



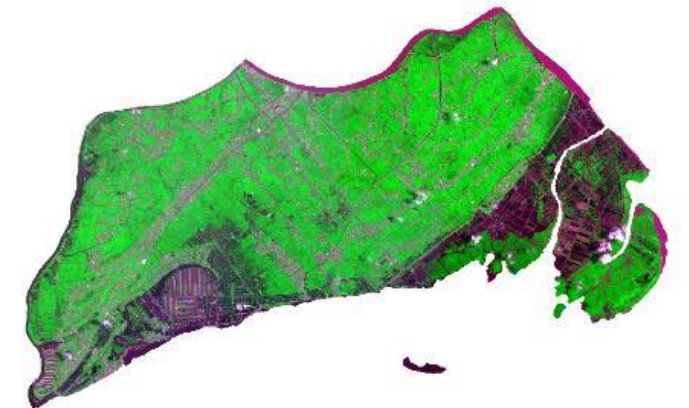
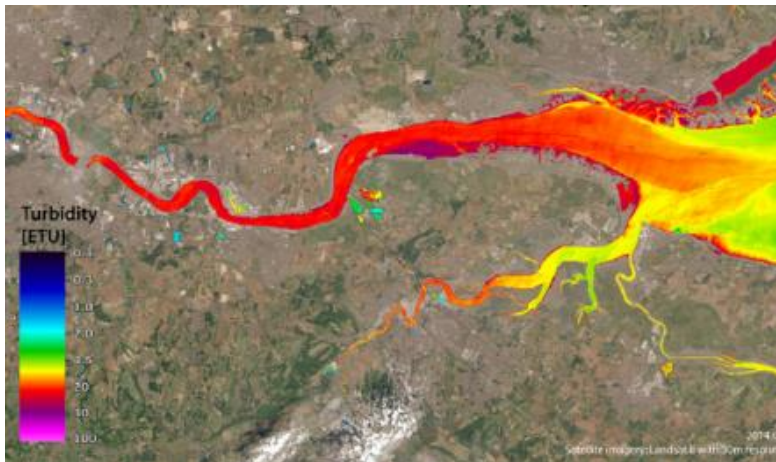
## Workshop Climate Change

# Investing in climate resilience through inclusion of Natural-based Solutions in water and disaster management

Lan Thanh Ha

Tuan Van Nguyen (Assoc.Prof. Dr.)

Manh Van Nguyen (Dr.-rer.nat.)



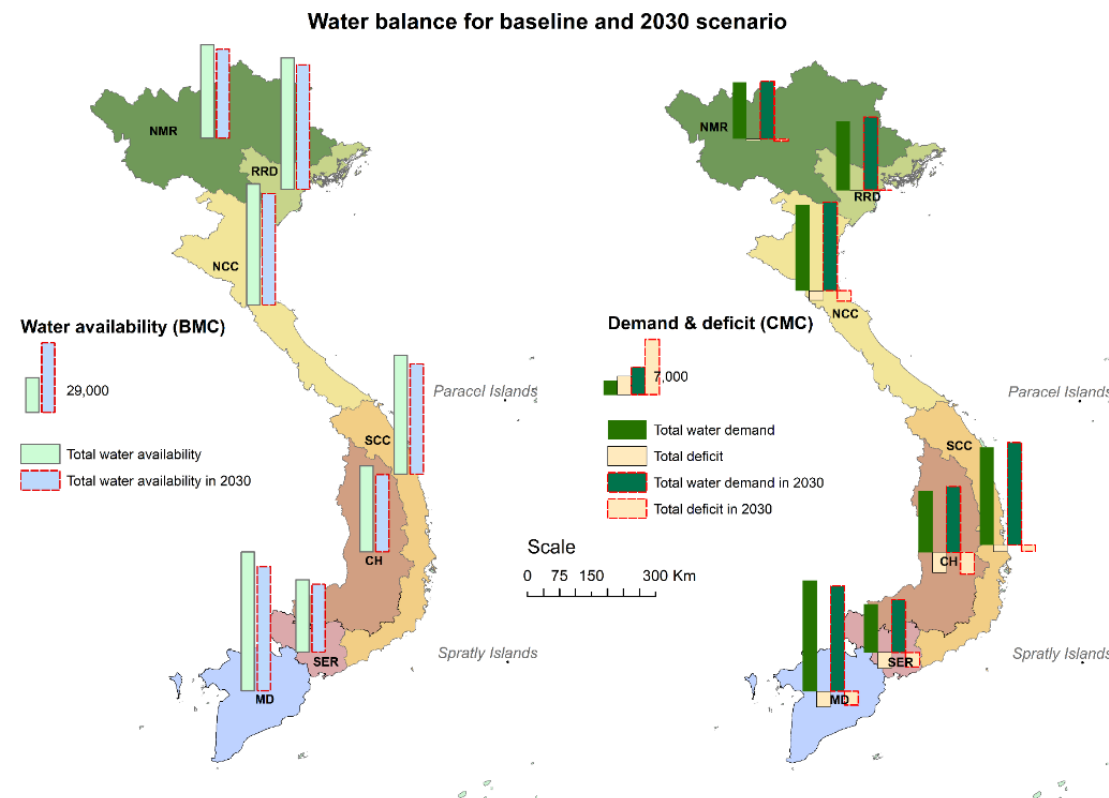
# About IWRP

- ❑ Established in 1961, Institute of Water Resources Planning (IWRP) is among leading institutions working in the area of water resources, climate change adaptation and food security.
- ❑ IWRP contributed to the drafting of *“Vietnam Water Security and Dam safety Programme for the period 2021-2030 with a vision to 2045”*.
- ❑ Currently working in National Master Plan on Water Resources and Disaster Prevention for the period 2021-2030 with a vision to 2050.
- ❑ IWRP actively works in promoting NbS in Red River, Vu Gia Thu Bon and other basins in Vietnam.

**IWRP Mission:** To promote sustainable use and development of water resources, water quality and environment in the country.

# Climate change context

- Vietnam is ranked 28<sup>th</sup>/49 countries in Asia with a National Water Security Index score of 59.9/100 (Asian Water Development Outlook report, ADB, 2020);
- Ranked 13<sup>th</sup>/180 countries in term of climate vulnerability (Global Climate Risk Index, Germanwatch, 2019);
- Infamous quotation: “Too much, too little, too dirty” (World Bank, 2019);
- Vietnam lost \$10 billion in 2020 (3.2% of GDP) to climate change impacts (World Bank, 2021).



Source: MARD, National 2023 Master Plan on Disaster Prevention and Water Resources, 2023





# Why NbS as the way forward

- Decision 36/KL-TW by Politiburo in June 2022 stipulated: *“ensure adequate water supply, both quantity and quality at any instance”* as the utmost objective. Planned actions include *“water-related disaster prevention and climate change adaptation”* and *“sustainable protection of critical watershed, mangroves and wetland ecosystem”*;
- World Bank’s Country Climate and Development Report: Vietnam, 2022 urged Vietnam to *“Develop a systematic approach to using nature-based solutions...”*
- 2023 National Master Plan of Disaster Prevention and Water Resources (in drafting) urged to develop *“non-regret water resources and disaster management solution...”*



# Knowledge (and institutional) gaps

- Few NbS studies in Vietnam, often concentrated in the urban environment. Experiences with NbS for flood risk prevention is limited;
- Limited knowledge and skills in NbS, especially when it comes to multi-sectoral planning;
- In addition, adequate data and information and knowledge of a Monitoring, Reporting and Verification system are lacking;
- Collaboration across players and between sectors is limited in all aspects, i.e., technical and operational, social & governance, institutional & financial aspects;
- Lacking of capacity to approach/apply for green finance.

