



Climate Risk Assessment: KISII WATER AND SANITATION COMPANY (KWASCO)

Purpose & Scope

This climate risk assessment is prepared for **KWASCO** as part of the Water Resilience Solutions Hub (WRSB), a facilitated collaboration platform connecting Kenyan and Ugandan water utilities with WASH innovations to build climate resilience. Its purpose is to translate the utility's operational experience of climate-related stress into a structured overview. This is meant to ground the subsequent enterprise matchmaking and co-design phase in prioritized challenges and potential entry points that build on the realities of the WSP.

The assessment is limited to KWASCO's own service area, assets and operations within the current planning horizon, and draws on operational data, staff input and site observations rather than a full engineering or hydrological study. The scope covers the utility's operational exposure to climate challenges, distinguishing climate symptoms from root causes to provide pointers towards potential types of solutions. Based on the engagement with the WSP it further identifies entry points for short and longer-term mitigation options and potential for collaboration with WASH enterprises and innovators.



PPC under the WRSH

The WRSH seeks to foster Public Private Collaboration (PPC) that goes beyond conventional infrastructure contracting. We are not seeking one-off arrangements in which a private company builds or installs infrastructure, is paid, and the engagement ends there. Instead, we are interested in longer-term collaborations in which WASH enterprises take on an ongoing operational role, assuming delegated responsibility for specific tasks or service areas that currently sit with the utility. What unites these models is that the **enterprise takes on genuine, ongoing operational responsibility, relieving the utility of specific recurring burdens while directly addressing one of its priority climate challenges**. The utility retains overall ownership and oversight, while the private partner brings specialized capacity, technology, or financing to sustain performance over time, rather than delivering a fixed asset and stepping away.

Concretely, this could take a variety of forms depending on a utility's needs and priorities like the following examples:

- Wastewater treatment could be offered as a service, with an enterprise designing, financing, and operating a treatment facility and being paid for the treatment delivered. This would spare the utility the upfront capital outlay for the plant and the need to build and maintain in-house wastewater treatment expertise, while still securing reliable treatment performance and treated wastewater as an alternative water source to reduce pressure on water supply.
- Pressure or water quality monitoring could be handled through an enterprise's own sensor and data systems, deployed and maintained at the enterprise's expense, while the utility would commit to paying for water quality data. Like this the utility avoids the upfront investment in monitoring equipment, does not need to establish its own procedures and staffing for pressure or quality management, and instead reliably receives the data it needs to monitor pressure surges or declines in water quality to respond to emerging challenges and builds more resilient management of its network.
- A specific network section or district metered area that is exposed to specific climate challenges (land slides, flooding / pressure surges or limited water supply) could be placed under a performance based contract or delegated management, with an enterprise taking on day-to-day operational responsibility for that zone (covering, for instance, non-revenue water reduction, meter management, or preventive maintenance) so the utility is relieved of an operational burden in that zone without having to expand its own establishment, while benefiting from an operator whose performance incentives are aligned with keeping that section running well.

System & Setting



SOURCING

KWASCO operates six water-supply schemes, predominantly supplied from rivers, with Kigati as the main scheme. Installed treatment capacity is around 33,000 m³/day, while current production is around 15,000 m³/day against estimated demand of approximately 20,000 m³/day.

The Gucha River is the main source for the Kigati system. Its catchment is intensively farmed, including cultivation close to riverbanks, with limited catchment protection. This contributes to erosion and sediment loads during heavy rainfall. Catchment management is largely outside KWASCO's mandate and falls under the Water Resources Authority.

Water availability has historically not been a major constraint, although lower river levels are becoming more noticeable in dry periods. At the same time, KWASCO is planning significant network expansion, including around 4,500 additional connections, making reliable source availability and production increasingly important.

TREATMENT & WATER QUALITY

KWASCO operates four water treatment plants, which provide around 90% of total production. The largest has a design

WSP INTRODUCTION

- Kisii County, Kenya
- Service: ~1.8 million people in application service area, ~600,000 served, 33% coverage
- Connections: 18'900; 9'000 unbilled
- Tariff: Rising to 90–105 KES/m³ (from 75–90) in ~3–4 months
- Main scheme: Kigati, one zone now on 24h supply
- Revenue: 22 million KES/month

capacity of approximately 27,500 m³/day and the other three plants are older.

KWASCO has its own laboratory and conducts water-quality testing in-house three times per day, with sampling at treatment plants and end-user level, complemented by quarterly external testing. Treatment adjustments remain partly manual.

