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TRANSITIONS TO RENEWABLE ENERGY AND SUSTAINABLE PROSPERITY IN LEBANON:

Why Democratic Infrastructure Supports
Innovative Energy Projects



FOREWORD

Displaced people and climate change are two of the biggest challenges facing Lebanon's future prosperity. They are also two opportunities that, if responded to through the uptake of renewable energy options, could produce a thriving economy in Lebanon. A renewable energy transition would utilise the skills of an increasing population, the country's natural resources, and provide energy resilience. It is not just about changing energy patterns but creating value for communities by reformulating public services to improve prosperity for all residents.

Our first workshop, *Transitions to Renewable Energy and Sustainable Prosperity in Lebanon: A People-Centred Approach to Equitable Energy Supply*, held jointly with Chatham House in January 2019 explored Lebanon's choices beyond the traditional top-down structural reforms to limit exposure to carbon risk and follow a cleaner pathway to sustainable energy. Energy supply must be addressed by utilising the understanding and expertise of the communities facing these crises, and those who are already benefitting from innovative, decentralised energy projects helping set them on their own pathways to prosperity. New and existing models of energy delivery must recognise communities' energy needs across various contexts, taking into account socioeconomic conditions and self-defined aspirations for achieving prosperity.

Building on our first publication, this second report explores the role of municipalities, the role of education and the future scenarios we can imagine for Lebanon's energy supply in the context of the climate emergency. Recent research shows that Lebanon could witness an increase of 1.2 to 3.2 degrees in temperatures in areas that are already very arid and suffer from water shortage. An increase in temperature and a decrease in precipitation will have particular impact on the electricity sector - a higher cooling demand in summer and increased consumption for electricity. Rising sea levels and water scarcity in Lebanon could lead to internal climate migration and mass displacement from rural to coastal regions affecting agricultural output, jobs and livelihoods. The economic situation in the cities that are already prone to poverty, illiteracy and unemployment could become worse.

National energy provision systems planning assumes energy access improvement through extension of the electricity grid. However, alternative

microscale technology at the household, community and municipality level means that the transition can take place at different scales. Microscale renewable energy allows energy sovereignty by providing independence. Access to electricity through decentralised generation renewable energy systems could have transformative impacts both in terms of directly improving the everyday lives of people at the household level and enabling them to be recognised as urban citizens with rights and claims, through the provision of services. There are many creative and informal ways that local communities and municipalities have been able to compensate for the lack of a comprehensive, consistent and reliable provision and storage of energy in Lebanon. These could contribute to a transition to renewable energy that does not solely rely on government-level political structures, or one that adds to the resilience of centralised power. However, more awareness and understanding of the environmental impact of energy systems at the municipality level is needed. This could have significant impact on access to energy for households living in informal settlements in Lebanon in particular and open up opportunities for job creation, social inclusion and opportunities for women's empowerment.

Lebanon is burdened with significant public debt which prevents it from investing in infrastructure and its huge fiscal deficit is partly caused by large subsidies of conventional energy. Renewable energy could provide a way forward here through the production of cheaper energy and reduced subsidy.

For this workshop, the second in our series, we partnered with Chatham House and UN Economic and Social Commission for Western Asia (ESCWA).

As you will see in the following report, Lebanon could benefit from a democratic infrastructure to allow people to participate in the decision-making process locally. The influence of climate change on general social instability is intimately and inextricably linked to energy and public services more broadly. Such instabilities can play a part in leading to mass exodus, the consequences and management of which is hugely demanding for the populations and countries involved. Renewed thinking on energy transition has much to offer.

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INTRODUCTION

With a rapidly changing commercial outlook for both fossil fuels and other alternative sources of energy, it is timely to consider how Lebanon, as a potential oil and gas producer, can limit its exposure to carbon risk and follow a cleaner pathway to sustainable energy through optimised models for energy and economic diversification.

The first workshop explored the transition to renewable energy in Lebanon, held by the IGP RELIEF Centre and Chatham House in January 2019, and discussed these issues by asking what choices Lebanon might have beyond the traditional top-down structural reforms in view of the evolving crisis response and resilience approach.

Discussions showed that there is great potential to support people's needs through place based and people-centered approaches, learning from what had worked in parts of Lebanon and elsewhere in the region. There was a strong emphasis on considering the economic and political economy realities that projects would need to engage with in order to be implementable and sustainable.

The second workshop in September 2019 took place just three weeks before protests erupted. Indeed, on the morning of the workshop, petrol station workers had gone on strike and frustration over a deteriorating economic situation was palpable. Across the social media forums and public demonstration platforms, protestors cited energy shortages a quality of life issue that had become untenable.

Several interests and paths forward were defined at the end of the workshop, including the desire to understand more from the point of view of local government; how people could be better educated in energy use and the available options to them; and how scenarios could help national and local policymakers to make robust decisions regarding energy.

Building on this, the second workshop focused more deeply on the role of municipalities, the role of education and the future scenarios we can imagine for Lebanon's energy supply in the context of the climate emergency. The participants in the meeting included more representation from local civil society groups and municipalities and two mayors from rural regions.

PREFACE

This paper is based on a discussion around the transitions to renewable energy and sustainable prosperity in Lebanon held at a workshop in Beirut, Lebanon on 23 September 2019, as part of Beirut Energy Forum. The paper was prepared by Dr Ala'a Shehabi at the Institute for Global Prosperity (IGP), University College London, RELIEF Centre, UN, with input from Glada Lahn at Chatham House.

This was the second in a series of workshops exploring the transition to renewable energy in Lebanon. at the UN-House in collaboration with UN Economic and Social Commission for Western Asia (ESCWA) and Chatham House. The workshop fell within the framework of the “Regional Initiative for Promoting Small-Scale Renewable Energy Applications in rural areas of the Arab Region (REGEND)” and showcased some of ESCWA’s regional pilot projects in rural areas in Lebanon, Jordan and Tunisia. Speakers and power point slides can be accessed on the ESCWA website.

The first workshop, Transitions to Renewable Energy and Sustainable Prosperity in Lebanon: A People Centred Approach to Equitable Energy Supply, explored the transition to renewable energy in Lebanon, held by the IGP, RELIEF Centre and Chatham House in January 2019, and discussed these issues by asking what choices Lebanon might have beyond the traditional top-down structural reforms in view of the evolving crisis response and resilience approach.

All quotes are taken directly from participants of the workshop. Discussions were based on Chatham House rules, but the main panel presentations were not.

WHAT SHOULD LEBANON BE DOING TO CURB EMISSIONS?

The world needs to curb its carbon emissions by 49 percent by 2030 as well as achieve 100 percent carbon neutrality by 2030 to avoid the extremes in climate further increases in global temperatures will produce (Kai, 2019). Furthermore, 85 percent of global energy production must transition to renewable and sustainable sources by the year 2050 (Kai, 2019).

In 2015, Lebanon presented its commitment to increase by 30 percent its share of renewables by 2030 as an unconditional target across four major sectors: electricity, transport, deforestation, and waste (Kai, 2019). Its 2015 internal sectoral targets include improving waste management efficiencies by through energy recovery, increases in the recycling of wastewater as well as addressing the improvement of the function of its forests by planting 20 million trees by 2030 (Kai, 2019). Targets in transport focus on increasing the usage of hybrid and electric vehicles, encouraging car sharing, and making improvements to public transportation (Kai, 2019).

As one of our workshop participants noted:

“We know that there are different ways of looking at the issue in a region like ours. Negotiators on climate change like to say that we are not the biggest contributors to CO2 emissions so therefore we don’t have to change and that fossil fuels are our lifeline. It’s our economy. We really need to rethink this. On the other hand,

we find that the role of renewable energy is growing and the share of renewable energy in the energy mix is growing. We have to become part of this change.”

