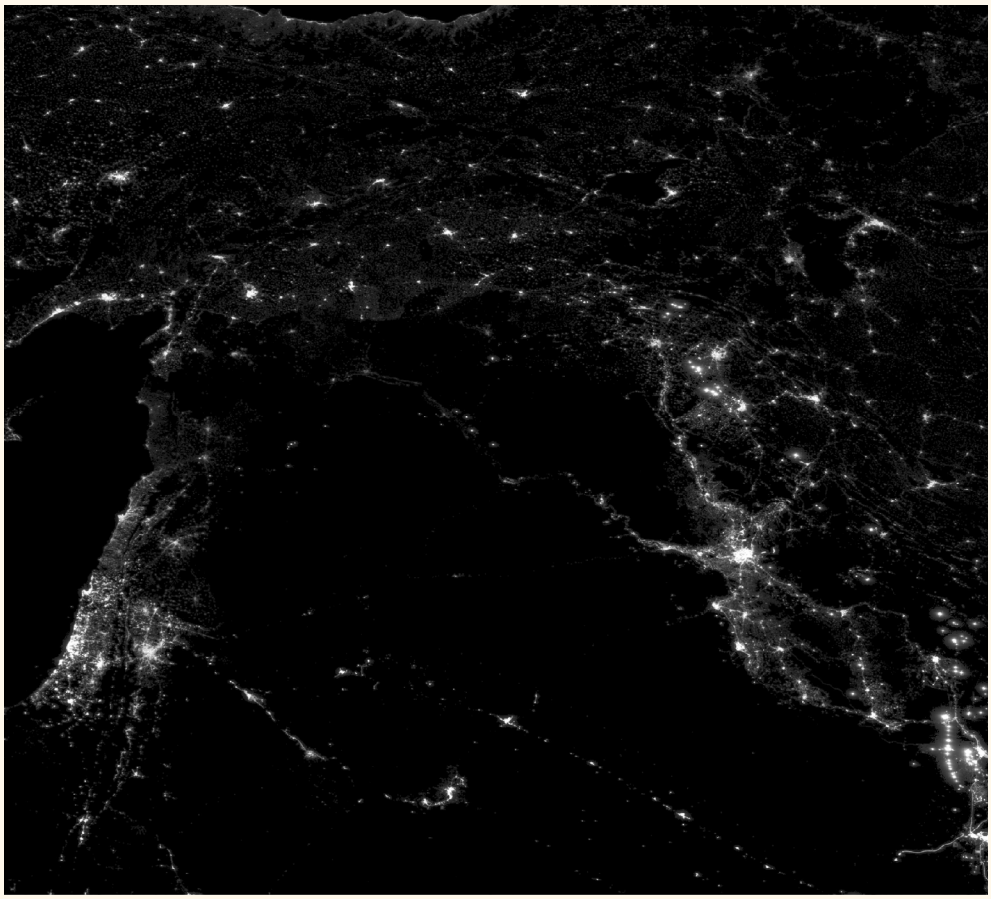
NORTHWEST SYRIA SERIES

HUMANITARIAN ACCESS TEAM

RESEARCH SERIES ON THE MEDIUM-TERM IMPACT OF THE 6 FEBRUARY EARTHQUAKE ON NORTHWEST SYRIA



Volume 2.

POST-EARTHQUAKE ELECTRICITY RECOVERY

MAY 2023

CA – SYR
CRISIS ANALYSIS – SYRIA

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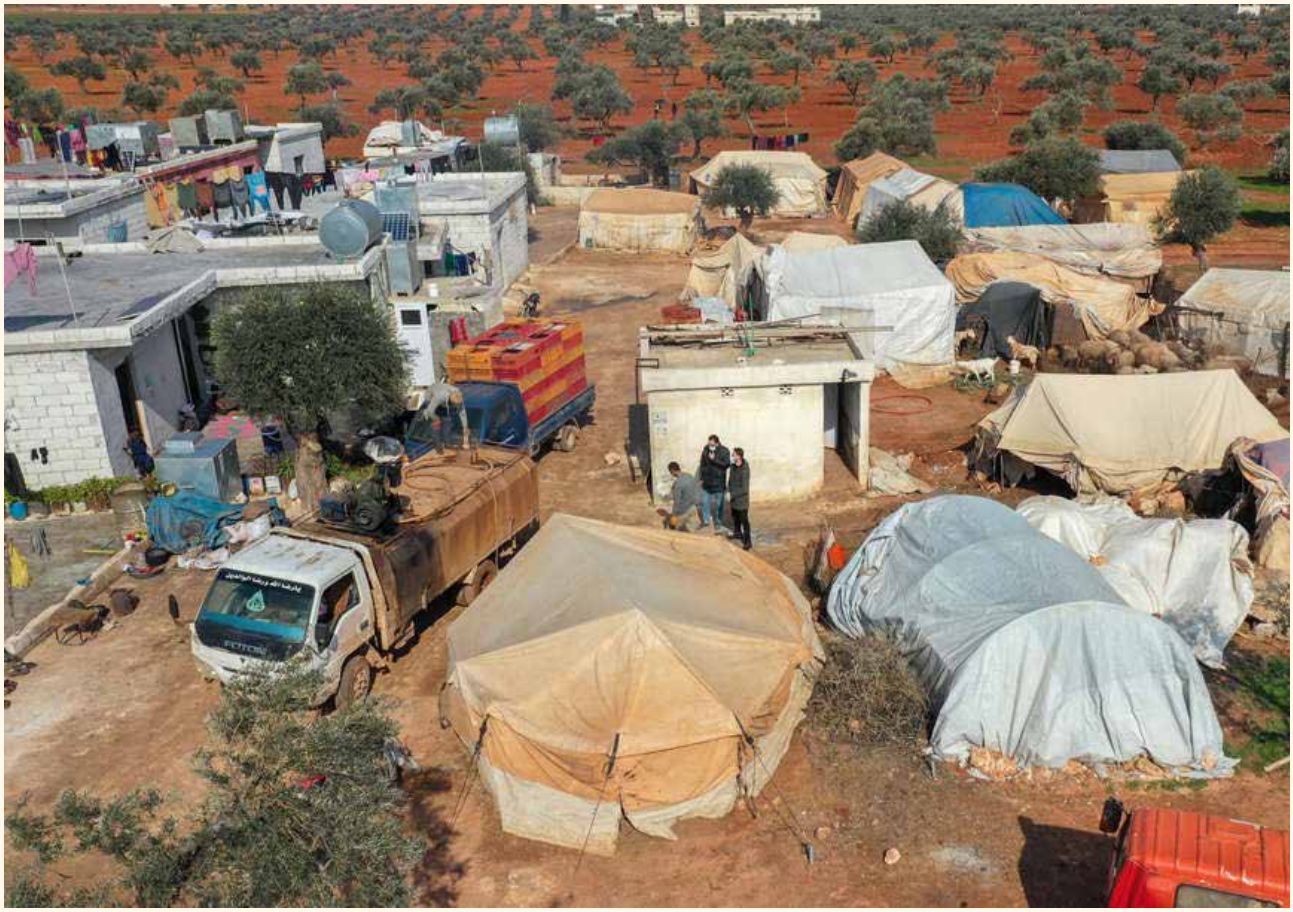

