Cambodia GeoSpatial Day 2025

18 November 2025

Institute of **T**echnology of **C**ambodia, Phnom Penh

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The **Cambodia GeoSpatial Day 2025** aimed at bringing professionals, policymakers, researchers, and students to **share knowledge, showcase their work, and discuss the latest developments** in the **field of geospatial science and technology**.

The event took place on **Tuesday 18th of November at the Institute of Technology of Cambodia (ITC)**, in Phnom Penh. This event followed on from The Khmer Earth Observation Day, which happened in May 28th 2024.

An open call for abstract for oral presentations or posters was opened during one month and a half month. The **Cambodia GeoSpatial Day 2025** featured 15 oral presentations and 6 posters in five sessions:

1. Drone / Aerial survey / 3D mapping
2. Land management / Urban planning
3. Biodiversity / Ecology
4. Climate and health-related studies
5. Coastal management / Spatial hydrology

Organizing committee:

- HERBRETEAU Vincent, Researcher at the French National Research Institute for Sustainable developmement (IRD), co-Director of KHEOBS Lab at the Institute of Technology of Cambodia (ITC), Phnom Penh, Cambodia
- ANN Vannak, Lecturer and Researcher at the Institute of Technology of Cambodia, co-Director of KHEOBS Lab, Phnom Penh, Cambodia
- CATRY Thibault, Researcher at the French National Research Institute for Sustainable developmement (IRD), KHEOBS Lab, Phnom Penh, Cambodia
- HENG Chhenglang, PhD candidate at the Institute of Technology of Cambodia and the University of Montpellier, KHEOBS Lab, Phnom Penh, Cambodia
- ROUSSEAU Véronique, Project Manager / Public Relations at IRD Espace-Dev, Montpellier, France

and **organizing team from KHEOBS and IRD Espace-Dev** (by alphabetical order): CHY Sreypich, CLEMENTE Agnès GE George, KHIM Sopheak, POV Kakda, RITH Ranny, TEILLET Claire, YORNGSOK Chamroeun

Thanks to:

- **Institute of Technology** for hosting the event,
- **IRD - Espace-Dev** for funding meals, coffee breaks and printing

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08:00 - 8:40	**Registration and welcome coffee**	Hall A, second floor of the main Building A, ITC
	Introduction	
08:40 - 8:50	LE CALVEZ Luc (IRD Representative in Cambodia), HERBRETEAU Vincent (IRD)	Welcome speeches and introduction of the conference
08:50 - 09:00	**Group picture**	
Session 1	**Chairs: CATRY Thibault (IRD) and FAURE Jean-François (IRD)**	**Drone / Aerial Survey / 3D Mapping**
09:00 - 09:20	MAC CARTNEY David (KGI)	3DGS and the National Museum
09:20 - 09:40	VOEUN Sothea (RUA), HENG Tong (RUA), OENG Eavhong (RUA)	Comparative Accuracy Evaluation Between RTK (CORS) And PPK Aerial Surveying Approaches
09:40 - 10:00	DEKEYNE Florian (IGNFI)	Technical Survey and Environmental Profile of the Mekong River – Results of Phase 1
10:00 - 10:30	**Coffee break**	
Session 2	**Chairs: POK Sophak (RUA) and HOSTACHE Renaud (IRD)**	**Land management / urban planning**
10:30 - 10:50	KRIN Kompheak (RUA), SOMBATH Linna (RUA), POK Sophak (RUA)	Evaluation of Inconsistency and Accuracy of Global and Regional Cropland Maps for Cropland Mapping in Cambodia
10:50 - 11:10	CHEA Oudom (RUA), POK Sophak (RUA)	Assessment of Land Use and Land Cover Change Using Sentinel-2 Images in Rotonak Mondol District, Battambang Province from 2016–2024.
11:10 - 11:30	PEANG Ratana (STEM Club Cambodia)	Leveraging Geospatial Data Analytics for Sustainable Urban Development in Cambodia
11:30 - 11:50	TRAUB Emilie (Urban Lab Cambodia), BERTRAIS Dolorès (ULC, Univ Geneva), KETH Piseth (ULC)	Krong Baitong! - Creating data to make Phnom Penh greener
11:50 - 12:00	1 minute poster presentation	
12:00 - 13:30	**Lunch and Poster session**	
Session 3	**Chairs: ANN Vannak (ITC) and TECK Vanna (SIG)**	**Biodiversity / ecology**
13:30 - 13:50	BOUVET Alexandre (IRD), MERMOZ Stéphane (GlobEO), DOBLAS PRIETO Juan (GlobEO), KOLECK Thierry (CNES), LE TOAN Thuy (CNRS)	Continuous detection of forest loss from Sentinel-1: the TropiSCO project
13:50 - 14:10	HENG Chhenglang (ITC), CATRY Thibault (IRD), HERBRETEAU Vincent (IRD), ANN Vannak (ITC), HOSTACHE Renaud (IRD)	Long-term flood monitoring system using Synthetic Aperture Radar (SAR) imagery in tropical climate region: Cambodia as a test case
14:10 - 14:30	CHEA Monysocheata (WWT)	From Satellites to Stewardship: Innovative Mapping, Modelling, and Mobilizing for Nature Conservation
Session 4	**Chairs: TEILLET Claire (IRD) and HERBRETEAU Vincent (IRD)**	**Climate and Health-related studies**
14:30 - 14:50	SOVANN Saren (IPC), FLAMAND (Claude IPC)	Climate and Health Observatory Accelerator Project: Assessing the Climatic Impacts on Health Through the Lens of Public Perceptions in Cambodia
14:50 - 15:10	LE BEUX Matilin (IPC), HENG Kimly (IPC), NOV Kimsear (IPC), RAKOTONORINA Antsa (IPM), COURTY Nicolas (UBS), BOYER Sébastien (IPC)	Integrating MALDI-TOF MS and Machine Learning for Rapid Mosquito Species Identification in Cambodia
15:10 - 15:40	**Coffee break**	
Session 5	**Chairs: BRUN Stéphane (TSA) and OGILVIE Andrew (IRD)**	**Coastal management / spatial hydrology**
15:40 - 16:00	BAUDU Flavien (IRD), HOSTACHE Renaud (IRD), DELENNE Carole (AMU)	Integrating time series of flood extent maps with a shallow-water model for estimating riverbed geometry: a synthetic twin experiment
16:00 - 16:20	FAURE Jean-Francois (IRD)	Monitoring mangroves using Earth Observation data: Introduction to the MangMap Platform and perspectives in Cambodia
16:20 - 16:40	SOK Kimhuy (ITC)	Seven decades of shoreline changes along a muddy mangrove coastline of the Upper Gulf of Thailand
	Closing words	
16:40 - 16:50	CATRY Thibault (IRD)	Presentation of the Cambodia Geospatial Workshop, 19-20th November and Closing words

