The Lower Mekong Initiative Workshop

Ha Noi, August 18-22, 2014

COLLABORATION BETWEEN THE VIETNAM NATIONAL UNIVERSITY OF HO CHI MINH CITY, CUAHSI AND UCSD ON HYDROLOGIC DATA MANAGEMENT IN SOUTHERN VIETNAM

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CONTENT

1. INTRODUCTION

- The difficulties in the management of water resources data

Data Heterogeneity

- From different agencies
- From investigators collected for different purposes
- Different formats:
  - Spatial Data: Points, Lines, Polygons,
  - Non-spatial Data: Fields, Time Series.

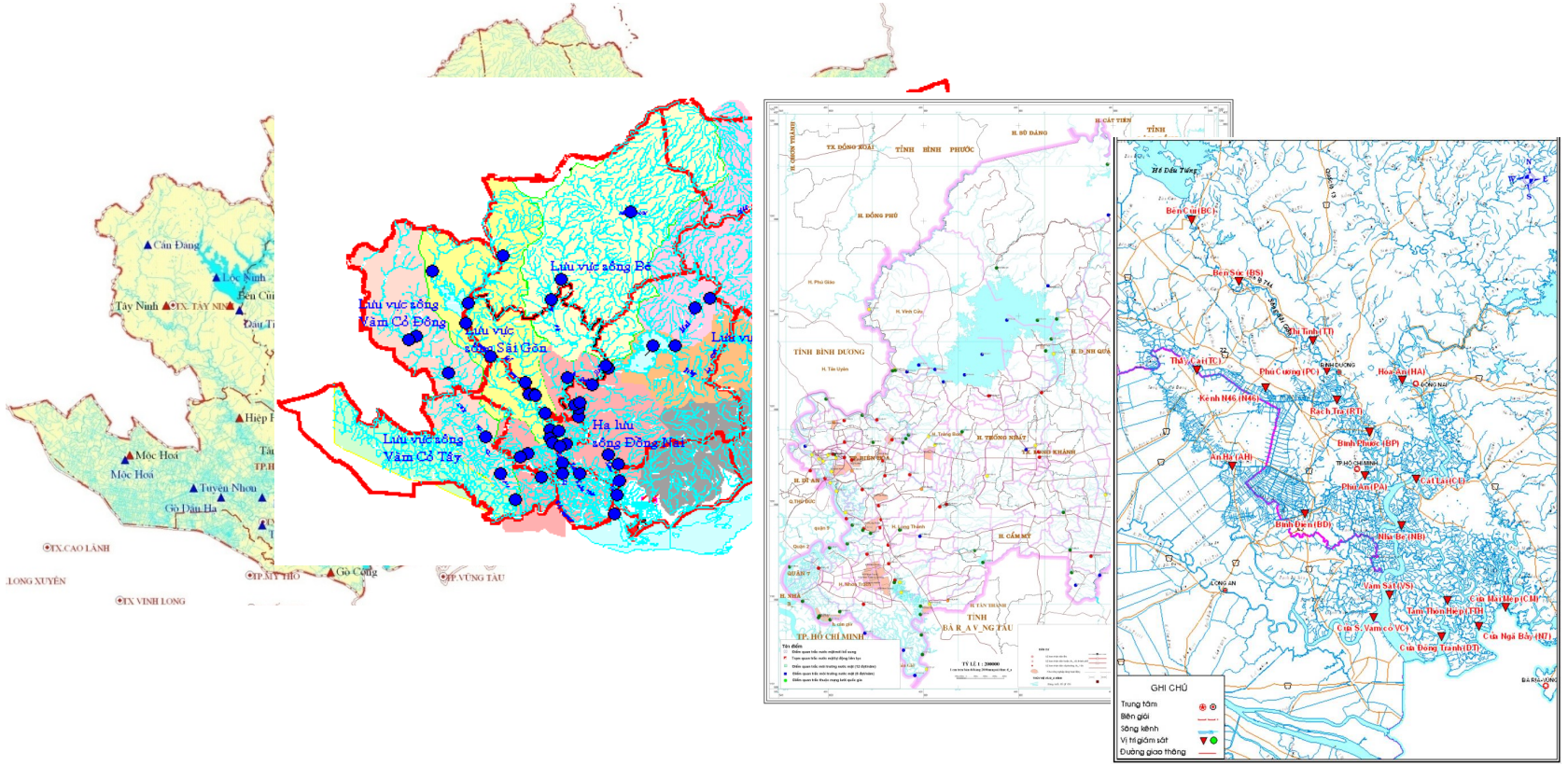
Sharing Data

- Lost data
- Overlapping data

→ THE NEED OF A SCIENTIFIC HYDROLOGICAL DATABASE MANAGEMENT SYSTEM

1. INTRODUCTION

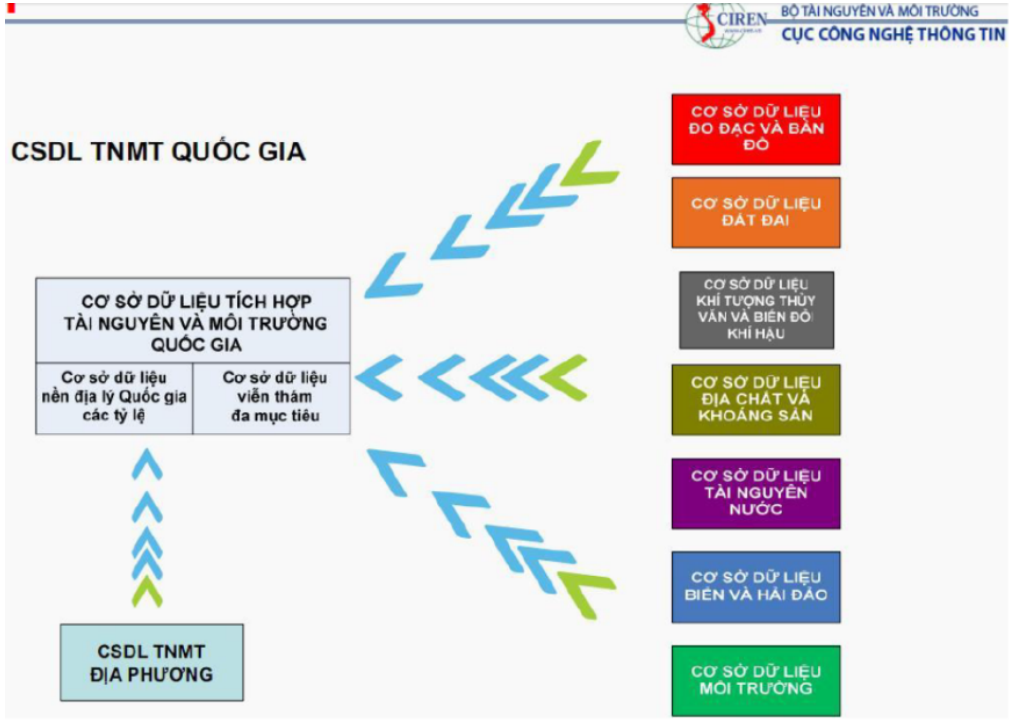
- Situation in Southern Vietnam



- Different database platforms
- Different schemas (scales, techniques…),
- Data is not easy to access or expensives

