



Remote Sensing data for One Health

Find ecological / climate indicators related to :

- the presence of vectors/reservoirs
- the occurrence of cases

Find indicators of exposure, such as:

- proximity to risk areas
- type of housing

Geolocation applications

(ex: GPS, Glonass, Galileo, etc.):

- Position field observations
- Guide interventions

Telecommunications:

- Allow **access to health care** through telemedecine

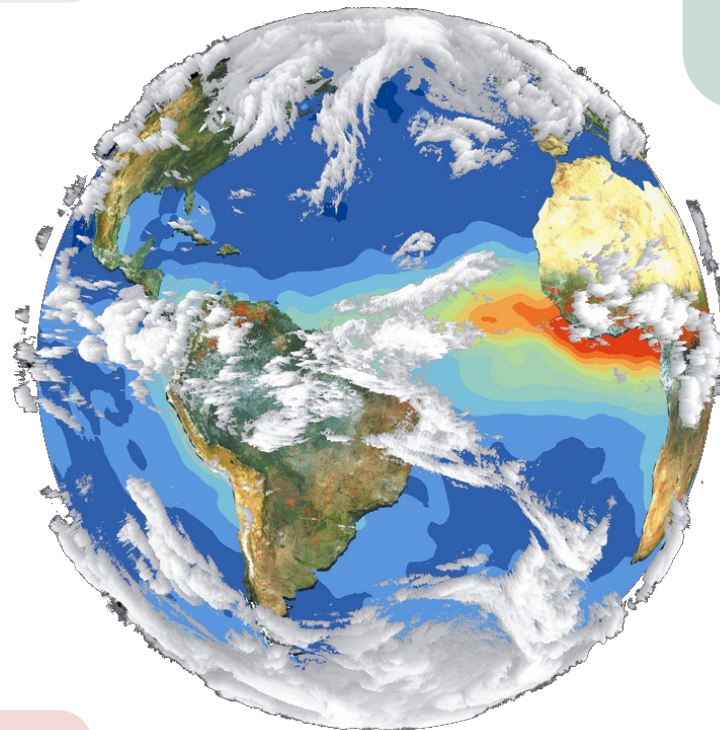


Image: NASA, 2017

Monitor ecological and climate dynamics, such as:

- deforestation (risk of spillovers, ecological disruptions, ...);
- flooding events,
- climate anomalies (droughts, heavy rains, etc.).