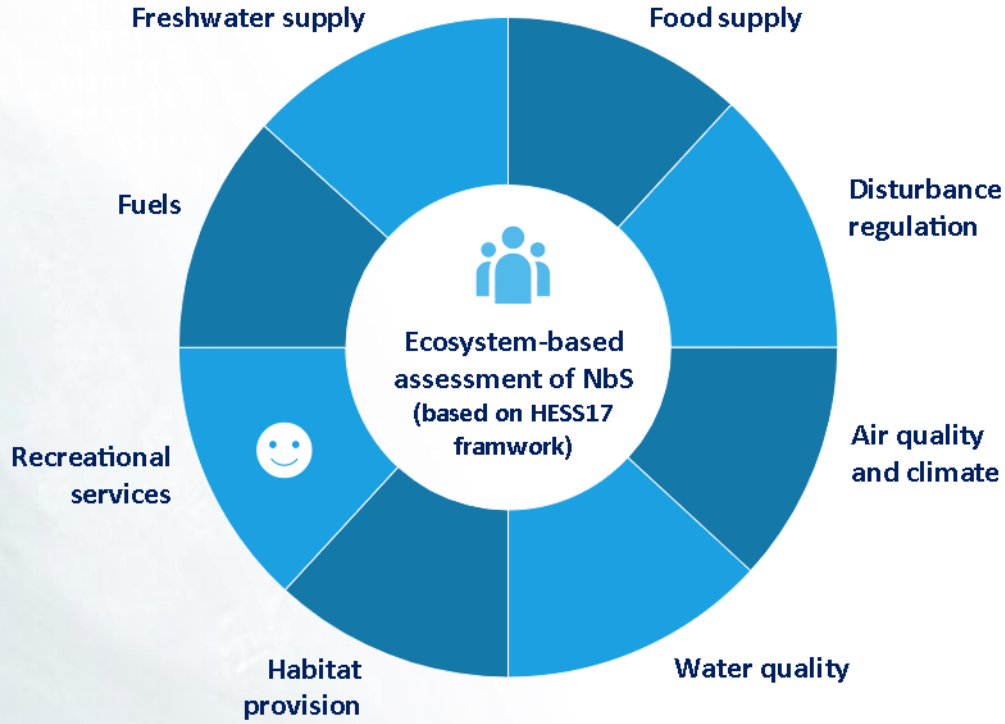
# List of potential NbS interventions

Category	Water stewardship activities/interventions	Contribution to CCA target	Cost effectiveness	Feasibility	Greenery level	
Aquatic habitat restoration	Wetland restoration and creation	☆☆	☆☆	☆☆	☆☆☆	
Land conservation	Reforestation	☆☆	☆	☆☆☆	☆☆☆	
Aquatic habitat restoration	Groundwater recharge (e.g., MAR.)	☆☆	☆☆	☆	☆☆	☆ Low
Water supply reliability	Crop conversion (exc. new practices SRI, AWD)	☆☆☆	☆☆	☆☆	☆☆	☆☆ Medium
Water supply reliability	Roof-top rain harvesting	☆	☆☆	☆☆☆	☆☆☆	
Water supply reliability	Leak repair	☆☆	☆	☆	☆	☆☆☆ High
Water access	Access to drinking water	☆	☆	☆☆	☆☆	
Water supply reliability	Temporary water storage	☆☆	☆☆	☆☆	☆☆	
Water supply reliability	Dam reoperation	☆☆☆	☆☆	☆☆	☆☆	
Water governance	Reservoir knowledge management	☆☆☆	☆☆	☆☆	☆☆☆	