THE NEED TO UNIFY WATER DATABASE MANAGEMENT

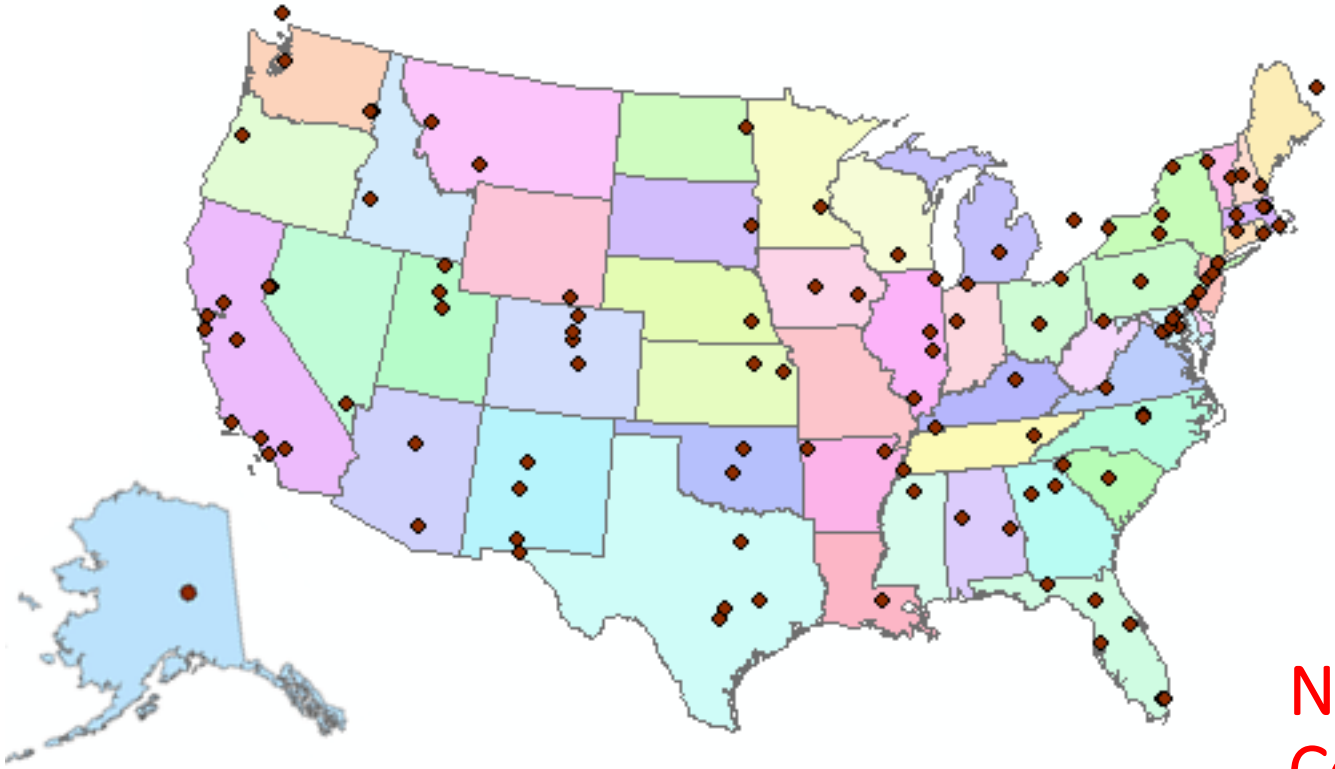
1. INTRODUCTION



- Many other projects are limited in term of data access, compliance with standards, sharing capacity, model integration
- Database is developed in separated sectors, not standardized, overlapping , etc.
- **Water-related Information System for the sustainable Development (WISDOM)** for the sustainable development of the Mekong Delta in Vietnam aims to design and implement hydrological and social information system.

CUAHSI HIS SYSTEM OVERVIEW

2. CUAHSI OVERVIEW



CUAHSI
universities allied for water research

http://www.cuahsi.org/

Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) - HYDROLOGIC INFORMATION SYSTEM (HIS)

Now operates Water Data Center: http://wdc.cuahsi.org

An organization representing **+125** United States universities and international partners, receives support from the National Science Foundation to develop infrastructure and services for the advancement of hydrologic science and education in the U.S.

Available sources of water observations integrated in CUAHSI HIS

Now nearly 120 sources of water data services. And several are from Vietnam!

2. CUAHSI HIS

REASONS TO APPLY CUAHSI HIS

Academics:

- Integrate data from different sources
- Discover data, interface data with models, interface with sensors
- Recognition of work, in support of research publications
- Data publication is mandated by the funding agency

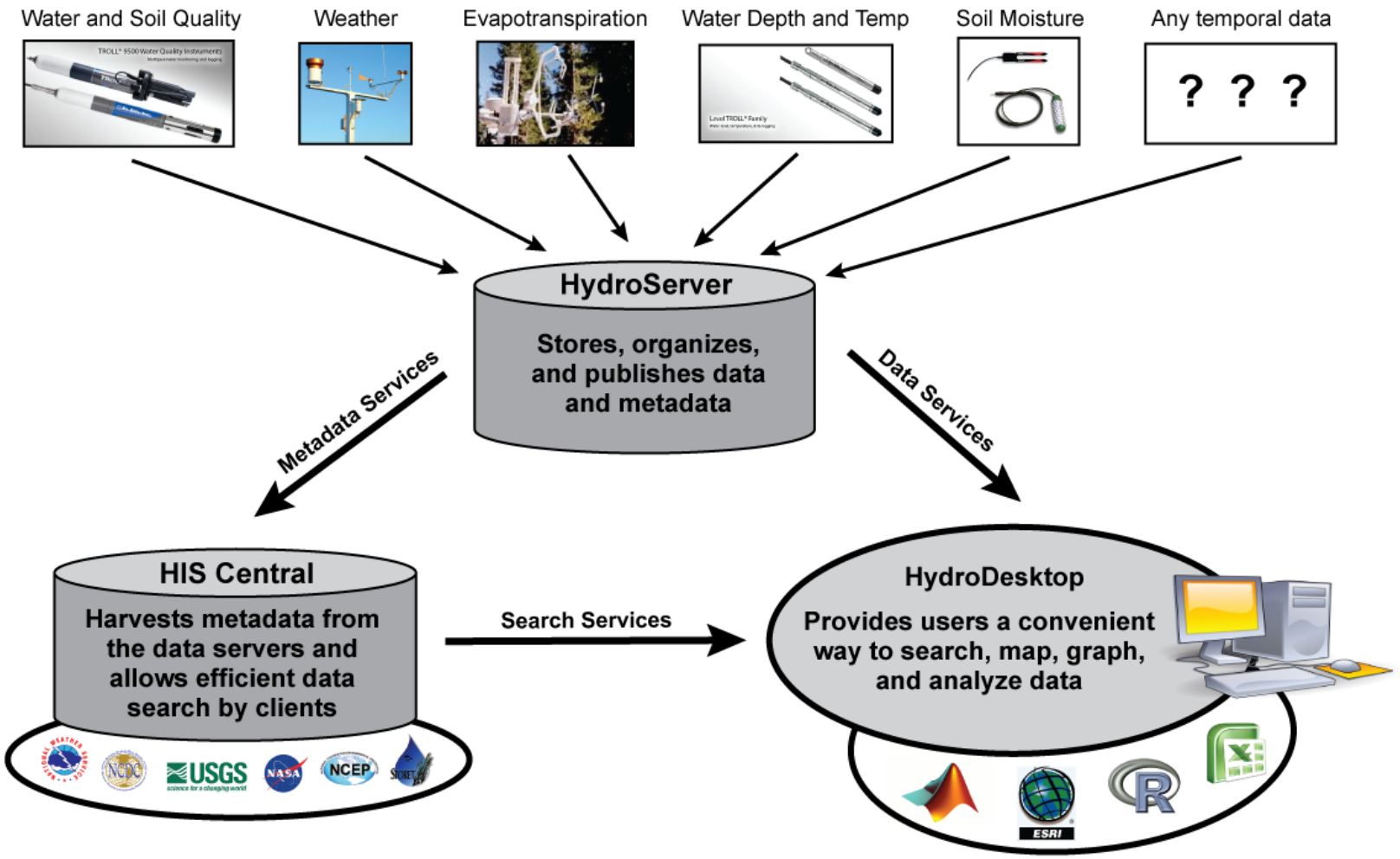
Agencies:

- Standardize data access (both internally and externally)
- Time savings in developing a publication system
- Public benefit with publication
- Return on investment – people can get the data themselves without requiring a “middle-man”
- Get all the state data “together”

Who is using HIS?

