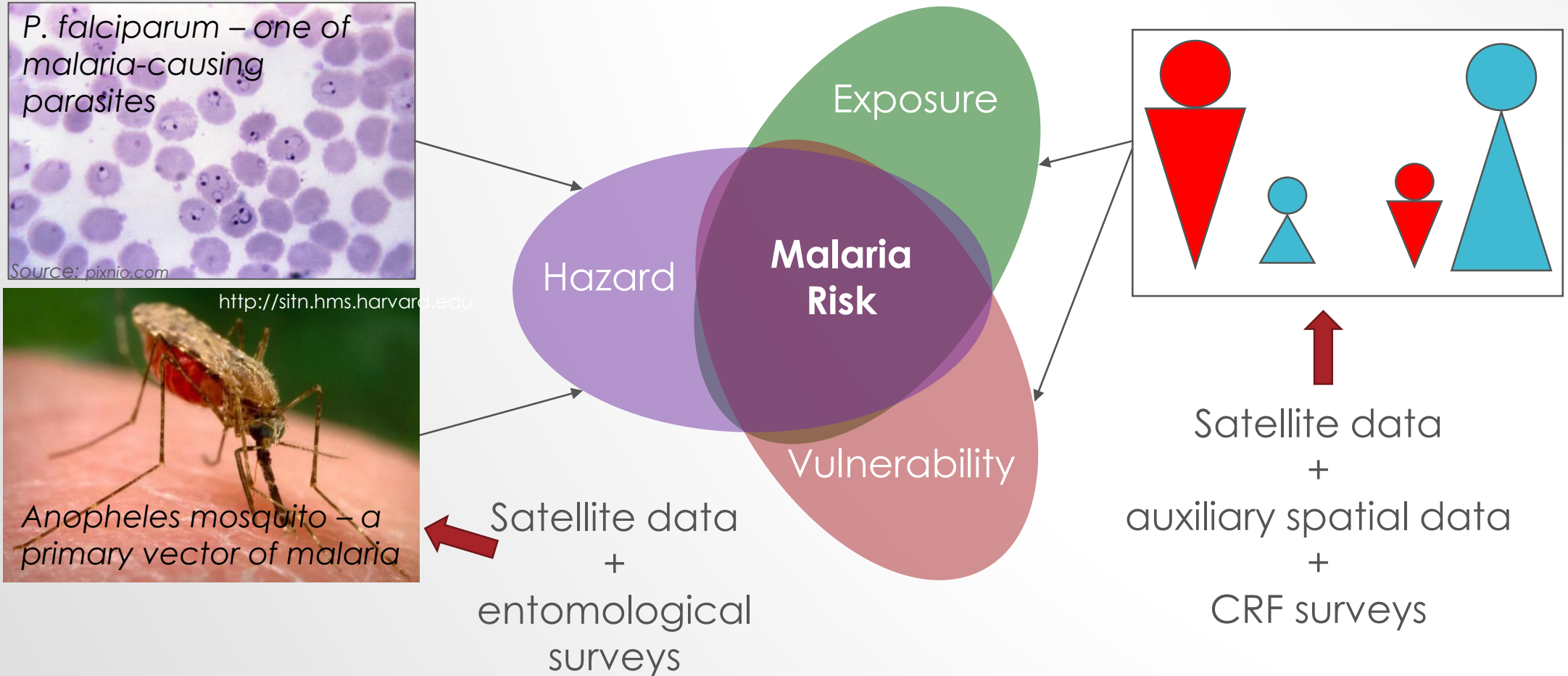# MYANMAR MALARIA EARLY WARNING SYSTEM (MMEWS)

Tatiana Loboda, Dong Chen, Varada Shevade, Amanda Hoffman-Hall, Jiaying He, Allison Baer
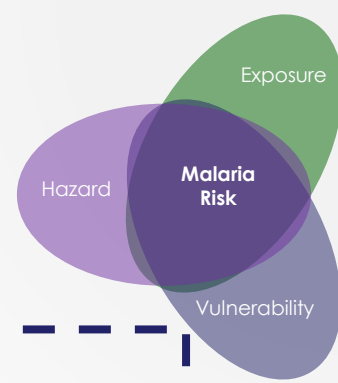Department of Geographical Sciences, University of Maryland

Christopher Plowe, Myaing Myaing Nyunt
Formerly Duke University

Poe Poe Aung
Duke Global Health Institute, Myanmar

MALARIA RISK

P. falciparum – one of malaria-causing parasites

Source: pixnio.com

http://sitn.hms.harvard.edu

Anopheles mosquito – a primary vector of malaria

Exposure

Hazard

Malaria Risk

Vulnerability

Satellite data
+
entomological
surveys

Satellite data
+
auxiliary spatial data
+
CRF surveys

MALARIA BURDEN POTENTIAL (MBP) NEW

Hazard
as available

Parasitemia (0.5)

Vector Abundance

Surface Water (0.167)

Surface T (0.167)

Veg Stress (0.166)

8-day

Exposure
annual / as available

Population Distribution (0.4)
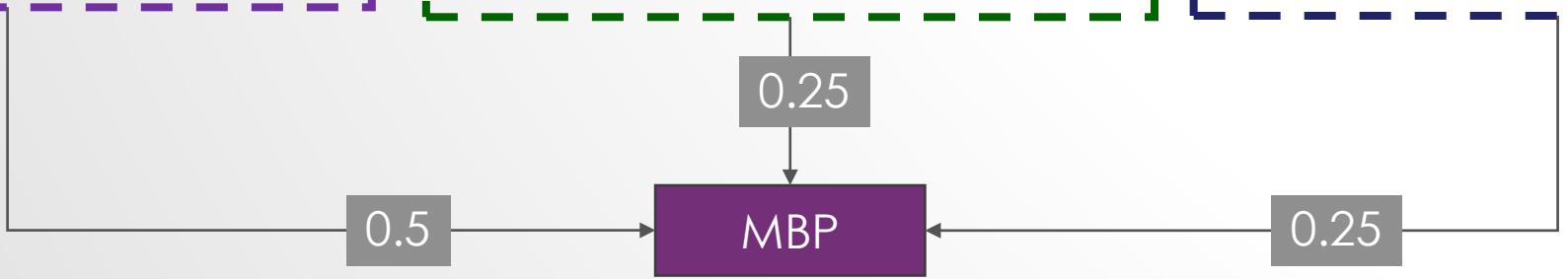
Occupational Exposure (0.6)

Vulnerability
annual / as available

Access to Care (0.6)

Social Vulnerability (0.4)

0.25

0.5

MBP

0.25

Exposure

Hazard

Malaria Risk

Vulnerability

MAJOR ACHIEVEMENTS TO DATE

GENERAL APPROACH/SCHEDULE*

	Date
Baseline land cover land use map development	Mar, 2020
Monitoring capacity from data fusion of moderate and coarse resolution datasets	Apr, 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 6/21/2020

