

Improving the Performance of Solar PV Installations in Rural Locations in Nigeria: A Case Study

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Outline

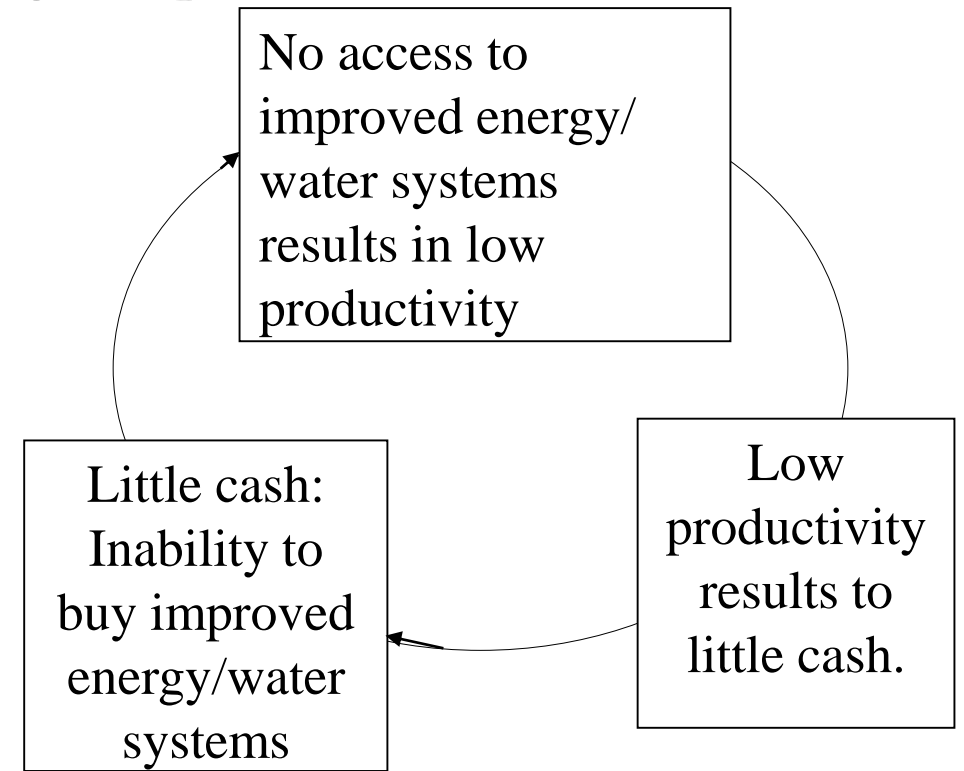
- Electricity in Nigeria
 - Urban and Rural Electricity in Nigeria
 - Solar PV Installations in Nigeria
- Case studies of Rural PV Installations
 - Factors affecting Performance of Installations
 - Recommendations for Improvement
- Conclusions

Electricity in Nigeria

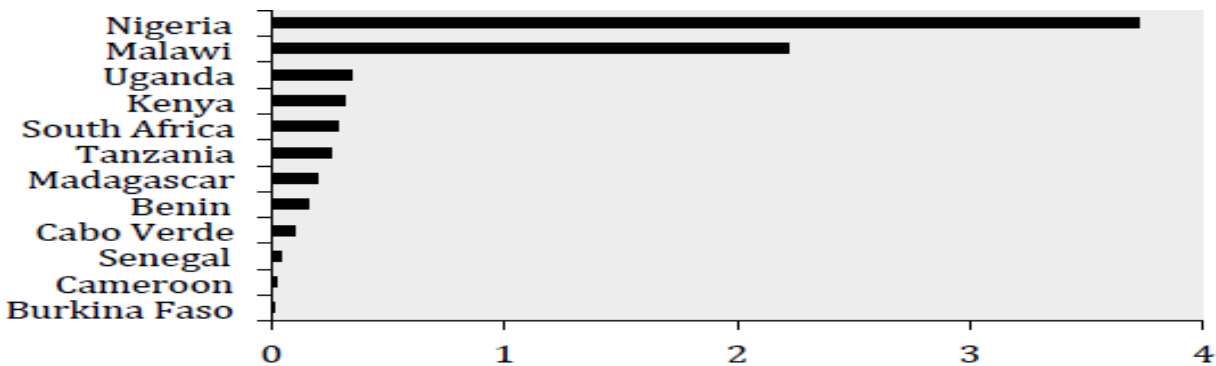
- Population is the 7th largest, while total generation is the 67th in world
- High System losses 33% - 41%
- Outages of over 320 days/year
- Large rural population with no grid electricity
 - Could take many years and billions of dollars to connect remote areas
- Consequently, on-site generators equate to 50% capacity of national grid capacity



