



Water, energy and food security Nexus in Jordan, Lebanon and Tunisia

Assessment of current policies and regulatory and
legal framework



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List of acronyms

ACC	Agricultural Credit Corporation
ACP	Agricultural Policy Charter
ACTE	Alliance of Commons for Energy Transition
AMCE	Arab Ministerial Council for Electricity
ANME	National Agency for Energy Control
ASFSD	Arab Strategic Framework for Sustainable Development
BOO	Build-Own-Operate
BOT	Build-Own-Transfer
BURs	Biennial Update Reports
CBS	Competitive Bidding System
CC	Climate Change
CCA	Climate Change Adaptation
CDM	Clean Development Mechanism
CDR	Council for Development and Reconstruction
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
COM	Council of Ministers
COP21	21st Conference of the Parties (or “COP”): Paris Climate Change Commitments
CPSC	Fund of loans and support of local communities
DGCPL	General Directorate of Public and Local Authorities
DGE	Energy General Department
DoS	Department of Statistics
DP	Direct Proposals
DSWH	Domestic Solar Water Heaters
EDL	Electricité du Liban
EDP	Executive Development Program
EE	Energy Efficiency
ENPI	European Neighbourhood Partnership Instrument
ESCOs	Energy Services Companies
ESCWA	Economic and Social Commission for Western Asia
ESD	Education for Sustainable Development
EU	European Union
FAO	Food and Agriculture Organization of the UN
FIT	Feed-in Tariffs
FNME	National Fund for Energy Control
GAFTA	Greater Arab Free Trade Area
GAM	Greater Amman Municipality
GDP	Gross Domestic Production
GEF	Global Environment Facility

GHG	Green House Gases
GIS	Geographic Information System
GIZ/GTZ	Deutsche Gesellschaft fir Internationale Zusammenarbeit (German)
GoJ	Government of Jordan
GTZ	German Organization for Technical Cooperation
GVA	Gross Value Added
GW	Gigawatts
GWh	Giga Watt
HDR	Human Development Report
HEFF	High Emission Factor Fuels
HEI	Higher Education Institutions
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
ISDB	Islamic Development Bank
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
JNCW	Jordanian National Commission for Women
JOD	Jordanian Dinar
JREEEF	Renewable Energy and Energy Efficiency Fund
JRV	Jordan Rift Valley
JVA	Jordan Valley Authority
kgoe	Kilogram oil equivalent
kV	Kilo Volt
kW	Kilowatt
LCEC	Lebanese Center for Energy Conservation
LEPAP	Lebanon Pollution Abatement Project
LNG	Liquefied Natural Gas
LRA	Litani River Authority
MDGs	Millennium Development Goals
MED- ENEC	Agencies for Energy Conservation
MEMR	Ministry of Energy and Natural Resources
MENA	Middle East and North Africa
MEW	Ministry of Energy and Water
MIS	Management Information System
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoEnv	Ministry of Environment
MoEW	Ministry of Energy and Water
MoH	Ministry of Health
MoI	Ministry of Industry
MoIM	Ministry of Interior and Municipalities
MoMA	Ministry of Municipal Affairs
MoPH	Ministry of Public Health
MoT	Ministry of Transportation
MoPIC	Ministry of Planning and International Cooperation
MRV	Measurement, Reporting and Verification
MSP	Mediterranean Solar Plan
MVA	Mega Volt Ampere
MW	Megawatt
MWh	Megawatt
MWI	Ministry of Water and Irrigation

NCCC	National Climate Change Committee
NCLW	National Commission for Lebanese Women
NDCs	Nationally Determined Contributions
NEEAP	National Energy Efficiency Action Plan
NGO	Non-Governmental Organization
NLWE	North Lebanon Water Establishment
NPMPLT	National Physical Master Plan for the Lebanese Territory
NRP	National Resilience Plan
NSAP	National Strategy and Action Plan
NSEQ	National Standards for Environmental Quality
NWMP	National Water Master Plan
NWSS	National Water Sector Strategy
OEA	Order of Engineers and Architects in Beirut
OMCs	Oil Marketing Companies
PMR	Partnership for Market Readiness
PPA	Power Purchase Agreement
PPP	Public and Private Sectors Partnership
PV	Photo-Voltaic
RCREEE	Regional Center for Energy Conservation and Renewable Energy
RE	Renewable Energy
REEEF	Renewable Energy and Energy Efficiency Fund
REEEL	Renewable Energy and Energy Efficiency Law
RSS	Royal Scientific Society
SCP	Sustainable Consumption and Production
SDGs	Sustainable Development Goals
SLWE	South Lebanon Water Establishment
TND	Tunisian Dinar
Toes	Ton oil equivalent
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WAJ	Water Authority of Jordan
WASH	Water, Sanitation and Hygiene
WB	World Bank
WEF	Water-Energy-Food
WEs	Water Establishments
WT	Wind Turbines
WTO	World Trade Organization
RICCAR	Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region

Executive Summary

Countries in the Middle East and North Africa (MENA) region have been dealing with the challenges of an arid climate for a long time. Over the last decades, however, pressures on water and energy systems have risen significantly as has the pressure to increase agricultural productivity and food supply. These developments have largely been driven by overall macroeconomic trends, such as population growth, urbanization, socio-economic development and environmental degradation; combined, all these factors are making the countries of the region more vulnerable to climate change. As a result, the region is facing new challenges that require a higher level of coordination between the three key sectors of socio-economic development -energy, water and food (WEF)- to ensure sustainable development. The Nexus Approach is part of the response to these challenges. Yet, how to implement the Nexus WEF Approach through pertinent policies and adapted national and pan-Arab regional development programmes and what governance structure or changes are needed for this purpose are the core questions that the current research is designed to address (The Energy-Water-Food Nexus in the League of Arab States - Franziska Otte, 2015).

This study is aimed at the assessment of current policies, regulatory and legal frameworks on renewable energy & energy efficiency, water management, the food security nexus and sustainable development in the countries of Jordan, Lebanon and Tunisia. While it assesses the aforementioned issues, this study closely considers climate change and the issue of gender. Also, the gaps, the needed solutions and recommendations for improvement were all embedded within the context of the report and summarized in the last part to include a policy framework for regulating the Nexus WEF at municipal and national levels, mapping regulations and evaluating governance to propose relevant alternatives in regulatory strategies and measures.

1. Water - Energy - Food (WEF) Nexus





1.1. Background and History

Water, energy, and food security are complex sectors on their own, but their interactions make them even more complex. The interrelatedness of the water, energy and food security sectors should not be viewed as a hindrance, but rather their relationships should be used as an opportunity to tackle development issues with a multi-sectoral approach. The Water, Energy and Food (WEF) Security Nexus Approach aims to understand how each of these three sectors relates to the other two and how this understanding can be used to make policy decisions that promote sustainable development and poverty reduction (Bizikova et al., 2013).

The connection between water, energy and food security may seem apparent in some cases; for example, agriculture is a main user of water and energy and water can be used as an energy source to power food production processes. In other cases, the link between the sectors may be more discrete. For example, does an increase in the production of biofuels affect a country's food security? (Bizikova et al., 2013). Similarly, advances in one sector may lead to degradation in the others. The inefficient use of water for agriculture can lead to the excessive withdrawal of groundwater, which may lead to food insecurity in the future. The Nexus Approach involves more than technological advances; it requires collaboration and cooperation among ministries, various levels of government and international partners. Reliable and effective governance is critical to the Nexus Approach. A crucial aspect of effective governance is the engagement of participatory approaches. Participatory approaches, including stakeholder involvement and the monitoring and evaluation of community responses, are critical to ensuring that the priorities of those affected by policies are being met.

As we enter a post Millennium Development Goals world, we must tackle contemporary issues as well as continue the fight for poverty elimination. Outside pressures, such as urbanization and climate change, are playing a significant role in the water, energy and food security sectors and will continue to do so in the future. Not only does the Nexus Approach focus on the link between water, energy and food security, but it also aims to address external pressures and how they ultimately affect quality of life and development.

1.2. The WEF Nexus and Climate Change in the Arab Region

Water security, energy security and food security are inextricably linked in the Arab region, perhaps more so than in any other region in the world. Generally, the region is known to be energy-intensive, water-scarce, food-deficient, and one of the world's most economically and environmentally vulnerable regions to climate change.

This strong interdependency between water, energy, food and climate change in the Arab region calls for the consideration of Nexus Approach when addressing the management of these three vital sectors. The Nexus Approach integrates management and governance across sectors, and where conventional policy and decision-making in 'silos' give way to an approach that reduces trade-offs and builds synergies across sectors especially in light of the global UN Sustainable Development Goals (SDGs) and the COP21 Paris Climate Change commitments in 2015.

Fortunately, this has been recently well-recognized in the Arab Strategic Framework for Sustainable Development (ASFSD), adopted by the League of Arab States in 2013, aiming at addressing the key challenges faced by the Arab States in achieving sustainable development during the period 2015-2030. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, and social systems, as well as boosting resource efficiency and productivity by addressing externalities across sectors.

1.2.1. Water

Average water availability in the Arab Region is 840m³ per person per year, only 12% of the world's average of 7000m³ per person per year (Sadik, 2013). The Arab region is currently using 75% of exploitable water sources in the region, and it is estimated that 58% of the region's renewable water resources will be depleted by 2030 (Sadik, 2013; Immerzeel et al., 2011). Arab countries obtain their water from several different sources, including groundwater, desalination and wastewater treatment. Groundwater provides 84% of total water supply in the Arabian Peninsula and is the largest water source in Bahrain, Jordan, Lebanon, Libya, Oman, Saudi Arabia, Tunisia, the United Arab Emirates and Yemen. Multistage flash distillation is the most common desalination technology used in the region and is primarily found on the Arabian Peninsula, where it supplies 8% of total water supply (Siddiqi & Anadon, 2011). Over 85% of the region's water use is dedicated to agriculture. Domestic and industrial water demands are 7.8% and 7% of total demand, respectively (Sadik, 2013).

1.2.2. Energy

The Arab Region has become almost synonymous with oil production. Oil and gas are major sources of income in the region, contributing to 36% of total Arab GDP. The shares from export earnings range from 33% to 97% in the region. However, as recent events have shown, oil revenues are vulnerable and subject to shocks and instability (Gelil, El Ashry & Saab, 2013). Oil and gas are not only important for earnings from exports, but they provide 97% of domestic demand in the region.

The region's overwhelming dependence on traditional energy sources has had a tremendous impact on greenhouse gas emissions. Carbon dioxide emissions in the Arab Region increased by 247% from 1990 to 2010; 95% of this increase has been attributed to the production and use of oil and gas sources (Gelil, El-Ashry, & Saab, 2013). Progress in renewable energy (RE) sources is being made. As of 2013, there were 106 renewable energy projects in the works. These projects equalled a more than 4% increase in current non-hydropower renewable capacity. Additionally, between 2008 and 2011, non-hydropower renewable capacity doubled (Bryden, Riahi & Zissler, 2013). Despite these advancements, regional policies that have kept energy prices artificially low have helped traditional energy sources remain popular and more attractive than renewable sources (Gelil, El-Ashry & Saab, 2013).

1.2.3. Food Security

The Arab Region is the number one importer of wheat in the world (World Bank, 2009). Despite being almost self-sufficient in red meats, vegetables and fruits, the region severely lags behind the world in cereal productivity and requires twice as much land to grow the same amount of cereal as other parts of the world. Many countries have suffered from stagnant productivity for years (Sadik, 2013). Seven countries account for 85% of total agriculture GDP in the region. Population is expected to reach 633 million by the year 2050 and reaching self-sufficiency in cereal production will require an additional 105 million hectares of land.

Land quality is limited in the region so increases in yields will have to come from improvements in irrigation, agriculture inputs and research and development (Sadik, 2013). Malnutrition is also present across the region. About 25% of children under five years old suffer from stunted growth and there are vast differences between countries. Yemen has the highest rate of childhood stunting at 57.9% (Breisinger, Ecker, Al-Riffai, & Yu, 2012). The poor are especially vulnerable to food insecurity in the Arab region. The poorest families in the region are estimated to spend 35% to 65% of their income on food (Food security and nutrition in the Arab region: key challenges and policy options, 2012).

1.2.4. Climate Change

Climate change, which impacts the Arab region more than any other region in the world, is acting as a threat multiplier across all of the above resources and human security issues. Climate change adds pressure to ecosystems and natural resources and with that, also to human securities. For example, the reduction of water availability and/or the reliability of water systems (with knock-on effects e.g. for energy systems) causes increased risks of droughts and floods (also risks for water and energy infrastructure), land degradation and desertification, the loss of agricultural productivity, the loss of hydropower production potential, higher temperatures and more heat waves, increased energy demand for cooling, reduced agricultural yields, etc. (World Bank Group, 2014).

The Arab Plan of Action to deal with Climate Change (APACC, 2012) suggests that these climate change impacts “may have social consequences due to the flow and migration of people from the affected areas to others within the same country, neighbouring countries or other countries [environmental refugees], which would result in increased pressure [there] on the environment and resources.” The Arab Strategy for Disaster Risk Reduction also highlights that the region is highly vulnerable to extreme events and natural disasters.

1.2.5. Nexus Opportunities in the Arab Region

The connections between the water, energy and food security sectors are overwhelming. Agriculture is the single largest user of water in the region, yet it suffers from one of the lowest efficiency rates at only 40% (Gelil, El-Ashry & Saab, 2013). Irrigation has been linked to higher cereal yields, yet only 27% of cultivated land in the Arab Region is irrigated (Sadik, 2013). Irrigation should be expanded, but it must be done correctly and efficiently in order to save water and energy (Siddiqi & Anadon, 2011). Raising irrigation efficiency to 70% could save enough water to produce an additional 35 million tons of cereal by 2030 (Sadik, 2013). The opportunities for utilizing a nexus approach are particularly apparent when observing the interactions between the water and energy sectors. It is estimated that the water cycle, from abstraction to treatment post-use, may use up to 15% of national electricity consumption in most Arab countries (Gelil, El-Ashry & Saab, 2013; Siddiqi & Anadon, 2011).

The Arab Region is currently home to 50% of the world's desalination capacity. Desalination is a highly energy-intensive process, using an average 3.5 kWh of energy per cubic meter of water (Mofor, 2013; Moawad, 2011). By 2050, desalination and wastewater are predicted to provide 28% and 15% of the region's water, respectively (Sadik, 2013). Energy demand for desalination will increase with the increased capacity, and the Arab region must consider how it will power these plants in the future. These links become even more critical when you consider the impact these changes in water and energy use will have on agriculture and food systems.

The benefits of conservation are also tremendous for the Arab Region. Reducing energy losses to only 10%, from the current 19.4%, would save the region US\$ 5.5 billion. Furthermore, transitioning to compact fluorescent lighting could reduce carbon emissions by 2.56% (Gelil, El-Ashry & Saab, 2013). Expanding the water cycle could also bring immense benefits to the region.

Agriculture policies that reduce the production of water-intensive crops and consider virtual water trade should also be regarded as conservation tools for the water and energy sectors (Gelil, El-Ashry & Saab, 2013). The Arab Region must also consider the effects of climate change as it moves forward. Studies estimate a 3° to 7° C temperature increase by the end of the century. This temperature increase could reduce groundwater supplies by 40% (Food security and nutrition in the Arab region: key challenges and policy options, 2012). Climate change may also reduce crop productivity and agriculture yields.

2. Sustainable Development Goals (SDGs)





2.1. Background and History

The Millennium Development Goals (MDGs), which were launched in 2000, set 2015 as the target year. Recognizing the success of the goals

(and the fact that a new development agenda was needed beyond 2015), countries agreed in 2012 at RIO+20, the UN Conference on Sustainable Development, to establish an open working group to develop a set of sustainable development goals.



After more than a year of negotiations, the Open Working Group presented its recommendations for the 17 SDGs. In August 2015, the 193 member states of the United Nations reached a consensus on the final document of the new agenda «Transforming our World: The 2030 Agenda for Sustainable Development.» Member states decided to hold the UN summit for the adoption of a new sustainable development agenda with its 17 goals from 25 to 27 September 2015 in New York; members convened at this high-level plenary meeting of the General Assembly.

There are 17 Sustainable Development Goals with 169 targets in contrast to the 8 Millennium Development Goals with 21 targets. The complex challenges that exist in the world today demand that a wide range of issues is covered. It is critical to address the root causes of the problems and not only the symptoms.



The SDGs are the results of a negotiation process that involved the 193 UN member states and unprecedented participation of civil society and other stakeholders. This led to the representation of a wide range of interests and perspectives. On the other hand, the MDGs were produced by a group of experts behind closed doors. The SDGs are broad in scope because they address the interconnected elements of sustainable development: economic growth, social inclusion and environmental protection.

The MDGs focused primarily on the social agenda. They targeted developing countries, particularly the poorest, while the SDGs apply to the entire world, both the rich and the poor.

2.2. The WEF Nexus and Climate Change within the Context of the SDGs

Though the 2030 Agenda did not adopt a nexus approach to achieving the SDGs, it did, however, strongly declare that the “SDGs and targets are integrated and indivisible,” and that the “interlinkages and integrated nature of the Sustainable Development Goals are of crucial importance in ensuring that the purpose of the new agenda is realized.”

The integrated nature of the SDGs matches well with the Nexus Approach, which specifically considers the numerous links between sectors. As a systems approach that aims to reduce trade-offs and build synergies by considering interactions and dependencies at all stages, the Nexus Approach enhances the efficiency of the entire system rather than increasing productivity of a specific sector often at the expense of others. An example of this is the climate change goal, SDG 13, which focuses on combating climate change and its effects. Climate change is a cross-sectoral stressor and a key driver of water and food systems. The energy system drives climate change and in return, is being affected by it. Projections by RICCAR, the Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region, indicate that the Arab region will be affected by a general rise in temperature, more hot summer days and decreasing average monthly rainfall.

At the core of the water-energy-food security nexus, Goals 2, 6 and 7 are easily identified. Goal 2 seeks to end hunger, achieve food security and improved nutrition and promote sustainable agriculture, and it has five associated targets and three means of implementation. Goal 6 aims to ensure availability and sustainable management of water and sanitation for all, and it has six associated targets and two implementation means. Goal 7 aims to ensure access to affordable, reliable, sustainable and modern energy for all, with five targets and two implementation means.

A closer look at the SDGs and their targets reveals several connections. For example, target 6.4, increasing water use efficiency across all sectors, is linked to targets 2.3 and 2.4 that call for better agricultural productivity and resilient agricultural practices, which are connected to target 7.3 related to improvement in energy efficiency. Connections are not limited to these three core goals of the nexus, but are present in others too, such as health target 3.9 that calls for the reduction in the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination, which is closely connected to target 6.1, which focuses on achieving universal access to safe drinking water for all.

Examining the SDGs as a system with a nexus lens helps identify these connections and guide decision makers along the long-term path of sustainable development. Governing bodies must ensure that the interdependencies among SDGs and sectors are accounted for in strategy and policy formulation. The water-energy-food Nexus Approach may also provide a cross-check on how progress in some thematic targets affects others.

The integrated nature of the 2030 Agenda was echoed in the key messages from the Arab Forum for Sustainable Development, to the follow-up high-level political forum on sustainable development. They highlighted the links between goals related to the environment, natural resources, climate change and economic and social objectives, and they called for increased cooperation across the region given the cross-border nature of water, energy, agriculture and food security challenges. The messages also stressed that human rights, including the right to development, gender equality and women's empowerment, are the foundation of the agenda, and they are in harmony with ESCWA's proposed water-energy-food security nexus.

2.3. SDGs, Targets and Implementation Means at the Core of the Water-Energy-Food Security Nexus and Climate Change

Each country has primary responsibility for its own economic and social development and the role of national policies, domestic resources and development strategies cannot be overemphasized. Good governance and the rule of law at the national and international levels are essential for sustained, inclusive and equitable economic growth, sustainable development and the eradication of poverty and hunger. Relevant SDGs for this study include (Table 1):



Table 1. SDGs Relevant to the Study (Related to WEF)

SDG-2: End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture

2030 Targets

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons.

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

Implementation means

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.

2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

SDG-6: Ensure Availability and Sustainable Management of Water and Sanitation for All

2030 Targets

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

6.4 By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

6.6 By 2020, protect and restore water related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Implementation means

6.a By 2030, expand international cooperation and capacity-building

support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

6.b Support and strengthen the participation of local communities in improving water and sanitation management.

SDG-7: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All

2030 Targets

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.

7.3 By 2030, double the global rate of improvement in energy efficiency.

Implementation means

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.

SDG-13: Take Urgent Action to Combat Climate Change and its Impacts

2030 Targets

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

13.2 Integrate climate change measures into national policies, strategies and planning.

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

Implementation means

13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.

13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities.

2.4. The WEF Nexus and Climate Change Related to the SDGs – Arab Region

The following analysis is mainly based on the WEF Nexus in the Arab Region Series, which was published by the League of Arab States (LAS) in 2016.

Resource scarcity challenges and other emerging development issues were recently well recognized in the Arab Strategic Framework for Sustainable Development (ASFSD) adopted by the LAS in 2014. The ASFSD is promoting the Nexus Approach to water-energy-food sustainability in the Arab region and encouraging the transition towards a low carbon economy to address the interdependencies between water, energy and food in order to make the nexus work for the poor. In addition, the Nexus Approach will enhance system thinking and integration of sectoral policies; this, in turn, will help the Arab region achieve the targets of the SDGs. In the SDGs of the UN's post-2015 Global Development Agenda, the three components of the WEF Security Nexus are clearly explained as:

- Goal 2 calls for ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture.
- Goal 6 calls for ensuring availability and sustainable management of water and sanitation for all.
- Goal 7 calls for access to affordable, reliable, sustainable and modern energy for all.
- In addition, Goal 13 addresses climate change.

In other words, access to water, energy and food are prioritized to achieve sustainable development. This highlights the necessity of the WEF Nexus Approach and the important role it can play in policy formulation for achieving both the SDGs and the Paris Climate Change targets. By acknowledging sustainable development inter-linkages among various environmental, social and economic dimensions, the SDGs are better achieved through integrated management of resources. The WEF Nexus Approach would offer the necessary foundation for forming potential synergies and win-win situations that would help parties achieve sustainable development.

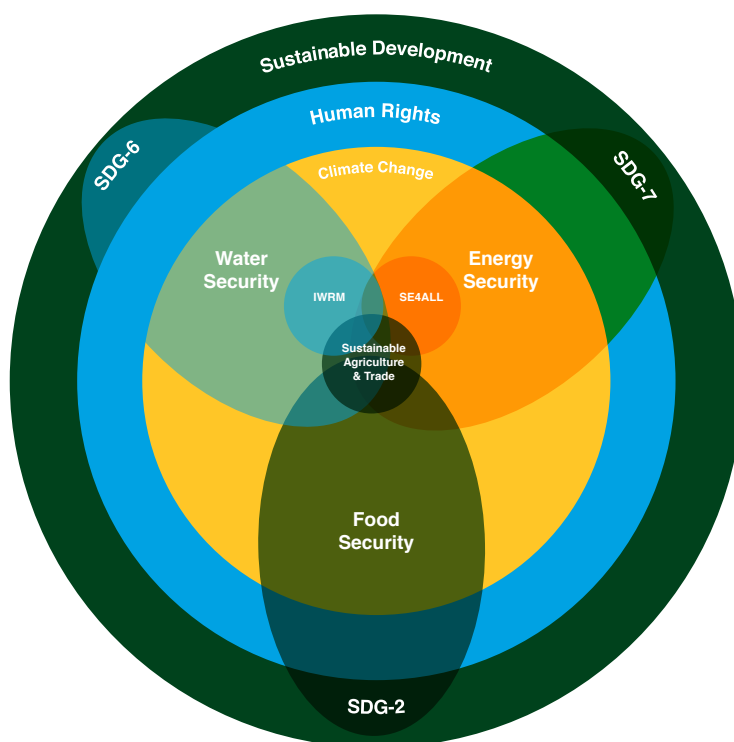


Figure 1. The Water-Energy-Food Security Nexus. Source: ESCWA, 2015b.

2.5. Assessment of Current Policies

Although the Arab region was among the first to develop a regional strategy for Sustainable Consumption and Production (SCP), the implementation of this strategy at the national level has been sub-optimal as the vast majority of SCP policies that exist in the Arab region are predominantly supply-oriented. Examples of these include improving efficiency of power generation and water networks, building new desalination plants and improving agriculture productivity. Demand-side policies curbing and influencing consumer demand by using economic instruments or rationalizing subsidies, for example, are rarely used. It is also worth noting that though the Arab SCP strategy identified energy, water and food as regional priorities, the nexus concept was not developed enough at that time of its adoption in 2009. The strategy addresses the efficiency of those three resources independently. In most of the Arab countries, energy, water and food policies are developed within each sector with little horizontal coordination. Additionally, climate change is still being addressed as an add-on policy issue rather than a core development challenge in the region.

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 offers real opportunities for synergies such as:

- Coordinated investments in infrastructure related to water, food and energy.
- Innovation to improve resource use efficiency and harness renewable energy to meet climate change obligations as per Paris Climate Change Agreement in 2015.
- Use of economic instruments for stimulating investment including pricing of resources and ecosystem services.
- Maximizing the beneficial uses of water and energy amongst competing demand.
- Applied and adaptive research to enhance adaptation to climate change in the agricultural sector and to ensure production systems resilience.
- Capacity building and sharing of experiences at national and regional levels.
- Bridging the present science-policy gap.

2.6. Policy Options

Clearly, there is a need for an institutional setup that enhances coordination, builds synergies and reduces trade-offs across the three sectors. However, this does not mean creating new institutions or new hard structures. The newly established climate change institutions and different forms of multi-stakeholder bodies, such as the national climate change committees that are already formulated in many Arab countries, could serve as catalysts to mainstream the Nexus Approach at all levels of policy development. Arab policymakers need to revisit their current and future development strategies and plans with a new nexus lens. Water, food and energy form a complex web of interlinkages, and due to their strong interdependence, policies and subsidies in one sector strongly influence the other two sectors. For example, changes in energy policies and subsidies influence water use for food production. This has been evident in many Arab countries.

The subsidy system implemented in many Arab countries is an across-the-board, or universal, subsidy system, which in fact, works in favour of the rich rather than the poor. Thus, the issue of setting the prices of water, energy and food has been always politically sensitive and thus requires careful consideration. Reassessing the pricing schemes of the three resources needs to be conducted using a holistic approach, taking into consideration the complexities of the interlinkages explained above. Furthermore, to achieve social justice, universal subsidies should give way to targeted subsidies that are directed at the needy segments of Arab society to ensure equity and apply the policy “treat unequals unequally.” The most important policy reform to be considered is to revise the current pricing policies in these three sectors and redesign them to reflect the real value of the resources and to contribute to their sustainability. These pricing policies should aim to ensure that basic human needs are met, incentivize the conservation of resources and recover the cost of their service provision without impacting the poor groups of society. Moreover, in order to achieve both the mandate and the targets of the SDGs and the 2015 Paris Climate Change Agreement, Arab policy makers need to mainstream the WEF Nexus Approach in their sustainable development strategies, plans and programmes. The League of Arab States needs to revise its current institutional framework of sustainable development to foster the WEF Nexus Approach, system thinking and institutional learning.

National and regional efforts to address the climate change challenge offer an unprecedented opportunity for a needed institutional reform in order to mainstream the nexus thinking in policy development and implementation. Several pioneering projects are offering opportune examples of the need to foster the Nexus Approach. Saudi’s first solar desalination plant will produce 60,000 cubic meters of desalinated water per day and will be the world’s largest utility scale solar desalination plant. Another excellent example is the Lake Manzala engineered wetland in Egypt, which has proved to provide an economically- and environmentally-sound alternative to traditional wastewater treatment facilities, while using the treated wastewater for agriculture and aquaculture. Both examples make a testing ground for the need to coordinate energy, water and food policies, while reducing environmental footprints and improving resilience to climate change at the national level.

2.7. Conclusion

The integrated management of natural resources would enhance resource efficiency and ensure that SDGs are reached at the national and regional levels. The ASFSD realized the WEF Nexus as an effective tool to enhance resource efficiency and achieve sustainable development. Subsidy reform of energy, water and food should be undertaken in a holistic fashion to target the poor. Furthermore, the newly-adopted Paris Climate Change Agreement, along with the established climate change bodies at the national levels, could serve as a catalyst to foster the WEF Nexus Approach.

3. Human Development Status of Jordan, Lebanon and Tunisia





3.1. Introduction to Human Development Index (HDI)

The Analysis below is based on the Human Development Report 2016 (UNDP, 2017).

The HDI is a summary measure for assessing progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. To ensure as much cross-country comparability as possible, the HDI is based primarily on international data from the United Nations Population Division (the life expectancy at birth data), the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (the mean years of schooling and expected years of schooling data) and the World Bank (the GNI - Gross National Income - per capita data).



3.2. Jordan's HDI Value and Rank

Jordan's HDI value for 2015 is 0.741, which put the country in the high human development category, positioning it at 86 out of 188 countries and territories. Between 1990 and 2015, Jordan's HDI value rose from 0.620 to 0.741, an increase of 19.6 percent.

Table 2 reviews Jordan's progress in each of the HDI indicators. Between 1990 and 2015, Jordan's life expectancy at birth increased by 4.3 years, mean years of schooling increased by 5.0 years and expected years of schooling increased by 1.4 years. Jordan's GNI per capita increased by about 61.0 percent between 1990 and 2015.

3.3. Lebanon's HDI Value and Rank

Lebanon's HDI value for 2015 is 0.763, which put the country in the high human development category, positioning it at 76 out of 188 countries and territories. Between 2005 and 2015, Lebanon's HDI value rose from 0.733 to 0.763, an increase of 4.1 percent.

Table 2 reviews Lebanon's progress in each of the HDI indicators. Between 1990 and 2015, Lebanon's life expectancy at birth increased by 9.3 years, mean years of schooling increased by 1.0 year and expected years of schooling increased by 1.6 years. Lebanon's GNI per capita increased by about 50.8 percent between 1990 and 2015.

