

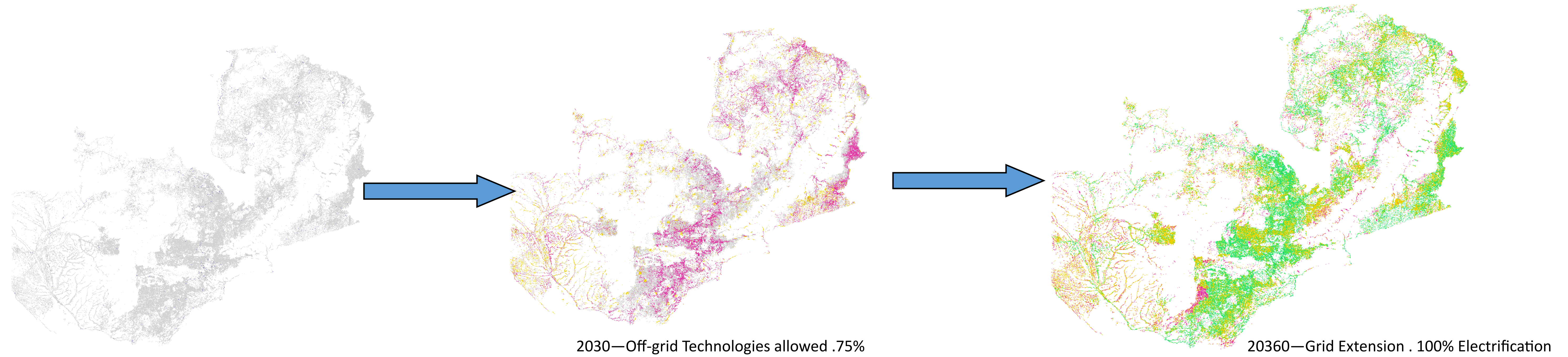
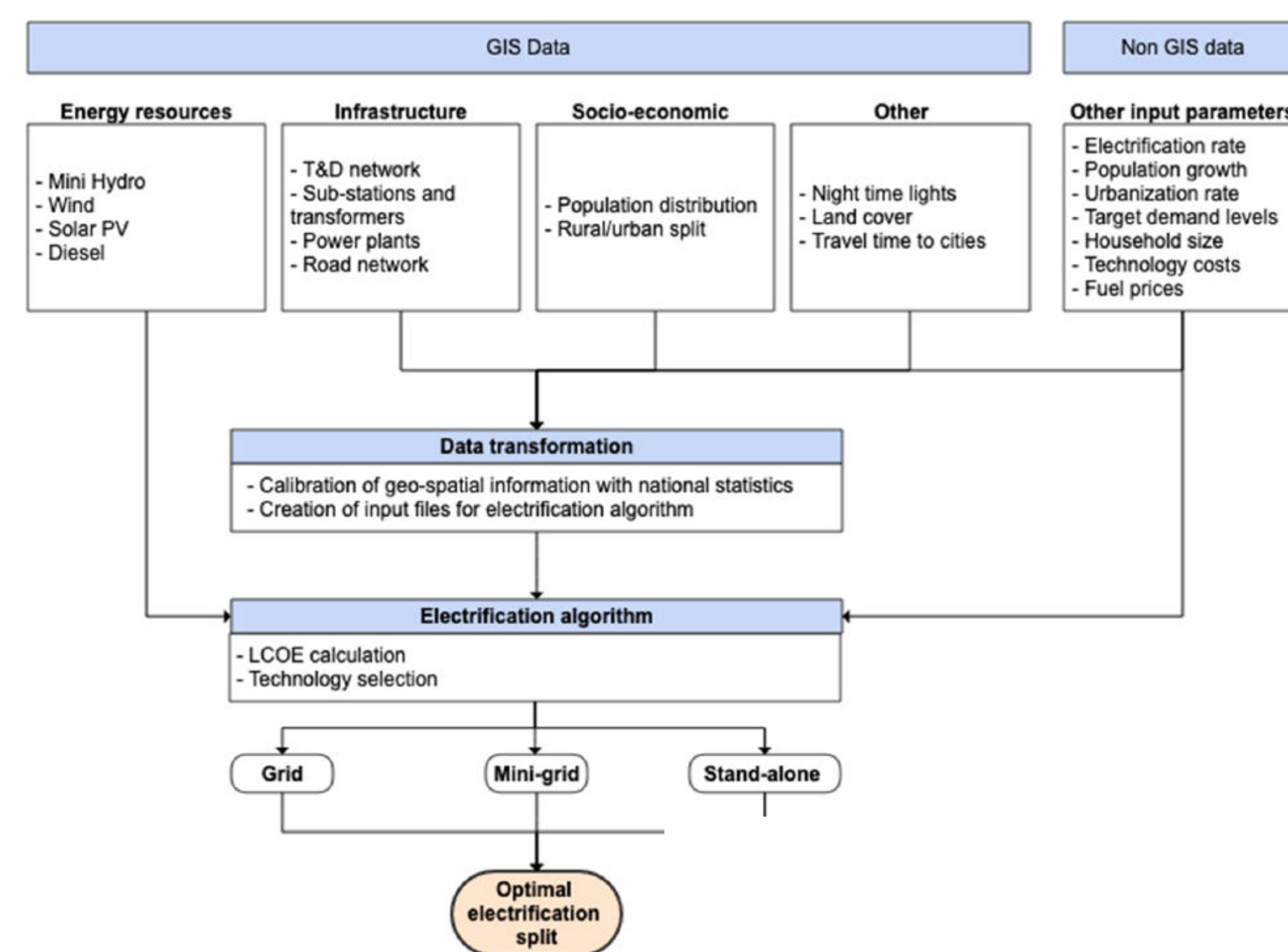
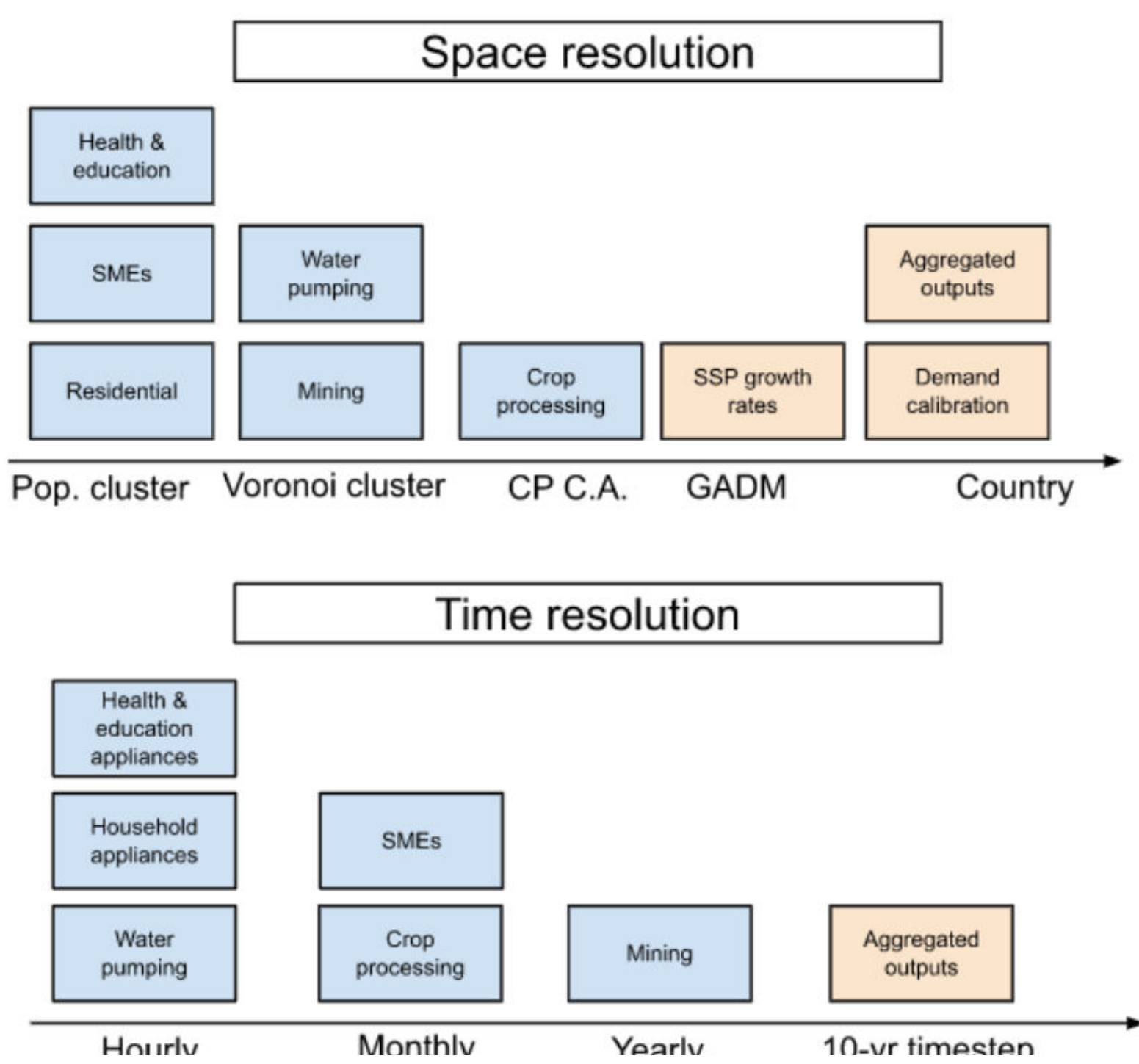
Navigating the Path to Sustainable Electrification: Examining Business Models for Large-Scale Mini-Grid Developments in Sub-Saharan Africa

