



## ReCaREDD Workshops / Training

# 'Tools and Methods for Monitoring Deforestation and Forest Degradation by Remote Sensing'

Workshops held in September and November 2016 in:  
Cambodia, Phnom Penh (at Inst. of Forest & Wildlife Research & Development)  
Laos, Vientiane (at Faculty of Forestry of the National University)  
Vietnam, Hanoi (at Guest House of the Parliament)



### ReCaREDD Project Partners:

Cambodia: Dept. of Nature Conservation and Protection (GDNCP), Ministry of Environment (MoE); Forest Administration (FA)

Laos: Forest Inventory and Planning Division (FIPD), Department of Forestry (DoF); Faculty of Forestry, National University of Laos (NUoL)

Vietnam: Forest Inventory and Planning Institute (FIPI)

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**ReCaREDD Project**

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Authors of the technical report: H-J. Stibig, A. Langner and D. Simonetti

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*(Full list of participants available in sections 6 'Cambodia', 7 'Laos', and 8 'Vietnam')*

Report published in May 2017

*European Commission, Joint Research Centre*

The workshops were organised and implemented by Hans-Jürgen Stibig, Andreas Langner and Dario Simonetti

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## 1. Context

### Background

The ReCaREDD<sup>1</sup> (**R**egional **C**apacities for **REDD**+) project is hosted by the European Commission's Joint Research Centre (JRC), funded by the European Commission's Directorate-General for International Development and Cooperation (DG DEVCO). The main goal of the project is to enhance the capacities of institutions in tropical partner countries to assess and report on deforestation and forest degradation in the context of REDD+, in a reliable and cost-efficient manner. Further objectives are to develop, share and adapt appropriate monitoring methods and software tools, and to provide direct assessments of the status and evolution of tropical forest cover in support to forest policies and national or international negotiations on emission reductions.

In continental Southeast Asia the ReCaREDD project has established direct collaboration with partners in Cambodia, Laos and Vietnam ('focus countries'), where methodologies for forest monitoring and new Sentinel-2 satellite imagery are being tested in the context of collaboration of JRC and national partner institutions. Test sites have been selected and field-work will be performed.

However, also other countries of the region ('associate countries') can similarly benefit from the project: All data, methodologies, and tools produced in the context of ReCaREDD will be shared. There will be regional workshops and case-by-case collaboration can be envisaged for selected topics, as done for instance for the provision of pre-processed Sentinel-2 data of the years 2015/2016 to national forest institutions in Myanmar and Nepal. Furthermore, the present phase of the ReCaREDD initiative on 'Prototyping a Regional Forest Observatory in continental Southeast Asia' covers all countries in continental Southeast Asia.

In the context of the ReCaREDD project, the JRC is implementing a set of regional or national workshops and training sessions to inform and train partner institutions in techniques for monitoring and assessing forest degradation using most recent satellite remote sensing data, combined with field surveys.

### National workshops/training in 2016

In 2016 national workshops/trainings have been organized in Cambodia, Laos and Vietnam on 'Tools and Methods for Monitoring Deforestation and Forest Degradation by Remote Sensing'.

In the case of Southeast Asia the implementation of separate workshops and training sessions at national level has been feasible due to the limited number of focus countries, offering some advantages: Firstly, the training could be tailored in order to meet specific conditions and needs of the country, secondly a larger number of national stakeholders

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<sup>1</sup> ReCaREDD full title: 'Strengthening national and regional capacities for reporting on the mitigation actions of the forest sector'

could be reached, including representatives from different national institutions, ministries or universities involved in REDD+ monitoring and reporting, and finally, staff from provincial offices of partner organization could participate in the training as well.

The workshops/trainings were scheduled in coordination with the ReCaREDD partners:

- **Cambodia:** Phnom Penh, 26-29. Sep. 2016
- **Laos:** Vientiane, 22-25 Nov. 2016
- **Vietnam:** Hanoi, 20-23. Sep. 2016

This report provides a summary of the main contents of the workshop and training.

## **2. Workshop/Training Objectives**

The main objective of the training sessions and workshops was to improve the technical capabilities of ReCaREDD partner institutions in monitoring forest change, addressing particularly processes of forest degradation.

The main topics covered in the workshops/training sessions included:

1. introducing to new SENTINEL-2 (S2) satellite data for monitoring forest change and forest degradation processes,
2. introducing to and intense training on the functionalities of the JRC software (IMPACT TOOL) for monitoring land cover change,
3. presentation of and discussion on potential approaches for the monitoring of forest disturbance/degradation based on satellite remote sensing imagery, presently under development at the JRC, and
4. testing selected approaches based on Landsat imagery and using the IMPACT tool.

### 3. Workshop Programme

Structure and contents of the workshop/training program have been comparable for the three countries.

**Table 1:** General structure of workshops/training

Time	Topic
<b>Day 1</b> AM	Registration of Participants
	Welcome and Opening Remarks
	Introduction / RECAREDD project ( <i>JRC presentation</i> )
	Assessment of Deforestation: JRC projects TREES-3 and Roadless Forest ( <i>JRC present.</i> )
	Status of national forest inventory and monitoring ( <i>country presentation</i> )
	Status of REDD+ monitoring and reporting the country ( <i>country presentation</i> )
PM	Introduction JRC Impact tool
	Hands-on sessions 1 &2: Impact Tool (Import, Pre-processing Landsat, Clipping)
<b>Day 2</b> AM	Material Review of Day 1
	SENTINEL-2 Satellite Data
	Hands-on sessions 3-5: Impact Tool (S2-Import & Pre-processing, Comparisons S2-L8, L8-Pan Sharpening, Grid generation & analysis)
PM	Hands-on sessions 6-7: Classification, Segmentation, Polygon edit and re-class, Grid assessment
	Hands-on session 8: NDVI Thresholds and Forest Masking
<b>Day 3</b> AM	Material Review of Day 2
	Monitoring Forest Degradation (Definitions, general concepts, JRC approaches)
	Discussion: Country views and experiences on assessing forest degradation
	Forest canopy disturbance assessment using NBR methodology
PM	Hands-on session 9: NBR, forest mask, grid generation, class assignment for grid; test for country polygons; visual comparison
Evening	Social dinner
<b>Day 4</b> AM	Material Review of Day 3
	Hands-on session 10: Forest degradation assessment based on Forest Map & Grid overlay
	Discussion: Feedback from different assessment methodologies, Integration of existing national forest maps
PM	Wrap-up, Feedback from Participants, Evaluation, & Questionnaires, Conclusions, Certificates, Closing Remark



## 4. Main Topics

### 4.1. Provision and Access to SENTINEL-2 (S2) Satellite Data

Since the end of 2015 Sentinel-2 (S2a) satellite data of high spectral quality and spatial resolution (10m) is available. S2 images are acquired at a swath width of 290km and at time intervals of 10 days (5 days when the second S2 satellite (S2b) becomes operational in 2017). The increased potential for country wide forest monitoring has been demonstrated during the workshop, highlighting the spatial and spectral detail of the data as well as the possibility of generating time series e.g. within the dry season 2015/2016. As further demonstrated, S2 data compare in terms of detectable detail quite well to 5m RE (Rapid-Eye) satellite data. For example, for Laos RE data has been purchased by donor projects for the year 2015 for the whole country (~ 300'000 US\$) and the new S2 data of the year 2016 could serve for direct comparison and change assessment.

