MYANMAR MALARIA EARLY WARNING SYSTEM (MMEWS)

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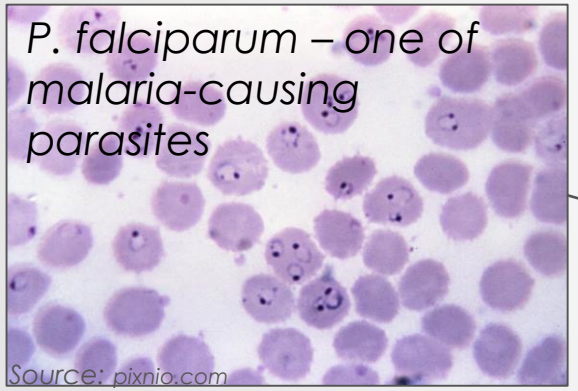
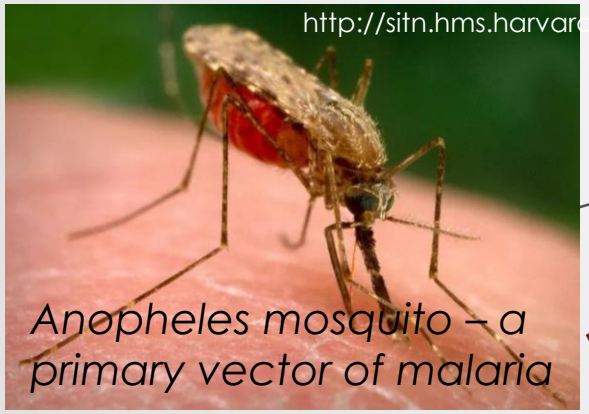
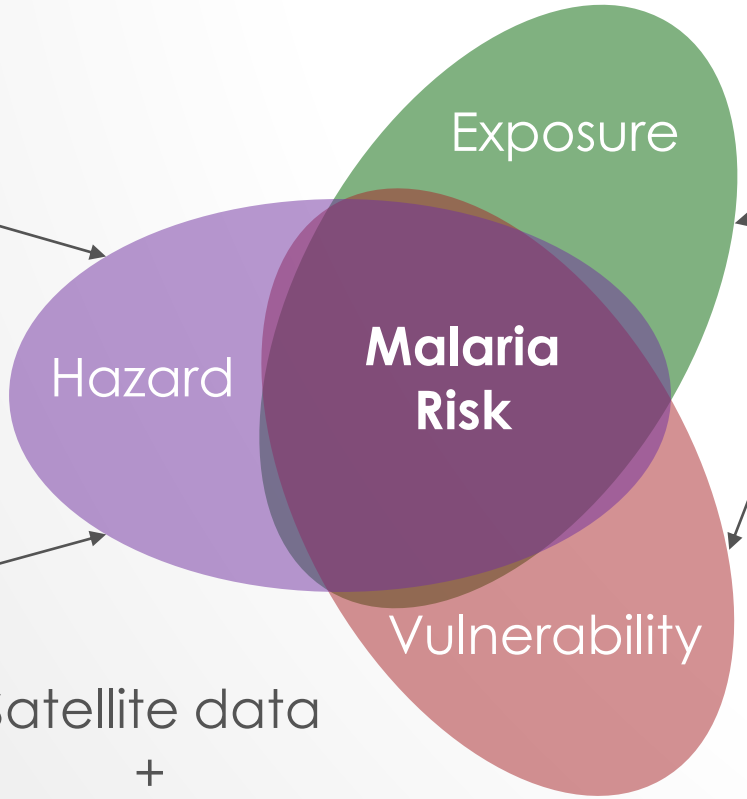
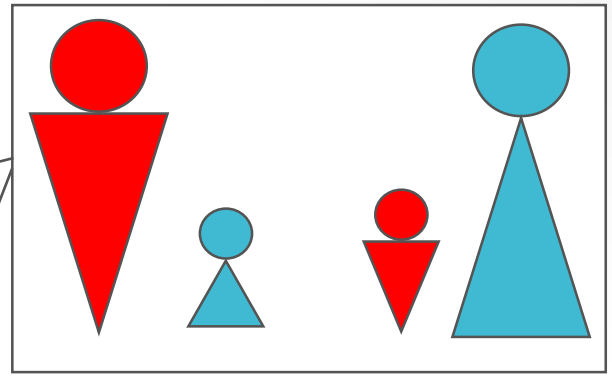
MALARIA RISK





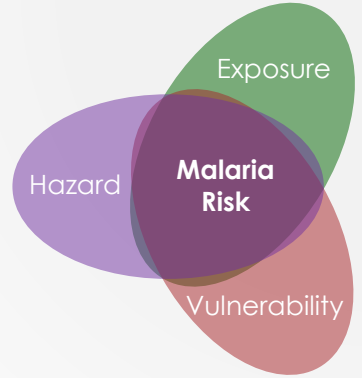




Satellite data
+
entomological surveys

Satellite data
+
auxiliary spatial data
+
CRF surveys

MALARIA BURDEN POTENTIAL (MBP)



Vector Abundance

- Surface Water (0.34)
- Surface T (0.33)
- Veg Stress (0.33)

8-day

Population Exposure/Vulnerability

- Population Distribution (0.25)
- Occupational Exposure (0.25)
- Access to Care (0.25)
- Parasitemia (0.25)

annual / as available

0.5 → MBP ← 0.5

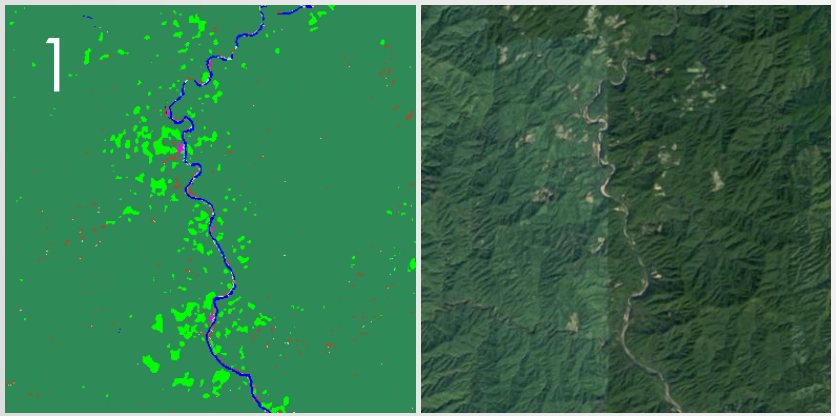
GENERAL APPROACH/SCHEDULE*

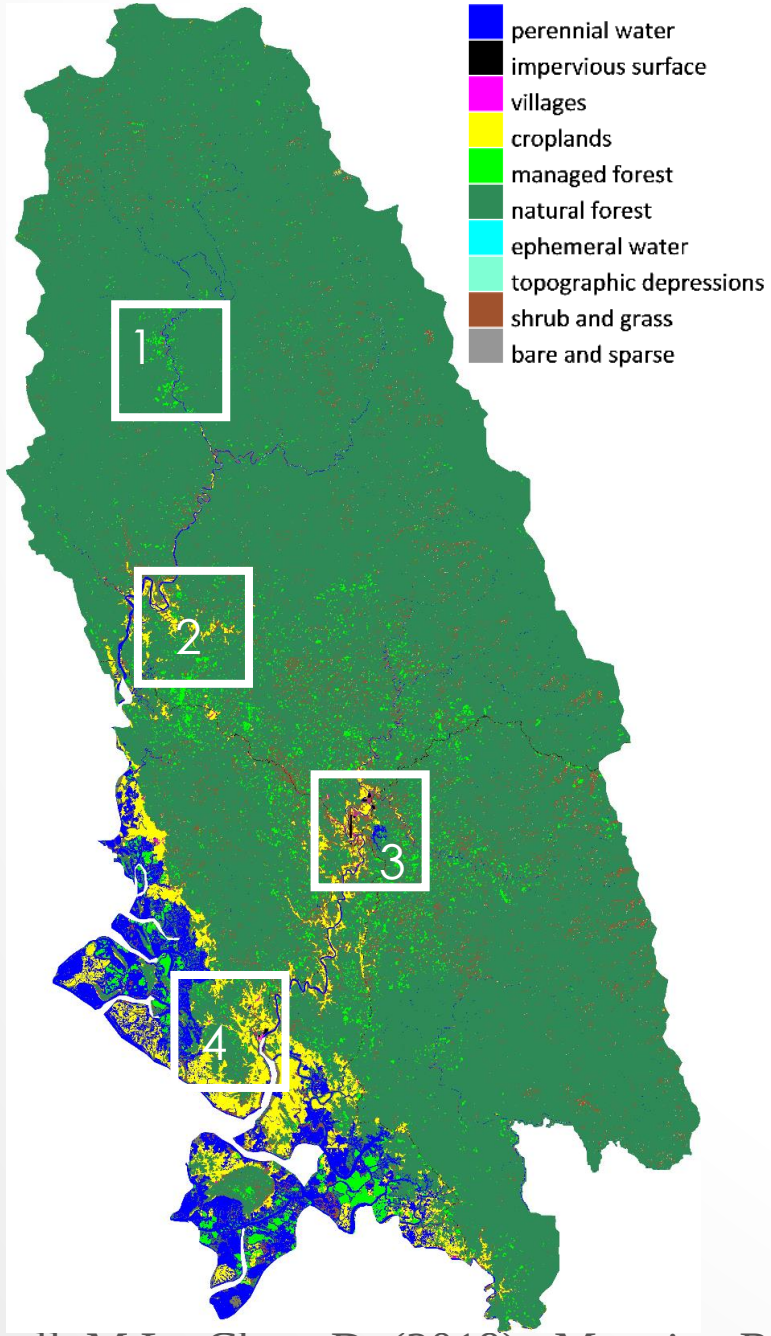
	Date
Baseline land cover land use map development	Sep, 2019
Monitoring capacity from data fusion of moderate and coarse resolution datasets	Feb, 2020
Threat levels and MMEWS reporting system	Aug, 2020
Testing, verification, and operational deployment	Dec, 2020
Capacity Building	every 6 mo
Stakeholder meetings	every 6 mo