- In the US: federal, state and local governments, many universities and companies; increasingly used outside the US

2. CUAHSI HIS



CUAHSI Hydrologic Information System

2. CUAHSI HIS

- CUAHSI **WaterML** is a standard output schema for CUAHSI HIS **WaterOneFlow** web services.
- The goal of **WaterML** design has been to capture semantics of hydrologic observations discovery and retrieval and express the point observations information model as an XML schema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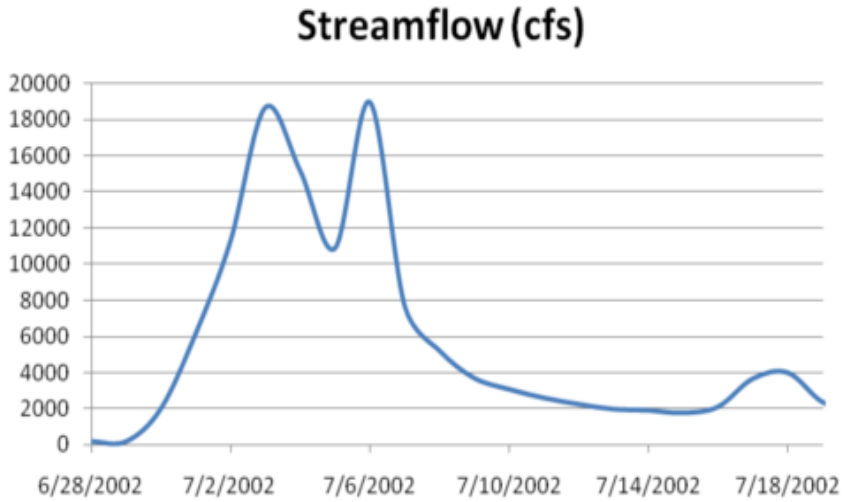
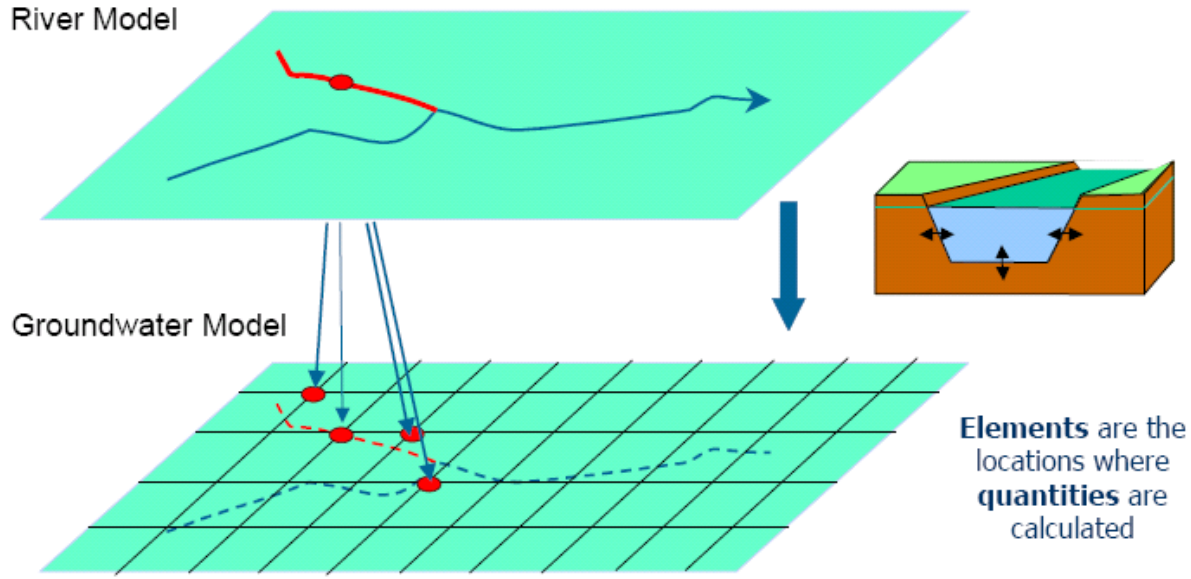


THE CONCEPT OF WATERML

2. CUAHSI HIS

OpenMI Integration



- Model coupling using Open Modeling Interface (OpenMI) developed in Europe.
- Models can ingest data from WaterOneFlow servers, ODM databases, or WaterML files directly
- The OpenMI provides a translation layer between data and models so that it is easier to plug-and-play models and data within a component-based modeling system

(Sources: Jon Goodall and Castronova, 2008)

OpenMI defines a standard interface so that models can exchange values during a simulation run. For example, a groundwater model and river hydraulics model could be coupled through the exchange of groundwater heads and river seepage rates.

HOW THE COLLABORATION STARTED

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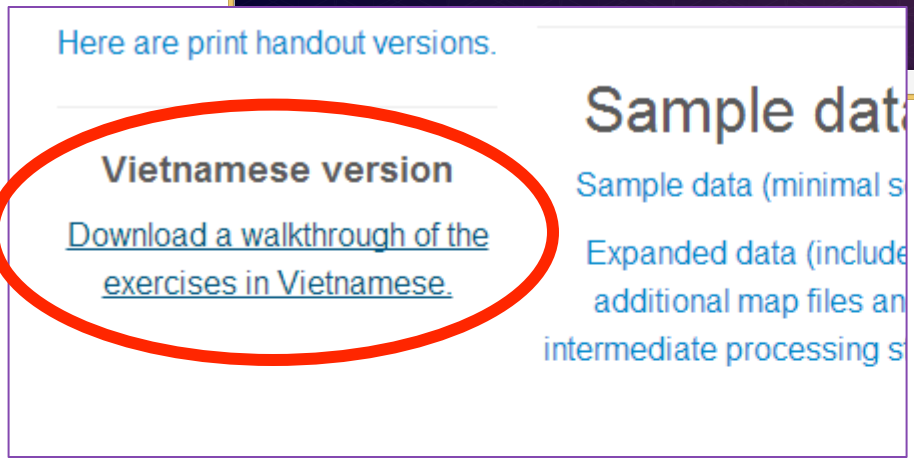
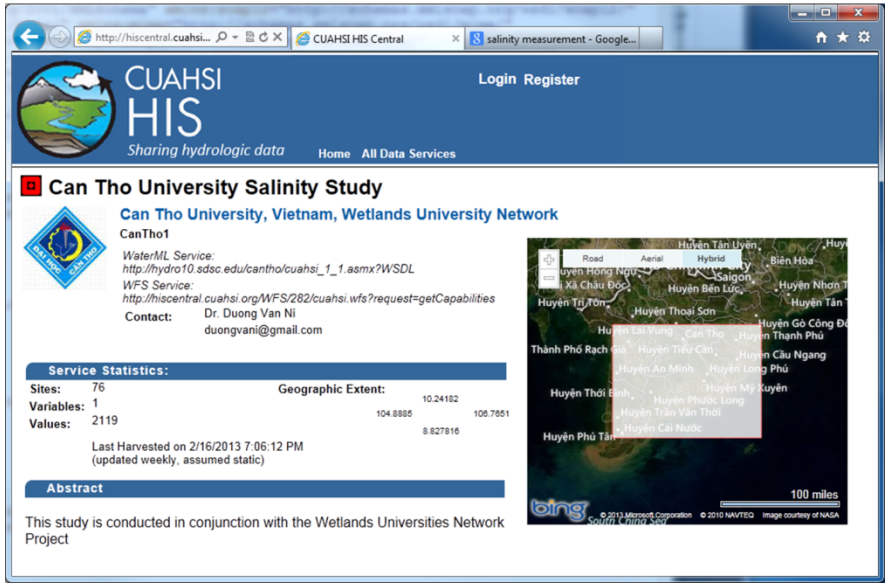


