OVERCOMING THE CHALLENGE OF INSECURITY IN NIGERIA'S MINI-GRID SECTOR

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1. EXECUTIVE SUMMARY

The levels of insecurity in Nigeria have risen in recent years. With increased levels of banditry and kidnapping, and the persistence of insurgency, many sectors have been affected. This policy brief represents the first assessment of the impact of insecurity on Nigeria's mini-grid sector.

This is an important issue because mini-grids are the most viable means of expanding access to energy to rural areas which face only a 31% electrification rate and little chance of being electrified for years to come.[1] Nigeria's rural electrification targets for 2030 through renewable energy solutions, as well as the achievement of the Sustainable Development Goal (SDG) 7 are being threatened by insecurity and its impact on rural electrification projects.

Using evidence from desk research, surveys and interviews with mini-grid developers, national security experts and government officials, we identify significant negative impacts of increased levels of insecurity on the mini-grid sector, especially in Northern Nigeria. The impacts include:

- Exclusion of sites facing high levels of insecurity;
- Delays or suspension of mini-grid projects;
- More restricted mobility of field personnel;
- Greater hesitation of funders for projects located in states and regions experiencing high levels of insecurity; and
- Delays in in-person verification of completed projects by the Nigerian Electricity Management Services Agency (NEMSA) and the Rural Electrification Agency and therefore in disbursement of funds to the developer.

The impact of insecurity on developers is, however, uneven. It is influenced by a range of structural factors, including the geographical locations of their mini-grid projects, their degree of specialization in mini-grid products, as well as their size and capacity.

In addition, mini-grid developers have taken several measures to mitigate their exposure to security threats. These include more careful assessments of security risks during site feasibility evaluation; clear precautionary and evacuation measures for their field personnel; making use of private security escorts; maintaining security liaisons in communities with ongoing projects; and hiring and training locals in mini-grid equipment installation, operations and maintenance.

The resilience of the developers arising from structural determinants highlighted above, combined with the adaptive measures they have taken to reduce their exposure to the threat of insecurity has meant that no mini-grid developer interviewed has suffered corporate failure as a result of insecurity.

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[1] World Bank (2021). "Access to electricity, rural (% of rural population)", *World Bank*. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZS?locations=NG.

Nonetheless, the adaptations by developers require more concerted efforts by the government at all levels to support, reinforce and build upon. To this end, various recommendations may be made. These include:

- Roundtable discussions should be held between mini-grid developers, the REA (Rural Electrification Agency) and donors on providing meaningful assistance to off-grid renewable energy developers facing project challenges due to insecurity. Responses could include possibly digitalizing some operations (such as verification at project sites); making provisions for additional funding which will cover the arrangement of private security for the transportation of key equipment to site; and intensifying efforts to minimize existing regulatory bottlenecks to provide some respite from the financial impacts on insecurity.
- Energy access is important both for improving the commercial activity among rural communities and for improving the resilience of states to insecurity. It is therefore imperative for the local and state governments to formalize the provision of site security to mini-grid developers at least for project sites identified as strategic to the development of these governments. This may be through their governmental connections to the federal security forces, local security initiatives, and the arrangement of private professional security cover available to developers in the state or local government.
- Actively attract and engage state-level and regional support for mini-grid development in conflict-prone areas. For instance, the North East Development Commission (NEDC) could drive engagement with mini-grid developers for the electrification of the conflict-prone areas of the North East which it already focuses upon.

2. INTRODUCTION

Nigeria in recent years has seen an uptick in the incidence of various forms of insecurity. Banditry, kidnapping, herder-farmer clashes and insurgency pose significant challenges to lives and property, and vary by region and state.[2] For instance, it is estimated that kidnappings in Nigeria account for 56% of all incidents throughout the continent,[3] and about 786 civilians have been killed by Boko Haram attacks between February 2020 and April 2021.[4]

These security challenges threaten human lives, livelihoods, property and commercial activity, especially in rural and peri-urban areas of states facing greater levels of insecurity. A number of factors account for many of these security challenges. Structurally, in areas where population density is low, and human settlements are geographically sparse, it becomes more difficult to establish and maintain security control.[5] Yet it is simultaneously more difficult to extend public goods and infrastructure to such areas, such as electricity, roads and water supply.

Historical and economic factors are also to blame for insecurity in Nigeria. Negative economic shocks from the Structural Adjustment Programmes (SAPs) of preceding decades, political instability and development challenges in Northern Nigeria led to the creation of the Boko Haram movement in 2002 in the North East. Climate change and a growing population have disrupted transhumance routes and led to conflicts between pastoralists on one hand, and farmers and sedentary communities on the other hand, especially in the North Central.[6] Finally, an economic downturn, economic shocks from the COVID-19 pandemic, unemployment and food inflation have increased the incidence of kidnappings and banditry across the country, especially in the North West, South West and South South.[7]

On the other hand, in a country where over 80 million Nigerians (or 40.7%) of the population are currently without access to electricity, there is huge potential for the development of the renewable energy sector.[8] Since 79% of the rural population does not have access to electricity, there is a particularly strong case for rural electrification

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[2] Council for Foreign Relations (2021). "Update Numbers: Behind Sectarian Violence in Nigeria". https://www.cfr.org/blog/update-numbers-behind-sectarian-violence-nigeria; Graves, LeAnne (2018). "Solar workers released after kidnapping in Nigeria", *LinkedIn*. https://www.linkedin.com/pulse/solar-workers-released-after-kidnapping-nigeria-leanne-graves/.

[3] Graves, LeAnne (2018). "Solar workers released after kidnapping in Nigeria", *LinkedIn*. https://www.linkedin.com/pulse/solar-workers-released-after-kidnapping-nigeria-leanne-graves/.

[4] Statista (2021). "Number of civilians killed in Boko Haram's attacks in Nigeria from February 2020 to April 2021", *Statista*. https://www.statista.com/statistics/1198292/civilians-killed-in-boko-haram-s-attacks-in-nigeria/.

[5] Herbst, Jeffrey (2000). *States and Power in Africa*: *Comparative Lessons in Authority and Control*. New Jersey: Princeton University Press.

[6] Madu, Ignatius A. and Nwankwo, Cletus F. (2020). Spatial Pattern of Climate Change and Farmer–Herder Conflict Vulnerabilities in Nigeria. *GeoJournal*. https://doi.org/10.1007/s10708-020-10223-2.

[7] Munshi, Neil (26 April 2021). "Why 'the kidnapping industry is thriving' in Nigeria", *Financial Times*. https://www.ft.com/content/d8d9bf8f-0aa2-405f-b3f7-2a3e7e7b297c.

[8] CSEA (2021). "Challenges and Interventions Needs in the Nigerian Electricity Supply Industry (NESI)", *CSEA*. http://cseaafrica.org/challenges-and-interventions-needs-in-the-nigerian-electricity-supply-industry-nesi/.[2] Adedeji, Adesina Akanji (2016-03-11). *Spatial exploration and analysis of electricity poverty: a case study of Ibadan, Southwestern, Nigeria* (Thesis thesis). Department of Geography.

through off-grid solutions such as mini-grids.[9] For example, it is estimated that about 14% of the population can be electrified by building 10,000 mini-grids of 100kW each by 2023.[10] Cumulative installed mini-grid capacity has therefore steadily increased, and a range of foreign donors have funded the industry in recent years.[11]

In light of Nigeria's energy poverty and its developmental consequences, the government set a target for generating up to 9,000MW from renewable energy by 2030 and the deployment of 10,000 mini-grids by 2023. Mini-grid development for unserved and underserved communities has been a major goal of the Rural Electrification Agency (REA) through the Nigeria Electrification Programme (NEP) and the Rural Electrification Fund (REF). A major tool is the provision of grants for the deployment of mini-grids and solar home systems for rural communities. Many mini-grid developers have engaged with such policy initiatives, and many others operate beyond these programmes.

Insecurity may pose a key obstacle to meeting the policy targets on rural electrification set by the government. It also threatens mini-grid infrastructure, investments, the monitoring of mini-grid projects, the mobility of field personnel and the availability of funding for developers. Additionally, insecurity may exclude many rural communities from the services of mini-grid developers when they need them the most. Communities may find it difficult to reduce their exposure to security risks due to a lack of energy to provide prompt access to communication services, to improve their connection to cities and urban areas through increased commercial activities, and to provide night-time illumination.

The effects of insecurity for communities, mini-grid developers and policymakers may have broader consequences for sustainable human development in the country. Both insecurity and poor energy access limit Nigeria's progress on achieving several Sustainable Development Goals (SDGs), including poverty reduction, healthcare, gender equality, employment and climate change. Energy poverty also affects the capacity of communities to reduce security risks and thus more safely pursue their well-being across the various SDGs.

Yet there has been little systematic research into the impact of increased insecurity in recent years on mini-grid development and consequently upon the progress towards rural electrification and achieving the SDGs in Nigeria. This research paper represents one of the first attempts at doing so.

The objective is to examine the impact of insecurity on mini-grid development in Nigeria. For mini-grid developers, it examines the impact of insecurity on their activities, site location, investments, funding and project monitoring. For communities, it assesses the capacity for mini-grids to enable communities to lower security risks.

[9] World Bank (2021). "Access to electricity, rural (% of rural population) - Nigeria", *World Bank*. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZS?locations=NG.

[10] Yahaya, Yusuf (2020). "The Nigeria Economic Sustainability Plan (NESP). Nexter Insights, 1(11): 8-11, p. 10

[11] BloombergNEF (2020). *State of the Global Mini-Grids Market Report 2020*. Washington, DC: BloombergNEF, p. 88.

Data was collected from a wide range of secondary sources, primary documents provided by stakeholders, as well as primary data from semi-structured interviews with the major mini-grid developers in Nigeria and officials from the Rural Electrification Agency (REA). A survey was also conducted with six (6) mini-grid developers of various sizes and specialization in mini-grid development, and with cumulative experience in mini-grid project development in all six (6) of the country's geopolitical zones.

This policy brief will also assist policymakers at the national and sub-national levels on acquiring information and developing possible solutions to the challenges faced by mini-grid developers, communities and funders resulting from insecurity.