In 2016, Lebanon signed the Paris Agreement and pledged to reduce its carbon emissions (Kai, 2019). The Lebanese government viewed this pledge as an opportunity to resolve its energy crisis in a sustainable and economically viable manner by seeking funding and technical assistance.

LEBANON UNDER CLIMATE CHANGE: WHAT TO EXPECT IN 2030?

The following section is based upon a presentation by Lea Kai, Project Manager of Climate Change Projects for United Nations Development Programme (UNDP)/ Ministry of Environment. The presentation slides and statistics can be accessed on the [ESCWA website](#).

According to Kai (2019), Lebanon is currently responsible for producing 0.7 percent of global emissions. Baseline data on Lebanon's emission productions shows that 86 percent of emissions come from energy production and transport (Kai, 2019). Globally, these two sectors alone account for about 75 percent of all carbon emissions (Kai, 2019). Investing in transitioning to transitioning these sectors to renewable and sustainable energy sources is where the biggest improvements can be made. For example, it is assumed that by shifting from relying upon the import of crude oil, gas, and diesel to using natural gas emissions can be reduced by one third (Kai, 2019). Internal sectoral targets set by the Lebanese government in 2015 aim to achieve its renewable energy targets by prioritising energy efficiency as well as the refurbishment, replacement and retrofitting of existing power plants (Kai, 2019).

There are, however, enormous challenges to be overcome in order to make this a reality. The impact of extremes in temperature and precipitation will continue to feed what is an already vicious cycle that encourages the consumption of fossil fuels. Increases in temperature and decreases in precipitation particularly impact the electricity sector as demand is higher. The financial toll of increases in the cost of electricity impacts the government and citizens alike. Kai (2019) notes that current projections put energy bills up by 3.8 percent to 5.8 percent in addition to the 7 percent normal increase in energy demand by 2030. Drought conditions will additionally result in a reduction in water supply for hydroelectricity and will have knock-on effects on agricultural output (Kai, 2019).

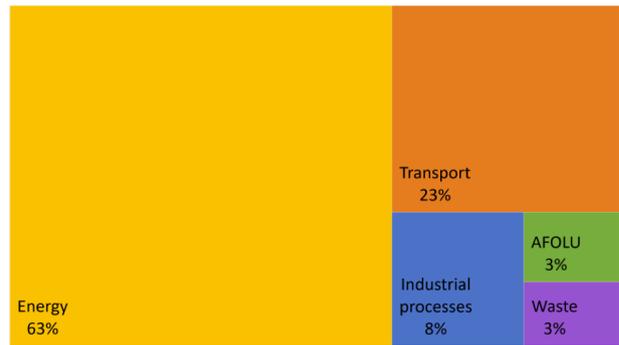
Recent research shows that Lebanon could witness an increase of 1.2 to 3.2 degrees in temperatures specifically in the Bekaa and Akkar, areas that are already experiencing water shortages (Kai, 2019). An increase in the frequency of extreme weather events will change the intensity and the geographical span of rainfall throughout Lebanon. Although there will be an increase in precipitation, the rainfall will be of a much shorter duration, for example, two weeks' worth of rain over a two-day period (Kai, 2009). This will allow very little time for groundwater absorption and will contribute to surface runoff (Kai, 2019).

The human toll cannot be understated in terms of the impact on the quality of life for those affected by adverse climate events. The changing temperatures would result in fifty thousand deaths every year from a cold spells and warmer summers that would hit the most vulnerable populations (Kai, 2019). A reduction in agricultural output for regions like the Bekaa will drastically reduce the earning of farmers and workers and related industries to as much as 45 percent of expected income (Kai, 2019).

In the future, there is the additional challenge of growing numbers of climate-related (alongside non-climate related) cross-border and national migration. Internal migration from rural to coastal regions is compounded by expected rises in sea levels and increases in rural and urban flooding in Lebanon (Kai, 2019). The projected changes in temperature and precipitation will antagonize existing environmental problems with results that will overwhelmingly impact the most impoverished. Tackling the climate emergency requires addressing the social problem of jobs and livelihoods in tandem with improving in a sustainable and profitable manner the economic situation in areas that are prone to poverty, illiteracy, and unemployment (Kai, 2019).

The challenges ahead of us are technical and complicated in terms of coordination across stakeholders at the level of the Ministry of Environment. While there is funding available for Lebanon through multilateral funds or even bilateral donors, there are still challenges in mainstreaming technologies. Regardless, it is important to prioritise dealing with transparency, institutionalising reporting and implementation, and the pursuit of Lebanon's development agenda through the climate change lens.

Lebanon's GHG emissions 2015



(Kai, 2019)

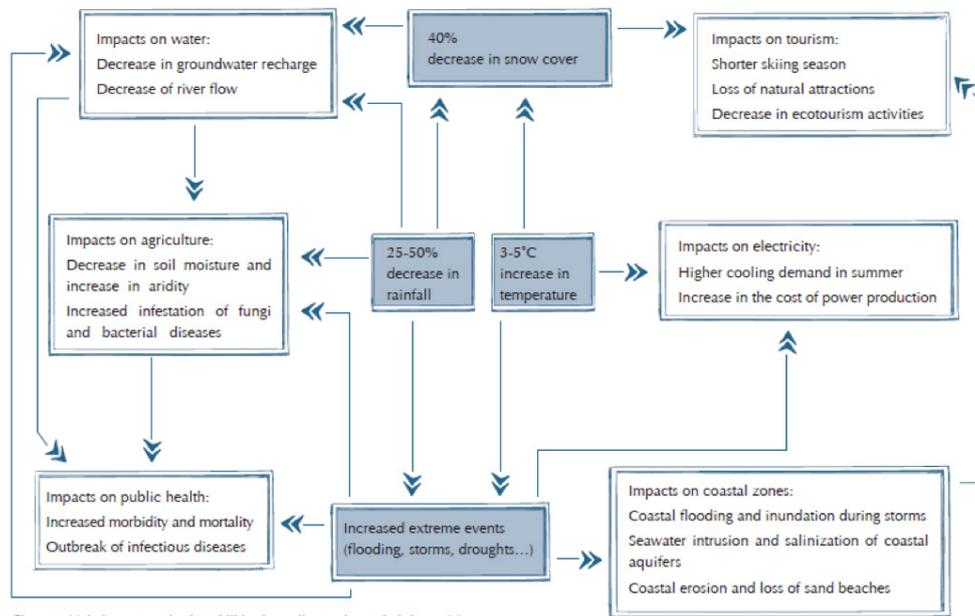


Figure 5: Main impacts and vulnerabilities from climate change in Lebanon⁽¹⁾

(Kai, 2019)

2015 Internal sectoral targets by 2030 Mitigation	Energy	Transport	Waste	Forestry
	Refurbishment , replacement and extension of conventional power generation capacities Fuel switch to natural gas	An unconditional 36% stabilization of the share of annual passenger-kilometers driven using public transport , increases to 48% conditional to support	Waste management through energy recovery , equivalent to avoiding emissions from landfilling at 1,000 tonnes per day	An unconditional target of 20 million trees planted , increases to 26 million trees conditional to support
	An unconditional 3% reduction in power demand through Energy Efficiency measures, increases to 10% conditional to support An unconditional 15% increase in the share of Renewables in meeting heat and power demand, increases to 20% conditional to support	A conditional 20% increase in the share of fuel-efficient vehicles in the fleet	An unconditional recycling rate of 25% , increases to 30% conditional to support An unconditional treatment of 51% of municipal wastewater , increases to 70% conditional to support	Improvement in the function of Lebanon's forests as a sink

(Kai, 2019)

INTEGRATING RENEWABLE ENERGY TECHNOLOGY AT THE MICROSCALE LEVEL IN URBAN AND RURAL SETTINGS, AND MEASURING ITS IMPACT ON COMMUNITIES AFFECTED BY MASS DISPLACEMENT

The following section includes a summary of discussion points raised by workshop participants. Find more information about the workshop as well as supporting slides on the [ESCWA website](#).

