International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Address: IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria

Email: komendan@iiasa.ac.at **Department:** ASA

Working paper

Energy Policy at Crossroad: potentials for sustainable energy transition in the Middle East and North African region

Authors: Nadejda Komendantova (IIASA), Leena Maraschdeh (University of Jordan), Ahmed Al Salaymeh (University of Jordan), Sönke Bohm (University of Flensburg), Love Ekenberg (IIASA and University of Stockholm), Christine Krüger (Wuppertal Institute), Driss Zejli (MENARES), Nedra Mtimet (ETAP), Franziska Wehinger (FES), Gianluca Sambucini (UNECE), Louy Qoaider (GIZ), Martin Kaltschmitt (University of Hamburg)

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Approved by:

Name: Elena Rovenskaya
Program: Program Director Advanced Systems Analysis, Acting Program Director Evolution and Ecology Program
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Abstract

Countries of the Middle East and North African (MENA) region such as Morocco, Jordan and Tunisia, are facing challenges which require systems analysis. These challenges are connected with the growing energy demand and the need to diversify energy supply while addressing targets of climate change mitigation and energy security policies. At the same time the countries of the MENA region are also facing challenges of socio-economic development, such as the need in creation of jobs and multiplier effects for national economies as well as of further technological development and political transformation.

Deployment of new and upgrading of existing electricity infrastructure, including generation, transmission and distribution systems, is an important prerequisite for sustainable development and economic growth. Energy policy solutions are needed for further upgrading of electricity system, which should be cost efficient, should support multiple development objectives and be based on compromise solutions involving a variety of views as well as perceptions of risks and benefits of various technologies from different stakeholders' groups. The goal of this research was to explore economic, social, political and environmental effects on national and local levels of different electricity pathways for the period of up to the year 2050 in three countries of the MENA region. The methodology of this research was based on integrated and interdisciplinary approach while applying various methods of stakeholders' dialogue such as multi criteria decision analysis, participatory modeling and others.

MENA-Select project results in Jordan

Energy Policy in Jordan

The Hashemite Kingdom of Jordan set targets to reach goals of climate change mitigation and energy security policies, namely, to satisfy growing Jordanian energy demand with sustainable energy supply as well as to reduce import dependency from volatile energy imports that are prone to political risks. At the same time, energy supply options should respond to the requirements of environmental sustainability regarding their possible impacts on land and water resources as well as safety concerns in terms of impacts on human health and pollution of soil, water and other environmental resources. Expectations also exist that further deployment of energy supply technologies will create multiplier effects on local economies as well as a number of direct, indirect and induced employment opportunities.

Currently, Jordan has a variety of choices to satisfy growing energy demand as the country has an abundance of renewable energy sources. There are also plans for the use of new resources like oil shale or nuclear power. For any of these options, all possible impacts, consequences, benefits and risks of every technology should be considered. These risks include objective risks, such as evidence of accidents during electricity generation by different power plants from the past or the number of job-years created per megawatt. However, there are also subjective risks, such as the risk perceptions of stakeholders involved in the decision-making process regarding the use of different electricity-generation technologies. These risk perceptions can include concerns about the safety of installations or about the ability of the local and national government to control the risks, concerns about economic or social impacts of energy transition and others.

As Jordan is entering the phase in which a backbone of its future electricity supply architecture will be created, a massive upgrade and change of existing electricity supply infrastructure is needed. New projects, whether they use renewable energies, oil shale or nuclear, will go beyond the phase of single demonstration projects but rather use technology on the large scale, which will lead to energy transition in Jordan and the transformation of the Jordanian energy system. Such change can lead to transformation of society, even defining new power relations over the generation and redistribution of energy.

History knows of a variety of such societal transformation processes. Without compromises that are more or less acceptable to all stakeholders' groups, such change leads to conflicts or decision-making processes in which some parties are trying to exclude others, thus creating winners and losers. At the same time, transformation processes, in which views, visions and opinions of different stakeholders' groups are taken into account, tend to be more sustainable, less prone to conflict and better balanced, even though sometimes they require more time for stakeholders to engage.

Therefore, the goal of this research was to understand visions and views of different groups of stakeholders on different electricity-generation technologies currently considered in Jordan. A total of nine electricity-generation

technologies were evaluated (concentrated solar power, large scale PV, wind, large-scale hydro, oil, oil shale, gas, coal and nuclear). The technologies were evaluated against a set of eleven criteria, which were developed and discussed in consultations with stakeholders. The innovative character of this research allowed bringing both, qualitative and quantitative, criteria together by not only providing quantitative estimations to a number of criteria based on available statistical evidence but also compiling data on stakeholders' views and feedback collected in dialogue with the stakeholders.

The research team discussed with different groups of stakeholders, such as policy-makers, representatives of the financing community, NGOs and local communities, young people and academia. Based on the well-recognized methodology of multi-criteria decision-making analysis, this work brings views of stakeholders together and identifies possible compromise solutions.

Methodology

The methodology of this research included several steps:

- Development of criteria needed to evaluate the technologies, based on available literature, in particular scientific works on participatory governance,
- Presentation of an overview on the energy and socio-economic-environmental background in Jordan, identifying relevant technologies and criteria,
- Discussion of criteria with stakeholders and collection of their feedback on definition of criteria or whether any criteria should be added or, on the contrary, criteria are not relevant,
- Quantification of criteria based on statistical data as well as responses derived from a large-scale survey with stakeholders involved in energy transition,
- Verification of criteria in the framework of stakeholders' exercises that were performed first by separate groups of stakeholders and then by a mixed group where all major stakeholders' groups were represented,
- Ranking of criteria according to their importance to stakeholders and relative importance in relation to other criteria,
- Triangulation of criteria with data received on stakeholders' visions about the environmental, economic and social future of Jordan as well as on stakeholders' perceptions of benefits and risks of each technology,
- Identification of trade-offs and favorable technologies based on multi-criteria decision analysis,
- Discourse analysis of arguments and concerns raised by stakeholders regarding each criterion as well as their perceptions of procedural and output justice of decision-making processes on energy transition,
- Media analysis of news reports and items about certain technologies,

- Validation survey on individual preferences versus preferences expressed during the workshops following the stakeholders' dialogue.

The following criteria were developed in the framework of the MENA-SELECT project:
Criterion 1: Use of domestic energy sources. This included two indicators: Current and future domestic potential of each technology's energy carrier for decreasing energy import dependence,
Criterion 2: Global warming potential based on the total lifecycle of greenhouse gas emissions per generated kWh.
Criterion 3: Domestic value chain based on the existing potential for integrating domestic industries that manufacture components for energy-generation installations, including all project cycles such as construction, operation and maintenance.
Criterion 4: Technology and knowledge transfer based on the effectiveness of educational policies to foster knowledge transfer and of industrial policies to foster horizontal technology transfer.
Criterion 5: Electricity system costs which include electricity-generation costs as well as additional integration costs.
Criterion 6: On-site job creation which includes the average number of jobs in person-years per megawatt during the construction period as well as the average number of permanent jobs in operation and management.
Criterion 7: Pressure on local land resources which include land requirement in terms of ha/MW as well as the land value that was identified by the suitability of land to livelihood and other services of the community.
Criterion 8: Pressure on local water resources which includes the average operational water consumption of each technology as well as the average water risk at the project site.
Criterion 9: Occurrence and manageability of non-emission hazardous waste in terms of the disposal of non-emission hazardous waste as well as in the potential of national capabilities to manage the disposal of the respective types of non-emission hazardous waste.
Criterion 10: Local air pollution and health, measured in volumes of air pollutants per MWh during the operation of the power plants as well as premature deaths per MWh of electricity produced.
Criterion 11: Safety, expressed in terms of 1) historical immediate fatalities per MWh from severe accidents during the transport and storage of resources as well as the operation of power stations and 2) the potential of disaster risk reduction authorities to manage and mitigate the risk.

Results of Participatory Process on Energy Policy in Jordan

The results allow us to identify discourses about economic, social and environmental visions of the future as well as about benefits and risks of different technologies. At the vision's level, the majority of stakeholders' groups

perceives the social, environmental and economic future of Jordan as positive. They mainly expected conditions for doing business to improve and the creation of drivers and points of growth for Jordan in new industries, such as the green economy. Perceptions about the social future were more polarized, as there are serious concerns that current changes in society will destroy the traditional family and value system. As concerns the environment, there are expectations regarding the transfer to environmentally friendly technologies. At the same time, the most frequently expressed concern was the current water scarcity and the further dynamics of this problem.

