

Session: The source-to-sea balancing act – Development needs and ecosystem preservation

Patrick Leinenkugel, Juliane Huth

## **Impacts of Mekong Upstream Developments on Downstream Socio-ecological Systems**

World Water Week

Stockholm – August 29, 2018

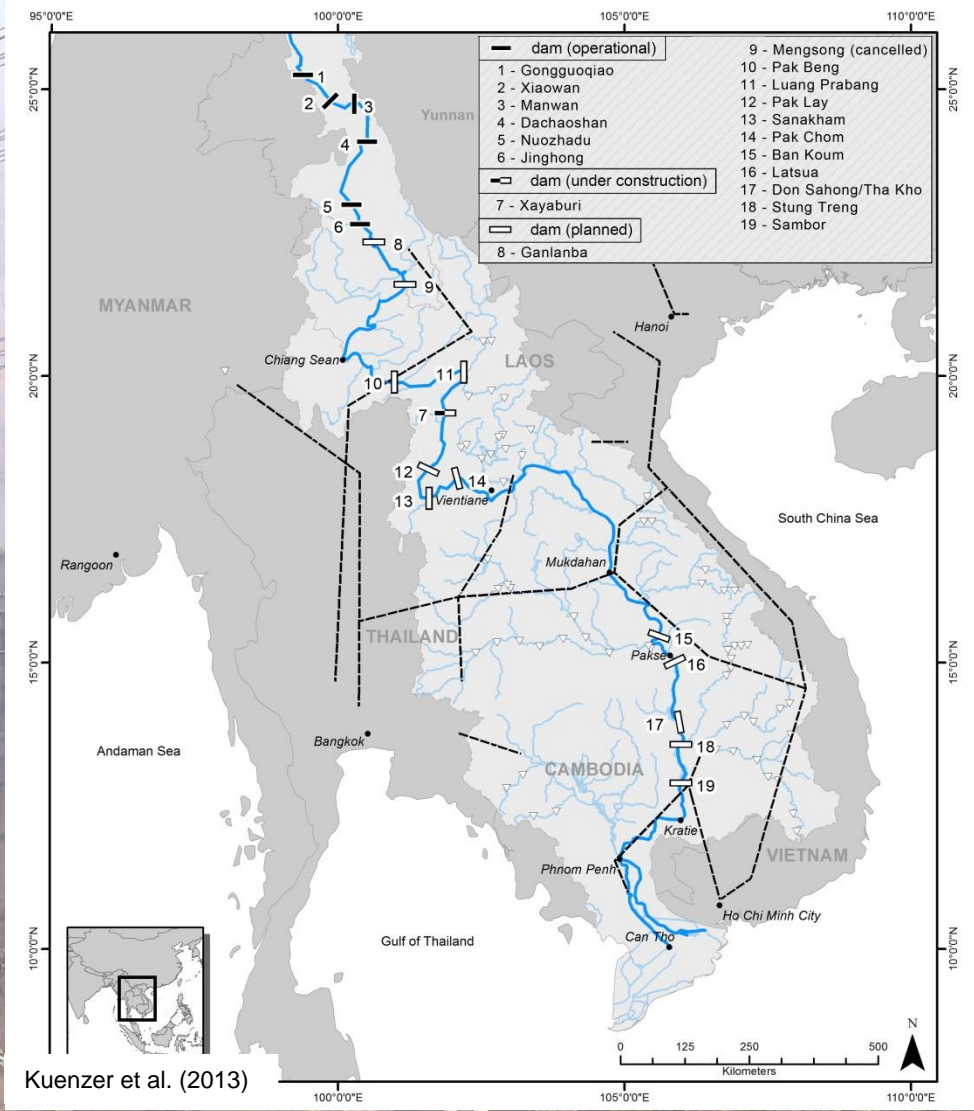


Knowledge for Tomorrow















# Challenges / Issues for the Mekong Delta Region

## UPSTREAM DEVELOPMENTS

Hydropower Dams | Land Use Change | Climate Change

Impacts



Consequences

## MEKONG DELTA

River bank/ Coastal  
Erosion

Agriculture/ Fishery  
Aquaculture

Salt water  
Intrusion

Floods &  
Droughts



## Project Coordination (WP 1000)



German  
Aerospace  
Center



German  
Research Center  
for Geosciences



Ludwig-Franzius  
Institute at  
University  
Hannover



University  
Wuerzburg



SEBA  
Hydrometrie  
GmbH



Earth Observation  
and Environmental  
Services  
GmbH & Co.KG



## Land Surface Dynamics, Hydrology and Sediment Dynamics in the Mekong Basin (WP 2000)

- Collection, preparation and harmonisation of open geodata for the Mekong Basin
- Spatio-temporal analyses of land cover dynamics in the Mekong Basin
- Estimation of sediment loads in the Mekong based on satellite data time series
- Extension, actualisation and calibration of the WISDOM hydrological Model for the Mekong Basin
- Scenario calculation related to reservoir development and sediment loads in the Mekong Basin

## Consequences For The Mekong Delta

### Saltwater Intrusion in Ground Water and Surface Water (WP 3000)

- Station/sensor development for hydrological measurements in ground water
- Field campaigns and implementation of ground water measurement stations
- Hydraulic modelling of saltwater intrusion in the Mekong Delta
- Scenario calculation: Impacts of hydrologic and climatologic changes upstream on saltwater intrusion in the Mekong Delta
- Impacts of salt water intrusion on agriculture in the Mekong Delta

### Bed-load Transport, River- & Coastal Morphology, Sea Level Rise (WP 4000)

- Station/sensor development for hydrological measurements in surface water
- Field campaigns for quantifying bed-load transport
- Development of morphodynamic model
- Calculation of transport balance; Changes in river bed & bed-load transport
- Impacts of sand mining and reservoirs on bank and coastal erosion
- EO based monitoring of river bank morphology
- Impacts of sea level rise and coastal erosion on land use systems in the Delta

