

Water Data Utilization and Capacity Building In the Mekong Region

2022. 05. 10

KMCRC, K-water

Dr. Park, Jin Hyeog / Director of KMCRC



Contents



Introduction

- Background
- Purpose of Project
- Project Overview
- Collaborating With Global Best Partners



Project Implementation

- Satellite-based Water Resources Information Monitoring
- Hydraulic/Hydrologic Analysis in the Mekong Region
- Training and seminar for strengthening capacity building



Anticipated Results & Future Plans

Background



The Mekong region continues to drive the high growth of ASEAN, However, the sustainable development is hampered in the Mekong region

Due to climate change and rapid urbanization, the frequency and intensity of water-related disasters such as droughts and floods are increasing every year



First cooperation project in the water resources field between Korean government and U.S. government




The United Nations' Sustainable Development Goals (SDGs) in 2015

Water disputes between upstream and downstream countries (dams and security of water resources)




Cooperation between the ROK's New Southern Policy and the U.S' Indo-Pacific Strategy

Contribute to enhancing safety from disasters through systematic water resources management



The joint statement of 'Water Management and Information Strengthening in the Mekong' (June, 2017)



Monitoring real-time water resource changes

Conducting the capacity building on water data utilization

Purpose of Project



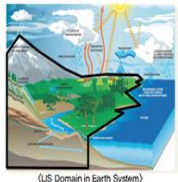
To produce hydrological data by utilizing the satellite-based technology and to apply hydrologic and hydraulic analysis technology in Mekong River Basin as study site and carry out trainee capacity building program.

1

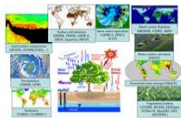
Technology Development (Pilot area)

To develop and provide a satellite-based hydraulic/hydrological disaster analysis

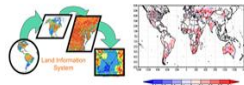
Land Information System (LIS)



(US Domain in Earth System)



(Remote sensing data for land data assimilation)



Action

- To produce and provide hydrological data through the integration of NASA's satellite-based observations and tools.
→ K-water & NASA joint research.
- To strengthen the use of analytical technologies such as hydraulic/hydrological models (HEC-RAS, HEC-HMS) in vulnerable areas by linking hydrological data with satellite data.
→ K-water & USACE joint research

2

Capacity Building

Build capacity on water data utilization in the Mekong region



Action

- To strengthen the expertise of the Mekong countries and the MRC based on global/regional water data utilization and disaster vulnerability analysis capabilities.
→ K-water, NASA and USACE

Project Overview



Introduction

- **Budget** \$1 million (3 years) / Korea(MKCF)· U.S.(State Department) joint burden
(**ROK-US Mekong Collaboration**)
- **Period / Target Region** '19.10 ~ '22.10 (3 years) / Lower Mekong Basin
- **Executing Organization** **Organizer : KMCRC(K-water) Participants : NASA, USACE**



Contents

⇒ **Generate and utilize satellite-based water resources data / Acquire hydrologic/hydraulic analysis technology**

Technology
Development

- **K-water & NASA** Generating water resources data, monitoring water-related disasters
- collaborate with USACE Constructing hydrologic and hydraulic test models

Capacity
Building

- Developing and operating training programs focused on Mekong countries and MRC staffs
(Training local staffs→ Enhance the water management capacity of Mekong countries)

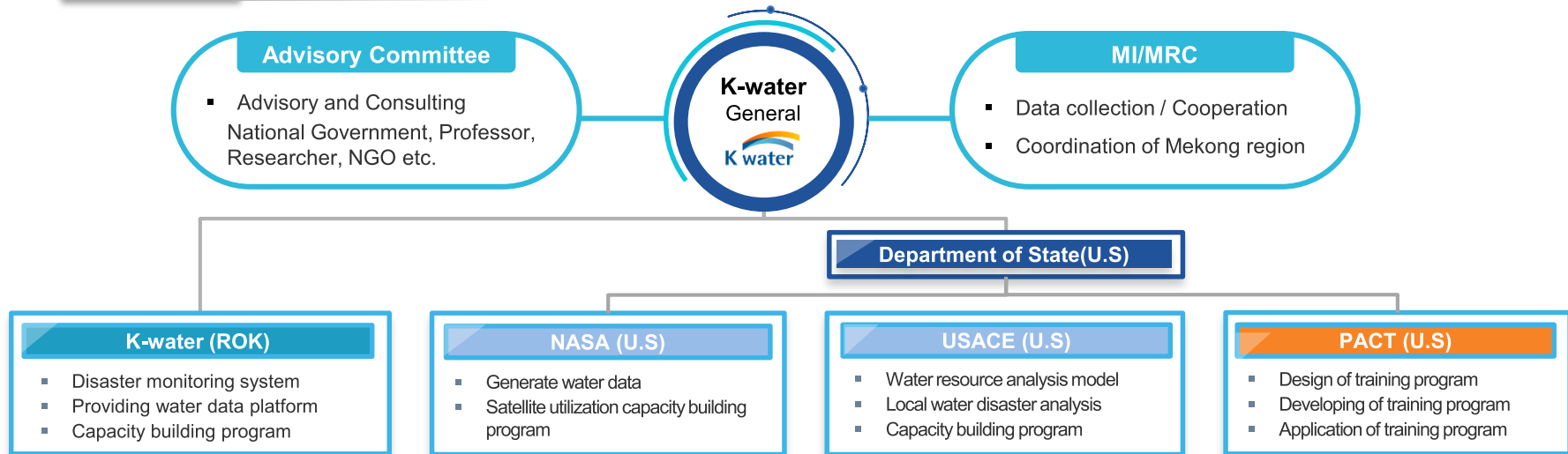
Collaborating with Global Best Partners



K-water(KMCRC) has a strong partnership with NASA and USACE. With them, K-water support efforts to improve access to and use of scientific water management analysis tools. And we participate in this project jointly to improve the water management software tools and analysis capacity of the Mekong Basin.