At the technology level, stakeholders voiced their concerns about certain technologies as well as hopes of benefits. For instance, benefits of the utility PV were connected with climate change mitigation and low costs electricity generation. At the same time, they were concerned about intermittency risks, the volatility and availability of storage. The most frequently expressed benefits of CSP were its low impact on the environment, its contribution to climate change mitigation and high level of efficiency. At the same time, the cons were high investment costs and land requirement. Stakeholders considered wind to be a safe and clean technology able to generate cheap electricity, but they were concerned about the noise level from wind turbines and the initial high costs of investment. Utility hydro was perceived as clean and environmentally friendly technology, highly efficient in the generation of electricity. The major obstacle to using this technology in Jordan is the absence of fast running or falling water in the country.

The stakeholders saw the competitive advantage of non-renewable energy sources in their cheap electricity generation, dispatchability and baseload. At the same time, all groups considered the negative impacts on human health and the environment to be high. The saw gas as a technology that can provide a stable baseload and that has potentials for back up. They also considered gas to be a relatively clean technology with low volumes of greenhouse gas emissions. They, however, also realized that a reliance on gas would mean to be dependent on an imported energy resource. They considered oil to have relatively few benefits for society and were aware of the huge risks involved, which are not only the dependency on an imported energy source but also the danger of air and environmental pollution. Nuclear energy was seen as a technology that has the technical potential to cover Jordan's current and future energy demands. At the same time, its use is fraught with high risks to human health and the environment, and it requires water.

The ranking of different criteria showed that the majority of stakeholders consider electricity system costs to be the most important criterion, followed by the safety of electricity generation, which was identified as high priority for decision-makers, finance and investment as well as local communities. At the same time, the majority of stakeholders considered domestic value chain integration to be the least important criterion (Table 1).

Table 1: Ranking of criteria within six stakeholders' groups

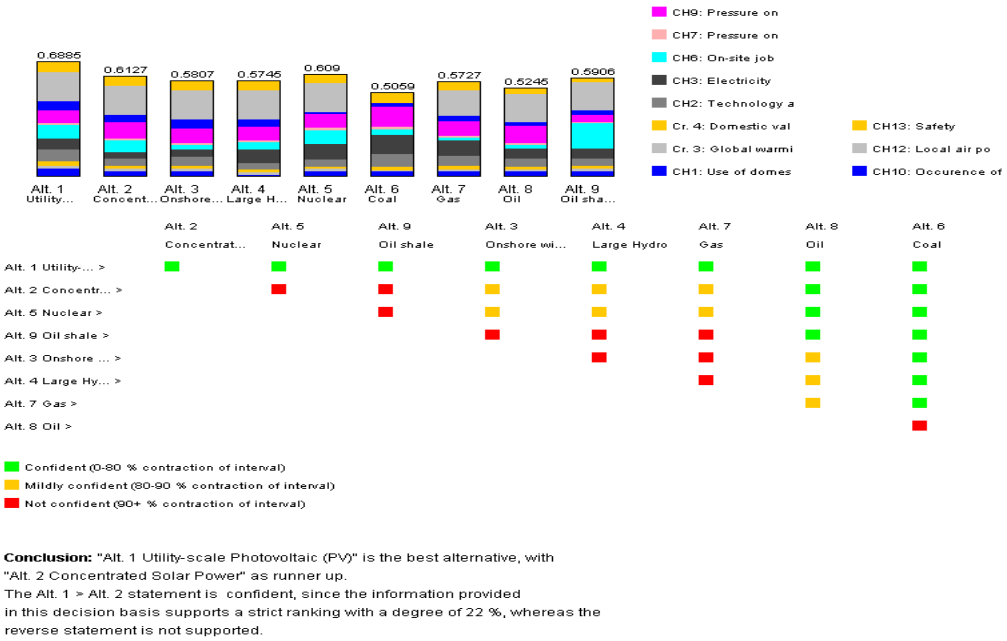
Group	Most important criterion	Least important criterion
Civil society and NGOs	Electricity system costs	Non-emission hazardous waste and domestic value chain integration
Finance and investment	Global warming potential, safety and electricity, system costs	Domestic value chain integration
Academia	Electricity system costs	Global warming potential, non-emission hazardous waste and pressure on local land resources
Future decision-makers	Safety and electricity system costs	Domestic value chain integration and non-emission hazardous waste
Local communities	Global warming potential, safety, and electricity system cost	Domestic value chain integration
Decision-makers	Safety	Pressure on local water resources and non-emission hazardous waste

In discussions about procedural and output justice about decision-making processes on energy transition, the majority of stakeholders agreed that while an involvement in decision-making processes on infrastructure that affects communities is crucial, the compensation of affected stakeholders should be the least advisable option. They agreed that infrastructure should rather contribute to making communities a better place to live. There was a slight disagreement on whether the process of providing information and raising awareness should be regarded as a first step of engagement or as a necessary precondition of it.

The preferences of different stakeholder groups as well as those voiced during the last workshop when representatives of all stakeholder groups ranked criteria together were evaluated with the help of the DecideIT software and the multi-criteria decision analysis methodology. The results show that the majority of stakeholders consider utility PV to be the most favorable option. However, some groups of stakeholders consider it to be the second favorable option. This is mainly because they considered the costs of this option to be a very important factor while environmental criteria were low on their agenda. The results were similar during the first round of ranking at the final workshop where mixed groups of stakeholders were present. The utility PV became the most favorable technology followed by nuclear, gas and coal. Concentrated solar power was ranked much lower. Oil and oil shale were ranked the least favorable technologies. The results also show the high ranking of electricity system costs in the overall results. However, at the second ranking, when these results were shown to the stakeholders, an intensive discussion about the criteria ensued, the results of which differed (Figure 1). They show that renewable energies were the most favorable electricity-generation technologies based on the

stakeholders' preferences of different criteria. Utility PV and CSP were selected as the most preferable technologies, followed by nuclear. Gas and oil were the least favorable technologies.

Figure 1: Results of stakeholders' preferences and technologies trade-offs during the second round of the final workshop

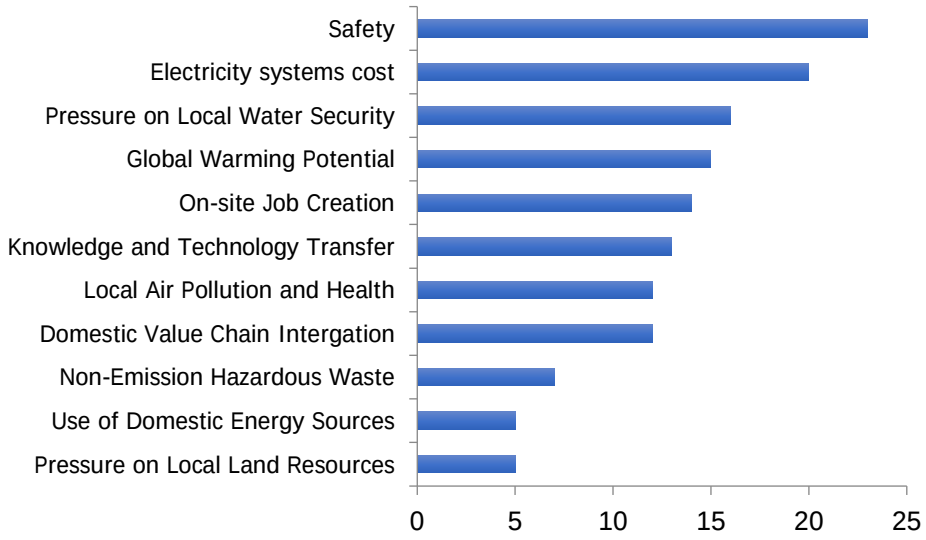


Conclusion: "Alt. 1 Utility-scale Photovoltaic (PV)" is the best alternative, with "Alt. 2 Concentrated Solar Power" as runner up.
The Alt. 1 > Alt. 2 statement is confident, since the information provided in this decision basis supports a strict ranking with a degree of 22 %, whereas the reverse statement is not supported.

The results also show that utility PV is the most favored technology to contribute to the achievement of the national energy planning objectives and local impact sensitivity.

The analysis of discussion during the final workshop shows that there was stronger dissent about some criteria than about others. The methodology developed in the framework of the MENA SELECT project allowed identifying how frequently one criterion was moved during the ranking procedure. For instance, safety, electricity systems costs and pressure on local water security were moved most frequently while the use of domestic energy sources and the pressure on local land resources were hardly moved (Figure 2).

Figure 2: Number of moves for each criterion during the final workshop



Criteria were moved as stakeholder groups had different positions, as the examples of the 'electricity system cost' and 'pressure on local water resources' show. In the first example, decision-makers', industry and finance groups were intent on prioritizing these criteria while national NGOs were moving these criteria down for the sake of other criteria.

