

# INTERNATIONAL WORKSHOP ON SUSTAINABLE MANAGEMENT OF TIDAL AREA IN THE ERA OF CLIMATE CHANGE

## GENERAL REPORT

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*General Reporter*

The coastal zone comprises only 3% of the earth's surface and accommodates about 60% of the world's population, a figure set to increase to 80% by 2050. As a result, 2/3 of those cities in the world, with a population of more than 7.6 billion people are found in coastal areas. Coastal areas have a great ecological value, for recreation and tourism and provide habitat for many endangered species and also are sources of 90% of the world's fish catch. When thinking of food demands of the future, one cannot ignore the coastal zone that provides both paddy and fish. ICID took note of this way back in 2001 and established the Working Group on Sustainable Development of Tidal Areas (WG-SDTA).

In 2011, WG-SDTA extended its tenure for five years with more focus on sustainable management and development of water and land resources in tidal areas, keeping in view the probable consequences of climate change.

This year, an international workshop on "Sustainable Management of Tidal Areas in the Era of Climate Change" is thus organized during the 22nd ICID Congress. Under the umbrella of this theme, eight topics are covered:

1. Marine and tidal influences of sea water rise, storm, waves and water temperature
2. Terrestrial influences such as flood and drought disasters with precipitation and other meteorological changes
3. Adaptation measures and strengthening of irrigation, drainage and flood prevention facilities
4. Environmental conservation to sustain water quality and biological diversity
5. Soil, water and wetland conservation in tidal and reclamation area
6. Institutional management and stakeholders' participation in tidal area
7. Impact of climate change on tidal reclamation work
8. Positive and negative economic effects in tidal area due to climate change

Among the seven full papers, there are four from Korea, two from Indonesia and one from Taiwan. The distinction among the papers in accordance of the eight above mentioned topics is not sharp. This may be due to a limited number of responses in addressing the topics, which in itself arises perhaps due to lesser relevance of some of the topics in the context of a given country. As a result, it is found that the topics 1, 2, 3, 4 and 5 have been partially addressed but topics 6, 7 and 8 have not been explicitly addressed by any of the full papers.

The paper by Yang et al., presents a coupled prediction of inundation and land subsidence using the one-dimensional land subsidence (LSUB1) model in Yunlin County in Taiwan, considering climate change. A designed 24-h rainfall for return periods of 2, 5, 10, 25, 50, 100,

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200 year and tidal datum were employed to estimate the inundation, the influences of climate change regarding intensified rainfall and sea level raise. The conclusion was that the study results could be applied to map out the potential inundation and establish flood-mitigation measures by the flood control authority through a decision support system.

Herawati et al., from Indonesia analysed the river flow regime changes related to water availability on Kapuas River. The result show an increasing rainfall trend during the last 30 years. The land use change occurred widely increasing the swamp shrub land, open land and plantations. While the land use of secondary swamp forest and primary upland forest decreased. The changes in the hydrological aspects of the study area have altered the river flow regime of Kapuas river within the last 30 years and has influenced the river water availability.

The paper by Mawandha et al. show how mini polders can be used as an alternative of flood management in the lower Bengawan Solo River in Indonesia. The proposed mini polder system should meet several objectives, i.e. they should work as a flood protection measure during high flood and allow river water flows to the area for irrigation during normal flow.

On some related issues, there are papers on nourishment effect and morphological changes of Byunsan Beach, field study on growth of species based on the decontamination processing technology of Saemangeum Reclaimed Land, evaluation of watershed management practices under uncertainty for water quality conservation in reclamation area, and flow characteristics near drainage gates of the Saemangeum tidal dike.

Lee et al., have presented a paper on beach morphology changes and beach nourishment effects on the Byunsan Beach, West Coast, South Korea. On the basis of monitoring the beach morphology, they concluded that despite large-scale beach erosion in the summer, the overall accumulation is clearly found after winter period, and the nourishment and recovery program on Byunsan Beach is considered as successful.

Dal-Lim et al., in their paper on the reclamation activity of the Saemangeum intertidal area in the south-western part of Korean Peninsula indicate that due attention is needed in selecting suitable plant species because of its unique environment such as high salinity and fast wind. In this study nurseries were grown of potential salinity-tolerant trees and saplings were planted in two different test fields. Based on the monitoring of growth rates of the saplings, the suitable plant species and the nursery bed dimensions have been recommended.

Ham and Hong performed uncertainty analysis to investigate the effects of various uncertainty types on water quality predictions using generalized likelihood uncertainty estimation (GLUE) for model parameter uncertainty and Monte Carlo simulation (MCS) for climate data and predicted PS load uncertainties. Although the integrated modelling system was calibrated using observed data, it still contained some uncertainty. The integrated modelling system under combined-uncertainty was used to assess watershed management practices.

Dikes and tidal gates are used for flow control in the coastal low lands. Though this does not fit to any of the topics as mentioned earlier, yet the quality of the study and the relevance of the findings in the stability of the region inside and outside the dikes merit a mention here. The related study was carried out by Jung et al, for the Saemangeum tidal dike in Korea. In their study, the discharge and water elevations predicted by the numerical simulations are in good agreement with the measurement. Using the study, one may be able to switch from empirical estimation to a more rigorous numerical estimation of the flow behavior in the tidal gate region of a dike.

Among the various efforts, studies on Sustainable Management of Tidal Areas and dissemination of the study results and valuable experiences are one of the important tasks of the WG. The 7 papers received for this international workshop will not only provide the participants with perspectives and insights on sustainable management of tidal areas in the era of climate change, but also give inspiration for further research - which may be helpful in addressing the challenges that will have a profound impact on tidal areas around the world.

Last but not least we thank the authors who gave their time and support to this workshop, the reviewers for their careful work in helping improving the quality of the workshop, the Korean National Committee, and the administrative assistance for workshop from ICID Central Office. Under the era of climate change, the anticipated sea level rise in the future highlights the need of sustainable management in tidal areas. Evolving strategies to address the impacts will thus be essential. We believe this international workshop contributes to an improved understanding of and brings out new information relevant to the sustainable management of tidal areas in the era of climate change.