3.4. Tunisia's HDI Value and Rank

Tunisia's HDI value for 2015 is 0.725, which put the country in the high human development category, positioning it at 97 out of 188 countries and territories. The rank is shared with Suriname. Between 1990 and 2015, Tunisia's HDI value rose from 0.569 to 0.725, an increase of 27.3 percent.

Table 2 reviews Tunisia's progress in each of the HDI indicators. Between 1990 and 2015, Tunisia's life expectancy at birth increased by 6.2 years, mean years of schooling increased by 3.7 years and expected years of schooling increased by 4.1 years. Tunisia's GNI per capita increased by about 86.2 percent between 1990 and 2015.

Table 2. Jordan's, Lebanon's and Tunisia's HDI trends based on consistent time series data

Year											Life Expectancy at Birth			Expected Years of Schooling			Mean Years of Schooling			GNI per capita (2011 PPP\$)			HDI Value		
	2015	2014	2013	2012	2011	2010	2005	2000	1995	1990															
	74.2	74.0	73.9	73.7	73.6	73.4	72.6	71.7	70.9	69.9	Jordan											Jordan			
	79.5	79.3	79.0	78.8	78.6	78.4	76.8	74.4	72.1	70.2	Lebanon											Lebanon			
	75.0	74.8	74.7	74.6	74.6	74.6	74.2	73.2	71.5	68.8	Tunisia											Tunisia			
	13.1	13.1	13.1	13.1	12.9	13.1	13.7	12.7	12.1	11.7	Jordan											Jordan			
	13.3	13.3	13.3	13.3	13.3	13.2	13.2	15.0	12.5	11.7	Lebanon											Lebanon			
	14.6	14.6	14.7	14.7	14.6	14.5	14.2	13.1	11.6	10.5	Tunisia											Tunisia			
	10.1	10.1	9.9	9.9	9.9	9.9	9.7	9.5	9.3	5.1	Jordan											Jordan			
	8.6	8.6	8.6	8.6	8.3	7.9	7.6				Lebanon											Lebanon			
	7.1	7.0	7.0	6.9	6.9	6.6	5.8	4.9	4.1	3.4	Tunisia											Tunisia			
	10,111	10,126	10,109	10,118	10,230	10,354	9,634	7,821	6,994	6,279	Jordan											Jordan			
	13,312	13,582	13,935	14,961	15,728	16,066	12,152	12,573	12,735	8,829	Lebanon											Lebanon			
	10,249	10,270	10,141	10,034	9,723	10,078	8,455	7,386	5,967	5,503	Tunisia											Tunisia			
	0.741	0.741	0.737	0.737	0.735	0.737	0.733	0.706	0.687	0.620	Jordan											Jordan			
	0.763	0.763	0.763	0.766	0.763	0.758	0.733				Lebanon											Lebanon			
	0.725	0.723	0.722	0.720	0.717	0.714	0.689	0.654	0.608	0.569	Tunisia											Tunisia			

Jordan's 2015 HDI of 0.741 is below the average of 0.746 for countries in the high human development group and above the average of 0.687 for countries in Arab States. From Arab States, countries which are close to Jordan in the 2015 HDI rank and to some extent in population size are Kuwait and Libya, which have HDIs ranked 51 and 102, respectively (see Table 3).

Lebanon's 2015 HDI of 0.763 is above the average of 0.746 for countries in the high human development group and above the average of 0.687 for countries in Arab States. From Arab States, countries which are close to Lebanon in the 2015 HDI rank and to some extent in population size are Jordan and Kuwait, which have HDIs ranked 86 and 51, respectively (see Table-3).

Tunisia's 2015 HDI of 0.725 is below the average of 0.746 for countries in the high human development group and above the average of 0.687 for countries in Arab States. From Arab States, countries which are close to Tunisia in the 2015 HDI rank and to some extent in population size are Libya and Morocco, which have HDIs ranked 102 and 123, respectively (see Table 3).

Table 3: Jordan's, Lebanon's and Tunisia's HDI and Component Indicators for 2015 Relative to Selected Countries and to the Arab States

	HDI Value	HDI Rank	Life Expectancy at Birth	Expected Years of Schooling	Mean years of Schooling	GNI per capita (PPP US\$)
Jordan	0.741	86	74.2	13.1	10.1	10,111
Lebanon	0.763	76	79.5	13.3	8.6	13,312
Tunisia	0.725	97	75.0	14.6	7.1	10,249
Morocco	0.647	123	74.3	12.1	5.0	7,195
Kuwait	0.800	51	74.5	13.3	7.3	76,075
Libya	0.716	102	71.8	13.4	7.3	14,303
Arab States	0.687	—	70.8	11.7	6.8	14,958

3.5. Gender Development Index (GDI)

The female HDI value for Jordan is 0.670, in contrast with 0.776 for males, resulting in a GDI value of 0.864, which places the country into Group 5. In comparison, GDI values for Kuwait and Libya are 0.972 and 0.950, respectively (see Table 4).

The female HDI value for Lebanon is 0.709, in contrast with 0.793 for males, resulting in a GDI value of 0.893, which places the country into Group 5. In comparison, GDI values for Jordan and Kuwait are 0.864 and 0.972, respectively (see Table 4).

The female HDI value for Tunisia is 0.680, in contrast with 0.752 for males, resulting in a GDI value of 0.904, which places the country into Group 4. In comparison, GDI values for Libya and Morocco are 0.950 and 0.826, respectively (see Table 4).

Table 4. Jordan's, Lebanon's and Tunisia's GDI for 2015 Relative to Selected Countries and to the Arab States

	Life Expectancy at Birth		Expected Years of Schooling		Mean years of Schooling		GNI per capita		HDI Value		F-M Ratio
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	GDI Value
Jordan	75.9	72.6	13.4	12.9	9.7	10.7	3,203	16.69	0.670	0.776	0.864
Lebanon	81.5	77.9	13.0	13.6	8.3	8.7	5,844	20,712	0.709	0.793	0.893
Tunisia	77.4	72.7	15.1	14.2	6.7	7.8	4,662	15,967	0.680	0.752	0.904
Morocco	75.3	73.3	11.5	12.6	3.8	6.4	3,388	11,091	0.579	0.700	0.826
Kuwait	75.9	73.6	13.6	12.4	7.4	6.9	35,164	107.99	0.769	0.791	0.972
Libya	74.8	69.0	13.6	13.2	7.7	7.0	7,163	21.36	0.691	0.727	0.950
Arab States	72.8	69.1	11.4	12.1	5.9	7.6	5,455	23.81	0.621	0.726	0.856

3.6. Gender Inequality Index (GII)

Jordan has a GII value of 0.478, ranking it 111 out of 159 countries in the 2015 index. In Jordan, 11.6 percent of parliamentary seats are held by women, and 78.5 percent of adult women have reached at least a secondary level of education, compared to 82.7 percent of their male counterparts. For every 100,000 live births, 58 women die from pregnancy-related causes, and the adolescent birth rate is 23.2 births per 1,000 women of ages 15-19. Female participation in the labour market is 14.2 percent compared to 64.4 for men. In comparison, Kuwait and Libya are ranked at 70 and 38, respectively on this index (see Table 5).

Lebanon has a GII value of 0.381, ranking it 83 out of 159 countries in the 2015 index. In Lebanon, 3.1 percent of parliamentary seats are held by women, and 53.0 percent of adult women have reached at least a secondary level of education compared to 55.4 percent of their male counterparts. For every 100,000 live births, 15 women die from pregnancy-related causes, and the adolescent birth rate is 12.4 births per 1,000 women of ages 15-19. Female participation in the labour market is 23.5 percent compared to 70.3 for men (see Table 5).

Tunisia has a GII value of 0.289, ranking it 58 out of 159 countries in the 2015 index. In Tunisia, 31.3 percent of parliamentary seats are held by women, and 37.5 percent of adult women have reached at least a secondary level of education compared to 49.9 percent of their male counterparts. For every 100,000 live births, 62 women die from pregnancy-related causes, and the adolescent birth rate is 6.8 births per 1,000 women of ages 15-19. Female participation in the labour market is 25.1 percent compared to 71.3 for men (see Table 5).

Table 5. Jordan's, Lebanon's and Tunisia's GII for 2015 Relative to Selected Countries and to the Arab States

	GII value	GII Rank	Maternal mortality ratio	Adolescent birth rate	Female seats in parliament (%)	Population with at least some secondary education (%)		Labour force participation rate (%)	
						Female	Male	Female	Male
Jordan	0.478	111	58	23.2	11.6	78.5	82.7	14.2	64.4
Lebanon	0.381	83	15	12.4	3.1	53.0	55.4	23.5	70.3
Tunisia	0.289	58	62	6.8	31.3	37.5	49.9	25.1	71.3
Morocco	0.494	113	121	31.7	15.7	25.7	33.2	25.3	74.3
Kuwait	0.335	70	4	9.8	1.5	56.8	58.1	48.4	84.5
Libya	0.167	38	9	6.2	16.0	65.7	44.2	27.8	78.7
Arab States	0.535	—	142	47.7	15.5	41.6	52.3	22.3	75.1

Maternal mortality ratio is expressed in number of deaths per 100,000 live births and adolescent birth rate is expressed in number of births per 1,000 women ages 15-19.

3.7. Multidimensional Poverty Index (MPI)

The most recent survey data that were publicly available for Jordan's MPI estimation are from 2012. In Jordan, 1.2 percent of the population (85,000 people) are multidimensionally poor while an additional 1.0 percent live near multidimensional poverty (69,000 people). The breadth of deprivation (intensity) in Jordan, which is the average deprivation score experienced by people in multidimensional poverty, is 35.3 percent. The MPI, which is the share of the population that is multidimensionally poor, adjusted by the intensity of the deprivations, is 0.004.

Table-6 shows the percentage of Jordan's and Tunisia's populations that live near multidimensional poverty and that live in severe multidimensional poverty. The contributions of deprivations in each dimension to overall poverty complete a comprehensive picture of people living in multidimensional poverty in Jordan and Tunisia. Figures for Kuwait and Morocco are also shown in the table for comparison.

Table 6. The Most Recent MPI for Jordan and Tunisia Relative to Selected Countries

	Survey year	MPI value	Headcount (%)	Intensity of deprivations (%)	Population share (%)			Contribution to overall poverty of deprivations in (%)		
					Near poverty	In severe poverty	Below income poverty line	Health	Education	Living Standards
Jordan	2012	0.004	1.2	35.3	1.0	0.1	-	65.0	31.5	3.5
Tunisia	2012	0.006	1.5	39.3	3.2	0.2	2.0	48.2	33.7	18.1
Morocco	2011	0.069	15.6	44.3	12.6	4.9	3.1	21.8	44.8	33.4
Kuwait	2007	0.005	1.4	37.5	6.3	0.1	-	47.9	31.9	20.2

3.8. Dashboard on Life-Course Gender Gap

Table 7 provides the number of indicators in which Jordan, Lebanon and Tunisia perform: better than at least two-thirds of countries (i.e., in the top third of performers), better than at least one-third but worse than at least one-third (i.e., in the medium third of performers), and worse than at least two-thirds of countries (i.e., in the bottom third of performers). Figures for Morocco, Kuwait and Libya are also shown in the table for comparison.

Table 7. Summary of Jordan's, Lebanon's and Tunisia's Performance in the Life-Course Gender Gap Dashboard Relative to Selected Countries

	Childhood and youth (6 indicators)			Adulthood (6 indicators)			Older age (2 indicators)			Overall (14 indicators)			Missing indicators
	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	
Number of Indicators													
Jordan	1	2	3	0	2	2	0	1	1	1	5	6	2
Lebanon	3	1	2	2	0	3	1	0	0	6	1	5	2
Tunisia	4	2	0	1	1	2	0	1	0	5	4	2	3
Morocco	3	2	1	1	2	3	0	1	0	4	5	4	1
Kuwait	5	1	0	2	0	3	0	1	0	7	2	3	2
Libya	2	0	1	1	1	1	0	1	0	3	2	3	6

3.9. Dashboard for Sustainable Development

Table 8 provides the number of indicators in which Jordan, Lebanon and Tunisia perform: better than at least two-thirds of countries (i.e., it is among the top third of performers), better than at least one-third but worse than at least one-third (i.e., it is among the medium third of performers), and worse than at least two-thirds of countries (i.e., it is among the bottom third of performers). Figures for Morocco, Kuwait and Libya are also shown in the table for comparison.

Table 8. Summary of Jordan's, Lebanon's and Tunisia's Performance in the Sustainable Development Dashboard Relative to Selected Countries

	Environmental sustainability (5 indicators)			Economic sustainability (5 indicators)			Social sustainability (4 indicators)			Overall (14 indicators)			Missing indicators
	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	Top third	Middle third	Bottom third	
Number of Indicators													
Jordan	0	3	2	3	1	1	1	1	1	4	5	4	1
Lebanon	1	2	2	2	0	2	0	1	0	3	3	4	4
Tunisia	1	3	1	1	2	2	0	2	1	2	7	4	1
Morocco	1	1	3	3	2	0	0	3	0	4	6	3	1
Kuwait	1	1	1	1	1	2	1	1	0	3	3	3	5
Libya	1	1	3	1	0	2	1	1	0	3	2	5	4

4. Current Legal Framework on WEF Nexus and Sustainable Development Considering Climate Change



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4.1. The Jordan Case – Energy Sector

4.1.1. General Overview of the Energy Sector - Jordan



Jordan has limited energy resources and depends heavily on imported crude oil for its energy use. The major national objectives in the energy sector in Jordan are to provide adequate energy for intensive development at the lowest possible cost and with the best specifications.

Recent developments, such as extreme volatility in oil prices, concerns about security of energy supply and demand and fears about future energy supplies, continue to remain at the top of our political agenda. The Government of Jordan (GoJ) is seeking to address challenges in the energy sector through a combination of medium- to long-term solutions. Additionally, the GoJ is seeking to improve its energy security and lower its exposure to external shocks in terms of supply. It is also working on the implementation of measures in line with the objectives to improve the fiscal and macro-economic situation in the country and create sound, sustainable growth for Jordan.

Crude oil and oil product imports have decreased from 7,130 thousand tons in 2012 to 5,705 thousand tons in 2016, a drop of around 20%. Table 9 and Figure 2 below show the quantity of crude oil and oil product imports in the period 2012-2016.

Table 9. Quantity of Imports of Crude Oil and Oil Products 2012-2016 (Thousand Tons)

Source: MEMR Annual Report 2016

Year	Crude Oil	Fuel Oil	Liquefied Gas	Diesel	Gasoline	Jet Fuel	Coal	Vacuum Residuals	Pot Cake	Total
2012	3,623	703	288	2,089	426	1	340	-	-	7,130
2013	3,170	685	280	1,670	515	27	306	23	123	6,799
2014	3,221	1,255	282	2,373	552	51	474	0	130	8,338
2015	3,513	848	335	1,121	670	34	230	0	204	6,955
2016	2,978	0	327	967	832	64	327	0	210	5,705

Import of Crude Oil, Oil Products, Coal, Coke

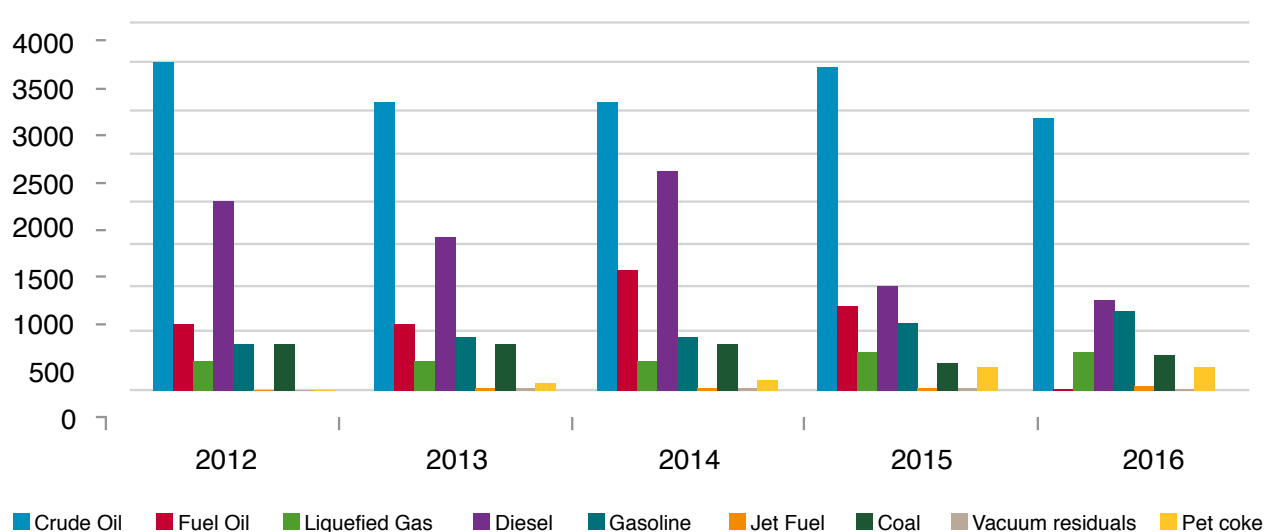


Figure 2. Quantity of Imports of Crude Oil and Oil Products 2012-2016 (Thousand Tons)

Source: MEMR Annual Report 2016

Tables 10 and 11 show the total primary energy consumption and the sectorial distribution of final energy consumption in the period 2012-2016.

Table 10. Total Primary Energy Consumption 2012-2016 (Thousand Tons)

Source: MEMR Annual Report 2016

Year	Type of Primary Energy						Total
	Crude Oil and Oil Products	Coal	Pet Coke	Natural Gas	Renewable Energy	Imported Electricity	
2012	6,992	226	-	659	140	188	8,205
2013	6,689	204	116	907	145	96	8,157
2014	7,479	332	88	301	152	109	8,461
2015	6,331	161	165	1,944	160	183	8,944
2016	5,327	220	182	3,338	412	84	9,614

Table 11. Sectorial Distribution of Final Energy Consumption 2012-2016 (Thousand Tons)

Source: MEMR Annual Report 2016

Year	Type of Primary Energy				Total
	Transport	Industry	Household	Others *	
2012	2,521	921	1,198	743	5,383
2013	2,734	924	1,109	617	5,384
2014	2,558	1,079	1,152	718	5,507
2015	2,811	991	1,272	754	5,828
2016	3,184	1,064	1,342	826	6,416

4.1.2. Energy Policy and Legal Framework

4.1.2.1. General Overview and Main Challenges

Jordan is heavily dependent on foreign energy sources with over 96% of its needs being met by imports of oil products, natural gas and electricity; the annual cost of these imports totals more than JOD 4 billion. The Second Gulf War created a shock in the energy sector in Jordan and brought the country's oil supply vulnerability to light. This has increased the calls for more serious efforts to diversify energy supplies and develop domestic energy resources to reduce Jordan's dependence on foreign energy resources and improve the security of the supply. The energy sector in Jordan is facing the following main challenges:

- Almost no indigenous energy resources.
- High dependency on imported energy (97% imported in 2015).
- Volatile oil prices (The energy cost in 2014 amounted to JOD 4.48 billion, which represented 17.6% of GDP at current prices; in 2015, this number decreased to JOD 2.5 billion, representing almost 10% of GDP).
- Continued increase in demand (High growth of primary energy demand of 5.5% and electricity generated capacity of 5.3% per year).
- High energy intensity of 207 oil kg equivalent/US\$ 1,000 in 2015.

4.1.2.2. Key Actions and Strategies

Securing the energy supply and diversifying energy sources are two of the main objectives of the GoJ's Executive Development Program (EDP) for 2016-18. In line with the Energy Strategy, which was updated for the years 2015-2025, the GoJ is seeking to diversify its energy supply and is currently considering the development of projects, which could be implemented in the very short term. Additionally, the GoJ is working on the security and reliability of its supply chain to avoid future energy shortages. Several on-going initiatives in that respect can be highlighted:

- Discussions with neighbouring countries to secure reliable supplies.
- On-going discussions with the Egyptian authorities to secure the supply of contracted quantities of gas from Egypt.
- Liquefied Natural Gas (LNG) Terminal in Aqaba, which was inaugurated on 30 July 2015, to import LNG through three main tracks i) importing LNG from international market through tendering or bilateral agreements ii) constructing an LNG Jetty and connecting it to the main Arab Gas Pipeline iii) leasing floating storage regasification units (FSRU) through requests for proposals from FSRU providers.
- Electricity production capacities (IPP1: 370MW; IPP2: 373MW; IPP3: 573MW; and IPP4: 240MW for peaking units) developed and financed by the private sector.
- Increase the country's strategic oil and oil product storage capacity to secure a strategic 60-day supply of petroleum products and develop infrastructure projects:
 - Oil terminal rehabilitation project.
 - Liquefied Petroleum Gas (LPG) Jetty.
 - Aqaba oil terminal (100 thousand tons storage).
 - Aqaba LPG terminal (6 thousand tons storage).
 - Amman Strategic Reserve Terminal (250-300 thousand tons of light oil products and 10 thousand tons of LPG).
- Liberalization of the downstream oil sector: the GoJ granted licenses to three initial Oil Marketing Companies (OMCs) to import and trade white products.
- Exploitation of national energy resources: there are medium- to long-term prospects for oil shale and additional extraction of natural gas from Risha field.
- Renewable energy programmes: 200 MW will be contracted (Power Purchase Agreement (PPA) and Implementation Agreement (IA) signed) in 2013 further to a direct proposals process carried out in 2011 and 2012.

Considering the existing technical potential for solar and wind energy in the country, the Energy Strategy calls for 10% of the Kingdom's energy mix to come from renewable energy sources by 2020. To achieve this, the GoJ is following an evolving multi-faceted action plan with partners from public and private sectors to significantly increase electricity generation from renewable sources, substitute conventional fuels for renewable energy across sectors and increase energy efficiency to reduce overall demand for energy without sacrificing economic growth.

4.1.2.3. Renewable Energy Policy

The Jordanian government's policies are focused on planning, supervision and regulation for bolstering the sector's capacity and enhancing the volume of investment. Jordan already signed agreements for more than 1000MW of renewable energy projects (both wind and solar); around 135MW of this total are already connected to the grid and under commercial operation. Another 900MW are currently under construction and financial closure.

The 2007-2015 strategy aims at promoting the development of renewable energy and energy efficiency. The strategy has adopted an ambitious renewable energy target to capitalize on local resources and has targeted a contribution rate of 10% of the country's energy needs by 2020. A total of 1850 MW of installed RE capacity was targeted to help Jordan reach this goal. Of this total, 1200 MW will be from wind, 600 will be from solar PV and 50 MW will be from waste. The 2007-2020 strategy is also aimed at reaching a share of 30% of households equipped with a solar water heater by 2020. The government has underlined its commitment to reach the ambitious targets set in the Energy Strategy and issued the Renewable Energy and Energy Efficiency Law on 17 April 2012. With this law, for the first time in Jordan, unsolicited or direct proposal submission is allowed; investors now have the opportunity to identify and develop renewable grid-connected electricity production projects such as wind parks, solar systems or others on their own and propose these to the Ministry of Energy and Mineral Resources. As a result of this process, 580 MW of renewable energy projects are planned till 2015. Of this total, 200 MW will be from direct proposals, 70 MW will be from PV solar projects and 70 MW will be from wind projects constructed on an engineering, procurement and construction (EPC) basis. The following RE projects are considered as committed renewable energy projects until 2015 within the baseline scenario in the Jordan's Third National Communication report on Climate Change:

- Wind power project in the Tafila area with a capacity of 117 MW.
- Wind power project in the Fujeij area with a capacity of 90MW.
- Wind power project in Maan area with a capacity of 70 MW (Gulf Grant).
- PV solar project in Quweirah area with a capacity of 70 MW (Gulf Grant).
- PV solar project with a capacity of 10 MW in the area of Mafraq.
- Direct proposal solar PV projects to generate solar electricity 200 MW.
- PV solar project with a capacity of 5 MW (Spanish Grant).
- Wind energy projects from direct proposals to generate electricity 100 MW.

The Renewable Energy and Energy Efficiency Law (REEEL) was approved and released in mid-2012 (Law No. 13 for year 2012). The main objectives of the REEEL include:

- Increasing the contribution of RE to the total energy mix in Jordan.
- Promoting and exploiting RE for environmental protection and sustainable development purposes.
- Enhancing energy efficiency in all sectors of the economy. According to Article 10 of this law, rules and regulations to guide implementation of the REEEL were issued by the Ministry of Energy and Mineral Resources and the Electricity Regulatory Commission, which was substituted by the Energy and Minerals Regulatory Commission in 2014.

According to the REEEL's approved directives and regulations, Jordan follows a five-track approach to develop and connect RE systems to electrical transmission or distribution grids in the country (see Annex B). These are:

- Direct Proposals (DP).
- Competitive Bidding System (CBS).
- EPC Turn-key (through grants).
- Small Scale RE Scheme (Net metering).
- Power Energy Wheeling.

In order to be ready to achieve policy targets and attract and receive commercial investments in this field, Jordan has established the following regulatory and policy frameworks as well as commercial tools for renewable energy:

- The Renewable Energy and Energy Efficiency Law (Law No. 13), the first in the region, allows investors to identify and develop grid-connected electricity production projects through unsolicited or direct proposal submission.
- This law also created the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF). The fund is financed by national and international institutions. The fund has a legal temperament and is financially and administratively independent. Both national and foreign private companies are allowed to apply for the Fund's support when setting up renewable energy generation projects.
- Net- Metering for small RE Systems (Roof Tops) with Fixed Purchase Prices for Excess Power is a directive that allows consumers to install, use and connect RE systems (solar, wind, bio-energy, geothermal, small hydro) to the grid if their expected generation does not exceed their average monthly consumption for the previous year (to be estimated by the distribution company in case of new users). The net value of the electricity consumption (or generation) is calculated each month. In case of net consumption, the user pays the value of electricity to the distributor. If there is net generation, the distributor can roll over the surplus to the next month as long as the balance is cleared by the end of the year according to the tariffs set by the law (0.17, 0.13 and 0.12 USD/kWh for solar, hybrid and other forms of renewable energy, respectively).
- Tax Incentive regime: A by-law was issued on tax exemptions for RE and EE systems and equipment. Article 11 states that "All systems and equipment of renewable energy sources and energy efficiency and its production inputs, whether manufactured locally and/or imported, will be exempted from all customs duties and sales tax." The By-law on Exempting Renewable Energy and Systems and Energy Saving Equipment from Custom Fees and Sales Tax (By-law No. 13 for year 2015) was issued by virtue of Article (11/B) of REEEL. In this by-law, it is clearly outlined that all RE and EE systems, equipment and devices - imported and locally manufactured (and inputs for local production) - are exempt from all customs fees and duties as well as sales taxes. For this purpose, the By-law establishes a special committee at MEMR to look at all applications related to tax exemption. Finally, the By-law "Jordan Renewable Energy and Energy Efficiency Fund" No. 49 for year 2015, was issued and enabled MEMR to start activities that support RE and EE projects.

4.1.2.4. Energy Efficiency Policy

The energy efficiency of the overall economy of Jordan can be assessed through the evolution of its primary and final energy intensities. The primary energy intensity has decreased from 0.942 toe/JOD 1000 in 2005 to 0.728 toe/JOD 1000 in 2011, which translates to a reduction of around 4.2%. The final energy intensity has decreased at a higher rate 4.9% in the same period. However, since 2011, both intensities have slightly increased with annual rates of 1.8% and 2.3%, respectively, which shows some kind of degradation of the economy's energy performance. In the 2005-2015 period, the primary and final energy intensity has decreased at annual rates of 1.8% and 2.1%, respectively.

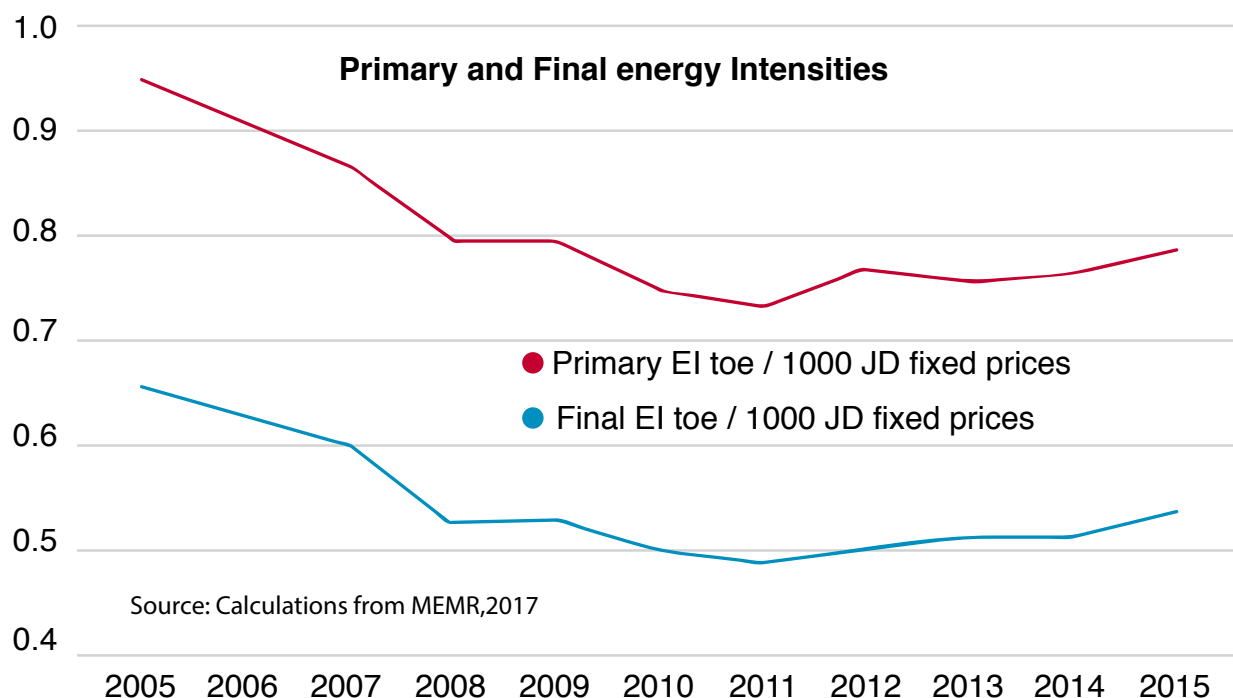


Figure-3. Primary and Final Energy Intensities, Source: MEMR Annual Report 2016

Compared to other countries, the primary energy intensity of Jordan is considered high. It was around 0.21 toe/US\$ 1000 in 2010, 1.2 times the world intensity and 4 times the average EU

intensity. The situation is worse when we consider the electricity demand which has increased much higher than the GDP. The electricity intensity has fluctuated from 1168 kWh/JOD 1000 in 2004 to 1416 kWh/JOD 1000 in 2015, partly due to the switch from fuel to electricity in space and water heating.