Photo: Post-earthquake WASH response in northwest Syria. Source: Mercy Corps Syria 2023.

Cover Photo: Night lights in northwest Syria, developed using VIIRS Nighttime Light (VNL) data produced by the Earth Observation Group, Payne Institute for Public Policy and Colorado School of Mines.

INTRODUCTION

The February earthquakes had a significant impact on Syria's electricity infrastructure, upending access to other key services including water, sanitation and hygiene (WASH) and protection in the immediate aftermath. Northwest Syria, already experiencing some of the most acute humanitarian needs, faced the highest per capita losses to electricity infrastructure due to the earthquakes, compared to other areas in Syria affected by the disaster.[1] The earthquake's financial and physical impact on the electricity sector is well documented. However, there is little data assessing the progression of electricity recovery and how electricity-related needs continue to shift three months on from the earthquake.

Volume 2 of Crisis Analysis – Syria's (formerly HAT) Northwest Syria Series aims to address these gaps by analyzing the rates and determinants of electricity consumption recovery across opposition-controlled areas of northwest Syria in the weeks following the February earthquakes.

Key findings

While electricity was restored in the weeks immediately following the earthquake in most parts of the northwest, longer term recovery and sustained access to electricity could be challenged in the future by affordability difficulties, loss of livelihoods, and monopolization within the region's energy sector. Several regional trends indicate where these dynamics are most palpable. When comparing across zones of control, areas controlled by the Syrian Interim Government (SIG) recovered more quickly than Syrian Salvation Government (SSG)-controlled areas. Where income data was available, areas with higher average wages experienced better electricity recovery outcomes than areas with lower average wages, suggesting that the relative affordability of electricity is an essential factor for recovery of electricity consumption.

Methodology

For the sake of this report, changes in electricity consumption are measured using the growth rate of night light reflectance (NLR) before and after the earthquake.[2] The change in NLR was regressed against several relevant variables to help explain the distribution of electricity consumption dynamics.[3] One model included locations under the control of the SSG in Idleb and the SIG in northern Aleppo. The second model only considered SSG-controlled locations in order to assess data from REACH's Humanitarian Overview of Syria assessment.

1 This loss was estimated to be $6,400 per capita in northwest Syria compared with $4,700 in government-controlled areas, according to a Rapid Needs Damage Assessment conducted by the World Bank.

2 The "before earthquake" period was defined between 1 December 2022 and 5 February 2023. The "after earthquake" period was defined as 20 February 2023 to 1 April 2023. The "rescue period", 6 February 2023 to 19 February 2023, was not included in the regression analysis.

3 Nightly VIIRS night lights satellite images were used for the analysis. Images with the minimum cloud were analyzed per-time period (pre- & post- earthquake rescue periods), were randomly sampled, with the sample size being the minimum number of days a certain day of the week was available in both the pre- and post earthquake rescue period for a given community. For example, if only one nightly image for a Wednesday occurred in the pre-earthquake period, though two nightly images on a Wednesday were available in the post-earthquake rescue period, then a random sample of one Wednesday per period was drawn for that location. This was done to ensure that the same number of nights were used to calculate the average for each time period, and that there was balance among the days of the week to avoid biases caused by the over representation of certain days, particularly weekends.

The models performed modestly, explaining 36% of the variation in electricity consumption dynamics in SSG-controlled locations and 25% of the variation among SSG- and SIG-controlled locations.[4] The coefficient results of this regression forms the basis of the analysis in this report and are displayed as a figure in Annex 1. Feedback from local sources in northwest Syria was also assessed to triangulate quantitative findings and offer qualitative insights with regard to electricity recovery and preferences after the earthquake.

