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Achieving water security in global change: dealing with associated risk in water investment

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Abstract

Water is affecting many aspects of human life, either in good or bad way. Water supports human life and become source of growth but water also takes away a lot of life which causes poverty. Water security itself means the capacity of population to harvest the benefits of water for human's life and environment and to protect themselves from water-related hazards at the same time[1,2].

Many developed countries which have invested earlier in both water infrastructure and institutions have achieved their water security status. As a result, they are able to harness the supportive side of water for economic growth. On the other hand, water investment in developing countries has not been able to fulfill basic requirements in the protection and access to water[3]. Global change puts additional pressure for countries in achieving water security due to increasing uncertainties and frequency and magnitude of extreme events. Increasing population, change of life style due to economic development, and declining of water quality and quantity reduce the access to supportive side of water.

Government also plays central role in the early investment in achieving basic water security through its fiscal resources. Before achieving water security, public investment in water security will not significantly improve the economic growth of a country and therefore politically become unpopular. In addition to this, threats from global change will likely give adverse effects and shocks on economy unless these threats are not properly addressed in water investment. Analysis using decision support system in hydro-economic may help these governments to manage their investment strategically taking into account the associated risk of global change. Thus, this paper will review the existing hydro-economic models and their potential contribution in supporting decision in water investment related to water security concept.

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1. Introduction

Achieving water security has always been a societal priority, both in harnessing its support to sustain human life and reducing its destructive impact. Water security captures the duality function of water as "the capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water related hazards -- floods, landslides, land subsidence, and droughts"[2].

Water is a main driver to the development and the source of economic growth. Although there has been escalating discussion whether water is a public good or market commodity, water, in principal, is an input in almost all production activities, such as agriculture, energy, transport, industry and even production of healthy and productive human capital. This part represents the supportive side of water towards economic growth. In order to be able to use water's supportive side, people need to manage its spatial and temporal variability of water quantity and protect its quality through investments in water transfer, storage, treatment, land use planning, etc.

Water supports human life, as long as it is still manageable. Beyond its management capacity, either it is too little or too much, water becomes destructive. In Ethiopia, for example, the inability to cope with the high rainfall variability because of limited water storage capacity hampers the country's economic to grow (Fig. 1). The figure depicts that the percentage changes in GDP Growth is correlated with the rainfall variation. There are also many other examples, which show limitation in the ability to manage the enormous quantity of water as in the case of floods and create damages both in human's life and properties. In this case, water restrains the economic growth and failure in water management characterizes the destructive side of water.

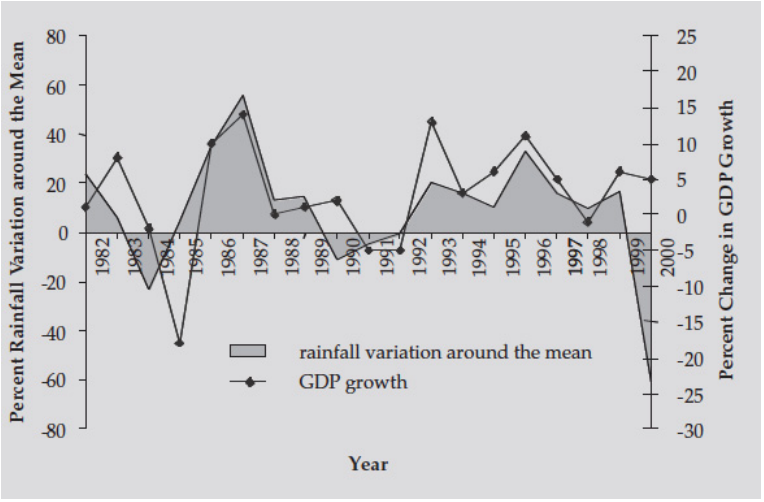

Fig. 1. Rainfall Variation Around the Mean and GDP Growth in Ethiopia (World Bank, 2006)

Attention to water as the source of growth and development has been increased significantly. In the 4th World Water Forum in Mexico City, "Water for growth and development" has been discussed as one of its main themes. The forum prepared a framework document to discuss how water secured countries are able to harness sustainable economic growth and countries which have not achieved water security either 'constrained' or 'stalled' in its development[3]. The discussion suggested that in order to achieve water security, a country should spend up to a certain amount of water investment to reach 'tipping point'. This tipping point represents the minimum investment platform to harness water contribution for growth (Fig. 2a). The magnitude of this tipping point is different among countries depending on their hydrological condition (Fig. 2b). Figure 2a shows that below the tipping point, a country considered to be water insecure and therefore unable to harness the benefit of water and enjoy it for