The situation is quite different for electricity generation, which has shown an important improvement in performance, mainly due to the introduction of gas-fired power plants with higher efficiency. The specific consumption of the electricity generation has, in fact, dropped from 251 toe/GWh in 2004 to 211 toe/GWh in 2014, showing an improvement of around 2.5% per year.

The energy strategy 2007-2020 has included a targeted 20% improvement in energy efficiency by the year 2020. In turn, MEMR developed the first National Energy Efficiency Action Plan in 2013. This plan included the following recommendations:

- Promote solar water Heaters (SWH) in different sectors.
- Upgrade and update the Solar Energy Code.
- Capacity building of engineers and technicians in the fields of solar and wind technologies.

In 2011, after the adoption of the Arab EE Guideline by the Arab Ministerial Council for Electricity (AMCE) in late 2010, Jordan set its 2020 target as part of the development of its first NEEAP for 2012-2014. The baseline was used as the 5-year (2006-2010) average electricity consumption prior to the adoption of the Arab EE Guideline late in 2010; therefore, the 2020 target remains 20% of the (2006-2010) baseline consumption of 11291 GWh. This results in 2258 GWh of cumulative electricity savings by 2020, which equals the 20% target.

According to the Renewable Energy & Energy Efficiency Law, Article 18, the MEMR issued energy efficiency By-law No. 73 for the year 2012; it is titled “Regulating Procedures and Means of Conserving Energy and Improving Its Efficiency.” The main objectives of this by-law are:

- Set the general policy of energy conservation and improvement of its efficiency and submit it to the cabinet for endorsement and enact the plans and programmes necessary for its implementation.
- Encourage investment in the field of conserving energy and improving energy efficiency.
- Monitoring energy audit procedures and implementation of systems and activities related to the conservation of energy and improving energy efficiency.
- Submit summer and winter daylight saving time dates to the Cabinet.
- Take the necessary measures for implementing an emergency plan to reduce energy consumption.
- Spread national awareness in the field of conservation of energy and improvement of its efficiency.
- Opine on energy-consuming projects.
- Establish a database related to the conservation of energy and the improvement of its efficiency.

According to this by-law, it is compulsory to use SWH systems. In addition, these systems now need a permit. Installations prior to 1/4/2013 did not need a permit to connect to services unless a SWH system was installed for:

- Building(s) with an area of 250 m² or more.
- Apartment(s) with an area of 150 m² or more.
- Office(s) with an area of 100 m² or more in commercial buildings.

4.2. The Jordan Case – Water Sector

4.2.1. General Overview of the Water Sector - Jordan



Jordan is considered to be the second poorest country in the world in terms of water resources per capita. In fact, it ranks far below the global threshold of severe water scarcity at less than 100m³/capita compared to 500m³/capita (National Water Strategy). In the past few years, the conflict among states in the region, high population growth and development needs have increased the demand for water and depleted the available, limited natural resources. Thus, water supply has become a major problem that needs to be addressed in a sustainable matter; this can be achieved by having institutions that cooperate to reach the overall vision of the water sector.

In terms of water governance, the Ministry of Water and Irrigation (MWI) was established with the aim of providing an integrated water management system, project execution as well as strategic direction and planning for water related issues. The MWI has two organizations under its mandate: The Water Authority of Jordan (WAJ) and the Jordan Valley Authority (JVA).

Water sector expenditures are mainly from the construction and expansion of collection systems and treatment plants as well as water production. Benefits are transferred to customers through quotas and subsidies for irrigation and domestic use. Capital projects are funded through donors and loans to the government. Water revenues have exceeded 100% of the operation and maintenance costs but only covered 60-70% of the total costs. Different measures have been considered as a way to reduce the gap between costs and revenues. Some of them include: increased fees on connections and services, reduced physical and administrative losses, improved energy efficiency and optimized systems.

Strategies have been developed in order to build a management structure for the water sector over the past years. The first strategy, formulated in 1998, is called “Jordan Water Strategy and Policy”. This strategy encompassed policies addressing water utilities, water, wastewater reuse, groundwater as well as water used for irrigation. Then, it was followed by “Water for Life: Jordan’s Water Strategy 2008-2022,” which was adopted until the formulation of a National Water Strategy, which has regulations to ensure optimal service and management levels. In total, Jordan has written four national policy and strategy documents and six sector policies that provide guidance for the water sector.

The National Water Strategy 2016-2025 is based on the previous strategic documents and is aligned with the sustainable development goals adopted by the United Nations in 2015. It aims to prepare the sector to be better prepared for future challenges by ensuring sustainability of water resources, strengthening integrated water resources management and planning. The following are key areas covered by the strategy: integrated water resources management; water, sewage and sanitation services; water for irrigation and energy; institutional reforms, management and monitoring; and other cross-cutting factors such as transboundary issues, public/private partnerships and the economic dimension of water.

Legislation amendments, including Article 28 of the WAJ Law, were implemented to allow private sector participation (2002). The Groundwater by-law aims to protect groundwater resources (2002). The National Water Master Plan (NWMP) was put into operation in 2004. This strategy is in alignment with the royal initiative for economic change in all sectors that was formulated in the nationally-adopted document “Jordan 2025, A National Vision and Strategy” in 2015. It considers the Sustainable Development Goals (SDGs) adopted by the United Nations in September 2015. The strategy also builds on the new development in the sector, including:

- The implementation of the approved “Action Plan to Reduce Water Sector Losses” in 2013.
- The development of strategic projects (e.g. Nuclear Power plan, Oil-shale and Red–Dead Conveyance).
- The increased demand resulting from the pressure water resources caused by the influx of Syrian refugees.
- The increased cost of production, especially the effect of electricity cost and increased fuel prices.
- The fiscal strain affecting the service delivery.
- The recently-developed sector policies.

The strategy includes provisions for climate change, the water-energy-food nexus, water economics and financing, sustainability of overexploited groundwater resources, the adoption of the new technologies and techniques available (including Decentralized Wastewater management), increased need for the utilization of surface water in the municipal supply and the reuse of treated wastewater. It incorporates more decentralization, commercialization and consolidation of water and wastewater services as well as private sector participation and changes in legislation. In addition, it is in line with the new strategies adopted in other sectors, including the National Energy Strategy 2007-2020 adopted by the Royal Energy Commission, the “Agriculture Document of 2009” issued by the Ministry of Agriculture and the “Environmental Policy and Plan of Action” developed by the Ministry of Environment. Strategy documents for health, education and municipal affairs also reflect synergies and partnership with the water sector and the new updates of water wastewater management master plans, solid waste management and the newly approved reform legislation including the decentralization law.

As Jordan moves towards the post-MDG era, it needs to examine the outcomes and achievements of its existing water strategy at endpoint (2015), evaluate its performance, contextualize the current situation in the country and the region, reinforce efforts to achieve the strategic goals set as part of this strategy and reconfigure the strategy for the future. The Ministry of Water and Irrigation (MWI) recognized the need to introduce an updated National Water Strategy 2016-2025 to ensure that national goals and priorities are realigned to the country’s changing needs and relate to the new SDGs. The revised strategy will respond to the substantial changes in the regional geopolitical situation, the ongoing risks and threats to Jordan’s renewable water resources, a growing population and an expanding economy that is water- and energy-dependent and highly vulnerable to risk. MWI has also elaborated on a set of principles to guide future water sector planning:

- Jordanians must recognize that there are limits to the country’s renewable, affordable, traditional, available water supply.
- Jordanians must use and reuse water more effectively, efficiently and responsibly.
- Citizens and the private and public sectors must share responsibility for water management and protection and work together to improve conditions within their local watersheds.

- A deeper knowledge of the availability, quality and protection of water is the foundation for effective decision-making. This includes knowing that there is an increased cost for any new, additional non-conventional resources.
- Healthy aquatic ecosystems are vital to a high quality of life for Jordanians and must be preserved in pursuing socioeconomic and community-level development.
- Jordan needs to address the impact of climate change on its social, economic and environmental development. Adaptation measures must ensure institutional response capacity, community education and awareness of the risks.

4.2.2. Municipal and Tourism Sectors

The government has implemented a strict water-rationing program, supplying water to households only once a week. Households that are not connected to the formal networks or have limited storage capacity, including those in informal settlements, nomadic communities, the poor, refugees and migrants, consume less.

The per capita domestic consumption of water is moderate. In 2010, MWI adopted a policy note that stated that the planned consumption of water from networks will be 120 L/C/day in Amman, 100 in other cities and 80 in rural areas. The targeted consumption amounts vary according to the industrial and commercial percentage of subscribers (non-residential subscribers).

Urbanized areas in Jordan make up about 83% of the country, and the percentage is increasing. The Water Reallocation Policy illustrates the amounts of water supplied to each governorate. Requirements for water are increasing in the municipal sector due to the population increases resulting from both a high birth rate and the recent influx of refugees, but rural areas have suffered the most. The Government focuses on water distribution in highly populated areas, and as a result, rural residents have access to water only every 12 days, while those in cities like Amman receive water at least once every seven days. The tourism industry uses about 4MCM annually, a figure projected to increase in the future. Efforts are underway to enhance quantities and improve services.

4.2.3. Institutional Framework

For the water sector and the Ministry of Water and Irrigation (MWI), there is a growing need for a more consolidated, harmonized and coordinated water management organization. It is critical that this organization is backed by a strong legal/regulatory framework, especially when the Integrated Water Resources Management (IWRM) approach, supported by key management instruments, is being reinforced to optimize water resource use. A harmonized national structure needs to be implemented to execute operational plans for water resourcing, distribution and delivery systems; mobilize public/private capital for expansion and improvement of infrastructure; sustainably recover operating and maintenance costs; protect the quality of water resources and water-dependent ecosystems; and protect the rights of customers.

The national water sector would require a reworked governance strategy and institutional framework that rationalizes, consolidates and reorganizes the core governance functions for: (i) national policy and planning; (ii) management of operations and quality assurance; (iii) delivery of sustainable sector services; (iv) regulatory and normative functions; and (v) sector coordination and client interface. This, in turn, requires a revised organizational structure and a comprehensive water law that factors in the new realities facing the sector.

4.2.4. Sector Institutions – Roles and Responsibilities

4.2.4.1. The Ministry of Water and Irrigation (MWI)

The Ministry of Water and Irrigation (MWI) is responsible for overall national leadership on policy, strategic direction and planning, in coordination with WAJ and JVA. Under By-law No. 14 of 2014, MWI assumes full responsibility of water and public sewage and all related projects in the Kingdom.

MWI aims to upgrade, develop and regulate the water sector and enhance the quality of water services. It has a mandate to: develop sectoral policies and strategies; endorse plans and programmes related to water resources protection; implement international agreements; develop laws, by-laws, regulations and normative and technical standards; develop private sector partnerships; supervise the implementation of strategic plans and programmes; and follow up on the performance of water companies and utilities. The Ministry of Water and Irrigation embraces the two most important entities dealing with water in Jordan:

4.2.4.2. The Water Authority of Jordan (WAJ)

- In charge of water & sewage systems. WAJ is responsible for:
- Municipal and industrial water supplies and wastewater. It plans water and wastewater projects, implements and operates all water supply and wastewater facilities in Jordan.
- Exploring existing water resources and maintaining and operating water and wastewater networks throughout the Kingdom.
- Providing licenses to farmers to utilize groundwater for irrigated agriculture, checking the drilling of tube wells and carrying out the testing of the yield of the wells.
- Checking the abstraction from the tube well in the groundwater basins and reducing overexploitation of renewable groundwater resources practiced by farmers.

4.2.4.3. The Jordan Valley Authority (JVA)

Responsible for the socio-economic development of the Jordan Rift Valley (JRV), including water development and distribution of irrigation. Its main tasks include:

- Constructing, operating and maintaining dams in the Side Wadis and in the JRV.
- Constructing, operating and maintaining public irrigation schemes in JRV.
- Delivering and distributing irrigation water to farmers and collecting irrigation water charges.
- Encouraging farmers to adopt modern irrigation methods and to save water and improve farm irrigation efficiency.
- Working with international donors and farmers on-farm irrigation practices and scheduling.
- Implementing emergency plans to face water shortages in dry years and seasons.
- Implementing public awareness and water conservation programmes in irrigation.

4.2.5. Water Utilities

4.2.5.1. Miyahuna Company

A government-owned (WAJ) utility that operates through commercial entities to provide retail distribution and other functions such as water and wastewater treatment in Greater Amman as well as Balqa, Zarqa and Madaba with an estimated 550,000 customers.

4.2.5.2. Aqaba Water Company

A government-owned (WAJ) utility, operating through commercial entities to provide retail distribution and other functions such as water and wastewater treatment in Aqaba, Karak, Tafileh and Ma'an Governorates, serving an estimated 130,000 customers.

4.2.5.3. The Yarmouk Water Company

A government-owned (WAJ) company that started operations in 2011 to provide retail distribution and other functions such as water and wastewater treatment services in Jerash, Ajloun, Mafraq and Irbid Governorates. The utility is now managed by WAJ and serving an estimated 380,000 to 400,000 customers.

4.2.6. Legal Framework

The Constitution of Jordan provides for equality before the law and equality of rights for all citizens. Water and sanitation are regulated by Ministry of Water and Irrigation By-Law No. 14 of 2014, Water Authority of Jordan Law No. 18 of 1988 and its amendments and Jordan Valley Authority By-Law No. 30 of 2001. Other relevant laws include Public Health Law No. 47 of 2008, Environmental Protection Law No. 85 of 2006 and Groundwater By-law No. 85 of 2002 and its amendments.

4.3. The Jordan Case – Food – Agriculture Sector

4.3.1. General Overview of the Agriculture Sector - Jordan



Jordan is a semi-arid and drought-prone country largely dominated by a mountain range in the west. Those highlands have a Mediterranean climate characterized by a hot, dry summer and a cool, wet winter separated by two short transitional periods. The southern and eastern parts of the country are arid with hot, dry summers and cold, dry winters. Temperature increases towards the south, with exceptions in some southern highlands. Precipitation is extremely variable and is confined largely to the winter and early spring seasons and ranges from over 500mm in the highlands to less than 50mm in the east. The long-term average annual precipitation is 8,317 million cubic meters (Ministry of Water and Irrigation, 2014) of which about 92.5% is lost to evaporation (Freiwan et al., 2007). The Eastern Desert (also known as the Badia) that lies east of the mountainous region and covers about 80% of the land area of Jordan has low precipitation. (The Hashemite Fund for Development of Jordan Badia, 2014). Agriculture's contribution to GDP declined from 20% in 1974 to 2.9% in 2011 (Bahdousheh, et al, 2010), while in absolute terms it has increased (e.g. from JOD 57 million in 1974 to JOD 598.3 million in 2011 as shown in Table 12).

Year	1954	1964	1974	1984	1994	2010	2011
Agriculture's Contribution in Absolute Terms (Million JOD)	15	32	57	98	193	560	598
Agriculture's Contribution in Relative Terms (%)	40	30	20	6	4.5	2.9	2.9
Total National GDP (Million JOD)	15	200	281	1,764	4,300	18,762	20,476

However, this sector maintained an increase in monetary value (market price) as reflected in the incremental contribution of agriculture to actual GDP as indicated by the value of the total agricultural gross output (from JOD 267.3m in 1986 to JOD 1,555.3m in 2010), plant and animal intermediate consumptions (JOD153.8m in 1986 to JOD976.4m in 2010) and the added value (A.GDP) from both crop and livestock products (from JOD113.5m in 1986 to JOD 576.9m in 2010). It is estimated that the indirect contribution of agriculture through auxiliary (supporting) industries of agriculture, such as agribusiness, food processing and the fertilizer industry, accounts for 27% of GDP.

However, the importance of the agricultural sector stems from the fact that it is not only the major source of food products (especially red meat, poultry, dairies, fruits and vegetables), but also one of the sources of hard currencies earned from exports. About 20% of the poor in Jordan live in rural areas depending mostly on agriculture; they are livestock keepers, smallholders of farm households and landless former agriculturalists. Despite lack of motivation for rural youth, agriculture is still an important source of employment in rural communities (IFAD 2010).

Jordan has five agro-ecological zones (AEZs) based on the annual rain levels (Table 13). A common element in all AEZs is the rainfall factor that determines the land use and farming systems in each zone. Drier zones are areas of small ruminant grazing and rain-fed barley cultivation. Wheat is also rain-fed but in higher rain areas, whereas irrigated farming, including intensive dairy, fruits and vegetables, is in the settled permanently irrigated areas.

Table 13. Jordan's Agro-Ecological Zones, Annual Rain Levels, Area and Land-use
Source: DOS, 2011

Agro-Ecological Zone	Annual Rain (mm)	Km2	Area (%)	Land use
Arid	<200	79,412	89	Range, small ruminants, irrigated cereal & forage
Marginal Zone	300-200	5,620	6.3	Wheat & barley, small ruminants
Semi-arid	500-300	1,338	1.5	Wheat, barley & food legumes, small ruminants
Sub-humid	800-500	892	1.0	Fruit trees, dairy farming
Jordan Valley	350-200	1,070	1.2	Vegetables, fruit trees, irrigated cereals, dairy farming
Water Bodies		986	1.0	
Total		89,318	100	

Livestock contributes about 55% of the agricultural production. Sheep and goats are the predominant livestock species in Jordan. The animals are generally raised on a crop-residue, planted fodder and barley-grain based system with the rangeland contributing about one month of livestock feeding in normal years. This contribution is severely reduced in overgrazed areas and during extended drought years. The maximum potential contribution of improved rangeland is not expected to exceed 30% of the daily feed requirements of one adult sheep or goat (Sidahmed, 2011).

Supplementary feed has been encouraged by the government's barley subsidies and reduced forage availability and has, as a result, led to lower profit margins for producers and less competitive products in national and international markets. Twenty years of subsidies and ease of transportation around the desert have enabled the livestock industry to become dependent on barley, which accounted for 63% of feed costs for producers.

The government policy for subsidizing prices of imported inputs, especially during the dry season, has also encouraged livestock herders to keep excessive numbers of animals, exceeding the carrying capacity of the rangeland.

4.3.2. National Agricultural Policies, Strategies, Laws and Programmes

4.3.2.1. Policies, Strategies and Laws Related to the Agricultural Sector

Policies, strategies, laws and temporary laws for agriculture, land use, livestock, rangeland use, water resources, environmental protection and biodiversity were developed and are coordinated by various public ministries as relevant, with varying degrees of performance and effectiveness. Brief descriptions of each one are summarized in Table 14.

Table 14. Policies, Strategies and Laws Related to Agricultural Sector, Source: MoA, 2011

Document	Year	Type	Description
Agricultural Policy Charter (ACP)	1995	Policy	The Charter aims to achieve consistency in agricultural development with local, regional and international requirements and changes and an integrated socio-economic development characterized by efficiency, sustainability and equity. Clear policy objectives and priority sub-sectors were defined.
Environmental Protection Law No. (52) of 1999	1995	Law	The Jordanian Environmental Law was enacted as a temporary legislation in 2003 and was ratified by the Parliament in 2006. This law provided the appropriate legislative umbrella for issuing the various detailed regulations and instructions regarding the protection of the environment.
National Rangeland Strategy	2001	Strategy	This strategy was developed in 2001 with the main objectives of controlling deterioration of the rangelands and reversing the desertification process; increasing sustainable livestock production by restoring the productivity of rangelands and increasing sustainable range fodder production; supporting fodder production in order to encourage intensive breeding; and encouraging local communities and sheep breeders to adopt intensive breeding techniques to regulate stocking rates.
National Strategy for Agricultural Development: - 2002 2010	2002	Strategy	This strategy discusses the role of the agricultural sector in social and economic development to achieve sustainable agricultural and rural development, taking socio-economic and environmental aspects, e.g. protection and conservation of agro-biodiversity during such development, into consideration. The strategy presents profiles of proposed projects in the five agricultural subsectors of rain-fed agriculture, irrigated agriculture in the Jordan Valley, irrigated agriculture in the highlands, livestock and rangelands and the marketing of agricultural produce.
Agriculture Provisional Law No. (44) of 2002	2002	Law	This law was enacted to organize and develop the agricultural sector to attain developed, growing, diversified and integrated agricultural production that conserves the environment and natural resources. This law helps enhance self-dependency and meets the international, regional and domestic requirements.
National Strategy and Action Plan to Combat Desertification	2006	Strategy	The National Strategy and Action Plan (NSAP) to Combat Desertification was launched in 2006. It includes six major programmes that are mainly “project-based.” The programmes include several projects related to desertification monitoring and control, capacity building, natural resources rehabilitation and development.
The National Agenda 2006	2006	National Strategy	The National Agenda was launched in 2006 comprising a comprehensive political and socio-economic reform plan for the country until 2017. The main goal of the National Agenda is to achieve consistent policies and ensure that they will not be subject to government change while taking into consideration the need to regularly develop and update these policies.

Irrigation Equipment and System Design Policy of 2008	2008	Policy	This policy statement follows from longer-term objectives outlined in the Water Strategy and supplements the Irrigation Water Policy and the Irrigation Water Allocation and Use Policy by establishing a policy on irrigation equipment and system design standards. The policy addresses the following themes: defining and updating equipment standards, raising farmers' awareness of standards, testing and enforcement of standards, training and certifying drip system designers and institutional responsibilities.
Irrigation Water Allocation and Use Policy of 2008	2008	Policy	This policy statement follows from longer-term objectives outlined in the Water Strategy and elaborates on priorities specified in the Irrigation Water Policy. As such, it includes updates and extensions of selected elements of the Irrigation Water Policy. In particular, it consolidates and elaborates on elements of that policy relating to on-farm water management, general management and administration, water tariffing and irrigation efficiency. The policy addresses the following themes: defining and updating crop water requirements, allocating water and managing billing practices, building farmers' water management skills, using reclaimed water, measuring deliveries and delivering water to groups.

4.3.3. Analysis on how Relevant Policies are Impacting the Agriculture Sector

4.3.3.1. Water Policies

The JVA is responsible for the delivery of water to the farm gate and is not directly responsible for providing farmers with advice on how to grow their crops or manage the use of irrigation water at the farm level. Also, the JVA is mandated to conduct studies of new irrigation technologies, but the law is unclear about how the information generated should be disseminated to farmers. The JVA officials believe that the authority should also play a greater role in providing extension services to farmers related to water management; this is now the responsibility of the MOA.

The overall efficiency of the Jordan Valley irrigation system is high; however, on-farm efficiency is still below 50% in many cases. The quantity of fresh water available for agriculture is on a continuous decline, and its quality is continuously deteriorating due to the increased rate of its mixing with treated wastewater of high salinity, especially in the middle Ghors (Jordan Valley), which has already resulted in increasing soil salinity, at a time when there are no adequate water resources to be used for soil leaching. Currently, farmers are not granted permits to dig groundwater wells for agricultural purposes as farmers in Disi indicated during an EU mission field visit to the area and meeting with farmers.

Policy and programmes need to concentrate on improving on-farm efficiencies, and a significant part of such improvements can come from altering cropping patterns in order to concentrate on products that generate higher returns per unit of water used. New strategies for water development and management are urgently needed to avert severe national, regional and local water scarcities that will depress agricultural production, damage the environment and escalate water-related health problems. Close coordination must be maintained between the Ministry of Agriculture and JVA and with other related institutions with the aim of enhancing on-farm irrigation efficiencies and maximizing the agricultural output of a unit of land area per unit flow of irrigation water. It is also recommended that a new set of standards be developed for use of treated wastewater and blended water in agriculture, and that a framework be established for the kinds of irrigation technologies appropriate to each grade of water quality.

4.3.3.2. Quality Control

All agricultural products that are either produced within Jordan or imported into Jordan are inspected for health and quality standards. While health standards are well defined, quality standards are not. Most quality standards are based on the size of the fruit or vegetable. Livestock products are inspected at government slaughter houses. Imported products require certificates of origin and a health certificate stating that the product is clear of diseases and radiation and not hazardous to humans or the environment. Live animals being imported are subject to inspection and quarantine. Fruits and vegetables for export are inspected by request to ensure international quality standards are met and to obtain necessary certification to prove that goods are free of diseases and residuals. Jordan's crop and livestock product standards related to health are internationally recognized norms.

Laboratory facilities for testing for chemical residues are present in the city of Baqa'a (near Amman) and being supervised by the MOA. The process of obtaining international certification of the laboratory results needs to be completed so that importers in other countries do not feel obliged to submit the products to new tests at accredited laboratories. Jordan now has laboratory capabilities for microbiological testing at the Royal Scientific Society and some producers have used that facility. On the basis of this infrastructure, the most urgent needs in this area are the development of a national set of food safety standards and obtaining international accreditation for laboratories in Jordan.

4.3.3.3. Marketing Policies

Jordanian agricultural production, including that which is destined for export, does not receive any incentives (except the price of irrigation water, the cost of pumping and the temporary export ban in the face of perceived scarcities on the domestic market). Extra costs on the production and marketing chain are imposed in the form of requirements to use municipal markets, even in the case of exports and even when direct sales to retailers could be made by farmers or farmer organizations.

Current import tariff policy encourages resource allocation to crops that represent inefficient uses of water, in terms of income generated per cubic meter of irrigation water: bananas, apples and oranges. In the case of apples and oranges, for example, it is clear that Jordan does not have a comparative advantage in production. Syria produces apples and oranges of equal or higher quality at a much lower price.

Government policies have long considered marketing only as a supplementary service for production despite the fact that marketing starts before production its creation of greater economic benefits, and its importance in determining economic returns. Most policies have focused on developing production, which resulted in over-supply of some products, and caused the wasting of large quantities of horticultural produce because of imbalance between supply and demand. The lack of organized production plans and weak farmer organizations also add to the problem of poor marketing. The marketing infrastructure suffers from clear weaknesses, especially in the fruit and vegetables sectors. Fruit and vegetables wholesale markets do not represent real markets, with the exception of the one in Amman, which still lacks the essentials of supply and demand data for price formation.

Infrastructure for post-harvest operations also suffers from shortages in the areas of pre-cooling, grading, packaging, refrigerated transport and storage and processing of products. There is an absence of support for small farmers' groups (farmers' organizations) to improve their capacities to enhance vertical integration means along the food supply chain (e.g. cooperatives that are capable to acquire cold chains, packaging facilities).

Significant weaknesses also exist in the provision of marketing support services, including market research, agricultural extension services, market information and to a lesser extent, the area of financing. There are few policies for direct economic market intervention; those that exist are characterized by their instability and temporary nature, such as in the case of protecting local production, or by the unsuitability of the mechanism used for their objectives, such as in the subsidies provided to sheep and goat breeders. It is recommended to have a comprehensive marketing policy to address all the gaps previously mentioned.

4.3.3.4. Agricultural Credit

The Agricultural Credit Corporation (ACC) makes soft loans available to farmers and investors in agribusiness. The loans fall into one of two classes: operational or developmental. Operational loans are from 12-24 months in duration while developmental loans may be made for up to 15 years. At present, the Agricultural Credit Corporation (ACC) is the only specialized agricultural credit institution in Jordan. Most of the loans offered by ACC are medium-term loans for financing land reclamation, purchasing farm machinery, planting fruit trees, drilling deep wells, erecting greenhouses and purchasing drip irrigation systems.

ACC development loans were in strong demand, not just because of the discounted interest rates and lack of commissions and fees, but also because commercial banks generally refused to provide loans with maturity beyond three years. ACC has not at all been involved in agricultural marketing, yet it could play a vital role in promoting high-value agricultural exports. It would be important to try to involve ACC in this area, particularly in providing export credit. Equally, it could participate in financing schemes for more efficient irrigation, especially low-pressure irrigation.

4.3.3.5. Food Safety Laws

The current food control regime in Jordan falls under two laws: Agriculture Law No. 44 of 2002 and Jordanian Food Control Law No. 32 of 2003. These laws were adopted at the Aqaba Special Economic Customs Centre in May 2002 and at the Amman Customs Centre in January 2004, respectively. Inspection criteria are codified into a computerized system. This system has been applied at all completed border centres and will be expanded as more centres are completed. A border committee comprised of representatives from relevant agencies inspects imported agricultural and food products.

4.3.3.6. Social Welfare Policies and Programmes

The government has implemented a series of programmes aimed at poverty alleviation by providing a better source of income for the poor and unemployed. The programmes implemented include: free education, free primary health care, business training for micro and small enterprises and social productivity programmes, such as small agribusiness projects (food industry, growing mushrooms and medicinal herbs, pickling, processing dairy products and honey beekeeping).

4.3.4. Challenges/ Issues Related to the Institutional and Legal Framework

- Low efficiency of agricultural institutions.
- Generally poor and/or inefficient agricultural services.
- Weak cooperative system and limited private sector involvement in certain sub-sectors and activities.
- Improper legal framework to govern the agricultural sector; some of the regulation is either lacking, weak or weakly enforced.
- Despite several policies, strategies and plans that have been formulated, government commitment and donor support to the sector are minimal.
- Inconsistent data, few agricultural statistics and weak GIS and MIS systems.

