A research agenda for a people-centred approach to energy access in the urbanizing global south

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Abstract

Energy access is typically viewed as a problem for rural areas, but people living in urban settings also face energy challenges that have not received sufficient attention. A revised agenda in research and practice that puts the user and local planning complexities centre stage is needed to change the way we look at energy access in urban areas, to understand the implications of the concentration of vulnerable people in slums and to identify opportunities for planned management and innovation that can deliver urban energy transitions while leaving no one behind. Here, we propose a research agenda focused on three key issues: understanding the needs of urban energy users; enabling the use of context-specific, disaggregated data; and engaging with effective modes of energy and urban governance. This agenda requires interdisciplinary scholarship across the social and physical sciences to support local action and deliver large-scale, inclusive transformations.

The majority of people without access to electricity and clean fuels live in rural areas.[1] Nevertheless, energy access challenges in urban areas are also significant and attract policy attention. Over 880 million people live in slums in developing regions, in households that suffer multiple deprivations in urban services, space and security of tenure.[2] Such households routinely lack access to a reliable and affordable supply of electricity and clean fuels. About 105 million people lack electricity in urban areas in sub-Saharan Africa alone.[3] In countries like Malawi, Mozambique, Rwanda or Tanzania less than half of the urban households have access to an electricity connection.[2] People living in urban areas face specific energy challenges, including: unreliability of energy services, lack of affordability, lack of access to microfinance and insecurities related to tenure issues and the erroneous perceptions of slums.[4]

Progress towards global objectives for universal energy access has been disappointing since the UN Secretary-General launched them in 2011. According to the Global Tracking Framework,[3] 1.05 billion people worldwide did not have access to electricity in 2014, down from 1.06 billion in 2012. The access rate increased 0.27% per year, which is not sufficient to achieve the goal of universal electrification by 2030. The figures for access to clean cooking are even more discouraging: over 3 billion people still lacked access to clean fuels and technologies in 2014. With a rate of improvement of 0.46% a year, the goal of achieving universal access to clean fuels and technologies by 2030 seems unachievable.

The challenge of achieving universal access to modern energy services in urban areas highlights the strong linkages between two Sustainable Development Goals (SDGs), SDG7 (Affordable and Clean Energy) and SDG11 (Sustainable Cities and Communities). Both SDGs can be advanced simultaneously through forms of inclusive urban planning that promote energy sustainability and resilience. This requires two changes in policy approaches.

First, policies need to address the lack of installed capacity for energy access and limited availability of clean fuels, particularly in sub-Saharan Africa.[5] Addressing this persistent challenge will require a substantial amount of public finance while recognising a diversity of feasible provision models.[6,7] Progress has concentrated in Asia, where multi-actor efforts in the context of industrialisation have improved the rates of energy access in urban areas. For example, in Indonesia, a national-level programme including governmental institutions, businesses and consumers facilitated a large shift from kerosene to Liquefied Petroleum Gas (LPG) and contributed directly to the alleviation of extreme poverty.[8,9] In Sub-Saharan Africa, in contrast, energy access rates remain stagnant. Energy access rates have even worsened in countries such as the Democratic Republic of the Congo and Angola.

Second, there is a need to challenge dominant paradigms of energy provision. Unfortunately, the assumption that urbanisation is akin to an extension of the electricity grid has long dominated debates of energy access in urban areas. This assumption puts a disproportionate emphasis on electrification at the expense of understanding the need for fuels and technologies for clean cooking.[10,11] Moreover, this assumption obscures the complex ways in which energy access barriers manifest in urban areas and, in particular, the specific limitations that emerge in sub-serviced, informal or peri-urban areas.[12-16] Delivering sustainable energy access in urban areas requires a multidimensional understanding of users' needs within diverse urban contexts.

These two policy changes call for a renewed research agenda on universal access to sustainable energy in urban areas. In this Perspective, we outline such an agenda, and frame progress towards sustainable energy as a complex, multi-dimensional challenge in the next section. Delving deeper into why the global energy challenge continues to haunt contemporary societies in the age of urbanisation, we then analyse barriers to energy access in urban areas. Finally, alongside a discussion of policy implications, we outline the contours of an interdisciplinary research agenda that considers users' needs, explores data gaps and

prioritises systems of governance that can deliver urban energy services in a sustainable and equitable manner.

Universal energy access is a multidimensional challenge

One of the greatest obstacles in achieving progress towards energy access is the dominance of a technocentric approach in policy and decision making. Energy provision is routinely thought of as a technical challenge, exclusively dependent on achieving economies of scale sufficient to extend grids or market chains. Most often, energy access is erroneously represented as a binary phenomenon, in which we can identify the precise moment after which energy needs are fully met.[4,17,18] This leads to definitions of energy access that are 'too modest' and do not reflect the multiple dimensions of energy demand.[19]

The energy ladder model dominates debates on urbanisation and energy access. This model assumes that urbanisation enables households to move up the energy ladder because households rationalize the use of energy, adopting cleaner and more expensive fuels as their income increases.[20] As a result, energy access in urban areas is most often treated as a homogeneous process of fuel adoption and grid expansion. Empirical evidence has long shown, however, that households use multiple fuels simultaneously.[21] More recently, the model has been redefined to focus on energy services rather than just fuels.[22] Nevertheless, the energy ladder model lacks explanatory power to explain why low income urban populations cannot access the services they need.

