Repurposing electricity access research for the global south: a tale of many disconnects

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Introduction

Contemporary research and existing policies have been scarcely effective in achieving ‘sustainable energy access and development’ across the global south (subsequently referred to as ‘the region’). In Sub-Saharan Africa (SSA) – a significant part of the region – the percentage increase in access to electricity over the past two decades is less than 15\% \textsuperscript{1}. SSA’s current total installed generating capacity per capita is about 0.084 kW which is just about 2.8\%, 7\%, and 21\% of that of the USA, China, and India respectively\textsuperscript{2,3}. About 56\% of SSA’s population (over 610 million people) have no access to electricity. The rate of electrification in SSA and the region at large is not at par with population growth rate. At current electrification and population growth rates, it might take more than 50 years to sustainably electrify the region.

An examination of the diffusion of mobile phones in the region, in particular SSA, reveals a major reason for the slow pace of electrification in the region. Achieving a 70\% diffusion rate across Africa in just 23 years\textsuperscript{4}, mobile phones have practically revolutionised communication across the region by opening up opportunities and connecting distant residents. The mobile phones used across the region have key functional benchmarks, namely SMS, voice calls, multimedia, and social media. A growing trend now sees most mobile phones being able to offer services beyond the benchmarks. For example, the possibility of upscaling (apps installation, maps, MMS, web services, etc.) as consumer circumstances improve. The inability of western scholars, policy makers, international agencies and national governments in the region to appreciate the need for electrification projects to have benchmarks has been the major impediment to successfully electrifying the region.

In this paper, we discuss the disconnects between researchers and policy makers in the global north and households in the region. We argue that it will be difficult to propose lasting and holistic solutions to problems one lacks first-hand experience in. We conclude by proposing common sense solutions for achieving sustainable electrification of the region.

Understanding the problem: a summary of many misconceptions

While health practitioners and academics across the world have uniform benchmarks and ethical standards governing their research, electricity access research in the region is done without benchmarks. This causes inconsistent interpretations of the objectives of electrification projects. For instance, the UN through its SDG 7 aims at “ensuring access to affordable, reliable, sustainable and modern energy for all” but is unable to provide tangible benchmarks and uniform guidelines on important issues like ‘clean energy’, ‘sustainable
energy’, minimum electricity (electricity sufficiency), system reliability and minimum allowance for electricity demand increase (electricity mobility).

The low electricity demand of households in off-grid and unelectrified communities has been a major argument always put forward to support low capacity systems. Electrification policies that necessitate the use of load-limiting devices might constitute a poverty trap by preventing mobility across energy consumption classes electrified. Although the use of such devices might defer capital investments in capacity expansion, the consequences of the created poverty trap can be very significant. In dismissing the arguments favouring low capacity systems for off-grid and unelectrified communities, we argue that in the global north, households irrespective of their electricity demand capacity can access as much electricity as they want as long as they can pay. It will be injustice to discriminate between indigent households based on the quality of electricity they can access simply because of their proximity to the grid. Furthermore, there will be no increased income generation and a limit on ability to pay for electricity without any productive use of electricity. Accordingly, to drive development in the region through electrification, electrification for off-grid and unelectrified communities should not be limited to providing access to electricity that is scarcely sufficient for basic domestic activities.

The general belief that socio-cultural dynamics across communities in the region can impede electrification (decentralised electricity systems) is a misconception that is mostly rooted in a misunderstanding of the indigenous knowledge system and how a distortion of its structure can affect technology diffusion. Electricity as a service is not at variance with tradition or culture in the region. Mobile phones with a 70% access rate across Africa are charged using some form of electricity. Thus, these mobile phone users are aware of the welfare benefits of electricity. Additionally, migration makes it possible for rural dwellers to be familiar with electricity and observe how it simplifies daily activities of residents in electrified communities.