Specialization

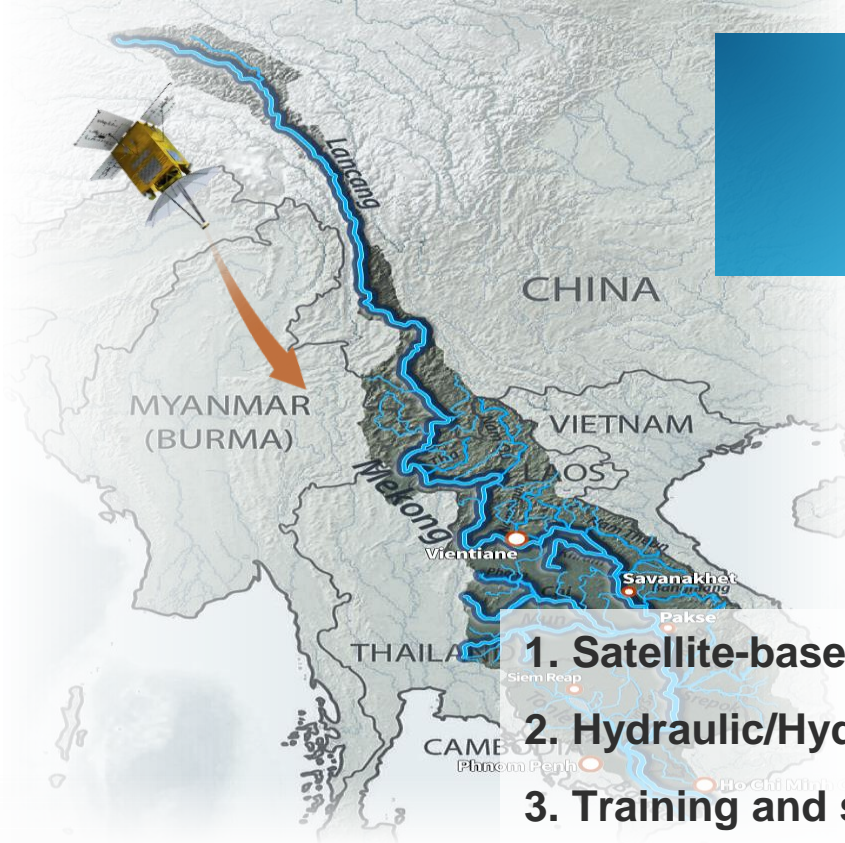
- K-water: Water resources planning, development, operation and management capability
- N A S A : Satellite data analysis tools
- USACE: Integrated water resources management and hydraulic/hydrological expertise





