.

It is clear that the efficiency of energy production and consumption patterns in the region reveals a huge potential for improvement. Energy efficiency is a development necessity both for oil producing and exporting countries, such as the GCC group, and for oil importing countries such as Jordan and Morocco. The driving forces for improving energy efficiency include alleviating the financial burden of oil imports in the oil importing countries, reducing demand on energy investment, making the best use of existing supply capacities to improve energy accessibility, improving economic competitiveness, reducing local pollution, and mitigating greenhouse gases (GHG) emissions. In addition, for oil producers, energy efficiency would extend the lifetime of their hydrocarbon resources, availing more oil for exports, and reducing their carbon footprint.

FIGURE 9 EMISSIONS METRIC TONS PER CAPITA CO_2 (2010)



Source: World Bank, 2010

FIGURE 10 CHANGE OF CONSUMPTION PATTERNS OF ENERGY RESOURCES IN THE ARAB REGION

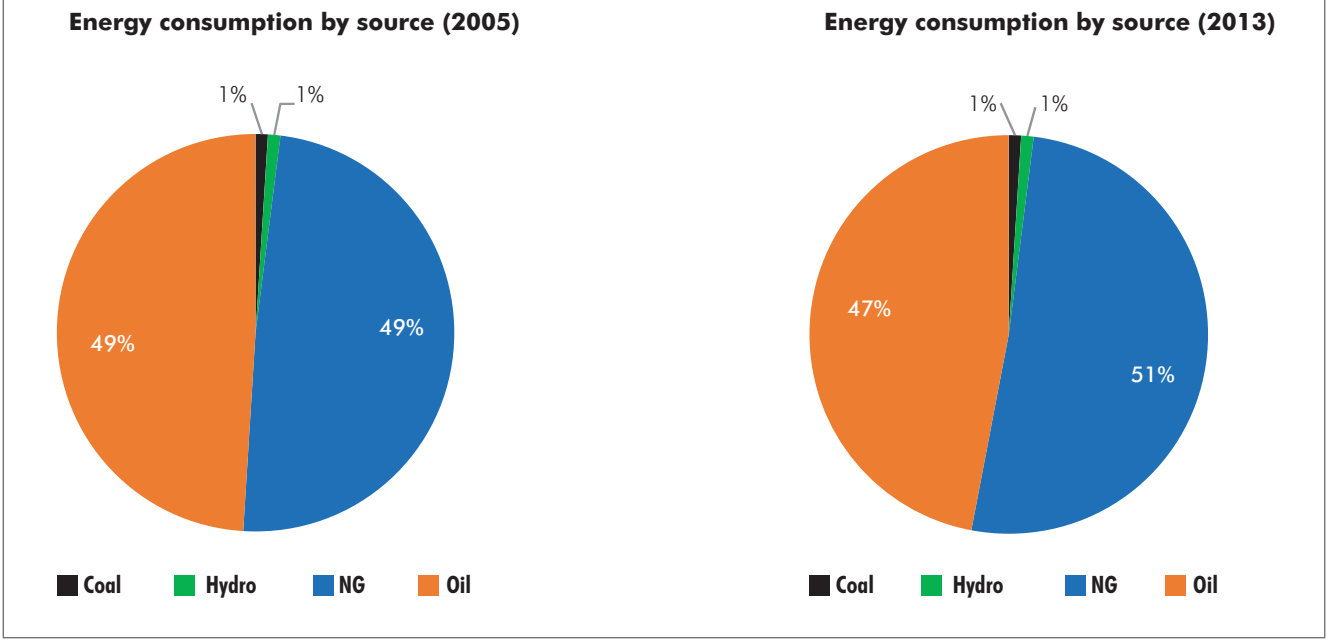


FIGURE 11 MAIN CONCERN WHEN YOU BUY ELECTRICAL APPLIANCE

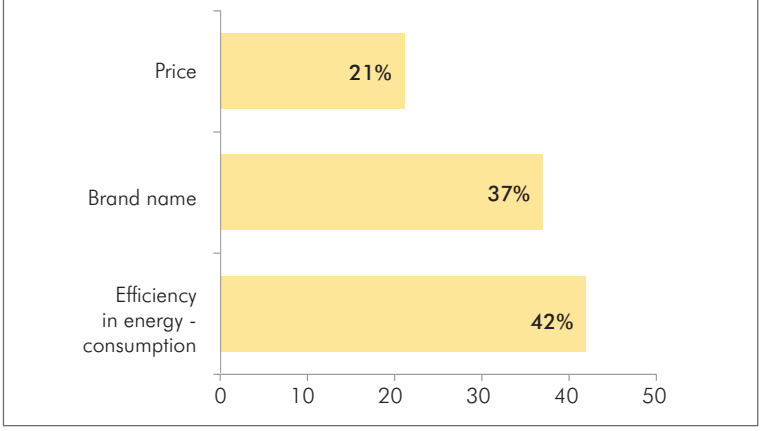
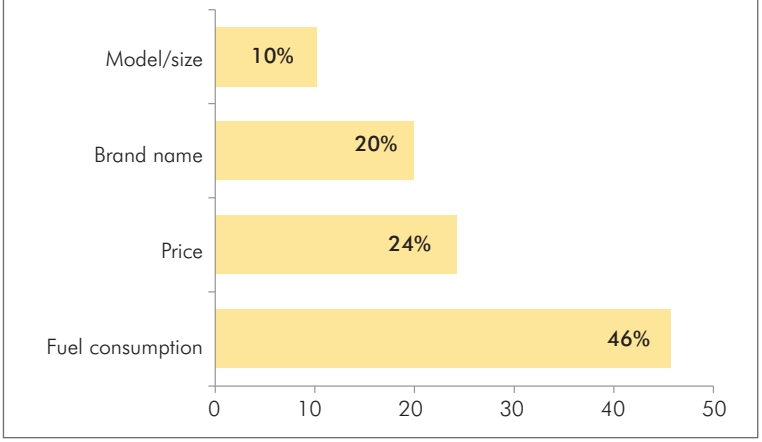


FIGURE 12 MAIN CONCERN WHEN YOU BUY A CAR



B. Water consumption patterns

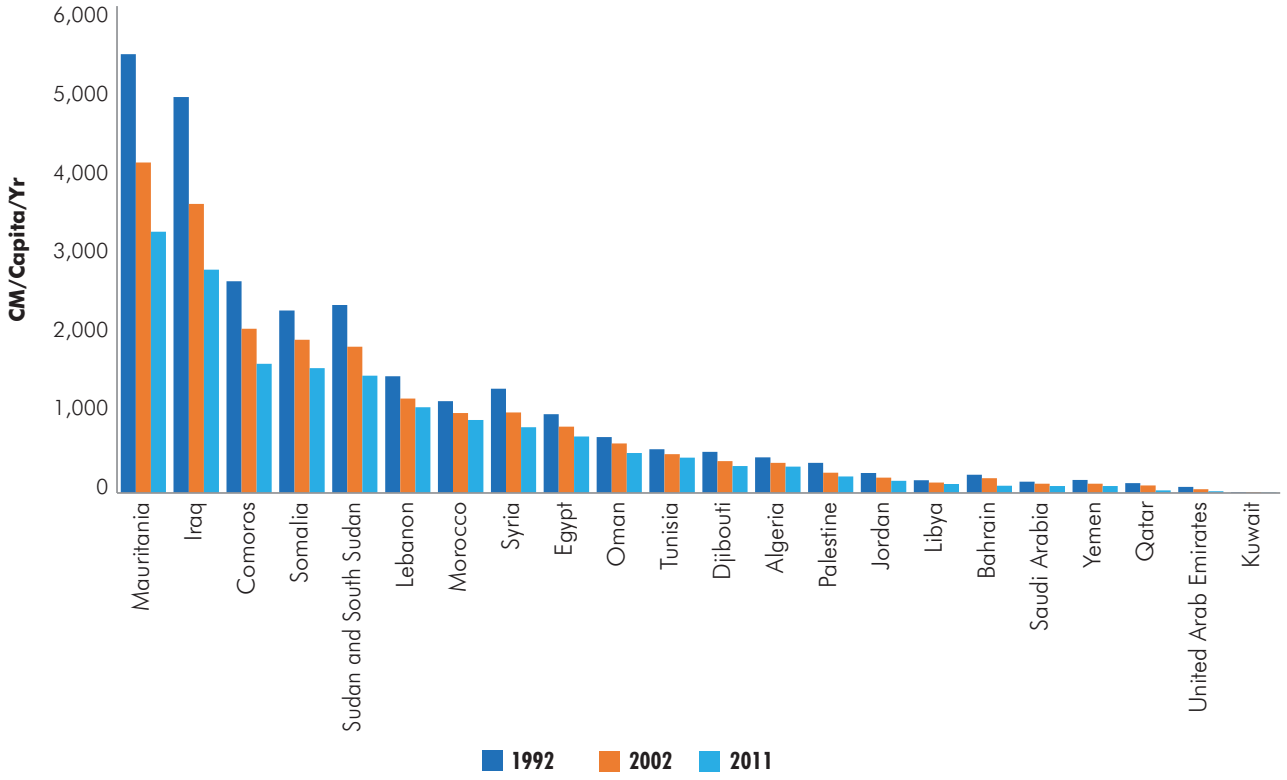
The Arab region is one of the world's most water-stressed regions. Rainfall scarcity and variability, coupled with high evaporation rates, have characterized this part of the world as having limited renewable freshwater resources. Under theses climatic conditions and poor endowment of water resources, and as a consequence of the rapid population growth experienced by the region since the mid 1970s, per capita freshwater availability decreased dramatically in all the Arab countries (Figure 13), with the majority of these countries currently below the border line for water poverty of 1,000 m^3/capita/year. While the world average for water availability is about 7,240 m^3/capita/yr, the average per capita freshwater availability in the Arab region is at about 800 m^3/capita/yr (AFED 2014). Based on projected population increase, it is expected that this indicator will continue to decrease to reach about 500 m^3/yr by the year 2030 when the Arab population surpasses 500 million, meaning that the whole region will experience absolute water poverty, where water will become a major constraint for development, impacting the standard of living, health and environment (Falkenmark, 1989 and AFED, 2014). Furthermore, by then, climate change is expected to have led to 20 percent reduction in renewable water resources and more droughts in the region (Doumani, 2008), which would further exacerbate the current water scarcity situation.

During the past three decades, water demand in all the Arab countries has increased dramatically as a result of increasing population and urbanization, improvements in the standard of living, accelerated industrial development and efforts to increase food self-sufficiency. The total water use for all sectors in the Arab region increased dramatically from about 190 billion cubic meter (BCM) in the mid 1990s (ACSAD, 1997) to about 255 BCM in 2010 (UNDP, 2013), while during the same period the population has increased from about 260 million to about 360 million (UNDESA, 2012).

The AFED survey results indicate, interestingly, that 72 percent of the respondents are aware of the above-mentioned facts of water scarcity in the region, and 77 percent are aware that per capita water consumption is high as well. Ironically, respondents from countries with the highest per capita consumption have a high level of awareness (UAE has a high awareness level of 92 percent, and Kuwait 90 percent). Though 90 percent of respondents from the UAE are aware of the high levels of per capita water consumption, only 50 percent of them indicate that they use water-saving devices at home. This result raises questions on the reasons behind it – whether it is because of availability of those devices in the market, or lack of awareness on their availability, or economics of their use, or a combination of all, remains to be further investigated.

These results show, as well, that public awareness is not enough to change consumption habits.

FIGURE 13 **TRENDS IN TOTAL RENEWABLE FRESHWATER RESOURCES PER CAPITA IN THE ARAB COUNTRIES, 1992, 2002, AND 2011**

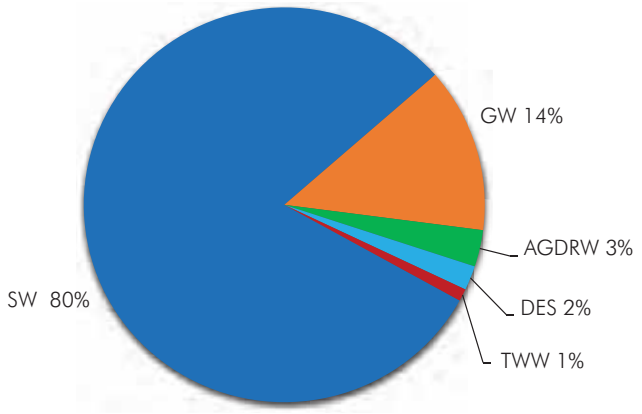


(Graph source: UNDP, 2013, Data source: FAO AQUASTAT, 2013)

Demand side management interventions are needed to complement public awareness.

To meet these escalating demands, Arab countries rely on both traditional water resources (including surface and groundwater resources) and non-traditional water resources (including desalinated water, treated wastewater, and irrigation drainage water), but with varying degrees (Figure 14). Most of the Levant, Nile Valley, and North Africa countries rely mainly on surface water resources, while the Arabian Peninsula countries rely mainly on renewable and non-renewable groundwater resources. All Arab countries are increasingly using treated wastewater, while desalinated water represents progressively a major component in the water budget of the GCC countries. Reuse of agricultural drainage water is practiced mainly in Egypt and Syria. The majority of water resources in the region is being used for agriculture (85 percent), while the municipal and the industrial sectors consume about 8 percent and 7 percent of the total water use, respectively (Figure 15).