Also, the non-recognition of scholarly contributions from academics within the region by western academics and policy makers inhibits the required synergy for advancing electrification in the region. For instance, in a recent special issue (SI) on the uptake and diffusion of solar power for energy access in developing countries in the Energy Research and Social Science (ERSS) Journal, the guest editors while introducing the SI offered that there was neither a single African as a guest editor nor was there any contribution from any African author based in an African institution. Actions like this call to question the compliance of official development assistance projects in ensuring technology transfer and forming lasting partnerships between western and African scholars on the issue of electrifying Africa.

Additionally, the treating of electrification as a black box has been promoted by academics and policy makers without proper technical know-how of the generation, transmission and distribution of electricity. This is evident in arguments supporting renewables. They often highlight the low cost of renewables (so-called levelized cost of energy – LCOE) and insinuate that the integration of renewables with the conventional grid is a simple case of addition and subtraction. These simplistic arguments ignore the complexities involved in electricity production and delivery. There are several decarbonisation paradoxes across the global north, despite huge investments in renewables. For instance, the claims by several large companies of generating 100% of their electricity from 100% renewables is misleading.
most cases, these companies remain connected to the ‘dirty grid’ and enjoy the secure electricity supply afforded by fossil fuels.

The increasing proposition of renewables as the ‘only’ solution to the region’s electricity crisis in recent literature should be checked. The proponents of this solution ignore the fact that the global north is experimenting the feasibility of a renewables-based future on the backbone of fossil fuels and nuclear energy. In this regard, the UK Export Finance (UKEF) must be commended for rejecting calls to end its continued support for fossil-fuel based energy projects overseas. Western policy makers show double standards when they argue for climate neutrality by 2050 yet fail to acknowledge the continued role of fossil fuels in guaranteeing energy security and providing the platform for experimentation with renewables in the global north.

**Re purposing electricity access research: the need for reasonable considerations**

It is necessary to caution the academic community, policy makers, international organisations and funding agencies to be wary of proffering theories and solutions that are of minimal effectiveness in electrifying the region but further ‘hidden interests’. By hidden interests, we mean the subtle attempts by the global north to force upon the region, technologies and practices that are inimical to its drive to provide sufficient electricity for all. Western governments and international financial corporations (IFCs) majorly fund renewable energy projects in Africa. Considering Africa’s lack of sufficient generation base (hydro, coal, nuclear), such investments might not yield real value for the continent due to their high investment costs and misalignment with the expectations of the electrified communities. Also, several international electrification initiatives in Africa seem to be focused on the creation of business opportunities for international energy companies back home. In repurposing electricity access research within the region, the following suggestions are offered.

1. **Tangible benchmarks (electricity sufficiency, electricity mobility, system resilience)** that should guide ongoing and future electrification projects must be set. The UN should take the lead role by establishing uniform guidelines on electrification projects.

2. **Efforts must be made to evolve timelines** that will ultimately lead to full electrification of households in the region. Research proposals that support the deployment of a suite of solutions (such as improved cookstoves with solar home systems) should only be regarded as transitional energisation schemes (TRESS). Providing households with TRESS and failing to localise generation expansion planning (GEP) within such households can lead to a relapse into old energisation habits which will significantly detract from positive climate change mitigation gains.

3. **International organisations, western governments and funders** must be cautious about funding electrification projects across the region that rely on 100% renewables. Such projects have several limitations including the intermittency of weather patterns, inadequate energy capacity and issues relating to resilience. Electrification interests should focus more on the design and deployment of decentralised resilient electricity.
supply systems. Such decentralised systems should include renewables (solar PV in most cases), a battery energy storage system and must be ‘firmed’ with natural gas/diesel/petrol/biomass generators. The resilience of such systems will largely depend on an effective logistics system that can guarantee the availability of fuel all year round.

4. Ongoing and future electrification projects across the region should leverage on select smart grid technologies, artificial intelligence (AI) and machine learning tools in optimising load dispatch across connected households. The deployment of AI in optimising the scheduling of heavy electrical appliances in households can significantly reduce peak demand, thus allowing for steady electricity demand growth. Additionally, virtual power plants can be leveraged to facilitate the aggregation of local generation capacities like solar home systems and to increase the penetration of prosumers.