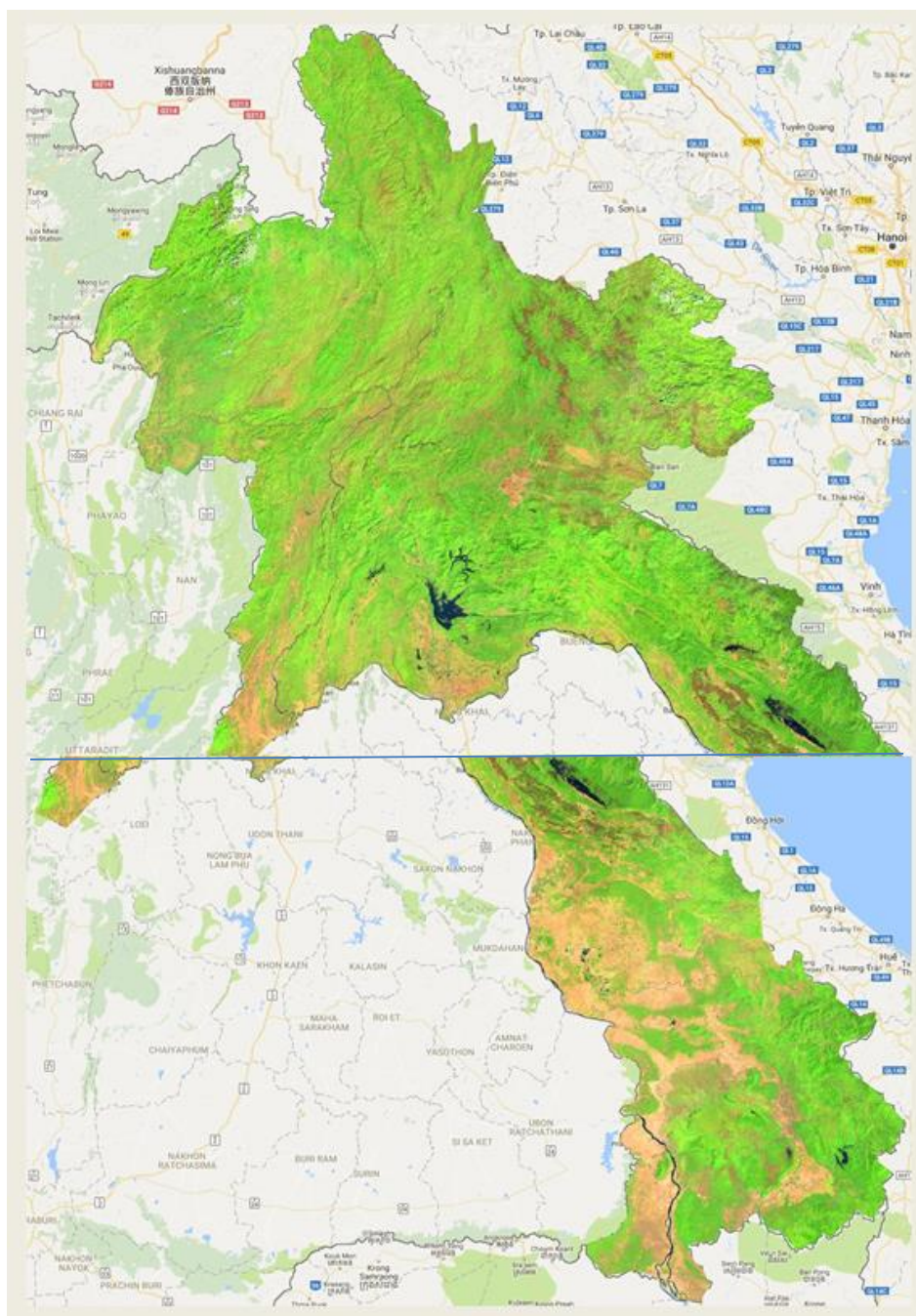
ReCaREDD partners considered in all three countries S2 imagery as a new basis for NFI and REDD+ monitoring from 2016 onward, for the following reasons:

- the 10m spatial resolution provides improved potential for assessing not only processes of deforestation, but also of forest degradation, up to now only achievable from commercial satellite imagery of higher spatial resolution,
- the high repetition rate of image acquisition permits coping reasonably well with cloud cover and effects of seasonality, and
- the satellite imagery is available at no cost.

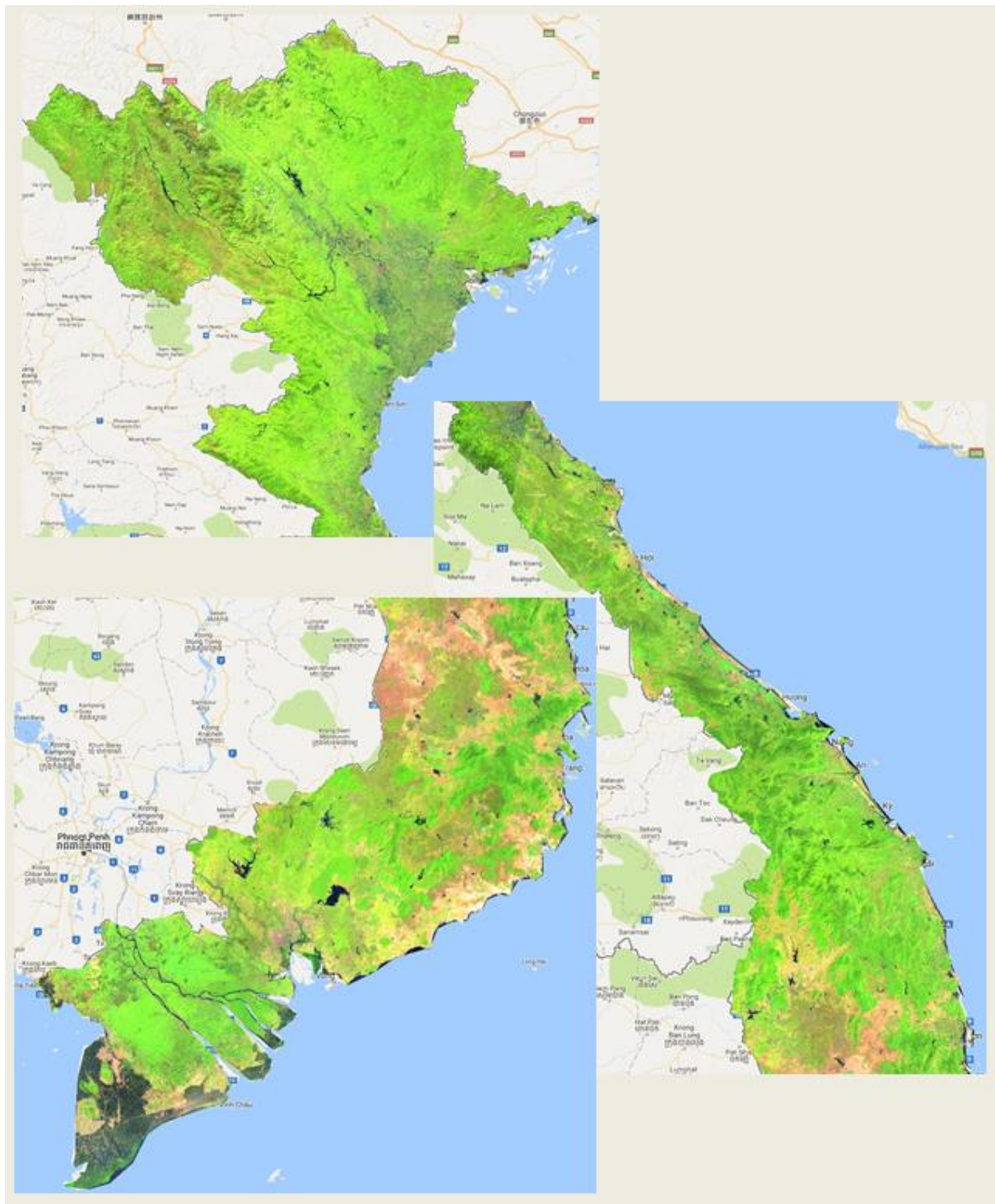
In the context of the workshops JRC provided to the ReCaREDD partners all available original S2-data acquired since the end of 2015 for the full country. In addition, a pre-processed S2 data set, consisting of a selection of best S2 imagery and 6 bands spectral bands, was delivered for immediate use.