National planning for energy provision systems in Lebanon assumes there will be energy access improvement through the extension of the national electricity grid. There are a wide set of technologies, practices and infrastructures to employ to begin a substantial transition to renewable and sustainable energy production in both an urban and rural settings. Integrated solutions, new business models and greater local ownership were highlighted as key success factors for the energy transition in other countries, which Lebanon can learn from. However, it was pointed out that there must be stakeholder engagement and positive capacity-building must accompany efforts to introduce new technology in the context of poor governance. “To have municipalities on board, you really need to empower them and build capacity to ensure the sustainability of anything that is done” said one participant.

Discussion concentrated on the potential role of municipalities. This raised two salient questions:

1. Could municipalities themselves be producers of energy to their communities and the grid?
2. How would the energy grid be transformed if one public or private body was permitted to sell electricity to another public body?

At a time when municipalities need the most support, it was pointed out that the current economic climate means that they in particular end up suffering. “Funding is now in a crisis - we are in the middle of an economic situation that’s very difficult and probably is going to get more difficult,” one participant noted. “Municipalities do not get the budget that they are due every year from the national government in a timely systematic manner so that they can carry out various services for their villages. They cannot borrow because you can only borrow when you have a certain income coming in

that can pay off the money that you will borrow”, explained another. Many UNESCWA assessments have found communities in other Arab regions left behind in terms of independence and access to funding, information, and tools to enact a transition to renewables.

There is the singular example of the municipality of Zahle, which runs its own independent power system grid serving 250,0000 residents, although this is an exception. Other Lebanese municipalities do not have a constitutional mandate to provide energy services (Zahle had a unique concession given to it over 100 years ago before its expiry in 2018). While the willpower at the municipal level might be there, a legal barrier exists that prevents municipalities from producing electricity. As one participant noted,

“There are many municipalities who are really eager to develop energy efficiency and renewable energy and they know specifically that there are many municipalities that are ready to build solar farms in order to generate electricity. But ... theoretically it’s not the role of municipalities ...”

The funding that has been available for the improvement of energy has historically been for small scale projects such as demonstrations, pilot programs, or studies carried out with limited resources. Getting the funding for these projects often requires a great deal of lobbying with politicians and private entities. Attracting funding from private donors can be problematic as money is expected to be spent and to generate returns within short timeframes. However, one participant mentioned a case where the donor community was

eventually persuaded by a UN agency to commit to more long-term solutions after first funding the installation of solar street and home system solutions at the municipal level (workshop, 2019). *“We were able to install solar PV systems on larger scale sites like hospitals and schools that we know will last 10, 15 to 20 years.”*

Despite current setbacks, alternative microscale technologies available at the household, community and municipality level mean that the transition to renewable and sustainable energy forms can take place at different scales. There are many creative and informal ways that local communities and municipalities have been able to compensate for the lack of a comprehensive, consistent and reliable energy provision and storage in Lebanon. They could contribute to, and make more likely, a transition to renewable energy that does not solely rely on government-level political structures, or one that adds to the resilience of centralised power. This could have significant impact on access to energy for households living in informal settlements in Lebanon in particular, which are further restricted as the government is not responsible for their energy services. So far, energy provision in these areas has tended to fall to individual families and the humanitarian and development agencies working in the area.

Micro-scale technologies also open up opportunities for small business job creation, social inclusion, and opportunities for women’s empowerment. Participants from United Nations Development Programme (UNDP) have worked with municipalities in Lebanon on several medium scale pilot projects, and reported that municipalities have been increasingly demanding sustainable biomass resources to provide heating for rural homes as well solar street lighting which have been rolled out under the National Energy Efficiency and Renewable Energy Action Plan (NEEARP). In order to meet Lebanon’s renewable energy (RE) targets, the UNDP has also taken a sectoral approach. They are currently working with the Lebanese army, for example, to make them more sustainable by drafting a sustainable energy strategy that aligns their targets and objectives to Lebanon’s climate change objectives.

One of the biggest benefits of microscale renewable energy is greater energy independence. By reducing dependence on the grid and on the central government’s energy services/systems, the decentralization of energy production can provide greater protection from externally influenced price and supply disruption.

There is a demonstrated need for integrated solutions that work in terms of functionality, design and funding so as to not leave anyone behind. Examples of the improvements these microscale technologies can make when they take into account these factors include the experience of a participant representing an NGO who described working with a women’s cooperative:

“We installed a PV system on a women’s cooperative in the south of Lebanon. This cooperative needed a lot of machines to run their operations. They only had a very little generator but after installing the PV system for them their condition improved. They had less manual labor so less physical pain, more time spent with their family, more diversified products, more income and so forth. So, this highlighted that decentralized renewable energy is not only a good solution for the environment but also for the social aspects; for woman and power, etc.”

According to one participant, the state now needs to do two things to enable microscale deployment through the development of renewable energy and energy efficiency:

1. issue new regulations and laws to enforce renewable energy and energy efficiency development across different sectors;
2. to allow smaller producers and consumers to generate electricity from renewable energy sources and sell it to the grid. A law is only now being drafted which would allow smaller consumers or producers to sell electricity to the grid based on net metering, collective net metering and municipal net metering based on a peer to peer exchange power.

ENERGY EQUITY, JUSTICE AND THE PROVISION OF MODERN ENERGY SERVICES TO VULNERABLE POPULATIONS: THE PERSPECTIVE OF MUNICIPALITIES

The following section includes a summary of discussion points raised by workshop participants. Find more information about the workshop as well as supporting slides on the [ESCWA website](#).

Access to electricity in Lebanon through decentralised generation renewable energy systems, could have transformative impacts, both in terms of directly improving the everyday lives of people. As mentioned above, municipalities may not have a legal mandate to provide energy services but they should be part of any feasibility study and early stages of designing any renewable energy projects. However, with the current resignation of the Lebanese government it is unclear whether parliament will pass legislation, currently in draft stages, which would facilitate projects at the municipal level. The legality of municipal provisions for energy remains in dispute, as one participant, a government representative highlighted during discussion:

These systems are not legal. They cannot replace the EDL (the state-owned electrical utility) systems. So that's why we have excellent pilot/demonstration project but only demonstration project. What we need to do as quickly as possible legalize these schemes to be connected to the grid to be able to supply to individuals and communities.

The gaps here are threefold; capacity and knowledge, financing and loan guarantees, and regulatory/legal obstacles. A distinct lack of funding and regulatory capabilities at this level means that the involvement of the private sector is crucial. There is still a lot of work that needs to be done to ease credit lines for municipalities community projects in terms of loan guarantees and power purchase agreement which would make community projects easier for banks to accept. This includes working to align policy initiatives, regulatory initiatives and banking initiatives. One participant expressed the frustration faced by authorities at the municipal level attempting to address their local energy production and consumption issues:

We have a lot of projects in the pipeline waiting for execution but they're in the gray area where they're not legal but could be admitted by the central authority. We're in a gray legal area. That doesn't help anyone. We have no legal recourse and then we're just doing it on best effort and this is not viable. There's not a viable model.

To address the complexities and potential models needed to transition municipalities to renewable energy sources involves assessing the environmental and human impact. Discussion centered on questions concerning how to ensure people are making

an informed choice about technologies, how to increase income generating activities and economic opportunities, and what developer obligations to help local people might look like. For large-scale projects, such as wind farms, how can local authorities ensure there are enough capacities in the region to facilitate the projects? For example, if there will be enough local workforce or if workers from Beirut or other regions will need to fill in the gap in supply.

