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Economic Gains from Benefit Sharing Based Water Allocation in the Aral Sea Basin

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Abstract

Water scarcity is rapidly increasing in many arid and semi-arid regions of the world due to population growth, irrigation expansion, industrial development, and climate change. At the same time, since water is delivered to the water users without considering its real economic value, water wastage is very high, especially in water abundant upstream regions of river basins, leaving less water to the downstream water users. Thus, there is strong need to provide efficient and equitable distribution of basin water resources among water users. Administrative water allocation fails to maintain Pareto efficient allocation and thus there is a potential for further increase in benefits of water users in the basin without losses incurred by any. This paper presents alternative water allocation mechanism which is based on benefit sharing by introducing tradable water use rights and incentives water users for rational water use. To this end, hydro-economic model combining both econometric and mathematical programming approaches was developed and applied to the case of the Aral Sea basin, where water is a critical resource for sustainability and development, as evidenced by the Aral Sea desiccation - one of the worst ecologic disasters in the world. Preliminary results show that all the riparian regions get additional benefits after introducing tradable water rights. In a normal year, overall basin benefit due to improved water productivity and efficient water allocation can increase \$US 83 million under intra-catchment water rights trading, while \$US 124 million under intra-catchment water rights trading without increase in total water use. Concurrently, if water users agree for keeping benefits unchanged while admitting conditions of benefit sharing based water allocation, water rights trading would allow saving additional water which can be released to the Aral Sea and thus serve to improve ecological sustainability in the region. It is argued that benefit sharing based water allocation, once its transaction costs are acceptable, can be more feasible option to increase water use efficiency in the basin than other technological improvements which require huge investment expenditures.

Keywords: Hydro-economic model, inter- and intracatchment, sustainability, water rights trading, water use rights