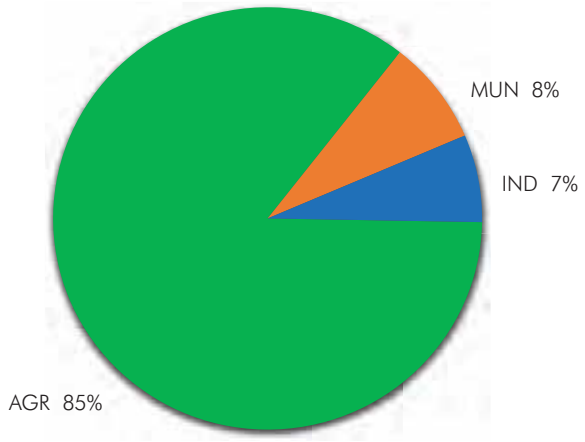
FIGURE 14 **WATER RESOURCES IN THE ARAB REGION**



SW=surface water, GW=groundwater, AGDRW=reused agriculture drainage water, DES=desalinated water, TWW=treated wastewater

In almost all Arab countries, rapid urbanization challenges efforts to meet rising domestic water demand, especially in countries with tight budget constraints. During the period 2005-2015, urbanization has increased from 67 percent to

FIGURE 15 **WATER USES**



AGR=agricultural sector, MUN=municipal sector, IND=industrial sector

about 70 percent of the Arab population, and is expected to continue to increase by the same rate in the next 10 years to reach 73 percent by the year 2025 (UN Urbanization Prospects, 2014). Along with this relatively rapid urbanization rate, domestic water consumption has increased from about 14 BCM in the early 2000s to about 20.4 BCM in 2011 (UNDP 2013), and is expected to increase to about 30 BCM in 2025 (Hamoda, 2004), translating into a more than 50 percent anticipated increase in the next 10 years.

Municipal/domestic water demand has been exaggerated by the level of per capita consumption in many countries in the Arab region. Average per capita domestic water consumption in the region is about 200 liters/day, but varies considerably, both among and within countries (Figure 16). For example in the GCC, which ranks amongst the highest in the world, it is over 500 liters. This volume has dramatically increased over the last three decades. For example, in Kuwait per capita water consumption was only around 200 liters in the 1980s and has increased to around 500 liters in the 2000s. This upward trend has been observed in all the GCC countries. The reasons for this trend are many; in general, the GCC relatively high per capita income and changing life style on one hand, and low municipal water tariffs on the other, are the most important.

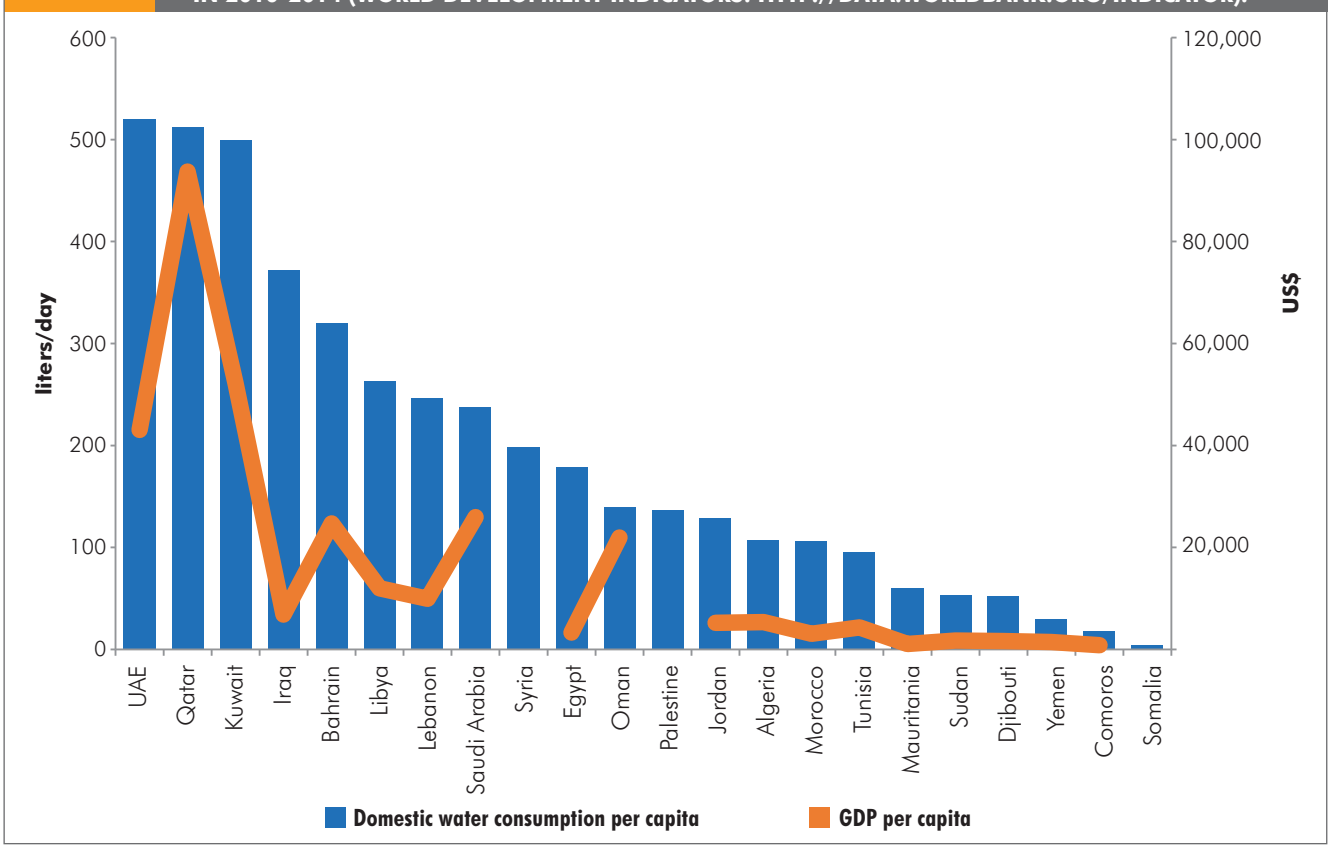
Supply-oriented government policies and subsidies for water supply (i.e., water production from aquifers and desalination plants), without giving adequate attention to efficiency of water use, conservation and demand side management, provide no incentives for consumers to save water (World Bank, 2005). The municipal water tariffs in the majority of the Arab countries are low, also providing no incentive for the consumer to save water. Moreover, it seems that per capita municipal water consumption is closely related to the income levels of the countries, as high-income GCC countries consume a significantly larger amount of water compared to other countries (Figure 16). This analysis suggests that regionally, domestic water consumption can significantly increase with the rise of living standards if water use efficiency and demand management policies and measures are not put in place. The AFED survey results reveal that only 6 percent of the respondents consider low tariffs as a main reason of excessive water consumption, while 77 percent are willing to pay more for their water consumption in return for better social benefits. Governments' fears of water pricing need to be revisited if enhanced social benefits are considered.

C. Food consumption patterns

Agricultural production and food distribution have always been major concerns for governments and social organizations as they seek to feed their populations and prevent extreme outcomes like hunger and famine. Fortunately, improvements in food production technology, processing, and transportation have helped to make food more available, affordable, and convenient. Unfortunately, these changes have negatively impacted diets, making food less diverse, less healthy and less sustainable, and have delivered negative outcomes for human health and the natural environment. While the debate around food security generally focuses on how to secure sufficient food calories for every human, issues of sustainable food consumption and sustainable diets have drawn wider attention.

Arab countries are generally falling short in achieving food security: in its 2014 report on "The State of Food Insecurity in the World," the FAO reveals that the Near East and North Africa is the only region in the world experiencing an increase in both the absolute number and the proportion of undernourished people within

FIGURE 16 PER CAPITA DOMESTIC WATER CONSUMPTION IN THE ARAB COUNTRIES IN 2011 AND GDP PER CAPITA IN 2010-2014 (WORLD DEVELOPMENT INDICATORS: HTTP://DATA.WORLDBANK.ORG/INDICATOR).



the total population. This might be partially attributed to wars and conflicts in countries such as Syria, Iraq, Yemen and Somalia. At the national level, high-income countries with the financial resources to procure food through imports, such as the GCC countries, are sometimes considered much more food-secure than countries with limited agricultural production, poor infrastructure, and weak economic development (Ahmed et al., 2013, and Breisinger et al., 2010). However, even in these resource-rich countries, ensuring adequate energy availability and intake has not been sufficient to achieve total food and nutrition security, as micronutrient deficiencies remain problematic in these countries (Micronutrient Initiative, 2009). In many Arab countries, efforts to achieve food security have focused on increasing agricultural production without considerable attention to the quality and sustainability of the food supply, or to the distribution, allocation, and diversity of food consumed by the population (Meerman et al., 2013). Moreover, issues of environmental, health-related, social, and economic sustainability have been neglected.

Concurrently, Arab countries are experiencing a nutrition transition. Factors driving this transition include economic growth and increased incomes, rapid urbanization, dramatic changes in lifestyle, and globalization of trade and marketing. Although the rate of under-nutrition and underweight, particularly among under-five children, has been on the decline in some Arab countries, there has been a parallel dramatic increase in the prevalence of overweight and obesity and diet-related non-communicable diseases such as diabetes, cardiovascular disease, and cancers (Popkin, 2000). For instance, the rising prevalence of malnutrition has been illustrated by an increase in the number of undernourished children over the past two decades in the Near East and North Africa. While approximately 9 percent of the population was undernourished in 1990-1992, a higher prevalence rate of 10 percent was reported in

2011-2013 (FAO, 2014). Moreover, at least one third of the population in the region is anemic and at risk of iodine deficiency, while 13 million young children suffer from Vitamin A deficiency (WHO, 2011). On the other hand, an estimated 65 percent of adults in Arab countries are overweight and obese, approaching the highest rates worldwide (WHO, 2011).

However, this generalization masks significant variations between Arab countries. WHO (2011) has classified Arab countries into four groups with regard to nutrition transition stages and dominant nutrition problems, major risk factors and underlying causes for non-communicable diseases, intervention programs in response to these problems, and enabling environmental factors for improved action. It is worth mentioning that even relatively wealthy Arab countries are subject to the triple burden where they simultaneously report stunting, overweight and obesity, and micronutrient deficiencies and, as such, are classified in advanced stages of the nutrition transition (Table 4). An important factor behind the above-mentioned nutrition transition in Arab countries is possibly the change in per capita energy (calories intake) consumption pattern. WHO reports a substantial increase in energy consumption in the Near East and North Africa region in recent decades, with levels that have exceeded the global average and that are expected to remain so in the next decade (Table 5).

These regional trends in food consumption patterns again mask significant variation at the national level. Table 6 shows a gradual and significant increase in daily energy supply across most Arab countries, as well as variations therein over the past few decades. For example, while per capita energy supply has increased by only 19 percent in Yemen over the period 1965-2011, it has more than doubled in Algeria (102 percent) over the same period. A sharp increase in daily energy supply has also been observed in Egypt (60 percent), Saudi Arabia (68 percent) and Libya (80 percent). Only five Arab countries

TABLE 4 **CLASSIFICATION OF ARAB COUNTRIES ACCORDING TO NUTRITION TRANSITION**

Category	Characteristics	Countries
Countries in advanced nutrition transition	• high levels of overweight and obesity • moderate levels of undernutrition and micronutrient • deficiencies in some population subgroups	GCC countries Tunisia
Countries in early nutrition transition	• moderate levels of overweight and obesity • moderate levels of undernutrition in specific population and age groups • widespread micronutrient deficiencies	Egypt Jordan Lebanon Libya Morocco Palestine Syria
Countries with significant undernutrition	• particularly high levels of acute and chronic child malnutrition • widespread micronutrient deficiencies • emerging overweight, obesity and malnutrition of affluence in certain socioeconomic subgroups	Djibouti Iraq Yemen population subgroups in GCC countries, Palestine (Gaza) and Tunisia
Countries in complex emergency	• severe child and maternal undernutrition • widespread micronutrient deficiencies	Somalia Sudan

Source: Adapted from WHO, 2011

TABLE 5 GLOBAL AND REGIONAL PER CAPITA ENERGY CONSUMPTION OF FOOD (KCAL/CAPITA/DAY)

	1964-1966	1974-1976	1984-1986	1997-1999	2015	2030
World	2,358	2,435	2,655	2,803	2,940	3,050
Near East and North Africa	2,290	2,591	2,953	3,006	3,090	3,170

Source: WHO, n.d.

TABLE 6 NATIONAL PER CAPITA ENERGY SUPPLY OF FOOD (KCAL/CAPITA/DAY)

Country	1965	1975	1985	1995	2005	2011	Percent Increase, 1965-2011 (%)
Algeria	1,591	2,058	2,613	2,785	2,958	3,220	102
Bahrain	-	-	-	-	-	-	-
Comoros	-	-	-	-	-	-	-
Djibouti	1,586	1,661	1,562	1,707	2,264	2,526	59
Egypt	2,229	2,430	3,069	3,315	3,367	3,557	60
Iraq	2,054	2,200	3,321	2,202	2,354	2,489	21
Jordan	2,158	2,138	2,651	2,687	3,119	3,149	46
Kuwait	2,556	2,538	2,922	3,214	3,576	3,471	36
Lebanon	2,472	2,437	2,933	3,287	3,128	3,181	29
Libya	1,783	2,995	3,251	3,225	3,190	3,211	80
Mauritania	2,129	1,959	2,449	2,533	2,632	2,791	31
Morocco	2,173	2,617	2,864	2,952	3,207	3,334	53
Oman	-	-	-	-	-	-	-
Palestine	-	-	-	-	2,237	2,032	-
Qatar	-	-	-	-	-	-	-
Saudi Arabia	1,857	1,795	2,703	2,852	2,973	3,122	68
Somalia	1,863	1,898	2,028	1,624	1,779	1,696	-9
Sudan	1,610	1,907	2,006	2,169	2,296	2,346	46
Syria	2,143	2,559	3,039	2,967	3,101	3,106	45
Tunisia	2,393	2,674	3,064	3,129	3,223	3,362	40
UAE	2,587	3,141	3,477	3,261	3,210	3,215	24
Yemen	1,842	1,870	2,054	2,043	2,093	2,185	19

FAOStat (2015) and authors' calculations

(Iraq, Palestine, Somalia, Sudan, and Yemen) have reported an energy supply of less than 2,500 kcal/capita/day, while nearly all other countries have reported an energy supply of over 3,000 kcal/capita/day.

