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Impact of Insecurity on the Development of the Nigerian Mini Grid Sector

SURVEY ANALYSIS BY

AFRICA MINI GRID DEVELOPERS' ASSOCIATION (AMDA) NIGERIA

MAY 2022

Acknowledgments & Disclaimer

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EXECUTIVE SUMMARY

Nigeria has experienced an increased level of insecurity in recent years, especially since 2018. Cases of banditry, kidnapping, herder-farmer clashes, and insurgency have surged, and pose challenges to lives and property¹. According to the Armed Conflict Location and Event Data Project, armed bandit groups killed more than 2,600 civilians in 2021.² Between January and March 2022 at least 360 people were killed by bandits in Kaduna State alone, while on 10 April more than 100 people were killed in attacks on several communities in the Kanam Local Government Area of Plateau State.³ However, these risks vary significantly across geopolitical zones and states.

There has, however, been limited examination of the impact of these trends on mini grid developers operating in high-risk zones as well as the overall impact on mini grid development in the country and by extension off-grid electrification efforts, as mini grids have been estimated as the least cost electrification for the 85 million Nigerians without access to electricity.

This report represents one of the first attempts to close this gap, and to call greater attention to the phenomenon. The report summarizes the results of an online survey conducted in 2021, to which a significant number of mini grid developers responded.

The survey results suggest that:

1. Many viable sites have been excluded from possible development of mini grids due to the high incidence of insecurity, especially in the Northern geopolitical zones of the country.
2. Operations and Maintenance (O&M) costs have significantly increased in high-risk areas due to the difficulty in accessing these sites.
3. There seems to be little or no impact on tariffs for mini grids since developers have avoided deploying sites in these regions altogether.
4. Several developers in Nigeria have recorded a revenue drop of up to 30 per cent. This is primarily because their sites being located in high-risk zones leads to delays in project development and inability to close financial rounds at deployed sites
5. Multiple site and community visits are often required to establish agreements with the community for the development of mini grids and the state of insecurity in conflict-prone areas significantly inhibits this.

¹ 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*.

² More than 2,600 civilians killed by armed bandits in 2021 <https://www.global2p.org/countries/nigeria/>

³ 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/>.

Although tackling insecurity is a long-term issue and primarily involves the Federal Government, with the cooperation of state and local governments, it is important to develop measures to mitigate the risks associated with it in the short- to medium-term. To this end, we propose that:

- Round-table discussions should be held between mini-grid developers, the Rural Electrification Agency (REA), Security Agencies in Nigeria and donors on providing meaningful assistance to off-grid renewable energy developers facing project challenges due to insecurity. Responses could include 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.
- As part of rehabilitation for communities post conflict, and in line with SDG 11 to make human settlements safe and resilient, the National military and security forces can provide efforts that significantly lead to the development of much-needed infrastructure, including energy systems through mini grids. Such efforts include security presence, peace support, as well as assistance from the engineering arm of the military. This provides confidence to mini grid developers to consider otherwise avoided sites and also encourages military civic action programmes, which are a counter-insurgency global best practice.

- It is also imperative that *mini grid developers/companies* adopt measures that can significantly reduce risk in these conflict-prone areas. Rather than avoid these areas altogether, they are strongly advised to work with Insurance companies to insure their sites. Also, tying into effective productive use of energy (PUE) by identifying the commercial needs of these communities will go a long way to ensuring the continuity of the energysystem.
- Investment targeted towards conflict-prone areas requires a different approach. It is also widely recognised that financial institutions are instrumental to the prevention of conflict and pursuit of peace and stability. By studying conflict indicators, investors and financiers are able to provide instruments towards social stability as well as innovative finance for reconstruction. Also, Public-private collaboration is key to improving the risk-reward ratio, which evaluates the level of potential downside to an investment, compared to the potential gains.

INTRODUCTION

Mini grid development in Nigeria, like other businesses, faces a number of business risks. Typically, risks can range from political risks to macroeconomic risks associated with the volatility of foreign exchange. In recent years, security risks have grown to considerable levels in certain regions of the country.

As a result, this analysis has the following objectives;

- To understand and measure the impact of national insecurity on mini grid development in Nigeria
- To create awareness among Federal government agencies, decision-makers and other stakeholders on the effect of issues of insecurity on nationwide electrification efforts
- To proffer solutions and advocate for mini grid development in high-risk and conflict-prone areas

METHODOLOGY

An online survey was carried out by Clean Technology Hub (CTH), the national representative of the African Mini grid Developers' Association (AMDA) in 2021, where representatives of mini grid companies and members of AMDA in Nigeria completed the survey, with most agreeing that insecurity issues risks have risen in recent years.

The survey results demonstrate that increased levels of insecurity in Nigeria have contributed to the rejection of potential sites in high-risk areas, an increase in Operations and Maintenance (O&M) costs in high-risk areas, and a drop in revenue for some developers who have suffered the most from insecurity.

This report hereby presents the results of the survey.

REPORT STRUCTURE

The following section provides the results of the survey. It begins by describing the characteristics of the sample, highlighting how, there is significant variation to make a reasonable inference.

It then presents the responses to the survey questions on the impact of insecurity on a range of project areas, including Finance and Logistics as major areas of interest.

