SOPRONI EGYETEM
LÁMFALUSSY SÁNDOR KÖZGAZDASÁGTUDOMÁNYI KAR

KONFERENCIAKÖTET

Conference Proceedings

Nemzetközi tudományos konferencia
a Magyar Tudomány Ünnepe alkalmából
International Scientific Conference
on the Occasion of the Hungarian Science Festival

Sopron, 2025. november 6.
6 November 2025, Sopron

FEJLŐDÉSI PÁLYÁK ÉS ÚJ TÖRÉSVONALAK A FENNTARTHATÓSÁGI ÁTMENET IDŐSZAKÁBAN

DEVELOPMENT TRAJECTORIES AND NEW DIVIDES IN TIMES OF SUSTAINABILITY TRANSITIONS

Szerkesztők / Editors:
RESPERGER Richárd, SZÉLES Zsuzsanna, TÓTH Balázs István

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LEKTORÁLT TANULMÁNYOK / PEER-REVIEWED PAPERS

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SOPRONI EGYETEM KIADÓ

UNIVERSITY OF SOPRON PRESS

SOPRON, 2026

JUBILEUMI TUDOMÁNYÜNNEP 2025 / SCIENCE JUBILEE 2025

Mottó: **„200 év a tudás és a társadalom szolgálatában”**
/ Motto: „200 years to knowledge and service to society”

MAGYAR TUDOMÁNY ÉVE 2025/2026

Felelős kiadó / Executive Publisher**: Prof. Dr. FÁBIÁN Attila**
a Soproni Egyetem rektora / Rector of the University of Sopron

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Tördelőszerkesztő / Layout Editor: Dr. RESPERGER Richárd

ISBN 978-963-334-579-5 (pdf)

DOI: https://doi.org/10.35511/978-963-334-579-5

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DOI: 10.35511/978-963-334-579-5-s5-1

Sociocultural Influences on Green Transition: Community Resilience and the Solar Energy Shift in Lebanon

Nadine AL AMINE
PhD Candidate
Eötvös Loránd University (ELTE), Faculty of Social Sciences, Department of Sociology

Abstract:
Since 2019, Lebanon has endured several crises, starting with an economic collapse with all its consequences, health challenges (COVID-19), the Beirut Port explosion, and most recently, the war in South Lebanon and the escalation to other regions. Lebanese people struggle daily with their basic needs and seek alternative solutions to the limited services provided by the government, with a primary focus on green energy. In the absence of government electricity, the adoption of solar energy has gained popularity among Lebanese citizens. This paper aims to explore the sociocultural aspects of Lebanon's solar energy transition, social resilience, and adaptation to crisis. Using secondary analysis, it highlights how the solar boom during the crisis reflects more than a technological change. It shows how the adoption of energy is a type of social adaptation, focused on local needs and people's dignity and solidarity with one another, rather than state planning or environmental policy. Using Fran Norris's community resilience framework and focusing on the four adaptive capacities: Economic development, social capital, information and communication, and community competences, this paper identifies community-based initiatives and non-state networks adopted to secure and sustain energy access. Thus, as the sun becomes an actor in Lebanese everyday life, it also redefines attitudes regarding resilience, autonomy, and responsibility at large. Findings suggest that Lebanon's shift toward renewable energy demonstrates that green transitions in unstable settings represents social efforts, reflecting cultural values, collective coping strategies, and new forms of social organization that emerge beyond the state.

Keywords: solar energy, green transition, crisis adaptation, community resilience, Lebanon
JEL Codes: O13, Q28, Z13

1. Introduction

Lebanon has been stuck in multiple crises since 2019, enduring political and economic weaknesses. These challenges, including political problems, economic collapse, social distress, infrastructural decline, and external shocks, are deeply interlinked (Khatib, 2022; Snaije, 2022). The literature reveals how historical sectarian governance and policy failures set the stage for the current collapse, with each aspect of the crisis intensifying the others in a falling manner. Below is a literature review of key facets of the Lebanese context, drawing on credible sources to illustrate the depth of the instability and its interconnected nature.