Instead, energy access should be understood as part of a progressive process of wellbeing improvement. Access is not only dependent on the supply of electricity and fuels. The Global Tracking Framework already recognises, for example, that clean cooking depends both on the fuels and the technologies employed in cooking. Additional evidence shows that energy services also depend on the built environment, such as the space available for cooking, ventilation and illumination within buildings and available appliances.[23] From street lighting to the maintenance of greenspaces, energy access is closely linked to the development of the built environment and public space. In slums access to energy is directly linked to livelihood opportunities, so investment in energy services is a key driver of development.[24]

Rather than prioritising the delivery of a predetermined model of energy supply, programmes for sustainable energy access should focus on delivering the types of service provision that will meet people's aspirations. Recent calls to focus on the productive uses of energy and the linkages to income generation activities[25] highlight that achieving the SDG7 requires examining the socio-economic conditions and perspectives of those who lack energy access. Addressing energy access from a people's perspective involves location-specific interventions engaging communities in energy planning activities.[4,18] Energy access also depends on community involvement to develop business models that integrate technical concerns with institutional frameworks and user preferences.[26-28]

For example, more than half of the urban population in Rwanda lacks access to the electricity grid. While over 65% of the households were connected to the grid in Kigali in 2011, only 17% of the households had a grid connection in other cities in the country.[3] Renewable energy technologies may provide an alternative to facilitate energy access. Some users of solar home systems in rural and peri-urban Rwanda require energy for in-household use only (e.g. lighting, mobile phone charging), while others require higher levels of access to power small businesses and bigger appliances, such as welding machines.[18] User needs are addressed in performance contracts, called *imihigo*, which provide an official framework for achieving development goals at all levels of the country's administration, including at the household level. Each year, households sign official commitments, including commitments to improve energy access. The source of energy is then chosen depending on the resources available, their safety and affordability.

Energy access is linked to other basic services such as water and sanitation, and depends on programmes to upgrade the built environment.[29,30] Significant gains can be made through interventions in urban areas, even in countries where there have been clear advances in energy access. In Ghana, about 1.7 million people gained access to electricity every year from 2012 to 2014. Huge rolling blackouts, however, have compromised these advances, particularly for poorer households lacking backup systems. This case calls for research looking beyond infrastructure coverage to examine, for example, how poverty and energy access are correlated in urban areas and how to ensure supply reliability in poorer households.[31]

The planning challenge is to provide electricity, cleaner fuels and technologies in rapidly growing urban and peri-urban areas within complex and often undefined institutional frameworks and ever growing demands for infrastructure.[12] Inclusive energy planning processes can support the recognition of the unmet needs of the urban poor whilst simultaneously acknowledging the urgency of shifting aspirations among those whose energy uses are already unsustainable.[3,32]

Challenges in urban areas

Energy access is embedded within multiple tiered deprivation processes faced by the urban poor. Changes to underlying factors, such as upgrades in the built environment, tenure status, access to decision making processes, or market access to key appliances, may have as much impact on people's energy access as any improvement in generation capacity or fuel supply. Three key reasons support the case for looking at energy access in urban areas: the prevalence of misunderstandings about energy access in urban areas; the concentration of vulnerable people in urban areas, especially in slums; and potential opportunities for planned management and innovation in business models at the local level.

On-the-ground evidence of the challenges of energy access in urban areas is scant, and there have been few efforts to document these experiences and compare them systematically. The Global Network on Energy for Sustainable Development (GNESD) and the Poor People's Energy Outlook (PPEO) are two pioneering efforts to develop a people-centred perspective on energy access which engage with the specific challenges of urban areas. GNESD is a UNEP-funded network that has studied energy access in urban areas since the mid-2000s, with regional studies in Kenya, Thailand, Brazil, Senegal, South Africa, Argentina, and India. The Poor People's Energy Outlook (PPEO) is an annual report funded by the UK Department for International Development and Practical Action since 2010. Both programmes have influenced policy making at the international level, for example, in the development of the Multi-Tier Framework to assess energy poverty.[33]

GNESD found that informal settlements are often subserviced and residents may have precarious structures of home ownership and limited access to both livelihood opportunities and institutions that can address their needs and concerns. Data produced at the national level rarely include slum areas which are often seen by governments (national and municipal) as illegal settlements.[3,23] When data can be accessed, the needs of the urban poor may be underestimated because of the exclusion of informal settlements in the processes of documentation and planning. Problems in slums are 'invisible' when government officials do not acknowledge their needs or even their existence. On the one hand, local governments may lack capacity to respond to the needs of informal settlements. On the other hand, urban development practices regularly ignore or misrepresent their existence, which may lead to conflicts over land and violence.[34]

Access to electricity in such conditions, for example through off-grid systems, may have transformative impacts both in terms of directly improving the lives of people at the household level, and enabling them to be recognised as urban citizens through the provision of services. Here again, communities and cooperative societies play a key role in providing business alternatives which can help implement and deliver direct improvements in energy access to the urban poor.[26,35]

The GNESD team analysed the barriers to energy access in urban areas, from both the supply side and the demand side.[18] Some of the barriers identified in the study relate to lack of planning; in countries such as Kenya and Senegal, electrification has rarely been part of development planning. Further, lack of capacity within local governments translates into an absence of planning at the institutional level. Often, citizens distrust government institutions and public utilities and associate their practices with corruption, carelessness, and lack of interest to implement sound solutions.

