

Presentation of the KHmer Earth OBServation (KHEOBS) Laboratory at the Institute of Technology of Cambodia

Vannak Ann (ITC) and Vincent Herbreteau (IRD)

Coordinated by:

- **ITC – Water and Environment Research Unit:** Dr. Vannak Ann
- **IRD – Espace-Dev:** Dr. Vincent Herbreteau



Officially opened on 17th November 2022

Objectives:

- **develop expertise in remote sensing** by training and supervising students,
- **set up or contribute to projects using remote sensing**, to ensure the continuity of the laboratory's funding,
- **set up a hardware infrastructure at ITC** to enable the storage of large spatial data sets and large-scale data processing, in order to contribute to projects in Cambodia.

Dematerialization of IGN aerial images of Cambodia:

- 11,000 aerial pictures of Cambodia taken by the IGN in the 1950s
- Partnership with IGNFI
- FSPI-R (Fonds de solidarité pour les projets innovants - Rapide), recently renamed FEF (Fonds Equipe France), from the French Ministry for Europe and Foreign Affairs (MEAE) through the French Embassy in Cambodia
- 1 year (12/05/2023 – 11/05/2024)

Activities:

- 1) **digitise** all the archive images (done by IGN),
- 2) **train geomaticians** to process these images in order to make them usable (training given by IGNFI),
- 3) **initiate processing** of images,
- 4) **communicate:**
 - Organization of an exhibition and conference,
 - Communication through social networks,
 - Official discussion to clarify the release of the final geo-catalogue in Cambodia for open use



Phnom Penh, 1953



Phnom Penh, 1993



Visit of Gaëtan Chaudagne from IGN FI on 23/03/2023

PREACTS AfriCam (PREZODE) – Cambodia

- Funded by AFD, 2023-2026
- Coordination : Anne-Laure Bañuls (IRD), Flavie Goutard (Cirad)
- Focal points in Cambodia : Vincent Herbreteau (IRD), Hélène Guis (Cirad), Krang Sidonn (National Focal point)
- Partners : IPC, Battambang Hospital, ITC, AVSF, WCS, iDE

Area: zoonoses - one health (risk assessment and reduction, strengthening surveillance systems towards OH)

ITC activities (Coordination: Ann Vannak):

- Activity 1.1.5: Collection of climatic, environmental and hydrological data
- Activity 3.2.6 (a): Strengthening the sharing of information on aquatic ecosystems in conjunction with PAER (Platform for Aquatic Ecosystem Research)
- Activity 3.2.6 (b): Development of capacities for the acquisition and processing of data from climatological and Earth observation satellites (hydrological and environmental dynamics).
- Activity 3.2.6 (c): Setting up a center of expertise to monitor environmental and climate dynamics



- **22-24 June 2022: Training on Earth Observation for hydrology and landcover mapping:**
 - Given by Thibault Catry et Renaud Hostache from IRD - UMR Espace-Dev
 - 24 participants (researchers, doctoral students, master's students)
 - Co-funded by the French Embassy the FSPI OHSEA project (One Health in practices in South-East Asia)



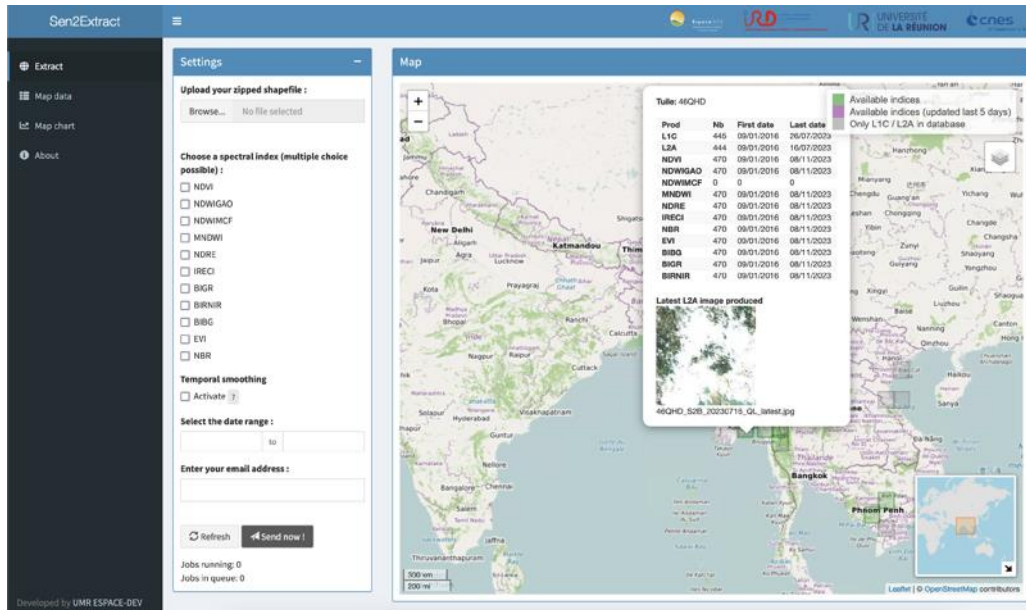
- **7-9 December 2022: Training on the monitoring of environmental dynamics by remote sensing:**
 - Given by Pascal Mouquet (IRD - UMR Espace-Dev) et Christophe Révillion (Univ. Réunion - UMR Espace-Dev)
 - 20 participants (researchers, geomaticians from Cambodian institutions, doctoral students, master's students)
 - Co-funded by the FSPI OHSEA project (One Health in practices in South-East Asia) + EASIMES project (Global Fund)