II

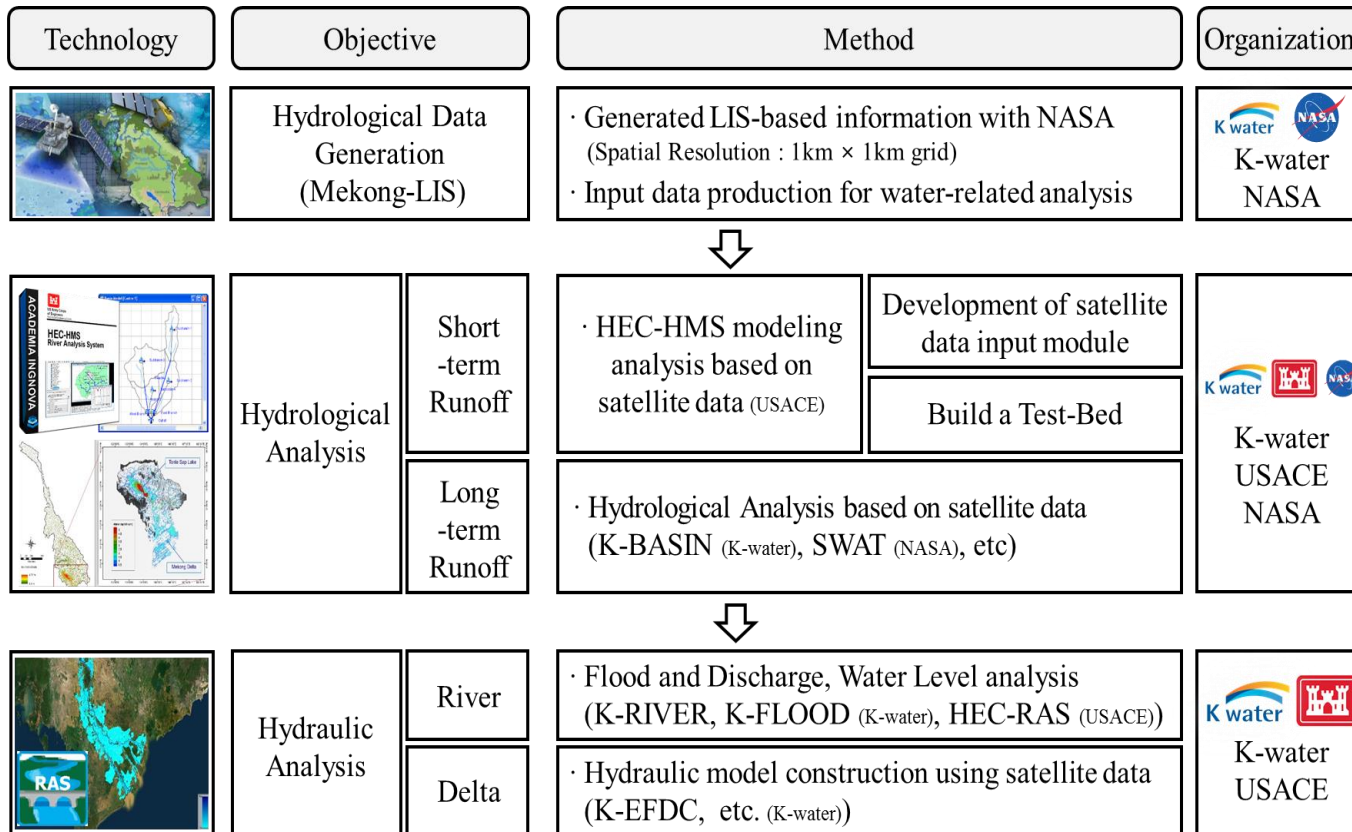
Project Implementation



1. Satellite-based Water Resources Information Monitoring
2. Hydraulic/Hydrologic Analysis in the Mekong Region
3. Training and seminar for strengthening capacity building



Concept Diagram for Water Data Utilization in the Mekong Region



Satellite-based Water Resources Information Monitoring



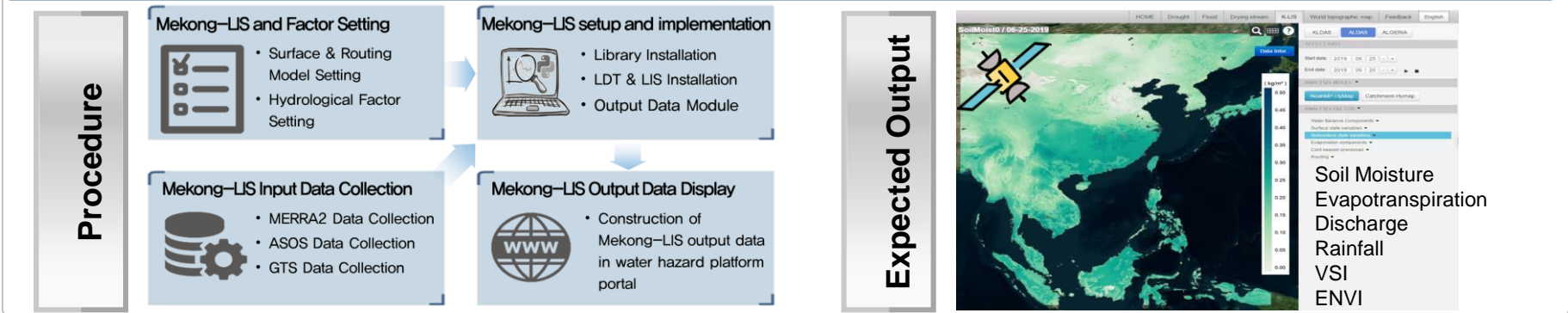
Development of Mekong-LIS based on Satellite and Ground observation Data

- What is LIS?

It is an integrated framework developed by NASA that uses hydrological data such as satellite and ground observation data and Land Surface Model (LSM) to generate hydrological parameters.

- Hydrological Parameters Estimation Based on Satellite and Land Surface Model(LSM)

- Model : NOAH, Catchment, HyMap, Area : Entire Mekong Region, Term : hourly and daily Outputs
- Output : Total 43 Hydrological Factors(Soil moisture, Evapotranspiration, Vegetation index, etc.) in East Asian region

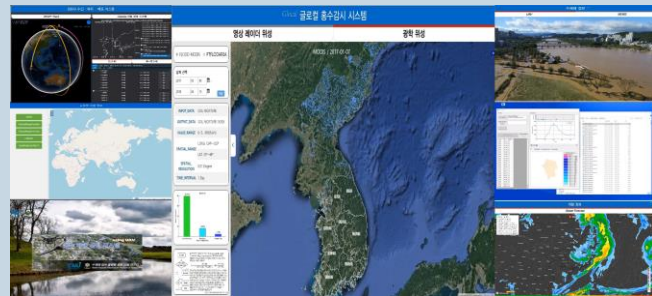


Satellite-based Water Resources Information Monitoring

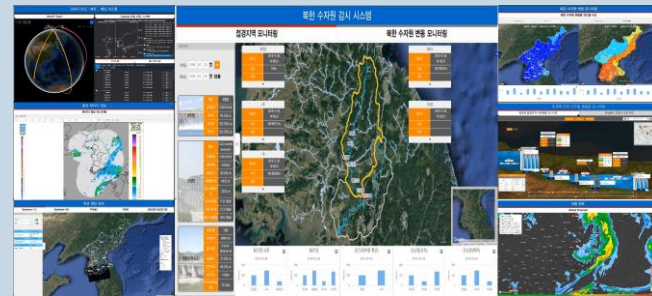


Water Hazard Information Platform System based on Satellite Information

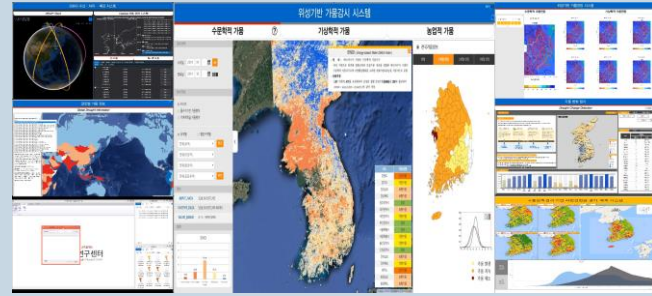
Global and Local Flood Monitoring System



