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Three Ways the Multi-Tier Framework Could Better Capture the Nature and Scale of Urban Energy Poverty

Bottom line up-front: New research finds that the World Bank's Multi-Tier Framework (MTF) overestimates energy access in low-income urban contexts where electricity provision is largely informal. It also overlooks restrictions on if, when, and how electricity can be used. Modifying MTF tiers and adding survey questions would help practitioners and policymakers better understand the access gaps faced by urban communities and the diversity of energy access strategies they engender.

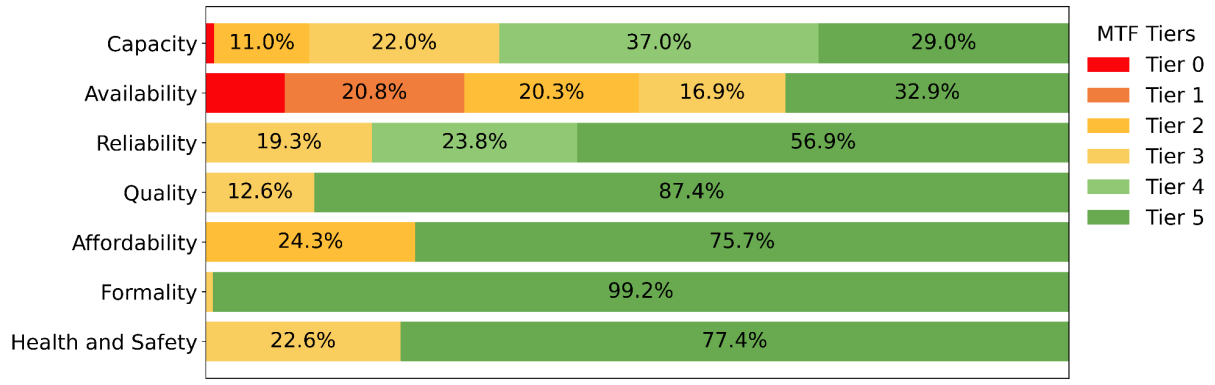
Why this matters: Energy access is a multi-dimensional phenomenon that goes far beyond a simple connected/non-connected binary. The World Bank's Energy Sector Management Assistance Program (ESMAP) designed the Multi-Tier Framework (MTF) to better capture the nuances of how people actually experience electricity access. It categorizes access across five tiers — from Tier 0 ("no access") to Tier 5 ("full access") — considering dimensions of capacity, availability, reliability, quality, legality, and safety [1]. However, we found that the MTF does not fully capture the nature and scale of energy poverty for low-income communities in African cities. In informal settlements, which house 60% of Africa's urban population, electricity use remains heavily constrained despite generally high levels of grid connection [2]. As rapid urbanization continues, addressing the unique challenges in informal settlements will become increasingly urgent. We propose three relatively simple adjustments that would make the MTF a much more insightful tool for urban energy challenges.

The MTF's blind spots in understanding urban energy access

Since 2021, Spotlight Kampala has worked with leaders and advocates from 25 informal settlements in Kampala, Uganda to characterize energy access deficits using a mixed-methods approach that includes surveys, interviews, focus groups, remote power quality monitoring, and wiring inspections [3].

Results suggest that most connections in Kampala's informal settlements score highly (Tier 4 or 5) on the MTF scale (see Figure 1). Despite this, people experience enormous access challenges that prevent them from using electricity for basic everyday uses. Some challenges do not correspond to any existing MTF dimension, and others pertain to existing dimensions but are not considered when assigning access tiers.

FIGURE 1: Breakdown of connections in informal settlements in Kampala against the MTF [4].



Source: Graphic by Jess Kersey.

The following five factors explain why the MTF can paint an overly rosy view of energy access in informal settlements.

1. **The MTF's approach to formality oversimplifies the diversity of electricity access strategies.** The MTF evaluates the formality of a household electricity connection in a binary manner: users either make payments to a utility or authorized representative (Tier 5) or they make no bill payments at all (Tier 3). We found that a majority of informal settlement residents in Kampala share a meter and make regular payments through an intermediary like a landlord, neighbor, or local electrician. The homogeneous categorization of these connections as "formal" in the MTF fails to account for practices like meter sharing or the presence and role of supply intermediaries.
2. **The MTF overestimates safety for users who have adapted to unsafe electrical conditions.** The health and safety aspect of electricity access, as defined by the MTF, focuses on the absence of serious or fatal accidents from electrical connections. However, this overlooks how low-income households in informal settlements adapt to high electrical risks. In Kampala, residents often avoid using high-demand appliances due to fear of sparks or fires, insulate their appliances to prevent injury, or simply live with high levels of household electrical risks. As a result, households classified as having higher-tier access based on accident rates may, in reality, face unsafe electrical conditions.
3. **The MTF's power quality dimensions do not capture the impacts of sustained low voltages.** The MTF's quality dimension defines access as Tier 3 if "voltage problems damage appliances." Damaged appliances usually result from high voltage spikes. However, in Kampala, our evidence shows that sustained low voltages are the predominant challenge: households experienced anywhere from two to ten hours of undervoltage (lower than 6% nominal voltage of 240 V) each day. Low voltage makes premature breakage more likely and reduces the lifetime of appliances. On a day-to-day basis, this manifests as periods in which appliances cannot be used because

the electricity supply is “weak”. This in turn suppresses demand as households forego buying appliances that require a constant and stable voltage to function.