Barriers also emerge from the intersection of energy issues and urban social processes. For example, high upfront costs and lack of proof of residence often lead to unauthorized means to access energy, whether this is renting backyards to poor families in South Africa, connecting through neighbours in Thailand, renting out electricity as a means of income generation in Kenya, or with the proliferation of unsafe connections in India and Senegal. In the context of a total lack of access, improvisation may be the only alternative open to the urban poor,[36] but has consequences in terms of the quality of service, its safety, and the distribution of responsibilities (e.g. the urban poor may end up paying more for the same service). Key urban issues, such as lack of tenure or proof of address, continue to determine energy access.

The last PPEO report, launched in October 2016, focused on national energy access planning.[37] PPEO's case studies in cities like Maputo, Mozambique, show the limitations of a grid-based understanding of energy access in urban areas.[38] Services do not always reach all urban areas, particularly in sub-serviced areas and unplanned neighbourhoods. Even when households have access to an electricity grid this is not an automatic guarantee of energy access since the service may be of poor quality and intermittent. Urban citizens may not be able to use the service because they cannot afford it or because they are not aware of how to use it. New energy services may be inappropriate to support certain cultural practices, or may overlap with other fuels that already meet energy needs.

The PPEO provides evidence for the need to disaggregate energy access data alongside social variables. For example, gender is a key variable to understand energy access. Energy services shape possibilities for women to access other urban services, such as sanitation services in ill-lit public spaces, and livelihood opportunities. Women may benefit from access to energy but there is little information about how access to energy (or lack of thereof) affects women's labour and time. Data collected at the household level rarely reflects women's needs and aspirations. As a result, energy policies targeting women are the exception, rather than the norm. Other factors like age, disability, ethnic group, or sexual orientation may also influence how energy access affects everyday life.

Another misunderstanding is the idea that large energy utilities are better able to contribute to the economy because they support large industrial and business areas. This does not recognise that the economies that support the urban poor are often characterised by a diversity of small enterprises which provide diverse local social and economic benefits. Access to energy at a scale targeted to support small enterprises can create direct livelihood opportunities for people living in slums. Often, small businesses and NGOs may also be effective in advancing context-based innovations. Alongside local governments, the private sector and civil society may also support action to facilitate access to sustainable energy.[27,28]

Both PPEO and GNESD are examples of a growing body of people-centered research on energy access in in urban areas, attending both at the manifestation of energy challenges in urban contexts and the opportunities to advance global goals through local governance processes.

Urgent research agendas

Achieving universal access to sustainable energy is an urgent challenge but progress against timescales has been slow at best. In urban areas there is space for cautious optimism, as rapid urbanisation opens up opportunities for investment and improved service delivery.

The integration of urban development and energy planning agendas is a policy priority. Such integration requires understanding the multi-scalar nature of energy challenges and how they manifest in urban areas. There needs to be far greater consideration of often-ignored issues in energy policy including the needs of the urban poor for clean cooking, and for better grid and off-grid electricity access, in terms of supplies and appliances that will meet household needs and support productive uses and community facilities. It also requires an inclusive policy agenda to diversify the voices that intervene in energy planning. Policy-makers should find the means to include the views of non-experts and disadvantaged communities in decision-making process, to understand their actual energy needs and how to meet them within present constraints.

Additional research is needed both to improve data collection and challenge long-held assumptions about energy access. We propose three questions to guide an emerging agenda of research. First, achieving the SDGs requires a true understanding of people's needs, their perspectives and aspirations. The research question is: 'what are the users' needs in specific contexts?' The question calls for a deep engagement with people's aspirations while understanding the structural constraints that shape such aspirations. Second, there is an urgent need to improve the types of energy knowledge and data available. The question is: 'Do we have the appropriate information to address energy access questions?' There is a chronic lack of data about energy use and demand, particularly for the urban poor living in rapidly urbanising areas. Ongoing challenges include improving survey designs to allow data disaggregation and combine quantitative data with in-depth analyses from qualitative studies. Third, in urban areas, different types of actions may be effective to address context-specific constraints. The question is: 'what is the match between government policies for energy access and the needs of the urban poor?' Specifically, to what extent do existing systems of delivery suit people's needs? Do planning systems address noticeable deficiencies in service delivery? These questions invite a reconsideration of resource distribution and institutional participation in energy planning, as well as people's representation in decision making processes.

The research questions and policy recommendations outlined here emphasise models of energy delivery that recognise users' needs in context. These questions highlight the importance of socially inclusive action and applied interdisciplinary research to achieve broader transformations towards universal energy access in urban areas.

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