From these discussions, a number of perspectives and potential solutions to these challenging questions were proposed. One of our participants, a mayor, identified multiple areas where municipalities can play a crucial role and can apply many distinct and important modes of governance in the field of renewable energy policy:

- Legitimate authority that contacts donors
- Regulation and planning
- Provision of energy, public organizations and housing: the municipality as business actor
- Support and information: promote the use of renewable energy

Municipalities can work with their citizens and businesses as well as with businesses from outside to attract investment in renewable energy as a 'legitimate' authority, using the frameworks that exist at higher levels of government. In terms of regulation and planning, the municipality could have a major role in identifying lands that are suitable for renewable energy projects and that will result in a reduction in the amount of money that would be invested on land leasing or even borrowing of land. This opens the door to potential revenue generation from this land. The community engagement process is also critical and the role of the municipalities in this "should start at the early stages of any project development."

For example, it was proposed that community engagement efforts could include the establishment of centers of excellence in the municipalities where projects are to be implemented. These centers of excellence would have the role of engaging schools and universities and would be responsible for the training and education necessary to implement and maintain projects. For example, if solar panels are installed on the roofs of technical college or university buildings, the project can also serve as

an educational platform for students majoring in electrical technology.

Community organisers described how a low level of awareness and knowledge about renewable energy in a rural area like Akkar has resulted in some residents having misperceptions of the safety of these technologies. Akkar is the site of construction for one of the country's largest wind farms which will impact some of Lebanon's most vulnerable people. Residents in Akkar initially believed that the wind blades could dislodge as the turbine spins. As one participant noted, "Akkar is the area where you have the least electricity from the government. And Akkar is also the area where you had the first macro scale renewable energy projects." Concerning Akkar's socioeconomic situation, average incomes are low (641 USD per month) and household numbers tend to be large. Most families in Akkar are reliant on a military salary or pension as their primary source of income.

This predicament suggests the need to develop a new, human centred, way of looking at the impact that such projects will have on local people. One participant said, "*So much of the impact that we're talking actually about has nothing to do with money. We actually have to grasp how to value the social impacts that take into account people's feelings about the impact on their everyday lives.*" It is clear that energy interventions not only encompass the energy technologies employed, but also the pillar of empowering human capacity. Participants noted that there is currently "*no real mechanism*" for incorporating the human factor in the kind of impact assessment needed to justify why and how the transition is a good investment and will improve people's well-being.

RAISING ENERGY LITERACY

The following section includes a summary of discussion points raised by workshop participants. Find more information about the workshop as well as supporting slides on the [ESCWA website](#).

Energy literacy among all energy consumers is required for a better understanding of the need for sustainable energy supply, the different technologies available, and cost management. It is difficult for individual consumers to navigate the market for most of this imported technology. It is also difficult for municipalities to build cost-benefit analysis and long-term planning to implement renewable energy projects whilst navigating a difficult political and legal terrain.

In the previous workshop sessions, the importance of knowledge and understanding amongst a wide range of people was emphasized. This section focuses on the role of education in the context of energy literacy and specifically to see how digital technology can help, especially regarding the use of digital learning and different ways of transmitting information about energy to the community at large.

Participants discussed and showcased some of the means and methodologies for public information and learning, but were also asked to provide feedback on the question of what is needed to encourage more community-led interest in solutions to renewable energy and raise knowledge and awareness.

Participants began the session by exploring the idea of designing a free ‘massive open online course’ (MOOC) and of using blended and collaborative learning experiences based on the research that participants were doing in Lebanon.

This is an unusual and distinctive approach because of its features: it would have a co-designed curriculum and video stories filmed on location. The pedagogy provides for collaborative learning activities and it would be in two languages. Additionally, these courses can be embedded within

Lebanese university courses to ensure longer-term continuation.

The course would aim to encourage and raise awareness of the energy transition and could seek to change people’s demand preferences, advise them on technologies, and help them with analyzing the costs and benefits to them of various energy products and plans. This mass course would allow people to imagine a different future, making a bridge between experts and citizens. The participants in this workshop, business and entrepreneurs, financiers, local changemakers and municipalities across different urban and rural, formal and informal settings, could all help in designing and delivering the course. Participants were invited to suggest what student expectations for the curriculum would be what the priorities should be.

As stated by one of our participants:

“We would be learning from [student participants] as much as they are learning from us. It’s a collaborative process. To try and characterize that with the kind of model that we’re running, we call it local inclusion because although this is a global course we’re trying to learn from all of those local participants as we go.”

As well as a broad-based public approach to campaigning to change attitudes and raise awareness, participants noted the need for information exchange where people come together

from across the region to share experiences and gain deeper knowledge.

For courses and professional development that are accredited, participation in workshops and knowledge hubs can help to develop personal and career progression. The ultimate aim is to accelerate energy transition and shift demand preferences in different target audiences. It was suggested that the MOOC should stay online so that it remains a living/archived resource that people can access whenever they can. In locations where internet connection is poor, participants are still able to download the course where wifi access is available. The course would not be a real-time course which will allow participants to do what they can, when they can. While it was unclear whether there was consensus that municipal employees would appreciate the MOOC format or not, it was clear that employees need incentives to carry out a course either via certification or institutional partnership.

The Natural Resource Governance Institute (NRGI) which focuses on extractives governance offered important insights on what works with public campaigns based around three main objectives:

- 1. Knowledge building:** building the information and monitoring resources, tracking government targets against national and community needs. Building resource hubs that people can keep going back to.
- 2. Awareness raising:** The public is essential in demanding the transition to renewable energy sources.
- 3. Skill building:** decision makers, municipalities, civil society groups and community leaders being trained in particular skills required to understand the technical, political, economic, legal and environmental aspects of energy systems.

INCENTIVIZATION AND BETTER COMPLETION RATES

A problem identified during this workshop session was the issue of retention and completion of the MOOC. A variety of potential solutions to reaching people and incentivizing them to take and complete the course were discussed by participants. These

solutions centered around incentivizing professional development in the form of earning a certification, increasing the retention rates by making the course more enjoyable and ensuring the course can be completed by participants who are time poor.

An interactive online course developed by NRGI experts called “Petronia” was highlighted as a good example of how gamification elements can be used to achieve higher engagement in the subject and better retention rates. Petronia, is a simulated learning experience exploring the policy challenges of a fictional developing country at the outset of oil production (NRGI, 2019). Learners join a team of experts deployed to advise “Petronia’s” policy-makers in a series of complex resource governance scenarios based on models and case studies (NRGI, 2019). The full learning experience takes four to eight hours with individual mission sessions of one to two hours and is suitable for users who may not be ready to invest more significant time required by a MOOC or in-person courses. A version of “Petronia” for renewable energy could be developed.

RECRUITMENT TO ONLINE COURSES

The scale of the climate crisis, globally and nationally, means that in order to positively influence general attitudes and behaviours, the need for education on climate and climate justice issues is universal. MOOCs operate on a large scale and require mass audiences and so the question of potential solutions to recruitment issues were discussed by participants in great detail. The suggestions that emerged included what format the MOOC could take in terms of blended learning and how customisable the course would be in terms of vocational training. This could take the form of running the MOOCs alongside workshops for all the teachers in a specific village.

Another suggestion was that the MOOC could be part of a broader mission on vocational training for people who have either technical or financial and business skills that are vital to transitioning to renewable energies. In this way, the MOOCs could bridge the knowledge & networking gaps between engineers, donors and institutions. An additional challenge to access and recruitment are language barriers. For example, NRGI has discovered through

the experience of running MOOCs on oil and gas governance that Arabic speakers have little interest in taking an online course in English. NRGi has responded to this by adapting platforms to Arabic and are now running the MOOCs in Iraq as well.