4.4. The Jordan Case – Climate Change Related to Water, Energy and Food (WEF)

4.4.1. General Overview



Jordan recognizes that climate change is a serious and pervasive threat to humanity. The Intergovernmental Panel on Climate Change (IPCC), the highest scientific body of the UNFCCC responsible for evaluating the risk of climate change, affirmed in its Fourth Assessment Report (2007) that the “warming of the Earth’s climate system is unequivocal” and that this warming is attributed to the dramatic rise in human-induced greenhouse gas emissions since the mid-20th century. Jordan faces potential serious impacts on its natural ecosystems, on its river basins and watersheds, on biodiversity as a whole. This then cascades down to impacts on food productivity, water resources, human health, public infrastructure and human settlements. Climate change will have serious implications on the country’s efforts to eradicate poverty and realize sustainable development for current and future generations, ultimately making climate change an issue of intergenerational equity. Climate change scenarios indicate that Jordan and the Middle East could suffer from reduced agricultural productivity and water availability among other negative impacts. At the same time, a significant potential for cost-effective reduction of GHG emissions exists in Jordan.

Although Jordan does contribute less than 20 million tons of CO₂eq p.a. (2000) to global emissions, it maintains a strong commitment to the objectives developed by the international community for the integrated environmental and economic response to the threat of climate change. The national circumstances in Jordan relevant for climate change mitigation and adaptation were described in detail for the first time in Jordan’s 2nd National Communication to the UNFCCC (later updated in the 3rd National Communication). The Ministry of Environment (MoEnv) of Jordan has strengthened the policy and legal frameworks in Jordan to foster compliance with the three Rio Conventions, including the UNFCCC.

4.4.2. Mitigation Measures

4.4.2.1. Mitigation in the Energy Supply, Renewable Energy and Climate Change

The energy sector is by far the major source of GHG emissions in Jordan. Jordan has very limited primary energy resources and depends to a large extent on imported petroleum, petroleum products and natural gas from neighbouring Arab countries. Due to economic growth and increasing population, energy demand is expected to rise by at least 50 percent over the next 20 years. The Energy Strategy’s main national priorities are to set supply security and reduce the fiscal burden to the national budget as imposed by the national energy bill. Climate change is not mentioned explicitly. However, the main objectives in this regard are:

- Exploiting renewable energy sources to increase their contribution to the total energy mix, achieving a safe renewable energy supply and promoting additional renewable investments.
- Contributing to environmental protection and achieving sustainable development by promoting the exploitation of renewable energy.
- Rationalizing the exploitation of energy and improving its efficiency in various sectors.

In conventional electricity generation (through fuel switch) and in electricity distribution (efficiency improvements), a substantial technical potential for GHG reduction exists. However, the current conditions in the power sector, including the restrictions on gas imports and the lack of investments in new infrastructure, make these measures unfeasible from a mitigation policy point of view in the period considered in this Climate Change Policy. Other (economic) drivers are far more important. The Renewable Energy and Energy Efficiency Law was approved in 2012. This law intends to promote private sector investment in renewable energy projects. Also, the Jordan Renewable Energy and Energy Efficiency Fund has been established (JREEEF).

The main barriers to renewable electricity development is the lack of long-term certainty on feed-in tariffs, the lack of national financing and the lack of institutional and legal support, including lack of enforcement for renewable energy projects. Another key area for application of renewable energy is solar water heating in the residential sector, which faces a range of barriers (high upfront costs, owner-tenant dilemma, weak enforcement of building codes and low domestic value added).

4.4.2.2. Mitigation in End-Use Energy Efficiency and Climate Change

After the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF) was established, a by-law was adopted in 2012, establishing a framework for specific energy efficiency regulation, including auditing, appliance labelling, minimum energy performance standards (MEPS) and smart metering. In addition, solar water heaters will become mandatory for large buildings. Current building codes in Jordan include standards for energy efficiency. Programmes are ongoing to promote green building codes and standards in Jordan, but so far, few buildings have complied.

Key barriers to energy efficiency remain, including: weak enforcement of existing measures and regulations, lack of knowledge by energy users of the benefits of energy efficiency, lack of coordination between stakeholders in developing energy efficiency projects, high initial implementation costs, high perceived risks, lack of suitable «nudging mechanisms» and lack of consistent institutional frameworks. There is a lack of attention to monitoring and evaluation of the implementation of policies, incentives and regulation. The lack of dialogue between government and stakeholders decreases the effectiveness of the legislation. As a result, the established policy and regulatory framework has not yet made a significant impact.

4.4.2.3. Adaptation to Climate Change in the Water Sector

Being one of the driest countries in the world, Jordan suffers from a severe water scarcity problem. The scarcity of water in Jordan is an important constraint to the country's growth and development. Available water resources per capita are falling, while water demand is rising. The water shortage will drastically increase in the future due to population growth and anticipated socio-economic development. Groundwater levels have dramatically declined showing that groundwater exploitation has been unsustainable.

Water management in Jordan is supply-based and, despite significant improvements in water-supply infrastructure, a critical and serious supply-demand imbalance remains. Jordan has been subjected to additional water stress due to the influx from neighbouring countries impacted by political instability in the region. Finally, the potential decreasing precipitation in Jordan as a result of climate change could worsen the existing problems.

The GoJ has developed a comprehensive water strategy entitled "Water for Life" for the period 2008 to 2022. The Strategy was updated in 2012. It mainly focuses on effective water demand management, effective water supply operations and institutional reform. The Strategy has climate change as part of its vision and as one of its principles. Jordan has already identified a list of no-regret measures that are required urgently to address the water sector problems in the short and medium terms. The water sector investment according to the Executive Development Program (2011-2013) is estimated to reach US\$ 3 billion, not including investment needed for the Red Sea - Dead Sea Conveyance project. Lack of financing was a major and persistent barrier facing water sector development activities over past decades.

Concerning the Dead Sea, pan evaporation measured at the Southern Dead Sea in the last decades has significantly increased. Wind, temperature and humidity measurements at the Dead Sea starting in the 1930s as well as 3-D model simulations all seem to indicate a statistically significant change in the local climate of the Dead Sea region.

4.4.2.4. Adaptation to Climate Change in Agriculture - Food Security

Although a small country, Jordan has many different climatic regions; there are at least three different climatic regions: sub-tropical, Mediterranean and desert. Only about 5 % of Jordan's land mass is considered arable, and the country is among the world's most water-deficient countries. Agriculture is one of the most sensitive sectors to climate change induced impacts. The increased temperatures and lower precipitation resulting from climate change would adversely affect crop and water availability, critically influencing the patterns of future agricultural production in Jordan. The main expected impacts of these scenarios are a decrease in available soil moisture for crops in the rain-fed areas, an increased crop water requirement, increased crop/weed competition, more frequent droughts, changes in rainfall intensity with more possible floods, a shortened growing season and the reduction in yield of rain-fed and irrigated crops. As a result, the climatic change could adversely affect agriculture in several ways:

- Productivity, in terms of quantity and quality of crops.
- Agricultural practices, through changes of water use (irrigation) and agriculture inputs such as herbicides, insecticides and fertilizers.
- Environmental effects, particularly in relation to the frequency and intensity of soil drainage, soil erosion and reduction of crop diversity.
- Land use, through the loss and gain of cultivated lands, land speculation, land renunciation and hydraulic amenities.

The sector strategies for agriculture refer to climate change but not in detail. The strategic document from the Ministry of Agriculture (2009) lists climate conditions (drought and frost) as challenges to the development of agriculture, but the document does not mention climate change in particular. The Ministry is currently developing the agriculture strategy in cooperation with the FAO.

Climate adaptation in agriculture comprises two related challenges: adaptation to current climate variability and to future climate change. In the 2nd National Communication (2009), adaptation measures are suggested for both rain-fed and irrigated agriculture in Jordan. Adaptation measures in agriculture to adapt to climate change have been identified in other studies. These options are no-regret options, which should be implemented independently of future human induced climate change.

4.4.3. Legal and Institutional Framework and Stakeholder Involvement

The legal framework was developed to ensure that the climate change objectives are embedded in national legislation and to provide the legal mandate for all public organizations involved in the implementation of the National Climate Change Policy. The institutional framework addresses the allocation of responsibilities for the different sectors of the climate change policies and strategies to different national authorities (ministries); the framework also differentiates between national, regional and local authorities. The institutional framework secures the necessary capacities at public institutions. Finally, the framework secures the coordination and cooperation between public and non-public stakeholders.

The Ministry of Environment (MoEnv) is the national focal point for the United Nations Framework Convention on Climate Change (UNFCCC). The Ministry operates under the mandate of Environment Protection Law (current law no. 52 of 2006). Individual experts in the Ministry within the Directorate of Monitoring & Assessment have been made responsible for specific tasks, including the Focal Points for UNFCCC, IPCC and the Secretariat of the DNA. A National Climate Change Committee (NCCC) was formed by a decree issued by the Prime Minister in 2001, but the legal mandate/ToR and current structure of the NCCC need to be strengthened and become more effective.

4.4.4. Overarching Policy and Legal Framework for Climate Change Governance

The provisions of this Climate Change Policy are to be integrated and mainstreamed in environmental, social and economic policies and legislation in the country. In particular, the following national policies will contribute to the climate change objectives formulated in the Climate Change Policy (The National Climate Change Policy of the Hashemite Kingdom of Jordan 2013-2020):

- The Sustainable Development Planning Policy, currently under development, was coordinated by the MoPIC and will specify how climate change is to be considered in planning, particularly in terms of adaptation.
- The future National Green Growth Plan will address how climate change mitigation can strengthen sustainable economic development. The Plan will be developed in 2013.
- The revised National Agenda for Jordan addresses climate change.
- Environmental Protection Law No. 52 of 2006 is currently being updated and will address climate change, in particular the legal and institutional climate change arrangements in Jordan.
- The National Poverty Reduction Strategy, currently being revised, will consider the impact of climate change on poverty with due consideration to the sex disaggregated data.
- The Environment Fund explicitly considers climate change related projects as eligible for funding and support.
- Universities and research institutions will consider climate change as a priority research area.
- The priorities and actions identified under the “Adaptation to Climate Change to Sustain Jordan’s MDG Achievements” Joint Program will be adopted and implemented.
- The “National Adaptation Action Plan” will be developed. There is a need to further develop and compile the adaptation strategies and action plans at the sector level into a comprehensive multi-sectoral “National Adaptation Action Plan” through the participation and engagement of the relevant institutions and gender-sensitive stakeholders; this includes the ministries of environment, water, agriculture and health as well as local affected communities with an emphasis on organizations that involve women.

4.4.5. Sector Mitigation and Adaptation Strategies, Action Plans and Legislation for Climate Change Actions

The tables (15 and 16) below summarize the key strategies, action plans and legislative documents that serve to implement the strategic priorities of the Climate Change Policy on Mitigation and Adaptation.

Table 15. Sector Level Strategies, Legislation and Action Plans Contributing to the Implementation of the Climate Change Policy (Mitigation), Source: The National Climate Change Policy of Jordan 2013-2020.

Sector Level (Mitigation) Strategy, Legislation, Action Plan	Responsible Entity	Climate Change Relevance
EE and RE Legislation	MEMR	Priority sectors for mitigation
EE Road Map/The National EE Action Plan	MEMR	Priority sectors for mitigation
Transport Strategy	MoT	Energy efficiency and climate mitigation to be integrated
Solid Waste Law	MoEnv	Mitigation aspect to be considered
Solid Waste Management Strategy	Ministry of Municipalities	Mitigation aspect to be considered
Updated Water for Life Strategy (2022)	MWI	Priority sector for mitigation

Table 16. Sector Level Strategies, Legislation and Action Plans Contributing to the Implementation of the Climate Change Policy (Adaptation), Source: The National Climate Change Policy of Jordan 2013-2020

Sector Level (Adaptation) Strategy, Legislation, Action Plan	Responsible Entity	Climate Change Relevance
National Water Strategy "Water for Life," revision 2012	MWI	Includes chapter on climate change vulnerability adaption
Water Law	MWI	Vulnerability and adaptation to be considered
Zarqa Basin Adaptation Plan	MoEnv	Adaptation aspects to be considered
Water Adaptation Strategy	MWI	Adaptation aspects to be considered
Health Sector Adaptation Strategy	MoH	Adaptation aspects to be considered
Jordan Protected Areas Policy Framework	MoEnv	2010 Adaptation aspects to be considered
Agriculture Adaptation Strategy	MoA	Adaptation aspects to be considered
Disaster Management and Climate Change	Civil Defence Department	Adaptation aspects to be considered
Programme for Mainstreaming Gender in Climate Change Efforts in Jordan	MoEnv	To be implemented; adaptation aspects to be considered
Regional development plans and local municipal development plans	GAM	National climate change policy and action plan should be reflected in regional development plans (governorates development plans) and local authority (municipality) plans.
Research plan for climate change	MoMA	Increased focus of policy-supporting climate change science
Reducing Vulnerability to Climate Change in Agricultural Systems	MoMA	Adaptation response strategies to climate change in Jordan
National Strategy and Action Plan	MoA	Adaptation aspects to be considered
Combat Desertification	MoEnv	Adaptation considered

4.5. The Jordan Case – Sustainable Development Related to Water, Energy and Food (WEF) and Climate Change

4.5.1. General Overview



Jordan's vision for the water-related Sustainable Development Goals (SDGs) envisages a sustainable environment, universal access to sanitation, sound wastewater management and reuse, pollution prevention, safe drinking water delivery, water security and regional cooperation. This vision will optimize the utilization of the interlinked resources of water, energy and food security. Jordan will adopt as a national water sector objective, 'Sustainable management of water and sanitation for all Jordanians'. It will align and refine the SDG targets and indicators in the context of the National Water Strategy. Jordan will also work towards the related SDGs and targets that complement the achievement of the national water sector objective, guided by principles of human rights and justice.

Jordan realizes that SDG implementation and sustainable development require significant mobilization of resources for developing countries from a variety of sources as well as the effective use of financing. Good governance and the rule of law at the national and international levels are essential for sustained, inclusive and equitable economic growth, sustainable development and the eradication of poverty and hunger.

4.5.2. Review of the Implementation of the 2030 Agenda of Sustainable Development

Food security, water availability and sustainability, affordable and reliable energy, environment and climate change action and gender equality were designated as top priorities when the first national review on the implementation of the 2030 Agenda of Sustainable Development was conducted by the Ministry of Planning and International Cooperation in 2017. Below is a summary of Jordan's efforts in this regard.

4.5.2.1. Food Security

Jordan has always attached priority to the issue of food security, from both an access and availability standpoint. The most recent estimates show that the prevalence of food insecurity in the country remains excessively high. The Food Insecurity Experience Scale survey shows that 12.8% of the total population was affected by severe food insecurity during the 2014-2016 period. The latest data on stunting shows that 7.7% of children under five years of age suffered from some form of malnutrition in 2012.

Food security is closely linked to population growth and reliance on the global commodity markets. In 2013, DOS reports estimated that the official yearly overall growth rate was 2.21%. This growth rate has changed significantly after the influx of hundreds of thousands of Syrian refugees during the years since 2011. The results of the last census (2015) indicated that the average rate of population growth over the period 2004-2015 (the two recent censuses) was 5.3%. They also showed that the average population growth rate for the same period was 3.1% for Jordanian nationals and 18% for non-Jordanians.

This situation has translated into a sharp rise in the import of basic food commodities and inflation, affecting the poor disproportionately. With 81% of its food requirements procured externally, Jordan is highly vulnerable to fluctuations in international prices of basic commodities. Satisfying the growing demand for food, for a growing population, will need to be addressed within the context of extreme water scarcity, as the demand for water for domestic use and sanitation services is increasing for Jordanian and non-Jordanian residents alike. This struggle falls among many other economic and social challenges.

As mentioned above, the absolute poverty rate (food and non-food) was 14.4% in 2010, and the abject poverty rate (food poverty) was 0.32 % in 2010. The rural poor make up 33.5% of the total poor in Jordan, the disadvantaged among rural populations are often the first victims of natural resource degradation and are impacted by crisis more severely than any other segment of the population. Lack of employment opportunities, poor labour productivity and lack of decent employment in agriculture are, therefore, serious constraints to food security in Jordan. This situation also contributes to increasing rural-urban migration and the rise of food insecure people in the cities.

Adequate water is a fundamental element in food production. Consequently, water is a vital issue in food security from the perspective of providing safe and adequate food supplies in the short and long-term. Given the multiple-use dimension of water resources, there has always been competition for the limited amount of available water between the municipal, agriculture, industrial and tourism sectors. The portion of water resources allocated to agriculture has dropped from about 70% a couple of decades ago, to 51% at the end of 2013. Agriculture will, therefore, have to optimize the productivity of water, in terms of its efficiency of use, value added and job opportunities provided by this sector and develop mechanisms that better reflect the value of water in agricultural production.

Food and agricultural production is facing many challenges, including: limited availability of surface water resources in the Jordan Valley; the rapid depletion of groundwater resources in the uplands due to over-exploitation; inefficient and misuse of irrigation water; and the degradation of soil and water quality. Small size holdings, especially in the Jordan Valley, and weak extension services that link agricultural research result in farmers having additional constraints. Another major challenge facing the agricultural sector is marketing that is closely linked to high post-harvest losses; inefficient markets; food safety issues; and the difficulties to ensure production that meets quality standards. The recent loss of some export markets has also affected agriculture considerably.

In response to the challenges of food security and agriculture, the Government has developed the National Strategy for Agricultural Development in addition to the National Water Strategy in line with “Jordan 2025.” Policies that will increase growth in agricultural production have been developed.

4.5.2.2. Water Availability and Sustainability

Jordan is facing complex challenges as a result of the geo-political environment of the region and the chronic water scarcity that it has traditionally experienced. The increase in population has placed a further strain on the very limited water resources of the country. Water management in Jordan has focused on prioritizing supplying water for human consumption. The country has reviewed its development plans and strategic options within the context of other crucial resources, i.e. the production of food and the generation of energy to ensure a better understanding of the water-food-energy nexus.

Almost all Jordanians (94%) have access to safe drinking water through water supply networks. However, the daily per capita water consumption is low; average consumption is 74.7 litres/person/day and the government is working to raise this to approximately 122.6 litres/person/day by 2030. The agricultural sector is the largest water user, using 51% of Jordan’s water; this is followed by the municipalities, which utilize 45%. The industrial sector makes use of 4%. The sewage service coverage in Jordan in 2015 was around 58%.

In addition, Jordan reuses approximately 93% of its treated wastewater for agriculture and is exploring additional sources of supply, such as deep aquifers, and brackish and large-scale seawater desalination. The Red Sea-Dead Sea Water Conveyance Project is currently under a PPP tendering process. Efforts are being made to optimize the use of existing resources by reducing physical and commercial losses and improving energy efficiency in water treatment and distribution.

The “Water for Life: Water Strategy in Jordan” for 2016-2025 has captured national efforts to manage the water sector and ensure optimal service levels. The strategy focuses on the limited freshwater resources and on the responsibility of all citizens, government and civil society to be partners in responsible water management, protection and sustainable use. The strategy is based on the integrated water resource management approach and includes policies and strategic directions in water and sanitation and working mechanisms with the agriculture, energy, industry, tourism and environment sectors. The key areas of the Strategy are as follows:

- Integrated Water Resources Management.
- Water, sewage and sanitation services.
- Water for irrigation, energy and other uses.
- Institutional reform.
- Sector information management and monitoring.

The Strategy would also address crosscutting issues of climate change adaptation; trans-boundary/shared water resources; humanitarian-WASH sector coordination; public/private partnerships; and the economic aspects of water. The Strategy identifies the results (objectives) to be achieved and reflects the Government’s national vision for the sustainable development of the water sector. Within the timeframe of this Strategy, the Ministry of Water and Irrigation (MWI), in coordination with other related institutions, will adopt a sector-wide integrated water resource planning and management approach, develop sector policies and legislation to enhance performance, equitable service provision and optimizing of available resources, initiate institutional reforms to restructure sector management, enhance fiscal discipline in cost recovery, improve internal efficiencies in sector coordination and management and build technical capacity. MWI will coordinate and lead the implementation of the water-related SDGs and targets in coordination with other relevant stakeholders in Jordan.

The Ministry will also assess more fully the available amounts, actual quality and natural protection of Jordan’s water resources as a foundation for effective decision making. It will also develop new partnerships with civil society and engage all stakeholders through regular consultations in water sector project planning, thus building awareness of the efficient use and conservation of water and protecting water infrastructure.

Under the new strategy, the Government is working towards a target of 84% of wastewater service coverage by 2030 and will continue expanding the sewage network. The re-use of the water from sewage plants (effluent) reached 93% in 2015 and is forecasted to reach approximately 96% in 2030. This is expected to total 373.22 million cubic meters by 2030, an increase of 150% compared to the current measurements, which were 147 million cubic meters in 2015.

4.5.2.3. Affordable and Reliable Energy

During the past decades, Jordan has been able to maintain the security of its energy supply by diversifying its sources of imported energy, developing local and renewable energy sources, rationalizing energy consumption intensity and improving its efficiency in order to ensure access of energy supplies to all segments of society and development sectors at reasonable prices. Jordan currently imports 95% of its total primary energy mix, mainly crude oil and its derivatives and natural gas, used to generate 88% of the country’s generated electricity. This has significantly contributed to reducing the emissions of CO₂ over the previous years.

In terms of electricity, all areas in Jordan have been covered by an electricity network that meets international standards, with 99.9% of the homes receiving electricity at suitable and sustainable prices. All the electricity needs of the commercial, industrial and tourism sectors are met on a regular and affordable basis. Jordan has worked closely with neighbouring countries to strengthen regional electrical connections by linking with Syria and Egypt.

As part of the country's drive to strengthen partnership with the private sector, the Government has provided incentives to the private sector to invest in infrastructure projects by establishing electricity generation projects. Build-Own-Operate (BOO) and Build-Own-Transfer (BOT) power generation projects have been expanded with international and local companies alike.

Jordan aims to increase the contribution of renewable energy to its total primary energy mix to reach 10% in 2020, equivalent to about 20% of the total electricity generated. The Government is working on setting higher targets by 2030. Jordan also intends to expand the use of natural gas, which contributed 35.3% to the total energy mix in 2016. Furthermore, nuclear energy will contribute about 43% of electricity generated by 2030, which is equivalent to 22% of the total primary energy mix, leading to a significant reduction in greenhouse gas emissions. The Government set the target to decrease its energy consumption from 296 to 276 kg of oil (equivalent to US\$ 1,000 at constant prices) by 2030 and to strengthen its partnership with the private sector in achieving this goal.

In order to further rationalize and optimize the efficiency of energy consumption intensity, Jordanian building codes (energy efficient building codes and solar energy codes) and the Jordan Green Building Manual have been issued to promote green buildings.

National efforts continue to improve energy efficiency in street lighting, public buildings, commercial and industrial buildings and places of worship as well as measures for the use of energy-saving technology and equipment, including energy-saving lamps, lighting units, tools and electrical equipment according to international standards.

Additionally, the Jordan Renewable Energy and Energy Efficiency Fund has played a supportive role by providing citizens with green financing to increase the efficiency of the energy they use and to shift towards renewable energy technologies.

4.5.2.4. Environment and Climate Change Action

Climate change presents a major environmental, economic and development challenge, and the sooner it is possible to address its negative impact, the better the opportunity is to mitigate its effects at lower costs. Jordan is affected more intensely by this phenomenon rather than contributing to it, as is the case in many developing countries. The negative effects of global warming on Jordan include: an increase in temperature; expansion in areas affected by drought; the loss of some natural eco-systems; migration and habitat degradation; deforestation; a rise in the incidences of forest fires; a fluctuation in rainfall; recurring heat waves; and a decrease in the amount of water available (groundwater and surface) as a result of the decline in water flows, which, in turn, impact food security. Jordan's greenhouse gas emissions total approximately 28.7 million tons per year, or 0.06% of global emissions. The annual amount of CO₂ emissions per capita amounted to approximately 4.41 tons at the end of 2016 and this figure is expected to rise to 5.59 tons by 2030.

The GoJ strongly believes in playing a major role in the implementation of global initiatives to adapt and mitigate the effects of climate change despite its limited resources. It has already taken concrete steps to adapt and reduce the effects of climate change.

An ambitious, evidence-based policy framework has been put in place through the National Policy on Climate Change covering various development sectors in the country. One of the most important steps taken by the Government of Jordan was the mainstreaming of objectives related to climate change within the various sectoral policies in the country, for example, within the new Water Strategy for the years 2016-2025. The Government is also accelerating its efforts to reach 10% in the renewable energy sector (of the total energy mix) by 2020.

Key results have been achieved: The Renewable Energy and Energy Efficiency Law was adopted and enacted, fuel prices liberalized, strategies were adopted in the transport sector to promote energy efficiency, tax exemptions were provided and the use of low-carbon hybrid and electric transport vehicles was facilitated. The National Commission on Clean Development Mechanism was established, and Jordan developed its first, second and third National Communications as per the Climate Change Convention Agreement. Jordan also joined the Partnership for Market Readiness (PMR) to ensure its economy is ready for climate change. In addition, the preparation of its Biennial Update Reports (BURs) has been institutionalized.

In September 2015, Jordan submitted its Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat; it faces a host of challenges in achieving the commitments spelled out in its NDC document. Most importantly, the implementation of projects related to the mitigation of and adaptation to climate change and the mainstreaming of environmentally-friendly green technologies requires further efforts for access to funding. The NDC document stipulates a reduction of emissions of 14% by 2030, of which 1.5% is unconditional contributions to the availability of funding at a cost of US\$ 0.5 billion, while 12.5% is contingent upon the availability of funds totalling US\$ 5.2 billion. A series of measures are proposed in this regard, including:

- Fundraising for the implementation of 73 projects incorporated in the NDC document in priority sectors such as energy, transport, waste management, industry, water and agriculture.
- Preparation of a funding strategy for the implementation of projects included in the National Adaptation Programme of Action (NAPA) document.
- The development of a Measurement, Reporting and Verification (MRV) System for Green House Gas (GHG) emissions.
- Preparation of necessary legislation, including the development of a by-law on climate change.

For the medium and long-term, the Government has adopted green economy principles and applied them at all levels. Several important steps have been taken in this regard, the most recent of which is the completion of the National Plan for Green Growth (2017-2025). This is a roadmap to encourage the public and private sectors to invest in priority areas like energy, water, transport, agriculture, tourism and waste management for the benefit of local communities by providing jobs and reducing unemployment.

In its efforts to shift towards sustainable production and consumption patterns, the Government has recently concluded the National Strategy and Plan of Action for Sustainable Production and Consumption (2016-2025) for the transport, waste management and agriculture/food sectors. A draft waste management framework law was prepared which would provide a legal umbrella to increase sustainable investments in the waste management and recycling sector, where the proportion of re-processed and re-used solid waste reached 15% by the end of 2016 and is expected to increase to 40% by 2030.

A number of pieces of legislation in this area, including a by-law on manufacturing, importing and trading of biodegradable plastic bags, were issued in 2016.

Finally, the Government has put in place an improved infrastructure at the hazardous waste dumping site in Swaqa and has initiated the preparations for an international tender for the establishment of comprehensive hazardous waste management units based on the principle of partnership between the public and private sectors (PPP). All initiatives, programmes, projects and activities emanating from the aforementioned plans and strategies will be included in the Government's EDPs and funding will be sought through all available funding mechanisms.

With regard to SDG14 on the conservation of the oceans, sea and marine resources, most of the targets do not apply to the situation of Jordan, especially those related to the oceans. Therefore, Jordan will pursue other more relevant targets and apply them to the Gulf of Aqaba, particularly in relation to marine pollution, ecosystem management and marine and coastal management, where many efforts have already started. However, the major challenge is the lack of data and indicators in these fields; priority will be given to addressing these data gaps.

4.5.2.5. Gender Equality

The adoption of the 2030 Agenda represents an opportunity to make a tangible shift in participatory development planning approaches and mechanisms. This entails mainstreaming gender into all national development plans in the years to come.

The National Higher Committee for Sustainable Development now includes the Jordanian National Commission for Women (JNCW) and representatives from civil society coalitions. Two additional working groups were formed to better align the working groups of the EDP with the 2030 Agenda and the SDGs: The Gender Equality Working Group, headed by JNCW, and the Human Rights and Freedom of Expression Working Group. The Gender Equality Working Group includes representatives of civil society, ministries and relevant governmental and national institutions, including the DoS. Together, all of these parties will ensure that the data on the indicators required to monitor the implementation of SDG5 and other goals related to gender equality and women's empowerment are properly reflected. The Gender Equality Working Group will also ensure coordination with regular reporting mechanisms established to account for commitments to international treaties and conventions.

As part of the "Jordan 2025" and the EDP covering 2016-2019, a set of strategic goals has been developed to address the empowerment of women in the following sectors: health, education, poverty, social protection, employment and labour.

Over the past decade in Jordan, women's participation throughout all walks of life has steadily improved. The percentage of female judges in the judiciary system is now 18.5%. Women make up 35.5% of political party members, 37.8% of municipal councils, 21% of trade unions, 19.9% of diplomatic corps, 8% of professional syndicates, 7.9% of chambers of industry and 0.6% of chambers of commerce. Despite these achievements, there are still a number of social and political challenges facing gender equality and women's empowerment that act as barriers to changing the stereotypes related to women's roles within social, political or economic spheres. To address these challenges and further build upon progress achieved thus far, Jordan aspires to increase women's political participation in all political forums, especially in local councils. Jordan is continuously reviewing its legislative system to further empower women, ensure their access to decision-making processes and protect them from all forms of discrimination and violence. The following are some significant results to date:

- The 2016 Electoral Law for the Lower House of Parliament raised the women's quota for seats from 10% to 11.5%. This is in addition to any seat that women could take in open competition. In 2016, the percentage of women in the upper and lower houses of parliament reached 15.4%.
- The 2015 Decentralization Law allocated a 10% quota for women in the elected seats in addition to a third of the appointed seats, thus ensuring a total of 15% of seats within the Governorates' Councils are reserved for women.
- The Municipalities Law allocated 25% of the Municipal Councils' seats for women.
- By-law number 48 on the Alimony Advancement Fund was issued in 2015 to expedite the enforcement of alimony for the wife, children and the elderly.
- The 2016 By-law number 171, regarding shelters for women at risk, was issued.
- The Flexible Work By-law was issued in 2017.
- The Law on Domestic Violence was also issued in 2017.