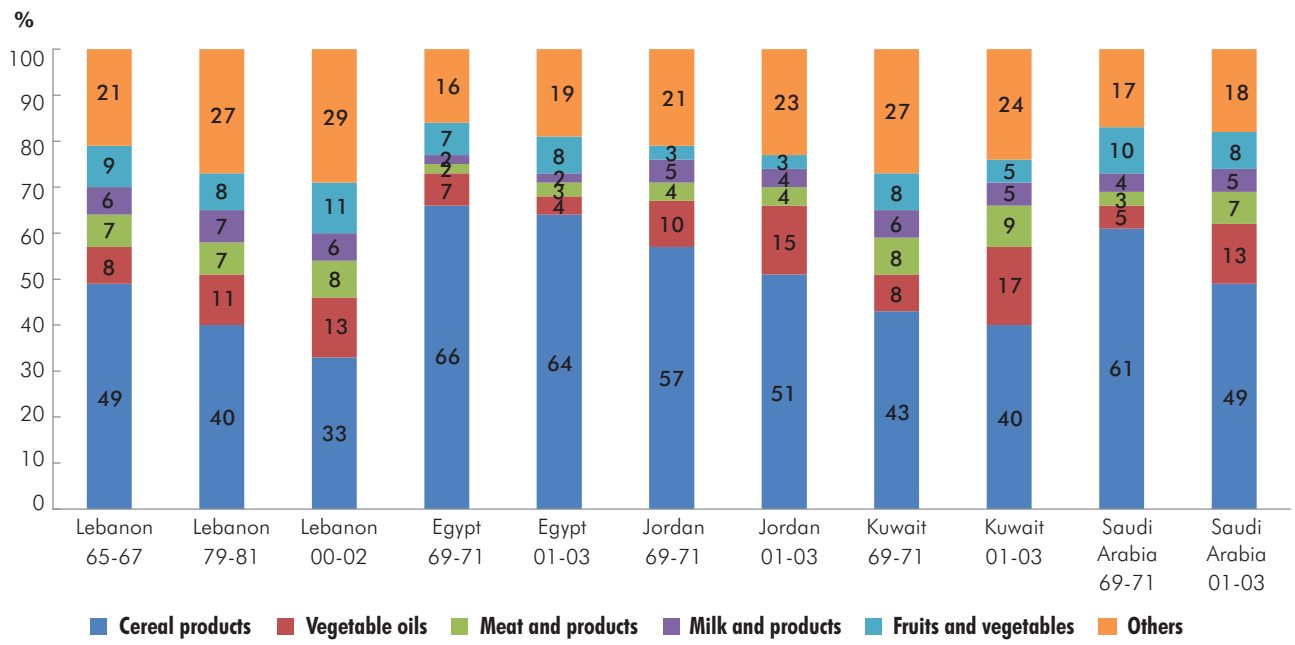
It is worth to emphasize that total energy supply, as noted above, does not fully reflect food and nutrition security. A diversity of nutrients is also required to ensure good health and prevent disease. No single food can provide all of the nutrients necessary for optimal health. Rather, a varied diet that is nutritionally complete is needed to ensure adequate amounts of essential macro- and micronutrients (Horwath et al., 1999; Bernstein et al., 2002; Hollis and Henry, 2007). Data on changes in percent dietary energy supply from various food groups in selected Arab countries over the past few decades are shown in Figure 17. A dramatic increase in the proportion of energy from vegetable oils has been particularly documented in Kuwait, Saudi Arabia, and

Lebanon, and to a lesser extent in Egypt and Jordan. The proportion of energy from fruits and vegetables has also decreased in Kuwait and Saudi Arabia, but increased in Lebanon.

It should be noted, as well, that supply levels should be treated with caution, as they do not reflect actual consumption. More recently, Afshin et al. (2015) evaluated national intakes of harmful and protective foods in countries of the MENA region using 2010 consumption data. Most, if not all, Arab countries showed insufficient per capita consumption of protective foods (fruits, vegetables and beans, nuts and seeds, whole grains, and seafood omega-3 fatty acids) that fell well below recommended levels. In fact, all Arab countries consumed fruits in amounts less than the recommended level of above 300 g/day. Similarly, no Arab country consumed the recommended level of vegetables and beans of above 400 g/day. Only three countries (Tunisia, Syria, and Lebanon) met or exceeded the recommended level of above 16 g/day for nuts and seeds. As for whole grains, the majority of Arab countries consumed 59-63 g/day, below the recommended level of above 125 g/day. Similarly, the majority of Arab countries consumed 50-75 mg/day of seafood omega-3 fatty acids, well below the recommended level of above 250 mg/day. Lowest intakes of protective food components were observed in Libya for fruits, vegetables and beans; in Saudi Arabia for nuts and seeds; in Egypt for whole grains; and in Lebanon for seafood omega-3 fatty acids. Figure 18 displays national consumption data of protective food components across Arab countries as reported by Afshin et al. (2015).

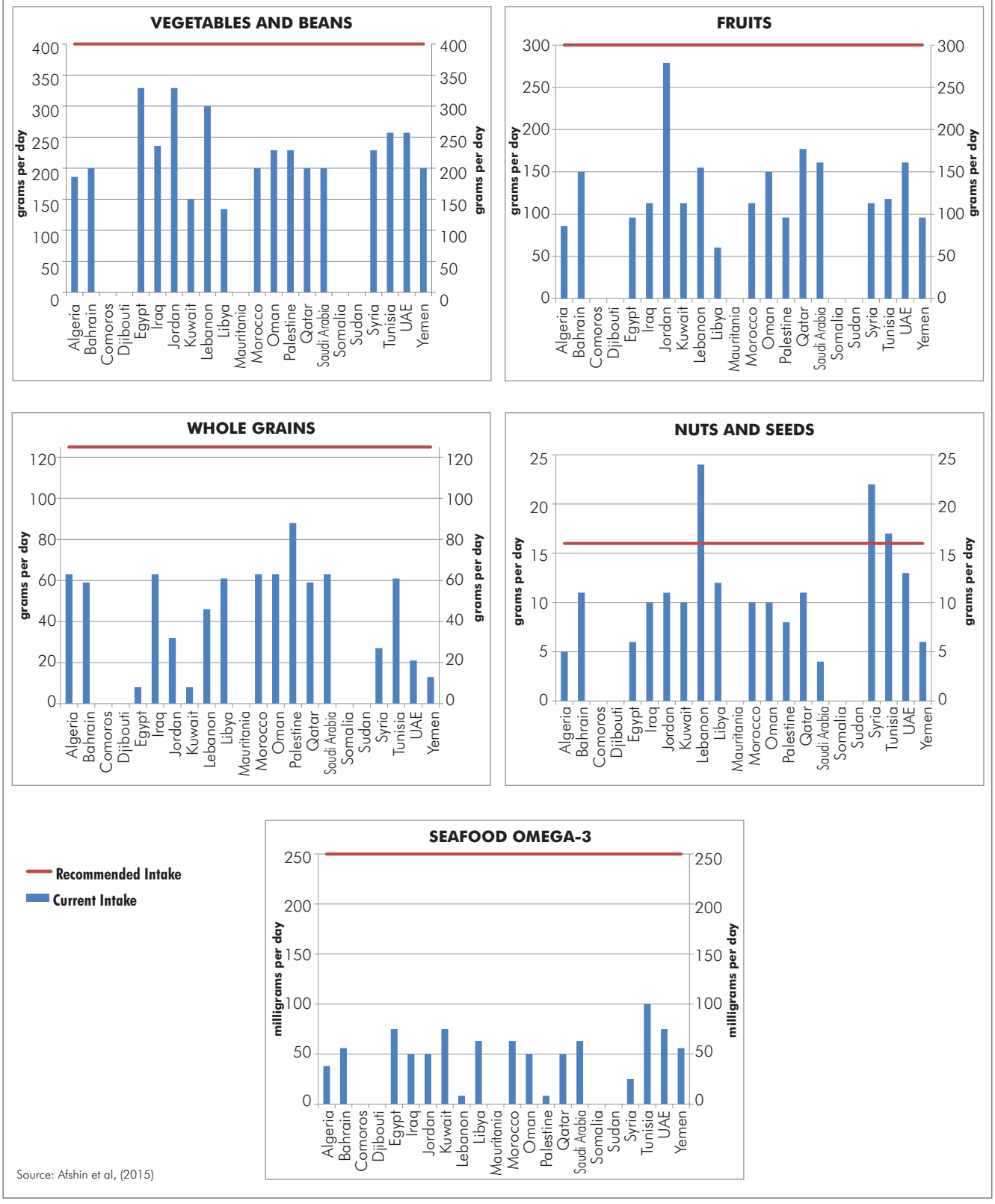
As for harmful food components, all Arab countries showed higher than recommended per capita consumption of selected food components (processed meat, red meat, trans-fatty acids, sugar-sweetened beverages, and sodium). For instance, while consumption of processed meat is not recommended, intake ranged between 3.4-6.5 g/day across most countries (an average of 1.5 kg per year). As for red meat, while the recommended level is 100 g/week, all Arab countries consumed levels ranging between 300-700 g/week. Regional consumption of trans-fatty acids was in the range of 1-3 percent E/day, higher than the recommended level of below 0.5 percent E/day. While consumption of sugar-sweetened beverages is not recommended, most

FIGURE 17 **PERCENT DIETARY ENERGY SUPPLY FROM FOOD GROUPS: A COMPARISON OF MENA COUNTRIES (FAOSTAT)**



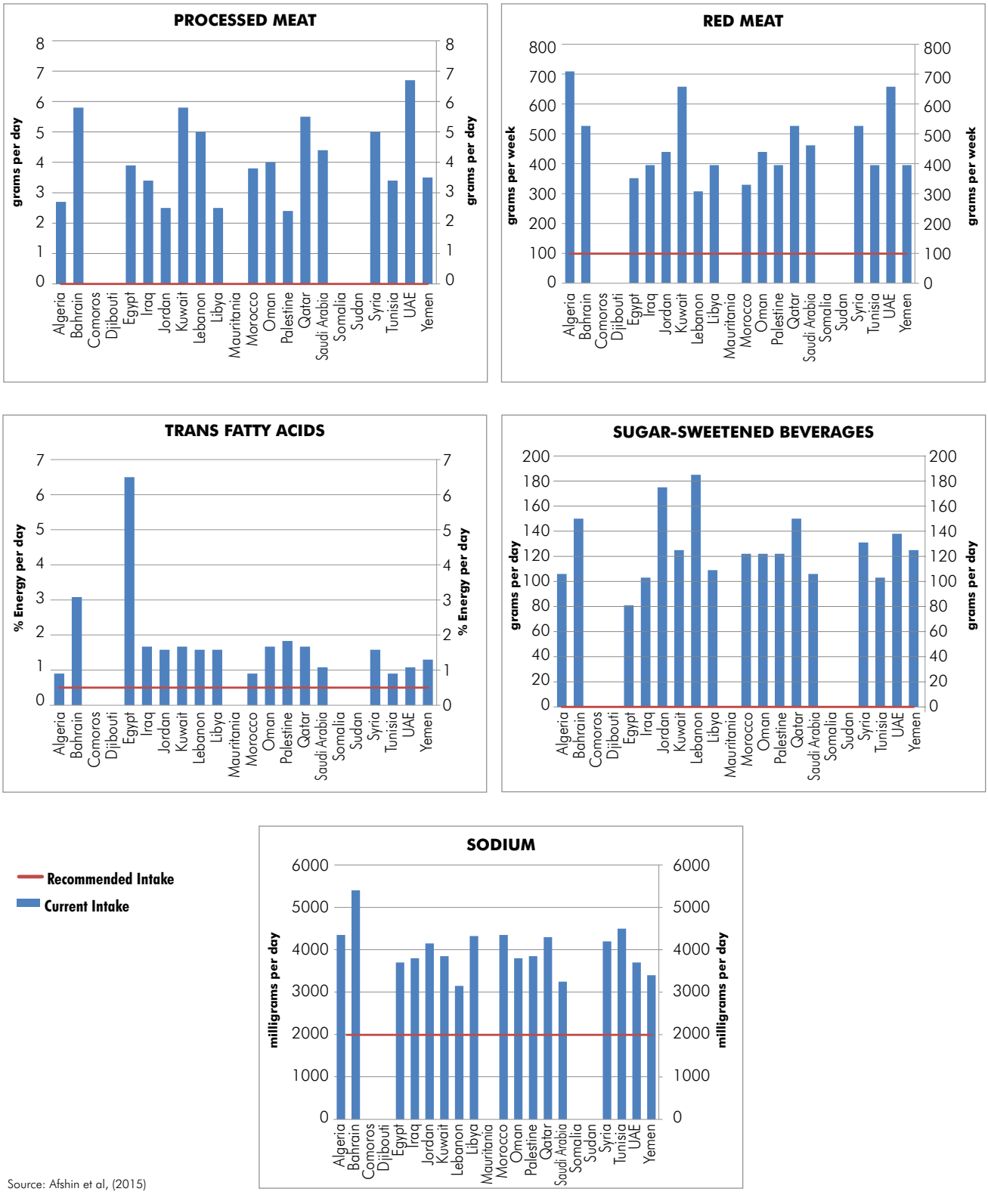
Source: Sibai et al., 2010

FIGURE 18 NATIONAL CONSUMPTION AND RECOMMENDED INTAKES OF PROTECTIVE FOOD COMPONENTS IN ARAB COUNTRIES



Source: Afshin et al, (2015)

FIGURE 19 NATIONAL CONSUMPTION AND RECOMMENDED INTAKES OF HARMFUL FOOD COMPONENTS IN ARAB COUNTRIES



Source: Afshin et al, (2015)

Arab countries had intakes between 100-185 g/day. The MENA region also suffers from high sodium intake above the recommended level of below 2,000 mg/day, as evident by the majority of Arab countries consuming 3,500-5,000 mg/day of sodium. Highest intakes of harmful food components were observed in the UAE for processed meat; in Algeria for red meat; in Egypt for trans-fatty acids; in Lebanon for sugar-sweetened beverages; and in Bahrain for sodium. Figure 19 shows national consumption data of harmful food components across Arab countries as reported by Afshin et al. (2015).