PRE-EARTHQUAKE PROSPECTS

Years of conflict have upended electricity access across northwest Syria, and access to sustained electricity is still not guaranteed in some localities. In 2012, the Syrian government severed the region's connection to the national electricity grid, giving rise to a budding generator industry in newly opposition-controlled areas. The Turkish military's incursion into parts of northwest Syria in 2018 prompted a notable shift in energy prospects as Turkish energy companies partnered with governing authorities – first with the SIG in 2019, and later with the SSG in 2021 – to restore and rehabilitate the electricity grid, later offering subscription options for residents. These subscriptions, sourced from energy providers in Turkey, serve as the main energy source across northwest Syria today. However many rural communities are still not connected to the regional grid (particularly in Idleb), and must rely on alternative energy sources including solar panels and fuel-run generators, although local sources indicate a higher usage of the former.

RECOVERY TRENDS

Distance from the earthquake's epicenter was the largest determinant of NLR growth rates in the weeks following the earthquake, indicating that, as expected, areas closer to the earthquake's epicenter witnessed a slower return to pre-earthquake electricity consumption levels. Qualitative data also indicates that across the hardest-hit areas, recovery occurred at different rates. According to local sources, the grid was disconnected across northwest Syria immediately following the earthquake. While electricity was later restored in Idleb after about 48 hours, some parts of northern Aleppo were not reconnected for over two weeks, including Jandaris and Afrin. The extended shutoff was reportedly linked to damage sustained at the Reyhanli power plant in southern Turkey, which supplies energy to parts of northern Aleppo. In the interim, aid organizations and local authorities provided generator and solar energy options to households in need.

Although coordination efforts helped restore electricity in the interim, NLR data indicates that some areas of northwest Syria have continued to experience electricity gaps in the months following the earthquake. One example is visible when assessing NLR across camps housing internally displaced persons (IDPs): While most of the highest NLR results come from camps housing a high population of IDPs ($r = 0.89$; $p < 0.00$), the *lowest* NLR rates were concentrated in and around Jandaris, despite it hosting a relatively high IDP population.[5] This trend could indicate poor electricity infrastructure in camps, as well as the high level of earthquake-related damage experienced in Jandaris. A sustained lack of electricity in Jandaris raises concerns over WASH services, ensuring protection, and facilitating long-term recovery for displaced communities in particular.

4 In other words, the models' variables explained approximately a quarter of the variation in the data, which is modest considering the model is intended to explain and not predict.

