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Disclaimer: The Lebanon sections of this brief are based on data collected from October 2023 to July 2024, reflecting the MSME landscape and stakeholder perspectives up to that time; similarly, the Sudan sections are based on similar data collected between October 2023 and January 2024 and historical data on the energy sector. The information contained in this brief, and the recommendations generated, do not fully reflect the impact of recent conflict-related destruction and displacement in both countries.

Lebanon and Sudan: The Energy Transition in the Context of Crises

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Introduction

Lebanon and Sudan are vulnerable and unprepared to deal with the potential negative impact of climate change. Lebanon ranks 116 and Sudan ranks 183 out of 192 countries in the Notre Dame Global Adaptation Initiative Country Index.¹ Lebanon is particularly vulnerable to the urban heat island effect, drought, and water scarcity risks, and faces adaptability issues due to financial crises, weak institutions, social unrest and exposure to negative spillovers from conflict.²

Similarly, Sudan, a predominantly agricultural economy, faces severe environmental risks, including increased incidences of drought and water scarcity, and increased desertification. In addition, it lacks the necessary institutional infrastructure and financial resources to adapt. Finally, the contribution of both countries to global greenhouse gas emissions is negligible and, on a per capita basis, both emit significantly less than the global and regional average.³

Amid the urgency to decrease emissions and combat climate change, renewable energy presents a major economic and social opportunity.⁴ The MENA region is endowed with enough wind and solar potential to satisfy the region's current and projected demand. A transition to low carbon energy systems could have a positive impact on economic growth⁵ and contribute to job creation across the region.⁶

Renewable energy adoption has recently increased in both Lebanon and Sudan, but in both cases it was driven more by necessity than deliberate policy decisions. Given both Lebanon and Sudan are net importers of energy, renewable energy could offer several positive contributions to the economy. Lack of dependence on energy imports reduces vulnerability to volatile global energy markets and depletion of foreign currency reserves. Off-grid systems provide opportunities for expanding economic activities to underserved regions, which alleviates existing equity concerns regarding energy access. Finally, the sustainability of the transition will depend on whether the push for renewables is planned or spontaneous, and whether the institutional structure exists to maintain it.

Compounded Crises: Why Lebanon and Sudan?

In Lebanon, a combination of corruption, clientelist practices, and mismanagement have resulted in multiple crises. Politicians use the weakened electricity sector as a space to exercise and perpetuate

¹ Notre Dame Global Adaptation Initiative. Rankings. <https://gain.nd.edu/our-work/country-index/rankings/>

² World Bank Group. Lebanon Country Climate and Development Report. 2024. p. II.

³ Climate Watch. 2024. Washington, DC: World Resources Institute.

⁴ World Bank Group. Middle East and North Africa Climate Roadmap (2021-2025).

⁵ Ibid.

⁶ Ibid.

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Human Rights Watch. 'Cut off from Life Itself': Lebanon's Failure on the Right to Electricity. 2023. <https://www.hrw.org/report/2023/03/09/cut-life-itself/lebanons-failure-right-electricity.p.7>.

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clientelistic practices through doling out jobs and profits from contracts made at the state's expense.⁷ In 2019, Lebanon experienced an unprecedented economic crisis⁸ whereby GDP contracted by around 40 percent.⁹ More than 15 years of economic growth had been erased; the severe economic contraction and deterioration in service provision led to increases in unemployment, poverty, and a brain drain.¹⁰

An already ailing power sector deteriorated as the financial crisis progressed.¹¹ The shortage of foreign currency at the central bank threatened fuel supply and rendered EDL (the public utility for electricity) unable to perform its daily operations, pay its obligations, and carry out maintenance.¹² Compounding this state of fragility, the Beirut port blast on August 4, 2020, caused extensive damage to the distribution network and some administrative and transmission assets of the utility.¹³

In Sudan, the secession of South Sudan in 2011 introduced a balance of payments crisis, a severe trade deficit, and an economic recession. Fossil fuel production decreased significantly and Sudan became a net-importer of fossil fuels almost overnight.¹⁴ The reduction in fossil fuel exports led to a decrease in government revenues and foreign exchange reserves. As a consequence, the Sudanese pound (SDG) lost significant value and a parallel currency market emerged, which led to a decrease in FDI.¹⁵

In addition, civil wars in Darfur, Blue Nile, and South Kordofan resulted in increases in defense and security expenditure,¹⁶ mainly to keep the regime in power. During this period, installed electricity generation capacity increased significantly but access to electricity remained modest due to the limited coverage of the national grid, its frequent power outages, and the expensive diesel generator fees.¹⁷

The compounded and multifaceted crises in both Lebanon and Sudan resulted in dysfunctional energy sectors characterized by political capture, low energy access, and low reliability. As a consequence, in both cases, a transition took shape away from centralized, fossil-fuel dominated energy systems to decentralized, more sustainable energy. While the primary motivation is access and sustainability, there are several positive implications in terms of energy security and energy equity.