Up to now partners in all three countries were not able to access and download the S2 imagery through the internet, due to the large amount of data and the lack of stability of the local internet. The provision of the S2 data was therefore highly appreciated by all ReCaREDD partners as a significant contribution of the ReCaREDD project to their ongoing work.

The pixel composites of S2 imagery of the dry season December 2015 - April 2016 generated for Laos, Vietnam and Cambodia (using Google Earth Engine) reflecting the availability of good quality imagery. (All original imagery used for generating these composites were delivered to the ReCaREDD partners.)



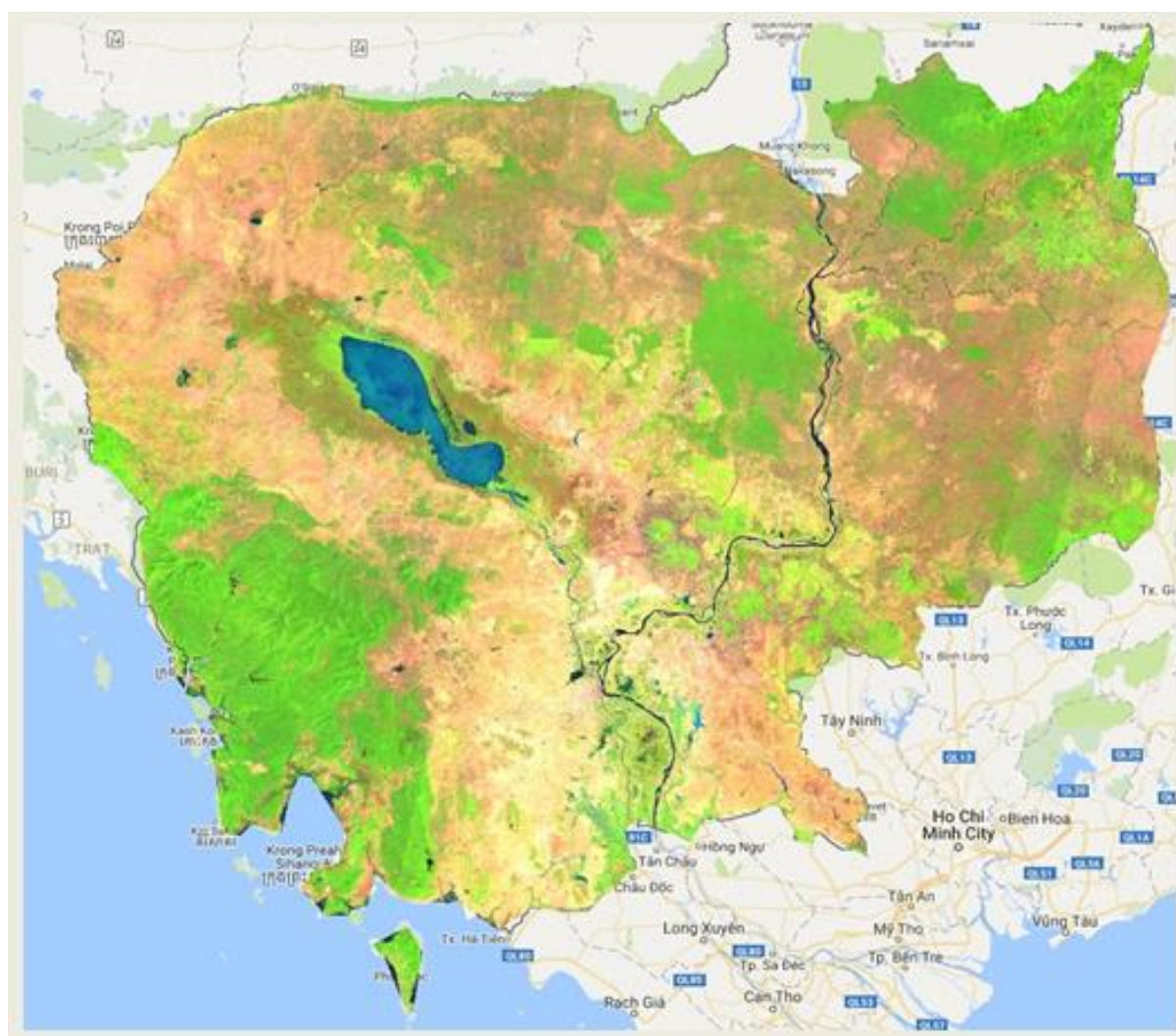
**Figure 1:** S2 pixel composite of Laos dry season 2015/2016 (top: north and central Laos, bottom: southern Laos)



**Figure 2:** S2 pixel composite of Vietnam, dry season 2015/2016 (top left = northern Vietnam\*, bottom left: southern Vietnam, right: central Vietnam)

*\*including imagery up to Dec 2016*





**Figure 3:** S2 pixel composite of Cambodia dry season 2015/2016

## 4.2. Training on the JRC IMPACT TOOL

The workshop included intense training on the JRC developed IMPACT tool and its main functionalities (see Table 1).

IMPACT is a stand-alone, open-source software package, offering a set of tailored modules for image processing and forest monitoring, such as steps of pre-processing, image classification, computation of indices that can be useful for first forest/non-forest stratification ('forest mask') or for detecting forest canopy disturbance.

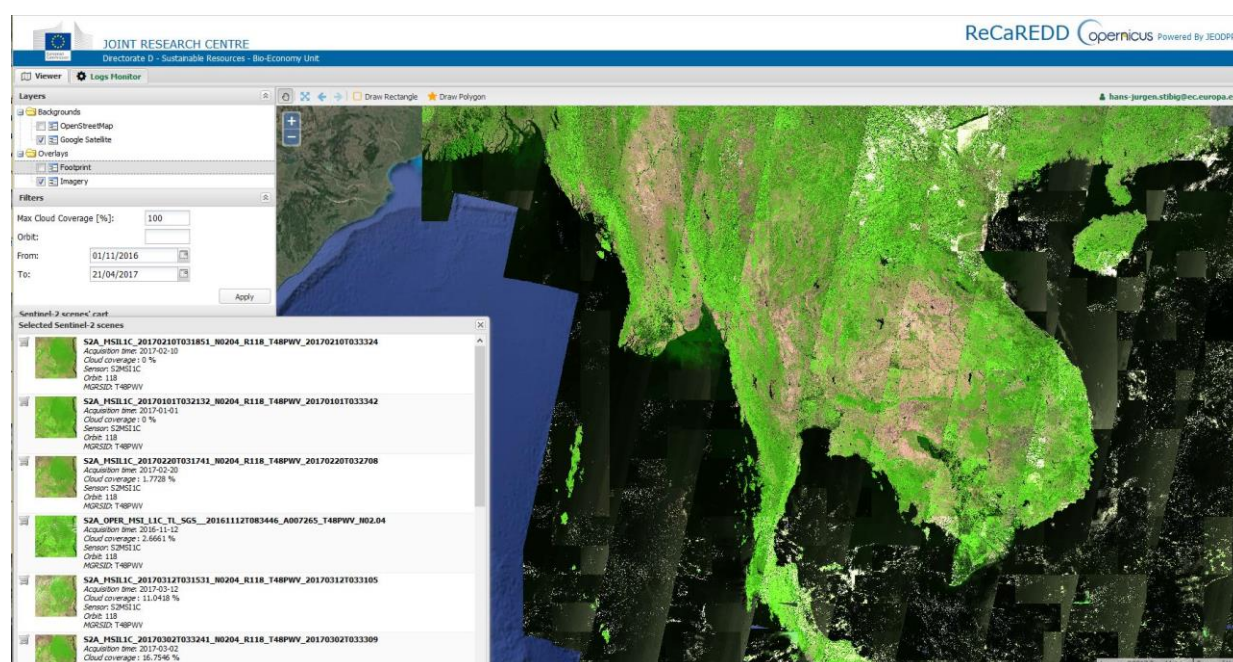
IMPACT has been presented as a tool, complementary to (and not replacing) existing RS and GIS software packages in use in the different countries. ReCaREDD partners can therefore