## Mekong Knowledge Hub (WP 5000)

- Capacity building in data management and system operation
- Development of the Mekong Knowledge Hub
- Data preparation and data ingestion



Center of Water  
Management and Climate  
Change, VNU, Ho Chi Minh  
City



Back Khoa University,  
VNU, Ho Chi Minh City



Southern Institute of  
Ecology, VAST, Ho Chi  
Minh City



Vietnam Southern Satellite  
Technology Application  
Center, VNSC, VAST, Ho  
Chi Minh City



Can Tho University,  
Can Tho City



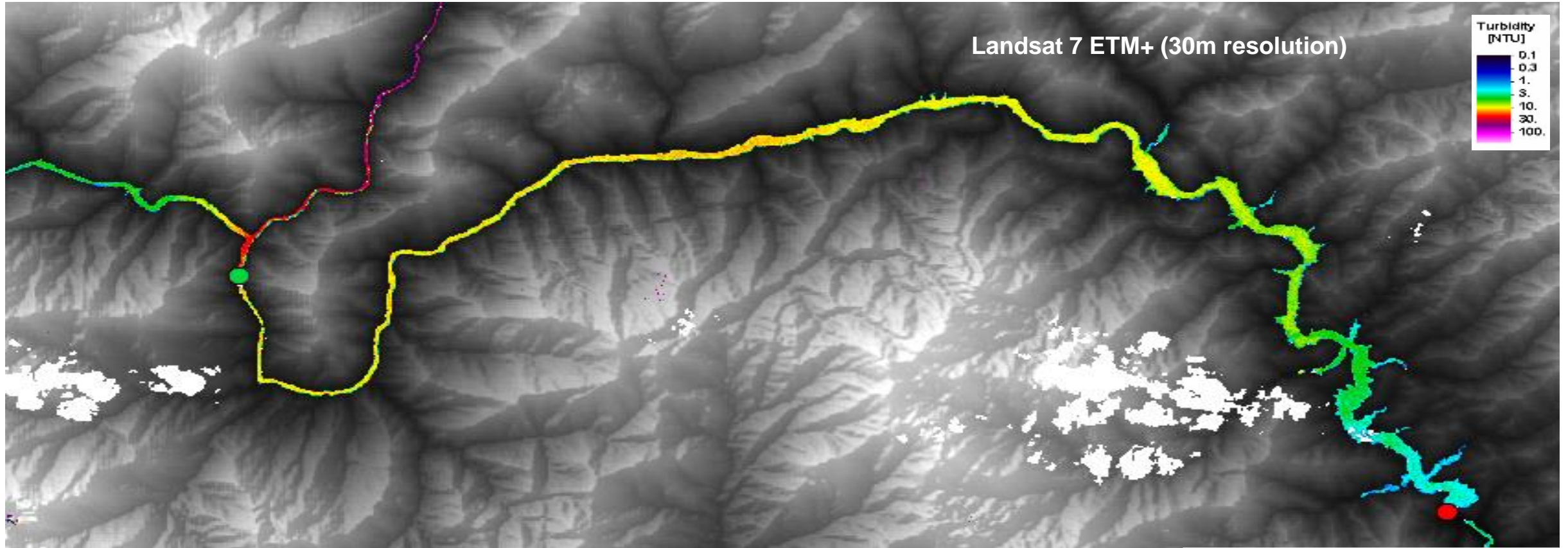
An Giang University,  
An Giang



Tra Vinh University,  
Tra Vinh