Lebanon's political system has long been characterized by sectarian power-sharing and elite rule. Since independence in 1943, government posts have been allocated by religious sect (a practice later reaffirmed by the 1989 Taif Accord), with the presidency reserved for a Maronite Christian, the prime minister a Sunni Muslim, and the parliament speaker a Shia Muslim (Bahout, 2016). While intended to ensure representation for all 18 sects, this *confessional* system primarily served as a treaty among sectarian elites rather than a framework for good governance (Khatib, 2022). The result has been a weak state and a patronage-based bureaucracy where jobs and public resources are allocated in return for political loyalty, establishing corruption and nepotism (Collard, 2019). Indeed, according to Arab Barometer (2019) only 20% of Lebanese trusted core public institutions, reflecting general frustration with this governance

model. Sectarian divisions thus deeply influence governance: leaders of each sect treat ministries as a way to enrich their followers, worsening competition and paralyzing decision-making. This legacy of sectarian clientelism advanced a culture of immunity: ruling parties have treated state institutions "as sources of income," planning across sectarian lines to protect a system that benefits them all (Khatib, 2022). Due to this elite bargain, major policy failures, such as the mismanagement of the electricity sector and waste services, went unchecked for decades. For example, in 2015, a garbage disposal crisis sparked the "You Stink!" protests, a rare public protest against government incompetence. Corruption became persistent, and accountability was nearly nonexistent, introducing a long-term instability (Lebanon Support, 2016).

Crucially, post-civil war economic policies also set the stage for collapse. After the 1975-1990 civil war, Lebanon's leaders rebuilt the economy on unsustainable foundations: heavy corruption, a bloated public sector, and a fixed exchange rate (Oguri, 2020). In 1997, the Lebanese pound was controlled and fixed to the US dollar at an artificially strong rate, which allowed massive economic and trade deficits to accumulate over the next two decades (Snaije, 2022). Rather than investing in productive industry, the state (dominated by former warlords-turned-politicians) financed itself through short-term bank loans and diaspora deposits, often at excessive interest rates. By the mid-2010s, public debt escalated to one of the highest levels in the world, and the economy became extremely dependent on foreign currency inflows (aid, remittances, Gulf tourism) to sustain the limit and fund imports (Oguri, 2020). Key governance failures, such as the refusal to reform the electricity sector which was draining around $2 billion annually (about a third of the state's budget deficit), compounded the financial strain (Perry & Francis, 2020). In short, Lebanon's pre-2019 order was a "fragile economic and social contract" born after the civil war, trading genuine reform for short-term stability (Snaije, 2022). By 2019, this model was collapsing: years of corruption, sectarism, and unsound economic policies had eroded the country's resilience.

1.1. Electricity Crisis

Lebanon's physical infrastructure has primarily collapsed under the strain of decades of neglect and the recent disturbance. Nowhere is this more evident than in the electricity sector. Lebanese households today receive only a bit of power from the national grid, often just 1-3 hours of electricity per day, as the state utility (Électricité du Liban, EDL) can no longer afford fuel for power plants (Dagher et al., 2023). Rolling blackouts, once a routine annoyance, have become near-total outages. Most of the population relies on private diesel generators for lighting and basic needs at a prohibitive cost. By 2022, it was common for families to spend more on generator subscriptions than food or rent (Vizoso & El Murr, 2022; Lawrie, 2024). This crisis was decades in the making: mismanagement and corruption in the power sector since the civil war led to chronic under-investment and substantial financial losses. The state has poured more than $36 billion into the electricity sector since 1992 (through subsidies and failed projects) without resolving the supply gaps (Rabah, 2018). Political interference, such as sectarian disagreements over where to build power plants, repeatedly stopped expansion and reform. As a result, even before the economic collapse, Lebanon endured daily power cuts. According to Human Rights Watch (2023a), the situation worsened after 2019 when the government could not maintain fuel imports, leading to severe blackouts (in 2021 and 2022, nationwide electricity outages lasted days). The lack of reliable electricity has flowing effects: water pumps and sanitation systems cannot run (contributing to water crises), businesses and hospitals incur massive costs for generators, and overall quality of life has plummeted. In a touching metaphor, Lebanese often say the state "switched off the lights" on the country. Reforms and foreign aid targeting the power sector (from the World Bank, etc.) have been pledged, but they remain tied to unmet political conditions (Perry & Francis, 2020). Thus, the electricity crisis represents Lebanon's infrastructure breakdown: it is both a cause and a consequence of the broader governance failure.