=> **Can inform disease surveillance**

Measure radiations, ozone depletion

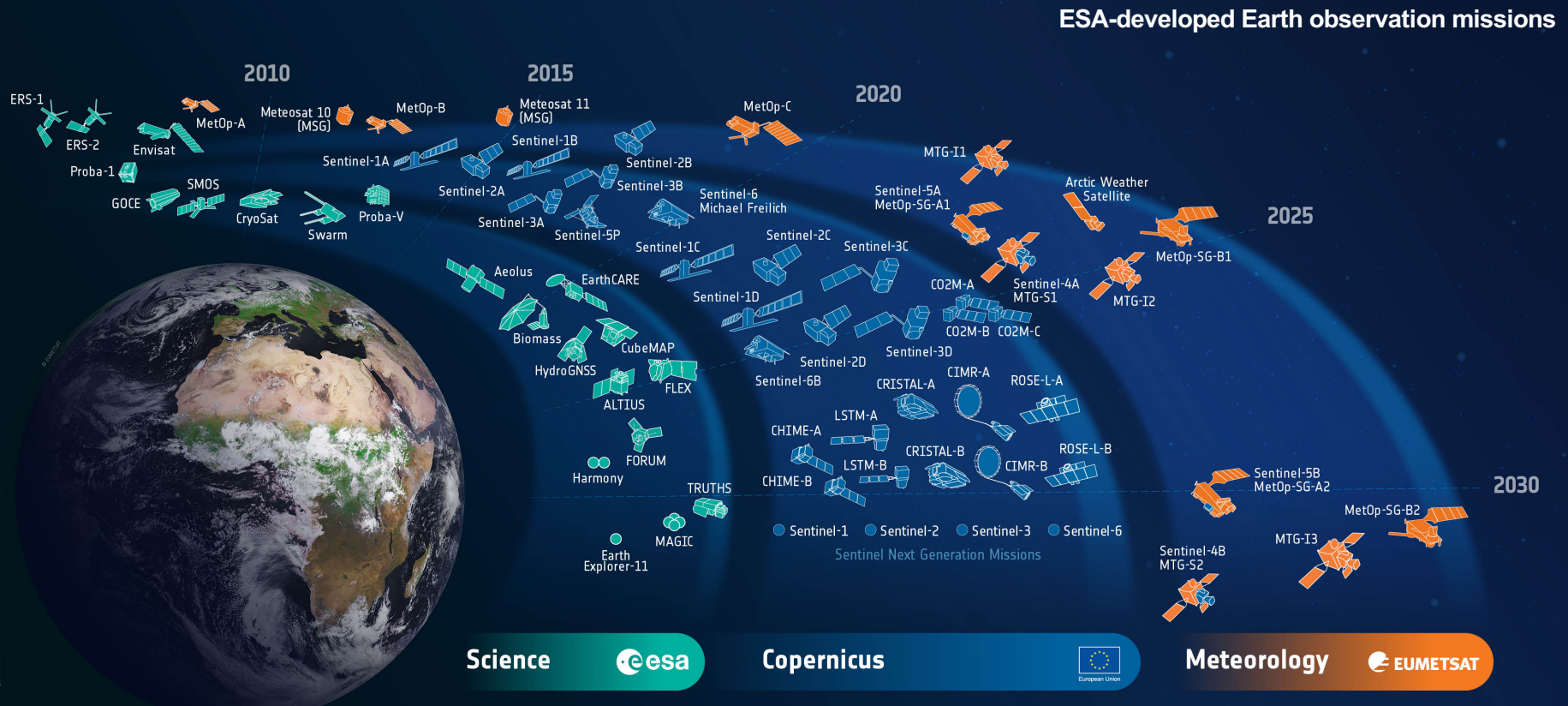
-> exposure to cancers

Measure air quality / pollutants

-> exposure to respiratory diseases

- Increasing number of Earth Observation satellites,
- Easier access to information (/ processing and price)
- Increasing computing capacities

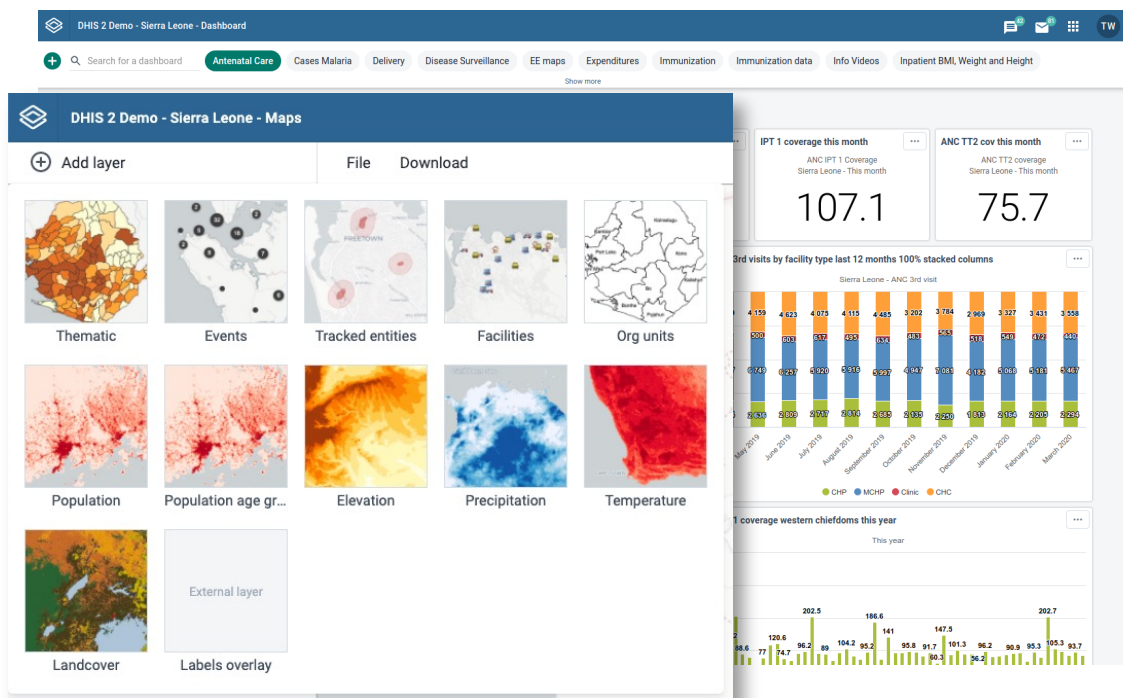
Possibility to use environmental & meteorological information in real-time to inform disease surveillance