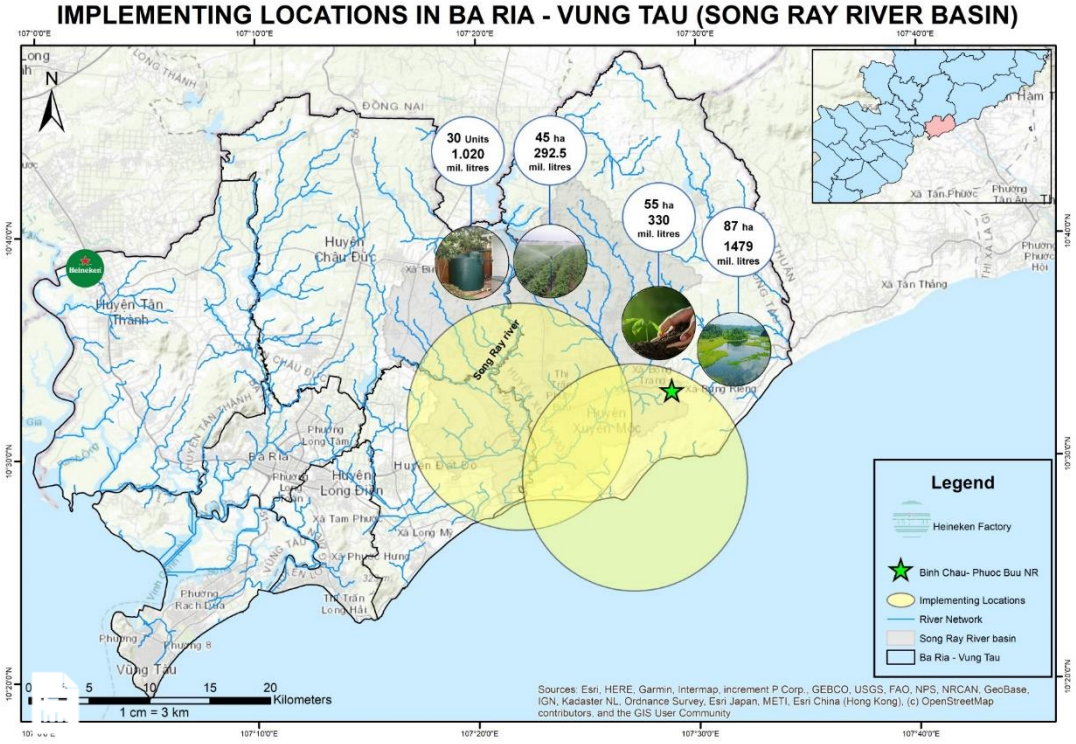
Source: IWRP, internal note, 2023



# Monitoring, Reporting and Verification (MRV)



Source: Ha et al., 2023a



Source: IWRP, internal note, 2023



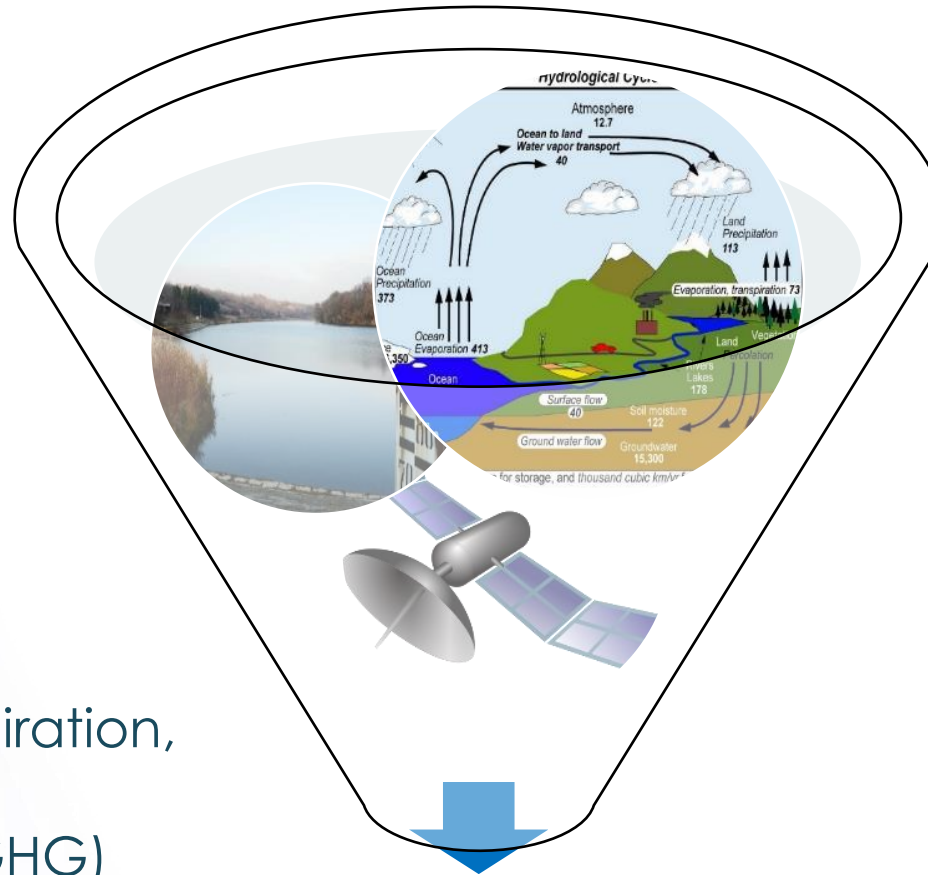
# Data and tools for NbS calculation

## 1. Data, in-situ measurement

- Basin profile, climate
- Hydrology (storage, discharge)
- Moisture
- Water quality
- Policies, plans...

## 3. Remote sensing

- Climate, Evapotranspiration, soil moisture change
- Greenhouse gases (GHG)
- Biomass
- Recharge



## 2. Hydrologic modelling

Physical-based, distributed (SWAT) for runoff, evapotranspiration (ET), recharge, moisture, storage, Water quality (WQ)...

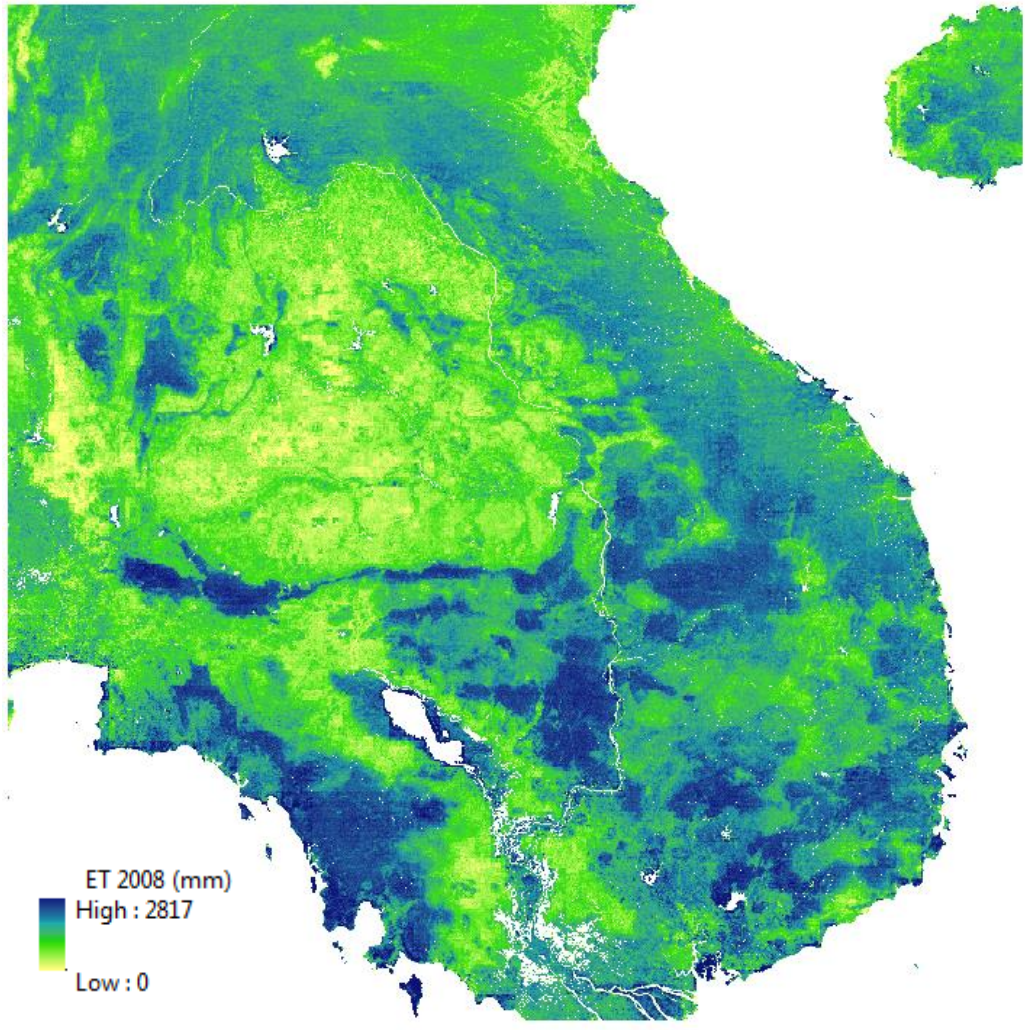
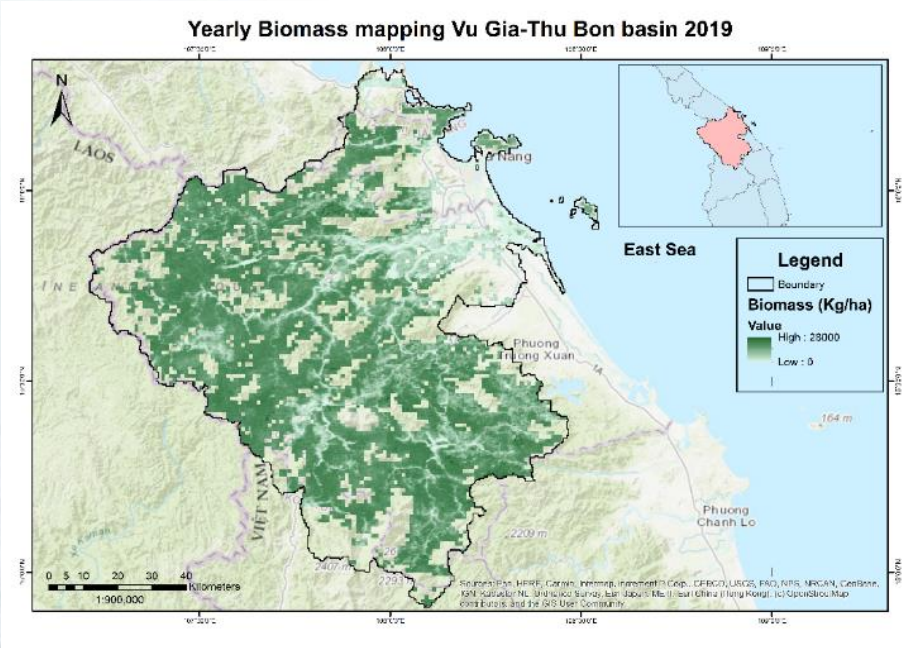
**System of MRV for NbS**



