

GroupMappers: a collaborative initiative for village mapping and developing an integrated geospatial dashboard to enhance health surveillance and planning in Southeast Bangladesh.

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Introduction

Malaria continues to be a significant public health challenge in the Chattogram Hill Tracts (Bandarban, Rangamati, and Khagrachhari) districts of Bangladesh. Despite progress in the national malaria elimination program, the number of malaria cases has nearly tripled from 6,130 in 2020 to 16,567 in 2023, with the Chattogram Hill Tracts region accounting for 91.33% of the total cases. Bandarban district alone contributed 60.37% of these cases, with figures rising from 4,166 in 2020 to 10,001 in 2023 (www.malariaapitracker.com). The National Malaria Elimination and Aedes Transmitted Disease Control Program (NMEATDCP) has stratified cases up to the sub-district (Upazila) level, identifying three high-risk Upazilas: Thanchi, Alikadam, and Lama.

Aim: The project aims to improve malaria control in Bangladesh by enhancing village-level surveillance for better malaria control and eventual elimination in the region.

Impact: The impact of the project includes improved data collection and timely reporting of malaria cases through enhanced village-level surveillance, enabling targeted interventions in hotspots, increased community engagement to inform adaptive strategies for malaria control.

Data Collection

Study area:

The study focused on the southeastern region of Bangladesh, specifically in Bandarban, an area characterized by vast hills and dense forests.