The challenge is in how to balance the macro and micro levels of the energy ecosystem across the value chain including business operations that can address all of the different levels of technical change needed. One participant noted, “*We have to think about reframing the context of energy, the concept of what return on investment means. What is this actually delivering for us?*” The building industry was used to illustrate this point. It must now think about sustainability in the context of a “*green building*” which is about more than clean energy or recycling, but also about embedded carbon and the well-being of buildings users for example. This process involves a lot of people with a large variety of education levels and skills. As part of a holistic systemic approach, all involved in a such a large-scale project would need to understand their part in this process and to show cross-sector and cross-discipline clarity.

FINANCING THE RENEWABLE ENERGY TRANSITION: FINDING THE COMMUNITY AND BUSINESS ALTERNATIVES TO ACCELERATE A GREEN ENERGY TRANSITION AND EQUITABLE ENERGY SUPPLY

The following section includes a summary of discussion points raised by workshop participants. Find more information about the workshop as well as supporting slides on the [ESCWA website](#).

Globally, increasing interest in the investment and development of renewable energy is bringing benefits to communities as well as private investors. There are already examples of co-owned, small-scale, locally-led renewable energy initiatives in Lebanon that engage the community in their business models. In this session participants discussed financing, business environment, and regulatory frameworks.

The green energy transition today relies on two levels of action; 1, large scale grid-level transformative initiatives and 2, smaller community and individual led initiatives with wide dissemination. Every contribution towards a greener economy counts. The support of the government is needed at every level, but there are opportunities on a smaller scale where obstacles that were discussed in this session can be overcome. This also applies to financing and new business models and the way the private sector and financial institutions have become very proactive in finding solutions. Lebanon however is much more dependent on humanitarian and development donors.

Lebanon is also burdened with the highest public debt in the world and that is preventing it from investing in infrastructure to unleash the benefits of RE. In contrast, the wider world is moving towards more decentralised energy systems. The benefits of this is having to invest less in grid updates, improving energy security, and having higher resilience, higher energy access coverage where power grid does not reach, and lower capital cost.

A Greenpeace study has shown that if the Lebanese government invested as much in renewable energy as they are investing in gas they would make more profits against the status quo benchmark on the

2015 internal sectors target of 30 percent by 2030. Another participant expressed concern about how to find the solution for Lebanon's energy shortages when the framing of the financial complexities is often boiled down to how to increase or decrease deficits, "This kind of thinking has restricted targets to 30 percent - not as ambitious as one like 50 percent."

Impact on Public Finances and Economy



\$36 Bn of Public Debt (including interest)
Between 1992-2017, directly attributed to Electricity Sector



\$1.4 Bn Annual Subsidy
In 2018, due to mismatch between tariff and cost to serve



Significant Outflow of Foreign Currency
\$ ~1.3 Bn / year to cover fuel imports bills



High Electricity Bill on Consumers
High share of inefficient distributed diesel generation



Power Cuts up to 12 Hrs/day
Outside of Beirut, and up to 4 Hrs/day in Beirut



High levels of pollution
From liquid-based utility and distributed generation

(Ayoub, 2019)

FINANCING

Regardless of how the problem of securing financing should be framed it is clear that Lebanon needs stronger sources of funding which could provide projects with money based on project financing. Lebanon's 2 billion dollar annual deficit currently contributes to borrowing internationally and conditions being imposed on the government. Financial services institutions have several roles to play here. First, they actively support the Ministry of Energy and in this regard, there have been some successes. For example, it was noted how one Lebanese bank was actively involved in the negotiations on the PPA for the Akkar wind project and in the development to set up the private to private regulatory framework. "The Lebanese banking sector, with the help of the central bank,

played a major role in the implementation of this green energy transition over the past 10 years,” noted one participant.

Both Lebanese and International Banks have injected not less than 560 million dollars into the green economy in the form of loans granted over the past decade, roughly translating into a more than 40-megawatt peak installed capacity for renewable energy. The Lebanese central bank also runs a subsidized loan scheme that allows the commercial banks in Lebanon to provide funding for renewable energy and energy efficiency projects with very low interest rates. These schemes are delivered through multiple mechanisms, including incentive programs and offering initiatives.

One participant from a Lebanese bank stated:

“The funding assistance we can provide to the private sector encompasses all sectors, all sizes; individuals SMEs, midcaps, corporates dealing with renewable energy e.g. energy efficiency in machinery, processes, agricultural projects, water saving measures, energy saving measures, buildings and constructions.”

Yet the cost of funding is directly impacted by Lebanon’s worsening economic situation and low credit ratings. The issue of high financing costs from the local banks for smaller-scale, community-led smaller scale projects in energy has also discouraged participation in transition.

Secondly, banks play a role alongside local, national and international financial institutions in monitoring and following up projects, mitigating the social and environmental risks beyond due diligence and obligatory assessments at the beginning of the project. As one participant, a bank executive explained, *“We’re not just extending money, we’re also working with the community with the help of our partners. We’re having a lot of capacity building workshops and we’re doing a lot of site visits to give free consultancy.”*

Banks also play a vital role in providing the technical

assistance for energy intervention projects.

There were several examples of this activity that participants had direct knowledge of. According to one of our participants from the government, banks are *“not just providing the funding ... they’re validating, they’re going and sitting with clients, with consultants, finding solutions, trying to amend projects to put the most efficient and the most reliable ways to implement projects.”* This is essential for green climate finance access and other green international finance. The experience of getting access to green climate finance should be explored further.

Participants highlighted growing ‘learning by doing’ in the banking sector. For example, one participant elaborated upon how the Lebanese bank has so far benefitted from the Akkar wind farm project. They said that their organisation was able to gain valuable knowhow in legal, business, environmental, and social aspects as a result of managing such a large Greenfield transaction. Another provided the example that as of October 2019, their bank will have a series of capacity buildings for all offices covering 700 employees working in the remote branches where there is little knowledge about new technologies and lending options.

However participants acknowledged that there are still challenges for smaller green projects and sustainable lending, how they can bring a broader perspective on value, how to discourage short-term views and encourage medium-to-long-term views on value, and how to ensure sustainability over the long-term.

REGULATORY FRAMEWORKS

Discussions underscored the need to revamp regulatory frameworks and governance processes, especially as there is currently no regulatory authority on RE. Whilst existing regulations say that the Cabinet or Minister will play the role of regulator, new laws related to enforcement and regulation may come into place by next year. Participants emphasized that Lebanon must have a regulatory framework which is safe for businesses, communities and donors to invest in renewables. Despite the fact that renewable energy is currently one of the cheapest ways to produce energy, Lebanon’s huge fiscal deficit is partly caused by large subsidies of conventional energy.

The irony is that while switching to gas reduces overall emissions when compared to fuels derived from oil, an overdependence on this as an energy source means that renewable energy solutions will

continue to be overlooked. Hence the challenges in convincing the Ministry of Energy to invest in renewables in order to reach internal sectoral targets by 2030. One participant explained:

“The focus should be on starting to phase out of our current conventional fossil fuel dependency on heavy fuel oil instead of being blinded by this frenzy of this clean gas coming our way without even knowing if we actually have gas ... because we don’t really know if we have a commercially viable resource.”

Another participant suggested that streamlining the approach would be helpful in order to make it easier on all parties, including the authorities and stakeholders, to deal with one another. According to them this would make it quicker and easier for everybody “... in dealing with disseminated and small size projects in remote areas.” Streamlining will require policy instruments to be developed to facilitate the allocation of fiscal privileges or tax credits for renewable projects on national and local levels. A more holistic approach would ensure that the projects that are being implemented are reaching expected goals and objectives.

