

Eastern Africa Regional Workshop on Wastewater Surveillance for Environmental and Public Health

International Livestock Research Institute (ILRI)

Nairobi, Kenya

ILRI Nairobi-Campus, off old Naivasha Road: Vercoe Auditorium (VA)

20th to 22nd May 2025



Eastern Africa Regional WES Stakeholders Group photo during the workshop held at ILRI-Nairobi Campus-off old Naivasha.

Executive Summary

The Eastern Africa Regional Wastewater Surveillance Workshop was organized by the International Livestock Research Institute (ILRI) in collaboration with the United Nations Environment Programme (UNEP) and the World Health Organizations (WHO) under the Wastewater Surveillance for Africa Initiative (WWS), led by UNEP and funded by the European Union Health Emergency Preparedness and Response Authority (HERA). The meeting strengthened the capacity for wastewater and environmental surveillance (WES) across Eastern Africa, bringing together over 50 public health and environmental experts from 10 African countries. The hybrid event included presentations, site visits, and networking opportunities, with a focus on fostering collaboration between health and environmental sectors in Eastern Africa. Participants shared information about ongoing initiatives, challenges, and opportunities related to WES across Eastern Africa, emphasizing the need for harmonized approaches, capacity building, and cross-sectoral collaboration. Furthermore, the participants discussed the importance of wastewater surveillance in early detection, tracking, and response to health threats, particularly in resource-limited settings.

The meeting also reviewed the capacity needs assessment surveys and capacity gaps in WES systems across different countries, highlighting challenges in data sharing, laboratory capacity, and infrastructure. The meeting emphasised the need for collaboration between ministries, the benefits of wastewater surveillance for disease assessment, the importance of building technical capacity and a WES harmonized approach for the region and the continent. The workshop included presentations on One Health perspectives, water quality monitoring and specific surveillance projects in various countries, concluding with plans for participants to develop country-specific action plans and next steps for implementation of WES upon return to their own countries.

Additionally, the workshop deliberated on the need to utilize opportunities for WES in various settings including non-sewered communities, airports, ports, and coastal cities in the Eastern Africa region. Participants engaged in interactive exercises to identify priorities, challenges, and actionable steps for developing a regional roadmap for WES systems in Africa. Generally, the findings and gaps identified the need to strengthen governance, review policy gaps, develop competency frameworks, consider decentralized solutions, benchmark best practices, invest in innovation, optimize financial resources, and consider environmental and climate resilience in the region. Thus, the feedback received from participants on the roadmap focused on multi-sectoral coordination, prioritizing WES targets, technical and operational capacity, and sustainable financing. The workshop concluded with plans for future regional capacity building initiatives, including online training webinars, and resource/partnership mobilisation to support the implementation of the Wastewater Surveillance for Africa Initiative (WWS) in Eastern Africa.

The Wastewater Surveillance for Africa Initiative (WWS) in Eastern Africa contributes to UNEP's '*Preventing and Addressing the Degradation of Freshwater and Marine Ecosystems from Source to Sea*' project, which promotes a Source-to-Sea approach to address wastewater, nutrient pollution, and habitat degradation. The workshop advances multiple project targets to protect freshwater and marine ecosystems from land and sea-based harmful activities, including: (Summary of results)

- enabling and increasing stakeholders, including women and youth, that use scientific knowledge and share best practices via digital platforms, with UNEP's support (Outcomes 3.1 & 3.2),

- supporting more countries to strengthen cross-sector coordination and integrated approaches (Output A3),
- expanding capacity development and training government officials, with knowledge gains documented on freshwater (Outputs B2 and B3),
- developing and training on socio-economic assessment tools and methodologies made for multi-sectoral entities and stakeholders (Outputs C1 and C2),
- and engaging stakeholders through webinars/trainings to change behaviour to increase awareness, access information, including but not limited to digital platforms/hubs, and acquire new knowledge and drive action (Outputs D2, D3 and D4).

Introduction

Infectious diseases cause 15 million deaths annually, disproportionately burdening low-and middle-income countries. Similarly, wastewater pollution impacts human health and the environment alike, especially marine and freshwater ecosystems. To combat diseases and aquatic pollution, a dynamic global response is needed, including early detection and innovative surveillance methods like wastewater and environmental surveillance (WES). In Africa, the burden of infectious diseases is high, and early detection is crucial. The United Nations Environment Programme (UNEP) is the leading global authority on the environment. UNEP supports countries during their transition to low-carbon and resource-efficient economies, strengthening environmental governance and law, safeguarding ecosystems, and providing evidence-based data to inform policy decisions. UNEP works closely with governments and relevant stakeholders to protect freshwater and marine ecosystems, addressing land-based sources of pollution, including wastewater, from source to sea. The potential of WES became prominent in relation to poliovirus and was greatly accelerated during the COVID-19 pandemic. WES activities were implemented in many global settings and provided an important line of data to support early detection of viruses causing COVID-19 waves. In addition, WES has potential to provide useful data to tackle land-based sources of pollution, maintain ecosystems services and protect freshwater and marine ecosystems. WES programmes are being established and expanded to a broader array of pathogens and other targets in many global settings including as part of early warning surveillance and pandemic preparedness. The African region has seen growing interest, with research, innovation and implementation of WES programs. However, action and information exchange across the whole of the African continent remains limited.

To establish and strengthen WES programmes in Africa, there is a need to build literacy among practitioners and stakeholders on the application and benefits of WES for ecosystem and public health. Exchanging knowledge and best practices from within the African continent and beyond is an integral part of this effort. UNEP is implementing a 30-month initiative called *“Support strategies, capacity and data for global wastewater and environmental surveillance,”* in short *“Wastewater surveillance for Africa (WWS),”* aimed at supporting governments and relevant stakeholders to establish and scale up WWS systems for environment and public health purposes in Africa.

Specifically, the initiative aims at:

- Developing WES strategies to contribute to pandemic preparedness and response in Africa.
- Developing capacity building strategies especially for low resource settings and in strategic locations.
- Contributing to global transparency in data exchange and enhance collaboration.

The initiative started in July 2024 and has four main outputs:

- 1) Harmonize monitoring approaches for WWS between regions of Africa for ecosystem and public health.
- 2) Foster enabling environments in all five African sub-regions to enhance coordination, good governance and scaling up of WWS.
- 3) Promote and facilitate knowledge exchange and outreach on WWS.
- 4) Enhance capacity building for wastewater monitoring on aircrafts and vessels involving at least 3 airports and 1 port in Africa.

The initiative is aligned with the goals of the [Global Consortium for Wastewater and Environmental Surveillance for Public Health \(GLOWACON\)](#), [the Libreville Declaration on Health and Environment in Africa](#), the UNEP-WHO Health and Environment Strategic Alliance (HESA), and aims to contribute to other existing initiatives or similar activities led by other key stakeholders. The target beneficiaries of the initiative are governments, including ministries of environment, water and health, private sector actors, academia, research institutes, national and international NGOs, development partners, and experts involved in WES in Africa. Some of the key partners include the [World Health Organization \(WHO\)](#), [the Africa Centres for Disease Control and Prevention \(Africa CDC\)](#), [the Global Wastewater Initiative](#), and other relevant national and regional stakeholders. The initiative is generously supported by [the European Union Health Emergency Preparedness and Response Authority \(HERA\)](#).

Eastern Africa faces unique challenges in wastewater management and surveillance capacity, with varying levels of infrastructure development across countries. Some countries are more advanced than others. There might be limited laboratory infrastructures and capacity, as well as resource constraints in implementing WES systems. Finally, data might not be easily shareable and available. At the same time, the region is home to great innovation, projects and examples of sustainable wastewater management and WES. The Eastern Africa regional workshop hosted by the International Livestock Research Institute (ILRI) in Nairobi, Kenya in collaboration with UNEP and WHO during 20-22 May 2025, brought together the main stakeholders from ten countries across Eastern Africa. The purpose of the workshop was to provide a platform for exchange of information, learning and discussions on how to strengthen capacity of member states and empower participants with tools and knowledge for sustainable WES systems. The workshop was generously supported by the European Union HERA and the UNEP.

Objectives

The overall objective of the workshop was:

1. To strengthen regional capacity for implementing and managing wastewater surveillance systems in Eastern African countries through knowledge sharing.
2. To support governments and relevant stakeholders to plan to establish, strengthen and/or scale up wastewater surveillance systems for environment and public health purposes.

The specific objectives included:

1. The identification of the most relevant needs for strengthening capacities on WWS in the target countries.
2. Discussion of a roadmap for wastewater surveillance for Africa.
3. Discussion of a harmonized approach to wastewater surveillance for environmental and public health purposes for Africa.
4. Transfer of knowledge across countries from Eastern Africa.
5. Fostering exchange of information across the region and strengthen regional networks for ongoing collaboration.

Methodology

The workshop adopted a participatory, hands-on approach to discuss the capacity gaps, challenges, and opportunities for implementation of wastewater surveillance for environmental and public health in Eastern Africa. It involved in person and virtual presentations, discussions, and Q&A sessions with national public health representatives, international experts, and environmental sector practitioners. The workshop also included specific training sessions for wastewater surveillance. Participants were government officials from 10 Eastern African countries, as well as academia, research institutes, non-profit organizations, private sector, and international organizations.

Expected outputs and follow-up

The expected outputs of the workshop were:

1. Increased knowledge, awareness and capacity among relevant stakeholders, especially government representatives from Eastern Africa on wastewater surveillance for environmental and public health is enhanced.
2. Strengthened regional capacity on wastewater surveillance, including exchange of data, information and best practices among Eastern Africa countries.
3. A harmonized approach, as well as a roadmap document and elements of a capacity needs assessment on wastewater surveillance are discussed and feedback from the participants is collected.
4. A workshop report documenting the proceedings of the event produced.

Eastern Africa Regional Workshop Deliberations and highlights

Session 1: Opening session and welcoming remarks

The opening session began with the introduction of participants from various countries and organizations, including government officials, researchers, and representatives from UN agencies, to discuss WES initiatives. During this session, emphasis was laid on the importance of health protection approaches, including wastewater monitoring, and the transformative value of WES for public health and environment. EU-HERA highlighted the need for infrastructure preparation and awareness across environment, water, and health, and the opportunity for long-term collaboration under the umbrella of GLOWACON for Africa. It was noted that the UNEP's Global Wastewater Initiative (GWWI) is focused on improving wastewater management globally, particularly in Africa where 30% of people lack access to basic sanitation. The European Commission is focusing on scaling up wastewater surveillance as a tool for early detection of infectious diseases, antimicrobial resistance, and emerging health threats. The International Water Management Institute (IWMI) promotes a one health approach, acknowledging competing uses of water by industry, agriculture, and growing urban populations. The session also laid out the role of UNEP and its partners in driving a wastewater surveillance initiative in Africa, aiming to improve public health and environmental management. To maximize the benefits of WES, the meeting deliberated on the critical place and the need to develop genomic tools for detecting pathogens, AMR, and pollutants in wastewater.

Session 2: Wastewater surveillance for environmental and public health: Setting the scene

In this session a presentation was made on wastewater surveillance, defining key terms and explaining its importance as an environmental indicator and public health tool. Taru Miller discussed the public health perspective, highlighting wastewater's role in monitoring community health and its advantages over clinical surveillance, and Popi Karaolia highlighted the role of wastewater surveillance for environmental protection. Josphine Wairimu Nduguti, representing UNEP, outlined the Wastewater Surveillance for Africa Initiative, which aims to develop strategies, build capacity, and enhance data sharing for environmental and public health across African regions. In this Initiative, WES is used in a broad, inclusive way to encompass both untreated and treated wastewater and other environmental compartments impacted by wastewater. In a public health context, WES is used more narrowly to include only environmental waters contaminated by human waste (inclusive of blackwater and/or greywater) as described in the WHO WES toolkit (<https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/sanitation-safety/wastewater>).

WHO representative Abdullateef Jiimoh, focused on environmental surveillance for polio and other pathogens, with highlights on its effectiveness in detecting viruses in sewage and wastewater. GLOWACON a global consortium launched in March 2024, was introduced by Anastasia Koutsolioutsou, who detailed its objectives, activities, and pilot programs, including airport and mass gathering event surveillance. The last two presentations emphasized the importance of early detection, preparedness, and collaboration in public health, with discussions on expanding sentinel systems globally.

Session 3: Wastewater surveillance for environmental and public health: capacity needs assessment and country elevator pitch

The session focused on wastewater surveillance challenges and opportunities across Eastern African countries, with presentations from Uganda, Ethiopia, South Sudan, Burundi, Somalia, Kenya, DRC and Rwanda, and discussions on regional collaboration. **Burundi** - The report revealed the multisectoral engagement in wastewater surveillance in Burundi. However, the country lacks capacity to treat the largest proportion of generated wastewater, which is a health hazard and raises public health concerns. The presentation also outlined limitations in the areas of WES infrastructure and financing. It also highlights the weak institutional setup and coordination, poor urban planning, and minimal focus on climate change mitigation. Opportunities identified included regional and global partnerships, capacity building, public private partnerships (PPP), academia/industry partnerships, regional collaboration, and opportunities for pilot projects.

Ethiopia – A presentation was shared on Ethiopia's surveillance activities, highlighting their extensive public health infrastructure and laboratory systems, including wastewater surveillance capabilities in Addis Ababa. He noted that while Ethiopia has made progress with wastewater surveillance during COVID-19, there are ongoing Challenges with system sustainability and resource mobilization.

Cecilia then presented on **South Sudan's** water and wastewater challenges, describing their single treatment plant in Juba which is overwhelmed by high nutrient levels and poor water quality, with only 68% of households having waterborne sanitation systems. While Ethiopia seemed to have very strong one health approach to WES budget, procurement challenges, sample collection bottle necks/site selection and lack of data sharing policies limit WES integration and implementation.

South Sudan faces severe water pollution and contamination due to a lack of a combined sewer system. Approximately 68% of households have waterborne sanitation systems, but the effluent quality is poor. Inconsistent water quality surveillance, inadequate equipment, and poor enforcement contribute to the issue. There is a lack of wastewater environmental surveillance plans, low capacity, and insufficient technical and human resource capacity. The country does have piped sewer systems, overflow of untreated wastewater, weak enforcement, and poor coordination. Lack of wastewater plan and environmental surveillance, low capacity, insufficient technical and human resource capacity. Establishing a WES system is necessary.

Uganda lacks wastewater treatment plants (WWTP) in rural areas, constrained by inadequate routine monitoring, and limited interagency cooperation. There is no legal framework for wastewater surveillance, no explicit regulations, and insufficient resources. There is also a lack of institutional and national wastewater surveillance databases, decentralized labs, and consistent sampling, analysis, and reporting procedures. Opportunities include independent programs, ministries' mandates, funding programs, and the existence of

human and infrastructural capacity. Strengthening inter-agency collaboration and incorporating wastewater surveillance in higher education curriculums is also suggested.

Somalia faces challenges in infrastructure, capacity, formal wastewater surveillance systems, systemic monitoring, lack of regulatory framework, and effective enforcement of environmental policies. Opportunities for comprehensive policies include regional collaborations, training initiatives, and zonal environmental agencies. Challenges include weak institutional capacity, inadequate water supply, and inadequate sanitation infrastructure.

The DRC lacks wastewater treatment systems, with some industries treating wastewater. The Ministry of Environment is working on requirements for industries and mining companies but lacks a database and suitable utility. Law enforcement measures are yet to be developed, and challenges include funds, insecurity, infrastructure, reagents, and bioinformatics.

Kenya lacks policies for WES, limited data on pathogen prevalence and AMR, and a comprehensive surveillance system. Opportunities include establishing standardized protocols and improving analytical methods.

Rwanda faces challenges such as limited infrastructure, poor sanitation access, and fragmented regulatory oversight. Opportunities include leveraging government support for One Health, developing national guidelines, establishing regional training hubs, piloting integrated climate and disease modeling, and utilizing open access data.

