SESSION 1

SANITATION AND CLIMATE

sustainable sanitation alliance

A) INTRODUCTION

B) CRS COALITION STATUS AND WAY FORWARD

C) CRS ANNEX TO GCF GUIDANCE

D) EXPRESSO PRESENTATIONS ON ADAPTATION

E) EXPRESSO PRESENTATIONS ON EMISSIONS

INTRODUCTION

sustainable
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SuSanA Sanitation & Climate Session

Climate Resilient & Mitigation Positive Urban Sanitation

- Martin Gambrill, World Bank consultant
- SuSanA 34th Meeting, Stockholm, August 24th 2024

WORLD BANK GROUP Water

GWSP GLOBAL WATER SECURITY & SANITATION PARTNERSHIP

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Climate Resilient & Mitigation Positive Urban Sanitation

Informal settlement in Dhaka. Image credits: Arup & Plan

- Climate resilient sanitation of growing importance within World Bank ... for sewered & non-sewered investments...
- ...with special emphasis on policies, institutions, regulation & financing (PIRF) dimensions of urban sanitation systems
- Building on foundations of other global Bank initiatives, including CWIS, WICER & PIR
- Collaborating with partners, including those from the Climate Resilient Sanitation Coalition

Climate Resilient & Mitigation Positive Urban Sanitation

- *Currently preparing a Policy Note for Climate Resilient Sanitation, building on above & other inputs, including:*
  - *Background research and recommendations from an Arup/WSUP consultancy*
  - *Leonie Hyde-Smith's Sanitation Failure Modes Matrix*
  - *CRS case studies from HICs & LMICs*
  - *PIRF recommendations*
  - *Costs & benefits of CRS*

- *Policy Note launch CY25 in collaboration with CRSC*

INFRASTRUCTURE AND SERVICE PROVISION (A)

- Robust, repairable or adaptable sanitation infrastructure
- Responsiveness and flexibility in service delivery, desludging and treatment operations
- Integration across the urban water cycle, including drainage
- Monitoring for continual adaptation

USERS (B)

- User engagement, awareness and capacity to cope and adapt
- Disaster response and support

INSTITUTIONS, POLICY, AND PLANNING (C)

- Policy integration of climate and sanitation
- Risk- and vulnerability-informed planning and wider urban development links
- Leadership and political will
- Institutional responsibilities
- Data and information systems

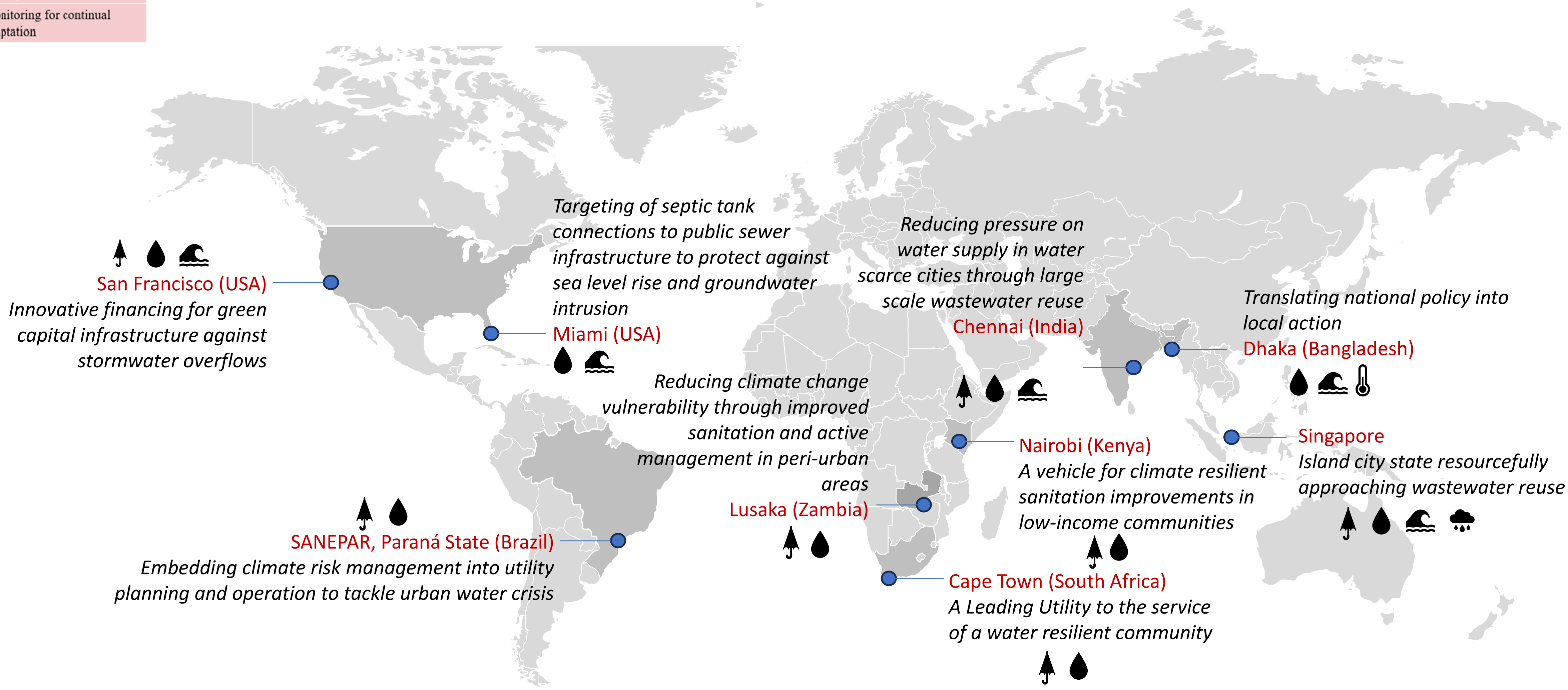
FINANCE (D)

- Financing along the sanitation chain (households, service providers, city governments) for
  - Preventive/adaptation measures
  - Disaster response

CRS Case Studies

Climate Hazards

Drought | Flooding | Sea level rise | Increased temperatures



Climate Resilient & Mitigation Positive Urban Sanitation

- *Other complementary urban sanitation work:*
  - *Revisiting long-list of CWIS indicators to include climate resilience & climate mitigation*
  - *Decarbonization pathways for water & sanitation utilities*
  - *Circular economy approaches for a full spectrum of typologies**
  - *GHG emissions tool for sewered & non-sewered investment projects*
  - *Climate finance landscaping*

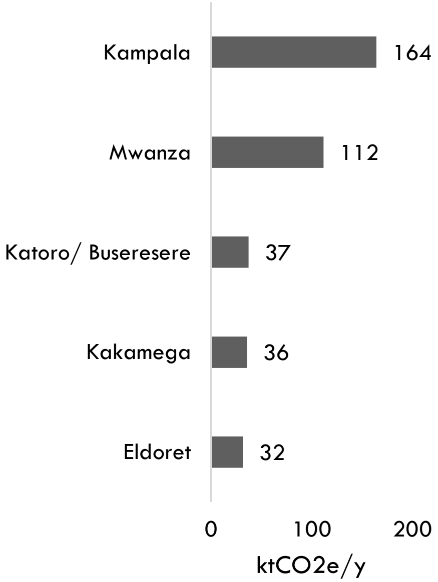
**conventional sewerage, OSS, FSM, CBS, simplified sewerage, decentralized wastewater treatment, source separation systems, etc.*

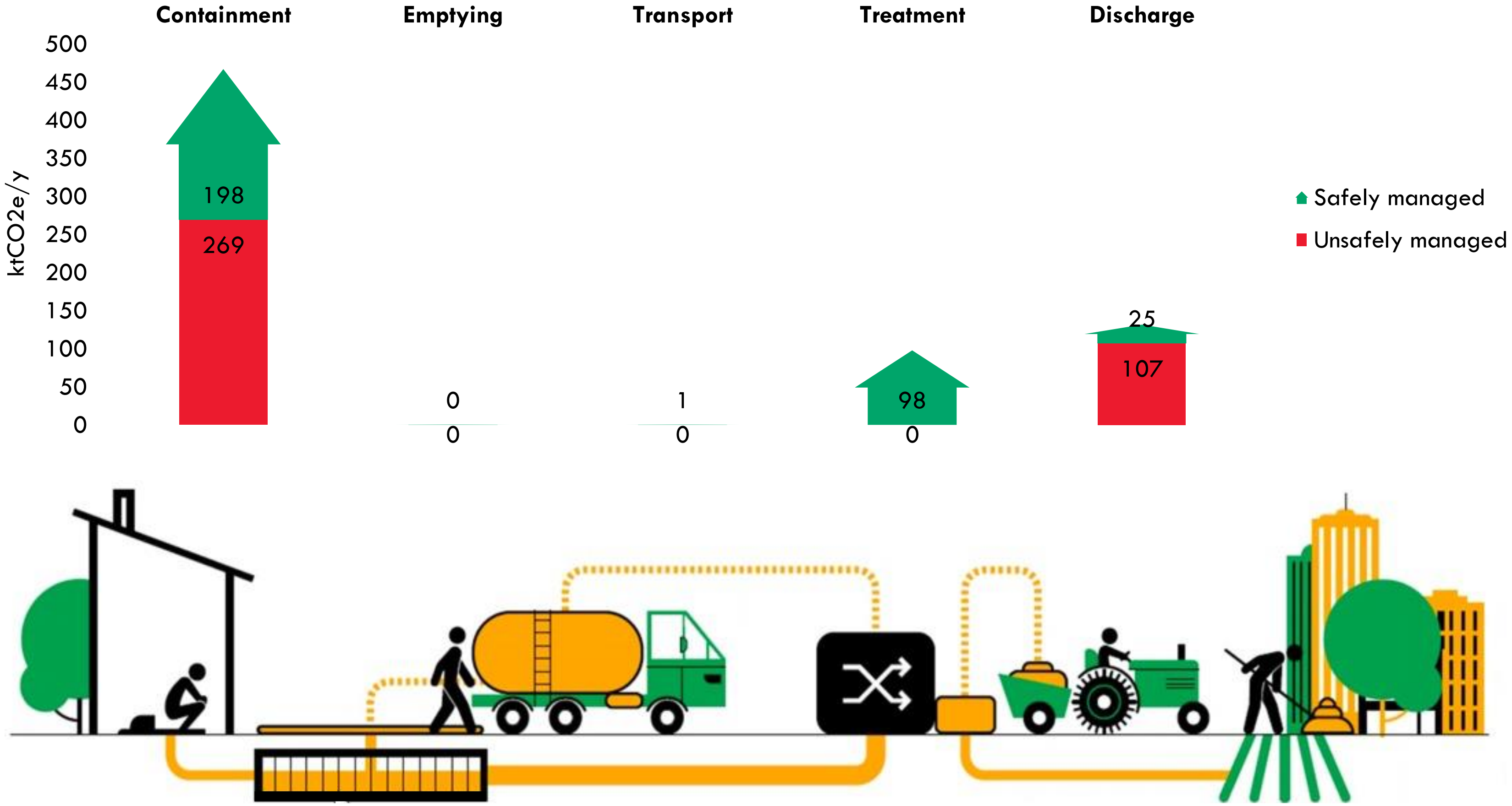
GHG emissions tool – Lake Victoria Basin