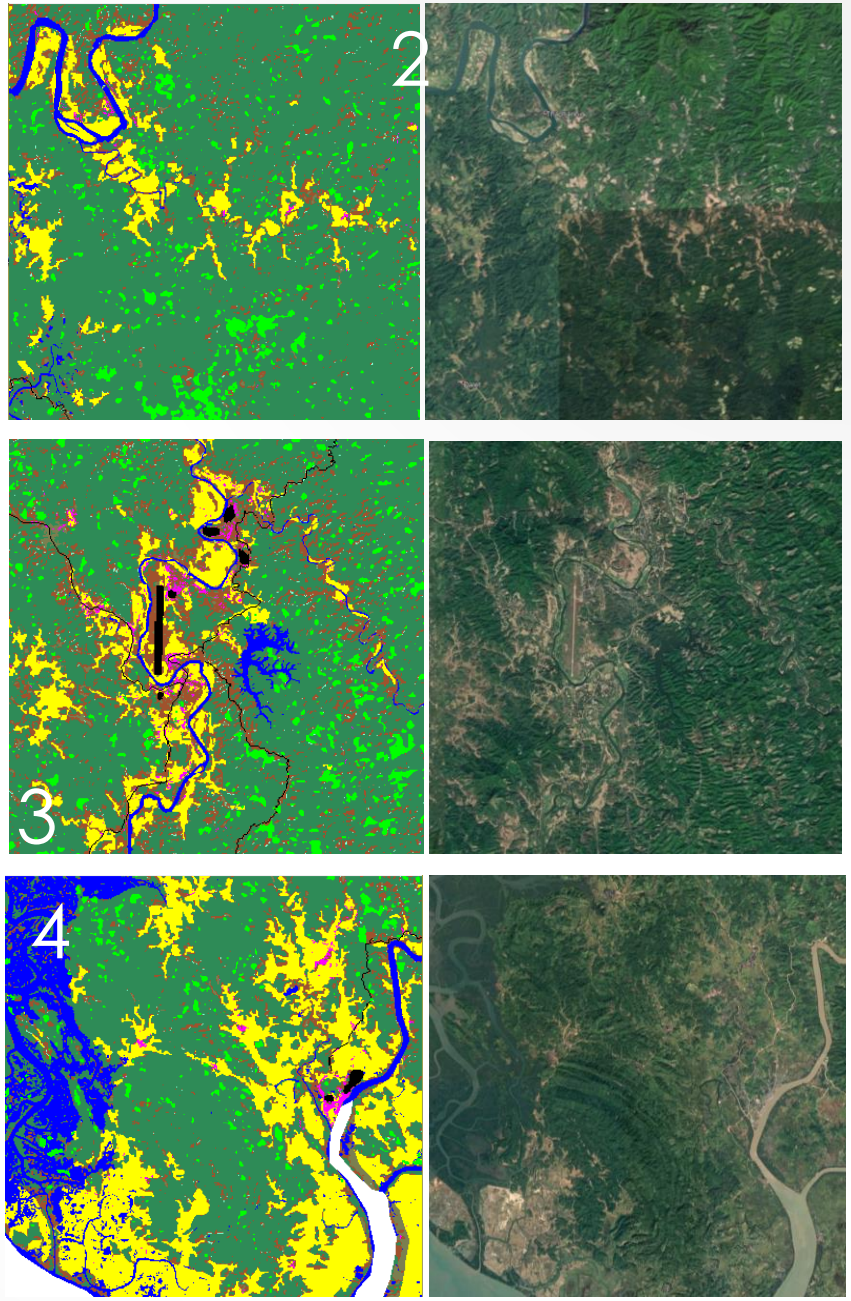
* As reported in Quarterly Report 6/21/2019

MAJOR ACHIEVEMENTS TO DATE

BASE MAP







Hoffman-Hall, A., Loboda, T.V., Hall, J.V., Carroll, M.L., Chen, D. (2019). Mapping Remote Rural Populations at 30 m Spatial Resolution Using Geospatial Data-Fusion. **Remote Sensing of Environment 233,** 111386.

FUZZY ACCURACY ASSESSMENT

Woodcock, C. E., & Gopal, S. 2000. Fuzzy set theory and thematic maps: accuracy assessment and area estimation. *International Journal of Geographical Information Science*, *14*(2), 153-172).

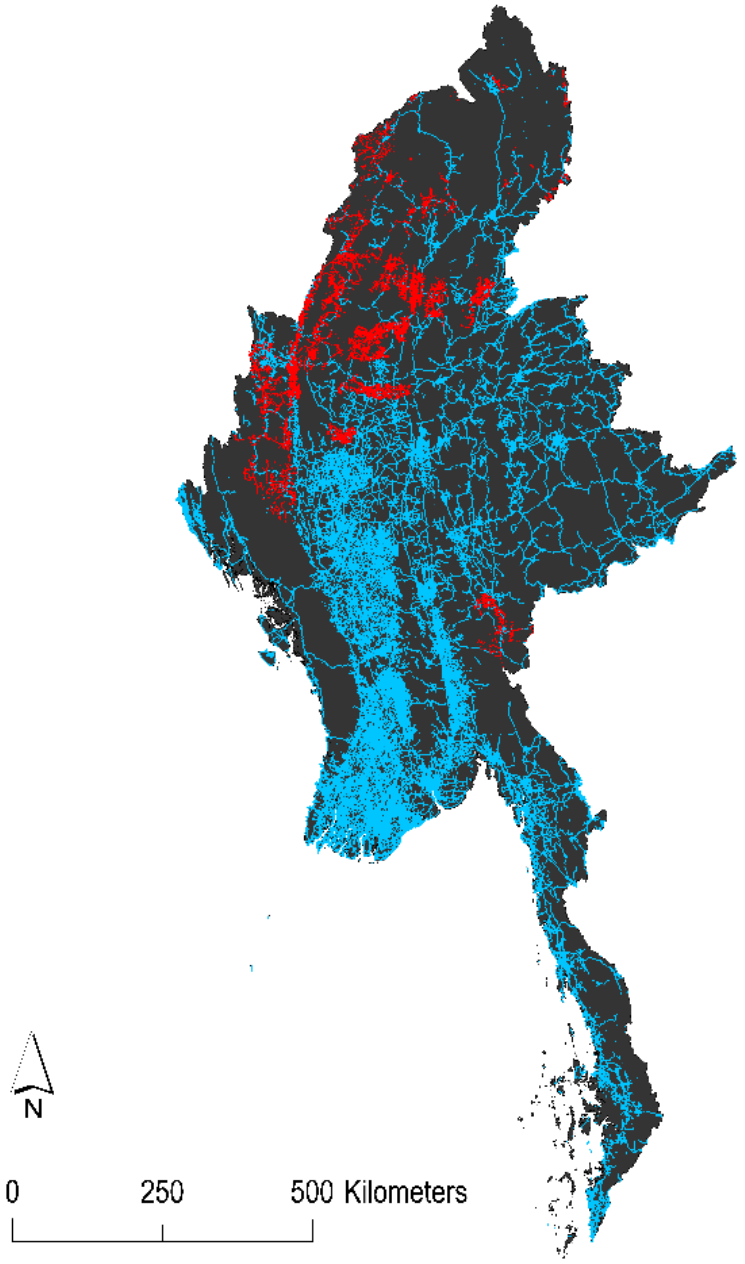
		Expert evaluation			
		Matches using		Improvement	
Map label	Plots	MAX (M)	Right (R)	(R-M)	Area weights
Perennial water	75	28.00%	34.67%	6.67%	0.043
Impervious surface	75	8.00%	48.00%	40.00%	0.001
Villages	75	58.67%	81.33%	22.67%	0.001
Croplands	75	68.00%	84.00%	16.00%	0.035
Managed forests	75	29.33%	48.00%	18.67%	0.057
Natural forests	308	74.35%	89.94%	15.58%	0.817
Shrub and grass	75	1.33%	20.00%	18.67%	0.038
Bare surfaces	75	0.00%	22.67%	22.67%	0.008
Accuracy	833	44.90%	63.75%	18.85%	
Accuracy total weighted		66.14%	81.73%	15.59%	

"MAX" and "RIGHT" operators were considered.