Flood Monitoring in Transboundary Area



Drought Monitoring based on Satellite Data



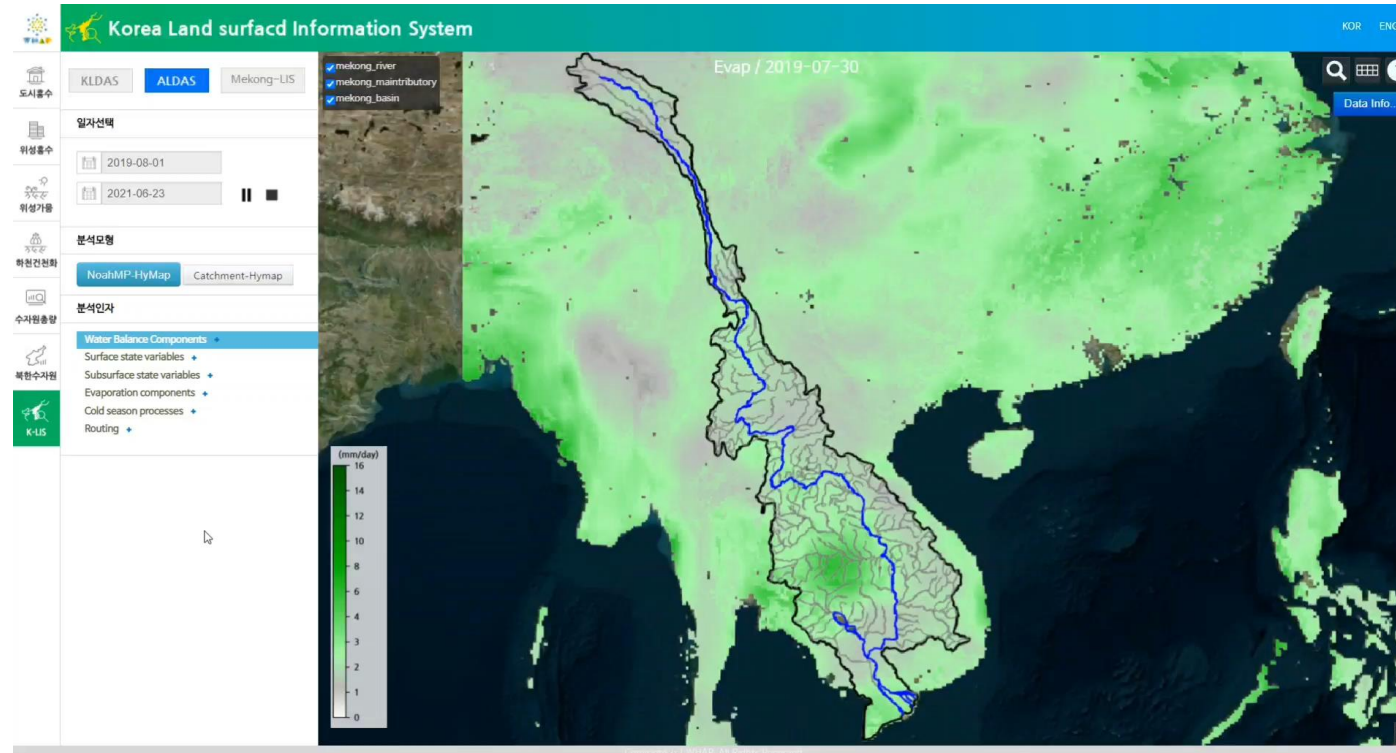
K-LIS (ALDAS) System



Satellite-based Water Resources Information Monitoring



- ✓ 40 kinds of **hydrologic information** such as rainfall, evapotranspiration, soil moisture, snow melt and so on



Part of the outcome



Hydraulic/Hydrologic Analysis in the Mekong Region



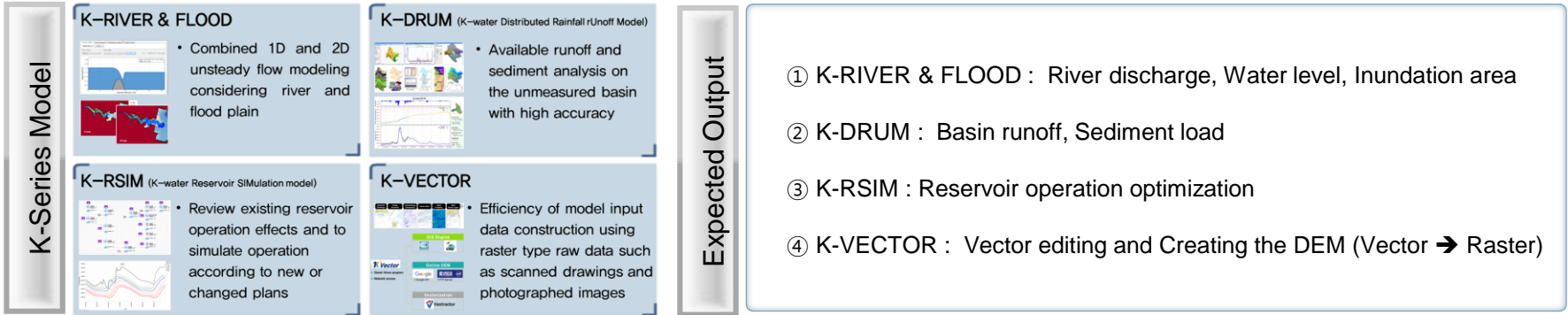
Hydraulic/Hydrologic Analysis based on Satellite and Ground Obs. Data

- What is K-Series?

K-series is a core brand of SWs and solutions with K-water's 50-year technical know-how to analyze and control the entire integrated water management process.

- Which models are used for hydraulic and hydrologic analysis in Mekong region?