STAKEHOLDER MEETING
(NOV 2019, MYANMAR - JANUARY 2020, DUKE, NC)

- Presented the prototype of the model

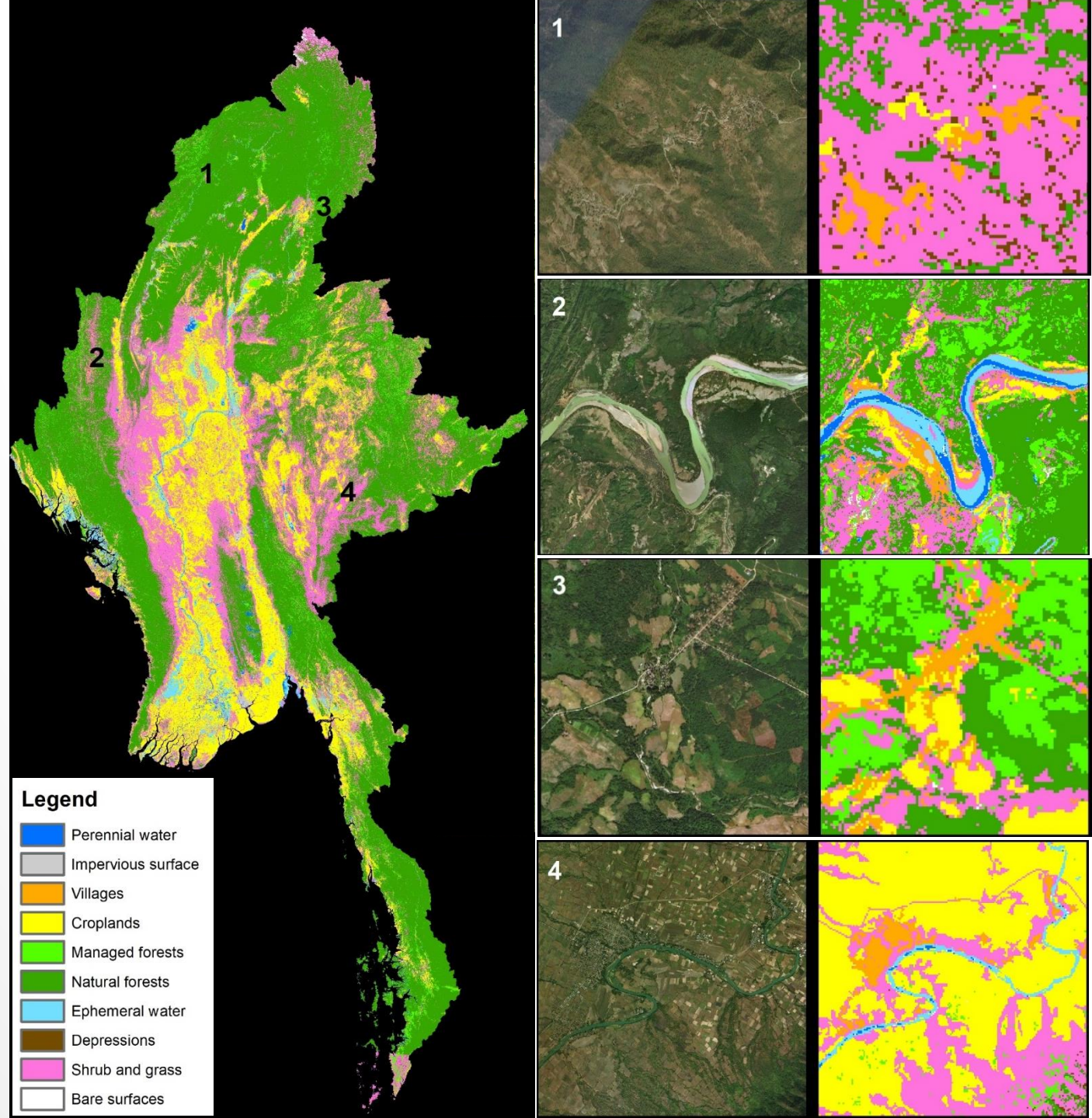- Discussed model parameterization

- Received ample feedback

GENERAL APPROACH/SCHEDULE*

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BASE MAP

- Chen, D., Baer, A., He, J., Hoffman-Hall, A., Shevade, V., Ying, Q., Loboda, T.V. 2020. Land cover land use map for Myanmar at 30-m resolution for 2016. PANGAEA, https://doi.pangaea.de/10.1594/PANGAEA.921126


Legend

■ (blue)	Perennial water
■ (grey)	Impervious surface
■ (orange)	Villages
■ (yellow)	Croplands
■ (light green)	Managed forests
■ (dark green)	Natural forests
■ (light blue)	Ephemeral water
■ (brown)	Depressions
■ (pink)	Shrub and grass
■ (white)	Bare surfaces

