ATHENA
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Strategic Sanitation Service Planning

Guidance Note on Service System Assessments

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Introduction

Context

For years, achieving infrastructure-focused targets and advancing equitable and safe services have been seen as mutually inclusive, with infrastructure construction and rehabilitation the primary route through which residents are perceived to benefit from safely managed sanitation services. However, the quality and maturity of sub-national service systems and the internal functions of sanitation service authorities have not received similar levels of attention and investment, despite their crucial role in sustaining the services facilitated by infrastructure.

Inadequate investment in sub-national service systems perpetuates ineffective planning and decision-making and can lower the capacity of the public service provider to effectively maintain and sustain infrastructure. Cities are burdened with costly infrastructure that cannot be maintained in a financially sustainable manner, chaining service authorities with debt that cannot be repaid and damaging their ability to access finance and provide services that customers are willing to pay for i.e. the 'vicious cycle' or 'cycle of decline'.

Moving away from this status quo is a complex undertaking, but one that must begin with changing how service authorities plan and prioritizing interventions that build up underlying systems that produce safe, equitable and sustainable services:

A service system is a dynamic configuration of people, processes and functional workflows, and hardware that facilitates services that satisfy the needs, wants and aspirations of all residents.

The **process** of developing a strategic sanitation service plan is how the public service provider engages with different actors to analyse their *service system* and identify *strategic* interventions, covering policies, people, infrastructure, processes, business service delivery models and technologies that are optimized to advance customer trust, loyalty and service experience.

The resulting **output** outlines how a service authority (and other stakeholders) will build up its ability to deliver services over time and space, ensuring that its resources (internal and external) are equal to the interventions that the service authority has determined are required to extend and maintain safe, sustainable and equitable sanitation. This could take the form of a city sanitation plan, city/utility master plan or organisational performance improvement plans.

Purpose and structure of this resource

This resource serves as guidance on developing the strategic planning output, focusing on the service provider's internal functions and systems that enable improved planning, risk prediction and management, and delivering equitable and safe services. This resource supplements tools

and toolkits that aid geo-technical and financial assessments of infrastructure[1] and participatory planning processes.[2]

Through this guidance note and its accompanying Excel-based tool, users have a **comprehensive framework for assessing the maturity of the service providers's internal systems, establishing a baseline, identifying and setting targets, allocating budgets and tracking progress**.

This is inspired by frameworks such as IaDB's Aquarating and the World Bank's Utility of the Future, which draw on experiences and examples of service systems in more mature contexts for local service authorities to reference as they draw up their plans.

This resource will help planners and service authorities undertaking <u>city sanitation plans, city/utility master plans and performance improvement plans (PIPs)</u> to target investment in the internal service systems of sub-national service providers. This resource can also help national governments and regulators to undertake <u>system maturity reviews/audits</u> to improve the resilience of water and sanitation service providers and advance the goals of safe, equitable and sustainble sanitation services for all.

Service System Assessment Checklist

Assessing service systems is vital for optimizing operations, strategically allocating resources, and ensuring accountability for service delivery. A rigorous assessment will proactively identify risks, align with industry standards, and set the stage for continuous improvement, enhancing the resilience and efficiency of sanitation services.

This section describes the service system to be assessed during the SSSP drafting process, and subsequent activities that should be addressed in the SSSP output. Building on experience from utility leaders and managers, and frameworks such as IADB's Aquarating and World Bank's Utility of the Future, nine service system areas have been identified:

1. Physical asset management
2. Planning
3. Accounting and financial management
4. Customer management
5. Business management
6. Risk management
7. Human resource management
8. Procurement
9. Environmental management

This guidance document is complemented by an Excel tool that allows users to self-assess where their organisations stands across the nine service areas. People, policies and processes must be

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[1] For example: World Bank Water Global Practice: CWIS Costing and Planning Tool (Beta). World Bank Group; Performance Assessment System (PAS) Project: SaniPlan: A Performance Improvement Planning Model. CEPT University. Cossio, C., Norman, J., McConville, J., Mattson, A., Mercado, A. (v.1 2020) EVAS tool: sustainability assessment too for small wastewater treatment systems

[2] For example: Lüthi, C. Morel, A. Tilley, E. Ulrich, L. (2011): Community-Led Urban Environmental Sanitation Planning (CLUES). Eawag; Parkinson, J., Lüthi, C. Walther D. (2014): Sanitation 21 A Planning Framework for Improving City-wide Sanitation Services. IWA, Eawag-Sandec, GIZ

central to any truly strategic plan. This is an opportunity to engage multiple teams and members of staff into the strategic planning journey, ensuring buy-in to the change management evolution and ensuring that the strategic plan itself is realistic and responsive to internal organizational progress and external progress towards service targets.

