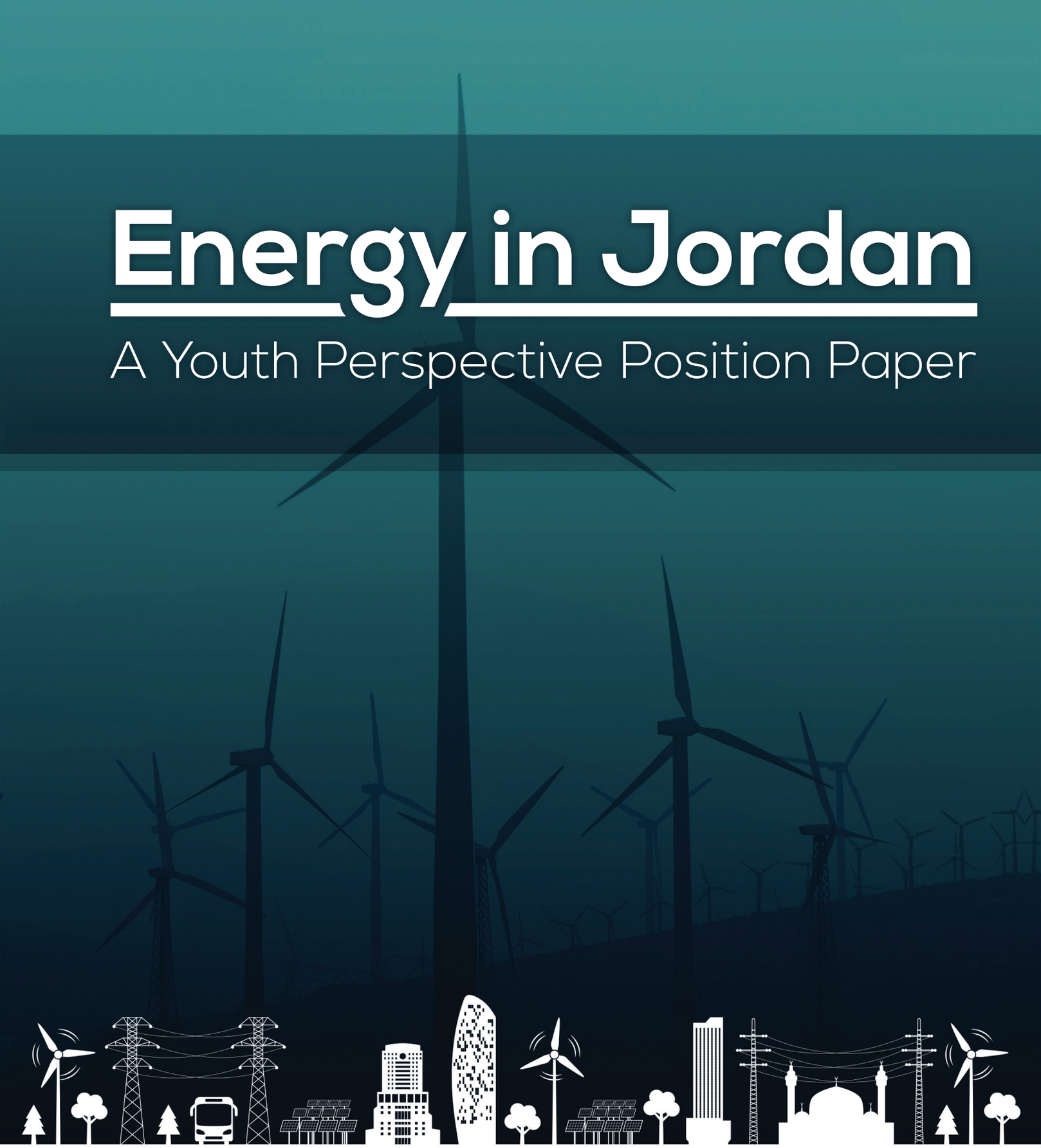
Energy in Jordan

A Youth Perspective Position Paper



A joint project between Friedrich Ebert Stiftung, Germanwatch and the Green Generation Foundation

