Optimal Application of Basin Management Practices in Geumho River for reducing Effect of Climate Change

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Geumho river is the second largest tributary of Nakdong river which is the longest river in the South Korea. Daegu which is one of the metropolitan cities in South Korea is placed in downstream of Geumho river. The metropolitan city uses Geumho river as the main water resources, so that the river management is very important. Recently, control of pollutant concentration has limitation to improve water quality, so that water quality control performs throughout control of pollutant loading called Total Maximum Daily Load(TMDL). TMDL will be assigned pollutant loads according to pollution sources and then water quality control will be performed within the range of assigned pollutant loads. The pollution sources are separated into two groups. First group is 'point source'. Measurement and Management of the pollutant from point source are simpler than the case of pollutant from 'non-point source'. The pollutant from 'non-point source' is difficult to measure because definition of non-point source is difficult. Moreover, measurement of the pollution loads from non-point source become difficult by climate change which causes increasing of temperature and changing of intensity and frequency of precipitation. This study aims to suggest basin management practices in Geumho river basin to recover water quality which is gotten worse by increasing of non-point source pollution by climate change.

The basin management practices are implemented at various regions according to land use. To get maximum effect of the basin management practices, several basin management practices apply to at the same time. The types of the basin management practices are as follows: Control of fertilizer is applied to a rice field. In case of a field, control of fertilizer, implement of tillage, filter strip and grassed waterway can be applied. The green roof which turns the impervious area into pervious area can be applied in urban.

The study area is selected Geumho river basin where water quality management must be performed by using the river as a main water resources. This study builds SWAT model to mimic hydrological factor (river flow) and water quality (Total phosphorus) in Geumho river. The constructed model uses to get river flow and total phosphorus data in the future. The used climate data to get future river flow and water quality data are the bias corrected precipitation, maximum/minimum temperature, wind speed, relative humidity and solar radiation data by QDM. Obtained future flow and water quality data are used to explore optimal basin management practices.

The optimal basin management practices are minimization of effect of climate change at the water quality. If the optimal basin management practices are implemented in the future, increase of pollution due to climate change could be reduced. The optimal basin management practices are explored throughout two steps. The first step, various basin management practices are applied according to land use and then calculates total phosphorus discharge loads in the future. The second step, the scenarios where calculated future discharge loads have the smallest difference from the present discharge loads before undergoing climate change are explored considering economic factors such as implement cost. The optimal basin management practices are suggested by the developed methodology in the study. The optimal techniques have maximum reducing effect of total phosphorus on cost. Therefore, the suggested optimal basin management practices can be utilized to water quality policy considering climate change. In addition, it is expected that the availability of the suggested optimal basin management practices is high because the optimal basin management practices are considered economic factor.

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