Additionally, many such possibly harmful components of the Arab diet are also examples of foods that have a negative impact on the sustainability of the current food system and hence on food and nutrition security. For example, red meat is currently over-consumed, with negative impacts on both human health and sustainability of the food system while fish and seafood are protective foods that are under-consumed but whose production can be more sustainable. Thus, changing dietary habits is a crucial issue involving intricate social and cultural values and traditions. For example, dwindling water resources is likely to prevent some countries from producing enough of a certain traditional crop, like rice, for an ever-growing population. The same applies to red meat, as raising cattle is a water-intensive activity. Moreover, cows in particular produce a very high level of greenhouse gases, which intensifies climate change. When asking the Arabs whether they are ready to change their dietary habits to protect the environment or the public health, the answers were surprisingly positives, as 84 percent of the respondents were ready to do so to save the environment, while an astounding majority of 99 percent went for it if it would protect their health, such as fighting obesity, diabetes and blood fats. Since considering that what is better for the health is better for the environment, as most cases show, the results might indicate that a good approach to promote positive change in food consumption patterns is to put more emphasis on the health benefits, as they are more easily recognized by the public.

VI. CONCLUSION AND RECOMMENDATIONS

Though the Arab region was one of the first to adopt a regional strategy for SCP, development and implementation of SCP strategies in most Arab countries are still lagging. The Arab demand on energy, water, and food is driven by a myriad of socio-economic and geographic factors including level of development, population growth, urbanization, scarcity of water resources, climate conditions, government policies and pricing schemes. Yet, the region is truly heterogeneous in terms of those factors and the level of per capita consumptions varies accordingly.

The AFED 2015 survey on sustainable consumption reveals the impacts of governments' interventions on purchasing decisions and patterns of consumption. Only 9 percent of the Qataris buy electrical appliances based on their energy efficiency, while the same figure increases to 57 percent in Tunisia. Similarly, brand name and model of cars were the main purchasing criteria in the GCC (countries with high income and very low fuel prices), while fuel efficiency and price dominated as the main factors for purchasing a car in Jordan, Egypt, Morocco, Lebanon, Iraq and Tunisia. Only 17 percent of Saudis would choose a car for its fuel efficiency, while the number increases to 72 percent in Jordan, which reveals a direct relationship between car purchase decisions and fuel prices. The same survey shows that public awareness is not enough to change consumption habits, and governments' interventions through demand side initiatives are inevitable to complement public awareness.

Though most of the Arab countries have had a long history of subsidizing energy, water, and food prices for different reasons, experience shows that subsidies only

promote wasteful consumption behavior, and do not help to ease the burden on the poor, as over 90 percent of the general subsidies go to the rich. An interesting response of the AFED survey, worth to consider while planning to reform energy and water pricing in the region, shows that 77 percent of the respondents agree to pay more for water and energy if compensated with better social benefits, such as education, health insurance and adequate pensions. Thus, governments' fears of price reforms need to be revisited if enhanced social benefits are considered.

Increased welfare is a major driver of food demand and changes in food consumption habits in the region. The Arab population is experiencing a nutrition transition characterized by a shift away from a traditional, more seasonal, and more diverse diet, rich in whole grains, fruits, and vegetables, towards a diet that is high in refined cereals, animal protein, fats, sugar, and salt. Although the rate of under-nutrition and underweight among under-five years children has been on the decline in some Arab countries, there has been a parallel dramatic increase in the prevalence of overweight, obesity and diet-related diseases such as diabetes, cardiovascular disease, and cancers. Changing dietary habits is a crucial issue involving intricate social and cultural values and traditions. The survey results indicated that 84 percent of the respondents are ready to change their dietary habits to protect the environment and 99 percent are ready to do so for better public health.

The Arab region is known to be energy rich, water scarce, food deficient, and one of the world's most economically and environmentally vulnerable regions to climate change. The current weak or lack of policy coordination for water, agriculture land, energy, and climate change calls for the adoption of the nexus approach when addressing the management of these vital resources in a changing climate.

In order for the Arab countries to gradually shift to sustainable consumption and production, every country, based on its respective socio-economic circumstance, needs to identify priority actions and enabling conditions necessary to facilitate that transition. These enabling conditions include: good governance, integrated policy planning, sound regulatory regime, use of market-based instruments, capacity development, access to finance and investments, research and development, public awareness, and green procurement.

REFERENCES

AFED (2010). Arab Environment: Water - Sustainable Management of a Scarce Resource. Annual Report of the Arab Forum for Environment and Development (AFED), El-Ashry, M., Saab, N. and Zeitoon, B. (Eds.). Beirut, Lebanon. Technical Publications.

AFED (2013). Arab Environment: Sustainable Energy. Annual Report of the Arab Forum for Environment and Development (AFED), Abdel Gelil, I., El-Ashry, M. and Saab, N. (Eds.); Beirut, Lebanon. Technical Publications.

AFED (2014). Arab Environment: Food Security. Annual Report of the Arab Forum for Environment and Development, 2014; Sadik, A., El-Solh, M. and Saab, N. (Eds.); Beirut, Lebanon. Technical Publications.

Afshari, A., Nikolopoulou, C. and Martin, M. (2014). Life-Cycle Analysis of Building Retrofits at the Urban Scale—A Case Study in United Arab Emirates, Sustainability (2014)6, 453-473. Available at: www.mdpi.com/journal/sustainability.

Afshin, A., Micha, R., Khatibzadeh, S., Fahimi, S., Shi, P., Powles, J. and Mozaffarian, D.(2015). "The impact of dietary habits and metabolic risk factors on cardiovascular and diabetes mortality in countries of the Middle East and North Africa in 2010: a comparative risk assessment analysis." British Medical Journal Open, 5:e006385.doi:10.1136/bmjopen-2014-006385.

Ahmed, G., Hamrick, D., Guinn, A., Abdulsamad, A. and Gereffi, G. (2013). Wheat

value chains and food security in the Middle East and North Africa region. Duke University Center on Globalization, Governance, and Competitiveness, Durham, NC.

Bernstein, M.A., Tucker, K.L., Ryan, N.D., O'Neill, E.F., Clements, K.M., Nelson, M.E., Evans, W.J. and Fiatarone Singh, M.A. (2002). "Higher dietary variety is associated with better nutritional status in frail elderly people." Journal of the American Dietetic Association, 102: 1096–1104.

Breisinger, C., van Rheenen, T., Ringler, C., Pratt, A.N., Minot, N., Aragon, C., Yu, B., Ecker, O. and Zhu, T. (2010). "Food security and economic development in the Middle East and North Africa: Current state and future perspectives." IFPRI Discussion Paper 00985. International Food Policy Research Institute, Washington, D.C.

El-Katiri, L. and Fatouh, B. (2015), A brief political economy of energy subsidies in the Middle East and North Africa, OIES paper.

ESCWA (2001), Energy options for desalination in selected ESCWA member countries., ESCWA.

FAO (2008). Climate Change and Food Security: A Framework Document. Rome: FAO.

FAO (2011). Energy-Smart Food at FAO: An Overview. Environment and natural resources management working paper. Rome: FAO.

FAO (2014) FAO Statistical Yearbook 2014: Near East and North Africa Food and Agriculture. Food and Agriculture Organization of the United Nations, Rome.

GTZ (2010). Fossil Fuel Prices in the Arab World and the Fear of Reform: Challenges facing reform attempts and the way forward.

Habitat, Habitat, Urbanization and Urban Risks in the Arab Region, 2013. 1st Arab Region Conference for Disaster Risk Reduction, 19 – 21 March 2013 at Aqaba - Jordan Katja Schäfer – UN-Habitat Regional Office for Arab States (ROAS).

Hollis, J.H. and Henry, J.K. (2007). "Dietary variety and its effect on food intake of elderly adults."Journal of Human Nutrition and Dietetics, 20: 345–351.

Horwath, C., Kouris-Blazos, A., Savige, G. and Wahlqvist, M.L. (1999). "Eating your way to a successful old age, with special reference to older women." Asia Pacific Journal of Clinical Nutrition, 8: 216–225.

Johnston, J., Fanzo, J. and Cogill, B. (2014). "Understanding sustainable diets: A descriptive analysis of the determinants and processes that influence diets and their impact on health, food security, and environmental sustainability." Advances in Nutrition, 5: 418-429.

LAS (2009). Arab Regional Strategy on Sustainable consumption and Production.

Meerman, J., Garrett, J. and Wüstefeld, M.(2013). "Development partners and country programming in nutrition and agriculture." SCN News, 40: 10-18.

Micronutrient Initiative. (2009). Investing in the future: A united call to action on vitamin and mineral deficiencies, global report 2009. Micro-Nutrient Initiative, Ottawa.http://www.unitedcalltoaction.org/documents/Investing_in_the_future.pdf.

Popkin, B. (2000). "Urbanization and the nutrition transition." IFPRI Brief, 7. International Food Policy Research Institute, Washington, D.C.

Sachs J. et al. (2010).Monitoring the world's agriculture, Nature, 466, 558-560.

SEI (2011). Understanding the Nexus, Background paper for the Bonn2011 Nexus Conference. Bonn2011 Conference, The Water, Energy and Food Security Nexus: Solutions for the Green Economy, 16 – 18 November 2011, Bonn, Germany.

Siddiqi, A. and Anadon, L., The water–energy nexus in Middle East and North Africa, Energy Policy 39 (2011) 4529-4540.

UNCED (1992). Agenda 21. Available at: https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf.

UNDESA (United Nations Department of Economic and Social Affairs) (2012) World Population Prospects, the 2012 Revision. New York. [http://esa.un.org/unpd/wpp/Excel-Data/population.htm].

UNDP (2013). Water Governance in the Arab Region: Managing Scarcity and Securing the Future. UNDP Regional Bureau of Arab States (RBAS). [Available at:http://www.arabstates.undp.org/content/rbas/en/home/library/huma_development/water-governance-in-the-arab-region.html.

UNEP (2010). ABC of SCP: Clarifying concepts on SCP., available at: http://www.uneptie.org/scp/marrakech/pdf/ABC%20of%20SCP%20-%20Clarifying%20Concepts%20on%20SCP.pdf.

World Bank (2012). Adaptation to a Changing Climate in the Arab Countries, available at: http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-9459-5.

World Bank (2014). HARNESSING THE GLOBAL RECOVERY: A TOUGH ROAD AHEAD, available at: http://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-0395-6.

World Bank (2015). WDI, available at: http://data.worldbank.org/data-catalog/world-development-indicators.

World Bank, FAO, IFAD (2009). Improving food security in Arab countries.

World Health Organization (WHO) (2011). Regional strategy on nutrition 2010–2019 and plan of action. WHO Regional Office for the Eastern Mediterranean: Cairo.

World Health Organization (WHO) (n.d.). "Global and Regional Food Consumption Patterns and Trends." http://www.who.int/nutrition/topics/3_foodconsumption/en/ [accessed March 13, 2015].

WSSD (2002).Johannesburg Plan of Implementation, Chapter III., available at: http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf.

WW (2007). The World's Water 2006–2007 Data, report of the Pacific Institute. Available: /http://www.worldwater.org/data.html.

NOTES

1. FAO defines the Near East and North Africa region as including Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen.

2. According to the World Health Organization (2015), overweight is defined as a body mass index (BMI) greater than or equal to 25 and less than 30; obesity is defined as a BMI greater than or equal to 30.

3. Food supply is used as a rough proxy for food consumption. Total food supply may overstate consumption, as food may be wasted or otherwise not consumed.

ANNEX

ENABLING CONDITIONS FOR SUSTAINABLE CONSUMPTION AND PRODUCTION IN THE ARAB REGION

Hussein Abaza

In order for the Arab countries to gradually shift to SCP, every country, based on its respective socio-economic circumstances, needs to identify priority actions and enabling conditions necessary to facilitate that transition. The following is shopping lists from which governments can use to tailor make their interventions. However, it is worth noting that government actions and policy interventions though essential, they will not be sufficient to bring about sustainable consumption and production in Arab countries without the engagement and active role of different actors and stakeholders in the Arab world. Civil society and the private sector as well as the general public have an important role to play in bringing about a change in consumption and production patterns that uses scarce natural resources in a more efficient and sustainable manner.

1. Good governance

A strong governance system that promotes transparency, accountability, and stakeholder participation is essential in promoting more sustainable consumption and production patterns and promoting a transition to a green economy. Moreover, fighting corruption is also a necessary prerequisite for a strong and efficient governance structure. Apart from promoting an all-inclusive approach to policy and decision-making, good governance should ensure an equitable distribution of incomes and wealth and the involvement of women and youth. This has been one of main reasons that have resulted in the series of unrests and revolutions in several Arab countries. Engaging different segments of the population in the decision-making process, promoting social justice and equity are all factors that contribute

to the acceptability of proposed policy measures and their successful implementation. They promote a sense of ownership andbelonging to the country, which consequently increases workers' productivity and positive attitude towards the government and its decisions. Adopting a participatory approach in the design and implementation of measures and policies that contribute towards sustainable consumption and production will ensure that the different interests of community stakeholders are taken into account. Officials, civil servants and decision makers should be provided with information, capacity training, and the ability to analyze challenges, assess opportunities and ensure coordination between different entities in order to avoid redundant, inefficient, and conflicting policies.

Overall managerial restructuring and reform of certain public bodies and the establishment of new ones with specialized mandates related to sustainable consumption and production could significantly facilitate the introduction of necessary policy tools and measures to green the economy and achieve sustainable development. Strategic environmental assessments, project level impact assessment, identifying sustainable development indicators, life cycle analysis, integrated environmental and economic accounting, and public environmental expenditure reviews are tools that could be used.

2. *Integrated policymaking*

Integrating environmental and social considerations with macroeconomic and sectoral policies are essential in achieving sustainable development. Integrated policy making should include the mainstreaming of sustainable consumption and production and greening the economy as a tool to achieve sustainable development. Such integration is necessary in designing overall government strategies and in formulating, plans, programs, and projects. A strong and good governance system will facilitate the realization of this integration. It will also facilitate the implementation of the proposed strategy, plans, programs, and projects. Integrated policymaking for sustainable consumption and production and green transformation should be conducted in a manner that contributes to achieving a number of key objectives. This includes promoting a more sustainable production and consumption practices, resource efficiency, waste reduction and eventually avoidance, the introduction and use of innovative technologies, enhanced competitiveness of final products, and job creation.