FRIEDRICH EBERT STIFTUNG | GERMANWATCH | GGF

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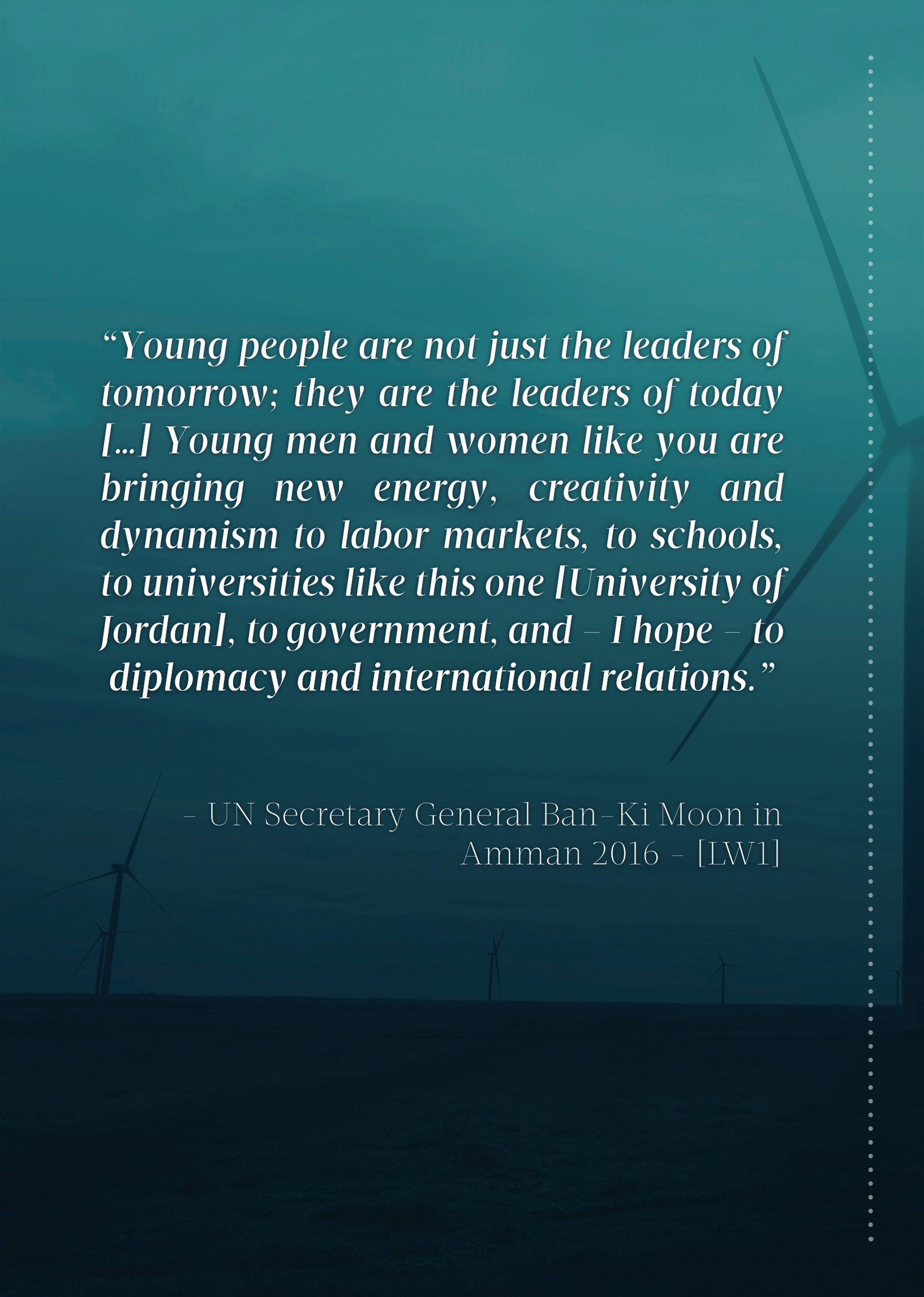

“Young people are not just the leaders of tomorrow; they are the leaders of today [...] Young men and women like you are bringing new energy, creativity and dynamism to labor markets, to schools, to universities like this one [University of Jordan], to government, and – I hope – to diplomacy and international relations.”

– UN Secretary General Ban-Ki Moon in Amman 2016 – [LW1]

The impacts of climate change can already be felt across the world and are becoming more severe as the global average temperature rises. Countries all over the world are engaged in a race against time to tackle the global climate crisis. Limiting global warming implies reconsidering almost all elements of our daily life, most of which are connected to the energy sector: water, food, buildings, transportation, global trade, etc.

The energy sector is the largest source of global greenhouse gas emissions through its burning of fossil fuels to generate electricity, produce heat or power engines, which directly causes climate change. However, as technologies rapidly improve and prices drop, many renewable energy options have emerged as an alternative to fossil fuels. Promoting renewable energy and energy efficiency is now an important part of the international climate debate and national energy policy in many countries, both of which are aimed at slowing down climate change.

However strongly impacted by climate change, the Middle East/North Africa (MENA) region possesses large natural potentials for solar and wind energy. Moreover, this region has another important resource: its youth. In order to achieve a successful, fair, and complete energy transition, all countries need agents of change. These agents of change should have innovative minds, a global outlook, and the spirited motivation to work for the future of their country, as well as for their own. Who else but the youth could be these champions of change?

As one of the pioneers in the energy field for the MENA region, our joint project will focus on Jordan, in cooperation with the Friedrich-Ebert-Foundation (FES) and the Green Generation Foundation (GGF). The project's objective is to encourage and empower young Jordanians to engage in climate and energy policy-related issues. Thanks to several training sessions, these young Jordanians learned about energy issues and drafted their own shared policy vision for Jordan's energy future. This paper was an opportunity for its young authors to present their views, as well as for decision-makers to learn first-hand which energy future young Jordanians would like to see.

We would like to sincerely thank our colleagues from FES, GGF and everyone who contributed to the project. A very special thank you goes to the young authors and their fantastic work. We hope they will continue their engagement, and that this policy paper will help lay the foundations for a clean energy future for Jordan and the region.

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ACRONYMS

Acronym	Description
BRT	Bus Rapid Transit
CSP	Concentrated Solar Power
EE	Energy Efficiency
EMO's	Energy Management Opportunities
EV	Electric Vehicles
FES	Friedrich Ebert Stiftung
JREEEF	Jordan Renewable Energy & Energy Efficiency Fund
GAM	Greater Amman Municipality
GHGs	Greenhouse Gases
HKJ	Hashemite Kingdom of Jordan
IEA	International Energy Agency
JREEF	Jordan Renewable Energy & Energy Efficiency Fund
LTRC	Land Transport Regulatory Commission
LRT	Light Rail Transit
MEMR	Ministry of Energy and Mineral Resources
MENA	Middle East/North Africa
NEEAP	National Energy Efficiency Action Plan
NEPCO	National Electric Power Co.
NREAP	National Renewable Energy Action Plan
NGO	Non-Governmental Organization
PPAs	Power Purchase Agreements
PV	Photovoltaics
RE	Renewable Energy
R&D	Research and Development
REEE	Renewable Energy & Energy Efficiency
SDG	Sustainable Development Goals
SWH	Solar Water Heater
UN	United Nations

Praised as a regional pioneer within the energy sector, the Hashemite Kingdom of Jordan (HKJ) has outstanding potential to utilize its climatic resources, namely solar and wind, for a greener contribution to overall national energy demand. This paper aims to clearly express the collective concerns of a group of young Jordanians with regards to the future of the energy sector and its impacts on climate change over the next 20 years. **We young Jordanian change-makers, envision an integrated affordable, sustainable, efficient and independent energy system and aim at achieving a 50% renewable energy (RE) share of the overall energy mix by 2038.** This paper will also provide recommendations on four interdependent topics aimed at exploring this goal to the fullest extent.