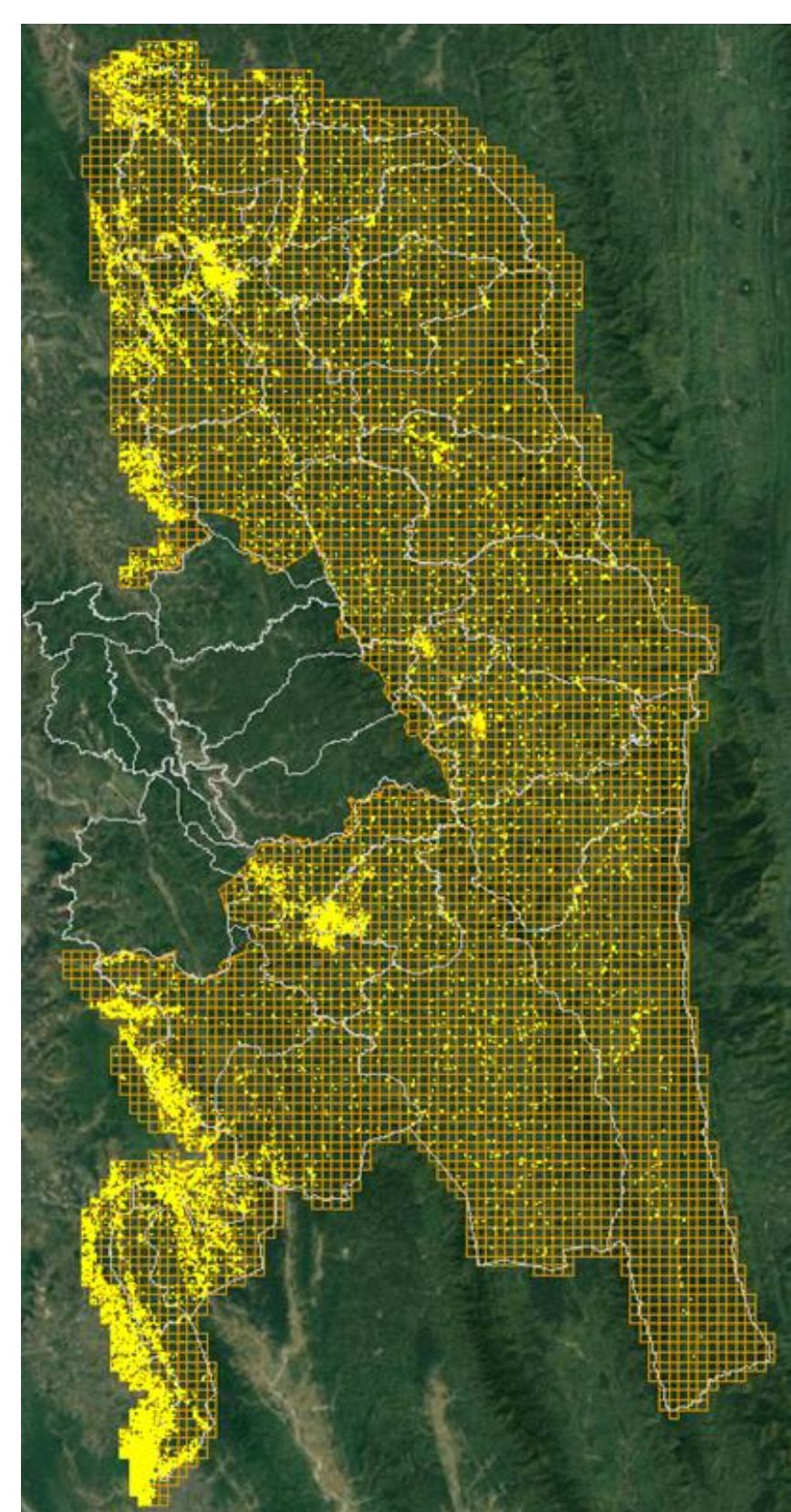


Figure-1: Study area map with grids and settlements

Methods

1. Map villages and temporary settlements:

update settlement maps from 2017 from satellite imagery; name/label villages to create Village Master List for malaria endemic areas; create mechanism for periodic update of village master list and village maps

2. Update and correct administrative unit boundaries:

check and update/correct union, ward, upazila and district boundaries

3. Calculate updated population estimates

4. Integration into Malaria Information System of village and health facility master lists and population estimates

5. Collection of malaria case data at village level create system and deliver training for healthcare workers to do electronic data entry of malaria case data in real-time

6. Geospatial analysis to identify malaria hotspots and map fine scale malaria risk for targeting of interventions, location, referral of severe cases