The tool enables self assessment across the service outcome areas, based on a qualitative rubric which assigns a numeric score to indicate the level of progress made. The scores range from 0 to 4, each representing a distinct stage in the progress towards achieving the specified service system outcomes. Note that these 'scores' should only be used indicatively, and that all outcomes may not be equally relevant or important.

Table 1 Self assessment rubric definitions

Progress towards outcome	Definition
Not applicable	This outcome is not relevant, suitable, or capable of being applied or used in this context
0 - Non-existent	No progress has been made towards achieving this outcome
1 - Initial discussions or planning	No tangible progress has been made, but written evidence of planning/strategizing towards this outcome is available
2 - Some progress made	The first steps towards achieving this outcome have been made. This can be demonstrated by tangible progress against a baseline
3 - Partial achievement	Some variation of this outcome is incorporated into regular operations, however it isn't fully integrated or effective
4 - Fully achieved	This outcome is fully and effectively incorporated into regular operations

The tool, once filled in, generates a summary chart for users to indentify the areas requiring the most attention and to easily track progress over time. Users are advised to produce supporting evidence for each self-assessed outcome, and if feasible, undergo verification by an auditor. The independent reviewer's role is crucial in ensuring the accuracy of the assessment, substantiating each outcome score with sufficient evidence. This comprehensive approach ensures a robust and reliable evaluation process.

Figure 1 Illustrative Excel tool summary chart highlighting progress made across the different outcome areas.
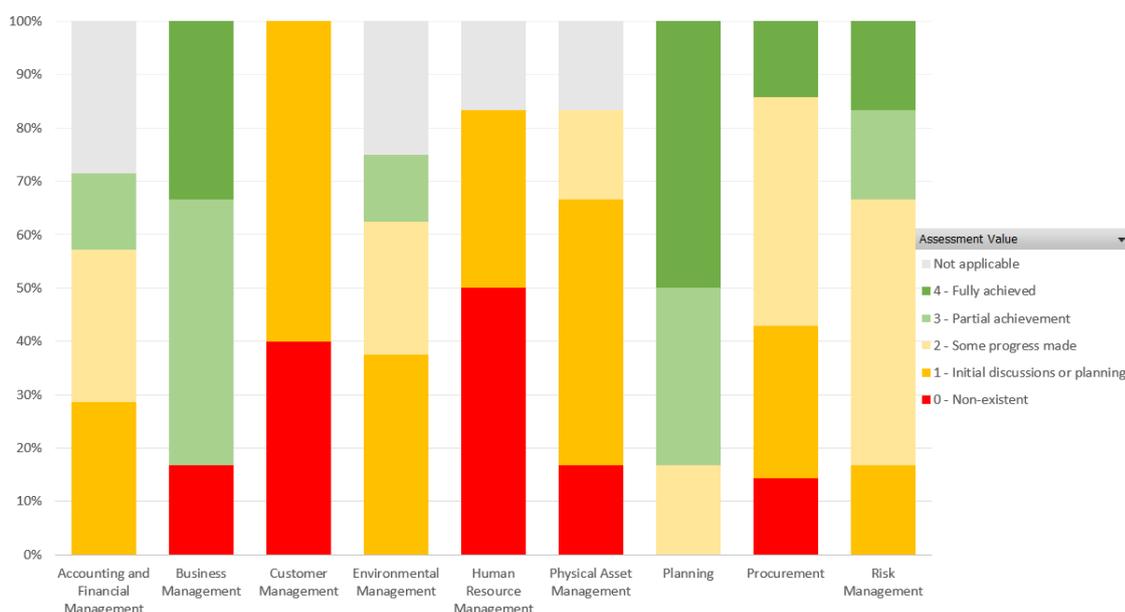
This serves as a foundational assessment of the aspects of service authority governance that are crucial for operating a functional and inclusive sanitation service for all urban residents. It reflects the organization's readiness and strength, providing a baseline for tracking progress in service system management. Positive outcomes in this assessment signify the capacity of a service provider to successfully **build and sustain** citywide sanitation services based on a strong governance framework.

The following tables detail the essential inputs for achieving positive governance outcomes, encompassing policy, process, and technology considerations. In instances where the Excel-based assessment tool reveals gaps in service system outcomes, it is recommended users refer to these tables. Doing so will enable a targeted exploration of the corresponding inputs, offering guidance on the necessary considerations to bridge identified gaps.