3. AN OVERVIEW OF MINI-GRID DEVELOPMENT IN NIGERIA

Nigeria has the largest population (200 million) and economy in Africa. Yet by 2018 only 57% of the population had access to electricity.[12] Although almost half (49%) of the country's population lives in rural areas,[13] there is a severe rural-urban divide in energy access. Whereas 82% of the urban population has access to electricity, only 31% of the rural population enjoys this privilege.[14]

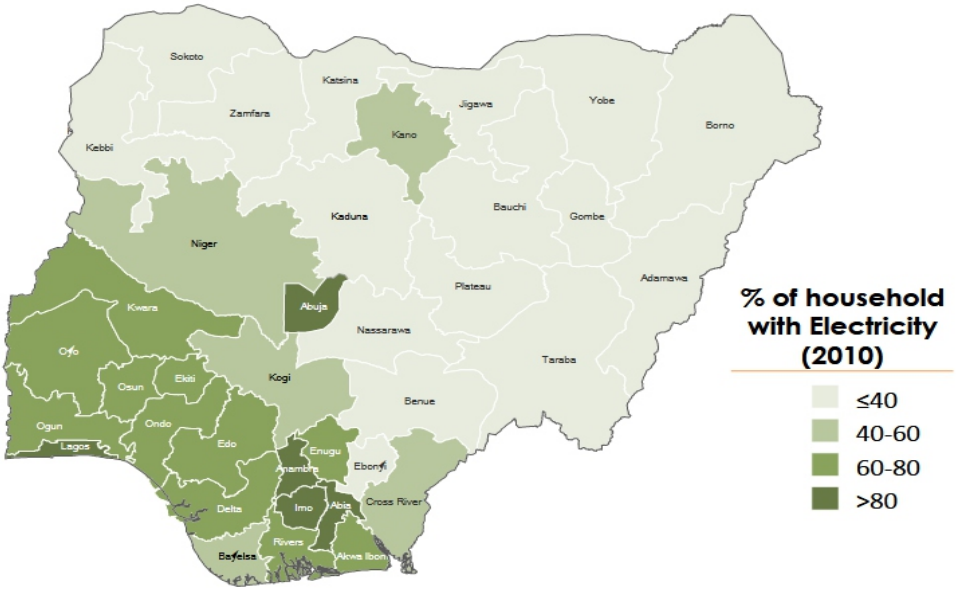

Figure 1: Percentage of households with electricity access

To make up for the lack of reliable energy supply, Nigerians have tended to rely on petrol and diesel generators. It is estimated that Nigerians spent $16 billion in 2016 alone to fuel privately-owned diesel/petrol generators to meet the shortfall in electricity supply.[15] In addition to being expensive, this alternative produces high CO2 emissions, thereby contributing to global warming and environmental pollution. On the other hand, renewable energy alternatives are both climate-friendly and cheaper than generators.

In addition, Nigeria's population is projected to reach 473 million by 2060,[16] and there are concerns over how such a large population would have stable access to energy. Renewable energy alternatives therefore provide an opportunity to satisfy growing energy demand, to supply populations presently unserved or underserved by the main grid, and contribute to combating climate change. For rural areas, mini-grids in particular represent a major solution to the limited electrification rate.

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[12] World Bank (2021). "Access to electricity (% of population)", *World Bank*. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=NG.

[13] World Bank (2021). "Rural population (% of total population) – Nigeria", *World Bank*. https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=NG.

[14] World Bank (2021). "Access to electricity, rural (% of rural population)", *World Bank*. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZS?locations=NG.

[15] BloombergNEF (2020). *State of the Global Mini-Grids Market Report 2020*. Washington, DC: BloombergNEF, p. 146.

[16] Luxton, Emma (20 September 2016). "By 2060, this country will have the world's largest population", *World Economic Forum*. https://www.weforum.org/agenda/2016/09/the-countries-with-the-biggest-populations-from-1950-to-2060/.

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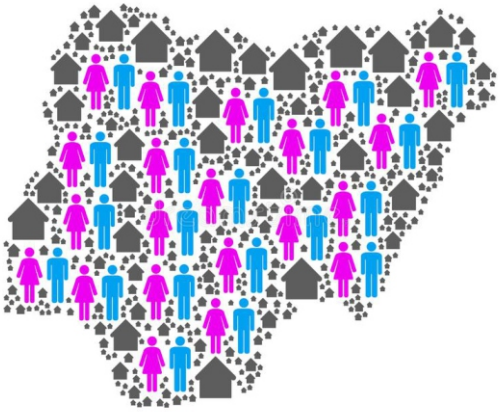

State of Affairs in the Mini-Grid Sector

The Nigerian Electricity Regulatory Commission (NERC) defines Mini-grid as "a stand-alone power system or an integrated local generation and distribution system with installed capacity below 1MW, capable of serving numerous end users independent of the national grid".[17] Mini grids provide electricity to several users through a distribution grid with metering mechanisms.[18]

There are isolated and interconnected mini-grids. Interconnected mini-grids are interconnected with the main grid and deployable in underserved areas, whereas isolated mini-grids are not connected to a distribution network and are deployable in unserved areas. Mini-grids can range in size from micro (typically serving 20-100 customers) to full mini-grids (serving well over 500 customers).[19]

The cost of on-grid electrification for many rural areas is typically prohibitively high due to low population densities and distance from urban areas and the main grid. However, mini-grid users in rural areas may have a potentially lower willingness to pay for electricity due to the low economic activity characterizing their localities.[20] On the other hand, the demand for electricity in these areas generally comes from small family businesses and homes whose energy expenditure is low. These can make mini-grid amortization more competitive against other off-grid systems such as diesel generators.

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[17] NERC (2021). "What is a Mini-Grid?", *NERC*. https://nerc.gov.ng/index.php/home/operators/mini-grid.

[18] Antonanzas-Torres, Fernando, Antonanzas, Javier and Blanco-Fernandez, Julio (2021). State-of-the-Art of Mini Grids for Rural Electrification in West Africa. *Energies*, 14(99): 1-21.

[19] World Bank (2017). *Mini-Grids & Gender Equality: Inclusive Design, Better Development Outcomes*. Washington, DC: World Bank.

[20] Antonanzas-Torres, Fernando, Antonanzas, Javier and Blanco-Fernandez, Julio (2021). State-of-the-Art of Mini Grids for Rural Electrification in West Africa. *Energies*, 14, 1-21, p. 11.

[21] SEforALL and AfDB (2018). Green Mini-Grid Market Development Programme. Abidjan: SE4ALL Africa Hub & African Development Bank. p. 14

Although electricity from mini-grids cost more than electricity from the national grid due to subsidies placed on the latter, mini-grid power remains cheaper than fuel for generators in the long term and is more convenient and reliable. In addition, it provides energy access for rural residents to make use of labour-saving and more effective electrical appliances in place of candles, kerosene and torches often used for lighting, and traditional biomass for cooking.[21]

In addition, mini-grids represent a greater energy source than smaller systems such as Solar Home Systems, solar-powered lamps and other appliances in terms of capacity and expandability. It is, therefore, better suited for commercial use and improving productivity in agriculture and cottage industries than these smaller systems.

Also, these mini-grids are especially time-saving for women, particularly in female-dominated labour-intensive agricultural and food processing activities through uptake of electrical appliances, such as water pumps, grinders, mills, blenders, refrigeration and in a few cases, electric stoves.[22] Electric lighting also increases efficiency and adds flexibility in the scheduling of household tasks. These therefore help free up women to undertake paid work.

Nationwide, the revenue opportunity from these mini-grids is approximately $1 billion to $8 billion per year.[23]Nigeria therefore represents the biggest market potential for mini-grid investments in sub-Saharan Africa.

Given the lesser urbanization rate and rural electrification, Northern Nigeria is estimated to hold 92% of the potential Nigerian mini-grid market, led by Borno and Zamfara States. The northern region also enjoys longer sunshine hours and higher solar irradiation which makes it more suitable and capable of meeting its energy needs.[24]

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[22] World Bank, *Mini-Grids & Gender Equality,* p. 3.

[23] Smith, Theresa (22 July 2020). "First undergrid mini-grid deployment in Nigeria a success", *ESI AFRICA*. https://www.esi-africa.com/industry-sectors/generation/solar/first-undergrid-mini-grid-deployment-in-nigeria-a-success/; Power for All (2019). Power for All Research Summary: Nigerian Mini-Grid Market Offers US$8 billion Annual Revenue Potential. https://www.powerforall.org/application/files/7515/6147/7841/Copy_of_RS__Nigerian_mini-grid_market_offers_US_8_billion_annual_revenue_potential.pdf.

[24] Ogunmodimu, Olumide and Okoroigwe, Edmund C. (2019). Solar Thermal Electricity in Nigeria: Prospects and Challenges. *Energy Policy*, 128: 440-448.

[25] REA (2021). "Database", *REA*. https://database.rea.gov.ng/.