7. Geospatial dashboard development to visualize case data at village level in real-time.

Results

Village mapping

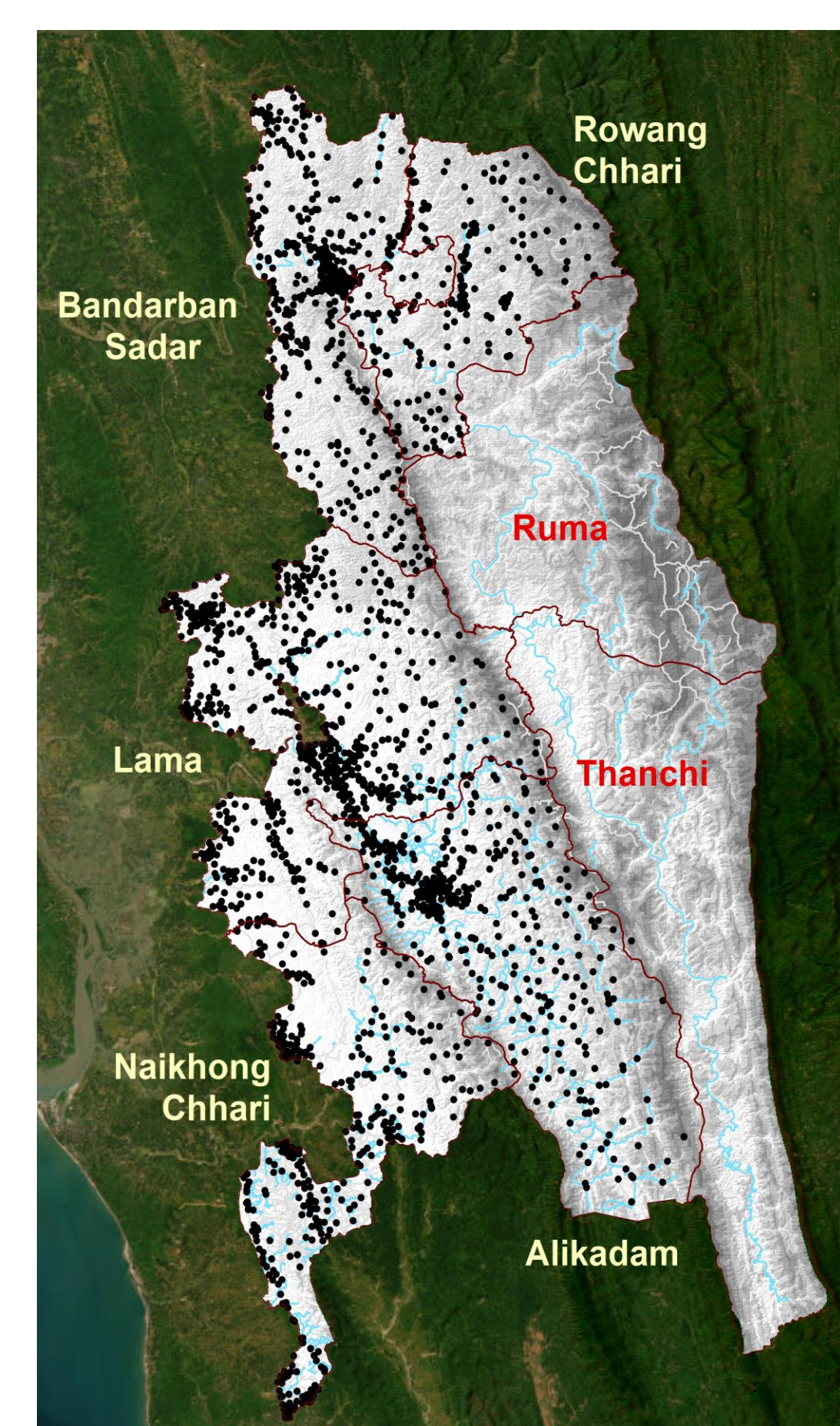


Figure-2: Distribution of para/mahalla/camps

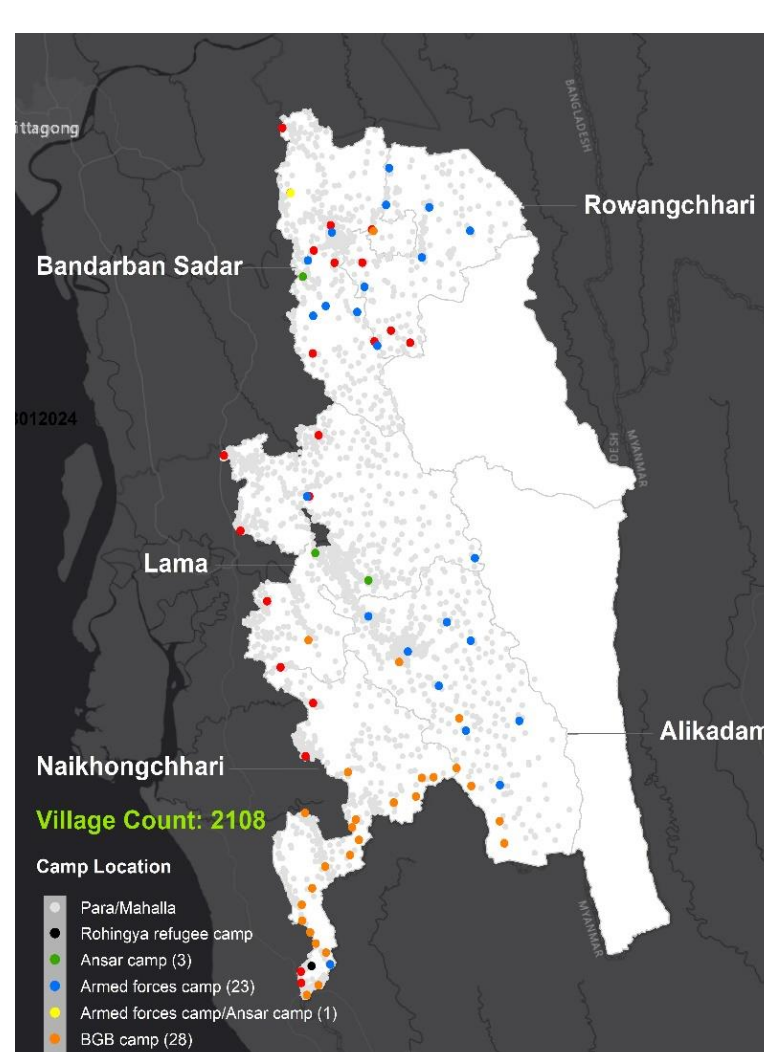