Social cohesion and equity considerations are essential elements that should be taken into account in introducing policy packages that promote sustainable consumption and production and the transitioning into a green economy. Special consideration should also be given to under privileged and marginalized communities. Subsidy reform for water, energy and food should be accompanied by the introduction of compensatory measures such as employment opportunities, and affordable housing and public transport systems, as well as social services, including access to health, educational, cultural and recreational services. Monitoring and evaluation should be introduced to continuously monitor and assess the adequacy of policies, the impact they have on different segments of the population, the extent of their inclusiveness, and in bringing about a transition to more sustainable and green economies.

Investments in much needed social and physical infrastructure and services especially in rural areas in the form of health, sanitation, and education can raise the standard of living of the rural population, their productivity, and sense of belonging.

3. Regulatory framework

Regulations can provide a strong and effective means for supporting and encouraging a transition towards more sustainable patterns of consumption and production in the Arab world. Certification for sustainably grown agricultural products, eco labeling and energy efficiency labels are possible tools that can be introduced through regulations. More than half of the Arab countries have adopted minimum energy efficiency standards for household appliances. However, the problem lies in monitoring and enforcing these codes standards. In addition, regulatory measures may also include the introduction of green building codes and equipment that promote water and energy efficiency. Mandatory building codes and the introduction or strengthening of standards for air conditioners are becoming more common in the region. Many Arab countries have adopted either mandatory or voluntary forms of energy efficiency building regulations, these include for examples UAE, Qatar, Kuwait, and Lebanon.

Regulations could also be designed to direct food production that leads towards food products that has more nutritious value, affordable to consumers and reduces the environmental footprint of the food products.

Weak compliance and monitoring mechanisms are among the main challenges facing the effectiveness of regulations in the Arab region. Financial resources and capacities needed in designing and managing a national regulatory framework represent a major constraint in many Arab countries.

4. Market based incentives

Economic incentives should be designed to support regulatory command and control mechanisms. They should be carefully selected to influence behavior towards more sustainable patterns of production and consumption. An incentive system should also be designed to encourage private sector engagement and investments in social and green infrastructure projects.

There is a need to reform the entire fiscal and tax system to achieve this goal. It is essential for example to shift the tax system from taxing jobs and incomes to taxing unsustainable practices. It should be designed to apply the polluter-pays principle, attempt to reflect full cost pricing of natural resources, and internalize environmental and social externalities. Full consideration should be given to ensuring that the proposed tax system does not represent an extra burden on citizens, particularly low-income and poor families. Moreover, it should attempt to achieve revenue neutrality, which does not result in reduced governments' revenues.

Economic instruments include taxes, pollution charges, credits and rebates, R&D grants, subsidy reform, and green subsidies. Other tools include feed-in-tariffs to promote the business competitiveness of renewable energy sources and encourage the building of its related infrastructure. Payment for providing ecosystem service schemes (PES) to promote ecosystem and biodiversity conservation is another economic tool that contributes to the sustainable management of natural resources.

More specifically government should reform the subsidies system to encourage the efficient allocation and use of resources and discourage consumption and production patterns. This is particularly important since subsidies in several Arab countries continue to represent a burden on government budgets and in many instances fail to reach the targeted segments of the population they are designed to support. Such a reform will reduce pressure on government budgets and release financial resources to provide the much needed social services, fund environmental activities, and investments in human resources and R&D. Subsidized water, electricity, fuel, food, and waste collection schemes are all examples of the extent of current local market distortions contributing to unsustainable production and consumption patterns that need to be corrected.

5. Human resource development

Investing in human resource development is key in making a qualitative shift towards sustainable consumption and production patterns and supporting government efforts to achieve sustainable development. Investing in human capital through an improved education system that integrates sustainability consideration across all disciplines is a necessary prerequisite to provide the needed calibers at all levels, whether managerial, technical, or skilled labor to support a transition to a green and sustainable economy. A well-educated and informed public will go a long way in supporting a transition to more sustainable and green economy that uses resources in a prudent and more efficient manner.

6. Access to finance and facilitating Investments

It is crucial to gradually redirect existing financial resources

towards sustainable development plans, programs, and activities. Innovative financial mechanisms include the introduction of soft loan programs, credit schemes, hedge funds, social venture capital, carbon credits, and micro finance. It is also important to emphasize that access to finance tools endorsed by governments should target small and medium size enterprises as they represent a large percentage of operating companies in the Arab world.

Financial tools should be used to stimulate local market demand; investments and practices along more sustainable consumption and production by supporting consumer-based schemes to purchase locally produced green and energy efficient goods such as renewable energy, organic products environment-friendly consumer goods and vehicles.

7. Research and development

Innovative technologies and practices are essential in supporting a transition to sustainable economy. Arab capacity on R&D has been very low due to many factors including lack of investments in R&D activities. Arab countries generally allocate small percentage of their GDP to R&D. Egypt for example has allocated in 2011, 0.43 percent of GDP to R&D (World Development Indicators, July 2015), while the Republic of South Korea currently allocated about 4.4 percent of GDP to R&D in 2014 (CEIC, Morgan Stanley, June 2014) and Israel allocated 3.9 percent of its GDP in 2012 (World Development Indicators, July 2015). This has to change if the Arab world is to achieve a real qualitative shift towards more sustainable patterns of consumption and production. Efforts should also be made to encourage private sector engagement in R&D. This can be achieved by providing incentives for private sector investment in R&D through tax cuts and rebates and other incentive measures.

It is also important to shift emphasize from relying on imported technologies, products and know-how to developing local technologies and products that suit local conditions and can eventually be exported to generate foreign exchange earnings.

Research and development in water, food and energy should focus on Arab priorities such as solar water desalination and wastewater treatment technologies, water saving irrigation equipment, and green building components.

8. Green public procurement

Government spending can be an effective tool in stimulating sustainable consumption and production patterns in the Arab world by directing government spending purchases and spending towards green products and services. Apart from setting the example for the general public and the private sector, green public procurement will also create markets and demand for green products.

Green public products include public offices, schools, hospitals, and other public buildings, transport systems, public infrastructure, building material, office equipment and supplies, etc. Promoting green public procurement and practices in the Arab world will go a long way in contributing towards a more sustainable and efficient use of resources across sectors. It can also influence the market for cleaner production and efficient consumption by purchasing locally made resource efficient products.

9. Public awareness and information dissemination

Public awareness and information dissemination can be effective tools in supporting government efforts in defining, informing and communicating the benefits and significance of sustainable consumption patterns for health, environment and the economy. As revealed by the AFED survey, unsustainable consumption patterns were in many instances attributed to lack of awareness to the negative implications of excessive and wasteful patterns of consumption on health, the environment and resource use.

These tools can take the form of Internet, social media, advertising and printed campaigns. They can also be in the form of educational materials, reports, and flyers and brochures that can be distributed in schools, and through commercial and public facilities. Seminars, expert consultations and lectures are also possible venues for outreach and awareness. It should be emphasized though that these communication packages should be designed to address different target groups in simple language and in a manner that caters for their specific interests, priorities and concerns.

Hussein Abaza, Former Chief, UNEP's Economics and Trade Branch, Geneva.

ANNEX

INTERNATIONAL LAW AND THE PYRAMID OF ASSUMPTIONS: DO WE NEED MORE FOOD TO TACKLE HUNGER IN THE FACE OF CLIMATE CHANGE?

Anne Saab

INTRODUCTION

Climatic conditions such as droughts, higher average temperatures, and higher levels of soil salinity are expected to cause a significant decline in crop yields in some parts of the world. Lower crop yields means less food production, which arguably leads to more food insecurity and exacerbates global hunger. A common response to issues of food insecurity and hunger – whether in the context of climate change or not – is to aim for an increase in production. Although increasing food production may indeed be necessary, particularly in certain regions, this is not the only way to address the issues. Changing consumption patterns may be a cheaper and more environmentally-friendly alternative to focusing so much attention on increasing production. In this piece, I will discuss some of the main conclusions from my doctoral research and argue that there are assumptions underlying popular discourse on climate change and hunger that strongly suggest that increasing food production is the main way to deal with climate-induced hunger. As a legal scholar, my focus is on the role that international law plays in upholding these assumptions.

In my doctoral research,[1] I explored one specific adaptation strategy that proposes to stabilize or even increase crop yields in the face of climate change, namely so-called 'climate-ready seeds'. Climate-ready seeds are genetically engineered to resist climatic stresses such as drought. Some actors contend that they are an adaptation strategy that will increase crop yields and tackle climate-induced hunger. A handful of large private seed corporations dominate the development of climate-ready seeds. These corporations are increasingly applying for patent rights on the seeds.[2] Others – notably critical NGOs – contend that climate-ready seeds benefit seed corporations but do nothing to alleviate hunger of the poorest and most vulnerable. They hold that seed corporations abuse the climate and food crises to monopolize the seed market.[3]

Contradictory accounts of climate-ready seeds present different views on whether this proposed adaptation strategy can contribute to combating food insecurity and hunger caused by the impacts of climate change. These accounts form the basis of my investigation and analysis. I am not in the position in my research to address the science behind climate change. I am also not in the position to address the science behind adaptation strategies, such as climate-ready seeds. Rather, my exploration focuses on studying discourses. In other words, what are different actors saying about the impacts of climate change on food security and hunger, and how we should go about addressing these problems? More specifically, as an international legal scholar, I focus on the role that international law plays in shaping these discourses. Which areas of international law are relevant to discussions about climate-ready seeds, and how do different actors in these debates employ international law in their discourse?

Several fields of international law are relevant to discussions on climate-ready seeds, and contradictory accounts of climate-ready seeds draw on these areas of international law. I examine in my research consecutively: climate change adaptation law, patent law (particularly seed patents), and human rights law (especially the right to food). An initial observation on the role of international law[4] is that law is most often presented as a means through which to 'solve' these problems, for instance in contributing to devising adaptation strategies. The main conclusion that I draw from my research, however, is that there are assumptions about the problem of climate change and hunger that are present in all narratives of climate-ready seeds, and that international law – in the way it is framed and how it is invoked – contributes to upholding these assumptions. These assumptions support a certain way of thinking about the problem of climate change and hunger, and consequently determine the types of adaptation strategies / solutions to the problem. I argue that upholding these assumptions limits other, and perhaps more effective, solutions.

The main analysis of my research therefore focuses on the cumulative role of different areas of international law in contributing to our understanding of the problem of food insecurity and hunger in the context of climate change. My analysis is based on five fundamental assumptions about climate change-induced hunger, which I will explain in the next section.

THE PYRAMID OF ASSUMPTIONS

While examining different stories about climate-ready seeds

and how they employ international law in their arguments, it became evident to me that most of the debate revolves around the question of patent rights on these seeds. The biggest issue appears to be that a handful of seed corporations are increasingly filing patent applications on those seeds. One influential and highly critical NGO, the ETC Group, has called these corporations 'Gene Giants'.[5] My initial focus in studying the role of international law was therefore on patent law, and how it has increasingly allowed the application of patent rights on living things, such as (genetically engineered) plants and seeds.

I soon realized, however, that to focus so much critical attention on the fact that seed corporations are increasingly applying for seed patents on climate-ready seeds, means that there are other questions relating to climate change and hunger that are not as explicitly addressed. The five assumptions that I identify are examples of questions that are left in the background of the debate, while corporate seed patents are in the foreground. I view these assumptions as a pyramid. The debate about patent rights and Gene Giants is situated in the tip of the pyramid, where most of the attention is concentrated. I argue that placing so much attention on this question in the tip of the pyramid serves to uphold the five assumptions that I identify lower in the pyramid.

The five assumptions are as follows: 1) climate change causes hunger; 2) increased food production is necessary to address hunger; 3) agricultural biotechnologies are needed to increase food production to address hunger; 4) private sector investments are necessary to develop agricultural biotechnologies to alleviate hunger; and 5) patent rights are necessary incentives for the development of agricultural biotechnologies. The first assumption forms the base of the pyramid and is the most fundamental. Each assumption higher in the pyramid depends on the acceptance of the foregoing assumption.

Each of these assumptions is highly contentious; this is the exact reason why I chose them. Despite serious and valid challenges to each of the assumptions, the way in which the discourse is framed and how international law is framed in the discourse in a subtle manner foregoes explicit questioning of each assumption.

First assumption: climate change causes hunger

If we are to have any discussions about food security and hunger in the face of climate change, then we must assume that there is some kind of causal relationship between climate (change) and hunger. The nature of this relationship is by no means uncontested. I draw on Mike Davis's study on famines in British colonies in the 19th century.[6] Davis argues that it was already known by some at that time that it was not only 'bad weather' that caused famines, but also 'bad systems' that leave some more vulnerable to the effects of the climate than others. Despite this recognition, Davis argues that British colonial rulers often attributed famines to 'bad weather', as a way to extenuate the adverse influence of the colonial system on the incidence of famines.[7]

In contemporary discussions about climate change, there is also recognition that it is not climate change itself, but rather vulnerability to its impacts that cause food insecurity and hunger. Notwithstanding these nuances, the way that the discourse is framed gives the strong impression that climate change causes hunger. The term 'anthropogenic' is often used to refer to climate change: climate change is caused by man. The same term is not used, at least not explicitly, for hunger. The suggestion seems to be that climate change is anthropogenic, and climate change exacerbates hunger, but hunger is not anthropogenic.

International law, notably climate change adaptation law and human rights law, also contribute to upholding this assumption. This is evident in reports published by the Intergovernmental Panel on Climate Change (IPCC)[8] and the UN Framework Convention on Climate Change (FCCC),[9] as well as in media reports[10] that draw on information from these authoritative climate change institutions. These reports, which can be viewed as part of the broader climate change adaptation legal discourse, place a great deal of emphasis on the relationship between climate change impacts, food insecurity, and hunger.

The way in which international human rights law is framed and invoked in discourse on climate change in general, and climate-ready seeds in particular, also contributes to this impression. Climate change is presented as a threat to human rights, and particularly to the right to food.[11] By presenting climate change impacts as potentially violating the right to food, the suggestion is raised that there is a causal link between climate change and food insecurity/hunger.

Second assumption: increased food production is necessary to tackle hunger

Assuming that climate change causes hunger, what needs to be done to alleviate climate-induced hunger?