# Turbidity Monitoring for Analysing Dam Impacts

## Effects of the Xiaowan Dam (Lancang/China) on River Turbidity

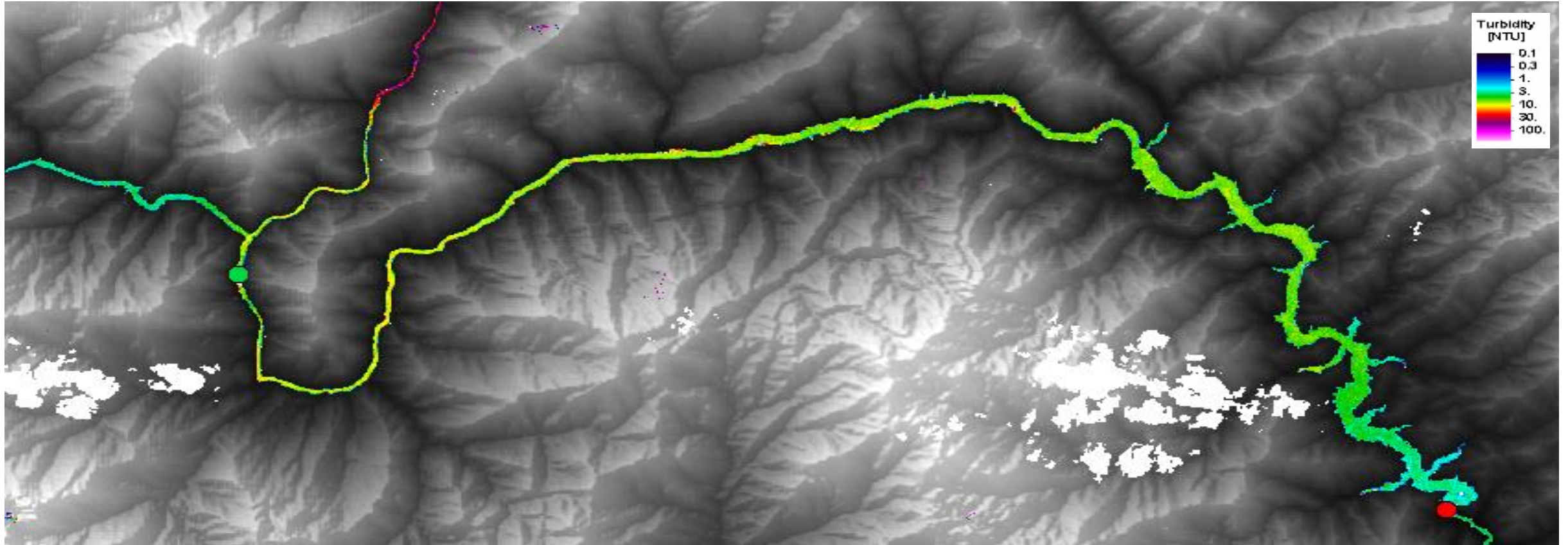




- Location of Xiaowan Dam
- Location of Manwan Dam

Situation before closure  
2009-Jan-09

# Turbidity Monitoring for Analysing Dam Impacts

## Effects of the Xiaowan Dam (Lancang/China) on River Turbidity

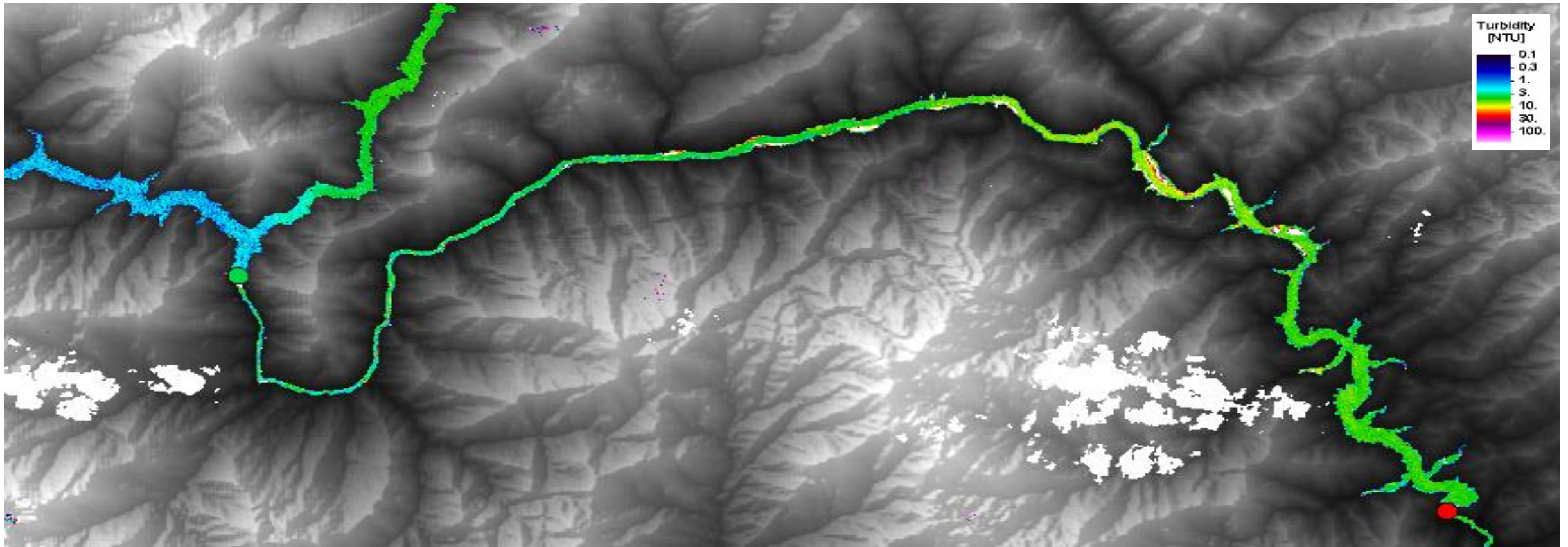


-  Location of Xiaowan Dam
-  Location of Manwan Dam

Situation before closure  
2009-Feb-10

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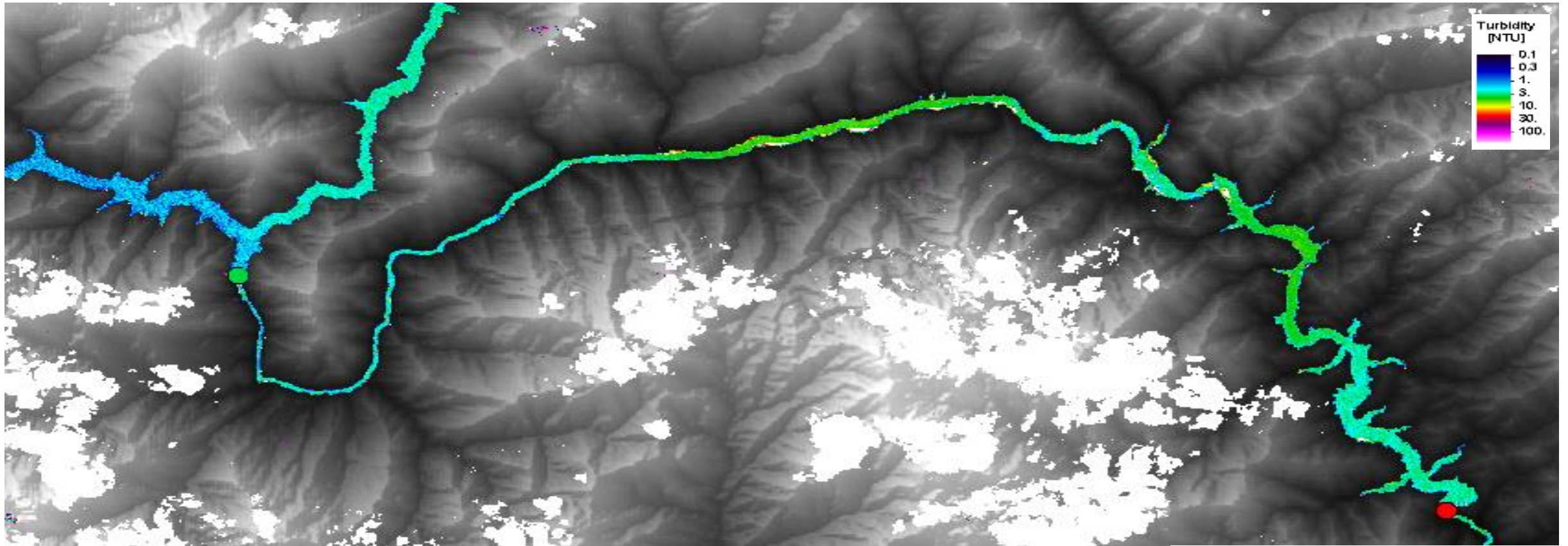