- MAX: "Highest rating given to a category for a given site to measure a match and provides a conservation estimate of accuracy"
- Right (R): "Accepts matches using any degree of right, which in the linguistic scale used here is any score greater than or equal to 3"
- Accuracy with fuzziness (tolerance of error) improves to 81.73% particularly useful for land covers at sub-pixel level

CHALLENGES (1): EXTREMELY POOR ROAD NETWORK

- Expanding upon the Humanitarian OpenStreetMap Team's Myanmar Roads (OpenStreetMap Export)
- Digitizing using Google Earth

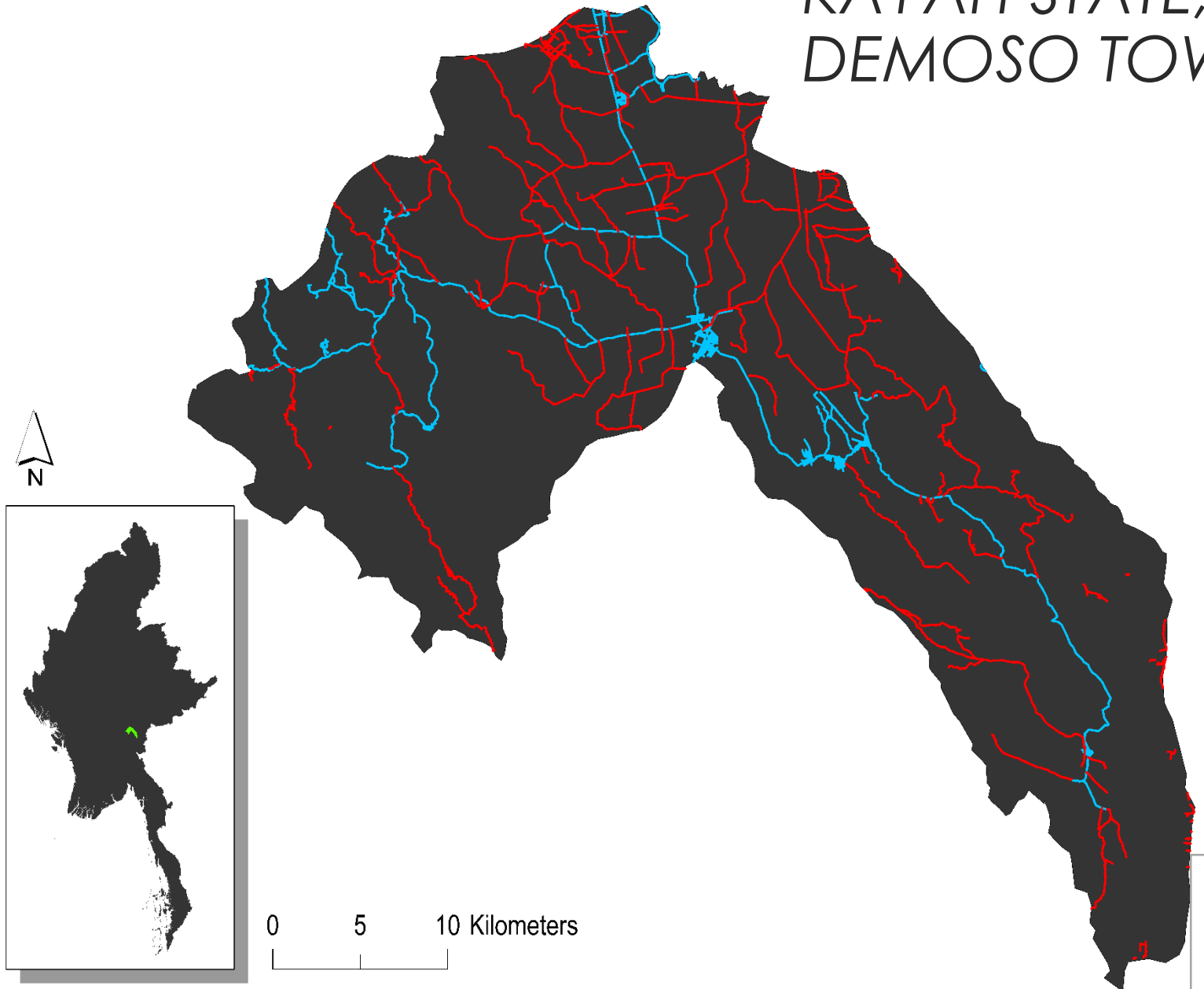


Legend

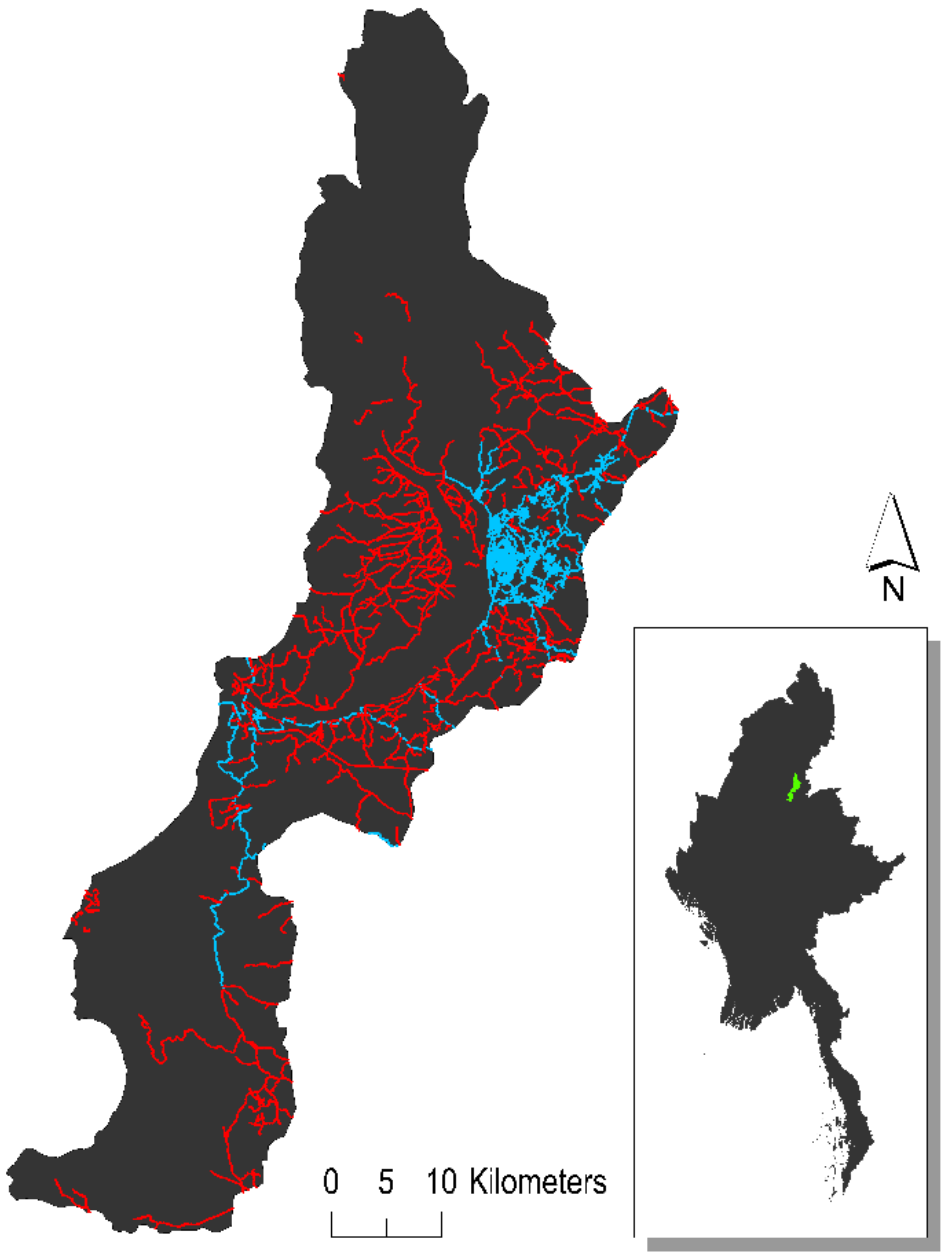
Base roads

Current effort

KAYAH STATE, DEMOSO TOWNSHIP



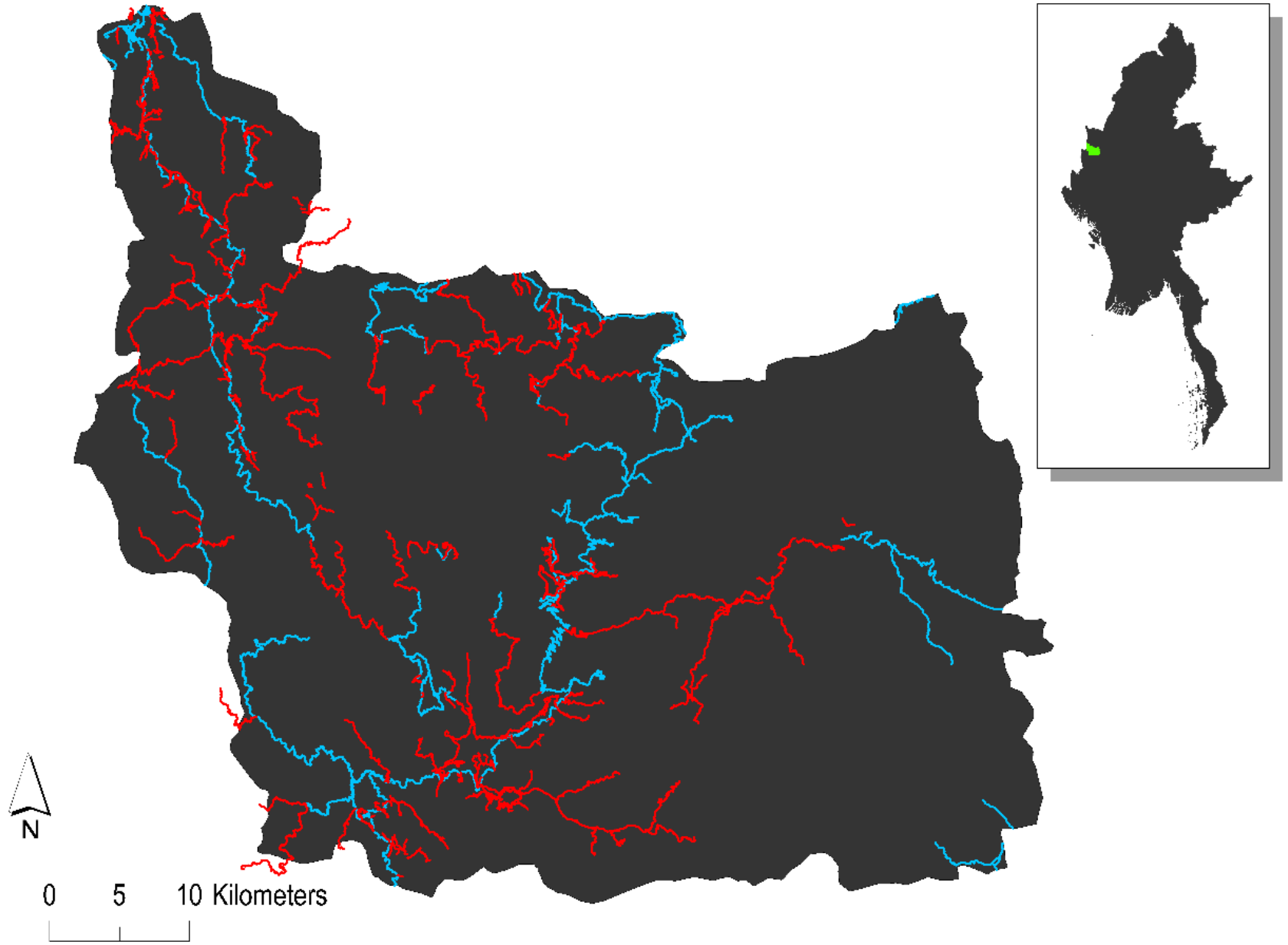
Kachin State, Bhamo Township



Legend

- Base roads
- Current effort
- Township area

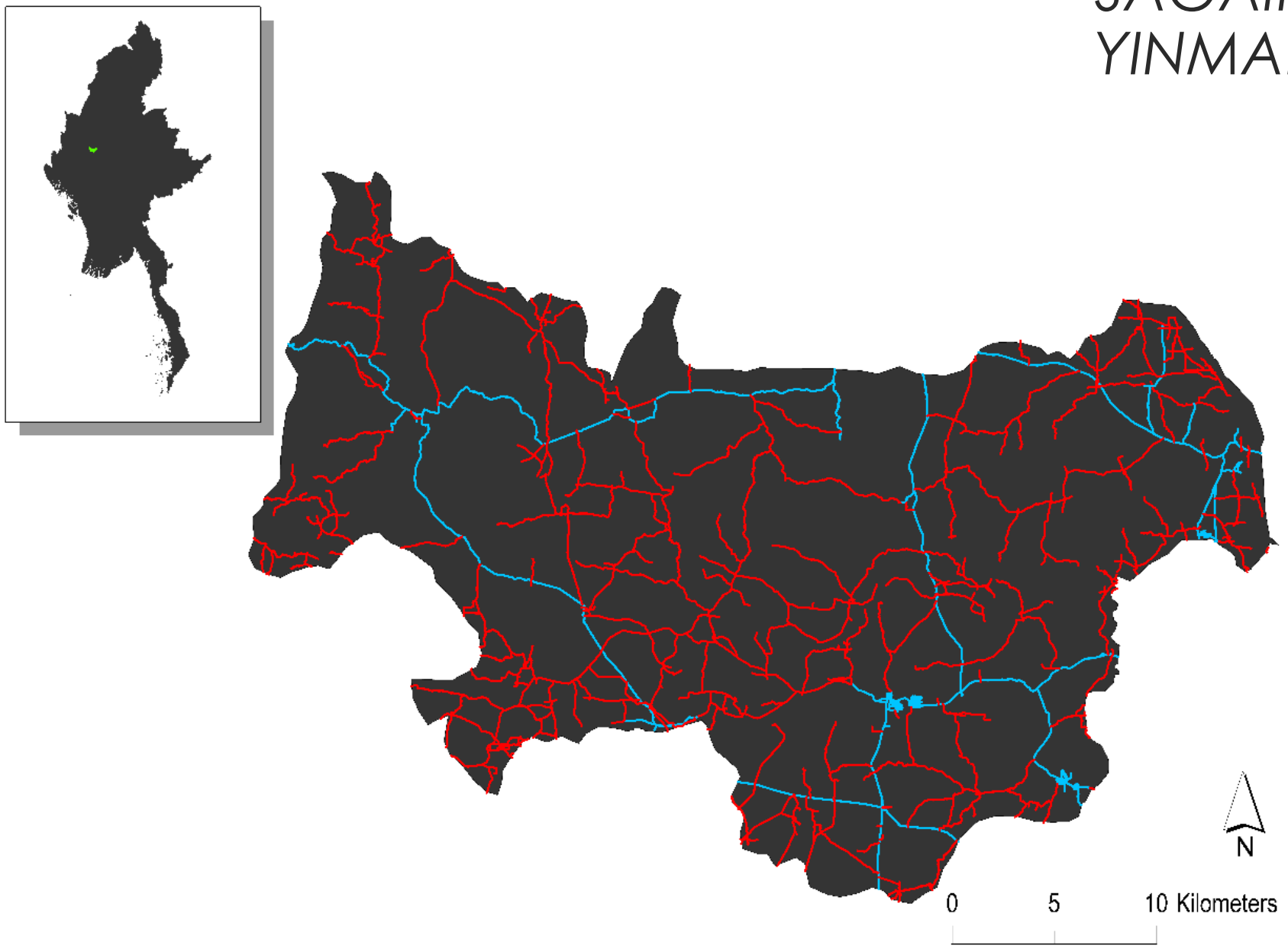
CHIN STATE, FALAM TOWNSHIP



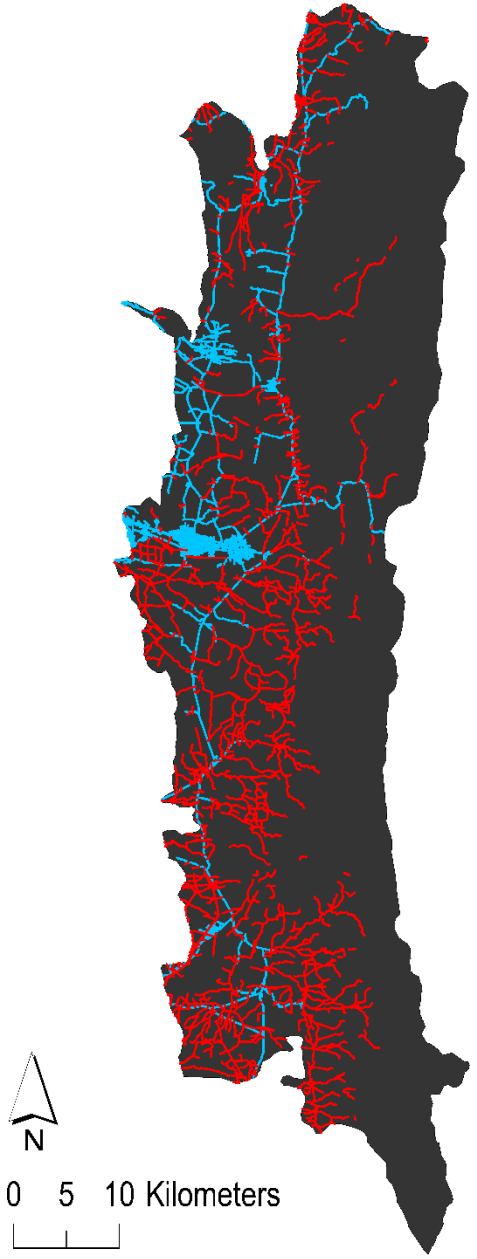
Legend

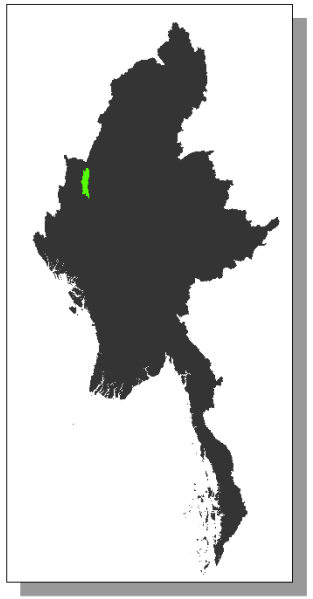
- Base roads
- Current effort
- Township area