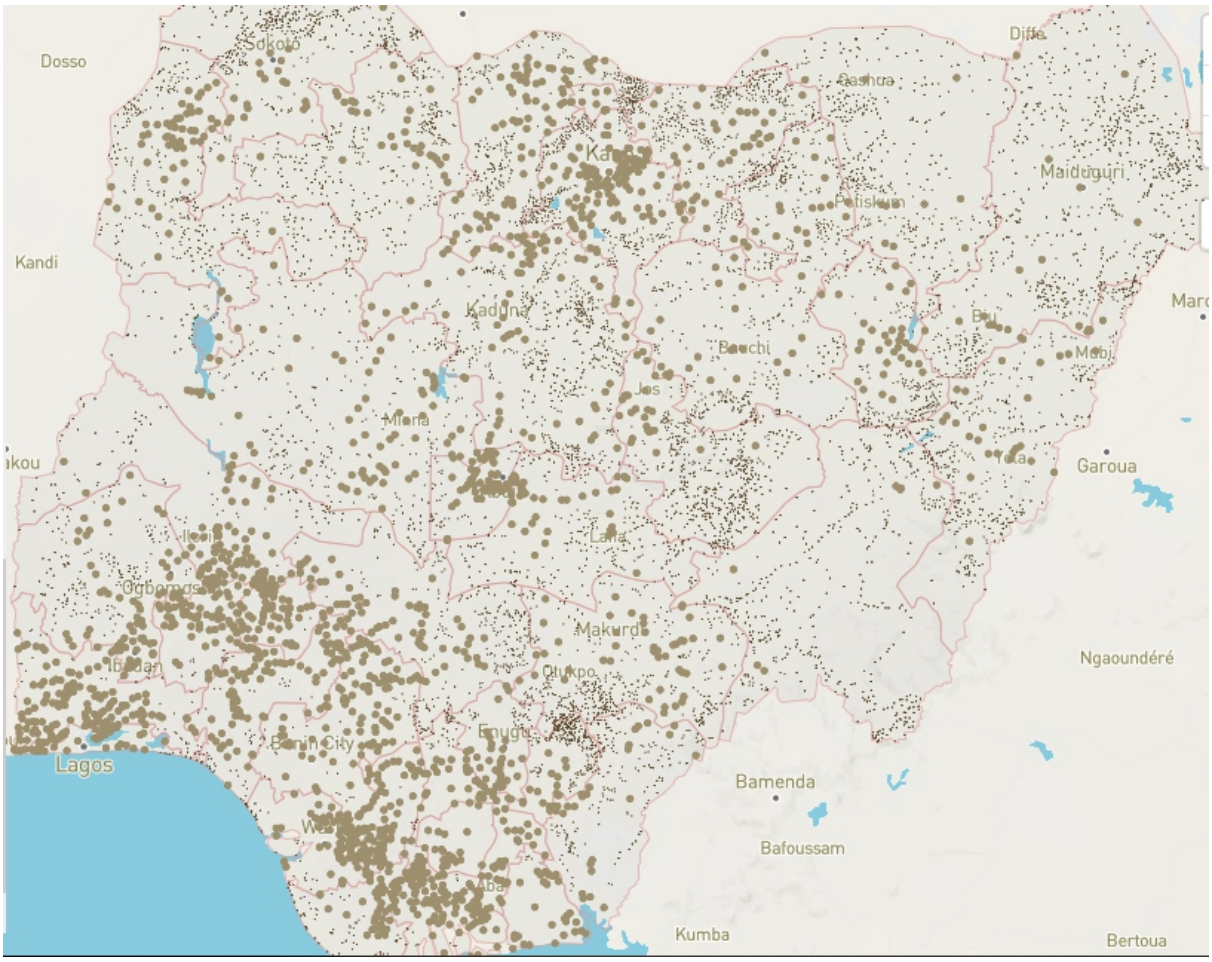

Figure 2: Potential mini-grid locations in Nigeria (thick dots represent electrified communities; thin dots represent potential mini-grid communities).[25]

Nigeria's estimated installed mini-grid capacity was about 2.8MW by the end of 2019, with 59 projects serving rural consumers.[26] This may be underestimated, as the figure is made up mostly of residential-based mini-grids, with some developed for specific productive uses.

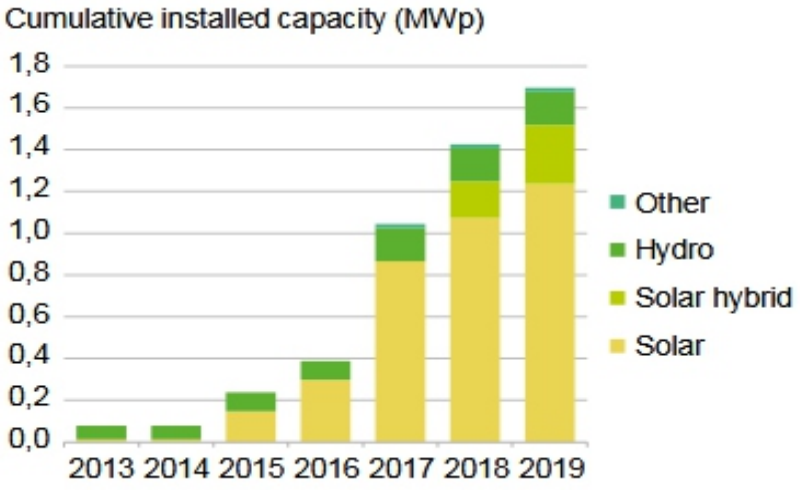

Figure 3: Nigeria's installed mini-grids, by capacity

[26] BloombergNEF "*State of the Global Mini-Grids Market Report 2020*", p. 146.

Mini-Grid Financing in Nigeria

Mini-grid developers may receive funding from foreign donors, subsidy mechanisms or debt and/or equity financing. In Nigeria, private-sector players primarily develop solar hybrid mini-grids with financial backing from DFIs and donor agencies.[27] Generally in West Africa, most mini-grid projects rely on international donors or cooperation agencies for funding, who work in cooperation with national governments.[28] In the last ten years, over $2 billion for global mini-grid funding has been approved by key funders such as the World Bank, the German Agency for International Cooperation (GIZ), the African Development Bank (AfDB) the UK Government through the Renewable Energy Performance Platform (REPP), the Department for International Development (DFID) and InfraCo Africa.[29] About 79% of this has been for sub-Saharan Africa, with Nigeria receiving the largest amount. This includes $350 million provided by the World Bank in 2019 for the Nigeria Electrification Project (NEP).

Major commitments of $550 million have been made by The World Bank, the African Development Bank (AfDB) and Nigeria's Rural Electrification Authority (REA) to fund the Nigeria Electrification Programme (NEP).[30] The NEP is also a private sector-led initiative with more than $400 million expected from private investors.[31] There are a few private financiers in Nigeria, including NEoT Offgrid Africa, an investment platform launched by France-based NEoT Capital and EDF in 2017.[32] On the other hand, commercial banks have largely been absent in the country's mini-grid market. Commercial bank loans are generally regarded by developers as too costly, inflexible, and requiring developers to provide physical assets as collateral instead of borrowing solely against predictable cash flows.[33] The Nigerian Bank of Industry (BOI) is the only institution able to provide naira-denominated financing for mini-grid developers under its '6 billion naira' solar fund.[34]

The Government's Mini-Grid Policy

Prior to 2017, the government's dominant approach to electrifying remote parts of the country was through the expansion of the national grid. This has, however, been recognized as economically infeasible due to the massive capital investments and administrative capacity required to connect remote and low-density communities to the grid. The Nigerian Electricity Regulatory Commission (NERC), by issuing the NERC Mini-Grid Regulations in 2017, has shown its commitment to follow the global trend of providing electrification solutions via mini-grid infrastructure in rural areas and small communities.

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[27] *Ibid.*, p. 148.
[28] *Ibid.*, p. 9.
[29] *Ibid.*, p. 88.
[30] *Ibid.*, p. 148.
[31] REA (2021). "REA Announcements", *REA*. https://rea.gov.ng/nep_announcements/.
[32] *Ibid.*, p. 149.
[33] *Ibid.*, p. 149.
[34] Bank of Industry (2021). "Solar Energy", *BOI*. https://www.boi.ng/solar-energy/.

Backed by international funding, the Nigerian government has thus sought to encourage the expansion of renewable energy systems in general and off-grid solutions where feasible. A range of policies have been put in place to this end, including the National Renewable Energy and Energy Efficiency Plan (NREEEP), the Rural Electrification Strategy Implementation Plan (RESIP), the Mini-Grid Regulations; and the operationalization of the Rural Electrification Fund (REF).[35] The official goal is to generate up to 9,000MW from renewable energy by the year 2030 and to deploy 10,000 mini-grids by 2023.

Mini-Grid Developers in Nigeria

The mini-grid sector is more crowded in Nigeria than elsewhere in sub-Saharan Africa.[36]The REA lists 48 renewable energy companies operating in Nigeria which have applied and are qualified for the National Electrification Programme (NEP).[37] Of these, 16 are major mini-grid developers in Nigeria, with GVE (Green Village Electricity) and Nayo Tropical Technology having the largest market shares.

Mini-grid developers operate across the country. There is no consolidated database for all mini-grid projects in the country yet. The REA provides a list of mini-grid projects under the NEP, but many other projects are undertaken outside of the NEP. The REA lists 17 states where NEP projects have been undertaken. Many of these projects have been situated in Niger State in the North Central zone.

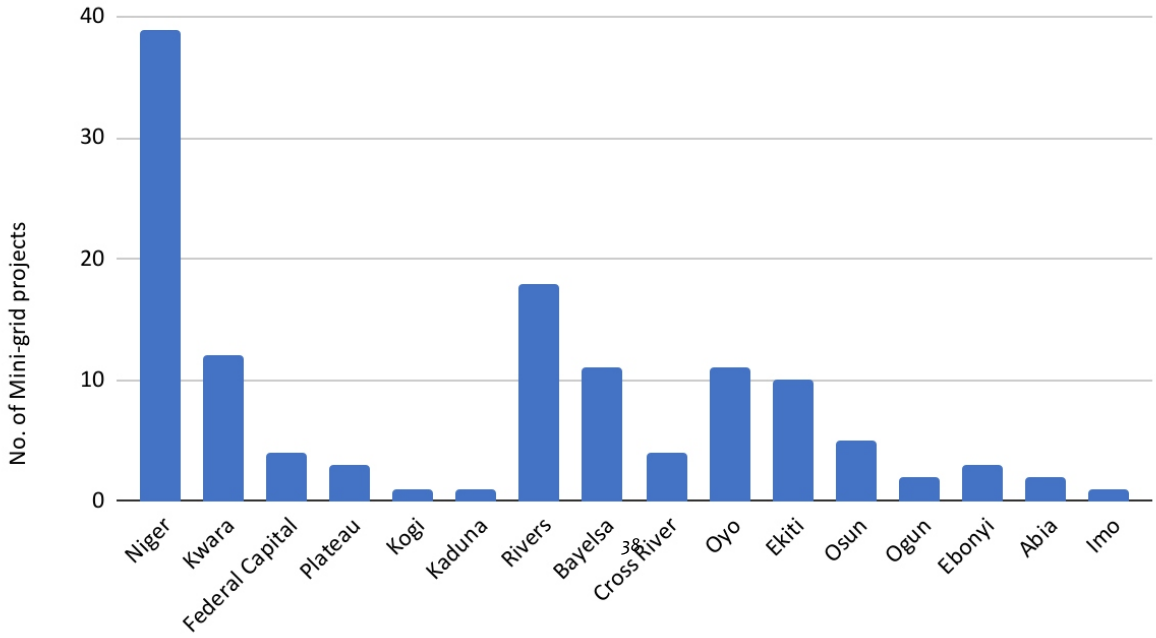

Figure 4: Mini-grid projects in Nigeria under NEP.