30 M LAND SURFACE TEMPERATURE

Only with Satellite observations

Town	Daytime		Nighttime	
	R2 adj	Pval	R2 adj	Pval
Monghsat	0.21	**	0.55	***
Lashio	0.57	***	0.71	***
Puta-O	0.44	***	0.04	0.14
Phyu	0.64	***	0.68	***
Pinlebu	0.60	***	0.83	***
Labutta	0.62	***	0.59	***
Pauk	0.73	***	0.49	***
Ann	0.55	***	0.60	***
Falam	0.46	***	0.79	***
He Hoe	0.51	***	0.69	***
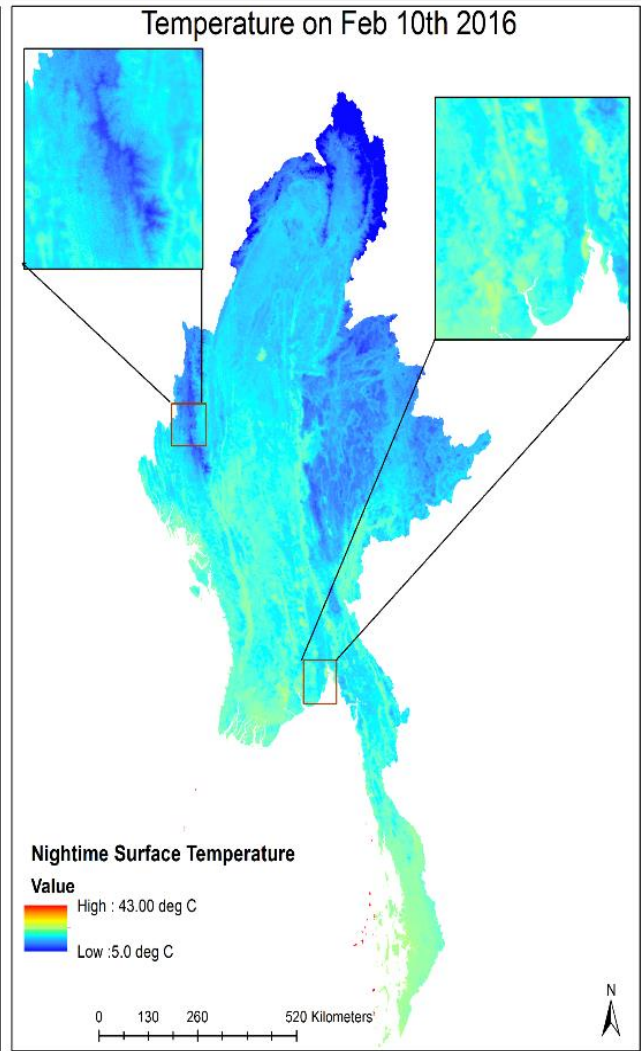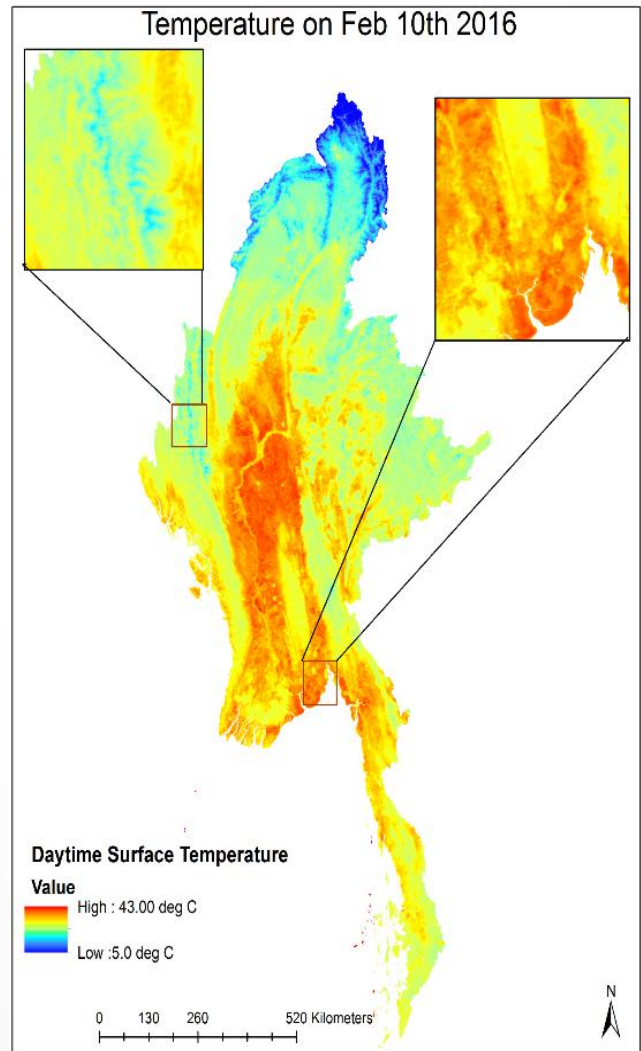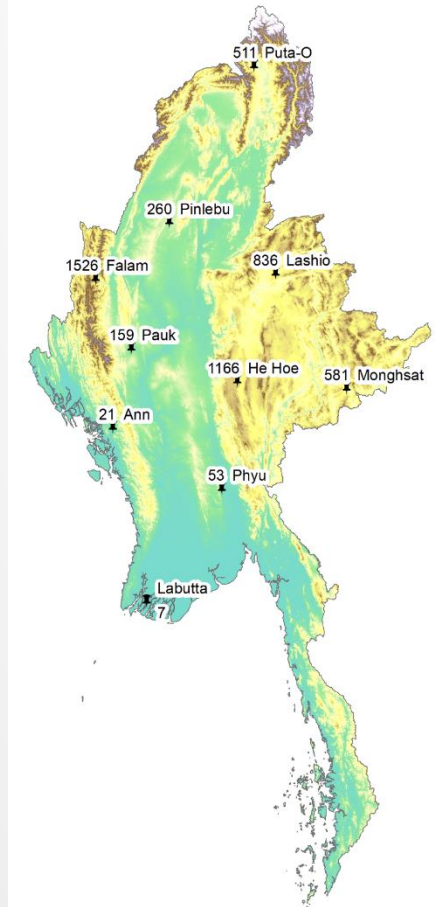
2018 daily records for 10 stations

