Malaria environmental surveillance system

Easimes Platform

Florian Girond
EASIMES Project aims at improving the understanding of environmental conditions which influence malaria transmission in the forested environments of Eastern Myanmar

- support microstratification and active surveillance tools used by the control and/or elimination programs.

Malaria Elimination Task Force

- Community-based access to early diagnosis and treatment of over 1250 malaria posts
- Provide early access to diagnosis (RDTs), and treatment (ACTs)

4 main activities:

- Accurate mapping of land-use/land cover and monitoring of fluctuations in environmental conditions
- Defining the malaria epidemiological landscape: Spatio-temporal analysis
- Defining vector-suitable high-risk environments
- Development of a Malaria environmental surveillance system
Malaria Environmental Surveillance System

**Easimes platform** for strengthening surveillance by:

- **automating** major data processing steps
- enabling data access — **Interactive Web-based system**
- **integrating surveillance data** with other relevant sources of information in a **prospective** setting.

Data visualization and exploratory analysis techniques have been widely used in scientific research to support the understanding of data for epidemiological inference and contextualization and eventually provide evidence to generate new hypotheses to test.

**Critical points include**:

- Providing timely harmonized epidemiological and environmental data.
- The need to be adaptable to consider continual stakeholder input throughout the sign, implementation, and operation of the system: versatility/flexibility
Malaria Environmental Surveillance System

- **Sentinel 2 gridded data**
- **Land Use Land Cover from Sentinel 2**
- **Forest loss indicators (HANSEN)**
- **Rainfall CHIRPS**

**Automated processing**

**Environmental Surveillance System**

**Malaria Surveillance System**

- **Web based interactive platform (R shiny)**
- **Malaria Elimination Task Force**
  - Weekly reporting
  - +1200 Malaria posts
### Table 1

Malaria Environmental Surveillance System

<table>
<thead>
<tr>
<th>Arches</th>
<th>Full Name</th>
<th>Data Source</th>
<th>Temporal Coverage</th>
<th>Spatial Coverage</th>
<th>Spatial Resolution</th>
<th>Latency</th>
<th>Leis</th>
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<tr>
<td>AReT</td>
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<td>Daily</td>
<td>Africa</td>
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<td>1983-present</td>
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+1200 Malaria posts
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21 Sentinel-2 satellite images:
- November 2019, January 2020, and March 2020

Object-based image analysis (OBIA) with eCognition
Temporal smoothing of NDVI and NDWI Gao indices, with three methods

- Cubic-spline
- B-spline
- Fourier transform

Weekly time series of vegetation and humidity indices

i) Make atmospheric conditions correction (SEN2COR algorithm) automatically and routinely
ii) Process Sentinel2 from L1C to L2A level (Sen2Chain) and
iii) Provide index production and time series computation
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Weekly time series of Rainfall
CHIRPS v.2

Example of yearly time series of Forest loss by ha over a few malaria posts
HANSEN (~30 m spatial resolution)
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Conclusion

- Provides timely harmonized epidemiological and environmental data.
- Enable data sharing across different disciplines by developing tools to facilitate data retrieval and analysis to provide access to both epidemiological and environmental remote-sensing data for research and applications.
- To facilitate more effective data-driven management of malaria interventions and provide practical examples and suggestions for use in other systems or settings.
- Technology transfer to Cambodia – KHEOBS laboratory.
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