- Increasing number of Earth Observation satellites,
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Possibility to use environmental & meteorological information in real-time to inform disease surveillance

➤ **But still no such data accessible in near realtime in health information systems**

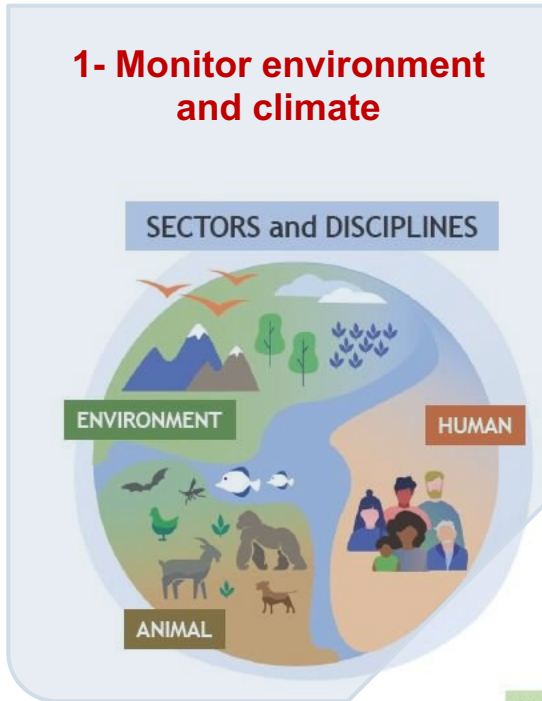


DHIS2 (Digital Health Information System, dhis2.org)

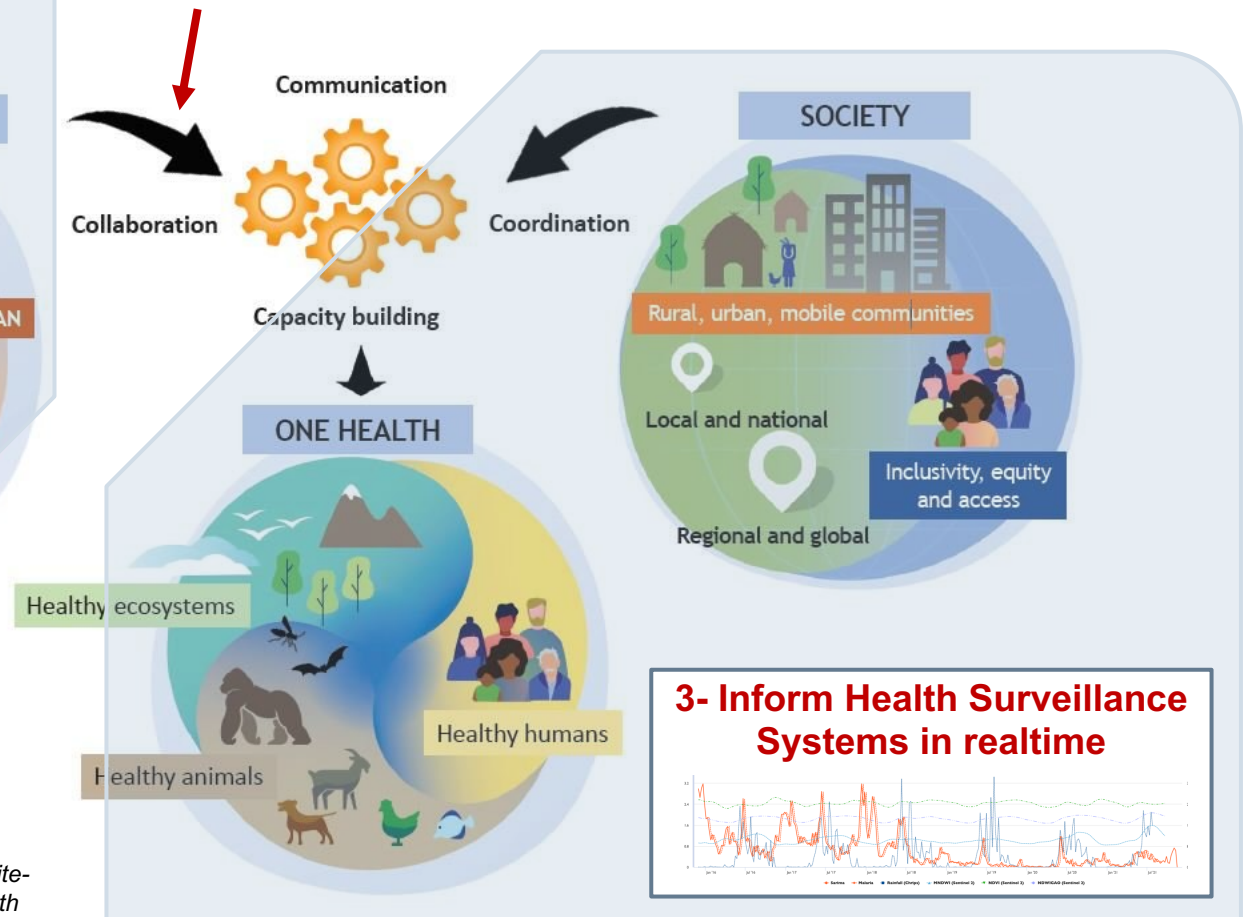
Recent possibility to display background spatial information from Google Earth Engine, but:

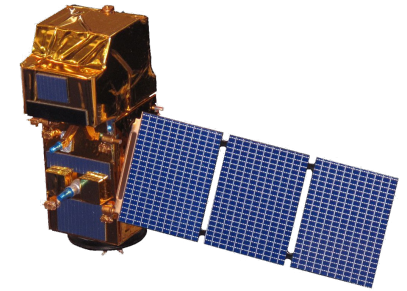
- > static and simple information,
- > no possibility to query and analyse time series.

1- Monitor environment and climate



2- Production of ecological and health indicators in realtime





- ESA (European Space Agency) Copernicus Project
- 2 satellites:
 - Sentinel-2A launched in June **2015**
 - Sentinel-2B launched in March 2017
- Lifetime: 7 years (extendable to 12 years)

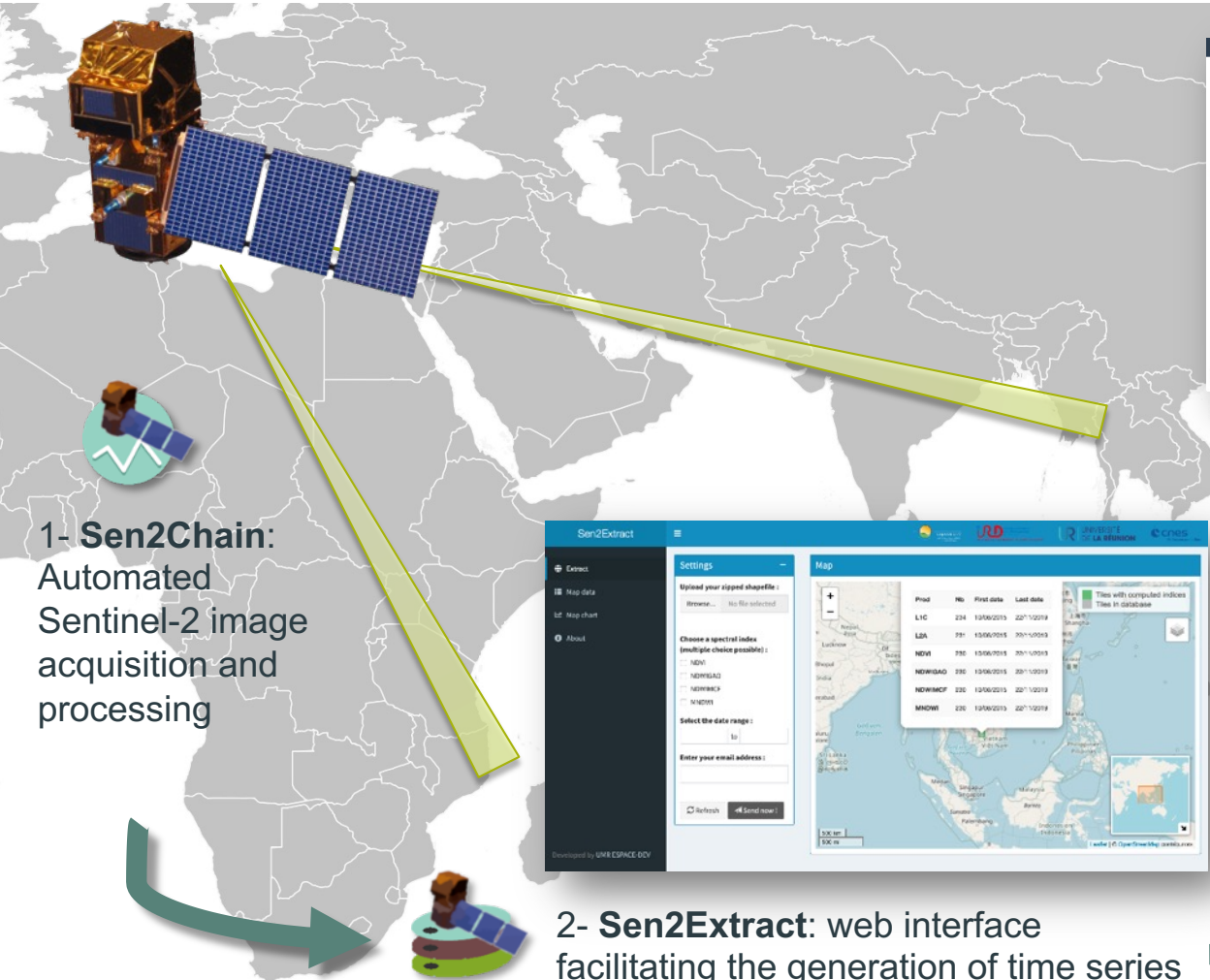
- 13 spectral bands (visible, near and far InfraRed)
- Spatial resolutions: **10m** / 20m / 60m

