Geophysical Research Abstracts,
Vol. 11, EGU2009-5961, 2009
EGU General Assembly 2009

Methodology to determine the vulnerability of deltas to climate change and to identify adaptation strategies

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Development of sustainable water management strategies involves analysing current and future vulnerability, identification of adaptation possibilities, effect analysis and evaluation of the strategies under different possible futures. Recent studies on water management often followed the pressure-effect chain and compared the state of social, economic and ecological functions of water systems in one or two future situations.

The future is, however, more complex and dynamic. Our approach starts at the end of the cause-effect chain by describing optimal conditions and critical thresholds for each water-related function in terms of their physical boundary conditions. This gives an indication of the current and future vulnerability. By comparing the optimal conditions with the physical conditions under the current and future climate and sea level we can identify mismatches. Where these occur are the vulnerable 'hotspots' for which adaptation strategies should be defined.

We developed a rapid assessment model to analyse the effectiveness of strategies for a large set of transient scenarios, in order to evaluate the strategies on robustness. This model describes the Pressure-State-Impact-Response chain of a delta system and exists of simple cause-effect relations based on outcomes of vulnerability analyses, complex hydrological models and studies on social responses. With the model transient scenarios are considered. These scenarios comprise time series that include trends, unexpected events, floods and droughts and the interaction between water system and society. We present the concept methodology for sustainable water management strategies by means of an imaginary case.