25-26 June 2013, Vietnam National University, Ho Chi Minh City

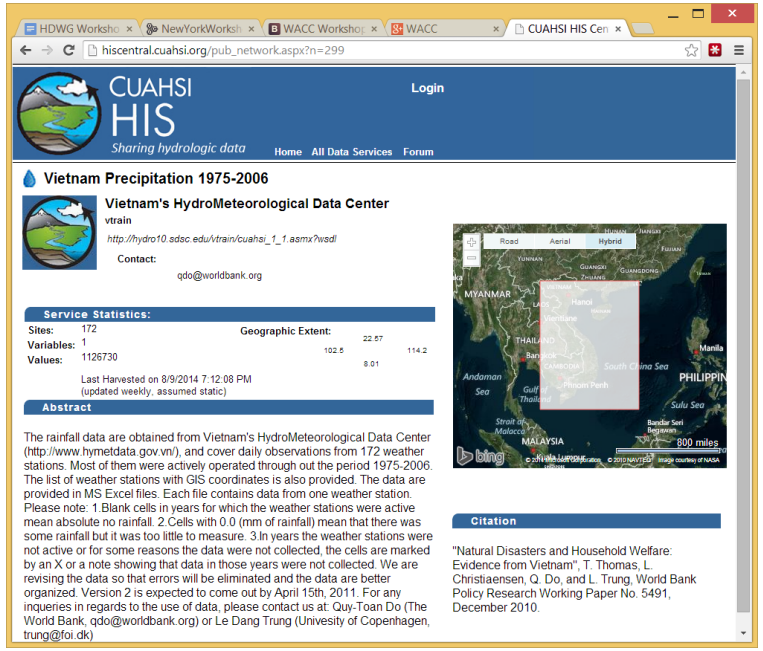
3. HOW THE COLLABORATION STARTED

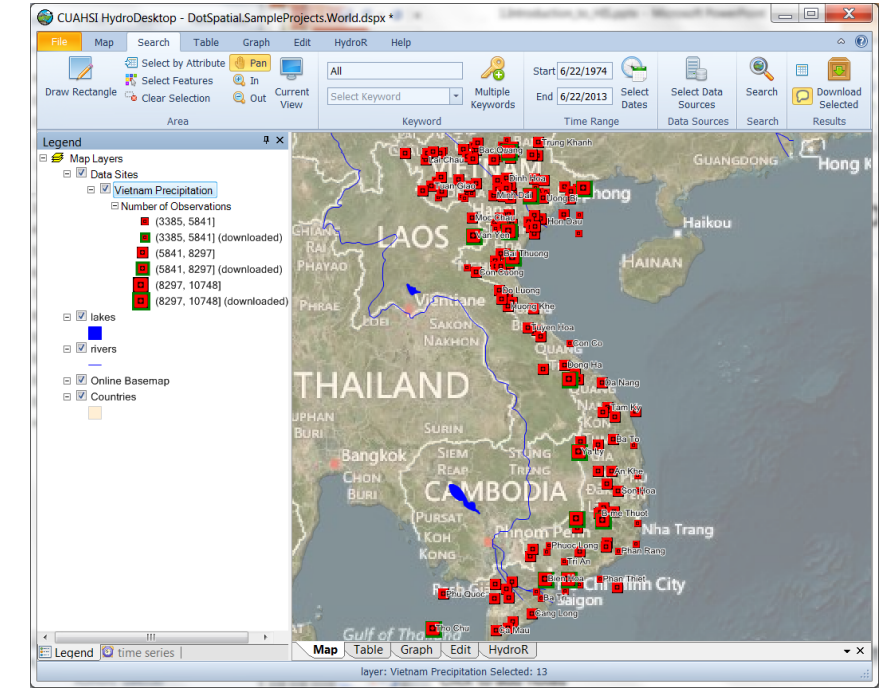
Dr. Duong Van Ni, Can Tho University, Vietnam; Coordinator of University Network for Wetland Ecology and Conservation



Salinity time series

Vietnam Precipitation 1975-2006





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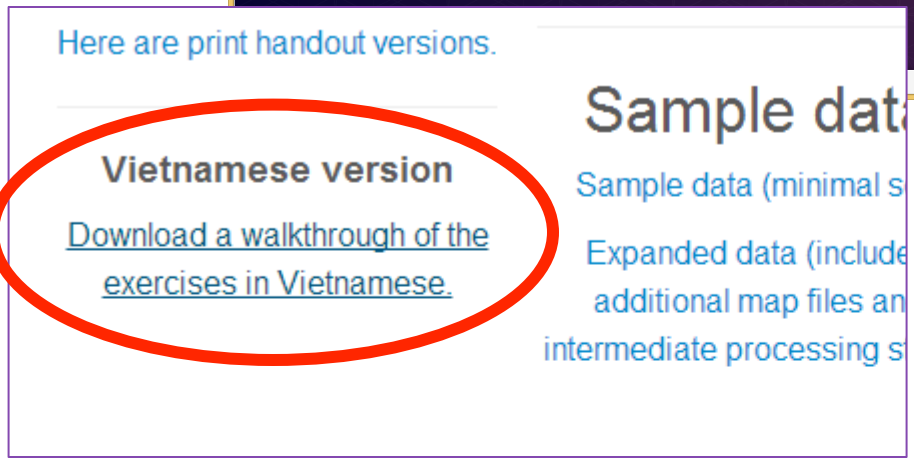

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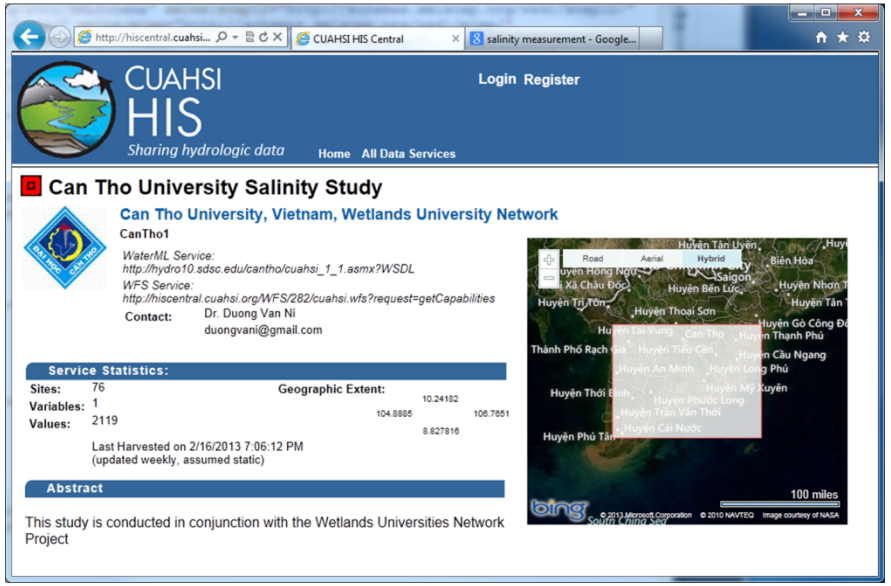