5 The data includes IDPs displaced before February 2023 as well as those displaced by the earthquake.

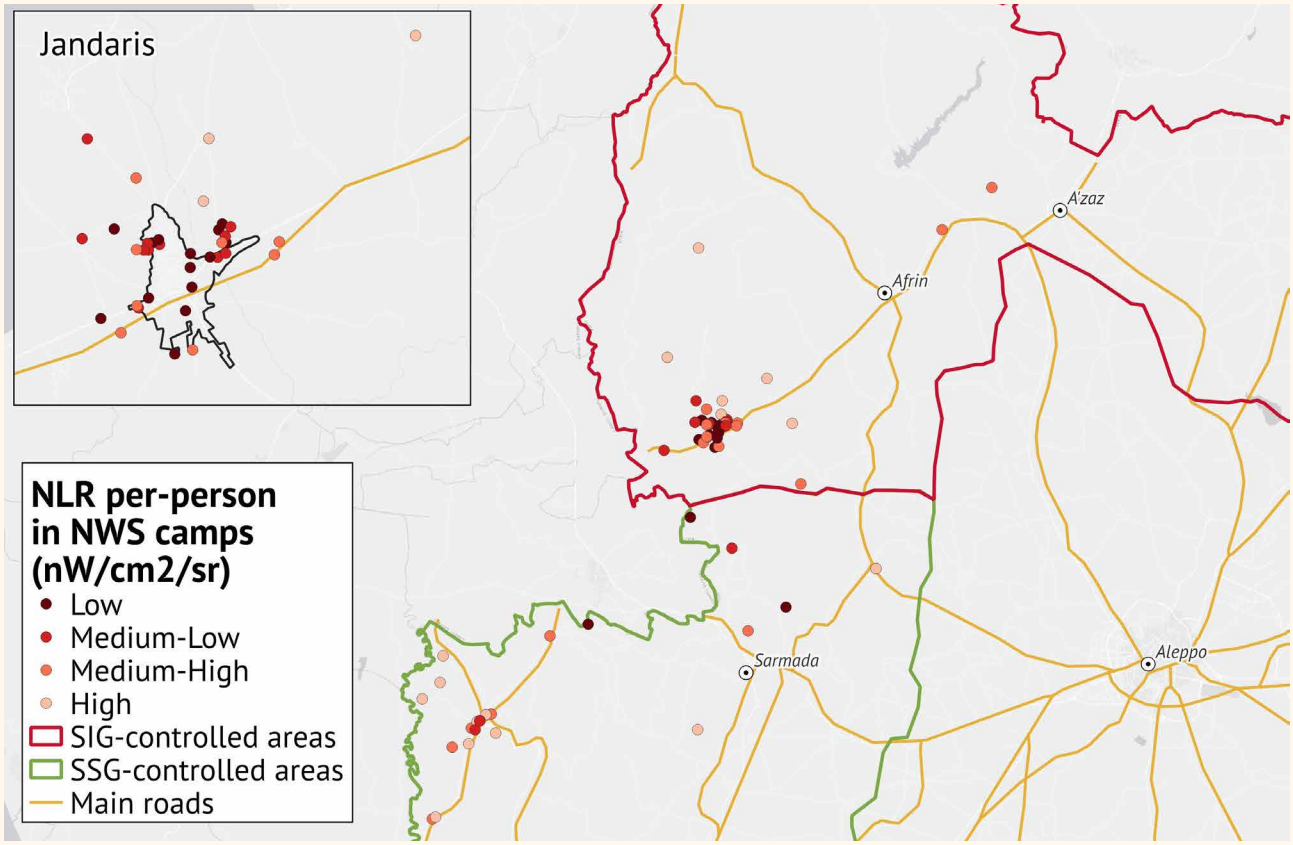

Figure 1. *Night lights reflectance per-person in IDP camps.*

More broadly, locations under SIG control experienced notably **lower** decreases in NLR after the earthquake than in SSG-controlled locations according to regression analyses. Even prior to February, energy consumption in SIG-controlled areas was consistently higher than SSG-controlled areas, as shown in Figure 2 below.

Figure 2. *Monthly NLR per-person in SIG and SSG-controlled areas prior to the February 2023 earthquakes. (Source: VIIRS night lights monthly composites and HNAP's Mobility and Needs Monitoring dataset.)*

Poorer communities in Idleb unable to afford subscriptions likely contributed to the disparities in electricity consumption in SSG-controlled areas over the years. The cost of an electricity subscription is estimated to be the equivalent of around seven working days of an average salary in Idleb, while the cost of solar energy amounted to around 11 days.[6] Jobs were also scarcer, with livelihoods comparatively more limited in Idleb than in northern Aleppo after the earthquake.

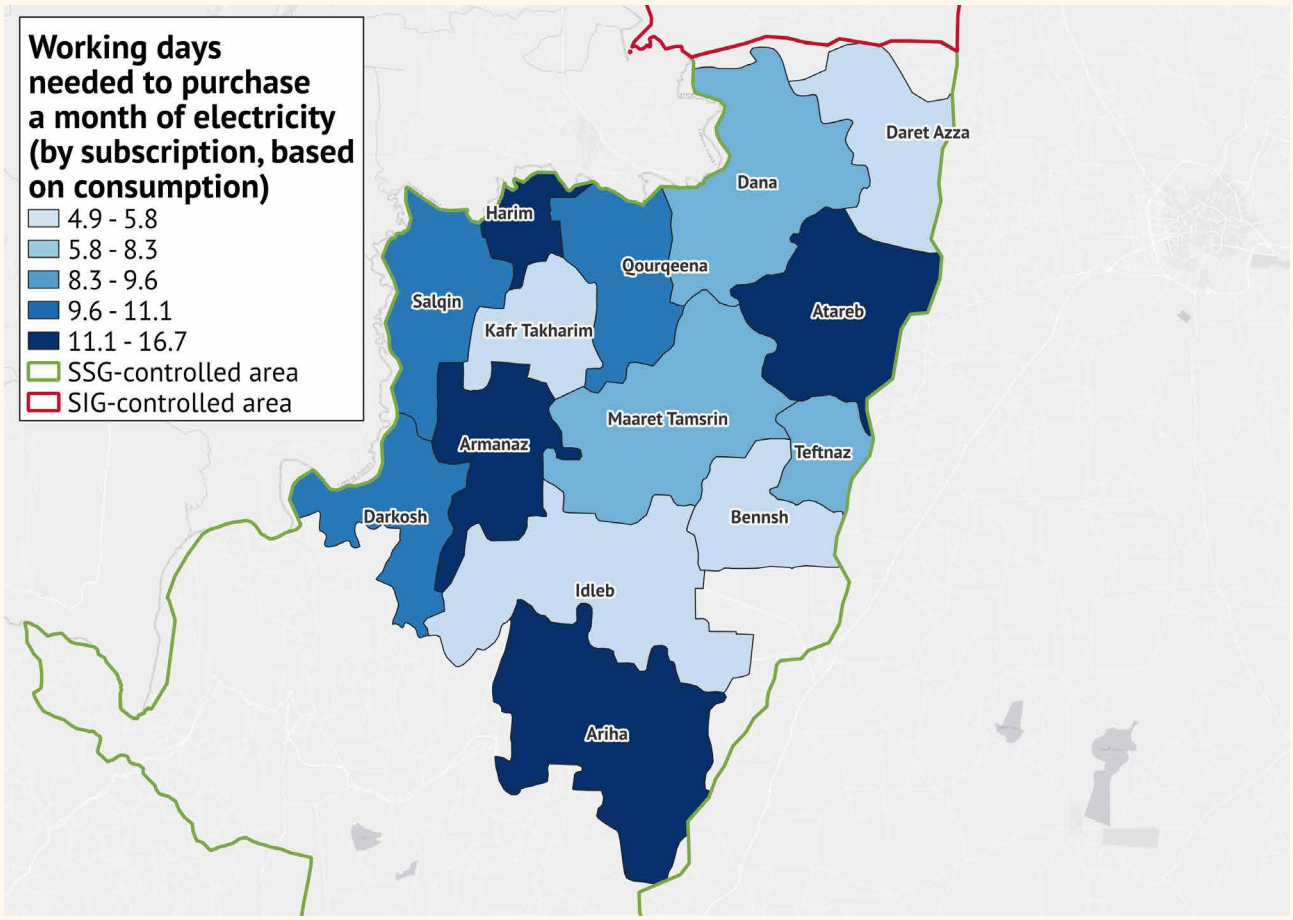

Figure 3. Working days needed to purchase a monthly electricity subscription as an unskilled worker (Idleb).

