

Assessment of future flood damage on agricultural areas under climate change in the Chao Phraya River basin of Thailand

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The Chao Phraya River basin is the largest river basin of Thailand and it is located in the tropical monsoon climate region with basin area of 160,000 km². The Chao Phraya delta is a major rice production area and often experiences large flood events, which may result in widespread rice-crops damage, as most recently recorded in 2011 and 2006 floods. The flood damage is also expected to increase more in future. It is thus necessary to assess flood damage to agriculture areas for future floods considering climate change impact for implementing effective preventive measures. This study focused on assessment of future flood damage to agricultural sector (rice crops) under climate change in the Chao Phraya River basin. Flood hazard characteristics such as flood depth and flood duration were computed using rainfall runoff inundation model (RRI Model). Flood damage to rice crops was defined as a function of flood depth, duration and growth stage of rice plants. For the assessment, satellite based data such as HydroSHEDS (SRTM) topographical and global land cover data were used. First, assessment of flood damage to agriculture sector was conducted for 2011 flood. The flood damage curves developed by ICCHARM were applied to assess the flood damage to rice-crops, and the comparison results between calculated damage and reported damage for 2011 flood were reasonably agreeable. The calculated results of rice crop using ICCHARM's damage curves were also compared with the damage estimated using flood damage curve developed by MRCS (Mekong River Commission Secretariat). Then, flood damage assessment was conducted for both present climate (1979-2003) and future climate (2075-2099) conditions using MRI-AGCM3.2S precipitation dataset. Frequency analysis was conducted using rainfall volume to identify flood hazard intensity for 50- and 100-year return period under present climate and future climate conditions, and flood damage was assessed for both return period cases with different rainfall patterns chosen from each climate scenario. The results obtained from the damage assessment were compared for worst cases and found that economical loss in agriculture sector due to flood can increase in the future by 15 % and 16 %, in the case of 50-year flood and 100-year flood, respectively. The agricultural damage areas can increase in the future by 13 % in the both flood scale cases. The results of the flood damage assessment in this study can be useful to implement flood mitigation actions for climate change adaptation.

Keywords: Flood disaster , Satellite based data, Agricultural damage, RRI Model, Climate Change Impact, Chao Phraya River basin

