USE CASES - Digitalization of the Water Sector

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This document lists the use cases to be used as part of the "Digitalization of the Water Sector" thematic call. It aims at developing sustainable services leveraging space assets and technology in consort to address key challenges and opportunities to develop operational solutions. The use cases presented focus on water sustainability and water resilience.

When writing the initial proposal (APQ/APQ+ proposal), the applicant will make clear which use case(s) their solution will address, if chosen from those listed here.

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Use Cases

1. Water Sustainability

According to UN-Water, water sustainability covers all the aspects needed to ensure a responsible management and use of water resources in a way that meets current human, environmental and economic needs without compromising the ability of future generations to meet their own needs. It includes: water quality monitoring, water availability management, water pollution and monitoring of industrial charges. The latter is particularly important in the industrial sector, which can significantly contribute to the pollution of water bodies if proper measures are not implemented. Key industries involved include textiles, agriculture, chemical, pharmaceutical and others.

Consultation with key partners have indicated the following topics as priorities:

- Water Quality Monitoring
- Water Availability Management
- Water Sanitation
- Monitoring of Industrial Discharge
- Water Pollution
- Global freshwater

Water Sanitation is also considered as part of the water sustainability as it deals with digitised sanitation systems that optimise data for operating efficiencies, maintenance, plus consumer use and health information insights.

2. Water Resilience

Water resilience encompasses the measures and systems required to ensure the efficient use of limited water resources, while minimizing the impacts of climate change, population growth, and aging or inadequate infrastructure. It involves the ability of water systems to anticipate, withstand, adapt to, and recover from disruptions. Key components include infrastructure monitoring, reduction of non-revenue water, prevention of sewage system failures, resilience to droughts and flooding, minimization of system losses, and the promotion of urban climate resilience.

Consultation with key partners have indicated the following topics as priorities:

- Infrastructure Monitoring
- High Non-Revenue Water
- Failure in Sewage
- Resilience to drought and flooding

- Infrastructure and system losses
- Urban climate resilience

Role of satellite technology and data

SatEO data are essential inputs for monitoring (near) real-time water quality indicators (e.g., turbidity, algal blooms, chlorophyll-a) and for forecasting and modelling future scenarios. EO data can determine the influence of environmental and anthropogenic variables driving impacts on watersheds and ecosystems. Satellite-based images can be incorporated into strategic modelling and operational workflows of water utilities and contractors for monitoring ground movement, which can impact the risk of pipe failure. EO data are essential also to analyse the impact of climate related events such as flooding and drought.

SatNav can be used for geo-location of local sensors underpinning GIS technologies and feeding into more accurate models of water catchment areas. IoT combined with remote sensing can be adopted to manage freshwater resources and improve water basin health through informed decision-making. Satellite imagery can contribute to identifying network anomalies and SatNav facilitate maintenance scheduling and coordination. GNSS Interferometric Reflectometry (GNSS-IR) is a method that can be used to measure water levels.

SatCom guarantee asset tracking and efficient responses also in remote areas and during emergencies situation to deliver water management data. SatCom supports as well early warning systems for droughts and floods.

GWOPA matchmaking opportunity

Companies interested in being connected with water and sanitation operators from the GWOPA network are invited to contact Kennedy Kamau - kennedy.kamau@un.org. Requests will be reviewed, taking into account the challenges identified in the GWOPA survey per country. Companies may indicate priority countries where their solution may be most applicable; however, this does not guarantee that connections will be made with operators in those countries.

Where relevant, an initial connection may be facilitated with potentially suitable operators. Participation in any pilot activity remains entirely at the discretion of the operators. Companies applying to the Digitalisation of the Water Sector call should note that Letters of Intent (LoIs) from pilot users are required; such operators may act as pilot users where appropriate.

The section below describes the challenges identified in the GWOPA survey on the needs of utilities on digitalisation results per country.