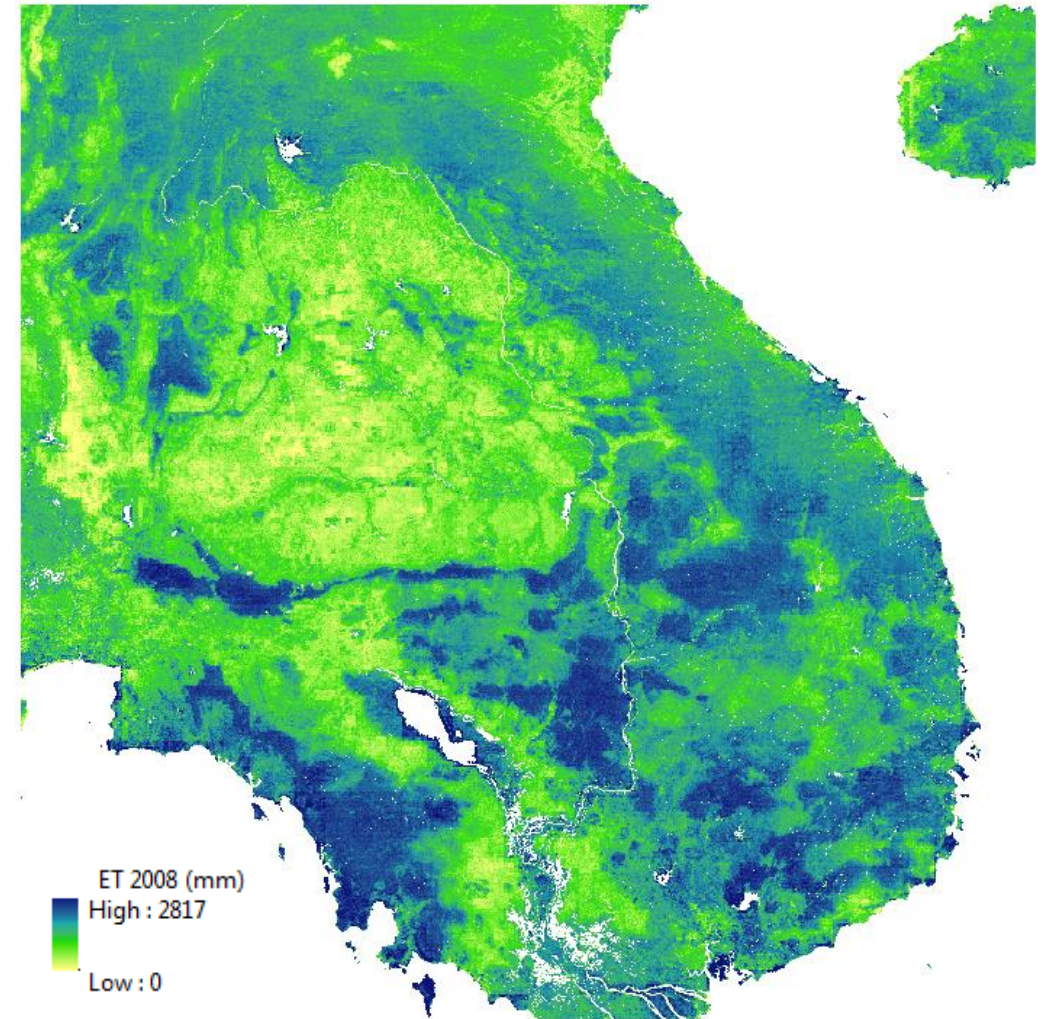
# Data and tools for NbS calculation

## Evapotranspiration:

- Global, regional (Resolution 250m-25 km)
- Basin-scale: Energy balance based on: Landsat, Sentinel



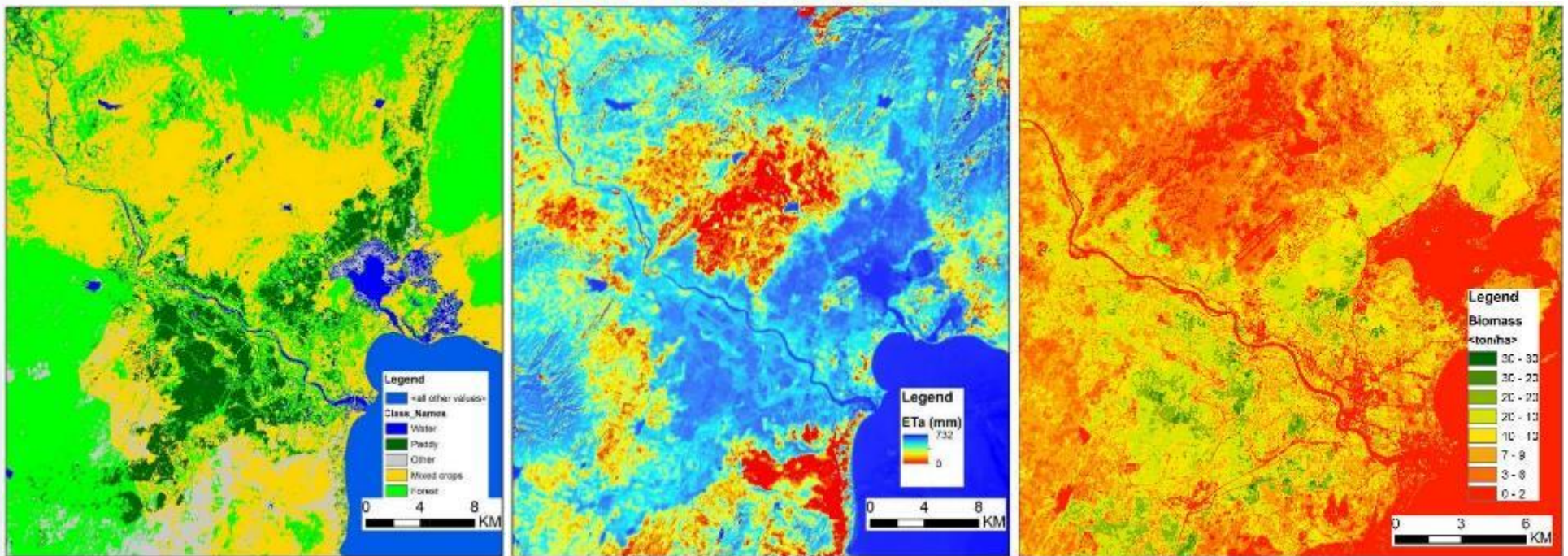
- Global, regional (Resolution 250m-25 km)
- Basin-scale: Energy balance based on: Landsat, Sentinel





# Data and tools for NbS calculation

## Land cover, ET, biomass production in Phan Rang, Ninh Thuan



Land cover (March, 2016)