decide case by case for which application the IMPACT tool is offering the best or easiest solution, integrating at a later stage the results in the existing software packages. A detailed IMPACT Tool user manual describing the single modules is available <sup>2</sup>.

The participants highly valued the straight forward and easy use of the tool, as well as pre-tailored specific applications. Modules of particular interest included for example:

- simple reading-in and pre-processing of Landsat and new S2 imagery (the module for S2 imagery input is a pre-requisite for ReCaREDD partners to operationally use the data),
- the possibility of (batch-) processing larger number of images in one step e.g. importing, pre-processing, 'cutting' areas of interest or sampling boxes,
- the modules for assessing forest change and canopy disturbance.

The training further included a demonstration on how S2 images could be viewed and accessed from the JRC Sentinel-2 web platform <sup>3</sup>. This platform offers a dedicated web interface developed at the JRC (in the framework of the ReCaREDD and Big Data pilot projects on Earth Observation and Social Sensing EO&SS@BD in collaboration with the JRC Text and Data Mining Unit). The online platform exposes the entire archive of S2 imagery acquired over the tropics through internet, offering image screening, full resolution browsing and pre-processing options by using an IMPACT-like interface. ReCaREDD partners will have the possibility to visualize and download tailored products (choice of number of bands, pixel-depth, AOI, geographical projection). This will significantly reduce the data amount to be finally transferred and will help to cope to some extent with the frequent problem of local internet capacity and stability. The latter up to now prevented ReCaREDD partners from successfully download S2 imagery to their institute servers.



**Figure 4:** Example of S2 spatial coverage available over tropics through the JRC S2 web platform

<sup>2</sup> <http://forobs.jrc.ec.europa.eu/products/software/>  
<sup>3</sup> <https://cidportal.jrc.ec.europa.eu/forobs/sentinel.py>



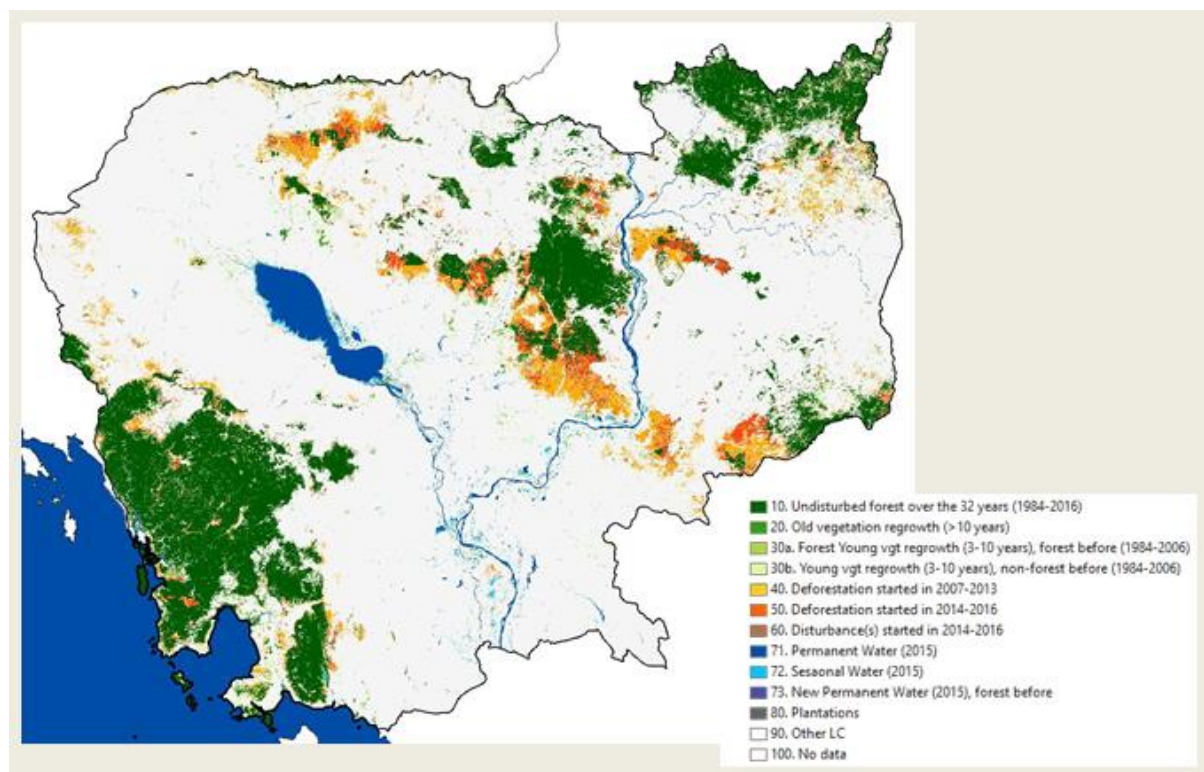
### 4.3. Assessment of Deforestation and Forest Degradation

#### 4.3.1. Mapping of Forest and Deforestation

The regional forest & forest change map produced in the context of the JRC Roadless Forest project was introduced, the methodology of map generation was described <sup>4</sup>.

The product has been generated from all Landsat Imagery (30m spatial resolution) available for SE-Asia from the mid of the 1980s. The map displays evergreen forest cover where now signs of canopy disturbance could be detected, but also forest change for defined sub-periods (e.g. deforestation 2007-2013 and 2014-2016, recent canopy disturbances 2014-2016, regrowth > 10 years, recent regrowth).

ReCaREDD partners were highly interested in the product, as the data set not only displays major forest change areas, but could help generating the forest cover status for specific reference periods. The map has been used in the course of the workshop as 'forest mask' for subsequent detection of indications of canopy disturbance.



**Figure 5:** Extract from regional forest map: Cambodia

A preliminary version of the country-wide products was delivered (as confidential data set in work) to the partner institutions for testing and feedback.

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<sup>4</sup> Vancutsem, C., Achard, F., 2016, Mapping Intact and Degraded Humid Forests over the Tropical Belt from 32 Years of Landsat Time Series, 2016 European Space Agency Living Planet Symposium, 9-13 May 2016

#### **4.3.2. Assessment of Forest Degradation**

The challenge of monitoring of forest degradation (in the sense of 'forest remaining forest') has been discussed, addressing aspects of

- the lack of a unique definition of forest degradation
- the importance of the 'observation' period for assessing of forest degradation
- the limitations of remote sensing to detect different forest degradation processes based on the spatial and spectral resolution of the sensor.