Total emissions

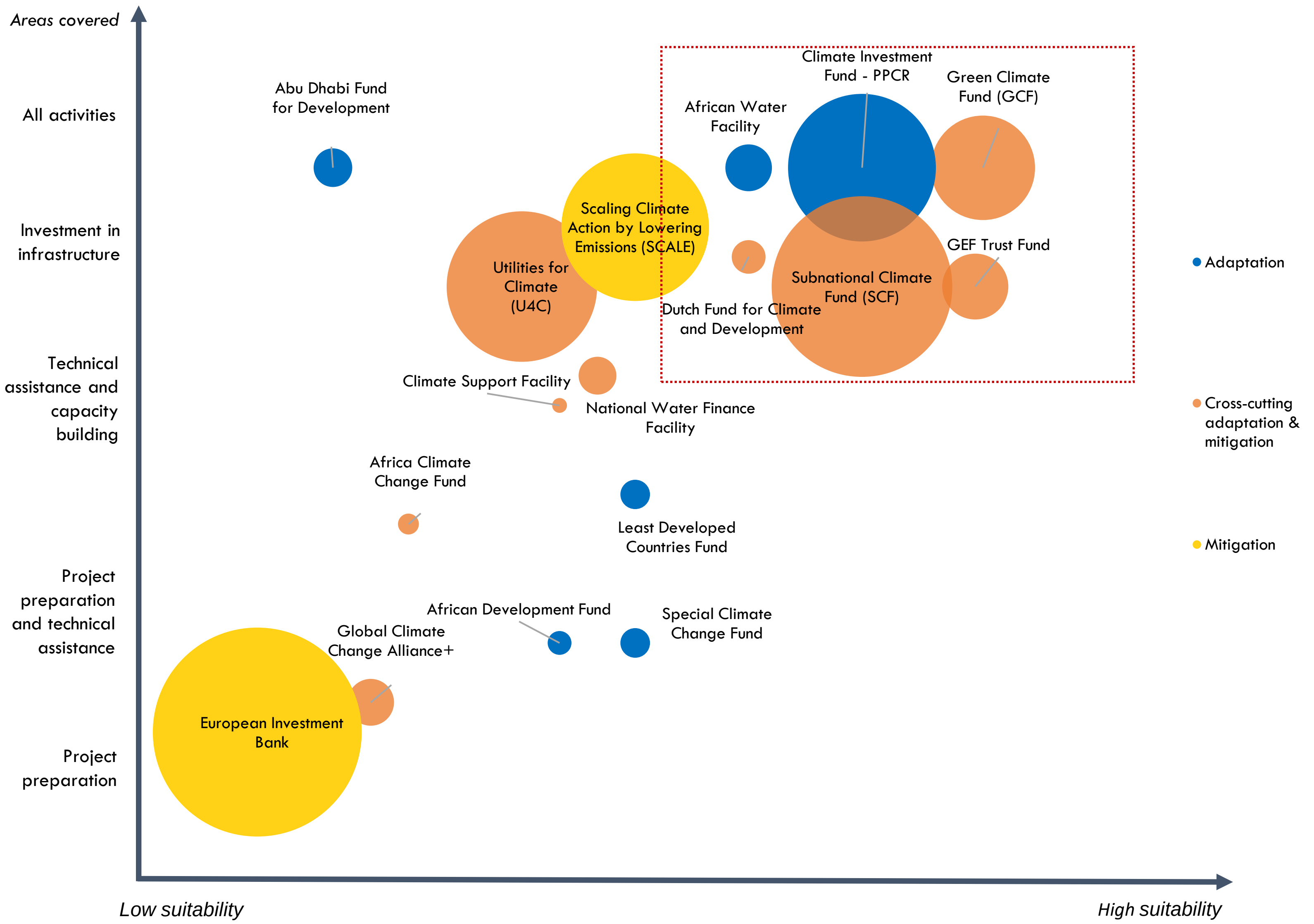
697,198 tCO_2e/y

Top 5 settlements





Climate Finance Landscape



Prioritized funds

GEF Trust Fund
SCCF

Emerging CRS Messages

- ***Limited evidence regarding key aspects of CRS – research gaps that needs filling***
- ***CRS key to strengthening urban water/city resilience through CE approaches***
- ***Urban water crises are strong drivers for rethinking approaches to sanitation***
- ***Integrated approaches*** *where* ***complementary urban services*** *(water supply, drainage, greywater, solid waste) incorporated into* ***resilient sanitation planning***
- ***Policies, institutions, regulation, financing & incentive frameworks key to promoting CRS***
- ***Regulators positioned to influence policy & incentivize performance*** *to encourage climate-resilient and mitigation-positive approaches to safely managed sanitation*
- ***CRS requires assessment of costs of inaction****…*
- *…and* ***a menu of financing options (conventional & novel)***
- ***Fast-moving area of research & practice – CRSC… and SuSanA!***

Thank You

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CRSC STATUS AND WAYFORWARD

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

WHO IS THE CRS?

….and growing! Coordinated by Nat Paynter and now Bisi Agberemi at UNICEF – mostly via monthly meetings.

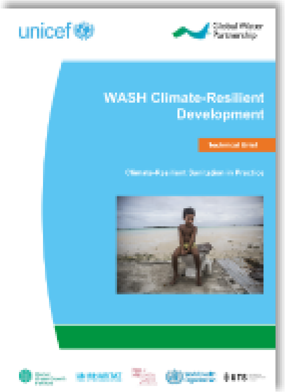
CRS COALITION HISTORY

the international water association

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

- SWWW '20 – '22: Gathering the evidence
- COP27: Launch Call to Action
- UN2023: Expansion of Call to Action
- SWWW '23: Launch CRS Coalition
- COP28: Engaging with Climate Sector
- **2024**
  - Build evidence base
  - Develop CRS Annex



CRS COALITION VISION

Integrating sanitation into global and national climate policy & practice; and integrating climate into global and national sanitation policy & practice.

PRIORITY ACTIONS

Increase Access to Finance	*Inclusion of sanitation in GCF Guidelines.*
Increase Prominence of Sanitation in Climate Policy	*Build the evidence base and best practice.* *Mainstream sanitation in the 3 key tracks of climate negotiations: adaptation, mitigation, finance*
Build Capacity at National Level	*Support governments with tools and expertise to include sanitation in climate policy and practice, and to include climate in sanitation policy and practice.*

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

CRS IS NOW A GLOBAL PRIORITY - ADAPTATION

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

- **Paris Agreement** established a **global goal on adaptation (GGA)** - **Global Framework adopted by consensus at COP28**

1. **WATER-SANITATION:** Significantly reducing climate-induced water scarcity and enhancing climate resilience to water related hazards towards a climate-resilient water supply, **climate-resilient sanitation** and towards access to safe and affordable potable water for all

Sanitation also linked to other targets

2) FOOD-AGRICULTURE 3) HEALTH 4) ECOSYSTEMS 5) INFRASTRUCTURE- HUMAN SETTLEMENTS 6) POVERTY ERADICATION- LIVELIHOODS 7) CULTURAL HERITAGE

CRS IS NOW A GLOBAL PRIORITY - MITIGATION

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

- **UNFCCC Sharm el-Sheikh Mitigation Ambition and Implementation Work Programme:**
  - 2024 dilaogues “**Cities: buildings and urban systems”**
  - Two official submissions by the CRS coalition on mitigation
  - Country NDCs to be updated by Feb 2025
- **COP29 Presidency Initiative on “Waste Sector Methane Abatement for Climate Action"**
  - Aligns with the goals of the Global Methane Pledge to cut emissions by at least 30% by 2030 relative to 2020 levels.