1. Physical Asset Management

Service System Outcomes	Inputs (Policy, Process and Technology)
A digital record of all key sanitation assets covering the full sanitation service chain and sewered and non-sewered households maintained and updated at least at an annual frequency	Asset Management Software: Implementation of specialized software for maintaining and updating digital asset records.
	Data Management Policy: A policy outlining the frequency and process for updating digital records.
Regular condition assessments conducted and documented for all assets	Condition Assessment Protocol: A documented protocol for conducting regular asset condition assessments.
	Condition Assessment Records: A system for recording and storing assessment results.
Preventative maintenance plans followed for all assets	Preventative Maintenance Scheduling Software: Utilization of software for scheduling and managing preventative maintenance.
	Maintenance Work Order System: A system for creating and tracking maintenance work orders.
Criticality analysis done to prioritize maintenance and capital investments	Asset Criticality Analysis Tools: Utilization of tools and methodologies for assessing asset criticality.
	Asset Investment Prioritization Criteria: Established criteria for prioritizing maintenance and capital investments based on criticality.
Standard operating procedures for operations and maintenance of all assets	Standard Operating Procedures (SOPs): Development and documentation of SOPs covering operations and maintenance of all asset types.
	Training and Certification Programs: Training and certification programs to ensure adherence to SOPs.
Asset management strategy and investment plans updated every 3-5 years aligning with strategic planning cycles	Strategic Planning Process: Integration of the asset management strategy and investment plans into the broader strategic planning cycles.
	Asset Management Policy: A policy that specifies the frequency and process for updating asset management strategy and plans.

2. Planning

Service System Outcomes	Inputs (Policy, Process and Technology)
Regularly maintained digital service maps exist, covering the entire service area	Network Infrastructure and Property Mapping: A comprehensive GIS displaying network infrastructure and properties served.
	Annual Map Update Process: clearly defined and financed
Service plans are developed or updated with a specific emphasis on identifying and prioritising investments, every 3-5 years.	Strategic Planning Process: Presence of a established and codified process on developing plans
Plans developed through participatory process involving communities	Community Engagement Framework: A structured framework for involving communities in the planning process.
Plans aligned with city master plans and national policies	Urban Planning Guidelines: Incorporation of urban planning guidelines from the city master plans.
	Policy Integration Team: A dedicated team responsible for ensuring alignment with national policies.
Clear and incremental targets set for coverage and service levels in line with national goals	Policy Framework Alignment: Ensuring that service targets are aligned with national goals through policy and regulatory alignment.
	Performance Monitoring Technology: Use of technology to track and measure progress toward targets.
Investment plans break down required finances and link to financing strategy	Financial Analysis Tools: Utilization of financial analysis tools to break down investment requirements.
	Financial Strategy Framework: A framework for developing a financing strategy that aligns with investment plans.
Comprehensive scenario modelling and impact simulation conducted to measure equity, environmental and financial outcomes [3]	Modeling and Simulation Software: Deployment of specialized software for scenario modeling and impact simulation.
	Data Analytics Expertise: In-house expertise or partnerships for data analytics and modeling.

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[3] Annexure 1 provides examples of business model options, tools and case studies on how service providers have attempted to introduce interventions to balance between equity and safety and financial sustainability goals through scenario modelling

3. Accounting and Financial Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Computerized accounting system fully adopted and integrated	Accounting Software Implementation: Implementation of robust accounting software for automating financial processes.
	IT Infrastructure Integration: Integration of accounting systems with existing IT infrastructure.
Cost accounting to track costs by customer, technology and transaction	Cost Accounting Policies: Establishment of cost accounting policies to track costs by various customer and infratsructure categories.
	Cost Accounting Software: Adoption of specialized software for accurate cost tracking.
Annual financial audits conducted by external auditor	External Audit Services Contract: Engagement of an external auditing firm to conduct annual financial audits.
	Audit Compliance Framework: Implementation of an audit compliance framework to ensure a smooth audit process.
Financial strategy and models developed for short and long term	Financial Strategy Team: Formation of a team to develop financial strategies for both short and long terms.
	Financial Modeling Tools: Use of financial modeling software to create long-term financial models
Financial controls in place for cash management, payments, and procurements	Financial Control Policies: Establishment of financial control policies for cash management, payments, and procurements.
	Internal Controls Oversight: Assignment of responsibilities for overseeing and enforcing financial controls.
Annual budgets prepared and aligned with strategic plans	Budgeting Process Framework: Implementation of a structured budgeting process to prepare annual budgets.
	Strategic Planning Integration: Integration of budgeting with the organization's strategic plans.
Regular financial monitoring and reporting to track revenue, costs, subsidies	Financial Monitoring Tools: Utilization of financial monitoring software and tools to track revenue, costs, and subsidies.
	Reporting Framework: Development of a reporting framework to provide regular updates on financial performance.