In addition, a home-based business licensing legislation has been enacted that will start to contribute to increasing women's economic empowerment and formalizing women's informal businesses that are not being captured in formal economic participation statistics. Moreover, the draft revision of the Penal Code is currently being reviewed by parliament. If endorsed, it will repeal Article 308 of the law, which allows the rapist to escape punishment by marrying the victim, and amend Article 98, so that crimes committed in the name of honour are no longer exempt from full enforcement of the law.

Jordan's ranking is 134 out of 144 countries in the 2016 global Gender Gap Index and has dropped to 138th of 144 countries in the index on women's economic opportunities. Jordanian women's entry into the labour market has been mainly concentrated in the health and education sectors. As per "Jordan 2025," Jordan aims to increase women's economic participation from 13.2% in 2016 to 27% in 2025. Women continue to face a wage gap of 33%, mainly concentrated in the private sector. The per capita income of females is US\$ 3,587 compared to US\$ 18,831 for males in 2015. The National Committee on Fair Pay has submitted a proposal to the Council of Ministers in favour of the amendment of 11 articles of the Labour Law to eliminate gender discrimination in employment and wages, promote women and family-friendly working environments, increase maternity leave days, introduce paternity leave (as is currently found in the public sector) and provide nurseries for those employed in private enterprises. The Jordanian National Plan of Action for the Implementation of Security Council Resolution 1325 for the years (2017-2020) is being finalized to ensure the full and effective participation of women in security and peace and to ensure equal opportunities for women to lead on an equal footing with men at all levels of decision-making. The plan focuses on four main outcomes:

- Achieve the active participation of women working in security, military and peacekeeping sectors.
- Achieve the active participation of women in the processes of peace-building and peace-making and in combating extremist ideologies and violent extremism.
- Provide gender-sensitive services (including psychosocial, legal and medical services) and facilitate safe access for Jordanians and refugees (including women and girls most vulnerable to violence and in need of protection) in host communities and refugee camps.
- Recognize the contributions and the role of women and youth in achieving security and peace.

Women's empowerment is supported by a strong political will at the highest levels. His Majesty King Abdullah II Ibn Al Hussein has shared a number of discussion papers to encourage a national dialogue on the political reforms and transformations in Jordan. These discussion papers stress the positive contributions of women in all political, economic, social, environmental and cultural fields, recognizing women as crucial partners in sustainable development and reforms for a better future.

4.5.3. SDGs Targets and Indicators for Water and Wastewater Services

The MWI, in collaboration with WAJ, expanded specific targets and indicators that are in harmony with the SDG 6 Goal that has three clear targets that build on the MDG drinking water and sanitation targets, providing continuity while expanding their scope and refining definitions. These targets and indicators will be moderated to reflect the current Jordanian water situation and adopted for use in the monitoring and evaluation mechanism in all sector-related institutions and in performance reporting (Table 17). In order to monitor the implementation of the SDGs, the availability of and access to data and statistics disaggregated by income, gender, age, race, ethnicity, migratory status, disability and geographic location should be improved. It is urgent that steps be taken to improve the quality, coverage and availability of disaggregated data to ensure that no one is left behind.

Table 17. Water Sanitation and Hygiene-Related Indicators to Measure Progress Towards National Targets (Sustainable Development Goal 6), Source: UN Water/GEMI report 2014.

Sustainable Development Goal 6	Target	Indicators to be used to measure progress towards quantified sub-targets
6.1	Universal access to safe and affordable drinking water	Percentage of population with access to safely managed drinking water services
6.2	Achieve access to adequate sanitation, end open defecation	Percentage of population with access to safely managed sanitation services
	Achieve access to hygiene for all	Percentage of population with access to hygiene
6.2	Improve water quality	Water Quality Index
	Halving the proportion of untreated wastewater	Percentage of wastewater (domestic and industrial) safely treated
	Increasing recycling and safe reuse by x%	Percentage of municipal wastewater safely reused and industrial wastewater recycled

4.5.4. Gender Mainstreaming in the Water Sector

The women of Jordan possess a very significant body of knowledge and understanding of the social, cultural, environmental, economic and political issues and approaches in water sector management. In communities, women play a pivotal role as providers and users of water and as guardians of the living environment. Involvement of women in sector decision-making and with in-service delivery implementation will be encouraged. The current legislative framework in the water sector does not discriminate on the basis of gender.

The National Water Strategy restates the national water sector's commitment to ensure that gender equity and sensitivity are mainstreamed in its management, project planning and monitoring processes. Specific measures that need to be taken as part of the National Water Strategy to facilitate and enhance the participation of women aim to:

- Target women and girls in awareness and education campaigns, including supporting their education in science and social subjects to enable them become water sector professionals.
- Establish mechanisms specifically targeted at women to encourage, promote and facilitate their engagement and participation in WASH activities.
- Facilitate dialogue and debate about issues of gender in WASH.
- Develop mechanisms and programmes that overcome cultural and social barriers that perpetuate gender inequalities.
- Assist sector agencies and national institutions to develop gender mainstreaming programmes.
- Monitoring systems and other tools to capture or factor in women's involvement in WASH.

4.5.5. Jordan's Position (Related to Climate Change) on Vulnerable Groups, with Emphasis on the Poor and Gender Mainstreaming

Jordan is a signatory to and member of several key international agreements that already commit the country to gender mainstreaming. Under the UNFCCC, increased attention is paid to securing a gender perspective in international policies and initiatives. The relationship between climate change and gender and poverty is apparent in the following issues:

Dependence of such vulnerable groups on natural resources that are susceptible to climate change. Twenty percent of the population depends on agriculture for their income. Agriculture vulnerability, especially in rain fed and irrigated areas, was also discussed in detail. These discussions lead to the conclusion that this 20% of population – who are also part of the poorest segment – will be most susceptible to climate change impacts.

- The dependence of communities on ecosystem services (water springs, rangelands and natural vegetation in medicine, etc.) that could be affected by climate change.
- A lack of assets, which hinders effective adaptation by the poor segments of population.
- Settlements in high-risk areas (i.e. drought-prone) in Jordan are known to be of the lower income groups, a fact which magnifies the potential negative impact of climate change on these groups' poverty levels.
- Low levels of education and professional skills that prevent members of poor households from shifting to climate-resilient sources of income.
- Though gender issues are still under-investigated in Jordan, the role of women in the economy of rural areas is known to be substantial. Women in these areas are traditionally responsible for the household economy and are active in field work as well. Any negative impact of climate change will be most sensed by women. Women make crucial contributions in agricultural and rural enterprises in drylands as farmers, workers and entrepreneurs through their indigenous knowledge.

Climate change issues are not directly addressed in the existing national strategies for poverty, childhood and early childhood development in Jordan. They are expected to be integrated into the upcoming Poverty Reduction Strategy. The "Programme for Mainstreaming Gender in Climate Change Effort in Jordan" was prepared in 2010 (MoEnv, IUCN and GGCA). The document was endorsed by the GoJ and presented to the international community as the official stand of Jordan on the issue of gender and climate change. The document is also endorsed by the Women's National Committee and was adopted as part of the Committee's strategy.

4.5.5.1. Climate Change Strategic Objectives to Vulnerable Groups and Gender Mainstreaming

- Integrate gender considerations and the interest of vulnerable groups in climate change policies and strategies in all relevant sectors, particularly in national strategies for poverty, childhood and early childhood development in Jordan.
- Ensure that financing mechanisms on mitigation and adaptation address the needs and conditions for implementation of poor women and men equally.
- Build capacity at all levels to design and implement gender-responsive climate change policies, strategies and programmes.

4.5.5.2. Priorities, Main Measures and Instrument for Mainstreaming Gender and Protecting Vulnerable Groups

- Build capacity at all levels to design and implement gender-responsive climate change policies, strategies and programmes.
- Ensure that financing mechanisms on mitigation and adaptation address the needs and conditions for implementation of poor women and men equally.
- Develop, compile and share practical tools, information and methodologies to facilitate the integration of gender into policy and programming.
- Instruct relevant entities to fulfil Jordan's international commitments regarding gender mainstreaming according to the international agreements approved by the country.
- Ensure that sector ministries will adopt the Action Plans suggested by the Program for Mainstreaming Gender in Climate Change Efforts in Jordan, including the Action Plans' specified objectives, actions and indicators required.

4.5.6. Conclusions and Recommendations

Addressing water energy and agriculture together and applying an integrated approach to planning based on the SDGs can lead to water, energy and food security optimization by increasing resource efficiency, ascertaining and reducing trade-offs, exploiting and building synergies and improving collaboration and governance across sectors. An integrated approach aids in identifying and addressing externalities across sectors which may otherwise be overlooked.

The global framework and tools available to implement the SDGs are important and diverse. Public and private finance, financial approaches, instruments and options and a range of public-private partnerships support government, the private sector and civil society in the implementation of the SDGs. Similarly, management that is based and owned in the community supports integration between different levels of government within a country; it also represents a grassroots bottom-up approach to the implementation of the SDGs. Projects that are based and owned in the community also assist in the implementation of those SDGs that require community engagement and involvement.

Modelling and assessment tools illustrate the numerous benefits of an integrated approach to resource planning and can support broad implementation of many SDGs with the expansive focus on climate, land, energy, water and development. Most of Jordan's water is used in the agricultural sector, while agriculture contributes less than 5% to the economy and employment. Jordan's water strategy focuses on large-scale supply infrastructure projects in addition to food imports. Jordan's supply water management options are reaching their limit.

Options include greater reliance on food imports with high virtual water values, improving the efficiency of the urban water systems including reducing the loss rate, using recycled water and treated waste water for agriculture, exploiting renewable energy for desalination, recovering heat from waste water and increasing efficiencies in all sectors. Furthermore, integrated land and water planning could preserve rain-fed agricultural land from development. Jordan's National Water Strategy supports increasing energy efficiency across water supply and treatment and using renewable energy to meet energy demand for water. A shift in focus to an integrated approach to water and resources, such as is present under the SDGs, could benefit Jordan by exploiting the interconnections. Potential benefits include: avoiding sunk costs that preclude funding other projects, improving the efficiency of the water system, improving the resilience of the economy and population and improving collaboration and cross-sectorial coherence across government.

4.6. The Lebanon Case – Energy Sector

4.6.1. General Overview of the Energy Sector - Lebanon



Lebanon has embarked on the path of sustainable energy since the commitment launched in Copenhagen in 2009 by the Lebanese Government to develop renewable energy. That famous commitment was well defined in the 2010 Ministry of Energy and Water (MEW) policy. The policy “Paper for the Electricity Sector” has become a challenge and a source of pride for the country. It is a real challenge to all concerned parties to reach the target by 2020, yet it is a real pride because this commitment has boosted sustainable energy development in Lebanon to a high priority level. The first RE power plant in Lebanon was installed back in 1924 using the hydroelectric power. The Bécharé plant was built under the French mandate, and it is still operational today, although only partially.

The average available electricity production capacity (including imports) was 1,500 megawatts (MW) while the average demand was 2,000 – 2,100 MW. The instantaneous peak demand in the summer of 2009 was estimated at 2,450 MW. The total energy demand in 2009 was 15,000 gigawatt-hours (GWh) although the total produced energy (including imports) was 11,522 GWh. Accordingly, the electric energy deficit in Lebanon was estimated to be 3,478 GWh. (Policy Paper for Electricity Sector, Bassil 2010).

In Lebanon, electricity is basically generated from thermal and hydroelectric power plants. Approximately 7.5% of the total electricity production in 2009 was purchased from Syria (589 GWh) and Egypt (527 GWh) through regional interconnections. In addition to the deficit in electricity supply, the Lebanese electricity sector was facing several problems such as load shedding, technical losses and the aging of power plants. This situation resulted in technical and financial impacts on customers, the Government and the entire economy.

The Lebanese end-users were forced to rely on diesel generators to overcome the electricity shortages (The National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020). The country's primary energy imports cover essentially the following types of oil products: liquid gas, gasoline, gas oil, fuel oil, kerosene and asphalt. Fuel oil is actually used by two main consumers, Electricité du Liban (EDL) and the local market. A considerable share of the fuel oil and gas oil imported goes to EDL, while another minor quantity goes to the local market (mainly used in industries). Liquid gas, gasoline, kerosene, and asphalt go directly to the local market as shown in Figure-4 (The National Renewable Energy Action Plan for the Republic of Lebanon, 2016-2020).

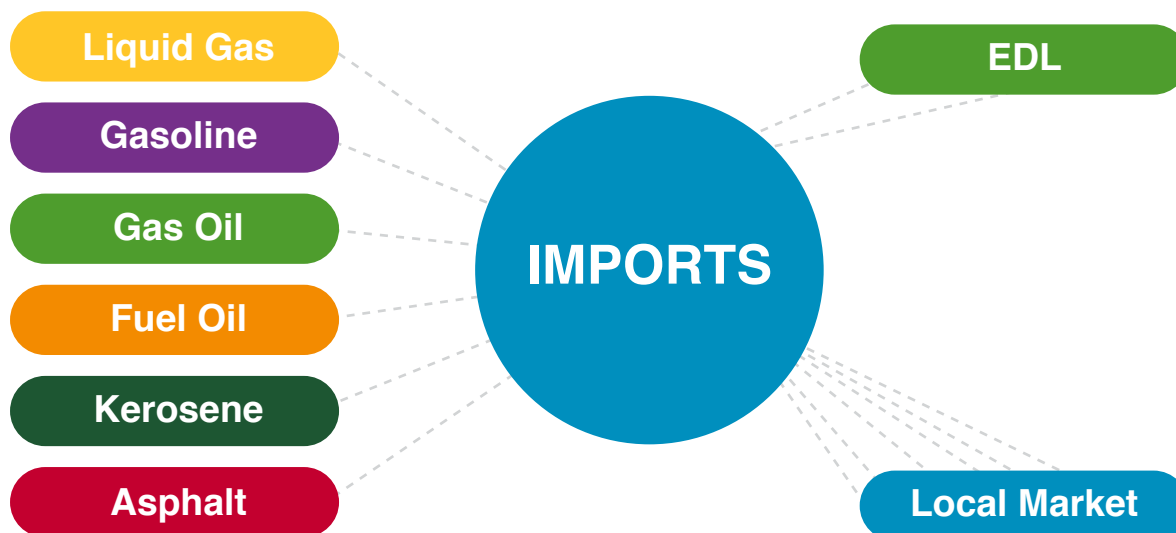


Figure 4. Flow of Oil Product in Lebanon Market. Source: National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020

During the 2010 baseline year, the total fuel imports (liquid gas, gasoline, gas oil, fuel oil, kerosene and asphalt) amounted to approximately 5,768 ktoe and were consumed in the different sectors in Lebanon. On the other hand, electricity imports from both Syria and Egypt amounted to approximately 1,248,871 MWh, whereas hydroelectricity produced by the different hydropower plants on the Lebanese territory amounted to approximately 836,537 MWh (equivalent to 180,909 toe). In addition, the amount of energy produced by solar water heater installations totalled approximately 12,719 toes (The National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020). Accordingly, the primary energy mix in Lebanon for the baseline year can be summarized as shown in Figure 5. The total consumption in 2010 amounts to 6,069,301 toes, out of which 96.8% was imported from outside Lebanon and the remaining 3.2% was locally produced.

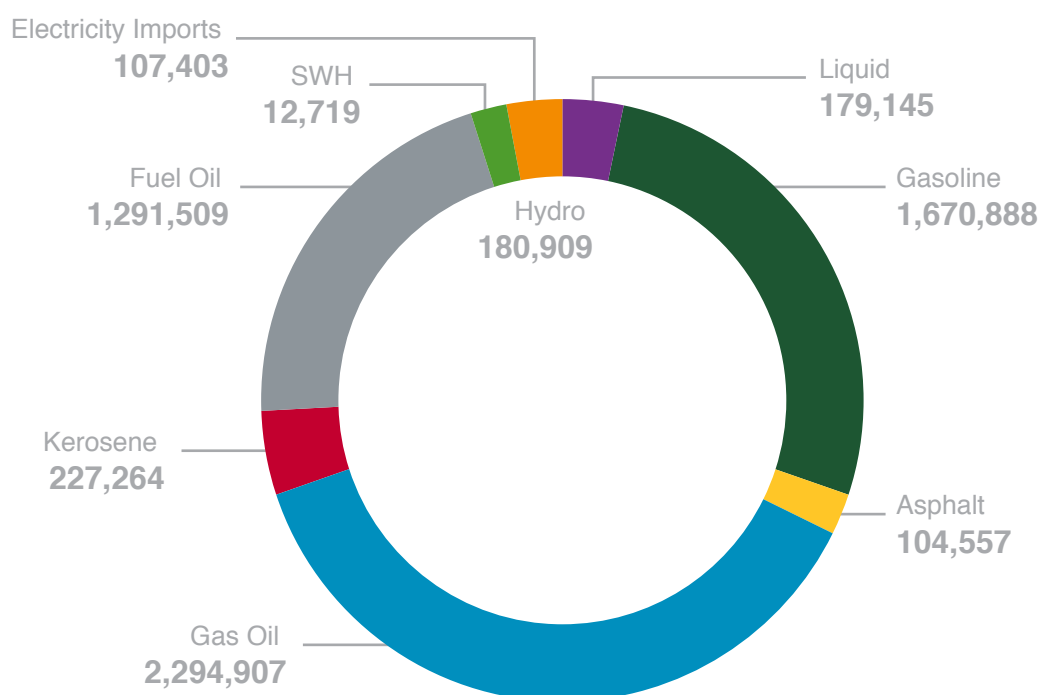


Figure 5. Energy Primary Mix in 2010 in Lebanon. Source: Energy Policy Assessment, 2017

4.6.2. Renewable Energy and Energy Efficiency Potentials

Lebanon has a Mediterranean climate characterized by long, hot, dry summers and short, cool, rainy winters. Moreover, Lebanon is a mostly mountainous country, east and west, separated by the fertile Beqaa Valley; a narrow coastal strip of land fronts the Mediterranean Sea. This climate and its special nature give Lebanon great potential to produce large amounts of renewable energy.

4.6.3. Policies and Strategies

In Lebanon, electricity is generated from thermal and hydroelectric power plants. Approximately 7.5% of the total electricity production in 2009 was purchased from Syria (589 GWh) and Egypt (527 GWh) through regional interconnections. In addition to the deficit in electricity supply, the Lebanese electricity sector was facing several problems such as load shedding, technical losses and the aging of power plants. This situation resulted in technical and financial impacts on customers, the Government and the entire economy. The Lebanese end-users were forced to rely on diesel generators to overcome the electricity shortages.

To overcome all these problems, the MEW published a comprehensive energy policy (the 2010 Policy Paper for the Electricity Sector) that was approved by the Council of Ministers (COM) on June 21, 2010. In addition to proposing a strategic solution to the electricity sector in Lebanon, the Policy Paper also built on the 12% commitment of RE to propose some future milestones. The year 2010 is then considered the turning point in the development of the electricity sector and, more specifically, RE in Lebanon (The National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020).

The Policy Paper for the Electricity Sector covers all the aspects of the energy sector in Lebanon and includes 10 initiatives, 3 of which are dedicated to EE and RE grouped as follows: infrastructure (generation, transmission and distribution), supply and demand (fuel sourcing, RE, demand side management/EE and tariffs) and legal framework. In terms of RE, the Policy Paper focused on the development of hydropower, wind energy, solar photovoltaic (PV applications, solar water heaters and waste-to-energy). The Policy Paper for the Electricity Sector has set the strategic path for the development of RE in Lebanon.

4.6.4. Policy of Institutional Key Players

4.6.4.1. The Lebanese Centre for Energy Conservation (LCEC)

LCEC is the national energy agency in charge of energy efficiency and renewable energy (EE and RE) matters in Lebanon. LCEC has succeeded in establishing itself as a focal point for energy conservation issues within the Lebanese Ministry of Energy and Water (MEW). LCEC has been in operation since 2002 and more actively, since 2005, on a project basis financed by the Global Environment Facility (GEF) and the Ministry of Energy Water (MEW) in addition to other bilateral donors and under the management of UNDP. LCEC developed energy efficiency standards and labels for some household appliances (in cooperation with Libnor and IRI) and helped in the creation and support of Energy Services Companies (ESCOs), which were able to conduct LCEC-funded energy audits for companies and institutions. As a matter of fact, LCEC supervised more than 100 audits for major sites like the Beirut International Airport, Casino du Liban and Hôtel Dieu de France. LCEC also helped in the installation of solar panels donated by different international funds.

On the communications front, LCEC launched a multitude of awareness campaigns, namely “some turn-offs do save,” “don’t burn your money to heat water, solar energy is for free” and

“save the energy and keep the light.” These and other tactical campaigns targeted industries, students as well as many other consumer groups. LCEC established successful partnerships with MEW, Electricité du Liban (EDL), local power companies, the Industrial Research Institute (IRI), the Council for Development and Reconstruction (CDR) and the Order of Engineers and Architects in Beirut (OEA).

Recently, LCEC and Kafalat signed a cooperation agreement to provide interest rate subsidies for energy efficiency projects. LCEC is the official representative of Lebanon in the Mediterranean Association of the National Agencies for Energy Conservation (MEDENER). It is also a founding member representing Lebanon in the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE). LCEC is the national focal point for different EU-funded projects like

MED-ENEC and MEDEMIP. LCEC is building a solid platform to become the national counterpart for the upcoming Mediterranean Solar Plan (MSP). The role of LCEC is growing with extended responsibilities for energy audits, financial incentive schemes, standards and labelling, promoting the use of renewable energy, a national energy database and the promotion of the Clean Development Mechanism (CDM) for carbon offsets.

4.6.4.2. Électricité Du Liban (EDL)

EDL produces, transmits and distributes electricity through seven thermal power plants and three hydraulic power plants. It is a public establishment with industrial and commercial operations. Its role would be to help in the implementation of all EE programmes. EDL will guarantee the recovery of credit through its electricity bills. EDL will collaborate with LCEC in conducting various surveys. Those surveys will be performed by EDL personnel when collecting electricity bill payments.

4.6.4.3. Ministry of Environment (MoE)

The MoE was established in 1993 (Law 216/93) and reformed late in 2005 (Law 690/2005) to empower its mandate to preserve the environment and strengthen decentralization. Its general duties are to formulate general environmental policies and to propose measures for its implementation in coordination with various concerned Government administrations. The MoE also strives to protect natural and manmade environments in the interests of public health and welfare and fight pollution by taking preventive and remedial actions. The MoE's role would be to set the emission reductions objectives by promoting efficient technologies and supporting EE project financing through the Environment Fund.

4.6.4.4. Ministry of Energy and Water (MEW)

MEW is a governmental department in charge of water and energy resource policy and management. It controls 21 Lebanese water authorities and the semi-autonomous public institutions in charge of providing drinking water. In May 2000, a Government decree merged the authorities into four larger public establishments. The MEW, through the energy department and LECEP, drives all activities related to RE and EE project implementation and awareness campaigns.

4.6.5. Renewable Energy Strategy

The government of Lebanon aims to have 12% of its total energy needs from renewable energy sources (RES) in 2020. This means roughly the production of 1800 GWh of electricity coming from renewable energy sources by 2020 if this entire objective is met through electricity-supplying sources only (Policy Paper for Electricity Sector Bassil 2010).

In terms of set numbers, the main target is to implement RE projects that would actually produce approximately 767 kilotons of oil equivalent (ktoe) in 2020, equivalent to 12% of the projected total electricity and heating demand in Lebanon during that year. MEW is aware that this target is challenging, but experts are also confident that aligning the efforts of all national players and international allies would lead to achieving this target.

Three main paths need to be developed in order to reach this 12% target. Wind energy for electricity production would represent one major milestone with a projected share of 2.06% of the total Lebanese demand for Energy in 2020. Solar energy, including solar photovoltaic (PV), concentrated solar power (CSP) and solar water heaters, would be another important milestone with around 4.20% of Lebanon's total annual energy demand. In addition, hydro resources would be needed to produce around 3.24% of the total electricity. Finally, biomass would cover around 2.50% (The National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020).

4.6.6. Identified Barriers

- In spite of the efforts to improve the situation in the energy sector in Lebanon, the sector is still suffering from a lack of generation capacities and shortages in the delivery of electricity. The main barriers to the improvement of Lebanon's energy situation are listed below:
- Lack of regulations and standards to control renewable energy, feed-in tariffs and net metering, in addition to the standards that control the renewable energy and energy efficiency system components and their specifications.
- The electricity grid infrastructure and the availability of the grid; both of these are obstacles to the functioning and feasibility of some Renewable Energy projects.
- The investors who invested in the power generation companies are pushing against the improvements to maintain their profits in the energy business.
- Lack of money and funds for such projects.
- Lack of data for the end users, which leads all parties to make many assumptions.

4.7. The Lebanon Case – Water Sector

4.7.1. General Overview of the Water Sector - Lebanon



Lebanon has relatively high per capita water endowment (1,000m³/capita, making the country the fourth best-endowed in MENA). Lebanon is already using two thirds of its available water resources, which is high by global standards. By comparison, other regions average 10-30%, and there is significant groundwater mining. There is a seasonal mismatch between supply (at its peak in the rainy winter) and demand (peaking in the hot, dry summer months). Factors exacerbating this seasonal water imbalance are the very low water storage capacity (6% of total resources, compared to the MENA average of 85%), the deficiency of water supply networks and, on the demand side, fast rising demand from the municipal and industrial sectors. These seasonal imbalances are likely to lead to chronic water shortages. Already, dry season shortages are emerging and water quality is deteriorating. If no actions are taken to improve efficiency, manage demand and increase storage capacity, the country could be dependent on mined groundwater or on high cost desalination for incremental resources in the long run.

Despite Lebanon's relatively high level of income, development of water services has lagged. Water supply services are below the levels expected in a middle-income country. Although network coverage is relatively high (79%), there are big regional differences, whilst unaccounted for water averages 48%, and supply continuity is low. For example, in summer, water is supplied for as little as

three hours a day in the capital service area where over half of the population live. The poor record is due largely to the low efficiency of public expenditures and to the slow implementation of the reforms begun under Law 221 of 2000 that were intended to create the Water Establishments (WEs) as autonomous, efficient and integrated water service providers. Due to capacity and institutional constraints, WEs have not been able to apply key measures to improve water supply reliability or to improve their financial viability. Flat rate tariffs provide no incentives to consumers to save water or to the WEs to improve service delivery. The intended increased role of private capital and management has not materialized.

The MoEW is responsible for the strategic planning of water resources management, including the preparation of the water master plan, regulation and conservation of surface and groundwater resources and design and implementation of large projects and dams. The MoEW also has the mandate to supervise the WEs in the planning and formation of their strategies for water monitoring and distribution. Until recently, there has been neither an accepted overall water resource master plan nor a strategy for development of water storage. MoEW has had weak capacity in water resources planning, allocation and regulation. The regulation of groundwater abstraction, including the issue of permits for well drilling, is currently not enforced; a large number of wells are reported as illegal. Little has so far been done to anticipate the effects of climate change on water resources or on water supply and irrigation; similarly, little has been done to plan for adaptation and mitigation. Meanwhile, demand has not been moderated by management measures such as regulation and pricing.

An expensive but poorly sequenced investment program and absence of a viable business model for wastewater have left 92% of Lebanon's sewage running untreated into watercourses and the sea. Responsibility for irrigation was supposed to be transferred to the WEs, but this has not happened. Also, proposals to decentralize management to user associations and to increase cost recovery have not been implemented. More than half of the irrigation schemes lack adequate O&M. Returns to water (\$/drop) are low, and the country is missing opportunities to increase production and trade in high value crops.

Underlying these poor sub-sectoral performances is the sector-wide issue of accountability. Reforms initiated under Law 221 of 2000 were designed to increase accountability between public agencies and between WEs and customers. The institutional and legal framework envisaged has not been effectively implemented, creating institutional uncertainty over sector responsibilities. Coordination within the government remains poor, particularly between MoEW and the CDR; these two entities struggle with continued fragmentation of responsibilities for investment planning and execution and consequent low efficiency of public expenditures. The (partial) implementation of a delegated model of service provision has not been complemented by a parallel effort to strengthen central government oversight over the water sector. Reciprocal accountability between WEs and clients remains weak as WEs are not adequately empowered to improve service levels.

Overall, the water sector is delivering poor services at a high fiscal and household cost. The WEs have to overcome tough economic and socio-political challenges if they are to become efficient and accountable service providers. In the meantime, water sector inefficiencies (particularly low collection of tariffs and high-water losses) and environmental damage are costing the economy the equivalent of almost 3% of GDP annually.

4.7.2. Water Policies in Lebanon

The water sector in Lebanon has various laws and regulations which date back to the Ottoman Empire and the French Mandate. Before the creation of the Lebanese state in 1920, the water sector was managed based on norms and customs according to each village. Organizing their own water usage, each village ensured a balanced and fair distribution among residents to prevent conflicts. However, driven by the growing demand for water, a franchise was issued by Ottoman Sultan to meet the citizens' needs; the first of these needs was to drag water from the Naher El Kalb River to Beirut. This issuance initiated the transition to water management within a general administrative structure.

As of 1920, a new legal phase began in Lebanon with the issuance of Law 144, dated June 10, 1925. This law related to the public domain and decision 320, dated May 26, 1926, which addressed the protection of public water and its use. The first clear water policy that was backed up with legislation and regulations was law 221 issued May 26, 2000. This law organized the water sector by addressing its institutional setup; however, some issues related to water management were not solved, including the overlap of responsibilities and the understaffing of stakeholders (MOE/UNDP/ECODIT, 2011). In 2012, the Council of Ministers (CoM) endorsed the National Water Sector Strategy (NWSS) prepared by the Ministry of Energy and Water in 2010. The strategy presents a detailed road map for improving water conditions and service delivery in the country and is presented in the following section. In general, water in Lebanon is regarded as a public domain, and its sale for profit is prohibited except for three cases:

- Rainwater harvesting by individuals.
- Resources extracted from a private land which do not come from a river (under a certain limit).
- Water for which rights were acquired before 1925 (Hayek, 2009).