SAGAING STATE, YINMARBIN TOWNSHIP



SAGAING STATE, KALE TOWNSHIP

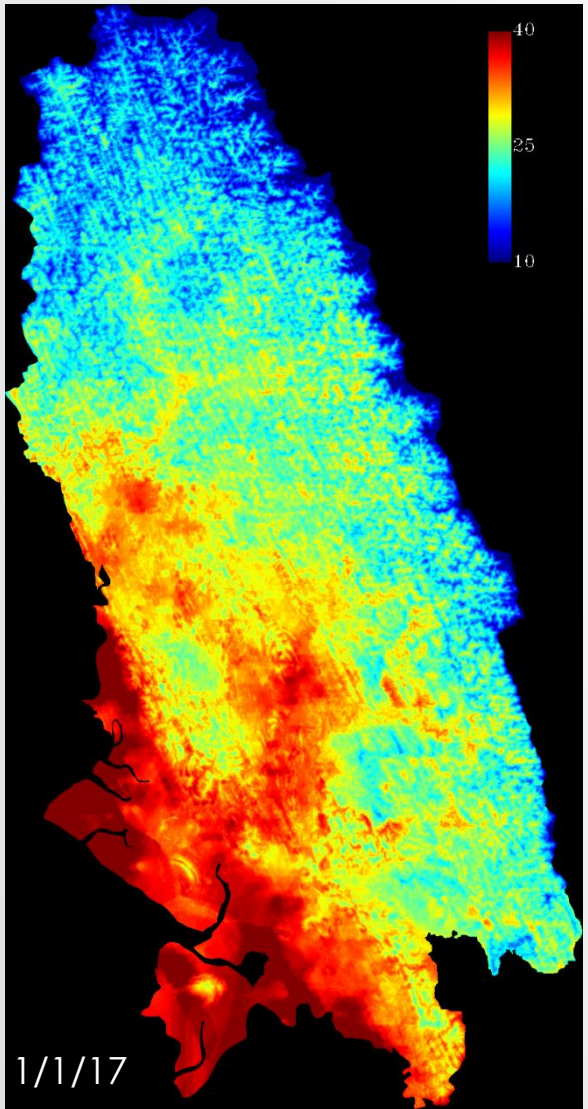


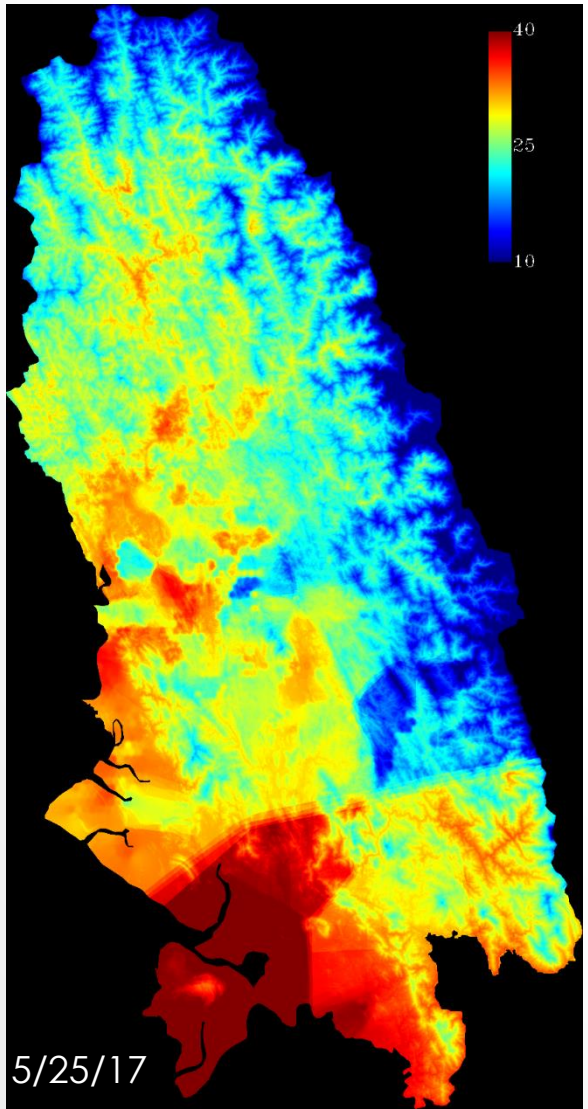


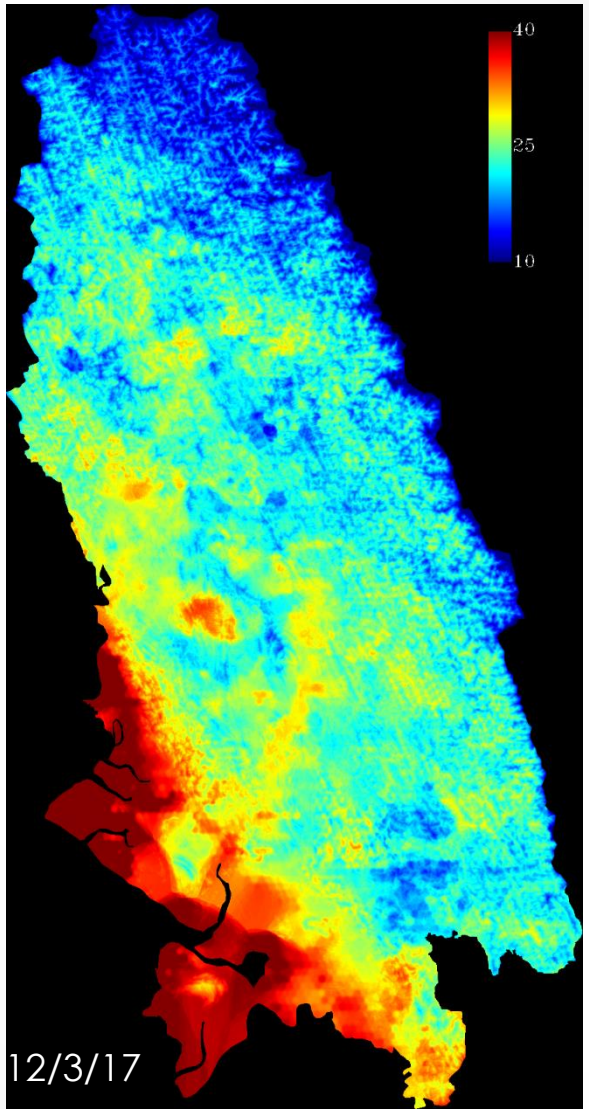
Legend

- Base roads
- Current effort Township area

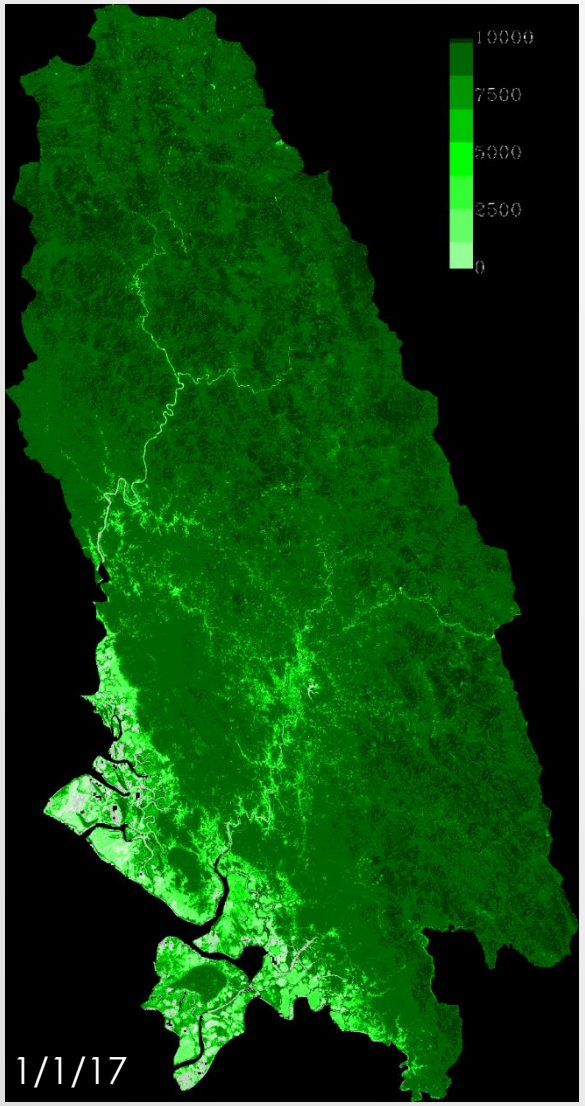
DATA FUSION FOR ENVIRONMENTAL MONITORING: LAND SURFACE TEMPERATURE

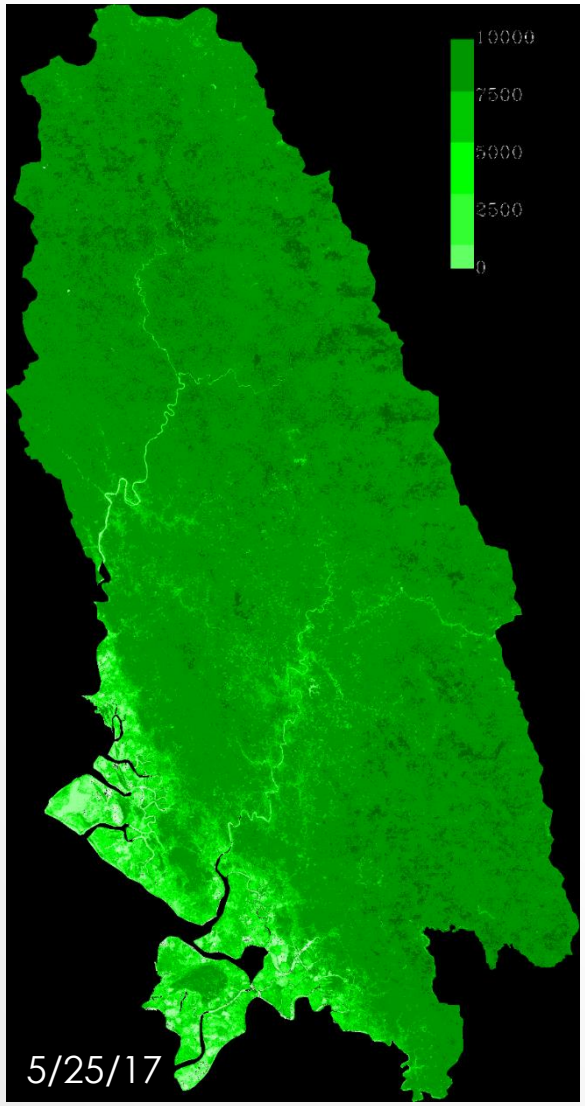


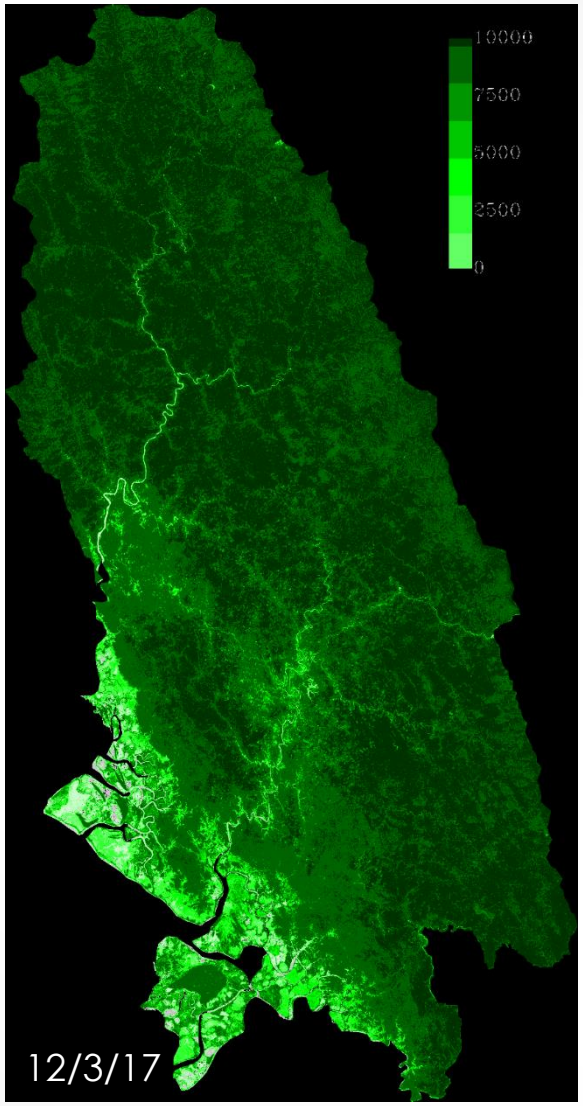