The persistent shortages of the state-run electricity provider, Électricité du Liban (EDL), have led to widespread reliance on private diesel generators to meet daily energy needs. This informal sector, comprising an estimated 3,000 to 3,500 operators, has become integral to the nation's power infrastructure, often supplying electricity around the clock, although at a premium price (Human Rights Watch, 2023b). The excess of these generators has not only imposed significant financial burdens on households but has also raised environmental and health concerns due to increased diesel consumption and associated pollution. Moreover, the unregulated nature of this industry has led to instances of monopolistic practices, with some operators exercising considerable control over pricing and service provision (Nasser, 2021). This dependency on private generators underscores the critical need for sustainable and decentralized energy solutions, such as the adoption of solar power, to enhance energy security and resilience in Lebanon.

1.2. Solar Boom Amid Crisis

Amid the darkness of the power crisis, one notable positive development has been a mass shift toward solar energy by Lebanese citizens, businesses, and communities. As the state electricity supply reduced to near zero in 2021–2022, many had no choice but to seek alternative solutions. Solar photovoltaic (PV) systems have emerged as a leading coping mechanism to secure elemental power (Tsagas, 2023). Virtually a solar energy boom is underway: Lebanon went from generating almost no solar power a decade ago to an estimated 90 megawatts (MW) of solar capacity by 2020 and then experienced an explosion in installations, an additional around 100 MW in 2021 and 500 MW in 2022 alone (Rasmi, 2023; Helou & Polese, 2024; Merheb, 2024). This represents a seven-fold increase in solar capacity since the start of the crisis, a remarkable community-driven energy transition. Households that can afford it have transferred their savings (or diaspora assistance) into purchasing solar panels, batteries, and inverters. Even though a basic home solar setup can cost several thousand dollars upfront, many Lebanese see it as a necessary investment to regain normalcy and dignity. Solar power allows them to "unsubscribe" from the expensive diesel generator mafias that long dominated backup power supply (Lawrie, 2024).

Lebanon's sunny climate, roughly 300 days of sunshine a year, makes small-scale solar relatively effective, and users are capitalizing on about 7-8 months of dry, clear weather that the country enjoys annually (El Khoury, 2023, as cited in Rasmi, 2023). By harnessing this abundant sunshine, communities are creating islands of energy security in an otherwise electricity-scarce nation. "Households were installing solar panels before 2021 out of ecological concern. However, in 2021, it became a means to secure energy supplies: EDL's production, which used to reach 1,800 MW, fell below 150 MW," said Pierre El-Khoury, general director of the Lebanese Centre for Energy Conservation (LCEC) (as cited in Rasmi, 2023). Families recount how keeping lights on and fridges running for 24 hours via solar has become more valuable than any luxury, especially as generator fuel costs skyrocketed in local currency by 2022. Economic considerations primarily motivated the decision when the relative cost of power from generators increased tenfold in Lebanese lira in 2022 (as noted in Delacloche, 2023).

2. Theoretical Framework

In her paper, “Community Resilience as a Metaphor, Theory, Set Capacities, and Strategy for Disaster Readiness,” Norris and her colleagues provided a comprehensive framework for understanding community resilience. Resilience is the theoretical lens for understanding how societies adapt to crisis, it refers to the capacity of a system or community to absorb shocks and regain normal function. It is not conceptualized as a constant trait but as a dynamic continuous process of adaptation. Norris et al. (2008) defines community resilience as *“process linking a*

network of adaptive capacities (resources with dynamic attributes) to adaptation after a disturbance or adversity". This perspective provides a new approach focusing on the active strengthening of communal competencies and resources that enables populations to handle, increase endurance and innovation, during hardship. In the context of Lebanon, it is interesting to analyze the shift to solar power amid crisis from the perspective of community resilience. It focuses on how communities mobilize economic resources, social networks, information and collective efficacy to adapt and build alternative solutions. Thus, resilience theory bridges the gap between crises and sustainability research, highlighting the ways local communities develop adaptation strategies that sustain societal functioning. Viewing Lebanon's solar energy boom as a resilience mechanism, we can investigate not only the technical shift in energy sources, but the social capacities that make this bottom-up transition possible in a fragile state.

