Practical Steps for Achieving Equity in Water Resources System Planning: Lesotho Irrigation Investment under Climate Change

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MOTIVATION

To achieve robust economic evaluation of water resources projects under climate change, without compromising on equity in the distribution of resources and risks.



Figure 1: Towards Increasing Robustness of Economic Evaluation and Confident Investment Decisions

METHODOLOGY



Figure 2: Methodology



Figure 3: Climate-responsive Modelling Framework

STUDY AREA



Phamong, in the Lesotho Lowlands, is one of the areas shortlisted for MDIH (Market Driven Irrigation Horticulture). The key infrastructure an irrigation dam İS designed to supply water to demarcated Integrated catchment cultivated areas. (ICM) interventions like management check dams have been proposed for implementation upstream of the dam to reduce sedimentation, thereby preserving live dam storage volume for irrigation purposes. Targeted benefit stream for this investment is revenue from the hectares cultivated each month.

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Precipitation, Temperature, evation, Land use and Soil data
Reservoir volume, height and
surface area, operating rules,
orage thresholds, release targets
crop patterns, gross crop water
emand, net crop water demand
(less precipitation)
estment time horizon, discount
te projected costs and benefits
e, projected costs and benefits
Model Inputs
Models
Model Outputs



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Figure 8: Potential Benefit of ICM in preserving Dam Storage Volume over a period of 44 years

Key Findings

- Decision making using a **single** Present Value (PV) may be less cumbersome analytically, but it is risky because the metric gives information investment's robustness to (climate) uncertainty.
- Simple sensitivity analysis that climate few (7) scenarios only presented partial information on the investment's robustness (Robustness Index. RI = 57%)
- The Stress Test approach led to RI \approx 31%, indicating that the proposed investment is about 26% less robust than analysis of few climate scenarios indicated.

Practical Implications

If a RI benchmark of 50% is chosen for decision-making, and a climate stress test is not performed, the need to invest in adaptations like ICM measures and safeguard the investment's robustness could be overlooked. However, since RI < 50% after conducting the stress test, the study is able to propose the adoption of adaptation measures (Step 6 in Figure 2) to improve the robustness of the MDIH scheme.

Exploring the potential of ICM as an adaptation measure to improve the investment's robustness under climate change, following the framework presented in Figure 2. Aspects of distributional equity would also be considered using a decentralized configuration of the MDIH scheme shown in Figure 4. Furthermore, the effect of equitable distribution on financial evaluation metrics, robustness of investments improved decision-making and would be examined.