A survey conducted among all workshops' participants about their satisfaction with the ranking of technologies and criteria showed that 53 per cent of all participants were satisfied with the ranking of criteria and 27 per cent were very satisfied. As concerns the ranking of technologies, 64 per cent were satisfied and 17% were very satisfied. However, 22 per cent of participants were not satisfied with the ranking of criteria and 18 per cent of participants were not satisfied with the ranking of technologies.

The online individual ranking of criteria and technologies showed that if participants were to rank criteria and technologies individually, they would prefer criteria that are relevant for socio-economic development and energy security while environmental criteria would be ranked much lower. The individual ranking of technologies showed that renewable energies such as utility PV and CSP would still be the most favorable technologies while nuclear energy was ranked much lower than during the workshops (Table 2).

Table 2: Final ranking of criteria and technologies during the final workshop and during the online survey

Criteria		**Technologies**	
Original ranking from final workshop	**Ranking based on survey**	**Original ranking from final workshop**	**Ranking based on survey**
Electricity costs	Electricity costs	Utility PV	Utility PV
Safety	Safety	CSP	CSP
Air / health	Domestic energy	Nuclear	On-shore wind
Water	Job creation	On-shore wind	Gas
Tech. transfer	Value chain	Large hydro	Large-scale hydro
Job creation	Air / health	Gas	Oil shale
Domestic energy	Water	Coal	Nuclear
Waste	Waste	Oil shale	Oil
Value chain	Land	Oil	Coal
Land	Tech. transfer		
Global warming	Global warming		

The team also analyzed media reporting on electricity-generation technologies in Jordan. This analysis showed that solar, nuclear and oil shale were most frequently reported on in the Jordanian mass media. While, however, reporting about solar energy was mainly positive, the reporting about nuclear and oil shale was more polarized with a significant share of positive but also negative news coverage.

From the results of this study, three major recommendations for the Jordanian energy policy process can be drawn:

Create a favorable environment for investment in renewable energy sources. The ranking of criteria as well as the stakeholders' preferences expressed during the workshops and surveys shows that the discourse about energy transition in Jordan is strongly dominated by economic rationality and energy security concerns. For instance, the electricity systems costs criterion was the most favorable criterion during most of the workshops. During the individual online survey, socio-economic criteria were constantly prioritized while other criteria were moved down. During the discussion of technologies and visions for Jordan, some of the major concerns were about uncertainty about the future levelized costs of electricity. The main expectations regarding the economic growth of Jordan were connected with investments in new technologies, the creation of employment opportunities as well as multiplier impacts. The evaluations with the help of DecideIT showed that the significant preference for the electricity system costs criterion contributed to a higher ranking of technologies such as coal.

Provide further opportunities for participation in decision-making processes on energy transition. The evaluation of results on discussions about procedural and output justice shows that the majority of participants think that compensating local communities for dangers to the environment and human health caused by electricity-generation and transmission projects should be the least favorable option as infrastructure projects

should rather be an opportunity to make communities a better place to live. The recommendations expressed during the workshops were that further efforts are needed to involve stakeholders but also laypersons into decision-making processes on energy transition, which would entail discussion about technology but also about the location of electricity power stations and electricity transmission infrastructure. Also, further awareness-raising measures are necessary to inform people about how they can participate. The level of transparency of decision-making processes and criteria relevant for decision-making processes should be increased.

Create conditions for an energy transition that is socially, environmentally and economically sustainable. The evaluation of the visions of the future of Jordan shows that Jordanian stakeholders have aspirations but also concerns about the economic, social and environmental future of Jordan. The young people are the most optimistic group of stakeholders. As concerns economic development, the majority of stakeholders' groups wishes that Jordan will become an economic leader in the region, an attractive country for investment and that it has a stable and resilient economy to different regional processes. Energy should become an essential component of this economic growth. Reducing energy import dependence should become an essential component of economic growth and debt reduction. At the same time, green growth should contribute to the use of locally available energy resources and create impulse for economic development in the regions in combination with further development of manufacturing capacities, technology and knowledge transfer. In the social area, energy transition will create employment opportunities but might also lead to disrupting traditional family values and creating the potential for societal conflicts if no compromise is found. In the environmental area, holistic solutions are needed to address water scarcity, the pressure on local water and land resources from continued use of electricity-generation and -transmission infrastructure. Energy transition is seen as an opportunity to reduce impacts from electricity-generation on the environment but also to change human behavior towards reducing pressure on the environment due to the increased level of awareness and the availability of new technologies.

Regional conference in Jordan

Introduction

A two-day regional conference was organized by the MENA-SELECT Project partners, including the University of Jordan, IIASA, European University of Flensburg, Wuppertal Institute, BICC, Germanwatch and MENARES under the patronage of H.E. the Minister of Energy and Mineral Resources. The conference took place on January 29 - 30, 2019 in Jordan. The main aim of the conference was to validate with stakeholders from different relevant energy policy sectors the results of the MENA Select project. The main topics were related to scenarios with various shares of different technologies as well as to human factors of energy transition such as the social

acceptance of various electricity generation technologies, the willingness to use different technologies and to participate in transformation of the energy system, variety of views and perceptions of risk across different groups of stakeholders and the need for a participatory political solutions in energy policy, in general, and in energy water nexus, in particular. The conference gathered about 54 participants from Jordan, Europe, Tunisia, and Morocco representing over 25 organizations from academia, industry, civil society, public authorities, research centers as well as regional and international organizations to explore and to discuss opportunities and strengths related to energy sector in Jordan (photo 1).

Photo 1: Participants of the MENA-Select regional conference in Jordan

The conference lasted for two days and included several sessions. On the first day it was opened with a welcome speech held by Prof. Al Salaymeh as well as the MENA Select project team members Dr. Nadejda Komendantova, Dr. Sönke Bohm and Mrs. Christine Krüger. The welcome round of the project partners was followed by the opening speech of Prof. Ahmad Y. Majdoubeh, Vice President, on behalf of the President of The University of Jordan Prof. Adbel-Karim Al-Qudah, the President of the University of Jordan. The welcome session was followed by keynote presentations of H.E. Iyad Dahiyat, Secretary General of Water Authority of Jordan and H.E. Minister of Energy and Mineral Resources Hala Zawati.

H.E. Minister of Energy and Mineral Resources Hala Zawati welcomed participants during the opening ceremony of the workshop to discuss the MENA Select project, which aimed to study the most important scenarios and possible paths for the future of the electricity sector in Jordan until 2050. H.E. the minister highlighted that the results of the MENA Select project will provide an important input to the national energy strategy. The ministry of energy is currently in the process of updating the national energy strategy to 2030, including short- and medium-term objectives, focusing on four axes: security and independence of energy, diversification of resources and reduction of energy costs.

The Minister of Energy and Mineral Resources Engineer H.E. Hala Zawati said that the recent decision on freezing the renewable energy projects that are bigger than 1MW1 of the Council of Ministers to stop giving approvals for investments into renewable energy projects is a temporary decision until the issuance of the national strategy for the energy sector, expected in the first half of this year and the comprehensive plan of the National Electricity Company, stressing that renewable energies will remain a priority within the national strategy. She also highlighted that the MENA Select project provided an important input for the further development of the national strategy for the energy sector. She added that the decision of the Council of Ministers aims to provide the opportunity to regulate the sector and to stop randomness in the projects as well as to set them in a comprehensive plan which includes the careful evaluation of electricity generation capacities needed by the Kingdom of Jordan up to the year 2030. She also noted that government land will be available for leasing for the purposes of renewable energy investments in parallel with the preparation of the infrastructure for renewable energy projects by strengthening the national electricity transmission and distribution networks and by linking with the neighboring Arab countries such as Iraq and Saudi Arabia as well as by adopting energy storage projects.

The H.E. Minister of Energy also provided an important input for private sector stakeholders, especially working on the emerging electricity generation solutions such as shale oil. For instance, few companies are currently working on the experimentation of shale, which is now in the financing stage and aims to produce 25,000 barrels per day of refined products (gasoline and diesel). There are 4 companies operating under concession agreements for deep oil shale or surface retorting. All companies are currently working on the implementation of their programs based on the agreements signed with them which are issued under special laws. Also, the government is intensifying efforts to boost the productivity of the Hamza and Risha fields, by working to double the production of the field next year is expected to provide this plan if successful about 5% of the gas consumed in the Kingdom. A request for expression of interest (EOI) was announced for exploring shale oil and gas in six open exploration blocks, 4 companies were shortlisted, but three withdrew leaving one company interested in three areas (Sirhan,

[1] http://www.jordantimes.com/news/local/zawati-reaffirms-freeze-renewable-energy-projects-%E2%80%98temporary%E2%80%99

Azraq and Dead Sea). It will consider the results of the MENA Select project, especially regarding different criteria for this electricity generation technology.