The second assumption that is left in place is that food production needs to increase in order to tackle hunger. This is also a much-debated issue. There are many reports that suggest that there is enough food produced globally to feed more than the world population; the real problem is distribution of, and access to, food. Indian economist Amartya Sen has famously said that starvation is not a problem of there not being enough food, it is a problem of some people not having access to enough food.[12] In climate change discourse, there are also recognition that it is not so much the overall global food production we should be concerned with, as much as the continued lack of access to food for those regions and peoples already most food insecure and vulnerable.

Despite these nuances, the different narratives of climate-ready seeds do not expressly pose the question of whether we really need to increase food production to tackle climate-induced hunger. Seed corporations evidently promote the idea that more food needs to be produced to address hunger, as they develop climate-ready seeds with the public intention of increasing crop yields. Critics of climate-ready seeds, however, do not question this assumption expressly. The way in which international law is framed and employed in the debates contributes to this.

Climate change adaptation law emphasizes crop failures and decreasing food production as the problem of climate change for agriculture and food security. Texts of the UNFCCC, the Kyoto Protocol, and the IPCC reports do not say explicitly that food production needs to increase. Nevertheless, there is a lot of emphasis in these reports on the predicted crop losses and on adaptation strategies aimed at increasing food production.[13]

Human rights discourse in relation to climate change also focuses much attention on crop losses and the devastating impacts for food insecurity and hunger. The right to food approach is used mainly as a way to regulate seed policies and to balance the corporate patent rights; not primarily to discuss questions of production of food versus access to food as means to combat hunger.

Third assumption: agricultural biotechnologies are necessary to increase food production

implicitly accepted the assumptions that climate change causes hunger and that food production needs to increase to address climate-induced hunger, the next question is: how do we increase food production? The third assumption is that agricultural biotechnologies – in the case of this research, particularly genetically engineered seeds – are needed to increase food production. Again, like the previous assumptions, this is a much debated issue. There is a lot of critical discussion about genetically engineered seeds. Reports state that GM seeds do not produce more;14 even Monsanto in its own report admits that a drought-resistant corn the company has developed for the US market does not give higher yields than conventional non-GM crops.[15]

Despite these contentions, in the way in which international law is used in discourses on climate-ready seeds there is a strong emphasis on the value of agricultural biotechnology and genetic engineering. International climate change adaptation law encourages the use of biotechnologies for adaptation. Special reports and technical papers written under the auspices of the UNFCCC and the IPCC endorse the use of biotechnologies and genetically engineered seeds to adapt to the effects of climate change and to increase food production.[16] Drought-resistant seeds are named expressly in these reports.

The patents rights debate, as drawn on in narratives of climate-ready seeds, centres on the question of who should have rights over seeds and crops. It largely ignores questions about the practical value of climate-ready seeds. Arguing about the property rights gives the impression that these seeds are worth fighting for, and that agricultural biotechnologies are valuable.

In a similar fashion, human rights law and how it is used recognizes the value of biotechnologies. The intention of those invoking human rights law is not to dispute the value of genetically engineered seeds per se. Rather, it is to ensure that the right to food is achieved and that those most vulnerable and food insecure will benefit from those seeds. There is little space in the accounts of climate-ready seeds for discussing the contentions about agricultural biotechnologies and food production.

Fourth assumption: private sector investments are needed to develop agricultural biotechnologies, thereby increasing food production and alleviating hunger

If agricultural biotechnologies, including genetically engineered climate-resistant seeds, are considered necessary to increase food production, the next question

is: who will invest in the development of climate-ready seeds? There is a lot of criticism of the private sector's role in 'solving hunger'. The private sector may indeed invest a lot of money into the development of genetically engineered that could produce more food in the face of climate change; but the question remains whether these seeds will benefit the world's hungry.[17] International law relevant to discourses on climate-ready seeds, however, is welcoming of private sector involvement without questioning these nuances.

Climate change adaptation law creates an enabling and welcoming environment for private sector engagement in adaptation. Even though international law – including climate change law – strictly creates obligations only for States Parties, the private sector is mentioned often in legal texts related to adaptation. Adaptation initiatives developed under the UNFCCC include private sector initiatives that provide corporations with a platform in which to suggest adaptation strategies.[18] Many of the large seed corporations have filed climate-resilient seeds as examples of adaptation strategies.[19] There is no discussion at all in narratives of climate-ready seeds about the role of adaptation law in setting a conducive context for private sector involvement.

Critics of climate-ready seeds are, as already mentioned, particularly critical of the large number of patent rights that a handful of corporations are applying for and obtaining on these seeds. In this critical discourse, however, there is no explicitly questioning of the necessity of private sector investments to combat hunger. The main gist seems to be a call for better regulation of private sector actions, rather than rejecting the value of private sector engagement. This is evident in how human rights law is framed and used. Human rights texts emphasize the need to regulate private sector action,[20] without expressly questioning the value and necessity of these investments. By invoking human rights law and by not addressing the role of adaptation law, critics of climate-ready seeds implicitly leave this assumption in place.

Fifth assumption: intellectual property rights are necessary incentives for the development of agricultural biotechnologies

The fifth and final assumption that is left in place is that intellectual property rights – mainly patent rights – are necessary incentives for investments in biotechnologies to eradicate hunger. This assumption contains the premises that applying intellectual property rights to living things is acceptable, and that intellectual property rights are necessary to incentivize innovation. Both parts of this assumption are highly debated. They are also – again – not challenged explicitly in discourses on climate-ready seeds, and international law contributes to that.

There is a great deal of debate about patenting living things, with groups calling for 'no patents on life' and 'no patents on seeds'.[21] Discussions about climate-ready seeds are set within a context of larger debates about genetically engineered organisms. The main legal response that critics provide to corporate patents on climate-ready seeds, is not to deny the application of intellectual property rights in living things altogether. It is, rather, to call for recognition of farmers' rights and developing countries' sovereign rights over natural resources.[22] Arguing for sovereign rights over natural resources and farmers' rights does not deny forms of proprietary rights on seeds and crops; it primarily argues that parties other than private corporations should also be granted property rights.

There is also a huge amount of debate over whether intellectual property rights do in fact incentivize innovation, and whether this innovation benefits larger society. There are many who argue that patent rights are not necessary to ensure innovation in agriculture, and that patents only direct rather than increase innovation.[23] In discourse on climate-ready seeds, this question of whether patent rights are necessary incentives to develop agricultural biotechnologies for adaptation is not expressly posed. One example is the way in which the right to food is employed. The right to food is used primarily as a way to direct (corporately patented) climate-ready seeds towards contributing to the realization of the right to food. Human rights are promoted as tools to regulate patent rights, not to dismiss or even question the latter.

Conclusion

The starting point of this research was the problem of hunger and food insecurity in the context of climate change. At the surface, the most obvious role of international law – of different fields of international law – is to contribute to finding ways to alleviate food insecurity and hunger in the context of climate change. This is so, for instance, in climate change adaptation law seeking to devise ways to adapt to climate change impacts; in intellectual property law seeking to incentivize

technological innovations to deal with climate change impacts; and human rights law seeking to put human suffering at the centre of climate change policies.

The argument that I make in this research is that international law – how it is framed and invoked in different narratives of climate-ready seeds – not only contributes to 'solving' hunger, but also, and importantly, has a hand in shaping our understanding of the problems of climate change and hunger. There are certain assumptions about climate change and hunger that are left largely in the background. Questions about these contentious assumptions are not posed explicitly in the discourse, and how international law is employed contributes to upholding these assumptions.

Debates about climate-ready seeds as proposed 'solutions' to climate-induced hunger take place within a framework of assumptions that set a certain way of thinking about climate change and hunger. This determines the range of solutions we can devise. It was not my intention to formulate answers to these contentions, but rather to show that international law as it is framed and invoked has a hand in obscuring important debates and determining the contours of the 'problem', thereby also limiting possible solutions.

This pyramid of assumptions places a lot of emphasis on increased food production as the main response to climate-induced food insecurity and hunger. Changing patterns of consumption, towards more sustainable food consumption, could well be a cheaper, more effective, and more environmentally-friendly way to address the problem. Recognizing the underlying assumptions is one step towards challenging the way we frame the problem of climate change and hunger, and opening the way for alternative solutions such as changing food consumption patterns.

Dr. Anne Saab is assistant professor of international law at the Graduate Institute of International and Development Studies in Geneva, Switzerland. She teaches courses on climate law, patent law, and global food systems.

Notes

1. 'A Legal Inquiry into Climate Change and Hunger: Climate-Ready Seeds in the Neoliberal Food Regime', was the title of my doctoral thesis at the Law Department of the London School of Economics and Political Science in June 2015.

2. See, for an overview of the patents on climate-ready seeds, two reports from civil society organization ETC Group: ETC Group, 'Patenting the "Climate Genes" … and Capturing the Climate Agenda' (ETC Group, 2008); ETC Group, 'Capturing "Climate Genes": Gene Giants Stockpile Patents on "Climate-Ready" Crops in Bid to Become "Biomassters"' (ETC Group, 2010).

3. Ibid.

4. I adopt a broad understanding of 'international law', including not only legal texts, but also legal discourse.

5. See the title of the 2010 ETC Group report, at note 2 above.

6. Mike Davis, Late Victorian Holocausts: El Niño Famines and the Making of the Third World (New York: Verso, 2001).

7. Ibid., at page 280.

8. The latest IPCC assessment report from 2014 contains a chapter dedicated to agriculture. The chapter emphasizes crop losses. John R. Porter et al, 'Food Security and Food Production System' Chapter 7 in Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 485-533, Cambridge, United Kingdom; New York, NY, USA: Cambridge University Press, 2013.

9. A technical paper published under the auspices of the UNFCCC in 2006 focuses on technologies for adaptation, and includes information on genetically engineered crops to increase food production. Richard J.T. Klein et al., 'Application of Environmentally Sound Technologies for Adaptation to Climate Change, FCCC/TP/2006/2' FCCC Technical Papers (UNFCCC, 10 May 2006).

10. For example: Ben Block, 'Climate Change Will Worsen Hunger, Study Says' World Watch Institute, http://www.worldwatch.org/node/6271; Action Against Hunger, 'Climate Change Could Become a Leading Cause of Hunger', http://www.actionagainsthunger.org/blog/climate-change-could-become-leading-cause-hunger; John Vidal, 'Poor Face More

Hunger as Climate Change Leads to Crop Failure, Says Oxfam' The Guardian, 5 July 2009, http://www.theguardian.com/environment/2009/jul/05/crops-farmers-climate-change-oxfam. Last accessed on 27 September 2015.

11. See, for instance: Caesens, Elisabeth and Maritere Padilla Rodriguez, 'Climate Change and the Right to Food: A Comprehensive Study' in Heinrich Boll Stiftung Publication Series on Ecology, edited by Heinrich Boll Foundation, Volume 8, Berlin: Columbia Law School – Human Rights Institute, 2009, https://www.boell.de/sites/default/files/Series_Ecology_Volume_8_Climate_Change_and_the_Right_to_Food_0.pdf.

12. Amartya Kumar Sen, Poverty and Famines: An Essay on Entitlement and Deprivation (Oxford, New York: Clarendon Press; Oxford University Press, 1981), at page 1.

13. See, for instance, the reports mentioned in notes 8 and 9 above.

14. See, for instance, reports from the Union of Concerned Scientists: Doug Gurian-Sherman, 'Failure to Yield: Evaluating the Performance of Genetically Engineered Crops' (Cambridge, MA: Union of Concerned Scientists, 2009); Doug Gurian-Sherman, 'High and Dry: Why Genetic Engineering Is Not Solving Agriculture's Drought Problem in a Thirsty World' (Cambridge, MA: Union of Concerned Scientists, June 2012).

15. Monsanto and the US Department of Agriculture acknowledge that that 'equally drought resistant corn varieties produced through conventional breeding techniques are readily available and may be cultivated in lieu of MON87460'. USDA/APHIS, 'Monsanto Company Petition (07-CR-191U) for Determination of Non-regulated Status of Event MON 87460' (November 2011), at page 33, www.aphis.usda.gov/brs/aphisdocs/09_05501p_fea.pdf, last accessed on 27 September 2015.

16. Intergovernmental Panel on Climate Change, 'Methodological and Technological Issues in Technology Transfer – Special Report of Working Group III of the Intergovernmental Panel on Climate Change' in IPCC Reports, ed. Bert Metz et al. (Cambridge, UK: IPCC, 2000). For the UNFCCC technical paper, see Klein et al at note 9 above.

17. As philosopher Henry Shue has stated: 'If there were lots of profit to be made in solving the world's hunger problem, market forces would presumably have sent people rushing in to solve it long ago'. Henry Shue, 'Solidarity among Strangers and the Right to Food' in World Hunger and Morality, ed. William Aiken and Hugh LaFollette (Upper Saddle River, New Jersey: Prentice Hall, 1996), at page 128.

18. UNFCCC, 'Private Sector Initiative - Database of Actions on Adaptation', http://unfccc.int/adaptation/workstreams/nairobi_work_programme/items/6547.php, last accessed on 27 September 2015.

19. Adaptation proposal involving climate-resilient crops by companies such as Monsanto, Syngenta, and BASF can be found in the list is initiatives.

20. General Comment 12 of the Committee on Economic, Social, and Cultural Rights, which elaborates on the right to food, specifies that States Parties are under the obligation to 'take appropriate steps to ensure that activities of the private business sector and civil society are in conformity with the right to food'. United Nations Economic and Social Council, CESR General Comment 12: The Right to Adequate Food (Article 11) E/C.12/2000/4 (12 May 1999).

21. See, for example: Rebecca Charnas, '"No Patents on Life" Working Group Update', http://www.councilforresponsiblegenetics.org/ViewPage.aspx?pageId=169; SWISSAID, 'No Patents on Life!', http://www.swissaid.ch/en/no_patents_on_life,; The International Coalition of 'No Patents on Seeds', 'Stop Patents on Plants and Animals!', http://no-patents-on-seeds.org/, last accessed on 27 September 2015.

22. As recognized in the International Treaty on Plant Genetic Resources for Food and Agriculture. International Treaty on Plant Genetic Resources for Food and Agriculture, Food and Agriculture Organization. Entry into force 29 June 2004, http://www.planttreaty.org/, last accessed on 27 September 2015.

