



Concept Note

Regional Land Cover Monitoring System - Production Workshop #2 Reference Data and Algorithm Development

Organized and supported by:

The USAID & NASA supported SERVIR-Mekong Program, United States Forest Service – Remote Sensing Applications Center (USFS-RSAC), ADB – Core Environment Program, and SilvaCarbon

11-14 July 2016, Swissotel Nai Lert Park, Bangkok, Thailand

Background/Rationale

In 2015, SERVIR-Mekong conducted a geospatial needs assessment for the Lower Mekong countries which included individual country consultations. The assessment revealed that many countries were dependent on land cover and land use maps for land resource planning, quantifying ecosystem services including resilience to climate change, biodiversity conservation, and other critical social issues. Many of the Lower Mekong countries have developed national scale land cover maps derived in part from remote sensing products and geospatial technologies. However, updates are infrequent and classification systems and accuracy assessment do not always meet the needs of key user groups. In addition, data products stop at political boundaries and are often not accessible. Many of the Lower Mekong countries rely on global land cover products to fill the gaps of their national efforts, compromising consistency between data and policies. These gaps in national efforts can be filled by a flexible regional land cover monitoring system that is co-developed by regional partners with the specific intention of meeting national transboundary needs, for example including consistent forest definitions in transboundary watersheds. During this assessment, regional stakeholders identified a need for a land cover monitoring system that will produce frequent, high quality land cover maps using a consistent regional classification scheme that is compatible with national country needs.

Based on this need and demand, SERVIR-Mekong is leveraging the recent development of remote sensing science and technology, such as Google Earth Engine (GEE), and working together with production partners to develop a system that will use a common set of input data sources to generate high-quality regional land cover maps on a regular basis (i.e. annual or every two years). The system is being designed to facilitate improved policy, planning, and decision making by a wide range of users (such as government agencies, local community groups, non-profit organizations, and the private sector). An important component of this system's design is the ability to leverage the recent developments in remote sensing science and technology that can contribute significantly to more timely land cover inventories. The system's design will also enable more effective and efficient mapping efforts. For example, GEE allows cloud-based storage and computation of large quantities of remotely sensed data that can be organized in many ways to meet specific needs.

In March of this year, SERVIR-Mekong and others convened a broadly participatory and consultative workshop that successfully developed a consistent regional land cover typology for categorizing land cover data using regionally agreed classes that are compatible with most elements of existing national classification systems. This workshop also defined a roadmap for building out a flexible system that will deliver map products defined by this and other typologies. Explicit working groups were established including a group focused on designing the "primitive" data elements that will form the building blocks of the regional system and a group dedicated to identifying the specific mechanisms and tools that will be

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required to generate accurate and transparent reference land cover data points for both calibration and validation of intermediary and final map products.

Building on this early step, SERVIR-Mekong and partners are now convening a second workshop focused on developing the methods and specific algorithms for producing the target map products. This workshop will bring together members of both the “Primitive/Features/Algorithm Working Group” and the “Reference Data Working Group”. The 3.5-day event will result in explicit algorithms, calibration procedures for collecting reference data, and a clear definition of the mechanisms that will support the application of these in a participatory, transparent, and well-documented way.

Workshop Objectives

This event will serve as a forum for discussion, consultation and capacity building, bringing together scientists and practitioners from the Mekong Region and beyond working on producing high quality land cover information products to support better decision-making in a wide variety of contexts. The main objectives of the workshop are to:

1. Further refine the logic and practical implications of how a system of biophysical land cover characteristics (“land cover data primitives”) can be used to derive map products reflecting multiple classification systems;
2. Design, refine, and test the algorithms necessary to derive these primitives;
3. Specify the reference data needs and sample design to support these algorithms;
4. Maximize consensus on one or more tools that will be used (or developed) to collect and curate high quality reference data; and
5. Review and refine the roadmap for completing the overall Regional Land Cover Monitoring System.

Expected Products

The principal workshop outputs will be:

1. A set of explicit algorithms for generating land cover data primitives along with documentation of the tools, procedures, and reference data needed to successfully execute the algorithms;
2. Specification of reference data needs, collection and management tools, and procedures to support the execution of the algorithms; and
3. Refinement and endorsement of the roadmap for completing remaining elements of the Regional Land Cover Monitoring System.

Prerequisites

- **Algorithm Group:** Field data from region, training in Earth Engine, computer with Chrome installed, current methods for developing classifications, select two typology priorities and research methodology from literature.
- **Reference Data Group:** Field data from region/country that can be used for this effort, existing up-to-date map products that can be used for collection and verification of reference data, and examples of existing field and photo sampling methods previously used.



Organizers

The workshop will be organized by SERVIR-Mekong in partnership with United States Forest Service-RSAC, SilvaCarbon, and ADB-CEP.