Subsequently, it demonstrates that mini grid developers have been active in adopting a range of mitigation measures to reduce their exposure to the risks of insecurity in Nigeria.

Finally, an analysis of the survey results is offered, highlighting the critical interactions among the various project areas explored. This is followed by the Conclusion, which summarises the key findings and highlights areas for further investigation, mutual collaboration and institute short-, medium- to long-term measures that the Nigerian government can take to ameliorate the impact of insecurity on mini grid development.

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SURVEY ANALYSIS

This section describes and analyses the survey results.

1. Sample Characteristics

Survey respondents differed in size and included those with between 6 and 10 permanent employees, and one having more than 30 members of staff (See Figure 1 below).

How many employees does your company presently have?

Workforce Size	Percentage
1-5	16.7%
6-10	33.3%
10-20	16.7%
20-30	33.3%
>30	16.7%

Figure 1: Size of respondents by workforce

In addition to a variation in workforce size, there was also a significant disparity in the reported percentage of their company's revenues derived from offering mini grid solutions. The minimum mini grid revenue dependence was between 5 – 10 percent and the maximum between 51 – 60 per cent. The respondents have commissioned 5 mini grid projects on average, with a minimum of 1 and a maximum of 14.

As expected, respondents with a larger workforce tend to have commissioned more projects than the average. Similarly, there is wide distinction in the reported number of projects in the pipeline that have completed the site identification process, ranging from 1 to 48, with the most common being 30 (See Figure 2 below).

How many mini-grid projects in your pipeline have completed the process of site identification?

Number of Projects	Count	Percentage
1	1	16.7%
2	1	16.7%
30	2	33.3%
50	1	16.7%
148	1	16.7%

Figure 2: Number of mini grid projects in the developers' pipeline which have completed site identification phase

Another beneficial aspect of the sample is the wide distribution of states in which the developers have commissioned projects over the last 3 years (See Figure 3 below). This ranges between 1 and 7 states, with an average of 3 states. There is an almost equal representation of sites between the North and South of the country, with at least one project in each geopolitical zone except the Northeast.

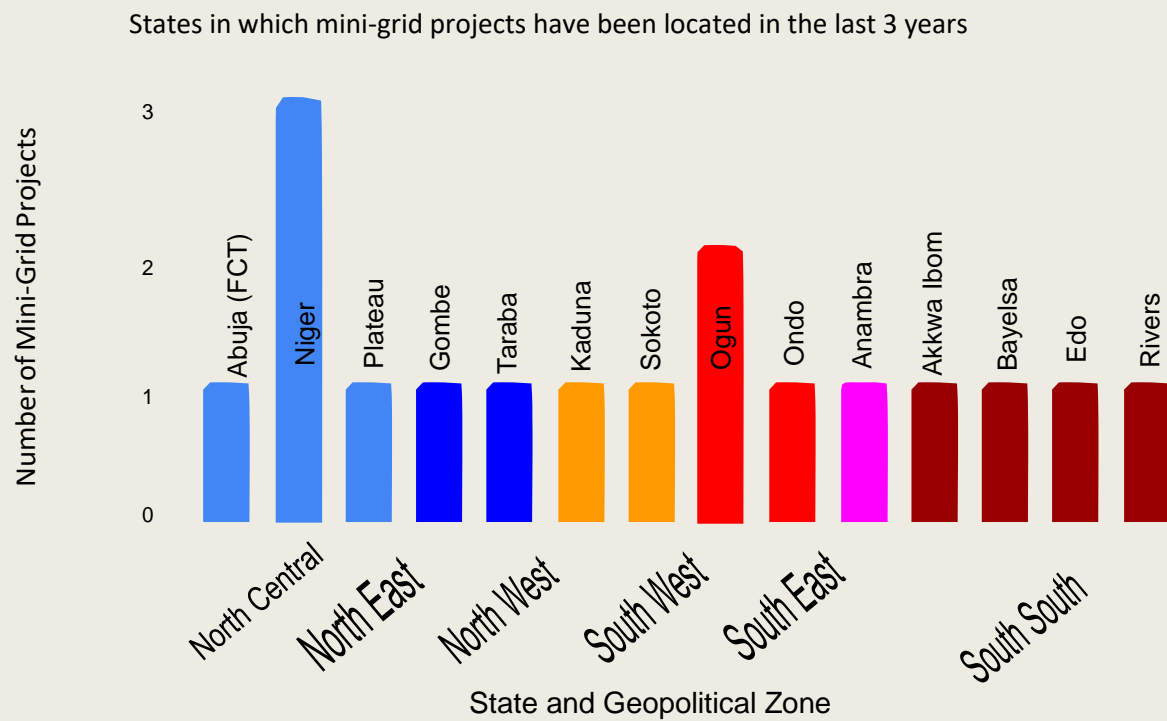


Figure 3: Distribution of mini grid projects by state and geopolitical zone

2. Current State and Impact of Insecurity

Most developers agree that insecurity has worsened in Nigeria in the last three (3) years. This can be seen in Figure 4 below:

In your estimation, has insecurity worsened, remained the same, or improved in Nigeria in the last 3 years?

