Supplementary information

Table S1 Interview guide for KIIs done in Ethiopia

Stakeholder	List of questions
WASH committees	**Indicator: Water supply management and community governance** 1. Which climate-related events (long dry periods, heavy rainfall, coastal storms, flooding etc.) occur in this area and how is the water supply impacted by these? 2. Are you aware of changing climate patterns in the region? 3. Are you aware of future climate change scenarios for the region? 4. Are you aware of the link between climate-related events and changes in water quality or source yield? 5. Does the WASH committee monitor and keep records of rainfall data, temperature, seasonal water quality and yield? 6. Where does your income/funding for WASH related work come from? 7. Does the WASH committee keep records of income (from tariffs) and expenditure? 8. How have you responded to decreased water availability during a prolonged dry season (e.g., reservoir construction, using alternative sources etc.)? 9. Are the limitations on the quantity of water allowed per household? Does this change for different seasons? 10. Do you place any restrictions on water use during the dry season? 11. Have you received training in water quality testing, hand pump repair, building toilets, installing handpumps or risk assessment for water supply (with or without the focus of climate change. one example could be training in water safety plans)? 12. Does the WASH committee have plans to accommodate the costs of repair and preventive maintenance? 13. Are you aware of the link between unsafe sanitation (open defecation, unlined pit latrines etc.) and water quality? 14. Does the WASH committee coordinate and work with health workers to promote safe sanitation and hygiene? 15. How often do you meet district officials, and do you discuss climate-related issues affecting your community? 16. How are members chosen to be on the WASH Committee? 17. How do community members engage with the WASH Committee? 18. How does the WASH Committee handle conflict over WASH resources? 19. Are there female members on the committee? If so, what role do they play? **Indicator: Institutional support** 1. Have you received training in risk assessment or management from the district (woreda) government?

	2. Do you feel the WASH committee receives adequate and timely support to carry out minor repair and maintenance in terms of access to skilled labour and parts? 3. Do you feel the WASH committee received adequate and timely support for repairs needed after a major climate-related event? 4. Does the district government discuss the threats of climate change and variability in the region to your WASH system? 5. Have you received support from the district to implement measures to address climate variability or prepare for climate change? 6. Do you receive financial support (or other) from local government? **Indicator: Supply chain** 1. Where do you buy spare parts, pumps, latrine slabs, septic tanks, or consumables? 2. How do you dig and empty pits for the latrines? 3. Do you use a service to collect faecal sludge? If so, where is it located? 4. Do you have access to multiple markets or just one? 5. How do you travel to these locations? 6. How long does it usually take to buy parts and carry out repairs? 7. Does this time change after a climate-related event? 8. Can you still access these locations after a heavy rainfall or a landslide in your area? 9. Do you store any surplus parts needed for minor repairs or maintenance? 10. Have you experienced a delay in buying parts or consumables because a road or bridge was flooded or damaged or because communication networks were disrupted? 11. If yes, how long did it take for these to be repaired? 12. What do you do if you can't repair the problem? 13. Are there roads or bridges that are frequently damaged or flooded? 14. Response of water supply to climate 15. Do you test water quality after heavy rainfall or flooding in the area? 16. Have you observed changes in colour, smell, or taste during the rainy season? 17. Have you noticed any increase in water-borne illnesses? 18. Does the source yield change during the dry season and do any of the sources dry up? 19. If a source dries up, do you have access to other improved sources (dug well or tube well/borehole with handpump, mechanized borehole, protected spring)? 20. If not, which other sources do you collect drinking water from?