The presentations concluded with recommendations for strengthening surveillance systems, including capacity building, decentralized labs, and harmonized data collection and reporting. The meeting discussed the importance of collaborations and regional bodies for developing wastewater surveillance capacities across Africa. It highlighted the need for an integrated system, data sharing challenges, and policy frameworks for sensitive information. The meeting also discussed the challenges faced by African countries in wastewater surveillance, such as lack of centralized treatment systems, limited treatment infrastructure, and the need for integrated surveillance systems. The discussion also highlighted the need for policies, infrastructure improvements, and strengthening institutional capacities for effective surveillance. The meeting concluded with an upcoming field visit to a wastewater treatment plant.

Session 3: Capacity Needs Assessment for wastewater surveillance in Africa

The Session focused on reviewing a capacity needs assessment survey for WES systems across Eastern African countries. The findings showed varying levels of preparedness and capacity among countries, with gaps identified in database development, sampling strategies, and surveillance for pathogens like polio, antimicrobial resistance, and TB. The discussion highlighted the need for improved data sharing, better integration of auxiliary environmental data, and increased efforts in wildlife and livestock surveillance, with only about 40% of countries recognizing existing policy instruments that could support wastewater surveillance.

The discussion focused on challenges and gaps in WES across different countries, highlighting issues such as limited laboratory capacity, lack of infrastructure, and insufficient funding. Key concerns included the need for better integration between clinical and wastewater surveillance, the importance of data analysis capabilities, and the importance of political goodwill and strong governance to support these initiatives. The participants emphasized the necessity of building capacity, particularly in data analysis and communication, and suggested that organizations like GLOWACON could play a role in capacity building.

The survey aimed to identify the challenges in public health surveillance and disease burden, particularly in urban areas. Several challenges, including weak enabling policy environment, lack of WES infrastructure, limited technical capacity, lack of WES databases, and sampling methods. The survey findings reinforced the need for increased cooperation and information sharing between the environment and public health authorities. The biggest challenge is the lack of technical capacity building, which needs to be strengthened. There is a need for improved infrastructure at a national level, strengthened civil society organizations, and private sector technical capacity to support WES was emphasized. Training and expert knowledge are also needed for capacity building in the WES. The dichotomy of mandates and practices between public health and environmental WES is highlighted, with sequencing being the most commented on technology for improving WES capacity. Data analytics capacity needs to be enhanced as a skill, and knowledge and ability to stay up to date with the latest advances and available tools in WES are also needed. In conclusion, the survey highlights the need for improved WES, data integration, and site selection criteria to ensure effective surveillance and long-term planning.

Session 4: Sharing country experiences on wastewater surveillance for environmental and public health

Session 4 focused on training on wastewater surveillance and sharing country experiences for environmental and public health. The historical evolution of One Health was discussed, the concept of One Water and One Health, and the definition of WES within One Health. Wastewater is seen as the mirror of the community, and detecting AMR is crucial as treated wastewater can be used for irrigation.

The importance of environmental health and the upstream pollution effects on downstream communities were also discussed. Monitoring and modeling watersheds to determine pollutants' contribution to rivers and transitioning to healthier systems is essential for long-term planning. Site selection and involving all key stakeholders are crucial for gathering the necessary information.

Session 5: Wastewater and environment surveillance prioritization, implementation and integration framework for one or more pathogens

During this session led by WHO, the workshop participants had the opportunity to map their own WES-specific contextualized priorities for pathogens and associated surveillance objectives, through structured interactive group work drawing on the WHO draft WES toolkit. The interactive workshop session aimed to familiarize

participants with WHO resources for pathogen prioritization, implementation, and integration for public health and assist them in applying these tools to their own context. The WHO presented an overview of the tools in support of WES for public health, including a framework for WES for one or more pathogens: guidance on prioritization, implementation, and integration, and six pathogen-specific WES evidence summaries. This exercise helped the participants consider and identify their own public health priorities and surveillance gaps, and for which pathogens WES might contribute useful information.

The session followed a structured interactive session with work of country teams (with WHO facilitators: Dr. Guy Mbayo, Dr. Dahbia Leila Anes-Boulaabail, Dr. Abdullatif Jimoh) and of one team focused on transport hubs (with a UNEP facilitator). Six sequential exercises were followed to apply WHO tools and prioritize pathogens/diseases for human health surveillance as well as WES in the specific local context.

The outcomes of the exercise by country and transport hubs teams were summarized below. The Democratic Republic of the Congo (DRC) has already environmental surveillance of wastewater (WES) for poliomyelitis, with 26 sites and a monthly frequency of collection. The priority pathogens of interest include cholera, poliomyelitis, and Mpox, as well as other pathogens of interest such as *Mycobacterium tuberculosis*, malaria, *Yersinia* spp., and AMR. WES could address gaps in existing routine surveillance systems, enabling early warning, monitoring trends, and obtaining genomic data to analyze antimicrobial-resistant strains.

Djibouti has two sites for poliomyelitis collecting grab samples fortnightly, and cholera was chosen as the priority pathogen for discussing the use of WES. Djibouti selected this disease to track spatial and temporal trends of outbreaks, obtain genomic data, and evaluate response effectiveness. WES is used as a trigger signal in an agile surveillance approach to assess response effectiveness, but it cannot be used routinely due to the seasonal outbreaks.

Burundi has seven sites for poliomyelitis with monthly sample collection using the grab method. The prioritized pathogen for discussing the use of WES is cholera, selected for monitoring trends and obtaining genomic data. If a WES result is positive, it would enhance existing surveillance and support communication on the health situation. WES is considered a complementary alternative for human health, providing useful information to health structures. However, WES samples are not taken frequently, and results may take a relatively long time.

The Republic of the Congo (ROC) has WES for poliomyelitis, although the number of sites, technique used, and sampling frequency were not known by the team present. The priority pathogen of interest selected to discuss the use of WES is MPOX, chosen for early detection to track potential introductions of new clades, monitor hotspot trends and transmission chains, and obtain genomic information to monitor clade circulation through routine use. If a WES result is positive, it could strengthen existing clinical surveillance, enhance WES by increasing the number of sites and sampling frequency, support communication on the health situation to ensure continuous feedback, and serve to promote hygiene and vaccination.

Rwanda has an environmental wastewater surveillance (WES) system for poliomyelitis with 7 operational sites and monthly sampling using the Grab technique. The prioritized pathogen for WES implementation in Rwanda is SARS-CoV-2, aiming to enable early warning for surveillance and assist decision-makers in taking measures. If a

WES sample is positive, it could strengthen existing epidemiological surveillance and support communication with decision-makers.

However, some limitations exist, such as traditional surveillance overlooking people who do not seek hospital confirmation, WES faces challenges related to stigma and conflicts, and human data and WES data must be combined to strengthen planning strategies and vaccination.

In Uganda, there is a Water, Sanitation, and Hygiene (WES) system for poliomyelitis, with 11 operational sites and monthly sampling using the Grab technique. The Turnaround Time (TAT) for poliomyelitis is about 28 days. The prioritized pathogens for WES implementation in Uganda are Mpox, SARS-CoV-2, and influenza. Other pathogens of interest include MVD, EVD, and RSV. WES could play an important role in addressing gaps in existing surveillance systems, particularly for Mpox and SARS-CoV-2 in routine surveillance and for hemorrhagic fevers (VHF) in agile surveillance.

The prioritized pathogen for WES implementation in Uganda is Mpox, which aims to enable early warning in areas with limited clinical surveillance, track trends in areas where clinical data are already available and obtain genomic data where WES surveillance already exists. This surveillance is envisioned routinely. If a WES sample is positive, it could strengthen existing epidemiological surveillance with better case management and better public communication.

In South Sudan, there is a WES for poliomyelitis with 7 known sites, monthly sample collection using the Grab method of collection. The prioritized pathogen for WES implementation in South Sudan is cholera, which aims to enable early warning to implement prepared and preventive responses, monitor trends of human cases and affected communities, and obtain genomic data. This surveillance is envisioned routinely.

If a WES sample is positive, it could strengthen epidemiological surveillance with improved case management and better public communication. WES is seen as a complementary approach to strengthening clinical surveillance, providing more information on individuals and reducing costs while covering a large number of people. However, some limitations remain: traditional surveillance may lead to stigma and require intensive resources, and WES requires human resources and adequate supply. Key information to combine between human and WES data includes case information, population movements, and past epidemics.

In Kenya, there is a WES for poliomyelitis with 22 known sites, monthly sampling by the Grab method. The prioritized pathogens for WES implementation in Kenya are poliomyelitis, zoonoses and AMR, which aims to enable early warning for emerging diseases, track trends, and obtain genomic data to determine resistance.

In Somalia, there is a WES for poliomyelitis with 16 routine sites and 3 ad hoc sites collecting samples monthly. The prioritized pathogens for WES implementation in Somalia are hepatitis B and C, polio, and influenza. WES could play an important role in addressing gaps in existing surveillance systems, particularly for cholera on a routine basis, and for emerging diseases like *S. Typhi* using an agile approach.

In Ethiopia, there is an existing WES for poliomyelitis with 7 operational sites where wastewater sampling is carried out monthly using the Grab technique. The Turnaround Time (TAT) for poliomyelitis is less than one month. The priority of diseases is Polio, Cholera, and Mpox, with other pathogens of interest including measles, malaria, and dengue. WES could play an important role in filling gaps in existing surveillance systems, particularly for cholera on a routine basis, and for emerging diseases like S. Typhi using an agile approach.

Session 6: Interactive session on wastewater for environmental health/monitoring

The meeting focused on preparing an action plan for WES implementation, using a fictitious scenario of environmental pollution in a specific context. Team Ethiopia and Somalia presented their work plan on antimicrobial resistance and antibiotic residues in wastewater from coastal cities, while the Kenyan group discussed their approach for wastewater surveillance in a river used by multiple sectors.

Session 7: Wastewater surveillance at airports, aircrafts and ports the session opened with an introduction to a new focus on wastewater surveillance at airports and ports. Bernd Gawlik (Joint Research Center, European Commission) provided a background on GLOWACON activities in transport hubs and mass gathering events, including an exercise that took place in September 2024 involving global airport sites from 19 countries. More exercises are being planned with invitations for more sites/countries to participate, especially in Africa. The importance of engagement with global aviation authorities and regulators IATA and IACO was emphasized, as well as sensitivities with business and other interests. The option of anonymity of location to use aggregated data and acceptability to stakeholders is being explored.

GLOWACON involves the public health authority for them to understand the kinds of systems that exist in surveillance. Kenya Airways highlighted the role of aircraft surveillance in aerial biodiversity surveillance and monitoring invasive species transport. Port health services play a crucial role in wastewater management, carrying out BOD and COD sampling, continuous surveillance of drainage systems, and ensuring pre-treatment of wastewater at the point of entry and exit.

Port operations if left unchecked can negatively affect environmental health by adversely affecting ecosystems and biodiversity. Multinational cooperations are developing strict environmental policies focusing on reduction of greenhouse gas emissions and waste management to enhance obligations of national legislation and international conventions. Challenges faced include the age and configuration of vessels and willingness to share data. Transportation hubs provide potential for wastewater surveillance. Bernd discussed the issue of reinsurance companies bringing new pressures, such as business continuity and revenue, and competitive advantages with other airports and air-companies. Opportunities for synergies on wastewater surveillance for environmental and public health in Africa were discussed, with a SWOT strategic planning tool and a roadmap for wastewater surveillance in Africa. Bernd presented the GLOWACON aviation initiative, highlighting its focus on proactive preparedness through wastewater surveillance at strategic locations like airports and large-scale gatherings. He explained that the program, involving public-private partnerships, has collected samples from 19 global locations with surprising results showing various pathogens like SARS-CoV-2, influenza, and MPox. Bernd

emphasized the importance of joint intelligence gathering rather than data sharing and discussed plans to launch a global sentinel system for aviation with IATA, helping every two months. He also addressed concerns about airline cooperation, explaining that airlines are interested in business continuity and crew health, and advised maintaining control over data. Bernd concluded by mentioning a 32-million-euro budget for logistics and instrumentation and plans for a call for proposals in September.

The main diseases of concern are yellow fever, malaria, MVD, and SVD. To prevent cross-border transmission, pilots and crew must declare any disease on board. WES at airports, ports, and incoming flights are essential for coordinated monitoring. Blind sampling in airlines can detect cases in a random and anticipatory manner. Analysis of results should be shared at the governmental level for swift decision-making. Communication should occur through standardized channels, and management committees should be set up at border points for coordination. Multisectoral committees can enhance public health responses. Food inspection in restaurants requires appropriate certificates and licenses. Recommendations include developing sampling protocols for airports, capacity building, strengthening human resource capacity, and ensuring necessary equipment for analyses and tests.

Judy Maye (Kenyan Airways Health) suggested capacity building should focus on sustainability over time and how to finance this on the long term. There is a center of health in Kenya Airport and KAA are the custodians, which could be a platform for what EU/IATA are looking forward. Kenya Airways presentation provided an overview of Kenya's water handling practices in aviation, highlighting compliance with global and local standards, and explained the water supply chain process from source to aircraft and disposal. Florence Mutoni, head of Port Services at JKA, described the role of Port Health Services in preventing infectious disease spread through ports of entry and exit, including their functions in waste management, surveillance, and emergency response. Both presentations emphasized the importance of maintaining high health and safety standards in aviation, with ILRI suggesting potential areas for disease surveillance and ecosystem monitoring, particularly regarding cargo and crew health.

Ken Ngaina, the operations manager at Jomo Kenyatta International Airport, provided an overview of the Kenya Airport Authority's mandate and operations, emphasizing the need for regulated access to the airport and the procedures for obtaining access permits. He also discussed the airport's water sources, wastewater management, and the role of Port Health in supervising water quality and disease surveillance.

The meeting was briefed of the coordination role of their organization in working with various stakeholders, including veterinary and agriculture departments, to address issues and implement standards. Bernd suggested organizing a video call with interested colleagues to discuss further actions, particularly after his return from the ICAO conference. A participant from South Sudan commended the airport authority's dedication and implementation of international standards, highlighting areas for improvement in port health coordination and emergency response.

Mubarak Sodha presented on the Port Management Association for Eastern and Southern Africa (PMAESA), emphasizing their role in promoting regional cooperation, improving port operations, and addressing environmental challenges. He also discussed ongoing initiatives, including wastewater management and collaboration with various stakeholders to enhance port sustainability and infectious disease surveillance.

The conversation ended with discussions on wastewater surveillance for vessels and aircraft. Florence and Mubarak addressed the challenges of sampling wastewater from ships, noting that some contents remain in receptacles after discharge. The group explored the possibility of capacity development in Kenya, with Florence highlighting the need for long-term sustainability and collaboration with KAA. Christian raised concerns about infrastructure and workforce capacity, while Bernd emphasized the importance of building trust and understanding the business perspectives of airlines. The conversation ended with a focus on the need for further dialogue and collaboration between public health sectors and the aviation industry.

Session 8: Opportunities for synergies on wastewater surveillance for environmental and public health in Africa

To explore potential synergies among WES stakeholders, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was conducted to aid strategic planning. During the workshop, participant sub-groups identified SWOT related to WES to each country, based on their areas of expertise. Each sub-group shared their insights, which were then presented and discussed with the wider group. The organizing team compiled and documented the key themes that emerged from these discussions, forming the basis for the core elements to be addressed in the Initiative's Deliverables and Roadmap.

Here the main outcomes of the SWOT analysis are to be added.

Session 9: Roadmap for wastewater surveillance in Africa

The Session focused on discussing the development of a roadmap for WES systems in Africa. The participants were divided into breakout groups to further discuss thematic areas and provide feedback through Mentimeter questions. The session aimed to lay the foundations for creating a structured outline for opportunities and key steps towards wastewater surveillance, with the goal of developing a continental roadmap document.