East and Southern Africa

Kenya · Sustainability + Resilience (3 operators)

- **Specific problems**: High NRW; meter reading and billing inefficiency; lack of sanitation data; lack of centralised, predictive, real-time monitoring systems; high WASH maintenance costs; inaccurate metering; inadequate asset and customer-area information.
- **Why a priority**: Revenue recovery; quality control; infrastructure planning; financial sustainability; predictive cost-efficient asset management.
- **Stage**: Mostly *planning stage*; one *currently implementing*.
- **Support wanted**: Data collection · data analysis · system integration · impact/performance analysis · sustainable centralised metering · digital meter management.
- **Initial technology ideas:** Satellite leak detection (soil moisture and chlorine signature anomalies); GIS asset mapping; high-resolution satellite imagery to identify illegal/informal connections; GNSS hand-held devices for meter coordinate capture; flood-zone hazard mapping for high-water-table areas.

Kenya · Sustainability only (1 operator)

- **Problem**: High NRW; declining raw water sources; limited real-time water-quality monitoring; inefficient resource allocation across the 20 utilities the agency supports.
- **Why a priority**: Sustainability, reliability and safety of services across multiple utilities (a regulator/agency response).
- **Stage**: Planning.
- **Support wanted**: Data collection · data analysis · impact/performance analysis.
- **Initial technology ideas:** Comprehensive Water and Sanitation Situation Survey supported by satellite imagery, remote sensing and GIS; IoT and SCADA for real-time monitoring.

Uganda · Resilience only (1 operator)

- **Problem**: NRW around **45%**, driven by bursts, leaks, old/poor-quality water meters; low service reliability.

- **Why a priority**: Estimated annual financial loss of **USD 1.2 million**; addressing this directly improves financial viability.
- **Stage**: Planning.
- **Support wanted**: Data collection · analysis · system integration · impact analysis.
- **Initial technology ideas:** Smart metering for real-time flow detection; geospatial imaging to map illegal connections.

Uganda · Sustainability only (1 operator)

- **Problem**: High NRW; water-quality monitoring; flood impacts.
- **Why a priority**: Climate vulnerability; service reliability; financial sustainability.
- **Stage**: Implementing and operational.

Tanzania · Sustainability + Resilience (2 operators)

- **Problem**: High NRW (utility 1); water pollution and turbidity, asset management, non-automated production and distribution networks, with pollution coming from small-scale gold mining and agricultural activity (utility 2).
- **Why a priority**: Financial risk, service reliability, health risk.
- **Stage**: Mix of planning, implementing, operational.
- **Support wanted**: Data collection · analysis · integration · impact analysis.

Zimbabwe · Sustainability + Resilience (1 operator)

- **Problem**: Persistent challenges across many urban utilities; capacity-building organisation perspective.
- **Why a priority**: Sustainability, reliability and safety of services; public health, economic growth.
- **Stage**: Planning and implementing.
- **Support wanted**: Capacity-building modules; mentorship and technical backstopping for local authorities.
- **Initial technology ideas:** Sees space-based and terrestrial tech as transformative; needs guidance on adaptation to local context.

West and Central Africa

Nigeria · Sustainability + Resilience (2 operators)

- **Problem**: High NRW (apparent and real losses); insufficient skilled staff; insufficient grid energy; lack of digitalisation; no regular power supply.
- **Why a priority**: Financial loss; sustainable potable supply; revenue; operational cost recovery; staff skills.
- **Stage**: Planning and implementing.
- **Support wanted**: Data collection · analysis · system integration · impact analysis.
- **Initial technology ideas:** Capacity building, data digitalisation noted by one respondent.

Nigeria · Sustainability only (2 operators)

- **Problems**: High NRW and infrastructure failure observed across utilities (regulator perspective); infrastructure failures (utility perspective).
- **Why a priority**: Reducing financial and operational losses; service reliability with maintained infrastructure.
- **Stage**: Planning.
- **Support wanted**: Impact analysis · data collection · analysis · integration.

Senegal · Resilience only (1 operator)

- **Problem**: Flooding and wastewater management.
- **Why a priority**: Health risk.
- **Stage**: Implementing.

Arab States

Egypt · Resilience only (3 operators)

- **Problem**: Monitoring industrial discharges; predicting rainfall events; measuring inflows to treatment plants.
- **Why a priority**: Public health protection; reduced operational costs; service reliability; resilience to climate-related flooding and pollution.
- **Stage**: Planning.
- **Support wanted**: Impact/performance analysis.
- **Initial technology ideas already shared**: Satellite rainfall forecasting; remote sensing for flood prediction; IoT-based sensors for industrial discharge and inflow monitoring.