- Location of Xiaowan Dam
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Situation after closure  
2009-Nov-11

# Turbidity Monitoring for Analysing Dam Impacts

## Effects of the Xiaowan Dam (Lancang/China) on River Turbidity

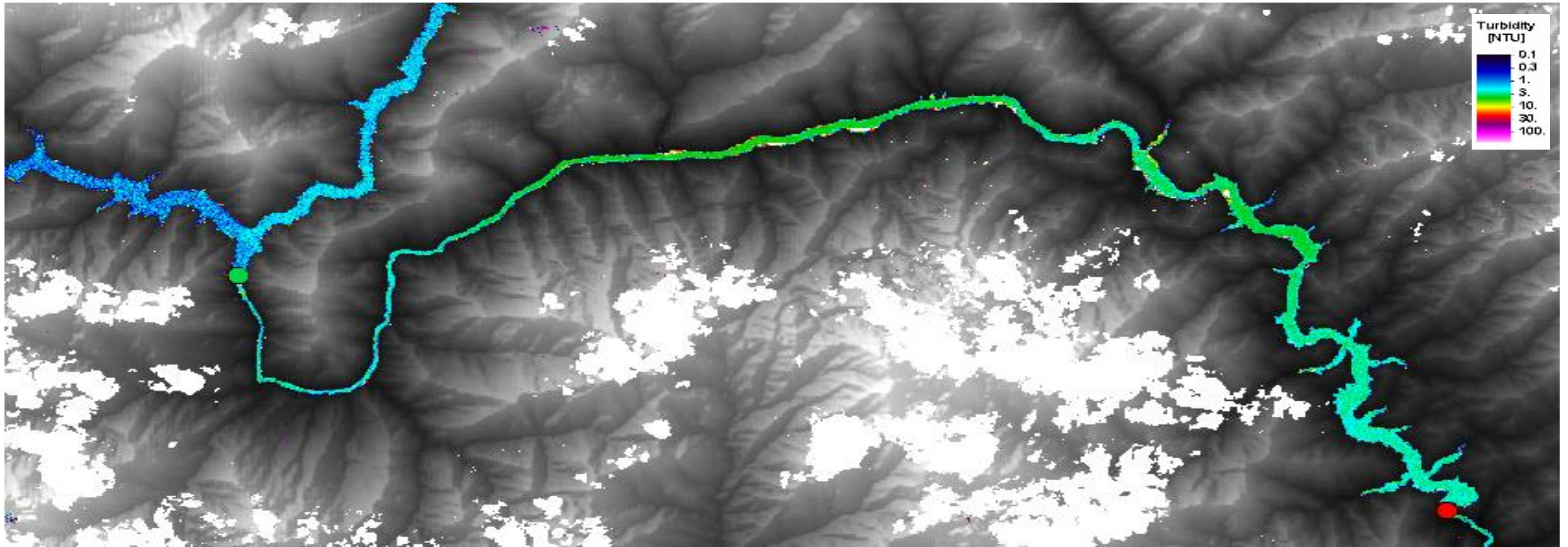


- Location of Xiaowan Dam