These capacities are grouped into four groups, and will be elaborated in the discussion:

- *Economic Development:* the availability of economic resources, emphasizes the importance of resources and equity in distribution within a community. It includes a resource base, employment, income, fair access to essential assets. An equitable economic foundation enhances the community's ability to recover. On the other hand, inequity and poverty may undermine resilience.
- *Social Capital* includes social support, participation, and community bonds; it reflects the strength of relationships and networks within a community. This includes bonding capital, withing families or groups, and neighborhoods. In addition to creating connections across different social groups and institutions. Communities with strong social capital can help, share information and coordinate recovery more successfully.
- *Information and communication:* Effective communication ensures accurate information circulation within the community, facilitating decision-making and coordination during emergencies. This includes having trusted information, effective communication channels both informal and formal. In addition to the ability to create and share meaning about the crises, either through narratives or public discourse. In resilient communities, people receive and share knowledge on how to cope, and transparent communication helps and coordinate collective responses to challenges.
- *Community competence:* the ability to engage in collective action, problem-solving, and decision-making. The ability to effectively identify needs, plan responses, and implement crisis strategies. This includes leadership, social cohesion, group decision making and conflict resolution. A competent community is a community that can build partnerships and adapt to new demands. It is reflected in flexibility and ability to improvise and adjust to unknowns. High community competence means that the community can self-organize to address problems when formal institutions are absent or fail.

It is important to note that resilience at community level is not always beneficial but has critics and complexities. The celebration of resilience can sometimes justify neglect by authorities. The Lebanese case will show both impressive adaptive capacities and the inequities and strains that might complicate the narrative of resilience.

3. Methodology

This paper is based on qualitative analysis of secondary sources obtaining a wide range of Lebanese literature including academic papers, policy and NGO reports, development agencies publications and news articles. The aim is to develop an understanding of existing knowledge on Lebanon's solar energy shift since 2019, with specific attention to community dynamics. The paper employs an interpretive framework through Norris's four adaptive capacities to organize and analyze data. Precisely, a thematic code was applied from sources according to each aspect: economic resources, social capital and networks, information/communication, or community competence in relation to solar transition. This allows connecting empirical observations to resilience concepts.

No primary data was used for this paper, however, many of the sources include actual insights from interview with community members and testimonies. This helps the study constructs a composite picture of how Lebanese communities have dealt with the energy crisis. It is a structured literature review for a case study aiming to deeply understand how and why solar transition progressed the way it did in Lebanese society.

4. Findings and Discussion

4.1. Economic Development: A double edged sword of resilience

An economic approach can best describe the expansion of the use of solar energy in Lebanon. The transition can be seen as a function of financial need rather than an awareness of a problem with the environment, and is a means of survival against hyperinflation of diesel-generator prices, making these alternatives cost-prohibitive for a significant number of Lebanese (Cuyler & Ayoub, 2025). However, it is a double-edged phenomenon itself because the financial outlay required by a typical residential solar energy arrangement is significant, estimated at a minimum 4000$ to 5000$.

Lebanon's solar uptake is decentralized and market-driven: companies import panels (over 100,000 tons of solar panels were imported between 2013 and 2022, with 80% of that in 2022 alone amid the crisis and households self-finance installations despite no government subsidies (Boukather, 2023). This rapid deployment happened without facilitating legislation: net metering policies, feed-in tariffs, or solar incentives are minimal. Citizens took it upon themselves to solve an urgent problem, underscoring societal resilience.

At the same time, the current solar energy boom exposes structural inequalities and the limits of resilience when it relies on individual action. Analysts observe that while the lights are indeed back on across many Lebanese towns and homes thanks to private solar investments, “at what cost?” and “what do we lose and gain from this?” remain pressing questions (Haytayan, 2024). The improvisational, market-driven nature of the solar rollout, described as “chaos” and “individualism” by one commentator, means that only those who can afford the upfront costs or who have external support can enjoy energy autonomy (Haytayan, 2024). Wealthier households and businesses have installed solar rigs and batteries, thereby insulating themselves (to an extent) from blackouts. Meanwhile, poorer families, who cannot master the capital for solar, risk being left further behind. This dynamic “reflects imbalance and inequity in the provision of basic services” (Haytayan, 2024), an imbalance that has deep roots in Lebanese society. Put simply, resilience has not been evenly distributed. In the other section, this paper also highlights the community bond in some cases which lead to helping and creating the sense of community unity.

Lebanese people pride themselves on adaptation, but the structural context, a history of corruption, uneven development, and now hyperinflation, means not everyone can adapt equally. Additionally, the influx of solar equipment has raised questions about safety standards, quality control, and environmental disposal of batteries in the future (Vizoso & El Murr, 2022). There is also the issue of grid integration (currently, most systems are off-grid). However, in the long run, a fragmented patchwork of private solar is not a substitute for a coordinated national energy strategy.