Beyond costs, connectivity was also lower in Idleb than in northern Aleppo before the earthquake, particularly in rural areas with lower populations. At the time of writing, Darkosh, northeast of Idleb city and Ariba in Harim subdistrict are in the process of being connected to the regional grid according to Green Energy, Idleb's primary energy provider. Within quantitative analysis, communities where batteries and solar panels serve as the main source of electricity are, on average, three kilometers from city centers, while people connected to the grid were only one kilometer away, underscoring that grid connectivity tends to be concentrated in urban areas.[7]

Affordability and price dynamics

In SSG areas, where income data was available, locations where residents have higher average daily wages experienced better electricity recovery outcomes than locations with lower average wages, indicating the close relationship between electricity consumption and relative affordability.[8] At the time of writing, prices are set at $0.20 per kilowatt (kW) for households across SSG-controlled areas (equal-

6 A graphic highlights these findings further in Annex 3.

7 The data results can be found in Annex 2 at the end of this report.

8 This was primarily assessed in relation to unskilled workers residing in SSG-controlled areas given the availability of this data.

ing around 3.9 Turkish lira, or TRY), while they vary slightly across SIG-controlled areas around a median rate of $0.15 (between TRY 2.85 and 3.20 according to field sources). In SIG areas, price variations are driven in part by the costs of rehabilitation and maintenance of the electricity grid in each locality.

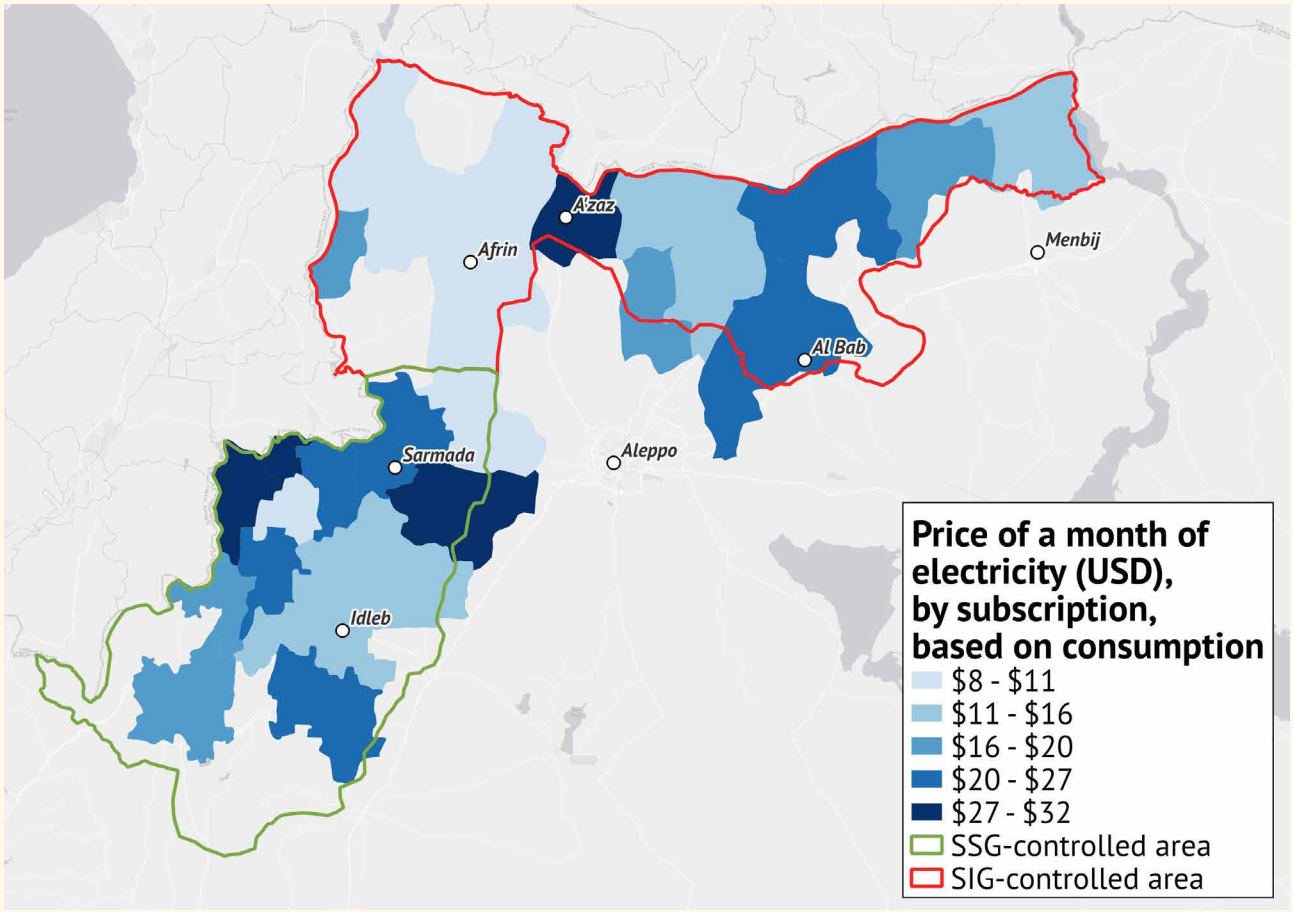

Figure 4. Energy consumption rates across northwest Syria (February 2023)[9]

Over 100,000 people are estimated to have lost their jobs in Aleppo and Idleb as a result of the earthquake, across government and opposition-controlled areas. While electricity was restored across a relatively wide expanse of northwest Syria, affordability will continue to present access barriers until livelihood prospects improve. Lower energy consumption rates in Idleb (as highlighted in Figure 2) are particularly notable for aid actors: While cash assistance may increase electricity accessibility in the interim, restoring sustainable livelihood options is necessary to ensure more equitable, long-term access.