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Ali Ahmad, p.19.

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Ibid, p.19.

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Ibid, p.19.

Energy in the Context of Crises

The collapse of the electricity sector in Lebanon reflects broader economic and governance failures.¹⁸ The failings of Lebanon's power sector go back to the Civil War (1975-1990), which contributed to the substantial destruction of EDL's generation, transmission, and distribution assets.¹⁹ Post war reconstruction and privatization schemes failed to deal with the underlying problems in the electricity sector.²⁰

Prior to the 2019 financial crisis, EDL supplied only 55 to 64 percent of Lebanon's electricity needs (approximately 12-14 hours per day on average until 2018).²¹ Lebanon's inefficient power sector has had a negative impact on the economy, with annual budget transfers to EDL averaging 3.8 percent of GDP over the last decade, accounting for close to half of the country's overall deficit.²²

EDL suffers from a high cost of production, high technical and non-technical losses, and low cost recovery.²³ Owing to the use of a polluting and inefficient heavy fuel oil (HFO) in thermal power generation, EDL has a high cost of production.²⁴ Elevated technical losses have resulted from the lack of investment and proper maintenance of power infrastructure, and have contributed to inefficient assets in generation, transmission, and distribution.²⁵

Law No.462/2002 provides the legal framework for the privatization, liberalization, and unbundling of the electricity sector. Under this law, the power sector is divided up into three components—production, transmission, and distribution—where transmission is restricted to EDL.²⁶ Private production and distribution are allowed under the Public Private Partnerships terms of Law 228/2000, which delineates the governance structure of private operations.²⁷

The yet to be ratified National Electricity Regulatory Authority (NERA) is mandated by Law No. 462/2002. NERA is mandated with licensing new power generation projects.²⁸ The current arrangement for Independent Power Producers (IPPs) requires projects with a generation capacity higher than 1.5 MW to be proposed by the Minister of Energy and Water and voted on by the Council of Ministers.²⁹ Despite the signing of several Power Purchase Agreements (PPAs) by the MoEW, the financial and political crisis has lengthened the tender process and raised doubts about the PPA's bankability and the investor ability to achieve financial closure.³⁰

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LDK. 2019. Electricity Sector Recovery Plan: Sudan Electricity Sector Diagnostic Study. World Bank Group. Washington, DC.

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Ayat, Carol. 2021. p.12.

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Ibid, p.12.

Sudan faces similar inefficiencies and limitations. The country's electricity sector is characterized by limited access to electricity, with clear historical and regional differences in the coverage of the national electricity grid, which is mostly concentrated in the Central and Northern parts of the country. Grid-connected areas suffer from continuous power cuts, with the available electricity capacity covering only 60 percent of demand.³¹

In addition, a major impediment to the financial viability of Sudan's electricity sector is the level of electricity tariffs.³² Sudan's tariffs in 2019 were significantly less than the Sub-Saharan African average. The tariff levels are maintained through an extensive subsidy regime, which, until 2023, applied to all tariff levels. Despite efforts since 2020 to remove subsidies, the macroeconomic environment was not conducive for such reforms.

To encourage private sector involvement in strategic sectors, the Sudanese government introduced the National Investment Act in 2013 and initiated a Public-Private Partnerships Act in 2015 (yet to be ratified) to encourage private participation in infrastructure development. Yet, despite these efforts, the sector remains highly dependent on MoFEP budget allocations for investments, maintenance, and grid expansion. Because of the ambiguity of the procedures to private participation, the lack of a clear regulatory structure to govern long-term PPAs, as well as the volatility of the exchange rate and other macroeconomic indicators, investment in the sector is almost non-existent.

In some areas, there are significant differences in the electricity sectors of Lebanon and Sudan. Lebanon's power sector is characterized by a high level of non-technical losses resulting from electricity theft, as well as unpaid and uncollected bills.³³ In addition, until 2023, EDL had maintained the same tariff level since 1994 at 142 LBP/kwh on average, when the price of oil was below \$20/barrel,³⁴ thus incurring further losses.

In contrast, in some areas, Sudan's power sector performs well. Due to the use of prepayment meters, the rate of bill collection is over 90%. This was mainly driven by a local industry producing electricity meters in response to sanctions on technology imports. Moreover, transmission and distribution losses are relatively low and generally in line with regional averages.

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Ibid. p.34.

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Ibid. p.34.