A total of 11 thematic areas were presented for discussion, while the moderating team led participants through a series of mentimeter questions to identify priorities at national and regional levels.

The 11 thematic areas are:

1. Multi-sectoral, multi-level, and multi-disciplinary, coordination and collaboration in WES.

2. Strengthening governance & regulatory frameworks for WES Implementation: policies, legal mandates, and institutional roles for coordinated, accountable and sustainable WES.
3. Identification and prioritization of WES targets with clear associated use cases for WES data to support public health and environmental protection decision-making and response actions, including circularity and prevention of land-based pollution.
4. Technical and operational capacity development for WES building on relevant systems and initiatives.
5. Sustainable and predictable financing, based on evidence of cost-effectiveness.
6. Integrated WES data infrastructure for national and regional information sharing.
7. Driving innovation in WES systems to support circularity and One Health approaches.
8. Ensuring ethical and transparent application of WES to facilitate social and legal acceptance.
9. Fostering transboundary, regional and international cooperation on WES with shared objectives, information sharing on public health and environmental threats, as well as harmonized regional approaches and frameworks.
10. Periodic review and evaluation of WES system effectiveness.
11. Supporting governments and relevant stakeholders to establish and scale up WES systems.

The mentimeter survey highlighted the most urgent national priorities being multi-sectoral collaboration, financing, and governance frameworks. While at the regional level, responses were more balanced across different areas. Participants identified coordination and collaboration, financing, and technical capacity development as the biggest challenges in their countries, with capacity building emerging as the top actionable step. The discussion concluded with participants suggesting missing elements from the thematic areas, including community engagement, data infrastructure, and ethical considerations for surveillance systems.

Session 10: Next steps for country-specific planning

The Session focused on next steps for WES in Africa, with participants discussing short-term and long-term actions needed for public health and environmental health at national and regional levels. The key points highlighted by the participants were establishing technical working groups, capacity building, and developing regulatory frameworks. The participants agreed on the need for sustainable financing and stakeholder engagement. The European Union representative highlighted the importance of a contextualized approach, collaboration among sectors, and the need for clear mandates and reporting mechanisms.

Session 11: Way forward

The workshop concluded with plans for future regional workshops, online training, and communication products to support the initiative. Closing remarks were given by several speakers, including Alex Pires from UNEP who announced upcoming online training programs and a harmonized approach for wastewater surveillance in Africa.

The participants were thanked for their contributions, with special recognition given to the host institution ILRI and the Kenyan government for their support. The meeting highlighted the growing momentum around sustainable wastewater management and surveillance in Africa, with plans for continued collaboration and capacity building through various initiatives.

An end-of-workshop survey was finally completed by the participants, gathering feedback on their views and impression of the workshop, the knowledge they gained and any recommendations they have for improvement of materials and content provided.

Enhancement of One Health is needed, with data integration between different ministries of Environment and Health. Policy integration is also a key gap in surveillance. A harmonized approach is suggested, with a focus on finding synergies between sectors of public health and environmental sectors. A roadmap is proposed to help countries develop/enhance WES, focusing on less technical, socioeconomic, and financial aspects.

Annexes

Annex 1: Eastern Africa Regional WES Workshop Capacity Needs Assessment Findings (Summary link: https://forms.office.com/Pages/AnalysisPage.aspx?AnalyzerToken=yZUVAHGJwSglLHARzvc4CGXqmwEG0DQ0&id=AA76ahT6t0CKLiKn-MNX1QeHVGuPDw9Hq0EofAQ-_dBUMDdEUDdNN0QzWDFIUUVJEVkl1IN0MxTVowUC4u)

Annex 2: Eastern Africa Regional Workshop on Wastewater Surveillance for Environmental and Public Health

Annex 3: Capacity needs assessment tool

Annex 4: List of participants

Annex 5: Photo Gallery:

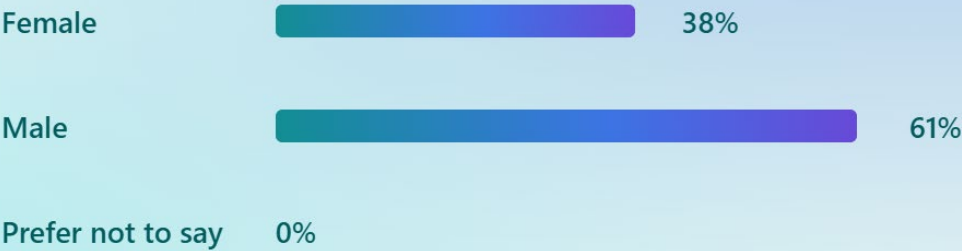
https://drive.google.com/drive/folders/1ozyce4OmsADf7Hi2Mb9xuDUgLPjwMGMx?usp=drive_link

Annex 1: Eastern Africa Regional WES Workshop Capacity Needs Assessment Findings



13 responses submitted

Gender



Treemap

Bar

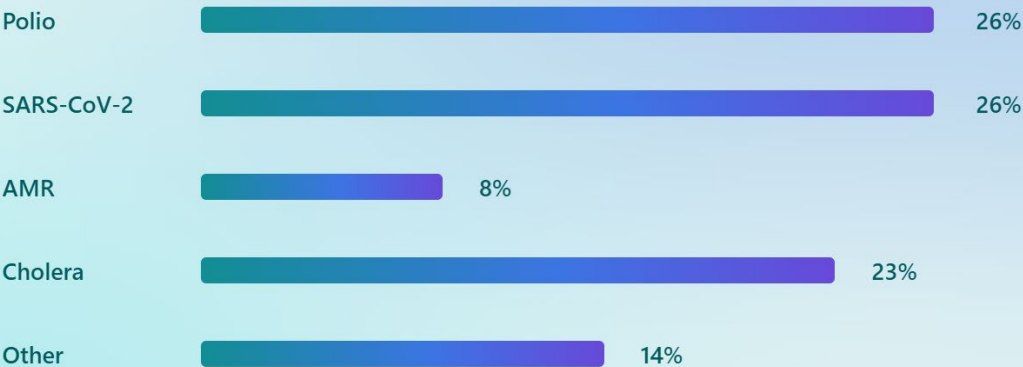


8 of 84



13 responses submitted

Which pathogens/targets are included in the current WES in your country?



9 of 84



13 responses submitted

Is there a database that collects and reports wastewater information in your country? If yes, describe the data-...



Treemap

Bar

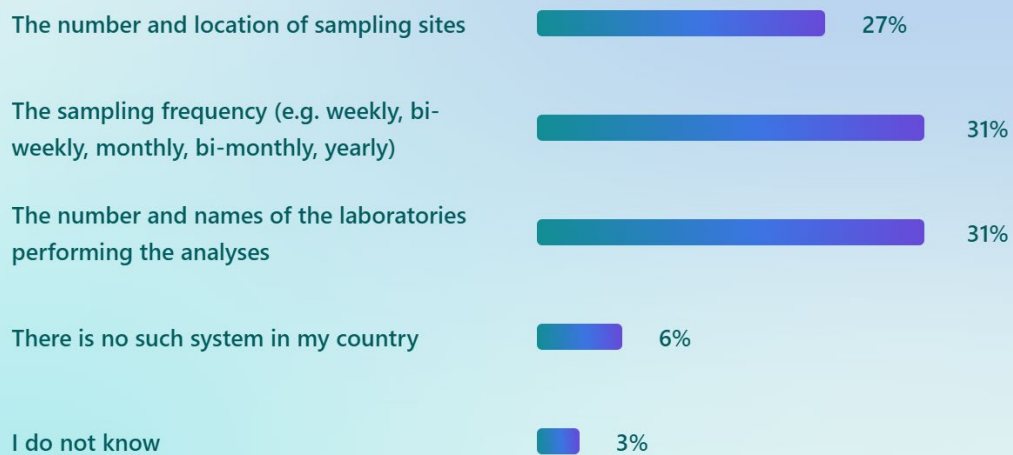


10 of 84



13 responses submitted

What is the strategy applied in sampling and gathering information about wastewater surveillance in your country? Please select all that apply and...



12 of 84



13 responses submitted

Please provide brief descriptions on your selected options above (if none indicate NA)



Wordcloud

All responses

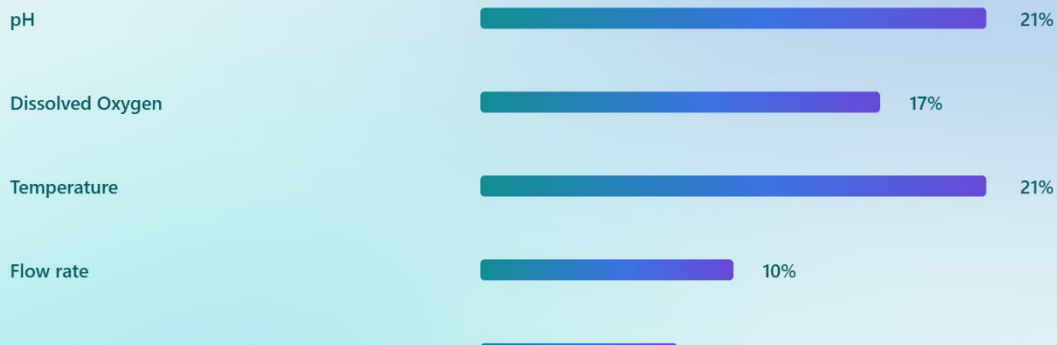


13 of 84



13 responses submitted

What are the auxilliary dataset or metadata collected during your wastewater sampling?

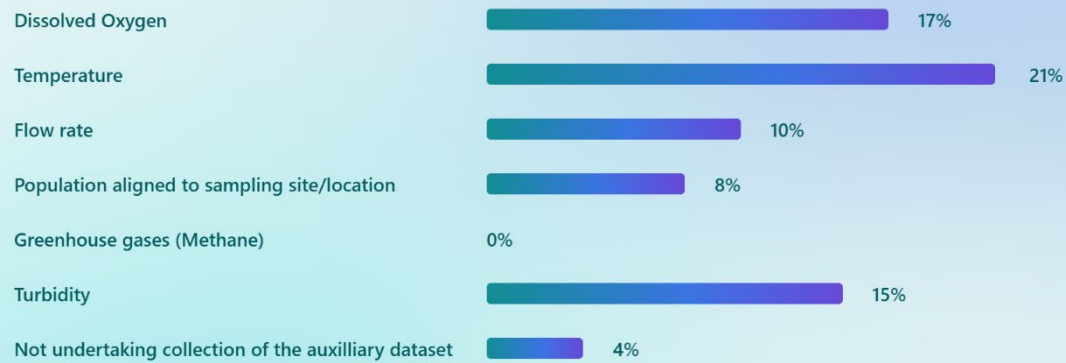


14 of 84



13 responses submitted

What are the auxilliary dataset or metadata collected during your wastewater sampling?

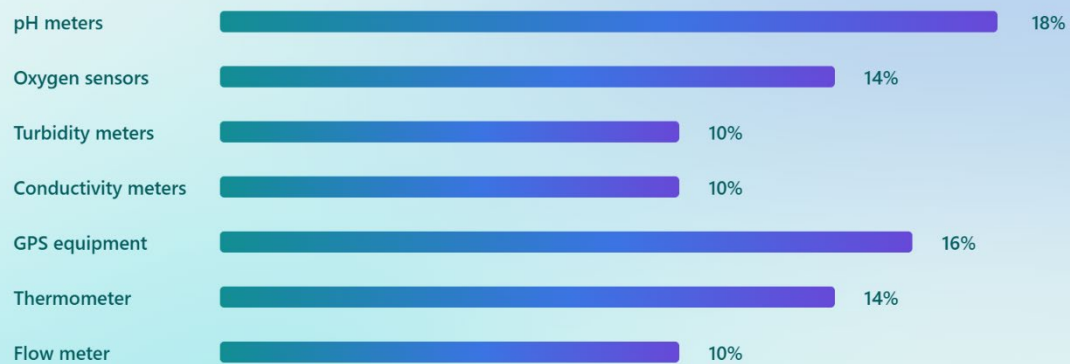


14 of 84



13 responses submitted

Please select the equipment used for the collection of the above contextual data

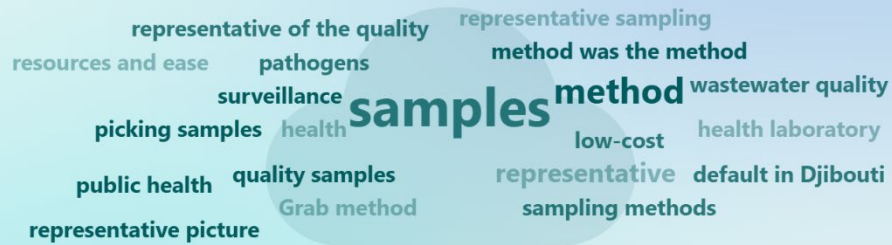


15 of 84



13 responses submitted

What is the reason for the preferred sampling method?



Wordcloud

All responses

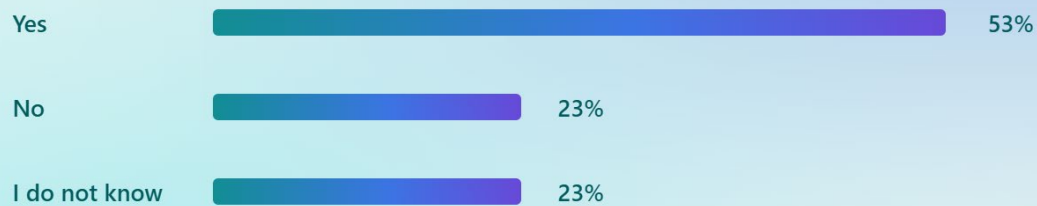


17 of 84



13 responses submitted

Is there a wastewater-based poliovirus surveillance system in your country? if yes, provide further information



Treemap

Bar



18 of 84



13 responses submitted

If yes, provide further information giving site and institutions involved (if no indicate NA)?

sample collectors surveillance system environmental surveillance surveillance of poliovirus sample collection poliovirus strains BUJUMBURA MAIRIE positive samples surveillance in wastewater

sample per site poliovirus surveillance wastewater sample collection

clinical surveillance Ministry sample wastewater laboratory

wastewater sample Institute Public Health testing



Wordcloud

All responses



19 of 84



13 responses submitted

Is there a wastewater-based Mpox surveillance system in your country? if yes, provide further information



Treemap

Bar



20 of 84



13 responses submitted

If yes, please provide further information giving sites and institutions involved (if no indicate NA)



Wordcloud

All responses

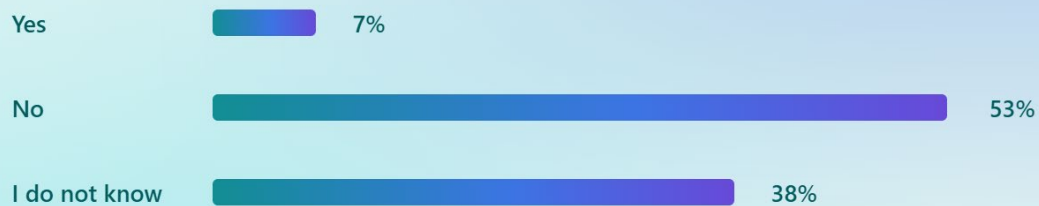


21 of 84



13 responses submitted

Is there a wastewater-based Mycobacterium tuberculosis (MTB) surveillance system in your country? if yes, provide further...



Treemap

Bar



22 of 84



13 responses submitted

Is there surveillance specific to livestock produced wastewater in your country? (veterinary disease surveillance), If yes, please provide further...