Actual evapotranspiration in Phan Rang,  
16/Nov/2015- 15/03/ 2016

Biomass production

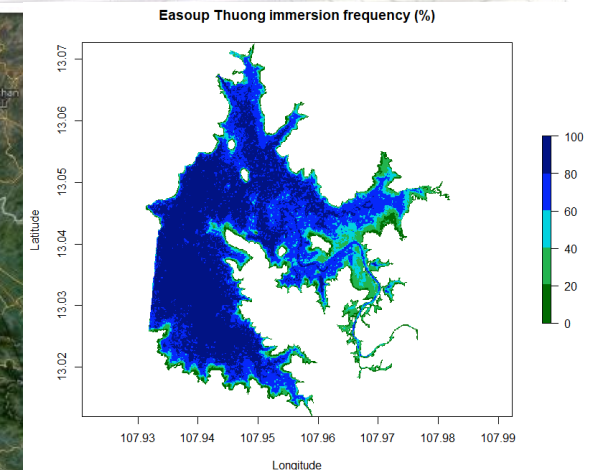
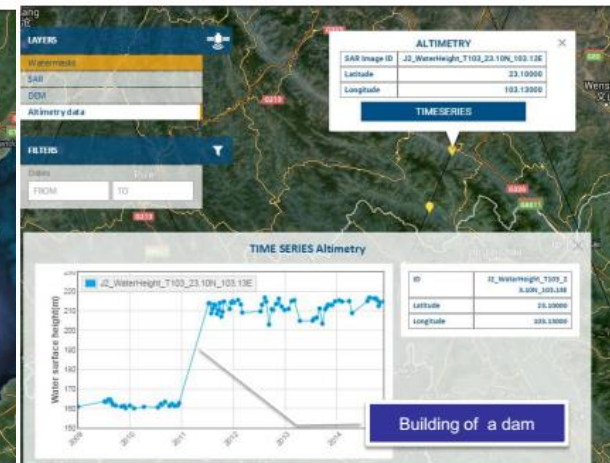
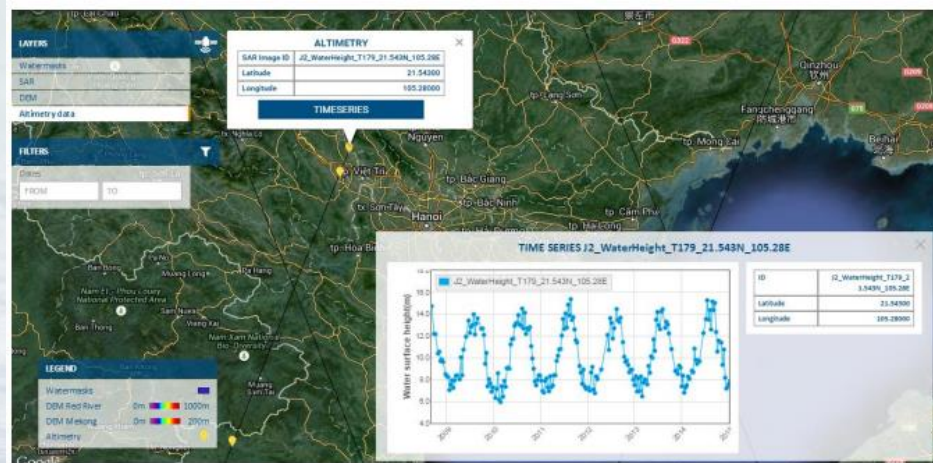
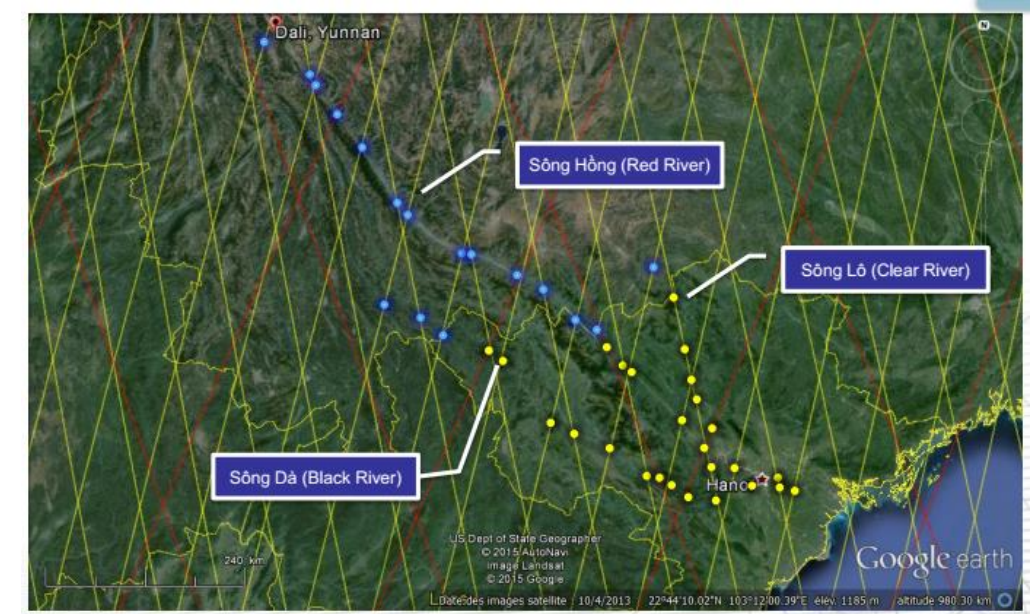
Source: IHE-Delft/IWRP, WEIDAP project/ADB, 2016



# Data and tools for NbS calculation

## Water storage:

- Global coverage, high accuracy, suitable for data-scarce region
- Interval of 27 days (Sentinel-3), 10 days (JASON)