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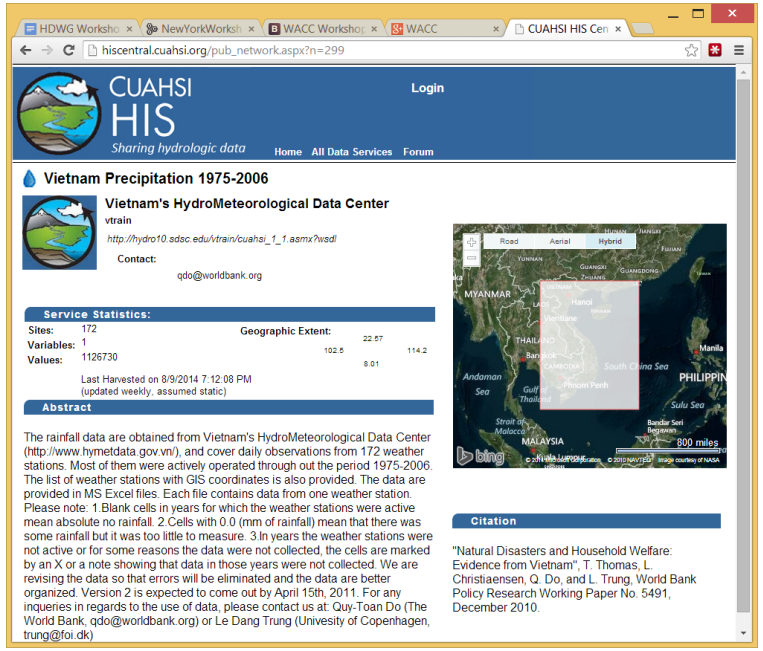

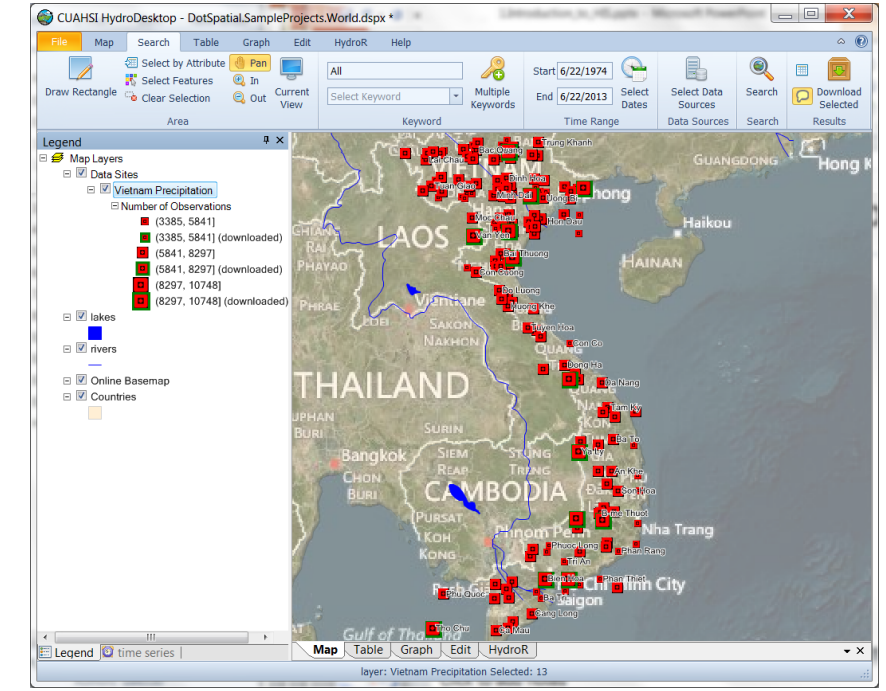

INITIAL APPLICATION OF CUAHSI HIS

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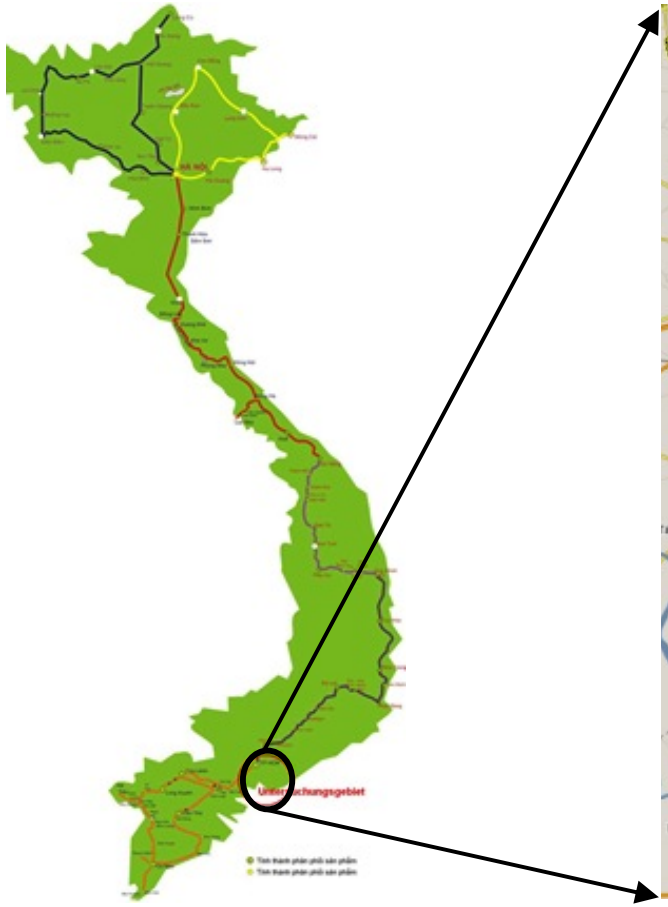
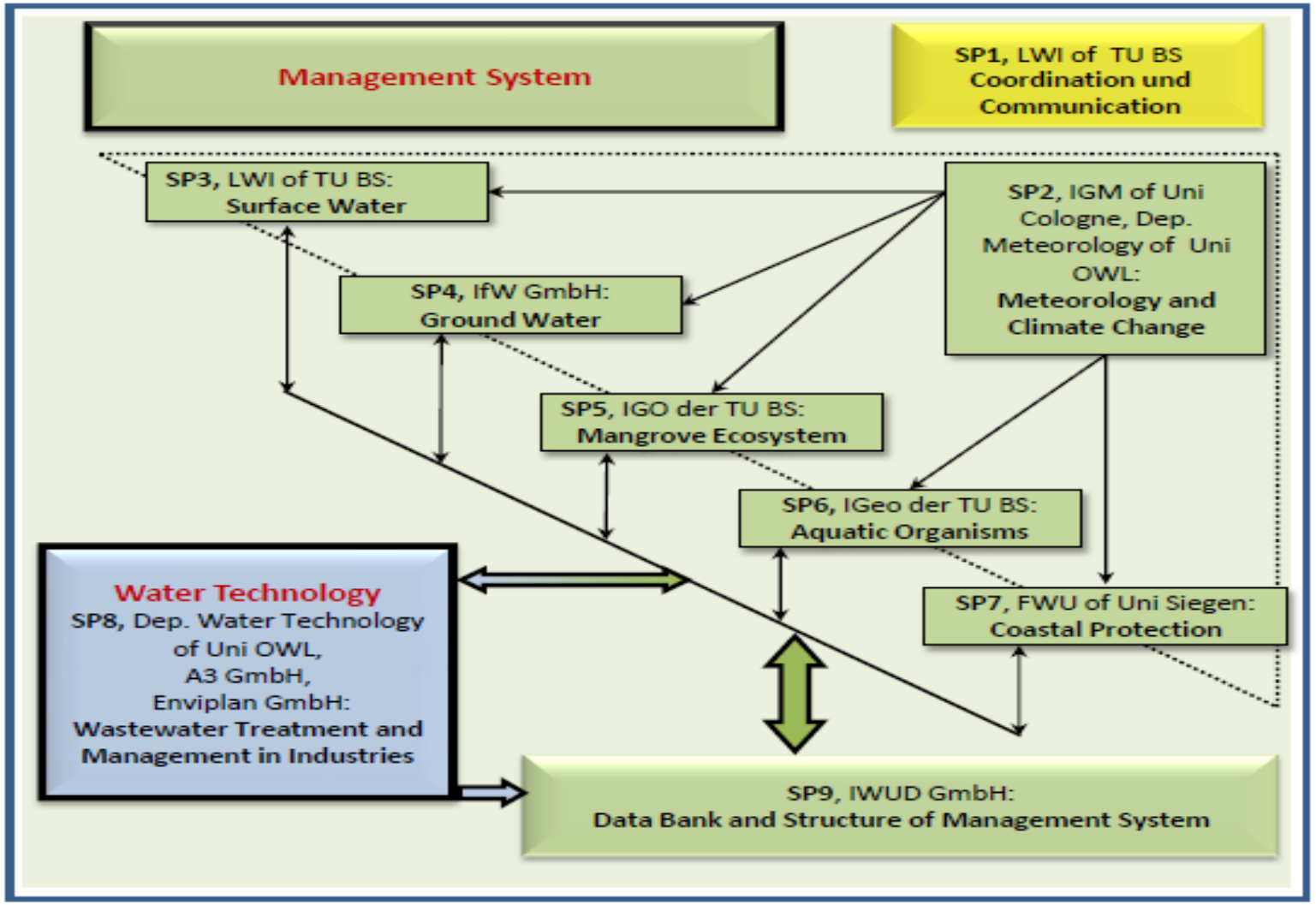