[35] CTH (2020). *Nigeria's Energy Situation*. Abuja: Clean Technology Hub (CTH).
[36] BloombergNEF "*State of the Global Mini-Grids Market Report 2020*", p. 148.
[37] REA (2021). https://nep.rea.gov.ng/.

There is a significant geographical spread of mini-grid projects, although North Eastern and North Western states have tended to have low numbers of projects. Nonetheless, given the largest mini-grid potential lies in the Northern region of Nigeria, many developers operate across several states in the region, especially the North West.

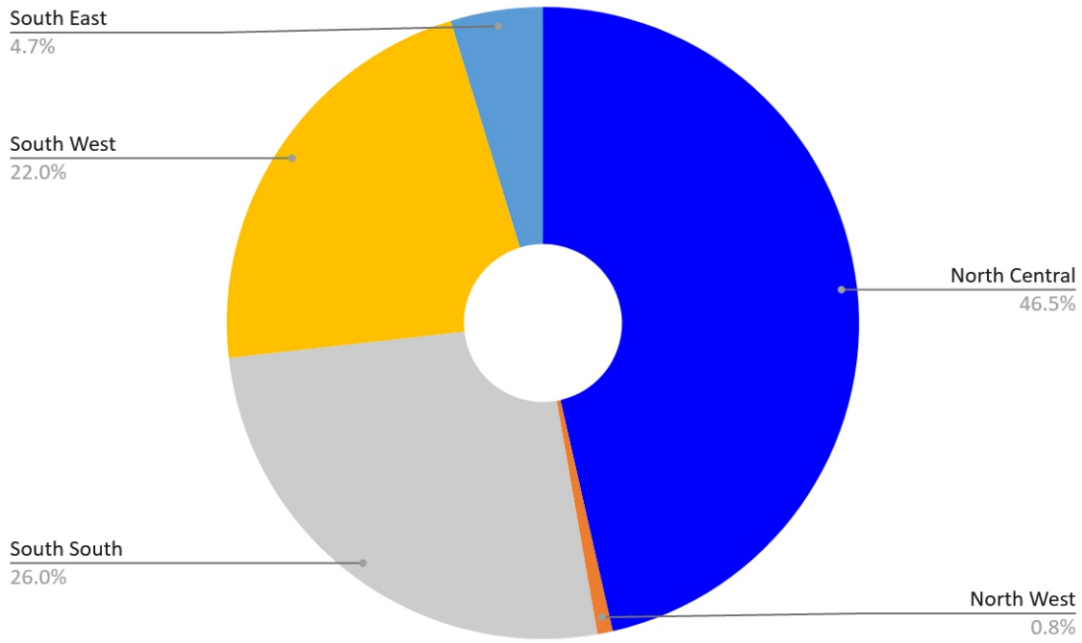

Figure 5: Mini-grid projects under NEP, by geopolitical zone.[39]

Although in 2018 these private developers may have been "generally positive about the future market for mini-grids", there has been little analysis undertaken of the impact of worsened security in recent years on mini-grid development in Northern Nigeria.[40] There nonetheless appears to be no empirical study of the impact of worsened state of insecurity in the region on renewable energy (and specifically mini-grid) projects. The most recent studies on mini-grid development in West Africa fail to mention the impact of increased security challenges on the sector in Nigeria.[41]

[38] REA (2021). "Achievements". https://nep.rea.gov.ng/achievement/.

[39] *Ibid*.

[40] BloombergNEF "*State of the Global Mini-Grids Market Report 2020*", p. 11.

[41] *Ibid*.

4. THE STATE OF (IN)SECURITY IN NIGERIA

On the 24th of April 2021, eight (8) communities were sacked by bandits armed with semi-automatic firearms, in Niger State. They abducted some people, injured many others, stole cash, destroyed houses and food stores, rustled cattle, and caused the villagers to flee to neighbouring villages.[42] Such attacks have become more frequent in recent years. They have encompassed herder-farmer conflicts, banditry, kidnapping, militancy and terrorism.

Insecurity in Nigeria is caused by a number of factors. These are a low level of economic development, low agricultural productivity, climate change, poor law enforcement, and a weak presence of governance in low-income communities in rural areas.[43]

Sedentary farmers have conflicted with migratory pastoralists from Mali, Niger, Burkina Faso, Central African Republic and Cameroon in their struggle for access to water and pasture in Nigeria's transhumance corridor.[44]The effects of climate change in the Sahel continues to complicate the situation in Northern Nigeria, including states located near the Lake Chad Basin in the North East. There is also significant spatial clustering, with one of the hotspots being the North Central, especially Benue State.[45]

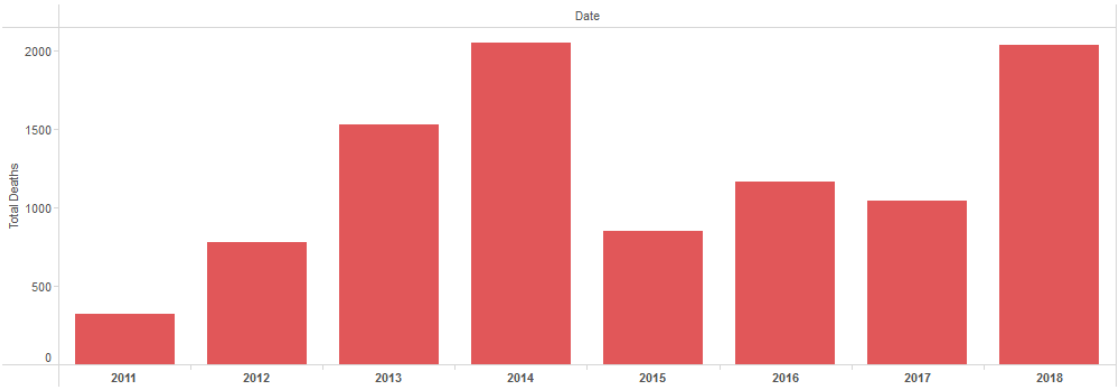

Figure 6: Deaths from sectarian violence since 2011 (excluding Boko Haram).[46]

Data from the Council on Foreign Relations' (CFR) Nigeria Security Tracker, which catalogues political violence based on a weekly survey of Nigerian and international press, shows that deaths by state are concentrated in the Northern region, especially the Northeast.[47]

[42] Dipo, Laleye (25 April 2021). "Eight Villages Deserted as Bandits Invade Communities in Niger", *This Day*. https://www.thisdaylive.com/index.php/2021/04/25/eight-villages-deserted-as-bandits-invade-communities-in-niger/amp/; Asishana, Justina (25 April 2021). "Bandits abduct 35 in Niger communities", *The Nation*. https://thenationonlineng.net/bandits-abduct-35-in-niger-communities/amp/.

[43] Interview with a security and climate change expert.

[44] Johns Hopkins SAIS and Nextier SPD (2020). *Conflict in The Sahel: Stepping Back from The Precipice: Are We Doing Enough*? Washington, DC and Abuja: John Hopkins SAIS and Nextier, SPD.

[45] Madu, Ignatius A. and Nwankwo, Cletus F. (2020). Spatial Pattern of Climate Change and Farmer–Herder Conflict Vulnerabilities in Nigeria. *GeoJournal*. https://doi.org/10.1007/s10708-020-10223-2.

[46] Harwood, Asch (18 July 2019). "UPDATE: The Numbers Behind Sectarian Violence in Nigeria", *CFR*. https://www.cfr.org/blog/update-numbers-behind-sectarian-violence-nigeria.

[47] *Ibid*.

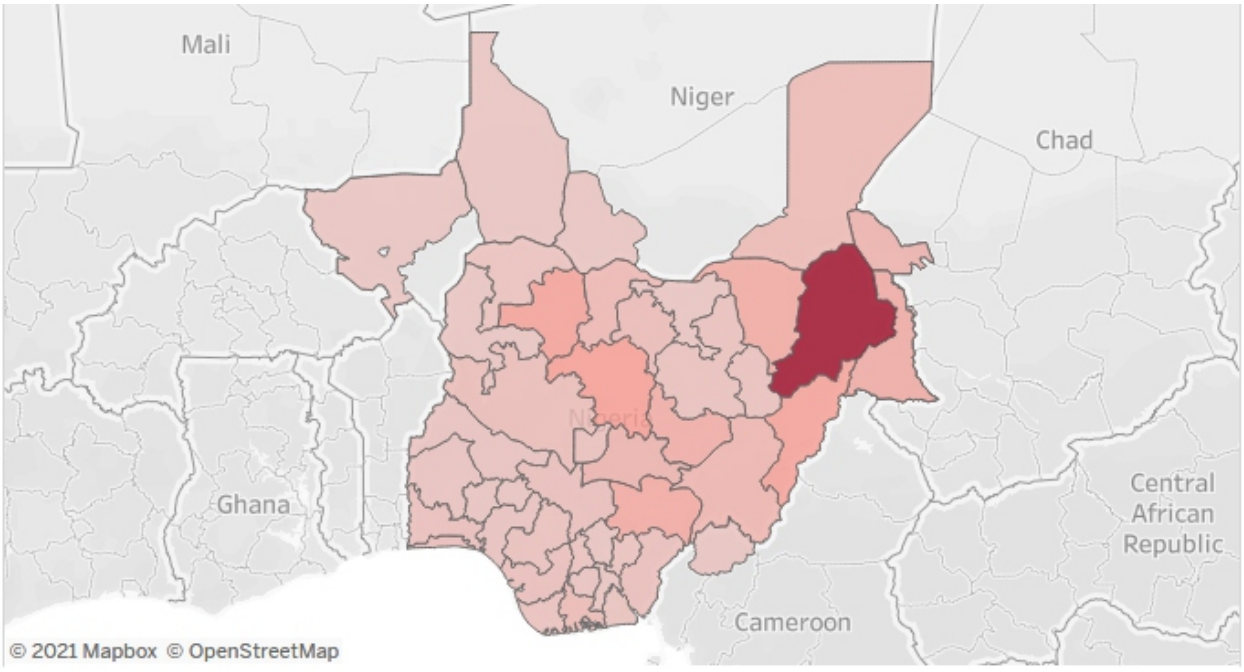

Figure 7: Deaths from political violence by state.