4.7.3. Water Strategies in Lebanon

The mission of the National Water Sector Strategy, which was prepared by the MoEW in 2010 and enacted by the Lebanese CoM under decision No.2 dated March 2012, is to ensure water supply, irrigation and sanitation services over all the Lebanese territory on a continuous basis and at optimal service levels with a commitment to environmental, economic and social sustainability. The NWSS has seven main objectives:

- Maximizing the potential and improving the quality of surface water resources.
- Improving the management and protection of groundwater resources.
- Fulfilling deficits through groundwater and/or surface water.
- Ensuring proper and continuous access to a high quality water supply.
- Providing adequate quantities and quality of water for irrigation.
- Increasing coverage of wastewater collection networks and treatment capacities.
- Optimizing current wastewater treatment processes and sludge disposal.

The strategy presents initiatives which fall under three headlines:

- Production: provision of additional water resources.
- Conveyance: water supply transmission and distribution.
- Wastewater: wastewater collection and treatment.

4.7.4. Laws and Decisions Related to the Water Sector in Lebanon

Table 18. Summary of the Lebanese Legislation Related to the Water Sector

Source: Water Base Study, 2016

Legislation	Year	Brief Description
Law No. 144	1925	Protection of surface and groundwater resources.
Decision 320	1926	Protection of public water and its use; protection of catchment areas.
Decree No. 7975	1931	Related to the cleanliness of residences and their extensions, the elimination of mosquitoes and flies and discharges of substances and wastewater.
Law 16/L	1932	General health rules and regulations.
Decree No. 2761	1933	Provides directions related to the discharge of wastewater and dirty substances. General instructions for sewage networks and household pipe connections, septic tanks and leaching fields are listed.
Decree 10276	1962	Protection zones for water sources and recharge areas.
Decree 14438	1970	Regulates water exploration and usage; the drilling of wells and their operation would require ministerial authorization.
Decision 67	1972	Methodology for bacteriological analysis of water.
Decree 8735	1974	Forbids the infiltration of sewage waters from cesspools or to leave them partially exposed, or to irrigate vegetables or fruits with their waters (Article 4); reserves places assigned by each municipality for the treatment of waste and agricultural and industrial residues (Article 13) and space for empty sewage waters by tankers in special locations by decision of provincial or district governor until drainage canals are built (Article 15); forbids the drilling of wells to undefined depth with the aim of disposing of sewage water.
Law No. 64	1988	Protects the environment from hazardous waste and hazardous materials and establishes a Higher Council for Environmental Protection.
Law No. 216	1993	Establishes the Ministry of Environment (MoE) and defines its mandate; the MoE is responsible for environmental protection and monitoring.
Decree 5591	1994	The organizational structure of the MoE and its jurisdictions. Establishment of technical specifications for design of wastewater treatment plants. Setting maximum acceptable limits for air, water and soil pollutants. Protecting and monitoring surface and ground water quality. Protecting rivers and springs from contamination by chemicals, pesticides, sewage and municipal and industrial wastes. Safeguarding against illegal sewage disposal in coordination with relevant stakeholders.
Ministerial Decision No. 52/1	1996	Environmental Quality Standards and Criteria for Air, Water and Soil. Environmental Quality Standards for Treated Domestic Wastewater (partly updated in Decision 8/1 dated 30/1/2001).
Law No. 667	1997	Amendment to Law No. 216, Organization of the MoE. Project Law 1997 Code of Environment.
Decree 13495	1998	Identifying Measures of Application of Decree no. 68 dated 1983- Organization of excavation works to extend public service lines within the limits of streets and roads.

Draft Decree	1998	All agglomerations have to be provided with collecting systems for urban wastewater at the latest by 31 December 2010 for those with a population of more than 15,000 and 31 December 2015 for those between 2,000 and 15,000 (Article 3). All urban wastewater entering collection systems shall, before discharge, be subject to secondary treatment or an equivalent treatment. This deadline for achieving this goal is 31 December 2010 for all discharges from agglomerations of more than 15,000 people and 31 December 2015 for those between 2,000 and 15,000 people (Article 4).
Decree 1039	1999	Sets permissible standards for drinking water parameters. It adopts the Standardizations No. 161/1999 for potable water and No. 162/1999 concerning the bottled potable water as per Lebanese regulations.
Law 221	2000	Reorganization of the water sector. This law updated and clarified the regulatory authority of the MoEW and merged the 22 pre-existing water authorities into five Regional Water Establishments (RWE), but this Law did not clarify the respective roles of RWEs and Municipalities and the coordination between them. An opinion (2004/40) from the Ministry of Justice confirmed that the RWEs are responsible for water supply and wastewater management.
Law 241	2000	Amends Law 221 by reorganizing the water boards into four regional water authorities.
Decision 8/1	2001	Updates/replaces Decision 52/1 by developing National Standards for Environmental Quality (NSEQ). Provides characteristics and standards related to air pollutants and liquid waste emitted from classified establishment and wastewater treatment plants.
Law 337	2001	Amendment of Law 221. Changed the Ministry of Hydraulic and Electric Resources (MHER) into the Ministry of Energy and Water (MoEW) and named the regional water authorities as Water and Wastewater Establishments located in Beirut, Bekaa, North Lebanon and South Lebanon.
Decree 8018	2002	Determination of the permitting essentials, procedures and conditions to establish and exploit factories or industrial institutions and enterprises. Article 20, Class I and II industries have to be 1000m away from springs.
Decree 8122	2002	Specifications for application of Law 221.
Law 444	2002	Law of the protection of the environment, sets the framework for environmental protection in Lebanon.
Decree No. 14596	2005	Internal organization of Beirut and Mount Lebanon Water Establishment (EBML).
Decree No. 14600	2005	Internal organization of South Lebanon Water Establishment (SLWE).
Decree No. 14602	2005	Internal organization of Bekaa Water Establishment (BWE).
Decree No. 14602	2005	Internal organization of North Lebanon Water Establishment (NLWE).
Decree 2366	2009	The Council of Ministries approved the National Physical Master Plan for the Lebanese Territory (NPMPLT) which describes the physical realities affecting land use, future challenges, alternative configurations for land use and development, land use principles and sectorial action plans.
Decision 2	2012	National Water Sector Strategy prepared by the MoEW in 2010 and enacted by the Lebanese CoM in 2012. This strategy presents a detailed road map for improving water conditions and service delivery in the country.
Law No. 251	2014	Establishing the Public Environmental Prosecutor.
Draft Water Code	Not yet issued	Draft Water Code prepared by the MoEW and still under review by the CoM. Modeled on the French code, it defines: the water sector actors, the establishment of a National Water Sector where all the actors will be represented and the incorporation of all the laws and statutes governing the water sector.

4.7.5. Mandated Roles and Responsibility of Governmental Stakeholders

Table 19. Mandated Roles and Responsibilities of the Different Governmental Stakeholders in the Water Sector, Source: The Way Forward to Safeguard Water in Lebanon, 2016

Topic	Description of Responsibilities	MOEW	WE	MOA	MOA	MOPH	MOIM	LRA	CDR	MOI
Policy Making	- Definition of the sector policy, institutional roles and structures - Enactment of legislation and regulation - Development of investment and subsidy policy	•								
Planning and Implementation	- Establishment of long-term consolidated planning for water, irrigation and waste water - Evaluation of infrastructure and investment requirement - Water rationalization - Design, construction and operation of major water infrastructures - Funding and execution of investment programmes	•	•	•		•		•	•	
Conservation and Resource Management	- Allocation of resources across regions, e.g., water reuse - Identification and promotion of water conservation campaigns	•		•	•			•		
Regulation and Enforcement	- Issuance of regulations - Enforcement of regulations and standards for cost recovery, service quality, water quality, and consumer relation	•				•	•			•
Operation and Distribution	- Billing and collection of tariffs - Maintenance and renewal of infrastructure		•					•		
Waste Water Treatment	Operate, maintain and renew sanitation infrastructure		•							
Control & Monitoring	- Management of all information including data collection, analysis and reporting - Implementation of service quality and contingency planning	•								

(MoEW) Ministry of Energy and Water, (WE) Water Establishments, (MoA) Ministry of Agriculture, (MoE) Ministry of Environment, (MoPH) Ministry of Public Health, (MoIM) Ministry of Interior and Municipalities, (LRA) Litani River Authority, (CDR) Council for Development and Reconstruction, (MOI) Ministry of Industry

4.7.6. Legislative Gap

As identified by The Way Forward to Safeguard Water in Lebanon (2016) and the above analysis, there is a clearly-fragmented legislative gap with weak enforcement. Lebanon has a good baseline of laws and regulations related to the water sector, but they are poorly implemented and enforced. This results from the existing overlap of roles and responsibilities between and within institutions. The contributing factors to this are:

- Lack of operational decrees for existing laws and long processes or delays in ratification of laws.
- Weak legal prosecution and absence of a single entity that is responsible for the enforcement and follow-up of violations.
- Absence of accountability mechanisms and the presence of corruption within the monitoring agencies.

- Political deadlock.
- Deficit in human and financial resources in institutions related to the water sector, mainly primary stakeholders.
- Poor coordination between relevant ministries.

4.7.7. Recommendations for Reform and Enforcement

The issuance of the stated operational decrees referred to in Law 221/2002 Article 9, could be considered a first step towards legislative reform. These decrees would expand each institution's roles and responsibilities in relation to planning and implementation of water resources policies.

The adoption of a basin management approach, which will be a form of decentralized resource management.

The creation of a national water board that includes all involved executive and legislative governmental bodies. Most importantly, this board shall overlook activities in relation to water resource and sector management and shall be interconnected and represented within the anti-corruption committee.

Activation of existing mechanisms and institutions which promote and regulate accountability and transparency in the public sector is urgently needed. Based on Article 19 of law 4517/1972, public institutions are under the obligation of submitting annual reports of their work (performance, financial audits and progress reports).

4.8. The Lebanon Case – Food – Agriculture Sector

4.8.1. General Overview of the Food - Agriculture Sector - Lebanon



Lebanon's location, topography and natural endowments enabled the existence of a diversified agriculture sector (CDR, 2005). Areas under cultivation are mainly concentrated in Bekaa and Northern Lebanon (42.1% and 27.2%, respectively), with Southern Lebanon accounting for 12.6% and Nabatieh and Mount Lebanon at around 9% each, rounding off the list (Ministry of Agriculture, 2013). Approximately half of the 270,000 hectares that are cultivated in Lebanon are irrigated (MoA, 2013). Land dedicated to agriculture has been declining over the past twenty years, to below 11% in 2011 (World Bank, 2013). Overall, the agriculture sector (including livestock) is responsible for almost 5% of Lebanon's GDP. Lebanon's climate is typical of the Mediterranean region with four distinct seasons that encompass a rainy period followed by a dry period. According to the PRECIS model, temperatures by 2040 will increase from around 1°C on the coast to 2°C in the mainland, and by 2090 they will be 3.5°C to 5°C higher, respectively. Rainfall is also projected to decrease by 10% by 2040 and by 25-45% by the year 2090, compared to the present. This combination of significantly less wet and substantially warmer conditions will result in an extended hot and dry climate (MoE, 2011).

Agriculture is one of the most vulnerable economic sectors to climate change as it is directly affected by changes in temperature and rainfall. Limited availability of water and land resources in Lebanon, together with increasing urbanization, adds challenges for its future development. In general, the direct effects of climate on agriculture are mainly related to lower crop yields or failure owing to drought, frost, hail, severe storms and floods; loss of livestock in harsh winter conditions and frosts; and other losses owing to short-term extreme weather events.

Agriculture in Lebanon is the highest consumer of available freshwater, consuming nearly 60%, while the remaining 40% is distributed amongst domestic use (29%) and the industrial sector (11%) (MoE/UNDP/ ECODIT, 2011). The energy sector is able to meet 77% of the total demand while the remaining 23% is provided by private generators at the local level. Only 4.5% of energy in Lebanon is generated by hydropower plants while 95% is generated by thermal plants (Ministry of Energy and Water, 2010a). Lebanon is a net food importing country where 20% of the total demand for food is produced locally and the rest is imported. Nearly 44% of processed food, 30% of livestock and 16% of crops are imported (MOA, 2009). The animal production sector is considered the mainstay of the Southern, Northern and Beqaa rural economy and has a key impact on household well-being and poverty alleviation due to:

- The generation of cash income by sales of live animals and animal products.
- Livestock being one of the main users of manpower in rural areas as there are a few opportunities for industrial employment in these areas.
- Most of the low income rural families in rural Lebanon relying on livestock for food security, nutrition and economic status.

The agricultural sector faces institutional, policy, technological and financial resource constraints, resulting in the sector's low performance. The convergence of all these constraints results in:

- Small and fragmented land holdings (70 percent of the total farm holders have an area of less than one hectare and cultivate less than 20 percent of their total cropping area); farmers' low income as a result of low productivity; inequality in ownership and access to productive assets; rural poverty; increased vulnerability of rural women; and decreasing food security.
- Lack of farmers' access to infrastructure (irrigation networks, agricultural roads, marketing outlets for agricultural and agro-processed products).
- Widespread use of foreign labour.
- Rural-urban migration.
- Insufficient knowledge of modern techniques and environmentally-friendly practices.
- Excessive use of pesticides.
- High cost of production resulting from high costs of inputs, labour and energy.
- Degradation of natural resources.
- Low competitiveness of agricultural products coupled with an increase in the agricultural trade deficit.

A rapid analysis of the strengths, weaknesses, opportunities and threats to Lebanon's agriculture sector shows that (Lebanon Agriculture Public Expenditure Review Note, World Bank, 2009):

Strengths include adequate arable land; a Mediterranean climate suitable for early season fruit and vegetable production; an entrepreneurial local population and Lebanese diaspora; and a strategic location between Europe and the Gulf states. It also has sufficient water resources to position its high-value fresh and processed horticultural crops for domestic consumption and export. These markets are attractive because they offer stable profit margins and strong growth potential.

Weaknesses include poor food quality and safety standards; a high cost structure compared with other neighbouring countries; institutional fragmentation and poor coordination that create bottlenecks; a weak marketing infrastructure and poor logistics, particularly in timeliness of delivery; water scarcity as a production constraint and a lack of adequate investments in irrigation infrastructure.

Opportunities include the production of high-end products such as organic fresh fruit and vegetables that offer higher premiums than conventional products and more stable returns than low-end ones; a potential realignment of public investment in research and development and food quality and safety; niche markets where the Lebanese diaspora is located; a low penetration rate of Middle Eastern countries' fresh fruit and vegetable exports to European markets where Lebanon could have less competition.

Threats include strong competition from Egypt, Syria and Turkey in major export markets and Jordan as an emerging competitor; climate change; a projected increase in key input prices, such as fertilizers and petroleum.

4.8.2. Government Planning and Initiatives for Agriculture

The MoA is the institution responsible for setting the agricultural strategic framework, as well as formulating and implementing policies and programmes for the development of the agriculture sector. The MoA is also responsible for developing a suitable legal and regulatory framework and enhancing infrastructure development to promote investment and improve agricultural production and marketing. MoA also plays an important role in the management of natural resources of the country (agricultural land, irrigation water, forests, fisheries, pasturelands) and contributes to rural development.

Recent initiatives by the Government of Lebanon (GoL) to strengthen agriculture have included the development of the 2004 Agriculture Strategy, which was prepared with FAO and the World Bank, and the 2006 Agricultural Strategy Implementation programme. However, the strategy and the programme could not be implemented, as priorities shifted toward the relief and rehabilitation efforts of the sector which was severely affected by the July 2006 war. The past two years have been marked by further major developments in support of agricultural and rural development. In January 2010, the MOA issued an updated Strategic Plan 2010–2014 and, with assistance from the International Fund for Agricultural Development (IFAD), will revise the implementation plan to reflect the new Strategic Plan.

The Strategic Plan 2010–2014 revolves around eight pillars which set forth interventions at the central and local levels, using a combination of programmes, projects and policy measures aimed at containing the cost of production and improving quality of Lebanese agricultural products. These pillars are as follows:

- Updating the regulatory/policy framework.
- Developing MOA's new organizational chart and improving coordination with the public, private and civil society sectors.
- Upgrading the agriculture infrastructure.
- Re-activating extension services.
- Enforcing control over all agricultural products and inputs.

- Developing value chains that focus on better quality, production, marketing and export of agricultural products.
- Establishing a credit scheme for SMEs.
- Managing natural resources (water, forests ...).

In early 2011, the Government launched its cross-sectoral National Social Development Strategy formulated with the contribution of several line ministries. The Strategy aims to achieve an integrated development through better and more equitable provision of social services and an expansion of socio-economic activities.

A National Ten-Year Strategy for Women's Affairs in Lebanon (2011-2021) was formulated in 2011 and a National Action Plan is currently being developed. The Strategy identifies twelve objectives including: combating poverty among women and giving special attention to the eradication of poverty in general; promoting the participation of women in the economic sector; enhancing the contribution of women to environmental protection; strengthening the capacity of institutions concerned with women's issues at the national level; reinforcing the partnership between The National Commission for Lebanese Women and public-sector departments, institutions, and civil-society organizations; and introducing gender mainstreaming in all fields.

The MoA has embarked on updating the sector's legal and regulatory framework and reinforcing control on agricultural products. In 2010, the MoA created 30 national technical committees. These committees later led to the development of a platform where all actors (public, private, civil society) can interact as well as exchange information and experience.

Main challenges facing the implementation of the MoA strategy include the mobilization of adequate financial resources and development of the strategy's implementation and technical capacities. This could be achieved by exploring innovative approaches to building stronger partnerships with donors, NGOs and other economic actors.

4.8.3. Agricultural and Food Policies

4.8.3.1. Objectives of Agricultural Food Policy

Lebanese agriculture is being overhauled through the various agreements Lebanon has entered into with organizations or states (i.e. FAO, the EU, etc.). Thus, the Ministry of Agriculture is carrying out a revision of all agricultural policies and strategies. The strategy of doing so was actually the outcome of the work done by FAO, the EU and the French cooperation protocol. The French Government, seeing the fundamental difficulties that the Lebanese Government was encountering after the Taif Agreement, generously offered technical assistance in various matters. This input from the French Government was included in a comprehensive agreement known as the French Protocol. The FAO project was focused on a useful agricultural census, the EU project on agriculture policy and planning and the French assistance with professional organizations in fruits, vegetables and vine production. Surprisingly, public expenditures on the agricultural sector have been low, which indicates the absence of agricultural policies.

The current food policy objectives of the Lebanese Government are focused on securing a steady stream of reasonably-priced produce for the Lebanese consumer and supporting local producers with their production and marketing efforts. The policy was also created to facilitate the smooth transition to the new state of agriculture as envisioned by the agreements entered into with the EU and other international relevant entities.

4.8.3.2. Formulation of Agricultural and Food Policy

The government considered undertaking structural reforms that further liberalize the economy by modernizing existing laws, minimizing restrictions and simplifying procedures, which will promote private investment, enhance public services, improve productivity, facilitate the process of privatization and render the economy more competitive.

Several measures were taken to modernize the laws and enhance the legal framework. The measures most relevant to agriculture are:

- A new, WTO-compatible Customs Law was enacted in June 2001 which, among other things, simplifies procedures and introduces modern information technology for customs declarations and international standards for clearance.
- Imports of oil were liberalized in 2001 and this is somewhat of a positive respite from the upward-spiralling cost of oil.
- Licensing requirements for trade are being streamlined to allow exports and imports to flow without hindrance.

4.8.3.3. Agricultural Policy Instruments Being Used

Policy instruments in Lebanese agriculture have been supportive through direct payments, price guarantees and subsidies. The problem has been that there was no comprehensive approach to agriculture. Important matters, like the organization of marketing activities in the form of associations and boards, never really received the attention they deserved. The ongoing implementation of agreements in the sector with the EU and GAFTA is forcing such issues to the forefront. As a result, the exports of Lebanese agricultural goods are increasing.

Subsidized loans have long been a favourite instrument of the Government. These are used to promote the activities of farmers and form professional organizations focused on fresh fruits, vegetables and vine production. Another agricultural policy instrument of the Lebanese Government is the more traditional one of supporting subsidies of specific agricultural products. Wheat and tobacco are classic products that have enjoyed this preferential treatment for years in Lebanon. Olive oil has also received this treatment, while fresh produce has not. The Higher Commission for Relief, a body that is under the authority of the Council of Ministers, is authorised to provide special relief and development support.

4.8.4. Institutions Involved in Agricultural Policies and Legal Framework

Direct Line Ministries and related agencies	• Ministry of Agriculture • Green Plan
Councils	• Higher Council of Urban Planning • National Council for Quarries • Higher Council for Hunting
Centres	• National Agricultural Research Centre • Industrial Research Institute • Lebanese Agricultural Research Institute
Indirect Ministries	• Ministry of Finance • Ministry of Social Affairs • Ministry of Public Health • Ministry of Interior and Municipalities

4.8.4.1. Ministry of Agriculture

Since 2010, the MoA has released two strategies; the first was for the years 2010-2014 and the second was for the years 2015-2019. The first strategy paper tackled the MoA's problems, including legal issues structural improvements within the ministry, enhanced relations with other governmental and non-governmental institutions and organizations and renovations and infrastructure planning to reduce trade-offs across sectors. This first strategy also addressed the monitoring of agriculture practices, raising the standards of product quality, encouraging small and medium enterprises through micro finance loans and protecting the natural resources (soil, forests, biodiversity and land management) within its scope (MoA, 2009).

As for the second strategy, it has been finalized and is awaiting approval from the CoM. Like the first strategy, this one has eight pillars, but they are more elaborate and detailed. Some of these pillars were carried over from the previous strategy, such as improved food quality and the protection of the natural resources. This strategy, however, includes the concept of good governance, the development of the ministerial capacities and the improved funding. Newly introduced pillars include the improvement of product competitiveness, strengthening of the research and extension systems and, most importantly, the plan to respond to climate change impacts (MoA, 2015).

4.9. The Lebanon Case – Climate Change Relate to Water, Energy and Food (WEF)

4.9.1. General Overview



Lebanon is a developing country with scarce water resources and high population density in the coastal areas. Lebanon is already facing and will continue to face several challenges as a result of climate change (Second National Communication, SNC, 2011). According to the climate models, temperatures are expected to increase by around 1°C on the coast and 2°C in the mainland by 2040, and by 2090, they will be 3.5°C and 5°C higher, respectively. At the same time, rainfall is projected to decrease by 10-20% by 2040 and 25-45% by the year 2090. This will lead to substantial detrimental effects in a number of areas. Lebanon has a diverse natural environment, including coastal, agricultural, forest and mountainous areas; many of these areas have unique biodiversity and ecosystems that are sensitive to climate change.

4.9.2. Climate Change Adaptation Related to Water, Energy and Food (WEF)

Lebanon's electricity infrastructure needs to cope with increased demand for cooling.

Temperature increases are expected to cause approximately 2,400-5,200 additional deaths annually by 2030; the public health sector needs to address this issue (SNC, 2011).

Tourism needs to adjust to rising sea levels, warmer temperatures and shrinking snow cover in the mountains resulting from an increase in temperature. Lebanon's arid / semi-arid climate makes it poor in terms of water resource availability and vulnerable to the impacts of climate change. The projected changes in rainfall will put tremendous pressure on national water security and create other negative effects in sectors such as agriculture, where around 70% of the available water is used for irrigation.

Given the projected decrease in precipitation, there is an immediate need to increase water resources by designing and commissioning dams and hill lakes as well as artificially re-charging the groundwater. In addition, there is a need to optimize the use of current water resources through the rehabilitation of the existing network and the installation of water meters. Lebanon is already undertaking major initiatives to ensure the availability of affordable water for domestic, industrial and agricultural use, in line with the National Water Sector Strategy (2012). However, more technical, financial and capacity building support and technology transfer is needed to optimize water storage,

water use efficiency, irrigation systems and the reuse of wastewater. To reduce these adverse impacts on environmental, economic and social systems, Lebanon will promote climate change adaptation by mainstreaming and building institutional capacity.

The National Sustainable Development Strategy, which is currently being prepared in cooperation with the Council of Ministers, clearly highlights the importance of adaptation and points out necessary action in nearly all of its sectoral chapters. The objective is to provide security and well-being for the Lebanese people while increasing the resilience to climate change. Yet climate change is one of Lebanon's many national development challenges. Other such challenges include population growth, rapid urbanization and geopolitical location. Addressing these issues should be pursued simultaneously to avoid working in silos; this is possible by collaborating with multiple government ministries and agencies, the private sector and other relevant stakeholders.

Lebanon has already made progress in mainstreaming climate change adaptation into the biodiversity (National Biodiversity Strategy and Action Plan draft, NBSAP, 2015), water (National Water Sector Strategy, 2012), forestry (National Forest Plan, NFP, 2015) and agriculture (Ministry of Agriculture Strategy, 2015) sectors.

The key actions included in these strategies are listed in Table 20 below. The actions reflect Lebanon's priorities given the current understanding of expected climate impacts. Sectoral strategies will be assessed regularly as part of the national development process and/or when new information about climate change and impacts become available.

Furthermore, Lebanon aims to reach land degradation neutrality by 2030, in line with the recommendations in the UNCCD framework. This has recently been agreed to by the Committee on Land Degradation and Desertification, led by the Ministry of Agriculture. Detailed adaptation measures to suit this aim are yet to be developed. Lebanon also continues promoting climate change adaptation in other vulnerable sectors by seeking to mainstream climate change adaptation into electricity infrastructure, tourism, human settlements and infrastructure and public health sectors.

The Climate Change Coordination Committee will continue to examine sectoral vulnerabilities, assess priorities and design/guide actions in cooperation with concerned ministries to increase resilience and minimize the impacts of adverse climate change. The work will build on the sectoral vulnerability assessments completed for the Third National Communication as well as on other relevant studies.

Table 20. Key Adaptation Measures in the Biodiversity, Forestry, Agriculture and Water Sectors

Sector	Examples of adaptation measures
Biodiversity	Overarching objective: By 2030, adaptation plans for ecosystems vulnerable to climate change have been developed and implemented. This will be achieved by: • Conducting needs assessment and defining pilot national monitoring sites and species. Coastal zones are considered a priority. • Designing and implementing pilot action plans.
Forestry and Agriculture	Overarching objective: Towards sustainably managed forest resources, safeguarded ecological integrity and economic and social development for the benefit of present and future generations. This will be achieved through the implementation of the National Forest Programme, which includes: • Raising tree nurseries' productivity. • Planting of trees. • Implementing the forest fire fighting strategy. • Rehabilitating irrigation canals. • Promoting Good Agricultural Practices through the support of organic farming and obtaining quality certificates. • Applying forest integrated pest management. • Developing an early warning system for agricultural pests and climatic conditions.
Water	Overarching objective: Increase water availability and improve water usage to decrease the sector's vulnerability to climate change impacts by: • Improving water security by increasing artificial recharge of groundwater aquifers and increasing surface storage dams and hill lakes. • Optimizing the use of the current water resources through the rehabilitation of the existing network and the installation of water meters. • Increasing wastewater collection and treatment. • Increasing water reuse, especially after wastewater treatment. • Improving water efficiency and decreasing water loss from irrigation.

4.10. The Lebanon Case – Sustainable Development Related to Water, Energy and Food (WEF) and Climate Change

4.10.1. General Overview



This analysis is based on the “National Report to the United Nations Conference on Sustainable Development (RIO+20) - Sustainable Development in Lebanon: Status and Vision, 2012”

The path to sustainable development in Lebanon since 1992 has been fraught with difficulties and challenges, both external and internal. Externally, several wars have eroded national resources and Lebanon's ability to plan for and manage sustainable development challenges. Three devastating wars with Israel (1996, 1999 and 2006) displaced thousands of people and also destroyed homes and primary infrastructure on a large scale. Lasting 35 days, the war in 2006 also caused the worst environmental oil spill in Lebanon's history causing \$200 million in oil-related damages. These events altered national priorities and often delayed sustainable development initiatives by siphoning away government (and donor) resources for emergency response and reconstruction efforts. Wars and related damages have also aggravated poverty issues and delayed social reform programmes.

Lebanon's path towards sustainable development was also derailed by regional factors. In particular, the global financial crisis, partly brought about by a failing real estate model, affected the Lebanese economy and distorted its real estate market. Whereas real estate crashed in the region, the Lebanese real estate market experienced unprecedented growth and kick-started a construction frenzy. Soaring real estate prices are impacting economic sectors and have severely limited the ability of the Lebanese people, particularly youth and newlyweds, to buy or even rent a home.

Civil society organizations contend that the government's piecemeal approach to development, usually focused on individual economic sectors separately (tourism, agriculture, industry, etc.) and/or basic services (health, education, transport), is counter-productive and cannot achieve sustainable development goals. Rather, Lebanon should approach development by looking at all sectors in a holistic and comprehensive manner, by understanding societal aspirations and by strengthening national identity. For example, instead of focusing exclusively on free trade agreements (bilateral, regional and multilateral), including WTO accession (in progress since 1998), the GoL should articulate a national strategy for developing productive sectors (including agriculture) and services. Rather than spending time and resources supporting a specific subsector in agriculture (e.g., tobacco, dairy), the GoL should set out a comprehensive framework for revamping the agricultural sector and mobilize the necessary resources to implement it through inter-ministerial coordination.

4.10.2. Gender

Maternal health has improved since 1993 with a decrease in maternal mortality from 140/100,000 live births in 1993 to 23/100,000 live births in 2009 (UNDP, 2010). Women represent almost half of the Lebanese population but only 21% are economically active, mostly working in services, finance and insurance (CAS, 2009). Regional disparities prevail with regards to women's participation in the labour force; Beirut has the highest woman labour force while Bekaa has the lowest (CAS, 2009). Traditionally, the role of women in the Arab World, including Lebanon, has been restricted to motherhood and being homemakers. The participation of women in leadership positions and political life in Lebanon has been very limited. For example, women represent less than 4% of the parliament's 128 seats.

The Council of Ministers (COM) does not fare better. Two women were appointed ministers for the first time in 2004 but the current cabinet is exclusively made up of men. The need to introduce a quota system for women in the new electoral law is urgently needed to increase women's participation in the political life. Although Lebanese women enjoy a better status than other Arab women, several issues hinder their progress in the Lebanese society. For example, Lebanese women who are married to foreigners cannot pass their citizenship to their children.