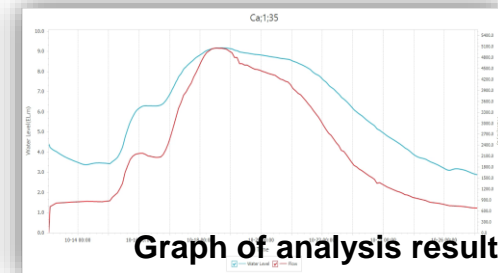
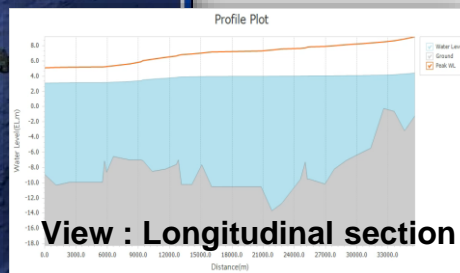
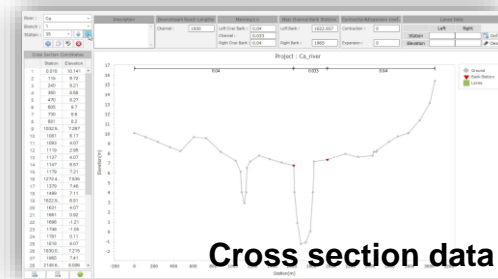
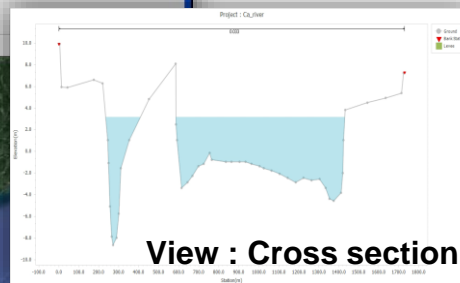
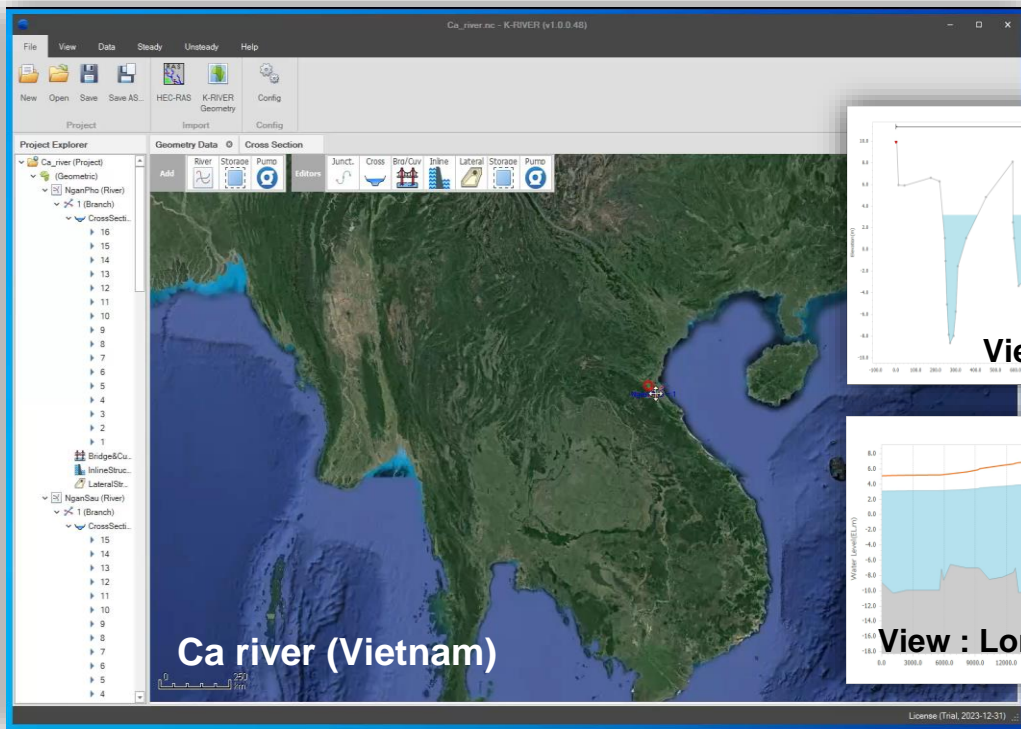
- ① K-RIVER & FLOOD (1D river flow and 2D flood inundation), ② K-DRUM (Distributed Runoff and Sediment Analysis)
- ③ K-RSIM (Integrated water supply management), ④ K-VECTOR (Data vectorizing and editing)



Hydraulic/Hydrologic Analysis in the Mekong Region



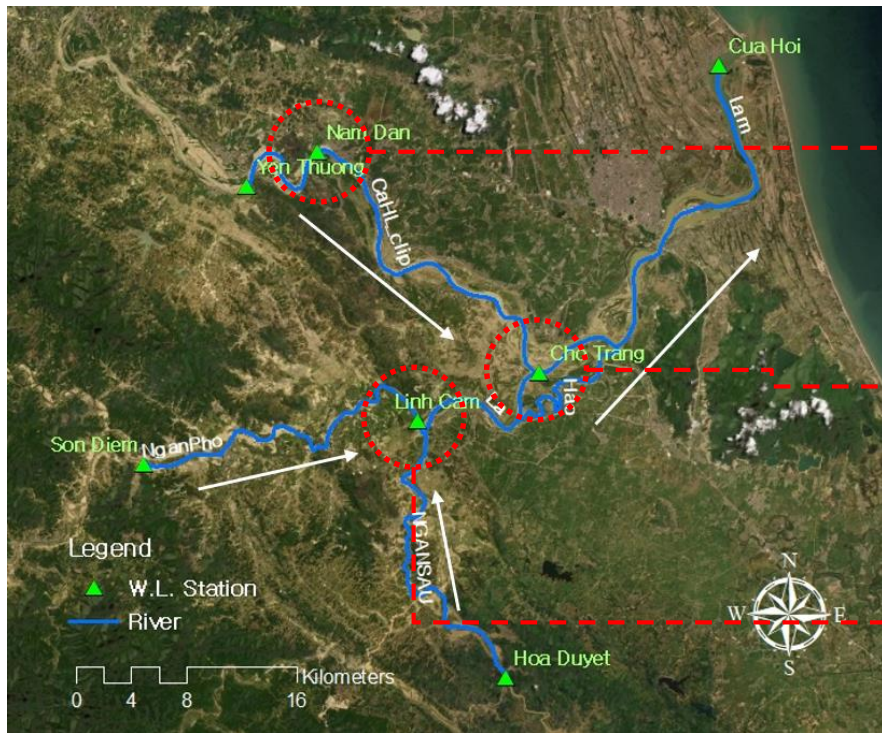
- ✓ **K-River** (One-dimensional river hydraulic analysis model)