As a result, the UK Foreign Commonwealth Development Organization has advised against all travel to four (4) Northern states, and against all but essential travel to eight (8) of the 19 Northern states.[48]

The incidence of kidnapping has also increased substantially over the years, as Figure 2 depicts. According to Arthur J. Gallagher & Co, a US-based insurer, kidnappings in Nigeria account for 56 per cent of all incidents throughout the continent.[49]

In terms of the absolute number of reported kidnap incidents, four (4) of the top 10 states with a high number of kidnap incidents over the last decade are in the South-South geopolitical zone, with three of them, Bayelsa, Delta and Rivers being a part of the Niger Delta.[50]The Niger Delta has been beset by militancy, which has been recognized as one of the challenges to renewable energy development in rural coastline communities due to vandalism.[51]

[48] GOV.UK (2020). "Foreign travel advice: Nigeria", *GOV.UK*. https://www.gov.uk/foreign-travel-advice/nigeria/safety-and-security.
[49] Graves, LeAnne (20 January 2018). "Solar workers released after kidnapping in Nigeria", *LinkedIn Pulse*. https://www.linkedin.com/pulse/solar-workers-released-after-kidnapping-nigeria-leanne-graves/.

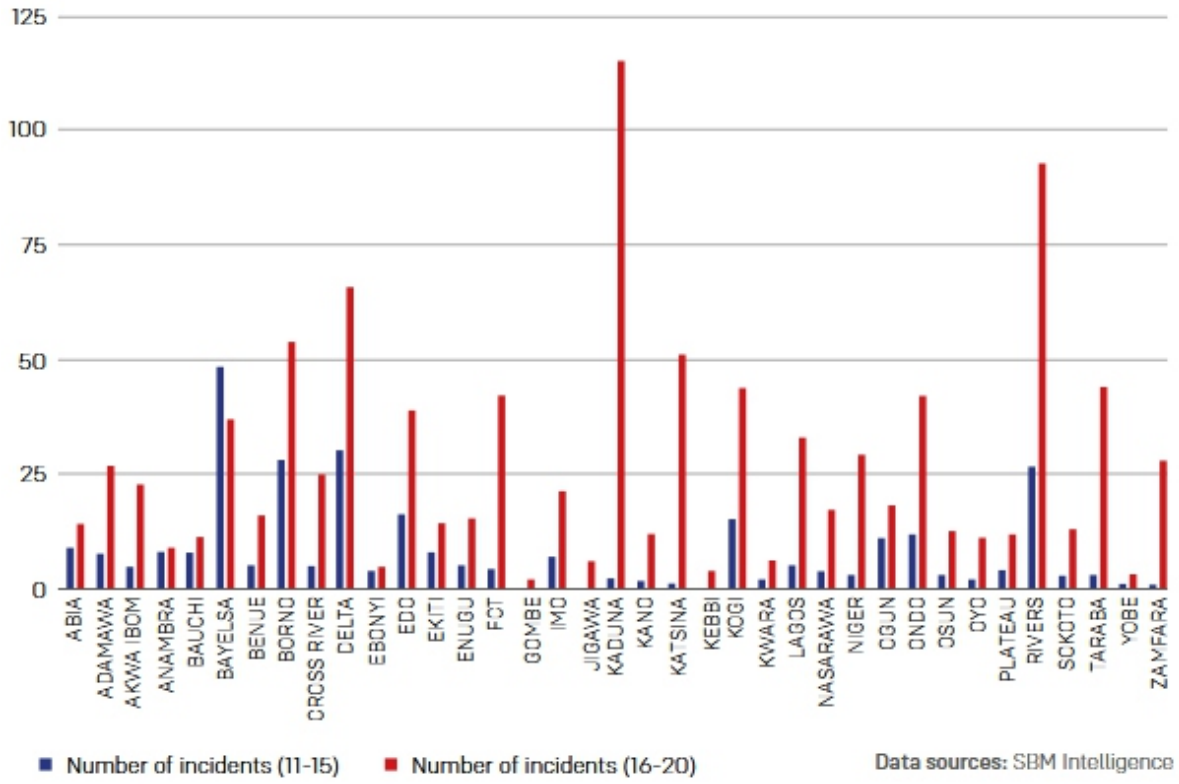

Figure 8: Number of kidnap incidents (2011-2015 and 2016-2020)

.[52]

Kidnapping has increased in almost all states between 2011-2015 and 2016-2020, but the sharpest increase has been in Kaduna, Rivers, Katsina, Zamfara and Taraba. Five Northern states also feature among the top ten states by number of kidnap incidents, topped by Kaduna State.[53] When the number of fatalities during kidnap attempts are taken into account, seven of the top ten states with the greatest number of fatalities during kidnap attempts are in Northern Nigeria.

The sudden uptick in fatalities per attempt coincides with the increase in attacks by bandits on villages especially in Zamfara and Katsina states, a situation which has gradually extended to Kaduna and Niger states. The pool of potential victims has also expanded. Departing from the targeted kidnapping of wealthy people alone, victims are now often poor villagers, sometimes kidnapped indiscriminately. This has had serious consequences on rural activities, including lower farming activity and output and lower rural-urban mobility.

[50] SBMorgen (2020). *Nigeria's Kidnap Problem: The Economics of the Kidnap Industry in Nigeria*. Lagos: SBMorgen Intelligence, p. 4.
[51] Diemuodeke, E.O. and Briggs, T.A. (2018). Policy Pathways for Renewable and Sustainable Energy Utilisation in Rural Coastline Communities in the Niger Delta Zone of Nigeria. *Energy Reports*, 4: 638–644, p. 640.
[52] *Ibid*., p. 7.
[53] *Ibid*.

Kidnapping

has increased in almost
all states between 2011-2015
and 2016-2020

Some parts of Niger State have also faced increased insurgency from Boko Haram terrorists. It is also estimated that 786 civilians have been killed by Boko Haram attacks between February 2020 and April 2021.[54]

Women and girls are disproportionately affected by conflict, directly and indirectly. They are more vulnerable to sexual and gender-based violence, both in their communities and in humanitarian camps if displaced. This is worsened by lack of night-time illumination; as well as their greater lack of independent means of livelihood which makes them more dependent on handouts from others when displaced.

Despite these increases in security risks across the country, the vast majority of the country remains stable enough for normal commercial and residential activity. Although the federal government and its security outfits have not been able to completely curtail insecurity, there are prospects for long-term institutional reforms. State governments may gain greater autonomy over their security capabilities, while devolution of some fiscal powers to enable state governments to be more fiscally self-sufficient and developmentally-oriented. This could not only mitigate the structural conditions which produce insecurity in the first place, it could open up opportunities for mini-grid developers to better engage with, and gain support from more empowered state governments.

To the extent that it nonetheless persists, increased insecurity nonetheless threatens Nigeria's capacity to achieve many of the SDGs intended to be attained by 2030. With regard to SDG1, over 86 million of Nigerian citizens live in extreme poverty.[55]Energy poverty contributes significantly to overall poverty, as engaging in productive and commercial activity becomes difficult.

[54] Statista (2021). "Number of civilians killed in Boko Haram's attacks in Nigeria from February 2020 to April 2021", *Statista*. https://www.statista.com/statistics/1198292/civilians-killed-in-boko-haram-s-attacks-in-nigeria/.

It is also estimated that
786 Civilians
have been killed by
Boko Haram attacks
between February
2020 and April 2021

For SDG 3, energy insecurity's impact on energy access makes it more difficult for rural communities to sustain quality health facilities, contact with health providers and medical information, and seek medical assistance. It also makes it more difficult to gain access to solar-powered cleaner water sources and cooking appliances which reduce health risks compared to alternatives such as stream water and kerosene-powered stoves.

For SDG 5 on gender equality, women are particularly exposed to energy poverty given that they comprise the majority of the rural and urban poor, and generally have access to fewer prospects/opportunities in terms of career and education than the male population.[56] Rural-dwelling women and girls are especially affected by energy poverty due to gender-defined roles in energy production, distribution and use in households, communities and the market.[57]There is therefore a major need to counter the impact of insecurity on women's energy access and sustainable development goals on gender equality through targeted interventions.

Communities do not have to industrialize before they face the need for reducing the use of climate-unfriendly energy sources. Hence access to clean energy is viable for rural communities; but this, as well as Nigeria's capacity to achieve SDG 7, is threatened by increased insecurity. At the same time, without access to modern energy, the reliance on human power and traditional tools and implements limits productivity, income growth, employment and economic growth. This is especially the case for rural areas where traditional work is most pervasive and traditional implements most widely used.

With insecurity leading to the scattering and instability of communities, lowering commercial activity and limiting rural electrification, various communities are being left out of the opportunities provided by mini-grid technologies, in addition to being cut off from on-grid electrification. Thus decent work and economic growth (SDG 8) becomes more difficult to achieve.

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[55] FOTE (2018). "SDG 1: No Poverty – The Nigerian Focus", *Friends of the Environment*. https://fote.org.ng/2018/11/sdg-1-no-poverty-the-nigerian-focus/.
[56] AfDB (2018). *Nigeria Electrification Project: Appraisal Report*. Abidjan: AfDB, 13.
[57] *Ibid*., 14.

Finally, the progress in reducing emission of greenhouse gases may become truncated if mini-grid investments are impeded. In 2017, in its Intended Nationally Determined Contribution (INDC), Nigeria pledged to unconditionally reduce GHG emissions by 20% by 2030, compared to business as usual (BAU) emission levels.[58] It aims to achieve this goal by improving energy efficiency by 20%, providing 13 GW of renewable electricity to rural communities that are currently not connected to the electric power grid, and by ending the flaring of gas. The problem of insecurity threatens the adoption of these mini-grid alternatives to dirty energy sources such as petrol generators.