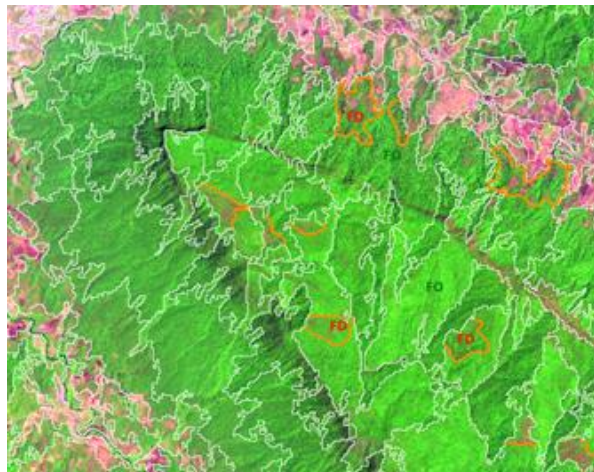
For the purpose of this workshop

- the term forest degradation was restricted to the loss of forest biomass.
- focus was put on monitoring 'forest canopy disturbance' from satellite imagery, the final decision on what should be considered 'forest degradation' would have to be taken using additional information on the change.

Approaches for detecting or mapping forest canopy disturbance discussed and/or tested using modules of the IMPACT Tool included the following:

##### **Manual revision or sub-segmentation of existing forest maps**

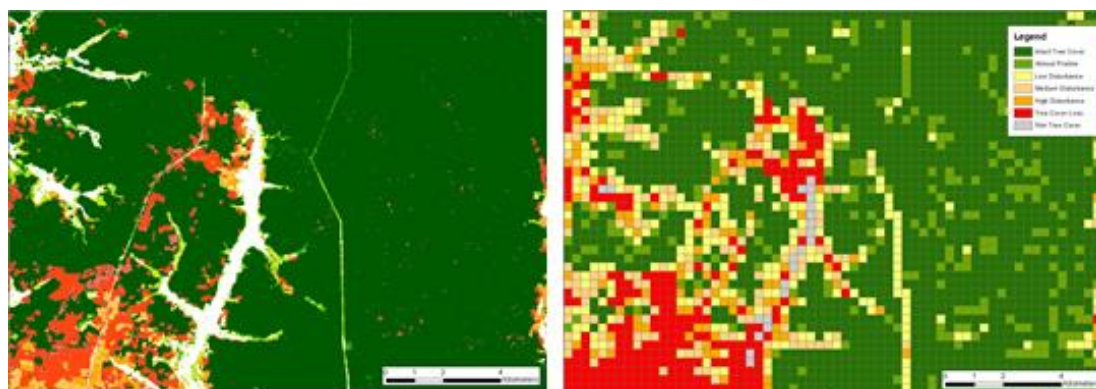
Revising existing forest maps in terms of canopy disturbance by visual interpretation (e.g. based on S2 imagery) and (i) adding labels on disturbance to the existing forest polygon label, or (ii) sub-delineation (manually/by automated segmentation) within existing mapping units and assigning 'disturbance' labels to newly created sub-polygons.



**Figure 6:** Example of sub-segmenting of an existing forest map based on S2 imagery over Laos

### **Determining canopy disturbance within larger grid cells for pixel based forest & forest change maps**

Starting from existing or newly generated digital forest/non-forest or forest change maps canopy disturbance could be addressed within larger grid-cells or blocks (e.g. 300m x 300m) by determining non-forest portions in each block and potentially accounting for edge effects (buffer).



**Figure 7:** Example of aggregating an existing forest map to larger blocks and assignment of ‘forest disturbance’ classes for a forest block in Cambodia

This approach was tested using the IMPACT tool and the ‘Roadless Forest Map’ (see 4.3.1) as input layer. The approach could serve for generating a rough area estimate of the potentially ‘degraded’ forest area, assuming that an opening in the forest canopy affects also the surrounding area, defined in this case by the block size. However, disturbance is only assigned based on ‘non-forest’ pixels in a ‘forest’ surrounding, i.e. changes at sub-pixel level not reflected by a clear opening of the forest canopy (i.e. a non-forest pixel) are not taken into account.

### **Detection of forest canopy disturbances based on Burnt Area Index (NBR)**

Among different band ratios and indexes that can be generated with the IMPACT Tool, the Normalized Burnt Ratio (NBR) has shown potential for detecting forest canopy disturbance at sub-pixel level.

$$NBR = \frac{NIR - SWIR_2}{NIR + SWIR_2}$$

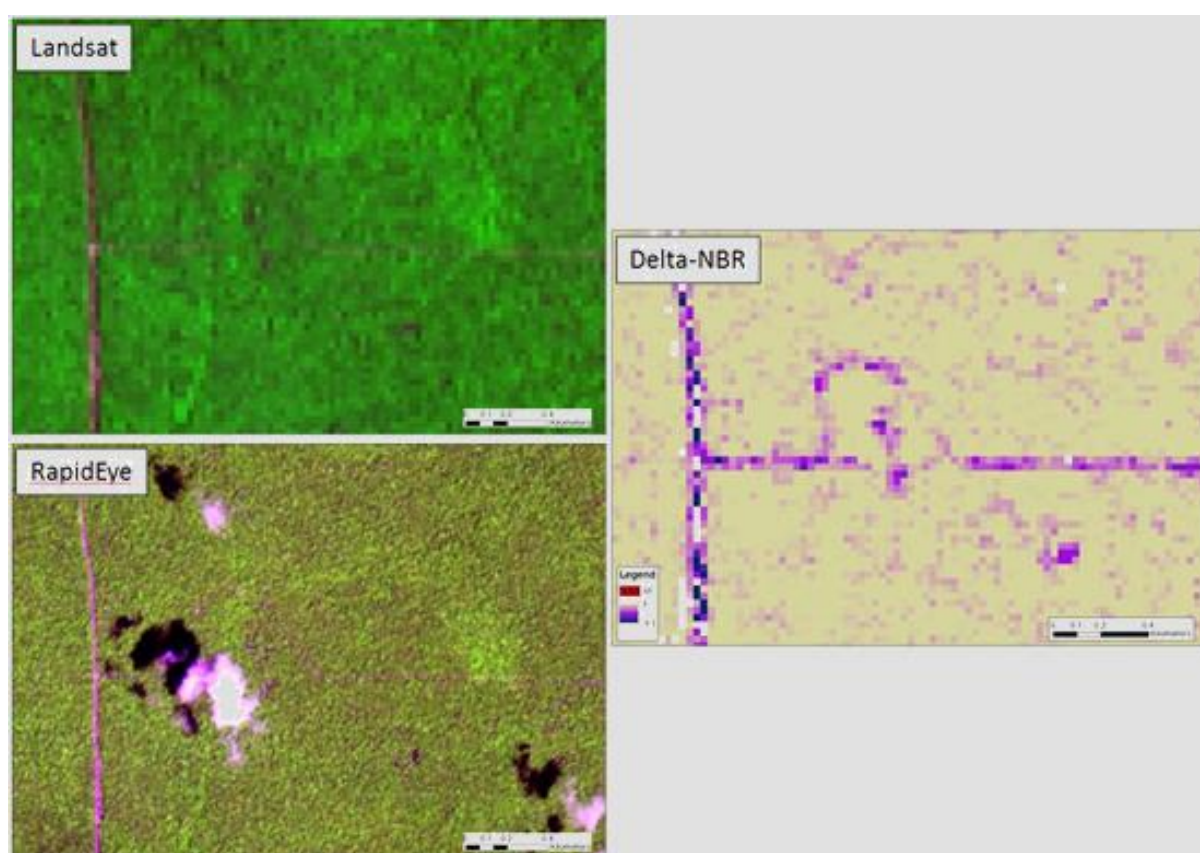
Indication of change can be obtained when assessing the differences of NBR values for a certain time period ( $\Delta$ -NBR). Contrary to the block-wise assessment of forest/non-forest maps, the NBR Index depicts from the satellite imagery non-forest components within single pixels. It therefore can be useful for addressing changes in ‘forest remaining forest’, resulting for instance from the tree removals, felling damages or from logging trails. The index may therefore serve as an indicator for forest canopy disturbance and potential ‘forest degradation’.