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Human Rights Watch. 'Cut off from Life Itself': Lebanon's Failure on the Right to Electricity. 2023. <https://www.hrw.org/report/2023/03/09/cut-life-itself/lebanons-failure-right-electricity>. p.29.

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Ahmad, Ali. p.8.

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Ahmad, Ali. p.14.

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Ibid. p.36.

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Ibid. p.35.

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Ibid. p.36.

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Ibid. p.36.

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Our World in Data. Solar panel prices have fallen by around 20% every time global capacity doubled. 2024. <https://ourworldindata.org/data-insights/solar-panel-prices-have-fallen-by-around-20-every-time-global-capacity-doubled>

Since the beginning of post-war reconstruction, Lebanon's power sector has been beset by poor governance and mismanagement.³⁵

One of the main challenges is the diffused decision-making, rendering it difficult to hold any single entity politically accountable for the multiple failures.³⁶ Other challenges include the lack of implementation of necessary reforms, and an inability to address EDL's technical, human capacity and management challenges.³⁷

Political turmoil, deadlock, and the absence of a clear investment plan have all together negatively impacted the sector, and vested interests in Lebanon's lucrative generator and fuel economy contribute to entrenching Lebanon's oil dependency.³⁸

The supply gap left by the state-owned utility has resulted in the emergence of an informal distributed generator sector that has been, for the most part, resistant to regulation. In Lebanon, subscribing to diesel generators has emerged over the years as a coping strategy to the country's failing power sector. EDL and licensed independent power producers are considered as the sole providers and distributors of electricity, according to Lebanese laws.³⁹ Government efforts to regulate the private generator market began in 2011; however, little was enforced until mid-2018.⁴⁰ On the local level, commercial generator owners exert high influence through forging strong connections with local authorities and law enforcement officers.⁴¹

Lebanon's diesel generator sector also relies on fuel imports, which comprise most of the diesel generator economy, to maintain its operations.⁴² At the national level, fuel importers exert a high influence due to the substantial amount of tax revenue generated from the fuel imports and these involved companies, which is a source of income for the government's treasury.⁴³ Also, an overlap exists between the country's political establishment and the shareholders of these companies. This overlap can manifest itself in the form of a politician owning shares in these companies, or through donations to political and religious institutions, philanthropic work, and nepotism.⁴⁴

Transition as a Consequence of Crisis

More recently, the fuel crisis in Lebanon has pushed many households and enterprises to turn to solar energy installations. With the declining cost of solar PV modules,⁴⁵ and the crippling costs of diesel for power generation, many households and enterprises who could afford it resorted to solar energy. In 2022, 80,315 tons of solar panels

were imported into Lebanon, four times the imports of the previous ten years.⁴⁶

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Boukather Ayat, Carol. Re-energize Lebanon: 5 Action Steps to Rebuilding Lebanon's Collapsed Electricity Sector. Issam Fares Institute for Public Policy and International Affairs. 2023. https://www.aub.edu.lb/ifi/Documents/publications/research_reports/2022-2023/Re-energize%20Lebanon%20Feb%202023.pdf. p.19

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KII with a manager at a UN organization conducted on 4/5/2024.

A survey conducted on 804 micro, small, and medium enterprises in 2023 revealed that 24% of surveyed enterprises had solar energy systems, with an average system cost of USD 9,000 across enterprise size. The majority of solar systems in the surveyed enterprises were installed in 2021 (28%) and 2022 (41%), which coincides with the removal of fossil fuel subsidies, including diesel.

International organizations and donors play an important role in Lebanon's energy transition. Many organizations have committed funds to expanding the deployment of renewable energy technologies across the country. For example, USAID created a USD 20 million Solar and Renewable Energy Fund in March 2023.⁴⁷ International organizations have also partnered with Lebanese universities and Technical and Vocational Education and Training (TVET) institutions on curricula that include the latest standards for solar PV.⁴⁸

Similarly, the limited coverage of Sudan's national grid has pushed both local populations and international organizations to explore alternative options. Development funding directed towards agricultural development now includes solar powered pumps and off-grid solar systems for food processing. For example, the African Development Bank's Desert-to-Power Initiative in Sudan, in partnership with the Ministry of Water Resources, Irrigation and Electricity, provides support to 1,170 farmers to reduce their dependence on imported fuel.

While a lot of these efforts are donor-driven, the increase in the adoption of solar pumps is a sign of a broader trend. Like Lebanon, after the policy changes instituted by the transitional government in 2020, particularly fossil fuel subsidy reform, the solar PV sector boomed. Enterprises operating in the solar PV sector saw an increase in sales, particularly in urban areas, where many households were looking for a safer, longer-term, and cheaper alternative to diesel generators.