- **FSPI-R KAPA project: Trainings on photogrammetry and processing of aerial pictures:**
 - **30th October – 10th November 2023:** theory on photogrammetry, use of Metashape software to build on orthophotograph (georeferencing, orthorectification, etc.)
 - **26th February – 1st March 2024:** improvement of image processing
 - Given by Vincent Bousquet (IGNFI)

IGNFI**IGN**
INSTITUT NATIONAL
DE L'INFORMATION
GÉOGRAPHIQUE
ET FORESTIÈRE

- **26th February – 1st March 2024: Remote sensing workshop to strengthen capacities in using time series of satellite images:**
 - Given by Pascal Mouquet (IRD - UMR Espace-Dev)
 - Work with George Ge (IRD-KHEOBS) and KHEOBS team on this task
 - Support from Agence Universitaire de la Francophonie (AUF)
 - Installation, testing and configuration of Sen2Chain, a Sentinel-2 satellite image processing chain developed by Espace-Dev to automate the production of time series of vegetation and water indices from Sentinel-2 images (every 5 days)

The screenshot shows the Sen2Extract web interface. On the left is a navigation menu with 'Extract', 'Map data', 'Map chart', and 'About'. The main area is divided into 'Settings' and 'Map'. The 'Settings' panel includes an 'Upload your zipped shapefile' section, a 'Choose a spectral index (multiple choice possible):' section with checkboxes for NDVI, NDWIGAO, NDWIMCF, MNDWI, NDRE, IRECI, BGR, BIRNIR, BIBG, EVI, and NBR, a 'Temporal smoothing' section with an 'Activate' checkbox, and a 'Select the date range:' section with 'from' and 'to' input fields. Below these are 'Enter your email address:', 'Refresh', and 'Send now!' buttons. The 'Map' section shows a satellite map of South Asia with a data table overlay. The table lists indices with their product numbers, first and last dates, and a 'Latest L2A image produced' section showing a small satellite image.

Prod	Nb	First date	Last date
L1G	445	09/01/2016	26/07/2023
L2A	444	09/01/2016	16/07/2023
NDVI	470	09/01/2016	09/11/2023
NDWIGAO	470	09/01/2016	09/11/2023
NDWIMCF	0	0	0
MNDWI	470	09/01/2016	09/11/2023
NDRE	470	09/01/2016	09/11/2023
IRECI	470	09/01/2016	09/11/2023
NBR	470	09/01/2016	09/11/2023
EVI	470	09/01/2016	09/11/2023
BIBG	470	09/01/2016	09/11/2023
BGR	470	09/01/2016	09/11/2023
BIRNIR	470	09/01/2016	09/11/2023



Sen2Extract: Data catalog of Sentinel-2 indices

PhD thesis of Chhenglang Heng:

- **Subject:** “Assessing the effects of land use dynamics on water quality and flood risk using satellite imagery, machine learning and hydrological modeling: the Tonle Sap Lake in Cambodia as a test case”
- **Direction:** Ann Vannak and Renaud Hostache
Co-supervision: Thibault Catry and Vincent Herbreteau
- Université de Montpellier and Institut de Technologie du Cambodge
- Start in September 2023
- Funding: Ministry of Education, Youth and Sports (MoEYS), and BGF grant (Bourse du Gouvernement Français, through the French Embassy in Cambodia)



CHY Sreypich (2024), M2 in Water and Environmental Engineering, ITC

- Subject: Monitoring flooded areas using remote sensing in Prek Sdei commune, Kandal province: towards an automated workflow for routine monitoring

POV Kakda (2024), M2 in Water and Environmental Engineering, ITC

- Subject: Lithology, land surface temperature, and Land use/land cover mapping using Landsat-8, ASTER, and Sentinel-2 data for the Tonle Sap Region

HOEUN Sokeang (09/2023-), Master 1 in Eco-Epidemiology of Emerging Disease, Univ. Montpellier

- Subject: Ecological and climate determinants of melioidosis in Cambodia

BASSE Manon (2024), Master 2 in Geomatics, University of Montpellier

- Subject: Spatial modeling of geographic accessibility to health care facilities in Cambodia



- **2023-2024: Increase in data storage and computing capacities at ITC:**
 - => Acquisition of dedicated servers with 120 To storage (with NAS backup), funded by EASIMES and AfriCam projects, managed by ITC - eLearning Center
 - => Capacity to acquire and process all Sentinel-2 satellite images from 2016 over Cambodia
 - => Possibility to host online applications
- **2023-2024: Installation and development of processing chains for satellite data:**
 - installation of Sen2Chain and Sen2Extract
- **2024: Creation of a catalog of spatial products,** easily available for use at ITC and by partners.



- Facilitate access to very high spatial resolution satellite images in connection with the French DINAMIS Facility and the Theia GeoDev network;
- Interactions (for training and developments) with SEAS-OI and SEAS-Guyane satellite receiving stations, connected to IRD - Espace-Dev
- National interactions between universities and remote sensing actors in Cambodia (Royal University of Agriculture, Ministries)
- Regional interactions: possibly with the Thai Spatial Agency GISTDA



=> Organization of annual workshops in Cambodia with French experts and partners

Coordinating institutions:

- Institute of Technology of Cambodia (ITC)
- French National Research Institute for Sustainable Development (IRD)



With support from:

- French Embassy in Cambodia
- Agence Universitaire de la Francophonie (AUF)



Collaborators:

- Institut National de l'Information Géographique et Forestière (IGN)
- IGNFI



Project Funders:



Satellite data providers:

