DATA COLLECTION ON RESILIENT URBAN TRANSPORT IN FREETOWN, SIERRA LEONE

By

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Presentation based on a Project done in Freetown, Sierra Leone under the Global Facility for Disaster Reduction and Recovery (GFDRR) funded by The World Bank Group.

- The Project Title was " Building transport resilience in Freetown".
- The overall objective of the World Bank project was:
- i. to improve climate resilience of transport infrastructure planning and investments in Sierra Leone;
- ii. To enhance local capacity to design and implement resilient transport infrastructure.
- Although the World Bank Project had four components, we were concerned with Component 1: ***Freetown transport infrastructure climate change risk identification: landslides and floods***

CONTEXT

- In general, Sierra Leone's geographical location, land characteristics, large number of rivers, and monsoon climate make the country susceptible to multiple natural hazards, particularly floods, wind storms, landslides, and coastal erosion. The primary cause of flooding in Sierra Leone is tropical rains, lack of urban planning and blocked drainages in urban areas and big towns. In September 2015, massive floods caused by torrential rains hit the capital, Freetown, and caused serious damage, particularly to people living in slum areas. They left more than 3,000 people displaced in Freetown and damaged a number of water points and sanitation facilities as a result of contamination.

- The transport system of Freetown (The Capital City) in particular is one of the most exposed and vulnerable sectors to climate change and natural disasters, especially to flash-floods and landslides. Freetown is a coastal city located in a mountainous peninsula. This geographical condition results in high exposure of the transport system to climate change and natural disasters as many waterways cross the city draining from the hilly areas. Additionally, many roads are exposed to rainfall induced landslides as the slopes in the central highland are steep and unstable. The urban transport system in Freetown is at very significant risk from natural disasters. Its exposure is combined with a high vulnerability, exacerbated by poorly engineered and constructed roads and drainage structures in very poor condition due to deficient maintenance

- Climate change aggravates this risk with rainfall duration of up to 5 -days in some cases , especially during the months of July-September. This risk posed on the transport system was evidenced by the August 2017 landslide and floods, as various communities in the city were isolated because of collapse bridges and damaged roads that made the task of recovery all the more difficult. The total damage to the transport infrastructure was estimated to be 0.98 Millon USD, in addition to loss of hundreds of lives.

The Data Collection Project Objectives

The data collection project that was undertaken was to use technology in a data scarce environment in order to facilitate planning of a more resilient urban transport system and to understand how flooding impacts transport Services.

The project provided data that will facilitate addressing of issues such as:

- How people move and the public transport options available to access jobs and services from different neighborhoods and communities;
- How public transport system can be planned better;
- How to address the issue of resilience of the urban transport system in a highly vulnerable environment to natural disasters.

Understanding Transport System Resilience in the context of Risk Management

- In the context of risk management, “resilience” is defined as a system’s ability to continue to function at an acceptable level of efficiency in the face of disruptive or unexpected conditions. This concept has been imported into the world of transportation demand management, giving rise to the idea of “transportation resilience.”
- Transportation resilience is defined as the ability of a transportation system to move people around in the face of one or more major obstacles to normal function. These obstacles can include extreme weather events, major accidents, and equipment or infrastructure failures. More specifically, the concept of transportation resilience has even more precise implications such as:

- For **individuals**, transportation resilience means being able to get around if the person's vehicle breaks down, or if the person is injured, becomes disabled, or suffers a loss of income;
- For **communities**, it means that public transport is accessible, and that traffic can continue to move despite accidents, emergencies , climate hazards, construction projects and special events
- On a **design** level, it means that transportation systems have specific built-in features to deal with extreme levels of demand and critical, unexpected problems such as natural disasters
- On a **strategy** level, it means a transportation system is created to accommodate future growth and possible changes to future usage or access patterns.


POWER YOUR LIFE

Data Collection Exercise and Techniques

- The data collection exercise was a student- led surveying and condition assessment exercise of urban transport infrastructure and mobility including urban roads in Freetown East to West (Kissy to Lumley), identifying retaining walls , bridges and culverts on the roads that were at risk to climate hazards especially flooding and landslides.
- Two teams of FBC Students (4 each in Eastern and Western area) was established.
- Students were trained on field mapping and surveying of bus and public transport routes and the vulnerable infrastructure.
- A data base of the Freetown roads used by public transport was first developed based on local experience, identifying vulnerable infrastructure that could affect mobility on the routes.