Main Issues:

Energy Conservation and Energy Efficiency: Capitalize on Energy-efficient Solutions and Reduce our Carbon Footprint

Energy consumption has grown steadily over the past decade and represents a significant economic burden on the Kingdom. However, this growth has not been accompanied by adequate awareness-raising campaigns, nor stringent regulations over national building codes. This situation calls for the implementation of energy-saving mechanisms, specifically through standardizing energy-efficient technologies and altering consumer behaviors. Not only does this concept improve energy resource costs, promote energy independence and reduce energy-related greenhouse gas (GHGs) emissions, but it also creates new job opportunities for technological innovation.

Transportation Sector: Achieve an Integrated, Accessible, Affordable and Sustainable Transportation System

The transportation sector accounts for 49%[1] of total energy consumption. As such, there is an urgent need to develop a reliable public transportation system across the entire Kingdom. Moreover, laws and regulations must be formulated to promote alternative means of mobility, such as electric vehicles (EVs), as well as developing an infrastructure that encourages citizens to shift their mode of transportation towards a more environmentally-friendly and energy-efficient option.

Mainstreaming Renewable Energy: Transition to Renewable Energy – Faster, Better and Bolder

The HKJ's energy sector depends greatly on imported fossil fuels, which depend on regional political stability. In light of the progress achieved thus far nationally in the field of RE, it is essential to explore additional sustainable resources to reduce the use of fossil fuel and gas imports. This may include installing energy storage technologies and gradually phasing out conventional power generation based on fixed Power Purchase Agreements (PPAs).

1 "Energy 2018 – Facts and Figures." Ministry of Energy and Mineral Resources, Ministry of Energy and Mineral Resources, pg. 1, http://www.memr.gov.jo/EchoBusV3.0/SystemAssets/PDFs/AR/BruchureA%202018.pdf.

Democratizing the Energy Sector: Bring Clean Energy to the Masses and Employ Self-reliance Tools

Despite the progress achieved thus far in implementing RE technologies, the general public's accessibility to RE opportunities is rather limited. Decentralizing RE projects will promote social justice within the energy sector. In addition, this approach will solve the problem of congestion in the national grid caused by centralized power plants. Moreover, decentralization not only eliminates transmission losses, but also enables excess energy to be stored and discharged as needed. We can achieve great advancements in this field through raising public awareness, encouraging innovative RE projects, and conducting valuable research.

Recommendations:

Based on this analysis, in order to achieve the desired targets and goals, the following recommendations must be considered:

- Consider the concept of energy efficiency (EE) governance by involving the public and private sectors, as well as the local community.
- Amend, update, and revise EE directives to be more flexible according to the ever-changing needs of the Jordanian market.
- Separate RE and EE sectors, particularly in terms of legislation, regulations, and actions, to target different groups of investors.
- Establish a group of experts to oversee the implementation of building codes, especially with regards to installing solar heaters per Article (10) of By-law No. (73) of year 2012 on Regulating Procedures and Means of Conserving Energy and Improving its Efficiency, and strictly punishing infringement thereof.
- Raising awareness of the laws, regulations, and EE equipment exemptions at the sectoral level and broaden them to include the general public.
- Construct a more efficient public transport network covering the entire Kingdom.
- Explore the potential for implementing alternative solutions and technologies to better manage the country's energy demand (e.g. CSP, EVs).
- Allocate funding resources for REEE projects in Jordan.
- Restructure the educational system in schools by including an informative curriculum concerning RE systems to alter consumer behavior and encourage innovative solutions.
- Include decentralization and democratization schemes within the National Renewable Energy Action Plan (NREAP) – currently in the drafting phase – and the National Energy Efficiency Action Plan (NEEAP).
- Increase support for RE research and development (R&D).

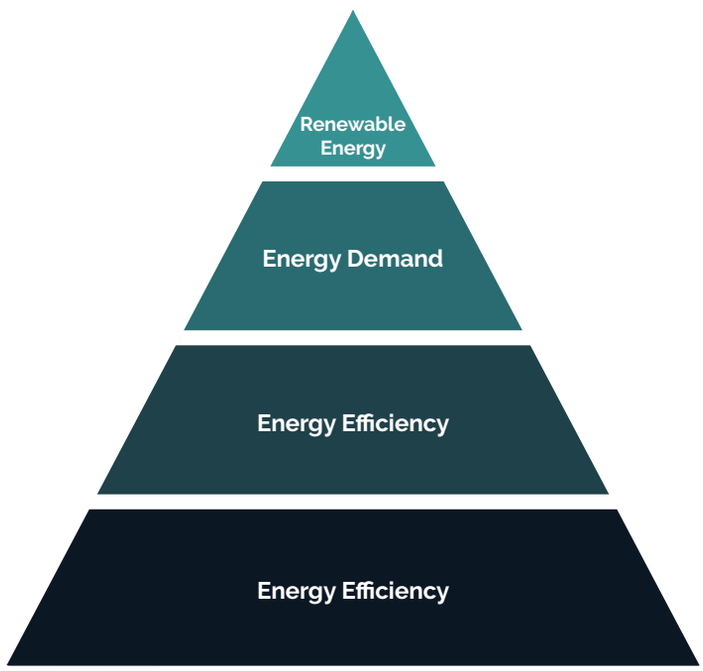
In light of the ever-developing world and its emerging economies, there is an urgent need to balance environmental and socioeconomic needs to counteract global climate change. In response to this need, the United Nations (UN) has identified seventeen Sustainable Development Goals (SDGs) aimed at protecting the planet and ensuring prosperity for all. SDG 7 aims to ensure access to affordable, reliable, sustainable and modern energy for all.[2] As such, the energy sector is key to tackling climate change and enhancing the world's environmental protection.