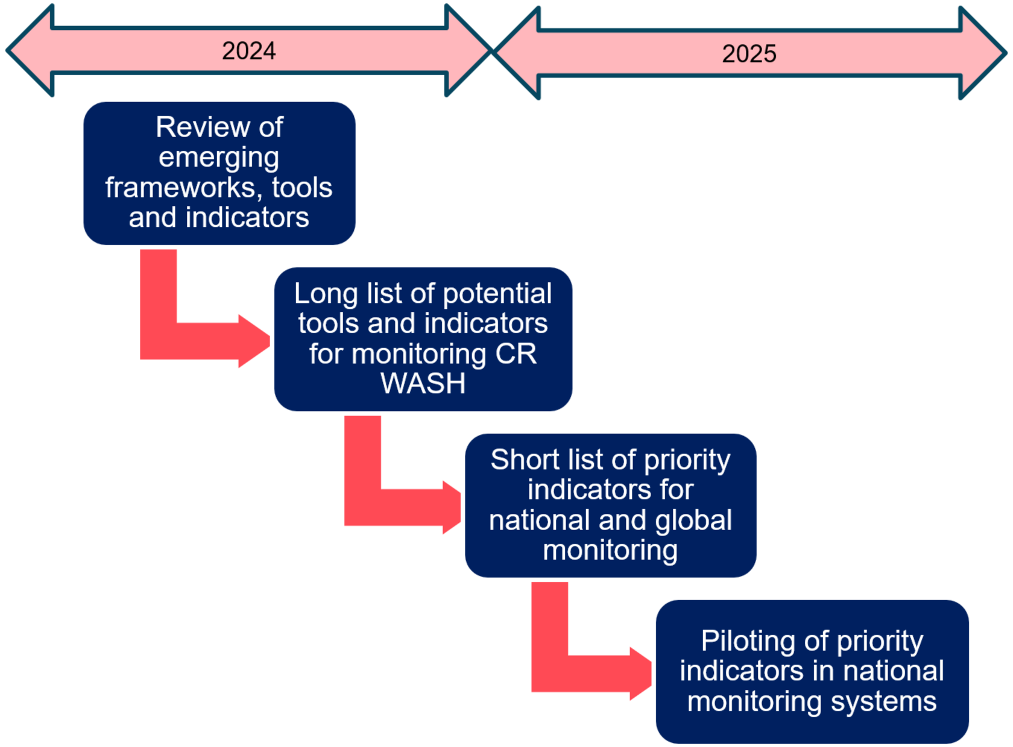
Global Methane Initiative

TOWARDS DEFINITIONS / INDICATORS

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Building a consensus on what is a "climate resilient sanitation system"

SWA, WHO and UNICEF work to identify indicators for climate resilient water supply and sanitation services

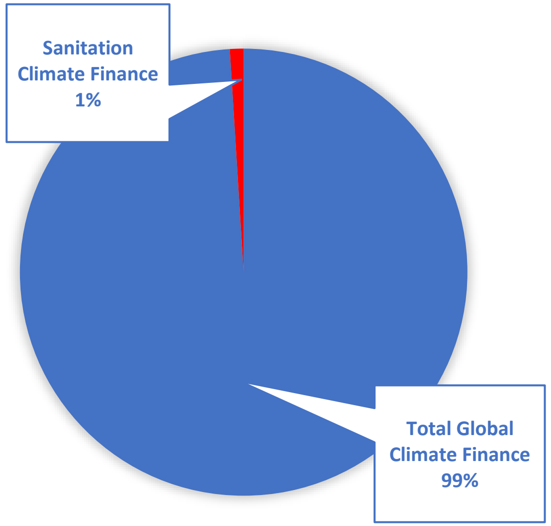


MOBILIZING COUNTRIES FOR CRS IMPLEMENTATION

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

- **Sanitation receives a vanishingly small amount of climate investment.**
- **Country teams are unsure of how to develop credible CRS project / programmes**
- **Sanitation Summit – 25 countries in Nepal June 2024**
- **Many more CRS events and activities using CRS coalition tecnicla resources**

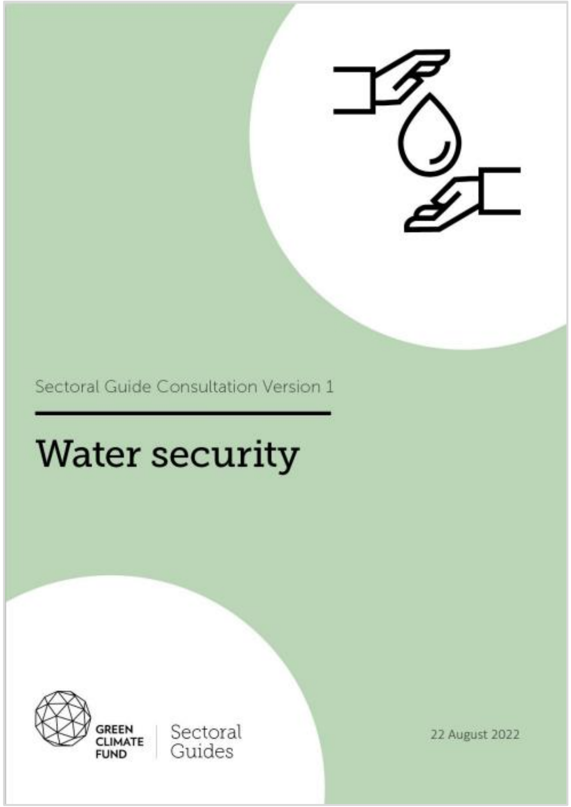
CLIMATE FINANCING

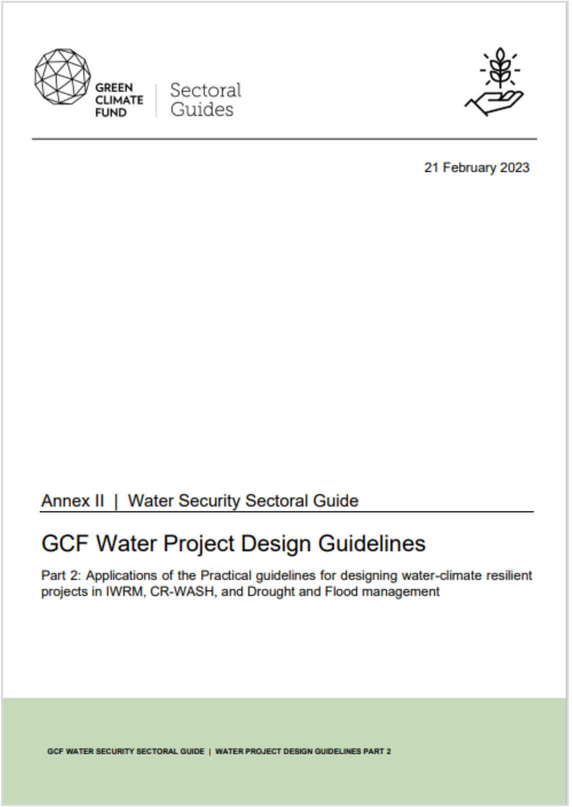


ONGOING WORK - GREEN CLIMATE FUND

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Development of a Sanitation Annex to the GCF Water Security Guidelines:





CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

THANK YOU

CRSC ANNEX TO GCF GUIDANCE

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CLIMATE
RESILIENT
SANITATION:
COALITION
FOR ACTION

Status of the GCF Sanitation Annex

24 August 2024

Recap: Purpose of the GCF Annex

The Annex provides **practical guidelines for developing projects and programmes that address the climate crisis through climate-resilient sanitation (CRS) solutions.**

The Annex **complements the GCF Water Security Sectoral Guide** that describes the position and ambitions of GCF's investment in the water sector, as well as the financial mechanisms and implementation arrangements that GCF is willing to support. The GCF Water Security Sectoral Guide **consist of three parts**:

Annex 1 - *Practical guidelines for designing water-climate-resilient projects*
Annex 2 - *Applications of the Practical guidelines for designing water-climate-resilient projects in IWRM, CR-WASH, and Drought and Flood management*
Annex 3 - ***Practical guidelines for designing climate-resilient sanitation projects***

Target Audience

The Annex is designed to be useful to any organisation interested in accessing GCF funding for climate-resilient sanitation projects. This includes Direct Access Entities (DAE) at the national levels, who co-originate projects with the National Designated Authorities (NDA); International Access Entities (IAE); and Accredited Entities (AE), who work alongside countries to develop project ideas and submit funding proposals to GCF

Structure of the document

1- Introduction

- *How the Annex relates to the GCF Water Security Sectoral Guide*
- *Status of sanitation globally*
- *Sanitation, the climate crisis, and health*
- *GCF approach to CRS*

2 - Building the Climate Rationale for Sanitation Projects: Adaptation

3 - Building the Climate Rationale for Sanitation Projects: Mitigation

4 - Potential interventions to support climate change adaptation across the Sanitation Service Chain

- *Adaptation*
- *Mitigation*
- *Strengthening systems to enable CRS*

5 - Developing a GCF proposal

Introduction: GCF paradigm shifts

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Annex 3 aligns with and expands upon the **Water Security Sectoral Guide's two major pathways for paradigm shifts**:

- **Pathway 1: Enhance water conservation, water efficiency and water reuse** — including through (for example) demand management, resilient digital water management, decentralized operation models and resource recovery.