Data Collection Exercise and Techniques

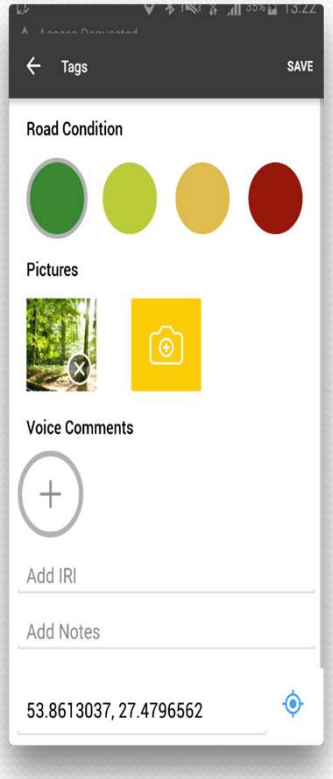
- The focal point of the data collection exercise was the Fourah Bay College (FBC)
- The exercise involved a student - centered activity of :
  - Road condition assessment during the peak of the rainy season to assess the network vulnerability to climate change (floods).
  - Mapping the public transport network in Freetown
- As a consultant to the World Bank, Ing. A. B. Savage was the local coordinator and focal person, supported by Ing. Oba Davies from the Civil Engineering Department of FBC; Ing Savage was responsible to:
  - Support the coordination and training with a team from ***WhereIsMyTransport*** (WIMT) that provided training on how to use the data collection tools.
  - Screen and select the team of 8 students to be trained.
  - Field support to the students' assessment and mapping exercises of the vulnerable public transport network using the digital data collection tools such as the World Bank ***RoadLab Pro*** and the ***WhereIsMyTransport Collector*** App , which are all applications that are used with smart phones.

First Phase of the Data Collection

- The first phase of the student – led data collection campaign for the public transport infrastructure of the Freetown roads was done in August 2018 , a peak rainy season month to assess the vulnerability of the network. A World Bank data collection tool called ***RoadLab Pro*** designed for use on smart phones was used.
- It is a smart phone app for road engineers and professionals with the following attributes:
  - Automatically **estimates pavement** roughness
  - Collects **GPS coordinates** of road
  - **It has Geo-coded tags** indicating landmarks and events
  - **It provides for Visualization of collected data** on smart phone and desktop.
  - **It is an easy to use data management system** linked to an individual user's dropbox or google drive

Other Functionalities of RoadLab

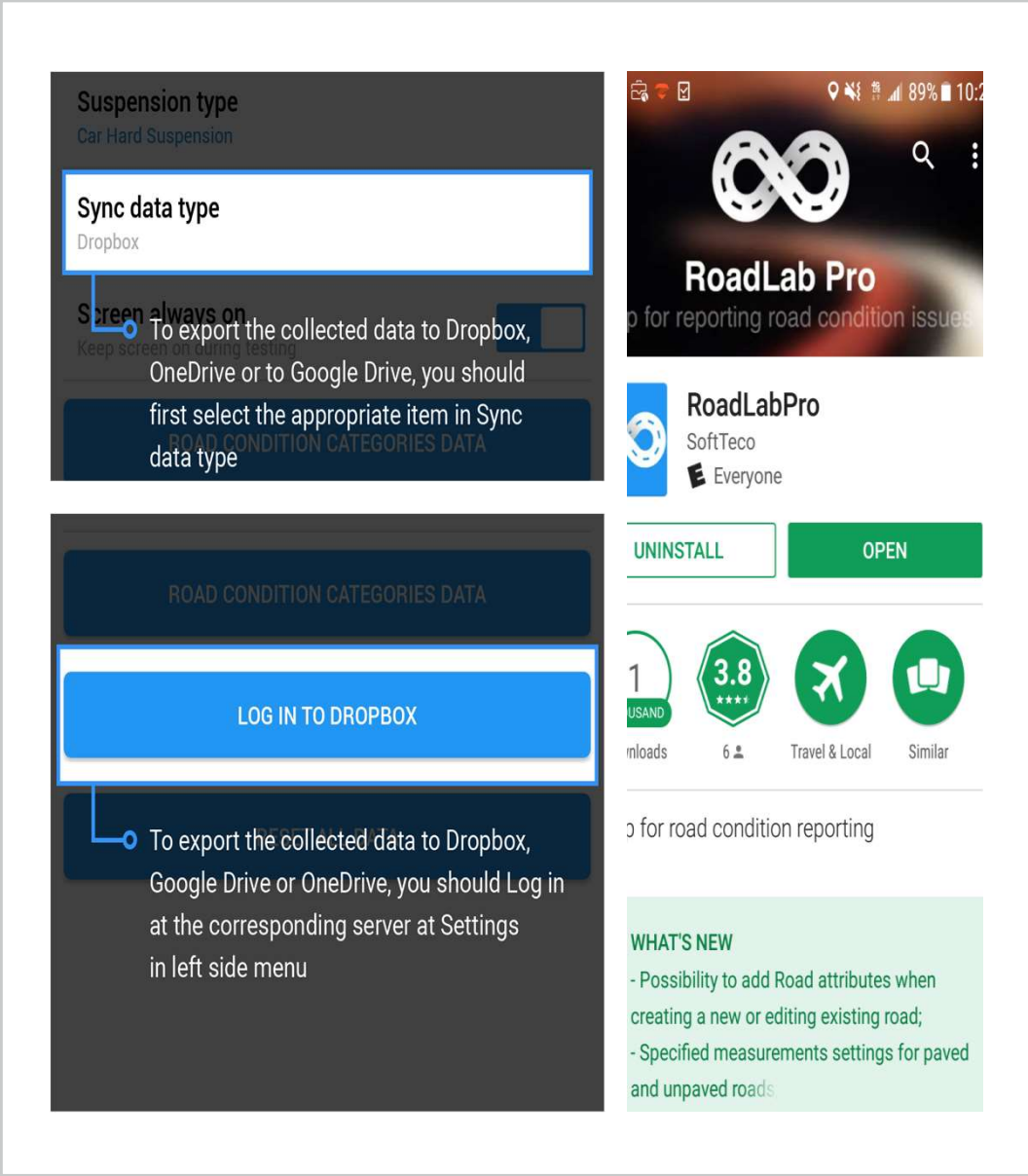
- Geo-coded tags indicating landmarks and events, including:
- Road condition
- Bridge, culverts, others
- Climate vulnerabilities
- Pictures
- Voice comments
- Notes