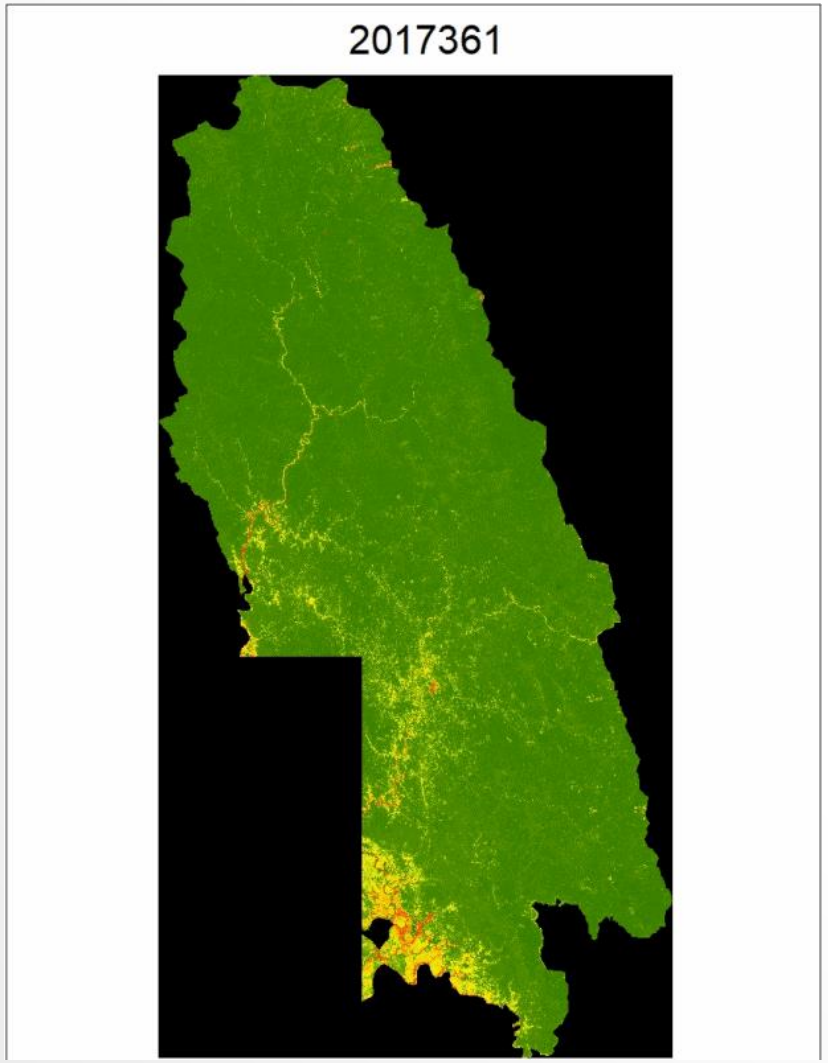
DATA FUSION FOR ENVIRONMENTAL MONITORING: VEGETATIVE STRESS







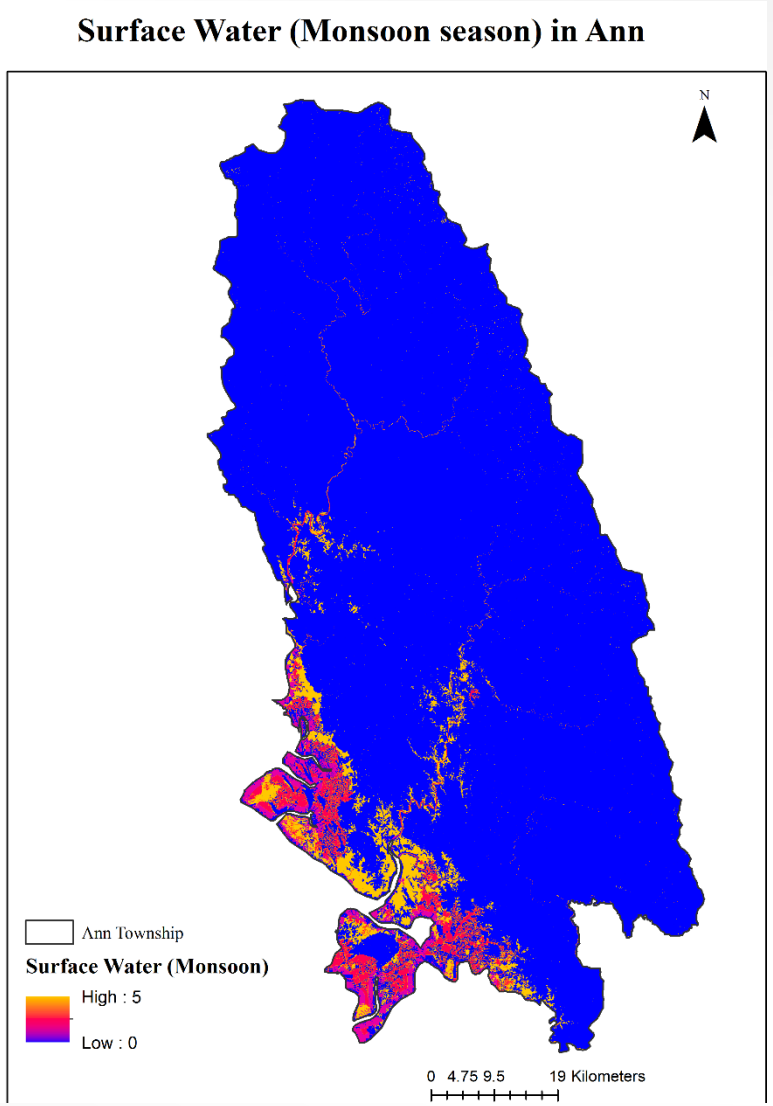
CHALLENGES (2): NDVI MAPPING DURING THE MONSOON



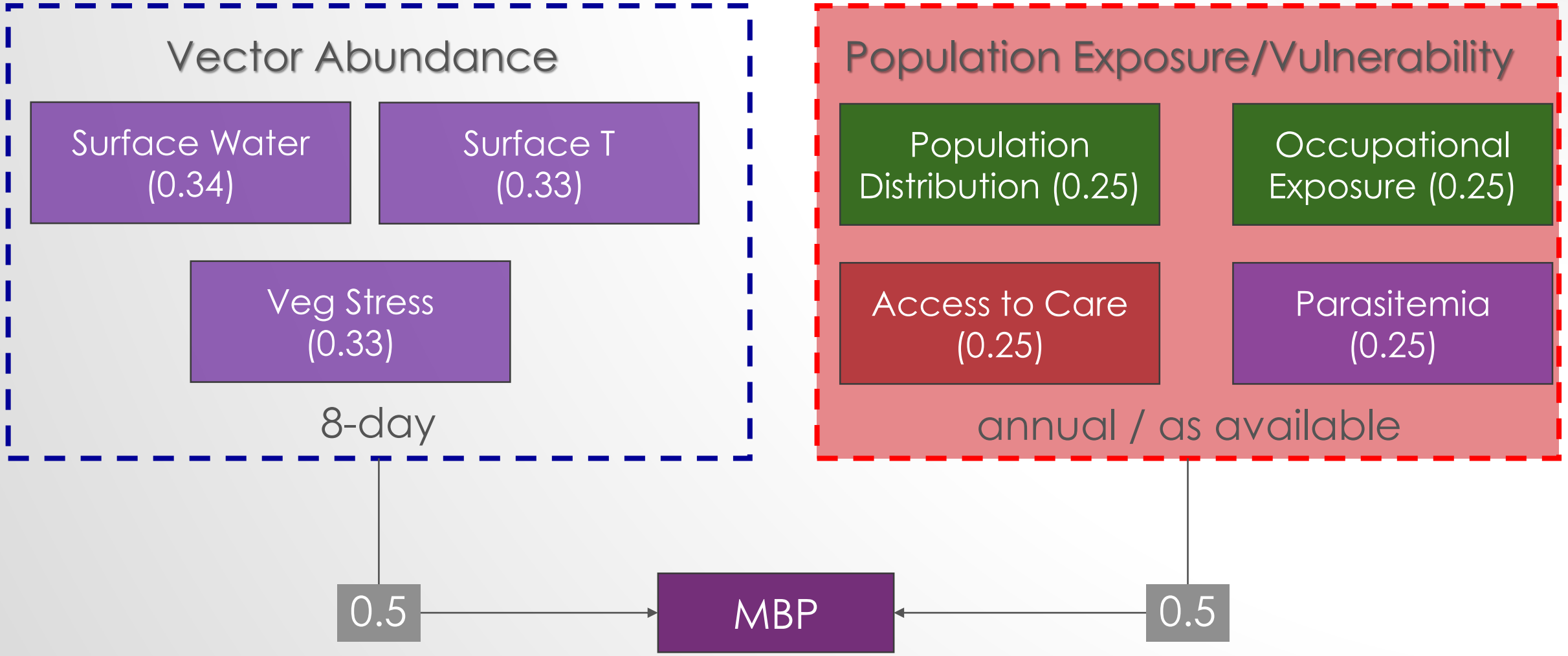
CHALLENGES (3): POOR RADAR-BASED DISCRIMINATION OF EPHEMERAL WATER

Inputs - Surface water from the surface water fraction (SWF) algorithm (DeVries et al. 2017)