- Location of Manwan Dam

Situation after closure  
2009-Nov-25

# Turbidity Monitoring for Analysing Dam Impacts

## Effects of the Xiaowan Dam (Lancang/China) on River Turbidity

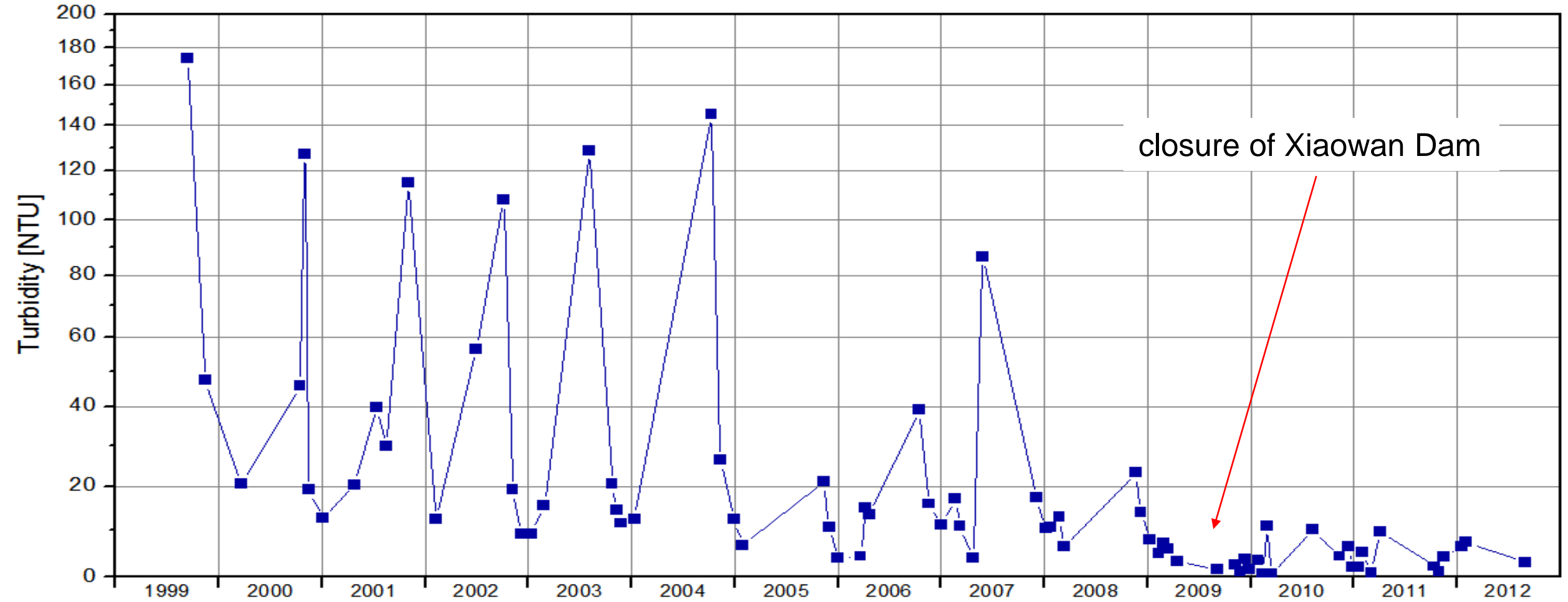


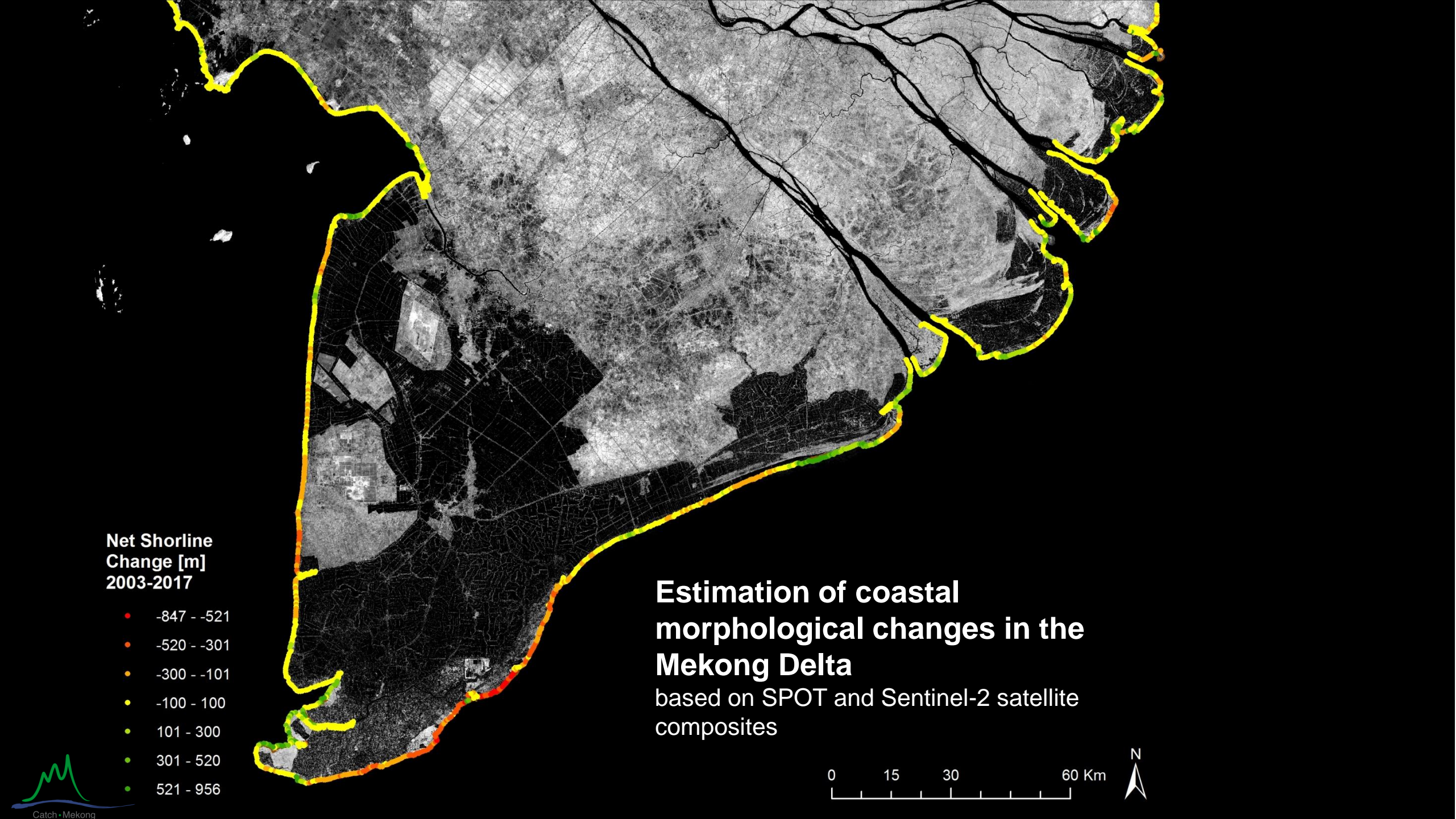
- Location of Xiaowan Dam
- Location of Manwan Dam