The Secretary General of the Water Authority, Eng. Iyad Dahiyat addressed the most important challenges facing the water sector, including the high cost of electricity for the water sector, pointing out that there should be a link between energy and water, especially now when Jordan is going to focus on seawater desalination within the coming years. These plans require large amounts of energy to pump water. Therefore, it is also necessary to explore the possibility of using water in the subject of energy storage.

While speaking about the energy use in the Jordanian water sector, H.E. Iyad Dahiyat highlighted that the water sector is the largest single electricity consumer which requires 14% of the total electricity generation. The specific energy consumption is 7.51 kWh/m3 (billed) (Water Authority of Jordan), mainly for municipal water supply and wastewater. The specific energy consumption is 0.274 kWh/m3 (billed) (Jordan Valley Authority), mainly for irrigation and industrial use in the Jordan Valley. The average specific energy consumption for all sectors is 4.31 kWh/m3. The electricity bill for 2017 was 161 million JD based on energy costs of 0.094 JD/kWh, which constitutes 43% of total operation and maintenance costs. The electricity tariff was increasing in July 2018 from 0.094 to 0.140 JD / kWh. The expected energy cost in 2019 will be 64% of total operation and maintenance costs.

There are following challenges for the Jordanian water sector:

- Severe water scarcity, dry climate with low precipitation and high evaporation (94%) rates
- Over abstraction from ground water
- Gap between demand (1200 MCM) and supply (900 MCM) for all uses
- High none revenue water with NRW = 48% and high energy costs
- Unexpected high population growth due to migration in the region and connected pressure on water resources
- Financial deficits and subsidized tariffs

To address these challenges the Ministry of Water and Irrigation in Jordan developed in 2016 the Energy Efficiency and Renewable Energy Policy in the Water Sector. The aim of the policy is to improve energy efficiency in water facilities in order to decrease the specific power consumption for water supply and to introduce renewable energy technologies to reduce energy prices and to protect environment. The policy target is to reach 15% reduction in the specific energy consumption of billed water by 2025. This corresponds to 0.47 kg reduction of CO2 emissions for the production per each billed cubic meter of water. Another target is to raise the share of renewable energy sources in power consumption to 10% corresponding to the total saving of 0.31 kg of CO2 emissions per each billed cubic meter of water.

The Vice President of the University of Jordan Mr. Majdoubeh praised the role of the University of Jordan in hosting such projects aimed at serving the community and addressing its problems, pointing out to the constructive cooperation of the University of Jordan with many European universities in a number of projects supported by the European Union and its leadership in this area. Mr. Majdoubeh explained that the need to organise the regional conference and to discuss the findings of the MENA Select project was one of the recommendations of the Sixth World Conference on Renewable Energy and Energy Efficiency in Desert Areas organized by the University of Jordan in April last year under the patronage of His Royal Highness Prince Hamza Bin Al Hussein.

Key messages from speakers

- Renewable energy is a national priority and the results from the MENA Select project are an important input. The target is to achieve 22% share from renewable energy in generating electricity by 2020
- National Petroleum Company (NPC) announced the plan to increase natural gas production rates from 10 to 16.5 million cubic feet by the end of 2018
- The plan for shale oil extraction from Hamzah Field will be developed
- The electricity tariff was increased in July 2018 from 0.094 to 0.140 JD/kWh
- The water sector is the largest single electricity consumer 14% of generation.
- The Ministry of Water and Irrigation (MWI) in Jordan has developed Energy Efficiency and Renewable Energy Policy in the Water Sector in 2016 to manage the use of energy in the Jordanian water sector efficiently and sustainably.

Regional and International Perspectives

The first day included four participatory joint sessions during which technologies relevant for the energy transition in the Middle East and North African region were discussed. The first session was about the regional and integrated perspectives, which also included one of the issues disputed by the majority stakeholders, i.e. the water scarcity and the need for a water and energy nexus approach. During this session representatives from Morocco and Tunisia, namely Dr. Driss Zejli from CNRST / MENARES and Dr. Nedra Mtimet from APER, presented the need of energy policy and criteria on a variety of discussed electricity generation technologies. Their talks

were followed by presentations from representatives of regional and global organizations to provide a regional and global perspective on deployment of various electricity generation technologies. For instance, Ms. Franziska Wehinger from the Friedrich Ebert Stiftung talked about the MENA regional perspective and Dr. Gianluca Sambucini from the United Nations Economic Commission for Europe talked about the global drivers and barriers for deployment of various electricity generation technologies. This session was moderated by Dr. Nadejda Komendantova.

Prof. Driss Zejli from ***CNRST / MENARES (Morocco)*** talked about the existing in the world challenges which require integrated approach and nexus thinking. He called these challenges as "VUCA" namely volatility, uncertainty, complexity and ambiguity. Energy policy in Morocco will need an integrated and nexus approach for sustainable energy transition (figure 3).

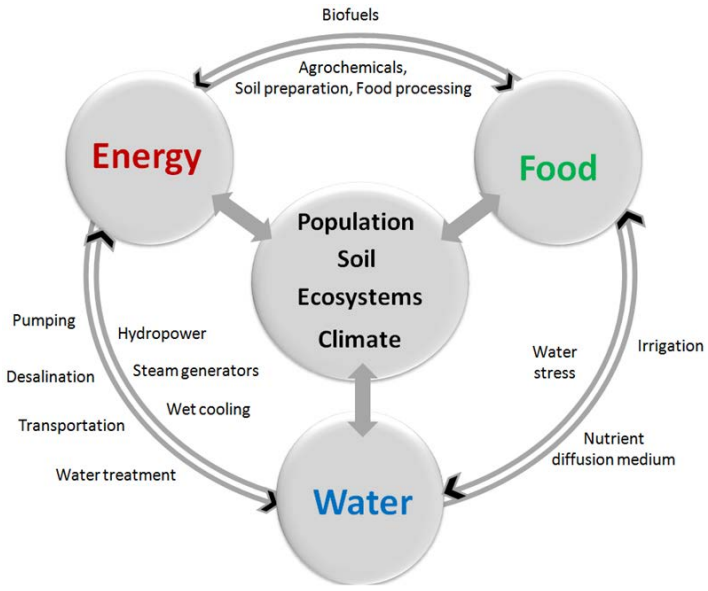


Figure 3: Nexus approach towards energy policy in Morocco

Source: Zejli, 2019

There are obvious negative consequences of the absence of nexus approach which results in water scarcity with water stress becoming structural, which will become even more acute due to energy intensive character of desalination. Water stress also has cascading impacts on other sectors and lead to irreversible salinization of groundwater, laying-off and unemployment, emigration of farmers to cities, loss of attractiveness of regions, higher salt water desalination costs, risk of closure of food industry companies and several other negative consequences.

This nexus approach will need integration of all sectors, which make part of the water, food and climate change nexus (figure 4).

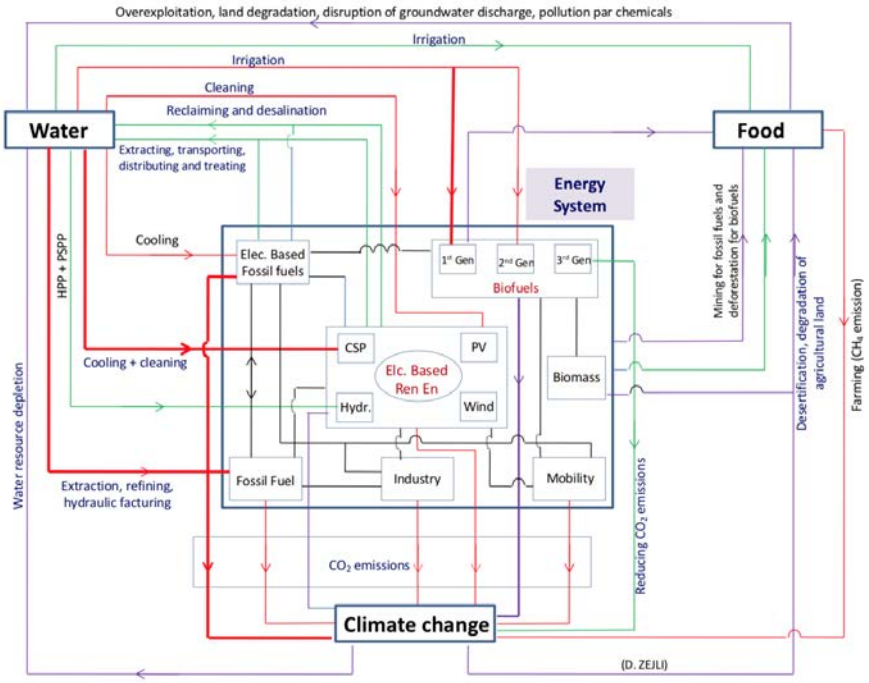


Figure 4: integration of water, food and climate change concerns in the nexus approach

Source: Zejli, 2019

Renewable energy policy is a part of nexus solution in Morocco but for its successful implementation it requires a nexus approach also. There are several drivers for deployment of renewable energies in Morocco, including drivers of social, economic, environmental and geopolitical nature. These drivers are the need to reduce energy dependency and energy costs, benefits of knowledge and technology transfer, enhancement of local content, creation of employment and added value, achievement of inclusive competitiveness in the emerging renewable energy technologies, transformation of useless areas into the useful ones, geopolitical position of Morocco as a hub in technological development between Europe and Africa as well as exports of energy.

