Geophysical Research Abstracts
Vol. 18, EGU2016-6066, 2016
EGU General Assembly 2016

Sediment dynamics in the Mekong Delta: impacts of planned hydropower development, climate change and sea level rise

Nguyen Van Manh (1), Nguyen Viet Dung (2), Nguyen Nghia Hung (3), Matti Kummu (4), Bruno Merz (2), and Heiko Apel (2)

(1) Institute of Water Resources Planning, Hanoi, Vietnam (donmanh@yahoo.com), (2) GFZ German Research Center for Geoscience, Section 5.4 Hydrology, Potsdam, Germany (hapel@gfz-potsdam.de), (3) Southern Institute of Water Resources Research, Research Centre for Rural Technical Infrastructure Development, Ho Chi Minh city, Vietnam (hungsiwrr@gmail.com), (4) Aalto University, Water Research Group, Helsinki, Finland (matti.kummu@aalto.fi)

The Mekong Delta is under threat due to human activities endangering the livelihood of millions of people. Hydropower development, climate change and the combined effects of sea level rise and deltaic subsidence are the main drivers impacting future flow regimes, sedimentation patterns and erosion in the Mekong Delta. In order to estimate the individual and combined impacts of the different drivers sensitivity-based scenario simulations were performed. The hydraulic processes and the sediment transport and deposition in the Mekong delta including the Tonle Sap Lake was simulated with a quasi-2D hydrodynamic for a baseline (2000-2010) and a future (2050-2060) period. For each driver a plausible range of future states was determined based on existing literature and studies. The ranges were discretized into different levels, resulting in 216 combinations of driver combinations. The results thus cover all plausible future pathways of sediment dynamics in the delta based on current knowledge. The results indicate that hydropower development dominates the changes in floodplain sediment dynamics of the Mekong Delta, while sea level rise has the smallest effect. The floodplains of the Vietnamese Mekong Delta are much more sensitive to the changes compared to other subsystems of the delta. The median changes of the three drivers combined indicate that the inundation extent would increase slightly, but the overall floodplain sedimentation would decrease by approximately 40%, and the suspended sediment load to the South China Sea would diminish to half of the current rates. The maximum changes in all drivers would mean a nearly 90% reduction of delta sedimentation, and a 95% reduction of the suspended sediment reaching the sea. These findings provide new and valuable information on the possible future development of floodplain hydraulics and sedimentation in the Mekong Delta, and identify the areas that are most vulnerable to these changes. This, in turn, provides a scientific basis for a thoughtful planning of mitigation and adaptation measures.