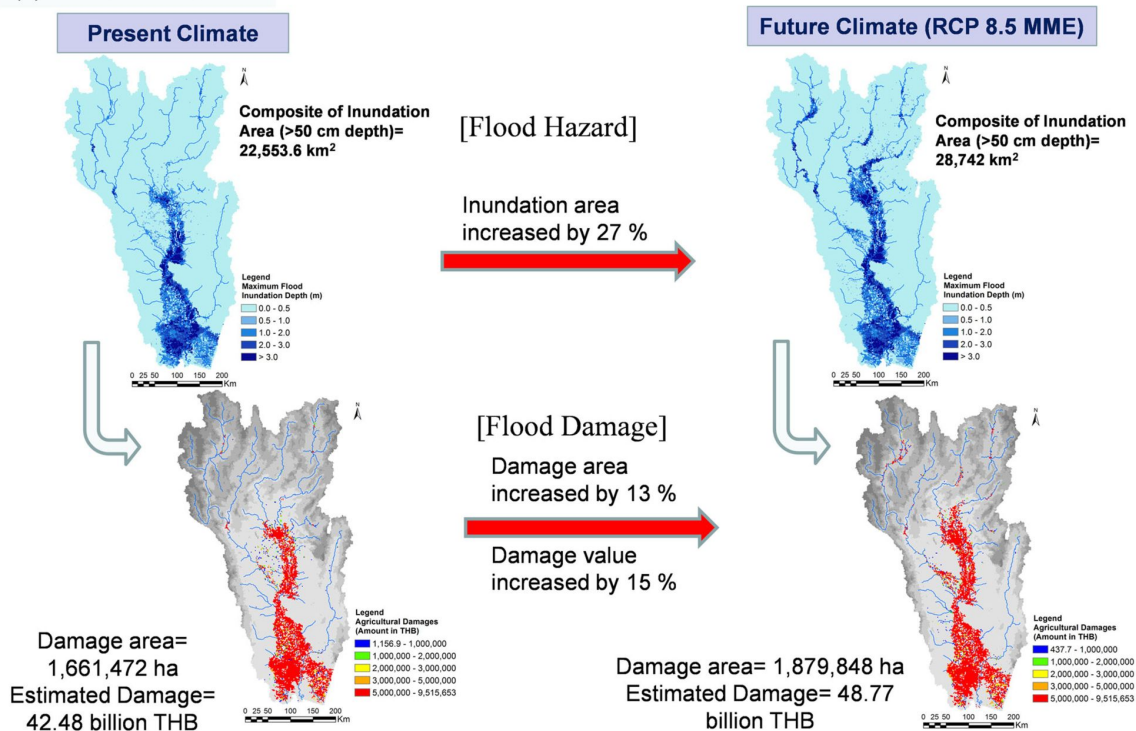
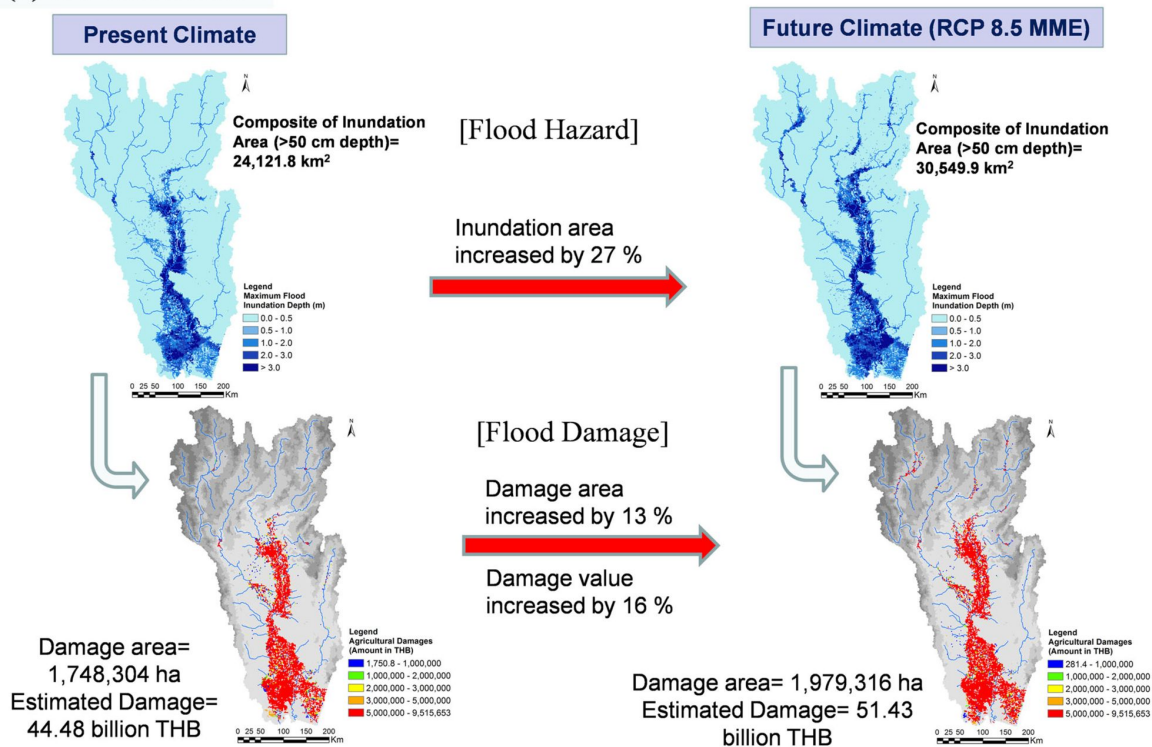
(a) 50-Year Flood**(b) 100-Year Flood**

Fig. 1 Comparison of flood hazard and agricultural damage between present climate and future climate cases for 50- and 100-year flood.