Dr. Nedra Mrimet from ***Tunisia*** addressed the role of civil society in the Tunisian energy transition. The objectives of energy transition in Tunisia are to reduce carbon intensity by 46%, primary energy consumption by 30% and to increase the share of renewable energy sources in electricity generation to 30% by 2030 (in comparison to 2010). The national renewable energy plan foresees deployment of 1.6 GW of renewable energy installed capacity, from which 1/3 should come from wind and 2/3 should come from solar. The government of Tunisia created several mechanisms to support deployment of renewable energy sources such as new regulatory framework which allows private sector to generate and to sell electricity, establishment of the national energy

transition fund, development of various investment and financial initiatives for renewable energies and consideration of renewable energies as a priority industrial sector. The influence of civil society in Tunisia is growing since the Arab spring and civil society organizations are already participating in national debate on energy and are supporting promotion of renewable energies across the country.

Currently activities of civil society organizations in Tunisia include following areas: strengthening of the role of women in energy transition, activation of influence of sustainable development concepts and awareness raising, participation in debates for modification of the power purchase agreements, establishment of the regulatory authority for the electricity sector and reduction of the role of monopolies in energy policy.

In her talk, Ms. Wehinger working on the ***Regional Climate and Energy project of Friedrich Ebert Stiftung (FES)*** highlighted that renewable energy sources could become the basis for Jordan's future energy system because of such factors as almost complete reliance on energy imports, availability of solar resources (irradiance which is two times higher than in Germany and nine hours of sunshine per day), economic potentials in the future. There were several reasons mentioned by FES to explain why the vision of 100% renewables would benefit Jordan and solve many national challenges. The three most obvious reasons are: 1. Reduce carbon emission because it does not affect competitiveness as economic growth is not based on conventional energy resources, 2. Reduce costs of energy on the national economy, 3. Reduce reliance on import

Other recommendations of FES are about more detailed technical and economic solutions such as: 1) Enhance the Jordanian renewable energy and energy efficiency fund schemes on a large scale based on REEEL 2014, which foresees currently 202 MW by net-metering and wheeling, 2) Facilitate roof-top solutions through simplification of procedures on licensing and administration, 3) Enhance direct proposals and competitive bidding, 4) Phase-out long-term contracts on gas imports, 5) Compensate NEPCO as the looser of the energy transition by for example finding alternative business concepts for them or financial re-compensation.

FES together with Wuppertal Institute has developed a phase model for energy transitions in the MENA region which they have applied to Jordan. Altogether there are four phases of energy transition towards the vision of the 100% renewable energy sources (figure 5)

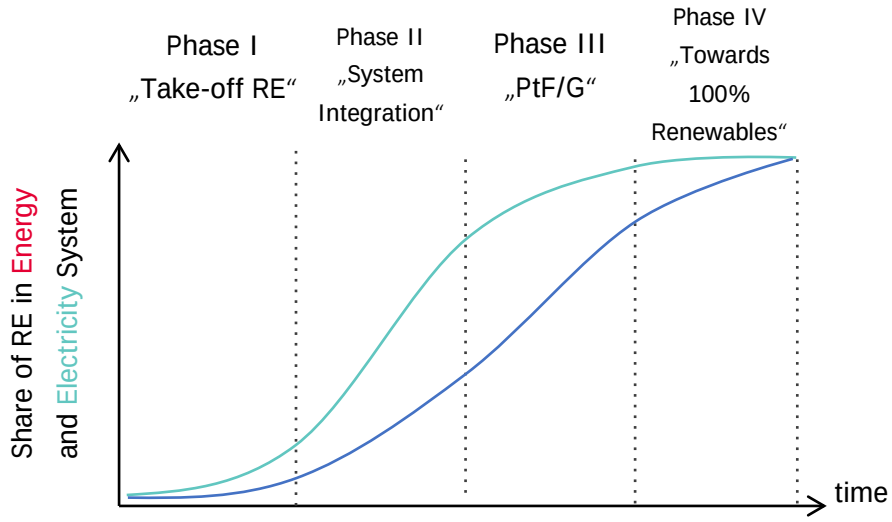


Figure 5: Phases of Jordanians energy transition

Source: Friedrich Ebert Stiftung, 2019

According to their study, Jordan is currently in between the first and the second phase and on a good path to reach the second phase soon. Currently, during phase 1, the share of renewable energy sources is making 5% in energy mix but several large renewable energy projects are currently in construction or planning in the areas of Ma'an and Tafilah. Electricity grids are currently experiencing limited capacity but sufficient extension through initiatives such as Green corridor is planned. Also financing schemes are currently under development or implementation through the Jordan Fund for Energy Efficiency and Renewable Energies. The financial schemes include feed-in tariffs, auctions, guaranteed grid access to renewable energies, net metering and wheeling regulations. There are also significant potentials in flexibility options and sector coupling, including e-mobility and pilot projects for battery storage.

If the Jordanian government had continued the path of the last five years in developing RE projects, they could have reached phase 2 by the year 2020 and the phase 3 by the year 2040 (figure 6). With the recent decision of January 2019 though, this is rather unlikely.

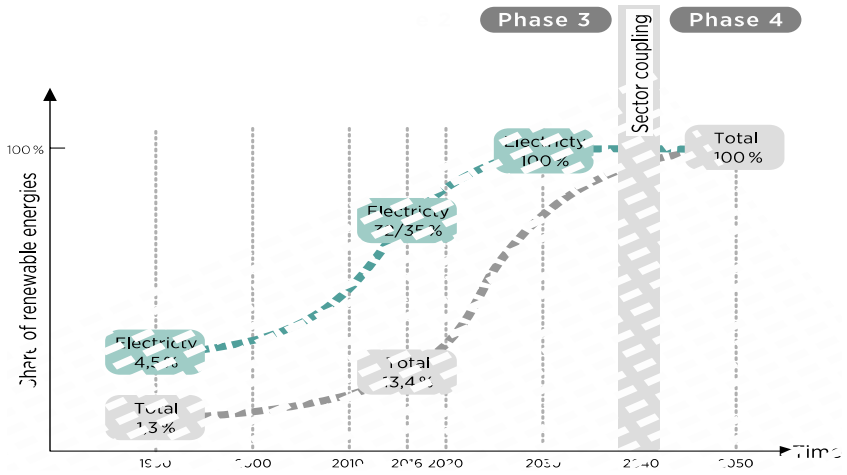


Figure 6: Phases of Jordanian energy transition

Source: Wuppertal Institute, 2019

During phase 1 the introduction of renewable electricity and initial signs of an accelerated diffusion will take place. During phase 2 (system integration) the flexibility options and sector coupling will become important. Renewable electricity will be applied in some other sectors such as heat and transport. During phase 3 (power to fuel or to gas) applications will enter the market and will absorb the increasing shares of “surplus” renewables. During this stage the market structures will be created. During phase 4 the residual fossil fuels will become fully replaced in all sectors through special power to fuel or to gas applications. There will be expansion of export market structures.

According to Franziska Wehinger, there are several solutions to deal with current concerns about the limited grid’s capacity to integrate more renewable energy sources and the volatility of renewable energy sources generation, which might impact stability of the grids. Altogether five different solutions were named:

1. Expand grid capacity (1 GW Green Corridor)
2. Extend grid cross-country connections to Syria, Iraq, Egypt, Saudi Arabia
3. Increase storage capacities through sector coupling (cars, industries) and water pumped storage hydropower
4. Smart grid, digitalization and demand supply management
5. Decentralisation of electricity generation

Decentralisation of energy generation is when it is produced closer to where it is used in contrary to electricity generation with large scale power plants with electricity transmission through the national grids. According to the Friedrich Ebert Stiftung, decentralisation has many advantages for Jordan’s socio-economic development:

- Decentralised solar transmission losses
- Decentralized solar increases security of supply in remote areas or after extreme weather conditions
- Decentralized solar allows economic savings for Jordanian citizens and businesses, not foreign investors
- Decentralised Solar comes with highly skilled and local jobs creation.
- Decentralised solar avoids competition on land use.
- Finally, decentralised solar increases the public acceptance of the energy transition.