- Tile coverage: 290 km

- Time between 2 revisits : **5 days** at the Equator (with the 2 satellites - without taking clouds into account)



Free and easily accessible data

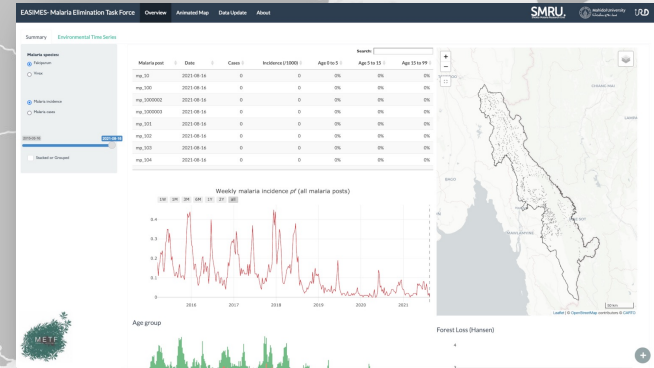


1- **Sen2Chain:**
Automated Sentinel-2 image acquisition and processing

Pixel	No	First date	Last date
L1C	234	13/06/2015	22/11/2019
LDA	231	13/06/2015	20/11/2019
NDVI	230	13/06/2015	20/11/2019
NDWISAO	230	13/06/2015	20/11/2019
NDWIMCF	230	13/06/2015	20/11/2019
MNDWI	230	13/06/2015	20/11/2019

2- **Sen2Extract:** web interface facilitating the generation of time series

<https://web.seas-oi.org/sen2extract/>



4- Integration into Health Information Systems

3- Modelling of time series of environmental indices

Open source: <https://framagit.org/espace-dev>

Funding



Partners

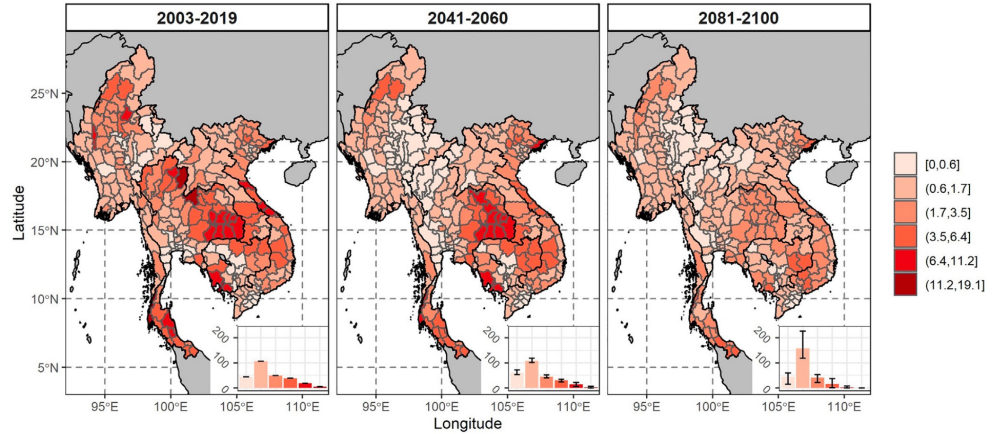


Regional scale: impact of climate changes on health

ECOMORE II, WP Climate, AFD 2018-2022: Modelling the impact of climate change on leptospirosis and *Aedes* mosquitoes in Southeast Asia (Cambodia, Laos, Myanmar, Philippines, Vietnam)