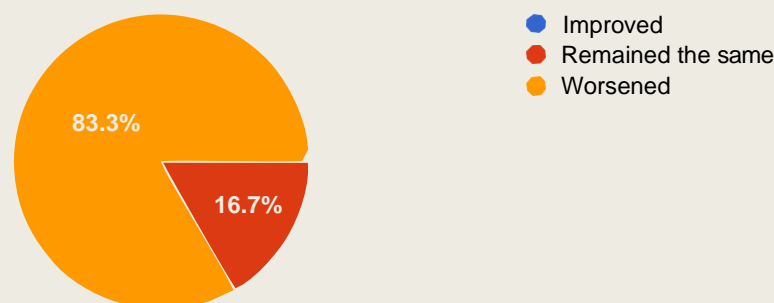


Figure 4: Perception about the condition of insecurity in Nigeria in recent years

Therefore, it is unsurprising that half of all respondents assigned a 50 per cent weighting to security when undertaking site selection. Generally, most respondents (88.3%) gave a 41 per cent and above weighting to security as a factor to site selection (Figure 5 below).

Many factors are considered when selecting a site, such as distance to the national grid, population and settlement density, commercial viability, security and accessibility. What percentage of importance would you assign to security as a factor?

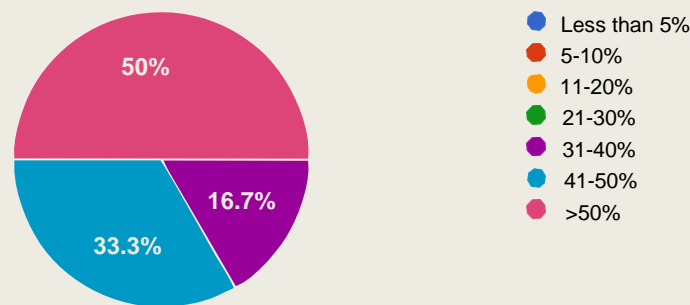


Figure 5: Weighting given to security during site selection

In Figure 6 below, two-thirds of the respondents reported suspending site development in some sites in the past 3 years.

How many sites has your company needed to suspend development in over the last 3 years due to security concerns?

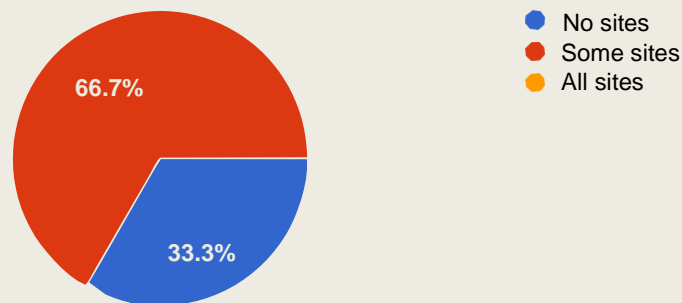


Figure 6: Number of sites where security- related suspension of development has occurred

Most developers who have had to suspend projects reported an average delay of 3 – 6 Months as shown in Figure 7 below.

For selected sites that have experienced some delay in development due to insecurity concerns in the last 3 years, how long has this delay been on the average?



Figure 7: Average duration of delay at sites where development has been delayed

Developers have consistently rejected developing sites in key regions due to insecurity risks, irrespective of the viability of the site for minigrid development in the past 3 years.

However, the figures range from 1 – 20. All of the states in which potential mini grid sites were rejected are located in Northern Nigeria, with many in the North East where insecurity levels are highest.

See Figure 8 below: What states have you had to exclude (in terms of number of sites) due to security concerns?

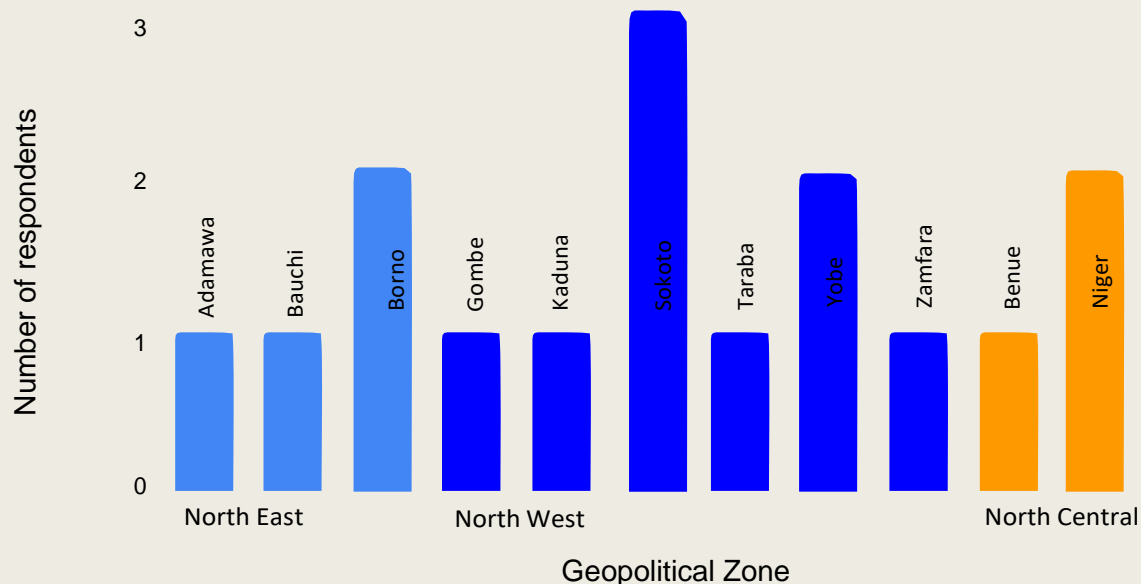


Figure 8: Distribution of site exclusion by state and geopolitical zone

For those who report that insecurity has not affected their pipeline, the reasons offered are that their projects are located in more secure locations or that strong security measures are taken to protect sites (See Figure 9 below).