Village leaders, elders or religious leaders	**Indicator: Community governance, climate trends** 1. Who holds authority/power within the Community? 2. What is the source of this authority/power (i.e., elected, heredity, appointed etc)? 3. Are you and the community aware of climate change? Where do you get your information on climate change? 4. Which climate related events have occurred in this area in the past ten years? 5. Have weather patterns changed over the last ten to twenty years? (Has the rainy season got dryer or wetter? Has the dry season got longer? Have storms got more frequent or intense?) 6. Who is/are responsible for managing crises linked to weather-related events (floods, droughts, poor harvests etc)?
Women's groups' representatives	**Indicator: Community governance** 1. Do women have positions of real leadership within the community (are women listened to)? 2. Is the WASH Committee sympathetic to the needs of women (WASH-related) in the Community? 3. What would the Women's Group like to change about the WASH Committee? 4. Are the members of the women's group aware of climate change? 5. Have they noticed any changes to weather patterns over the past ten to twenty years? (Has the rainy season got dryer or wetter? Has the dry season got longer? Have storms got more frequent or intense?) 6. Do women play an active role on the WASH committee in your community? 7. Does your group coordinate with the WASH committee while making decisions on WASH services, location of new water sources or latrines, tariff, and other water access rules? 8. Do you use different sources for drinking water during the dry and rainy season?
Woreda officials	**Indicator: Institutional support** 1. Have officials had any training with respect to climate change? If so, from what sources? 2. Does the woreda have a climate change strategy? If so, what does it entail? 3. What forms of support does local government get from central/federal government for WASH-related issues (i.e., training, equipment, expertise etc)? 4. How do woreda officials communicate climate change strategies to local communities? 5. Is there a formal risk assessment or management program for officials overseeing WASH committees and committee members? 6. Are there plans to develop climate adaptive measures? 7. What kind of support does the woreda offer to committees to procure parts and carry out minor repairs or preventive maintenance? 8. What kind of support does the woreda offer to committees for major repairs? 9. Does the woreda conduct water quality monitoring?

	10. Does the woreda train WASH committee members in water quality testing, repair and maintenance etc.? 11. Do the woreda officials in charge of water supply and sanitation coordinate with officials in the health, agriculture, water resource or other relevant sectors? **Indicator: Supply chain** 1. What are the main climate-related natural hazards that occur in this area? 2. Which roads and bridges have been damaged after a climatic event in past 1 year, 5 years, 10 years? 3. How many days, weeks, months did it take for the roads or bridges to be repaired? 4. Are there hazard resilient design guidelines for roads and bridges? 5. Are there improvements planned for the transport infrastructure by the government? (Paved roads, new embankments etc.) 6. Are there plans to develop new water resources, expand the sanitation market, setting up new water points (through digging borewells, private vendors etc.)? 7. Are there plans to improve the communication infrastructure?
Health extension workers	**8. Indicators: Water supply management and community governance** 9. Which climate-related events (long dry periods, heavy rainfall, coastal storms, flooding etc.) occur in this area and how is the water supply impacted by these? 10. In which months of the year do these changes happen? 11. Are you aware of changing climate patterns in the region? 12. Are you aware of future climate change scenarios for the region? 13. Are you aware of the link between climate-related events and changes in water quality or source yield? 14. Are you aware of the link between unsafe sanitation (open defecation, unlined pit latrines etc.) and water quality? 15. Does the HEWs coordinate and work with WASH committees and other partners to promote safe sanitation and hygiene? 16. What types of promotion activities have you conducted? 17. Do you have regular communication with the HEWs to monitor water quality, treatment services? 18. Indicator: Supply chain 19. Do the community have pit latrine, please explain? 20. How do people dig and empty pits for the latrines? Do they have got technical support for superstructure, concrete slab, and related? 21. How is the attitude and utilization of the community on latrine utilization? Why don't some people in the community do not use pit latrine? 22. Do you use a service to collect faecal sludge? If so, where is it located?

	23. Response of water supply to climate 24. Do you monitor and test water quality after heavy rainfall or flooding in the area? (How it is monitored, how regular it is, who are involved in monitoring activities) 25. Do you have regular water treatment schedule? What types of treatment chemicals do you use? Is the chemical accessible and affordable for community use? Do you collaborate with the WASH committee? 26. Have you observed changes in colour, smell, or taste during the rainy season? What do you do in such condition? 27. Have you noticed any increase in water-borne illnesses? When and where? 28. In which season of the year does water-borne illness increase? When and where? 29. What is the link between water-borne illnesses and change in climate condition?
AFOSHA (local self-help group) leaders	**Indicator: Community governance** 1. Who is influential in the community and why? 2. Who holds authority/power within the Community? 3. What is the source of this authority/power (i.e., elected, heredity, appointed etc)? 4. How were you chosen as the leader of AFOSHA? 5. Are you and the community aware of climate change? Where do you get your information on climate change? 6. Which climate related events have occurred in this area in the past ten years? 7. Have weather patterns changed over the last ten to twenty years? (Has the rainy season got dryer or wetter? Has the dry season got longer? Have storms got more frequent or intense?) 8. What is the role of AFOSHA leader in managing crisis linked to weather-related events (floods, droughts, poor harvests etc.)? 9. Who is/are responsible for managing crises linked to weather-related events (floods, droughts, poor harvests etc.)?