Decentralised solar has limited impact on the grid, especially in urban areas, and can even optimise grid use. Decentralised solar requires proportionate grid reinforcement. Studies have shown that grid reinforcement needs are very limited or inexistent in the case of decentralised solar, because the systems are connected to the distribution grid, in most cases close to consumption points and in areas where the grid is already developed.

Dr. Gianluca Sambucini from the *United Nations Economic Commission for Europe (UNECE)* talked about the trade-offs in the Mediterranean Basin. For instance, sustainable energy is commonly considered in terms of climate change, and acceleration of emissions reductions is imperative due to this existential threat. But, the countries of the developing world require energy access to drive development efforts. Poverty, health, nutrition, education, environmental aspects and other issues must be considered in addition to the reduction of carbon emissions. Fossil fuel dependence exists, and quality of life aspirations cannot be expected to be abandoned. Currently 80% of the World's Total Primary Energy Supply is coming from fossil fuels but as renewable energy sources become more cost competitive with traditional thermal electricity generation, renewable energy investment has increased. And the year 2012 was the first year when renewable energy capacity additions surpassed non-renewable capacity additions. The energy mix of the North Mediterranean countries is diversified, and fossil fuels are still playing a large role. According to IEA's Renewables 2018 report, renewable energy capacity in the MENA region is projected to increase 70% over 2018-23, but these infrastructure projects require financing. Investment in renewable energy infrastructure, when cost competitive, will free up fossil fuel resources to be exported.

There are some common themes to the different paths. One is that we should be able to count on mutually beneficial economic interdependence. We need a rules-based system that allows economically, socially, and technologically optimal outcomes. The same thinking applies to the countries around the Mediterranean. Full development of resources in a sustainable manner whether fossil or renewables is in the interests of all. Dealing with energy markets as integrated wholes is the ideal. For some it is naïve to not consider the politics of energy, but in fact politics whether domestic or international, often interfere with our ability to enhance quality of life on the globe. And yet that should be the objective of governments. The recommendations are to rely on financial mechanisms such as the European Bank for Reconstruction and Development (EBRD) and public-private

partnerships, to implement the bilateral approach rather than “one-size-fits-all” regional approach and to identify country-specific remedies for hurdles to renewable energies uptakes through instruments such as hard talks organized by UNECE.

The session was followed by a roundtable discussion where invited participants had a chance to provide presentations about their organizations and the roles of their organizations in energy policy in the MENA region. Participants also talked about their visions of energy transition in the region and desirable social, environmental and economic future. This session was moderated by Dr. Thomas Fink from GIZ.

Water-Energy Nexus Perspective

The session 4 focused on the need of a nexus approach for various criteria as a recommendation for implementation. The most intensive discussion was about the need of a water and energy nexus. This session also benefited from three input presentations on nexus potentials and the necessity for dialogue enhancement by Dr. Louy Qoaider from GIZ, on concepts for innovative renewable energy projects in the water sector by representatives of KfW and the Dorsch company as well as on the pumped hydro storage potential in Jordan by REEE-II from the EU. The first day ended by the joint dinner where participants had an opportunity for networking and further discussions.

According to Dr. Qoaider, water-energy nexus should include solutions for the following phases:

- Energy for water abstraction and transmission
- Energy for water treatment and desalination
- Energy for water waste treatment
- Water for electricity generation
- Water as a source of energy but also as a sink of energy

The water-energy nexus potentials include pump water for improved load management, energy storage in water, waste water plants as sustainable energy source and renewable energy access power for desalination. Energy storage can include hydro power and pumped storage. Demand management can include hydro power and pumped storage as well as brackish water desalination, demand management in wastewater treatment and irrigation systems. The innovative energy procurement approaches include buying electricity from NEPCO at favourable prices to desalinate water. According to GIZ, nexus targets should include the availability and affordability of water and energy for everyone in Jordan.

The second day had two intensive participatory sessions. The first session was on the “Recommendations for

the policy-making process on implementation of scenarios with consideration of criteria, which matter for the majority of stakeholders". During this session, the MENA Select results and key challenges for their implementation were presented to participants. Dr. Nadejda Komendantova from IIASA provided an input presentation about the results of the work package 2 on human and social factors of energy transition as well as on multi-criteria decision making analysis of criteria relevant for various electricity generation technologies. Dr. Sönke Bohm from EUF and Mrs. Christine Krüger from the Wuppertal Institute talked about the identification and ranking of scenarios for the countries' future energy systems and about recommendations arising from these findings. These inputs were the base for participation of the audience which took form of a world café, moderated by Dr. Izad Sartawi from Jordan.

There were tables for the following questions:

- How can the preferred scenarios with high shares of renewables be implemented in Morocco, Jordan and Tunisia?
- What will be the role of different societal groups on the path towards a highly renewable energy system?
- What are the obstacles and opportunities arising from the envisaged development?
- What is the role of an international collaboration in implementing energy systems with high shares of renewables?

Participants could join one of the tables for a 30 minutes discussion, the main statements were noted on flipcharts. After that, participants changed the tables to contribute to another discussion, but one host remained at each table. In the following, these hosts presented the main discussion results to the audience.

After the lunch break the second session discussed the participatory governance options and compromise solutions for energy transition. The session was opened by the impulse statement on key questions of energy transition as well as recommendations from the MENA Select project and from the energy transition in Germany and in Austria. The impulse statements were provided by Prof. Martin Kaltschmitt from the Technical University in Hamburg on the energy transition in Germany and various technical and economic factors. It was followed by the presentation of Dr. Nadejda Komendantova on results from the MENA Select project. Further on, Ms. Franziska Wehinger from the Friedrich Ebert Stiftung office in Amman provided presentation on participation and engagement in decision-making processes on energy transition.

The lessons learned from the German energy transition are that transition of the electricity system towards higher shares of renewables is possible. Such process will have economic and environmental benefits and will help to increase energy supply security. Solar (PV) and wind energy are the most promising renewable energy sources for electricity generation. With an increasing share of fluctuating electricity related to the overall electricity provision more and more technical and organizational measures need to be implemented to allow for a stable

supply system. Such measures are available and are already developed or are under development.

The lessons learned from Austria which are based on the results of the survey with over 1601 completed questionnaires in two climate and energy model regions of Austria show that the level of awareness among inhabitants about the need of climate change mitigation is extremely high (over 90%). However, social acceptance for the renewable energies is available as long as everyday routines are not affected, even though the majority of people will be ready to pay 10% for electricity if it comes from renewable energy sources and additional 10% if energy comes from their own region. Solar PV is considered the most favorable technology. The majority of people will be happy to participate in decision-making processes on energy transition especially on questions like choice of technology and location as well as the type of the project, planning and financing.

The roundtable was moderated by Dr. Thomas Fink from GIZ and addressed following questions:

- Which are the crucial debates to be facilitated among stakeholders (clashing interests)?
- How can we enhance the cooperation between the several stakeholders?
- Which reforms in adjacent policy sectors (environmental protection, procedural justice etc.) are necessary to promote societal support?
- How can we collaborate on a regional level on energy issues, especially on the electricity sector?

Recommendations

The discussion of the MENA Select project contributed to a better understanding of the complex relationships between the various power tracks and sustainable development in three selected countries in the MENA region - Morocco, Jordan and Tunisia - to come up with effective proposals and recommendations adopted by decision-makers to contribute to the development of the energy strategy in Jordan, but also in other countries of the MENA region, which is developed according to economic, technical, social and environmental standards, taking into account the challenges and opportunities facing the energy and electricity sector in the coming years.

The participants of the roundtable discussions were researchers and specialists in the fields of energy, renewable energy and energy efficiency in the desert regions, as well as representatives from academia, industry, civil society, public authorities and research centers. They exchanged their views on energy transition and acceptance electricity generation technologies as well as on potential mechanisms for international cooperation on technology transfer needed to drive the energy transition. Participants also expressed their views on the necessary criteria for energy transition such as local energy use, on-site job creation, integration of the local value chain, transfer

of technology and knowledge, electricity generation costs, global warming potentials, pressure on water resources, pressure on land resources, local air pollution and health and safety.