Poster session (alphabetical order)		
	BOUVET Alexandre (IRD), LE TOAN Thuy (CNRS), MERMOZ Stéphane (GlobEO), DOBLAS PRIETO Juan (GlobEO), KOLECK Thierry (CNES)	Large scale estimation of methane emissions from rice paddies: examples in South-East Asia
	HOSTACHE Renaud (IRD), HENG Chhenglang (ITC-IRD), BAUDU Flavien (IRD), ALEXANDRE Cyprien (IRD), CATRY Thibault (IRD), HERBRETEAU Vincent (IRD)	An automatic processing chain for the monitoring of surface water using Copernicus Sentinel 1 satellite data: first results of the SCO-CASCADES project
	KUN Pechann (RUA)	Analyzing Land Use and Land Cover Change Using Sentinel-2 Imagery in Prek Tnoat River Basin
	NAY Sonsak (WCS), MEN Ratha (WCS)	The role of GIS and Remote Sensing in REED+ program in Cambodia
	SIVYI Yann (ITC), EANGTHAY Tang (K-Global), PANHA Yang (ITC)	The Study of City Bus Route in Battambang City
	YUN Daravathana (K-Global Consultants), SOY Makara (ITC), ROUS Bunhuot (K-Global Consultants), LUN Sambo (ITC)	Mapping Land Cover in Taveaeng kraom Commune, Taveaeng District, Ratanak Kiri Province from 2015-2025

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Drone / aerial survey / 3D mapping

3DGS and the National Museum

David Mac Cartney * [1]

[1] KGI – Cambodia

I will present 3DSG technology and what we did for the National Museum of Cambodia.

Keywords: 3DGS, XGRIDS, National Museum, 3D, spatial navigation, digital twin, 3D Gaussian Splatting

*Speaker

Comparative Accuracy Evaluation Between RTK (CORS) And PPK Aerial Surveying Approaches

Voeun Sothea [*†] [1], Heng Tong [1], Oeng Eavhong [1]

[1] Faculty of Land Management and Land Administration, Royal University of Agriculture – Cambodia

The drone revolution has significantly increased in the last decade, leading to the ease of aerial mapping. There are various aerial surveying methods available, such as the Continuously Operating Reference Station (CORS), Real-Time Kinematic (RTK), Post-Processed Kinematic (PPK), and many others. Therefore, the result of the aerial mapping can be varied. Traditional photogrammetry employed Ground Control Points (GCPs) and Check Points (CPs) to enhance the accuracy of the aerial photo, which negatively impacts the time-consuming process in the field survey. This research will examine the horizontal and vertical accuracy of the RTK (Real-Time Kinematic) and PPK (Post-Processed Kinematic) approaches with a UAV (DJI M350 RTK) to capture photos with the Zenmuse L2 sensor (LiDAR). To evaluate the result of these two methods, 4 GCPs and 4 CPs were designed in order to compare their positional accuracy. The results indicate that the accuracy of the PPK method is surpassed by the RTK method, which has RMSE values of X=0.000179, Y=0.000168, and Z=0.003542, respectively. On the other hand, the RMSE values obtained from the RTK approach are X=0.001023, Y=0.001068, and Z=0.008013, respectively. Therefore, the accuracy obtained through the PPK approach tends to be more accurate than RTK (CORS), as the RMSE values of the PPK method are smaller than RTK.

