

Rise and Fall - Strategies for the subsiding and urbanising Mekong Delta

Rise and Fall: strategies for the subsiding and urbanising Mekong Delta (Vietnam) facing increasing salt water intrusion

Introduction

This project aims to enhance the capabilities of individuals and organisations to develop sustainable strategies for dealing with groundwater extraction, land subsidence and salt water intrusion in the increasingly urbanising Mekong Delta (Vietnam). We will enlarge the knowledge base of stakeholders (including policy makers, water managers and scientists) and work with them to develop and implement innovative tools and technologies in practice and policy. A new integrated delta model will be developed, linking surface water, groundwater and geo-mechanical models, to analyse the interrelated character of groundwater extraction, subsidence levels and salt water intrusion. Together with stakeholders the new and comprehensive model will be constructed and applied to quantify the effects of water management strategies in the Mekong Delta. Stakeholders will analyse and develop adequate strategies by simulating and demonstrating the effects of development scenarios and policy recommendations, such as expressed in the Mekong Delta Plan (2013).

This programme consists of the following four projects, see also [UU website](#)

1. Subsurface characterization and subsidence
To understand, quantify and predict subsidence in the Mekong Delta and to determine the impact of subsidence on current and future saltwater intrusion under different delta management scenarios.
2. Fresh and saline groundwater dynamics
To quantify the dynamic behavior of fresh and saline groundwater in response to surface water dynamics and urbanization induced changes of the hydrogeological system.
3. Salt intrusion and flood risks in estuarine channel networks
To understand and predict the changes in flooding statistics and salt intrusion in surface and groundwater, both as a function of different management strategies.
4. Governance strategies for sustainable management
To develop governance strategies together with public and private stakeholders to deal with groundwater extraction, subsidence and salt-water intrusion in delta areas and their economic and potential ecological damage. This project integrates the results of the PhD studies and implements these results into policy and management.

Media outings (a selection of):

- The great salt drought desiccating Vietnam's Mekong Delta. 2020. ([link](#))
- New Elevation Measure Shows Climate Change Could Quickly Swamp the Mekong Delta. 2019 (<https://www.scientificamerican.com/article/new-elevation-measure-shows-climate-change-could-quickly-swamp-the-mekong-delta/>)
- Dams, Sand, Rice: The Life and Possible Death of the Mekong Delta. 2020. (<https://saigoneer.com/saigon-environment/18401-dams-sand-rice-the-life-and-possible-death-of-the-mekong-delta>)
- Elevation of sinking for Vietnam's Mekong Delta incorrectly estimated for decades: researcher 2019. (<https://tuoitrenews.vn/news/society/20191005/elevation-of-sinking-for-vietnams-mekong-delta-incorrectly-estimated-for-decades-researcher/51460.html>)
- Bodemdaling is niet alleen in Nederland een probleem. In Vietnam lopen 18 miljoen mensen gevaar. 2019. (<https://www.trouw.nl/groen/bodemdaling-is-niet-alleen-in-nederland-een-probleem-in-vietnam-lopen-18-miljoen-mensen-gevaar-a417c401/>)
- Huge Land Loss Predicted for Vietnam's Mekong Delta. 2019. (<https://www.voanews.com/a/huge-land-loss-predicted-for-vietnam-mekong-delta/4788413.html>)
- Gravest threat to Mekong delta today is sediment starvation not rising seas. 2019. ([link](#))
- Mekong dams, sand mining linked to saline intrusion in Vietnam's Mekong Delta: expert. 2020. ([link](#))
- Dams, Sand Mining Threaten to Wreck Mekong Delta. 2019. ([link](#))
- Mekong Delta Freshwater in Peril By Sand Mining And Dam Construction 2019. ([link](#))
- Schmidt, C., 2015. Alarm over a sinking delta. Science (80). 348, 845–846. (<https://science.sciencemag.org/content/348/6237/845.full>)

Video's:

- Land subsidence Mekong delta: https://www.youtube.com/watch?v=cMr_BKzY4IU
- Modelled hydraulic head and subsidence in the Mekong delta: <https://www.youtube.com/watch?v=UVCKy3etorw>

Articles:

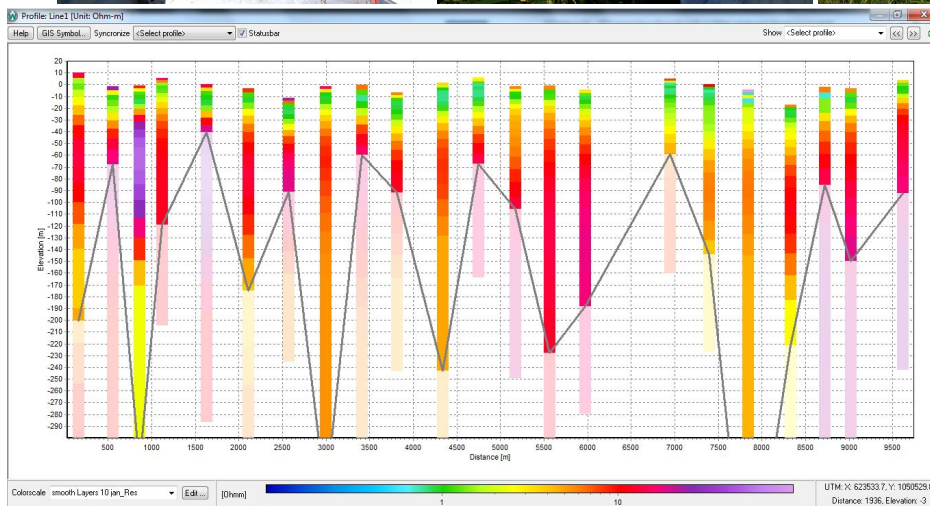
- Hung Van Pham, Van Geer, F.C., Bui Tran, V., Dubelaar, W., Oude Essink, G.H.P. 2019. Paleo-hydrogeological reconstruction of the fresh-saline groundwater distribution in the Vietnamese Mekong Delta since the late Pleistocene. Journal of Hydrology: Regional Studies, 23(February), 100594. <https://doi.org/10.1016/j.ejrh.2019.100594>.
- Minderhoud, P.S.J., Erkens, G., Van Hung, P., Vuong, B.T., Erban, L.E., Kooi, H., Stouthamer, E., 2017. Impacts of 25 years of groundwater extraction on subsidence in the Mekong delta, Vietnam. Environ. Res. Lett. 12, 13. doi:10.1088/1748-9326/aa7146
- Minderhoud, P.S.J., Coumou, L., Erban, L.E., Middelkoop, H., Stouthamer, E., Addink, E.A., 2018. The relation between land use and subsidence in the Vietnamese Mekong delta. Sci. Total Environ. 634, 715-726. doi:10.1016/j.scitotenv.2018.03.372
- Policy note march 2017: Towards strategies for the subsiding Mekong Delta in Vietnam