Raw-water quality deteriorates during heavy rainfall, with high turbidity and sediment loads increasing treatment requirements and periodically forcing the main treatment plant to stop production.

KEGATI INTAKE AND TREATMENT WORKS



NRW

NRW remains high at around 56%, although it has declined substantially from 77% four years ago. Progress has recently plateaued, with both physical and commercial losses remaining significant.

KWASCO has around 18,900 connections, of which approximately 9,000 are currently unbilled, and around 7,000 meters require replacement. Parts of the distribution network are old and poorly structured, with frequent bursts particularly in the CBD.

System visibility remains limited. DMA and zonal meters are largely non-functional or inaccurate, and network and NRW data are spread across several systems. KWASCO has a dedicated five-person NRW unit and is gradually introducing improved metering and monitoring, including tank monitoring and better-instrumented DMAs.

STORAGE, PUMPING & ENERGY

KWASCO's system is highly dependent on pumping, with electricity accounting for around 40% of operating costs. The main treatment plant alone has an electricity cost of approximately KES 5.4 million/month, compared with average utility revenue of around KES 22 million/month.

KWASCO has already introduced solar pumping at selected sites, including the Milimani solar booster, which pumps water uphill to a 650 m³ reservoir for subsequent gravity distribution. However, operational issues such as sediment entering pumps and leakage from storage infrastructure affect system performance.



SANITATION

Sewerage coverage is very low, at less than 10% of connections. KWASCO operates a central wastewater treatment plant with a reported capacity of around 3,200 m³/day, currently treating approximately 1,800 m³/day. The plant is underutilised largely because of the limited sewer network and number of connected properties.

Onsite sanitation therefore remains important. KWASCO operates 1–2 exhauster trucks, alongside eight registered private exhausters. Dried sludge from the treatment plant is collected by farmers, but there is currently no systematic quality testing, guidance for agricultural use, or commercial reuse model.

The sewer network is also vulnerable to landslides and heavy rainfall, which can damage exposed sewer lines and result in wastewater entering the environment.

Climate Context

Kisii is a high-rainfall highland county, generally receiving around 1,400–2,000 mm of rainfall annually. Rainfall is highly variable, with both intense rainfall events and seasonal dry spells already affecting the county. Kisii’s 2023 climate risk assessment identifies prolonged dry spells, floods and landslides among its main climate hazards.

Recent years illustrate the intensity of rainfall events. During the 2024 long rains, western and central highland areas experienced above-normal rainfall and widespread heavy-rainfall impacts. Kisii station recorded 379.5 mm in April and 300.6 mm in May 2024. The 2026 long-rains outlook again indicated uneven rainfall distribution, intermittent dry

spells and the potential for heavy downpours across the western highlands.

Climate projections point towards greater rainfall variability and stronger extremes, rather than simply more rainfall overall. Heavy rainfall events are expected to become more intense, while dry periods are also expected to become more pronounced. This means: intense rainfall increases exposure to erosion, landslides and deteriorating raw-water quality, while longer dry periods can place increasing pressure on river flows and water availability.