Set up the App

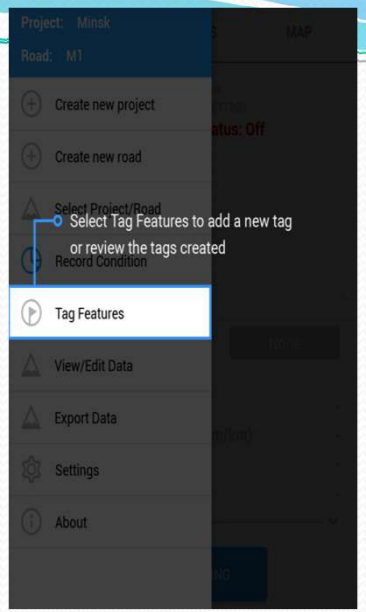
- Download RoadLabPro from playstore

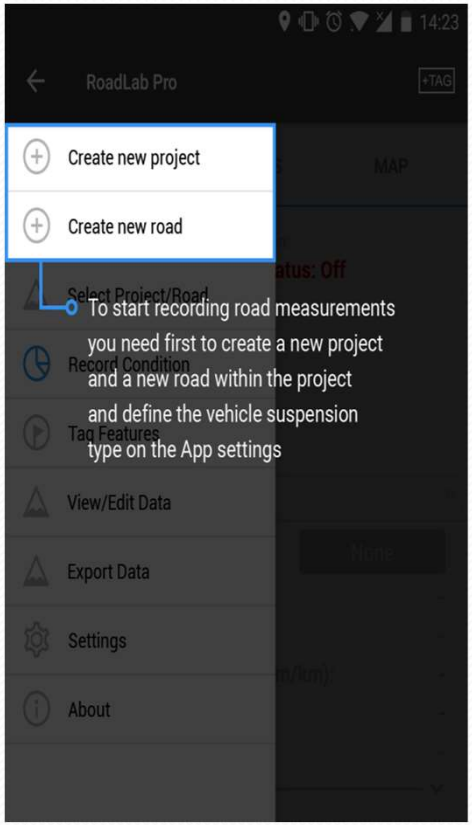
- Sync with google drive
  - **Email:** mappingfreetown@gmail.com
  - **Password:** freetown18