Treemap

Bar

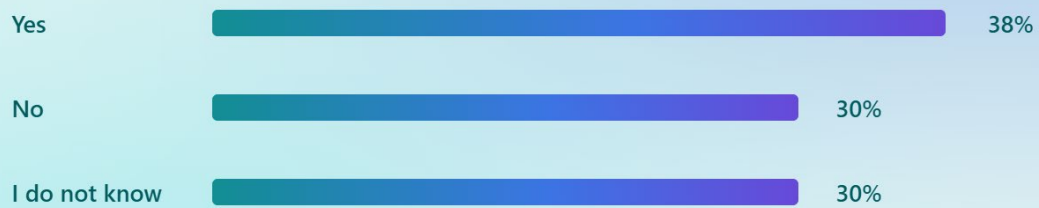


24 of 84



13 responses submitted

Are there efforts geared towards wildlife disease surveillance in your country? if yes, please select the appropriate option(s)



Treemap

Bar

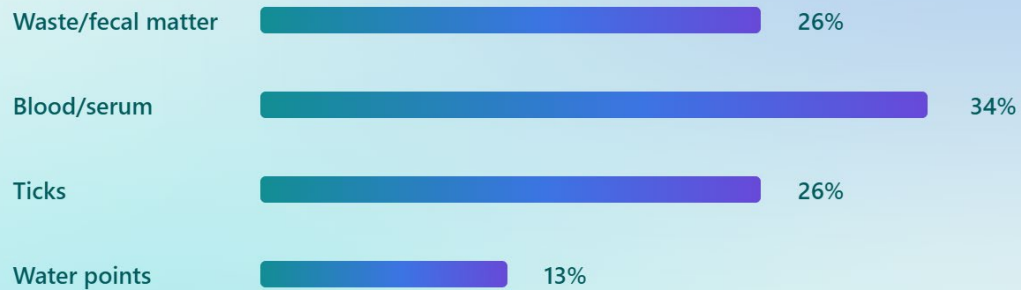


26 of 84



13 responses submitted

What sampling option(s) are used in wildlife disease surveillance in your country?

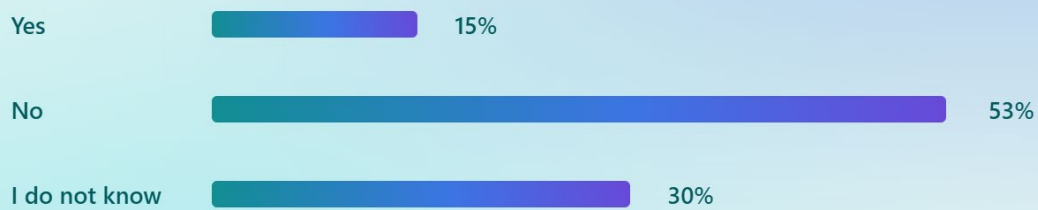


27 of 84



13 responses submitted

Is antimicrobial resistance (AMR) monitored from wastewater and/or from environmental samples in your country? If yes, please provide a brief de...



Treemap

Bar



28 of 84



13 responses submitted

If yes, please provide a brief description of the action

Central None
wastewater or environmental health laboratory ministry of health
Somalia **antimicrobial resistance** public health
ChatGPT AMR surveillance CPHL
laboratory and ministry **samples AMR** Djibouti



Wordcloud

All responses



29 of 84



13 responses submitted

Do you have a database that includes useful environmental information, such as climatic data? If yes, please provide a brief description

Yes, we have. The database contains the following information and the contact person/entity maintaining this is:

30%

No

53%

I do not know

15%



Treemap

Bar

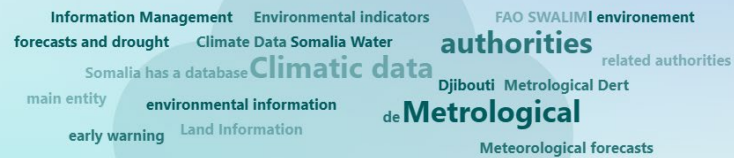


30 of 84



13 responses submitted

If yes, please provide a brief description (if no indicate NA)?



Wordcloud

All responses

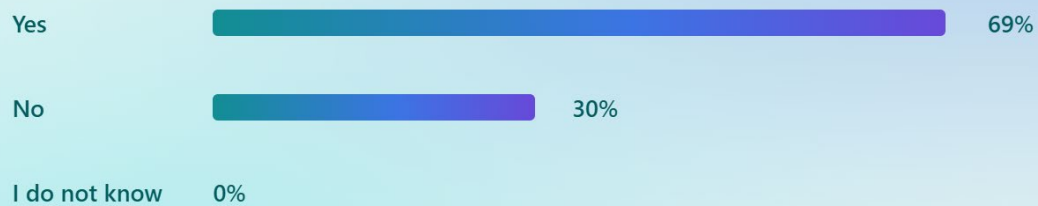


31 of 84



13 responses submitted

Is there existing cooperation and information sharing (e.g., data sharing) between environmental authorities and healthcare authorities? If yes, pr...



Treemap

Bar



32 of 84



13 responses submitted

If yes, provide a brief free format description



A word cloud visualization of responses. The most prominent word is 'health'. Other significant words include 'information sharing', 'ministry', 'authorities', 'cooperation', 'sharing agreement', 'waterborne diseases', 'Health and Population', 'public health', 'disease', 'data sharing', 'Environmental and health', 'health and environment', 'disease surveillance', 'disease outbreaks', 'healthcare authorities', 'environmental authorities', and 'agreement between Ministry'.

Wordcloud

All responses



33 of 84



13 responses submitted

Which areas in your country would have the best opportunities (e.g. existing wastewater treatment utility, colla...

The following urban areas:  70%

The following rural areas:  23%

I do not know  5%

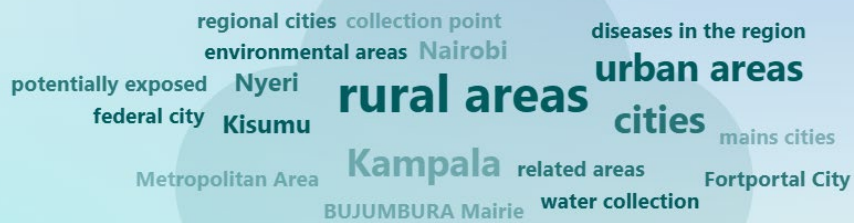


34 of 84



13 responses submitted

List the urban and rural areas



Wordcloud

All responses

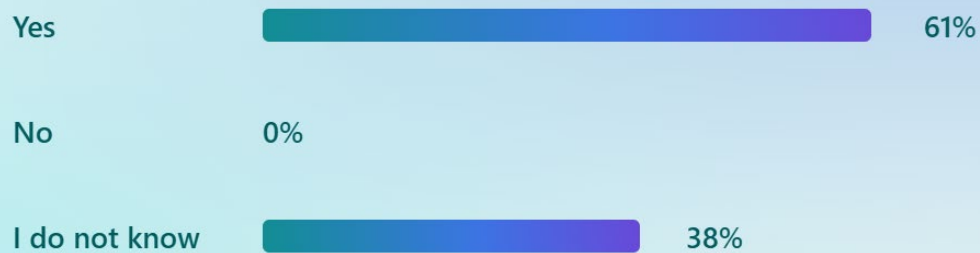


35 of 84



13 responses submitted

Is your country a signatory to major international declarations, initiatives and codes for WES implementation...



Treemap

Bar



36 of 84



13 responses submitted

If your response is Yes, kindly list any international declarations, initiatives or codes. If your response is No indi...

A wordcloud visualization of responses to the question about international declarations, initiatives, or codes. The words are arranged in a circular pattern. The most prominent words are 'Environmental', 'Health', 'Convention', 'Management', 'Africa', 'UNEP', 'Wastewater Surveillance', 'Hazardous Chemicals', 'Surveillance for Africa', 'Consent Procedure', 'Water Convention', 'Convention on Wetlands', 'Transboundary Movements', 'Convention on the Control', 'international declarations', 'Hazardous Wastes', 'Wastes within Africa', 'Import into Africa', 'protocol', 'Basel Convention', and 'Wastewater Surveillance'.

Wordcloud

All responses



37 of 84



13 responses submitted

What policies and national strategies exist for WES in your country? In your view, do these policies...

A wordcloud visualization of responses to the question about policies and national strategies for WES. The words are arranged in a circular pattern. The most prominent words are 'WES', 'policies', 'national', 'Environmental', 'Surveillance', 'Health Policies', 'Waste Management', 'drinking water', 'Framework', 'Water and Sanitation', 'Southern Water', 'water quality', 'waste water', 'policy or strategy', 'Water Sector', 'Water Policy', 'water code', 'water discharge', and 'national policy'.

Wordcloud

All responses



38 of 84



13 responses submitted

In the existing policies your country, what are the improvements that are needed?

A word cloud visualization of responses to the question 'In the existing policies your country, what are the improvements that are needed?'. The words are arranged in a circular shape, with 'policy' and 'WES' being the most prominent. Other visible words include 'disease', 'environmental', 'public', 'water quality', 'policies and roles', 'environmental regulations', 'WES policy', 'data', 'policy implementation', 'Health', 'disease surveillance', 'Capacity', 'surveillance', 'environmental policy', 'different organisations', 'policy of Ethiopia', 'certain diseases', and 'waste management'.

Wordcloud

All responses

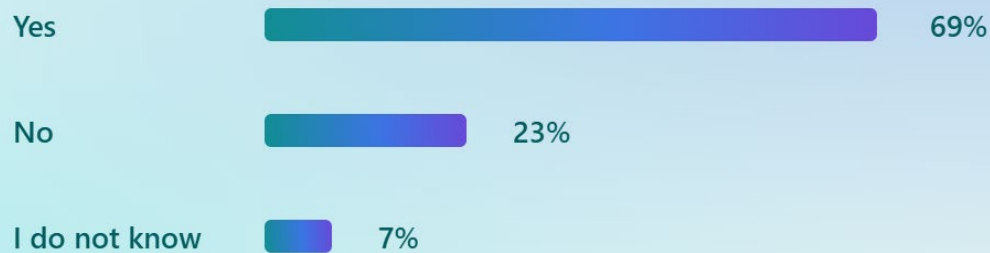


39 of 84



13 responses submitted

Are you aware of any WES initiative or programme already ongoing in country and beyond?



Treemap

Bar



40 of 84



13 responses submitted

If Yes, Please list down the



Wordcloud

All responses



41 of 84



13 responses submitted

Are there efforts in place in your country for environmental pollution monitoring and protection? List initia-...



4 respondents (31%)

Wordcloud

All responses



42 of 84



13 responses submitted

Are there efforts in place in your country for environmental pollution monitoring and protection? List initia-...

water pollution environmental law pollution and quality Enforcement
Ministry of Environment efforts environmental monitoring
National pollution types
limited resources **environmental** standards Environmental Policy
pollution control **pollution** Waste **environment** pollution monitoring
environmental audit discharge to the environment different environment

Wordcloud

All responses



42 of 84



13 responses submitted

What aspects of capacity for WES need to be strengthened in your country?

collection methods need for funding environmental and health strategy for surveillance
human resource **Capacity need** Institutional Capacity
need assessment Data **need capacity** Key aspects
capacity building monitoring sample collection
capacity for Water diagnostic capacity climate resilience capacity Infrastructure capacity
Development & Maintenance

Wordcloud

All responses



43 of 84



13 responses submitted

Are there national sources of funding to support WES in your country?

REGIDESO heavily supplemented Available but limited plans
Not sure budget by GoK **limited** budget funds funding
sources water and sanitation ministries and agencies projects
no sources national Burundi international partners

Wordcloud

All responses



44 of 84



13 responses submitted

What are the main gaps that you see at national level for WES?

agency coordination Inadequate Infrastructure Infrastructure & Maintenance
Infrastructure insufficient data collection **Lack** environment sector
coordination data **WES** data sharing
laboratory infrastructure **monitoring** data base Weak **funding**
coordination mechanisms technical expertise technical and infrastructure

Wordcloud

All responses



45 of 84



13 responses submitted

What are the most important conditions for strengthening or establishing WES systems at the national level?

The word cloud features the following terms and phrases:

- integration of surveillance
- Environment
- key conditions
- Infrastructure
- Financing & Investment
- Political
- capacity
- coordination
- national level
- Strong
- wastewater surveillance
- framework between the health
- wastewater data
- surveillance program
- national strategies
- capacity building
- WES Systems
- Strategic plan
- Funding
- Coordinator

Wordcloud All responses

< 46 of 84 >

13 responses submitted

Are there mechanisms for ensuring coordination, information exchange and effective policy implementation f...

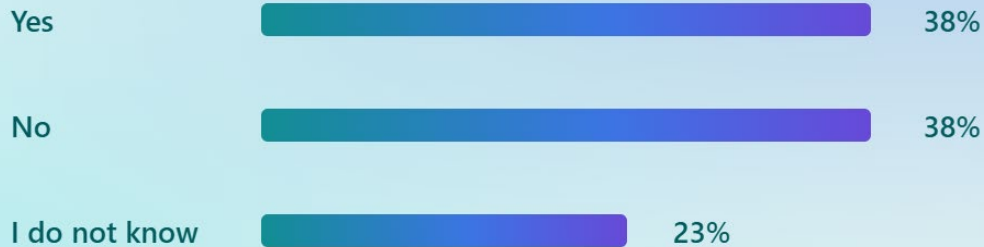
Wordcloud

All responses

< 47 of 84 >

13 responses submitted

Do you think or know whether the different ministries/departments and institutions involved in WE...



Treemap

Bar



48 of 84



13 responses submitted

If Yes, please cite examples

approaches and protocols EPI department recent approaches
water quality city Sewerage authorities capacity
MOH **Ministry of Environment** Addis
requisite qualifications department and Ministry **Water** Ababa
monitoring programs health disease surveillance

Wordcloud

All responses

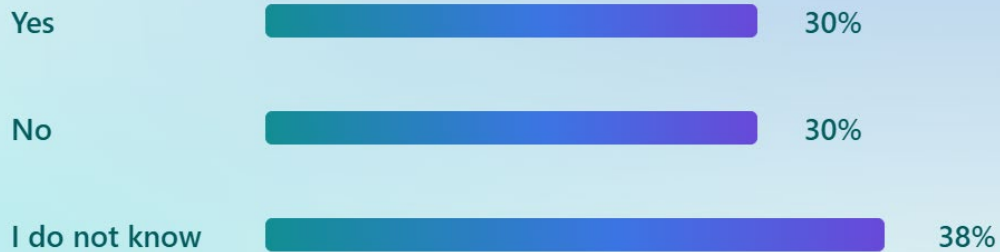


49 of 84



13 responses submitted

Are the technical capacities of civil society organizations (CSOs) in your country and the private sector adequate...



Treemap

Bar



50 of 84



13 responses submitted

Which Ministries and institutions work on WES in your country?



51 of 84



13 responses submitted

Which Ministries and institutions work on WES in your country?



51 of 84



13 responses submitted

Which ministries/departments (national and local level) are involved in the development, administration, implementation and enforcement of legis...

Environment Management National Environment Management Authority
Ministry of health
Public Health
Environment and Health
Health departments
ministry of environment



Wordcloud

All responses

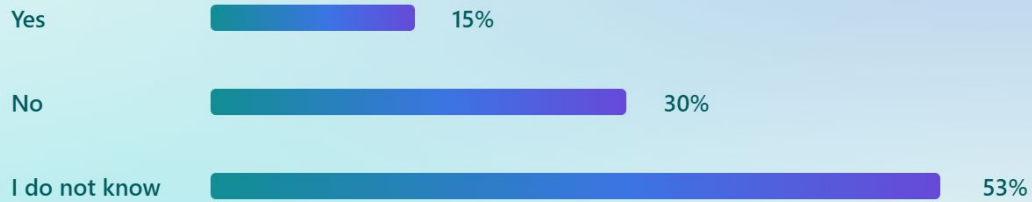


52 of 84



13 responses submitted

Is institutional infrastructure and technical capacity in your country align with the latest best practices in WES?