Situation after closure  
2009-Dec-27

# Turbidity Monitoring for Analysing Dam Impacts

## Effects of the Xiaowan Dam (Lancang/China) on River Turbidity





**Net Shoreline  
Change [m]  
2003-2017**

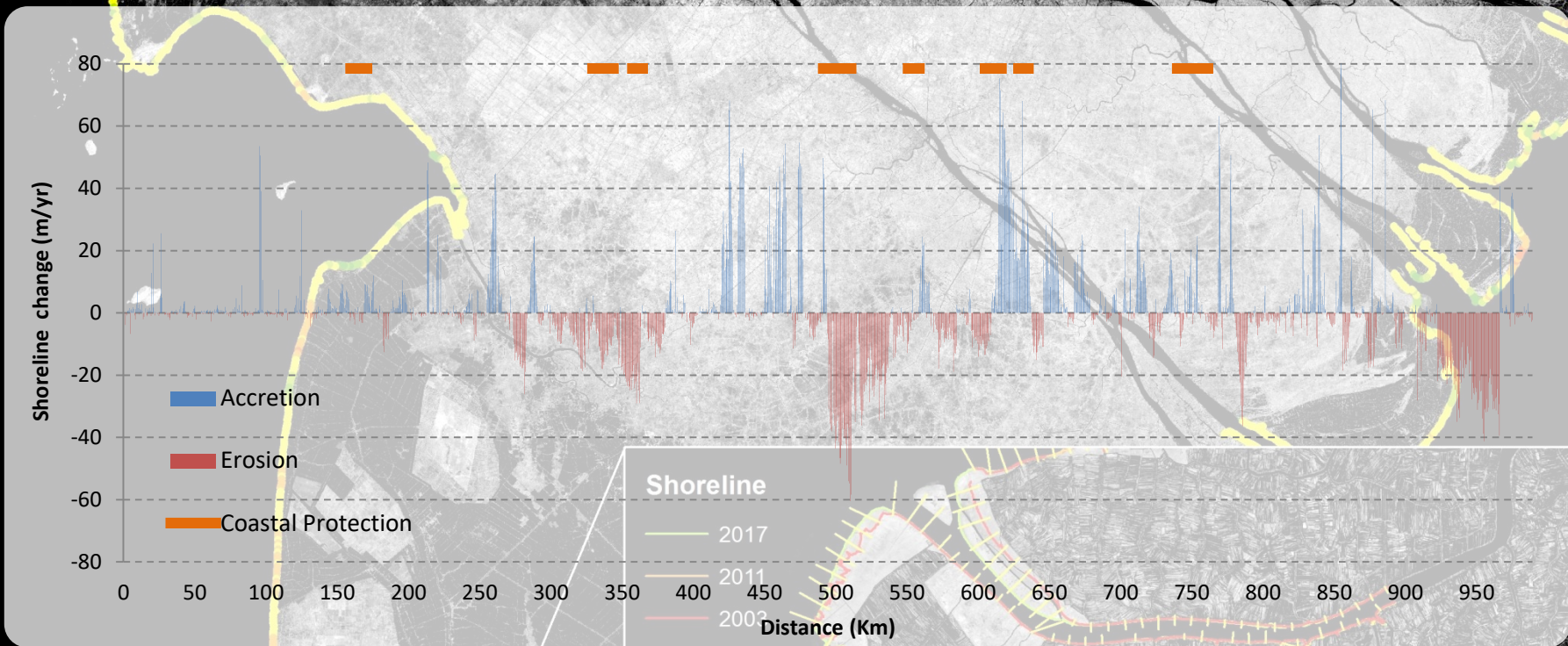
- -847 - -521
- -520 - -301
- -300 - -101
- -100 - 100
- 101 - 300
- 301 - 520
- 521 - 956

**Estimation of coastal  
morphological changes in the  
Mekong Delta**  
based on SPOT and Sentinel-2 satellite  
composites

0 15 30 60 Km

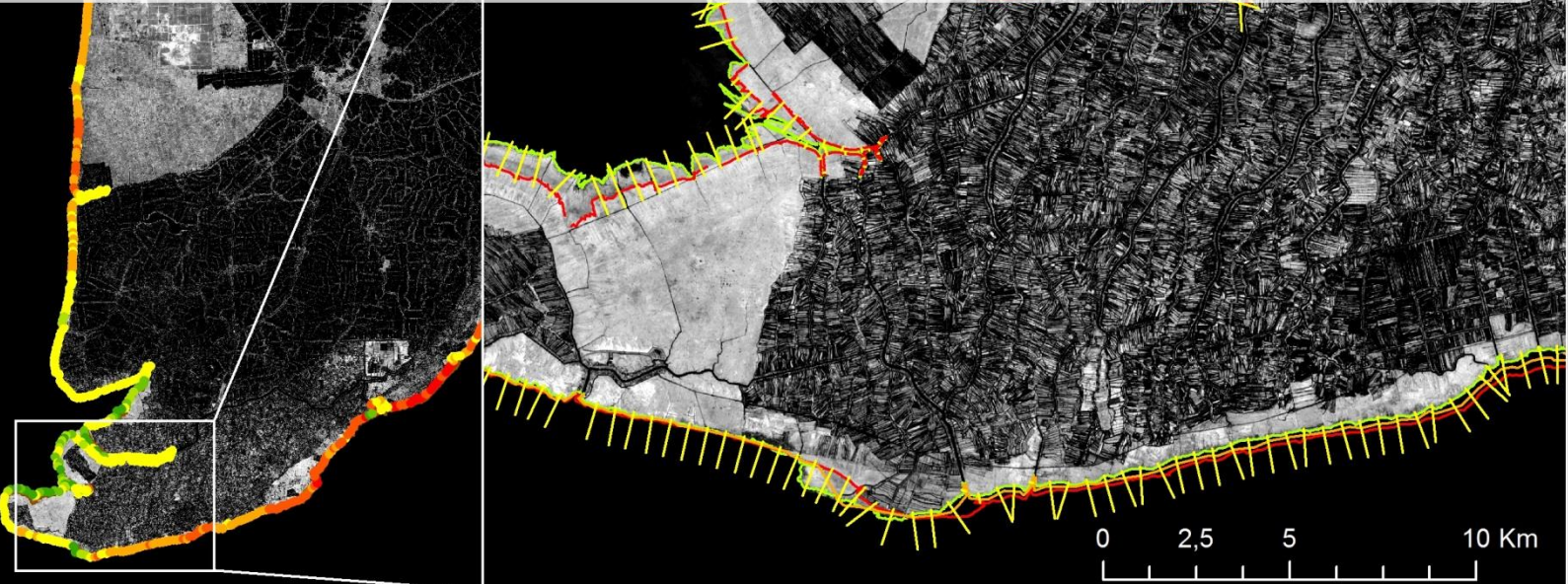






**Net Shoreline Change [m] 2003-2017**

- -847 - -521
- -520 - -301
- -300 - -101
- -100 - 100
- 101 - 300
- 301 - 520
- 521 - 956