Based on 'self-referenced' NBR values, the  $\Delta$ -NBR can be calculated within the IMPACT Tool for pairs of satellite images (e.g. Landsat, S2 imagery) of a defined time period, indicating potential disturbance when exceeding a certain value. The methodology is described in literature <sup>5</sup>.

More potential is offered when calculating NBR values from an annual/seasonal series of satellite imagery and establishing the  $\Delta$ -NBR between different years and for larger regions. This can be achieved by making use of the Landsat archive and the parallel processing capacities of Google Earth Engine (GEE) – methodological paper in preparation.

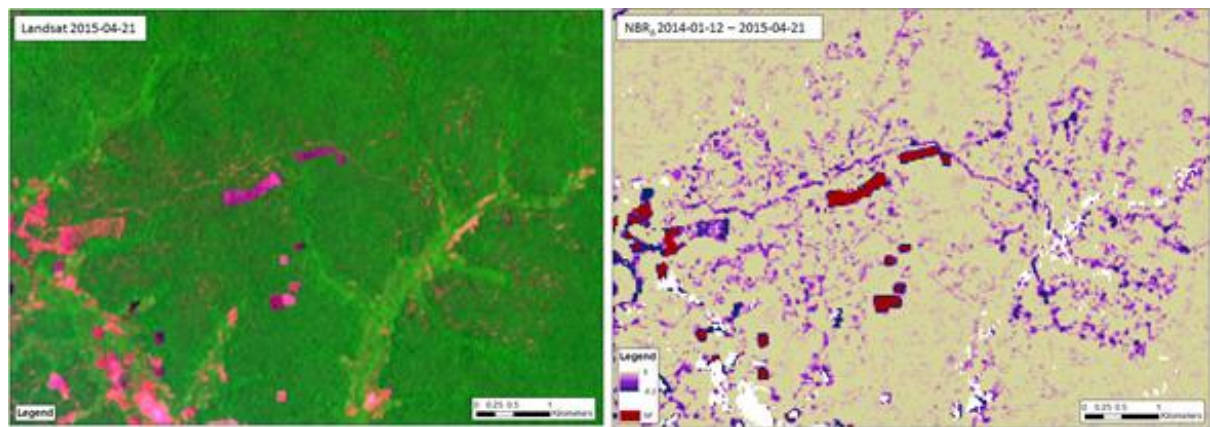
This pair-wise  $\Delta$ -NBR approach was tested during the workshop. Examples of annual  $\Delta$ -NBR products were demonstrated during the workshop. A preliminary version of the country-wide products (Fig 10) was delivered to ReCaREDD partners (confidential - in work) for testing and feedback.



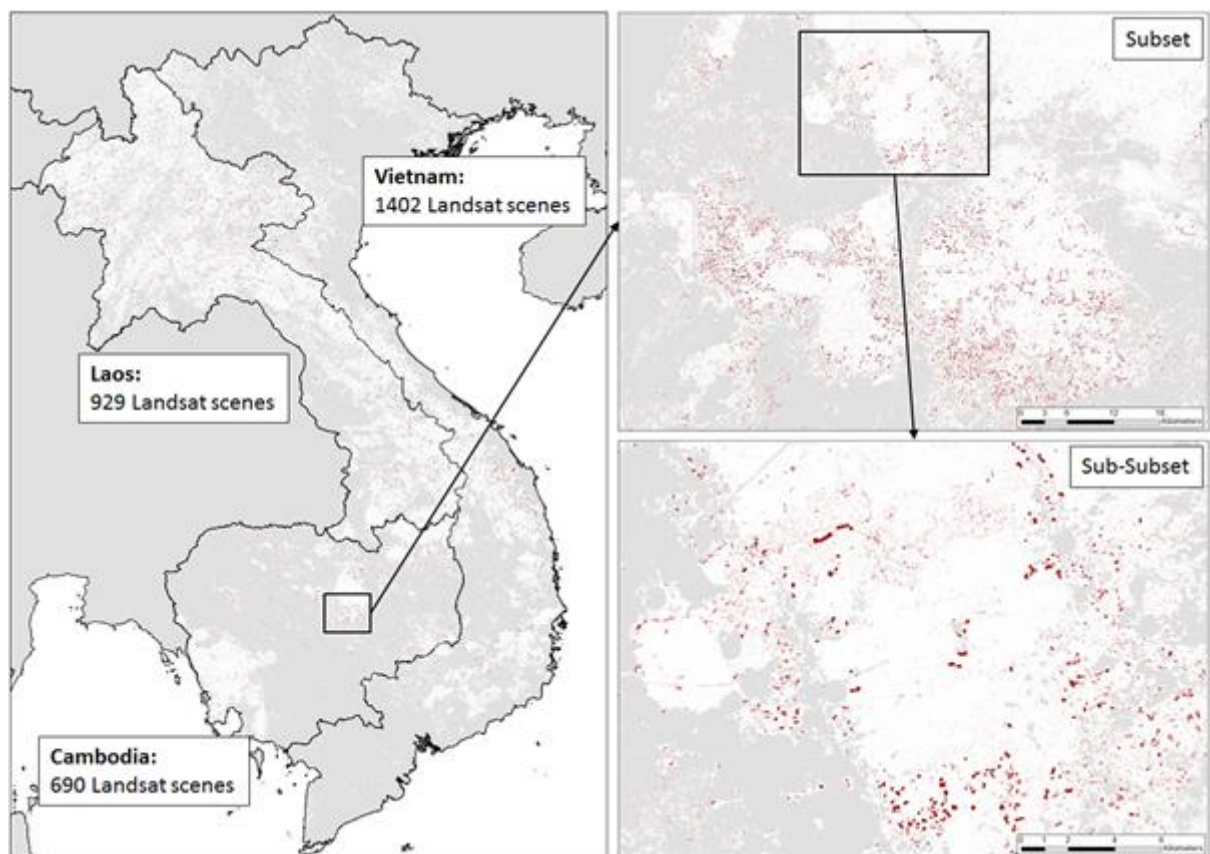
**Figure 8:** Detail of disturbance pattern of logging roads/trail. Top left: Landsat 30m imagery; Right:  $\Delta$ -NBR detection based on Landsat 30m imagery; Bottom left: Rapid Eye reference satellite imagery at 5m resolution

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<sup>5</sup> Langner et al. 2016 Monitoring Forest Degradation for a Case Study in Cambodia -Comparison of Landsat 8 and Sentinel-2 Imagery- Proc. 'Living Planet Symposium 2016', Prague, Czech Republic, 9–13 May 2016 (ESA SP-740, August 2016)