SERVIR-Mekong: The SERVIR-Global network of regional geospatial support hubs is an initiative of the United States National Aeronautics and Space Administration (NASA) and the United States Agency for International Development (USAID). SERVIR-Mekong, the newest hub in the network is a geospatial data for development program designed to respond to the needs of the Lower Mekong countries. It builds the capacity of governments and other key stakeholders in the Lower Mekong countries to employ publicly available satellite imagery and geospatial technologies for decision making related to climate change, environmental management, and disaster risk management. SERVIR-Mekong is implemented by the Asian Disaster Preparedness Center (ADPC) and its technical partners Spatial Informatics Group (SIG), Stockholm Environment Institute (SEI), and Deltares.

United States Forest Service –RSAC: The Remote Sensing Applications Center (RSAC) is a national technical service center of the United States Department of Agriculture Forest Service (USDA Forest Service). The mission of RSAC is to provide the Forest Service with the knowledge, tools, and technical services required to use remote sensing data to meet the agency's stewardship responsibilities. A structured program of work creating science-based information that supports the assessment and monitoring of natural resources is accomplished through the following program areas:

- Remote Sensing Evaluation, Application & Training – evaluates new remote sensing technologies and integrates promising ones into Forest Service business functions.
- Rapid Disturbance Assessment & Services – provides tactical and strategic support in response to disturbance events including fire, wind events, and natural disasters.
- Resource Mapping, Inventory & Monitoring – provides operational remote sensing support and analysis to meet interagency programmatic assessment and monitoring needs.
- Enterprise Data & Services – coordinates with Forest Service Central Imagery Office to provide enterprise remote sensing technology and data.

SilvaCarbon: SilvaCarbon is an interagency technical cooperation program of the United States Government (USG) to enhance the capacity of selected tropical countries to measure, monitor, and manage forest and terrestrial carbon, and more accurately estimate greenhouse gas (GHG) emissions resulting from changes in land use, forest cover, and forest degradation. SilvaCarbon helps advance Reducing Emissions from Deforestation and Forest Degradation (REDD+) and other climate change mitigation and development initiatives by working with technical teams at government agencies in partner countries to design and implement credible landscape monitoring systems and GHG inventories that feed into international reporting frameworks such as the United Nations Framework Convention on Climate Change (UNFCCC).

ADB – CEP: Facilitated by the Asian Development Bank as an integral part of the GMS Economic Cooperation Program, the Core Environment Program seeks to create a region where economic growth and environmental protection are approached in parallel, and in a way that benefits all who live there. It brings together the six countries of the Greater Mekong Subregion (Cambodia, People's Republic of China, Lao PDR, Myanmar, Thailand and Vietnam) to work towards this ambitious goal through the mainstreaming of environmental and biodiversity protection.

Workshop Dates: 11, 12, 13, 14 July, 2016

Venue: Swissotel Nai Lert Park, Bangkok, Thailand



Daily Workshop Topics and Outputs

Day	Topics / Themes	Products
1	<ul style="list-style-type: none"> • Introduction to workshop and participants • Review conceptual, logical, and practical structure of Regional Land Cover Monitoring System (RLCMS) • Review of Regional Typology and Biophysical Factors • Review of opportunities provided by Google Earth Engine, introduce repository and other tools • Establish focus groups and objectives for general land cover types (e.g. forest, agriculture, built-up areas, wetlands, etc.) and for reference data needs 	<ul style="list-style-type: none"> • Operational objectives for each general land cover type and reference data needs
2	<p><u>AM</u></p> <ul style="list-style-type: none"> • Algorithm Group: review/revise Generic Algorithm Design Types, Assumptions, and Selection Criteria (machine learning, etc); prioritize Primitives; break into individual focus groups; link typology to biophysical factors or classes; review existing methods • Reference Data Group: Review Reference Data Design Criteria, Review existing reference data collection tools, field data sources, and potential high resolution image sources • All: Group Conversation about Reference Data Design <p><u>PM</u></p> <ul style="list-style-type: none"> • Algorithm Group: draft conceptual design of scripts (including integration of reference data) and begin drafting preliminary algorithms • Reference Data Group: Select Regional Reference Data Tool, Response and Sampling Design 	<ul style="list-style-type: none"> • Preliminary algorithm design types documented • Summary of reference data decisions, implications and needs
3	<p><u>AM</u></p> <ul style="list-style-type: none"> • All: Plenary presentation of draft algorithms with comments and suggestions for refinement and inputs to Reference Data Group for setting reference data targets • Algorithm Group: refine and document algorithms • Reference Data Group: Develop quality assurance and quality control procedures <p><u>PM</u></p>	<ul style="list-style-type: none"> • Final draft algorithms and associated documentation • Summary of reference data QA/QC and analytics decisions, implications and needs



	<ul style="list-style-type: none">• All: presentation of reference data collection decisions• Algorithm Group: Consolidation and documentation of algorithms and reference data needs• Reference data Group: Inventory Analytics and Data Compilation Methods	
4	<p><u>AM</u></p> <ul style="list-style-type: none">• Algorithm Group: Finalize documentation and draft work plan• Reference Data Group: Finalize documentation of selected protocol/methods and Regional Scaling and Timeline <p><u>PM</u></p> <ul style="list-style-type: none">• Participants depart from Bangkok in afternoon/evening	<ul style="list-style-type: none">• Refined products from previous days• Refined production roadmap

