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# Building Lasting Capacity for Water Management in Lower Mekong using Satellite Observations

*October 5-7, 2016, Hanoi, Vietnam*

# BACKGROUND

Low-lying deltas in Indochina are vulnerable to water resources availability due to dense population and extensive irrigation. Inhabitants of the deltas depend heavily on groundwater to supplement surface water stocks for irrigation and domestic use, especially during the dry season. Over-exploitation of groundwater has led to land subsidence, and hence increased the risk of flood magnified with coastal sea level rise. The vulnerability worsens due to uncoordinated human activity in the upstream regions, such as extraction, diversion and dam impoundment of river waters. The delta's vulnerability is largely related to lack of resilient capacity of the co-riparian countries to manage the water resources under the current socio-economic development pressures and impacts due to climate change in recent years. The lack of resilient capacity is due to lack of ability to independently gauge the current and projected state of water resources. Before any stakeholder nation or entity can make an official and science-based decision on what needs to be done to manage, one has to know what is really happening in space and time over the entire region. However, the conventional ground networks for measurements of river/reservoir level, rainfall, groundwater, land subsidence, and sea level, cannot provide a holistic view of the dynamic state of water resources evolving in the countries of Indochina. In trying to understand the real water management needs of the people of the region through our life-long mission to truly empower Southeast Asia, building capacity in the use of NASA's satellite data, which are freely available, is urgently needed. ADPC (Asian Disaster Preparedness Center) is a strategic partner and host to the SERVIR-Mekong Initiative supported by the USAID and NASA. The SERVIR program is designed to improve environmental management and resilience to

climate change. With an eye toward this goal, the SERVIR program works to build the capacity of the governments and other key stakeholders to integrate Earth Observation information and geospatial technologies into operational decision-making. PEER (Partnerships for Enhanced Engagement in Research) is another USAID-funded program that is intended to build scientific capacity and empower researchers in developing countries to use science, technology, innovation, and partnerships to address local and global development challenges. IESE (Institute of Environmental Science and Engineering) under NUCE (National University of Civil Engineering), recently funded by the PEER program (Title: *Application of Geodetic, Satellite Remote Sensing and Physical Modeling Tools for Management of Operational Groundwater Resource in the Red River Delta, Vietnam*, PI: Luong Duc Nguyen). National Center for Water Resources Planning and Investigation (NAWAPI) is a national agency working under Ministry of Natural Resources and Environment which mandated "to plan, investigate, and monitor water resources in the whole country" in Vietnam. NAWAPI is the major partner of IESE-NUCE in carrying out the PEER project. IESE-NUCE and NAWAPI will facilitate engagement with Vietnamese stakeholder agencies with this parallel application effort. In this context, ADPC within the framework of SERVIR-Mekong initiative is collaborating with IESE-NUCE/NAWAPI and organizing a 3-day training on "*Building Lasting Capacity for Water Management in Lower Mekong using Satellite Observations*" for ADPC and stakeholder agencies in the region in Hanoi during October 5-7, 2016.

# OBJECTIVES

This capacity building should address the unique and diverse needs and operating conditions of regional and national government stakeholder agencies in Indochina to enable integrated water resource management and flood/drought risk reduction. Such systems need to survive independently (i.e. ARL=9) within the existing environment of government agencies to give meaning to the SERVIR motto '*Space to Village*'.

As the title suggests, this training is aimed at building "lasting" applications or adoption of satellite remote sensing technology that will truly grow into something durable and sustainable within an agency framework long after the training is over and trainers are not accessible. Thus, the planned training will be highly targeted involving 1-1 hands-on interaction with individual stakeholder agency and be small-scale yet inclusive. The training also aims to be intense with extensive brainstorming activity and spending time with the agency decision-making process on the "drawing board" to get concrete answers to strategic problems that are in the way of raising the application readiness level of a satellite product or idea. The take-home for both the stakeholder participants and trainers (Dr. Lee and Dr. Hossain) will be a 1-year plan (2016-2017) and a list of 'to-dos' to address during the post-training phase so that the goal of durable and sustainable satellite applications is one step closer for each agency by early 2017.

# CONTENTS

The proposed contents for our Year 1 training are aligned to support the unique needs of SERVIR-Mekong and local stakeholder agencies through the development of a comprehensive system that can routinely map, warn, and enable decision-making on water-related vulnerability issues in lower Mekong:

- Satellite altimetry based *virtual stream gauging and river level forecasting* in near real-time.
- GRACE-based monthly monitoring of macroscale groundwater storage anomalies.
- Satellite precipitation (GPM) and climate model based seasonal forecasting of anomalies of *water availability* using VIC macroscale hydrologic model.
- Satellite-based monthly-to-seasonal *reservoir outflow* estimation using GPM, MODIS and satellite altimetry measurements.

# Tentative Schedule

Day	Session	Contents	Resource persons
Day 1	9:00 - 9:30	Registration	
	9:30 - 10:30	<b>Opening Session</b> <ul style="list-style-type: none"> <li>By IESE-NUCE and ADPC</li> </ul>	
	10:30 - 12:00	<b>Application potential of current and future satellite altimeters for water level monitoring and forecasting</b>	Dr. Hyongki Lee
	12:00 - 13:00	Lunch Break	
	13:00 - 15:30	<b>Hands on Training on the Use of Satellite Altimetry for Flood Forecasting and Lake/Reservoir Storage Changes in Lower Mekong</b>  (A toolbox (ArcGIS-based) will be provided with enough functionalities to let participants 'play with it' to assess the value for their decision making needs.)	Dr. Hyongki Lee, and Dr. Faisal Hossain
	15:30 - 15:45	Tea Break	
	15:45 - 17:00	<b>Discussion and Assimilation agency-specific feedback of the altimetry tool for short-term (flood forecasting) and mid-term (monthly - reservoir storage changes)</b>	Dr. Hyongki Lee, and Dr. Faisal Hossain

Day	Session	Contents	Resource persons
Day 2	9:00 - 11:00 (Tea break in between)	<b>Surface Water Management - Hydrologic and Hydraulic Models &amp; Reservoir Outflow Estimation using multi-scale and multi-platform satellite data for Lower Mekong</b>	Dr. Faisal Hossain
	11:00 - 12:00	<b>Hands on Training on Satellite-based Hydrologic and Hydraulic Modeling and Reservoir Outflow Estimation</b>  (A web-GIS platform operationalizing the VIC model with nowcast and forecast functionalities and do-it-yourself exercises for reservoir outflow estimating using satellite data from microwave, visible, and infrared instruments will be provided).	Dr. Faisal Hossain, and Dr. Hyongki Lee

	12:00 - 13:00	Lunch Break	
	13:00 - 15:00	<b>Continued Hands on Training on Satellite-based Hydrologic and Hydraulic Modeling and Reservoir Outflow Estimation</b>	Dr. Faisal Hossain, and Dr. Hyongki Lee
	15:00 - 15:15	Tea Break	
	15:15 - 17:00	<b>Discussion and Assimilation agency-specific feedback of the VIC-integrated web portal and monthly-to-seasonal reservoir outflow</b>	Dr. Faisal Hossain, and Dr. Hyongki Lee

Day	Session	Contents	Resource persons
Day 3	9:00 - 10:15	<b>Use of Satellite Gravimetry (GRACE) for Groundwater Management Applications</b>  (Participants will first be exposed to the working principles of satellite geodesy and gravimetry to understand how the satellite mission GRACE works.)	Dr. Hyongki Lee
	10:15 - 10:30	Tea Break	
	10:30 - 12:00	<b>Hands on Training on using GRACE to monitor groundwater storage changes</b>  (This will be followed by participants 'playing with' a front-end visual tool that empowers users to extract, visualize and make decisions based on GRACE anomalies for groundwater management.)	Dr. Hyongki Lee, and Dr. Faisal Hossain
	12:00 - 13:00	Lunch Break	
	13:00 - 14:30	<b>Discussion and Assimilation agency-specific feedback of the GRACE-based groundwater monitoring tool</b>	Dr. Hyongki Lee, and Dr. Faisal Hossain
	14:30 - 14:45	Tea Break	
	14:45 - 16:30	<b>RECAP OF ALL DISCUSSION AND ASSIMILATION POINTS FOR EACH TOOL AND EACH AGENCY</b>	Dr. Hyongki Lee, and Dr. Faisal Hossain
	16:30 - 17:00	CLOSING SESSION	