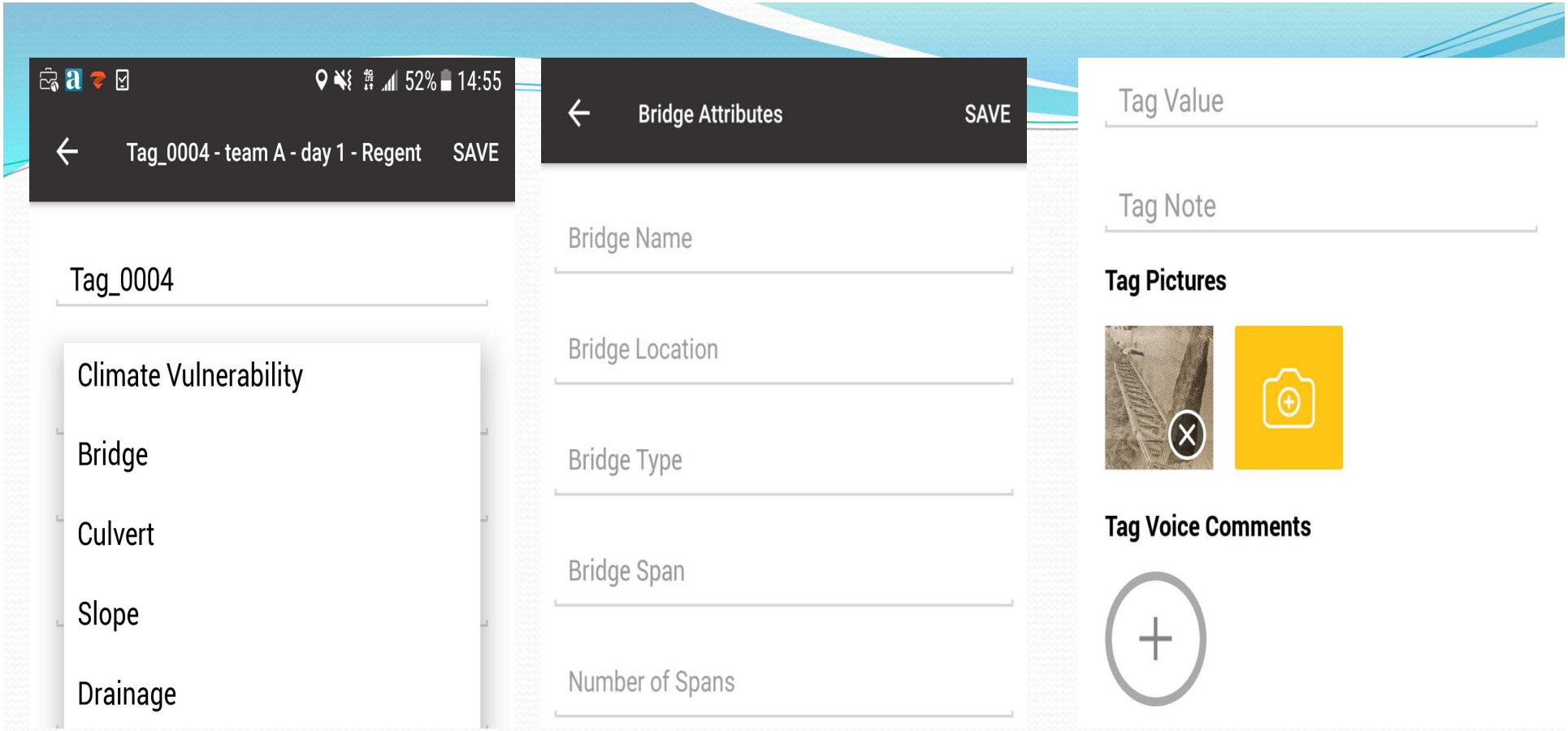


Set up a project every day

- Create a new Project Name
- For example: “ Team A – day 1”
- Create new road
- Tag Features