Electricity in northern Aleppo

In recent years, prices have been on the rise across areas governed by the SIG while power cuts have become increasingly frequent, fueling frustrations among local residents. In December 2022, AK Energy – the primary electricity provider in northern Aleppo – announced a 35% price hike for households, reportedly resulting from increased energy prices in Turkey where electricity is sourced for both SIG- and SSG-controlled areas. The news was met with protests in several towns and push back from local councils, causing AK Energy to eventually walk back the increase. Since February, AK Energy an-

9 Electricity subscription prices are set by local electricity providers but price data varies from one district to the next in northern Aleppo; therefore, these prices likely represent the cost of the average household's rate of electricity consumption, creating variation from one district to another. Data was sourced from February 2023 market price data from Assistance Coordination Unit.

nounced a reduction in the price per kilowatt for subscribers from its previous rate of around $0.18 (TRY 3.45) due to a similar decrease in southern Turkey. While this reduction may be helping to restore energy consumption following the earthquake, price fluctuations tend to provoke tensions. They should continue to be monitored for any impact on social tensions, primarily between communities, local councils and other governance actors, and electricity providers.

Electricity monopolization in Idleb

In SSG-controlled areas, pricing dynamics are notably different. Subscriptions to the local grid are exclusively managed by Green Energy which offers a single price option and different packages depending on the preferred consumption level. Idleb's energy sector is also comparatively more centralized than northern Aleppo's: Green Energy operates as an SSG-mandated monopoly, dealing directly with the SSG as opposed to local councils. Green Energy also increased energy prices in Idleb prior to the earthquake, though has not reduced prices in recent months in parallel with reduced prices in southern Turkey. While subscription costs are prohibitive according to local sources, protests condemning energy prices are not as common in Idleb as in northern Aleppo.

In April, Green Energy enacted a new policy that single-meter subscriptions could only be issued to homeowners.[10] Local sources expect the policy to disrupt electricity access in the coming months, particularly for tenants. The policy poses particular risks for people living in homes irregularly and IDPs, who make up a significant portion of Idleb's population. Proving ownership may also present additional challenges for owners living abroad or who lack ownership deeds.

Electricity preferences and behaviors

Local sources across northwest Syria indicate that where possible, consumers have reverted to the energy source they used before the earthquake. However they also mention that even the cheapest relative option – an electricity subscription through a local provider – is costly in light of lost livelihoods after the earthquake.

Field feedback and quantitative data indicate certain coping mechanisms used to offset these difficulties. REACH data from Idleb shows that electricity consumption 24 hours a day was not common in Idleb even where available, indicating a possible preference for scheduled outages to reduce costs. People with a subscription consumed on average 15 hours of electricity per day while people with solar panels consumed much less – around seven hours per day.[11] REACH data also indicated a relatively high rate of battery use, while local sources confirm that many people rely on batteries to store energy sourced from the grid, solar panels, or elsewhere. In Idleb, residents also have the option to sell energy produced by privately owned solar panels back to Green Energy to offset subscription costs. While these methods serve as a worthwhile coping mechanism, solar panels and batteries entail relatively high up-front costs. They are less feasible for lower-income residents or people who lack remittance support from abroad.

10 While the policy was drafted in January, an announcement on April 16 confirmed the upcoming implementation of the policy.

11 Data source: REACH's January 2023 HSOS assessment. This data is visualized in Annex 4 at the end of this report.

CONCLUSION

The immediate rehabilitation of the power grid in northwest Syria can enable the restoration of other electricity-reliant service sectors such as WASH and early recovery in the short term, serving as a crucial first step in post-earthquake recovery. However, affordability, loss of livelihoods, and monopolization will likely continue to limit household electricity consumption and longer-term recovery of earthquake-affected communities if livelihoods are not adequately restored. If not addressed, these disparities could negatively impact economic growth and the provision of services in the medium term, particularly for rural communities and those with limited purchasing power, such as IDPs. Identifying areas where green options such as solar panels could be offered to communities could help offset these impacts while finding more sustainable solutions to the region's energy needs.

In addition to tracking these broader linkages between local economies and the energy sector in northwest Syria, aid actors should also closely monitor the sector for any violations to housing, land, and property rights (HLP) resulting from the recent Green Energy policy to bar energy subscriptions to tenants. By preventing tenants in Idleb from subscribing to energy services, the new policy could potentially contribute to housing discrimination, posing a threat to marginalized communities such as IDPs who already face difficulties finding and renting housing. The policy could also undermine longer-term recovery efforts if people are deterred from moving back into rented spaces due to a lack of electricity or if discrimination by owners becomes far-reaching. In light of these dynamics, ensuring that electricity is accessible and equitable across different communities will present a key criteria for post-earthquake recovery in Syria's northwest.