Treemap

Bar



53 of 84



13 responses submitted

Please provide more details



Wordcloud

All responses

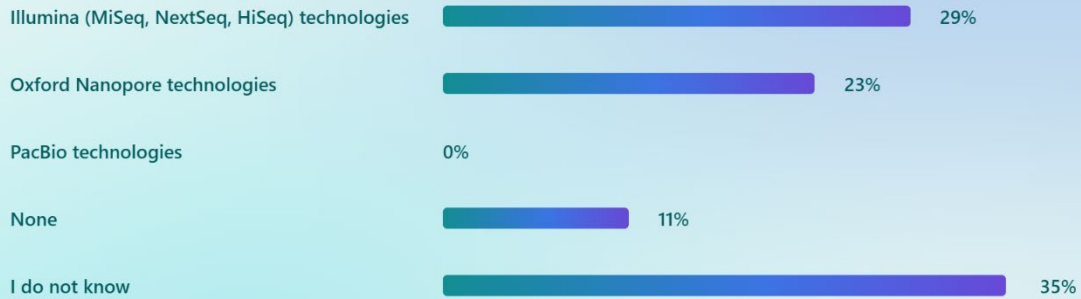


54 of 84



13 responses submitted

What next generation sequencing capacity/platforms exist in your country?



55 of 84



13 responses submitted

What technological or methodological advancements do you think are needed to improve wastewater and environmental surveillance for One...



Wordcloud

All responses

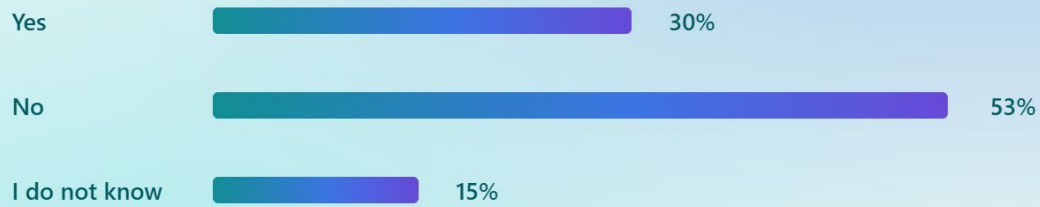


56 of 84



13 responses submitted

Does the relevant Ministry/department in your country have a WES training programme to improve staff skills at various levels?



Treemap

Bar

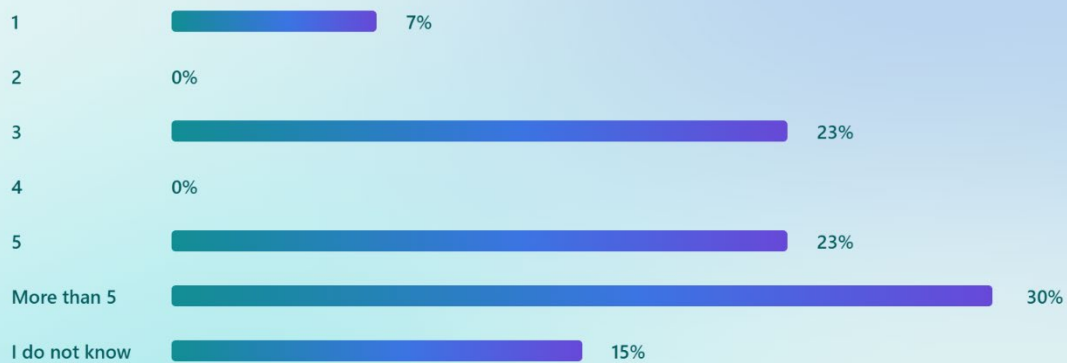


57 of 84



13 responses submitted

How many staff are currently engaged in WES activities in your institution?



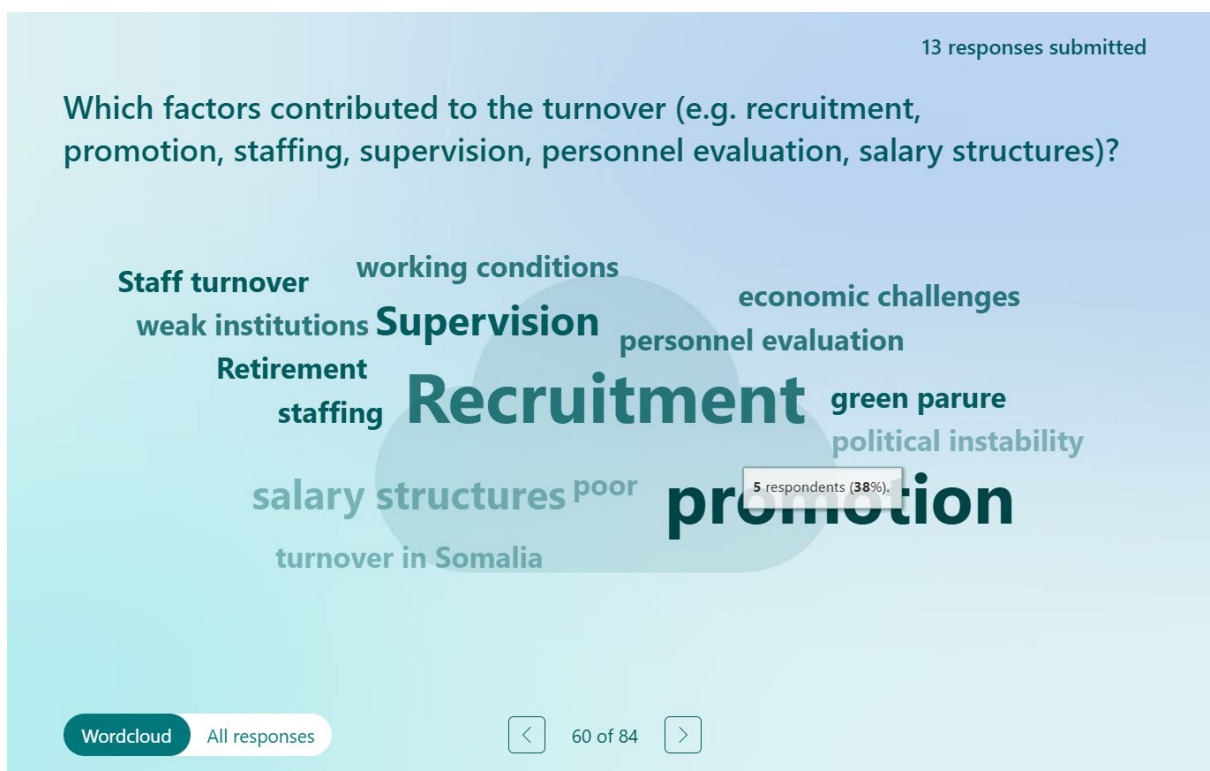
Treemap

Bar



58 of 84





y

13 responses submitted

Please provide a brief statement on the barriers that are limiting your institution's ability to fully implement and...

wastewater surveillance Technical Expertise Financial Constraints
capacity lack Funding
equipment reagents

Wordcloud

All responses



61 of 84



13 responses submitted

What are the most important skills and knowledge that you need to strengthen or establish WES in your countr...

management **skill** analysis
Technical Skills **data** sample
needs

Wordcloud

All responses

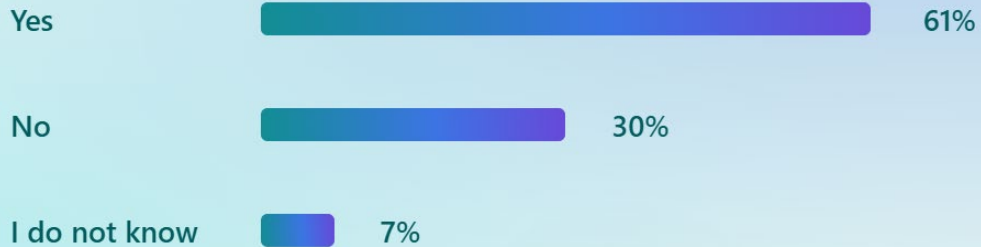


62 of 84



13 responses submitted

Do you have bioinformatics data analysis or data analytics capacity within your institution? If yes, please provid...



Next question

Treemap

Bar

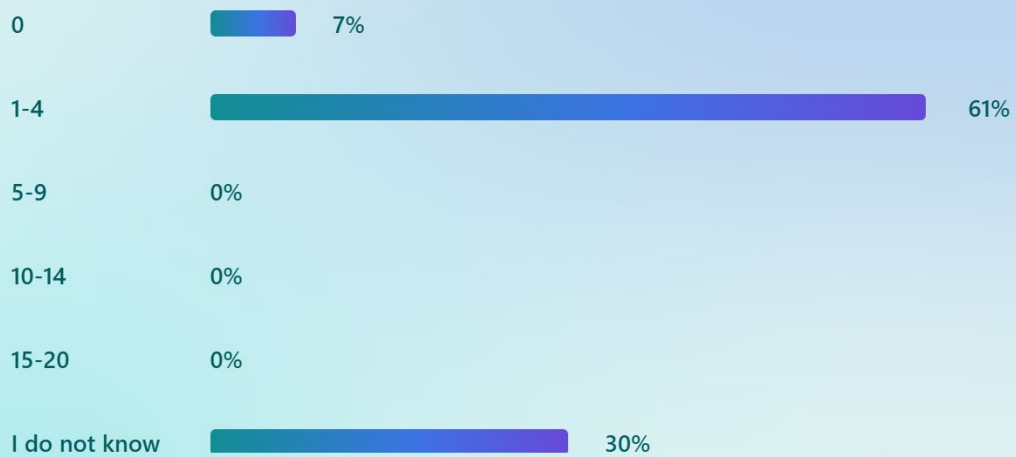


63 of 84



13 responses submitted

If yes, please provide the number of data analytics specialists in your institution?



Treemap

Bar

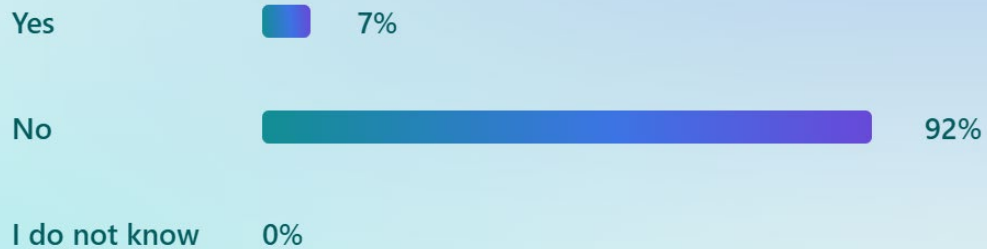


64 of 84



13 responses submitted

Do you feel equipped in terms of capacity for wastewater surveillance?



Treemap

Bar

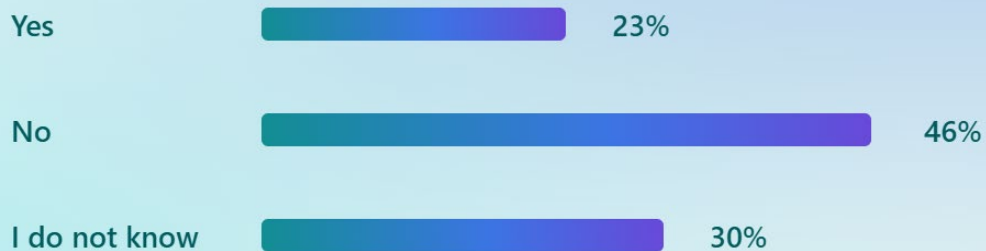


65 of 84



13 responses submitted

Is there a competency framework for individuals working on WES in your country and beyond?



Treemap

Bar



66 of 84



13 responses submitted

Please suggest skillset and competency



Wordcloud

All responses

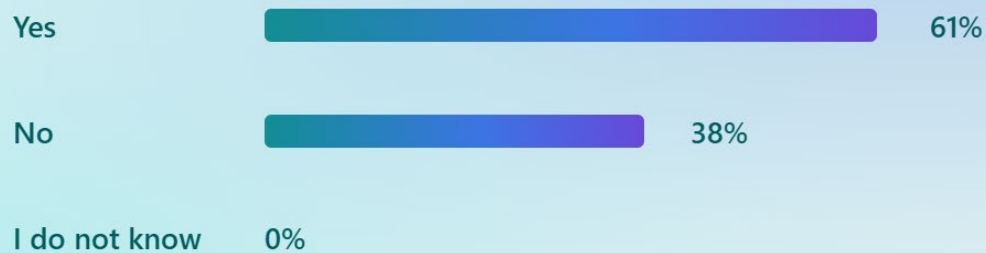


67 of 84



13 responses submitted

Are there learning opportunities to prepare individuals to respond to the country's needs for WES developmen...



Treemap

Bar



68 of 84



13 responses submitted

If Yes, please list the learning opportunities. If No, please suggest the training modules (subjects).



A word cloud visualization of responses. The most prominent words are 'Training' and 'Laboratory'. Other visible words include 'regional workshops', 'Skills', 'Data management', 'Environmental', 'Public health', 'Technical and Laboratory', 'environmental health', 'Laboratory Skills', 'Local', 'ILRI trainings', 'Analysis', 'Key subjects', 'IDSR training', 'Wastewater', 'health', 'technology', 'Information Technology', 'laboratory staff', 'ongoing training', 'wastewater sampling', 'BioNet Project', and 'engineering'.

Wordcloud

All responses



69 of 84



13 responses submitted

Do you think practitioners and relevant stakeholder are up to date with the latest approaches and technical...

Yes 7%

No 69%

I do not know 23%

Treemap

Bar

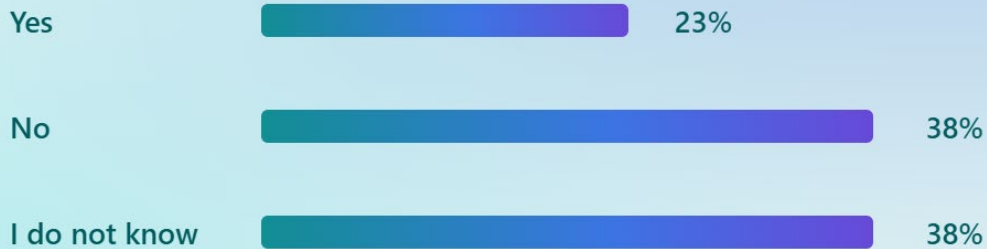


70 of 84



13 responses submitted

Do you know if women and youth are well represented in WES activities and programmes in your country?



Treemap

Bar

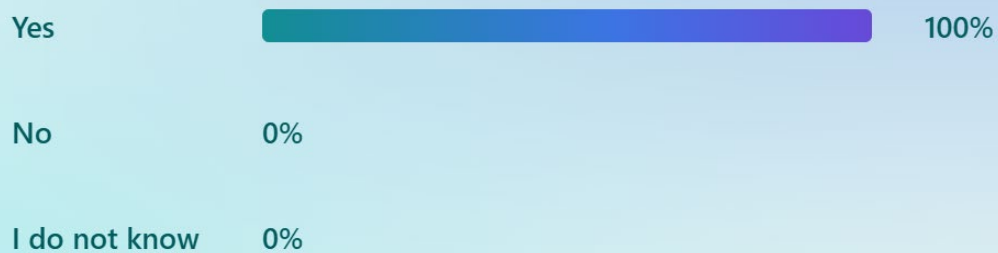


71 of 84



13 responses submitted

Do you think that women and youth should be given the opportunity to strengthen their capacity for WES in...



Treemap

Bar



72 of 84



13 responses submitted

What challenges have you encountered in implementing wastewater or environmental surveillance systems, par...

A wordcloud showing various challenges. The most prominent word is 'lack'. Other significant words include 'policy', 'data repository', 'policy makers', 'weak integration', 'data sharing', 'public/policy', 'surveillance data', 'lack of SOP', 'lack of training', 'national policies', 'coordination', 'data collections', 'analysis skill', 'poor policy', 'limited', 'skills', 'capacity and skills', 'repository and data', and 'policy understanding'.