Hydraulic/Hydrologic Analysis in the Mekong Region

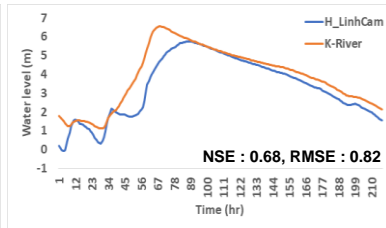
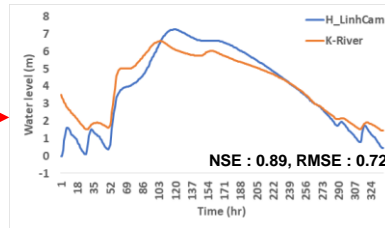
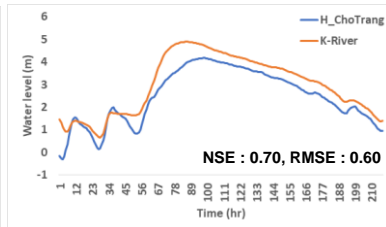
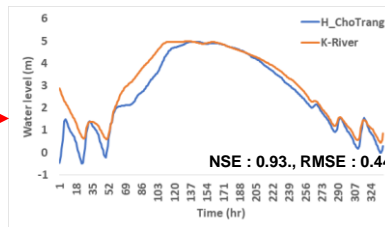
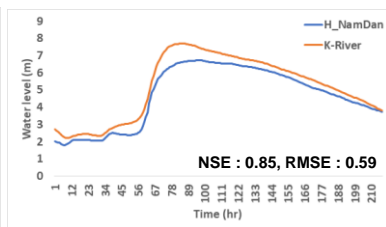
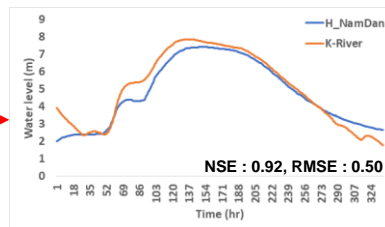


✓ Analysis the past flooding period in the pilot area (Ca river) using K-River model



Case 1 : 2010. 10. 13 ~ 27 (337hr)

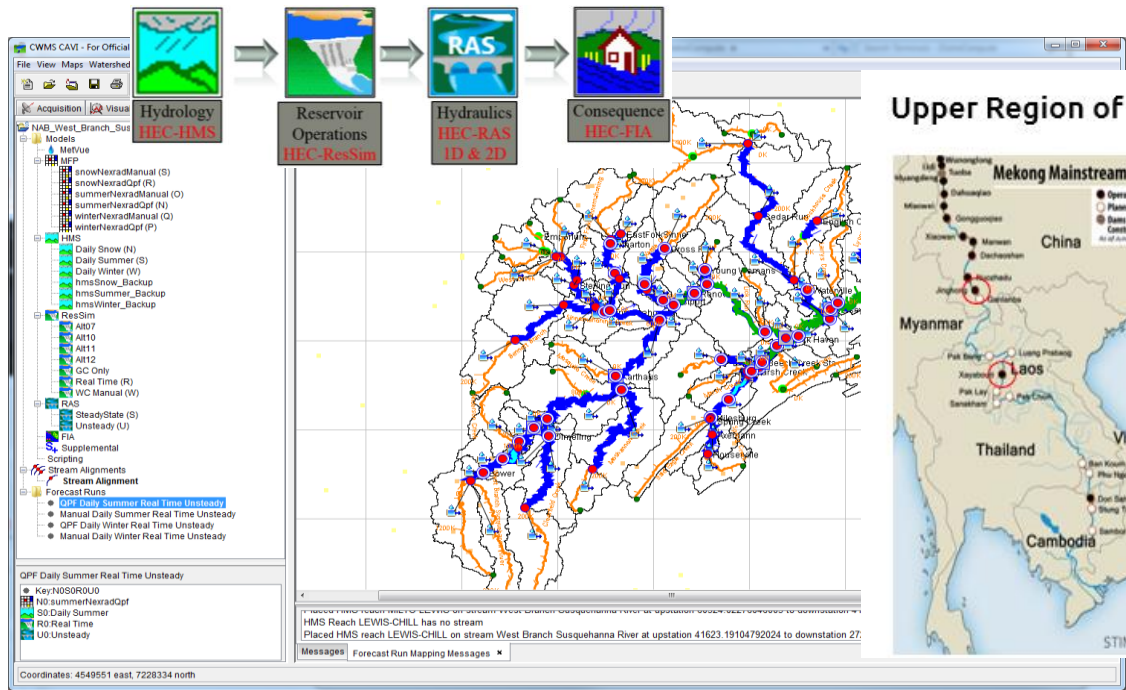
Case 2 : 2013. 10. 14 ~ 23 (217hr)