Keywords: Aerial Mapping, UAV, RTK, PPK, CORS, LiDAR

[*]Speaker

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Technical Survey and Environmental Profile of the Mekong River – Results of Phase 1

Florian Dekeyne * [1]

[1] IGN-France International – IGN-France International – France

The consortium of IGN FI (France), NP SURVEY (Thailand), and CDG (LAOS) has implemented an integrated methodology for environmental monitoring and river profiling in support of the Mekong River Commission's monitoring, forecasting, and assessment program. This presentation presents methodology ans results of Phase 1 focused on three key locations-Pak Beng, Pak Lay, and Pak Chom-where advanced geodetic control networks, high-resolution LiDAR mapping, multi-beam bathymetric surveys, and sediment sampling have been conducted. The collected data includes topography, riverbed morphology, sediment composition, and anthropogenic activities along the riverbanks. These deliverables provide a robust scientific foundation for sustainable river management, habitat conservation, and future development planning in the Mekong basin.

Keywords: Mekong River, environmental monitoring, river profiling, geodetic control network, LiDAR mapping, multi, beam bathymetry, sediment sampling, sustainable river management

*Speaker

Mapping Land Cover Change in Taveaeng Kroam commune, Taveaeng district, Ratanak Kiri province from 2015 to 2025.

Daravathana Yun *† [1], Makara Soy [2], Bunhuot Ruos [1], Sambo Lun [2,3]

[1] K-Global Consultants Engineering Co.,Ltd – Cambodia
[2] Institute of Technology of cambodia – Cambodia
[3] WAE Research Unit, Institute of Technology of Cambodia, Phnom Penh, Cambodia – Cambodia

Earth-observing satellite data has been widely used in various studies to quantify data from the past and define land use and land cover (LULC) changes. Understanding this change are crucial for research and sustainable land use planning, as they illustrate long-term landscape patterns that link the resources availability with human demands. This work aims to study LULC changes in Taveang Kraom commune, Taveaeng district, Ratanak Kiri Province, Cambodia, using Geographic Information Systems (GIS) and high-resolution satellite imagery from PlanetScope (4.7m), over the years 2015, 2018, 2021 and 2025. The study examines how land cover classes including deciduous forest, evergreen forest, barren land, plantations, and water bodies have been influenced by human and environmental factors. The results show from 2015 to 2025, deciduous forests experienced a significant loss of 12,721 hectares (17.03%) despite partial recovery after 2018, while evergreen forests showed overall growth of 7,872 hectares (10.54%) but faced declines after 2018. Barren land expanded slightly until 2021 but then decreased sharply by 2,239 hectares (3%), resulting in a loss of 1,595 hectares (2.14%). Plantation areas consistently grew, increasing by 6,724 hectares (9%) over the decade, indicating agricultural expansion. Water bodies fluctuated slightly with a minor net decrease of 280 hectares (0.37%), likely due to environmental and human factors.

Keywords: LULC, GIS, Remote Sensing, Satellite image

*Speaker
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Land management / urban planning

Leveraging Geospatial Data Analytics for Sustainable Urban Development in Cambodia

Peang Ratana * [1]

[1] STEM Club Cambodia – Cambodia

Cambodia is undergoing rapid urbanization, creating both opportunities and challenges in managing land use, infrastructure, and environmental sustainability. Geospatial data has become an essential tool to support evidence-based decision-making in these areas. This study explores how integrating geospatial technologies with data analytics can enhance urban planning, environmental monitoring, and sustainable resource management in Cambodia. By combining satellite imagery, GIS mapping, and open-source datasets with advanced data processing tools, we demonstrate methods for analyzing urban growth patterns, identifying high-risk flood zones, and monitoring land-use changes. Case studies from Phnom Penh and provincial cities highlight practical applications for transportation planning, waste management, and disaster preparedness. The findings emphasize the importance of building local capacity in geospatial data literacy, fostering collaboration between government, academia, and private sectors, and promoting open data initiatives. This research contributes to Cambodia's digital transformation goals by showing how geospatial data can be harnessed not only for spatial insights but also for driving sustainable, inclusive, and resilient urban development.

Keywords: urbanization, data, analytics

*Speaker

Evaluation of Inconsistency and Accuracy of Global and Regional Cropland Maps for Cropland Mapping in Cambodia

Krin Kompheak *† [1], Sombath Linna [1], Pok Sophak [1]

[1] Faculty of Land Management and Land Administration, Royal University of Agriculture – Cambodia

Accurate cropland information is critical for agricultural planning and production, especially in countries that are heavily dependent on agriculture, like Cambodia. Although widely used medium-to-high-resolution satellite-based cropland maps have been developed from various remotely sensed data sources over the past few decades, discrepancies exist among these products both in total area and spatial distribution of croplands, hindering further applications of these datasets. In this study, we evaluated the consistency and accuracy of four widely used cropland maps in Cambodia during 2023. These include three global land cover products (ESRI, Dynamic World or DW, and GLC_FCS10) with a 10-meter resolution and one regional product (RLCMS) with a 30-meter resolution. We evaluated these products for two regions: Coastal region, and Plateau and Mountains region. Validation in the Coastal region using the 2023 district cropland statistics shows that the cropland maps from ESRI, DW, GLC_FCS10 and RLCMS have an RMSE of 13,674 hectares, 18,849 hectares, 10,879 hectares and 82,272 hectares respectively. Validation in Plateau and Mountains region using the district cropland statistics indicates that ESRI product has an RMSE of 53,363 hectares, DW has an RMSE of 60,900 hectares, and GLC_FCS10 has an RMSE of 51,444 hectares, whereas the RLCMS has an RMSE of 54591 hectares. Separately, accuracy assessments using ground-truth data from Google Earth images revealed that in Coastal region the 10-meter resolution GLC_FCS10 provides the highest accuracy (86.25%), while in Plateau and Mountains region the 30-meter resolution regional RLCMS map provides a moderate accuracy (82%). Notable spatial inconsistency between the maps was observed in both regions. This could be due to the varying accuracy of the cropland maps, cropland fragmentation, and management practices. This research provides key insights for enhancing future cropland mapping efforts in Cambodia, and aids in the decision-making process for selecting data sources to produce high-accuracy cropland maps.

