Economic Benefits, External Costs and Payments for Water Services from Soyang Watershed, South Korea

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Background

The Korean government has regulated the domestic water charge for political purposes. As a result, the price covers only part of the production cost (about 80.0%). It has become one of the causes of wasting water and an efficiency decrease in the water industry. The agricultural water use accounts for about 62% of the total water use. It is, nevertheless, free and the charge exemption has prevented efficient water use and management. Water yield and quality are highly affected by climate change and agricultural intensification. This study is aimed to contribute to a more sustainable water management in South Korea.

Objectives

- ♥ **To identify the water price with external costs internalized for drinking and agricultural water**
- ♥ **To determine the marginal abatement cost for nutrients in water**
- ♥ **To stimulate the impacts of climate, land use and water policy change on the water pricing and abatement cost of water**

Method

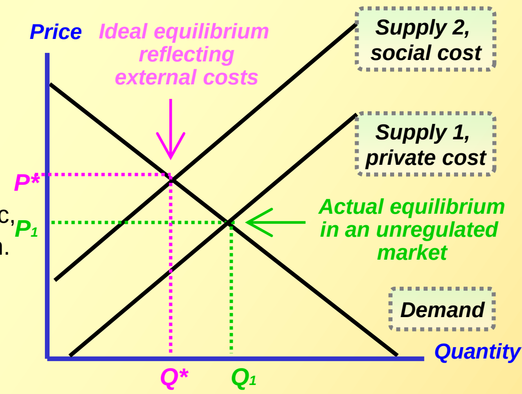
Water pricing with external costs internalized for water uses

Supply (S): Soyang Watershed is one of the most important sources of water supply in South Korea. Water supply is determined by the water storage in the Soyang Dam and affected by precipitation and temperature.

Demand (D): Monthly and yearly data on water consumption of each sector (domestic, agricultural, industrial, other uses) are needed for estimation of each demand function.

Equilibrium water prices (S = D): The water prices for each sector are determined through the combination of the supply and demand.

Internalized external costs:. Water pollution is one of the typical external costs Actual equilibrium is determined at price P1, quantity Q1, instead of more efficient price P* and quantity Q*. These latter reflect that the social benefit should equal the social cost, but the social benefit is less than the social cost at actual equilibrium. The problem is that people are consuming and wasting too much water (between Q1and Q*). Thus, the water price should be determined with external costs to be internalized.

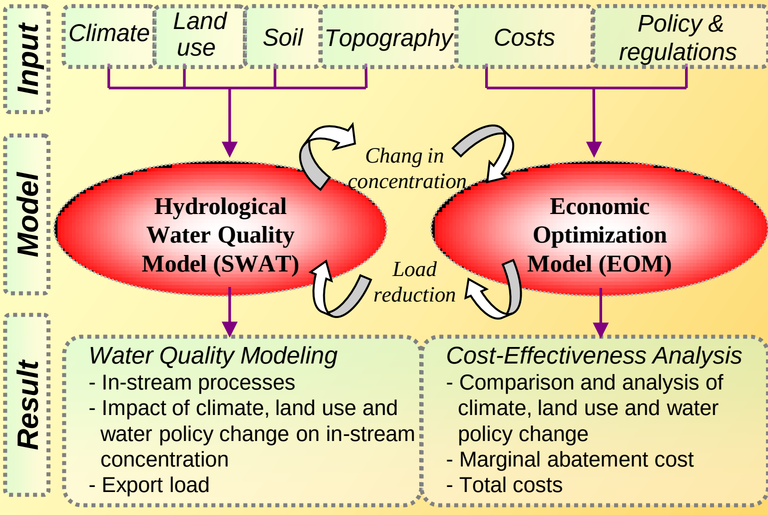


Determination of marginal abatement cost curves

Hydrological water quality model (SWAT): SWAT is used to determine the relationship between the modelled in-stream concentration at the Soyang river basin outlet and the associated emission reduction *(see poster of Rim Ha et al. for details).*

Economic Optimization Model (EOM): EOM is used to set up marginal abatement cost curves for nutrient demanding substances. It determines the least-cost combination and calculates cost of pollution abatement measures.

The Coupling of SWAT and EOM: The stationary coupling between SWAT and EOM is adequately considered for the long-term planning purposes considered in the Soyang Watershed management plans.



Expected Result

♥ The equilibrium water price paid by water users should reflect its relative value as measured by water supply, and the price changes will be stimulated under climate, land use and water policy change. For climate change, it will directly influence the water supply and land use change, so the demand for domestic and agricultural water (drinking water, irrigation, etc.) will change as well. For water policy change, relevant diverse scenarios will be worked out. One of the potential scenarios may be a tax or fee levied for irrigation water which is free now, or the increase of water charge for drinking water.

♥ The Coupling of SWAT and EOM will quantify the required emission reduction to reach an in-stream concentration target and to compare the cost-effectiveness of measures across sectors. The variation in marginal costs will show a potential for cost savings and a cost-effectiveness analysis will be able to provide an added value for the watershed and water resource management.

References

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