Figure-3: Camps distribution

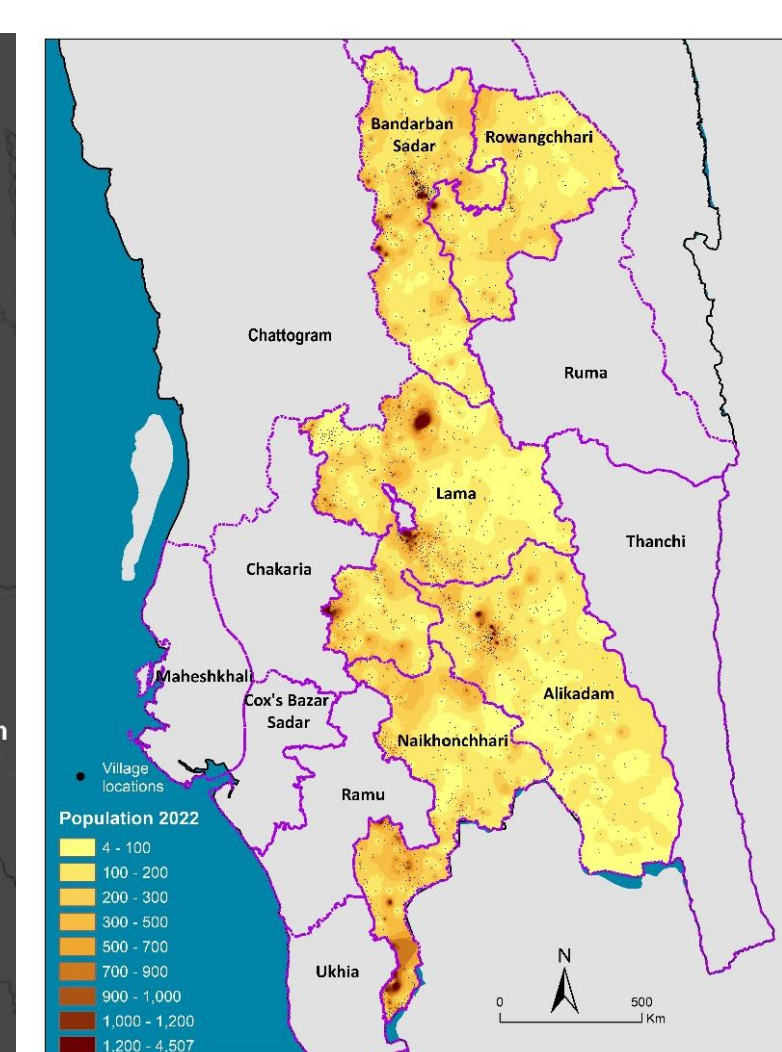


Figure-4: Population distribution

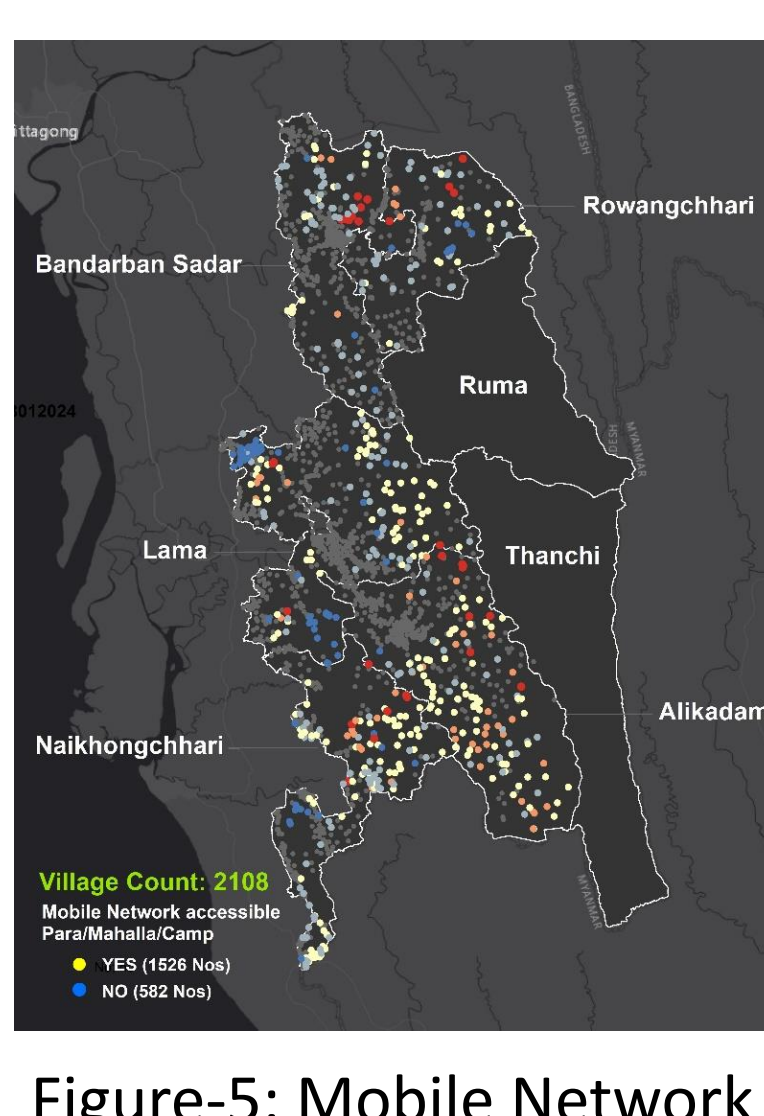


Figure-5: Mobile Network

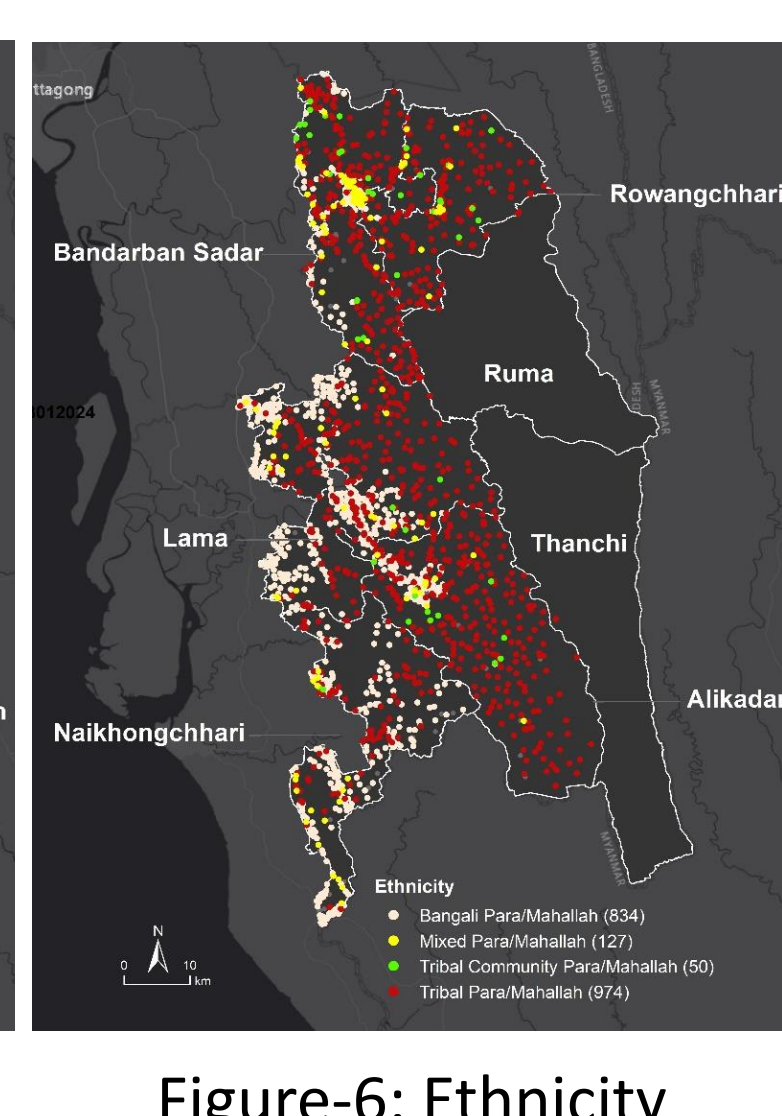


Figure-6: Ethnicity

Updated administrative unit boundaries