4. Customer Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Resolution of all "complaints" is notified and satisfaction is verified digitally	Customer Relationship Management (CRM) System: Implementation of a CRM system for tracking complaints and satisfaction verification digitally.
	Digital Feedback Mechanism: Integration of a digital feedback mechanism for customers to report and verify resolution.
Customer satisfaction survey conducted at least once a year	Survey Software: Utilization of survey software for conducting customer satisfaction surveys.
	Survey Methodology Guidelines: Development of guidelines for survey methodology and frequency.
A customer/user ombudsman exists	Ombudsman Position: Establishment of a dedicated ombudsman role to address customer/user concerns.
	Ombudsman Framework: Development of a framework outlining the responsibilities and processes for the ombudsman.
Customer communication strategy in place including media campaigns	Communication Strategy Team: Formation of a dedicated team responsible for developing and executing the customer communication strategy.
	Media Campaign Planning Tools: Use of tools to plan and execute media campaigns effectively.
Processes streamlined for new connections, disconnections, payments	Process Automation Software: Implementation of software for automating and streamlining processes related to new connections, disconnections, and payments.
	Process Optimization Expertise: Expertise in process optimization techniques to improve efficiency.
	Call Centre: Presence of a central communication hub for customer and utility engagement.
Customer data is disaggregated by demographics, geographic location, service level, preferences, service history, and customer segments, and integrated into Geographic Information Systems (GIS) and other databases.	Data Integration Tools: Utilization of tools for integrating customer data with GIS and other relevant databases.
	Data Analytics Framework: Establishment of a framework for analyzing and using disaggregated customer data for decision-making and service improvements.

5. Business Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Strategy and service plane establishing a clear vision operations and outlining concrete steps to achieve goals in place	Strategic Service Planning Process: A structured process for developing and updating strategic service plans
	Service Planning Framework: Framework for creating detailed service plans
Organizational structure and staffing regularly reviewed and aligned to strategy	Organizational Review Policy: A policy for regular review of the organizational structure.
	Staffing Alignment Process: A defined process for aligning staffing levels and skills with the strategic goals.
Standard operating procedures and performance standards established	Procedure Development Framework: Framework for creating and updating standard operating procedures.
	Key Performance Indicators (KPIs): Development of KPIs to measure and ensure performance standards are met.
Integrated Management Information System (IMIS) in place to enhance operational efficiency and strengthen planning across the value chain	Information Technology Infrastructure: Implementation of the necessary IT infrastructure to support an IMIS.
	IMIS Development Team: A dedicated team responsible for designing, developing, and maintaining the IMIS.
Partnerships formed with to improve capabilities where gaps exist (PPPs, Inter-governmental, NGO, Research Institution, etc)	Partnership Strategy: A strategy for identifying and forming partnerships with relevant entities.
	Partnership Liaison Officer: A designated point of contact responsible for managing and nurturing partnerships.
Training programs instituted	Training Needs Assessment Process: A process for assessing the training needs of the organization.
	Training and Development Budget: Allocation of a budget specifically for training programs.
Knowledge management system adopted to retain and transfer knowledge	Knowledge Management Policy: A policy for managing and preserving organizational knowledge.
	Knowledge Management Software: Implementation of software or tools for knowledge capture and transfer.

6. Risk Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Enterprise risk management framework adopted	Business Risk Management Policy: A comprehensive policy outlining the framework for managing business risks.
	Risk Management Software: Implementation of specialized software to support business risk management processes.
Maintenance of a risk library and risk register for physical asset risks.	Asset Risk Identification Process: A structured process for identifying and cataloguing risks specific to physical assets in the risk library.
	Asset Data Management System: A system for maintaining and updating the risk register related to physical asset risks.
Development of mitigation plans for key physical asset risks, such as disasters and project risks.	Physical Asset Risk Assessment Methodology: A methodology for assessing and prioritizing key risks associated with physical assets.
	Project Management Expertise for Physical Assets: Utilization of project management expertise specifically for the development of risk mitigation plans related to physical assets.
Business continuity and emergency preparedness plans in place	Business Continuity Policy: A policy outlining the framework for business continuity and emergency preparedness.
	Crisis Response Team: A dedicated team responsible for developing and implementing response plans.
Adoption of risk-based design standards for physical technologies and infrastructure.	Physical Asset Risk Analysis Tools: Tools for conducting risk assessments and incorporating findings into design standards for physical technologies and infrastructure.
	Engineering Expertise for Physical Assets: Engineering expertise to develop risk-based design standards specifically for physical assets.
Monitoring of physical asset risks through leading indicators, such as asset condition and failures.	Data Analytics Tools for Physical Assets: Use of data analytics tools to track leading indicators related to physical asset condition and failures.
	Predictive Maintenance Technology for Physical Assets: Implementation of technology for early detection of physical asset failures.
Integration of physical asset risk management into planning, budgeting, and operations.	Integrated Physical Asset Risk Management Framework: Development of an integrated framework that connects risk management for physical assets with planning, budgeting, and operations.
	Risk Management Training for Physical Asset Staff: Training programs to ensure staff are aware of and capable of integrating physical asset risk management into daily operations.