4. **The MTF does not account for autonomy.** Autonomy refers to a user's ability to control when, how, and how much electricity they use. In informal settlements, intermediaries like landlords often limit power supply, especially during peak hours, and restrict the use of certain appliances. They commonly use circuit breakers to cut power when users exceed their limits. The MTF does not currently address the dynamics of electricity restrictions—who imposes them, when, or for what reasons.
5. **The MTF misses temporal variability.** Residents of informal settlements routinely gain and lose connection to the grid for various reasons. Evictions, confiscation of an illegal connection, landlords withholding services because of unpaid rent, or an argument with the neighbor supplying power can lead to disconnection. Disconnections can be temporary–lasting days, weeks, or months–or permanent. No MTF dimension captures the temporal dynamics of precarious electricity connections, despite the prevalence of this challenge in informal settings .

Key recommendations to strengthen the MTF

The following changes to MTF surveys could be used to capture the missing insights [5]:

1. **The MTF should capture service arrangements to provide insights on the diverse energy access strategies used by informal communities.** Understanding how electricity and payments flow between end users, intermediaries, and the utility provides better insight into energy access dynamics than a simple formal/informal designation. MTF surveys should include users’ service arrangements, defined as the unique combination of their connection type and payment recipient. The ‘connection type’ (example here) describes the configuration of wiring that provides electricity and captures practices like meter sharing and grid tapping. The ‘payment recipient’ captures any intermediaries involved in electricity provision. The MTF should move beyond imprecise categories like “authorized representative” to capture specific actors like neighbors, landlords, and local electricians, and allow for multiple selections.
2. **The MTF survey should include questions that capture insecurity and autonomy.** In grid-connected urban centers, questions that probe the number and duration of disconnection events can provide better insights into the precarious nature of energy access. Additional MTF survey questions that probe when, how, and why users limit electricity use can more accurately reflect their true level of energy access. The MTF can also capture demand suppression dynamics by asking whether respondents would use certain appliances absent restrictions.
3. **The MTF should introduce additional tiers to reflect the quality and safety of power supply in informal settlements.** Current dimensions for capturing the quality and health and safety of electricity connections are binary. To better capture daily challenges, the MTF should ask about users’ experiences of everyday risks like sparking and shocks. The MTF tiers should also be adjusted so that households that have

experienced serious or fatal accidents could correspond to Tiers 1 or 2, while those experiencing lower intensity but high-frequency risks could occupy Tier 3. A similar logic could apply to the MTF's quality dimension: Tier 3 could correspond to households that forgo using appliances during certain times of the day when electricity is too weak, and households with appliances that have broken as a result of poor power quality could be designated as Tier 1 or 2.

Conclusion

In African cities and many other developing urban regions, a grid connection is not necessarily equivalent to full, modern electricity access. Tools like the MTF have helped evaluate and bring attention to access deficits in many communities, but blind spots remain for informal settlements and other low-income urban communities. Adjustments to the MTF would help shed light on the challenges specific to these settings and inform policy, program design, and other efforts to support equitable and sustainable urban development.

Endnotes

1. Bhatia, M., & Angelou, N. (2015). Beyond Connections: Energy Access Redefined (Technical Report 008/15). World Bank.
2. UN-Habitat. (2016). Slum Almanac 2015-2016: Tracking Improvement in the Lives of Slum Dwellers. https://unhabitat.org/sites/default/files/documents/2019-05/slum_almanac_2015-2016_psup.pdf
3. Kersey, J., Mbabazi, J., Massa, C. K., Letaru, L., Lukuyu, J., van Hove, E., & Kyoma, P. (2023). Illuminating Energy Inequities in Informal Urban Communities: Main Findings Report. Spotlight Kampala.
4. Capacity is based on power capacity ratings estimated using the wiring gauge measured in 100 household wiring inspections. Availability and reliability are based on data from power quality sensors deployed for two months across 148 users. Quality, affordability, formality, and health and safety estimates are based on a survey of 500 users.
5. We note that the implementation of these recommendations are also dependent on adjustments to the MTF survey's sampling strategy. New techniques are needed to identify informal settlements as these boundaries are not always known to national statistical offices.

Appendix

FIGURE 2: Examples of unsafe practices captured during wiring inspections.

Source: Photos by Paul Kyoma.