Table S2 Interview guide for KIIs done in Nepal

Stakeholder	List of questions
Management committee (WUSCs)	**Indicator: Water supply management** 1. Can you describe the responsibilities of each member of the management committee? 2. Who has ownership of the scheme? 3. Can you please share the gender ratio on this committee? 4. Is there any tariff on water use? 5. Are any households deprived due to the connection cost? 6. Is there any change in water demand at a specific time / month / season? 7. Has the source yield declined in the past few years? 8. Is there any evidence of public health risks from the water supply? 9. Has there been any incidence that has interrupted the water services for longer time? 10. Do you know anything about climate change? 11. Have you heard about climate change on the radio, television, or through workshops? 12. Are there system problems reported due to 13. heavy rainfall, flooding 14. storms 15. longer dry period? 16. Have you experienced any difficulties in managing the water supply during rainfall or during longer snowfall days? 17. Has the source dried in any season? 18. What adaptation measures have been put in place to make the scheme safe from extreme weather events (heavy rainfall, long run snow fall, new source allocation for emergency)? 19. Is the water supplied without treatment? 20. If treatment is done, can you please share the methods of treatment? 21. If no treatment, what are the reasons? 22. Have you ever tested the quality of the water in a lab? 23. How often do users complain about the water quality? 24. Are there seasonal challenges for water treatment?

	25. What are some of these challenges e.g., pipe leakage, lack of availability of reagent, disruption of road access during rainy season etc.? 26. Have you developed or implemented a water safety plan for this scheme? **Indicator: Community governance** 1. Does the committee run any community awareness campaigns on water use and sanitation improvement? 2. Do you receive any community support for managing the scheme? **Indicator: Institutional support** 1. Have you received any aid or support for the operation and maintenance of the scheme? 2. How do you manage your finances related to the water supply scheme? 3. Has your team been trained on the management and operation of scheme after handover by the government? 4. Have you received any trainings or attended workshops regarding water quality improvement? 5. Has your team ever attended any workshop specific to climate change? 6. How is the quality of scheme maintained in terms of service provision and water quality?
District engineers	**Indicator: Institutional support** 1. Can you provide a background of the water supplies in this district? 2. How many registered and unregistered schemes are there in the district? 3. Are there regular WASH meetings in your office? 4. What are the major challenges in running the water supply schemes in this area? 5. How supportive are the water committees? 6. Is there regular institutional support to the schemes in the form or trainings or technical hardware support? 7. What is your experience on awareness of climate change on management committee? 8. Are there district plans to cope with climate change impacts on the WASH sector? 9. What changes have you found in the weather pattern, climate variation and natural events? 10. What institutional support is available to cope with the climate change? 11. Are you aware of water safety plans? 12. Do you keep records of resilience-building activities? 13. Are there conflicts between users and management committees? 14. What are the most recurring problems faced by water supply schemes? Is there institutional preparedness to address those issues? 15. Can you please help to list out possible doable solutions or actions to resolve/address these core problems (specific to institutional management and scheme operation)? 16. Are there any distinct climate resilience activities being implemented on any of the scheme on this area?