Total wards: 252
Total unions: 28
Total upazilas: 5

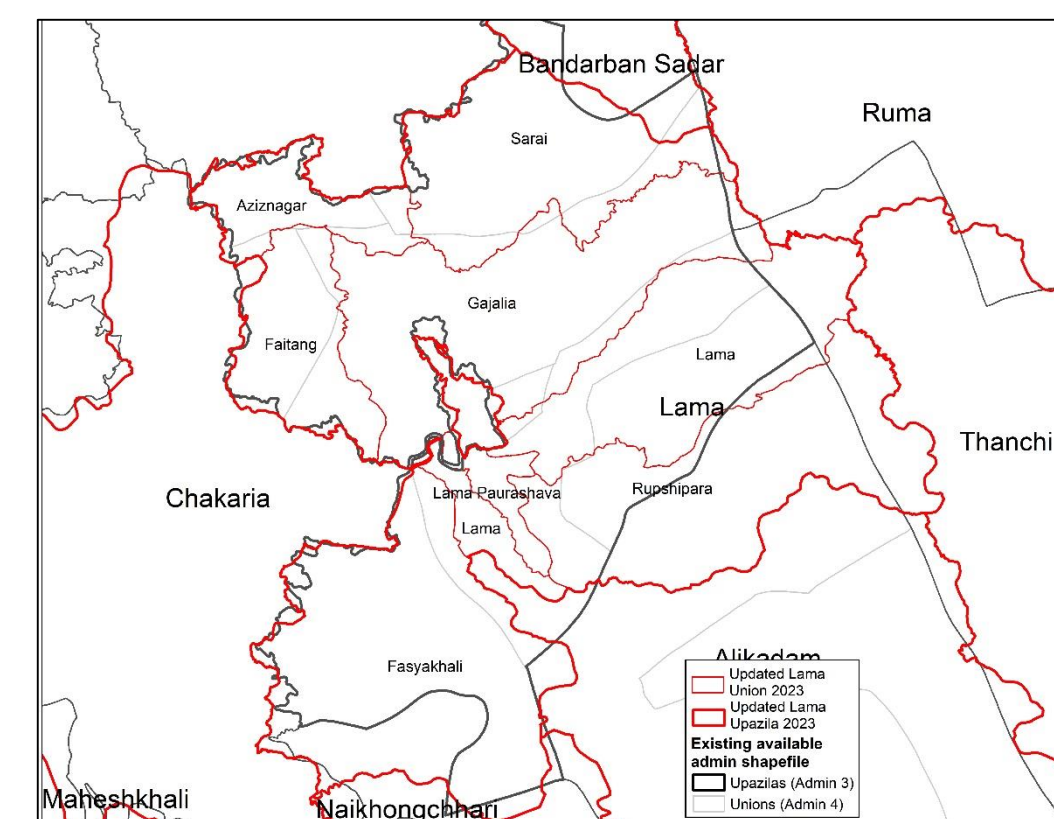


Figure-7: Updated Union and Upazila boundaries for Lama Upazila

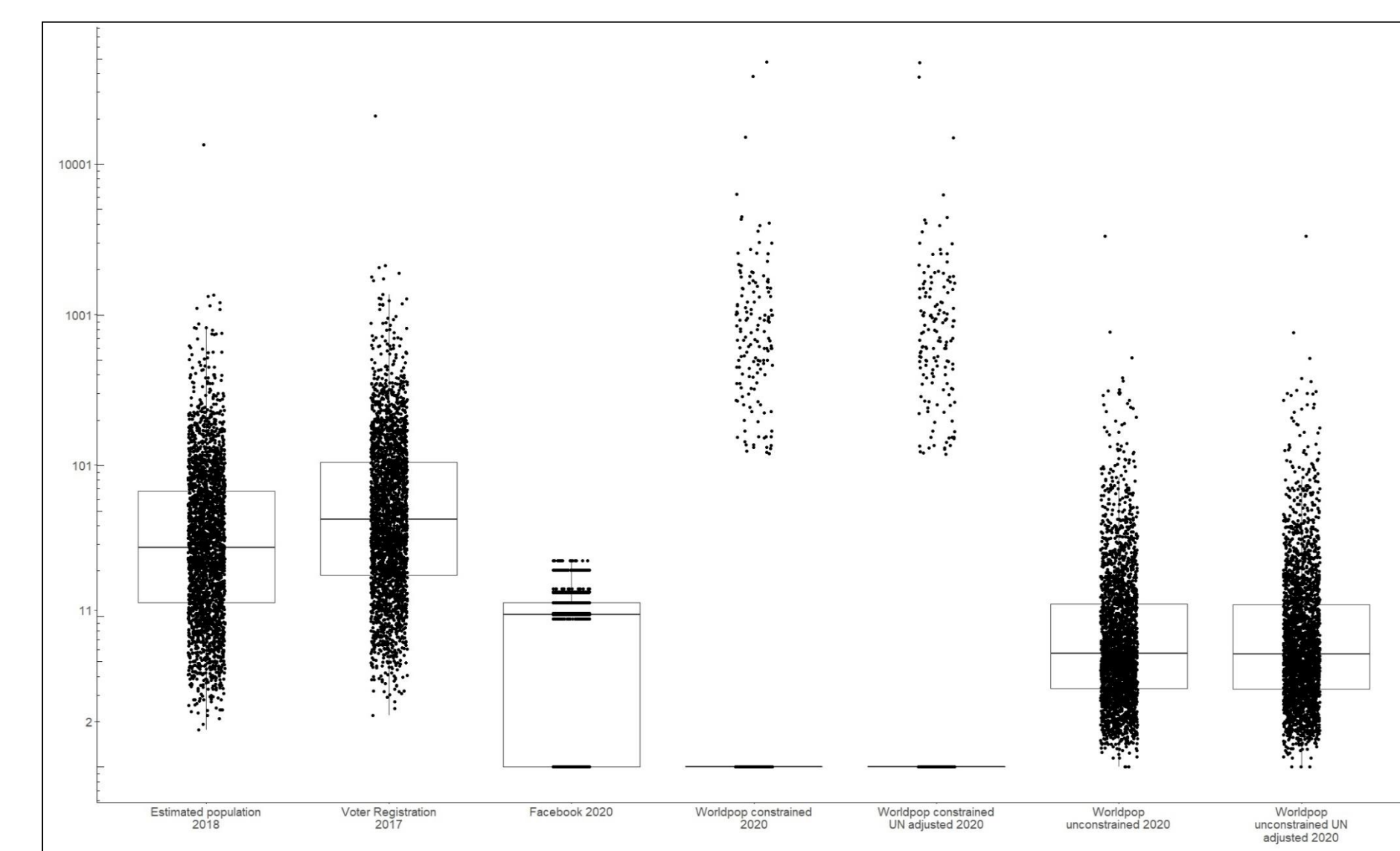


Figure-8: Comparison of estimated population from 2694 polygons with voter registration for 2022, Facebook for 2020, Constrained WorldPop for 2020, Constrained WorldPop UN adjusted for 2020, Unconstrained WorldPop for 2020 and Unconstrained WorldPop UN adjusted for 2020 using log scale boxplot.