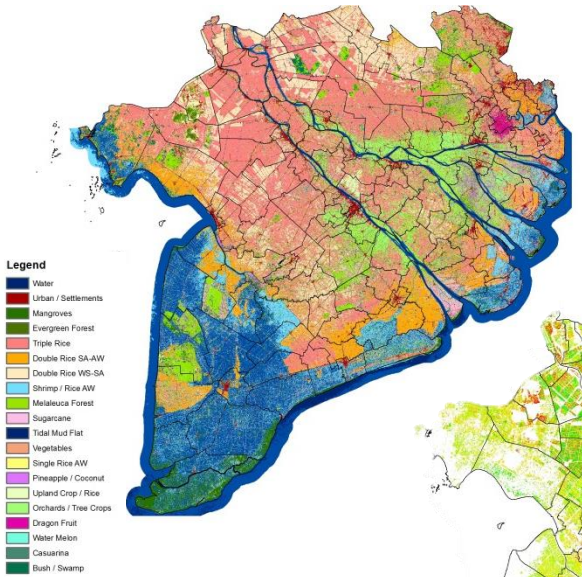


# Innovative Technologies for Upstream Impact Assessments in the Mekong Delta

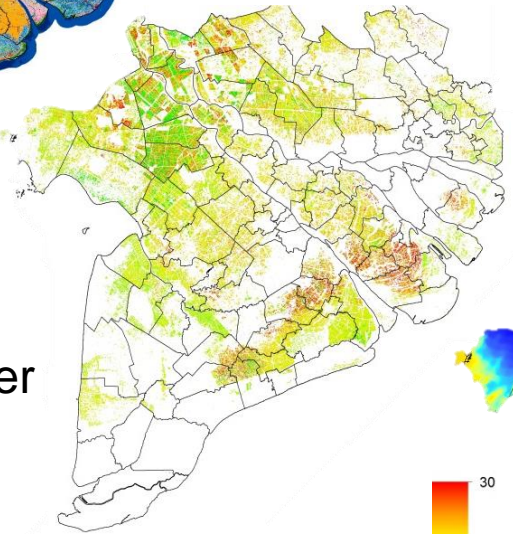


Remote Sensing +  
Hydrodynamic  
Modelling

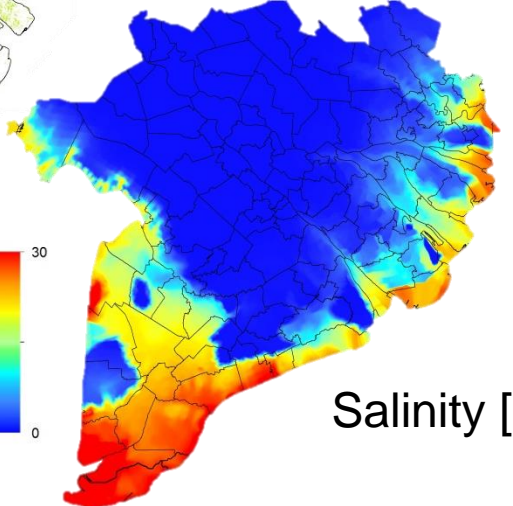
Average rice yield increase when changing  
from sensitive to tolerant rice variety



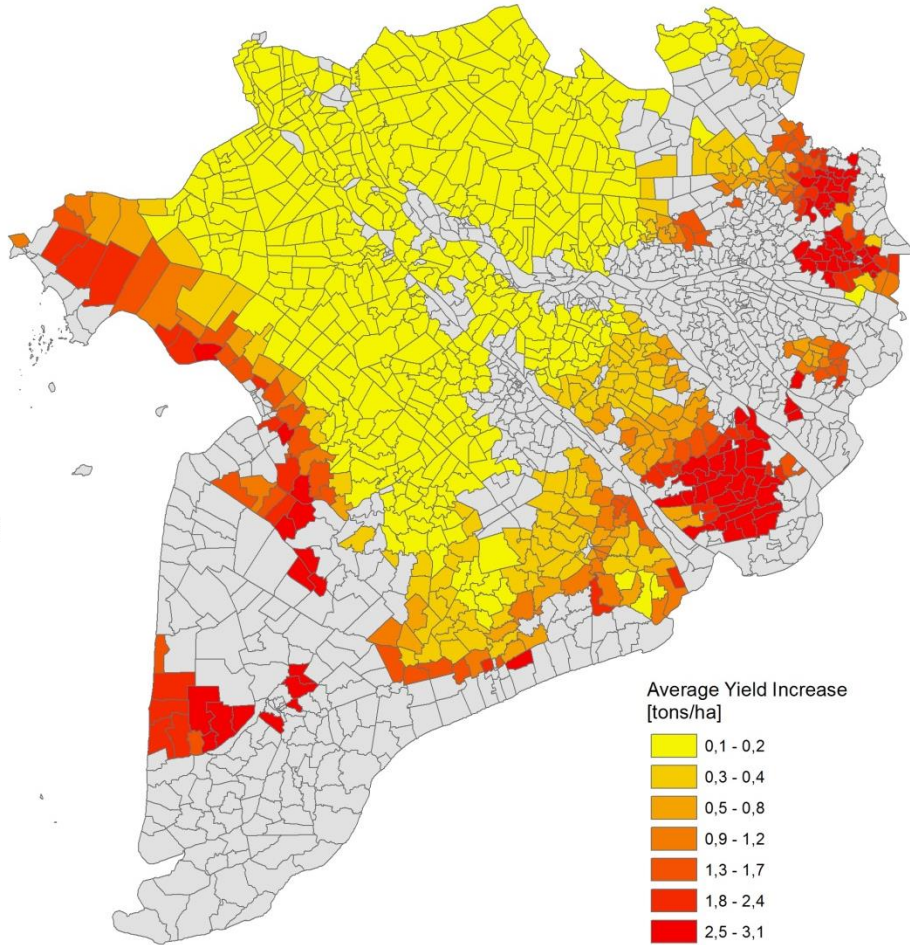
Land Use / Land Cover



Rice Yield [t /ha]