Keywords: Cropland mapping, Inconsistency, Accuracy, RLCMS, ESRI, GLC_FCS10, Dynamic World, Cambodia

*Speaker

†Corresponding author: krinkompheak04@gmail.com

Assessment of Land Use and Land Cover Change Using Sentinel-2 Images in Rotonak Mondol District, Battambang Province from 2016–2024.

Chea Oudom * [1], Pok Sophak *

1

[1] Royal University of Agriculture – Cambodia

Rotonak Mondol district is a district in Battambang province that once was the hot battlefield of the civil war. After the civil war ended in 1998, the district took on a new face and has undergone significant land use and land cover (LULC) changes, primarily driven by agricultural expansion and infrastructure development. Monitoring these changes is important for sustainable resource and spatial planning. This study aimed to use Sentinel-2 satellite imagery and remote sensing and GIS techniques to analyze LULC change over an eight-year period (2016-2024). First, we compared the effectiveness of the Support Vector Machine (SVM) and Maximum Likelihood (ML) supervised classification algorithms in mapping LULC. Then, we quantified the spatial and temporal LULC changes across six distinct categories: annual crop, forest, shrubland, built-up area, perennial crop, and water bodies. The comparative analysis found that the SVM method demonstrated significantly higher overall accuracy at 87%, compared to 73% for the ML method. Using the SVM output for post-classification change detection, notable transformations were observed between 2016 and 2024. The most dramatic shifts include a substantial decrease in natural cover, with forest areas decreasing by 5,597 hectares and shrubland decreasing by 7,292 hectares. Conversely, annual cropland expanded by 1,458 hectares and built-up area grew by 1,918 hectares, reflecting intensified agricultural production and the expansion of built-up areas along major road networks. This work is intended to be a foundational resource, providing policymakers with the LULC data necessary to make informed decisions regarding land management, agricultural zoning, and the urgent need for targeted conservation efforts to safeguard the district's remaining natural resources.

Keywords: Land Management, Land Use, Land Cover, Remote Sensing, GIS, Sentinel 2, Support Vector Machine, Maximum Likelihood

*Speaker

Krong Baitong! - Creating data to make Phnom Penh greener

Emilie Traub * [1], Dolores Bertrais [1,2], Piseth Keth [1]

[1] Urban Lab Cambodia – Cambodia
[2] Université de Genève = University of Geneva – Switzerland

Urban green spaces are considered an essential component of urban life around the world for the role they play in environmental, social, physical and mental health fields.
In Phnom Penh, the green and blue landscapes have drastically evolved over the past two decades, with the reintegration of the Cambodian capital to the globalized economy after the civil war. Hand-in-hand with the city's exponential growth since the late 2000's, challenges around livability, such as mobility, air and water pollution and public spaces have emerged. In the past decade, and especially since the Covid-19 pandemic, a growing awareness on the importance of and demand for urban green spaces has been developing.

However, despite the importance and growing attention towards Urban Green Spaces in Phnom Penh, little data exists and only small-scale segmented projects have been implemented. Krong Baitong!, a 12 months research-action project, set out to better understand the quantity, quality, geographical distribution and accessibility of urban green spaces in Phnom Penh thanks to the creation of primary data sets collected through extensive field observation, key stakeholder interviews, surveys with park users and satellite imagery analysis. Funded by the I-NGO People in Need Innovation Fund, it was hosted by L-NGO Open Data Cambodia and implemented by Urban Lab Cambodia in 2023-2024.
Presenting the results of satellite imagery analysis, contextualized with the complementary qualitative data sets created through on-site observation, this intervention provides a pragmatic example of the need and applications for data for sustainable, green and smart development in Phnom Penh.

Keywords: Green spaces, urban development, urban planning, data triangulation

*Speaker

Analyzing Land Use and Land Cover Change Using Sentinel-2 Imagery in Prek Tnoat River Basin

Pechann Kun * [1]

[1] Faculty Land Management and Land Administration, Royal University of Agriculture, Phnom Penh, Cambodia – Cambodia

Evaluation of land use and land cover (LULC) changes is crucial for sustainable river basin management. The Prek Tnoat River Basin (PTRB) is one of the main river basins located in southwestern Cambodia and covers parts of the provinces of Kampong Speu, Koh Kong, Kampot, Preah Sihanouk, Takeo, Kandal, and Phnom Penh. The basin has been experiencing significant development over the past decade, leading to LULC changes. In this study, we examined LULC changes in the PTRB using Sentinel-2 satellite images. First, we produced LULC maps with five classes (water bodies, built-up area, bare land/sparse vegetation, forest, and agricultural land) for 2019 and 2024 using Random Forest machine learning in Google Earth Engine platform. Furthermore, we performed LULC change analysis using Zonal tools in ArcGIS Pro. The results of the accuracy assessment showed that the overall accuracy of the 2019 LULC map was 96.35%, while the overall accuracy of the 2024 LULC map was 97.40%. The results of the LULC change analysis revealed that water bodies, built-up areas, and bare land/sparse vegetation increased, whereas forest and agricultural land decreased by 5.73% and 7.65% respectively, between 2019 and 2024. This decline in agricultural land and forest cover could lead to increased water runoff from the western to the eastern part of the basin, particularly affecting the southern area of Phnom Penh. The increase in built-up areas near the Prek Tnaot River channel could also cause narrowing of the river flow path if not properly managed. This study prompts the relevant authorities and basin management committee to pay close attention on measures to control developments in the PTRB.