Geospatial Analysis

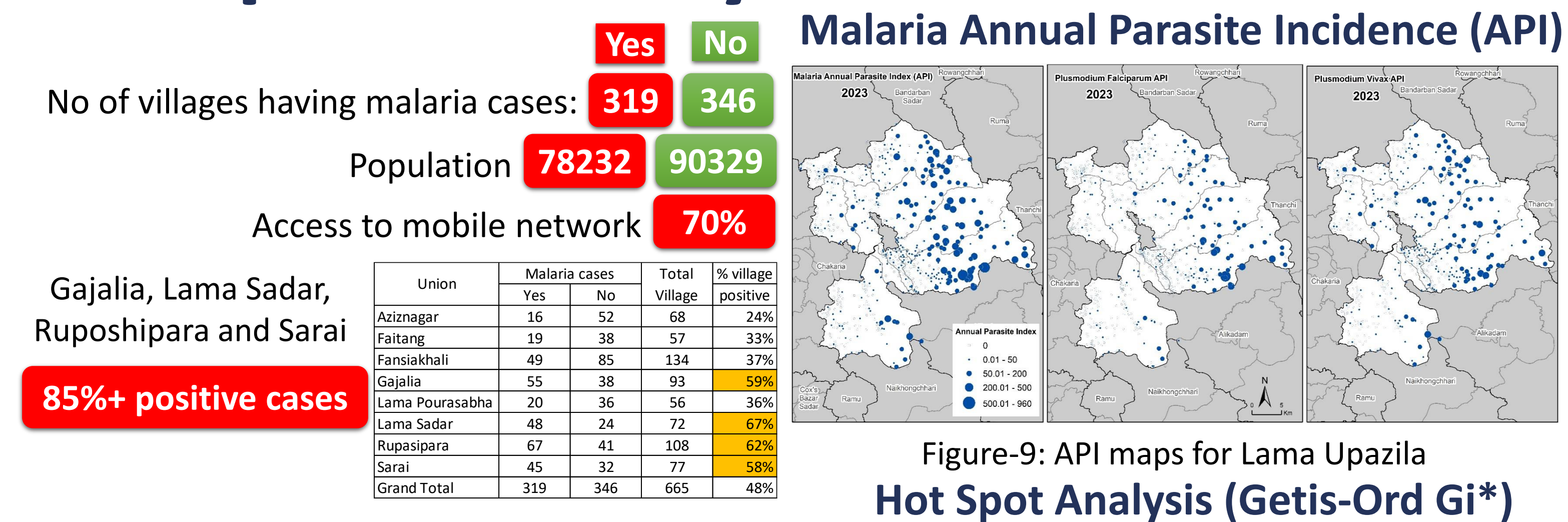


Figure-9: API maps for Lama Upazila Hot Spot Analysis (Getis-Ord Gi*)

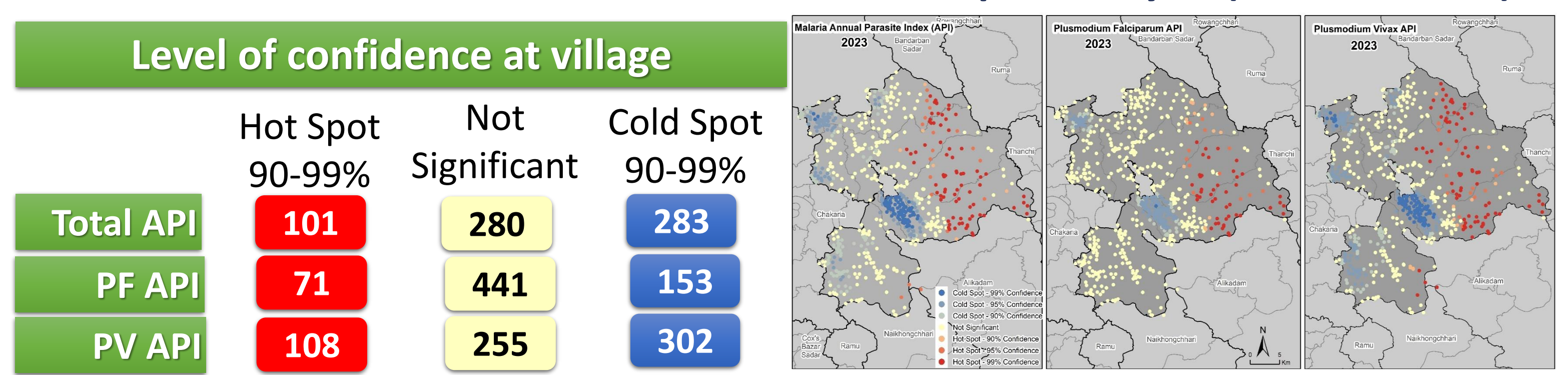


Figure-10: Hot Spots maps for Lama Upazila

Geospatial Dashboard

Malaria 360: This innovative dashboard allows us to monitor and visualize malaria cases, providing a comprehensive view of the situation down to the village level.

• **Malaria API Tracker:** Upazila level data from Malaria Information System (MIS) is visualized via Application Programming Interface (API)

• **Community Malaria Tracker:** Implementing Micro stratification Approach (village mapping and malaria data collection at village level)

Malaria case data collection using mobile devices: Collect village-level malaria data in Lama Upazila, Bandarban, using SMS text messaging for basic phone users and the KoBoCollect mobile app for smartphone users.