If insecurity issues have NOT affected your pipeline, why do you think this is so?

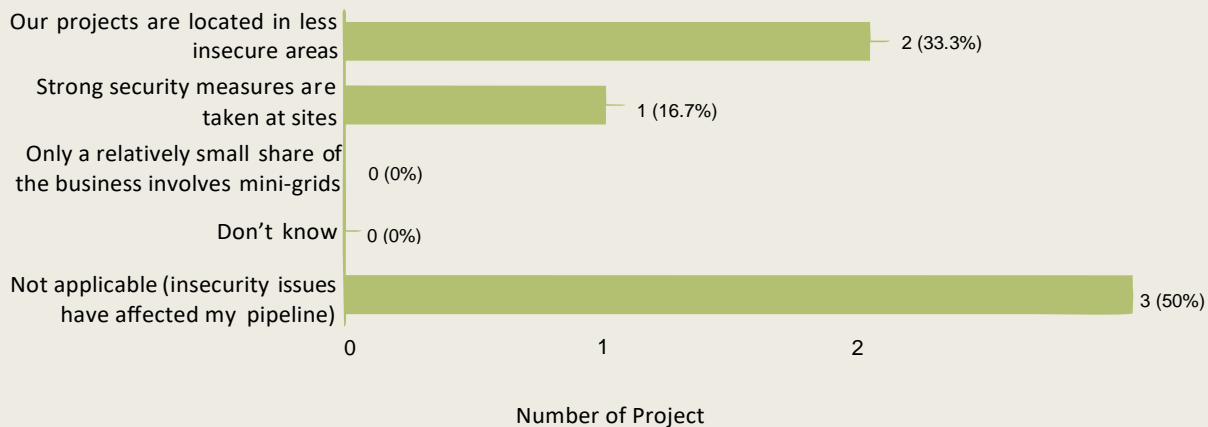


Figure 9: Reason for the absence of Impact of Insecurity on Pipeline Projects

Surprisingly, all respondents reported that their deployed mini grid infrastructure have never been vandalized before, during or after installation.

How often do you have mini-grid infrastructure being vandalized or destroyed either before during or after installation at a site?

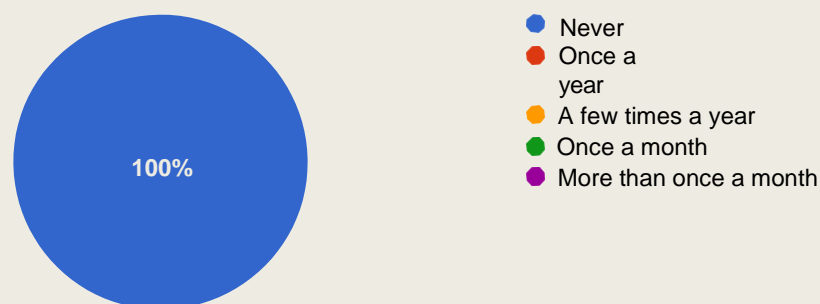


Figure 10: Frequency of vandalism or destruction of mini -grid infrastructure

a. Impact on Finance

Most respondents (67%) noted that security concerns have impacted their ability to close financial rounds at deployed sites.

Have security concerns impacted your ability to close financial rounds for deployed sites?

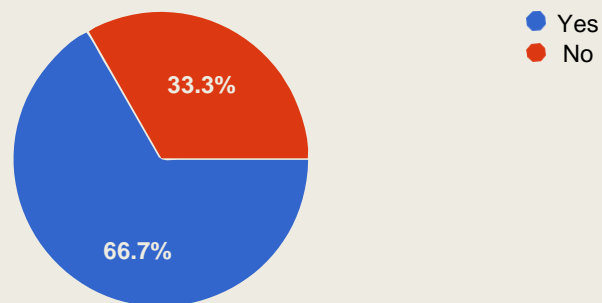


Figure 11: Impact of insecurity on the ability to close financial rounds

On the other hand, two-thirds of developers stated the current level of insecurity was not affecting their ability to secure funding. See Figure 12 below.

Has the current state of insecurity affected your company's ability to acquire funding?

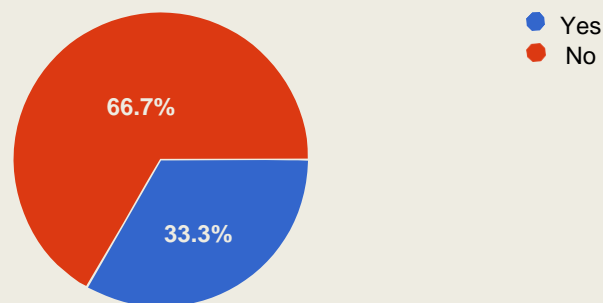


Figure 12: Impact of insecurity on the ability to acquire funding

Half of all respondents reported that security issues negatively impacted their revenues in the last three years. The most commonly stated loss of revenue year-on-year was 30 per cent, with one developer only noting a slight 2 per cent drop. Revenue loss is attributed to developers limited O&M ability in insecure areas leading to increased down time. It is also attributed to reduced revenues within the community as insecurity issues are affecting other SME businesses, logistics and market access (See Figure 14 below).