23. See for instance: Arnold Plant, 'The Economic Theory Concerning Patents for Inventions' Economica 1 (1934), 39.

OPINION

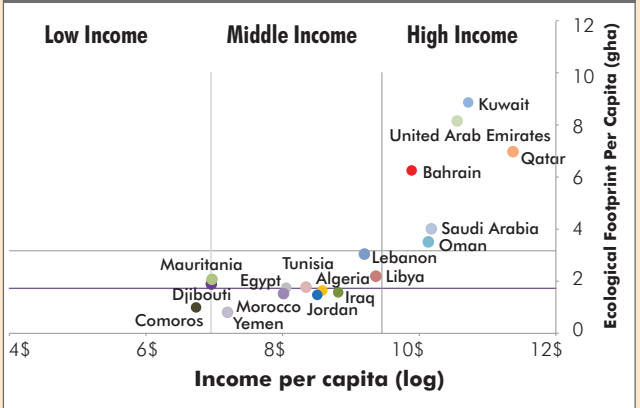
SCP WITHIN THE SUSTAINABLE DEVELOPMENT GOALS

Roula Majdalani and Fidele Byiringiro

The Millennium Development Goals (MDGs), which came to an end in 2015, are credited with notable improvements at the global level and in selected regions in areas such as poverty reduction, access to education or health improvement despite their shortcomings such as working in silos or being UN-led (UN, 2014a). The Rio+20 Summit had called for a new set of goals to guide development in the post-2015 era and following extensive consultations, the Sustainable Development Goals were recently agreed upon as a continuation of the MDGs while being more balanced as well as consultative, integrated, universal and the recognition of key development challenges. Thus, in addition to goals such as poverty and hunger, education, gender, health, environmental sustainability and global partnership, new goals have been included such as access to energy for all, sustainable industrialization and human settlements, inequalities within and among nations, climate change or sustainable consumption and production (UN, 2014b; UNEP, 2015a; UN, 2015).

With regards to sustainable consumption and production (SCP) – Goal 12 in the SDGs – it is crucial as the current level of carbon dioxide is the highest in over 800,000 years, mostly due to the consumption of fossil fuels which make up 81 percent of the energy consumed. Further, the "recent food and energy crises, and high prices for many commodities point to a world where increasing resource scarcity is the norm" (UN, 2013) while the Global Footprint Network (2015) estimates that there is a world bio-capacity deficit of 0.9 global hectares per person, meaning that we need about 1.5 earths in order not to overuse available renewable resources. Our current consumption and production patterns are unsustainable and might lead to catastrophic economic, social and environmental disasters (Akenji & Bengtsson, 2014; UNEP, 2015a).

PER CAPITA INCOME AND ECOLOGICAL FOOTPRINT IN THE ARAB REGION, 2011



Source: Adapted from the Global Footprint Network (2015)
Ecological Footprint values are 2011 values from the 2015 National Footprint Accounts, Global Footprint Network. Income values are GNI Atlas Method as provided by the World Bank (2013)

Unsustainable consumption and production patterns also affect the Arab region, as at least 10 countries have an ecological footprint that is beyond the world's average bio-capacity (Global Footprint Network, 2015). In the Arab region, the consumption of resources, particularly water and energy, is growing at an unsustainable rate with little to no evident attempt to "decouple" economic growth from environmental degradation. The high consumption of resources is driven in part by generous subsidies that in some cases amount up to 5 percent of the gross domestic product (ESCWA et al, 2015). If these unsustainable consumption and production patterns are not addressed, they could lead to decreased ecological goods and services (e.g., less food, clean air and fresh water, slower decomposition of wastes, lower greenhouse gas mitigation, less pleasing landscapes, etc.) and could potentially turn into a vicious cycle of degradation, low productivity, poverty and instability.

To make the shift towards sustainable consumption and production a reality, SCP principles have been embedded in several of the proposed 17 sustainable development goals (SDG). These include food security (Goal 2), healthy lives (Goal 3), water and sanitation (Goal 6), energy for all (Goal 7), economic growth and employment (Goal 8), infrastructure, industrialization and innovation (Goal 9), cities and human settlements (Goal 11), oceans, seas and marine resources (Goal 14), sustainable use of terrestrial ecosystems (Goal 15) and means of implementation (Goal 17). However, SCP also has its own dedicated goal, Goal 12, which specifically calls to "Ensure Sustainable Consumption and Production Patterns" (UN, 2014b). As adopted, the SCP goal has 8 targets and 3 means of implementation (UN, 2015; UN, 2014b):

The achievement of the SCP goal will largely depend on the ways the global, regional, national and local economy and society function. SCP and sustainable development will only be achieved if our ecosystem is able to provide the necessary natural resources to sustain us while also

SCP GOAL 12 – TARGETS

1. Implement the 10-Year Framework of Programme on SCP Patterns
2. By 2030, achieve the sustainable management and efficient use of natural resources
3. By 2030, halve global food waste at the retail and consumer levels and reduce food losses along production and supply chains
4. By 2020, achieve environmentally sound management of chemicals and wastes
5. By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse
6. Adopt sustainable practices and integrate sustainability information into reporting cycle
7. Promote sustainable public procurement practices
8. By 2030, ensure the availability of relevant information and awareness for sustainable development and lifestyles

SCP GOAL 12 – MEANS OF IMPLEMENTATION

a. Support developing countries to strengthen their related scientific and technological capacities
b. Develop and implement tools to monitor sustainable development impacts
c. Rationalize inefficient fossil fuel subsidies that encourage wasteful consumption

Source: Adapted from UN (2015, 2014b)

absorbing our wastes and emissions (UN, 2012; Schoon et al, 2013). Agreeing upon a dedicated goal and specific targets is a step in the right direction, but there is also a need to agree upon specific indicators to monitor implementation (SDSN, 2015, UNEP, 2015b).

A recent review of the experience of selected Arab countries with monitoring the MDGs was found to be modest at best due to a lack of capacity, resources, appropriate conceptual framework and a transparent mechanism for monitoring and follow-up. This might be a challenge for improving the science-policy interface which is increasingly seen as a critical aspect not only of governance but also of sustainable development. Some of the common challenges facing countries of the region include the lack of a fully integrated process for compiling and reporting indicators and the necessary capability at the institutional level to interpret and design appropriate strategies and programmes in support of sustainable consumption and production and sustainable development (ESCWA et al, 2015).

To support regional efforts, the Economic and Social Commission for Western Asia (ESCWA) together with its regional stakeholders – notably the League of Arab States (LAS) and the United Nations Environmental Programme (UNEP) – organized several major regional consultations, which culminated in the establishment of the Arab Forum on Sustainable Development (AFSD). The AFSD endeavors to improve access to information, enhance the science-policy interface, assess progress, trends, gaps and opportunities and determine national and regional priorities. Its upcoming Arab Sustainable Development Report provides key ingredients of a roadmap for the Arab region to enhance sustainable consumption and production and to achieve sustainable development that include (i) Enhancing knowledge; (ii) Improving the institutional framework; (iii) Enhancing data capacity and collection; and (iv) Aligning financial resources with requirements (ESCWA et al, 2015).

References

Akenji, L. and M. Bengtsson (2014). Making Sustainable Consumption and Production the Core of the Sustainable Development Goals. Discussion Paper, Institute for Global Environmental Strategies (IGES), Kanagawa, Japan.

Global Footprint Network (2015). Ecological Footprint and Biocapacity in 2011: Results from the National Footprints Account 2015 Edition.

ESCWA, UNEP and LAS (2015). Arab Sustainable Development Report: Prototype Edition – Technical Summary. ESCWA, Beirut, Lebanon.

Schoon, N., F. Seath and L. Jackson (2013). One Planet Living – The case for Sustainable Consumption and Production in the Post-2015 development agenda. BioRegional (www.bioregional.com).

SDSN (2015). Indicators and a Monitoring Framework for the Sustainable Development Goals: Launching a data revolution for the SDGs. A report to the Secretary-General of the United Nations by the Leadership Council of the Sustainable Development Solutions Network.

UN (2012). Outcome of the Conference: The Future We Want. Rio+20 Conference, United Nations Conference on Sustainable Development, Rio de Janeiro.

UN (2013). A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development. Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. United Nations, NY

UN (2014a). The Millennium Development Report 2014. United Nations.

UN (2014b). Open Working Group proposal for Sustainable Development Goals. United Nations, A/68/970 (http://undocs.org/A/68/970).

UN (2015). Draft outcome document of the United Nations summit for the adoption of the post-2015 development agenda. Follow-up to the outcome of the Millennium Summit, United Nations General Assembly (A/69/L.85)

UNEP (2015a). Sustainable Consumption and Production and the SDGs. UNEP Post 2015 #2 (http://www.unep.org/post2015).

UNEP (2015b). Sustainable Consumption and Production Indicators for the Future SDGs. UNEP Discussion Paper, UNEP.

World Bank (2013). Gross National Income Per Capita 2013, Atlas Method and PPP. (http://databank.worldbank.org/data/download/GNIPC.xls).

Roula Majdalani, Director of the Sustainable Development and Policies Division (SDPD) at the Economic and Social Commission for Western Asia (ESCWA); Fidele Byiringiro, Economic Affairs Officer, SDPD, ESCWA.

OPINION

SOLAR DEVELOPMENT AND SUSTAINABILITY IN DUBAI

Ahmed Buti Al Muhairbi

The Emirate of Dubai has charted its name on the global map as the new growing regional hub for logistics, tourism, finance, innovation, among other sectors. It comes at no surprise that, over the past 10 years, Dubai has registered one of the fastest growing electricity demand rates with a compound annual growth rate (CAGR) of peak power demand of about 8 percent. As the city continues to grow, it is expected to maintain a relatively high electricity demand growth rate between 5-6 percent over the next decade [DEWA Sustainability Report 2013].

Currently, Dubai's installed capacity of about 9.6GW is powered mainly by imported natural gas. With limited local gas reserves, Dubai is therefore a net energy importer. To fuel its booming infrastructure development and sustain its economic growth, the Emirate is compelled to pursue a sustainable development path, particularly given the recent global commodity market dynamics and sustainable technology advances.

In particular, the fast and continued decline in solar PV module cost witnessed a drop of over 75 percent in the past five years [Renewable Power Generation Costs 2014, IRENA]. In a country endowed with high solar irradiation along the year and in the absence of other energy sources such as hydropower or significant wind resources, solar technologies are deemed an attractive alternative energy option.

THE SOLAR TIPPING POINT OF DUBAI

Today, within a short span of about two years, Dubai delivered on its commitment towards sustainability and establishing the tenets of a green economy. Before October 2013, the city's total installed solar PV capacity was about 4.5 MW scattered across residential and commercial applications. This figure tripled with the commissioning of a 13 MW solar PV power plant in October 2013, as the first phase of the Mohammed Bin Rashid Solar Park. Less than two years later, Dubai's efforts to open the energy market to independent power producers reaped a new global benchmark of the cheapest unsubsidized levelized cost of energy generated by solar PV in the world. An additional 200 MW was then awarded, almost 15 times the previous phase. This record-breaking public-private partnership (PPP) deal placed solar at par with conventional sources such as natural gas, and transformed how utilities, project

FIGURE 1 **TIMELINE OF MAJOR MILESTONES IN DUBAI'S PATH TOWARDS DEPLOYMENT OF SOLAR ENERGY**

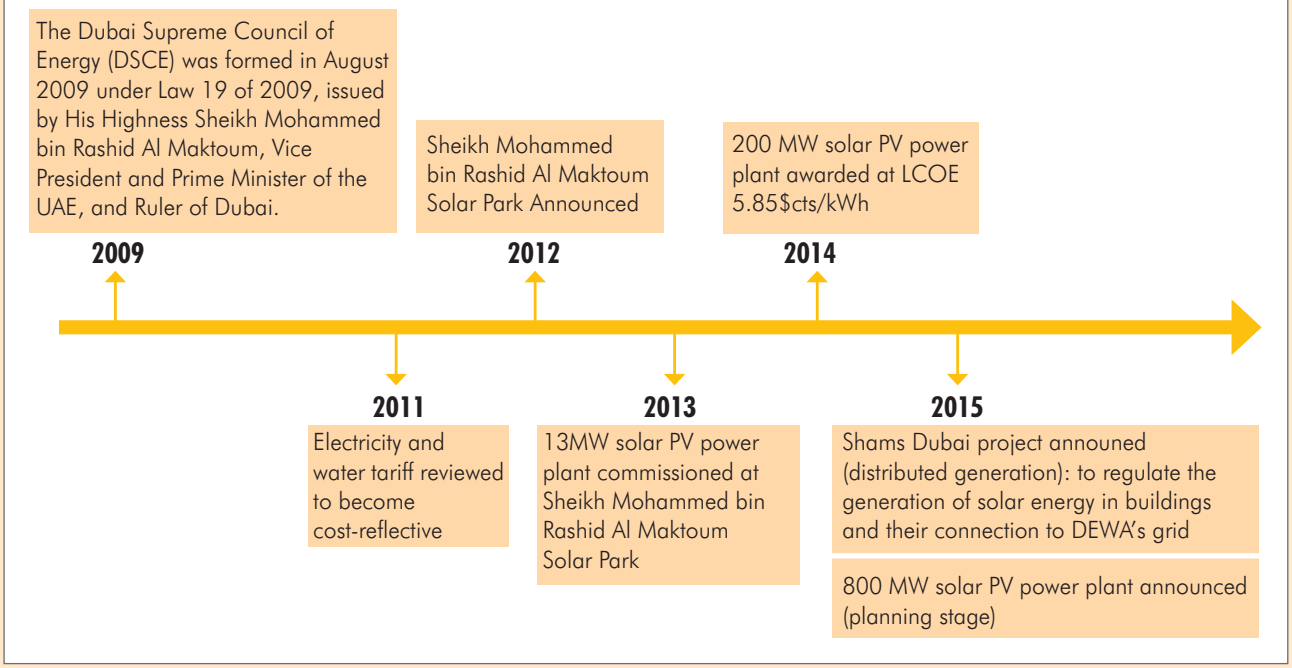
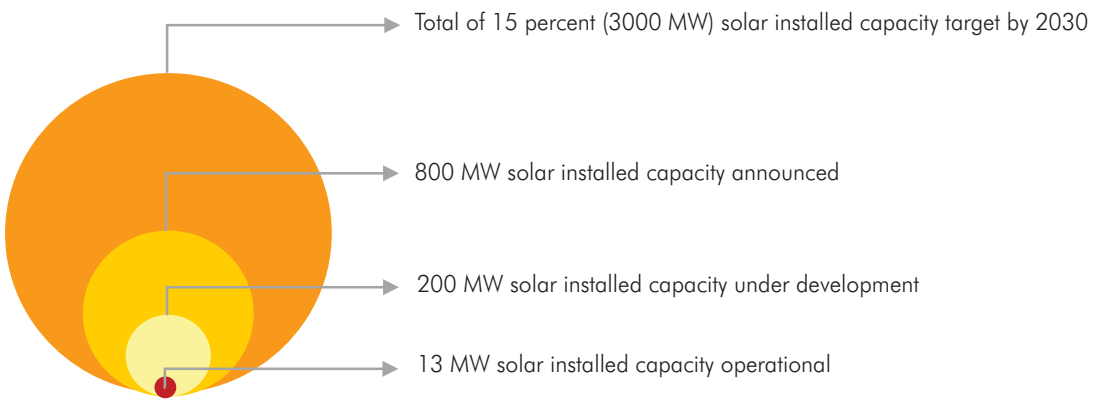


FIGURE 2 **UTILITY SCALE SOLAR PV PROJECT DEVELOPMENT IS PROGRESSING SIGNIFICANTLY IN DUBAI**



developers, policy makers and consumers perceive solar energy in Dubai and the region. Shortly after the initiation of the 200 MW solar PPP deal, Dubai's Electricity and Water Authority (DEWA), the utility that owns and operates Dubai grid, – announced its plan for the third phase of 800MW solar project.