L. Douchet et al.

Science of the Total Environment 832 (2022) 155018



Distribution of leptospirosis in Southeast Asia and its predicted evolution under the SSP5–8.5 scenario of climate change (Douchet et al., 2022)



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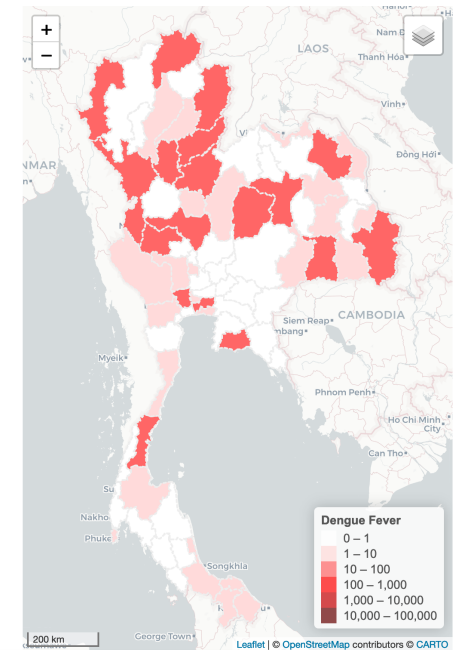
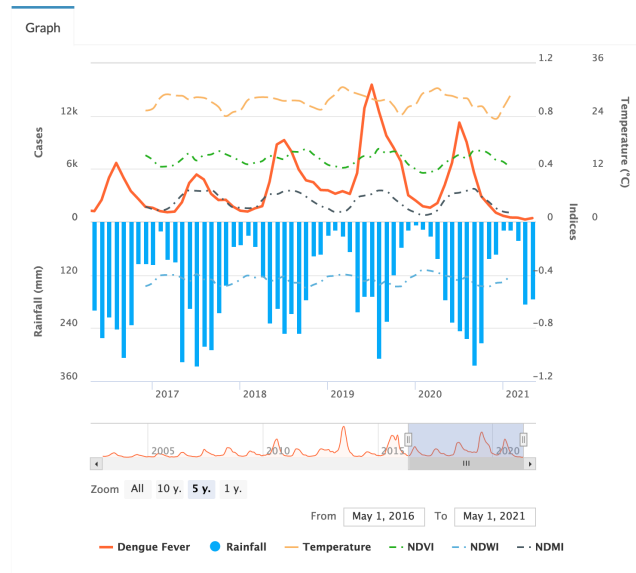
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Regional scale: impact of climate changes on health

National scale: monitoring of climate and environmental dynamics for health surveillance

ClimHealth, Space Climate Observatory (SCO) CNES 2020-2022: Climate and environmental monitoring for health early warning