There are several projects and donor fundings, for example USAID’s 20 million dollars solar fund and the EU CEDRO 5 program with a 22-million-euro budget (UNDP, 2023; Sandwell et. al., 2024) however, they are often temporary, uncoordinated with the state and insufficient to lead complete transformation (Saade, 2025). According to Saade (2025) energy inequality is not just an outcome but a moral and political necessity to address it. He recommends prioritizing affordability and ensures equitable access, as a just transition requires proactive measures to make solar energy accessible for all.

4.2. Social Capital: Networks of Mutual Support

Despite the fact that in some cases individualism and economic situation may impact the opportunities of having access to solar energy, Lebanon's special social structure has been a key actor in solar transition, demonstrating the power of society in fostering resilience. The response to crisis is not uniquely individualistic, regardless of the economic restraints, it has been mediated through community bonds, diaspora networks and civil society organizations. In Norris's framework, this corresponds to social capital: the bonds that enable people to cooperate for mutual benefit. In the Lebanese case, the social capital is both an alternative safety net for absence of government support and an incentive for innovation in the energy domain.

Lebanon's move toward solar energy cannot be understood in isolation from the country's sociocultural fabric and structural realities. On one hand, there is a long-standing cultural narrative of Lebanese resilience: a sense of creativity and adaptability refined by decades of instability (Obeid, 2024). Communities have developed what some call a "DIY mentality" toward basic services. For example, it has become expected that families will secure their own electricity (via generators or now solar panels) and water (via private wells or deliveries) when public utilities falter. This norm of self-reliance is partly a cultural adaptation to government failure. Indeed, state weakness has effectively "forced people to figure out ways of accessing basic services" on their own (Monroe, 2023). Social structures in Lebanon, the extended family unit, sectarian or municipal community organizations, charities, and the vast diaspora have traditionally shouldered the burdens that the state failed to carry (Cammett, 2011; Diab, 2021; Assi, 2022). These structures have greatly influenced the shift to green energy by organizing resources at the community level.

For example, neighborhood groups have collectively funded solar panels for shared water pumps or street lighting in some villages (Bitar, 2024; Haytayan, 2024; UNHCR, 2024). Diaspora donors and NGOs – like American Near East Refugee Aid (Anera) and others – have sponsored solar systems for schools, hospitals, and community centers to ensure critical services can continue (Anera, 2023; Thomas, 2023). One striking case involved residents and expatriates of a southern village (Tayr Harfa) financing a $130,000 solar-powered water pumping station to supply the community - an act of self-reliance amid state failure (Abou Aljoud, 2023). The project was implemented in 2022, when three concerned sons of Tayr Harfa (one local, one in Beirut and one in Africa) decided to help and solve village's water crisis themselves. They reached out to people and expatriates, formed a committee and within months they raised the amount with 60% of the contributions coming from diaspora natives of villages. In summer 2023, after completing the project, around 90% of the villager's water needs were met by this community-built solar system. This initiative is an example on how bonding social capital and diaspora support translated into resilience gains. Tragically, this system was destroyed by conflict in late 2023, showing that even grassroots infrastructure is vulnerable to war. Moreover, social capital in Lebanon's crisis has a cultural dimension. Decades of state inadequacy have normalized turning to family, neighbors and religious institutes. Such norms meant that when electricity crisis hit, community did not wait for their government to act, they immediately explored their solutions

4.3. Information and Communication: A Market of Mixed Quality

The rapid spread of solar energy in Lebanon was facilitated by the fast flow of information and know-how through society. According to Norris's framework, information and communication refer to the ability of communities to share knowledge, communicate and develop a common narrative during crisis. In the Lebanese context, this capacity was shown in different ways: the exchange of technical knowledge about solar installations, to communication by media and daily or weekly reports, to sharing on social media. This helped Lebanese people find a way to solar power.

It is important to note how quickly information about solar systems proliferated among citizens. Prior to crisis, solar energy was not widely spread and understood by the public. Reports showed that as crisis started, Lebanese people quickly leaned from each other how to install and use solar systems. For example, one Lebanese electrician who started his business as a solar energy installer, described how neighbors and clients started asking him to install batteries and panels, turning it to be "a gold mine right now" as he mentioned (Vizoso & El Murr, 2022). Another person mentioned ironically how his father bought solar panels from a doctor who turned to be an importer of solar kits: "everybody in Lebanon seems to know somebody who has reinvented themselves overnight to make a living" (Vizoso & El Murr, 2022) reflecting word of mouth diffusion. However, it came with challenges and led to misinformation and uneven quality of advice in some cases. As demand increased, instant experts and new companies filled the market (Cuyler & Ayoub, 2025). Not all were competent, which led people to trust the word of mouth. Often, negative experiences were spread on social media and groups as a caution.