30 M LAND SURFACE TEMPERATURE

All days

Town	Daytime		Nighttime	
	R2 adj	Pval	R2 adj	Pval
Monghsat	0.24	***	0.49	***
Lashio	0.34	***	0.68	***
Puta-O	0.19	**	0.01	0.24
Phyu	0.75	***	0.15	**
Pinlebu	0.48	***	0.82	***
Labutta	0.38	***	0.47	***
Pauk	0.48	***	0.42	***
Ann	0.40	***	0.45	***
Falam	0.53	***	0.72	***
He Hoe	0.39	***	0.72	***
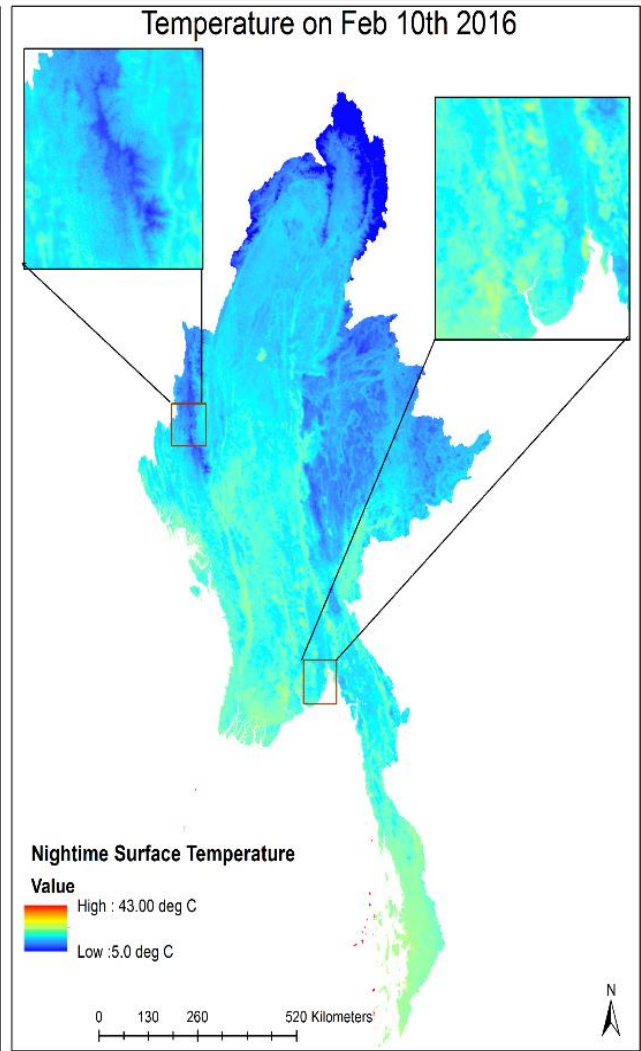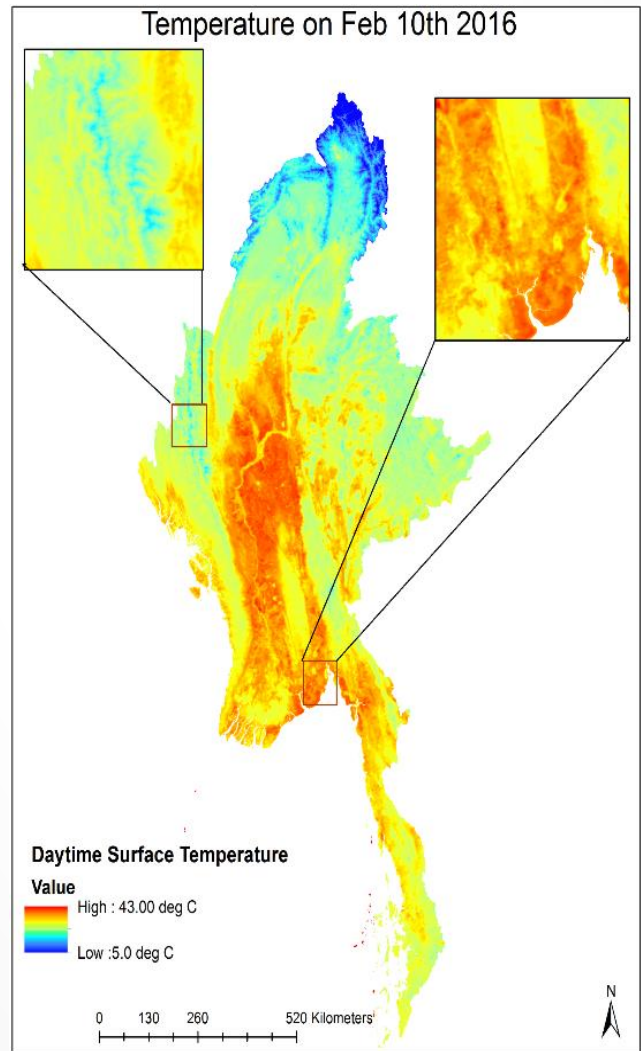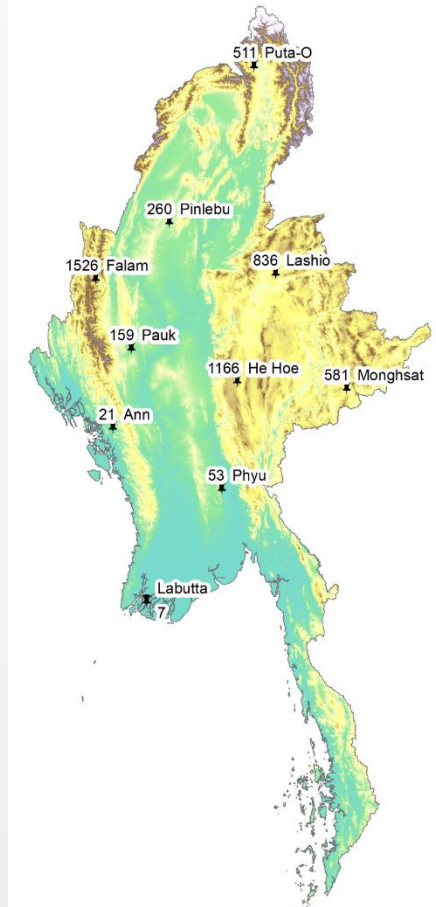
2018 daily records for 10 stations

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MYANMAR-WIDE MBP MODEL

- Wall-to-wall model of Malaria Burden Potential
  - 30 m resolution
  - 8-day update
  - 1 – 2 months forecast

- Executed: 2017 and 2018

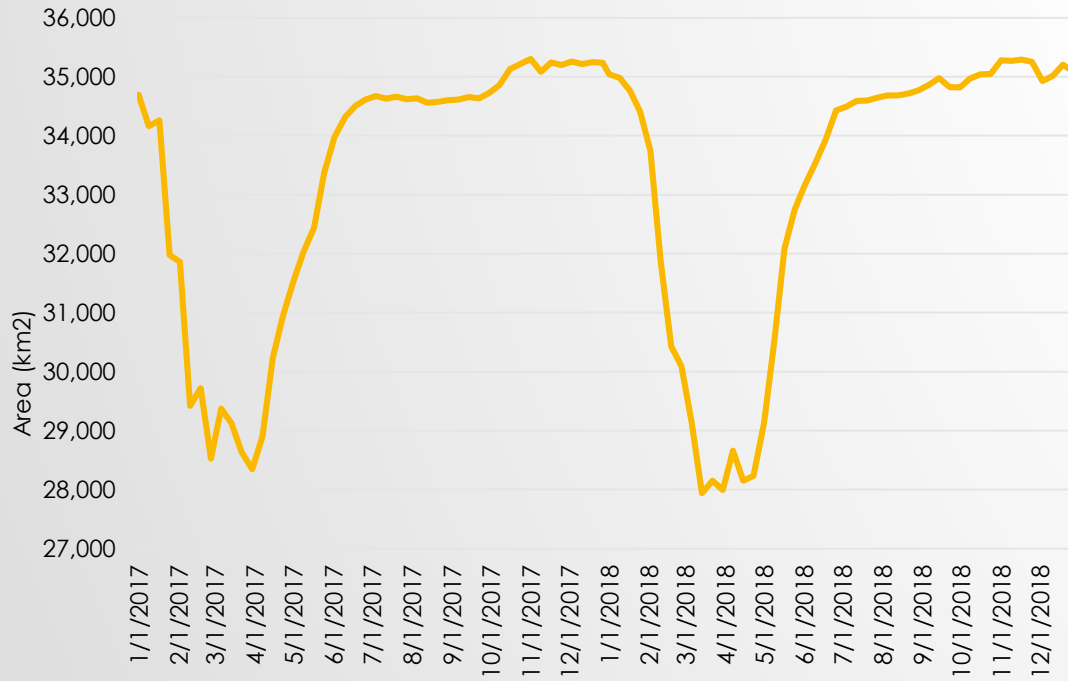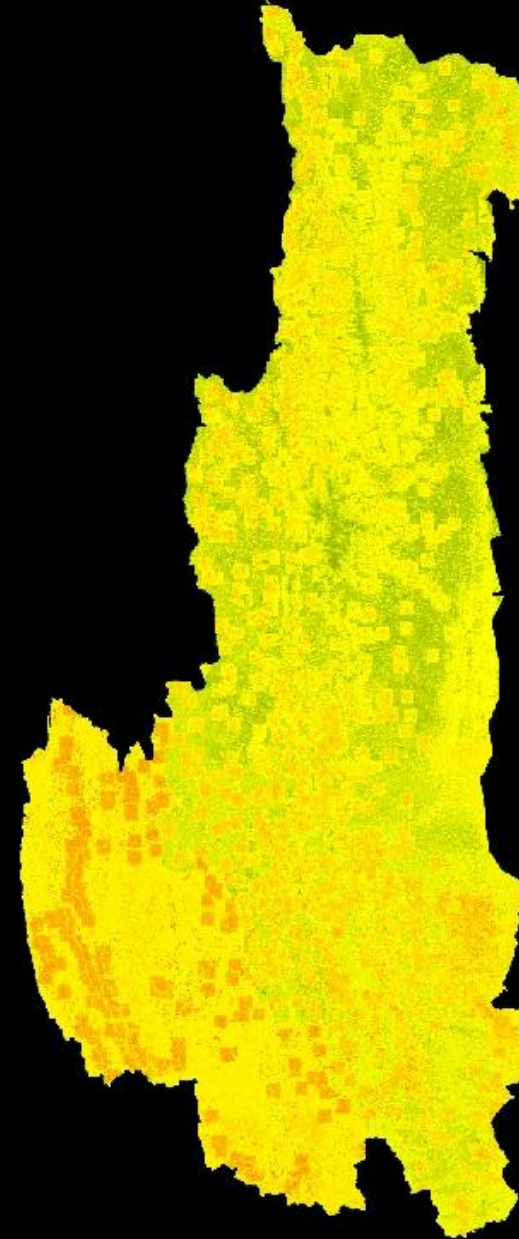- In progress: 2014 – 2016, 2019, 2020