The objective of this policy paper is to analyze Jordan's current energy situation and reflect the Jordanian youth's perspective. As Jordan's young generation, we know that our future will be safer and more stable if our country develops concrete REEE strategies. We young Jordanians envision an integrated affordable, sustainable, efficient and independent energy system by achieving a target of 50% RE share in the energy mix by 2038.

In Jordan, 100% of the populace is supplied with electricity.[3] RE, mainly solar and wind energy, accounted for 5% of the nation's primary energy consumption in 2017,[4] and it is expected to reach 10% by 2020. [5]

As one can see from the Energy Pyramid pictured on the right, energy conservation and efficiency shall be initially promoted by reducing energy consumption and implementing best management practices. In fact, one of Jordan's 2020 strategic objectives is to rationalize energy consumption and improve energy efficiency within all sectors by 20%.[7]

Through this paper, we identified opportunities for enhancing our country's RE potential according to the following topics: energy conservation and energy efficiency; transportation sector; mainstreaming renewable energy; and opportunities for democratizing the energy sector.



Energy Pyramid[6]

2 "Sustainable Development Goal 7: Ensure Access to Affordable, Reliable, Sustainable, and Modern Energy for All." *Sustainable Development Knowledge Platform*, United Nations, https://sustainabledevelopment.un.org/sdg7.

3 "Energy 2018 – Facts and Figures." *MEMR*, http://www.memr.gov.jo/EchoBusV3.0/SystemAssets/PDFs/AR/BruchureA%202018.pdf.

4 Ibid.

5 "Annual Report 2016." *MEMR*, pg. 22, http://www.memr.gov.jo/echobusv3.0/SystemAssets/333853a2-7d89-4021-80f3-449f89707679.pdf.

6 Buffington, Dennis. "Energy Pyramid." *Penn State*, The Pennsylvania State University, 31 March 2010, https://news.psu.edu/story/169254/2010/03/31/thinking-green-energy-project-expert-urges-conservation-first.

7 "Updated Master Strategy of Energy Sector in Jordan for the period (2007-2020)." *MEMR*, 27 January, 2016, pg. 11, http://eis.memr.gov.jo/publication/policy/law-policies/283-energy-strategy.

Vision: Capitalize on Energy-efficient Solutions and Reduce our Carbon Footprint

Jordan imports most of its energy resources (oil, coal and natural gas) as energy consumption and energy intensity per capita has consistently grown over the past decade. Primary and final energy consumption in 2017[8] grew by 4.1% and 5.1% respectively as compared with 2016.[9] Moreover, the cost of total energy consumed in 2017 was around 2.429 billion JOD,[10] while it was 1.924 billion JODs in the previous year.[11] This increase in energy imports and consumption calls for utilizing new technologies to help Jordan become energy independent.

In this chapter, we will highlight energy conservation and EE as two of the highest priorities that decision-makers must consider for managing energy demand efficiently.

The main working definitions for EE and energy conservation are as follows: EE is the "key to ensuring a safe, reliable, affordable and sustainable energy system for the future. It is the one energy resource that every country possesses in abundance and is the quickest and least costly way of addressing energy security, environmental and economic challenges;"[12] and energy conservation is "any behavior that results in the use of less energy. Turning the lights off when leaving the room and recycling aluminum cans are both ways of conserving energy."[13] Thus, EE is the use of technologies that require less energy to perform the same task, whereas energy conservation is any behavior that results in reducing energy consumption. For example, between 2006 and 2010, the International Energy Agency (IEA) estimated that 11 IEA member countries avoided consuming 570 million tons of oil equivalent after investments in EE, equivalent to 420 billion USD at a price of 100 USD per barrel.[14]

Challenges:

- Slow implementation of EE plans.
- Lack of public awareness of the benefits of EE.
- Inaccessible database and lack of clear information.
- Lack of oversight in implementing Jordanian building codes.
- Need for new articles to the EE Applications Law.
- Insufficient funding for EE projects for low-income households.
- Lack of access to quality EE education, empowerment, and training.

8 "Annual Report 2017." *MEMR*, pg. 6, http://www.memr.gov.jo/echobusv3.0/SystemAssets/27837e72-d7f4-4705-a3e9-de6cf78a2a4b.pdf.

9 Ibid. 13.

10 Ibid. 6.

11 Ibid. 13.

12 "Energy Efficiency." *OECD/IEA,* https://www.iea.org/topics/energyefficiency/.

13 "Energy Efficiency and Conservation." *US Energy Information Administration,* https://www.eia.gov/energyexplained/index.php?page=about_energy_efficiency.

14 "Energy Efficiency Market Report 2013." *OECD/IEA,* pg. 55, https://www.iea.org/publications/freepublications/publication/EEMR2013_free.pdf.

EE policies, like any type of public policy, can be poorly designed, implemented and monitored. In Jordan, there are several policies that need to be reconsidered, such as Article (10) of Bylaw No. (73) of year 2012 on Regulating Procedures and Means of Conserving Energy and Improving its Efficiency, which came into effect on 1 April 2013.[15] This law states that standalone buildings smaller than 250 m2 and apartments smaller than 150 m2 do not have to install Solar Water Heaters (SWHs), thereby exempting more than two-third of dwellings from this regulation. [16]

During our research, we also found conflicting statistics and a lack of EE data. For example, after comparing the annual report issued by the Ministry of Energy and Mineral Resources (MEMR) to the National Electric Power Co. (NEPCO) report, we discovered that per capita electricity consumption in 2015 was 2,483 kWh according to the MEMR report,[17] but 2,320 kWh according to NEPCO report.[18] This discrepancy in statistics demonstrates the poor coordination between competent authorities and consequently hinders research.