- **Pathway 2: Strengthen integrated water resources management** – including protection from water-related disasters, preservation of water resources, and provision of resilient water supply and sanitation services, through (for example) ecosystem-based management, alternative water sources and IWRM.

Introduction: GCF approach to CRS

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

GCF's envisioned paradigm shift for CRS is that: *Transformative sanitation planning and programming for climate-resilient sanitation is applied in national and regional adaptation and mitigation planning and programming*

To be successful, sanitation proposals to GCF must have a **clear climate rationale** and must display a **level of ambition consistent with GCF's envisioned paradigm shift** for climate-resilient sanitation. Successful proposals must achieve the following:

- Effective articulation of the **climate science basis and rationale** for the project
- Alignment with overall **GCF investment criteria** and **paradigm shift categories**
- Alignment with GCF's envisioned **paradigm shift for climate-resilient sanitation**
- Alignment with GCF **key strategies for climate-resilient sanitation**

Introduction: Overall GCF Investment Criteria

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

1. **Impact potential:** this criterion assesses the extent to which the project can achieve significant climate adaptation and mitigation benefits. For sanitation and wastewater projects, this means reducing greenhouse gas emissions through energy-efficient waste treatment processes, enhancing water conservation, or improving the resilience of sanitation infrastructure to climate impacts like floods and droughts.
2. **Paradigm shift potential:** Projects are evaluated on their ability to catalyze systemic change and drive long-term sustainable development. Sanitation and wastewater projects should demonstrate innovative approaches, such as circular economy principles where waste is treated and repurposed as a resource (e.g., biogas production or nutrient recovery), and scalable solutions that can be replicated or expanded to other regions.
3. **Sustainable development potential:** This criterion looks at the co-benefits of the project, including environmental, social, and economic impacts. For sanitation projects, this involves improving public health outcomes by reducing disease prevalence, creating jobs through the construction and maintenance of sanitation facilities and the provision of sanitation services, and enhancing water quality in local ecosystems.
4. **Needs of the recipient:** The focus here is on addressing the specific vulnerabilities and needs of the communities involved, particularly those most affected by climate change. Sanitation projects should target underserved populations, ensuring access to resilient and sustainable sanitation services that protect them from climate-related hazards like flooding or water scarcity.
5. **Country ownership:** Projects are evaluated on the degree of alignment with national climate strategies (e.g. Nationally Determined Contributions and National Adaptation Plans) and the involvement of local stakeholders. Effective sanitation and wastewater projects should be integrated into national and local development plans, involve community participation, and build local capacity to manage and sustain the infrastructure over the long term.
6. **Efficiency and effectiveness:** This criterion assesses the project's cost-effectiveness and the adequacy of its financial structure to achieve the intended results. Sanitation projects need to demonstrate efficient use of resources, leveraging co-financing and ensuring that the financial models are sustainable, enabling long-term operation and maintenance of the facilities.

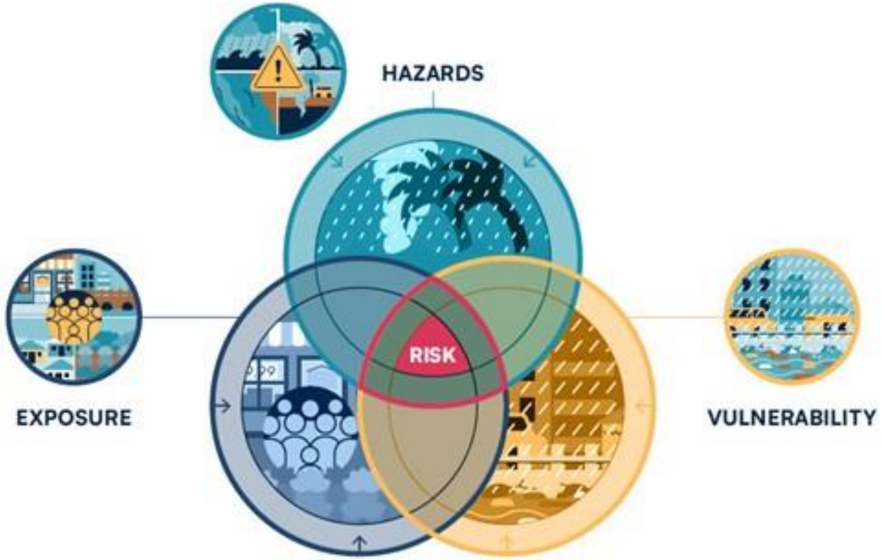
Introduction: Key strategies for CRS

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

1. **Climate-resilient infrastructure and services**: invest in building new and upgrading existing sanitation infrastructure, to achieve synergies between adaptation and mitigation, and to withstand climate-related impacts along the whole sanitation chain — including flood-resistant sanitation systems, decentralized climate-resilient sanitation and wastewater treatment, and the adoption of sustainable sanitation technologies .
2. **Circular economy and integrated management**: promote projects that integrate sanitation with broader water, food and energy security, ensuring ecosystem protection. This includes practices like water recycling and safe wastewater reuse for agriculture. In urban contexts, infrastructure and services should be integrated with water supply and stormwater management, including greywater management.
3. **Community engagement and capacity building**: alongside capacity development support to service providers, empower local communities through understanding of climate risks, and training and involvement in the planning and maintenance of resilient sanitation systems. This ensures the sustainability and resilience of projects by leveraging local knowledge and fostering ownership.
4. **Policy, regulatory and governance support**: assist governments in developing and implementing policies that promote climate-resilient sanitation services and practices. This includes creating regulatory frameworks that encourage private sector investment and public-private partnerships.
5. **Monitoring and evaluation**: Implement robust systems for monitoring the impacts of climate change on sanitation, and conversely, systems that monitor the impacts of climate-resilient sanitation projects on community resilience and the resilience of the environment. Use data to continually improve and adapt strategies.

Building the climate rationale: Adaptation

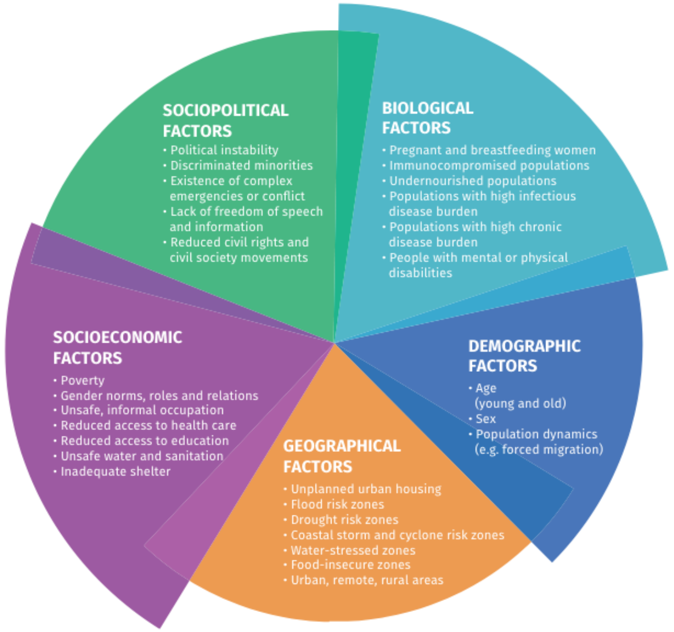
CLIMATE RESILIENT SANITATION: COALITION FOR ACTION



Evidence of Climate Change Impacts on Urban Sanitation System (relevant to flooding and storms) (Hyde-Smith et al, 2022)

Hazard	**Impacts** (using Peal et al, 2020 failure mode classification)				
	Fecal sludge not contained, not	**Fecal sludge and supernatant not delivered**	**Fecal sludge and supernatant not treated**	**Wastewater not delivered to treatment**	**Wastewater not treated**
High-intensity rainfall, increased flooding, erosion and landslides	Damage to pits or superstructures making latrines unusable	People 'drain' toilets into the environment using floodwater during flood	Flooding and damage to wetland flora	Increased frequency or spill volume of combined sewer overflows	Flooding and damage to wastewater treatment plant structure and equipment
	Pits overflow/collapse leading to fecal contamination	Structural damage to pavements		Increased risk of urban flooding (overflow of inspection chambers, flooding of basements)	Flooding of wastewater treatment plant leading to temporary system failure and discharge of raw sewage
	Toilets become inundated/inaccessbile (causing people to abandon toilets and revert to open defecation)	Road collapse or development of sinkholes due to destabilization of soil caused by damages sewers		Increase risk of pipe damage due to changed soil moisture and subsidence	Electricity failure leading to failure of pumps and aeration
				Changes to inflow and infiltration rates into the sewer system	Road interruptions leading to disruption of site access for wastewater treatment plant staff and supplies
	Electricity failure resulting in lack of water supply and non-functioning of toilets	Damage to roads infastructure elements other than pavements (eg bridges)		Sewer blockages after an event because of sand, debris or solid waste entering sewers and pump stations	Pollutant load exceeding biological treatment capacity of wastewater treatment plants
	Inundation of drainfields	Road capacity decreases/increases in congestions/travel time increases		Electricity failure leading to failure of pumps	Discharge of untreated/partially treated effluent due to overloading or bypassing of treatment
	Backflow/overflow of sewage from septic tanks	Roads become inaccessible		Damage to sewer pumps and mains	Increased dilution of influent
	Damage to pits, septic, tanks and absorption fields	Electricity failure leading to traffic light failure		Overload of sewer system resulting in overflow to the drainage system	Reduced nutrient removal cpacity during high-intensity rainfall events (eg due to reduced retention time and high
Contamination of and damage to surface water and groundwater supplies				Higher pollutant concentration in receiving waters due to increase in combined sewer overflow spill volumes/frequency	Contamination of receiving water bodies due to wastewater treatment plant failure
Changes to groundwater recharge and groundwater levels	Floatation and damage of septic tanks due to high groundwater levels	Structural damage to pavement (destabilisation of the substrate)			Inflow and infiltration into seprate systems causes higher inflow into wastewater treatment plants that stretch their design capacity
	Flodding and famage of septic tanks due to high groundwater levels				
	Higher groundwater pollution				
More extreme winds				Uprooting of trees and replacement of dmaged electricity poles leading to damage of sewer pipes	Damage to wastewater treatment plant infrastructure/buildings

Figure 4. Multiple vulnerability factors for health impacts of climate change



Source: Based on Gamble JL, Balbus J, Berger M, et al. Populations of concern. In: The impacts of climate change on human health in the United States: a scientific assessment. Washington, DC: U.S. Global Change Research Program; 2016; and Quality criteria for health national adaptation plans. Geneva: World Health Organization; 2021.