The **Vicious Circle** relating low access of energy to poverty



Economic cost of Power Outages



Most rural settlements are devoid of basic amenities...

- Water is assessed for drinking and cooking through Wells and rivers
- Lighting is provided by local oil lamps, lanterns and, in few instances, petrol generators
- Cooking is mainly by open fire using fuel wood



Lantern and Gasoline Generator



Open Air Cooking using fuel wood



Uncovered Well for Water

A study of solar PV installations in two rural settlements, Ide Village and Sagbokoji Village was undertaken

METHODOLOGY

- Visitations to study locations
 - Observation
 - Evaluation of installations
 - Interviews and discussion with users (rural dwellers)
- Structured Interviews and discussions with other stakeholders
 - Government officials
 - Contractors

Technical Features of Installations at Study Locations

| | Ide | Sagbokoji |
|----------------------|-------------------------------|------------------------------------|
| Population | ~ 400 | ~ 800 |
| Type of System | Solar Water Pumping | Solar Water Pumping & Lighting |
| Year of Installation | 2012 | 2008 |
| Installing agency | Ministry of Rural Development | Ministry of Science and Technology |
| Deployment Method | Direct Labour | Contractor |
| No of Solar Cells | 4 | 30 |
| Type of system | DC only | AC and DC |
| No of batteries | N/A | 12 X 100Amps |
| Present condition | Partially Functional | Not functional |

Findings

Ide Village

- The installation developed faults less than 3 months after it was installed
- No member of the community was trained by the installers on how to carry out (minor) repairs on the installation.
- Slow response by supervising agency to cases of faults.
- Palpable bitterness among the dwellers based on alleged bias relating to a 'bigger' solar PV installation to a relatively smaller neighbouring community
- Users are ignorant of 'transfer of ownership'; opined ownership of installation remains with the government
- No local security is provided for the installation, yet no case of sabotage is recorded
- Residents suggested means of improving the performance of the installation

Findings (Cont'd)

Sagbokoji Village

- The installation - the first of its type in Lagos State - was designed to power streetlights, lighting of village hall and to pump water.
- It started having problems less than 6 months after installation
- Initially, the supervising agency repaired the faults and restored the installation to its working state. However, the breakdown did not cease
- Users were alleged to have overloaded the system through illegal connections.
- After some time, supervising agency ceased to repair the installation
- Extensive breakdown period resulted in the community to slacken/ withdraw security provided for the installation
- Slackened security led to the installation to be vandalised by unknown persons; leading its present dilapidated state
- The situation has remained same for over 4 years and the probability of restoring it appears low