- Buffer water polygons to distinguish between deep / running water and edges of water bodies
- Buffer coastal areas to identify coastal wetlands
- Dry season – Depressions and croplands considered 'No water'
- Monsoon – Add depressions and croplands from basemap to the 'Very high' category



ASSESSING EXPOSURE AND VULNERABILITY

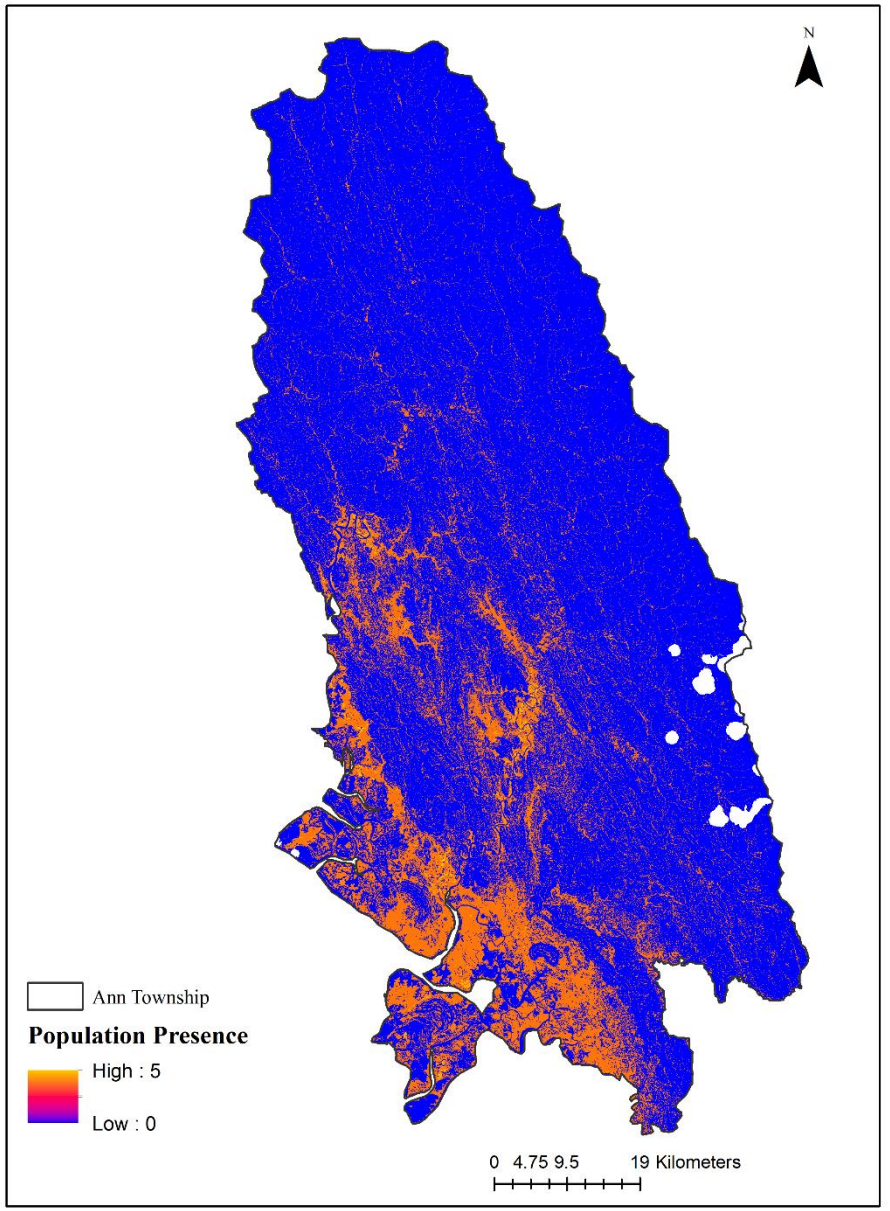


POPULATION PRESENCE

Inputs - Census 2014 population data for village tracts

- Population distributed across Ann and rescaled.
- Population distribution modeled based on –

- road proximity
- land cover
- mapped settlements (Hoffman et al. 2019)
- slope



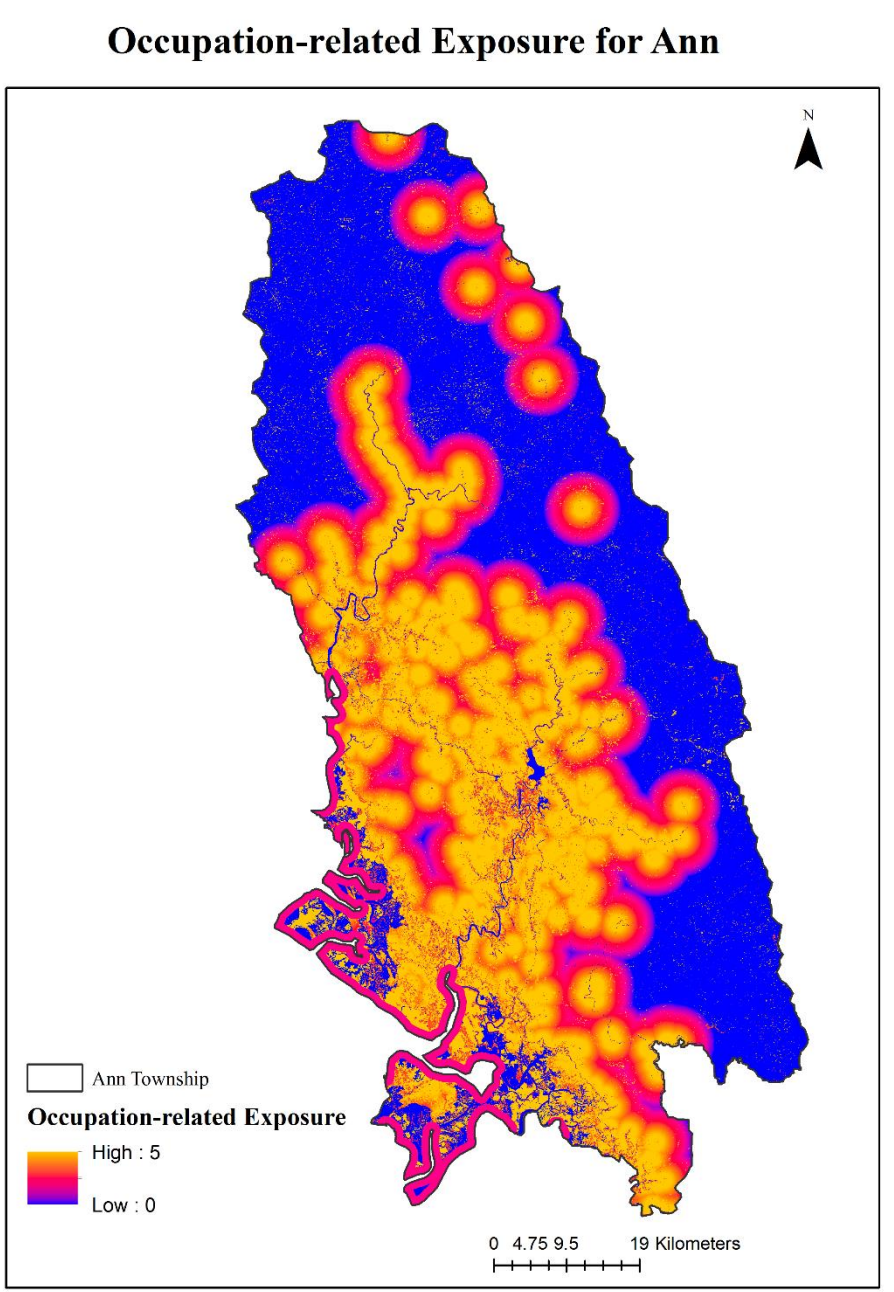
ACCESS TO CARE COST

<u>Inputs</u> - Hospitals, Roads

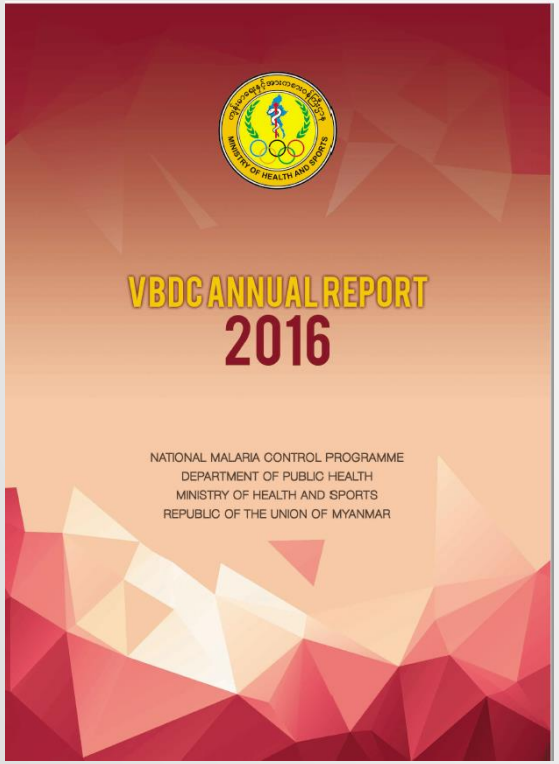
- Travel cost to hospitals
- Using Distance to roads