Building the climate rationale: Mitigation

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Sets out the **evidence for the nature and scale of emissions associated with sanitation systems and services**. Divided into three sub-sections:

- Emissions which arise within sanitation infrastructure and services when they are operated as designed;
- Emissions which are associated with sanitation failures and with discharge of incompletely stabilised faecal waste in to the environment; and
- Emissions which arise from the use of products which could be appropriately substituted by products from sanitation systems.

	Category of Emissions			
Sanitation service chain element	**Containment**	**Emptying/ emptying and transport**	**Treatment**	**Disposal on land and in aquatic systems**
(a) Systems which use road based transport or store waste onsite (pit latrines, septic tanks and containers)				
Direct	CO_2, CH_4 and N_2O from pits and tanks	n/a	CO_2, CH_4 and N_2O from treatment plants	CO_2, CH_4 and N_2O from land and water bodies
Operational	n/a	CO_2 from truck fuel combustion	CO_2 from energy used in treatment processes	n/a
Embedded carbon	Materials in construction of pits and tanks	n/a	Materials in construction treatment plants	n/a
(b) Systems connected to sewers				
Direct	n/a	CO_2, CH_4 and N_2O from in-sewer wastewater	CO_2, CH_4 and N_2O from treatment plants	CO_2, CH_4 and N_2O from land and water bodies
Operational	n/a	CO_2 from pumping of wastewater	CO_2 from energy used in treatment processes	n/a
Embedded carbon	n/a	Materials in construction of sewerage	Materials in construction of treatment plants	n/a

Responses and interventions (1)

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

- Potential for sanitation to act as an entry point for wider systems change across sectors and to contribute to **transformative adaptation** to climate change

- Potential **sanitation interventions to support climate change adaptation** across the sanitation service chain. These interventions respond to the risks posed by climate change to sanitation outlined in Section 2;

- Potential **sanitation interventions to support climate change mitigation** through reduced greenhouse gas emissions, building on the linkages set out in Section 3; and

- Potential policy, institutional, regulatory and financing (PIRF) interventions to **strengthen sanitation systems** and enable climate-resilient sanitation

Type of Response	Containment	Emptying and Conveyance	Treatment, Reuse and Disposal
Technical modifications to infrastructure	Raised latrines/ containment **CRIS** Robust and resilient latrines/ containment **CRIS** Low or no water latrines **CRIS**	Simplified sewers **CRIS** Vacuum sewer systems **CRIS** Treatment of sewer overflows **CRIS/IM** Sustainable Drainage Systems **CRIS/IM**	Site selection and flood prevention **CRIS** Corrosion resistant design **CRIS** Modular FSTP/WWTP design **CRIS** Decentralised/ distributed FSTP/WWTPs **CRIS**
Active management of the infrastructure or service	Scheduled emptying for OSS **CRIS**	Scheduled emptying for OSS **CRIS** Preventative O&M of sewer systems **CRIS**	
Preparing sanitation systems for cascading impacts of failures in other systems	Alternative water sources for flush toilets **CRIS/IM**	Alternative emptying vehicles and equipment for OSS **CRIS**	Alternative power sources for FSTPs and WWTPs **CRIS**

Responses and interventions (2)

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Mitigation

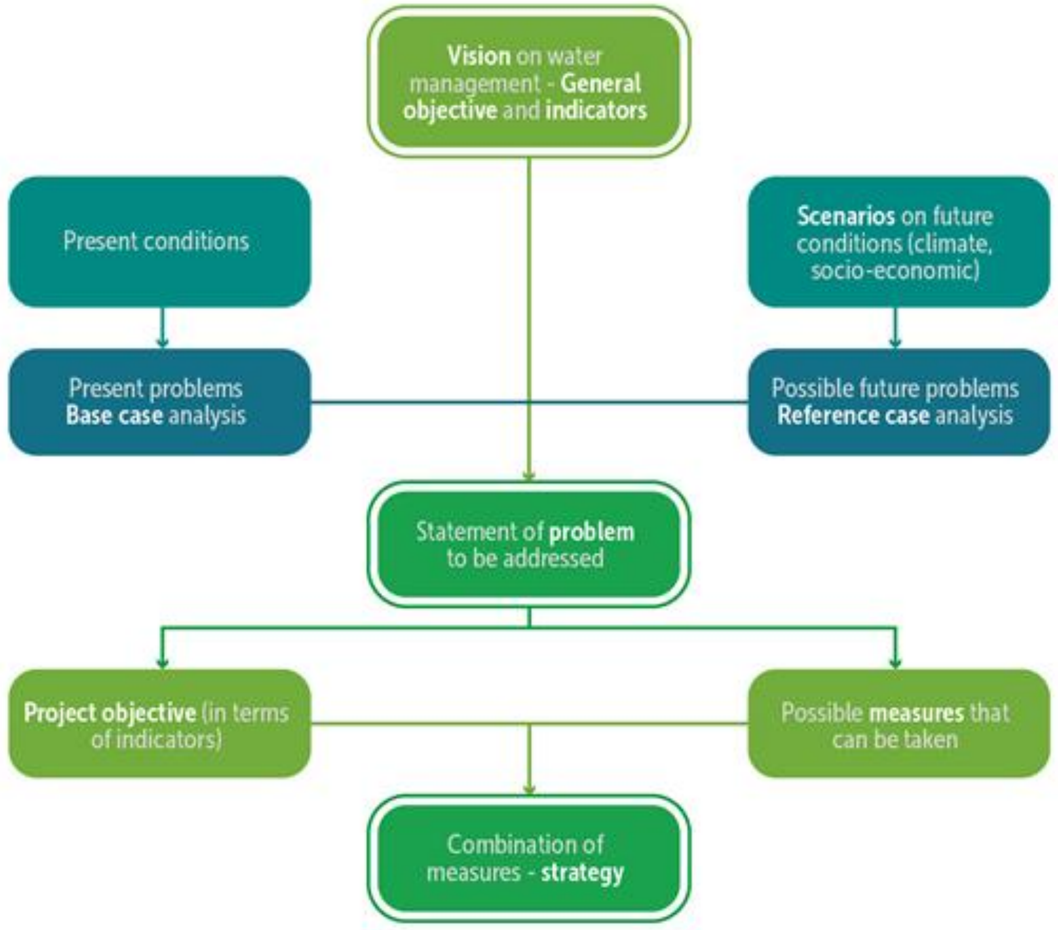
	Effect category	*Reuse of end products*		*Reducing failures*	*Sanitation system modifications*		
Intervention type		*Capture and productive use of emissions*	*Substitution of products*	*Reduction of emissions in the environment*	*Optimising sanitation system design for low emissions*	*Ensuring efficiency of scale of operations*	*Gaining operational efficiency*
Infrastructure modifications	*Anaerobic digestion at treatment (with or without co-treatment of MSW)*	⤊ H			⤊ H		
	Addition of methane/biogas capture on aerobic treatment plants	⤊ H			⤊ H		
	Enhanced composting of fecal wastes to produce agricultural products (including black soldier-fly lava)	⤊ H	⤊ H		⤊ H		
	Water recovery from wastewater or fecal sludge treatment for use in agriculture		⤊ H				
	Additional tertiary treatment and enhanced nutrient removal			⤊ H			
Scale and management operations	*Regular emptying of household pits and tanks particularly prior to rainfall*			⤊ M		⤊ H	⤊ H ⇔ H
	Optimisation of scale and design of sewerage					⤊ L ⥁ L	⤊ H ⇔ H