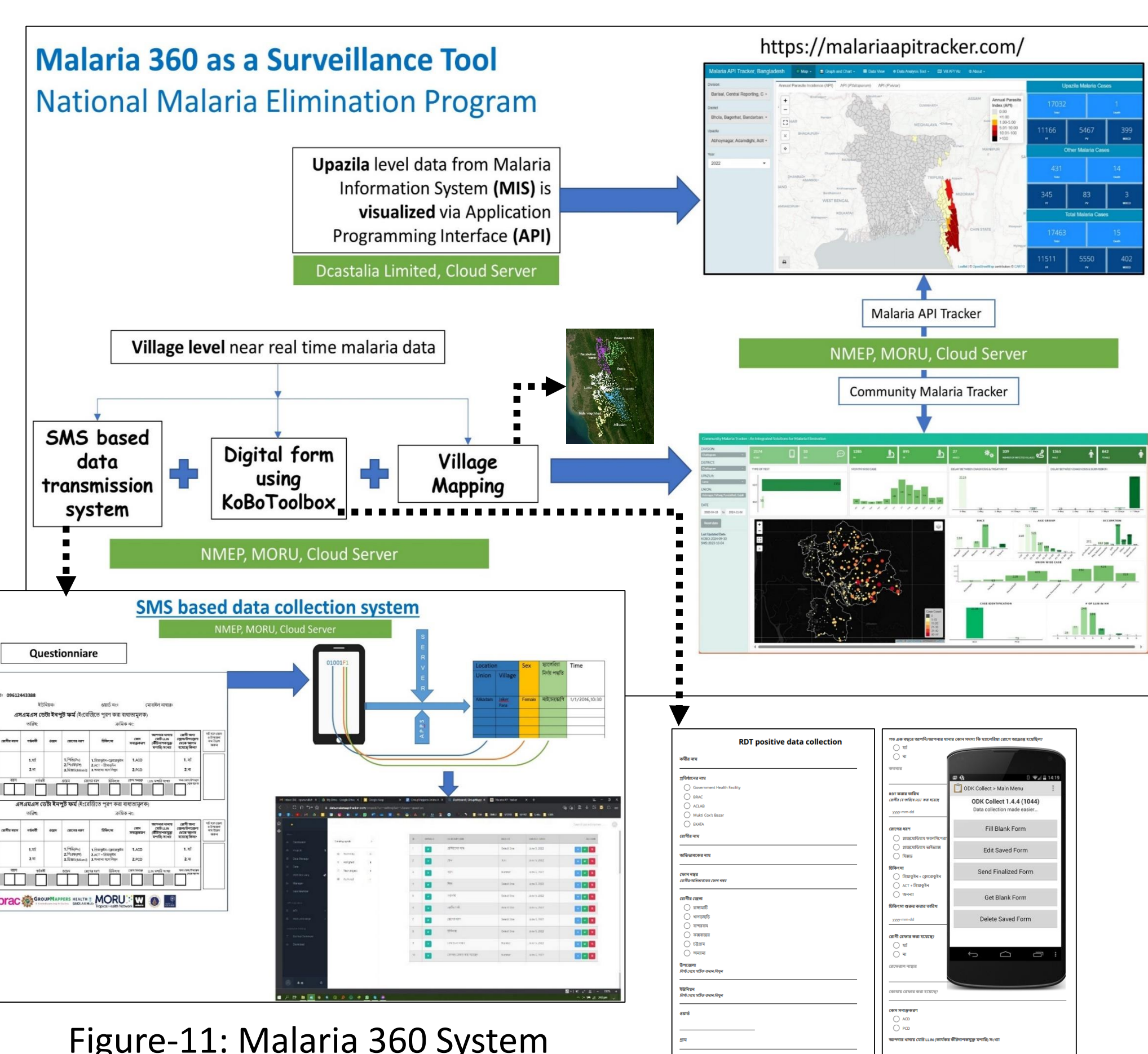


Figure-11: Malaria 360 System

Conclusion

Data limitations included possible household size discrepancies, village changes with missing or abandoned buildings, misidentification of multi-building households, inability to detect multi-level structures, and lack of non-residential building data. Historical Google Earth images also often lack consistent geo-referencing, causing displacement that may reduce accuracy.

We present the development and application of a simple, robust and easily scalable set of methods for volunteers and local government to rapidly map and collect the names of rural communities as villages (para/mahalla/camps). The data generated has multiple uses to help improve provision of health, education and other essential services which can assist countries to achieve the SDGs. It can also provide much-needed training and validation data for the various automated image analysis methods currently under development to map populations across the world.

Acknowledgement 