# Development of Integrated Impact Assessment System to Support Climate Change Policy

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In recent years, climate change is one of the most important global environmental agenda and international issue. Especially climate change has influenced on various sectors including ecosystem, water resource, natural hazards and health and so on. In Korea, the average temperatures of the six major cities from 1912 to 2008 have increased by 1.7℃, which is more than double the global average (0.74℃±0.03) by climate change (KMA, 2009). In addition, average temperatures are expected to increase by a minimum of 2℃ from 2000 to 2050 (when simulated under the IPCCs Climate Change Scenario A1B) (KMA, 2009).

To reduce the adverse impacts of climate change, the governmental action plan in Korea was published in 2010 to adapt to climate change in a comprehensive manner at the national level. However, this action plan therein was not established based on the quantitative information from the climate change impact assessments. Furthermore, the plan needs to consider multi-disciplinary and socio-economic impacts of various sectors. Different data formats and designs impose enormous challenges in planning the responses to climate change such as mitigation and adaptation. Thus, this study proposed development of integrated impact assessment system for supporting decision-making process of mitigation and adaptation policies at the regional as well as the national level.

We reviewed the information and previous studies in detail to develop an integrated assessment system including agriculture, forestry/ecosystem, disaster, water resources sectors, etc. This year we examined forest ecosystem and water quality as pilot study.

To assess and predict changes in South Korea forest ecosystem, MC1 (MAPSS CENTURY1), TAG (Thermal Analogy Groups), HyTAG (Hydrological and Thermal Analogy Groups) models were used. Forest ecosystem vulnerability is assessed by vegetation distribution and forest ecosystem function. We found that the vulnerable forest area is 54% of the whole based on A2 scenario. And compared to the past vegetation distribution, sub-alpine forest and cool temperature mixed forest area could be changed 60% of the whole to subtropical forest area.

To understand and assess the impacts of climate change on vegetation distribution and its subsequent impacts on water, sediment, and nutrient cycles in an watershed, we developed a simple integrated

assessment model of climate change, by linking three models: 1) a regional climate model (SNURCM), 2) a forest ecosystem model (TAG), 3) an watershed scale model (SWAT). By applying the model to a small Kyoung-An River basin, South Korea, with IPCC SRES Scenarios A2 and B1, we found that the average annual water discharge in the near future (2046-2065) will increase by 26% and 23% for A2 and B1 scenarios, respectively, compared to those of the current period. In addition, future yields of SS, TN and TP in the near future based on the A2 scenario will rise by 61%, 31%, and 71% compared to the current yields, respectively.

To develop the proposed system, sectoral impact assessment based on a well-accepted database for future physical and socio-economic changes, a consistent method to assess sectoral impacts, and integration of climate policy with sectoral results in deep uncertainty should be considered. We will develop sectoral models and prepare the required dataset for assessing regional impacts during a short-term period (1-2 yrs). Then the impact function by sector will be prepared to assess the efficiency of climate change policy implementation by national levels. A simplified result from the sectoral impact function represents the quantitative impact of climate change from the physical model by sector (Figure. 1). Next step will be supported climate change policy by focusing on the integrated impact modeling system to assess potential impacts of climate change in regional areas.

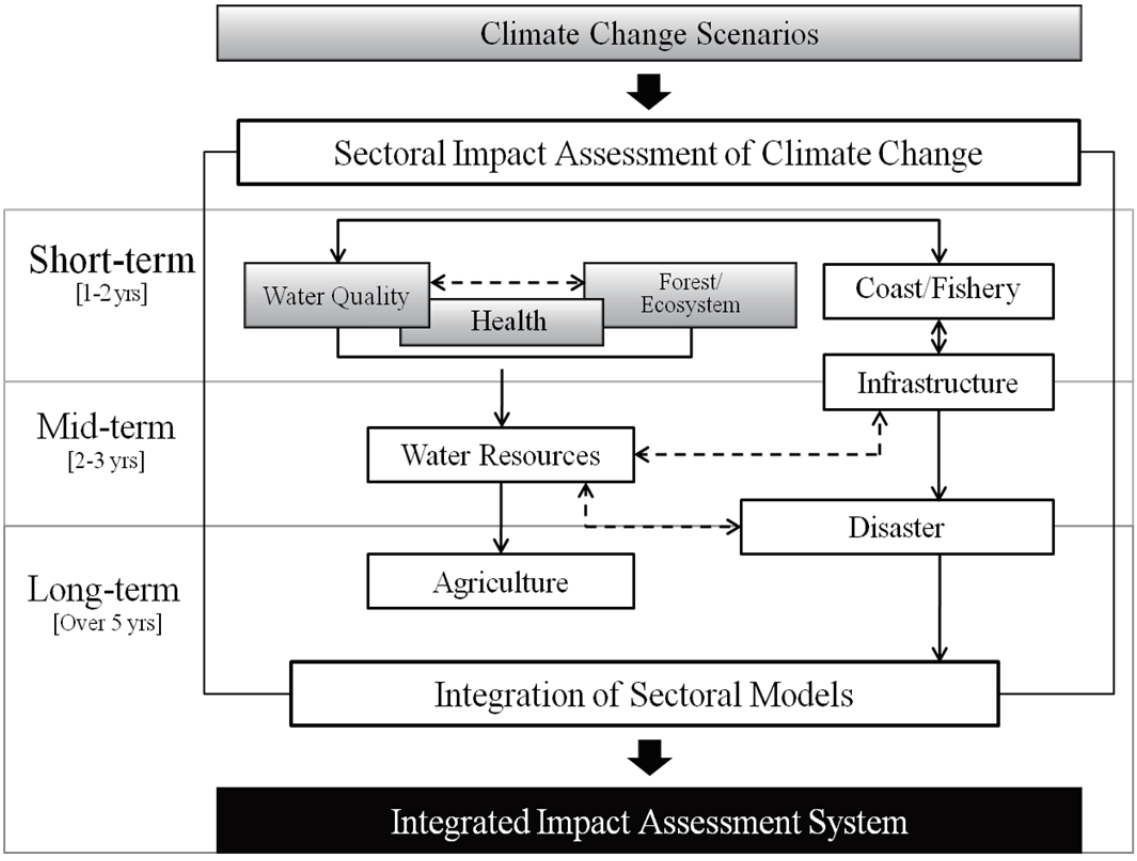


Figure 1. Integrated impact assessment system framework