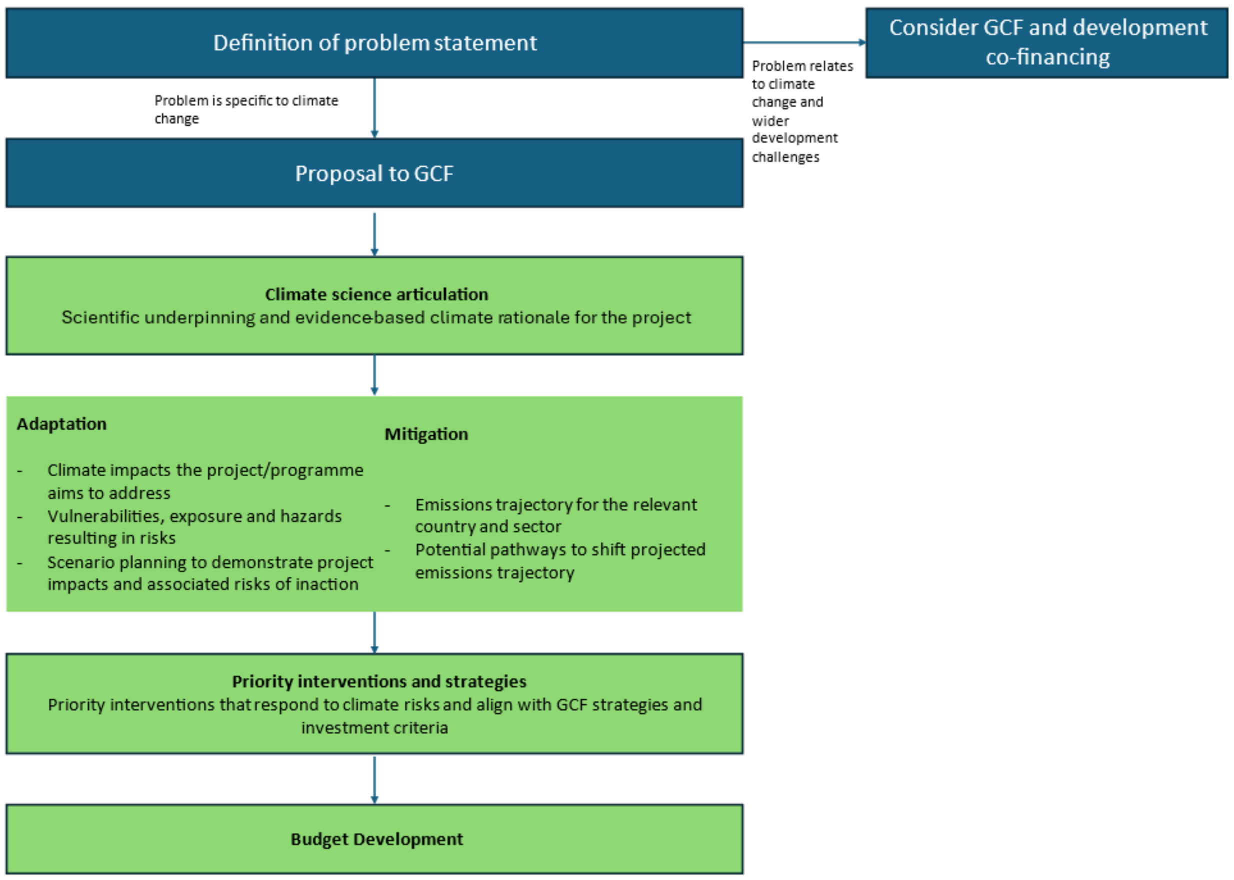
Systems strengthening

Box 4.1: Summary of potential PIRF interventions to enable climate-resilient sanitation.

- Ensure projects align with and strengthen relevant climate policies and plans, particularly NDCs and NAPs
- Ensure policy frameworks promote circular economy approaches
- Ensure service providers are prepared for a future of multiple revenue streams and equipped with climate-specific knowledge and skills
- Mainstream climate-resilient sanitation into regulations, guidelines, standards, and codes of practice at every step of the sanitation service chain
- Leverage a menu of financing options to support the sustainability and scalability of project interventions
- Create targeted financial incentives to support private sector engagement and resource recovery
- Strengthen policy, institutional and regulatory frameworks to support the integration of sanitation with wider basic services and urban development processes
- Build flexibility into planning, financing, and regulatory frameworks to support service providers in adapting to emerging or unexpected conditions

Developing a GCF proposal





Next steps

- Development of Draft 2 ongoing in response to CRS Coalition and GCF reviewer comments
- **Early September**: Draft shared for GCF consultation
- **Early October**: Development of Draft 3 in response to consultation
- **Late October**: Editing and finalisation

EXPRESSO PRESENTATION ADAPTION

sustainable sanitation alliance

Climate Resilient Inclusive WASH in Asia Pacific – lessons from Water for Women

Saturday, 24 August 2024
Time: 11:40 – 11:45 (CEST)
Espresso Presentation,
34th SuSaNa meeting
Stockholm

Water For Women

Australian Aid

What does climate-resilient, inclusive WASH look like?

WASH Programs

1. How do WASH programs commonly understand climate risk and resilience?

WASH Governance

2. How do WASH governance systems commonly integrate consideration of climate risks and resilience?

GEDSI & CR

3. Why and how is gender equality, disability and social inclusion (GEDSI) critical to climate-resilient WASH?

1. How do WASH programs commonly understand climate risk and resilience?

The "non-negotiable ingredients"

Risk informed	**Inclusion**	**Governance**
Sustainability	**Gender**	**Leadership**
Adaptability	**Partnerships**	**Evidence**

International Water Centre and University of the South Pacific / Heather Molitambe

2. How do WASH governance systems commonly integrate consideration of climate risks and resilience?

Some emerging promising practices:

Integrate climate risk into existing processes

Community members create a wall from local materials to protect their water source – SNV Nepal/ Heman Paneru

Use both traditional/customary processes and climate data

Inclusive WASH infrastructure co-design workshop based on local traditions to design in a holistic way – Monash University

Use inclusive tools and processes

Community members contribute tracking and monitoring data to the "Saniclimi Wall", a public accountability dashboard in Jaipur India – CFAR Archives

3. Why and how is GEDSI critical to climate-resilient WASH?

Key messages

Those at the community frontline of climate change are experiencing and know better than most about the climate change impacts.

The barriers to climate resilient inclusive WASH are wide ranging and are compounded for those who have the least access to WASH services and power in decision making.

If we want to support GEDSI transformation particularly for those most marginalised, we must consider the inherent linkages between climate change, WASH and inclusion.

Inclusive approaches will benefit everybody – a game changer for poverty reduction.

Building (climate) resilience into WASH services increases opportunities for inclusion.

Increasing inclusiveness of WASH services strengthens prospects for community and climate resilience

The Water for Women Learning journey

Scan QR

Lost in transition?

Equity in planning and funding of climate adaptive urban sanitation

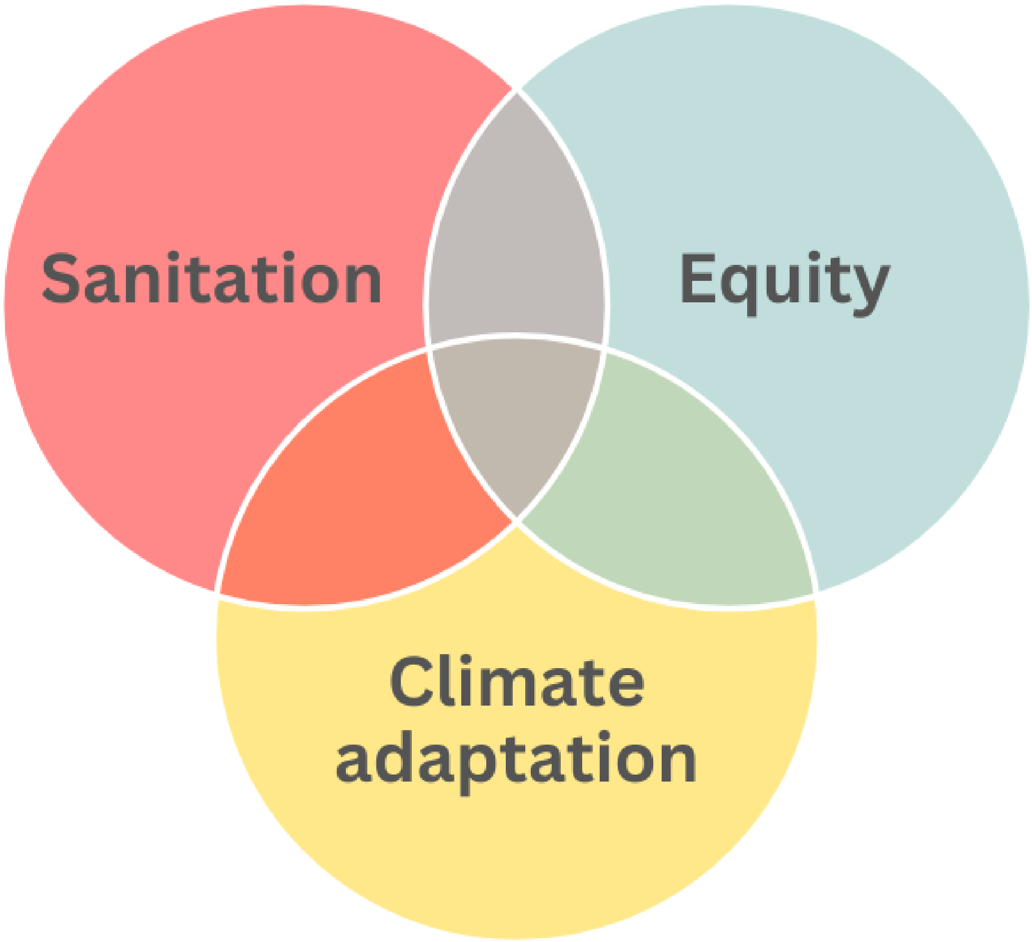
Leonie Hyde-Smith

Advisory team: Prof Anna Mdee, Dr Katy Roelich and Prof Barbara Evans

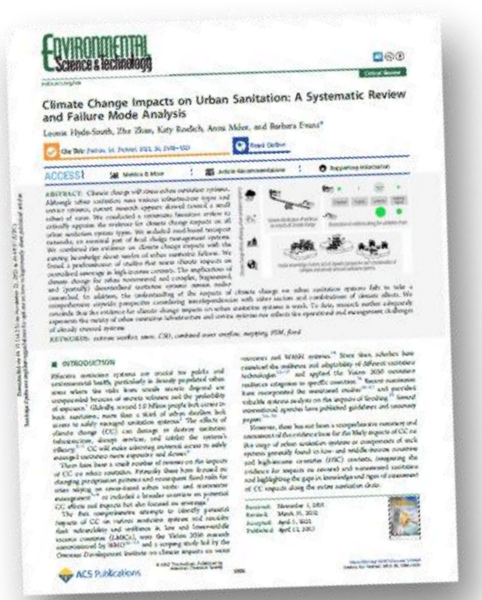
This work was supported by the Engineering & Physical Sciences Research Council [grant number EP/S022066/1]

Purpose

To explore the equity considerations in the planning and funding of climate change adaptive urban sanitation systems.