A summary of Lebanon’s current policy frameworks developed through the Nationally Determined Contribution process:



2015 NDC Process (Kai, 2019)

GOVERNANCE ISSUES & FISCAL INCENTIVES

Workshop participants identified the need to offer fiscal incentives to those adopting new technologies such as by offering tax incentives, financial subsidies, as well as a set of standards and norms for new buildings that would embed a trend and accelerate it. Under current circumstances, pressure is put upon the Ministries who may experience a lack of intervention or a lack of encouragement from the executive authority to kickstart a more long-term ER project. This leaves municipalities “relying on the goodwill of the central bank.” Legal and financial obstacles are leaving Lebanon behind and it is not seeing the same massive growth in RE businesses in its markets when compared to those in Morocco and Egypt, for example. The key challenges lie in how to phase out fossil fuel subsidies in the right way while at the same time ensuring that the government will make money and not lose money without having to raise taxes (which will be unpopular with Lebanese citizens). Some incentives are already in place and can certainly be further developed in the forms of tax credits and central bank subsidies.

At the national level there are tax credits that have been passed to encourage either renewable energy or energy efficiency. Just last year, the Lebanese government passed tax cuts on hybrid and electric vehicles. The Lebanese government has also been waiting for operational approvals since 2017 for tax revenue cuts for companies that provide environmental services. While representing a move in the right direction, participants suggested that these types of incentives could go further. It was suggested that incentives could be in the form of a reduction in property taxes for properties that have RE installations (PV or other), or for companies that use or produce energy from renewable sources to benefit from some reduction in their taxes. Possibilities for punitive taxation could also encourage behavioural changes, such as taxing the use of plastic bags or diesel generators.

CENTRAL BANK SUBSIDIES

On the subject on the availability of Central bank subsidies as an incentive, there is a lot of room for improvement. Central bank subsidies have already allowed commercial banks to offer comparatively low interest rates on renewable energy. However, conventional energy is also subsidized. As one participant pointed out “... We need to counter that situation in order to make sustainable energy attractive. Once conventional energy subsidies

cease then there is no need for subsidies [to renewable energy and energy efficiency].” Without sufficient measures, even existing clean energy subsidies risk falling away, similar to what has been seen in Europe.

It was generally agreed that subsidizing helps but cannot by itself address the problems of scalability of sustainable energy over the long term given everything that must be done to achieve 2030 targets. Some called for greater clarity on the role that the Central bank will play in this. Some argued that the Central bank is stepping in beyond its remit and has been incentivizing projects that should be taken care of by the Ministry or by the Council of Ministers. One participant noted that it has been doing so for the past 10 years on multiple levels not only on renewable energy, other sectors as well.

NET METERING

feed-in tariffs and net metering schemes are important regulatory issues for communities. Such schemes have proven to be a prominent vehicle towards promoting renewables elsewhere (workshop, 2019). Currently, net metering agreements that would allow consumers to feed back surplus electricity into the grid whilst also ensuring that they can use that electricity on demand are in need of being negotiated. However, for some projects that consume and distribute off-grid energy locally only, net metering agreements are not required (workshop, 2019). One participant explained, *“There is still some willingness of EDL to connect them [individuals] and to provide a net metering on goodwill basis. But for municipalities and communities, it’s very different because they are not legally mandated to provide energy.”* Getting approval from the Ministry to go from pilot projects to large scale projects can also take months or may not be granted at all. Yet, with a legal change, municipalities could be owners of renewable projects, providing energy for their own needs and could in addition, facilitate relations between EDL and renewable energy project owners in their regions. Such schemes would need to be adapted to specific communities’ needs and business models. If communities were allowed to benefit from the sales or electricity to the grid and/ or the savings on current diesel and electricity bills, they would have more incentive to fund themselves rather than being be reliant on grants or on support from the international community in order to be really sustainable.

A PEOPLE-CENTERED PROSPEROUS FUTURE: WHAT FUTURE SCENARIOS FOR 2030 CAN WE IMAGINE FOR LEBANON'S ENERGY SUPPLY IN THE CONTEXT OF THE CLIMATE EMERGENCY?

The influence of climate change on general social instability are intimately and inextricably linked. These instabilities can play a part in leading to mass exodus, the consequences and management of which is complex for the populations and countries involved. Indeed, shortly after the workshop, a mass uprising erupted in Lebanon driven by socioeconomic deprivation and poor public services, with energy shortages and costs as prominently cited grievances. Separating these influences and trying to quantify them is difficult. This is made all the more challenging by the chronic lack of data about energy use and demand in Lebanon, particularly for those in rural areas, but also for the urban poor living in rapidly urbanising areas and in informal settlements.

One participant explained:

“We are being suffocated by fossil fuel emissions on a daily basis; fossil fuels from outdated power plants; fossil fuel from diesel generators across the country; fossil fuels from every single car that is emitting emission across the street. Lebanon has been ranked among the top five polluting countries in the region in the last to report that Greenpeace has

released. If that is not enough for us i.e. our health what we are inhaling as the reason for us to change then the future of the next generation for me is an important element.”

In this session, Ayoub (2019) presented the results of a study in which three energy mix scenarios to determine the optimal renewable energy penetration for 2030 were analyzed. The software used was called “Long Range Energy Assessment Planning” (LEAP) to calculate the least generation cost of energy using a power dispatch model for each of the three scenarios (Ayoub, 2019). The power dispatch model looks at all the energy sources that are available and then chooses the ones that have the least cost optimization (Ayoub, 2019). The three main pillars of this study were the land availability for renewable energy, the grid updates that are needed and the budget availability. Each was assessed on five strategic priorities: a system cost, system reliability, energy security, socio-economic impact and environmental impact. LEAP evaluated four different scenarios: do nothing/status quo, mixed energy, a Capital Investment Plan, a green transition in line with Lebanon’s internal sectors target of 30 percent RE by 2030, and a leapfrog scenario (48 percent renewables).

The simulation produced the following results of the energy mix simulation for 2030 where you can see the assumption of the complete end of diesel consumption (Ayoub, 2019).

In the “Green Transition” scenario, **3.5 GW of solar and wind** by 2030 is installed and reduces the cost of electricity by 17.8 c/kWh compared to Do Nothing and 1.2 c/kWh compared to CIP Plan. The “Leapfrog RE” scenario installs **6.1 GW of solar PV and wind** by 2030 reducing the cost of electricity by ~20 c/kWh compared to Do Nothing and 3.2 c/kWh compared to CIP Plan.

Most importantly, concerning **greenhouse gas emissions (GHG)** in the Leapfrog renewable energy scenario GHG by 61 percent in 2030 while the green transition will reduce it up to 53 percent. The scenarios also value healthcare costs and sustainable job creation. Both scenarios will have higher impact on GDP and higher number of sustainable jobs in remote areas.

Leapfrog scenario with 50 percent or 48 percent of renewables in the energy mix.

This will be combined by around 4 gigawatts of conventional power production mainly the natural gas power plants. So, the share of solar and wind alone and in 2030 will reach around 18 percent while in 2020 it will reach around 16 percent, if there are no delays on implementation.

How much would the different scenarios cost?

Estimated capital investments are as follows:

The IFI team carried out an assessment of the land availability in the Baalbek Hermel governorate of public lands that are suitable for solar and wind project implementation. They identified the Tufail area in the far east of Lebanon an area of 13 sq. kilometers of elevate flatlands with the highest level of solar radiation. They carried out a feasibility study for a 300-megawatt solar farm in the area of Tufail which is on the border with Syria and could be ideal for possible electricity swap deals and trading with Syria in the future. The distance was also assessed between Tufail and the nearest grid substation in Baalbek and others that can be connected directly to the grid if no swap deals with Syria were developed.

The PV plant appears to offer robust technical and financial incentives and lowest prices are expected to be achieved via multistage, well-planned, transparent and flexible auctioning and competitive bidding. Using a very conservative approach in the simulation of 300 megawatts production, and offering a price ranging between 4 – 5.3 cents per kilowatt hour. The total installation cost or the CapEx needed (direct and indirect costs) ranges between 225 and 300 million dollars. The area needed was 5.2 square kilometers in the region of Tufail.