	17. Is there community willingness to cope with the climate change challenges? 18. Have you noticed any evidence of public health risks from water supplies in this district? 19. Are there marked examples of changing weather pattern in this region? 20. Are there regular trainings organized by your office related to climate change? 21. Are there schemes that are vulnerable to impact of climate changes? 22. Have you noticed any effects on the water supply schemes due to heavy rainfall, flooding, storms, or longer dry period? 23. What adaption measures have been implemented to make schemes safe from extreme weather events? (heavy rainfall, long run snow fall, new source allocation for emergency)? 24. Does snowfall have an impact on the schemes in this area? 25. Do long snowy days or rainy days change people's water consumption? 26. Are water supply schemes affected by rainfall or during longer snowfall days? Do sources dry during any season in this area? 27. Are there awareness campaigns on water use or sanitation improvement? 28. Are there local programmes on coping strategies e.g., trainings, awareness, workshops on climate adaptation? 29. Do you promote source canopy cover restoration or tree plantation in catchments? 30. What is the perception of management committees and the community on water treatment? 31. Which are the preferred methods of treatment? 32. If there is no water treatment, what are the reasons? 33. Does your office provide support for water treatment activities? 34. Any specific seasonal challenges for treating water? (E.g., rainy days cutting off road access or flooding pipelines etc) 35. Is institutional aid or support for the operation and maintenance of water supply schemes provided in this area? 36. How is the finance managed for WASH activities management (at the national, international, or community-level)? 37. Are there national / international trainings, workshop on capacity building regarding WASH services and climate change?

Table S3. Number of participants in KIIs and FGDs.

Stakeholder	Number of participants
Ethiopia	
Members of water management committees	41
Representatives of women's groups	12
Community elders	7
Representatives of self-help groups	13
Health extension workers	9
Kebele leaders	4
Government officials	10
Nepal	
Members of water management committees	30
Users	54
Students	17
Government officials	5

Table S4. Rationale for assigning environmental indicator scores.

Environmental indicator score (from 1 to 5)	Rationale for the score
4	The catchment is covered by shrub and bare land with a small lake. The source is located on gently sloping, agricultural land along a foot trail. Some scattered houses are at a similar elevation as the source, 200 meters away. There are some signs of landslips in the catchment 2800 meters away from the source. Low population density around the source. There are some latrines located uphill of the source but are more than 1.5 m above the water table, with low to medium risk of flooding.
2	The borehole is located adjacent to a cluster of houses and some farmland, on relatively flat ground. The area around the borehole is at risk of flooding (there have been major floods 3 times in the last 20 years). Some of the toilets near the source get flooded with rainwater. The community has some open defecation, but is not densely populated.
1	The catchment is covered by degraded bare land. The source is located downhill of moderate to steeply sloping and, on agricultural land along the roadside, with no terraced fields or natural conservation structures. Low population density around the source. Latrines are located downhill of the source and are more than 1.5 m above the water table but have medium to high risk of flooding.
2	Source is on steep (54% slope) forested land downhill of terraced field, clusters of houses and trails. No landslide scars uphill of the source. Tap stands are at risk of damage from soil erosion, runoff or rock fall.

Table S5. Rationale for assigning infrastructure indicator scores.

Infrastructure indicator score (from 1 to 5)	Rationale for the score
2	High sanitary risks at borehole. Latrines located uphill, and within 10m of the source. Faulty drainage channel, allowing water to collect around the wells. Other sources of pollution near the borehole. Missing fence and cracked apron. No qualitative evidence of decrease in yield.
3	Median sanitary risk score: 5/12 (Intermediate), worst sanitary score risk score: 6/12 (High) [based on 6 rounds of seasonal inspections] Evidence of seasonal decrease in yield. Sources of pollution within 10m of the handpump, faulty drainage causing stagnant water within 2m of the handpump, inadequate fencing around the source, ponding on the concrete floor, unsanitary well cover
3	Median sanitary risk score: 4/10 (intermediate), worst sanitary score risk score: 5/10 (intermediate) [based on 6 rounds of seasonal inspections] Evidence of decrease in yield. Contaminating silt in the spring box, lack of surface water diversion ditch around the spring, area around the spring in unfenced
3	Median sanitary risk score: 3/9 (low) [based on 6 rounds of seasonal sanitary inspections] No data on trends in yield. No tanks at risk of wind damage. Faulty drainage around the source, and a latrine or sewer within 100m of the pumphouse.

Table S6. Rationale for assigning management indicator scores.