In Jordan, EE application, oversight, and evaluation in building codes are severely lacking, as only less than 2% of Jordanian buildings applied the Jordanian national building code with regards to thermal wall and ceiling insulation.[19]

Recommendations:

The following recommendations will help promote EE plans:

- Seriously consider the concept of EE governance by involving the public and private sectors, as well as the local community.
- Launch mass media awareness campaigns aimed at all segments of society throughout the Kingdom, highlighting the importance, advantages, and impact of EE on the individual and country. This process will help replace old and wasteful electrical appliances and lighting.
- Coordinate student activities related to EE and energy conservation in universities and schools and include EE within the curriculum.
- Design more flexible laws to include a broader segment of society and entice everyone to use EE and energy conservation appliances, such as SWHs and LED lighting, through incentives.
- Distinguish the RE sector from the EE sector, especially in legislation, regulations, and actions, so that each sector will target a different group of investors.

15 "Bylaw No. (73) for year 2012 on Regulating Procedures and Means of Conserving Energy and Improving Its Efficiency." *MEMR*, pg. 5085, http://www.emrc.gov.jo/images/electric/energy_efficiency_systems.pdf.

16 Abu Dayyeh, Ayoub. Personal interview. 8 September 2018.

17 "Annual Report 2015." *MEMR*, pg. 12, http://www.memr.gov.jo/echobusv3.0/SystemAssets/71d249c7-b29e-4bfd-83a2-19d86ac42f67.pdf.

18 "Annual Report 2015." *National Electric Power Company*, pg. 16, http://www.nepco.com.jo/store/docs/web/2015_en.pdf.

19 Al-Hamidi, Tariq. "Study: 2% of Buildings Achieved National Building Code Requirements." *Alrai*, April 2018, http://alrai.com/article/10432320.

- Amend, update, and revise EE directives to be more flexible in accordance with the Jordanian market's ever-changing needs.
- Activate the role of the Jordanian building codes by monitoring building construction, especially with regards to roof and wall insulation, thereby reducing energy consumption and making the world a cleaner place to live.
- Promote passive design and reduce air infiltration.
- Support the Jordan Renewable Energy and Energy Efficiency Fund's (JREEEF) role and inform more people about its services and funding.
- Conduct preliminary energy audits in facilities wishing to install RE systems.
- Article (12) provides that the "Energy Efficiency Award" shall be awarded to encourage consumers to conserve energy and improve efficiency. Information about the award should be advertised through mass media as soon as possible to encourage people to participate.
- Stakeholders should focus on applying REEE measures in water pumps, as water pump electricity requirements in 2017 represented about 15% of Jordan's total electricity production.[20]

Jordanian youth has the ability to help design, evaluate and implement policies and plans at all levels of governance. They can visualize the future and help expand energy conservation and EE measures, all of which will contribute to energy security, provide affordable energy, reduce GHGs, create new jobs, and improve the populace's economic well-being.

20 "Annual Report 2017." *MEMR*, pg. 33.

Vision: Achieve an Integrated, Accessible, Affordable and Sustainable Transportation System

The transportation sector plays a significant role in driving the Jordanian economy and boosting its GDP, as well as increasing economic and social development. On the other hand, it is one of the largest and most critical sectors in which EE technologies must be applied. Furthermore, the Jordanian government must make intensive investments in this sector in the coming years and develop it through implementing major projects. This includes creating a balanced and integrated system that best utilizes existing public transportation fleets and traffic facilities, thereby forming the basis for a long-term sustainable transportation strategy.[21]

Transportation makes up 52% of Jordan's energy bill. [22] Based on Jordan's energy balance, fuel consumption in the transportation sector was 2.558 million tons of oil equivalent in 2014 and 3.184 million tons in 2016. The total net energy emissions (Net Gg of CO_2) for the transportation sector in 2012 was 7,391.60, [23] meaning that this sector's consumption continues to increase at a large, steady pace. In short, EE is sadly not part of the equation in the transportation sector.[24]

Jordan's motorized vehicle rate increased from 49 cars per one thousand people in 1999, to 63 in 2001, 67 in 2002, and 80 in 2005. Between 2005 and 2008, vehicle registrations in Jordan grew by 25%,[25] while the public transport fleet numbered 24,144 vehicles by March 2018, with 0.7 buses per a one thousand people. Additionally, the public transport fleet's average operational life is 9.8 years.[26] Capital investment for 2016 was 20.170 billion JOD. [27]

Electric vehicles (EVs) are one of the most energy efficient technologies in this sector. EVs convert about 59%–62% of electrical energy from the grid to power the car's movement, while conventional gasoline vehicles only convert about 17%–21% of the energy stored in gasoline. According to Land Transport Regulatory Commission (LTRC) statistics, the total number of electric and hybrid cars was 12,406, 151716 by mid-2018.[28] The success of hybrid cars in Jordan has reassured many people about the feasibility of investing in EVs. However, the future depends primarily on the laws and regulations enacted by the government to find the best solutions for promoting EVs over conventional cars.

21 "Public Transportation Policy Document." *Ministry of Transport,* http://www.mot.gov.jo/Pages/viewpage.aspx?pageID=121.

22 Shbeb, Lina. "Jordan: Public Transportation through Hybrid Cars to Save Energy." *Watan News Agency,* 29 January 2015, http://watananews.com/jonews/watana/104541.html.

23 "Jordan's First Biennial Update Report." *United Nations Development Programme,* http://www.jo.undp.org/content/jordan/en/home/projects/jordan_s-first-biennial-update-report.html.

24 "Energy Balance Document 2017." *MEMR*, http://www.memr.gov.jo/echobusv3.0/SystemAssets/86096887-5c42-47e8-b543-3c8c04aa4994.pdf.

25 "Amman TMMP Final Report." *Greater Amman Municipality*, http://www.mediafire.com/file/0q9n2w8208mqpc4/Amman+TMMP+Final+Report.pdf.

26 "Quarterly Report for the Months of January, February, and March 2018." *Land Transport Regulatory Commission*, http://www.ltrc.gov.jo/sites/default/files/ltqryrlrby_lwl_2018_rkb_1.pdf.

27 "Development of Urban Transport System in Jordan Report." *LTRC*, http://www.ltrc.gov.jo/sites/default/files/1_ltrc_development_of_urban_transport_system_in_jordan.pdf.

28 Ibid.

Challenges:

The transportation sector in Jordan faces many challenges, from a lack of information, research, laws, and legislation in this sector, socioeconomic aspects, to challenges facing the transition to EVs.

As for information and studies, the last integrated transportation study was conducted in the mid-1980s, and the recommended strategy from the study was never even implemented. [29] On the policy level, public transportation does not seem to one of the state's priorities, as the vehicles driven on any public road often belong to private citizens. Such large numbers of cars are very difficult to manage efficiently, and certain improvements are difficult to implement under such an ownership paradigm. [30] In regards to the economic aspect, there is very little investment in public transportation. In 2008, public transportation made up only 2.8% of all vehicles on the road and 14% of all trips made in Amman. There is a social perception of buses as only a means of transportation for low-income groups, which hurts public transportation's general appeal to potential passengers.[31] As for EVs, the new government imposed a 55% special tax on hybrid cars regardless of engine capacity and a 40% tax on hybrid cars that replace old vehicles. [32]

Recommendations:

The following points aim to achieve a future energy-efficient transportation system in Jordan:

- Establish an integrated and sustainable public transport system between all the Kingdom's governorates through completing major public transport projects, such as the Bus Rapid Transit (BRT). Other new projects should also be started, such as the Light Rail Transit (LRT) and underground metro networks (subways) to reduce the number of private cars and increase the demand for public transportation.[33] Rehabilitating and activating the railway as an official means of transportation covering all the governorates should be a top priority for the government.

- Another priority for policy-makers should be public transportation. Increasing the government's ownership of public transport would make dealing with regulators easier, since it is easier to deal with a handful of operators rather than with thousands of them, as is currently the case. In addition, large-scale operators will be able to benefit from economies of scale in running their operations. This would allow them to bring down operating costs per passenger or distance covered, as well as improve services that small operators cannot afford. [34]

- Provide a strong infrastructure for EVs by increasing the number of charging stations

29 "Amman TMMP Final Report." *Greater Amman Municipality*, http://www.mediafire.com/file/0q9n2w8208mqpc4/Amman+TMMP+Final+Report.pdf.

30 Ibid.

31 Ibid.

32 Maani, Yanal. "Customs Circular on Hybrid Vehicles." *Ammon News Agency*, 6 January 2018, https://www.ammonnews.net/article/349102.

33 "Public Transportation in Jordan: A Policy Study Report." *Center for the Study of the Built Environment and Friedrich Ebert Foundation*, https://static1.squarespace.com/static/5671433fc647ad9f55531f40/t/58c7cc2a6b8f5ba6ce63ec68/1489488942230/Public+Transportation+in+Jordan+-+A+Policy+Study+Report.pdf.

34 Ibid.

to allay fears over the EVs breaking down due to empty batteries. Additionally, energy storage technology must be developed. Governmental incentives, such as tax and customs exemptions for EVs and hybrid cars, are not sufficiently available throughout the country.

- Introduce the idea of carpooling, which reduces each person's travel costs in terms of fuel, tolls, and stress. Carpooling is also a more environmentally friendly and sustainable way to travel, as sharing rides reduces air pollution, carbon emissions, traffic congestion on roads, and the need for parking spaces.

- Invest in more scientific research and innovative ideas related to this sector based on an organized approach for collecting, documenting and recording information as objective analytical observations free from emotion and bias.

We hope to transition from private cars to public transportation, from taxis to carpooling, from buses to the BRT and metro, from fossil fuel and energy drain to REEE and conservation technologies. There are now more transportation options than ever before, but we need to reduce the energy bill by achieving a balanced and integrated public transport system.

MAINSTREAMING RENEWABLE ENERGY

By: Leen Baddar and Yousef Awawdeh

Vision: Transition to Renewable Energy – Faster, Better and Bolder

The RE sector has witnessed a surge of technological advancements, improving the overall cost-effectiveness and applicability of large-scale RE developments. Despite the global shift towards clean energy generation, Jordan remains profoundly dependent on imported fossil fuels.

In 2017, 94% of Jordan's energy was imported,[35] meaning that the country's energy security relies heavily on the political stability of neighboring counties. Since Jordan is at the center of a crisis-torn region, energy independence should be recognized as one of the nation's upmost priorities.

Jordan has made considerable efforts towards revitalizing RE as part of its energy mix, particularly through setting a 10% target by 2020 and an additional target of 10% by 2025. With climatic conditions exhibiting a solar irradiance of 5-7 kWh/m2 for 320 days/annum [36] and wind speeds ranging between 7-9 m/s, Jordan is highly suitable for RE developments.[37] Currently, the energy sector has only reached the 6%-mark, casting doubt on the extent to which these milestones can be achieved. Moreover, the third round of direct proposals for solar PV and wind projects was cancelled and then later relaunched, thereby hindering the progress of said goals.[38]

35 "The Country Situation Report." *The Social and Economic Council*, 2018 pg. 2.

36 Zafar, Salman. "Solar Energy in Jordan." *EcoMENA*, 4 July 2018, https://www.ecomena.org/solar-energy-jordan/.

37 "Annual Report 2015." *MEMR*, pg. 12, http://www.memr.gov.jo/echobusv3.0/SystemAssets/71d249c7-b29e-4bfd-83a2-19d86ac42f67.pdf.

38 Roscow, Andrew. "Developers Work on Jordan Renewable Energy Submission." *MEED*, 8 November 2018, https://www.meed.com/developers-work-jordan-renewable-energy-submissions/

Nonetheless, mainstreaming RE will prove to be challenging, especially with existing Power Purchase Agreements (PPAs) constraining the possibility for introducing an adaptive approach to energy management (e.g. the 15-year gas supply agreement with Israel, or the scheduled Basra-Aqaba oil pipeline). The opportunistic costs of these projects have failed to consider the intrinsic socio-economic benefits associated with potential RE projects.