Keywords: Land Use Land Cover, LULC, LULC Change Detection, Prek Tnoat River Basin, PTRB

*Speaker

Biodiversity / ecology

Continuous detection of forest loss from Sentinel-1 : the TropiSCO project

Alexandre Bouvet * [1,2], Stéphane Mermoz [3], Juan Doblas Prieto [3], Thierry Koleck [4], Thuy Le Toan [1,3]

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[2] ACROSS (IRD lab) – Vietnam

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[4] Centre National d´tudes Spatiales [Toulouse] – Centre National d'Etudes Spatiales - CNES (Toulouse, France) – France

In this study, we present an operational system to detect forest loss at a large scale accurately and in a timely manner, using Sentinel-1 times series. Within the TropiSCO project (https://www.tropisco.org/), forest loss maps are updated every 6 to 12 days over selected countries (Vietnam, Laos, Cambodia, Thailand, Gabon, French Guiana, Suriname, and Brazil), with a gradual extension to the whole tropical belt. To do so, we used a method based on the detection of the shadows that appear in Sentinel-1 images at the edge of the deforested patches. The main advantage of this method is the ability to avoid false alarms, which is relevant in Southeast Asia where the areas of forest disturbance may be very small and scattered. Over Vietnam, Laos and Cambodia, the estimated user accuracy of the forest loss map was 0.95 for forest disturbances and 0.99 for intact forest, and the estimated producer's accuracy was 0.90 for forest disturbances and 0.99 for intact forest, with a minimum mapping unit of 0.1 ha. This represents an important step forward compared to the values achieved by previous studies. We also found that approximately half of forest disturbances in Cambodia from 2018 to 2020 occurred in protected areas, which emphasizes the need for an increased monitoring and conservation of natural resources in protected areas. On an annual basis, the forest loss areas detected using our method are found to be similar to the estimations from Global Forest Watch. These results highlight the fact that this method provides not only quick alerts but also reliable detections that can be used to calculate weekly, monthly, or annual forest loss statistics at a national scale. The TropiSCO data can have many uses: fighting illegal logging and mining, illegal agricultural crops and wildlife trafficking, but also providing easily usable data and statistics.

Keywords: deforestation, forest

*Speaker

Long-term flood monitoring system using Synthetic Aperture Radar (SAR) imagery in tropical climate region: Cambodia as a test case

Chhenglang Heng * [1,2], Thibault Catry [2], Vincent Herbreteau [2], Vannak Ann [1], Renaud Hostache [2]

[1] Institute of Technology of Cambodia [Cambodge] – Cambodia
[2] UMR 228 Espace-Dev, Espace pour le développement – Institut de Recherche pour le Développement, Université de Montpellier – France

Topical's flood plain challenges for flood mapping due to persistent cloud cover, and dynamic hydrological regimes. This study introduces a robust workflow for flood detection using Sentinel-1 Synthetic Aperture Radar (SAR) data. We implement the adopted CASCADES algorithm which parametric thresholding to isolate water bodies based on backscatter intensity, followed by a region-growing algorithm to refine flood extents. The methodology is optimized for reproducibility of flood extend maps over long-term periods. The results underscore the potential of SAR-based approaches for near-real-time and long-term flood monitoring in tropical regions, offering critical insights for disaster response, and climate surveillance system.

Keywords: Flood Mapping, Sentinel, 1, SAR, Parametric Thresholding, Region Growing, Tonle Sap Lake

*Speaker

From Satellites to Stewardship: Innovative Mapping, Modelling, and Mobilizing for Nature Conservation

Monysocheata Chea *† [1]

[1] Chea Monysocheata – Cambodia

In the face of accelerating environmental change, translating satellite data into meaningful local action is key to effective conservation. This presentation highlights how science and technology, spatial modelling, and community engagement can be integrated to strengthen wetland conservation and sustainable landscape management. By combining Earth observation data with on-the-ground measurements, this approach provides powerful tools to understand, monitor, and restore complex wetland ecosystems.

Using case studies from Cambodia's wetlands and floodplain ecosystems, the presentation demonstrates how scientific insights guide targeted restoration interventions. The results show how data-driven analysis can inform management decisions, prioritise restoration efforts, and empower local stewardship.

By bridging the gap between advanced geospatial science and on-the-ground conservation practice, this work illustrates a clear pathway *from satellites to stewardship*-where technology not only observes nature but actively helps protect it.