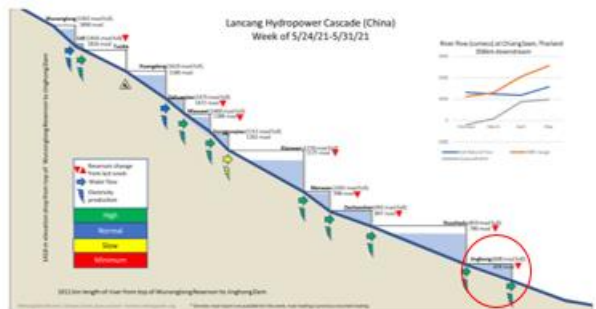
Hydraulic/Hydrologic Analysis in the Mekong Region



✓ **HEC-Series** (USACE Hydrological Engineering Center's model)



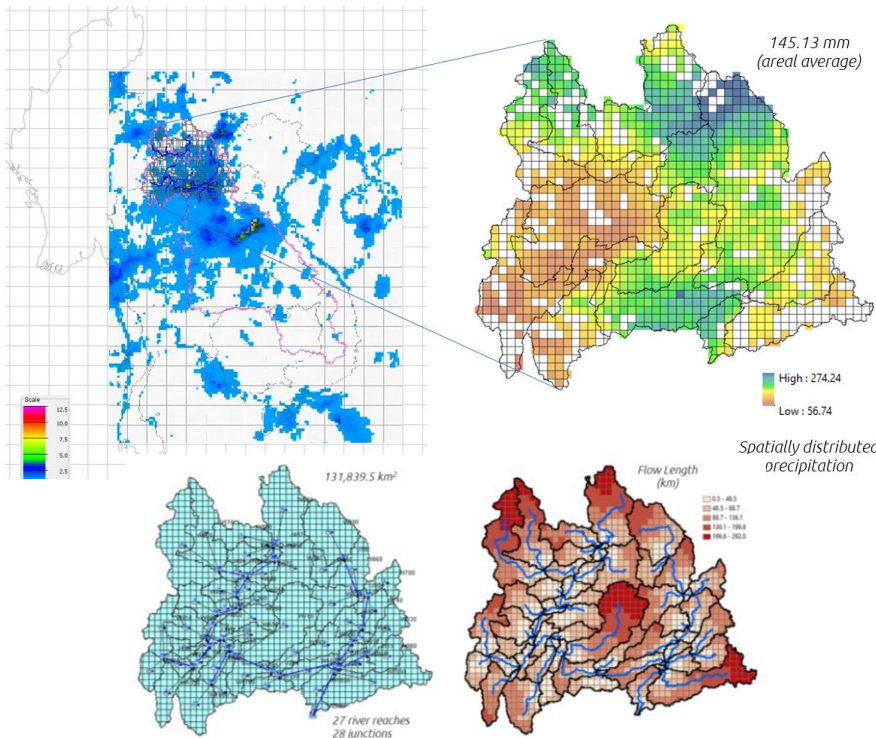
Upper Region of Lower Mekong Basin



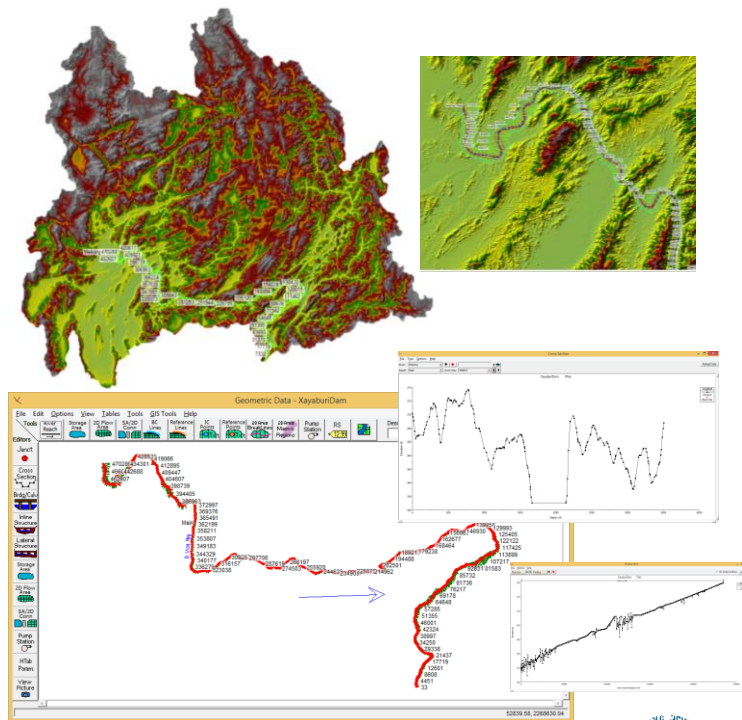
Hydraulic/Hydrologic Analysis in the Mekong Region



✓ **HEC-HMS** (Hydrological Modeling System)



✓ **HEC-RAS** (River Analysis System)



Training and seminar for strengthening capacity building



Key points and expectations (Training : 4 times, Seminar : 4 times)

- Benchmarking by introducing policies and systems through case studies and data utilization
- Improving capacity by acquiring and processing water data and acquiring analytical skills

• Invitational training, local education, best practices exchanges or case studies with advanced countries

- **(Invitational training) ROK**, K-water (UNESCO i-WSSM joint)
- **(Local training) Mekong Country**, Participation of countries in the Mekong region, MRC practitioners
- **(Exploring advanced country) U.S**, NASA and USACE (Practical case studies, education, etc.)