[58] World Bank (2021). "CO2 emissions (metric tons per capita) - Nigeria, Sub-Saharan Africa, World", *World Bank*. https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=NG-ZG-1W.

5. MINI-GRID SYSTEMS AND INSECURITY

Given the interdependence of mini-grid development, security and broader socio-economic outcomes enshrined in the SDGs, it is important to take an integrated approach. Low population density increases insecurity and facilitates energy poverty through the infeasibility of grid extension.

At the same time, energy poverty makes rural and peri-urban communities more vulnerable to insecurity and more difficult to rebuild their lives after experiencing attacks. Yet insecurity also makes it difficult to undertake mini-grid development in such communities.

On the other hand, both insecurity and mini-grid development affect the progress on SDGs independently, while mini-grid development may affect the progress on SDGs through its effect on insecurity as well. These connections are reflected in figure 7 below.

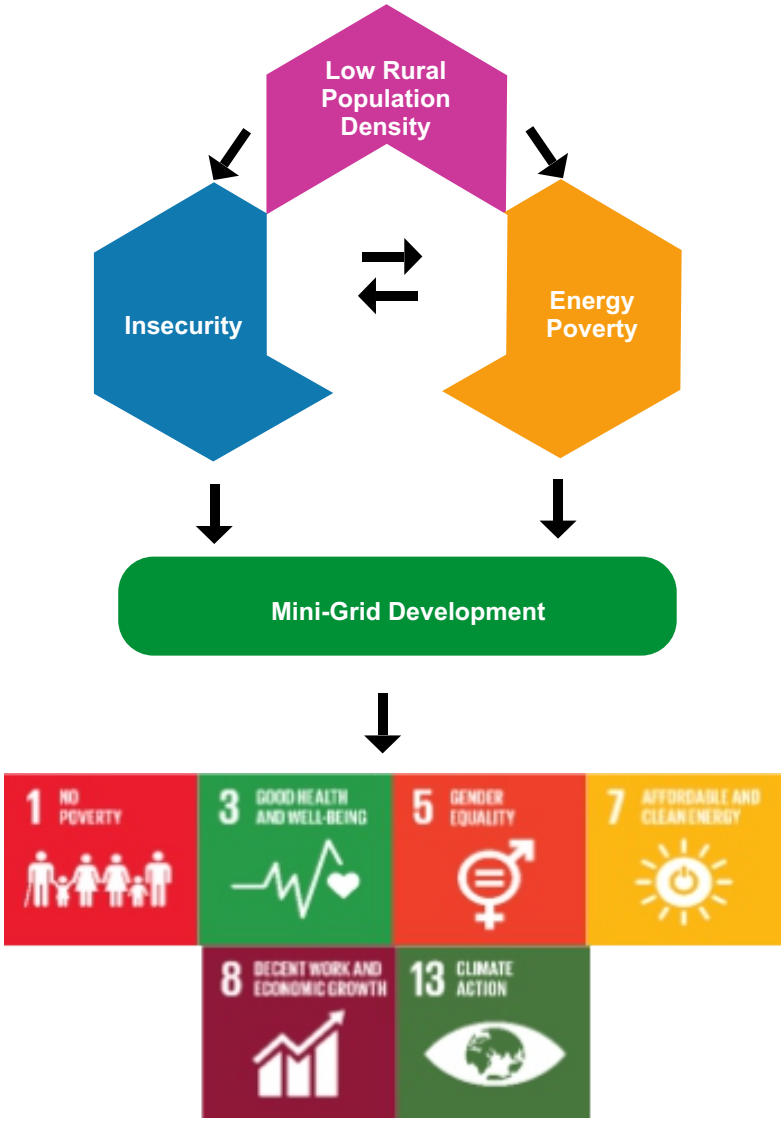


Figure 9: The interaction between insecurity, mini-grids and SDGs

Impact of Insecurity on Mini-Grid Development

Insecurity may affect mini-grid development before project launch and afterward, from site selection or evaluation and project implementation, to terminal evaluation. Prior to site selection, the state of site security is evaluated, and contributes towards the final decision to launch a mini-grid project in a potential location.

Following project launch, insecurity can have both direct and indirect impacts on mini-grid development. For the mini-grid developer, it may threaten mini-grid infrastructure and installations and reduce distributional and personnel mobility and accessibility. It may also reduce demand for mini-grids, as educational institutions close down in response to insurgency and kidnapping, and communities may be scattered after experiencing banditry and kidnapping.

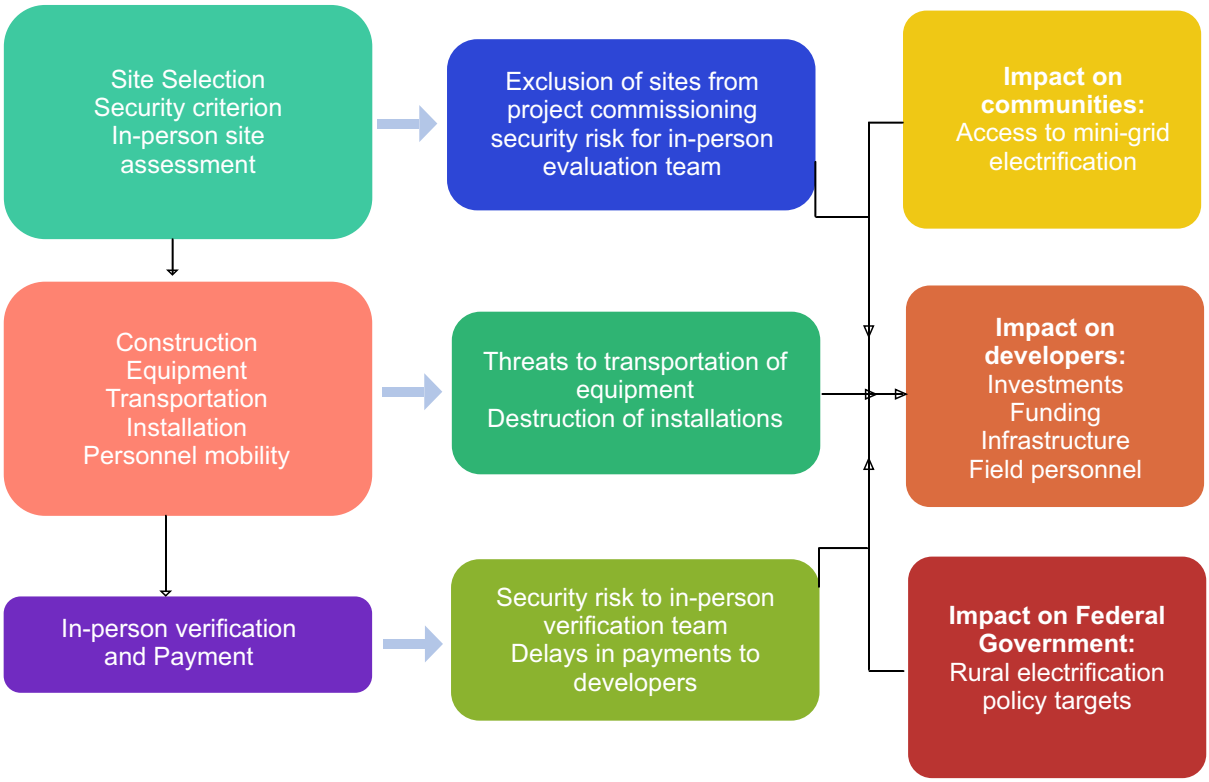


Figure 10: The impact of insecurity on mini-grid development

However, the degree to which insecurity affects a developer's mini-grid portfolio and their broader business model depends on a range of factors, including the company's size, the states in the country which it operates, and the size of mini-grid investments as a share of the company's total investments. Nonetheless, security generally affects expansion plans of mini-grid companies, especially into Northern Nigeria.

Insecurity may affect mini-grid development before project launched and afterward, from site selection or evaluation and project implementation to terminal evaluation security generally affects expansion plans of mini-grid companies, especially into Northern Nigeria

Site selection

For developers, the state of security is often one of the main criteria considered during their site feasibility evaluation for mini-grid projects.[59]Such feasibility evaluation also includes in-person site assessments, thereby making security a key issue as well for field officers. It is therefore generally the case that security concerns affect assessments of locations for mini-grid development in the first place. The worsened security situation has increased the weighting of security criterion in site feasibility evaluation. A major developer with projects across Northern Nigeria notes that security represents as much as 50% of site feasibility weighting. Indeed, half of survey respondents report having a security criterion weighting of 50%, while a third report a weighting of 41-50%.

This is not limited to mini-grid developers. For instance, in one renewable energy project in Borno State completed in 2021, one of the local government areas (LGAs) could not be visited for site feasibility evaluation due to insurgent activities on the roads. For two other locations the project implementers had to make use of UN humanitarian helicopter services for transportation. This has become a common occurrence. The developers interviewed reported at least one case where a site had to be rejected due to high levels of insecurity.

The effect on site selection takes various forms. In addition to stricter security weighting for site selection for some developers, it has included a shift from isolated to interconnected mini-grids, which privileges sites closer to the main grid. This means that some developers have also shifted from rural to peri-urban sites closer to city-centers, where security risks are relatively safe and commercial viability is greater.

Generally, there is increased hesitance to situate mini-grid projects in Northern regions. The states in which developers identify as sites that have been rejected due to security concerns are: Adamawa, Bauchi, Benue, Borno, Gombe, Kaduna, Niger, Sokoto, Taraba, Yobe and Zamfara.

[59] GIZ ProSolar (2014). *Where Shall we Put it? Solar Mini-Grid Site Selection Handbook*. Nairobi: GIZ ProSolar; https://greenminigrid.afdb.org/how-it-works/help-desk-developers-and-operators/site-selection.