**Figure 9:** Pattern of disturbance by logging in a forest block in Cambodia: Left: Landsat 8 -30m imagery, Right:  $\Delta$ -NBR Index – red: deforestation, pink: disturbance

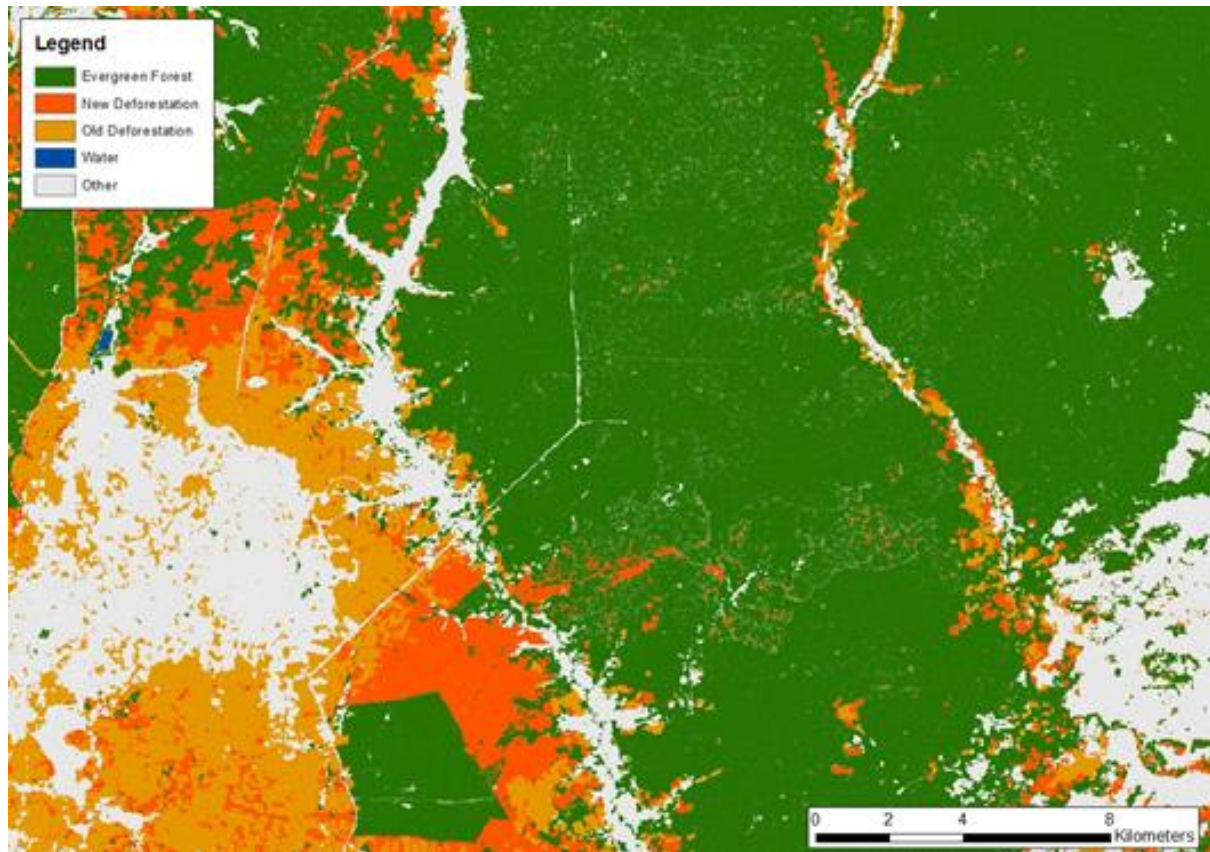


**Figure 10:** Regional disturbance pattern based on  $\Delta$ -NBR Index calculated for seasonal time series for the year 2015 using GEE



#### 4.3.3. Combination of Deforestation Assessment and NBR Disturbance Indication

The combination of the Roadless Forest map produced by the JRC (4.3.1) and of the  $\Delta$ -NBR product on potential forest canopy disturbance (4.3.2) could be an interesting option for getting indication on deforestation and canopy disturbance. As demonstrated during the workshop, this map displays forest cover (at 2015), areas of deforestation during the previous years, but also a pattern of potential forest disturbance.



**Figure 11:** Forest change and disturbance pattern (2015) derived from Roadless Forest map and  $\Delta$ -NBR product (whitish pattern within green area of forest)

## 5. Main Feedback from ReCaREDD Partners

- There was high interest in the IMPACT software as well as in the regional products of the Roadless Forest map and of the  $\Delta$ NBR disturbance index. As both products are still under development, their potential still needs to be further explored and the result to be validated.
- ReCaREDD partners desire follow-up workshops during the year 2017. The focus at that stage would be less on the teaching and on the training on technical modules of the IMPACT tool, but more on implementing a test case for monitoring forest change and degradation during the training. There would be a reduced number of selected technical staff (5-10). The most up-to-date JRC results on forest change (Roadless Forest) and forest disturbance (NBR approach) assessments may serve as input to that training. In turn, national institutions will provide existing data on forest cover at higher detail for incorporation into the JRC approaches.
- ReCaREDD partners will in the meantime examine and test the preliminary products they have received from the JRC on Forest Change and on Forest Canopy Disturbance for their usefulness in the context of national forest and REDD+ monitoring, they will send feedback to the JRC team for refining the approaches.
- ReCaREDD partners raised interest in including a training session applying the Delta-NBR methodology in the context of GEE.
- There is a desire for testing near-real time monitoring of forest change, using particularly S2 data, and including the Delta-NBR change detection approach. This point was particularly underlined by the Cambodian counterpart.
- There is a desire to further receive pre-processed S2 imagery from the JRC in view of the limited internet capabilities in the countries.
- Accessing S2 data through the JRC Sentinel-2 web portal is of great interest.

## 6. Cambodia

Main ReCaREDD partners:

- the General Department of Nature Conservation and Protection (GDNCP) of the Ministry of Environment (MoE - implementing REDD+ related monitoring from 2017 onwards)
- the Forest Administration (FA) of Cambodia responsible for production forests



Collaborative contacts: FAO /Phnom Penh Office

The workshop and training took place at Phnom Penh from 26-29 Sep. 2016 at the REDD+ Building at the Institute of Forest and Wildlife Research and Development, Street 1019, Sangkat Phnom Penh Thmey, Khan Sen Sok, Phnom Penh.

Mr. G. Edgar (Ambassador EU Delegation) and Mr. Chan Ponika (DDG Forest Administration) gave the welcome addresses at the official opening.

Workshop participants came in majority from the Forest Administration (FA). In addition, there were participants from other institutions involved in forest and REDD+ activities or research, including the Ministry of Environment (MoE), the Fisheries Administration, FAO, as well as from the two main universities (Royal University of Phnom Penh, Royal University of Agriculture).