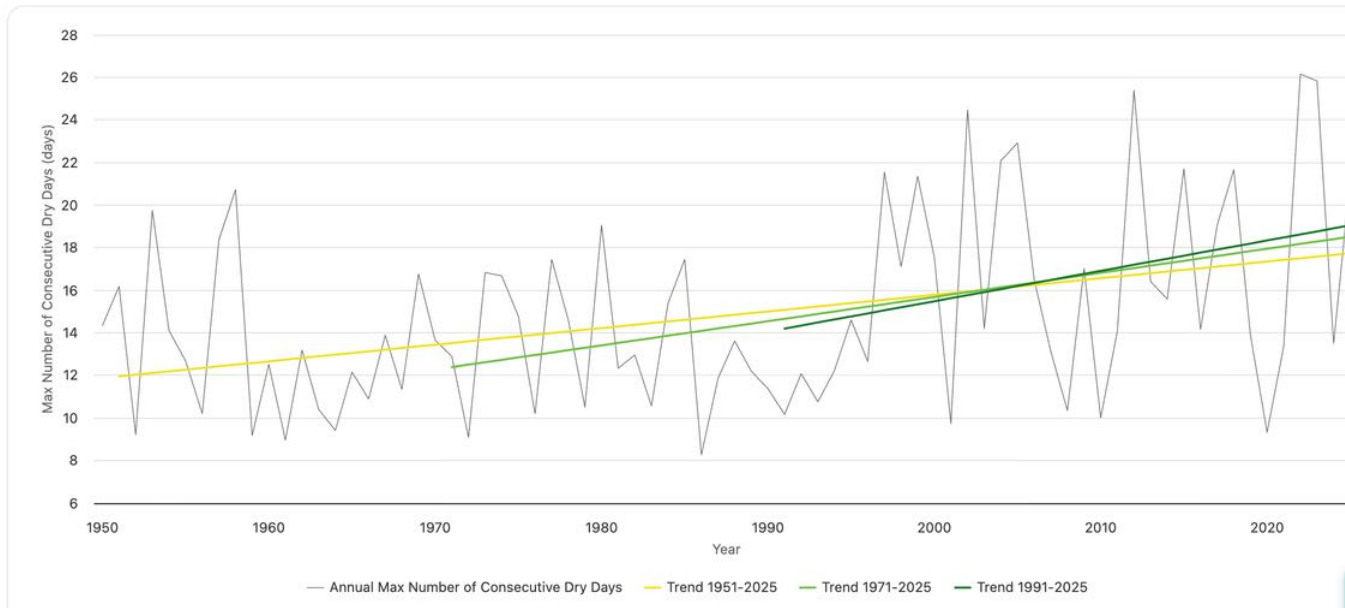
Sources:

- Kisii County PCRA (2023); KMD State of the Climate in Kenya 2024; KMD Western Kenya Highlands Climate Bulletin, May 2026; MoALF/CIAT Climate Risk Profile: Kisii County; World Bank Climate Change Knowledge Portal – Kenya Climate Data and Projections.

Observed Trends per Decade for Different Periods, Max Number of Consecutive Dry Days

Kisii, Kenya • 1950-2025

EXPAND
DETAILS



Assessment Summary

KEY CLIMATE RISKS

Five main climate risk candidates were prioritized for KWASCO ahead and during the site visits:

- high turbidity & water quality pressure affecting treatment and production
- high NRW, ageing infrastructure & network vulnerability
- pumping & energy pressure
- sanitation & FSM gaps

Each is addressed in its own section on the following pages.

POTENTIAL ENTRY POINTS

Around the risk various potential entry points for PPC were identified.

- WWTP monitoring, automation & operational optimisation
- performance-based NRW, metering & DMA management
- energy-efficient and resilient pumping services
- wastewater/FSM operations & resource recovery

These entry points are indicative not meant to be exhaustive and enterprises are encouraged to propose other collaborative solutions.





High Turbidity & Treatment Pressure

33,000 vs 15,000 m ³ /day	5,099,420 KES/month	758,964 KES/month	324 hours/year
installed vs. actual treatment capacity	water treatment costs (energy and chechemicals)	average monthly chemical cost for water treatment	production lost due to high turbidity

Strong rainfall event cause rapid changes in raw-water quality, with turbidity increasing from around 50 NTU under manageable conditions to around 10× this level. Once turbidity exceeds what can be managed through dosing, the main plant may need to stop production for several hours until conditions improve. High turbidity also increases backwashing and wet-well desilting and affects equipment.

KWASCO has already invested in a well-equipped in-house laboratory, with turbidity testing three times per day and an established sampling plan. A proposal is in development for monitoring and automation of both the treatment plant and WWTP, covering water quality, dosing, pumps and valve control. This has not yet been implemented, as laboratory investment has been the priority so far.

High-turbidity conditions occur for around three months per year and roughly double treatment costs, mainly through higher chemical use and additional treatment requirements. This creates a significant seasonal operational and financial burden.

A large share of production is concentrated in one main treatment plant, making it a strategic intervention point: improvements at a single facility could have a significant effect on overall production reliability and treatment performance.

ENTRY POINT

Treatment automation & monitoring — continuous turbidity and water-quality monitoring, automated/responsive dosing and remote monitoring and control of key plant operations, building on the existing laboratory and planned automation proposal.



High NRW & Network Vulnerability

56%	~9,000	~7,000	6 landslides
current NRW	unbilled connections	meters requiring replacement	affecting mains last rainy season

NRW has fallen substantially from 77% four years ago to 56%, supported by pressure management and faster burst repairs, but progress has now plateaued above the 45% target. Commercial losses are increasingly the constraint, with around 9,000 unbilled connections, old or broken meters and persistent illegal connections.

