Some Water Related Challenges of Climate Change Impacts to Developing Countries in Southeast Asia

Shie-Yui Liong
National University of Singapore

There is a wide scientific consensus that the rapid rise in anthropogenic or human induced greenhouse gas (GHG) emissions over the past two centuries has been a major contributor to the global warming that we experience now. The Intergovernmental Panel on Climate Change estimates that global surface temperatures may rise to about 1°-2°C by the year 2050 and to about 2°-5°C by the end of the 21st century, depending on how much of the anthropogenic GHG will be emitted to the atmosphere in the coming decades (IPCC, 2007). Whilst there is much uncertainty on these GHG emissions, the main concern is the degree of detrimental impacts that both natural variability and human induced GHG will cause at some parts of the world.

In the Assessment Report AR4, the IPCC has detailed regional climate change projections for several regions of the world, including Southeast (SE) Asia. The projected increasing temperatures and increasing extreme weather events will lead to, for examples, serious flooding, droughts, forest fires, decline of crop yield and hydropower generation, infectious diseases, landslides, degradation of coastal and marine resources. An increase in annual precipitation over SE Asia with a median rate of 7% with extremes between -2% to +15% for all seasons is also expected. The annual temperature change for the whole of SE Asia is expected to be around 3°C by the end of this century (IPCC, 2007). The projection was done using 24 Global Climate Models (GCM) with resolutions ranging from 150x150km to about 600x600km. These low resolution GCMs cannot provide the much needed catchment scale's rainfall projection. Hence, climate downscaling with high resolution dynamical and/or statistical downscaling is called for.

The main focus of the talk is on:
(1) Dynamical Downscaling of some Global Climate Models using high resolution Regional Climate Model (RCM), WRF (Weather Research and Forecasting), and challenges faced will;
(2) The most recent approach to derive Intensity-Duration-Frequency curves for ungauged sites which are essential in drainage designs particularly in rapidly urbanized and data poor SE Asian cities. These IDF curves are developed with the projected rainfall data, through downscaling, for the present and future climate. Poor drainage designs in many SE Asian mega cities contribute significantly to massive flooding witnessed in the recent past decades;
(3) Assessing crop yields and developing food risk map to reflect the anticipated changes in climate. Rainfall and temperature projected by RCM WRF are applied in crop yields.