The Mekong Futures Project

The Exploring Mekong Region Futures project aims to improve the sustainability of the Mekong region by investigating the complex relationships between the production, distribution, and use of energy, food and water of the region.

The project focuses on the dynamic interactions that occur with the management of food, energy and water at local and regional scales. The research explores regional and local factors that affect national decisions, livelihood outcomes and preferred strategies. The results will help identify the benefits, costs and risks of natural resource development options, subject to a changing climate.

1. Rubber futures in Yunnan, China
2. Water options in Lao, PDR
3. Future farming in Northeast Thailand
4. Impact of development in Tonle Sap, Cambodia
5. Sea-level rise and future livelihoods in Vietnam's Mekong Delta

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Local Study 5: Sea level rise and future livelihoods in Vietnam's Mekong Delta
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The Mekong Future project first draft report on the hydrological simulation by To Quang Toan, Nguyen Hieu Trung, Dang Kieu Nhan (2011)

More information

www.csiro.au/science/MekongFutures

www.csiro.au

Local Study 5: Sea level rise and future livelihoods in the Mekong Delta: Hyrdological modelling and crop response

Exploring Mekong Region Futures

Australian Government Aid Program

CSIRO

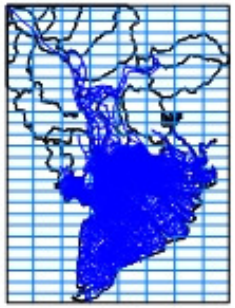
Modelling hydrology and crop response in the Mekong Delta

This study examines how a projected sea level rise of 30 cm by 2050 could impact on agricultural production in the Mekong Delta given existing water infrastructure. It uses hydrological modelling to examine different scenarios for understanding effects of structural measures both upstream and in the Mekong Delta.

Adaptation to sea level rise needs to consider the broader context of land use change and upstream developments. In particular upstream developments such as hydropower, irrigation and water diversion can substantially offset the effect of hard adaptation measures such as dikes and sluice gates.

This study emphasises the need to understand combined effects of factors such as sea-level rise, upstream dams, upstream irrigation and drought.

Considering that more dry years are projected in the future, management of upstream dams has more impact than expensive investments in water infrastructure.

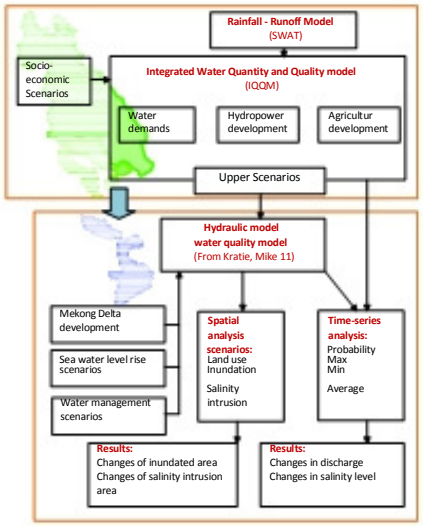


The simulated area for the model begins at Kratie and covers the floodplain in Cambodia and the whole Mekong Delta of Vietnam

The hydrological model of the Mekong Delta

The model for this study is based on an existing model developed by the Southern Institute for Water Resources Research (SIWRR). The new scenarios were developed by stakeholders through the Exploring Mekong Region Future project. The physical conditions used in this model are based on 2005: historically the driest year of the Vietnamese Mekong Delta.

Sources of data, information and assumptions that underpin the model are available in the report on the Mekong Futures website



All types of water use can be simulated including water used for agriculture, domestic, and industrial development and other land use.

Scenarios

Five scenarios are considered, shown below.

No	Abbreviation	Description
0	SCN0: SLR30+RfC	Sea level rise 30cm + Rainfall pattern change (Climate change) + Based year land use
1	SCN1: SLR30+RfC+AgrP	Sea level rise 30cm + Rainfall pattern change + Land use scenario (toward increasing of rice area)
2.1	SCN2.1: SLR30 + UPS30	SCN1 + Upstream hydropower and land use scenario.
2.2	SCN2.2: SLR30 + UPS30-Qp85%	SCN1 + Upstream hydropower and land use scenario in the drought hydrological year with probability of 85%
2.3	SCN2.3: SLR30 + NFD-Opti	SCN1 + Upstream near future hydropower dams scenario with optimum operation (NFD-Opti) (based on Nguyen Quang Kim et. al. 2010)
2.4	SCN2.4: SLR30 + RVCNA	SCN1 + Upstream hydropower and main stream dams in the RVCNA model (based on Hannu Lauri2011)
3	SCN3: SCN1 + CloseW	SCN1 + Cailon and Caibe sluice gates (close two large river at the West Sea-Gulf of Thailand) + sea dikes
4	SCN4: SCN2 + CloseW	SCN2.1 + Cailon and Caibe sluice gates (close two large river at the West Sea-Gulf of Thailand) + sea dikes
5	SCN5: SCN4 + CloseAll	SCN4 + Hamluong and Cochien sluice gates (close 2 main Mekong river mounts)

Results of the hydrological modeling

The model outputs are the monthly salinity levels and duration maps for the five simulated scenarios

- Impacts of intensifying rice cultivation on salinity intrusion: under SCN1, increased salinity levels of 2 g/l are projected only in the Quang Lo Phung Hiep salinity control project. Intensified rice production upstream of the VMD seems unlikely to affect salinity downstream in the dry season.
- Impacts of the upstream hydropower on salinity intrusion: under SCN1, upstream hydropower development in dry years (85% probability drought) is likely to result in significant increases in salinity levels and saline duration.
- Effectiveness of the sluices: Proposed structural measures to control salinity in the Mekong Delta would significantly reduce the salinity condition of the Mekong branch and also in many provinces.
- Under projected climate change, there is increased demand for water in the rice intensification scenario during certain cropping stages: this information is useful for planning crop adaptation.
- Combining projections of saline intrusion and proposed land use for food security can improve land use planning policy for the VMD and support adaptation measures to climate change.

Summary for adaptation strategies in the Mekong Delta

- Sea level rise of 30 cm, the increase upstream VMD rice area may reduce by >120,000 ton of rice in the coastal provinces compared to the base scenario.
- Structural measures such as large sluice gates can increase rice production from 160,000 ton to 300,000 ton compared to the base scenario but has unknown environmental and socio-economic impacts.
- Increases irrigated land in upstream country and 42 near future hydro-dams under existing hydrological condition of 2005 may reduce rice production by 170,000 ton, and under low flow (1995-2010) may reduce rice production of ~200,000 ton of rice. With flow of 85% probability (1920-2010), serious saline intrusion can occur in the VMD.
- Under optimum operation of all 126 upstream hydro-dams, more fresh water will flow to the VMD increasing rice production by more than 300,000 ton of rice compared to the base scenario. However, collaboration on the hydro-dams operation remains a challenge.