Impact of Climate Change on Salinity Distribution and Adaptation Options: Case study of Huai Khamrian Subwatershed, NE, Thailand

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Regional Climate Models project significant changes in temperature and rainfall over the Northeastern region of Thailand over the 21st century. The potential impacts of climate change on areas affected by waterlogging and shallow saline groundwater in this region was investigated using the variable density groundwater model SEAWAT supported with recharge estimates derived from the hydrologic model HELP3. The focal area is Huai Kamrian subwatershed. Changes in groundwater salinity and waterlogging areas at the middle and end of this century were predicted using the calibrated model. These predictions used the dynamically downscaled PRECIS regional climate change scenarios generated by ECHAM4 GCM A2 and B2 scenarios. Recharge rates are predicted to increase as a result of the higher intensity of rainfall. Shallow watertable areas are projected to increase by approximately 23% from existing conditions during the middle of the century and up to 25% by the end of this century. Whilst the precise rate and timing of climate change impacts are uncertain, all of the scenarios clearly point towards an extension in the area of waterlogging and area affected by shallow saline groundwater areas. Given that areas affected by shallow saline watertables are predicted to expand for both climate change scenarios as well as for the base case, it is concluded that climate change will have a significant impact on the area affected by salinity and waterlogging areas for both climate change scenarios. Simulation of management option using ecohydrology approach was carried out to find the possible adaptation options for living in salinity environment and minimize the extension of salt affected areas in the future. The result from the management scenarios shown that integration of plantation of fast-growing tree and abstraction of shallow fresh groundwater for vegetation plot in the recharge area can reduce the impact of climate change on waterlogging and salinity distribution about 90% of the projection under the climate change scenarios. Due to high uncertainty of climate change projections, intensively preparation of waterlogging and salinity control including promote agro-forestry to reduce recharge to groundwater system, enhance drainage efficiency and intercept fresh groundwater for agriculture integration with improve soil texture and fertility in slightly and moderately salt affected areas and introducing salt tolerant paddy rice are urgently required to implement systematically in this region.

Key words: climate change, salinity, waterlogging, groundwater modeling, adaptation