Approach


Climate Change Impacts on Urban Sanitation: A Systematic Review and Failure Mode Analysis

Hyde-Smith, L, Zhan, Z, Roelich, K, Mdee, A, Evans, B. (2022) Climate Change Impacts on Urban Sanitation: A Systematic Review and Failure Mode Analysis. Environmental Science and Technology, 56 (9). pp. 5306-5321. ISSN 0013-936X

Global systematic literature review on the evidence base for the impacts of climate change on urban sanitation / linking results to common urban sanitation failures

Mapping the landscape of sanitation climate adaptation investments and their equity considerations

Equity implications of current and planned sanitation adaptation measures in a city with pronounced sanitation service inequity

Key findings

- Lack of engagement with the real systems of sanitation service delivery
- Sanitation adaptation research, funding, and planning do not adequately address the entrenched socio-spatial sanitation inequities in cities
- Disconnect between policy rhetoric and implementation at the intersection of sanitation, equity, and adaptation to climate change

Key take-aways

- There is a risk that ‘resilience’ and ‘equity’ are used as shiny labels to repackage ‘business-as-usual’ sanitation planning and funding approaches without effectively prioritising the needs of vulnerable and unserved populations
- Approaches of financing sanitation adaptation appear to not adequately consider equity

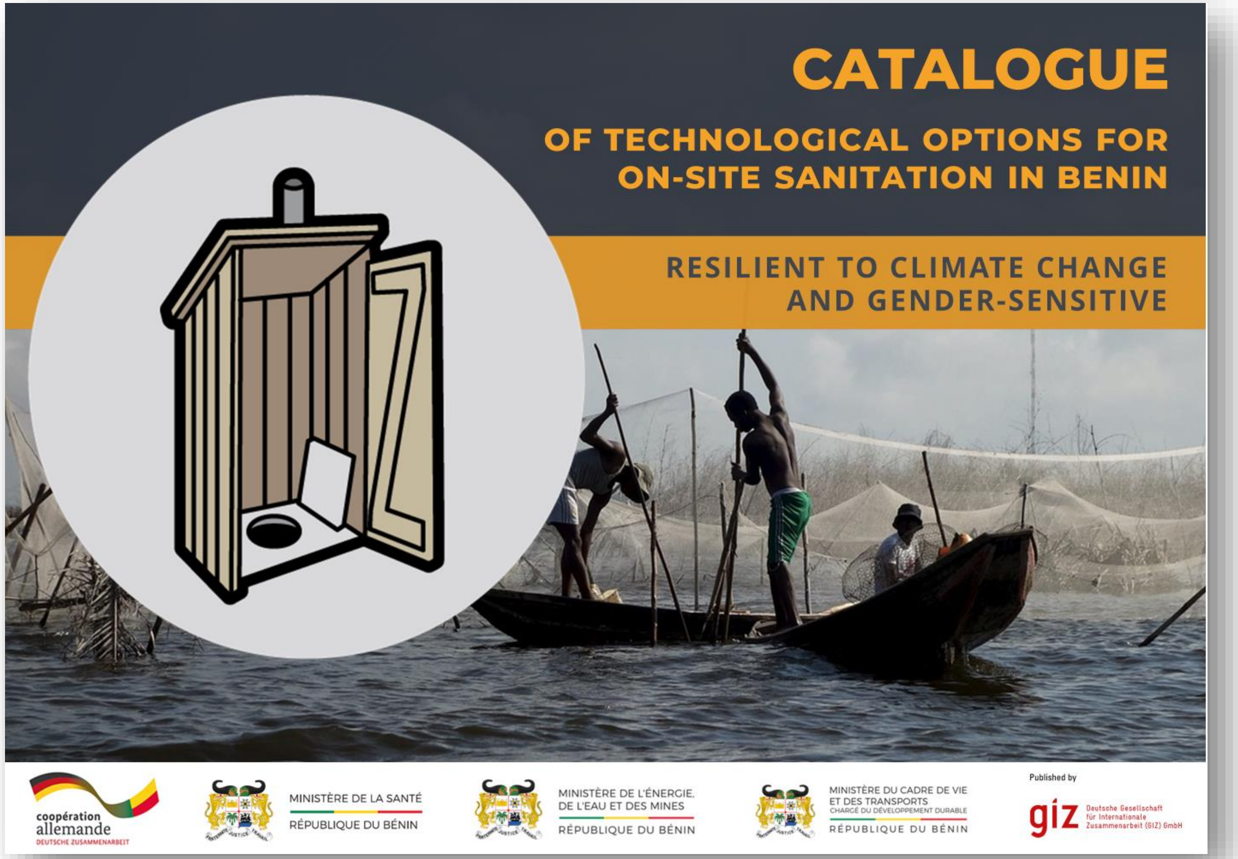
Thank you!

CATALOGUE OF TECHNOLOGICAL OPTIONS FOR ON-SITE SANITATION IN BENIN

RESILIENT TO CLIMATE CHANGE AND GENDER-SENSITIVE

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

Why a catalogue?



- Slow progress in improving access to sanitation
- Climate risks: intense rainfall, flooding, drought, and rising sea levels

Decision support tool presenting different models of on-site sanitation:

- adapted to climate change risks
- for households and public facilities
- address socio-economic and cultural contexts
- integrate gender issues
- distributed according to geological conditions

Catalogue structure and content

Introduction

On-site sanitation facilities (3-6 models per zone type)

a) Descriptive drawing
b) Technical data brief
c) Various 3D drawings

Handwashing facility (x3)