Since this study, European Bank for Reconstruction

and Development (EBRD) has released a call for consulting firms to further study the establishment of a 300 -500-megawatt solar plant. Many companies have applied to this bid and offers are currently under review. There is another land assessment survey that is being done in the Baalbek Hermel governorate.

One of the main recommendations of the workshop was that the Lebanese government should establish a clear and transparent competitive bidding process by defining pre-qualification requirements and tender evaluation criteria. Officials and government ministries should identify and secure plots of land for project development and engage with technical advisors to initiate pre-development activities. Finally, to review the grid update plan and secure required funding to enable the penetration of utility scale renewables.

Public lands availability will reduce the cost of financing and deliver lower prices for end users. This exercise demonstrated that academia can work in close coordination with all the ministries to share data and research. When we see prices of wind energy globally at around 5-6 cents per kilowatt and then we see in Lebanon that it costs 9-10 cents, it is because the cost of investment that is put on bidders/independent power producers to go find the land, build the pumps and the substations. In previous bids, such as the Akkar wind farm, the bidders had to go and search for the land and negotiate with land owners. If we invest a bit more in this kind of planning, we can move into smarter grids where funding can be secured to invest in utility scale renewable energy penetration especially in peak hours during the day.

Yet we kept it at 3 percent growth each year and the results showed where the graphs were shown on the smart grid. The question of course we're not aiming for a full digitized smart grid but again the ministry is currently planning to update the metering process and now the DSP is the distribution service providers are working on projects to implement the smart meters to consumers. And this will allow them to know from their station or from the LS main headquarters how the consumption is being developed. So what we mean by smart grids that to take project by project case and for example if we're aiming to do something and fail to consider what is needed from the grid a substation or collection centers in each dysentery I mean decentralized substations that allow us to if we have several for example projects of renewable projects on the grid how can we allocate or I mean how can we manage those oil projects altogether.

Simulations of course are limited by their simplicity and reductive assumptions. A software for simulation of scenarios cannot substitute the different kinds of

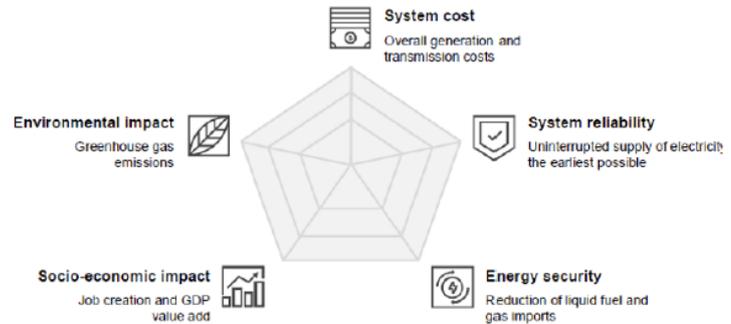
complex modeling exercises that are done in this field and that is why the scenarios may be unrealistic and unfeasible.

- the assumptions in the simulation does not consider national context of specifically electricity and not all the energy needs in industry; the energy performance of buildings which usually consume a large amount of energy (heating/cooling).
- simulations do not consider changing behaviours and lifestyle habits of the Lebanese based on a private car transport use especially four-wheel drives vs electric cars.
- doesn't consider the enormous storage required and its cost.

The issue and purpose of smart grids and smart meters caused some debate. Some terms mean different things to different people e.g. smart grids. Participants differ in the need for smart meters for payment collection or to be able to monitor the demand and supply from their headquarters, region by region and project by project. The sunk investments in Europe in particular over so many years in the existing grid, in order to transition to a smart grid has been very cumbersome and *“the last thing you want to do is to embroil current investment plans in Lebanon in any kind of smart grid direction. And so, we need to clarify what we mean by a smart grid for Lebanon and to differentiate between smart grid as a concept and using digitization and intelligent metering in some way shape or form for other purposes.”*

Dispatch model

-  Least cost optimization over entire analyzed period (2020-2030)
-  Hourly supply-demand profiles and solar resource availability ensuring output accuracy
-  Capacity retirement plan in-line with asset technical lifetime
-  Asset construction lead time accounted for capacity ramp-up



7

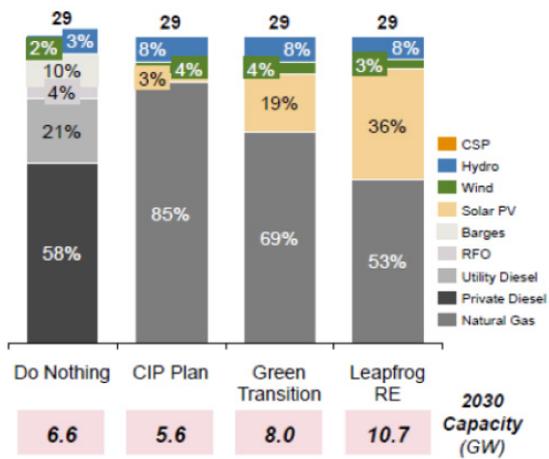
(Ayoub, 2019)

Lebanon 2030 Energy Mix Scenarios

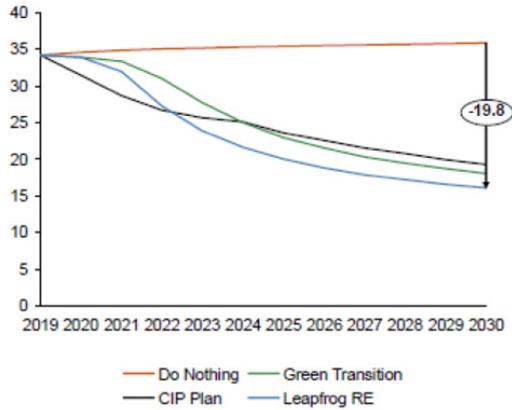
	Do Nothing	CIP Plan²	Green Transition	Leapfrog Renewables
Land availability¹ for RE 	Lands committed based on CIP plan: ☀️ 7 Km ² Solar 🌪️ 155 Km ² Wind	Lands committed based on CIP plan: ☀️ 7 Km ² Solar 🌪️ 155 Km ² Wind ☀️ 3 Km ² CSP	Government-owned lands limited to: ☀️ 45 Km ² Solar 🌪️ 155 Km ² Wind ☀️ 5 Km ² CSP	Government-owned lands limited to: ☀️ 111 Km ² Solar 🌪️ 155 Km ² Wind ☀️ 5 Km ² CSP
Grid upgrades 	No Upgrade	Upgrade: • Regional subs. to 66 kV and main cities to 220 kV • 25 added interconnections between cities • 400 kV interconnections w. neighboring countries ³	Basic upgrade enabling yearly additions of: ☀️ 1,000 MW Solar 🌪️ 50 MW Wind ☀️ 500 MW CSP 🔥 1,000 NG	Smart grid enabling yearly additions of: ☀️ 2,000 MW Solar 🌪️ 100 MW Wind ☀️ 500 MW CSP 🔥 2,000 NG
Barges availability 	Maintained at 385 MW to 2030	Increased to 825 MW by 2020 and retired in 2022	Maintained at 385 MW and retired in 2022	Maintained at 385 MW and retired in 2022

(Ayoub, 2019)