OCCUPATION-RELATED EXPOSURE

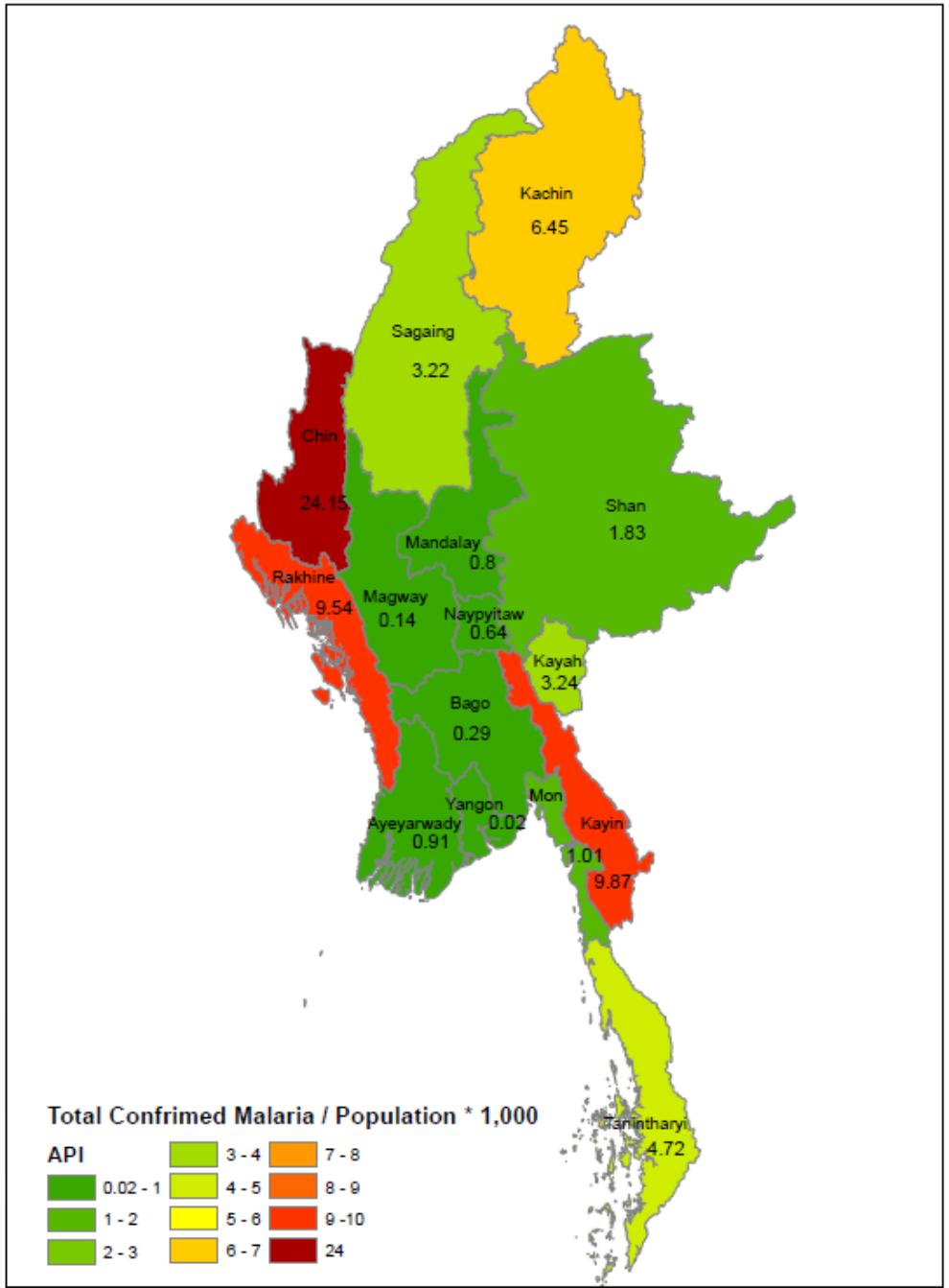
- *Inputs – Basemap*
- Identify coastal areas using a buffer
- Distinguish subsistence natural forests using buffers around settlements. Exposure values reduce with distance in forests > 1km from settlements
- Add Ann urban wards (MIMU) to identify urban areas with low exposure



PARASITEMIA



Annual Parasite Incidence (API) by State/Region



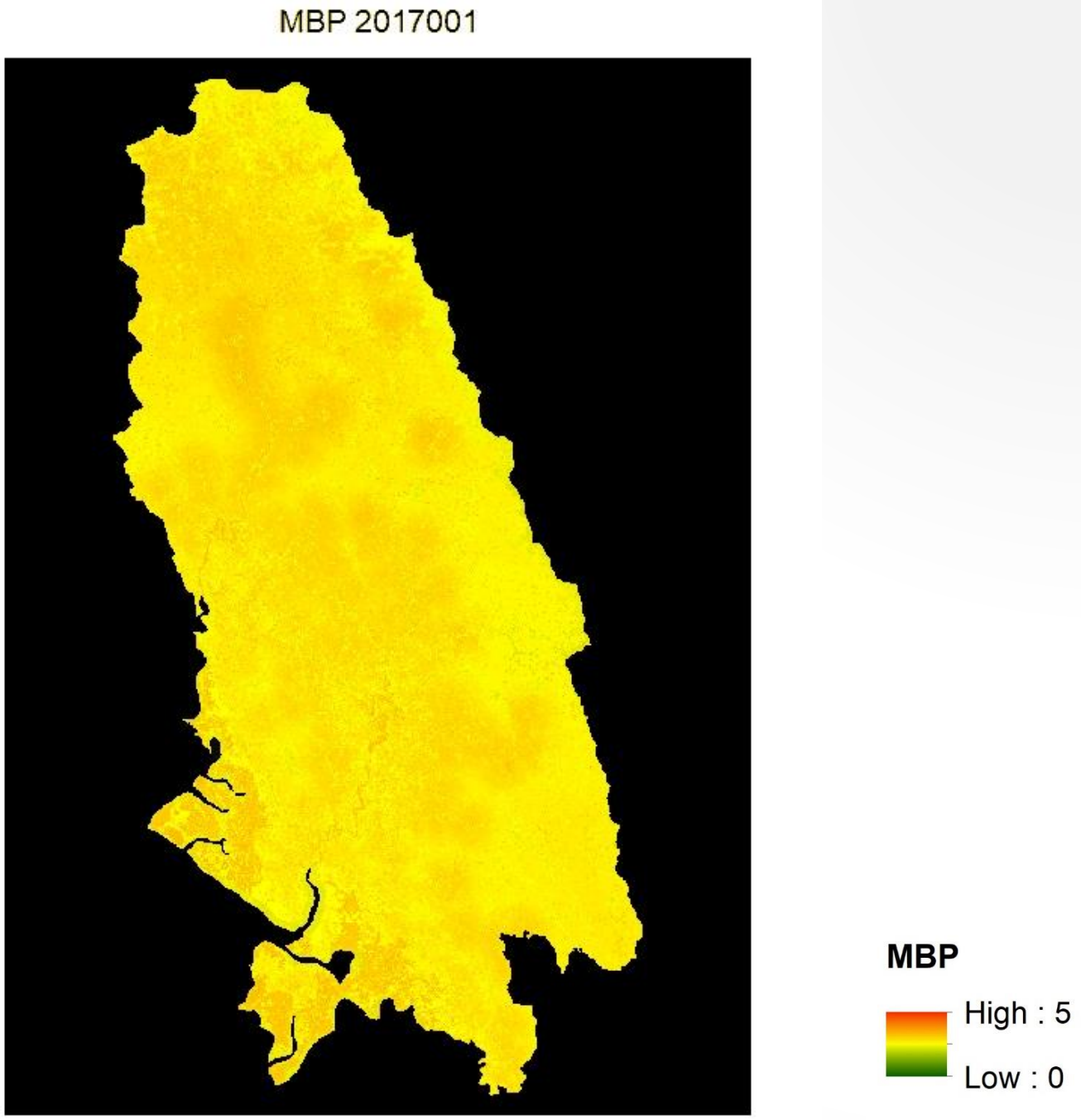
MBP REPORTING

- Spatially-explicit reports (i.e. maps):
  - Country-wide
  - 30-m resolution
  - 8-day update

- Aggregated tabular reports (i.e. text reports)
  - Country-wide
  - Mean-township level
  - 8-day update

MBP MODELING FOR ANN TOWNSHIP

ARL 4:
Initial Integration and Verification (Prototype Developed)



NEXT STEPS

- October/November:
  - in-country meeting with health care professionals to discuss the modeling outcomes and seek the input on the model parameterization
  - Discussions with the divisions of he Ministry of Health to access data for model validation
  - Capacity-building workshop at the University of Pubic Health

- Introduce modifications to the Ann Township model
- Proceed with executing the model country-wide

GENERAL APPROACH/SCHEDULE*

	Date
Baseline land cover land use map development	*Dec, 2019*
Monitoring capacity from data fusion of moderate and coarse resolution datasets	Feb, 2020
Threat levels and MMEWS reporting system	Aug, 2020
Testing, verification, and operational deployment	Dec, 2020
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QUESTIONS?