Within communities, effective communication is important in organizing collective projects. As mentioned earlier, in the Tayr Harfa example, the initiators collected phone numbers of locals and expats and called them one by one to pitch the project, in addition to a communication campaign through social media (Abou Aljoud, 2023). This reflects Norris's point that trusted sources of information and inclusive communication increase community engagement. The diaspora also played crucial role where professionals often advised families back home on what systems to buy, some spend their vacations checking the process of installations in their family homes.

Moreover, the narrative of solar energy shifted: the perception of sustainability. Unlike in some countries where a green ethos or climate concern drives the adoption of renewables, in Lebanon the turn to solar has been largely pragmatic. The surge in solar capacity since 2020 (from about 100 MW pre-crisis to an estimated 1,000 MW in 2023) grew out of necessity and suffering, and [not] because people believed in the need for energy transition (Dagher et al., 2025). There is a certain irony: a shift that contributes to climate sustainability is happening in Lebanon primarily as a survival strategy, not due to pro-environment attitudes or policies. This indicates that sustainability and resilience are intersected by coincidence. Nonetheless, now that thousands of systems are in place, a cultural change may follow, with more people appreciating the benefits of clean, independent power. Already, some local stakeholders frame solar power as a form of empowerment and *"freedom"* from a corrupt system (Thomas, 2023). What began as a desperate measure could evolve into a more conscious movement for renewable energy, bridging the gap between necessity and sustainability.

4.4. Community Competence: Self-Organization and Leadership

Lebanese communities showed remarkable competence in how they took charge of their fate. Local initiatives and leadership were essential, in many municipalities and sometimes citizens, stepped out to guide the community's response which linked different stakeholders. For instance, in some villages the municipality and mukhtar (local elected representative) conducted meetings to discuss the electricity problem, in one town, they took the lead by collaborating with Anera in 2025 to lunch a community solar project which will directly benefit 200 households and indirectly support and additional 640 households (Anera, 2025). The Mayor of Ain Ebel described it as "turning resilience into action", focusing on how the community's experience of wartime and crisis was converted into a proactive strategy.

Another indicator of community competence is the development of local expertise and capacity-building. When thousands of solar systems are installed across the country, as have been in the last few years, a cadre of skilled technicians and operators must also appear. Young electricians received training on how to design and maintain solar through vocational programs

(Unicef-funded courses via Anera training students in installing panels) (Anera, 2022). In addition to collective decision making by forming councils in each village.

However, this competence has its restrictions. The decentralized, uncoordinated nature of the solar rollout has created a divided and inefficient mixture of private systems. It is not a substitute for a coherent national energy strategy. A major challenge is the lack of grid integration. With no net-metering system in place, excess energy generated by private solar installations is simply lost when batteries are full, a significant waste of power (Cuyler & Ayoub, 2025). Furthermore, as more rich users go off-grid, it reduces demand for EDL, hurting the utility's financial viability and making it harder to plan for future national-level investments. This highlights a central tension in the resilience narrative: while community competence enables survival and adaptation, it can also lead to inequitable outcomes at the macro level and potentially release the state of its responsibilities.