Wordcloud

All responses



73 of 84



13 responses submitted

What training or capacity-building needs do you see as critical for improving the effectiveness of wastewater a...

A wordcloud showing various training and capacity-building needs. The most prominent words are 'WES Training', 'capacity', 'data', and 'analysis'. Other significant words include 'equipment', 'needed technical training', 'capacity-building', 'pollution monitoring', 'tasting and data', 'monitoring technologies', 'analytics', 'data analysis', 'Training in testing', 'management capacity', 'water quality', 'capacity by training', and 'enforcement ef'.

Wordcloud

All responses



74 of 84



13 responses submitted

What do you suggest as the major challenges in implementing wastewater and environmental surveillance (WES) of infectious diseases and AMR in...

1 2 3 4 5

Limited knowledge on opportunities of environmental surveillance or on environmental transmission o...

Creating collaboration between environmental and health authorities

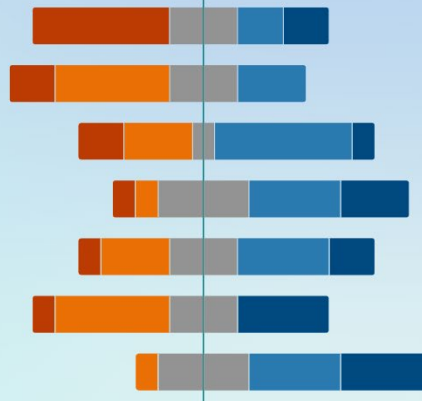
Poor integration with clinical surveillance data (creating an information system/database)

Inadequate monitoring practices of water sources and environmental reservoirs (data/sample collecti...

Limited laboratory capacity

Overall limitations in human resources and available capacities (lack of experts, training etc)

Limited awareness or lack of collaboration with local communities



< 75 of 84 >

13 responses submitted

What do you suggest as the major challenges in implementing wastewater and environmental surveillance (WES) of infectious diseases and AMR in...

tal surveillance or on environmental transmission o...

Creating collaboration between environmental and health authorities

Poor integration with clinical surveillance data (creating an information system/database)

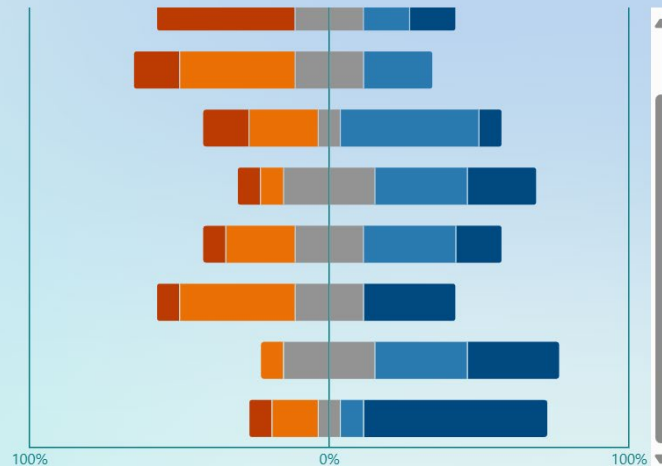
Inadequate monitoring practices of water sources and environmental reservoirs (data/sample collecti...

Limited laboratory capacity

Overall limitations in human resources and available capacities (lack of experts, training etc)

Limited awareness or lack of collaboration with local communities

I do not know



< 75 of 84 >

13 responses submitted

What other challenges do you see in implementing wastewater and environmental surveillance (WES) of in...



Wordcloud

All responses



76 of 84

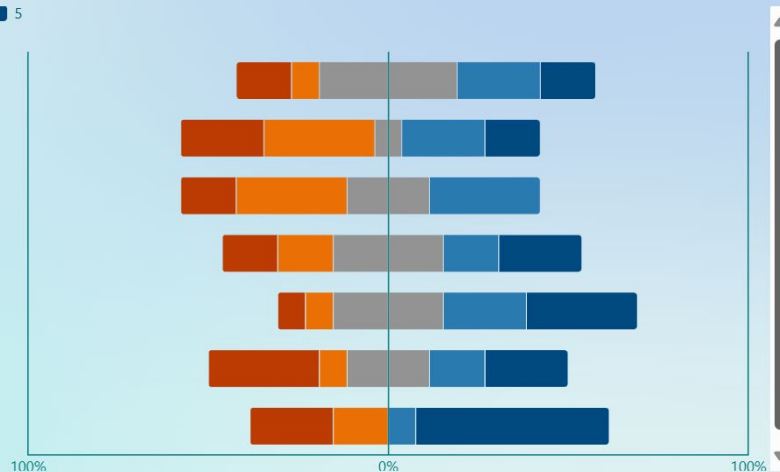


13 responses submitted

What do you suggest as major infrastructural weaknesses in your country's water systems (water supplies and wastewater treatment plans, hazardous...

1 2 3 4 5

Seasonal variation (rainy/dry season)
Limited access to clean water supply
Limited sanitation
Areas prone to flooding/drought
Areas with livestock
Industrial areas
I do not know

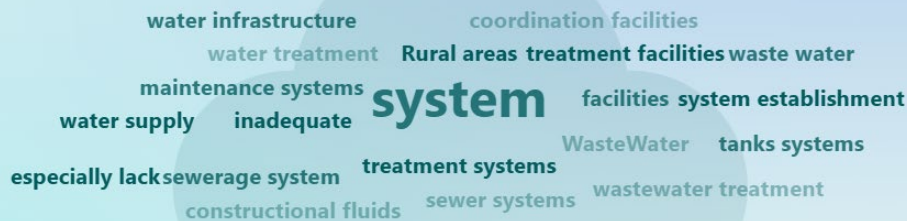


77 of 84



13 responses submitted

What other infrastructural weaknesses you consider relevant in your country's water systems?



Wordcloud

All responses



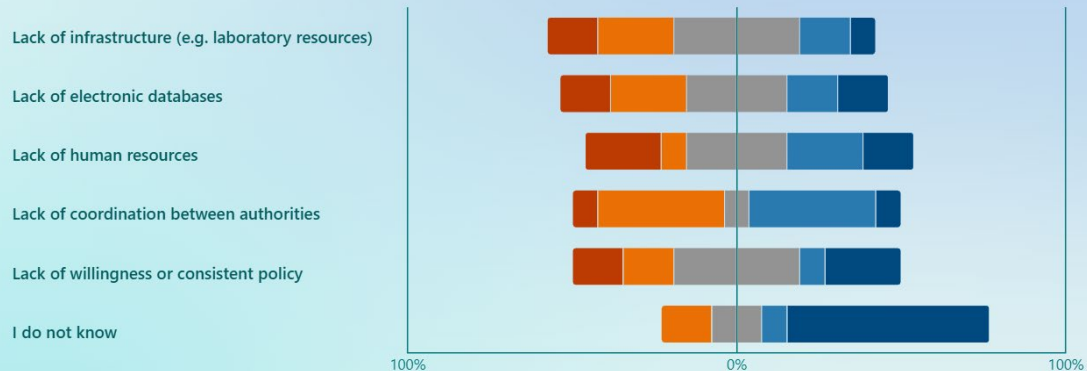
78 of 84



13 responses submitted

What are the major challenges or limitations in existing (clinical and/or environmental) surveillance systems for detecting infectious disease out-...

1 2 3 4 5



79 of 84



13 responses submitted

What other challenges or limitations you see in existing
(clinical and/or environmental) surveillance systems for...

Surveillance protocols
funding and prioritization
Techniques for testing
None
funding for surveillance
Inadequate funding

Wordcloud

All responses

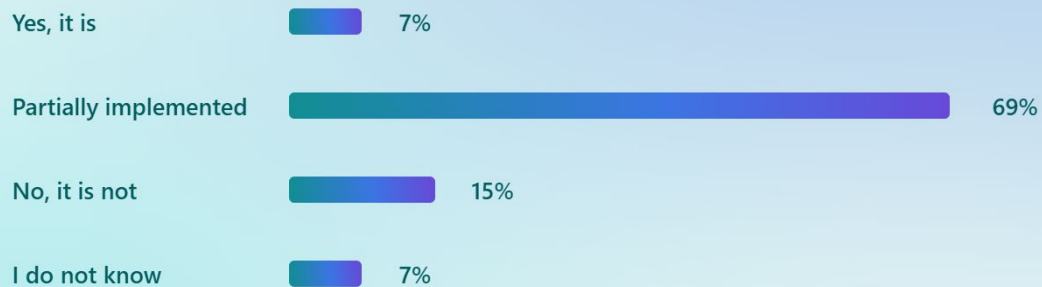


80 of 84



13 responses submitted

To your knowledge, are the concepts of One Health (OH) implemented in
the context of AMR, disease/pathogens surveillance in your country, at lo...



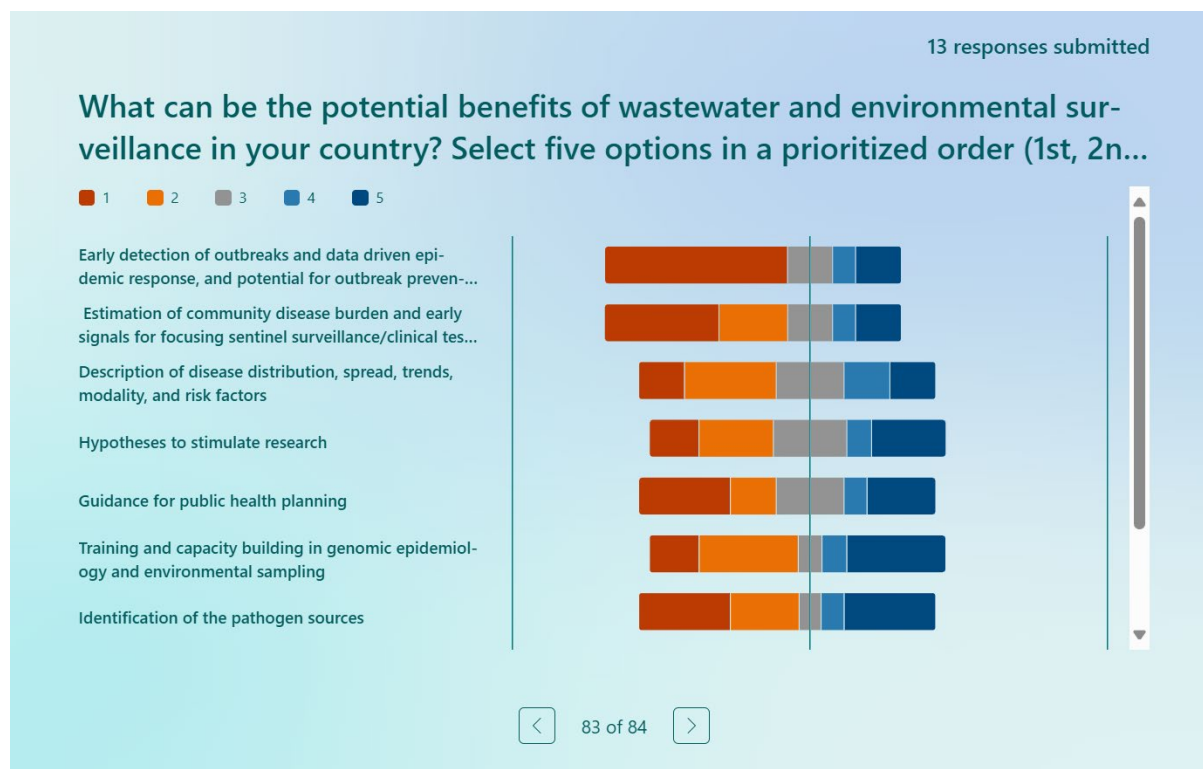
Treemap

Bar



82 of 84





Venue: International Livestock Research Institute (ILRI) - Nairobi Campus, Off Old Naivasha Road (adjacent to Uthiru roundabout)

Day 1 – Tuesday, 20 May 202r		
08:00 – 08:30	Registration	
08:30 – 09:30	Session 1: Opening session and welcoming remarks	Moderator: Bernard Mware, Molecular Biologist, ILRI Rapporteur: Josphine Wairimu Nduguti, Programme Associate, UNEP
08:30-08:40	Dr. Hung Nguyen Interim Program Leader - Health	
08:40-08:50	Dr. Kamene Kimenye, Director General, Kenya Public Health Institute	
08:50-09:00	Heidi Savelli-Soderberg, Chief, Source to Sea Pollution Unit, UNEP	
09:00-09:10	Guy Mbayo, Technical Officer, World Health Organization (WHO)	
09:10-09:20	Anastasia Koutsolioutsou, Policy Officer, EU HERA (<i>Online</i>)	
09:20-09:30	<i>Participants' introduction (10 min)</i>	
09:30 – 10:15	Session 2: Wastewater surveillance for environmental and public health - Setting the scene: the relevance of wastewater surveillance for people and the environment (7 min) Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP and Taru Miller, Wastewater Surveillance Expert, UNEP - Wastewater Surveillance for Africa (WWS) Initiative (7 min) Josphine Wairimu Nduguti, Programme Associate, UNEP - Wastewater Surveillance for Africa: overview of WHO initiatives (7 min) Abdullateef Jimoh, Surveillance Officer, WHO - Wastewater surveillance: the Global Wastewater Consortium (GLOWACON) (7 min) Anastasia Koutsolioutsou, Policy Officer, EU HERA (<i>Online</i>) <i>Questions and answers (15 mins)</i>	Moderator: Riccardo Zennaro, Project Management Officer, UNEP Rapporteur: Bernard Mware, Molecular Biologist, ILRI

10:15 10:30	–Coffee break and group photo	
10:30 – 12:00	Session 3: Wastewater surveillance for environmental and public health: capacity needs assessment and elevator pitch <i>Elevator pitch:</i> countries briefly presenting their status of capacity vis a vis wastewater surveillance (5 min each country)	Moderator: Alex Pires, Programme Management Officer, UNEP and Bernard Mware, Molecular Biologist, ILRI Rapporteur: John Juma, Biologist, ILRI
12:00 12:30	–Information about field visit Felix Lukwa, Engineer, Nairobi City Water and Sewerage Company (NCWSC)	
12:30 – 13:30	Lunch break	
13:30 – 17:30	Field visit <i>Wastewater treatment plant in Ruai, Nairobi and Kenya National Public Health Laboratory.</i> Please wear comfortable shoes and depending on the weather, we recommend you bring a hat, sunglasses or an umbrella or waterproof jacket/clothes!	
	Welcome cocktail	

Day 2 – Wednesday, 21 May 2025		
08:00 09:00	–Arrival and registration	
09:00 09:15	–Recap of day 1 and preparations for day 2 <i>Slido/Mentimeter question related to day 2</i>	Moderator: Taru Miller, Wastewater Surveillance Expert, UNEP
09:15 10:45	–Session 3: Capacity needs assessment for wastewater surveillance in Africa	Moderator: Bernard Mware, Molecular Biologist, ILRI

	• Presentation of responses to the survey • Further discussion about the elevator pitch • Practical examples • Questions and answers	Rapporteur: Josphine Wairimu Nduguti, Programme Associate, UNEP
10:45 11:00	–Coffee break	
11:00 12:15	–Session 4: Sharing country experiences on wastewater surveillance for environmental and public health • One Health approach and wastewater • Site selection, sample preparation/processing, including wastewater surveillance in non-sewered sanitation systems • Building up environmental surveillance in DRC: successes, challenges and lessons learnt • Case study: Wastewater surveillance in Kenya <i>Questions and answers (15 minutes)</i>	Resource persons: • Popi Karaolia, UNEP • Taru Miller, UNEP • Bilge Alpaslan Kocamemi, Marmara University (<i>Online</i>) • Javier Mateo-Sagasta, IWMI (<i>Online</i>) • Abdullateef Jimoh, WHO • Japhet Kabalu, University of Kinshasa • Sylvia Omulo, Washington State University
12:15 13:00	–Session 5: Interactive exercise on wastewater and environmental surveillance for public health Wastewater and environment surveillance prioritization, implementation and integration framework for one or more pathogens • <i>Introduction to World Health Organization package</i>	Moderator: Monica Nolan, Consultant, WHO Rapporteur: Leila Anes Boulahbal, Consultant, WHO
13:00 14:00	–Lunch	
14:00 16:00	–Session 5 (continues): Interactive exercise on wastewater and environmental surveillance for public health	Moderator: Monica Nolan, Consultant, WHO