(Sources: Meon and Huyen Le, 2012)

EWATEC COAST German – Vietnamese collaboration projects

4. INITIAL APPLICATION OF CUAHSI HIS



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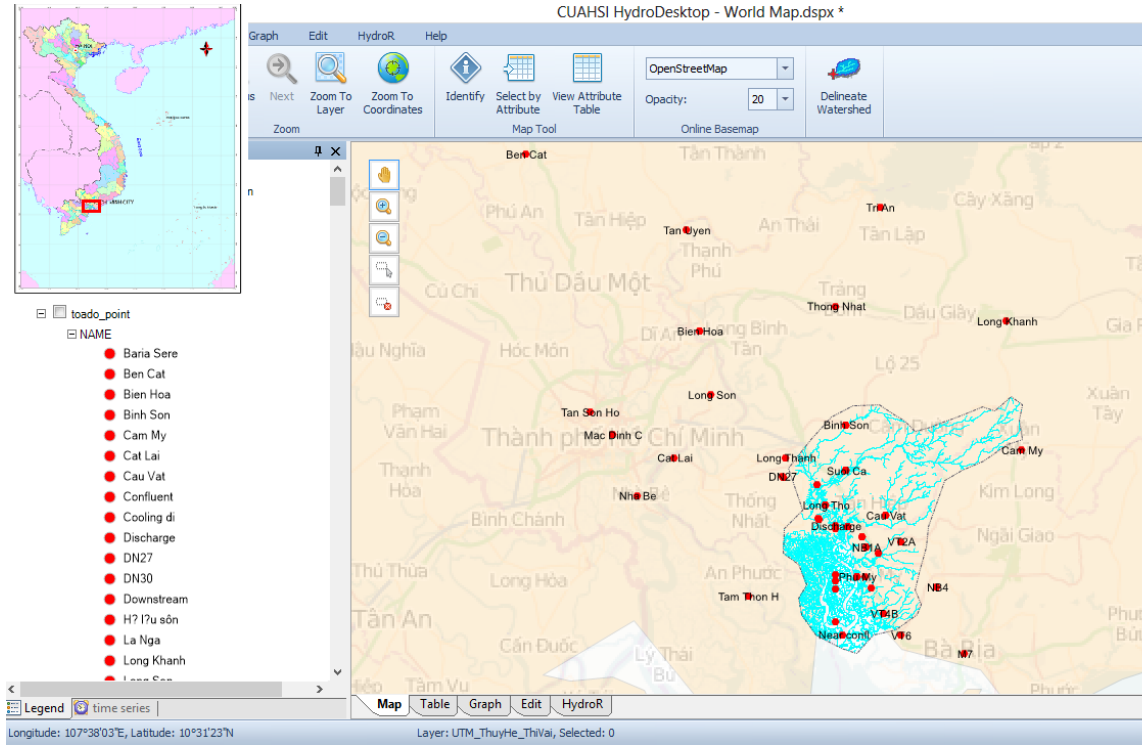
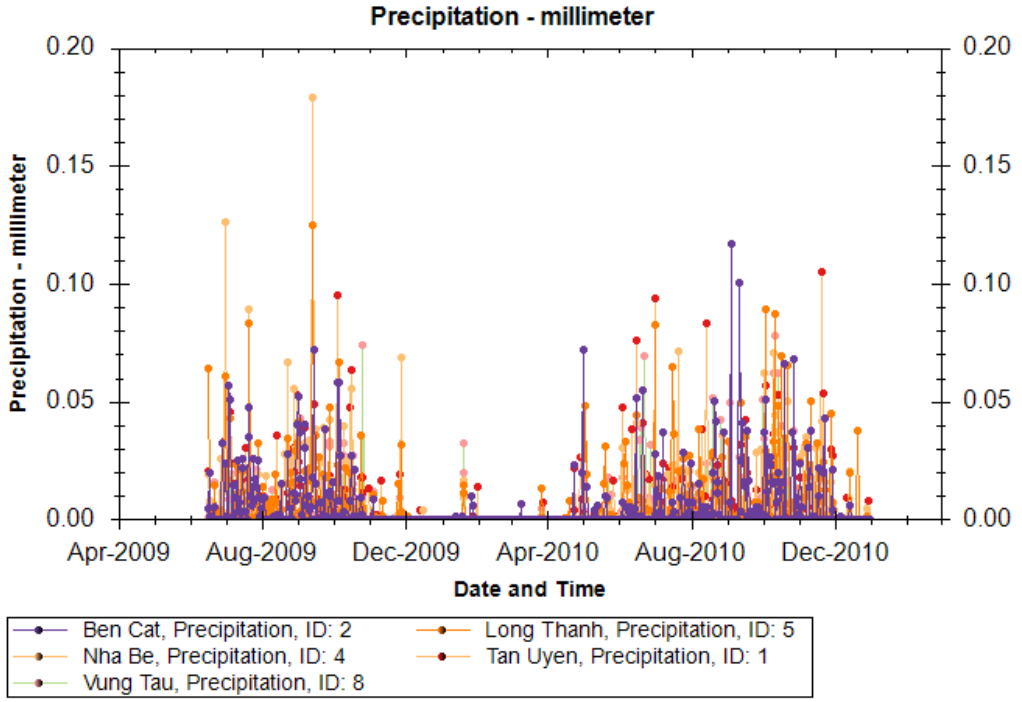
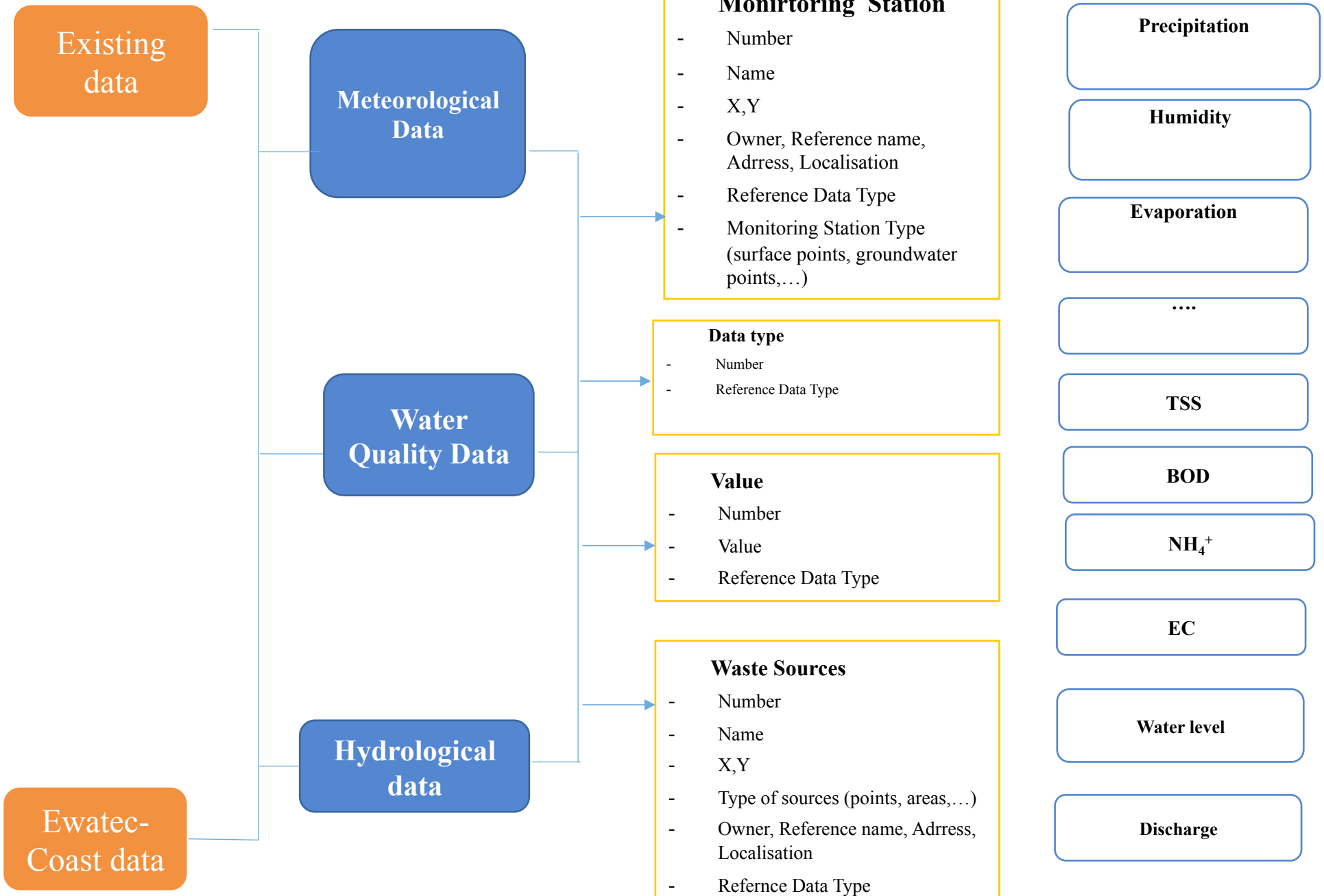