Gender is respected in the Lebanese Constitution and in many national policies. However, the need to articulate a national vision on how to improve the status of women in all aspects of society and to mainstream gender issues (as declared in Lebanon's 1926 Constitution) in social development is urgent. Gender mainstreaming positions women and men at the heart of policy-making. It can also improve governance based on diversity and equity. An immediate step in this direction is to combat gender-based violence. In 1995, the GoL established the National Commission for Lebanese Women (NCLW) as the official national mechanism responsible for realizing women's advancement and gender equality in Lebanon. The commission developed a 10-Year National Strategy for Women and is currently being reviewed by the COM.

In 1996, Lebanon acceded to and ratified the United Nations Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) but has yet to sign the Optional Protocol which allows individual women, or groups of women, to submit claims of violations of rights protected under the Convention to the Committee (the body that monitors States parties' compliance with the Convention). A Women's Affairs Division at the Ministry of Social Affairs was established to monitor the implementation of the said UN Convention (and other Conventions) and formulate programmes which respond to the needs of women by improving and strengthening their capacities; the Department proposes budgets to implement these programmes.

Local and regional NGOs are also promoting women's participation in public life and implementing awareness campaigns to counter stereotypical attitudes in the country. Recently, one of Lebanon's commercial banks launched the "WE" initiative to empower women to become social and economic entrepreneurs in the workplace and wider community and to facilitate their entry in the Global Banking Alliance for Women.

4.10.3. Water

Two-thirds of Lebanon's surface area is covered with Karstic formations characterized by springs, caves and sinkholes. They make up a unique hydrogeological system resulting in aquifers that are highly productive but extremely vulnerable to water contamination. Lebanon's water sector faces great challenges including unsustainable water management practices, population growth, urbanization and pollution. The long-term effects of climate change (potentially reduced precipitation and water availability) cannot be understated. Water demand in the country varies depending on source. Assumptions range from 1,473 to 1,530 million m³ per year (WB, 2009 & MOEW, 2010, respectively). Available water, defined as "present renewable resources per capita," is just over 1,100m³/capita/year, dangerously near the international benchmark of 1,000m³/capita/year. Falling below this benchmark would indicate water resource stress (WB, 2009). The GoL is fully aware that meeting the country's water demand over the medium- and long-term poses a significant challenge to its work.

Although Lebanon is blessed with a favourable water regime - the country has the highest average annual rainfall of any country in the Middle East: 661 mm/year (FAO, 2012) - water supply is a serious problem almost everywhere in the country. It should be noted that Lebanon does not have the capacity to measure the volume of snow cover with any degree of confidence, but some institutions are conducting research related to snow cover and snowline. Total available water in Lebanon, including rivers and springs, storage dams and groundwater is estimated at 2,000-2,700 million m³ per year. This exceeds projected water demand of about 1,800 million m³ in 2035, but widespread pollution and substandard water infrastructure are restricting the Government's ability to meet water demand in the future. Irrigation is the largest water consumer in the country (61%) with low efficiency as open channels still constitute the majority of the networks (MOEW, 2010). Little is known about the quantity of water used by the industrial sector in Lebanon, but sources estimate that the industrial water demand ranges between 150 and 163 Mm³ per year, equivalent to around 11% of the total annual water demand (MOEW, 2010).

Wastewater generation from households (estimated at 249 Mm³/year, WB, 2011a) and industries (60 Mm³, MOEW, 2010) is affecting the quality of groundwater resources almost everywhere in Lebanon. Contamination occurs from raw sewage overflow, septic tanks and leaking sewer lines. Also, according to CAS, only 52% of buildings in 2004 were connected to sewage networks with significantly low treatment levels (4%). This means that at least 48% rely on septic tanks; most septic tanks are permeable or deliberately drained to prevent overflow. Nationwide, the highest rate of sewage connection was recorded in Beirut (96%), and the lowest was recorded in Batroun-North Lebanon (1%), followed by Bent Jbeyl-South Lebanon (4%). In the absence of industrial wastewater treatment plants, most industrial wastewater is discharged into the environment with little or no prior treatment, either directly into rivers and streams or through municipal wastewater networks.

Many river systems receive raw sewage resulting in dangerously high biological loads. The Litani River is probably the most publicized case of river pollution. Since 2000, the Ministries of Interior and Municipalities, Energy and Water and Environment as well as the Council for Development and Reconstruction have invested millions of dollars in solid waste management, wastewater treatment and land use management (agriculture) in and around the Litani river and watershed to prevent and reduce pollution of the Qaroun Lake (the river estuary). Unfortunately, severe pollution problems persist today. In 2011, a business plan for combating pollution of the Qaroun Lake was prepared by MOE-UNDP. The \$150 million business plan was presented to the Parliamentarian Committee for the Environment and discussions are underway to find sources of finance.

In 1999, to protect and increase water resources (Principle 18 of Agenda 21), the Ministry of Energy and Water (MOEW) developed a 10-Year Plan to build 17 dams and lakes across the country, which would capture approximately 650 Mm³ of water per year (Comair, 2010). Dams and lakes envisioned under the Plan were mainly for drinking water and to a lesser extent irrigation. The 10-Year Plan was slated to be substantially completed by 2010. To date, only the Chabrouh Dam in the upper Kesrouan area (Mount Lebanon) was completed at the cost of approximately \$65 million for a 9 million m³ capacity. Despite technical challenges, budget overruns, construction delays and now growing evidence of leaks (which even if unplanned help replenish aquifers), the dam represents a much-needed water reservoir for the upper Kesrouan region and should serve as a case study for future dam projects in the country. Very little progress has been made towards building the remaining 16 dams. However, in 2010, the MOEW developed a National Water Sector Strategy to revamp the water sector in the country (described in Section VI under aspirations in the water sector).

4.10.3.1. Water – Balancing Supply and Demand

In 2010, the MOEW developed a National Water Sector Strategy (NWSS). The strategy, approved two years later by the COM (March 9, 2012), provides a general overview of the water sector and the legal and institutional framework, presents projections of how planned resource augmentation will meet future demand (1,800 million m³ in 2035) and identifies US\$ 7.7 billion worth of capital investment for reshaping the water sector (infrastructure and management). This strategy aims to significantly improve water supply, irrigation and sanitation services over the Lebanese territory with a commitment to environmental, economic and social responsibility. Specifically, the national strategy has articulated seven objectives:

- Maximizing the potential and improving the quality of surface water resources.
- Improving the management and protection of groundwater resources (construction of wastewater networks and treatment plants; 26 WWTP by 2020).
- Fulfilling deficits through groundwater (artificial recharge of up to 200 million m³ in 2020) and/or surface water (construction of remaining dams, surface storage up to 650 million m³ by 2020).
- Ensuring proper and continuous access to high quality water supply (reduce extraction from private wells and increase extraction from public wells; upgrade and/or extend water networks).
- Providing adequate quantities and quality of water for irrigation (reuse of treated wastewater: up to 101 million m³ by 2020; implementation of water-saving irrigation techniques).
- Increasing coverage of wastewater collection networks and treatment capacities.
- Optimizing current wastewater treatment processes and sludge disposal.

Strategy implementation requires (1) improved coordination between Regional Water and Wastewater Establishment, the MOEW and other government agencies (CDR, MOE, etc.), (2) the application of a new water tariff regime, (3) the promotion of private sector participation in O&M activities, (4) enhancement and modernization of the legal framework and (5) the implementation of sustained awareness and conservation campaigns.

Although the National Water Sector Strategy was only just recently approved and projects to augment water resources are proceeding slowly, a significant number of municipal sewage plants and systems will become operational in the next five years. In total, the GoL built seven wastewater treatment plants (Tripoli, Chekka, Batroun, Jbail, Nabi Younes, West Bekaa and Nabatieh), but these have yet to go online pending the completion of the corresponding networks and/or service contracts.

Industrial wastewater treatment plants are still missing in the country and industrial wastewater is discharged into the environment with little (small-scale treatment plant within the industry) or no prior treatment, either directly into rivers and streams or through wastewater networks. To reduce industrial pollution, the MOE and the CDR, with a grant from GIZ/EFL, prepared a Policy Paper on Industrial Wastewater Compliance and Management. The Policy Paper provides a complete analysis of the legal framework impacting industrial wastewater treatment and disposal in Lebanon and formulates policy recommendations to improve and enforce effluent discharge standards. This paper will guide the design of the Lebanon Pollution Abatement Project (LEPAP).

4.10.4. Energy – Improving Energy Sustainability

Lebanon is a net energy importer (97% of its energy needs is imported) and has been hit hard by the global energy crisis. Poor energy planning since the end of the Civil War has had a compounding effect on Lebanon's energy sector. So far, Lebanon has been relying heavily on High Emission Factor Fuels (HEFF) or "dirty" fuels such as light (mainly Gasoil and Diesel) and heavy fuel oil in its primary energy mix. Although Lebanon is a signatory to the UNFCCC, this poses no requirements for decreasing national GHG emissions. The GoL has submitted national inventories of GHGs for baseline years 1994 and 2004; these reports quantify the carbon footprint of various economic activities, assess Lebanon's vulnerability to Climate Change and propose adaptation and mitigation strategies to reduce GHG emissions. Surprisingly, the building sector is the largest energy consumer, followed by the transport sector. The following sections describe Lebanon's aspirations and current planning to alleviate energy poverty in the country.

In 2010, the Ministry of Energy and Water developed the much-anticipated Policy Paper for the Electricity Sector which seeks to redress the country's ailing electricity sector by 2015. The policy paper includes 10 strategic initiatives to improve sector performance, improve supply/demand (fuel sourcing and renewable energy, including wind, biomass, solar, hydro, etc.) and revamp the legal and institutional framework for energy production. The paper proposes a battery of short-, medium- and long-term measures to remedy the sector's problems, starting with increased power generation to cover the existing gap (e.g., leasing electricity-generating ships, rehabilitation of existing power plants and construction of new power plants). The policy paper envisions that Lebanon's power generation capacity will reach 4,000 MW in 2014 and 5,000 MW after 2015.

The Policy Paper also aims to switch the energy mix from polluting fuels to Liquefied Natural Gas (LNG), increase electricity generation efficiency and promote renewable and alternative energy sources. To implement the switch, Lebanon would need to build an off-shore LNG terminal at Selaata or Zahrani and connect all the power stations in the country with a land (or subsea) pipeline extending from Beddawi (North Lebanon) to Sour (South Lebanon). The pipeline will follow the railway track to limit expropriation costs and would eventually also feed industrial, commercial and residential facilities (city gas). It could in the future also support a Natural Gas Vehicle initiative.

The energy switch would not only make the energy mix in Lebanon more acceptable (cleaner) but also more economical. One year in the making, the Policy Paper was formally approved by the Council of Ministers in June 2011. The Lebanese COM agreed in March 2012 to lease power-generating ships to produce 270 MW for a period of three years and to build 1,500 MW power plants. To ensure environmental sustainability, the policy paper would require a full Strategic Environmental Assessment.

4.10.4.1. Renewable Energy Pledge

The GoL has voluntarily committed itself in Copenhagen (2009) to increase renewable energy shares to 12% of the total electrical energy consumption by 2020. RE will bring significant advantages to the country by improving energy security, energy acceptability and energy independence. The spectrum of available technologies envisaged is quite wide, including wind turbines (WT), photovoltaic (PV), domestic solar water heaters (DSWH) and biomass that includes converting waste to energy and geothermal heat pumps. Already many initiatives are being implemented to favour the penetration of these technologies in the Lebanese market. For example, CEDRO recently completed Lebanon's first Wind Atlas (2011) and Biomass Atlas (2012) in support of the nascent RE market in Lebanon.

Legislation is currently being considered to introduce Feed-in Tariffs (FIT) mechanisms at EDL. Feed-in tariffs imply that consumers will be able to generate power and inject it into the grid at a preferential rate. However, allowing the private sector to invest in the energy sector requires amending Law 462 (dated 02/09/2002). FIT will go a long way towards removing economic barriers to using PV and wind turbines. Without FIT systems, there is little incentive for consumers to produce their own clean electricity from clean energy sources. Another clean electricity production incentive tool is net metering. Piloted in Lebanon in February 2012, net metering allows consumers to inject power that is generated at their premises into the grid. Like FIT, the consumer will be charged the net balance of electric energy supplied and consumed.

4.10.4.2. Energy Efficiency

In February 2012, the COM approved the National Energy Efficiency Action Plan (NEEAP). The plan describes 14 initiatives:

- Banning the import of incandescent lamps to Lebanon.
- Adoption of the energy conservation law and institutionalization of the LCEC.
- Promotion of decentralized PV and wind applications in the residential and commercial sectors.
- SWH for buildings and institutions.
- Design and implementation of a national strategy for efficient and economic public street lighting.
- Electricity generation from wind power.
- Electricity generation from solar energy (PV).
- Hydropower for electricity generation.
- Geothermal, waste-to-energy and other technologies.
- Building codes for Lebanon.
- Financing mechanisms and incentives.
- Awareness and capacity building.
- Paving the way for energy audits and ESCO business.
- Promotion of energy-efficient equipment.

4.10.4.3. Energy Conservation Law

NEEAP implementation requires a framework document. The Draft Energy Conservation Law, which was approved in early 2012 by the COM (but is still awaiting Parliament's approval), would provide the MOEW a framework for mainstreaming EE & RE activities in Lebanon, and would institutionalize the Lebanese Centre for Energy Conservation as the lead energy entity in the country for the management of EE & RE activities. The draft law proposes:

- Conducting obligatory and periodic energy audits.
- Evaluating and assessing energy intensive projects.
- Hiring the services of energy auditors or energy service firms.
- Energy labelling of products, machines, equipment and electrical appliances.
- Energy saving in both the private and public sector.
- Brokering agreements between LCEC and institutions who want to invest in energy conservation.
- Providing tax exemptions for EE & RE equipment.

If implemented, the Energy Conservation Law will create a dynamic market for energy audit firms or energy service companies (ESCO's), improve the energy efficiency of the Lebanese economy, spread technological know-how and introduce best practices in energy efficiency. Lebanon is also applying to become a member of the International Renewable Energy Agency (IRENA).

4.10.4.4. National Energy Strategy (the Missing Capstone)

So far, Lebanon has already declared four initiatives related to the energy sector:

- Electricity Sector Policy Paper.
- 12% Renewable Energy Pledge.
- National Energy Efficiency Action Plan.
- Energy Conservation Law.

4.11. The Tunisia Case – Energy Sector

4.11.1. General Overview of the Energy Sector - Tunisia



Tunisia's primary energy consumption has increased since 1990 in a roughly-linear way with approximately 4,500 ktoe in 1990, 6,700 ktoe in 2000 and 8,300 ktoe in 2010 (without biomass). As shown in Figure 6, the sharpest increase was in the gas sector, which represented 55 % of the primary energy supply in 2012. As a result, the share of oil, including crude oil and petroleum products, has slightly decreased. The share of coal and peat has always been minimal and reached zero in 2012. In 2014, primary energy consumption was about 9,200 ktoe (Tunisia Energy Situation, 2016).

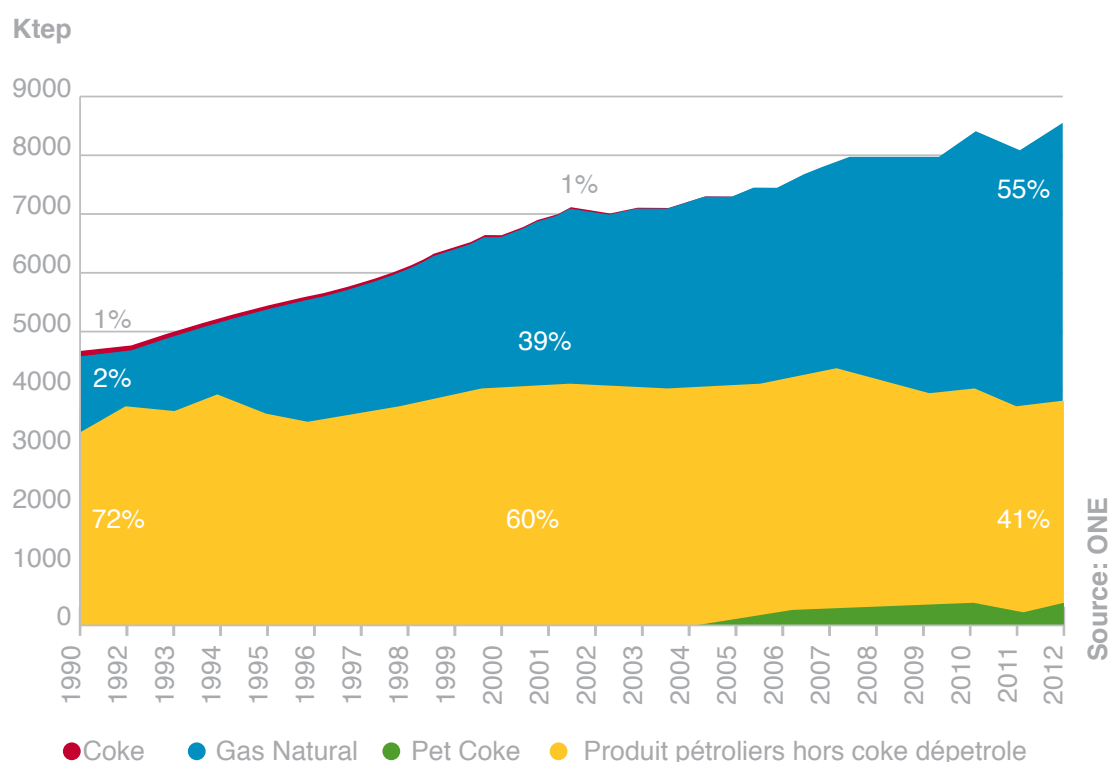


Figure 6. Primary Energy Consumption since 1990. Source: Tunisia Energy Situation, 2016

In 2016, 99% of total energy is used by oil products. Natural Gas covers only 52.2% of the primary energy consumption while 47.3% of consumption is being covered by other oil products. Electricity consumed 75% of the total natural gas consumption in 2016.

Electricity production is 99% dependent on natural gas; this dependence may pose a serious problem in terms of the security of electric production because the domestic production of natural gas has stagnated, or even declined, in recent years. The domestic production of oil products provides 40% of the primary energy consumption compared to 60% coming from imported production. Fifty-six percent of the total consumption of petroleum products is distributed to the transportation sector compared to 44% for industry, building and agriculture. The transportation sector is highly dependent on petroleum products, which represent 99% of its energy consumption. Reliance on fossil-fuel reserves and a lack of political support has meant that, historically, development of renewable energy has not been considered a high priority for Tunisia.

4.11.2. Energy Policy and Legal Framework

4.11.2.1. General Overview

The energy sector is managed by the Ministry of Energy. The Ministry defines the Government's energy policy and monitors the enforcement of legislation related to the energy sector. The Energy General Department (DGE) within this Ministry is in charge of the execution of Tunisia's energy.

In the mid-1980s, Tunisia developed an energy control policy. The implementation of this policy is based on four main instruments: institutional, legislative, financial and fiscal. The National Agency for Energy Control (ANME) is the institutional body in charge of implementing the State's policy in terms of RE promotion and the rational use of energy.

In order to reduce its dependency on Algerian gas, Tunisia needs to diversify its electricity mix and extend its interconnections. A gas interconnection with Italy ("Gazoduc") already exists and is currently being used to transport Algerian gas to Europe. This interconnection may be used for gas imports to Tunisia in the future. An electric interconnection with Italy with a 400-kV submarine cable is currently being considered. It may be used for import and/or export later on; complementary daily and annual production and consumption profiles of North Africa and Europe can create synergies.

In 2016, Tunisia developed an energy strategy which aims to guarantee the security of the country's energy supply while ensuring access to energy at an affordable price for the economy and the Tunisian population. This strategy focuses on four key areas:

- The development of national hydrocarbon resources, especially natural gas.
- The strengthening of the refining, transport and distribution of petroleum products.
- The development of electrical production and strengthening of interconnections, including the construction of the interconnection with the Italy line.
- The transition to strengthened energy efficiency and the development of renewable energy. Tunisia has set objectives to reduce its consumption of primary energy by 30% and to achieve a share of renewable energy in the production of electricity by 30% by the year 2030.

Furthermore, there is a strong need for institutional and budget reforms in the energy sector since the current situation drastically differs from that of 20 years ago. Some things about the sector, such as subsidies, have become a burden, hindering the sector's continued development. In November 2014, the Ministry of Industry, Energy and Mines called for drastic cuts for the year 2015. Subsidies should decrease from €1.3 billion (TND 2.7 billion) to €0.9 billion (TND 1.96 billion) in order to use the saved money in investment projects. In 2014, energy prices were raised by approximately 10% in total in order to reduce subsidies. By June 2014, electricity price subsidies for cement producers were completely phased out.

Forecasts from the ANME expect the consumption to double by 2030 if comprehensive action is not implemented; therefore, energy efficiency should be strengthened. Measures since 2000 have brought results: Tunisia has reduced its energy intensity by 20%.

4.11.2.2. Subsidies

The energy sector is heavily subsidized in Tunisia. Subsidies for natural gas as well as electricity increased sharply in the early 2000s. In 2012, energy subsidies amounted to TND 5,600 million (€ 3,100 million), i.e. 20% of the public budget or 9% of GDP, whereas energy subsidies only represented 3% of GDP in 2005. This rise in subsidies is not sustainable for the state and has several negative impacts on public spending, such as a decreasing budget for public investments. Subsidizing procedures remain non-transparent. The subsidy system is composed of indirect and

direct subsidies. Indirect subsidies are the difference between supply costs of crude oil and gas for the State and the selling prices to the two public operators (STIR for oil and STEG for natural gas). Direct subsidies are subsidies made directly by the State to STIR and STEG in order to offset their deficits.

4.11.3. Renewable Energy Policy

By the 1980s, Tunisia had spearheaded a proactive policy regarding continuous energy management, positioning itself as one of the pioneer countries in the region. In the mid-2000s, Tunisia was engaged in a process of accelerating the energy transition, which was part of a strategic vision toward a Bursar to low carbon. It was based on two main principles:

- A. Improving energy efficiency through a better control of energy demand; the goal for this is to reduce the demand for primary energy by 30% by 2030 compared to the scenario.
- B. Substantial use of renewable energy, for the diversification of the energy mix for electricity production; the target for this is to achieve a 30% share from renewables in electricity generation by 2030.

Since the middle of the 1980s, Tunisia has developed a suitable regulatory framework for the development of RE, which has been constantly enhanced to support the Government's policy in this domain. Decree 2002-3232, dated December 3, 2002 and later modified by Decree 2009-3377, authorizes cogeneration facilities to sell their surplus to STEG and to transmit their production via the national network. Law n. 2015-12, dated May 11, 2015, related to the production of electrical power through RE complements the existing legal framework. It takes on provisions related to self-production and authorizes the creation of specialized companies in the production of power designed for local consumption (STEG) or for exports. (Centre of Mediterranean and International Studies & Konrad Adenauer Stiftung).

Law n. 2005-106, dated December 19, 2005, provides for the creation of the National Fund for Energy Control (FNME). This Fund constitutes the financial instrument supporting RE promotion policies and can be used to provide direct financial incentives granted in the framework of the energy control law and related legal texts. Direct subsidies granted by FNME have been complemented by specific fiscal incentives allocated to the purchase of equipment and products used in RE production: application of minimal customs fees and VAT exemption.

Despite the relatively low levels of current installed RE capacity, it could be argued that Tunisia has, in fact, spent the last 20 years preparing for the current transformation of its energy sector. Since 1985, Tunisia has pursued a "Rational Use of Energy" policy and has sought to establish an appropriate institutional environment conducive to energy conservation and management. Among the MENA countries, Tunisia is acknowledged as a "pioneer" in the initiation of energy efficiency and renewable energy policy.

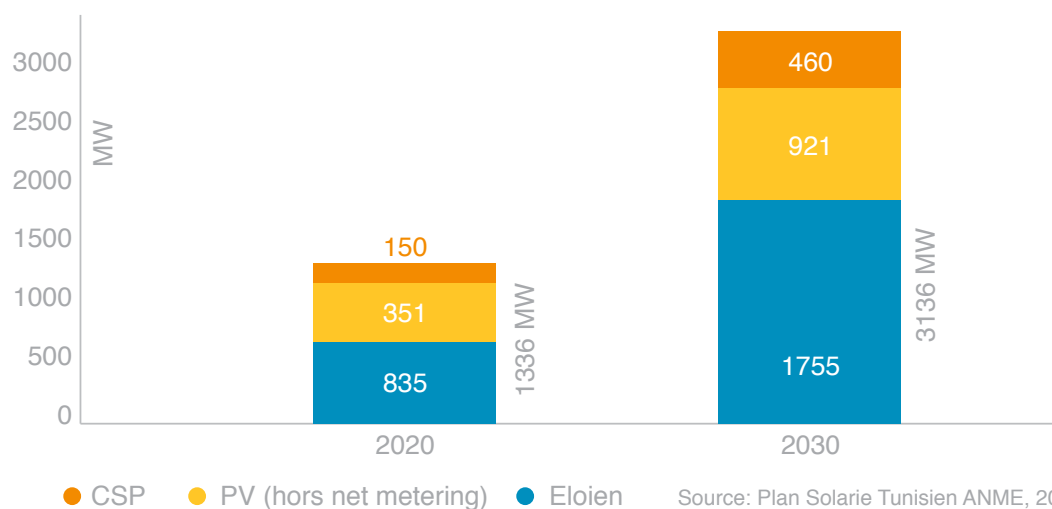


Figure 7. Foreseen RE Installed Capacity in Tunisia in 2020 and 2030, Source: Tunisian Solar Plan, AMNE, 2012

The Tunisian Solar Plan, initiated in 2009, includes a number of projects to implement before the year 2016. It was reviewed in 2012 and in 2015. The Tunisian Solar Plan is a renewable energy development plan elaborated by the ANME but not officially adopted by parliament or government. The Plan foresees a 30% share of renewables in the electricity mix by 2030. This corresponds to an additional total capacity of 3 GW and an overall investment of €4.75 billion. Figure 7 shows Foreseen RE Installed Capacity in Tunisia in 2020 and 2030. The Tunisian Solar Plan was updated in 2014.

A new law on renewable energies was adopted by Parliament in May 2015. The objective of this law is to promote private investment in renewables to contribute to the 30/30 objective of the Tunisian Solar Plan. The Tunisian Government has adopted a Renewable Energy Action Plan with two main objectives:

- Development of large scale projects for the production of electricity from renewable energy sources; the target RE production value is 14% of the national electricity production by 2020.
- Strengthening of the solar water heater program in the residential and tertiary sectors and its extension to the industrial sector (for process heat).

Thus, the program targeting the installation of 1010 MW of renewable energy in the 2017-2020 period is divided as follows:

- The installation of additional wind capacity of 570 MW; of this, 490 MW will be centralized and 80 MW will be decentralized.
- The installation of an additional 420 MW of PV capacity; of this, 290 MW will be centralized, 65 MW will be used by clients connected to the network (Net metering) as part of the «Solar roofs» program and 65 MW will be used by clients connected to the network MT/HT.
- The installation of an additional 20MW of electric capacity from biomass (mainly electric generators to biogas).
- The installation of an additional 487,000 m² of capacity from solar hot water collectors, 450, 000 m² in the residential sector, 23,000 m² in the tertiary sector and 14,000 m² in the industrial sector.

The implementation of the action plan in the field of renewable energy will require the mobilization of a total investment of about US\$ 1.46 billion (TND 3.36 billion) and should prevent the emissions of 1.9 Mteco.

The Tunisian program “Alliance of Commons for Energy Transition” (ACTE), which was launched on May 27, 2015, formed the partnership between the National Agency for the Control of Energy (ANME), the Fund of Loans and Support of Local Communities (CPSCL) and the General Directorate of Public and Local Authorities (DGCPL). The program aims to strengthen the capacity of Tunisian municipalities to contribute to their capacity levels. The scope of the ACTE program at the local level covers all Tunisian municipalities. Currently, there are 350 municipalities; 86 were created in May 2016 and are not yet functional. The program mainly addressed six areas:

- Building and urban planning to support municipalities in their roles in regulating and developing their territories; to promote territorial and sustainable urban planning; and to be resilient to climate change.
- Equipment and municipal buildings to support municipalities to encourage consumers and public service providers to be models of energy diversification.
- Enhancing municipalities’ capacity to promote energy efficiency and the use of renewable energy in its regions.
- Provide support to municipalities regarding transportation-related issues.
- Strengthen municipalities’ capacities to improve their internal organization, monitoring and evaluation; to set up a system of internal governance within each municipality, including a monitoring and evaluation system for the local energy policies.
- Enhancing municipalities’ capacities to cooperate and communicate matters to support public, private and civil society; to facilitate energy control, including areas that are not directly within its jurisdiction.

A local authority that commits to energy control through the ACTE program will benefit from a threefold support system:

- Direct or indirect technical assistance through national, regional and local experts throughout the project cycle: energy audits, development and implementation of action plans and monitoring and evaluation of program contracts.
- Legal and institutional support for the structuring of investment projects, the preparation of energy performance contracts and development of management methods best suited to the public service concerned (e.g. use of energy service companies (ESCOs) or other forms of public-private partnerships).
- Mobilization of financial support through the CPSCL.

4.11.4. Energy Efficiency Policy

Law No. 2004-72 on the rational use of energy defines the wise use of energy as a national priority and as the most important element of sustainable development policy. It states three principal goals: energy saving, renewable energy promotion and the creation of new forms of energy that favour cost reductions and national economic alignment as well as environmental protection.

The Action Plan of Energy for the period 2017-2020 has been developed as part of the preparation of Tunisia's new development plan over the same period. The implementation of this action plan should combine 2.5 Mtoe of primary energy savings with a reduction in GHG emissions of 6.3 Mteco₂. For the 2017-2020 Action Plan, the total investment required would be 4.7 billion dinars, equivalent to US\$ 2 billion.