The current REEE Law of 2012 and its amendments have established two main schemes for REEE projects:

1- Direct Proposals for large scale projects, which sell electricity to the government on a fixed-term basis (PPA).

2- Net-Metering for small to medium-scale projects connected with distribution networks, where consumers are allowed to generate electricity to compensate for their own actual demand. Normally, generating systems are connected directly within the consumer's vicinity, but other locations may be considered as well (as per Wheeling regulations).[39]

Challenges:

Regardless of the RE legislative framework in Jordan, there is a persistent challenge with regards to the technical, social, and institutional dimensions of mainstreaming RE. The lack of unified and consistent data, as well as dysfunctional inter-ministerial and cross-sectoral coordination, has discouraged a well-informed decision-making process.

The main technical issues affecting RE progress include national energy overproduction and the intermittent nature of RE. The electric grid is already over-stressed, and it would be risky to add installations that overlap with existing electric systems that can no longer handle a power surplus.[40] Intermittency could also adversely impact the overall electric system by rendering it unstable.

With a commitment to promoting cleaner energy sources and a sustainable code of conduct, we could effectively mitigate the aforementioned challenges by devising new transformative strategies for our energy infrastructure.

Recommendations:

- 50% renewable energy in the total mix of energy by 2038.
- Decentralize the national grid to accommodate more energy contribution.
- Use zero feed-in technology, build more storage stations, and export energy to neighboring countries.

39 "Wheeling of Electric Power Regulations, 2015." *National Electric Power Regulatory Authority*, https://www.nepra.org.pk/Legislation/Wheeling%20of%20Power%20Regulations.pdf.

40 Zeidan, Reham. "The Capacity of the National Electricity Grid is Limited in Absorbing the Production of Renewable Energy Projects." *Al Ghad*, 6 July 2015, www.alghad.com.

- Projects like the Green Corridor can be beneficial at this stage, so we recommend having another corridor in the eastern part of Jordan.

- Due to intermittency problems, pump water to a higher point and release it at night to move turbines.

- Hybrid systems can be very efficient, and concentrated solar power technologies are also considered more efficient than PV systems. Both could help with the energy storage problem.

Through these recommendations, we can attain a higher percentage of renewable energy production in the energy system, which should be a priority for helping Jordan become energy independent. People also have the right to access clean energy and affordable electricity technologies, which will be discussed further in the next chapter.

DEMOCRATIZING THE ENERGY SECTOR

By: Amjad Khashman and Kareem Shukri

Vision: Bring Clean Energy to the Masses and Employ Self-reliance Tools

The way we develop and utilize our national infrastructure directly impacts sociopolitical and environmental dynamics. This section conceptualizes an energy sector that advocates the fundamental principles of energy justice, namely our right to shape future energy systems.

In principal, such an energy transition occurs through a bottom-up approach that requires comprehensive knowledge of day-to-day societal interactions with underlying energy systems. Regulators and policy-makers who engage with local communities have an opportunity to encourage low-carbon practices and tackle climate change issues. Consequently, this integrative, grassroots approach effectively minimizes the risks of public resistance and intrusive energy consumption.

Jordan has witnessed remarkable advancements in implementing RE technologies in the field of electricity production over the past few years. By the end of 2018, the generation capacity for both wind and solar projects are expected to be 961 MW.[41] However, only one-fifth of this capacity comes from small systems, and a smaller fraction of that represents projects serving only small-consumers. A majority of the general public is still not able to fully and equitably access Jordan's promising RE in Jordan, as priority is constantly given to international investors who currently dominate the energy market with colossal RE projects and fixed-term agreements.

In light of these perspectives, democratizing the energy sector will allow citizens to exploit RE resources by developing decentralized systems and realizing their right to secure a supply of reliable, clean, and cheap energy. For example, the farmer's life will be much easier if he no longer has to concern himself with the cost of pumping water, as would the blacksmith's when he can use the latest energy-dense equipment without worrying over his monthly electricity bills.

41 "Annual Report 2017." *NEPCO*, http://www.nepco.com.jo/store/docs/web/2017_en.pdf.

Democratization depends on a well-informed citizenry to make reasonable decisions on what strategic direction the Jordanian energy sector should take. Many organizations and NGOs, such as EDAMA, have actively conducted awareness campaigns and capacity-building workshops within this field. However, there seems to be a lack of interest in research and on-the-job training. All in all, we must bridge the gap between educational programs and the industry.

Challenges:

- Establish the necessary infrastructure and regulative framework for small-consumers to independently meet their energy needs.
- Address the urgent need for educating consumers on their rights to cleaner energy sources and the impact of their consumption patterns.
- Lack of state plans to mainstream democratization/decentralization.

Decentralizing RE projects requires a shift form large-scale projects to smaller, community-based projects. Decentralized systems normally include local loads of great technical value. Thus, the decentralized approach can relieve the grid of congestions caused by centralized power plants. Moreover, these systems do not need significant upgrades to the grid. They also eliminate transmission losses, since the generated electricity is consumed at nearly the same exact location.

Recent developments in energy storage technologies can further boost decentralization efforts by allowing the storage and discharge of excess energy as needed. As this technology is relatively new, there are no existing laws or regulations for using grid-tied storage. Smart and micro grids are other necessary technologies for a successful decentralization process. Likewise, digital active meters and the internet of things can make balancing between energy generation and demand much easier. These grids increase the grid's stability and, consequently, the resilience of the whole electrical system.

The decentralization approach will also bring more value via job creation and local involvement. In this regard, smaller local contractors and suppliers will handle these projects, as opposed to international and foreign contractors in the case of centralized, large-scale projects.