Malaria Burden Potential
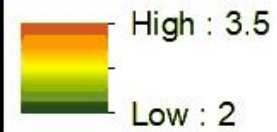
High : 5

Low   1

MBP
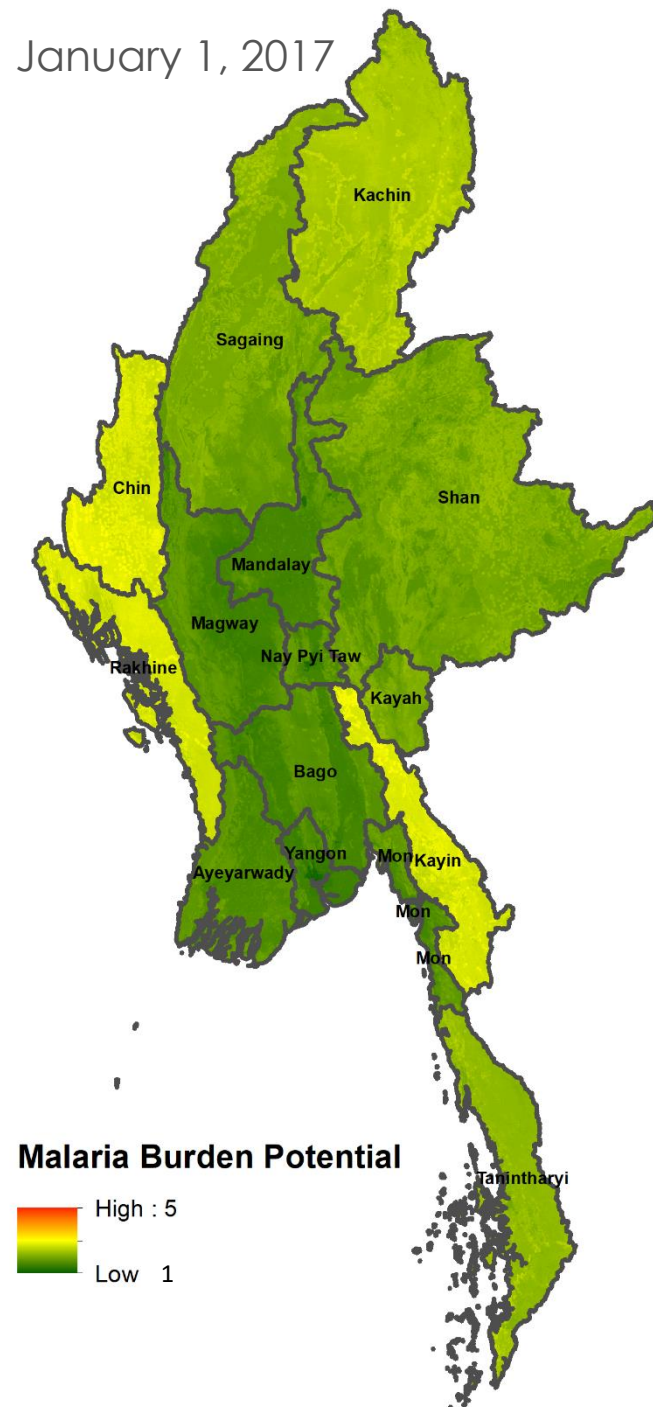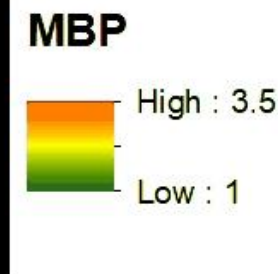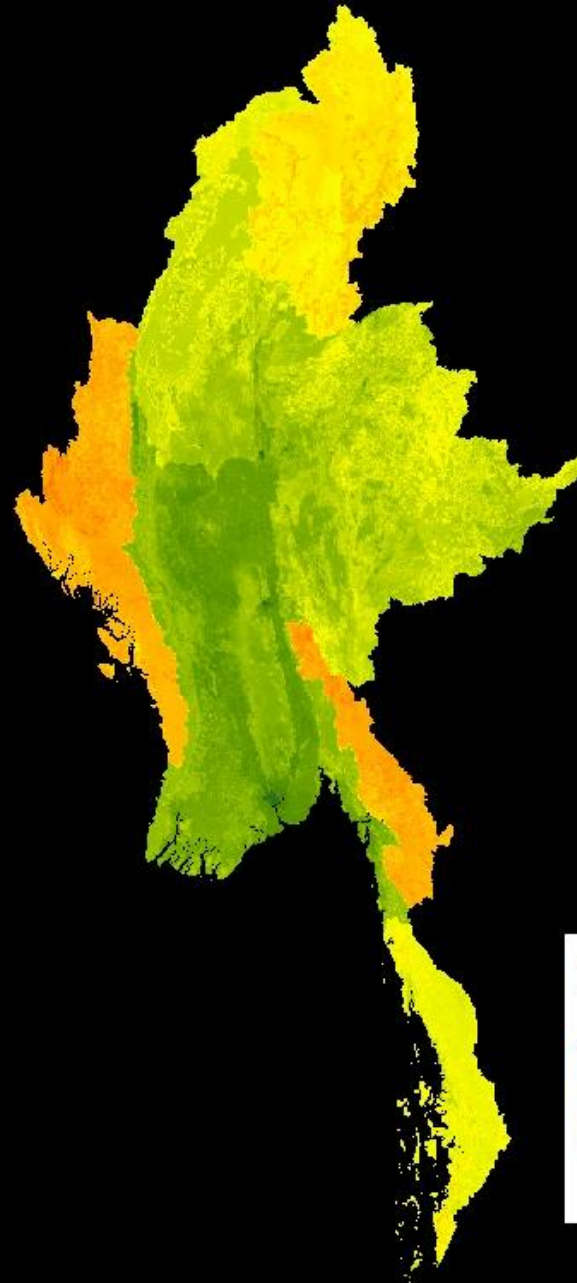
MBP: HIGH RISK CHIN