The transformation of the energy sector in Dubai is also taking place at the customer side. Dubai residents can now generate their own electricity using solar panels that can also feed extra energy to Dubai power grid. This will gradually transform consumers to prosumers, meaning consumers that also generate part of their own energy consumption.

These developments collectively mark a tipping point for solar energy in Dubai. Today, solar energy is considered economically feasible compared to conventional fuels at market price. The strong backing of the Dubai Government for solar projects and the announcement of a solar target of 15 percent of installed capacity by 2030 send positive signals to private investors and financiers. In addition, the gradual introduction of solar projects has also helped establish a learning curve and build local capacities that would be needed to resolve possible technical challenges during implementation. The looming question is how did Dubai succeed - in a relatively short time – in building the enabling environment to transform its energy sector towards higher shares of renewables?

THE TRANSFORMATION

The achievements of Dubai are a natural result to the effective and efficient governance model of its energy sector. A model that is referred to as one of the few comprehensive demonstrations of streamlined energy sector management. The efforts started back in 2009 when the Dubai Supreme Council of Energy (DSCE) was established under Law 19, issued by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, and Ruler of Dubai. The Council is therefore responsible to oversee the whole energy sector in Dubai and provide the governance platform and strategic direction through a defined roadmap. Dubai Sustainability Model is a manifestation of DSCE structural approach to drive the energy transformation of the Emirate. It comprises ten pillars: policy and regulatory framework, capacity building, diversification of energy sources, demand side management and energy efficiency, energy pricing and consumer behavior, investment in clean and smart technology, stakeholder engagement, public-private partnership, energy services contracting, and carbon abatement.

Under the DSCE, Dubai pioneered the first-of-its-kind integrated energy strategy, a comprehensive strategy to drive the energy sector and align visions and targets of various stakeholders. The strategy encompasses both the supply and the demand side of the energy ecosystem, making it the launching pad towards a common vision of Dubai 2030. In order to catalyze this transformation, Dubai needed first to review its electricity tariff structure. As a result, a slab system was introduced in 2011 to incentivize lower consumption and more efficiency in the use of water and electricity. In fact, in 2011, Dubai Electricity and Water Authority succeeded in reducing power demand growth to only 3 percent of net consumption growth, despite a simultaneous 5 percent growth in combined registered electricity and water accounts [Dubai Status of Energy Report 2014].

FIGURE 3 **THE 13 MW GRID-CONNECTED SOLAR PV PLANT, THE FIRST PHASE OF THE MOHAMMED BIN RASHID AL MAKTOUM SOLAR PARK**

CREDIT: RECHARGE NEWS, CHARLES VERGHESE

The review of the tariff also sent positive signals to clean energy investors, as the market becomes economically attractive for renewable energy technologies with cost-reflective electricity tariffs. This has paved the road for the announcement of Sheikh Mohammed bin Rashid Al Maktoum Solar Park in January 2012. This 48 km2 park is solely marked for the development of large scale utility solar projects, through phases to reach the final goal of 15 percent (equivalent to 3000 MW) of solar power installed capacity by 2030.

To respond to fast growing demand of infrastructure development, a market-based approach using Public Private Partnerships promises to meet Dubai's needs. Such an approach leverages funding sources and helps balance the risk between the government and private investors. By fostering partnerships with leading international firms in clean energy, Dubai also aims to develop its local capacities through transfer of knowledge and skills. Therefore, since its inception, the DSCE has rolled out a series of step by step regulatory reforms and policies to open the electricity market for independent power and water producers (IPWPs). This involves establishing the Regulatory and Supervisory Bureau (RSB) for the electricity and water sector in 2010. Part of RSB responsibilities include licensing of new generators in the power sector. The robust regulatory framework resembles the fundamental block for sound policy design to attract investment, namely transparency, longevity and certainty. In other words, Dubai's excellent solar resources around the year combined with the stable political environment, credit worthy off-taker (DEWA) and transparent procurement processes facilitated access to low-cost finance through local commercial banks resulting in a global benchmark for the market-driven levelized cost of energy (LCOE) for solar PV: less than 6 US$ cents/kWh.

SUSTAINABILITY AS A COMPREHENSIVE ECOSYSTEM

The bold strides that Dubai is making in clean energy are not limited to power generation. The Emirate through its Dubai Plan 2021 aims to integrate clean energy development as part of a paradigm shift of its socioeconomic outlook and economic diversification. This includes fostering the local clean energy market and expanding its activities to cover wide segments of the supply chain. Today, there is a noticeable increase in solar companies that are based in Dubai benefiting from excellent logistics infrastructure and easy access to emerging economies in Asia, MENA region and Africa. In fact, a survey of Emirates Solar Industry Association (ESIA) in 2009 found that 50 percent of the then 70 solar companies in the Middle East were based in Dubai [Dubai State of Energy Report 2014].

In addition to developing the downstream marketing and sales arm of the clean energy industry, Dubai is keen to advance the research and development (R&D) component. As part of the Mohammed bin Rashid Al Maktoum Solar Park, DEWA is developing a state of the art R&D center coupled with an innovation center. The center aims to spur development of creative solutions pertaining to solar energy, water treatment, smart grid and energy efficiency among others. Such an institution will contribute to building local capacities to drive innovation in the clean energy sector, owing to its vital attribute to link government, industry and academia, resulting in relevant and sustained capacity building programs.

As Dubai embarks on developing its clean energy sector, it is expected that thousands of jobs will be created as the industry grows. In particular, both large scale utility solar projects and the distributed solar generation (sometimes referred to as Shams Dubai Project) will contribute to adding new jobs to the market during the manufacturing, engineering, procurement, financing and project development, construction, operation and maintenance, and decommissioning.

In a rapidly changing world, Dubai has seized the opportunity to follow a sustainable development pathway as it continues to grow. The clear and supportive vision of its leadership paved the way to develop a long term strategy and deliver stepwise but steady implementation progress towards higher share of solar in its energy mix. This galvanized the trust of the private sector, resulting in successful public private partnerships (PPP) that drove the cost of solar energy to unprecedented ranges, impacting the future of solar not only in Dubai but the entire region. Dubai's model is emerging as a benchmark for the transition to a sustainable energy future in a region historically perceived as a synonym to "oil". As we approach 2030, Dubai is expected to turn its sunny days into a sustainable fuel for generations to come.

FIGURE 4 **ILLUSTRATION OF THE FUTURE DEWA R&D CENTER**

Ahmed Buti Al Muhairbi is Secretary General of Dubai Supreme Council of Energy (DSCE) – the governing body tasked with policy development, planning and coordinating with concerned authorities and energy bodies to deliver new energy sources while employing a balanced approach to protecting the environment. Mr. Al Muhairbi is also the Vice Chairman of Dubai Regulatory & Supervisory Bureau for Electricity and Water and a member of the Board of Directors of Emirates National Oil Company (ENOC).

SwitchMed: PROMOTING SUSTAINABLE CONSUMPTION AND PRODUCTION IN THE MEDITERRANEAN

Anna Ibañez de Arolas

The Mediterranean Region has seen rapid economic development in recent decades. However, this has been accompanied by a serious depletion in natural resources and a widespread degradation of the natural environment. The adoption of "consumption intensive" lifestyles by the Mediterranean population and the current unsustainable patterns of production are increasing the pressure on the local and regional environment. This pressure is characterized and affected by water scarcity, population growth and rapid urbanization in coastal areas, growing waste generation, climate change and mass tourism. In the Mediterranean region, decoupling development from environmental degradation and resource depletion has become an urgent need, and making the shift to more sustainable consumption and production (SCP) patterns is becoming more necessary by the day. This shift can only be achieved through a holistic approach that tackles every aspect involved in the way we consume and produce.

The SCP approach responds to this need by proposing a combined implementation of tools and measures oriented to redesign the way in which goods and services are consumed and produced. This approach aims at addressing key economic and social challenges while decoupling economic development from environmental pressure by applying life cycle thinking. Life cycle thinking is at the core of the SCP approach since it involves considering all the environmental and social impacts that occur during the life cycle of the consumption-production chain. In short, the SCP approach can drive the revitalization of industrial and socio-economic development towards non-pollutant, no-waste, low-carbon, resource efficient, socially inclusive, green and circular economies.

The successful implementation of the SCP perspective needs the active participation and collaboration of all relevant stakeholders including: governments and policy makers, businesses and entrepreneurs and, civil society organisations and individual citizens. Governments and policy makers can stimulate both the supply and demand side for sustainable products at country levels; businesses and entrepreneurs can increase their efforts to produce products and services entailing the least environmental impact and the lowest energy and resource consumption; and a conscious and involved civil society adopting sustainable lifestyles can drive the demand side for more sustainable products and services in the market.

Over the last two decades SCP policies have gained a central role on the road towards sustainable development, as recognised by world leaders in the World Summits in Rio (1992), Johannesburg (2002), and Rio+20 (2012) where the 10-Year Framework of Programmes (10YFP) on Sustainable Consumption and Production patterns was adopted. In the Mediterranean Region, the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention), adopted in 1976, constitutes a unique regional policy umbrella for environmental protection and sustainable development. Its 22 contracting parties recognise the importance of switching to more sustainable patterns, and since 2005 many actions have been developed to strengthen SCP in the region. In the Middle East and North Africa (MENA) region, Arab countries adopted in 2012 the Arab 10YFP on SCP with the aim "to promote the concept of sustainable consumption and production in the Arab region through encouraging the utilisation of products and services that ensure environmental protection, conserve water and energy as well as other natural resources, while contributing to poverty eradication and sustainable lifestyles".

In line with this approach, the European Union (EU) funded SwitchMed Programme has been designed as a multi-component programme to facilitate the shift towards SCP in the Southern Mediterranean Region including: Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia.

SwitchMed is an initiative that supports and connects stakeholders to scale-up SCP in the Southern Mediterranean Region through social and eco innovations. It aims at achieving productive, circular

and sharing economies in the Mediterranean by changing the way goods and services are consumed and produced so that human development is decoupled from environmental degradation. It supports industry, emerging green entrepreneurs, civil society and policy makers through policy development, demonstration activities and networking.

SwitchMed is implemented through collaborative efforts of the EU, the United Nations Industrial Development Organization (UNIDO), the United Nations Environment Programme / Mediterranean Action Plan (UNEP/MAP), UNEP/MAP Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC) and UNEP – Division of Technology, Industry and Economics (UNEP-DTIE) (www.switchmed.eu).

The programme, which works with a wide range of stakeholders, is committed to catalysing the market of sustainable products and services in the Mediterranean via:

1. Engagement with policy makers to establish a regulatory and policy framework to boost the market for sustainable products and services. At the national level, it supports targeted countries to develop and refine national SCP policy action plans while at the regional level it develops a Mediterranean SCP Action Plan and a roadmap for its implementation under the Barcelona Convention. The SCP Action Plan aims at achieving the shift to sustainable patterns in four priority areas of consumption and production, namely food, fisheries and agriculture; goods manufacturing; tourism; and housing and construction.

2. Demonstration activities through which the programme implements concrete actions tackling the barriers faced by key players responsible for the shift towards SCP patterns:

    - Through the MED TEST II Initiative (Transfer of Environmental Sound Technology in the Southern Mediterranean Region) it provides capacity building in industry service providers targeting small and medium sized enterprises for resource efficiency improvements;

    - It provides trainings for start-ups and entrepreneurs to build skills in ecodesign, business planning, marketing and financing of sustainable products and services;

    - It works for the empowerment of citizens and civil society organizations to lead socially innovative solutions addressing environmental changes;

    - It implements demonstration activities in each country drawn from the SCP National Action Plans developed with governments.

3. Networking activities, through which it supports the visibility, effectiveness, long-term sustainability and impact of the programme. The SwitchMed Action Network gathers relevant stakeholders, links with similar initiatives and networks, supports the exchange of information and the scaling-up of current activities while minding synergies with the sister programmes, namely SWITCH-Asia and SWITCH-Africa Green.

Through the implementation of all these SCP practices, SwitchMed aims to generate positive environmental, social and economic impacts to Mediterranean environment and societies, while it creates tangible benefits related to climate change and other cross-cutting issues such as water and energy efficiency, food security, land use, and pollution.

Anna Ibañez de Arolas, Information Officer at the Regional Activity Centre for Sustainable Consumption and Production, Mediterranean Action Plan - United Nations Environment Programme (SCP/RAC-UNEP/MAP), SwitchMed Programme Networking Facility.