THE POSSIBLE INFLUENCE ON THE IMPACTS AND VULNERABILITY OF CLIMATE CHANGE: AN EDITORIAL

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The present volume is the special issue of the 5th international conference on earth observation and societal impacts (ICEOSI-2015) on the possible influence on the impacts and vulnerability of climate change. ICEOSI is an annual international conference held by Taiwan Group on Earth Observations (TGEO), a non-governmental organization founded with the academia in August 2010, in response to the sustainable development of the earth against global warming and the anomalous climate, and the projects of earth observations supported by the G8 summit of the United Nation in order to find out the solutions of precaution against natural calamities and reduce the impact of disasters. Based on the conclusions mentioned above, TGEO aims at improving the global environment observation capabilities combined with the knowledge management to resolve the environmental crisis caused by global changes into a turning point of sustainable development for Taiwan, conducting relevant research and knowledge exchange. The issue includes nine areas: biodiversity and ecosystem sustainability; disaster resilience; energy and mineral resources management; food security and sustainable agriculture; infrastructure and transportation management; public health surveillance; sustainable urban development; water resources management and industry and elaborating the significant influence to raise the overall well-being in Taiwan. Recently, climate change affects the global marine ecosystem continuously and has brought many disasters and environmental changes (Scheffer et al., 2001; Belkin and Lee, 2014). Among them, coastal zones located in populated and rapidly developing areas face high risks of natural and anthropogenic disasters. In addition, the world is urbanizing, and the most rapid urbanization is taking place on the coast (Ramesh et al., 2015). Therefore, the invited session "Climate Change Impact and Vulnerability" in ICEOSI-2015 was chaired by Dr. Sumiko Anno & Dr. Ming-An Lee for discussing the possible influence of climate change on East Asia.

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This special issue consists of seven papers exemplifies various aspects of the impacts and vulnerability of climate change in the East Asia and the Central West Pacific Ocean. Kim et al. (2016) addressed that tidal flats is a kind of coast topography developed along the west coast of the Korean Peninsula. Changes of topography and sediment characteristics in tidal flats are due mainly to changes in tidal currents and wave patterns by sediment budget processes, marine energy processes, and coastal construction activities (Park et al., 2009). Thus they tried to assess these landform changes using combined analysis of multi-temporal remote sensing images and grain size measurement data in Baramarae tidal flat, Korea. Their results suggested that the combined analysis of both topography and surface sediment characteristics is highly useful for exploration and monitoring of the landform change in tidal flats. However, the in-situ measured data are also further suggested to combine together, their incorporation with the primitive DEM can be accomplished by multivariate kriging to produce more reliable elevation information.

The natural hazards and influence of climate change are uncertain on coastal zone in Taiwan. Hunag et al. (2016) studied risk maps and coastal defense criteria in Taiwan. They assessed the severity level of these four hazards including storm surge, coastal erosion, flood and ground subsidence for zoning coastal protection areas. The protection code assessment principles for protection facilities and land use management within the coastal areas in Taiwan were developed. Based on the natural and anthropic environmental characteristics of each coastal sector, risk level analysis was adopted to designate the protection code for the hazard prevention management. The risk level was estimated referred to the hazard and vulnerability factors. Finally, the case study of the Yunlin coastal area was used to verify the proposed assessment principles. The risk map and non-engineering measures were also proposed for the integrating coastal protection in this study.

Chu et al. (2016) investigated the impact of climate change on Shihmen reservoir water supply. The Tank Model was utilized with five downscaled General Circulation Models (GCMs) during 2046-2065. In comparison to 2004-2011, the average annual precipitation of the Shihmen watershed in 2046-2065 was lower, especially during the wet season (from May to October).

Therefore, the risk to the water supply will increase in the first cropping season (from March to June) in the future. To reduce the risk of water shortage because of public demand, irrigation fallowing over the cropping season is necessary.

On the other hand, the vulnerability concept based on the Driver-Pressure-State-Impact-Response (DPSIR) was implemented to evaluate the adaptation of coastal communities in the coastal zone of northwestern and southwestern Taiwan. The former aims to suggest reinforcements to local adaptation strategy and social vulnerability, encouraging communities to cope with threat of climate change together (Chiang and Huang, 2016). They highlighted the balance among built-environmental (sensitivity) and human (adaptability) dimensions, emphasizing social vulnerability, to address social resilience from risk perception perspectives. Decision making tool for adaptation is provided as a prototype, highlighting co-design process between residents and decision makers. The latter considers the most significant climatic disaster—flooding that is encountered by most of the communities along the seashore of Taiwan. In a face-to-face interview, interviewees reflected that the most important effect of climate change is the fishing industry, which item was eliminated by experts during a questionnaire. Having learned from multiple floods, all six communities performed relatively well in the category, "infrastructure stability", but poorly in the category "outdoor environment adaptability" (Chuang et al., 2016).

Teng et al. (2016) is the first trial to evaluate the vulnerability of fishery villages influenced by climate change and anthropogenic activity in the coastal zone of Taiwan. The analytical hierarchy process (AHP) was used to determine the vulnerability indices of the two fishing villages in the Coastal Zone of the Tamsui River, with experts evaluating the weights assigned to a range of criteria, namely hydrological data (such as sea surface temperature and sea level), stakeholder perceptions, and fishery data. This study suggests that both climate change and human factors (e.g., overfishing and pollution) cause decrease in marine resources, thus affecting the livelihoods of stakeholders. However, fishery authorities also consider essential management measures to be the crucial factors for reducing the vulnerability of ecosystems and fishery-based livelihoods. Implementing measures that reduce the vulnerability of fishermen's livelihoods are the most crucial task in addressing the uncertainty of natural climate variability in future.

Finally, changes in climate have caused impacts on natural and human systems on all continents and across the oceans in recent decade. Evidence of climate-change impacts is strongest and most comprehensive for natural systems (i.e., food security) (IPCC, 2014). Skipjack tuna is an important migratory species, contributing significantly to the economy and to industrial fisheries worldwide. Yen et al. (2016) therefore tried to collect and analyze catch and effort data of skipjack (*Katsuwonus pelamis*) tuna from a purse seine fishery, as well as remote sensing environmental variables and simulation data from climate models under various scenarios. They suggested that catch rates of skipjack tuna declined substantially in the northeastern waters off Papua New Guinea during 2020 and 2030. The production of skipjack tuna in the WCPO exhibited an upward tendency under a relatively high greenhouse gas emission scenario (RCP 8.5), but the tendency did not show a change in the lower emission scenario (RCP 2.6). The variation in production of skipjack tuna under the global warming scenarios in the WCPO should be taken into account in the risk assessment to produce better fishery management policy for this stock.

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