7. Human Resources Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Skills assessment done and competency models defined for key roles	Competency Assessment Tools: Utilization of tools and methods for assessing employee competencies.
	Job Analysis Process: A structured process for analyzing key roles and defining competency models.
Adequate staffing levels across the organisation	Workforce Planning Framework: A strategic workforce planning framework to project staffing needs.
	Recruitment Strategy: An effective recruitment strategy to attract and retain talent
Training programs instituted to build required capabilities	Training Needs Analysis: Regular analysis of training needs to identify skill gaps.
	Learning and Development Programs: Implementation of training and development programs to address skill deficiencies.
Performance management system aligned to strategy and values	Performance Appraisal Guidelines: Development of clear performance appraisal guidelines.
	Alignment with Organizational Values: Integration of performance management with the organization's strategic goals and values.
Succession planning for critical positions	Talent Identification Process: A process for identifying and nurturing talent within the organization.
	Leadership Development Programs: Programs designed to prepare individuals for critical roles and leadership positions.
Workforce planning and analytics used to project requirements	Workforce Analytics Tools: Implementation of tools for data-driven workforce planning.
	Demographic Analysis: Analysis of workforce demographics to project future requirements.
HR policies exist for recruitment, development, retention, separation	HR Policy Framework: A comprehensive framework for HR policies covering recruitment, development, retention, and separation.
	Legal and Compliance Expertise: Legal and compliance experts to ensure policies adhere to labour laws and regulations.
HR administration automated through HR information system	HR Information System (HRIS): Implementation of an HRIS to automate and streamline HR administrative processes.
	Technology Integration Team: A team responsible for integrating HRIS into the organization's operations.

8. Procurement

Service System Outcomes	Inputs (Policy, Process and Technology)
Standardized procurement manual and templates adopted	Procurement Policy and Guidelines: Established procurement policy and guidelines as the basis for standardization.
	Document Management Software: Utilization of software for creating and managing standardized templates.
e-Procurement platform used to bring efficiency and transparency	E-Procurement Technology: Implementation of e-procurement software and technology.
	Data Security Protocols: Security measures and protocols for safeguarding sensitive procurement data online.
Panel of qualified/accredited vendors created	Vendor Qualification Criteria: Defined criteria and procedures for vendor qualification.
	Vendor Accreditation Program: Implementation of a program to accredit vendors based on established standards.
Contract management system used to track KPIs and obligations	Contract Management Software: Utilization of contract management software to monitor and track key performance indicators (KPIs) and contractual obligations.
	Performance Metrics Framework: Framework for defining and tracking KPIs within contracts.
Procurements audited periodically to ensure compliance	Audit and Compliance Team: A dedicated team responsible for conducting periodic procurement audits.
	Audit Checklist and Procedures: Established checklist and audit procedures to ensure compliance with procurement policies.
Staff trained on procurement policies and procedures	Training Programs: Procurement training programs to educate staff on procurement policies and procedures.
	Training Resources: Educational resources and materials for staff training.
Procurement strategy aligned with overall strategic plans	Strategic Planning Framework: Integration of procurement strategy within the organization's overall strategic planning framework.
	Strategic Alignment Team: A team responsible for ensuring alignment between procurement and the organization's strategic goals.

9. Environmental Management

Service System Outcomes	Inputs (Policy, Process and Technology)
Environmental impact assessments conducted for new projects	Environmental Assessment Guidelines: Clear guidelines for conducting environmental impact assessments.
	Trained Environmental Assessment Teams: A team of experts trained in environmental assessment methodologies.
Effluent quality monitored regularly across sanitation value chain	Monitoring Technology: Advanced monitoring technology for tracking effluent quality.
	Regulatory Compliance Framework: A framework that ensures adherence to effluent quality standards.
Standard operating procedures adopted for waste handling and disposal	Waste Management Policy: A policy that guides the development of standard operating procedures.
	Waste Handling Expertise: Expertise in waste handling and disposal practices.
Technologies selected based on sustainability criteria	Sustainable Technology Assessment Criteria: Criteria for evaluating and selecting technologies based on sustainability.
	Technology Assessment Team: A team responsible for assessing and recommending sustainable technologies.
Environmental risks identified and mitigation plans adopted	Risk Assessment Methodologies: Established methodologies for identifying environmental risks.
	Risk Mitigation Strategy: A strategy for addressing and mitigating identified environmental risks.
Environmental metrics and indicators tracked	Environmental Data Collection Tools: Tools for collecting data on environmental metrics and indicators.
	Data Analysis and Reporting Framework: A framework for analyzing and reporting on environmental data.
ISO 14001 or similar international standard certification attained	Environmental Management System (EMS): Development and implementation of an EMS in line with ISO 14001 standards.
	Certification Process Expertise: In-house or outsourced expertise to navigate the certification process.
Climate action plan in place	Climate Change Assessment Tools: Tools for assessing climate change impacts and vulnerabilities.
	Climate Resilience Planning Team: A dedicated team responsible for developing and implementing climate vulnerability plans.

