

Modeling Water Inequality and Water Security: The Role of Water Governance

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Abstract : Water inequality, water security, and water governance are fundamental parameters that affect the sustainable use of water resources. Through policy formulation and decision-making, water governance determines both water security and water inequality. Largely, where water inequality exists, water security is undermined through unsustainable water use practices that lead to pollution of water resources, conflicts, hoarding of water, and poor sanitation. Incidentally, the interconnectedness of water governance, water inequality, and water security has not been investigated previously. This study modified the Gini coefficient and used a Logistics Growth of Water Resources (LGWR) Model to access water inequality and water security mathematically, and discussed the connected role of water governance. We tested the validity of both models by calculating the actual water inequality and water security of Ghana. We also discussed the implications of water inequality on water security and the overarching role of water governance. The results show that regional water inequality is widespread in some parts. The Volta region showed the highest water inequality (Gini index of 0.58), while the central region showed the lowest (Gini index of 0.15). Water security is moderately sustainable. The use of water resources is currently stress-free. It was estimated to maintain such status until 2132 ± 18 , when Ghana will consume half of the current total water resources of 53.2 billion cubic meters. Effectively, water inequality is a threat to water security, results in poverty, under-development heightens tensions in water use, and causes instability. With proper water governance, water inequality can be eliminated through formulating and implementing approaches that engender equal allocation and sustainable use of water resources.

Keywords : water inequality, water security, water governance, Gini coefficient, moran index, water resources management

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