Energy security was mentioned several times and many participants highlighted that the achievement of energy security is an absolute priority. Currently a significant share of Jordan's energy mix is provided by the liquified natural gas installation in Aqaba. Therefore, a wish for diversification of this source of energy supply was continuously expressed. Energy security for many participants meant energy diversity together the energy independence and the reduction of energy costs. Further solutions should be developed to provide stability of the Jordanian electricity supply through existing and upgraded transmission and distribution grids, which should be adapted in light of the energy transition in the country.

Several participants highlighted that the conference was a very good networking opportunity and a perfect platform for constructive dialogue aimed at exchanging scientific knowledge and practical experience to take advantage of modern technological experiments and techniques to deal with the problems facing the electricity sector in Jordan in an attempt to find radical solutions in light of future economic, social and environmental challenges. The conference provided fruitful discussions on the topics of energy, water, food and other critical and vital for modern society systems.

During the roundtable discussion about the feasibility of the results on human factors, which are important for energy transition, we discussed three major key areas such as interconnectivity of electricity generation projects in the region, coordination of actions of different stakeholders and orientation of energy policy towards separate projects or towards a strategic planning. Several participants mentioned that interconnections are needed but this is also the question of financing and access to power. Therefore, the role of donors in stimulation of interconnectivity projects is crucial. We spoke about political, technical and economic interconnectivity. Examples of technical interconnectivity are actions to balance electricity markets in different countries or to balance electricity generation and supply in terms of storage. Political interconnectivity is represented, for example, by pan-Arab electricity markets.

Participants mainly saw the role of donor organizations in the stimulation of technical cooperation and political and technical interconnectivity. They also mentioned that diversification of donors' efforts is needed. This diversification should bring the existing energy system away from the main focus on large scale projects towards variety of electricity generation options and multiple small-scale projects.

Also, feasibility of water and energy nexus solutions could be an example of interconnectivity. For instance, the water and energy nexus solutions are needed to preserve the stability in electricity transmission and distribution

grids. Electricity interconnection projects were considered as an example of interconnectivity such as the Green corridor or the Eastern corridor with interconnections to Iraq. There are also other interconnectivity projects with Egypt, Syria, Lebanon, Iraq or Saudi Arabia. They are all important for stability of electricity grids in Jordan in light of the ongoing energy transition.

The economic interconnectivity included common trade mechanisms, common markets or financial networks. When we spoke about coordination, participants mainly addressed the issues of technology transfer and the need for coordination in terms of horizontal or vertical technology transfer, when electricity generation technology is provided through turn key power stations or when it is embedded in society through different joint ventures and stimulation of research activities.

While speaking about other technologies, Hamzah and Risha fields explorations of natural gas deserved a special attention. Participants spoke about the need of intensification of efforts to double the amount of gas. In this case it will be possible to satisfy 5% of the existing electricity demand. Industry can also increase the usage of gas instead of the usage of heavy oil. Oil shale explorations were also discussed intensively. For instance, four companies are currently interested in retorting projects. Imports of crude oil from Iraq were also mentioned. The oil pipeline in Aqaba would have 5 million barrels of oil per day of transfer capacity. The current energy need is, however, only 1 million barrels of oil.

While discussing renewable energy sources the vision of a high share of renewable energy sources was dominating the discussion. However, several challenges were also mentioned such as intermittency character of renewables and the need for storage options. The majority of participants expressed the wish for further development of electricity system resilience, which should be based on three main pillars: a) available storage options, b) existing interconnections within electricity market and with markets within the region, c) digitalization and transfer of necessary technologies. Also facilitating factors for implementation of high share of renewable energy sources were mentioned. These factors included enhanced planning capacities, open market and possibilities for bottom-up decision-making processes.

Several opportunities and obstacles for energy transition were identified during the roundtable discussions.
The identified obstacles were the following:

- Lack of active policy making
- Poor energy sector planning
- Lack of energy storage and stability of the grids
- Difficulties in financing of renewable energy projects
- Lack of experience and awareness about renewable energy sources

- Poor knowledge transfer between different groups of stakeholders

The identified opportunities included:

- Limitation of available energy sources such as fossil fuels
- Availability of solar radiation
- Availability of suitable land resources
- Availability of local skilled labor
- Drivers of global climate policy and international technology transfer
- Decreasing costs of renewable energy sources

While discussing the issues of participation of different groups of stakeholders in decision-making processes on energy transition, participants clearly distinguished two kinds of participation for two various groups. The first group included government, policy-making stakeholders, lobby groups as well as private sector. The second group included laypeople. While speaking about participation of laypeople mainly measures on awareness raising were mentioned such as educational campaigns, different kinds of media work, also including social media, climate marches. Also, some actions at the level of tokenism and consultation were identified and included participation in commissions (mainly for stakeholders), organization of workshops (also mainly for stakeholders), surveys and questionnaires. While speaking about engagement of local communities into decision-making processes on the planned energy infrastructure participants mentioned following factors which hinder participation of local communities: lack of clarity in procedures regarding participation in energy policy and lack of sufficient financing and other resources which would secure participation of local communities.

By discussing the feasibility of MENA Select results in renewable energy sources, participants mentioned that international collaboration here is especially crucial. But first it is necessary to define what international collaboration is. Is it participation of a country within a global process? Or is it participation of a country with neighboring countries?

Further coordination of efforts from donors is required. The coordination could be provided by the ministry which could organize regular meetings with all donors involved. Coordination should be realized in line with the goals of the Jordanian energy policy and to ensure cooperation and synergies in activities of various donors. Coordination is required to identify priorities in the activities of the donors as well as of national entities in their fund-raising efforts. This coordination should also include various programs and actions of various stakeholders. Significant efforts should be also dedicated to the capacity building measures and awareness raising campaigns.

Further on, for implementation of the results of the MENA Select project there should be a significant turn in

energy policy from the process of energy formulation to the process of energy implementation as several good studies remain without proper implementation due to the existing divide between science and policy, or due to the divide between policy formulation and implementation processes. Such reorientation of the Jordanian energy policy would require the implementation of a strategic and long-term planning approach as well as the amendment of the existing in Jordanian laws in the area of energy policy.

According to the results of the roundtable discussions during the conference the countries of the MENA region should address the energy policy needs as well as the challenges of economic and social development and climate change at the same time. The results based on the compromise solution stressed that a key requirement to overcome these challenges is the deployment of a new electricity infrastructure. The results of the roundtable discussions also confirmed that concerns about the energy transition are dominated by energy security concerns such as electricity costs and safety of electricity generation and transmission. The discussion also confirmed that solar energy generation is one of the most preferable electricity generation technologies. Also modelling software developed during the MENA Select project received a positive evaluation as a potential tool for developing possible alternatives for an energy resources mix for electricity generation in the future.

The discussion showed that all three countries of the region (Jordan, Morocco and Tunisia) as well as many countries in other regions stand at the crossroads of current electricity policies that support traditional fossil fuels such as coal, gas and oil, including oil shale, but renewable energy and nuclear energy often require discussion by stakeholders to come up with useful proposals for their countries and serves the energy sector, which requires holding a series of meetings for dialogue and consultation in this regard. Also, despite the many studies that were conducted in energy, there is no certainty on to how the investments in different electricity development can interact with social, economic, political and environmental dimensions at multiple levels. Therefore, participatory governance solutions and further stakeholders' consultation process can be helpful.

Stakeholders, especially from the Ministry of Energy and NEPCO, highlighted that the results from the MENA Select project will provide an input to the process of formulation of the Jordanian strategy of development of energy sector, which is planned to be developed by the second half of the year 2019.

According to the final statements of the participants of the regional conference the countries of the MENA region should address the energy policy needs in synergy with the challenges of economic and social development and climate change mitigation. The participants stressed that a key requirement to overcome these challenges is the deployment of new electricity infrastructure. However, despite many existing in the energy field scientific studies, there is still no certainty about how investments into different electricity generation technologies can interact with social, economic, political and environmental dimensions at multiple levels.

Annex 1: Media coverage

Press releases were published for the conference in newspapers and electronic websites. The releases covered the opening and closing of the conference.