Salinity [g/l]

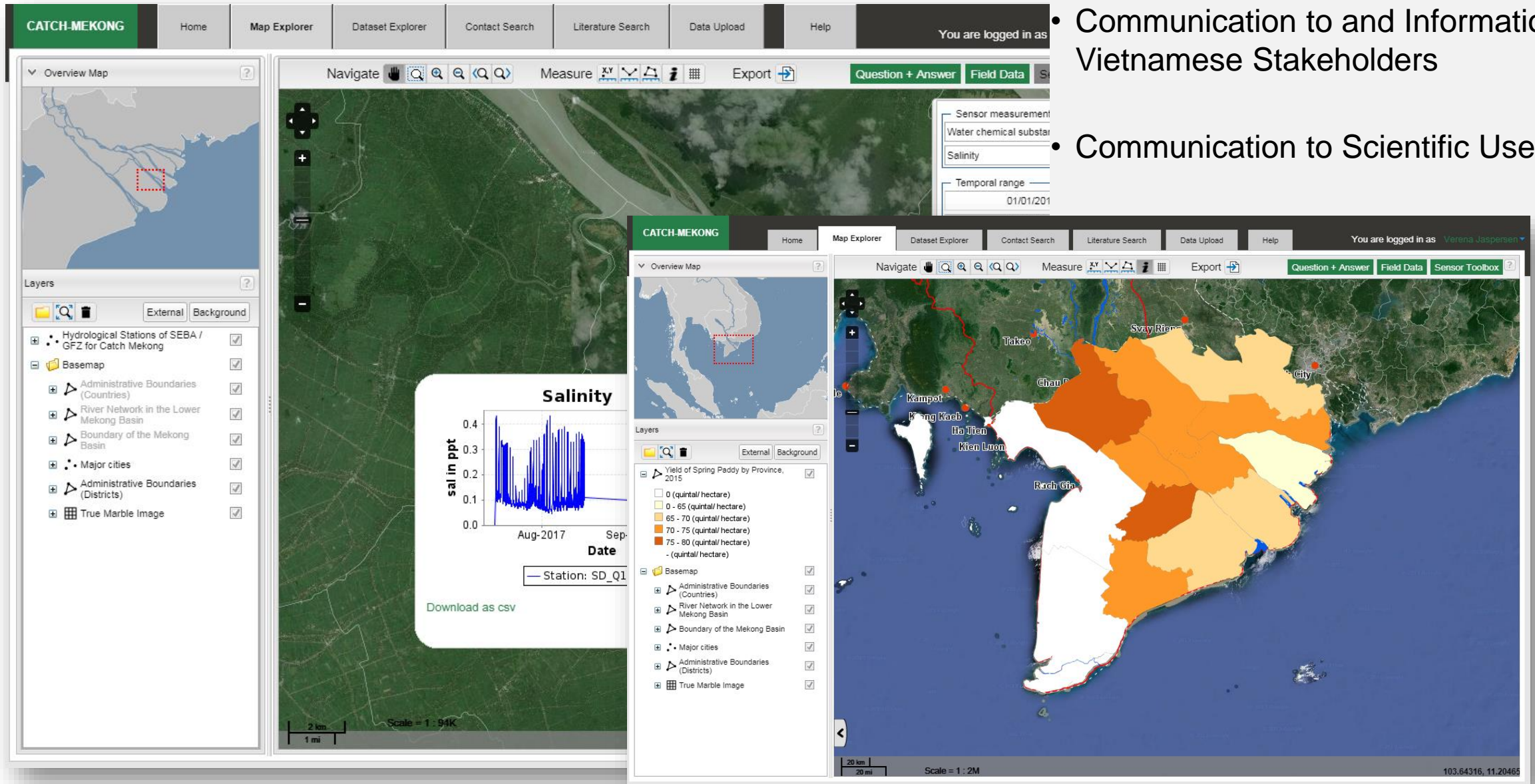


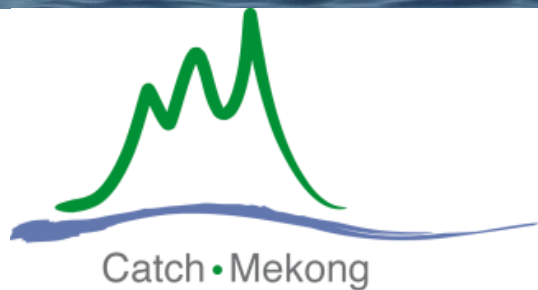
Average Yield Increase [tons/ha]

0,1 - 0,2
0,3 - 0,4
0,5 - 0,8
0,9 - 1,2
1,3 - 1,7
1,8 - 2,4
2,5 - 3,1

# Catch-Mekong Information and Knowledge Hub

- Data Hub of Project Data and beyond
- Communication to and Information for Vietnamese Stakeholders
- Communication to Scientific Users





[catchmekong.eoc.dlr.de](http://catchmekong.eoc.dlr.de)  
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project leader: [patrick.leinenkugel@dlr.de](mailto:patrick.leinenkugel@dlr.de)

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