Precipitation distribution in some meteorological stations including in EWATEC COAST projects

4. INITIAL APPLICATION OF CUAHSI HIS

Simplified version of the attribute data scheme for EWATEC – COAST database.



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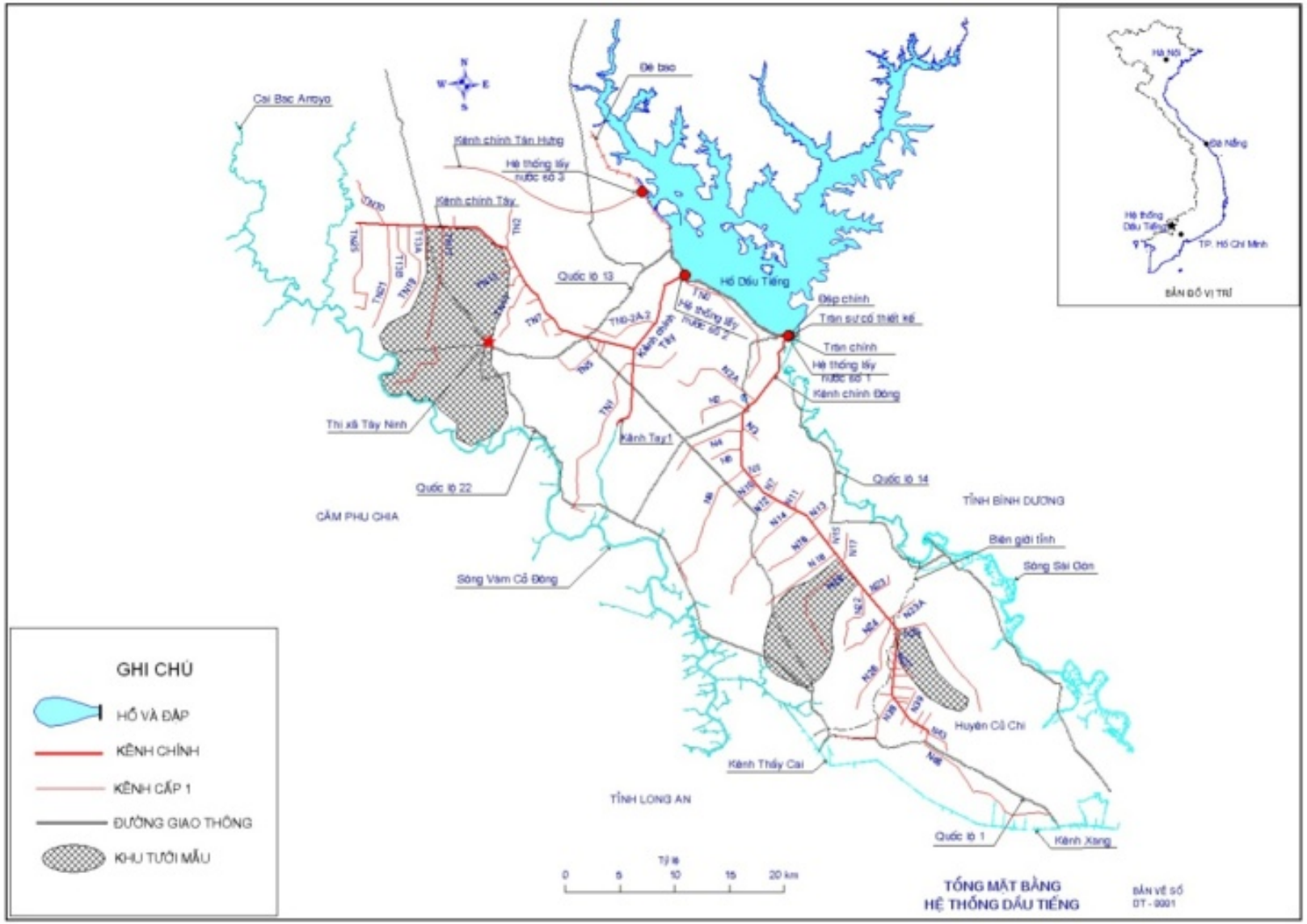
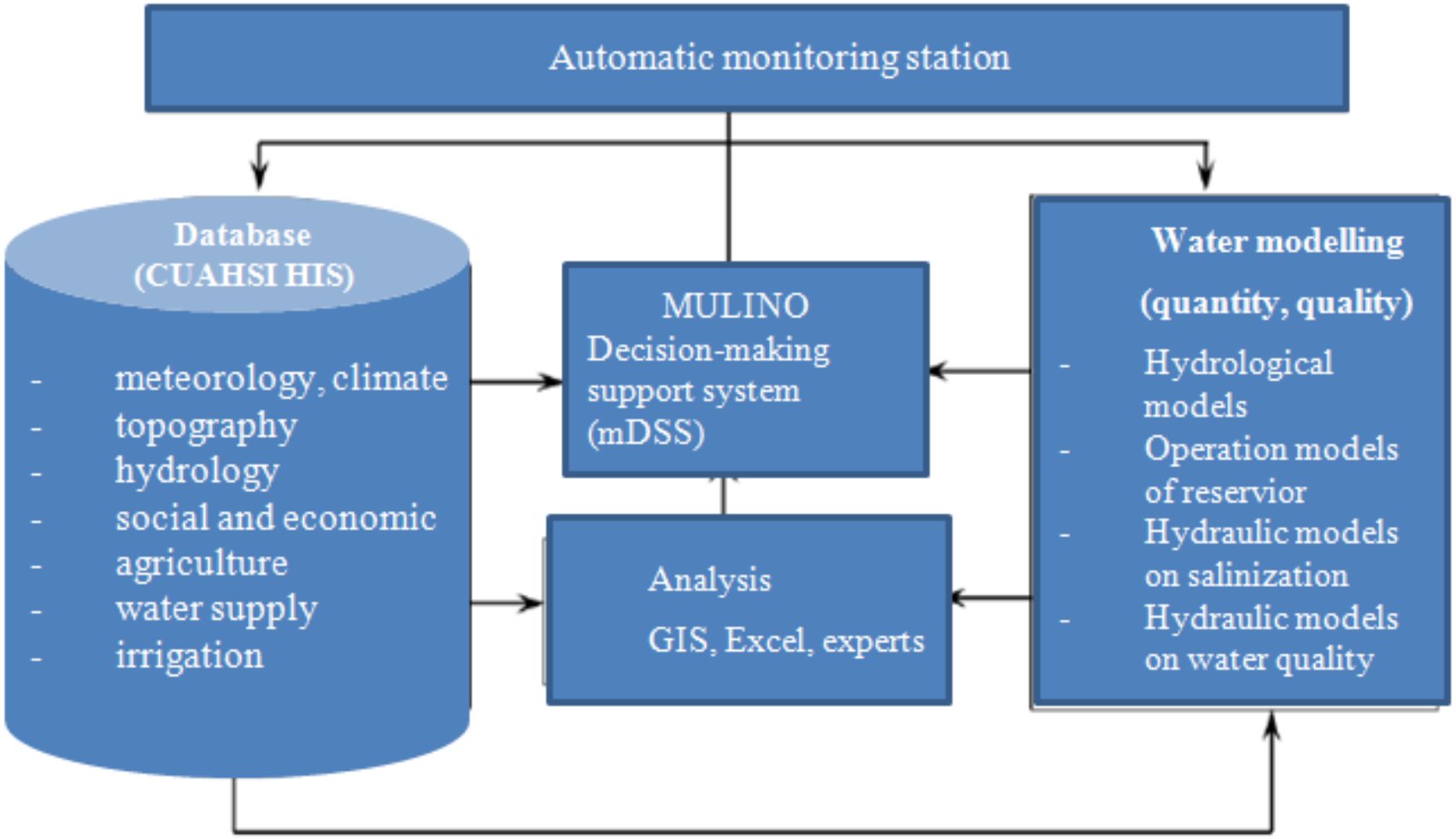