4.5. Sustaining Momentum for a Renewable Future

The prospects for renewable energy in Lebanon hinge on leveraging this momentum while instituting supportive policies. The Lebanese government has formally recognized the importance of renewables; it is a signatory of the Paris Agreement and, in its Nationally Determined Contribution (NDC), has pledged to reach 30% of power from renewable sources by 2030 (International Renewable Energy Agency [IRENA], 2020). If the current trend continues, the country might approach this target through sheer private initiative well before 2030. Officials have optimistically (perhaps prematurely) claimed that Lebanon is on track to meet its renewables goals. However, most observers argue that the solar rollout has happened with minimal government involvement or planning (Haytayan, 2024), regardless of some government initiatives. To truly sustain and expand alternative energy use, there is a need for regulatory frameworks, e.g., standards for equipment, financing mechanisms to help lower-income households adopt solar, and potentially integrating these private systems into a smarter grid. International aid could be directed to scale up renewable energy projects (for instance, grants or soft loans for community solar farms or wind projects) as a dual solution for the energy and climate aspects of the crisis. Moreover, investing in renewables could create green jobs locally, partially balancing the brain drain (Abou-Ali & Kubursi, 2024). The crisis has inadvertently spurred an energy transition that aligns with global sustainability trends; what remains is to organize and equitable-ize this transition. In academic terms, Lebanon's turn to solar energy can be seen as an emergent form of adaptive resilience: society adapting to infrastructure failure by building a new system from the ground up. Researchers like Boukather (2023) have noted that this shift represents a collective move "against the fossil-fuel economy" and a vote of no-confidence in the state's ability to provide for its citizens. In conclusion, the rise of solar power in Lebanon, illustrating how interconnected crises (in this case, economic collapse, infrastructure failure, and conflict) can lead to transformative changes in behavior. If harnessed properly, this could set the foundation for a more sustainable and decentralized energy future for Lebanon, reducing reliance on costly fuel imports and improving community resilience to shocks.

Lastly, Lebanon’s case highlights the interaction between community-driven initiatives and formal structures. Thus, the green energy shift has been community-driven and market-driven, with minimal government coordination and implementation. For example, according to El Khoury (2023) solar installation companies (growing from 150 firms in 2020 to over 800 by 2023) and neighborhood cooperatives are the actual new infrastructure providers (as cited in Rasmi, 2023). While this has led to quick gains in resilience, it also raises issues of regulation, quality control, and sustainability of the shift. There are growing concerns about the “privatization of the sun”: e.g. corrupt vendors, e-waste management challenges, and the lack of oversight in the rush to solar (Vizoso & El Murr, 2022). Culturally, Lebanese society don’t trust the centralized authority (given decades of governmental failure), so bottom-up initiative is a natural path, yet some form of coordination or support could ensure that resilience-building

today does not create new vulnerabilities tomorrow (such as environmental hazards from discarded panels or batteries).

5. Conclusion

Lebanon's spontaneous solar energy transition is evidence to the resilience of its communities in the face of state failure. This paper has analyzed this bottom-up change through the perspective of Norris et al.'s community resilience framework showing how the organization of adaptive capacities has enabled a people-led response to the country's deep electricity crisis. On one hand, the solar transition showed remarkable adaptability with diaspora transfers, social networks and a feeling of self-reliance for energy independence. On the other hand, this resilience is not equal and might create a new form of energy poverty.

The analysis emphasized that despite community resilience being able to secure crucial life-support functions when formal institutions have collapsed, it is by no means a replacement for just and effective governance. The solar rollout, being fragmented and driven by the market, has been inefficient, with no quality control, and has failed in the main to complete the full potential of decentralized renewable energy. Community self-organization has been presented too often as a substitute for state action, a presentation that not only lets the state off the hook but also guarantees, in observable fact, that the state's fundamental responsibilities will not be met.

For Lebanon to move from a state of uncertain resilience to one of sustainable recovery, a fundamental shift in governance is required. This involves not only technical solutions like implementing a net-metering law and establishing an independent regulatory authority but also a deeper commitment to social and economic justice. The challenge is to connect the incredible adaptive capacity demonstrated by the Lebanese people and route it into an organized, inclusive national strategy. This means creating policies that ensure equitable access to renewable energy, fostering community-owned energy models, and establishing transparent, participatory platforms for decision-making. Finally, the future of energy in Lebanon depends on transforming the political and institutional structures that led the country into darkness, building a system where the state empowers and supports the resilience of its citizens.

Full disclosure

This paper relies on secondary sources in Lebanon and doesn't incorporate primary research. All claims are derived from available materials publicly, including academic articles, NGOs reports and journalist investigations documenting testimonies from Lebanese residents. The discussion reflects the perspectives presented in the sources. The research was conducted independently and didn't receive any external funding. No political or organizational actors influenced the selection of sources. The paper tried to represent the Lebanese context as accurate as possible, however, the situation in Lebanon is changing rapidly and is highly fluid. Therefore, the analysis is an interpretation based on the best available evidence rather than a final account of ongoing events. Finally, because of lack of full-scale research across Lebanon, the findings presented here should not be generalized or assumed to capture the full diversity of experience across Lebanon. The community resilience dynamics may vary across regions based on different factors; thus, the paper acknowledges these limitations.

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