Egypt · Sustainability only (1 operator)

- **Problem**: Water scarcity; quality risks; climate change impact.
- **Why a priority**: Public health; economic stability; service reliability.
- **Stage**: Implementing.
- **Support wanted**: Data collection · analysis · impact analysis.
- **Initial technology ideas:** Remote sensing of hydrological parameters (river flow, reservoir levels, groundwater recharge, surface water extent); real-time decision support.

Jordan · Sustainability + Resilience (2 operators)

- **Problem**: Water scarcity; high NRW; water-quality risks; lack of institutionalised water and sanitation safety plans; climate change impacts on water resources.
- **Why a priority**: Drought is dropping groundwater aquifers and reducing surface flow.
- **Stage**: Implementing.
- **Support wanted**: *"Transfer of knowledge between utilities in Arab Region through restructuring the WOPs at the regional level"* : explicit ask for a regional WOP-based delivery model, not just technology.

Palestine · Resilience only (1 operator)

- **Problem**: Insufficient water supply; demand exceeds supply; **NRW around 40%**; high energy expenses; deteriorated wastewater pumping stations; outdated water safety plans.
- **Why a priority**: Water quality, lifestyle, financial impact, transboundary issues, climate.
- **Stage**: Not yet started.
- **Support wanted**: Data analysis · system integration.
- **Initial technology ideas:** Leak detection campaigns and data analysis to reduce NRW.

Palestine · Sustainability + Resilience (1 operator)

- **Problem**: High NRW directly draining finances; high operational expenses for maintenance; need for digital transformation.
- **Why a priority**: Financial drain from NRW; high cost of network maintenance.
- **Stage**: Implementing and operational.

- **Support wanted**: Data collection · analysis · integration · impact analysis · technology systems.
- **Initial technology ideas:** SCADA or AI; smart meters for bulk system or pre-meters for households.

Palestine · Sustainability only (1 operator)

- **Problem**: Lack of source water for domestic use; high O&M costs; network losses across multiple sites.
- **Why a priority**: Reducing maintenance cost and network losses.
- **Stage**: Implementing.
- **Initial technology ideas:** SCADA, AI methodology.

Asia

Nepal · Sustainability + Resilience (2 operators)

- **Problem**: NRW around **29%**; no underground leak detection capability; rainy-season turbidity in stream water source; spring-source drying; pipeline leakage; unbilled water; faecal contamination in drinking water; river pollution; need for a WASH plan.
- **Why a priority**: Cannot supply needed quantity to users; revenue loss; public health; financial sustainability; climate resilience.
- **Stage**: Operational (utility 1); planning (utility 2 : Godawari Municipality).
- **Support wanted**: Data analysis · impact analysis · NRW calculation.
- **Initial technology ideas:** First exposure for one respondent; the other (Godawari) sees clear potential for satellite/digital tools to support NRW calculation and system digitalisation.

Philippines · Sustainability + Resilience (1 operator)

- **Problem**: High NRW; water-quality risks; infrastructure failures; drought and flood; climate change; earthquake exposure.
- **Why a priority**: Financial loss, service reliability, climate vulnerability; goal is to become a more sustainable and proactive utility.
- **Stage**: Planning and implementing.
- **Initial technology ideas:** New to space-based/terrestrial tech; explicitly open to engagement.

Latin America

Argentina · Resilience only (1 operator)

- **Problem**: High NRW; water-quality risks; failures in main sewers.
- **Why a priority**: Operational efficiency; service reliability.
- **Stage**: Implementing.
- **Initial technology ideas:** Early-warning systems for water-quality risks; soil-erosion identification around main pipes to reduce collapse risk; leak detection.

Bolivia · Sustainability only (1 operator)

- **Problem**: Data governance and energy efficiency *(responses in Spanish : translation provided)*.
- **Why a priority**: Financial losses; performance improvement.
- **Stage**: Planning.