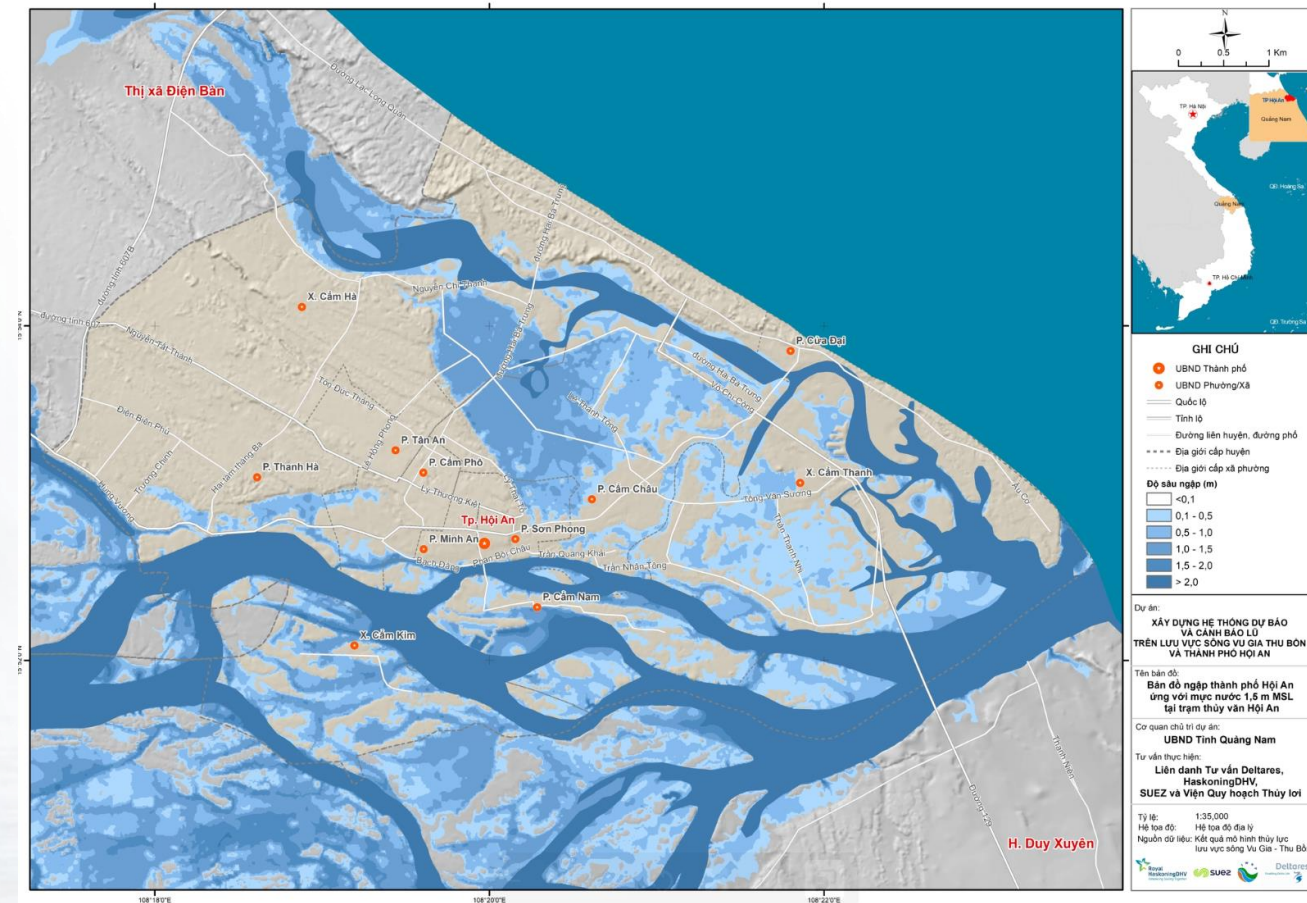


Source: CLS (2018); Ha et al. (2023a)



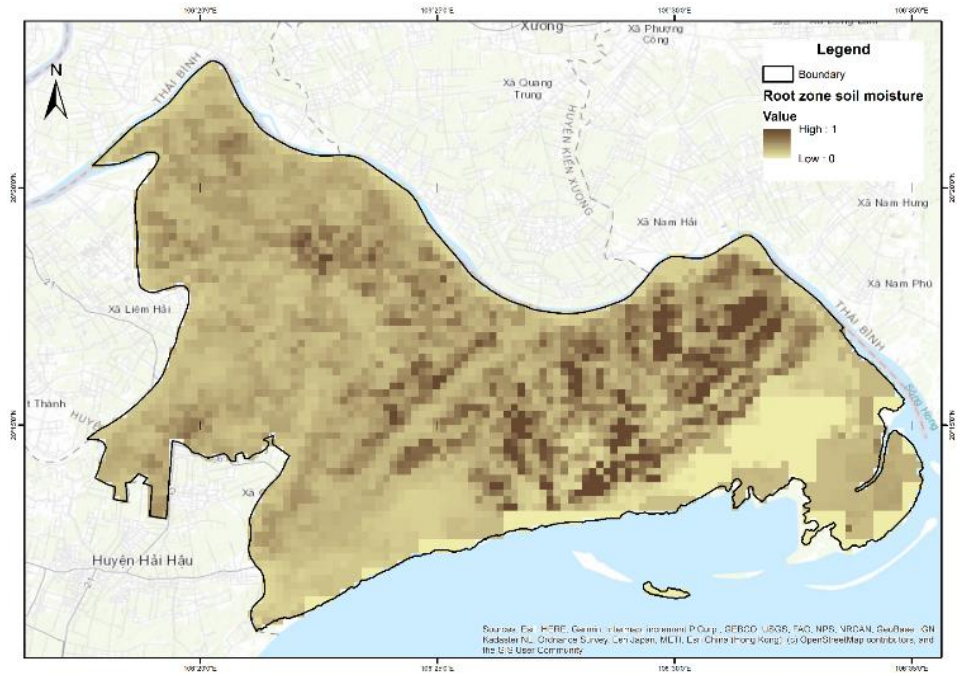
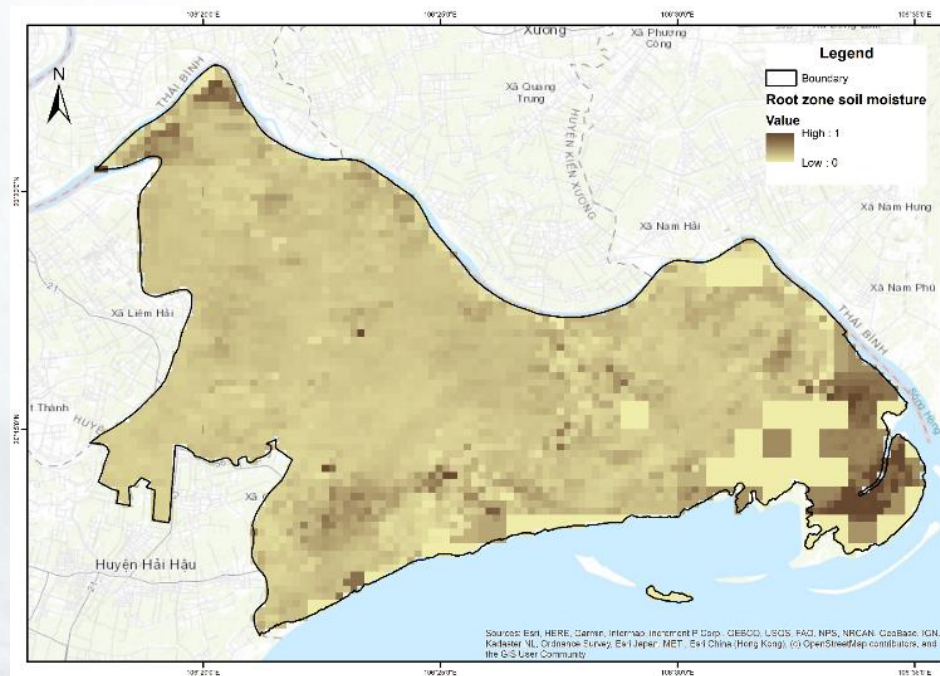
# Data and tools for NbS calculation

## Flood risk information (spatial and temporal)



# Ecosystem-based MRV

Rootzone soil moisture  
(calculated from energy balance (ETLook) of MODIS Aqua/Terra, CHIRPS,  
ERA5)