	Wastewater and environment surveillance prioritization, implementation and integration framework for one or more pathogens <i>Interactive session: using WHO tools</i>	Rapporteur: Leila Anes Boulahbal, Consultant, WHO
16:00 16:15	Coffee break	
16:15 17:30	Session 6: Interactive session on wastewater for environmental health/monitoring <i>Group work with scenarios (45 minutes) and reporting back to plenary (30 min)</i>	Moderator: Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP and Taru Miller, Wastewater Surveillance Expert, UNEP

Day 3 – Thursday, 22 May 2025		
08:00 – 09:00	Arrival and registration	
09:00 – 10:30	Session 7: Wastewater surveillance at airports, aircrafts and ports - Bernd Gawlik, Portfolio Leader, European Union, Joint Research Centre (EU-JRC) (10 min) <i>(Online)</i> - Judy Maye, Head, Kenya Airways Health (10 min) - Florence Muthoni, Head, Port Health Services, Jomo Kenyatta International Airport (JKIA) Nairobi (10 min) - Ken Ngaina, Operations Manager, Kenya Airport Authority (JKIA) (10 min)	Moderator: Riccardo Zennaro, Project Management Officer, UNEP Rapporteur: Bernard Mware, Molecular Biologist, ILRI

	• Mubarak Sodha, Project Manager, Port Management Association of Eastern and Southern Africa (PMAESA) (10 min) <i>Questions and answers (40 min)</i>	
10:30 – 10:45	Coffee break	
10:45 – 12:00	Session 8: Opportunities for synergies on wastewater surveillance for environmental and public health in Africa <i>Breakout group work with SWOT exercise (45 min) and reporting back to plenary (30 min)</i>	Facilitators: • Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP • Taru Miller, Wastewater Surveillance Expert, UNEP • Monica Nolan, Consultant, WHO • Guy Mbayo, Technical Officer, WHO • Leila Anes Boulahbal, Consultant, WHO Rapporteur: Riccardo Zennaro, Project Management Officer, UNEP and Bernard Mware, Molecular Biologist, ILRI
12:00 – 13:00	Session 9: Roadmap for wastewater surveillance in Africa <i>Group work and open discussion (60 min)</i>	Moderator: Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP and Taru Miller, Wastewater Surveillance Expert, UNEP Rapporteur: Bernard Mware, Molecular Biologist, ILRI
13:00 – 14:00	Lunch break	
14:00 – 15:15	Session 10: Next steps for country specific planning and additional support that countries would want • <i>Breakout group work – countries report back to plenary on the next steps</i> • <i>Immediate efforts and long-term efforts</i> • <i>National efforts and regional efforts</i>	Facilitators: • Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP • Taru Miller, Wastewater Surveillance Expert, UNEP • Monica Nolan, Consultant, WHO • Guy Mbayo, Technical Officer, WHO

		Leila Anes Boulahbal, Consultant, WHO Rapporteur: Riccardo Zennaro, Project Management Officer, UNEP and Bernard Mware, Molecular Biologist, ILRI
15:15 – 16:00	Session 11: Way forward - Bernd Gawlik, Portfolio Leader, European Union, Joint Research Centre (EU-JRC) (<i>Online</i>) (5 min) - Guy Mbayo, Technical Officer, WHO (5 min) - Alex Pires, Programme Management Officer, UNEP (5 min) - Bernard Mware, Molecular Biologist, ILRI (5 min) <i>End-of-workshop survey, discussion and way forward (25 min)</i>	Moderator: Riccardo Zennaro, Project Management Officer, UNEP and Popi Karaolia, Senior Wastewater Surveillance Expert, UNEP

Annex 3: Capacity needs assessment tool

Introduction

Infectious diseases are a global public health challenge, causing approximately 15 million deaths annually, with a disproportionate burden on low- and middle-income countries. Pathogens causing these diseases evolve and adapt to new environments, leading to new strains and variations. The global response to infectious diseases is influenced by factors such as human behaviour, demographic shifts, urbanization, globalization, and environmental changes. Effective control and prevention strategies require a dynamic and adaptive global response, including early and innovative approaches to infectious disease surveillance, such as wastewater-based surveillance (WBS). In Africa, the burden of infectious diseases is high, with many countries facing significant challenges in disease control and prevention. Early detection of infectious diseases is crucial for monitoring and providing timely warnings, highlighting the need for strengthening early warning systems like WBS. However, there is a significant gap in the utilization and availability of WBS in Africa, highlighting the need for further research.

Africa's natural and mineral resources are being exploited, leading to extreme environmental pollution. Population growth and urbanization, traffic emissions, and open burning contribute to air pollution. The Sahara Desert is a major source of dust, while South Africa experiences high mercury emissions from coal combustion and gold mining. Surface waters are contaminated by untreated effluents from urban and industrial discharges. Soil pollution is caused by agricultural activities, mining, roadside emissions, and e-waste recycling. Proper regulation of environmental pollutants is needed in Africa.

The United Nations Environment Programme (UNEP) is a leading environmental authority that sets the global environmental agenda and advocates for sustainable development. It coordinates environmental policy consensus and brings emerging issues to the attention of governments and the international community. UNEP is part of the Quadripartite Alliance, a collaboration between UNEP, FAO, WHO, and WOA, aiming to promote a global One Health approach. Wastewater and surveillance activities are highlighted in the Under 2022 One Health Joint Plan of Action. UNEP's Ecosystems Division supports countries in conserving, restoring, and sustainably managing terrestrial, freshwater, and marine ecosystems. The Marine and Freshwater Branch promotes the protection, conservation, restoration, and sustainable management of marine and coastal areas. The SSPU works towards ecosystem resilience and a pollution-free planet by protecting freshwater, coastal, and marine ecosystems from pollution. The initiative "Supporting strategies, capacity and data for global wastewater and environmental surveillance in Africa" aims to establish and scale up wastewater surveillance systems for environment and public health purposes across Africa.

Its focus is to build capacity, enable knowledge exchange, and raise awareness on wastewater surveillance systems for ecosystems and public health, involving all sub-regions of Africa. UNEP is partnering with ILRI to conduct WES capacity needs assessment (CNA) across Africa. The CNA project aims at

- 1) Performing assessment of existing wastewater surveillance capabilities across African countries (SWOT analysis).
- 2) Documenting the current state of infrastructure, technical expertise, and resources allocation for wastewater surveillance in different African countries.

- 3) Reviewing policy and regulatory landscape across African countries regarding wastewater surveillance and environmental monitoring.
- 4) Documenting opportunities for knowledge exchange and collaboration between African countries and international experts in wastewater surveillance.
- 5) Compiling a detailed report outlining capacity building opportunities, challenges, and recommendations on strategies for enhancing environmental and wastewater surveillance in Africa.

Geographical Scope of work

A continent wise CNA is proposed through five sub-regions (Fig. 1) (Northern, Western, Central, Eastern and Southern sub-regions). Biosciences of eastern and Central Africa Hub at ILRI has established networks and country collaboration across various sub-regions which will be tapped into to conduct the CNA.

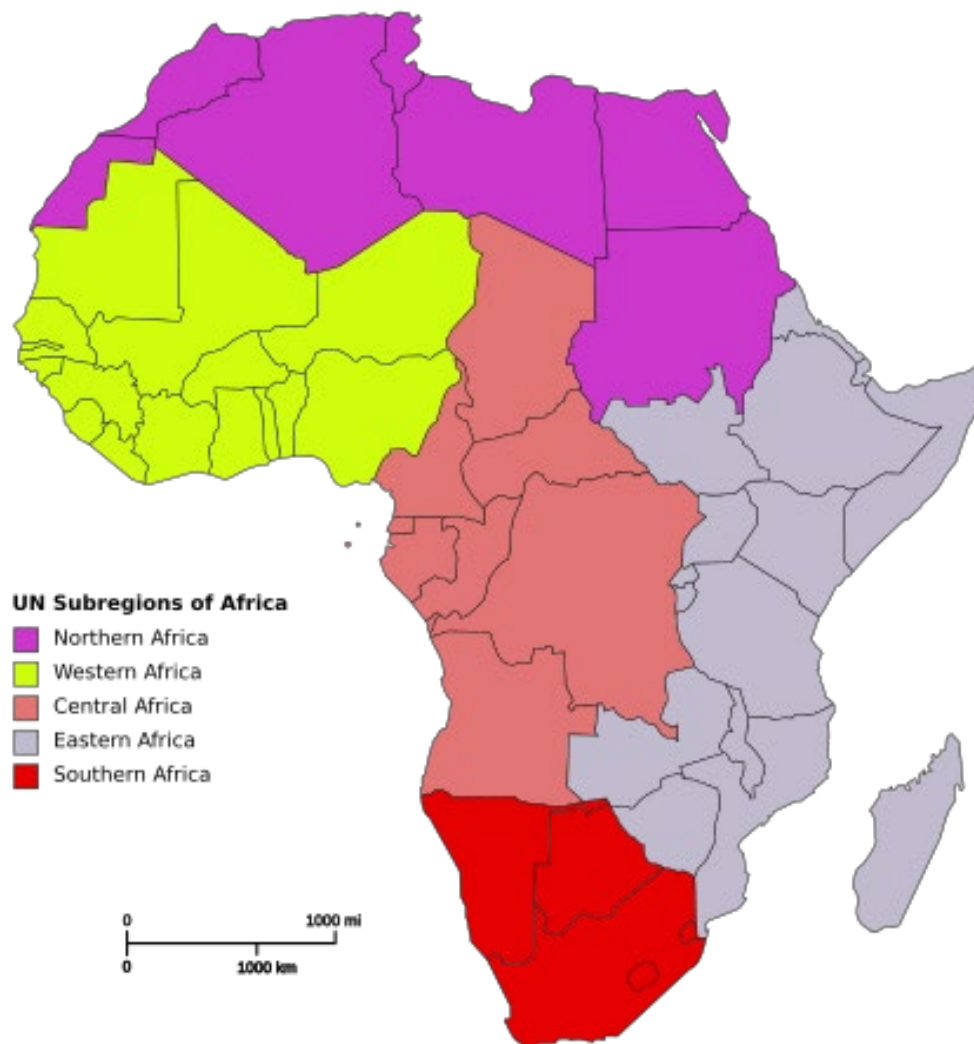


Figure 1: Map of Africa (five sub-regions)

Capacity Assessment Methodology

The proposed Capacity Assessment Framework targets three dimensions:

- **Points of entry:** We acknowledge that a country's capacity is influenced by individual, organizational, and enabling environment levels. Capacity assessments will cover all three levels, providing a comprehensive view of capacity constraints, enabling more holistic capacity development responses.
- **Core Issues:** We focus on identifying wastewater environmental surveillance gaps linked with public health sector accountability, access to information, inclusion, equity, enabling environment and international best practices.
- **Functional and Technical Capacities:** WES functional capacities are crucial for policy development and management. We will focus on WES situation analysis, policy design, resource allocation, implementation, and monitoring.

CNA Process outline (methodology)

- **Constitution of a capacity assessment team:** The capacity assessment team will include WES reps from ILRI (WES research associates, bioinformaticians/Biostatistician/data, UNEP representative, nominated sub-regional representatives and Global WES networks (GLOWACON). The team is expected to provide WES expertise, substantive content, methodological skills, and CNA management skills. They facilitate discussions on WES CNA scope, scale, framework adaptation, data collection, and interpretation.
- **Pre-CNA study**
 - Conduct desk review of existing literature and data on WES in Africa to identify current WES projects, capacity gaps and constraints
 - Define desired WES capacity for Africa (defining desired future capacities, defining levels of desired future capacities).
 - Develop CNA tools (questionnaires, set up digital platforms for administering questionnaires and data analytics) based on literature review findings.
- **Enlist Partners for CNA:**
 - Identify the relevant stakeholders engaged (supposed) in WES in the country (selected National Public Health Institutes/Laboratories, Medical Research Institutes, relevant

Ministries/agencies/ (water, health, environment, agriculture, aviation industry partners, mining industry, transport and trade) and sub-regional workshops (Public Health Institutions, Africa CDC, WHO, UNEP, Africa Union).

- **Conduct CNA in at least 30 countries (selected from the 5 sub-regions)**
 - UNEP intends to Convene country and sub-regional workshops to engage with stakeholders. The CNA team intends to attend the workshops and utilize the opportunity to administer questionnaires to attendees from different countries, assess WES physical infrastructure, institutional and technical capacities of at least six countries within the sub-regions (assessing existing capacity levels). The workshops will also be used to identify and agree on WES capacity development issues.
 - Use of Digital platforms to administer CNA questionnaires will be prioritized where appropriate and in circumstances where physical engagement with partners will not be feasible.
 - Capacity assets and needs will be evaluated using a variety of techniques, such as digital surveys, focus groups (workshop attendance), individual face to face interviews of partners and different organizational levels.
 - Collected quantitative and qualitative data will be analyzed and interpretation compiled outlining WES gaps, opportunities and strategies for WES capacity building in Africa.

