

Research No.: 26 E-2 ODA Loan Joint Research

Date: 16/Oct/2020

1	General Title	Analyzing and modelling water and land resources
2	Core Members	CTU: Van Pham Dang Tri (Project Leader) , Truong Chi Quang , Le Tan Loi , Nguyen Vo Chau Ngan , Nguyen Dinh Giang Nam , Tran Van Ty Japanese Universities: Jun SASAKI (The University of Tokyo) , Tetsuji MUTO (Nagasaki University)
3	Duration	Jan. 2018 – Dec. 2020 (3 years) <Batch-2>
4	Main Objectives	To simulate environmental changes to support early responses and adaptations
5	Focal Points	

Topic 1: Modeling land-use change and developing strategies for sustainable land-use management in response to impacts of climate change in the Vietnamese Mekong Delta

The land use changes model was built for Soc Trang province.

Land use 2010	Rice (ha)	Crops (ha)	Fruit trees (ha)	Shrimp (ha)
Rice (LUC)	130,512	1,664	2,080	368
Crops + Other	544	576	96	1,232
Crops	0	7,140	640	1,104
Fruit trees	0	832	5,360	352
Shrimp	768	1,024	1,232	44,240

Land use 2015 simulation results: Kappa = 0.84. Salinity dynamic maps are also shown.

Topic 2: The development of numerical models for predicting surface water pollution in a river

Water quality monitoring location in Cai Xue canal and Xung Thu lake, Can Tho, Vietnam.

Onsite monitoring results for Ammonium and Nitrate concentration at monitoring points in low & high tide time.

High tides increase the movement of water in canal and affected pH, DO, TDS... concentration in the system. Tide has varied effects on the nutrients status and phytoplankton community.

Result of DO (%) and tide regime in canals and lakes.

Topic 3: The interaction between coastal mangrove forest, tidal wave and coastal erosion

The overall objective: The research will be conducted by empirical research methods to measure mangroves structure and collect the wave energy from the fields at coastal zone in Soc Trang province.

Diagram of installation of wave gauges.

Wave gauge data analysis.

Mangrove forest structure.

The correlation between the mangrove forest and wave energy.

Change in significant wave height as a function of water depth.

Wave conditions and cumulative distributions of significant wave height during three deployment sites.

Topic 4: Geomorphological changes of secondary channels under climate change scenarios and agri-aquaculture activities along the neighboring floodplain

The overall objective:

- This study was to apply the 2-D flow model for a small tidal river with insufficient data.
- The mass of sediment from upstream to downstream each season.
- Supplying scenario under the impact of climate change.

Hydrodynamics modelling.

2-D flow model of My Thanh River.

Yearly changes of flow primary tidal constituents and mean sea level.

Simulation cases, the modified data from 1985 to 1990.

Spatial distribution of measured depth samples.

The simulation results of the improved 2-D flow model of My Thanh River.

Topic 5: Water quality changes given impacts of intensive farming systems

Literature review, Arranging the experiment, Collecting water and soil samples, Developing a model to estimate the residues of fertilizer, Estimating pollution concentration.

Setting the field experiment.

Rain and evaporation measuring instruments.

Water sample testing at the lab.

Phosphorus concentration in surface water and groundwater.

Nitrogen concentration in surface water and groundwater.

Nitrogen and phosphorus in soil.

Topic 6: Assessment of sustainable groundwater resources management in urban areas in the Vietnamese Mekong Delta under socio-economic development and climate change context

Literature and Data collection.

Evaluating the current state of GWR → GWL and land subsidence.

Pumping test → Calibrating and Validating of GWL simulation. Forecasting.

Developing the scenario → Results.

Upper Phreatic zone (SP₁).

Upper Middle Phreatic zone (SP₂).

Total subsidence.

Annual groundwater extraction induced subsidence rate from 2006-2010 from Minderhoud et al (2017).

E2 - Program timeframe

Content	2018				2019			
	Q.1	Q.2	Q.3	Q.4	Q.1	Q.2	Q.3	Q.4
Literature review								
Arranging the experiment								
Collecting samples								
Developing the model								
Forecasting								
Writing the scientific journal								

Observed hydraulic head time series at district representative monitoring wells and corresponding cumulative calculated subsidence.

References:

- Tran Van Ty, H.V.P. Minh, L.H. Bao Ngan, D.T. Nhan and T.C. Loan. Pumping test for determining hydrogeological parameters for groundwater flow simulation in Can Tho city, Vietnam. Ky yu hoc nghien Khoa hoc tinh quoc VITEGO 2019. "Thu ky thuat va sach dung phuc vu phat trien ba tinh". Vinh Long, 25-26/10/2019. Trang 43-44. NXB Khoa hoc va ky thuat, ISBN: 978-604-01-1975-5.
- Tran Van Ty, Huynh Vuong Thi Minh, Binh Anwar, Pankaj Kumar, Huynh Van Hiep, and Mustafa Karaman. The spatiotemporal variation of groundwater level and its impact on land subsidence in Can Tho city, Vietnam. (Submitted to Water, ISSN: 2071-4441).
- Tran Van Ty and Huynh Vuong Thi Minh. (in press). Simulation of groundwater level in Can Tho city.