Area under "Moderate (2.5 – 3.5)" risk
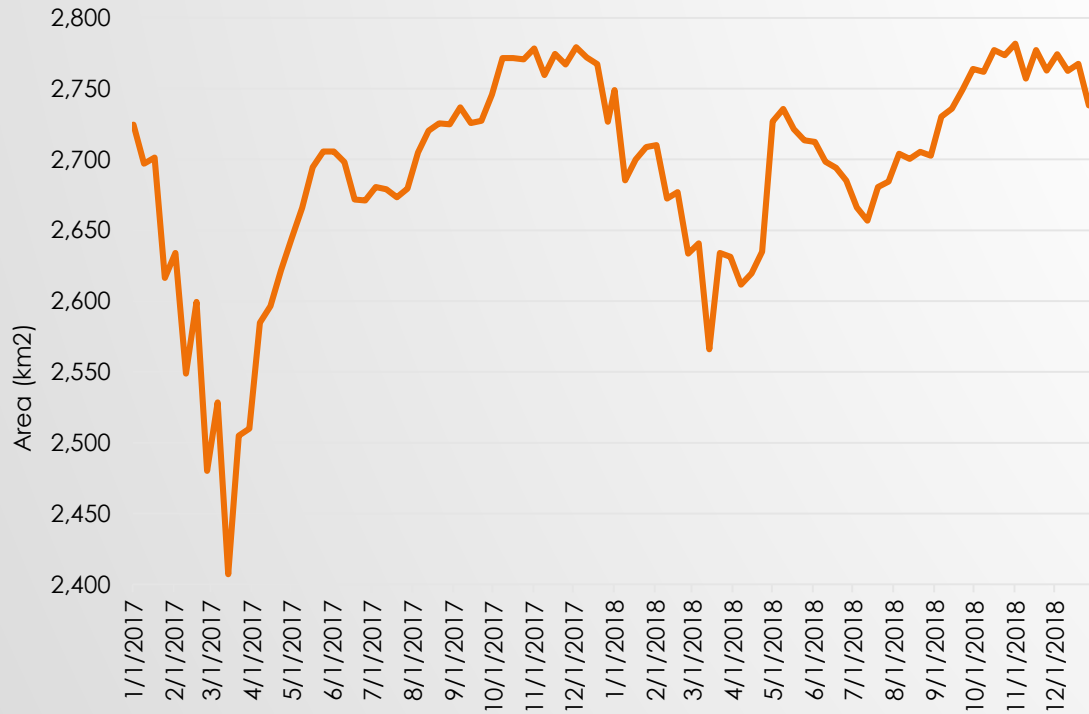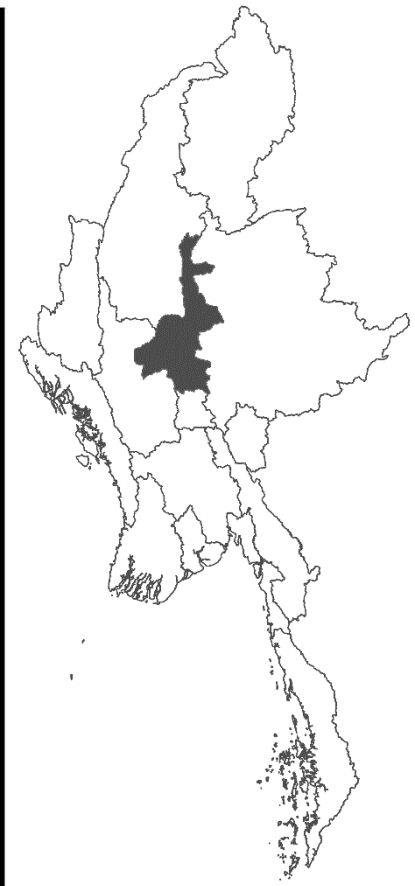