Annexure 1: Scenario modelling to balance between equity, safety and financial sustainability outcomes at city/service area scale.

Service authorities must find creative ways to advance their goals within a set of constraints (financial and natural resources, institutional capacities, etc.). This requires assessing multiple models that, when carefully combined, can deliver equitable, viable, and resource efficient services.

When weighing up options for which models to pursue, a clear set of desired outcomes and awareness of trade-offs between those outcomes is critical. This section describes a set of six outcome metrics grouped under 'equity', 'safety' and 'sustainability' as a minimum starting point for evaluating options. The planning authority may add additional areas based on their local priorities and goals (e.g. greenhouse gas emissions)

Equity:
- % poor with safe coverage
- HH expenditure on sanitation by poor vs non-poor
- Public expenditure on poor vs non-poor

Safety:
- % waste safely managed

Sustainability
- % Cost coverage /Utility Net Profit/Loss
- Water consumption

Outcomes Metrics Explained

Outcome	Metrics	Explanatory Notes
Equity	% safe sanitation coverage by income group	Percentage of population in a service area segregated by Low-Income Households (LIH) and Non-Low-Income Households (NLIH) that have access to either conventional sewer, non-conventional sewer, safe onsite (lined pits / septic tanks), unsafe onsite systems
	Total life cycle cost (in currency)	*Public expenditure* includes the monies spent by government entities (public authority) to provide the sanitation services categorized by hardware option. The lifecycle cost includes the capital costs, O&M and replacement expenditure over a ten-year period. The expenditure must be disaggregated to track monies spent on low income and non-low income population in that category.
	Average annual household expenditure in currency	Average annual recurring expenditure incurred by low income and non-low income household availing the sanitation services. The HH expenditure in each containment hardware is aggregated from the price paid by household defined by its system from toilet to reuse
Sustainability-Financial	% cost coverage / net profit or loss (in currency)	*Cost coverage* is the annual net loss or profit for the public authority by each hardware type consolidated over a period of ten years during which the lifecycle assessments are made. Cost coverage is also expressed as a percentage of costs covered by the revenue for providing the sanitation services by the public authority. Revenue and cost related to each hardware type (SS, NCS, Safe onsite, unsafe onsite) are considered to compute cost coverage for the respective services by the public authority
Sustainability-Water	Annual water requirement (in Mn Ltrs)	The annual total amount of water required for each hardware type based on the toilet/containment. The total water required in each hardware is presented by low income and non-low-income population
Safety	% safely managed waste	Percentage of waste safely managed at each level of the sanitation chain for each category and presented at each level of the sanitation chain (aligned to SFD)

Achieving these outcomes requires the service authority to assess multiple levers, including hardware construction or rehabilitation, revenue generation models, financing strategies and regulatory changes. An illustrative (but not exhaustive) set of actions under these different categories is presented below.

The EquiServe Tool
EquiServe is an analytical tool designed to assist public sector leaders and development actors to design creative service models that advance equitable, safe and sustainable sanitation services in cities. It helps users analyze the sanitation market system as a whole and illustrates how different interventions affect the sanitation service outcomes. The tool was co-developed by Athena Infonomics with the Eastern and Southern Africa Water and Sanitation Regulators' Association (ESAWAS) and Aguaconsult.

Refer to **Annexure 2** *for detailed steps to set up the scenario modeling process in EquiServe.*

Options to advance urban sanitation services

	Containment	Emptying & Transportation	Treatment	Reuse
Hardware	• Increase sewer connection density • Upgrade unlined pits to lined pits and/or ecosan toilets • Improve toilet interface (e.g. add doors) • In-situ treatment models (with or w/o energy recovery) • Community or public toilet complex with energy recovery	• Build transfer stations (mobile/ fixed) • Rehab/optimise sewer network • Phase expansion of network to new areas • Cross utilize infrastruture e.g. transport truck • Explore new emptying technology (e.g. PuPu pumps) • Provide safety equipment, specialized equipment, or innovations to private emptier to aid emptying.	• Rehab treatment plant • Co- treat to separate wastewater and fecal sludge treatment plant • Nature-based solutions • Cluster FSTPs	• Co-composting • Residential reuse/ bio-gas
Revenue /Demand	• Metering water/wastewater • Improve billing and collection efficiency	• Charge for emptying unlined pits • Gradient pricing based on customer profile/ sludge type (HH, commercial) • Introduce tipping fee • Reset sewer tariff structure • Control prices of regulated emptiers • Group emptiers based on geography/type of containment	• Introduce a tipping fee • Vary FSTP fee based on seasonal flow / quality of inputs	• Sell compost • Sell recycled water • Farmer/ truck partnership
Finance	• Direct / indirect and part or fully subsidized containment construction • Construction subsidy for formal vs informal settlements • Sanitation levy/ tax • Cross subsidise from other users/ solid waste	• Self-selected and voucher based emptying subsidies (fixed period) • Asset-based finance	• Prepaid fees/ road tax/ permits/ license to operate/ fines • Pooled financing • Payment for Ecosystem services (PES) • Escrow arrangement	• User service charges • Sanitation taxes • Result-based financing (OBA) • Payment for Ecosystem services (PES) • Carbon finance

