Climate change futures of water: Impacts on Highlands and Lowlands

This summary is based on forthcoming RiPPLE Working Paper Climate Change Futures of Water and Livelihoods in Ethiopia: A Study of the Impacts of Climate Change on a Highland to Lowland Transect in Eastern Ethiopia available for download at: **www.rippleethiopia.org**

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This research examined inter-linkages between water and food security. It aimed to provide an information system and analytical tools to assess constraints to water access for survival and livelihoods protection in livelihood zones along a transect from highland to lowland. The tools developed through the Household water Economy Analysis (HWEA) sub-LARS activity have also been used to model different scenarios of impacts of climate change-related trends and hazards on different wealth group households in each of the livelihood zones. This answers the call of climate change task forces and bodies such as the UNFCCC for 'scenario-based approaches' to climate change that provide policy-makers, water resource managers, and institutions alike with practical, actionable information and evidence that contributes to more informed, targeted, and specific policy and risk mitigation efforts.

HWEA Highlights

Water availability and access vary across the transect. Water availability and access are highest in midland Sorghum, Maize and Chat (SMC) Livelihood Zone, which is characterised by a moderate aquifer base and high recharge from rainfall and runoff from the highlands, and a moderately dense population which exerts pressure on water sources. Water availability and access is

lower in highland Wheat, Barley and Potato (WBP) Livelihood Zone, where a dense population competes for seasonal and perennial springs that have small aquifer bases and high seasonality (i.e. vulnerability to changes in rainfall or environmental conditions), although recharge is high from rainfall in most years. Water availability is moderate and access is low in Shinile Agro-Pastoral (SAP) Livelihood Zone. Although groundwater is available in large aquifers with relatively high water tables in normal years, access is nevertheless constrained by poor borehole construction practices.

Water access increases with wealth. The poorer wealth groups in all livelihood zones face 'water survival deficits', in which they are not able to meet minimum human consumption (5 litre per capita and day (lpcd)) and hygiene and sanitation needs (4 lpcd) in the dry seasons of normal years. This indicates seasonal vulnerability that would be amplified in drought or water stress, whether due to climate variability in the short term or climate change over the longer term. At the same time, middle and better off households in all zones are in some ways more vulnerable to climate change hazards that result in increased water stress, because they are more heavily dependent on water-based livelihoods strategies – namely, livestock production, and in some cases, irrigated chat and crop production in the midlands and highlands.

Conflicts over labour and time allocation have significant implications for livelihoods and health, particularly in the highland and midland agricultural zones. In these zones, labour release for water collection must be weighed against release of labour for engagement in agricultural labour, particularly in very poor and poor households, for whom cash income from agricultural labour makes up 50% and 25%, respectively, of cash income – and for whom household sizes are 2 to 3 people fewer than those of middle and better off households. Amplifying these intra-household conflicts over labour and time allocation is the coincidence of a peak agricultural labour period (Nov-Dec and Feb) with the long dry bona season, when lines and collection times are at their height. The other peak agricultural labour period falls in March and April, when diarrhoea incidence is highest due to belg season access at unprotected springs, which are heavily contaminated at the beginning of the rains due to polluted floodwater runoff. Water-based disease in this case impedes productivity levels and ultimately income. Diarrhoea also peaks at the start of the meher rains in June and July – which coincides with the hunger season, when cash reserves are lowest and treatment unlikely as poorer households must allocate available cash to staple food purchase.

The highland and midland livelihood zones in particular are the most vulnerable to changes in rainfall and environmental conditions. Increased variability and seasonality is likely to lead to lower groundwater recharge in all zones, as recharge is likely to decrease as more water is transported to lower altitudes through runoff instead

of being absorbed into the ground. If precipitation declines in areas such as these in Ethiopia, severe water scarcity is likely to result in the highlands and lowlands first, followed by the midlands. Decline in runoff originating from the higher altitudes may lead to reduction of base river flows and potential drying of rivers in the lowlands. Any increase in water stress is likely to amplify already significant conflict over springs sourced for irrigation in the highlands and midlands. An increase in precipitation in these areas of the country is likely to result in flooding (and contamination) of water points in all zones; landslides which damage property and water sources in the midlands and highlands; an expansion of opportunity for irrigated production in wetlands in depressions, particularly in midland SMC Livelihood Zone, and an increased recurrence of water-related diseases.

Policy Implications

On the Local Level: Local government and NGOs providing water supply and sanitation services should be briefed on major findings and recommendations. Local level interventions may include the following:

1. Groundwater development potential is high in the midland livelihood zone. Shallow wells are likely to be successful in valleys and depressions, and these and spring protection would improve access to safe, protected water and would be likely to mitigate water-related disease risk.

2. Spring protection is highly recommended in the highland zone as well in order to minimize risk of diarrhoea and increase labour productivity of poorer households in particular.

3. Construction of artificial recharge enhancement structures such as ponds may also help to increase the water retention in the highlands.

4. Establishment of water use rights and allocation rules in highland and midland zones for springs used for irrigation is highly recommended to mitigate conflict over limited spring resources.

5. In the lowlands, where water is retained in excavated riverbed pits even in the dry seasons, where most households access water for their livestock, the construction of sub-surface dams to facilitate storage and extraction of water would be an effective preventative and resilience building measure in this zone, where livestock are central to livelihoods and survival. Improved standards for borehole drilling are imperative in this zone, where many boreholes have been abandoned due to faulty siting and drilling to depths too shallow to reach water in the dry seasons.

6. Training in use of HWEA tools may assist wereda water and agricultural officials in decision-making processes regarding water supply and its role in livelihoods protection.

On the Regional Level: Zonal and Regional Water Bureaus should be encouraged to review scenarios of climate change related hazards and their likely impact down to the household and livelihood level as a part of contingency planning and risk mitigation for water, health, and food/agricultural sectors. The Regional LPA may also be a vehicle for influence, as in the other sub-LARS.

On the National Level: Scenario analysis findings should be made available as an input into the NAPA implementation strategy. Extrapolation of the findings to zones similar in groundwater availability and livelihoods may be considered as a means to extending the reach of the findings to elsewhere in Ethiopia. Both baseline and scenario findings should also be made available as an input into the PSNP program.

Researchers

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