Abstract:

Electrifying 600 million people in sub-Saharan Africa will require substantial investments. Integrated electrification models inform key policy decisions and electricity access investments in many countries. In this research we examine the different pathways for large-scale mini-grids developments when national electricity arrives within the proximity of the national grid. Three business models are examined, including Single Power Producer (SPP), Single Power Distributor (SPD), and the possibility of mini-grids being abandoned altogether. In this research, we soft link, Multi-latent Energy demand model (Falchetta et al., 2020) with the a modified code of the global electrification platform (ONSSET) (Mentis et al., 2017) . ONSSET code has been modified to restrict to restrict electrification technologies to off-grid technologies (Mini-grid Solar, Stand-alone Solar, Mini-grid Wind and Hydro) until 2030, After it's Grid extension is allowed to connect these mini-rids with the national grid . Our findings emphasize the importance of effective business models and financing for sustainable mini-grid development. Local mini-grid developers often face challenges in accessing financing and developing viable business models

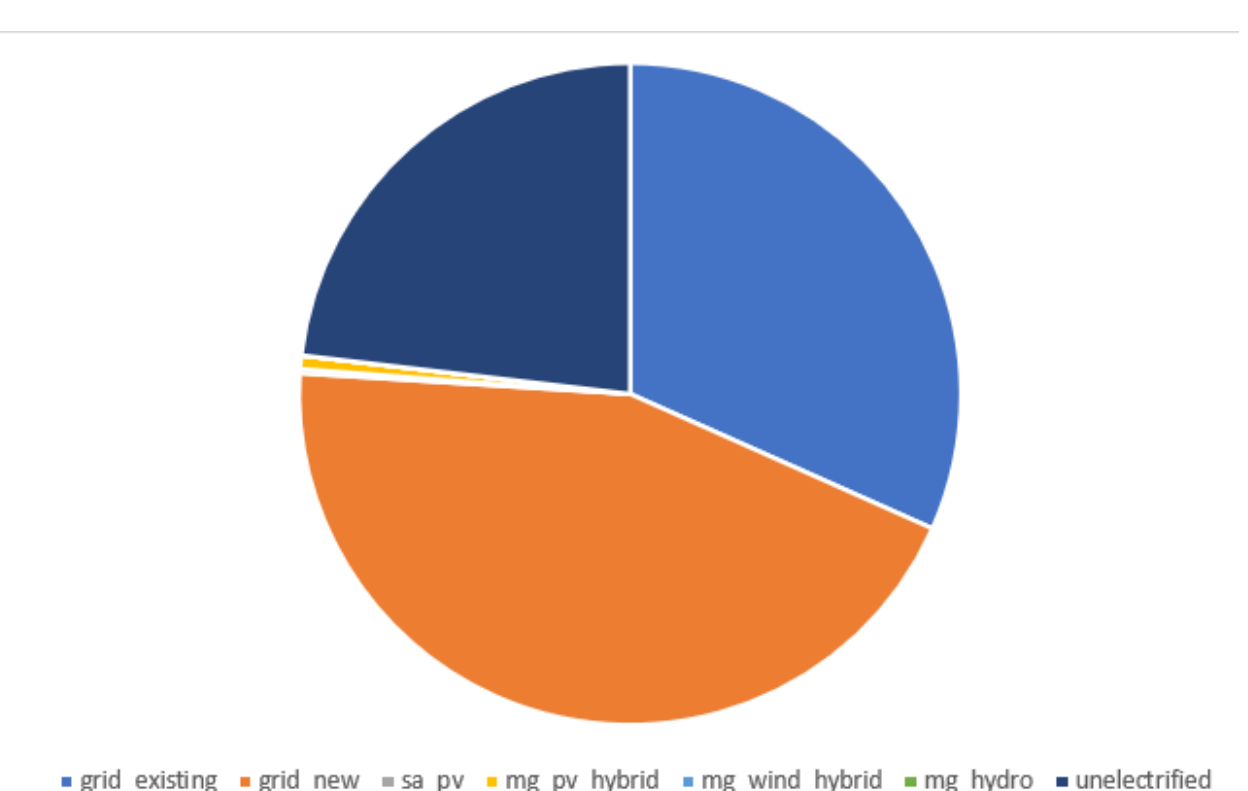
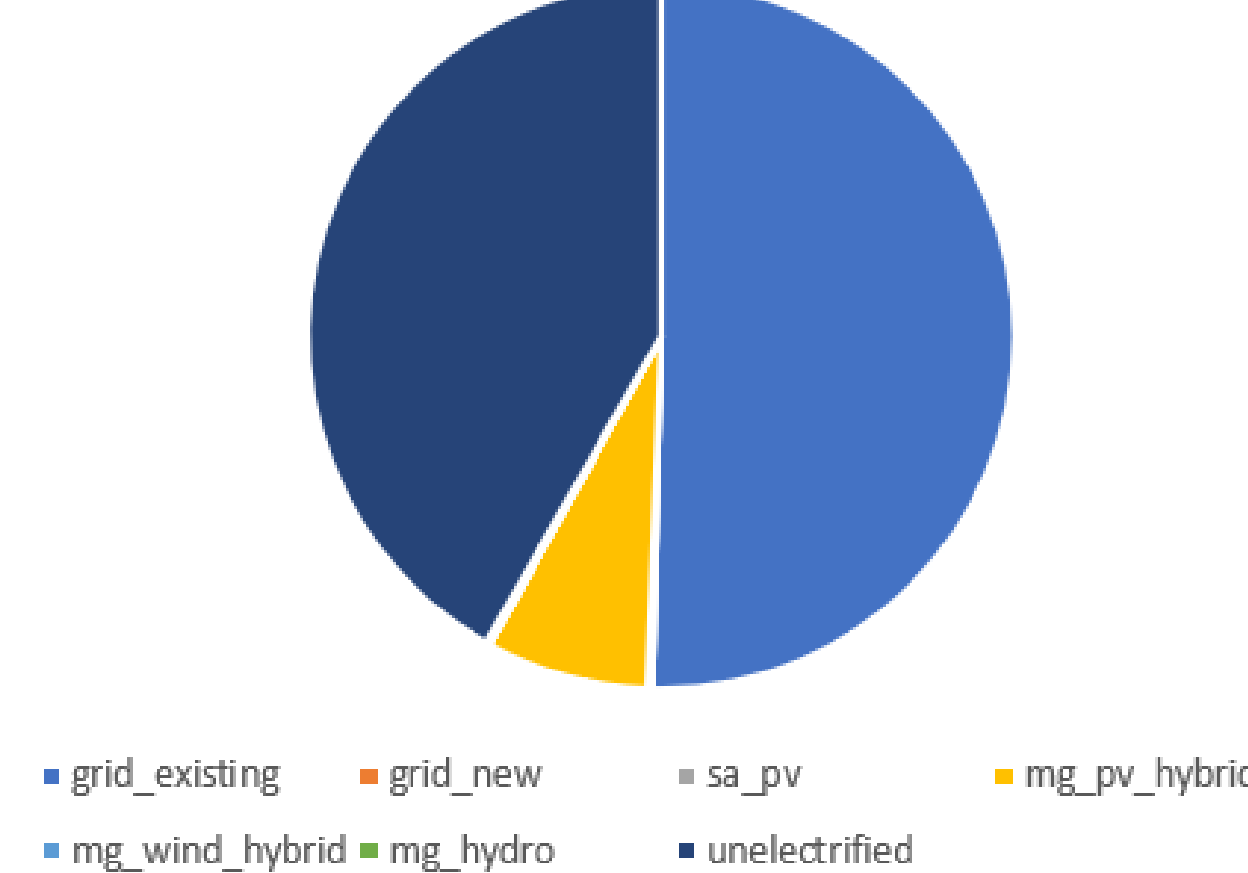
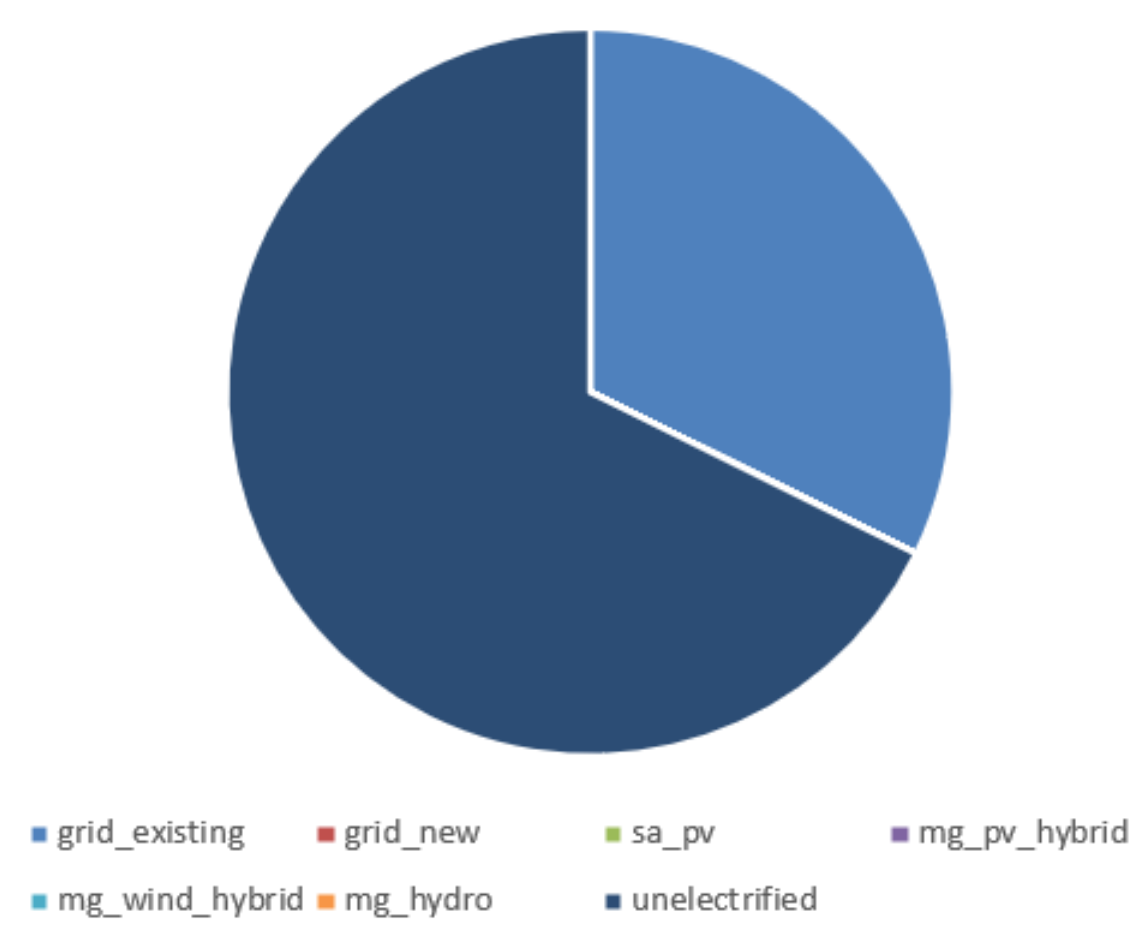
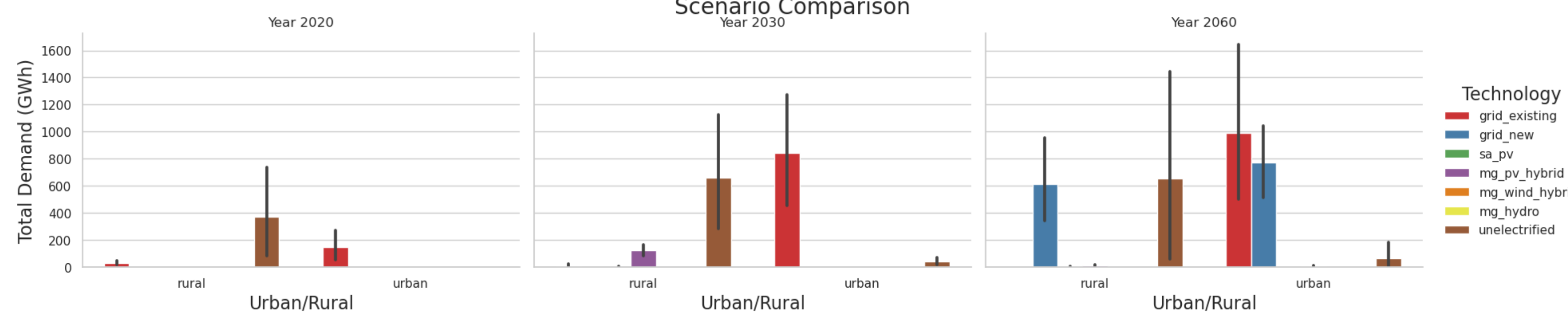
Multi-sectoral Energy demand (M-LED) Tool [Falchetta et al. \(2021\)](#)