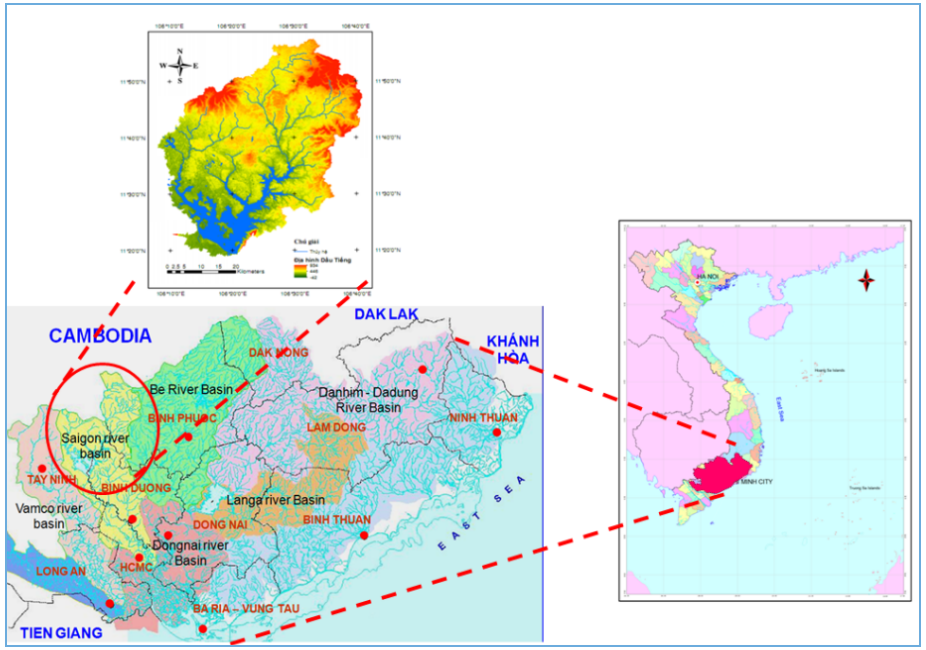
"Building a decision support system for the surface water resources management in Sai Gon river basin in the context of water shortages and climate change" (HCM-DSS)

4. INITIAL APPLICATION OF CUAHSI HIS



4. INITIAL APPLICATION OF CUAHSI HIS: EXTENDING THE COLLABORATION

- Complex hydrologic regimes (reservoir upstream, local rainfall, hydraulic operation, tide) and water quality issues (from point and non-point sources) at different spatial (and temporal) scales
- Current and future combined anthropogenic and climate change impacts
- State-of–the-art hydrologic data management, modeling and decision support tools, leading to a sustainable infrastructure for hydrologic observations and analysis and better decision-making
- The system should help evaluate and monitor water management strategies and guide operational practices



HCM-DSS
(further collaboration using CUAHSI HIS – preparing a proposal for support)

4. INITIAL APPLICATION OF CUAHSI HIS: EXTENDING THE COLLABORATION

CUAHSI
universities allied for water research

UCSD

Dr. Ilya Zaslavsky,, San Diego Supercomputer Center, UCSD (water databases, services, standards)

Climate change modeling and downscaling expert (TBD)

Water resource modeler (TBD)

Setting up a working group

Workshops

Joint modeling work

Data collection and sharing platform

Data-model integration

OGC standards work

Capacity building

ĐẠI HỌC QUỐC GIA TP.HỒ CHÍ MINH

TRƯỜNG ĐẠI HỌC KHOA HỌC TỰ NHIÊN KHTN TP. HỒ CHÍ MINH

ĐHTL WRU

Dr. Nguyen Hong Quan, Institute for Environment and Resources (IER), VNU-HCM

Dr. Duong Thuy Nga, University of Science, VNU-HCM (database development)

Mr. Trieu Anh Ngoc, Water resources University (hydrologist, optimization)

Asso. Prof. Dr. Nguyen Thoi Trung, University of Science, VNU-HCM (applied mathematics, optimization)

CONCLUSIONS and NEXT STEPS

5. CONCLUSIONS

- CUAHSI HIS have been widely used all over the world: leveraging this system will help integrate data from Vietnam with standards-based analysis and modeling tools used elsewhere
- Initially, use of CUAHSI HIS will simplify the process of sharing data between stakeholders and ensure consistency in data structures and data interpretation
- Currently, Vietnam does not yet have a unified system to manage water data → we need to build a web-based system for exchanging data and use it as a platform for various applications, in particular in modeling climate change impacts

6. NEXT STEPS

- Involving governmental organizations and other funding agencies to further develop application of CUAHSI HIS in Vietnam and in other LMI countries
- Setting up a Central catalog server in Viet Nam, leveraging the experience of CUAHSI HIS Central
- Adopting OpenMI for model coupling in complex modeling systems (e.g. the Dong Nai river basin), to integrate several models (e.g. SWAT, MIKE) in a simulation
- Developing new data analysis tools based on R programming language through HydroR extension of HydroDesktop

Thank you for listening !