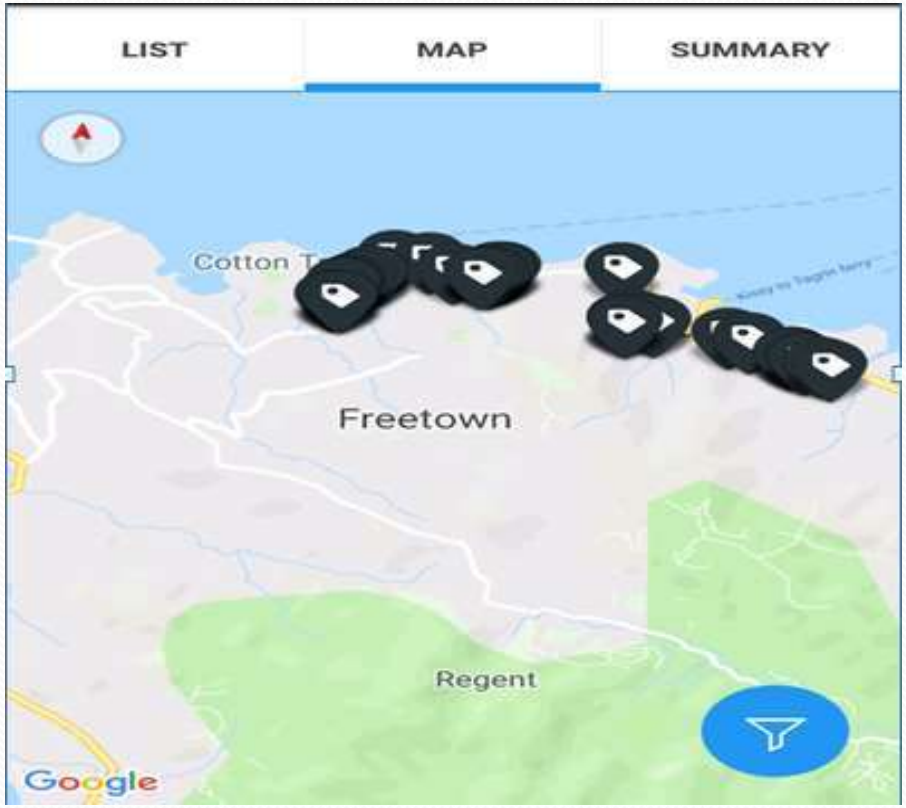






Relevant tags

Bridge, culvert, slopes and drainage


LIST
MAP
SUMMARY
Freetown
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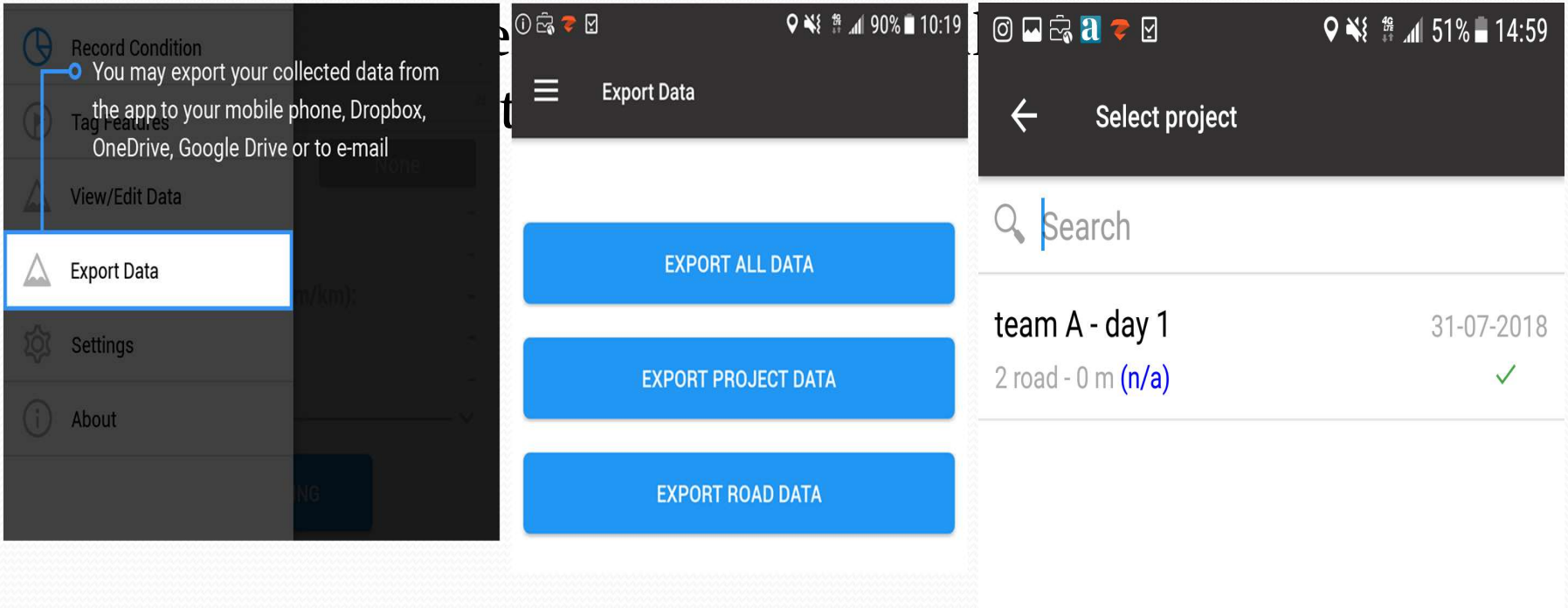
Google

Exporting

- At the end of the day – export data – export project data
  - **Email** to project lead or sync to **google drive**



Impact of Data Collected:

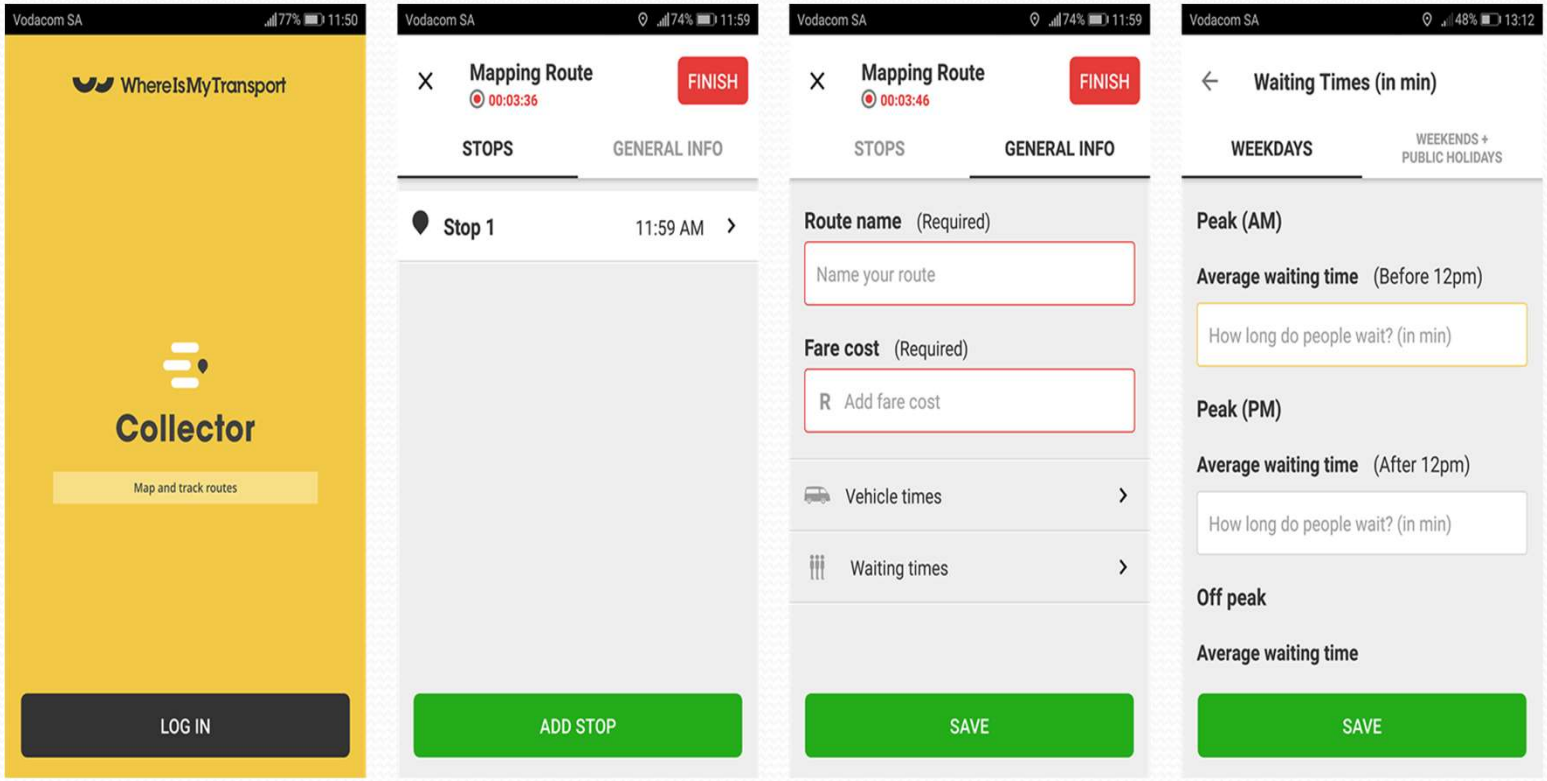
- The data collected was used to characterize the vulnerability of the transport corridors to climate change; how flooding impacts transport services
- The task provided data for quantifying of the risk of urban transport network in Freetown; and to identify the most vulnerable sections of the transport network to flood and landslide impacts.
- The vulnerability assessment is expected to identify and prioritize suitable interventions.

Second Phase of the Data Collection

- In Freetown, informally run modes of transport such as minibuses/poda podas and taxis accounts for over 80% of public transport passenger trips.
- Information on these services is sparse or non – existent causing many people to rely on personal knowledge and experience of the system and information from other users on where to wait and board these transport modes to get to various destinations.
- There is no central source of information on fares, routes, transport hubs and frequencies of service.
- A second phase of the data collection exercise was undertaken in November 2018 to provide digitized transport data especially for the informally run public transport (specifically for Freetown mini buses/poda podas, taxis, and the ferry service). The ***WhereIsMyTransport*** platform was used

- The data collectors downloaded the **WherIsMyTransport** route mapping app ***Collector*** and were trained to familiarise themselves with its features and functions.
- ***Collector*** is a proprietary app that was designed and developed to map formal and informally run public transport systems in emerging markets.