However, this increase in adoption of solar did not spill over to low-income households and adoption of solar home systems or to broader increases in large off-grid systems, as the government had initially planned in its development plan to 2031. Before the start of the current conflict, the increase in adoption of solar PV for self-generation was obvious to many observers, but no official record of sales or installations exists.

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Ahmad, Ali. p.8.

During military attacks on power infrastructure, the proliferation of distributed power generation systems, be it fossil fuel based or renewable energy, has served as a safety net.⁴⁹ The drive towards decentralized solutions protects consumers from the impact of conflict on the energy infrastructure and disruption to fossil fuel supply chains, ensures consistent supply of electricity, and serves as an example for the benefits and resilience of decentralized solutions during instability. Furthermore, these systems serve as a safety net in contexts where there is a lack of state capacity to provide accessible and reliable electricity.

Recommendations

Lebanon and Sudan's experiences with decentralized renewable energy systems can be characterized as a spontaneous transition in response to compounded crises. While renewable energy adoption in Lebanon has expanded beyond household-level usage, renewable energy deployment in Sudan is still largely confined to the agricultural sector and some individual urban consumers. However, both cases demonstrate the flexibility of renewable energy systems and their potential in times of instability and crisis. Yet, a long-term, sustainable and equitable transition can only take place through deliberate government policy. To that end, the following are important points for consideration:

- Reforming the energy sector is crucial for Lebanon's recovery process.⁵⁰ While the surge in individual and municipal driven solar installations has helped address the harmful impact of the multiple crises, they are no substitute for core reforms within Lebanon's ailing power sector. Similarly, in Sudan the prospects for the post-conflict adoption of renewable energy will depend on political commitment and stability, and alignment with a long-term development strategy.
- In Lebanon, full implementation of Law No.462 would serve as a major driver of renewable energy deployment. Establishing an Electricity Regulatory Authority (ERA) would provide an access point for the private sector.⁵¹ The ERA would contribute to streamlining procedures for the licensing of new renewable energy projects. Furthermore, the roles and scopes of the existing entities within the licensing and management processes would be better defined by establishing an ERA and defining the different licensing procedures.⁵²

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World Bank Group. Lebanon
Country Climate and Development
Report. 2024. p.47.

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Ibid.

- In contrast, Sudan's ERA would benefit from a restructuring that ensures its independence. This would also allow for more relevant and clearer regulations and procedures for private sector participation in the electricity sector. However, these developments must proceed in parallel to broader growth strategies that ensure productive use of electricity.
- The high dependence on imported fuel for power generation, whether for centralized or distributed systems, has increased vulnerability in both countries to fluctuations in global energy prices, negatively impacting energy security and increasing pollution. Therefore, expanding the deployment of renewable energy technologies and diversifying the two countries' energy mix would reduce dependence on energy imports.⁵³
- A functional grid and an adequate regulatory framework are necessary requirements in order to take advantage of the energy transition underway in both countries.⁵⁴ This would need to be supplemented by broader reforms and interventions, particularly regarding the labor market, affordable finance for renewable energy projects, and conducive regulations for broader uptake.⁵⁵
- Establishing a local skills base is essential for the broader expansion of renewable energy. This can be achieved through deliberate government policy to create training institutions and certification standards. One approach is to partner with existing education institutions or create new institutions with specific skills training curricula.
- Finance is essential for individual and grid-level expansion of renewable energy. This can be tackled through establishing funds or financial instruments specifically targeting renewable energy projects. Moreover, both governments can take advantage of the growing number of global financing facilities for renewable energy development in developing countries.
- Addressing governance and corruption issues within the power sector is essential through improving transparency and accountability. Measures should be taken to address illegal connections which contribute to losses in revenue.
- Streamlining energy transition considerations across different sectors and ministries in both countries will accelerate the process of large-scale adoption of renewable energy. Coordination between different government bodies, including government departments

⁵³ International Renewable Energy Agency. p.6

⁵⁴ World Bank Group. Lebanon Country Climate and Development Report. 2024, p.47.

⁵⁵ Ibid, p.47-48.

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A Policy Brief is a short piece regularly published by LCPS that analyzes key political, economic, and social issues and provides policy recommendations to a wide audience of decision makers and the public at large.

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that regulate the electricity sector, the respective central banks, and ministries of industry, is essential in ensuring planned and future projects are implemented in a timely manner.

- Finally, in both Lebanon and Sudan, subsidies can be redirected to where they are most needed. Subsidies targeting the initial start-up capital for renewable energy systems will ensure the current momentum continues in Lebanon and increased adoption among rural and low-income households in Sudan. Moreover, subsidies for grid connections would ensure that government-planned, grid-connected renewable energy projects reach underserved regions and communities. Finally, a more informed and targeted tariff system could ensure that price subsidies increase affordability of electricity to low-income households with access to the grid.