Have security-related risks negatively affected the company's revenue in the last 3 years?

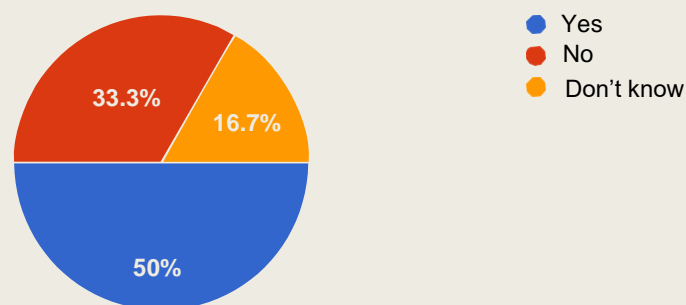


Figure 14: Impact of insecurity on revenue

It is worth noting that no company reported a reduction in staff size due to the negative financial impacts of insecurity.

b. Impact on Logistics and Operations & Maintenance (O & M)

Insecurity does appear to have a significant impact on the mobility of field personnel in high-risk zones. Half of the respondents expressed that insecurity at high-risk sites affects the mobility of field personnel 'a few times a year'. Only one respondent said that insecurity at high-risk sites affects field personnel's mobility 'more than once a month'. A third of the developers surveyed reported that insecurity did not affect movement of their field personnel at high-risk sites. (See Figure 15 below).

How often does issues of insecurity affect the mobility of field personnel at high-risk sites?

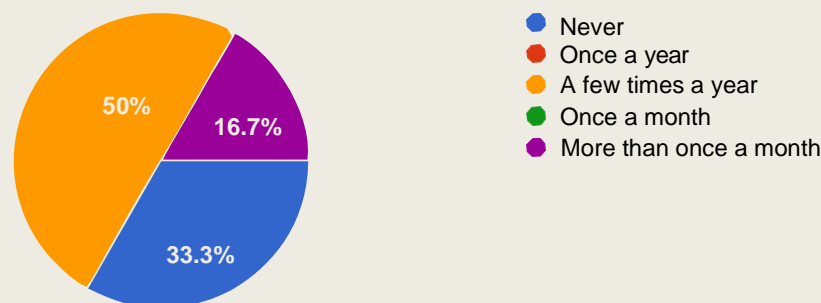


Figure 15: Impact of insecurity on the mobility of field personnel

All respondents stated that insecurity levels have made it more challenging to transport equipment to project sites. Likewise, all respondents also stated that insecurity negatively affected the quality-of-service delivery at high-risk sites, leading to higher Operations and Maintenance (O&M) costs. Most developers noted an 18 per cent increase in O&M costs, with the least increase being 5 per cent and the highest 40 per cent.

c. Impact on Land Lease Agreements and Revenue Collection

Regarding revenue collection at operational mini grid sites, a third of the respondents stated that security issues have affected this aspect of their projects, compared to 67 per cent, as seen in Figure 16 below.

Have the insecurity issues negatively impacted the ease of revenue collection at deployed mini-grid sites?

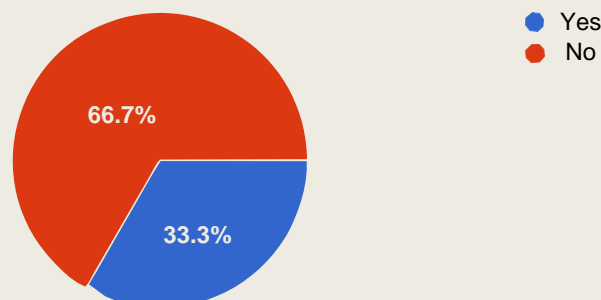


Figure 16: Impact of insecurity on ease of revenue collection

Half of the respondents also reported that insecurity affected their negotiation of land-lease agreements with local communities. This may be due to the fact that several trips need to be embarked upon to these communities before the land agreements can be concluded.

d. Impact on Tariffs and End User Consumption

Despite the reported rise in O&M costs, 83 percent of developers surveyed reported that there had been no increase in tariffs paid by end-users in the last three years. This clearly indicates a significant reduction in profit margin to the mini grid companies. However, the single respondent who reported a rise in tariffs notes that the tariff increased by 16% in their previous 3 years of operation due to higher security costs.

Now, regarding consumption by end-users, most respondents also report that they have not seen any change in consumption levels due to security issues, while one reports a decrease in consumption.

Consumption reduction is related to reduced ability to maintain O&M and reduced economic flow in insecure areas

Please see results in Figure 17 below.

Has there been a change in energy consumption by end-users due to insecurity issues?



Figure 17: Impact of insecurity on end-user energy consumption

e. Impact on the Nigeria Electrification Project (NEP)

With regards to the Nigeria Electrification Program (NEP), only one respondent reported experiencing delay in payment from the implementing agency, REA, due to the overall inability to access high-risk sites for inspection, testing and verification of completed projects.