Colombia · Sustainability only (1 operator)

- **Problem**: Water losses; water-quality monitoring limitations; climate variability impacts.
- **Why a priority**: Service reliability; operational and financial losses; public-health risks.
- **Stage**: Not yet started : early opportunity for partner involvement in design.
- **Support wanted**: Data analysis · technical support for digital monitoring system design including sensors and data platforms; staff capacity-building; financial support; access to satellite data and analytics tools.
- **Initial technology ideas:** Satellite data for source monitoring and climate pattern tracking; terrestrial sensors for drought/flood risk identification.

Honduras · Sustainability + Resilience (1 operator)

- **Problem**: Equipment and infrastructure failure.
- **Why a priority**: Climate vulnerability.
- **Stage**: Planning.

Caribbean

Dominica · Sustainability + Resilience (1 operator)

- **Problem**: Ageing infrastructure; flooding susceptibility; high NRW.

- **Why a priority**: Financial loss; service reliability.
- **Stage**: Planning.
- **Support wanted**: Data collection · analysis · integration · impact analysis.
- **Initial technology ideas:** GIS for utility management : already aware of regional sister-company examples.

Trinidad and Tobago · Sustainability + Resilience (1 operator)

- **Problem**: End-of-life infrastructure with limited financial resources.
- **Why a priority**: Sustainability and compliance.
- **Stage**: Planning.
- **Support wanted**: **Finance** *(explicit ask).*

Western Europe

Spain · Sustainability + Resilience (1 operator)

- **Problem**: Reservoir water quality; watercourse quality after rainfall wastewater discharge; emerging pollutants treatment; supply management efficiency.
- **Why a priority**: Service quality improvement; climate adaptation (scarcity and rainfall patterns).
- **Stage**: Implementing and operational.
- **Support wanted**: Data analysis · system integration.

Italy · Resilience only (1 operator)

- **Problem**: Digital solutions for NRW.
- **Why a priority**: Service reliability; climate vulnerability of infrastructure.
- **Stage**: Operational.

Netherlands · Sustainability + Resilience (2 operators)

- **Problem**: Collective intelligence : handling all available information and using digital solutions as a steering mechanism (utility 1); sewerage overflows, water pollution, high energy consumption of wastewater assets, wastewater reuse (utility 2).
- **Why a priority**: Setting priorities; training the right people; investing in the right challenges in the right sequence (utility 1); environmental pollution risk, health, financial sustainability, reuse potential (utility 2).

- **Stage**: Operational and planning.
- **Initial technology ideas:** Collective intelligence dashboards for collective impact; satellite data for wastewater reuse optimisation in WOP partnerships (specifically named: Jordan); aeration optimisation for wastewater treatment plants.

South-Eastern Europe

Bosnia and Herzegovina · Sustainability + Resilience (1 operator)

- **Problem**: High NRW.
- **Why a priority**: Financial loss; lack of water.
- **Stage**: Implementing.
- **Support wanted**: Data analysis · system integration.
- **Initial technology ideas:** *"Every solution is good if it can address our problem"* : pragmatic, open to options.
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Hungary · Sustainability + Resilience (1 operator)

- **Problem**: Water quality risks; infrastructure failures (old drinking water network, breakdowns); drought and flood; low water level of the Danube.
- **Why a priority**: Service reliability; climate vulnerability.
- **Stage**: Implementing and operational.
- **Support wanted**: Data collection · analysis · integration · impact analysis.

Turkey · Resilience only (1 operator)

- **Problem**: High leakage ratio; old infrastructure needing replacement; drought; salination of underground sources; migration-driven population growth.
- **Why a priority**: Sustainable, environmentally friendly, technological solutions for future generations.
- **Stage**: Planning and implementing.
- **Support wanted**: Data collection · analysis · integration · impact analysis.
- **Initial technology ideas:** Satellite data for surface water monitoring; leakage detection.

Eastern Europe

Ukraine · Resilience only (1 operator)

- **Problem**: **Operating under martial law and constant shelling.** Damage to critical infrastructure; energy and water supply disruptions.
- **Why a priority**: Threat to civilian water supply; need to maintain service continuity in conflict.
- **Stage**: Implementing.
- **Support wanted**: Integration with existing system.