ANNEX

Annex 1

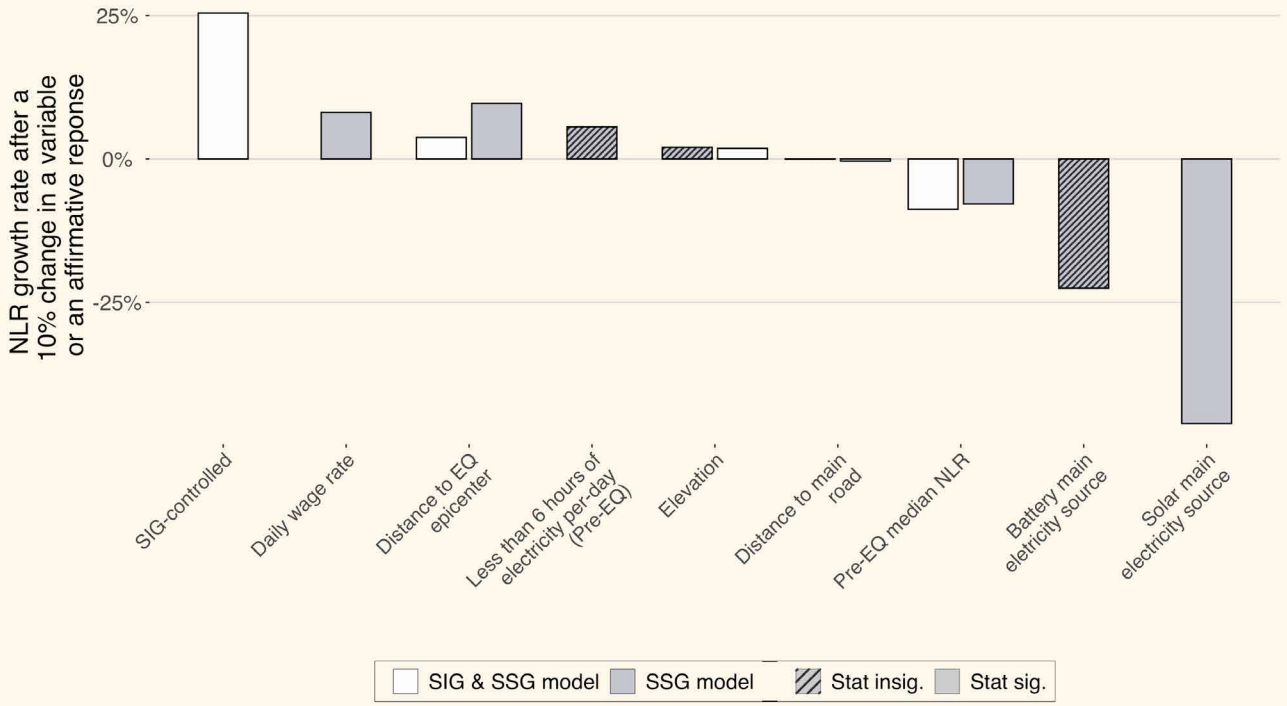

Figure A1. *Regression analysis results for the models including locations controlled by the SIG and SSG, and a smaller sample of only SSG-controlled locations.*

Annex 2

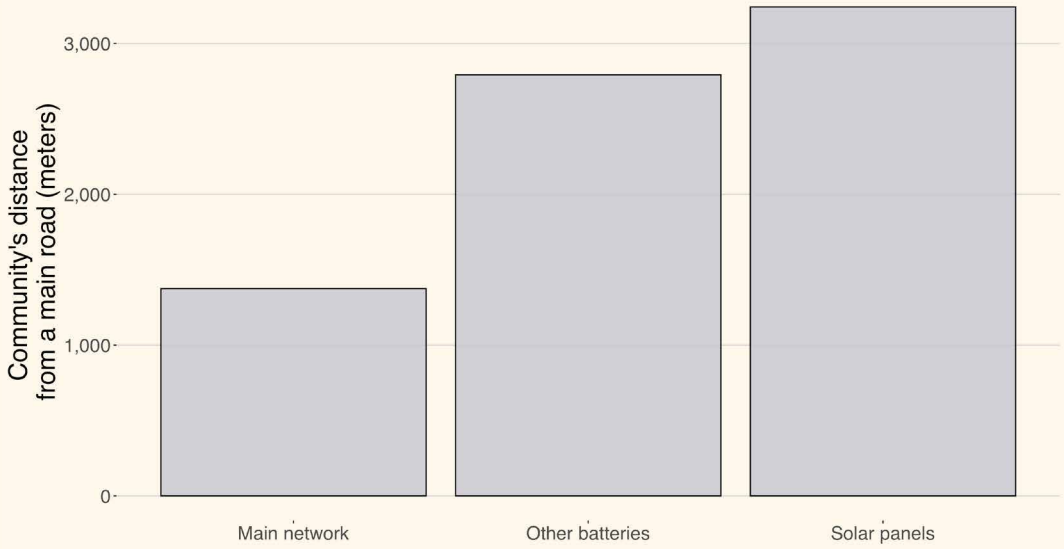

Figure A2. The average distance from communities to a main road by the community's main source of electricity. Data source: REACH's January 2023 HSOS assessment.