Keywords: Wetland, conservation, restoration, biodiversity, habitat

*Speaker

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Large scale estimation of methane emissions from rice paddies: examples in South-East Asia

Alexandre Bouvet * [1,2], Thuy Le Toan [1,3], Stéphane Mermoz [3], Juan Doblas Prieto [3], Thierry Koleck [4]

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[2] ACROSS (IRD lab) – Vietnam

[3] GlobEO – globEO – France

[4] Centre National d´tudes Spatiales [Toulouse] – Centre National d'Etudes Spatiales - CNES (Toulouse, France) – France

Anthropogenic methane (CH4) emissions are a major cause of rising global average temperatures. To slow global warming, 158 countries, including Cambodia, have committed to reducing their methane emissions by 30% by 2030 within the Global Methane Pledge initiative. Agriculture is a major anthropogenic source of CH4, of which rice paddies are one of the largest through the decomposition of organic matter in the oxygen-free environment of flooded rice fields. Reducing methane emissions can be achieved by performing one or more drainages during the rice growing season, a practice known as Alternate Wetting and Drying (AWD). For mitigation measures by national authorities or by organizations that provide financing to rice farmers through low-carbon incentive credits, it is essential to monitor water regimes in rice fields at different stages of the plant growth cycle. Information is needed at the local level, for farmer reporting, but also at the regional level for national CH4 inventories and subsequent actions to reduce emissions. In this presentation, we present a methodology using remote sensing data, in situ observations and IoT measurements to estimate methane emissions from rice fields, with the aim of providing a tool for stakeholders to simulate different water management scenarios to reduce methane emissions. Remote sensing provides the following information: 1) Dynamic mapping of rice growth: using Sentinel-1 time series data, it is possible to provide maps of the rice area, rice cropping intensity, and rice growth stage, 2) Mapping of rice field flooding status using L-band SAR, which has the ability to penetrate through a rice canopy at the full growth stage. Newly developed and tested automatic methane emission chambers are being implemented in experimental fields in Vietnam, and are used to estimate methane emission factors linked to fields under continuous flooding or fields under AWD.

Keywords: rice, methane, GHG

*Speaker

The role of GIS and Remote Sensing in REED+ program in Cambodia

Nay Sonsak * [1], Men Ratha * † [2]

[1] Sonsak Nay – Cambodia
[2] Men, Ratha – Cambodia

The Wildlife Conservation Society saves wildlife and wild places worldwide. We do so through science, global conservation, education, and the management of the world's largest system of urban wildlife parks, led by the flagship Bronx Zoo. Together, these activities change attitudes towards nature and help people imagine wildlife and humans living in harmony.
WCS has been working in Cambodia since 1999, with a focus on four landscapes and ten main project sites. These sites are the Northern Plains Landscape (four project sites), Tonle Sap Great Lake (three project sites), Eastern Mekong Forests (one project site), and Kohkong Rivers and Wetlands (two project sites). WCS Cambodia has a project agreement with two ministries of the Royal Government of Cambodia, the Ministry of Environment and the Ministry of Agriculture, Forestry and Fisheries, to provide financial and technical support in order to protect natural resources and biodiversity in Cambodia.

Within the ten main project sites, KEO SEIMA REDD+, one of project sites, has succeeded in selling carbon credits in 2016 to Disney Company.
The effectiveness of the conservation, REDD+ Program is ultimately attributed to the accuracy, efficiency, and transparency of monitoring activities that are improved by the integration of GIS and remote sensing technologies. The GIS&RS tools are used for mapping, geoprocessing, modeling, spatial analysis, creating baseline maps, monitoring deforestation and land use change, predicting the risk area of deforestation and forest degradation, estimating carbon stocks, and other REDD activity data generation. GIS and remote sensing also provide a very visual opportunity to share information about the impact and danger of these practices to all stakeholders. GIS and Remote Sensing is a crucial tool for Conservation in Cambodia.

Keywords: GIS, Remote Sensing, Conservation, REDD+, Cambodia.

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Climate and Health-related studies

Integrating MALDI-TOF MS and Machine Learning for Rapid Mosquito Species Identification in Cambodia

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Accurate identification of mosquito species is essential for ecology, vector control and surveillance. However, morphological identification using stereomicroscope or microscope is challenging, particularly for closely related species within complex groups. Molecular techniques represent reliable alternatives, but they are time-consuming and costly. In this study, we evaluated the use of a protein-based molecular approach, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), combined with machine learning to improve mosquito species identification. A total of 404 specimens belonging to 19 species were collected from different provinces across Cambodia. In similar studies, the machine learning component is often neglected or insufficiently described to ensure reproducibility. Here we address this limitation by adopting a combined model-centered and data-centered approach, using six preprocessing methods and six classification algorithms to identify the most effective configuration. The proposed pipeline enables the selection of the optimal preprocessing-model combination according to the characteristics of the data. The combination of binning as preprocessing and a Convolutional Neural Network (CNN) model achieved an F1 score exceeding 99% considering the 19 species including species complex group. We demonstrated the improvement of integrating machine learning with MALDI-TOF MS to develop a rapid, cost-effective and reliable tool for mosquito species identification including complex groups.