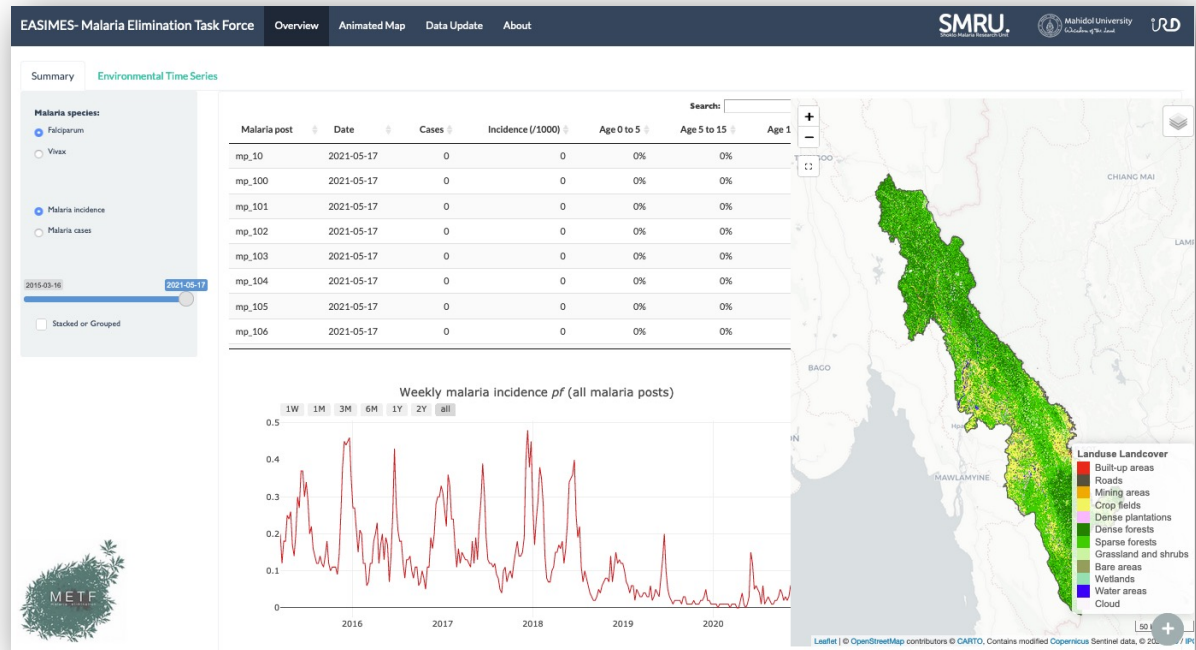
Regional scale: impact of climate changes on health

National scale: monitoring of climate and environmental dynamics for health surveillance

Subnational scale: surveillance system for SMRU-METF

**EASIMES, Global Fund (RAI2E)
2019-2021: Environment Analysis
and Surveillance to Improve
Malaria
Elimination Strategy in Myanmar**

-> C19RM (2021-2023)



Regional scale: impact of climate changes on health

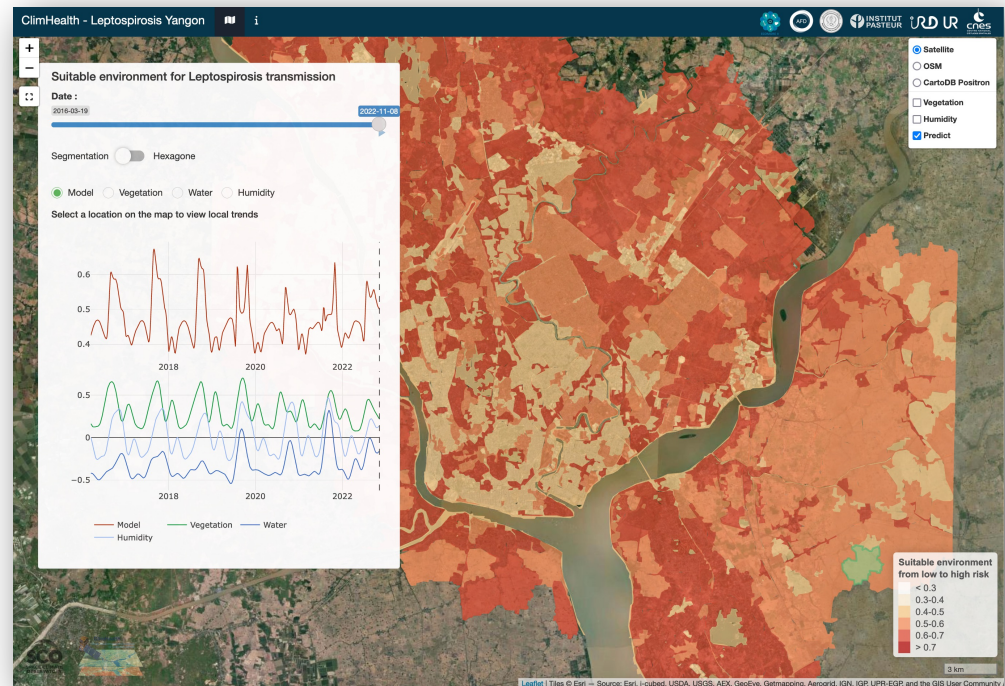
National scale: monitoring of climate and environmental dynamics for health surveillance