The WherIsMyTransport Collector App



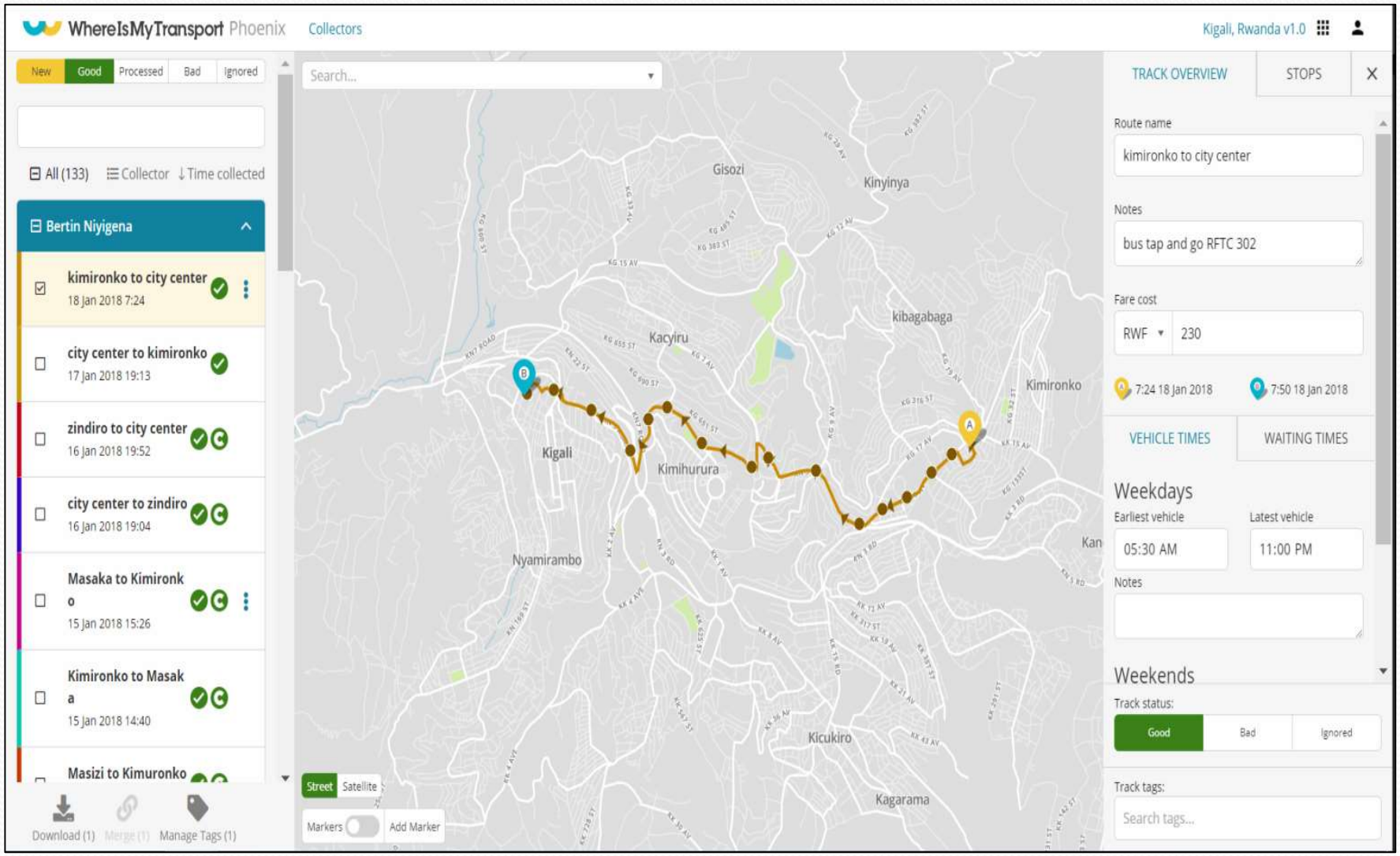
Team Being Trained

- Over the course of two weeks, the students used smart phones with the downloaded ***Collector*** App to capture the data on about 200 routes; they were provided with Megabytes of Data , daily lunch subsidy and transport fares to the routes they are assigned to.
- The mobile tool was used to track the routes of the Road Transport buses, mini buses/poda podas, taxis and the ferry; all important metadata about each route operation by the various public transport modes were collected.
- For each route, tracking was done for three periods– morning peak period , off peak afternoon period and evening peak period. For each period an outward and inward trip was run i.e return trips. This means there were a total of 6 trips for each of the routes identified.
- As the data was collected, it was visualized on a map and checked and validated by Ing. A. B. Savage the project coordinator assisted by Ing. Oba Davies; the validation included identifying bad trip runs and trips with incomplete information.