Half of survey respondents report having a security criterion weighting of 50%, while a third report a weighting of 41-50%

- **Stricter security weighting for site selection.**
- **Shift from isolated to interconnected mini-grids.**
- **Shift from rural to peri-urban areas where security risks are lower and commercial viability stronger.**

Mini-grid equipment and infrastructure

Mini-grid installations may also be vulnerable to vandalism. Copper wires, PV panels and other valuable materials or system components, for which a secondary market exists, are in danger of being stolen. However, a 2015 series of interviews with mini-grid expert members of the Alliance for Rural Electrification (ARE) estimated the probability of such a risk occurring to be medium to low and the negative impact can be moderate.[60]

Although our interviewees and survey respondents reported not having a challenge of vandalism at sites, they all identify difficulties with transporting equipment, especially in certain states of the Northern region of the country. As a result, private security for transported equipment is occasionally arranged where the security risk of transportation is assessed to be high. Moreover, insurance is often taken against the risk of theft and damage to infrastructure and equipment.

A renewable energy consulting company raised the issue of transporters sometimes engaging in risky behaviour in a bid to reduce their security risks. When transporting smaller quantities of materials using small trucks, there is the risk of drivers going at speeds above normal for fear of running into an ambush. This could also damage the materials due to the combination of above-normal speeds and very bad roads.

Such challenges could therefore delay the delivery of equipment to sites, thereby delaying service completion in high-risk areas.

[60] Manetsgruber, David, Wagemann, Bernard, Kondev, Bozhil and Dziergwa, Katrin (2015). *Risk Management for Mini-Grids: A New Approach to Guide Mini-Grid Deployment*. Brussels: Alliance for Rural Electrification.

Interviewees identify diffculties with transporting equipment, especially in certain state of the Northern region of the country

- **Arranging private security for the transportation of key equipment to sites.**

Safety of field personnel

Field personnel are typically required to visit project sites to conduct in-person site feasibility evaluation, equipment delivery, mini-grid installation and monitoring and evaluation - the entire project life cycle of mini-grid projects. Insecurity on the roads and in communities pose a challenge in high-insecurity areas.

Sometimes in-person site evaluation and mini-grid installation cannot be performed due to security risks to the field personnel. Field personnel are at risk of getting kidnapped or suffering other consequences of insecurity. One developer in the South South reports having personally escaped a failed kidnap attempt. Another developer has noted that as early as 2019, nine (9) Northern states, including Plateau, had been rated as having high security risk and thus the developer's personnel could not be sent there.

This challenge is not exclusive to Nigeria. In neighbouring Chad where insecurity persists, warnings have been given for travel outside the capital N'Djamena in Chad. Boko Haram activities also occur around lake Chad and the Cameroonian border. In an international mini-grid project implemented by UNIDO (2012-2015), it was agreed that the International Evaluation Expert will not travel outside N'Djamena to visit the project pilot sites.[61] It was instead conducted by the National Evaluation Expert alone. Therefore, for international projects, some responsibilities for terminal site evaluation have been deferred to nationals.

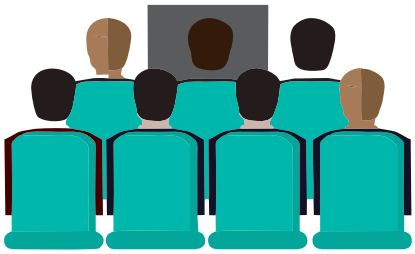
Several measures have been taken by developers to mitigate the exposure of the staff to security risks. One measure taken by developers is to require their field personnel to first visit the police station closest to the project site, to obtain information about where not to go and what times are best for moving around. They also acquire security contacts which may come in handy.

In addition to more careful security assessments for site selection, developers have sought to overcome these challenges by providing security escorts for field personnel. A developer in the South South warns that this may sometimes be counterproductive in some sites, where it may look aggressive or may falsely suggest that the personnel are wealthy. Indeed, field personnel are encouraged to keep a low profile.

Another measure is to intimately direct, monitor, and track the movement of field personnel. First, a major developer reveals the creation and implementation of a "journey management map" which lays out in detail the activity plan, timeline and locations involved in an activity at a project site. This is complemented by a journey buddy system whereby a specified buddy calls the field staff member at specific intervals each day to ensure their safety. There are also cut-off times when personnel are required to leave sites. In addition to these precautionary measures, a reactionary measure exists in the form of a disaster recovery mechanism, which outlines the process for evacuation of personnel in the event of security-related incidents or emergent security threats.

In addition to gaining intel from the community members before sending field personnel to sites, some developers hire locals of the communities and train them on mini-grid installation and monitoring. This leverages the locales' better assessments and navigability of security risks. These locals are familiar with the site and its transportation routes, maintain continuous communication with the communities, speak the local language, and can better assess security risks. They can then be brought on as contract staff and trained. This also provides community members with some employment opportunities. A major developer regards this as an opportunity to experiment, since such locals could sometimes be more efficient with the tasks than permanent staff residing in cities.

Some developers hire locals of the communities and train them on mini-grid installation and monitoring



[61] UNIDO (2016). *SPWA-CC: Promoting Renewable Energy Based Mini-Grids for Rural Electrification and Productive Uses in Chad*. Vienna: UNIDO, p. 53.

A major adaptation, mostly prompted by the pressure to adapt operations in light of the COVID-19 pandemic, is the digitization of some operations. Technologies can be used to monitor and follow-up on installations, more so when local contract staff are employed.

- **Obtaining security updates from an advisor at the location before embarking on trips.**
- **Visiting the closest police station to get security updates on the area.**
- **Employing persons form the target communities, and training them aspects related to mini-grid installation. Leveraging their localized knowledge helps reduce security risk to the project.**
- **Locating sites where security conditions are less onerous.**
- **Digitization of some operations.**

Funding availability

Potential investors care about the security conditions of potential sites when developers conduct site feasibility evaluation. Investors also include assessments of transport costs of equipment to the destination site, and site development costs as part of their mini-grid investment due diligence for mini-grid projects.[62]Such costs could increase due to security costs in high-insecurity areas.

National and international funders often work with the UK Travel Advisory which maps regions of a country by their levels of security. Some of the international funders require additional levels of security priority for sites located in the North East such as Gombe and Borno States.

Therefore, some developers have seen some hesitancy from foreign donors. About two-thirds of mini-grid developers state that insecurity has affected their ability to close financial rounds, although only a third report insecurity negatively impacting the ability to acquire funding.

Some funders have even shifted from debt financing to equity financing to reduce the risk they bear with mini-grid projects. About 83% of developers identify this as an issue. As a result, the pressures for stricter criteria when conducting due diligence increases. The expectation, as one developer reveals, is that the companies which have their legs on the ground should be able to mitigate the security risks, thereby making the switch to debt financing unproblematic. Funders nonetheless continue to press developers about security risks and their mitigation measures taken.

Small-scale developers less exposed to security risks have not observed an impact on funding availability. Larger scale developers, who also tend to have projects across states in the North, have indicated some negative impact on funding.

[62] GIZ (2017). *Due Diligence Guidelines for Mini-Grid Investors in Nigeria*. Abuja: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), p. 20-21.

- **Some financiers are shifting from equity-financing to debt-financing for high-security risk mini-grid projects.**
- **Foreign funders need greater assurance of risk mitigation.**

Investments

Interviewees agree that insecurity has had a significant impact on their activity. In some project sites, insecurity has led to delays and suspension of mini-grid projects due to difficulties in site visitation, transportation of equipment and monitoring. There is presently no estimate for how much investment has been held up in delayed or suspended mini-grid projects. Two-third of surveyed developers report having to suspend mini-grid development in some sites in the last three years over security concerns. In these cases, half of the respondents report an average delay of 3-6 months, with none experiencing delays of more than six months.

A major developer states that a project worth hundreds of thousands of dollars has been suspended and cannot be commissioned due to insecurity. Similarly, N120 million in a Northern state has been stuck for two years. The developer also laments that billions of naira worth of contracts in the north have been lost due to insecurity. Survey responses suggest that insecurity may have affected the revenues of about 50% of developers, at an average reduction in revenues of 31%.

It is possible that there is an impact on tariffs paid by the end user due to increased security costs which may have to be matched by increased revenues. This is a problem especially since there is a pre-existing issue of low incomes in less dense areas making it difficult to recover costs. Yet developers report that increased security costs have not generally led to increased tariffs to end users, and only 17% of survey respondents report

Survey responses suggest that insecurity may have affected the revenues about 50% of developers, at an average reduction in revenues of 31%

this. This is not unexpected, since the high-insecurity sites are often excluded from site selection in the first place.

Although mini-grid systems may be less vulnerable to insecurity than macro-grids, they may be more vulnerable than smaller systems such as Solar Home Systems (SHSs). A major developer reported having to resort to reduced investment in mini-grid projects in high-insecurity communities, in favour of such smaller systems which require lower equipment volumes, installation burdens, monitoring and site interaction. This is

temporary, pending improvements in the security situation, and so that these communities are not completely left out of energy access. Nonetheless, SHS is a limited solution given the low incomes prevailing in rural areas, and are more viable in peri-urban and urban areas which incidentally face a lower vulnerability to insecurity. Smaller renewable energy appliances, such as solar lamps and torches are more functional as an aid when being displaced from a location by an attack.

Other developers may intensify plans to reduce their exposure to national risks such as insecurity and macroeconomic volatility by diversifying into foreign markets within and beyond West Africa. One large developer stated plans along this line. This option appears to be available only to large developers, and dependent on ability to access foreign financing for such expansion as a smaller scale developer believed.

Larger renewable energy companies appear to have greater flexibility to adjust their strategies to the security challenges. For instance, developers which are more broadly classified as technology companies may draw a fairly minor share of their business activity and revenues from mini-grid development. This limits their exposure to the security risks involved with mini-grid development in rural communities. This is not the case with developers which specialize in mini-grid development and have most of their projects in high conflict zones. Larger companies are also better able to adapt their funding mechanisms to the new situation than smaller players. The impact of insecurity on developers also differs by the geographical profile of their project portfolio. Those with predominant operations in the South South and South West report facing less challenge from insecurity.

- **Shift from an emphasis on mini-grids to smaller systems such as Solar Home Systems (SHS) in high-insecurity locations.**
- **Reduce exposure to national macroeconomic and insecurity risks by diversifying to other countries within West Africa.**

Impact on Rural Electrification and REA activity

The REA conducts pre-feasibility site evaluation under the NEP to map out sites where mini-grid demand is present, but this does not explicitly take into account security conditions at sites.[63]It is the developers who strongly consider security in their site feasibility evaluation.