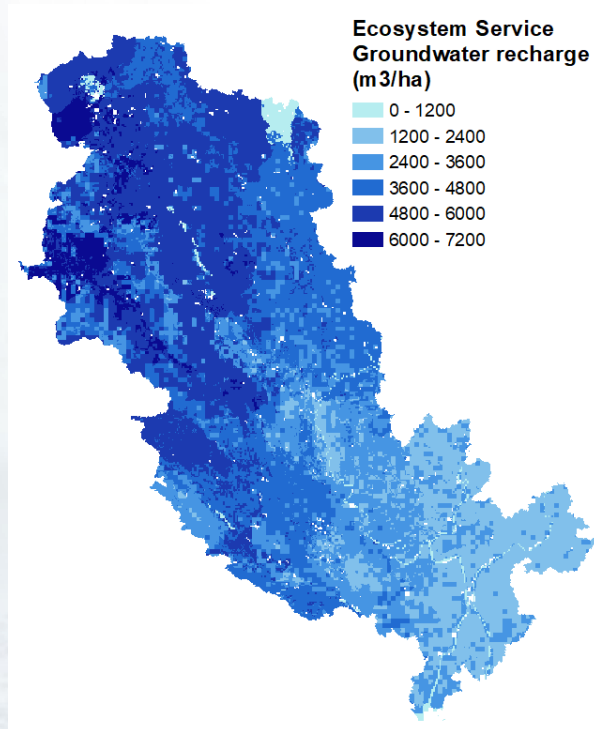


Source: IWRP, Project NĐT/eA-sia/22-26 funded by MOST

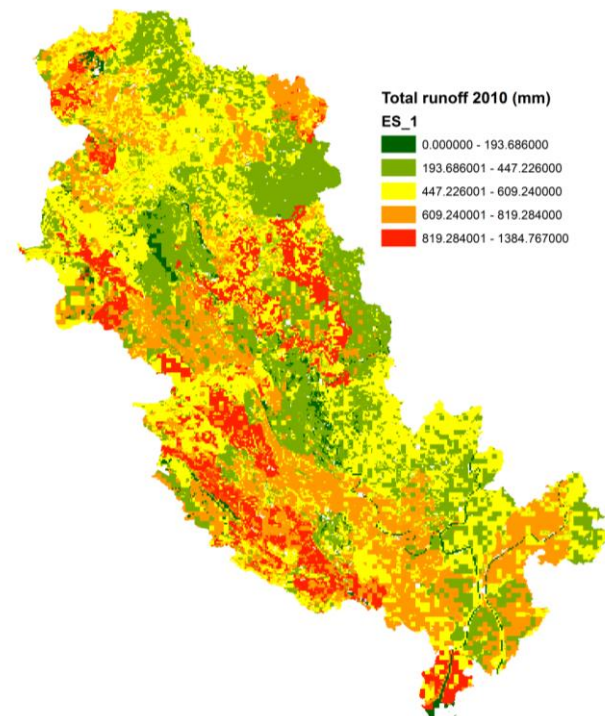


# Ecosystem-based MRV

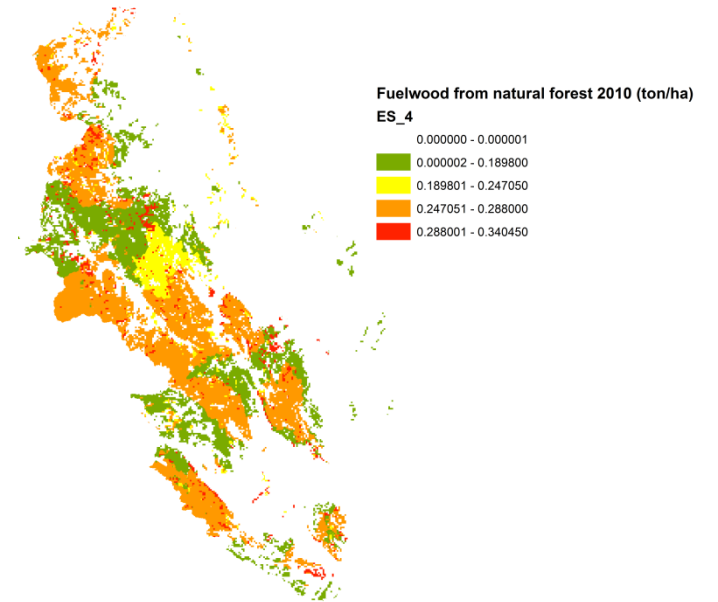
Groundwater recharge ( $\text{m}^3/\text{ha}$ )



Total runoff ( $\text{mm}/\text{ha}$ )



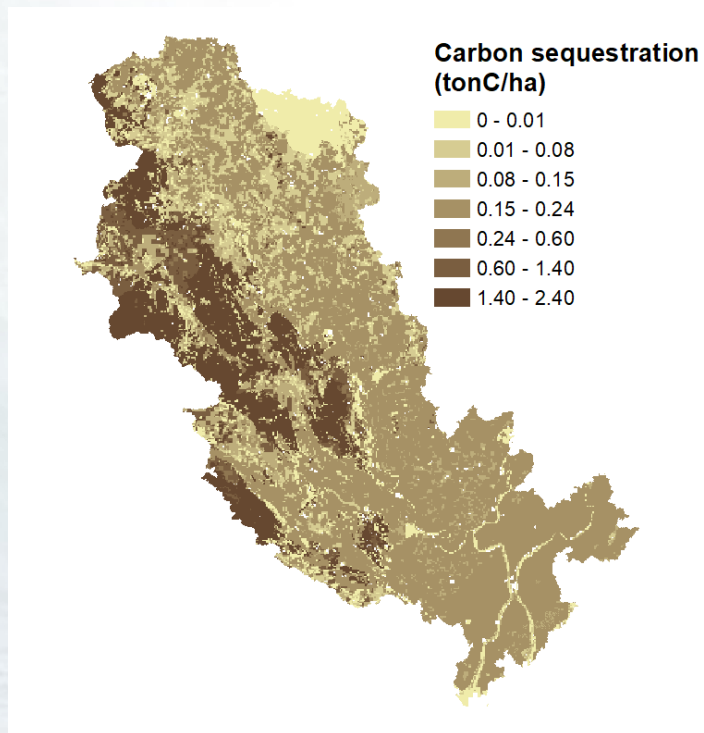
Fuelwood (ton/ha)