References

1. [List of regions of Africa - Wikipedia](#)

Annex 4: List of participants

Entity/Organization Name	Entity Type (as per pro. Doc)	Country	Name	Title	Email
EPA	Government	Burundi	Jean Baptiste Njimbere	Chief Labo OBPE National Public Health Institute	jeanbaptiste4991@gmail.com
Ministry of Health	Government	Burundi	Dr. Ndayengenge Jean Marius	Manager of Health Promotion, Care request, Community and Environmental Health (DPS-DSCE)	jman_carafa@yahoo.fr
EPA	Government	Djibouti	Mohamed Elmi Obsieh		med.environnement_dj@yahoo.fr med.environnement_dj@yahoo.fr
EPA	Government	Democratic Republic of the Congo	Mr. BOPE BOPE LAPWONG Jean Marie	Expert at the Water Resources Directorate	jmbope2lap@gmail.com
	Government	Democratic Republic of the Congo	Jocelyne Mpemba Kazadi	Aquatic biology expert	joycekazadi1@hotmail.com
Ministry of Health	Government	Democratic Republic of the Congo	Emmanuel Lokilo Lofiko		emmanuel.lokilo@inrb.cd
EPA	Government	Eritrea	Ms. Lidya Teklehaimanot Isak	Waste Management Expert	lidyatekle18@gmail.com
EPA	Government	Ethiopia	Mesfin Gebrehiwot Damtew	Environment Protection Agency	mgebrehiwot22@gmail.com
EPA	Government	Kenya	Christopher Muteti	Principal Environmental Officer NEMA	cmuteti@nema.go.ke mutetick@gmail.com
Ministry of Health	Government	Kenya	Esther Sigilai	laboratory Focal Person	esthersigi35@gmail.com
EPA	Government	Rwanda	Byukusenge Oliva,	The Green House Gas Inventory Officer at the Rwanda Environment Management Authority	obyukusenge@rema.gov.rw
	Government		Onesphore NDUWIMANA		onduwimana@rema.gov.rw
Ministry of Health	Government	Rwanda	Dr Edison Rwagasore	The Manager of the Public Health Surveillance and Emergency Preparedness and Response Division at RBC	edison.rwagasore@rbc.gov.rw
EPA		Somalia	Nurta Mohamed Ali	Liquid Waste Management Officer	nuura6144@gmail.com
EPA	Government	South Sudan	Mrs. Cecilia Mogga Kenyi	Director Pollution Control	ceciken2019@gmail.com

Ministry of Health or Water	Government	South Sudan	Ms. Nyankiir Alor	National WASH-IPC focal person, IPC-WASH unit of Dept. of Environmental and Occupational Health	nyankiiralor85@gmail.com
EPA	Government	Sudan	Ms. Khawla Elbashir Awdalla Mohamed	Environmental Inspector	khawlaelbashir@gmail.com
Environmental Management Agency	Government	Uganda	Innocent Makello	National Environment Management Authority	innocent.makello@nema.go.ug
Ministry of Health or Water	Government	Uganda	Mirembe Rachel Faith	The Technical Coordinator, Sanitation and Hygiene Fund	rachellefaith@ymail.com
Country reps - 14 participating physically 5 participating remotely - total of 19 country reps					
UNEP	IGO	Nairobi, Kenya	Heidi Savelli	Chief of Unit	heidi.savelli@un.org
UNEP	IGO	Nairobi, Kenya	Alex Pires	Head of Unit	alex.pires@un.org
UNEP	IGO	Nairobi, Kenya	Riccardo Zennaro	Project Management Officer	riccardo.zennaro@un.org
UNEP	IGO	Nairobi, Kenya	Avantika Singh	Programme Associate	avantika.singh@un.org
UNEP	IGO	Nairobi, Kenya	Geraldine Deblon	Communication Consultant	geraldine.deblon1@un.org
UNEP	IGO	Nairobi, Kenya	Jianying Feng	Communication Intern	jianying.feng@un.org
UNEP	IGO	Cyprus	Popi Karaolia	UNEP WWS Consultant	popi.karaolia@un.org
UNEP	IGO	Portugal	Taru Miller	UNEP WWS Consultant	taru.miller@un.org
UNEP	IGO	Nairobi, Kenya	Josphine Wairimu Nduguti	Programme Associate	josephine.nduguti@un.org
European Union Joint Research Centre (JRC)	IGO	Ispra, Italy	Bernd Gawlik	Portfolio Co-Lead	bernd.gawlik@ec.europa.eu
EU HERA	IGO	Brussels, Belgium	Anastasia Koutolioutsou	Policy Officer	Anastasia.KOUTSOLIOUTSOU@ec.europa.eu
National Public Health Laboratory (NPHL) DRC	Government	DR Congo	Leadisalle Hosanna Lenguiya	Research Engineer	hosannelenguiya@gmail.com
WHO	IGO	Geneva, Switzerland	Kate Medlicott	Sanitation Team Lead	medlicottk@who.int
WHO	IGO	Australia	Monica Nolan	Senior Technical Advisor WES (Consultant - WHO HQ)	nolanm@who.int
WHO	IGO	Brazzaville, Congo	Leila Anes-Boulahbal	AFRO Emergencies team	anesboulahbald@who.int
WHO	IGO	Brazzaville, Congo	Guy Mbayo	Technical Officer	mbayog@who.int
WHO	IGO	Brazzaville, Congo	Abdullateef Jimoh	ES consultant WHO AFRO	ajimoh@who.int
Ethiopian Public Health Institute	Government	Ethiopia	Mohammed Ahmed Rameto	Waste water Surveillance, Epidemiologist	moharameto21@gmail.com
Nairobi Water and Sewerage Company	Government	Nairobi, Kenya	Felix Lukwa	Engineer	LLukwa@nairobiwater.co.ke
Washington State University	Academia	Kenya	Prof Sylvia A. Omulo	Assistant Professor/AMR Research Program Lead – Kenya	sylvia.omulo@wsu.edu

KNPHI-MoH	Government	Kenya	Dr. Leonard Kingwara	Technical Lead Biomedical Testing and Analytical Services Directorate	leonard.kingwara@gmail.com
Kenya Airways	Public-Private Partnership	Kenya	Dr. Judith Maye	MoH- Kenya Airways (KQ)	judith.maye@kenya-airways.com
Kenya Airways	Public-Private Partnership	Kenya	Mr. Haig Anyonyi	Director Safety-MoH Kenya Airways	Haig.Anyonyi@kenya-airways.com
Kenya Airways	Public-Private Partnership	Kenya	Roy Rimui		Roy.Rimui@kenya-airways.com
Kenya Airports Authority	Government Entity	Kenya	Mr. Ken Ngaina	Kenya Airports Authority	ken.ngaina@kaa.go.ke
Kenya Airports Authority	Government Entity	Kenya	Ms Regina Ombati	Kenya Airports Authority	Regina.Ombati@kaa.go.ke
Porth Health Services-MoH	Government	Kenya	Mrs. Florence Muthoni	Head of Porth Health Services-JKIA	fmuthoni8@yahoo.com
PMAESA	IGO	Kenya	Mr. Mubarak Sodha	PMAESA	MSODHA@PMAESA.ORG
Kenya Maritime Authority	Government Entity	Kenya	Mr Isaiah Nakoru	Ag. Director General-Kenya Maritime Authority	Info@KMA.go.ke and Imuhambe@kma.go.ke
Kenya Ports Authority	Government Entity	Kenya	Capt. William K. Ruto	Managing Director-Kenya Ports Authority	kpamd@kpa.co.ke and ca@kpa.co.ke and codoo@kpa.co.ke
Additional resource persons/experts for consideration					
INRB - DRC		DRC	Placide Mbale	Director INRB	mbalaplacide@gmail.com
University of Kinshasa, School of Medicine, Department of Tropical Medicine, DRC	Academia and Research	DRC	Japhet Kabalu	ODIN Project	kabalujaphet@gmail.com
Rwanda Biomedical Centre (RBC)	Government Entity	Rwanda	Jean Pierre Musabyimana		Jpierre Musabyimana jpierre.musabyimana@rbc.gov.rw
UVRI Uganda	Research Institute	Uganda	Josephine Bwogi	(TBC) Lab Director - supporting regional polio program	Josephine Bwogi jbwogi@uvri.go.ug
National Public Health Laboratory (NPHL) Tanzania MoH	Government Entity	Tanzania (maybe there could be a presenter from other EAC Mobile Lab countries that are participating this workshop?)	Peter Mkama	EAC Mobile Laboratories Project (collaborating at least with ODIN project)	Peter.mkama09@gmail.com
CHU Djibouti	Research and Academia	Djibouti	Mohamed Migane Abdi		miganov76@gmail.com
African Development Bank (AFDB)	Development Bank	Kenya	Caroline Adhiambo		C.ADHIAMBO@AFDB.ORG
African Development Bank (AFDB)	Development Bank	Kenya	Nancy Ogal	Water and Sanitation Engineer	N.OGAL@AFDB.ORG
African Development Bank (AFDB)	Development Bank	Kenya	Sifuma John	Water and Sanitation Engineer	J.SIFUMA@AFDB.ORG
African Development Bank (AFDB)	Development Bank	Kenya	Boniface Aleobua	Water and Sanitation Specialist	B.ALEOBUA@AFDB.ORG

UNICEF	IGO	Nairobi, Kenya	Steven Mudhuviwa		smudhuviwa@unicef.org
IWMI	IGO		Christine Mugami	Manager-Resource Mobilization and Partnerships	C.Murugami@cgiar.org
IWMI	IGO		Mateor Sagasta Javier		j.mateo-sagasta@cgiar.org
Turkish Water Institute	Government Entity	Turkey	Bilge Apaslan Kocameni	National Wastewater Surveillance Project Coordinator	bilge.alpaslan@marmara.edu.tr
UNICEF	IGO	Nairobi, Kenya	Hodaka Kosugi	WASH Specialist (Sanitation & Hygiene)	hkosugi@unicef.org
Total No of Participants		64			
Remote participants		14			
Onsite Participants		50			
ILRI sponsored participants		19			
"Country reps - 14 participating physically 5 participating remotely - total of 19 country reps"					

Annex 5: Workshop contribution to achieving the results (Outputs/Outcomes) for PoW (Program of Work) UNEP Indicators for the 'Preventing and addressing the degradation of freshwater and marine ecosystems from source to sea' project.'

- **Outcome 3.1** – 25 Stakeholders (national authority participants) including women and youth have used with UNEP's support, scientific knowledge, information and data obtained from the workshop to make informed decisions to prevent ecosystem degradation and pollution and enhance the protection of freshwater and marine ecosystems from land and sea-based harmful activities. (14 male, 11 female) (41% women used information obtained from the workshop) Full list:
 - A. [Feedback Survey for the East Africa Regional Workshop on Wastewater Surveillance for Environmental and Public Health – Nairobi, Kenya \(May 2025\).pdf](#)
- **Outcome 3.2** – 18 Best practices, experiences and/or examples shared by stakeholders, with UNEP's support, to prevent ecosystem degradation and pollution via the workshop. The best practices, experiences and examples shared by stakeholders were delivered via presentations and statements.

Best practices shared via presentations/examples			
No.	Name/Stakeholder	Organization	Best practice/example shared
1	Abdullateef Jimoh	WHO AFRO/PEP	Presentation on Wastewater Surveillance for Africa: overview of WHO initiatives, which included the Role of Environmental surveillance in Poliovirus detection and challenges encountered.
2	Eng. Lusiri Lukwa.	NAIROBI CITY WATER AND SEWERAGE COMPANY	Experiences shared on wastewater management in DESTW-RUAI PLANT which aims to tackle physical treatment; which

			involves the removal of both organic and inorganic solids from the wastewater both manually mechanically and, biological treatment; which involves the breakdown of organic waste by use of bacteria aerobically and anaerobically and the removal of pathogens by the U-V light
3	Bilge Alpaslan Kocamemi	Turkish Water Institute (SUEN)	One Health Approach and WES in Türkiye as a case study
4	Japhet Kabulu Tshiongo	ODIN DRC	Building up Environmental Surveillance in Low-resource Settings Approach, Outcomes, Challenges and lessons learnt from DRC
5	Javier Mateo-Sagasta & Alemseged Tamiru Haile	IWMI	Lessons learned in wastewater, WQM and AMR monitoring ok akai river, Ethiopia
6	Sylvia Omulo	Washington State University	Environmental surveillance of resistant <i>E. coli</i> in Kenyan Communities, including challenges in field surveillance i.e., Logistical Constraints Access to remote sites and timely sample transport is challenging. Environmental Variability Fluctuations in environmental parameters complicate consistent testing. Sample Integrity Maintaining sample quality during transport is critical for accuracy.
7	Monica Nolan, Guy Mbayo, Leila Anes-Boulahbal and Jimoh Abdullateef	WHO HQ and WHO AFRO	Wastewater and environment surveillance prioritization, implementation and integration framework for one or more pathogens for public health. Experiences and best practices: a) To familiarise participants with WHO resources to support pathogen prioritization, implementation and integration for public health b) To assist participants to apply these tools to their own context to use of WES for public health
8	Bernd Gawlik	GLOWACON	Wastewater surveillance at airports, aircrafts and ports summary of findings and experiences related to connecting GLOWACON to aviation, including measuring and testing methodologies, the global sentinel system for aviation and engagements with multiple partnerships

9	Florence Murithi	Kenya, STATE DEPARTMENT FOR PUBLIC HEALTH & PROFESSIONAL STANDARDS PORT HEALTH SERVICES JOMO-KENYATTA INTERNATIONAL AIRPORT	Best practices and experiences on defense against introduction of Public Health Events and risks associated with international trade and travel.
10	Ken Ngaina	Kenya Airports Authority- JKIA	Experiences and best practices for preparation to access airports for wastewater sampling, including issuance procedures undertaken and highlighted significance measures taken for airport access which are highly regulated based on ICAO standards and recommended practices.
11	MUBARAK SODHA	PMAESA SECRETARIAT	Role of PMAESA and Maritime Gateways from the region in using Wastewater Surveillance for Environmental & Public Health including weaknesses (from a port operations perspectives) and takeaways.
12	7 Country representatives:	Burundi, DRC, Ethiopia, Kenya, South Sudan, Somalia, Uganda	<i>Elevator pitch:</i> 7 countries briefly presenting their status of capacity vis a vis wastewater surveillance and their experiences and lessons learned

- **Output A3** - Generally, the findings and gaps identified the need to strengthen governance, review policy gaps, develop competency frameworks, consider decentralized solutions, benchmark best practices, invest in innovation, optimize financial resources, and consider environmental and climate resilience in the region. Thus, the feedback received from participants on the roadmap focused on multi-sectoral coordination, prioritizing WES targets, technical and operational capacity, and sustainable financing. 10 countries that participated in the SWOT analysis, facilitated with UNEP's support to strengthen coordination of cross cutting issues, with the application of integrated approaches across sectors to be considered for implementation in upcoming project activities (name of the countries to be specified).
- **Output B2** – One capacity development initiative held. The Eastern Africa Regional Workshop on Wastewater Surveillance for Environmental and Public Health served as a capacity development initiative which included countries/national governments, and other stakeholder groups to protect freshwater and marine ecosystems from wastewater pollution as well as the destruction of habitats.
(+1)

- **Output B3** - 22 government officials were trained that reported increased knowledge on the protection of freshwater and marine ecosystems from wastewater and nutrient pollution, as well as the destruction of habitats. Of the 22 government officials, 45 percent were female.
- **Output C1** - 4 environmental socio-economic assessment tools and methodologies were made available for governments, private sector entities and financial institutions to guide action on preventing the degradation of ecosystems.

	Name of tool/methodology	Description
1	SWOT decision-making tool	This is a strategic decision-making framework to help participants assess Strengths, Weaknesses, Opportunities, and Threats (SWOT) related to WES in their own countries. It enables the identification of capacities, gaps and external factors influencing the implementation of WES. The findings using this tool help to inform the development of national priorities and regional WES strategies, for public health and environmental protection.
2	Next country-specific steps analysis	The next country-specific steps analysis during the workshop focused on the identification of short-term and long-term actions that countries need to take to implement and scale up WES at national and regional level.
3	WHO-guided WES prioritization, implementation and integration framework	The WHO-guided WES prioritization, implementation, and integration framework made available during the Eastern Africa workshop, provided a structured approach for countries to identify key pathogens, define surveillance objectives, and context-specific priorities for WES.
4	Capacity needs assessment	The capacity needs assessment made available during the workshop, evaluated the readiness of Eastern African countries to implement WES. It also identified key gaps in various areas including technical infrastructure, expertise and trained personnel, data sharing mechanisms and integration and policy and regulatory considerations. It highlighted the need for capacity building, harmonizing regional WES approaches and cross-sectoral and regional coordination.

- **Output C2** - 23 representatives from governments and financial institutions were trained in the use of tools and methodologies, namely the SWOT decision-making tool, the next country-specific steps

analysis, the WHO-guided WES prioritization, implementation and integration framework, and the capacity needs assessment made available during the workshop, which evaluated the readiness of Eastern African countries to implement WES. 96 percent of the representatives were from governments and 4 percent were from financial institutions. (+22 government representative and +1 finance institution representative.)

- **Output D2 ,D3 and D4** – 55 stakeholders from the workshop (excluding UNEP personnel), have engaged in events/campaigns organized to increase awareness, have had access to information including but not limited to digital platforms/hubs, and were engaged to acquire new knowledge via the workshop training organized to change behavior and drive action on WES for evidence based decision making to protect freshwater and marine ecosystems from land and sea-based harmful activities.

Photo Gallery

https://drive.google.com/drive/folders/1ozyce4OmsADf7Hi2Mb9xuDUgLPjwMGMx?usp=drive_link

Presentations: <https://drive.google.com/drive/folders/1iYOYkNaOXiSwyXO2yVM8urIkPafINla?usp=sharing>





Eastern Africa Regional WES Stakeholders Group Visit to Nairobi City Water and Sewerage Company Treatment Plant in Ruai during the workshop held at ILRI-Nairobi Campus-off old Naivasha on 20th May 2025.