• Training target and number: Public and Senior officials of countries in the Mekong region (4 times)

• Training content: Organizing and conducting educational programs at each level

- **(Basic)** Introduction to water data understanding and satellite image processing
- **(Application)** Satellite data utilization and hydraulic/hydrological model practice
- **(Policy)** Introduction to water management data utilization and policy/system in ROK and U.S

• Seminars for sharing know-how and strengthening technological capability

(1 Year) Oct. 2019 ~ Sep. 2020

- **Kick-off Meeting and Seminar (1 time)**
- Nov. 28, 2019 in Busan, Korea
- **Zoom meeting with MI (3 time)**



(2 Year) Oct. 2020 ~ Sep. 2021

- **Capacity Building Training (1 time)**
- Jul., 2021, Online training #1
- **The 10th Anniversary Symposium of Mekong-Rok Cooperation**
- Nov. 2021 in Korea



(3 Year) Oct. 2021 ~ Sep. 2022

- **2nd AIWW, Korea-Mekong Special Session**
- Mar., 2022 in Mekong Region (TBD)
- **Capacity Building Training (3 times)**
- Feb., 2022 Online training #2
- Jun or Jul., 2022 in Mekong Region (TBD)
- Oct, 2022 in Korea (TBD)
- **Technical Forum, MKWF (1 time)**
- Oct., 2022 in Korea (TBD)

Training and seminar for strengthening capacity building



“Improved Hydrologic and Hydraulic Decision Support for the Mekong Basin”

Online Training #1

- Period : 2021. 7. 21 ~ 2021. 7. 23 (Online)
- Content : HEC-suites, NASA’s satellite data and SWAT online, K-series and K-LIS



AN INTRODUCTION TO HEC-RESSIM

ROK-US Mekong River Collaboration

By: Juan Kilrich
Hydrologic Engineering Center
HEC-Ressim Technical Lead

K-SERIES

Enhancement of IWRM technology in the field of water resources management based on Software Platform

INTRODUCTION TO SOIL WATER ASSESSMENT TOOL (SWAT) ONLINE & NASA ACCESS (MODULE 1)

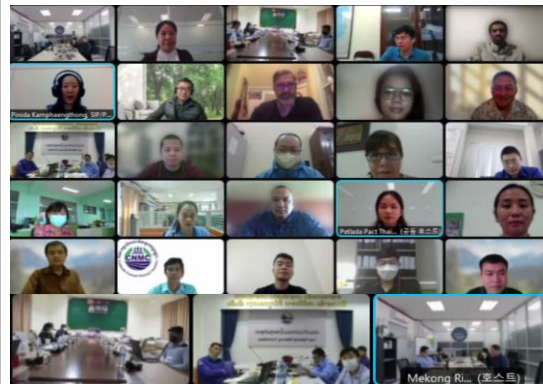
Ibrahim N. Mohammed¹, John D. Bolton¹, Venkat Lakshmi¹, Prinda L. Kamphaengbong¹

¹NASA Goddard Space Flight Center, Technology Applications, TRAC Center Mekong Indochina LDC

Greenbelt, Maryland
20 Nov 2021

Online Training #2

- Period : 2022. 2. 15 ~ 2022. 2. 17 (Online)
- Content : Precipitation bias correction, NASAaccess & SWATonline, HEC-RAS 2D, SWAT



REPUBLIC OF KOREA-UNITED STATES MEKONG COLLABORATION
Water Data Utilization and Capacity Building in the Mekong Region
“Improved Hydrologic and Hydraulic Decision Support for the Mekong Basin”
Online Training #2
February 15 – 17, 2022

Welcome to The Second Regional Training on the In-depth Introduction of Potential Tools to Support the MRC DSGP!

Please complete your pre-training assessment survey before the training starts. The link is available in the chat box.

São Francisco River Watershed SWAT – HEC-RAS Integration

Dr. Calvin Creech, P.E.

February 2022

CODEVASF 2.0

WVU
West Virginia University
US Army Corps of Engineers
BUILDING STRONG

NASAACCESS & SWATONLINE: ESSENTIAL SKILLS (MODULE 2)

Ibrahim N. Mohammed¹, John D. Bolton¹, Prinda L. Kamphaengbong¹

¹NASA Goddard Space Flight Center, Technology Applications, TRAC Center Mekong Indochina LDC

Greenbelt, Maryland
20 February 2022

Creating an HEC-RAS 2D Model Overview

Carmon Anderson, PE, D-WRE
Stanford Silicon, Ph.D.
USACE, Institute for Water Resources, Hydrologic Engineering Center



Anticipated Results & Future Plan



Anticipated Results



Improvement of a water data and sharing system in the Mekong region to coordinate national conflicts and provide support for a more efficient water-related disaster management system

■ **Production and sharing** of hydrographic factors in the Mekong area using satellite information

Satellite data linkage and hydraulic/hydrological **model analysis capability** for vulnerable areas

Developing measures to **improve the performance** (Business Process) of practitioners participating in Mekong Capacity Building

SYNERGY EFFECT

REDUCTION EFFECT

Reduce damage to Mekong countries by water disaster

Drought and flood modeling and real-time decision support through the acquisition of satellite-based hydrological data

Resolve **water resources disputes** in Mekong

Resolving **water resources imbalance** between Mekong countries

Future Plan



(K-water) Water resources planning, development, operation and management capability

(NASA) Satellite data analysis tools **(USACE)** Integrated water resources management and hydraulic/hydrological expertise

Task	Year																																				
	2019			2020												2021												2022									
Month	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
Activity 1.1.	- (K-water) Production of global satellite based water resources data and water disaster monitoring																																				
Activity 1.2.	- (K-water) Analyze the hydraulic/hydrological situation in vulnerable areas by linking hydrological models with satellite and in site data																																				
Activity 1.3.	- (K-water) Seminar in ROK																																				
Activity 2.1.	- (NASA) Training																																				
Activity 3.1.	- (USACE) Training on use of HEC-HMS																																				
Activity 3.2.	- (USACE) Training on use of HEC-RAS																																				
Activity 3.3.	- (USACE) Training on use of HEC-RAS 2																																				

Thank you