Leaking surface water pump of the solar PV installation at Ide Village

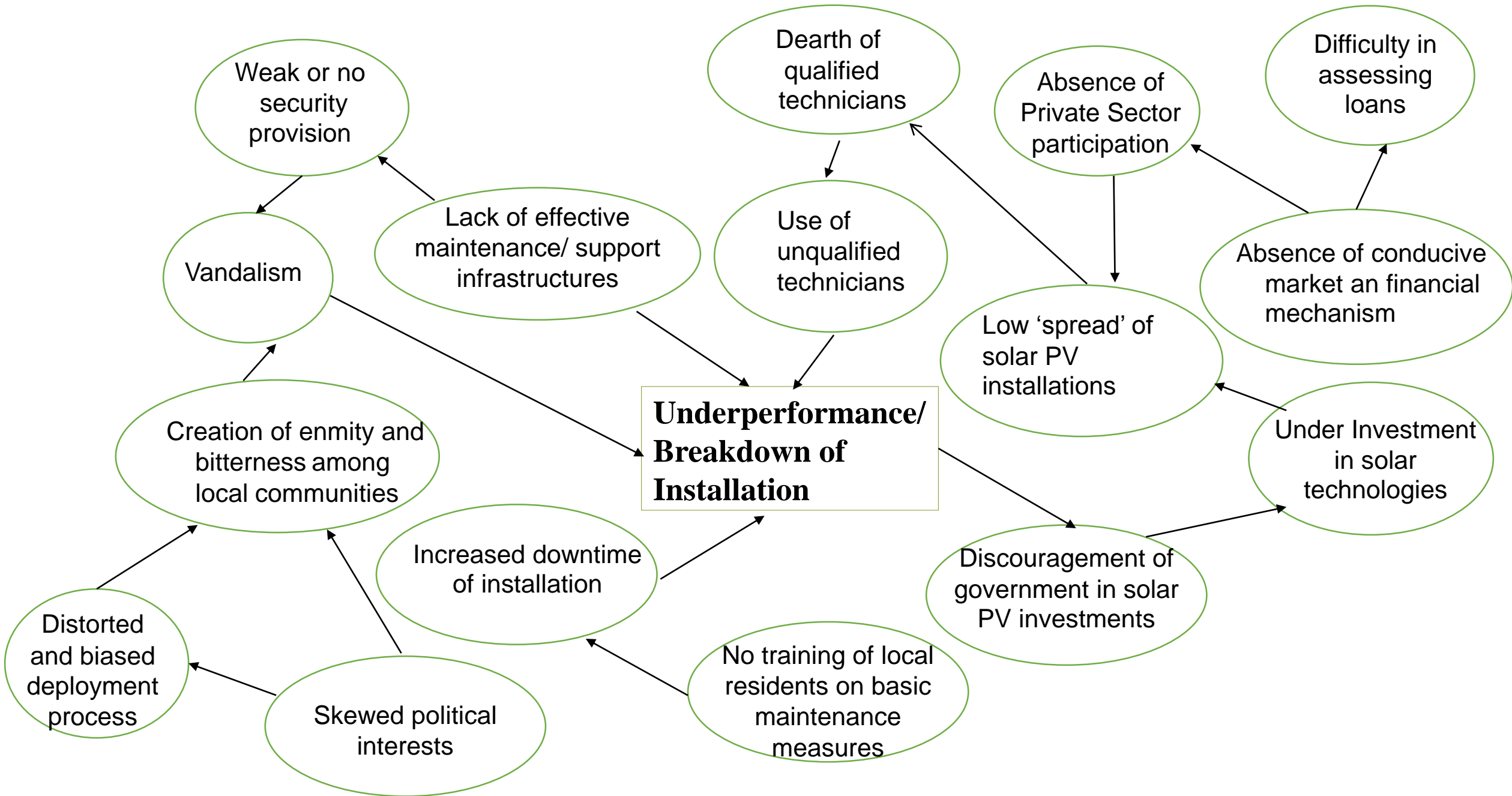


The non-functional Solar PV Installation Sagbokoji Village

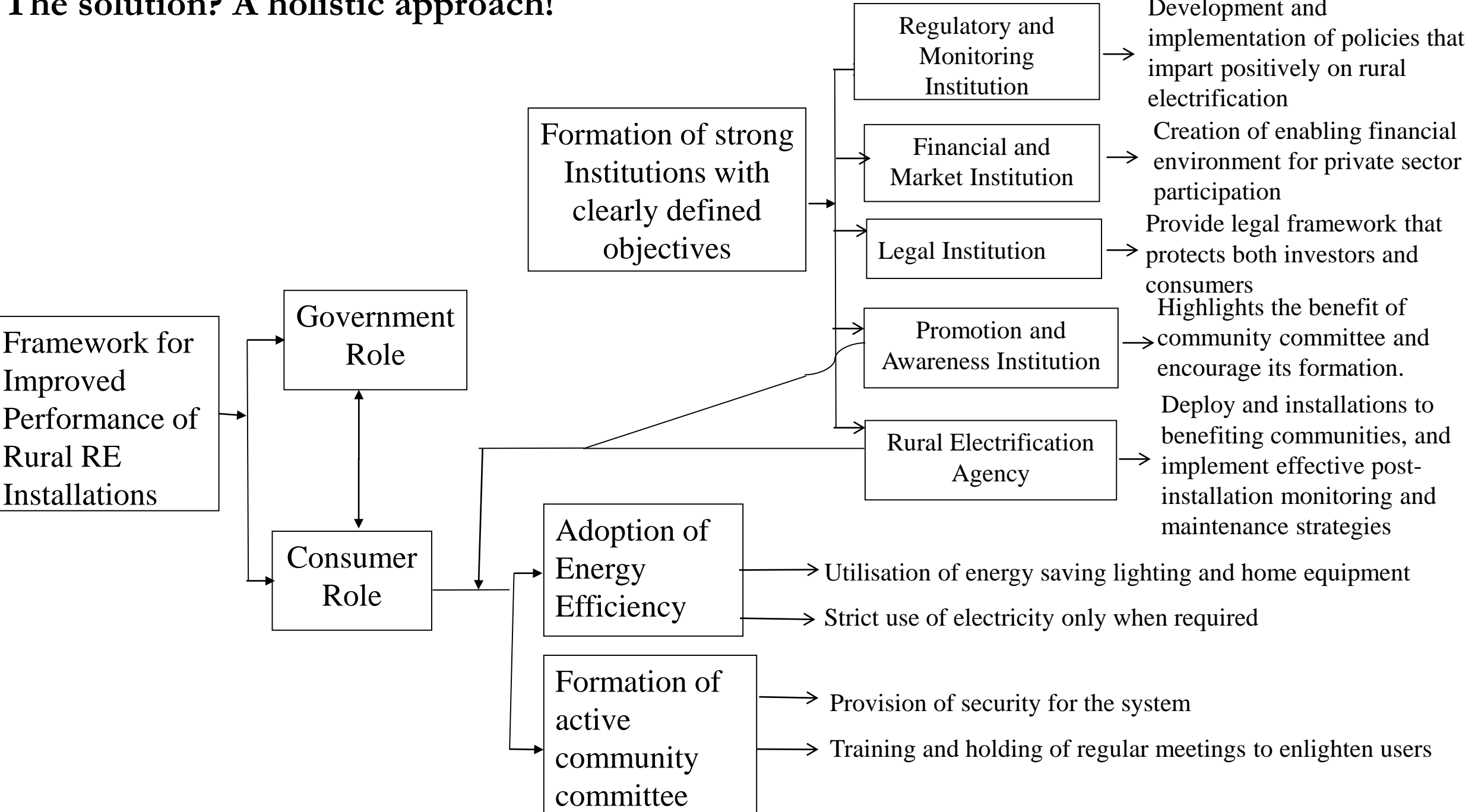
Factors identified to be responsible for the underperformance/breakdown include

- Weak post-installation maintenance strategies
- Jealousy and bitterness among communities
- Absence of Private Sector participation
- Distorted and biased deployment process
- No training of local residents on basic maintenance measures
- Non-Involvement of end users in planning stages
- Slack implementation of deployment strategies and policies
- Non-Existence of Community Development Associations

These factors may trigger other ones, and are interwoven in various ways...



The solution? A holistic approach!



Conclusion and Recommendations for Improvement

While it is not in doubt that solar PV installations can be deployed to improve the lighting and water access of rural dwellers, a number of recommendations are necessary to be implemented in the Nigerian situation:

- ✓ Increased government attention
- ✓ Formation of strong institutions with well-defined roles
- ✓ Strict adherence to guidelines for standards and practices
- ✓ Development of favourable policies (e.g tax waivers on imported RE equipment) to elicit active private sector & international donor organisations' participation.
- ✓ Development and implementation of appropriate post-installation monitoring and maintenance strategies
- ✓ Create awareness of benefits and limitations of RE Systems among rural dwellers

Thank You