- Schmidt, C., 2015. Delta subsidence, an imminent threat to coastal populations. Environ. Heal. Perspect. 123, 204-209
- Schmidt, C. 2015. Alarm over a sinking delta: Rise and Fall project seeks ways to slow land subsidence in Vietnam's populous Mekong delta. Science, 348 (6237), 845-846.

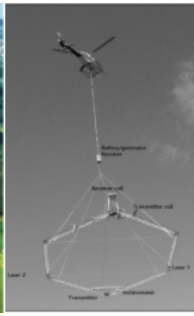
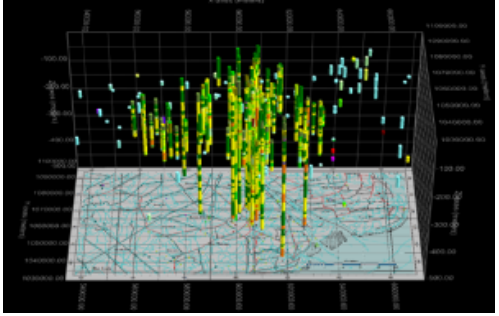
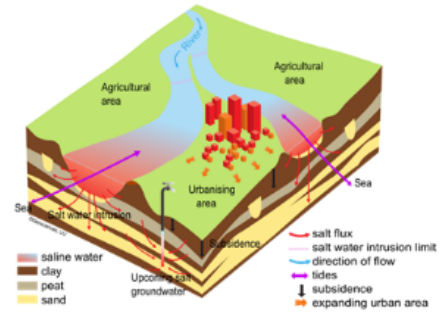
Workshop Can Tho, Vietnam, March 2017



- **WalkTEM field campaign salinity mapping Soc Trang Province**



Project: September 2014 - Augustus 2018



iMOD

major features:

- MODFLOW/MT3D/SEAWAT oriented
- easy to use graphical user interface
- interactive geologic schematisation
- supports participative processes
- compatible with other models & codes
- handles large data volumes
- creates and runs scenario's
- very fast

SUB-CR (subsidence)

major features:

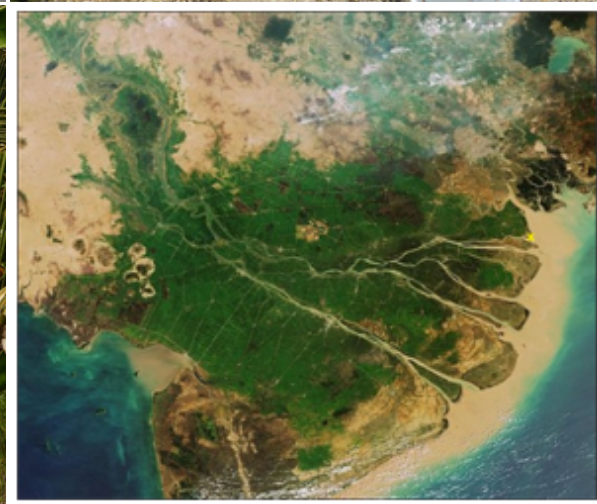
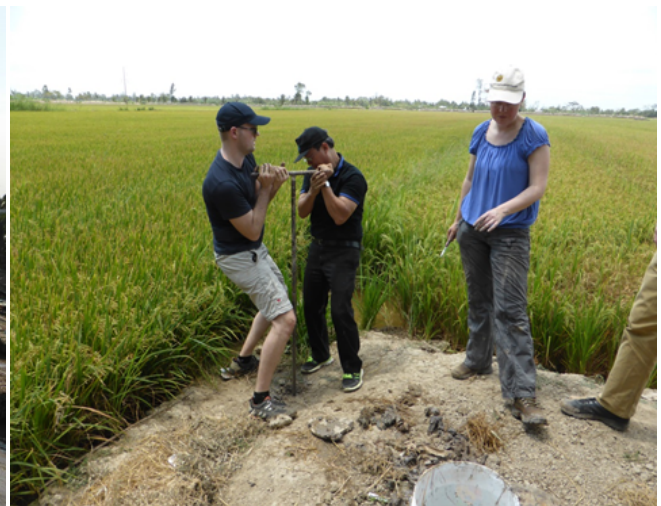
- using MODFLOW as core
- Includes slow subsidence (creep)
- for saturated and unsaturated zone

SEAWAT

major features:

- groundwater & solute
- non-steady state
- variable-density
- salt water intrusion
- core MODFLOW, 3D

See also: [website Vietnam](#)



More Information:

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