Keywords: Machine learning, Mosquito species identification, MALDI, TOF MS

*Speaker

Climate and Health Observatory Accelerator Project: Assessing the Climatic Impacts on Health Through the Lens of Public Perceptions in Cambodia

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Due to its tropical climate and weak surveillance system, Cambodia is still at high risk of infectious diseases outbreak and transmission. Previous studies have shown that dengue outbreaks vary by locality, highlighting the need for surveillance and early warning systems that can monitor spatial transmission patterns and detect local emergences for timely, targeted responses. Despite this, little is known about how populations perceive the health effects of climate change or how behavioural and social factors influence exposure and access to care. This represents a critical knowledge gap. The study combines qualitative and quantitative approaches to identify socio-cognitive and behavioural determinants of exposure risk, healthcare access, and acceptance of public health interventions. To better anticipate future risks, it is essential to study the links between climate conditions, disease transmission, and local perceptions through focused, integrated, and nationwide research that can inform predictive models and guide effective public health preparedness. In the medium to long term, environmental and climate-related determinants of infection risk will be explored using geospatial models to predict human epidemiological risk across Cambodia. Lessons learned will not only benefit Cambodia but may also inform strategies in other countries facing similar climate-related health threats.

Keywords: Climate, Health, Perception, One Health, National Survey, Population, based Design, Infectious Diseases, Cambodia

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Coastal management / spatial hydrology

Integrating time series of flood extent maps with a shallow-water model for estimating riverbed geometry: a synthetic twin experiment

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Two-Dimensional Shallow Water (SW) modelling is a powerful tool to provide predictions of floodwater extent and levels as well as flow velocities that are necessary to help preventing the adverse consequences of these highly destructive phenomena. However, setting up such models on a river and its floodplains and calibrating their parameters is challenging in many places around the world where accurate topographic and bathymetric data are lacking or sparsely available. In this context, Data Assimilation (DA) that optimally combines uncertain models and observations is very relevant for retrieving such missing data or parameters. In our study, we propose to develop an approach aiming to estimate the geometry of a river stream via the assimilation of satellite image-derived flood extent information. More precisely, we make use of synthetic aperture radar (SAR) data, where floodwater extents can be rather easily detected. To take into account the observation uncertainty, as required in DA, we derive from the SAR image a probabilistic flood map where the value of each pixel represents its probability of being flooded, given the observed backscatter. Using a tempered particle filter (TPF), we assimilate multiple SAR-derived probabilistic flood extent maps into an ensemble of hydraulic simulations, called particles hereafter, carried out using the same model architecture but with sampled random riverbed geometries. To evaluate the proposed methodology in a controlled environment, we set up a synthetic twin experiment grounded on a real test case over the River Severn in the UK around the town of Tewkesbury, Gloucestershire, which is known for its frequent flood events. Our results indicate that the riverbed geometry of the River Severn can be effectively retrieved using the proposed approach.

Keywords: Floods, Shallow Water, Data Assimilation, Riverbed Geometry

*Speaker

Enhancing Hydrological Monitoring and River Flood Forecasting through Satellite Imagery in the Lower Mekong Basin

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The Mekong River Commission (MRC), through its Secretariat in Vientiane and the Regional Flood and Drought Management Centre (RFDMC) in Phnom Penh, plays a central role in monitoring and managing the environmental and hydrological conditions of the Lower Mekong Basin (LMB), including the forecasting of river floods and droughts.

To further strengthen its monitoring and forecasting capabilities, the MRC seeks to integrate satellite imagery into its Core River Monitoring Network (CRMN), also known as the Mekong Hydrological Cycle Observing System (Mekong-HYCOS). Leveraging satellite-based observations alongside ground-based hydro-meteorological measurements will enhance the accuracy, coverage, and efficiency of hydrological models and river flood forecasting systems.

This presentation highlights the MRC's initiative to utilize satellite data for improved environmental and hydrological surveillance, with a focus on calibrating satellite-derived information using in situ observations. The integration of these datasets is expected to enhance the precision of flood forecasting and support more effective basin management.

Additionally, the MRC is exploring the potential of satellite imagery to monitor sediment transport and quantify sediment loads across the LMB which is an important component of the upcoming MRC Strategic Plan 2026–2030. Understanding sediment dynamics through remote sensing is essential for assessing the impacts of hydropower development, sediment extraction, and other human activities on water quality, river morphology, and ecosystem health.

By combining satellite and ground-based observations, the MRC aims to strengthen its monitoring systems, refine predictive tools, and contribute to sustainable water resource management and disaster risk reduction in the Mekong region. The MRC also intends to collaborate with regional and international partners to advance this work in the coming years.

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Keywords: Water resources management, transboundary rivers, spatial imagery, hydrology modelling, forecast, sediment transport, hydrometeorolgy

Seven decades of shoreline changes along a muddy mangrove coastline of the Upper Gulf of Thailand

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This study evaluates the historical coastal change and development along the eastern coastline of the Upper Gulf of Thailand between 1953–2024 based on a series of aerial photographs and satellite images. Long- (_˜70 years) and short-term (_˜10 years) shoreline movement rates were analyzed using the Digital Shoreline Analysis System (DSAS). Results of this analysis indicate that the shoreline along the western coast (WBK) of the Bang Pakong River mouth has undergone severe coastal degradation with a land loss of about 940 ha over the last seven decades. Meanwhile, the eastern coastline (EBK) has continuously developed over this time span resulting in a land growth of about 565 ha. Based on historical shorelines recorded since 1954, the shoreline recession along the WBK coast accelerated over five decades. The average shoreline change rate reached approximately –9 m/y in 2002 and is shown to be related to land subsidence, which was due to groundwater withdrawals. The WBK coastline stabilized in 2009 and became an accretionary coast since 2016 due to the introduction of engineered coastal protection measures. In addition, construction of major dams on the Chao Phraya and Bang Pakong Rivers did not result in severe shoreline recession along the WBK coast. A significant reduction in sediment supply to the coastal zone due to damming was not observed. In contrast, the EBK coastline continuously advanced since 1953 with average growth rates between 0.5–7.6 m/y over 50 years as a result of increased riverine sediment supply. Our results also indicate that mangrove deforestation was not a major factor causing shoreline retreat, and mangrove reforestation was not a successful coastal protection approach in this coast.