- The Jordan News Agency (Petra Agency)
- The University of Jordan website
- Fact international
- Almadenah news
- Jordan TV
- Addustour Newspaper
- Alghad News paper
- Khaberni website
- Alrai Newspaper
- Ammoun news
- Albosala news

Annex 2: List of participants

	Name	Position / Organization
1	Driss Zejli	National Center for Research
2	Nedra Mtimet	APER-Alliance pour la promotion des energies renouvelable
3	Dr. Nadejda Komendantova	IIASA
4	Christine Krüger	Wuppertal Institute
5	Dr. Sönke Bohm	University of Flensburg
6	Mr. Gianluca Sambucini	United Nations Economic Commission for Europe (UNECE)
7	Prof. Ahmad Y. Majdoubeh	Vice President For Humanities Faculties
8	Prof. Ahmed Al-Salaymeh	The University of Jordan
9	Eng. Leena Marashdeh	The University of Jordan
10	Mr. Hussien Omari	The University of Jordan
11	Ms. Fadia Otaibi	The University of Jordan
12	H.E. Eng. Hala Zawati	Minister of Energy and Mineral Resources
13	H.E. Malek Kabariti	Former minister of Energy and Mineral Resources
14	Dr. Rasmi Hamzeh	Executive Director JREEEF Jordan Renewable Energy & Energy Efficiency Fund
15	Eng. Muhieddin Tawalbeh	National Energy Research Center (NERC)
16	Mr. Mustafa Al Khatib	Director of Electricity Department, Ministry of Energy and Mineral Resources
17	Mr. Zeyad Alsaaydeh	Director of Rural Electrification Department, Ministry of Energy and Mineral Resources
18	Dr. Khader Al-janaideh	Energy & Minerals Regulatory Commission (EMRC)
19	Eng. Muna Musa	Energy & Minerals Regulatory Commission (EMRC)
20	Eng. Ahmad Khataibeh	Energy & Minerals Regulatory Commission (EMRC)
21	Eng. Murad Omari	National Electric Power Co. (NEPCO)
22	Mr. Nadeem Rizfi, general director	Central Electricity Generating Co (CEGCO)
23	Eng. Ali Al-Rawashdeh	Division manager at Central Electricity Generating Co (CEGCO)
24	Mr. Majed Abu Khalil	Senior Manager at Central Electricity Generating Co (CEGCO)
25	Eng. Maher Tubaishat	Division Manager at Central Electricity Generating Co (CEGCO)
26	Eng. Mwaffaq Alawneh	Senior manager at Central Electricity Generating Co (CEGCO)
27	Eng. Sami Al-Zawatin	Media spokesman Electricity distribution company (EDCO)

28	Mr. Amro Kisht	Jordan Petroleum Refinery Co. LTD
29	H.E. Dr. Hisham Khatib	Chairman of Energy Committee at the Jordanian senate
30	Mr. Jamal Qamoh	Parliament
31	Eng. Amani Hamdan	(MEMR)
32	Dr. Wael Ababneh	(MEMR)
33	Eng. Amani Mohammed Hassan Al Azzam	Secretary General (MEMR)
34	Eng. Yacoub Marar	MEMER
35	Eng. Samer Zawaydeh	Director of Energy Chapter
36	Eng. Bassam Maaytah	Planning & Reliability Maintenance Manager Private sector Arab Potash Company Ltd
37	Dr. Iyad Sartawi	American University in Madaba
38	Prof. Suhil Kiwan	Jordan University of Science and Technology (JUST)
39	Wael Elayyan	Water Authority of Jordan /Energy Unit
40	Hamzeh AlHawamdeh	Water Authority of Jordan /Studies and feasibility section-Water Affairs
41	Abdallah Hijab	Water Authority of Jordan /Energy Unit
42	Alaa AlMomani	Water Authority of Jordan /Energy Unit
43	Anas AlMomani	Water Authority of Jordan /Energy Unit
44	Zaid Hamoudeh	Water Authority of Jordan /Energy Unit
45	Ahmed Al-Labadi	Water Authority of Jordan /Energy Unit
46	Yaser Njadat	Water Authority of Jordan /Energy Unit
47	Louy Qoaider	GIZ
48	Thomas Fink	GIZ
49	Haneen Sa'deh	GIZ
50	Ms. Franziska Wehinger	FES
51	Mr. Basim Saleh	GreenTech
52	Munther Said	Orange company
53	Mr. Samer Judeh	Chairman of Jordan Wind Project Company
54	Eng. Saddam Al-Tamimi	Head of renewable Energy and Energy section at Irbid Electricity
55	H.E. Eng. Iyad Dahiyat	Secretary General of Water Authority of Jordan
56	Stefan Kugler	Dorsch International Consultants
57	Nadine Ghantous	Dorsch International Consultants
58	Kareem Shukry	Dorsch International Consultants
59	Thomas Frank	Dorsch International Consultants
60	Abdulhakim Saada	Dorsch International Consultants

Annex 3: Agenda

Day 1

January 29, 2019

09:00-09:30	Registration of participants and welcoming coffee
Opening Session	
09:30-10:10	Welcome by the Chairman of the Organizing Committee, Prof. Ahmed Al-Salaymeh, The University of Jordan, Welcome by MENA-SELECT project partners, Dr. Nadejda Komendantova, International Institute for Applied Systems Analysis (IIASA), Dr. Soenke Bohm, University of Flensburg (EUF) and M.Sc. Christine Krüger, Wuppertal Institute, Welcome by H.E. Eng. Iyad Dahiyat, Secretary General of Water Authority of Jordan, Welcome by Prof. Ahmad Y. Majdoubeh, Vice President, on behalf of the President of The University of Jordan, Welcome by H.E. Eng. Hala Zawati, Minister of Energy and Mineral Resources
Keynote Presentation	
10:10-10:30	H.E. Minister of Energy and Mineral Resources, Eng. Hala Zawati Energy Strategy in Jordan
10:30-10:50	H.E. Secretary General of Water Authority of Jordan, Eng. Iyad Dahiyat Energy challenges in the Jordanian water sector
10:50-11:20	Coffee break and Group photo
Session 1	
Regional and integrated perspectives, including water-energy nexus approach	
11:20-12:30	Moderator: Dr. Nadejda Komendantova, IIASA (Austria) Dr. Driss Zejli, CNRST and MENARES (Morocco)

	Dr. Nedra Mtimet, APER (Tunisia) Mr. Gianluca Sambucini, UNECE (Switzerland) Ms. Franziska Wehinger, FES (Germany)
Session 2 **Vision of Energy transition**	
12:30-13:30	Moderator: Prof. Ahmed Al-Salaymeh, UJ and Dr. Thomas Fink, GIZ Presentation of participants and their visions of energy transition and nexus
13:30-14:30	Lunch
Session 3 **Presentation of MENA-Select results and roundtable discussion key challenges**	
14:30-15:30	Moderator: Prof. Ahmed Al-Salaymeh Implementability of results in the policy-making process and Compromised based participatory governance solutions Dr. Nadejda Komendantova, IIASA (Austria) Dr. Soenke Bohm, EUF (Germany) Ms. Christine Krüger, WI (Germany)
15:30-15:45	Coffee break
Session 4 **Water-Energy Nexus**	
15:45-17:30	Moderator: Dr. Louy Qoaider, GIZ Nexus Potentials and necessity for dialogue enhancement, Dr. Louy Qoaider, GIZ Concepts for innovative RE projects in the water sector KfW /Dorsch Water Pumped Storage potential in Jordan – REEE-II, EU
19:00	Joint Dinner

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Address: IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria

Email: komendan@iiasa.ac.at **Department:** Advanced Systems Analysis (ASA)

Day 2
January 30, 2019

09:00-09:30	Welcoming Coffee

Session 1

Roundtable discussion: Recommendations for the policy-making process on implementation of identified scenarios

Prof. Ahmed Al Salaymeh (Jordan)
Dr. Soenke Bohm, EUF (Germany)
M.Sc. Christine Krüger, WI (Germany)
Moderator: Dr. Iyad Sartawi, RE Consultant (Jordan)

09:30-12:30

- *Which policies/measures must accompany particular scenarios/technologies to increase benefits and mitigate adverse impacts?*
- *What are starting points to initiate a transformation of electricity systems in the MENA region?*
- *How can Morocco, Jordan and Tunisia move forward towards 2050 based on current planning?*
- *Where are maybe adjustments needed to set a more long-term track for the energy transition in the electricity sector?*
- *Are policies sufficiently aligned?*

12:30-14:00	Lunch break

Session 2

Roundtable discussion: Participatory governance and compromise solutions for energy transition

Dr. Franziska Wehinger (FES)
Dr. Nadejda Komendantova, IIASA (Austria)
Prof. Martin Kaltschmitt, TUHH (Germany)
Moderator: Dr. Thomas Fink, GIZ

14:00-16:00

- *Which are the crucial debates to be facilitated among stakeholders (clashing interests)?*
- *How can we enhance the cooperation between the several stakeholders?*
- *Which reforms in adjacent policy sectors (environmental protection, procedural justice etc) are necessary to promote societal support?*
- *How can we collaborate on a regional level on energy issues, especially on the electricity sector?*

16:00-16:30	**Closing session**