	Containment	Emptying & Transportation	Treatment	Reuse
Procurement	• Microfinance • Franchising • Subscription • Pay-per-use • Community owned - community operated	• Own & operate emptying services • Lease equipment to operators • E&T licensing to groups • Community owned – community operated E&T services	• BOT end user PPP • Design Build Operate (DBO) • Hybrid Annuity Model (HAM)	• Tri-party fixed price model • Reuse utility buy-back model • End user reuse PPP • Water Swaps Model/Inter-sectoral Water Exchange
Others	• Capacity building for designing/ construction/installation of improved toilet and containments systems • IT/ ICT tech for improving access to toilet and/or upgrading containment system	• Train operators/workers on SOPs/use of PPE etc. • IT/ ICT tech to plan and/or monitor emptying and transport of FS (GIS mapping and GPS monitoring)	• Capacity building on implementing a treatment facility, including SOPs for operating the same • IT/ ICT tech to monitor the FS/WW load delivered and functionality of the treatment plant	• Capacity building on implementing a reuse facility, including SOPs for operating the same.

The case studies below highlight how cities have leveraged one or more of these options.

Strengthening tariff structures in Zambia

The national regulator in Zambia, NWASCO, is planning to separate water and sanitation tariffs. Tariffs are to be based on operating costs and investments (current and future), differentiated according to customer categories (domestic, commercial and institutional), and include cross-subsidies among customer categories to ensure affordability for low-income households.

Regarding non-sewered services, the guidelines propose separate pricing for emptying pit latrines and septic tanks, based on the volume and quality of the sludge emptied, as well as the distance between the point of collection and the nearest FSTP. For example, for pit latrines, pricing is to be set per barrel of sludge and the presence of solid waste in the pit (i.e., customers will be charged extra if inappropriate substances are found in the pit latrine). For septic tanks, pricing is differentiated between domestic and non-domestic customers. Emptying rates for the domestic category are progressive and divided into three bands: 12-15m^3 (the standard size of a domestic septic tank), 15-18m^3 and then 18-21m^3.

In addition to the costs of service, tariffs will be determined by a mark-up capped at a maximum of 10% for both pit and septic tank emptying. The tariff changes are expected to help utilities serve different customers while accounting for sanitation revenues and costs.

Evaluating rehabilitation vs. new infrastructure & phasing hardware interventions in Kampala, Uganda

The Kampala Strategic Investment and Financing plan envisaged improving sewer coverage from 0.17 million to 0.70 million people by 2030. Within this larger goal, the Kampala Capital City Authority wanted to agree on medium term objectives to reach more people by 2025. Analysis showed that simply expanding the sewer network would require a capital outlay of USD 84 million for 13km of new network; however, a combination of rehabilitating 2.3km, replacing 84km (50% of the network), and densification efforts would require only USD 72 million and reach more people. Repairs and densification would increase sewer coverage at a lower cost and ensure steady inflows for WWTP rehabilitation. Although Kampala plans to build new WWTPs and FSTPs to expand treatment capacity, the city also needs to address existing treatment capacity constraints. Options analysis showed that the city could take a phased approach in the interim, adding electro-mechanical dewatering equipment to increase treatment capacities of the existing FSTP.

Progressive regulation in Tema, Ghana

The city of Tema, Ghana, was struggling with poor revenue collected through utility bills, as an increasing number of customers were illegally connected to the trunk network. The city modeled the cost of legalizing all sewer connections and associated revenue improvements. Options analysis showed that legalizing all sewer connections could improve the collection efficiency from 20% to 80% for LIC households and 80% to 90% for the rest of the city. As a result, the administrative process could be strengthened with one-time spending, yielding improved efficiency in the long term.

Investing in technology shifts and operational efficiences for CBS in Cap-Haitien

SOIL, a container-based sanitation company in Cap Haitien, Haiti, serving about 1%-2% of the city population, proposed to invest in more efficient and scalable windrow composting technology. Modeling shows that if SOIL expands service coverage to 10% of the population, efficiencies in operations alone could save indirect costs by 36%. There would be additional savings in direct costs due to improving CAPEX utilization. The business model established non-linear efficiencies in scaling with savings in direct cost, indirect costs and new revenue sources (sale of compost) while improving safely managed sanitation.