Keywords: Sediment dynamics, shoreline change, severe erosion, groundwater use, mangrove deforestation, land subsidence

*Speaker

Monitoring mangroves using Earth Observation data: Introduction to the MangMap Platform and perspectives in Cambodia

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Mangroves represent a vital natural heritage. Our capacity to ensure their preservation is a key issue for fighting against global warming, preserving biodiversity and ensuring the way of life and subsistence of the increasing human population concentrated along the coasts. Over the last half century mangroves have suffered an alarming loss of global cover. In order to improve the understanding of the dynamics and functioning of mangroves, up to date and recurrent mangrove mapping and monitoring tools are crucial assets.

MangMap is an online monitoring platform opened in Demo mode in 2024. It is dedicated to the dissemination of products and services useful to mangrove mapping, using satellite data from Sentinel-2 Constellation. The Platform offers a complementary approach to existing on-

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line resources, providing interactive tools in order to extract and manipulate information from imageries and spectral indexes at local scales. An automated vector contour of mangrove spatial distribution is calculated every quarter. Temporal composites of all indexes are processed monthly, quarterly, semesterly and yearly. End-users can specify on-demand analysis inside their own areas of interested, between two dates, showing: (1) indicators of mangrove spatial distribution in time; (2) indicators of index anomalies in time; (3) statistical evolution of index in time and space.
In its current version MangMap focuses on 5 pilot sites. They will be complemented in 2026 with 11 new sites. Further up-grades are in preparation, such as an alert system for mangrove deforestation, degradation and restauration. The main challenge ahead is to open MangMap to new study areas, broaden the community of end-users, and strengthen partnerships with networking programs: webinars to raise awareness, training sessions, events to share scientific and technical applications and perspectives. MangMap will receive funds in the next two years to match these objectives, with priority given to new sites in Madagascar, Cambodia, Brazil.

Keywords: Mangroves, Earth observation, Monitoring, Satellite data – Open platform

An automatic processing chain for the monitoring of surface water using Copernicus Sentinel 1 satellite data: first results of the SCO-CASCADES project.

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Water is essential to life of various ecological and social systems. Unfortunately, water is one of the natural resources most impacted by climate change, with increasingly intense hydro-meteorological extremes (floods, droughts, etc.) and growing societal demand. To help manage this vulnerable resource, it is vital to assess and monitor its availability on a regular basis, as well as to track its trajectory over time to better understand the impact of global change on it. Surface water (lakes, rivers, flood plains, etc.) represents an important component of total water resources, and it is of primary importance to monitor it to better understand and manage the consequences of climate change. Surface water resource provides populations around the world with essential ecosystem services such as power generation, irrigation, drinking water for humans and livestock, and space for farming and fishing.
In this context, the CASCADES project implements end-to-end processing chains for satellite Earth observation data, including Sentinel-1 and 2 (S-1 and S-2), in order to provide surface water products that will be made available via an interactive platform.

In the first phase of the project a fully automated Sentinel-1 based processing chain has been implemented. This derives various maps using a sentinel-1 image time series including:

an exclusion layer identifying areas where water cannot be detected on Sentinel 1 image (e.g. Urban and forested areas)

a permanent water body map.

an occurrence map providing the number of time (over the time series) each pixel was

*Speaker

under water

a water body map for each sentinel-1 image

an uncertainty map characterizing the water body classification uncertainty

In this poster, we present the workflow of the processing chain and the resulting maps produced over the Mekong flood plains between Kratie, the Tonle Sap lake and the Mekong Delta using a 2-year time series satellite images (2023-2024).

Keywords: Satellite earth observation, Sentinel satellite constellations, surface water resource, water body mapping, flood depth mapping, interactive platform

Transportation

The Study of City Bus Routes In Battambang City

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Battambang, the second largest city in Cambodia, is facing transportation problems due to its heavy reliance on private transportation, resulting in high travel costs and insecurity, especially for motorcyclists. Without a formal public bus system, many areas lack adequate access to transportation services, leading to social inequality, traffic problems, and environmental impacts. This study aims to design an efficient and equitable urban bus network to address these issues. The study uses a mixed-method approach, using software such as geographic map analysis, statistical analysis, and a survey of 383 residents in Battambang. The study focused on the design of public bus routes, the selection of suitable locations for public bus stops, and the determination of preliminary locations for public bus stations. The proposed public bus route network, which uses a combination of Grid and Radial layouts, has a total length of 111.16 km and 234 public bus stops, spaced 400-600 meters apart. Analysis shows that the public bus network within 400 meters can cover about 31% of the population and within 600 meters can cover about 40% of the population in Battambang. This plan can serve as a model for other medium-sized cities in Southeast Asia that want to transition from informal transport to reliable and sustainable public transport.

Keywords: Keywords: City Bus network, transport equity, geographical analysis and statistics

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