3. Mitigation Measures

Developers have adopted a number of measures to mitigate the impact of insecurity on their project's country-wide. Most have a local contact person at sites and have hired and trained the members of the local community in mini grid operations and maintenance to enhance seamless operation of the energy system. Others have deployed digital solutions for remote monitoring and operations, while others cooperate closely with local law enforcement personnel. The hiring of private security guards is also another mitigation measure, albeit less commonly utilised by developers. (See Figure 19 below)

What measures have been taken by your company to reduce security risks in projects?

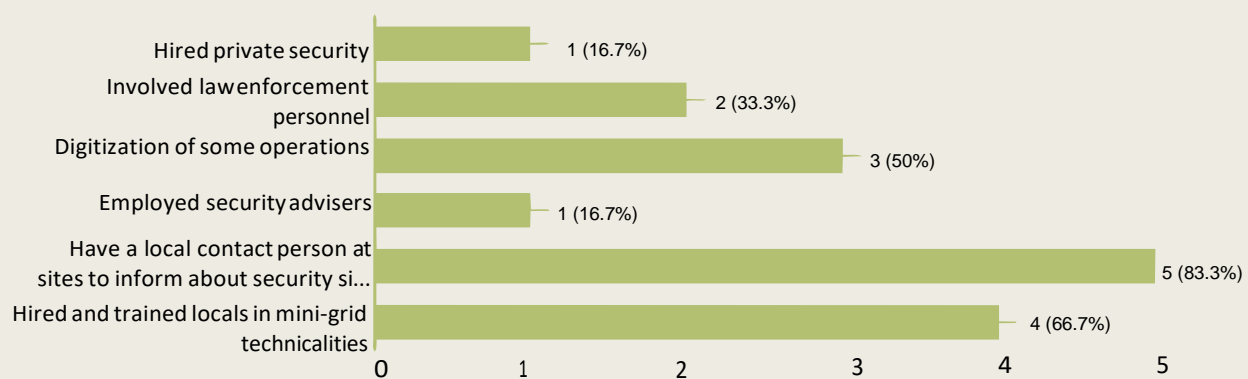


Figure 19: Measures taken to reduce security risks

Nonetheless, the most common measure to reduce exposure to security risks, as chosen by 83 per cent of respondents, is to simply withdraw from areas experiencing high levels of insecurity. While this form of risk avoidance may prove to be less threatening to continued business operations for the mini grid developers, it puts a considerable constraint on the national off-grid electrification goals.

The next commonly adopted measure is to shift site locations to peri-urban and urban centers. Finally, a respondent reported pivoting their business focus from mini grids to Solar Home Systems (SHSs), diversifying into other countries and concentrating their efforts in more secure states. See Figure 20 below.

What measures have you taken to reduce the company's exposure to the challenge of insecurity facing mini-grid sector in Nigeria?

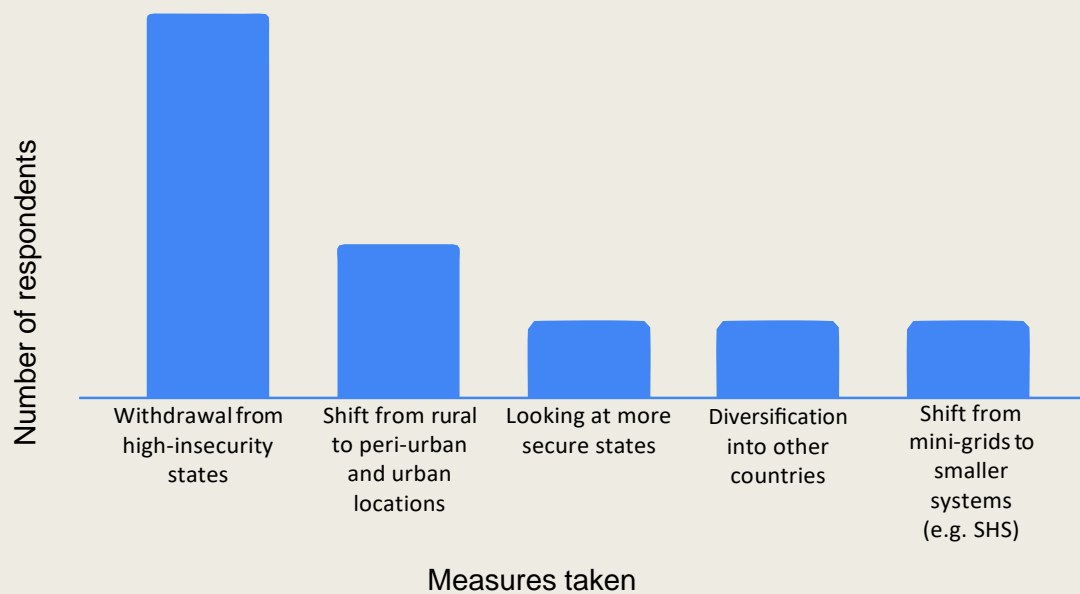


Figure 20: Measures taken to reduce exposure to insecurity

Lastly, in an open-ended question about future mitigation efforts, respondents reported several measures: the careful selection of sites in more secure zones; digitization of operations; increased coordination with State Governments and Local Government Authorities; and hiring more security personnel.

4. Analysis

Although the sample size made inference through regression analysis impossible, simple correlation analyses and statistical tests on descriptive statistics were used, with the correlation between pairs of variables suggesting several associations.