Further action, however, is required on the education front. Higher education institutes need to become more connected to the industry. Researchers can benefit greatly from data and measurements gathered from existing renewable energy projects. Additionally, these existing projects represent an excellent opportunity for students to receive hands-on training and apply their theoretical knowledge. Schools also provide a great platform for promoting energy democratization. In Jordan, many schools already have renewable energy systems from which students can learn about their technical and social importance. Moreover, the curricula need to include sufficient information about renewable energy and its potential.

Several financing institutions offer interest-free loans and subsidies for small-scale RE projects.[42] The Jordan Renewable Energy & Energy Efficiency Fund (JREEEF) is one of the most prominent institutions working to democratize the energy sector. JREEEF actively coordinates with civil

42 "Renewable Energy Loans." Cairo Amman Bank, www.cab.jo/ar/service-details/264.

society organizations[43] and labor unions[44] to implement a wide-range of projects, including solar thermal collectors, PV systems, improved insulation, lightning and energy audits in public schools.[45] Some areas within JREEEF's mandate, however, require further reinforcement, namely in raising awareness and supporting research and training efforts in educational institutions.[46]

Recommendations:

The recommendations are divided between short-term and long-term goals:

Short term:

- Minimize connection capacity allocated to large-scale projects and promote the establishment of smaller community-based RE systems. This could be accomplished through pilot projects aimed at examining the applicability of such systems.
- Develop the regulative framework and policies for small-scale storage systems.
- Link higher educational institutes with developers to launch innovative programs for developing decentralized RE systems.
- Educate students on becoming energy leaders and develop the appropriate curricula.
- Support JREEEF's mission by allocating more funds, launching awareness campaigns, encouraging innovative RE projects, conducting research, and incubating entrepreneurs.

Long term:

- Introduce feed-in tariff schemes for small RE systems.
- Include a decentralization and democratization scheme within the NREAP – currently in the drafting phase - and the NEEAP.
- Include storage systems under the JREEEF's subsidized funding schemes.

43 "200 Civil Organizations Benefit from JREEEF Services." *Jordan News Agency*, 11 July 2018, http://www.petra.gov.jo/Include/InnerPage.jsp?ID=11185&lang=ar&name=governorate_news.

44 "JREEEF Signs Agreements with Engineers and Journalist Unions." *Alrai*, 18 October 2017, https://bit.ly/2yvSa9L.

45 "JREEEF Implements Consumption Efficiency Measures in 58 New Schools." *Al Ghad*, 2 May 2018, https://bit.ly/2NceYo9.

46 "Bylaw 49 of Year 2012: Renewable Energy and Energy Efficiency Fund Bylaw." *MEMR*, http://www.memr.gov.jo/EchoBusv3.0/SystemAssets/PDFs/AR/Regulations/.

In conclusion, we, the youth of Jordan, acknowledge the challenges and opportunities that Jordan's energy sector faces. Remarkable progress has been made in RE utilization at the national level, where clean energy sources (solar and wind) have clearly proven their worth in Jordan by providing technical and economic benefits. However, their share in the country's total gross energy consumption is still considerably low, as it contributes only about 2% to the total energy mixture.43 Considering that energy demand is still high and always on the rise, it is crucial to continue the current efforts to reform existing measures, modify the already agreed-upon political and regulatory conditions, and implement plans to utilize new technology in the short and long terms.

We who contributed to this paper worked hard to address the energy sector's main challenges through the four main topics. In response to the challenges that lie ahead, we made recommendations meant to raise the voices of the Jordanian youth and provide strategies for tackling those challenges. The analysis summarized possible laws, regulations, and ideas to improve the current approach to climate change, avoid risks in the energy sector, and make Jordan more resilient in the future. We also explained the socioeconomic consequences of tackling these issues, such as shifting to RE to decrease Jordan's energy dependency, as well as improving transportation in a sustainable, equitable way. All in all, by addressing climate change and the challenges at the individual, national, and international levels, we underscored the need for united action on these fronts in order to protect our nation and world.

In order to achieve an impactful change, it is important to address common interests and cooperate with other countries throughout the MENA region facing similar energy sector issues. Such regional cooperation can be accomplished through collaborating with energy experts, engaging the private sector, and implementing regional projects together. In this way, we will ensure not only the survival of our and future generations, but also that of the entire planetary ecosystem.

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Conclusion

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Germanwatch: Observing. Analyzing. Acting.

Germanwatch is an independent German environmental organization advocating for sustainable global development, understood as socially equitable, ecologically sound and economically stable development. Germanwatch works on solutions to the global climate crisis. We are interested in sharing best practices and experience on energy transitions between Germany and other countries. The Middle East/North Africa (MENA) region is a focus region for our work. We aim to promote new partnerships between Europe – particularly Germany – and countries in the MENA region to enhance energy transitions and benefit from increased prosperity, regional stability, and reduced climate change impacts.

Friedrich Ebert Stiftung - Climate & Energy Project MENA

The Friedrich-Ebert-Stiftung (FES) is the oldest political foundation in Germany with a rich tradition in social democracy dating back to its founding in 1925. The work of our political foundation focuses on the core ideas and values of social democracy – freedom, justice and solidarity. As a non-profit institution, we organize our work autonomously and independently. Our regional climate and energy project brings governments together with civil society organizations, provides policy recommendations based on research, and encourages a strong regional agenda for global negotiations. Battling against climate change and promoting of REEE in MENA cities are at the core of this Amman-based project.

Green Generation Foundation

The Green Generation Foundation (GGF) was founded in 2014 as a youth environmental Organization. It aims to empower a new generation of young Jordanians able to adapt to and understand ongoing worldwide environmental changes, as well as create future leaders with the skills to solve environmental and climate-related challenges. GCF also strives to empower, encourage, and mobilize the youth in environmental issues through developing their abilities to analyze environmental problems and find practical and implementable solutions to solve them. This is done through elevating these young leaders' understanding of climate crises via education and advocacy.

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