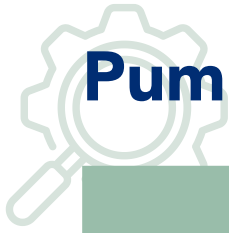
KWASCO has a dedicated five-person NRW unit, meter-testing capacity, NRW patrols, billing audits and rapid burst-response procedures. It has also introduced Mobi-Water tank-level monitoring at four tanks, while a KfW last-mile programme will establish 2–3 better-instrumented DMAs in the CBD.

Metering and system visibility remain weak. Around 7,000 customer meters require replacement, while existing zonal meters are often non-functional or inaccurate, making weekly zone water balances unreliable. Old and fragmented network sections, particularly in the CBD, continue to experience frequent bursts.

A concrete next step is already under development: a proposal with Aqua for All and Cooperative Bank for 1,500 smart meters, focused on commercial and high-use customers, with an investment of around KSh 50 million and a completed cost-benefit analysis. This could provide a basis for better consumption monitoring and commercial-loss reduction.

ENTRY POINT

Smart metering & NRW management: build on the proposed 1,500-meter investment and new KfW DMAs to improve customer and zonal metering, integrate flow and billing data, and identify losses. As reliable baselines develop, selected zones could move towards performance-based NRW management.



Pumping & Energy Pressure

~40%	~KES 5.4M/month	280 m ³ /hour each	21 kWp
of operating costs spent on electricity	electricity cost at the main treatment plant	installed pump capacity at main treatment plant	solar pumping booster station

The main treatment plant has substantial installed pumping infrastructure, with six raw-water and six treated-water pumps, each rated at 280 m³/hour, as well as an existing pump control panel. It currently operates for only around 13 hours/day, with production substantially below installed treatment capacity.

KWASCO has already demonstrated interest in solar pumping, including the Milimani booster. The next step would be to identify other high-energy pumping sites where solarisation, pump rehabilitation or replacement, improved controls and operational optimisation could generate sufficient savings to justify investment.

ENTRY POINT

Solar pumping & energy efficiency — identify high-energy pumping sites and assess solarisation, pump optimisation and efficiency retrofits, potentially through a performance- or service-based model linked to verified energy savings.





Sanitation & FSM Gaps

<10%	~1,800 m ³ /day	~3,200 m ³ /day	~10
sewerage coverage	currently treated at the WWTP	WWTP treatment capacity	1–2 KWASCO + 8 registered private exhauster operators

With less than 10% sewerage coverage, most of the service area depends on onsite sanitation. Faecal sludge collection is already largely privately provided, but the overall service chain from emptying through treatment and safe disposal or reuse remains weak.

Heavy rainfall and landslides create an additional climate risk by damaging exposed sewer lines and causing wastewater releases. Some damaged sections have only been temporarily protected, leaving them vulnerable to repeated failure during future rainy seasons.

At the same time, the sanitation system is expanding. The WWTP still has unused treatment capacity, while planned KfW sewer expansion and last-mile connections should increase wastewater flows. Schools and other potential customers have also expressed interest in connecting.

This creates an opportunity to strengthen both sewered and onsite sanitation as one system. In particular, the existing private exhauster market could be better integrated with WWTP operations, while improved sludge quality control and guidance could support safer agricultural reuse.

ENTRY POINT

Faecal sludge management as a service — build on the existing private exhauster market through clearer service arrangements, coordinated collection and delivery to the WWTP, and potentially quality-controlled sludge treatment and reuse. This could develop into a longer-term service model rather than additional utility-owned trucks.

Considerations for internal measures

Based on the assessment, there are a few initial areas that may be worth exploring with KWASCO. These would need to be discussed further to confirm their relevance and practicality.

- Extend the existing GIS to landslide-prone areas: Overlay slope and landslide risk with existing leak/burst data to identify recurring failure points and better target protection and budgets.
- Strengthen slope protection: Improve gabion siting and explore complementary slope bioengineering.
- Integrate Kenya Met forecasts into operations: Plan pre-rains protection, pre-position crews and materials, and allocate maintenance budgets seasonally to reduce the 1–2 weeks of disruption per landslide event (KES 3.3M in repairs last season).
- Update the Water Safety Plan to incorporate climate risk: Build on last year's WSP to make climate risks and corresponding preventive measures part of ongoing operational planning.



cewas

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