First, the size of the mini grid company (**measured by the reported number of employees**) appears to play a role in the financial impact of insecurity. The negative correlation between the company's size and its ability to close financial rounds due to insecurity suggests that this impact of insecurity on developers falls disproportionately on smaller-sized developers. Indeed, the reported O&M cost increases and tariff increases due to insecurity appear to be relatively negatively correlated with the company size.

The higher the percentage of revenues derived from offering mini grid services, the lower the share of rejected mini grid sites of identified sites. When conducting site feasibility evaluations, those with higher security weighting report a higher ratio of suspended sites to commissioned sites. This may seem counter-intuitive, but it likely reflects the tendency for developers operating in less secure states (and thus more likely to experience project suspensions) to increase security weighting in their feasibility evaluations.

On the other hand, developers with higher security weighting also tend to report lower revenue lost due to insecurity. At the same time, there is a moderate tendency for these developers to report increased difficulty in acquiring funding and higher O&M costs due to insecurity.

Developers who reported O&M cost increases due to insecurity also tended to report tariff increases to end-users. Those who reported O&M increases and tariff increases also tend to report greater difficulty acquiring funding (although less so for those who report tariff increases). This suggests that the difficulty in obtaining financing, the O&M cost increases, and the possible shift from equity to debt financing may put pressure on especially smaller-sized developers to transmit increased costs to consumers through tariff increases.

In summary, the table below shows the level of impact that the risk of insecurity has on mini grid development in Nigeria.

Variable	No Impact	Moderate Impact	Strong Impact
Rejection of viable sites			
Suspension of project development at sites			
Ability to close financial rounds			
Ability to secure equity-financing relative to debt-financing			

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Increase in O&M costs			
Ability to acquire funding			
Decline in revenues			
Increase in tariffs for end-users			

Table 1: Impact of insecurity upon critical variables

CONCLUSION

Survey data suggest that insecurity has had the following impacts on the Nigerian mini-grid sector:

1. Many sites have been excluded from being prospected or assessed due to insecurity. Whether the sites are viable or not cannot be established yet.
2. O&M costs have significantly increased in high-risk areas due to the difficulty in accessing these sites.
3. There seems to be little or no impact on tariffs for mini grids since developers have avoided deploying sites in these regions altogether.
4. Several developers in Nigeria have recorded a revenue drop of up to 30 per cent. This is primarily because their sites being located in high-risk zones leads to delays in project development and inability to close financial rounds at deployed sites.
5. Multiple site and community visits are often required to establish agreements with the community for the development of mini grids and the state of insecurity in conflict-prone areas significantly inhibits this.

The fact that excluded sites are most concentrated in northern geopolitical zones, where off-grid energy access is most sorely needed—due to lower urbanization and electrification rates—threatens Nigeria's off-grid electrification targets and national development and climate goals. There is currently little investigation into this phenomenon and insufficient government attention. This modest data and the survey analysis presented represent a first step towards creating public and policy awareness of the impact of insecurity on the Nigerian mini-grid sector and the urgent need for countervailing interventions.

RECOMMENDATIONS

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), Security agencies 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.
- As part of rehabilitation for communities post conflict, and in line with SDG 11 to make human settlements safe and resilient, the National military and security forces can provide efforts that significantly lead to the development of much-needed infrastructure, including energy systems through mini grids. Such efforts include security presence, peace support, as well as assistance from the engineering arm of the military. This provides confidence to mini grid developers to consider otherwise avoided sites and also encourages military civic action programmes, which are a counter-insurgency global best practice.

- It is also imperative that *mini grid developers/companies* adopt measures that can significantly reduce risk in these conflict-prone areas. Rather than avoid these areas altogether, they are strongly advised to work with Insurance companies to insure their sites. Also, tying into effective productive use of energy (PUE) by identifying the commercial needs of these communities will go a long way to ensuring the continuity of the energysystem.
- Investment targeted towards conflict-prone areas requires a different approach. It is also widely recognised that financial institutions are instrumental to the prevention of conflict and pursuit of peace and stability. By studying conflict indicators, investors and financiers are able to provide instruments towards social stability as well as innovative finance for reconstruction. Also, Public-private collaboration is key to improving the risk-reward ratio, which evaluates the level of potential downside to an investment, compared to the potential gains.

APPENDIX

Table A: Survey questions and answer options

S/ N	Question	Options
<i>Section 1: Company Profile</i>		
1.	How many employees does your company presently have?	1. 1-5 2. 6-10 3. 10-20 4. 20-30 5. >30
2.	Approximately what percentage of your company's revenue comes from offering mini-grid solutions?	1. 0% 2. <5% 3. 5-10% 4. 11-20% 5. 21-30% 6. 31-40% 7. 41-50% 8. 51-60% 9. 61-70% 10. 71-80% 11. 81-90% 12. 91-100%
3.	How many mini-grid projects has your company commissioned so far?	<Input number>
4.	How many mini-grid projects in your pipeline have completed the process of site identification?	<Input number>
5.	How many mini-grid projects in your pipeline are currently under regulatory review/approval?	<Input number>
6.	How many mini-grid projects in your pipeline are currently awaiting financial pay-off?	<Input number>
7.	In how many States has your company had mini-grid projects in the last 3 years?	<Input number>
8.	Please indicate what States these mini-grid projects are located.	<List of States in Nigeria>