The REA began in-person verification partly because the lack of good telecommunication infrastructure and services in rural areas disallows verification of electrified households through phone calls alone. By introducing a physical element to the verification process, a negative outcome has been greater vulnerability of the process to insecurity. There has therefore been a disruption of the verification process in sites facing high insecurity

levels, thereby leading to delays in verification and disbursement of funds to developers. For example, it has become difficult to verify completed mini-grid installations in some locations in Niger State under the NEP, as a result of insurgent activity. Insecurity is therefore worsening cash flow for developers through this channel.

This makes it more difficult for the government to achieve its rural electrification targets, with negative consequences for achieving broader Sustainable Development Goals which are most closely impacted by clean energy access.

However, developers reveal that there has been no structured or targeted intervention from the REA and the government to the insecurity challenges faced by mini-grid developers and projects. State governments are generally incapable of providing adequate security cover. They can only connect developers to local officials and community leaders who advise on security concerns. Yet one developer noted that states may attempt to downplay security risks in order to retain mini-grid investments in their states.

The REA on the other hand also does not have capacity or funding to provide meaningful assistance to developers facing project challenges due to insecurity. The conflict resolution panel under the NEP does not seem to have a structured mechanism to take care of security problems. The REA could, nonetheless, reduce administrative bottlenecks to ease costs and delays for developers, as a means of partially offsetting rising security costs, as one developer argues.

- **Delays in verifying completed projects at high-insecurity sites, leading to payment delays from REA for developers.**
- **Concertedly reduce regulatory bottlenecks to offset some of the increase in security costs for developers.**

[63] REA (2017). *Nigeria Minigrid Investment Brief*. Abuja: REA.

Impact of Mini-Grids on Insecurity in Communities

Although insecurity affects mini-grid development, mini-grids may also help communities reduce the impact of insecurity in several ways.

A more secure alternative

Mini-grids may, in the first place, be a means to circumvent security problems associated with other sources of energy. Oil and gas pipeline vandalization has been a perennial problem limiting the efficiency of gas-powered power plants; solar PV has been advocated by some as an attractive alternative energy source to avoid expensive interstate pipelines susceptible to vandalism.[64]In fact, one small study shows that the risk of theft or vandalism to renewable energy projects appears to decrease with the scale of the project, enabling the authors to suggest the greater sustainability of smaller projects.[65] Mini-grid installations benefit from proximity to the users' residential or business infrastructure, making it more monitorable than large projects in locations without surrounding inhabitants.

Night-time security

When the impact of mini-grid development upon security is discussed by stakeholders, the channel most often raised is that of street-lighting. Indeed, night-time security is one of the major areas in which mini-grid development can contribute to greater security in rural areas, given that attackers often target areas with low levels of illumination and population density.

For example, with the infamous case of the kidnapping of the Chibok girls, the absence of illumination at night-time prevented more girls from accurately identifying and fleeing from the military imposters who kidnapped them.[66]Green Village Electricity, GVE therefore often mentions that one of the impacts of its solar mini-grid projects is "enhanced security at night".[67] Night-time illumination also contributes to the reduction of sexual molestation and other forms of gender-based violence (GBV) especially against women and girls.

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[64] Olaniyi, Ola (11 September 2017). "Research: Tackling the energy crisis in Nigeria – a case for solar", *How we made it in Africa*. https://www.howwemadeitinafrica.com/research-tackling-energy-crisis-nigeria-case-solar/59635/.

[65] Ikejemba, Eugene C.X. and Schuur, Dand P.C. (2018). Analyzing the Impact of Theft and Vandalism in Relation to the Sustainability of Renewable Energy Development Projects in Sub-Saharan Africa. *Sustainability*, 10(814): 1-17.

[66] Lilienthal, Peter (21 June 2016). "Renewable Energy for Security: Electricity and the Boko Haram Kidnapping", *Renewable Energy World*. https://www.renewableenergyworld.com/storage/renewable-energy-for-security-electricity-and-the-boko-haram-kidnapping/#gref.

[67] GVE (2016). "Bisanti Village Mini-Grid Project", *GVE*. https://gve-group.com/portfolio/bisanti-village-mini-grid-project/.

Security-related communication and mobility

Mini-grids may improve the ease of contact with the outside world, which includes communication with security contacts. Energy access provides rural communities with the capacity to more reliably power their mobile devices, access the internet personally and through mini-grid-powered cyber cafes, and other means of communication and information transmission.

Some developers install Satellite VSAT at powerhouses. This is used for internet connection in remote areas of the world where a connection to the traditional copper or fibre network is not possible. With mini-WIFI, as well as their personal internet access using mini-grid energy, communities can easily send out pictures and WhatsApp messages.

There may be two indirect impacts of mini-grids on security and the sense of security in rural communities. Even the presence of mini-grid developers in communities may provide them with an additional bridge to urban security contacts. One developer indicated that the presence of personnel and security escorts may improve locals' perception of the safety of the project and the community.

An indirect impact of mini-grids on security in rural communities is the connection between community leaders and leaders of mini-grid companies who may have stronger connections to relevant urban contacts and security services. One interviewee recalled how a community leader gave him a phone call in the middle of the night to request his intervention in response to the threat of an impending attack by bandits. The developer could contact the closest garrison commander to send reinforcements. In essence, the activity of mini-grid developers, which are urban-based companies, provides a channel of contact with their networks which include security contacts.

Rebuilding and long-term resilience

Mini-grids may also contribute immensely to rebuilding efforts of communities following attacks.[68] Without access to the main grid, rebuilding communities becomes more cumbersome. Energy access is therefore necessary. In the long-run, mini-grid development could accelerate the pace of rural-urban connections and commercial and security relations.

[68] Nextier Power (12 January, 2017). "Nigerian Community Harness Solar Energy as they Rebuild Homes After Boko Haram Attacks", *Nigeria Electricity Hub*. http://www.nigeriaelectricityhub.com/2017/01/12/nigerians-community-harness-solar-energy-as-they-rebuild-homes-after-boko-haram-attacks/.

These connections ultimately make it easier for the government to provide security and public order in rural communities. Rural communities may be relieved of some of the difficulties involved with promptly acquiring security-relevant information, improving the ease of contacting security forces, improving transportation linkages to urban and peri-urban areas, and making local security stations more self-sufficient. These could enable communities to be more resilient to security threats, both by the precautionary measures they take, their response during attacks, and the speed of recovery and rebuilding after attacks. Given that low agricultural productivity is regarded by some experts as one of the reasons for vulnerability of rural communities to insecurity, mini-grids could help propel productivity growth and agro-processing cottage industries, enabling greater income growth, commercial activity and peri-urbanization.

Although the disruption to their lives is unimaginable, in some cases, there is the possibility that the costs of disruption reveal to communities the need to better empower women whose hesitant spouses, culture or socio-economic structures may have previously impeded their greater engagement in commercial activities. Indeed, some research from Khyber to Peshawar district in Pakistan reveals that the impact of displacement from a rural to a semi-urban area has been hugely positive for many.[69] The loss of land on which to pursue their families' traditional agricultural activities has pushed women to look for other sources of income, such as needlework, on which they are able to work independently. Greater access to amenities such as running water, cooking gas and electricity in Peshawar has reduced the amount of time women and girls have to spend on domestic chores. Girls are able to attend school more easily as a result, and also because all-girl schools are available. Moving to a wage economy has also made education a much higher priority for both boys and girls.

6. POLICY RECOMMENDATIONS

It is apparent that the impact of insecurity on mini-grid developers is influenced by a range of factors, including the geographical locations of their mini-grid projects, their degree of specialization in mini-grid products, and their size and capacity. As long-term efforts to improve Nigeria's security situation progress, there is a need to seek ways for federal, state and local governments to aid mini-grid developers in improving their short-, medium- and long-term resilience to insecurity. The following are recommended steps and actions to take in order to mitigate the impact of insecurity on the Nigerian mini-grid sector:

- Round-table discussions should be held between mini-grid developers, the REA (Rural Electrification Agency) and donors on providing meaningful assistance to off-grid renewable energy developers facing project challenges due to insecurity. Responses could include possibly digitalizing some operations (such as verification); making provisions for more funding which will cover the arrangement of private security for the transportation of key equipment to site; and intensifying efforts to minimize existing regulatory bottlenecks to provide some respite from the financial impacts on insecurity.

- Energy access is important both for improving the commercial activity among rural communities and for improving the resilience of states to insecurity. It is therefore imperative for the local and state governments to formalize the provision of site security to mini-grid developers at least for project sites identified as strategic for these governments. This may be through their governmental connections to the federal security forces, local security initiatives, and the arrangement of private professional security cover available to developers in the state or local government.

- Actively attract and engage state-level and regional support for mini-grid development in conflict-prone areas. For instance, the North East Development Commission (NEDC) could drive engagement with mini-grid developers for the electrification of the conflict-prone areas of the North East which it already focuses upon.

[69] Cazabat, Christelle, André, Clémentine, Fung, Vincent, Montandon, Raphaëlla, Patten, Hamish, Ponserre, Sylvain and Yasukawa, Louisa (2020). *Women and Girls in Internal Displacement*. Geneva: Internal Displacement Monitoring Centre (IDMC), 23.

7. CONCLUSION

The great challenge of insecurity in recent years has negatively affected many mini-grid developers and communities, especially in Northern Nigeria. Yet the need for rural electrification, ending energy poverty and achieving sustainable development goals remain.

Mini-grid development is therefore affected by, and affects, insecurity experienced by rural communities. Communities are better able to take security precautions, respond to attacks and rebuild following attacks with the help of energy access provided by mini-grids. It is therefore imperative for the government to take this into account when tackling insecurity.

Developers may have devised various ways of adapting to the new situation – from rejecting high-insecurity sites to digitizing some operations – but they still require much support. Therefore, while broader efforts to reduce insecurity proceed, targeted interventions for mini-grid developers and communities are required. This is expected to at least reduce the impact of insecurity on the progress on achieving policy targets for rural electrification and sustainable development.