This training is organized in the frame of:

- the OHSEA Project (One Health in Practices in South-East Asia), funded by the FSPI (Solidarity Fund for Innovative Projects) under the French Ministry for Europe and Foreign Affairs,
- the Dissemination activities of the EASIMES (Environment Analysis and Surveillance to Improve Malaria Elimination Strategy) Project funded by the Global Fund
“One Health” arises from the recognition that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

One Health is defined by the High Level Expert Panel (OHHLEP) states as an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

https://www.who.int/news/item/01-12-2021-tripartite-and-unep-support-ohhlep-s-definition-of-one-health
Some diseases and health situations are impacted by environmental, meteorological and climate dynamics, from local to global scales, from short events to global changes.

Examples:

- Impact of climate changes on vector-borne diseases or respiratory diseases
- Impact of seasonal rainfall anomalies on tropical diseases
- Impact of environmental changes:
  - loss of biodiversity and emergence of invasive species and virulent pathogens
  - deforestation activities and malaria,
  - urbanization and difficulties in sanitation, emergence of antimicrobial resistance
  - land artificialization, flooding and increased transmission of water-related diseases, also difficulties in accessing health care.
Geospatial approaches for One Health:
possible inputs

Spatial epidemiology

Vulnerability assessment

Disease ecology

Confirmed *P. falciparum* + Mixed case distribution by district, 2006-2019, Cambodia. From Chean et al., 2021

Access to care. From Ihantamalala et al., 2021
1- Identify the relations between environment, climate and health
   -> produce indicators through:
   • Earth observation
   • In situ measurements
   • Local knowledge

2- Monitor environmental, climate and health indicators in real-time

3- Inform Health Surveillance Systems in realtime

https://www.who.int/news/item/01-12-2021-tripartite-and-unep-support-ohhlep-s-definition-of-one-health
Geospatial approaches for One Health: 
tools and methods

Spatial epidemiology
Vulnerability assessment
Disease ecology

Tools and methods:

Geographic Information Systems (GIS)
Geostatistics
Remote sensing
Informatics

=> Organization of trainings to strengthen capacities

=> with support from 2 projects: FSPI OHSEA and EASIMES (RAI2E)
OHSEA project funded by the Solidarity Fund for Innovative Projects (FSPI) under the French Ministry for Europe and Foreign Affairs

Objectives:

- establish an inventory of environment – zoonoses in South East Asia;
- contribute to the reinforcement of the skills of students, professionals and decision-makers in a One Health Environment approach (through training in interdisciplinarity and inter-sectoriality);
- contribute to supporting or consolidating emerging One Health projects in practice;
- develop tools for accessing data to understand and act through the One Health approach.

https://ohsea.ird.fr/en/home/

OHSEA is also a first step in structuring a research community with a view to setting up actions within the framework of the global PREZODE Initiative launched at the One Planet Summit in January 2021.
EASIMES Project (2020-2021): Environment Analysis and Surveillance to Improve Malaria Elimination Strategies

EASIMES aims at improving the understanding of environmental conditions which influence malaria transmission in the forested environments of Eastern Myanmar in order to improve microstratification and active surveillance tools used by control and/or elimination programs.

Based on the malaria surveillance in the Kayin State conducted by the Malaria Elimination Task Force, Shoklo Malaria Research Unit (SMRU), Mae Sot, Thailand

**Partners:**
- SMRU, MORU, Mahidol University, Thailand
- IRD France:
  - UMR ESPACE-DEV : GeoHealth Team at Institut Pasteur du Cambodge
  - UMR SESSTIM,

**Funding:** Global Fund, RAI2E (2019-2021)
EASIMES Dissemination activities

28th November to 2nd December 2022
Training: Mapping and spatial analyses in R for One Health studies

5th December 2022
Symposium on Geospatial Approaches in One Health studies

6th December 2022
EASIMES restitution workshop

7th to 9th December 2022
Training on the monitoring of environmental dynamics by remote sensing
23 Participants:

- 8 from Cambodia:
  - National Institute of Public Health (NIPH)
  - Institut Pasteur du Cambodge (IPC)
- 1 from Indonesia: National Research and Innovation Agency of Indonesia (BRIN)
- 3 from Laos:
  - Center for Malariology, Parasitology and Entomology (CMPE),
  - National University of Laos (NUoL)
- 3 from Myanmar:
  - Save the Children International,
  - Myanmar Health Assistant Association (MHAA)
- 3 from Thailand:
  - Ministry of Public Health,
  - Mahidol University
- 4 from Vietnam:
  - National Institute of Hygiene and Epidemiology (NIHE),
  - National Institute of Malariology, Parasitology and Entomology (NIMPE)
  - Pasteur Institute in Ho Chi Minh city
- 1 from France: IRD- Espace-Dev