Section 2: Impacts of Insecurity

9.	In your estimation, has insecurity worsened, remained the same, or improved in Nigeria in the last 3 years?	<ol style="list-style-type: none"> 1. Improved 2. Remained the same 3. Worsened
10.	Many factors are considered when selecting a site, such as distance to the national grid, population and settlement density, commercial viability, security and accessibility. What percentage of importance would you assign to security as a factor?	<ol style="list-style-type: none"> 1. Less than 5% 2. 5-10% 3. 11-20% 4. 21-30% 5. 31-40% 6. 41-50% 7. >50%
11.	How many sites has your company needed to suspend development in over the last 3 years due to security concerns?	<ol style="list-style-type: none"> 1. No site 2. Some sites 3. All sites
12.	For selected sites that have experienced some delay in development due to insecurity concerns in the last 3 years, how long has this delay been on the average?	<ol style="list-style-type: none"> 1. Less than 1 month 2. 1-3 months 3. 3-6 months 4. 6-12 months 5. >12 months
13.	In the last 3 years, how many potential mini-grid sites have you had to reject due to strong security concerns?	<Input number>
14.	What states have you had to exclude (in terms of number of sites) due to security concerns? Please indicate.	<List of States in Nigeria>
15.	Have security concerns impacted your ability to close financial rounds for deployed sites?	<ol style="list-style-type: none"> 1. Yes 2. No
16.	If insecurity issues have NOT affected your pipeline, why do you think this is so?	<ol style="list-style-type: none"> 1. Our projects are located in less insecure areas 2. Strong security measures are taken at sites 3. Only a relatively small share of the business involves mini-grids 4. Don't know 5. Not applicable (insecurity issues have affected my pipeline)

17.	How often do you have mini-grid infrastructure being vandalized or destroyed before, during or after installation at a site?	<ol style="list-style-type: none"> 1. Never 2. Once a Year 3. A few times a year 4. Once a month 5. More than once a month
18.	Has the current state of insecurity affected your company's ability to acquire funding?	<ol style="list-style-type: none"> 1. Yes 2. No
19.	Have funders become more insistent upon debt/loan-financing rather than equity-financing in the last 3 years due to increased insecurity risks in the country?	<ol style="list-style-type: none"> 1. Yes 2. No
20.	How often does issues of insecurity affect the mobility of field personnel at high-risk sites?	<ol style="list-style-type: none"> 1. Never 2. Once a year 3. A few times a year 4. Once a month 5. More than once a month
21.	Has the insecurity issues negatively impacted the ease of revenue collection at deployed mini-grid sites?	<ol style="list-style-type: none"> 1. Yes 2. No
22.	Has the insecurity issues negatively impacted the quality-of-service delivery in high-risk areas?	<ol style="list-style-type: none"> 1. Yes 2. No
23.	Are insecurity issues affecting the overall Operations and Maintenance of high-risk sites?	<ol style="list-style-type: none"> 1. Yes 2. No
24.	How much has the current state of insecurity increased the operations and maintenance costs (in %)?	<Input number>
25.	Has the insecurity issues negatively affected the ease of transporting mini-grid equipment to sites?	<ol style="list-style-type: none"> 1. Yes 2. No
27.	Has there been an increase in tariffs for end users due to higher security costs in the last 3 years?	<ol style="list-style-type: none"> 1. Yes 2. No
28.	If Yes in the previous question, by how much (in %)?	<Input number>

29.	Has there been a change in energy consumption by end-users due to insecurity issues?	<ol style="list-style-type: none"> 1. Have seen increase in consumption 2. Have seen no increase in consumption 3. Have seen a decrease in consumption 4. Not sure
30.	Have security-related risks negatively affected the company's revenue in the last 3 years?	<ol style="list-style-type: none"> 1. Yes 2. No 3. Don't know
31.	If the answer is yes in the previous question, what is the estimated loss in revenue (%) year on year due to insecurity?	<Input number>
32.	Has insecurity ever affected your company's negotiation of land-lease agreements with communities?	<ol style="list-style-type: none"> 1. Yes 2. No
33.	Has your company had to downsize due to negative financial impacts of insecurity?	<ol style="list-style-type: none"> 1. Yes 2. No
34.	Under the NEP, have you experienced any delays in payment from the REA due to their inability to access high-risk sites for verification of projects?	<ol style="list-style-type: none"> 1. Yes 2. No 3. Have not yet started an NEP project

Section 3: Mitigation Measures

35.	What measures have been taken by your company to reduce security risks in projects?	<ol style="list-style-type: none"> 1. Hired private security 2. Involved law enforcement personnel 3. Digitization of some operations 4. Employed security advisers 5. Have a local contact person at sites to inform about security situation 6. Hired and trained locals in minigrid technicalities
36.	What measures have you taken to reduce the company's exposure to the challenge of insecurity facing the mini grid sector in Nigeria?	<ol style="list-style-type: none"> 1. Shift from rural to peri-urban and urban locations 2. Shift from mini-grids to smaller systems (e.g. SHSs) 3. Withdrawal from high-insecurity states 4. Diversification of product offerings away from mini-grids 5. Diversification into other countries 6. None