5. Sufficient allowance must be provided to households in building electricity demand capacity. In pacing decarbonisation, households in the region will need sufficient time to acclimatise and get used to electricity before they can begin to increase their electricity consumption – either by increasing the duration of use or increasing their ownership of electrical appliances. For the extremely poor, the full benefits of electrification may still not be realized without consumption subsidies.

6. In considering electrification for socioeconomic development, care must be exercised not to place the burden of poverty eradication entirely on electrification or more generally on energy resource availability. This is often ignored by scholars and policy makers who view the connection of households to ‘some electricity source’ as a panacea for the endemic socioeconomic problems in the region. The claim that lack of energy causes poverty is refuted by the evidence of poverty where energy is available. Thus, other factors (besides electrification) that drive poverty must be considered. This calls for the evolution of more holistic development programmes within which electrification might play a central role. While electrification (as a form of energy) might not suffice to eradicate poverty in the region, it could significantly alleviate it. Accordingly, there is a need to critically engage local contexts to understand how the targeted population for electrification perceive their electricity needs with respect to their present conditions and future aspirations. Demographic diversity within a population or across populations implies that electrification policies in one location might not be readily applicable in another.

7. The dynamics of the socio-cultural landscape across the region needs to be properly understood in order to design strategic approaches that can facilitate the diffusion of electrification technologies without distorting the existing socio-cultural structure. Host communities must play integral roles from the conception to execution and management of electrification projects to achieve harmonisation of expectations and project sustainability. History has shown that excluding communities from project conception,
execution and management or executing projects that are not aligned with community expectations will result in increased project failure. International governments and funders must insist on adequate skill transfer and local content development for projects funded across the region. It is not enough to require some compliance from project contractors, there must be an effective plan to ensure that the greater part of project funds are spent on actual project execution in the region and not frittered through ‘consultants’.

**Concluding remarks**
Achieving universal access to electricity in the region, that is sufficient and scalable will rely mostly on the availability of benchmarks and guidelines for uniformity in the execution of electrification projects. The failure of academics, industry practitioners, western funders and international aid agencies to recognise this need holds grave dangers for the region. Global umpires must awaken to their responsibilities of championing the need for value-based electrification projects across the region. The provision of electricity in the region must not complicate existing routines nor create instances of marginalisation or injustices. Considering the role of increased electricity access in improving the quality of life (QoL) and economic development of households, it is imperative to develop practical solutions that can achieve sustainable electricity access across the region and also mitigate climate change and poverty.

Lastly, establishing effective synergies between scholars and researchers across the global north and the region that will lessen the dependence on western capacity for designing and deploying electrification projects. This will be instrumental in propagating and sustaining resilient electrification initiatives across the region.

**Conflict of interest**
None.

**References**


About the authors

Dr Monyei is currently a research fellow on energy policy and sustainable decarbonisation at the University of the West of England, where he works as a researcher and consultant on issues pertaining to sustainable energy systems modelling. Specifically, my research spans core electrical engineering, the social sciences and computer science and focuses on sustainable development, integration of renewable energy systems, smart grid, applied artificial intelligence, energy efficiency and the design of public policy to help facilitate easy access to electricity and improvement in the resilience of energisation systems.

Kingsley Akpeji received the BSc(Eng.) degree in Electrical & Electronic Engineering from the University of Ibadan, Nigeria in 2014, and the MSc (Eng.) degree in Electrical Engineering from the University of Cape Town (UCT) in 2019. He is currently a teaching and research assistant at the Department of Electrical Engineering, UCT. Kingsley's passion about a just energy transition and the alleviation of energy poverty in Sub-Saharan Africa reflects in his research on decentralized electricity supply systems, cost of interruptions of electricity supply to commercial and industrial end-users, and sustainable electrification frameworks and policies.