Annex 3

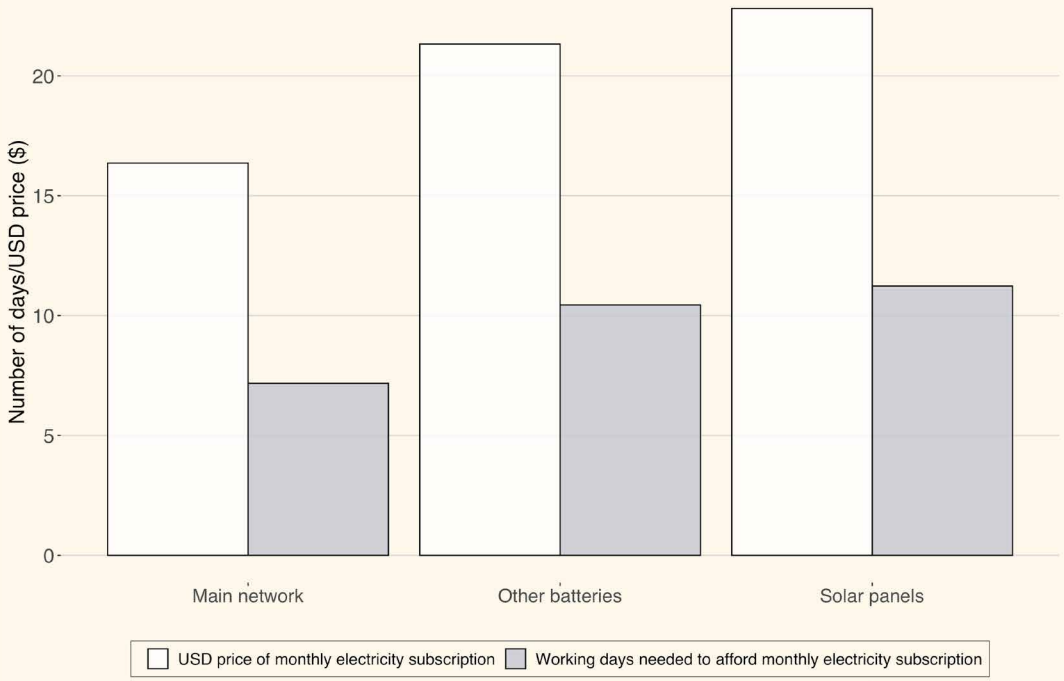

Figure A3. *The average USD price of an electricity subscription by the community's reported main electricity source in SSG-controlled subdistricts. Data source: January 2023 market price data from Assistance Coordination Unit and REACH's January 2023 HSOS assessment.*

Annex 4.

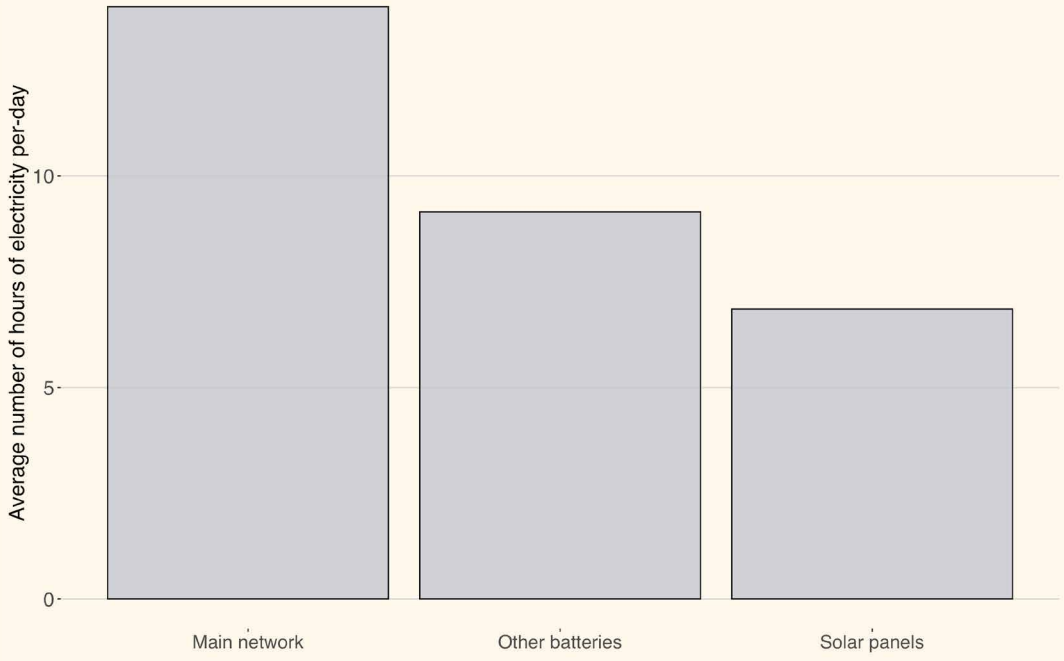

Figure A4. *The number of hours of electricity available per-day in SSG-controlled communities by the community's main source for electricity. Data source: REACH's January 2023 HSOS assessment.*

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The Crisis Analysis – Syria team (formerly HAT), was established in Beirut in March 2015 in response to the collective challenges facing the remote humanitarian response in Syria. CA–SYR's most important function is to collect and analyze data and information. Since 2015, our analysis has provided a forward-looking template for international interventions in Syria, and facilitated an increasingly adaptive, integrated, and ultimately impactful international response to the conflict. CA–SYR is a team within Mercy Corps, and is part of the Mercy Corps response to the Syrian crisis.

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