+ 6 trainers from France and Cambodia: IRD-IPC GeoHealth Team + CNRS UAR RIATE
Training: Mapping and spatial analyses in R for One Health studies, from 28th Nov to 2nd Dec
## Training: Mapping and spatial analyses in R for One Health studies, from 28th Nov to 2nd Dec

<table>
<thead>
<tr>
<th>Monday 28th November</th>
<th>Tuesday 29th November</th>
<th>Wednesday 30th November</th>
<th>Thursday 1st December</th>
<th>Friday 2nd December</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction to R</strong></td>
<td><strong>Mapping in R</strong></td>
<td><strong>Geoprocessing in OSM</strong></td>
<td><strong>Using OSM and raster data in R</strong></td>
<td><strong>Applied exercises in R</strong></td>
</tr>
<tr>
<td>8H30-10H00</td>
<td>Lecture 1: Contribution of mapping and spatial analysis in epidemiological studies and health surveillance (Vincent Herbreteau)</td>
<td>Practical 4: Map layout in R (Chapter 5.2)</td>
<td>Focus on applications: Introduction to geostatistics (Léa Douchet)</td>
<td>Practical 9: Applied exercises</td>
</tr>
<tr>
<td>Coffee break</td>
<td>Practical 2: Make a simple map in R (Chapter 5.1)</td>
<td>Practical 5: Using vector data in R (Chapter 3)</td>
<td>Practical 6: Data acquisition (Chapter 2.1)</td>
<td>Practical 9: Applied exercises</td>
</tr>
<tr>
<td>10H30-12H00</td>
<td>Practical 2: Make a simple map in R (Chapter 5.1)</td>
<td>Practical 5: Using vector data in R (Chapter 3)</td>
<td>Lecture 3: Introduction to OpenStreetMap (OSM) (Lucas Longour)</td>
<td>Practical 9: Applied exercises</td>
</tr>
<tr>
<td>Lunch</td>
<td>Practical 3: Thematic map in R (Chapter 5.1.2 to 5.1.6)</td>
<td>Practical 5: Using vector data in R (Chapter 3)</td>
<td>Practical 7: Import OSM data (Chapter 2.3)</td>
<td>Practical 9: Applied exercises</td>
</tr>
<tr>
<td>Coffee break</td>
<td>Practical 3: Thematic map in R (Chapter 5.1.2 to 5.1.6)</td>
<td>Practical 5: Using vector data in R (Chapter 3)</td>
<td>Practical 8: Using raster data in R (Chapter 4)</td>
<td>Final discussion about future interactions among participants Awarding of certificates</td>
</tr>
<tr>
<td>15H30-17H00</td>
<td>Practical 1: Introduction to R (refresher course)</td>
<td>Practical 3: Thematic map in R (Chapter 5.1.2 to 5.1.6)</td>
<td>Practical 5: Using vector data in R (Chapter 3)</td>
<td>Practical 8: Using raster data in R (Chapter 4)</td>
</tr>
</tbody>
</table>

**Online tutorial:** [http://rspatial4onehealth.geohealthresearch.org/](http://rspatial4onehealth.geohealthresearch.org/)
# GeoOneHealth2022 symposium

[https://geoonehealth2022.sciencesconf.org/](https://geoonehealth2022.sciencesconf.org/)

<table>
<thead>
<tr>
<th>Session</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 - 9:00</td>
<td><strong>Vincent Herbreteau</strong> Espace-Dev - French National Research Institute for Sustainable Development (IRD), Cambodia and <strong>Florian Girond</strong>, Institut Pasteur du Cambodge - Cambodian CDC, Cambodia</td>
<td>Introduction</td>
</tr>
<tr>
<td><strong>Session 1</strong></td>
<td><strong>Sébastien Boyer</strong>, Institut Pasteur du Cambodge (IPPC), Cambodia</td>
<td><strong>Aedes vectors and dengue</strong></td>
</tr>
<tr>
<td>09:00 - 9:20</td>
<td><strong>Sébastien Boyer</strong>, Institut Pasteur du Cambodge (IPPC), Cambodia</td>
<td>Seen from above: how satellite technology can fill gaps in mosquito biology</td>
</tr>
<tr>
<td>09:20 - 09:40</td>
<td><strong>Kien Quoc Do</strong>, Pasteur Ho Chi Minh, Vietnam</td>
<td>Prospect of geo-mapping application in Dengue control in South Vietnam</td>
</tr>
<tr>
<td>09:40 - 10:00</td>
<td><strong>Palamy Changleuxai</strong>, National University of Laos (NUoL), Lao PDR</td>
<td>Investigating the Relationship between Surface Water and Dengue Fever Incidence: A case study in Vientiane Capital, Laos</td>
</tr>
<tr>
<td>10:00 - 10:20</td>
<td><strong>Claire Teillet</strong>, Espace-Dev - French National Research Institute for Sustainable Development (IRD), France</td>
<td>Remote sensing analysis of the links between urban landscapes and the risk of exposure to <em>Aedes</em>, vectors of arboviroses</td>
</tr>
<tr>
<td>10:20 - 10:50</td>
<td><strong>Coffee break</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Session 2</strong></td>
<td><strong>Ho Quang Phuc</strong>, National Institute of Malariaology, Parasitology and Entomology (NIMPE), Vietnam</td>
<td><strong>Malaria</strong></td>
</tr>
<tr>
<td>10:50 - 11:10</td>
<td><strong>Ho Quang Phuc</strong>, National Institute of Malariaology, Parasitology and Entomology (NIMPE), Vietnam</td>
<td>Geographic Information System in malaria surveillance in a context of elimination and post-elimination in Vietnam</td>
</tr>
<tr>
<td>11:10 - 11:30</td>
<td><strong>Peeriya Watakulsin</strong>, Ministry of Public Health, Thailand</td>
<td>Malaria surveillance in Thailand</td>
</tr>
<tr>
<td>11:30 - 11:50</td>
<td><strong>Jordi Landier</strong>, SESSTIM - French National Research Institute for Sustainable Development (IRD), France</td>
<td>Forest malaria in Myanmar: tracking landscapes at risk within a hidden diversity of environments</td>
</tr>
<tr>
<td>11:50 - 12:10</td>
<td><strong>Florian Girond</strong>, Institut Pasteur du Cambodge - Cambodian CDC, Cambodia</td>
<td>Malaria environmental data-driven surveillance system in Eastern Myanmar: development, challenges, and opportunities</td>
</tr>
<tr>
<td>12:10 - 14:00</td>
<td><strong>Lunch</strong></td>
<td></td>
</tr>
</tbody>
</table>
### GeoOneHealth2022 symposium

