Recommendations for Continued Growth of the Rural Electrification Data Portal

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| Top Priority    | *Add Missing Data  
                 *Embed in MME Website  
                 *SQL Database  
                 *Create Updating Agreement  
                 *Stakeholder Meetings | *Calendar and Discussion Board (require data portal to be embedded in website) | *Decide on which *Tableau software to use |
| Mid Priority    |       | *Google Map View |           |
| Low Priority    |       | *Images on Tooltip  
                 *Additional Dashboards |           |

**Broad:**

**Add Data:** There is still a fair amount of data missing from the data portal, as well as data that is incomplete or potentially outdated. This is described in the section below:

**Missing:**

- Electrification Status Other Public Institutions
- Future Electrification Interest/Projects (All Buildings)
- Priority Status (All Buildings)
- Year Electrified (All Buildings)
- Electrification Source (All Buildings)
- Remaining Schools (690 Schools are Missing Geographical Location)
- Generation Stations (Geographical Locations)
- RED Power Lines (Medium Voltage Lines)
- Supplier/Regional Electricity Distributor (All Buildings)
- Benefactor and Contact Information (Health Buildings and Other Public Institutions)

**Incomplete:**

- EduVentures Data (needs to be manually added for each school)
- UNDP Data (needs to be manually added for each clinic)
Outdated:

- MHSS Electrification Data (all data from their data portal needs to be updated)

*Further explanation about missing/incomplete/outdated information can be found in Appendix D of the final paper.

**MME Website:** For the continuation of this effort, it is critical that the data portal first be embedded into a stakeholder’s website to be accessed and viewed. The stakeholder that would be best to host the website is the MME because the MME is overseeing most of the electrification efforts. If MME is going to host the website, the ministry must take responsibility for updating and managing it in order for the data portal to be sustained. Once the data portal is put onto a website, we recommend the creation of various webpages that outline stakeholder contact information, and includes their important documents. The user and administrator manuals should also have their own webpage. The introduction dashboard could then have stakeholder logos link to these pages instead of each stakeholders respective website.

**SQL Database:** Furthermore, the creation of a singular government database that connects to the data portal would maximize the speed and usefulness of the portal, such that all relevant documents could be updated in one location. A Structured Query Language (SQL) Database would be an improvement to Google Sheets, which is currently being used to update information which requires an administrator to manually “refresh” the data from Tableau Desktop to Tableau Public whenever data is updated. The SQL database would allow a live connection between the data and Tableau. A live connection ensures that newly inputted data is updated on the data portal automatically. However, the implementation of an SQL database requires additional expertise to create, and due to time constraints, the team was unable to fully research and implement this concept.

**Updating Agreement:** The team also recommends that stakeholders come to an agreement on how often information in the data portal should be updated or checked for accuracy. Contributors may decide to update information once a month, for instance, or even as it comes in, to ensure that the information is accurate and up to date. New data may include, but is not limited to, newly planned projects, a change in electrification status, the addition of a new school, or the placement of a new power line.

It is just as important to make changes and updates correctly and in the necessary format, as it is to regularly update the data. If the data is not inputted into the document correctly, the information will
not be displayed properly or accurately. For this reason, the team created Appendix F of our paper to outline how information is currently stored and in what order.

**Stakeholder Meetings:** The last broad recommendation is for stakeholders to hold regular meetings to discuss electrification progress and recent changes to the data portal. These meetings would hold stakeholders accountable for providing up-to-date information on the data portal as well as keeping track of what each organization is contributing to the rural electrification initiative. Meetings would be most beneficial every 3-6 months at a designated time of the month.

**Technical:**

**Calendar and Discussion Board:** Based on suggestions from EduVentures, we recommend that a calendar and discussion board be added to the same website as the data portal (cannot add to data portal through Tableau), on a connected webpage. A calendar would be useful to notify other stakeholders of upcoming conferences, meetings, data portal changes, or project groundbreaking events. Similarly, a discussion board would be a great place for users to ask questions, provide data portal feedback, or discuss recent updates. The team was unable to address this suggestion since the data portal was not embedded into MME’s website prior to our departure.

**Google Map View:** Another recommendation is to incorporate Google maps as the satellite view. This would provide additional regional names, local attractions, and roads on top of the conventional satellite view. This would be possible by converting a Google web map to a mapbox web map, which is the website our team used to incorporate the satellite map layer into Tableau. For more help follow this link: https://stackoverflow.com/questions/40672983/can-i-use-mapbox-for-street-view-like-google-maps-street-view

**Images on Tooltip:** One suggestion that the team was unable to incorporate due to time limitations was connecting an image into the tooltip feature. For example, if a user scrolls over a school, it would be beneficial if a picture of the school pops up with the additional information provided, on that specific dashboard. This can be further researched at https://playfairdata.com/how-to-add-an-image-to-a-tableau-tooltip/.

**Additional Dashboards:** We recommend a dashboard with national energy statistics, and one outlining Namibian Electrification History, specifically milestones and challenges faced. We have all the necessary energy statistics but did not have time to create and implement a new dashboard.
Software:

Tableau Software: The following section discusses the software required for the current data portal, as well as recommendations for efficient future use. As of now, only one Tableau Desktop account is needed to access and update the data portal, since any stakeholder can update information through Google Sheets, if given access.

Once the Tableau story is published on Tableau Public and embedded into a website, anyone can view and utilize the data portal. Even though this decreases the cost of operating the data portal, specifically the software cost, it presents a limitation to the current plan, as only one administrator or desktop can edit the Tableau visualizations. The team predicts that it will be beneficial if there are multiple administrators from different stakeholders so one individual is not responsible for updating other organization’s information and data.

One example of when multiple administrators would be helpful is when new power line maps are updated. When new power lines need updating, the administrator must download the shapefile from ArcGIS, rename it as the new powerline file, and then re-upload the Tableau Story. This is a unique updating procedure requiring administrator access for a GIS employee; however, another employee from a different organization may want to change the filters or visualizations on the specific buildings on that dashboard. Therefore, it is beneficial to have multiple administrators to balance out the responsibility of making changes or additions to the data portal.

Since having two or more individual Tableau Desktop accounts would create more problems collaborating because the administrators would have to constantly send the uploaded data portal between each other, the team recommends Tableau Online. Administrators (Creator accounts) could edit information on their desktop which then updates the communal, shared version be viewed by other administrators on Tableau Online. The only drawback of this option includes the additional costs of Viewer Tableau accounts to utilize the data portal when embedded into a website. An individual Creator account costs $70 USD a month, which can come with Tableau Desktop and Online, however if stakeholders decide to go for the Tableau Online option, there is a minimum of 100 viewers ($12 USD per person per month) required for a team or organization. There is also the option to have a minimum of five Explorers ($35 USD per person per month).

This decision will need to be made by all stakeholders since each option has pros and cons for the cost or time requirement for administrators (extra steps every time the data portal is modified).