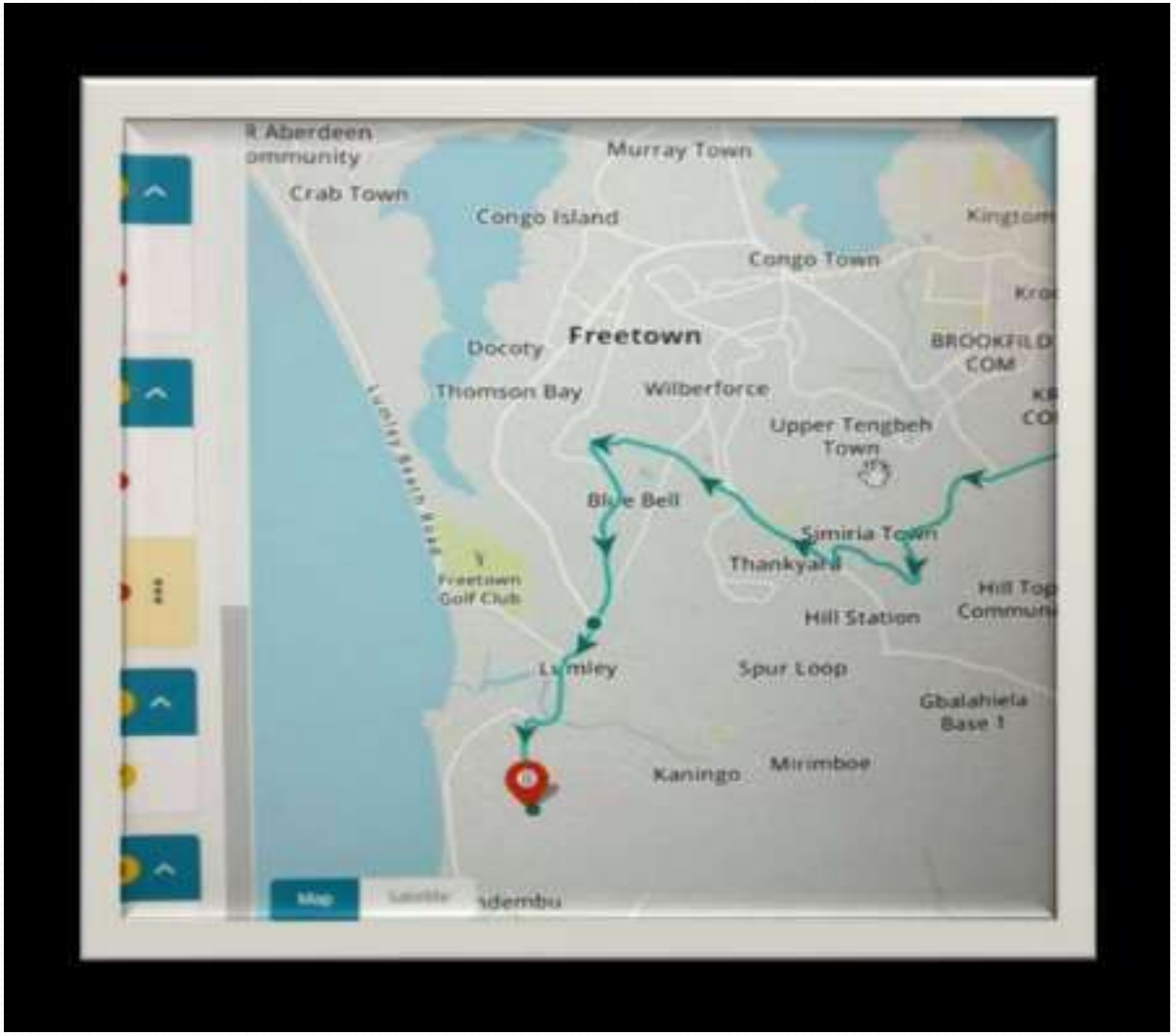
- Routes were grouped by “hubs”, which were previously identified . Data collectors started at their assigned hub, and map all routes that depart from that hub. When we identify new hubs during the course of the data collection process – which happened occasionally – we added the new hubs to the route backlog, and updated the project plan to include them in the data collection process.
- Data collectors gathered the following information using the ***Collector*** app:
  - Route start point (name, GPS coordinates)
  - Route end point (name, GPS coordinates)
  - Boarding/alighting points (common name, GPS coordinates, and number of riders boarding and alighting)
  - Detailed route fares/tariff
  - Travel time – between stops and along the route
  - Average speed along the route
  - Length of the route and distance between stops
  - Stop (name and GPS coordinates)
  - Timetable or frequency (for morning and evening peak and afternoon peak)

- At the terminus of every given route, the data collector uploaded the route data to the secure, cloud-hosted database. This was done route-by-route to minimise the risk of losing data if a data collector's phone malfunctions at any stage during the day.
- Every day the data uploaded by the data collectors were validated by Ing A. B. Savage, the local consultant and project coordinator with the assistance of Ing. Oba Davies of the Civil Engineering Department of FBC.
- The tool used enabled us to visualise the routes collected, and to ensure – day by day – that the route GPS track and all supplementary information have been properly recorded. If certain information, such as fares or waiting times were missing, the data collector was contacted to add this missing information directly in our validation tool. We mark routes to be re-tracked if the missing information is unknown or unattainable – e.g. GPS error.
- This process of in-field validation saved time and cost vs. the alternative – and much more common – method of validating data only once the project is complete and processing begins.
- Once the local validation was completed, the data was sent to Head Office for processing.

Example of the validation tool



Actual Tracked and Validated Route



Impact of the data collection exercise

- The data from the study can be made openly available through the **WhereIsMyTransport** platform to provide very useful data on mobility patterns and valuable information especially for transport users of informally run transport modes in Freetown; information about modes, journey times, various origin and destination hubs, frequency and fares can all be made available.
- App Developers can use the data and information from the platform to include in apps to test solutions for informally run transport problems in hachathons.
- The data will facilitate putting Freetown on the map of cities with accessible information on informally operated public transport.


THANK
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