The National Energy Efficiency Action Plan consists of three phases:

1. Awareness raising, first concrete and grass-root actions were taken under two programmes, (2000-2013) that contributed to an annual decrease of 2% in energy intensity.
2. Continued implementation and voluntary investment via the mobilization of industry, construction and transport (audits, cogeneration, lighting, household appliances, buildings and transport).
3. Implementation of large scale projects in order to reach the 30-30 goals - 30% of electricity shall be produced by renewable sources by 2030 (2020-2030).

The Action Plan also foresees an independent regulator in the electricity market.

The main actions to be undertaken are:

- Achieve 500 contracts for large consumers of energy in the different economic sectors (industry, building, tertiary and transport).
- Install an additional 278 MW of power capacity of cogeneration in industrial and tertiary sectors.
- Broadcast 4 million of LBC in the residential sector and 1.4 million LED in the tertiary sector (trade).
- Broadcast 545,000 LED lights and install 6,000 inverters of tension for efficient public lighting.
- Replace 300,000 refrigerators in the next 10 years with Class 1 refrigerators.
- Renovate 40,000 homes as energy-efficient buildings.
- Start with a verb 250 industrial enterprises enter a process implementation and certification of their Energy Management System according to the standard ISO 50001.
- Achieve 26 (PDU) urban transport Plans in Tunisian cities.

The implementation of the action plan in the field of energy efficiency will require the mobilization of a total investment of about US\$ 467 million (TND 1,075 million) and should avoid the issuance of 4.5 Mteco.

4.12. The Tunisian Case – Water Sector



4.12.1. General Overview of the Water Sector

In 2015, 98% of the Tunisian population had access to «improved» water. This total included 100% of the urban population and 93% of the rural population. Subsequently, there were, in 2015, 253,000 people lacking access to «improved» water. Regarding sanitation, in 2015, 92% of the population had access to «improved» sanitation; this included 98% of the urban population and 80% of the rural population. The total number of people that lacked access to «improved» sanitation in 2015 was around 944,000 people. (WASHwatch.org – Tunisia, 2017)

Responsibility for the water supply systems in urban areas and large rural centres is assigned to the National Society of Water Exploitation and Distribution (Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE)), a national water supply authority that is an autonomous public entity under the Ministry of Agriculture. Planning, design and supervision of small and medium water supplies in the remaining rural areas are the responsibility of the Directorate General of Rural Engineering (Direction Générale du Génie Rural (DGGR)).

4.12.2. Water Policies, Strategies and Governance in Tunisia

Due to its geographic location between the Mediterranean and the Sahara, Tunisia has an arid climate throughout most of its territory. This aridity, coupled with the variability of the Mediterranean climate, makes water resources both scarce and unevenly distributed in time and space. Indeed, rainfall varies from less than 100 mm in the extreme south (Saharan climate) to more than 1500 mm in the extreme northwest (wet climate). Rainfall is, on average, 594 mm in the north, 289 mm in the centre and 156 mm in the south of the country. The ratio between the minimum and maximum rainfall varies from 4.4 to 15.8 in the South to the North, confirming the significant inter-annual irregularity and variability from one region to another.

Given this difficult hydraulic environment, Tunisia has developed strategies for the mobilization of water resources; these strategies have enabled the mobilization of more than 90% of the mobilized resources towards the end of 2012. This was possible due to the construction of 34 dams (with a capacity greater than 5 Mm³), 234 hill dams (with a capacity of 1 to 5 Mm³), 800 hill lakes (with a capacity of less than 1 Mm³) and more than 100,000 water wells.

This mobilization policy, along with a policy of transferring water from the Northwest region, which has a surplus, to the deficit regions of the Northeast and Central East, has helped satisfy water demand. In addition, the implementation strategies for the mobilization of resources, such as desalinated water and treated wastewater, have also been key in providing water to different regions and socio-economic sectors and ensuring a relatively comfortable balance between supply and demand.

4.12.3. Water Governance

Governance is a complex process involving participation at several levels beyond the state. Its implementation follows its path and its optimization is a priority today. Water governance has four main interdependent dimensions:

A social dimension that aims for an equitable use of the resource.

An environmental dimension that allows sustainable use of the resource and ecosystem integrity.

An economic dimension that balances the efficient use of the resource, the role of water in economic growth and the productivity of m³ of water.

A political dimension that ensures that all stakeholders, users and citizens have equal opportunities to access water.

4.12.3.1. Importance of the Role of Government

- A public water commission and a national water council assist the Ministry of Agriculture and Hydraulic Resources in carrying out its tasks.
- The government is developing water management plans and strategic studies in the water sector, including plans for the short, medium and long terms; it is also implementing the country's basic water infrastructure and accompanying measures to monitor, control and protect resources and ecosystems.
- The government defines national water management policies.
- The government adopts legislation on water resource management.
- The government ensures the separation between regulation and distribution services.
- The government stimulates and regulates the private sector through the gradual establishment of a public-private partnership with all water stakeholders.
- The government promotes inter-sectorial dialogue with different water users, arbitrates conflicts of use, distributes the resource and promotes dialogue with neighbouring countries that share water with Tunisia. Thus, a consultation mechanism was established for the joint management of groundwater resources shared between Tunisia, Algeria and Libya.
- The Government seeks the necessary funding for the promotion of the water sector.

4.12.4. Water Policies in Tunisia

The water policy in Tunisia has two main phases.

● Phase-I - 20th Century:

This initial phase includes supply management and the expansion of services with major investment programmes: a network of dams, water supply, sewerage and irrigation services and intensive aquifer operations. There were three master plans (North, Central and South: 1970s) leading to the establishment of a chronogram of mobilization works, water transfer, flood protection and valorisation of the use of groundwater.

Master plans have helped distribute water allocations, meet the demands of various sectors and identify the best land to be irrigated.

During this phase, the First National Strategy for Mobilizing Water Resources (1990-2000) was developed with the following objectives: mobilize 85% of the water resource potential, realize the boreholes of recognition and exploitation, realize the piezometers of control and monitoring, improve and develop networks to measure and monitor water resources and create 21 dams, 203 hillside dams and 580 hillside lakes.

● Phase-II - Medium-Term (2030) and Long-Term (2050) Strategies

This phase began at the beginning of the 21st century, when Tunisia began to realize its limits and that the transition to water management was necessary. There is a slow evolution towards a new approach that takes into account the quality and quantity of water as well as the whole hydrological system, the promotion of demand management, tariff reform, the establishment of public-private partnership and the strengthening of the enforcement of environmental protection regulations. This is the concept of Integrated Water Resources Management (IWRM).

4.12.5. Water Strategies

The various strategic studies developed in the water sector have made it possible to develop strategies for mobilization, rational exploitation, integrated and sustainable management and the conservation of water resources and protection of the environment. Three main strategies have been adopted and implemented:

- The ten-year strategy for the mobilization of water resources (1990-2000).
- The complementary strategy (2001 -2011).
- The medium-term strategy (2030) and the long-term strategy (Water 2050).

● First Strategy (1990 – 2000)

This strategy defined supply growth as a priority. It enabled the realization of:

- 21 large dams to mobilize 1,927 Mm³;
- 203 dams and 1,000 hilly lakes to mobilize 273 Mm³;
- 1,150 deep boreholes to mobilize 1,127 Mm³; and
- 105,000 surface wells to mobilize 740 Mm³.

These achievements have mobilized 4.067 billion m³ of water, representing a mobilization rate of 87.5% at the end of 2004 compared to 60% in 1990. During this phase, the Ten-Year Strategy for Water and Soil Conservation (1991-2000) was developed, which permitted the development of 892,000 hectares at the watershed level, 580 hilly lakes and 3,500 spraying and recharge facilities. and mitigating erosion, solid transport and silting of dams.

● Second Strategy (2001 – 2011)

This was a complementary strategy for the mobilization of water resources during the period 2001-2011. It aimed to mobilize 90% of the water resource potential, increase irrigated areas to 405,000 hectares, reach 97% rural drinking water supply and improve the quality of water supply. It included plans for the construction of 11 large dams, 50 hill dams and an interconnection between large dams. This purpose of this interconnection is to balance water stocks in water works, improve drinking water quality and ensure water supply to the capital city (Tunis) and major coastal cities (Sousse, Monastir, Mahdia and Sfax) in times of drought.

During this phase, the Complementary Strategy for Water and Soil Conservation (2002 -2011) was developed. It permitted the development of 700,000 hectares of erodible land at the rate of 70,000 hectares/year; it also called for the construction of 1000 hilly lakes, 3500 spreading and recharging structures.

Also, developing a Presidential Program (2004-2009) which focused on:

- A restructuring of agricultural production to reach 50% of this production at national level from the irrigated perimeters which occupy only 7% of the agricultural areas.
- The conduct of a national water desalination program.
- The generalization of a water-saving program at irrigated farms and for different users.

● Third Strategy: Medium-Term 2030 and Long-Term 2050

The Water Sector Medium-Term Strategy 2030 made it possible to confront the development of water supply and demand by 2030. The objectives are:

- Better knowledge of water resources;
- Mobilization of all identified water resources;
- Water saving efforts;
- Rationalization of operations;
- Involvement of users in water management;
- The establishment of an evaluative legal base (water code);
- The use of nonconventional waters (440Mm³);
- Desalination of brackish waters and seawater (49Mm³); and
- Artificial recharge of the aquifers (200Mm³).

4.13. The Tunisian Case – Food – Agriculture Sector

4.13.1. General Overview



The Tunisian agricultural development model has enabled important advances, such as a significant increase in production and improved agricultural and food supply. The development process, however, showed signs of fragility during the 2007-2008 international crisis that shook the agricultural and food markets. This period revealed the structural limitations of the model. At the same time, issues of global scope, but with significant consequences at the national level, emerged as the country continued its process of economic opening.

Tunisia must adapt and adjust its agricultural development model in order to continue the process of intensification and growth of production and ensure a better distribution of the fruits of growth. The country also needs to preserve natural resources and improve the control of integration of Tunisian agriculture into the global economy.

4.13.2. The Foundations of Agricultural Policy in Tunisia

Beyond a few temporary reflections, the Tunisian agricultural policy has been registered over the last 30 years in relative continuity characterized by the importance accorded to market mechanisms (both national and international) and the efforts made in rural infrastructure.

This policy has mainly mobilized two types of tools, namely intervention on prices and interventions on production structures. The main elements of the Tunisian agricultural development model can be characterized as follows:

- Priority is directed at the roles of the internal market, food safety and the preservation of consumer purchasing power.
- Support is given at family farming and medium-sized farms through agricultural and rural development projects, the promotion of irrigation and price guarantees for certain products.
- Support is manifested, in particular, by the important role of pluri-activity and the direct mode of assertion.

- Emphasis is placed on promoting export earnings from a limited range of traditional products for which Tunisia has comparative advantages.
- Importance is given to the mobilization of natural resources with priority for the agricultural sector
- Development of rural infrastructure (roads, drinking water, electrification, etc.) since the early 1980s is ongoing and is possible by mobilizing relatively large resources.

The results of this model in the long-term speak for themselves both in terms of the development of the agricultural sector itself and the improvement of living conditions in rural areas. Agricultural production has grown more than the population (an average of more than 3% in the long-term), thereby improving the country's food supply. At the same time, Tunisia has managed to preserve, or even improve, its market share for certain products for which it has a comparative advantage and an export tradition.

As a result, export earnings have increased and the rate of import coverage by exports has improved. However, this significant progress over the last thirty years in the growth of the agricultural sector has not prevented the gradual reduction of agriculture in the Tunisian economy, as is the case in many other countries.

This development undoubtedly explains the relative reduction in government support in terms of the percentage of agricultural investment in total public investment, given the rapid development of other sectors of the economy and the achievement of all major projects, such as irrigated public dams and perimeters.

4.13.3. The Main Elements of Agricultural Policy

4.13.3.1. The Construction of a Reasoned Argument

The promotion of a new model that is collectively desirable calls for new forms of public intervention that must be reasoned with the greatest rigor and with the support of the greatest number of operators. The fragility of the development model and the existence of exogenous shocks, such as climate change and greater volatility in international agricultural prices, cannot be overcome by market forces alone. The areas and modalities of public intervention are thus argued on the basis of the effective correction of market failures and government failures.

4.13.3.2. The Strategic Axes of the 11th & 12th Plans

The strategic axes formulated in the 11th Plan and reiterated in the 12th Plan remain topical, but they must be reconsidered by taking better account of the interactions between them. These interactions include: the interdependence of different agricultural productions, tension between production levels and the risk of exhaustion resources and better consideration of sustainability.

The updated axes include: achieving food security through reasoned access to markets, an evolution of the production model, valorise exports by systematically seeking better value added products and sustainable management of natural resources through better exploitation of environmental externalities in agriculture.

4.13.3.3. Enhanced Coherence Between Agricultural Policy and other Public Policies

Strengthening coherence at different levels (articulation between sub-sectors and coherence of agricultural policy with other cross-sectorial and sectorial policies on economic and social development), through a redefinition of the role of the State and of the producer-consumer relationship and through an institutional framework conducive to consultation and participation of all stakeholders.

4.13.4. Strategic Orientations of Agricultural Policy in Tunisia

4.13.4.1. Improving the Institutional Framework and Coordination of Actors

- Improve the effectiveness and coordination of state interventions;
- Improve the organization of supply chains and strengthen the participation of rural populations; and
- Orient the behaviour of the actors in the direction of the sustainable management of natural resources.

4.13.4.2. Improving the Provision of Public Services

- Improve access to appropriate credit and insurance instruments; and
- Adapt the services of agronomic research, extension and training to the priorities of the upgrading and the needs of the actors of the sector.

4.13.4.3. Optimizing the Integration of Tunisia into the International Economy

- Improve the competitiveness of the national supply;
- Stabilize the national supply of agricultural products;
- Adopt a trade policy consistent with the objectives of agricultural policy; and
- Promote access to sufficient food, guaranteed quality and balanced diet.

5. Summary and Conclusions, Gaps and Recommendations





5.1. Summary and Conclusions

- Adopting the WEF Nexus Approach will provide great benefits for the Arab region in its pursuit to achieve the SDGs and mandates of the 2015 Paris Climate Change Agreement.
- The interdependency among water, food and energy in the Arab region is strongly and
- closely interlinked, probably more than any region in the world.
- The Arab Region is one of the most vulnerable regions in the world to the potential adverse impacts of climate change. The current water-energy-food-climate policy landscape in the region is complex and fragmented; these sectors have been developed independently of each other.
- Water, energy and food security are central to the sustainable future of the Arab world. Arab countries devised policies to tackle this security nexus challenge, which will set the tone for the sustainable development of the region in the years to come.
- National and regional efforts to address climate change offer an unprecedented opportunity for a needed institutional reform in order to mainstream the nexus thinking in policy development and implementation.
- In view of the recent global commitments of the SDGs 2030 and the new mandate (of the Paris Climate Summit in December 2015) to have a lower carbon economy, the current institutional framework in many Arab countries will probably need to be reviewed.
- The institutional framework governing the elements of the WEF nexus in the region needs strengthening mechanisms for effective resource management. Some countries succeeded in presenting different models of “integrated institutions,” but their comprehensive and inclusive management of these interlinked priorities still needs support, especially since various institutions governing these sectors are themselves fragmented because of the existence of multiple and overlapping jurisdictions.
- The institutional framework governing the elements of the WEF nexus in Arab countries is mostly fragmented, which has to delay the comprehensive and inclusive management of these interlinked priorities. This fragmented institutional framework has also led to a sectoral approach to policy planning, and consequently fragmented policies.
- This fragmentation is also found within the sector itself. For example, more than one authority governs the water sector, where one ministry controls water allocation for domestic and industrial use while another controls irrigation water use (such as the case of the water sector in Jordan). In Lebanon, one body is responsible for the policy, planning and/or management of two or more sectors/resources; for example, the Ministry of Energy and Water in Lebanon is the main public stakeholder responsible for the policy planning and management of both the water and energy sectors.
- Since the environment generates benefits, it has value. This value should be protected by all of those involved, including public, private and civil society organizations. Appropriate and fair policies are necessary to support social equity and equality and could be achieved through a greater inclusion of all stakeholders, regardless of status, gender, age or power. Equality and equity, both within and between generations, improvements in efficiency and the maximization of benefits will require a policy and legislative framework that puts emphasis on rights, inclusiveness and fairness, while also aiming to improve livelihoods and well-being. Good environmental governance can be achieved if equity and equality are reflected in policy formulation, strategies and programmes at all levels (Waslekar 2011, UN and LAS 2014).
- Women, as other disadvantaged groups, are especially vulnerable to climate change. Current socio-economic and cultural constraints affect women disproportionately. Women in Arab

countries, especially the poorest ones, already suffer high rates of illness and death related to pregnancy and other reproductive functions.

- It is obvious that the power sector will only achieve sustainable development if gender analysis is integrated into policy formulation. It is crucial to involve at various levels those who stand to benefit most from the technologies - women - as agents of change. They should be trained in how to promote, set up and operate renewable energy and energy efficiency technologies (e.g. improved cook stoves) because RE and EE projects are much more effective when women are involved. Their input in the design phase makes energy appliances more user-friendly.
- Little attention is currently given to gender mainstreaming in the development of energy policies and programmes. It will be of high value to mainstream gender in the energy sector and enhance energy access for women and other vulnerable groups, especially in rural and peri-urban areas, through targeted programmes. Beyond this gender issue, sustainable energy can also empower vulnerable groups, such as single parent households, orphans, elderly and people with chronic illnesses or disabilities, and help them break the cycle of poverty.
- The current low pricing policies of resources in the majority of Arab countries have been promoting unsustainable consumption and production patterns leading to more resource depletion. Low pricing and across-the-board non-targeting subsidies have resulted in domestic over-consumption of resources and the absence of incentives to achieve resource efficiency. This calls for a paradigm shift in policies and policy development. Reforming pricing schemes would improve resource efficiency, enhance economic and climate resilience, lessen burdens on governments' budgets and help achieve the newly adopted SDGs and mandates of the Paris 2015 Climate Summit.
- In order to achieve reliable water, energy and food supplies at a national and global scale, multi-stakeholder platforms are needed in order to develop and explore science-policy-society linkages and opportunities to share knowledge and employ it to meet the targets for both the Sustainable Development Goals and the Paris Climate Change obligations.
- Decision support tools are highly valuable in promoting cross-sector communication and trade-offs, thus it is critical to create these competencies at individual as well as institutional levels.

5.2. Opportunities

- Even though existing institutions of the Arab world face many challenges regarding a Nexus Approach, there are many opportunities that should be tapped into, such as increased awareness of the importance of the Nexus Approach in Arab countries among policy makers and the existing research projects and small-scale pilot projects, which could inform policy options.
- The established climate change institutions and different forms of multi-stakeholder bodies, such as national climate change committees, that are already formulated in many Arab countries could serve as catalysts to mainstream the Nexus Approach at all levels of policy development. The ultimate aim is to have institutions that are able to mainstream and reflect the WEF Nexus Approach in policies in Arab countries in light of the mandate and targets of both the SDGs and the Paris 2015 Climate Summit. This is important in order to ensure that the Arab countries will not, in the near future, be side-tracked by crippling resource insecurities on their sustainable development path.
- Regional institutions and initiatives such as those under the League of Arab states could play an important role in assisting Arab countries with mainstreaming the WEF Nexus Approach. This could be achieved by supporting Arab states by conducting in-depth assessments of existing institutions and then determining entry points.
- Coordination and collaboration mechanisms among and between institutions is a vital factor to adopt an "integrated Nexus Approach" to resource management in a new era of diminishing

resource bases and escalating risks and threats that are associated with climate change risks. This situation could be the driver for institutional reform and policy integration of the nexus in the Arab region. Enabling existing institutions could be more important and appropriate than establishing new institutions to achieve the targets for both the Sustainable Development Goals (SDGs 2016-2030) and the mandates of the 2015 Paris Climate Change Summit.

5.3. Recommendations for Improvement

- Governance and institutional structures in the Arab region can be enhanced and strengthened for more effective and integrated resource management by analysing current national institutional arrangements for better understanding of the weaknesses and gaps that hinder the implementation of the WEF Nexus Approach in each Arab country.
- Empower and strengthen existing institutions already active in developing and implementing strategies/policies that are related to WEF sectors to develop a comprehensive WEF nexus national strategy; a key element of this is data homogenization and sharing.
- Enhance coordinating and collaborating mechanisms amongst institutions as a key for mainstreaming the WEF Nexus Approach at local, national and Arab regional levels; this does not necessarily require establishing new institutions for the WEF nexus.
- Adopt a WEF Nexus Approach policy to increase policy coherence among the three sectors and climate change policies to provide integrated solutions and to mitigate nexus-related risks (integrated policies, non-siloed thinking, linking up across sectors and ministries).
- Apply appropriate policy and legislative and economic tools to ensure that basic human needs for the three resources are met at a low, subsidized price, while excessive use is priced at a tariff that reflects the cost.
- Implement integrated planning and management that reduces trade-offs and builds synergies across the three sectors.
- Improve resource efficiency towards the transition to a sustainable economy by reforming economic policy and market incentives.
- Promote sustainable consumption and production patterns to achieve SDGs and mitigate and adapt to climate change mandates and targets as agreed upon in the Paris Climate Change Summit.
- Harness existing multi-stakeholder platforms to improve policy coherence, institutional and social learning and leadership. Multi-stakeholder platforms are needed in order to develop and explore science-policy-society linkages and opportunities to share knowledge, including the public sector (legislators, politicians, utilities, etc.), the private sector (utilities, supply chain, agricultural and industrial sector, etc.), civil society and foreign aid agencies.
- The establishment of a network of leading experts in the region is encouraged to create more synergy with technical knowledge as well as in transboundary issues, international conventions and legal and institutional aspects.
- The involvement of civil society in the nexus governance can be an important asset in generating better dialogues and bringing legitimacy and accountability to governing institutions.
- Mainstream the nexus mental models, concepts and tools in policy and development plans.
- Create training programmes across the various sectors to build capacity on the analytics as

- well as the negotiation aspects of the implementation of nexus solutions at different levels, and develop specific institutional programmes and individual capacity-building programmes across the three sectors.
- Legislators have a central role in facilitating institutional reforms, laws and enforcement mechanisms that will create better collaborative platforms.
- Scale up, replicate and fund on-going projects related to the nexus, including integrated seawater energy and agricultural systems, renewable energy for wastewater treatment and reuse and solar desalination.
- Build capacity for policy makers and institutionalize regional knowledge management systems to share best practices on the WEF nexus.
- Support and provide incentives for strategic partnerships and cooperation between research centres and the private sector.
- Introduce inclusive and fair rules, institutions and practices governing social interactions to improve outreach to the vulnerable, such as poor men and women, and the younger and older generations.
- Gender equity and women's empowerment are declared goals for all Arab countries. Women should play effective roles in identifying water governance options at all levels. A first step can be training programmes on gender awareness and analysis for water professionals and the community.
- Gender issues and participatory approaches must be integrated into local and regional businesses, especially in agricultural and poor communities.
- Ensure that women are equal partners with men in decision-making over development, use, technology choice, financing and other aspects of water management.
- Ensure that the environmental and social needs of future generations are reflected in current policies and practices.
- Focus water development policies on eradicating poverty and improving the livelihoods of women and men.
- Reforms are also needed at the local level to effectively integrate gender-aware and participatory approaches into local and regional businesses, especially to empower women.
- There are several options for mainstreaming the WEF Nexus Approach. One option (which is more favourable than others as it does not aim to develop new entities with the specific mandate of managing the WEF nexus) is to make one designated body the focal point for preparing a comprehensive WEF nexus strategy for the country. Ideally, this would be a body that is already active in elaborating and implementing strategies that are related to the WEF sectors. This is possible through periodic policy dialogues and the evaluations of WEF nexus policies. Also, the Nexus Approach may be mainstreamed as part of the sustainability reporting mechanism. Other models that can possibly mainstream the nexus include:
 - Shared Governance: all the units involved have representatives to a body that will be empowered and entrusted to govern the nexus.

- High Level Governance Unit: establishing an independent body with representation of all stakeholders involved in the nexus that will have resources and authority to implement policy.
- Private-Public Partnership (PPP): the implementation of the Nexus Approach is expected to conserve resources, which may be reflected in the form of financial savings.
- Whichever mechanism(s) is/are adopted, more improved coordination between ministries related to WEF sectors needs to take place to meet future challenges. Arab countries need to assess key public entities that are already involved in all of the WEF sectors as the principal administrators of the development and mainstreaming of policies and strategies that tackle the WEF sectors in an integrated and comprehensive way.

References

1. Agricultural Research Institute Cyprus (2005). *National Agricultural Policy Report*
2. Al-Zubari, W.K. (2016). *The Water-Energy-Food Nexus in the Arab Region*.
3. American University of Beirut (AUB) Policy Institute (2016). *Lebanon's Agricultural Sector Policies: Considering Inter-Regional Approaches to Adaptation to Climate Change. Policy Brief no. 6*.
4. APACC (2012). *Arab Plan of Action to deal with Climate Change*.
5. ATKINS. (2016) *Renewable Energy and Energy Efficiency Strategy & Action Plan*.
6. Bizikova, L., Roy, D., Swanson, D., Venema, H.D. and McCandless, M. (2018). *Towards a Practical Planning and Decision-support Framework for Landscape Investment and Risk Management. Policy Paper. International Institute for Sustainable Development*.
7. CEDRO (2013). *Hydropower in Lebanon: History and Prospects. Lebanon: UNDP/CEDRO*.
8. El Tabch, L. et al. (2012). *The Impact of Ministerial Decision 950/1 On Food and Beverages Producers in Lebanon*.
9. Endo, A., Tsurita, I., Burnett, K. and Orenco, P.M. (2017). *A review of the current state of research on the water, energy and food Nexus. Working Paper No. 2016-7. Manoa, Hawai'i: University of Hawai'i Economic Research Organization*.
10. Economic and Social Commission for Western Asia United Nations (ESCWA) (2016). *Developing the Capacity of ESCWA Member Countries to Address the Water*.
11. ESCWA(2006). *Guidelines for Legislative and Institutional Reforms Needed for the Implementation of IWRM at National Level in ESCWA Region*.
12. EuropeAid (2012). *Assessment of The Agricultural Sector in Jordan*.
13. Food and Agriculture Organization of the United Nations (FAO) (2012). *Country Programming Framework for Lebanon. Rome, Italy: FAO*.
14. Gelil, I. A., El-Ashry, M., and Saab, N. (eds.) (2013). *Sustainable energy prospects, challenges and opportunities. Arab Environment 6. 2013 Report of the Arab Forum for Environment and Development*.
15. GFA (2017). *Mainstreaming the water-energy-food security nexus into policies and institutions in the MENA region. Legal and Institutional Framework for Environmental Management*.
16. International Center for Agriculture Research in the Dry Areas (ICADRA) (2013). *Policies for Water and Food Security in Dry Areas. Lebanon*.
17. Mader, C., Mahjoub, B., Bressler, K., Jebari, S., Kuemmerer, K., Bahadir, M. and Leitenberger, A.-T. (2015). 'The Education, Research, Society, and Policy Nexus of Sustainable Water Use in Semiarid Regions, A Case Study from Tunisia'. *Green Energy and Technology*
18. Ministry of Energy and Mineral Resources (MEMR) (2016). *Annual Report of the Ministry of Energy and Mineral Resources. Jordan: MEMR*.

19. Ministry of Energy and Water (2010) *National Water Sector Strategy*. Jordan: MEW.
20. Ministry of Energy and Water (2016). *The National Renewable Energy Action Plan for the Republic of Lebanon 2016-2020*. Jordan: MEW
21. Ministry of Environment (2012). *National Report to the United Nations Conference on Sustainable Development (Rio+20). Sustainable Development in Lebanon: Status and Vision*. Lebanon: MoE.
22. Ministry of Environment (2013). *The National Climate Change Policy – Jordan 2013-2020*. Jordan: MoE.
23. Ministry of Water and Irrigation (2016). *Energy Efficiency and Renewable Energy Policy*. Jordan: MWI.
24. Ministry of Water and Irrigation (2016). *National Water Strategy 2016 – 2025*. Jordan: MWI.
25. Ministry of Water and Irrigation Jordan (2016). *Climate Change Policy for a Resilient Water Sector*.
26. Mofor, L. (2013, September) *Nexus Assessment in the MENA Countries*.
27. National Laboratory of the U.S. Department of Energy (2014). *Making Sustainable Energy Choices*.
28. Rasul, R. (2016). *Managing the Food, Water, and Energy Nexus for achieving the Sustainable Development Goals in South Asia*.
29. R-KNOW (2015). *The Water, Energy & Food Security Nexus Opportunities for sustainable development and effective environmental governance*.
30. Sadik A. et al. (2014). *The State of Food Security and Agricultural Resources in Food Security Challenges and Prospects*.
31. Sadik, A. (2013). *Food security and Agricultural sustainability*.
32. Schuster-Wallace, C.J., Qadir, M., Adeel, Z., Renaud, F. and Dickin, S.K. (2014). *Putting Water and Energy at the Heart of Sustainable Development*. Hamilton, Canada: UNU-INWEH.
33. Scott, A. (2017). *Making governance work for water energy food nexus approaches*. South Africa: ODI and CDKN.
34. Siddiqi, A. and Anadon, L.D. (2011). *The water–energy nexus in Middle East and North Africa*.
35. Stockholm Environment Institute (SEI) (2012). *Climate Change, Water and Energy in the MENA Region*. Sweden: SEI.
36. The Royal Scientific Society (2017). *Energy Policy Assessment – Jordan*.
37. The Royal Scientific Society (2017). *Energy Policy Assessment – Tunisia*.
38. United Nations Development Programme (UNDP) (2017). *Human Development Report 2016*.
39. United Nations Environment Programme (UNEP) (2016). *GEO-6 Regional Assessment for West Asia*.

40. United Nations Industrial Development Organization (UNIDO) (2014). *Inclusive and Sustainable Industrial Development in Arab Region*.
41. Wakeford, J.K. and Mentz Lagrange, S. (2015). *Mitigating Risks and Vulnerabilities in the Energy-Food-Water-Nexus in Developing Countries*. South Africa: Sustainability Institute.
42. World Bank (2009). *Lebanon Agriculture Public Expenditure Review Note*.



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