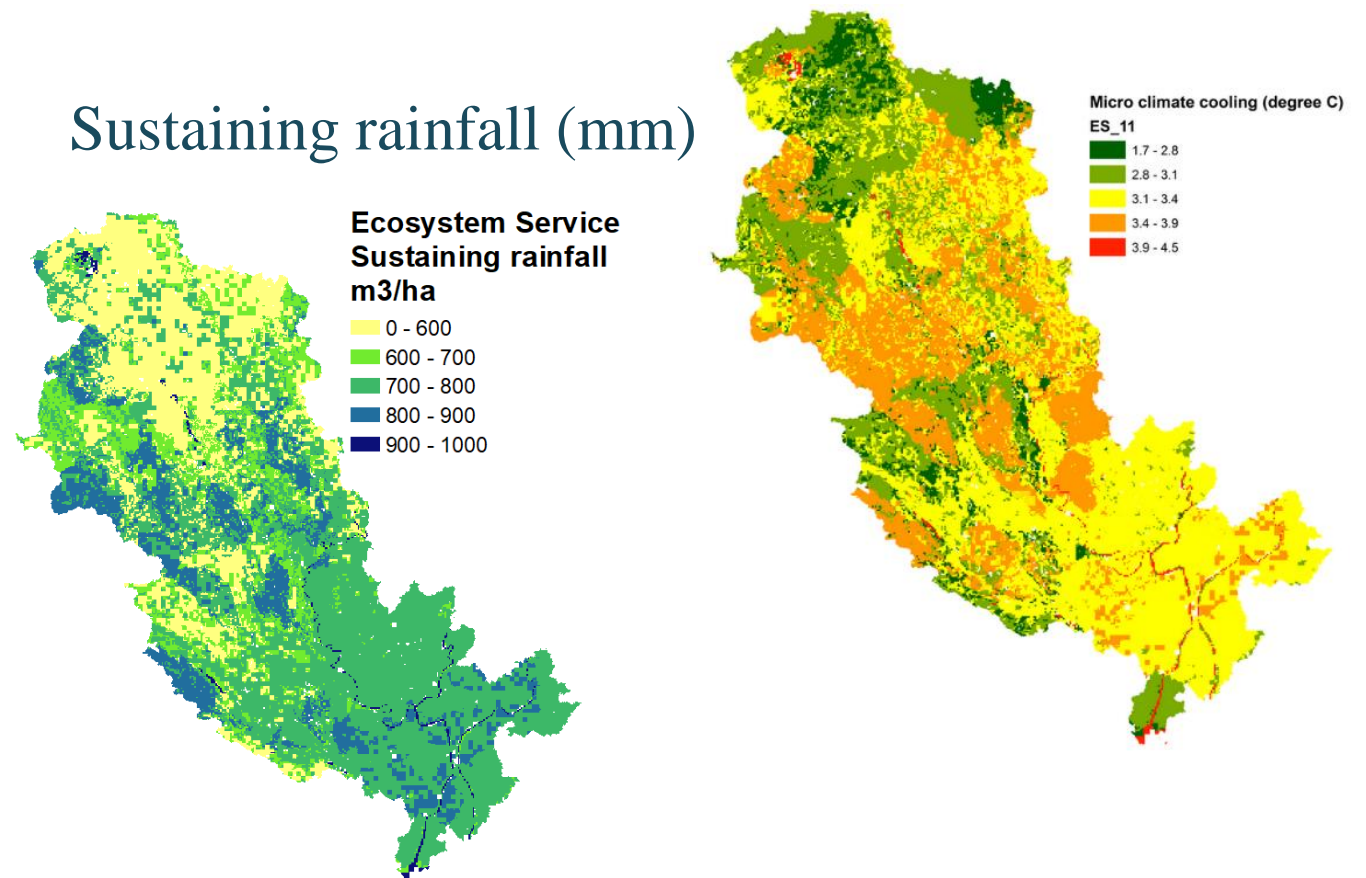
# Ecosystem-based MRV

Carbon sequestration (ton/ha)



Micro-climate cooling (°C)

Sustaining rainfall (mm)



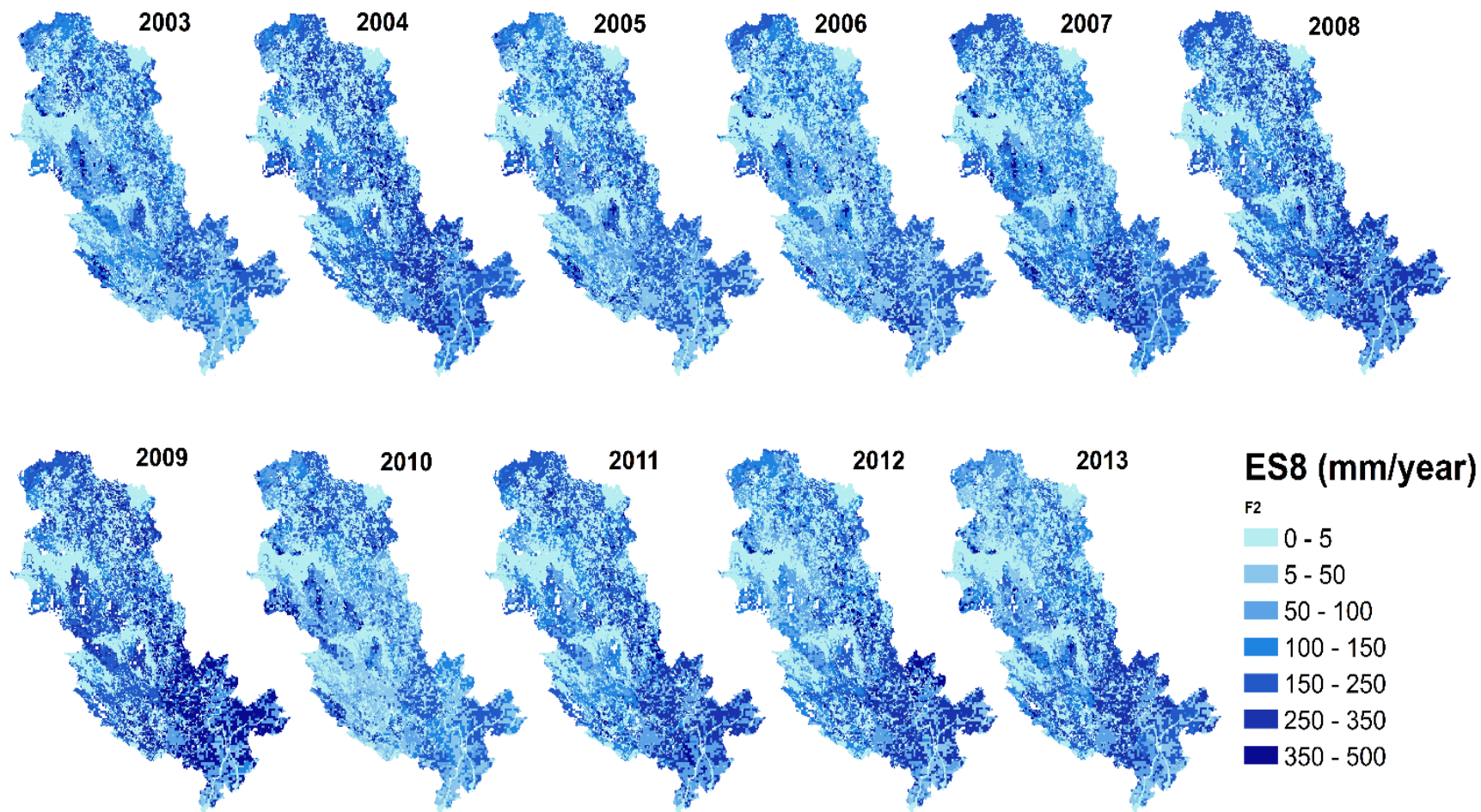
Micro climate cooling (degree C)  
ES\_11

1.7 - 2.8
2.8 - 3.1
3.1 - 3.4
3.4 - 3.9
3.9 - 4.5

This map shows the spatial distribution of micro-climate cooling. The legend indicates five categories, with values increasing from dark green (1.7-2.8) to red (3.9-4.5). The map shows higher cooling values in the central and southern parts of the region.

# Ecosystem-based MRV

Peak flow attenuation (mm/year)



Source: Ha et al., 2021



# What can be done to improve NbS uptake in Vietnam







# Potential collaboration

- To conduct R&D between VN and DE of newest practices and novelties of Nature-based Solutions (NbS) and its role in embracing water, flood risk reduction and climate resilience;
- To develop and demonstrate a business model of NbS in river deltas such as Red or Mekong river;
- To strengthen capacity for relevant water professionals and water community in application of scientific-based tools, such as ecosystem-based adaptation, monitoring, reporting and verification (MRV) of NbS and other approaches to sustainable water, flood risk reduction and responding to climate change.



**Thank you for your attention**

(lanht.tl@mard.gov.vn)