2030 Generation Mix TWh



Levelized Cost of Electricity NPV, 2019 US cents / KWh



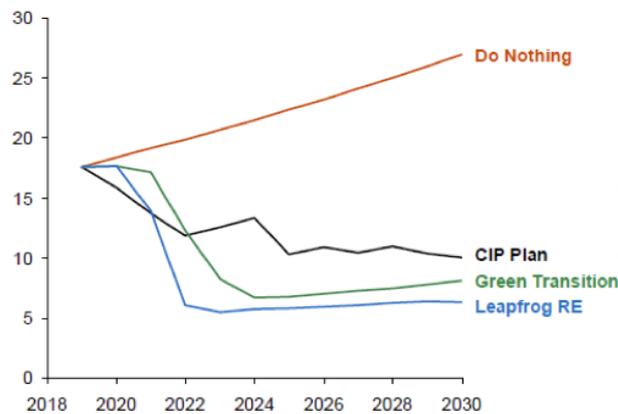
(Ayoub, 2019)

Most importantly, concerning greenhouse gas emissions (GHG) in the Leapfrog renewable energy scenario GHG by 61 percent in 2030 while the green transition will reduce it up to 53 percent. The scenarios also value healthcare costs and sustainable job

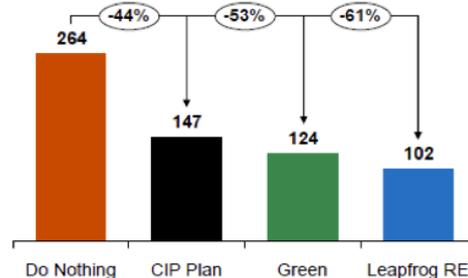
creation. Both scenarios will have higher impact on GDP and higher number of sustainable jobs in remote areas.

How much would the different scenarios cost? Estimated capital investments are as follows:

Yearly Greenhouse Gas Emissions¹ Mn Tons of CO₂ Equivalent



Total Greenhouse Gas Emissions Mn Tons of CO₂ Equivalent, (2019 – 2030)

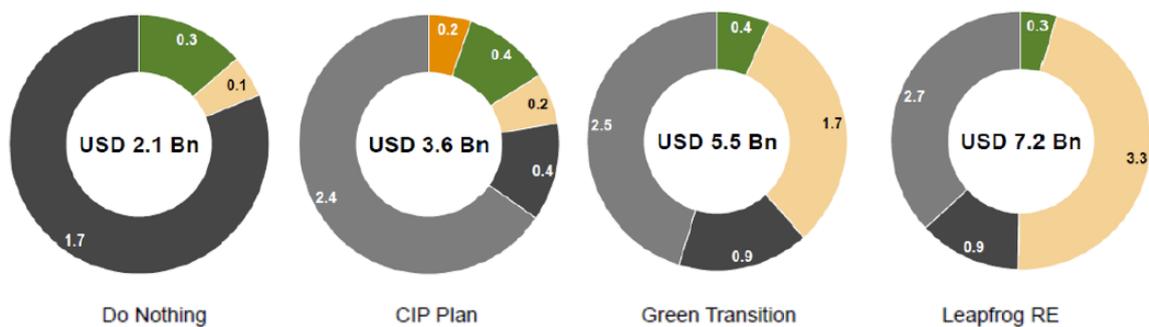


Avoided Healthcare Costs NPV USD Bn, (2019 – 2030)



(Ayoub, 2019)

Cumulative CapEx¹ By 2030, USD Bn



Legend: CSP, Hydro, Wind, Solar PV, Barges, RFO, Utility Diesel, Private Diesel, Natural Gas

(Ayoub, 2019)

CONCLUSION

Considering the timing of the workshop was just under a month prior to the eruption of mass protests in Lebanon and an ensuing banking crisis that could affect future funding and investment decisions in energy. The demand for greater energy equity, centering social value, livelihoods, health and wellbeing, and most importantly sustainability, makes the insights of the workshop even more relevant in informing what needs to be done. The following key recommendations were proposed:

1. There is a need to have clear and well-defined renewable energy targets at the national as well as the local levels and not just assume that those at the national level will trickle down to the local level. The legal and constitutional obstacles to decentralization, particularly allowing municipalities, communities and individuals to generate electricity and feed-in should a priority. The potential of each local area and its needs should be defined in a clear manner with an eye towards low-cost financing for renewable and energy efficiency projects in any rescue plan. We saw a supportive role for academic institutions in conducting or assisting with land assessment and feasibility studies to propose sites for the construction of solar/wind plants, which could greatly accelerate transition at scale over the next 2-5 years if seriously adopted.
2. There is a need to ensure a **guaranteed feed-in tariff for renewable energy to the grid**. This entails the existence of a clear regulatory framework which is currently a work in progress but needs to be pushed more strongly in policy and public forums. To pass the draft law which would allow smaller consumers or producers to sell electricity to the grid based on net metering, collective net metering and municipal net metering based on a peer to peer exchange power. If Lebanon does this it needs to pre-empt Jordan's problems of grid capacity and potential surplus of fossil fuels power. EDL must have the right incentives if it is to be the off taker
3. **Offer attractive tariffs for electricity from renewable energy**. Current prices for many renewable energy technologies are very competitive with conventional electricity but are still higher than other countries in the region. Despite the fact that renewable energy is currently one of the cheapest ways to produce energy, Lebanon's huge fiscal deficit is partly caused by large subsidies of conventional energy. The only way to reduce this subsidy is to find long term solutions rather than short term solutions like FRSUs that temporarily prop up supply.
4. Promote the **direct and decentralized use of microscale renewable energy applications** for providing energy services. Encourage applications that can use renewable energy in a direct manner without going through the grid. For example, water heating, food drying involved in some agricultural processes, and street lighting.
5. Create **financial incentives and schemes for promoting renewable energy projects** for medium and small-scale renewable energy projects and programs which are based on a large dissemination of small renewable energy systems. For these types of projects, a comprehensive implementation scheme is needed that would include financing as well as a dissemination process which has clear logistical support for the end users and the people that will benefit from the financial support. The future of central bank subsidies under the current financial crisis should continue after the banking liquidity crisis is resolved.

For the RELIEF Centre:

6. To raise energy literacy through a global MOOC in energy in Arabic and English in development with a community of practice and wider public consultations on which aspect to focus on. This will be closely linked to the discussions and outputs of the citizen assembly
7. To study how energy systems can become more democratic, accountable and beneficial to communities who use and produce energy. To this end, the idea of a citizen assembly on energy was proposed and will be conducted in 2020.

In terms of going forward, participants agreed that the next steps should include a workshop and further research into methods of public engagement on renewable energy issues with all stakeholders. The sense of urgency in setting Lebanon on a sustainable path by pushing through green energy solutions as a key demand is palpable.

The hard work is actually to convey and build scenarios through stories that engage the public in identifying these systemic problems. There is a need to “*go beyond thinking about community consultation as a box ticking exercise.*” Democratic infrastructures need to be put in place to ensure that the law and decentralised energy that is effective is for the citizens of Lebanon.

“There is a tokenistic approach to involving the civil sector. What is clearly missing is a democratic infrastructure to be built and set in place ready to evolve and to allow people to participate in the decision-making process locally particularly that energy is going to become centralized. There is a politics of energy that we should not ignore. If we do that it sets out a pattern that we have all seen in the waste sector. These democratic means are present in some social spaces in Lebanon and they should be revitalized particularly in peripheral areas such as Akkar.”

ANNEX 2: DATA SOURCES

<https://www.unescwa.org/events/transitions-renewable-energy-and-sustainable-prosperity-lebanon-role-municipalities-education>

Data from Lea Kai's presentation:

https://www.unescwa.org/sites/www.unescwa.org/files/events/files/5.1_lebanon_2030_under_climate_change_what_to_expect_lea_kai_0.pdf

Data from Marc Ayoub's presentation

https://www.unescwa.org/sites/www.unescwa.org/files/events/files/5.2_what_future_scenarios_for_2030_for_lebanons_energy_sector_leapfrogging_to_higher_penetration_of_ren._-_marc_ayoub.pdf

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