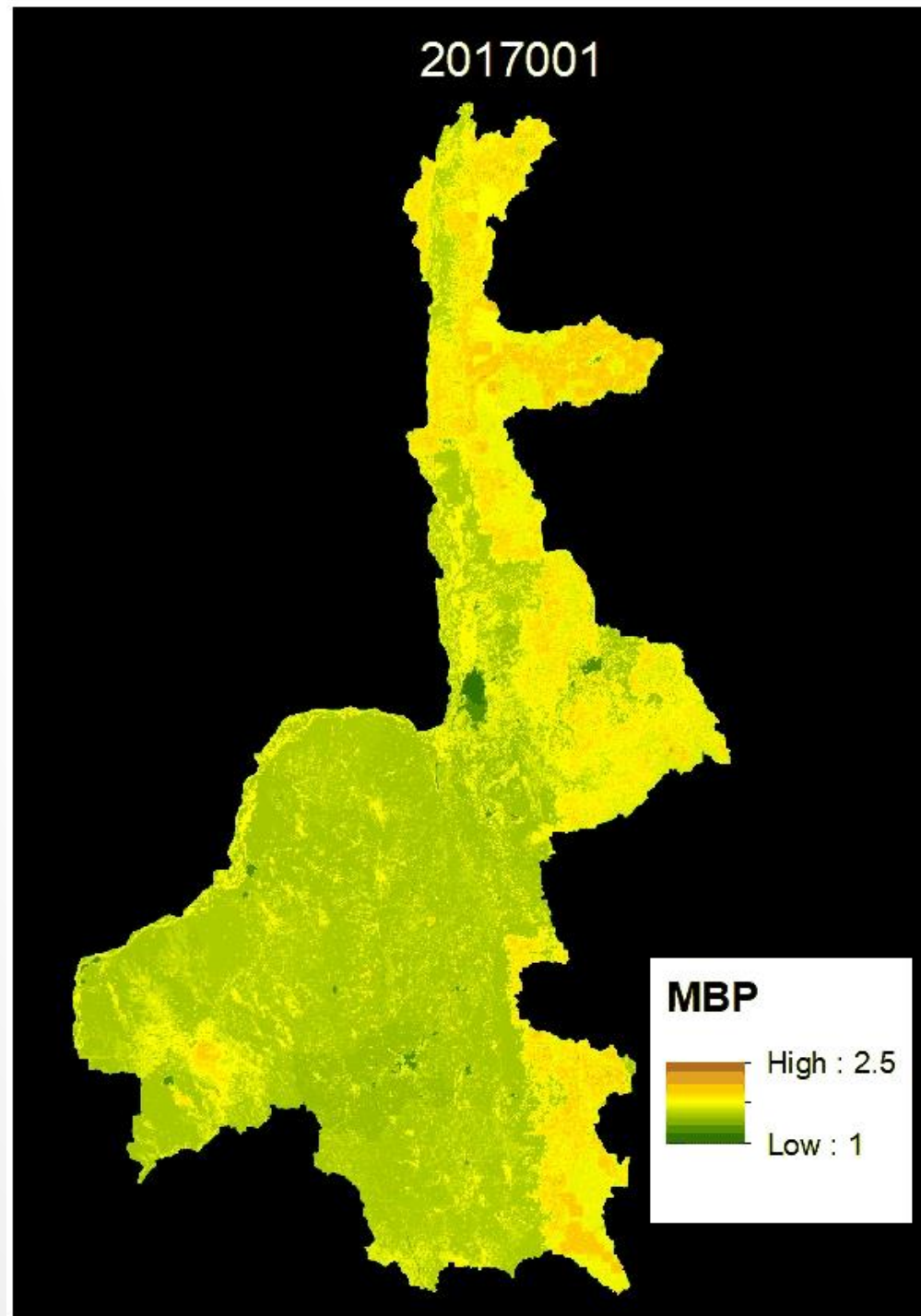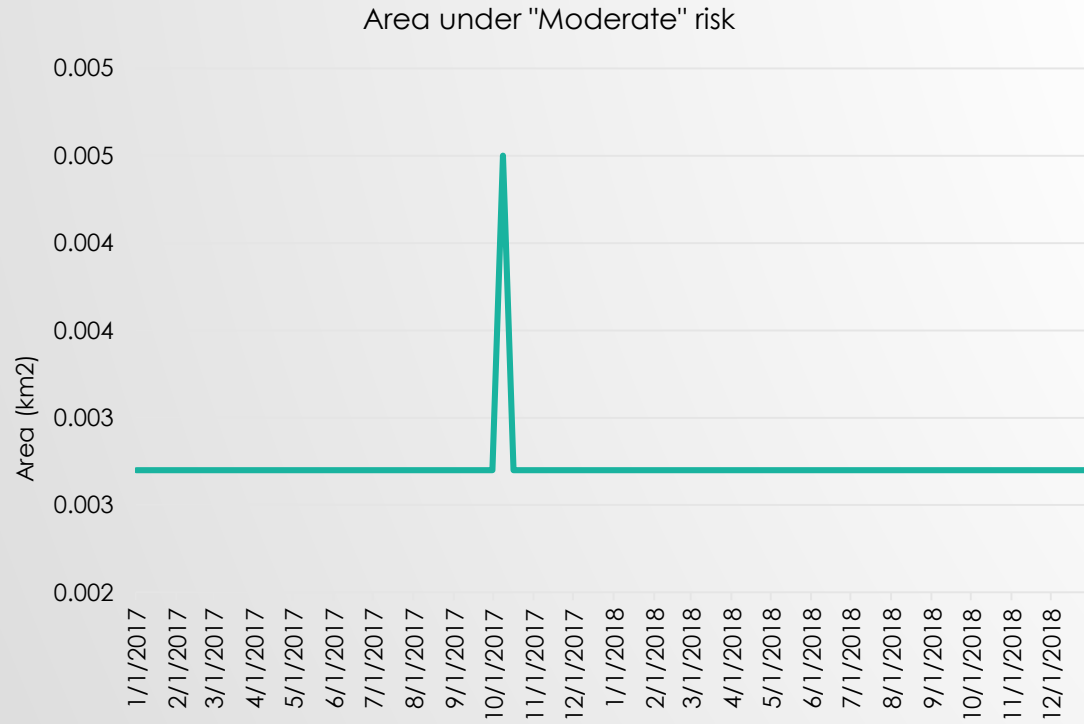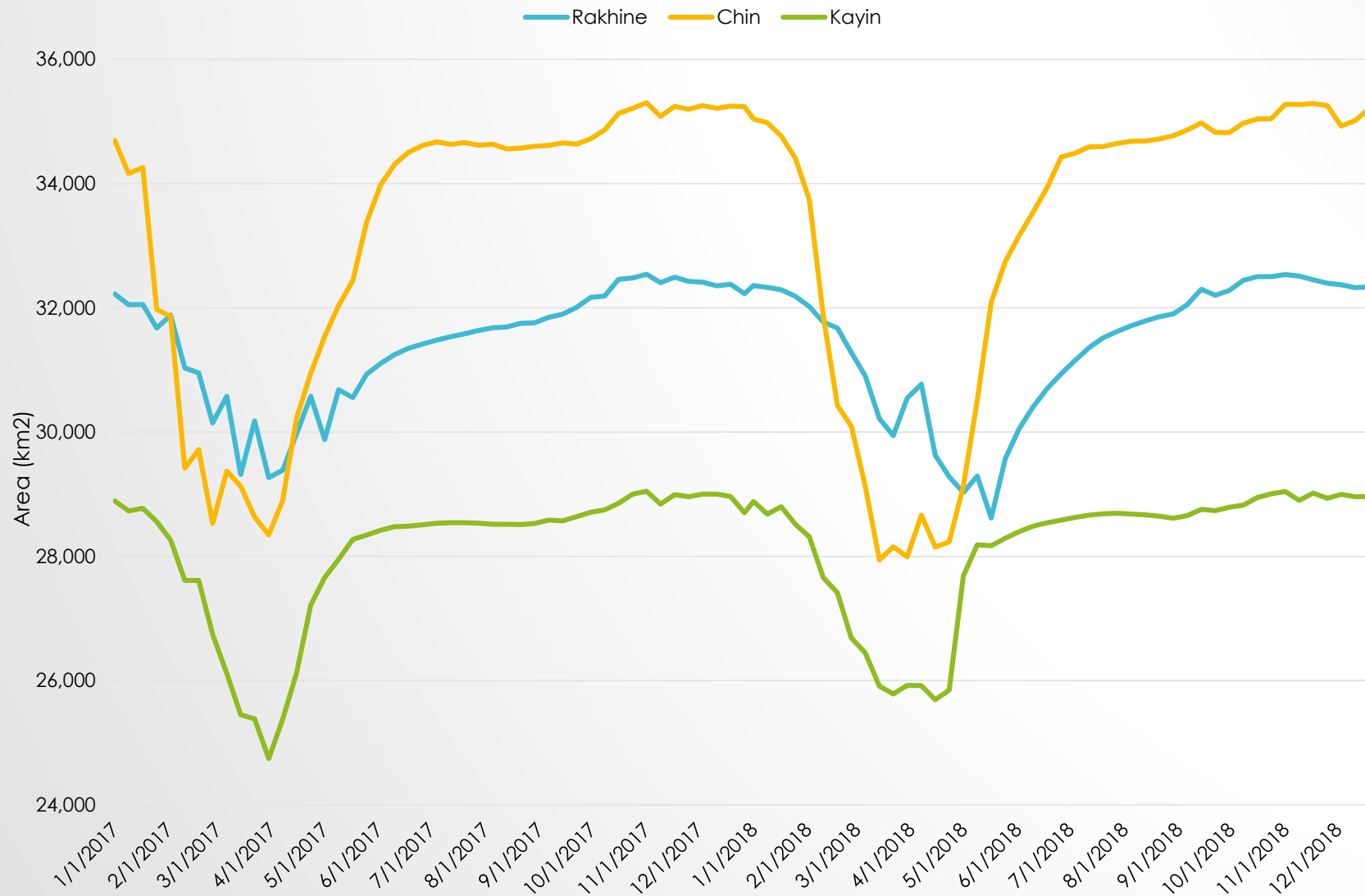
MBP: MODERATE RISK TANINTHARYI