Modified OnSSET Code (Mentis et al., 2017)



2020—Base

Scenario Comparison



Agutu, C., Egli, F., Williams, N., Schmidt, T., & Steffen, B. (2022). Accounting for finance in electrification models for sub-Saharan Africa. *Nature Energy*, 7. <https://doi.org/10.1038/s41560-022-01041-6>

Korkovelos, A., Mentis, D., Bazilian, M., Howells, M., Saraj, A., Hotaki, M. S. F., & Missfeldt, F. (2020). *Supporting Electrification Policy in Fragile States: A Conflict-Adjusted Geospatial Least Cost Approach for Afghanistan*. <https://doi.org/10.1596/33464>

Mentis, D., Howells, M., Rogner, H., Korkovelos, A., Arderne, C., Zepeda, E., Siyal, S., Taliotis, C., Bazilian, M., Roo, A., Tanvez, Y., Oudalov, A., & Scholtz, E. (2017). Lighting the World: the first application of an open source, spatial electrification tool (OnSSET) on Sub-Saharan Africa. *Environmental Research Letters*, 12, 085003. <https://doi.org/10.1088/1748-9326/aa7b29>

Tenenbaum, B., Greacen, C., Siyambalapatiya, T., & Knuckles, J. (2014). *From the Bottom Up: How Small Power Producers and Mini-Grids Can Deliver Electrification and Renewable Energy in Africa*.

© Sustainability, Inclusiveness and Governance of Mini-Grids in Africa (SIGMA) Project

Contact—Prof. Subhes Bhattacharyya, s.c.bhattacharyya@surrey.ac.uk