Targeted subsidies for emptying in Kampala and Lusaka

Both Lusaka (LWSC) and Kampala (KCCA) modeled direct subsidies to improve safe coverage and emptying among poorest residents. The subsidy designed in Lusaka was based on self-selection, while Kampala chose targeted subsidies. In both cases, there was a remarkable increase in demand for emptying services. In Kampala, the first five rounds of emptying subsidies resulted in 77% more barrels emptied than targeted, either from neighbors of the subsidy recipients or additional demand by the beneficiaries themselves. In Lusaka, three years of emptying subsidies resulted in 28,000 m^3 of fecal sludge emptied and delivered to the treatment plant, compared to less than 1,000 m^3 per year before.

Annexure 2. How to Set Up the Scenario Modeling Process in EquiServe

The [EquiServe Tool](#) can be used to develop scenarios for the baseline (current situation) and a variety of intervention combinations. After free online registration, users can follow these steps for setting up the scenario modeling process in EquiServe:

1. Define the service area for planning and the population to serve

Planning should start with base data on a) population to serve; b) population growth patterns, including floating/ transient populations. When a city master plan exists, the planner should check the master plan for settlement patterns, including tenancy shifts of the low-income population, to ensure uniformity in planning. The actual population to serve can be different from the projected census data and should be based on the (future) mandate of the authority. The authority may also choose to target a sub-area of the city, when resources are limited and the area is in the most dire need of service improvements.

For example, the current sanitation service area for Kampala City only includes its five administrative divisions totaling 1.6 million people (2021 census data), but the Uganda Vision 2040 envisions developing a Greater Kampala Region that covers the peripheries. This means that the authorities need to plan sanitation services for 2.8 million people (residents and transient), which is projected to grow to 5 million by 2030. While the proportion of the poor and non-poor populations may not drastically change over a short period, the growth patterns in each area will dictate the intervention options.

2. Construct a "baseline scenario" in the web tool by entering the data points from the situational assessment

The situational assessment should collect comprehensive data on service levels across the sanitation value chain by neighborhood. The EquiServe tool then organizes the data points and turns them into a systems view of the "baseline" (current) situation to reveal service gaps, safely managed sanitation, service cost and sustainability issues, etc. The tool bifurcates data for low-income and non-low-income households, highlighting inequities in service levels and household price burden.

The "baseline scenario" also sheds light on the potential impact of one service chain segment on another. For example, unlined pits were found to be the most commonly used containment option in Kampala (mostly in low-income settlements). Since unlined pits lack proper construction support and may collapse during emptying, poor containment would be a major barrier for the city to improve safely managed sanitation. The authority hence needs to consider systematic pit upgrades in planning.

3. Define what needs to be achieved and for whom

The types and quantum of intervention depend on the gap between existing service levels and benchmarks/ targets. Target setting is a complicated yet critical task that needs to involve all key stakeholders to ensure that the targets address different needs and priorities. It should also identify if the service gaps are fundamentally due to a) sanitation hardware (no hardware, wrong type, malfunctioning, under capacity, inefficient) or related basic infrastructure (energy availability); OR b) institutional/ structural/ policy gaps. The targets should be set based on

realities and broken down by sanitation service chain segment, for each population group/ neighborhood to ensure service equity.

The time frame for overall targets and the sub-goals should also be set. At this stage, an overall frame can be set based on stakeholder discussions, and the details/ exact timeline can be determined once the intervention options are selected, following the "critical path method".

4. Define constraints

When planning, the authority is always faced with limited resources and needs to plan within these constraints. Primary constraints include financial resources available for the intervention over its full lifecycle, and water availability and reliability. These constraints set non-negotiable boundaries within which the interventions operate. Other important factors include availability of power, vulnerability to flooding, access to roads, household income and affordability levels. Data on these factors is collected as part of the situational assessment.

For example, in Nanyuki, Kenya, 18% of current water supply is sourced from borewells to supplement the insufficient water supply from the nearby river. However, there is still a water deficit of 6-8% of current demand. While the city is undertaking water supply augmentation work to meet the supply shortage, the additional capacity will still not support the amount of water required if the city wants to move from 39% to 100% sewer coverage. This constraint compels the city to look beyond sewer-only interventions for sanitation service improvements.

5. Construct scenarios using various levers

Once constraints are defined, the planner can replicate the "baseline scenario" in EquiServe with a click of the button, and modify changeable conditions to create a new scenario showing each intervention package. Refer to Guidance Area 3: Options Analysis for an illustrative list of levers that can be considered while constructing new scenarios.

6. Model the scenarios to maximize safe services within the set of constraints

Once the tool calculates the oucomes under each scenario, the planner can compare the scenario options using Equity, Safety, and Sustainability metrics. The authority is inevitably faced with trade-offs between the metrics among the various scenarios. The tool helps the planner visualize the types and extent of trade-offs made. The planner could then select the option that best balances the authority's priorities with those of other key stakeholders.

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