https://geoonehealth2022.sciencesconf.org/

<table>
<thead>
<tr>
<th>Time</th>
<th>Session 3</th>
<th>Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:10 - 14:00</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>12:10 - 14:00</td>
<td><strong>Session 3</strong></td>
<td></td>
</tr>
<tr>
<td>14:00 - 14:20</td>
<td><strong>Hai Tuan Nguyen</strong>, National Institute of Hygiene and Epidemiology (NIHE), Vietnam</td>
<td>Identification of space-time clusters and hotspots in communicable diseases surveillance in Northern Vietnam</td>
</tr>
<tr>
<td>14:20 - 14:40</td>
<td><strong>Chung Nguyen</strong>, National Institute of Hygiene and Epidemiology (NIHE), Vietnam</td>
<td>Introduction to the plague surveillance system and proposal for detection and mapping of rodent-related pathogens in the northern provinces of Vietnam bordering China and Laos</td>
</tr>
<tr>
<td>14:40 - 15:00</td>
<td><strong>Hannah Holt</strong>, University of Health Sciences (UHS), Cambodia</td>
<td>Understanding zoonotic and pandemic risk in relation to swine production systems in Cambodia</td>
</tr>
<tr>
<td>15:00 - 15:20</td>
<td><strong>Kemnarey Seang</strong>, University of Health Sciences (UHS), Cambodia</td>
<td>Using community engagement approaches within a digital health intervention to improve access and retention among people living with HIV (PLWH) in Cambodia</td>
</tr>
<tr>
<td>15:20 - 15:50</td>
<td><strong>Coffee break</strong></td>
<td></td>
</tr>
<tr>
<td>15:50 - 16:10</td>
<td><strong>Mujiyanto</strong>, National Research and Innovation Agency of Indonesia (BRIN), Indonesia</td>
<td>Spatial approach for vector borne and zoonotic diseases research in Indonesia</td>
</tr>
<tr>
<td>16:10 - 16:30</td>
<td><strong>Kraichat Tantrakarnapa</strong>, Mahidol University, Thailand</td>
<td>Challenge of climate change in public health: Southeast Asia perspectives</td>
</tr>
<tr>
<td>16:30 - 16:50</td>
<td><strong>Lea Douchet</strong>, Espace-Dev - French National Research Institute for Sustainable Development (IRD), France</td>
<td>Estimating leptospirosis burden in southeast asia and its future evolution based on climate and environmental determinants</td>
</tr>
<tr>
<td>16:50 - 17:00</td>
<td><strong>Closing</strong></td>
<td></td>
</tr>
</tbody>
</table>
• **EASIMES:**
  • *Shoklo Malaria Research Unit* (SMRU): François Nosten, Gilles Delmas, Aung Myint Thu, Kevin Jung Yuan-Lee
  • **Global Fund** and **UNOPS**

• **FSPI OHSEA:**
  • Project coordinators: Clarisse Veylon-Hervet (Embassy of France to Thailand), Serge Morand (CNRS) and Eric Deharo (IRD)
  • French Ministry for Europe and Foreign Affairs through the FSPI (Solidarity Fund for Innovative Projects) program

• **IRD regional representative offices of the French National Research Institute for Sustainable Development (IRD) in Cambodia, Indonesia, Laos, Thailand and Vietnam**