Subnational scale: surveillance system for SMRU-METF

Local scale: monitoring of suitable environments for disease transmission

ECOMORE II WP Myanmar + ClimHealth, 2021 : Lepto Yangon

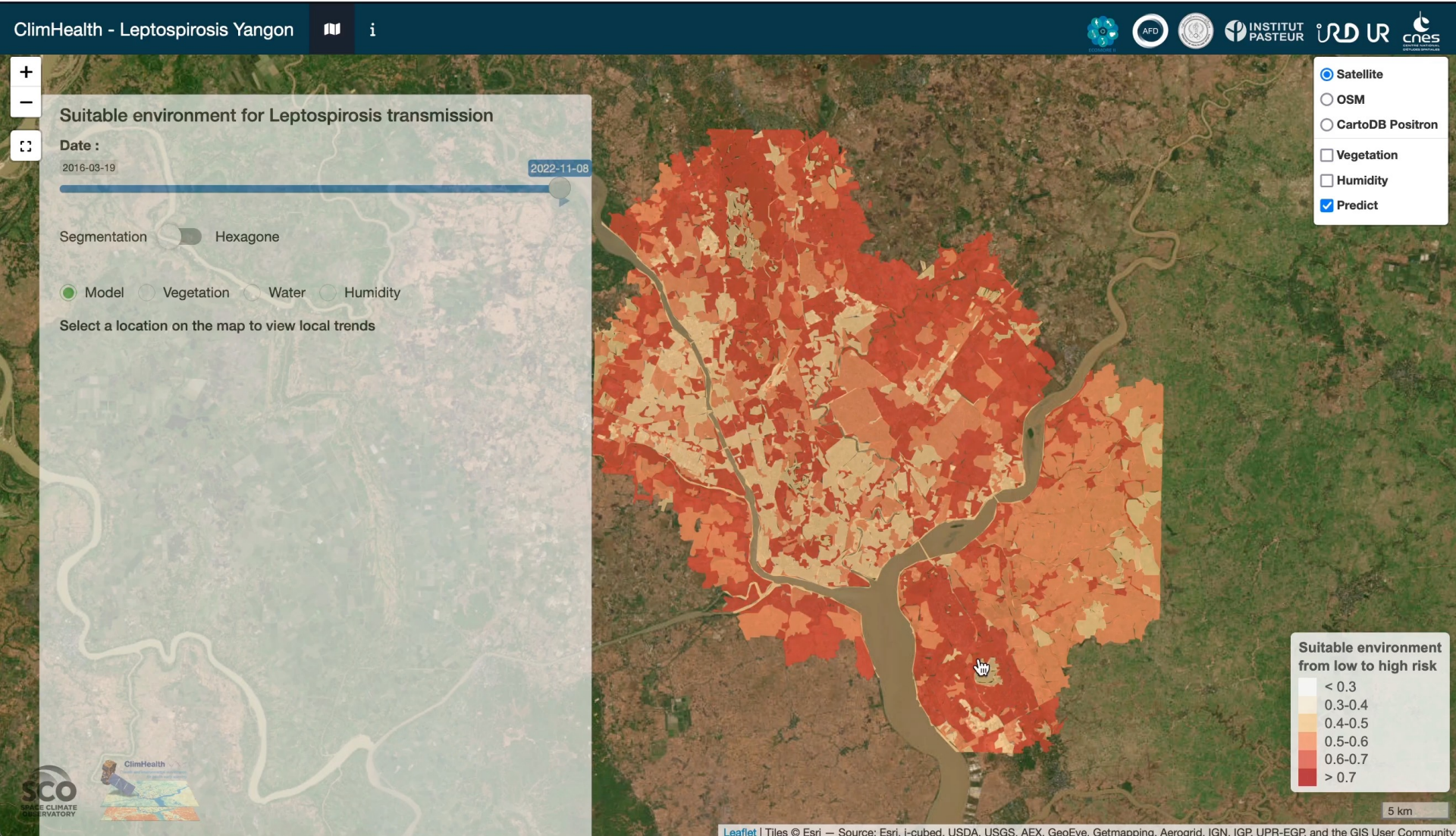
<https://leptoyangon.geohealthresearch.org/>



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Conclusion

- ⇒ There are **still major development needs** for the operational use of data from observation satellites for health
- **Interest for remote sensing data:**
 - increasingly free and accessible data,
 - available in near real time to build early-warning systems,
 - can be used for both research and operational monitoring.
 - **Needs to:**
 - **further investigate** ecological and climate indicators of health signals (outbreaks, dynamics),
 - **develop pipelines** to process satellite data and export to Health information systems,
 - **train and develop local capacities** in SEA:
 - ⇒ purpose of the Khmer Earth Observation (KHEOBS) Laboratory created in 2022 in Cambodia.