Area under "Moderate" risk

MBP: LOW RISK MANDALAY
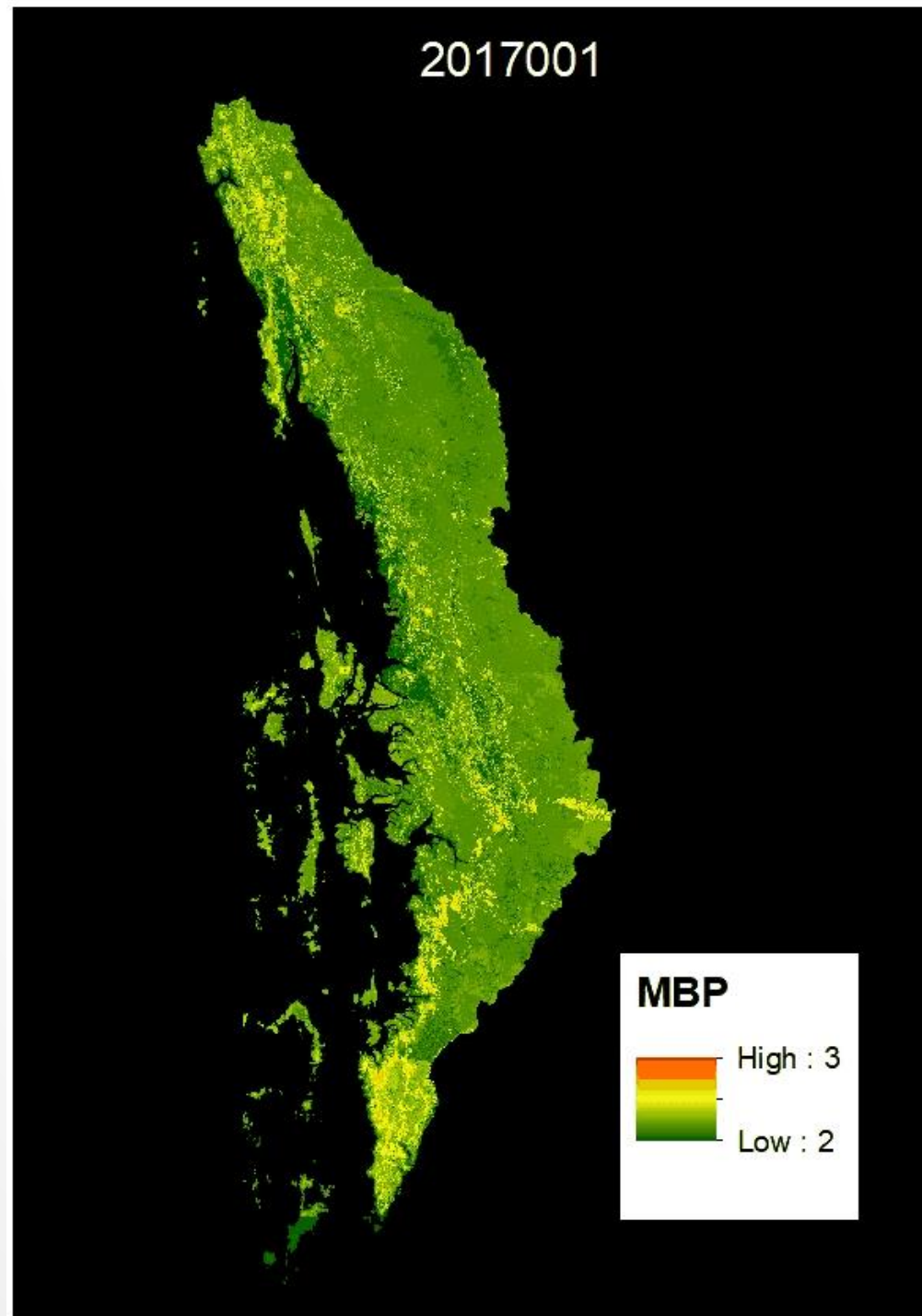
Area under "Moderate" risk

TEMPORAL TRENDS

Area under "Moderate (2.5-3.5)" risk for 3 most malarious states

Rakhine — Chin — Kayin

CHALLENGES

COVID19 + POLITICAL CONTEXT + PARTNERS

- Unable to travel to meet and work with stakeholders

- Stakeholders are fully engaged in COVID response

Unable to complete text-reporting system development

Unable to complete testing, verification, and operational deployment

GENERAL APPROACH/SCHEDULE*

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CURRENT STATUS

- Starting ARL 1

- Current ARL 6: Potential Demonstrated

- Potential ARL 7 (if political situation continues to deteriorate) or ARL 8 (if relationships stabilize)

NCE PLAN

- Continuing development of reporting system:
  - Automating map and tabular report production
  - Finalizing the design of the reporting system (categorical vs numerical)

- Verification of MBP forecasts (2016-2020)

- Operational Deployment for 2021

- Optimizing datastream processing:
  - Using a scaled coarse – fine processing approach
  - Testing AWS environment and costing

QUESTIONS?