Management indicator score (from 1 to 5)	Rationale for the score
1	There is no drinking water user committee. Residents brought pipes and 3 households contributed money to develop the source. Residents volunteer to clean and repair the source when needed.
2	Some perception of changing climate patterns in the region; Awareness of link between rainfall, open defecation and threats to water quality and disease; some training in water quality, source repair and conservation but no training in risk assessment or management; there are 2 female members on the committee (in charge of locking up the source at night and managing conflict) but none in leadership positions
1	No formal management committee and no women are involved in managing the source. One person is in charge of repairing the source. No user tariff is collected. Frequent mechanical issues with the handpumps due to overuse. Frequent repairs needed, but not everyone in the community can afford to contribute money to pay for repairs. Some perception of changing climate patterns and the threats to water availability and some awareness of climate change. No water quality testing is done.
4	The committee has received trainings in water safety plans and water treatment. Strong financial capacity with bank balance for emergency use on service improvement, support from the central government on trainings and capacity buildings. President of management committee has a basic understanding of climate change and adaptive management with the ability to response the scheme activities as per the climate change initiatives (e.g., action plan for water recharge and seasonal water quality testing).

	Representation of women in management committees as per the provision of Government of Nepal (33 %).

Table S7. Rationale for assigning institutional support indicator scores.

Institutional support indicator score (from 1 to 5)	Rationale for the score
Institutional support: 2	The woreda supports the WASH committee for doing repairs by assigning a technician and provides some spare parts for free, but the committee does not perceive this support to be adequate. There is little concern about climate change in the woreda office. The committee met the woreda office one year ago but there were no discussions about climate change.
Institutional support: 1	The community has not received any funding or technical support from the local government. The local government has provided money to construct toilets but water supply is low priority.
Institutional support: 1	The government has not provided support for this water supply. Residents have not informed the ward about the challenges with their water supply.
Institutional support: 3	Local government has provided training to water supply managers; has provided support to develop a water quality testing laboratory, quick response on addressing emergency issues with water supply management.

Table S8. Rationale for assigning community governance and engagement indicator scores.

Community governance and engagement indicator score (from 1 to 5)	Rationale for the score
4	Equal participation of women and men in WASH committees. All members of the community decide whom to nominate to be on the WASH committee, but no special considerations are given for women or young community members. Community meetings are held once every two weeks. Water sharing and allocation rules are in place.
2	The community cooperates and contributes money to maintain the boreholes if they can afford to. There is some conflict over the boreholes because of high demand for water.
4	Less participation of women than men in WASH committees. All members of the community decide whom to nominate to be on the WASH committee, and the committee has a strong engagement with the community including AFOSHA. The community has been participating in keeping the area around the source clean. Water sharing and allocation rules are in place. Owners of private wells provide water in times of water shortage and the WASH committee supports them by providing materials.
2	Users less likely to be involved in the scheme management and water user committee manages everything by themselves. Advise from the community groups are only sought for important regional issues. The elected management committee makes all major decisions. Limited inclusion from the marginalized community on the water management

Table S9. Rationale for assigning supply chain indicator scores.

Slope classification	Slope angle	Slope percentage (rise over run)
Gentle	up to 7°	up to 12%
Moderate	7° -17°	12-30%
Steep	above 17°	above 30%

Table S10. Slope classification used to score water supplies on the environment indicator.

Supply chain indicator score (from 1 to 5)	Rationale for the score
2	There are 2 markets for consumables and spare parts, but these towns are both far away from the community. No surplus parts are stored locally.
2	Spare parts and consumables are available in 3 towns: Kersa, Dire Dawa and Harar; WASH committee members travel to the markets by public transport. Minor repairs are done in 2-3 days but sometimes it can take up to a month. It is expensive to make these trips repeatedly because of the cost of transportation. No surplus parts are stored locally.
2	Spare parts and consumables are available in 3 towns: Kersa and Haramaya; WASH committee members travel to the markets by car. Minor repairs are done in 2-3 days, and this time does not change in the rainy season. Sometimes it takes time to check the availability of required materials, which can delay repairs by up to a month. There are no roads or bridges that get flooded or damaged in the rainy season. No surplus parts are stored locally.
4	Multiple sources of consumables and parts, multiple routes exist between community and the market. There is very low risk of damage to roads, bridges or mobile communication networks from natural hazards at this area as the area lies on the flat surface of Terai region. Even if the landslides occur on the connection roads, quick action is taken to reopen the transportation. Well maintained storerooms are available with sufficient spare parts (e.g., pipes, fittings, and water treatment chemicals)