### Workshop Participants:

Mr. Leng Chivin	DD, Dep. of Forest & Community Forestry (DFC) / Forestry Administration (FA)
Mr. Hem Saravuth	Deputy Chief, Office for Forest Demarcation, Registration & Forest Land Use / FA
Mr. Net Norin , Mrs. Hout Naborey, Mr. Menh Khidorang, Ms. Nay Sikhoeun, Mr. Khin Sokim On, Mr. Chek Sovansom, Mrs. Koh Sotheavy	DFC / Forestry Administration FA
Mr. Sokha Sophorn	DD, Dep. of Administration, Planning & Finance, Min. of Environment (MoE)
Mr. Lim Sovannara	Chief, GIS Office, Dep. of Geospatial Information Service, MoE
Mr. Phat Chandara	Dep. of Natural Resources Management & Development, Royal University Phnom Penh
Ms. Von Chhay Soneath	Faculty of Forestry, Royal University of Agriculture
Mr. In Hul	Chief, Office of Conservation & Crocodile Industry, Fisheries Admin.
Mr. Chin Pich	Vice Chief, Office of Domain, Map Geography; Fisheries Admin.
Mr. Mathieu van Rijn	FAO, Phnom Penh

Collaboration with FAO at Phnom Penh is envisaged in terms of sharing field data for verifying forest canopy changes detected by the JRC NBR approach, potentially also linking to existing field data recorded by FFPRI (Japan).

## Article in Phnom Penh News



# Satellite training for FA

Cristina Maza

THE European Union has begun training Cambodia's Forestry Administration to use satellite imagery to crack down on deforestation.

Members of the EU's Joint Research Centre (JRC) have been meeting with forestry officials since Monday, teaching them how to analyse images captured by the EU's Sentinel-2 satellite and use imaging software to detect signs of forest degradation.

The project, which uses open-source software designed by the JRC, is meant to assist Cambodia's government in reducing carbon emissions released due to deforestation.

George Edgar, the EU ambassador to Cambodia, said the high-quality resolution of the satellite images would greatly improve the government's ability to observe the impacts of illegal logging.

"Thanks to these technical characteristics, there is now much higher potential for cloud-free observation of tropical forest canopies at large-scale and several times a year, and at the same time at high spatial detail," Edgar explained in an email.

A second satellite will be introduced next year that can produce images of any location in the country every five days.

Environmental activists welcomed the measure, but some expressed scepticism that technology alone could solve Cambodia's deforestation issues.

"Technology is only as useful as its application," said environmental researcher Courtney Work. "We will know when political will and practical application come together, because we will no longer see tractors loaded with wood leaving the forest everyday from multiple roads in four provinces."



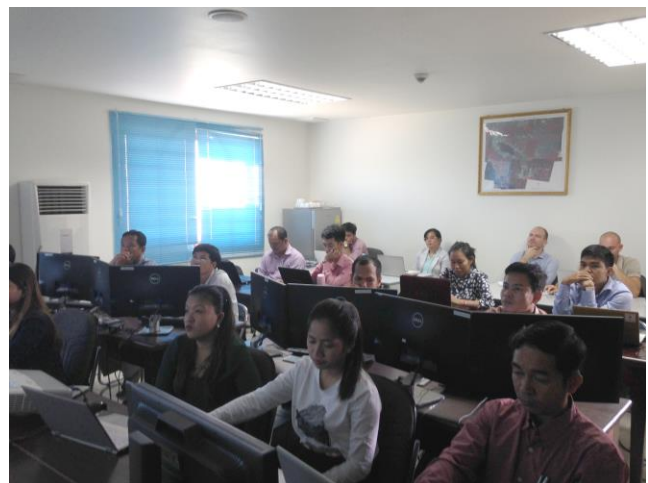
## Workshop Photos Phnom Penh



Group Photo Phnom Penh



Opening, DDG Forest Administration Mr. Chan Ponika and EU Ambassador Mr. G. Edgar



Training

## 7. Laos

ReCaREDD partners:

- the Forest Inventory and Planning Division (FIPD) of the Department of Forestry (DoF), implementing the REDD+ monitoring in Laos
- the Forest Faculty of the National University of Laos (NUoL)



Collaborative contacts:

- the Finish *SUFORD-SU* project
- the GIZ *ProFLEGT* and *CLIPAD* projects
- the JICA *F-REDD* project
- WWF Laos



The workshop and training took place at Vientiane from 22.-25. Nov. 2016 at the Faculty of Forestry of the National University of Laos (NUoL) (Dong Dok Campus). Workshop participants (24) came from the Forest Inventory & Planning Division (FIPD)/Dep. of Forestry (DoF) – Min. of Agriculture and Forestry (MAF) and from the National University of Laos. There were a number of participants also from other institutions and universities, including the REDD+ Office/DoF, the Min. of Natural Resources & Environment (MONRE), Min. of Science & Technology (MoST), the National Agriculture & Forest Research Institute (NAFRI), as well as from an NGO (WWF).

### Workshop /Training Participants Laos

Mr. Thongkham Vorabout, Mr. Somxay Phaophongsavath, Mr. Onkeo Ladvieng Ms. Kongsy Syliphong Mr. Keovilay Chanthaphone & Ms. Yommala Phaengsuwan	FIPD / DoF
Mr. Souvanna Chanthaluesy	
Mr. Soutvilay Douangphachan	REDD+ Office (DoF)
Mr. Bounchan Lattanavongkot & Mr. Saiyasith Phonphakdy	NREI, MONRE
Mr. Phan Sengbounthone	Luang Prabang Forestry Sector
Mr. Bountham Sithixay	NAFRI
Mr. Chittana Phomphila Mr. Vansaleum Phengvichith Mr. Saengmany Boutthavong Mr. Souliyaphon Kommadam Mr. Vongpaseuth Thorathy	Min of Science & Technology
Mr. Bakham Chanthavong & Mr. Synouk Thilavong	
Mr. Phokham Latthachack	NUoL, Fac. of Forestry)
Ms. Manolom Vongsenekeo	NUoL, Fac. of Environm. Sci.
Ms. Hor Manythong & Mr. Bounxian Phetlumphun	Savannakhet University
Mr. Stefano Zenobi	Souphanouvong University
	WWF Laos



## Workshop Photos Vientiane



Group Photo Vientiane



Dr Soukanh (DDir FIPD), Dr Chittana and Prof Sithong (Forest Faculty)



Training

## 8. Vietnam

ReCaREDD partner:

- Forest Inventory and Planning Institute (FIPI), implementing the national forest monitoring and mapping, including REDD+ monitoring with headquarter at Hanoi and branches (Sub-FIPIs) in the provinces



Collaborative contacts:

- VNFOREST

The workshop took place at Hanoi from 20.-23. Sep. 2016 at the Guest House of the Parliament, 27A Tran Hung Dao Street.

Workshop participants (15) came from the Forest Inventory and Planning Institute (FIPI) HQ and from provincial Sub-FIPI offices.

Workshop /Training Participants Hanoi:

Mr. Le Truc Huan	Sub-FIPI - Ho Chi Minh City
Mr. Tran Quoc Nghia	Sub-FIPI - Quy Nhon region
Mr. Pham Manh Ha	Sub-FIPI - Hue region
Mr. Le Cao Thang	Sub-FIPI - Nghe An region
Mr. Nguyen Phuc Truong & Mr. Luong The Vu	Sub-FIPI - Vinh Phuc region
Mr. Nguyen Truong Chinh & Mr. Bui Thanh Hue	Sub-FIPI - North West region
Mr. Do Quang Thuong	FIPI Consultancy and Service Centre
Mr. Pham Manh Ha & Mr. Nguyen Van Kien	FIPI Forest Resource & Environment Centre
Mr. Hoang Minh Nguyen	FIPI Div. of Database Management
Mr. Trinh Ngoc Hiep & Mr. Pham Ngoc Hai	FIPI Remote Sensing Centre
Mr. Pham Tuan Anh	FIPI Div. of Sciences, Technology & Environment

## Workshop Photos Hanoi



Group Photo Hanoi



Training



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