Conclusion

Zones without constraints

Flood-prone areas / with shallow water table

Plinth zones

Black earth zones

Lake areas

Intro page by zone type

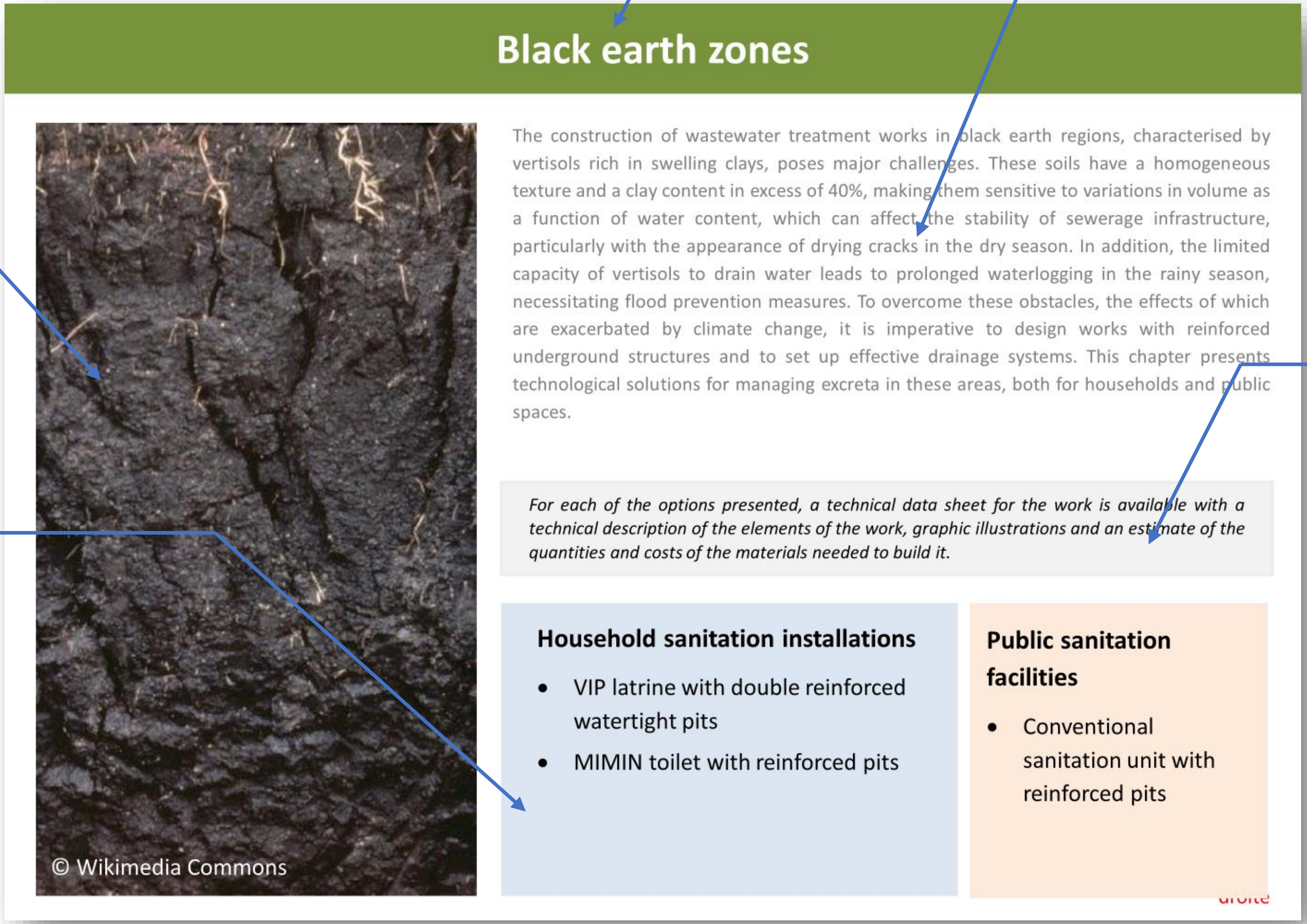
Zone type

Description of the zone type and the specific climate risks

Image representing the zone type

Models of household and public facilities

Elements of the data brief for each model



Black earth zones

The construction of wastewater treatment works in black earth regions, characterised by vertisols rich in swelling clays, poses major challenges. These soils have a homogeneous texture and a clay content in excess of 40%, making them sensitive to variations in volume as a function of water content, which can affect the stability of sewerage infrastructure, particularly with the appearance of drying cracks in the dry season. In addition, the limited capacity of vertisols to drain water leads to prolonged waterlogging in the rainy season, necessitating flood prevention measures. To overcome these obstacles, the effects of which are exacerbated by climate change, it is imperative to design works with reinforced underground structures and to set up effective drainage systems. This chapter presents technological solutions for managing excreta in these areas, both for households and public spaces.

For each of the options presented, a technical data sheet for the work is available with a technical description of the elements of the work, graphic illustrations and an estimate of the quantities and costs of the materials needed to build it.

Household sanitation installations

- VIP latrine with double reinforced watertight pits
- MIMIN toilet with reinforced pits

Public sanitation facilities

- Conventional sanitation unit with reinforced pits

© Wikimedia Commons

Overview (with legends and total cost)

Name of the model

Zone type

Technical description of the components of the facility

3D drawing

Estimated cost

Lake areas

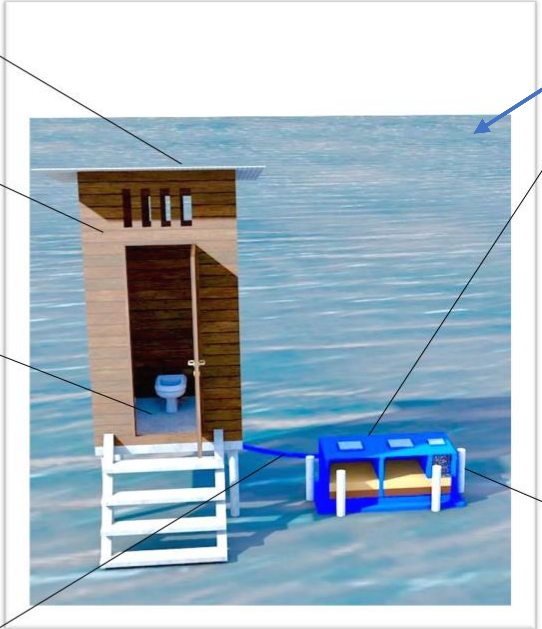
FLOATING POLYESTER TOILET

Roof in sheet metal or other materials

Wooden superstructure with reinforced concrete staircase and piles

Wooden floor with a bowl fitted with a siphon to prevent odours from rising to the surface

10 cm diameter HDPE flexible pipe linking the toilet siphon to the septic tank, allowing the system to adapt to variations in water level while maintaining the gravitational gradient required for black water to drain away



1.80 m3 (2 x 1 x 0.90 m) polyester floating septic tank with 3 compartments 75, 60 and 45 cm long. The last compartment houses a filter bed consisting of a layer of charcoal, sand and gravel

8 wooden posts sunk into the ground and positioned around the pit to ensure its lateral stability while allowing it to move vertically according to the water level

Total cost
1 765 000 FCFA

gauche

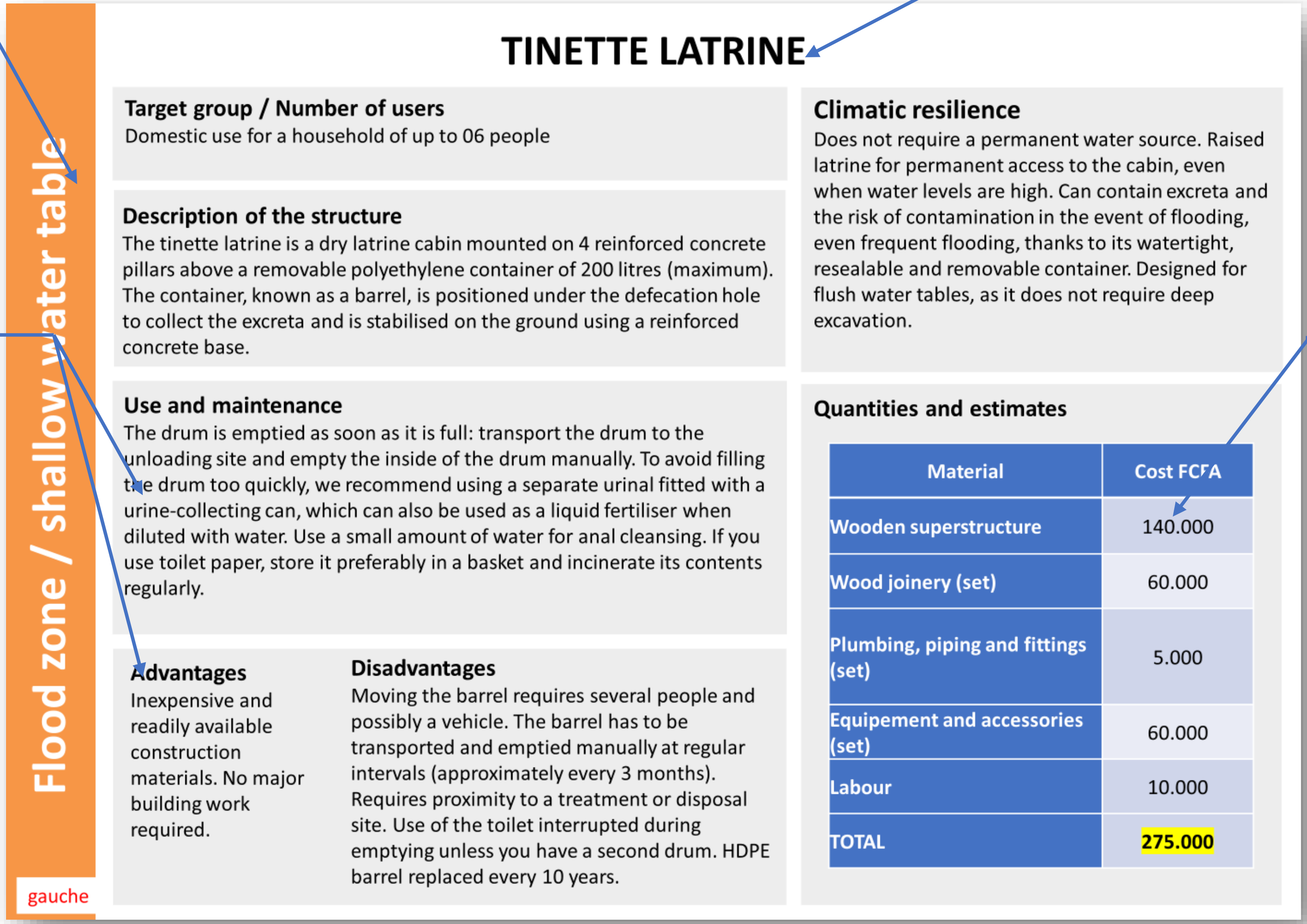
Technical information

Zone type

Name of the model

Text boxes with technical information

Detailed material and costs



Flood zone / shallow water table

gauche

TINETTE LATRINE

Target group / Number of users
Domestic use for a household of up to 06 people

Description of the structure
The tinette latrine is a dry latrine cabin mounted on 4 reinforced concrete pillars above a removable polyethylene container of 200 litres (maximum). The container, known as a barrel, is positioned under the defecation hole to collect the excreta and is stabilised on the ground using a reinforced concrete base.

Use and maintenance
The drum is emptied as soon as it is full: transport the drum to the unloading site and empty the inside of the drum manually. To avoid filling the drum too quickly, we recommend using a separate urinal fitted with a urine-collecting can, which can also be used as a liquid fertiliser when diluted with water. Use a small amount of water for anal cleansing. If you use toilet paper, store it preferably in a basket and incinerate its contents regularly.

Advantages
Inexpensive and readily available construction materials. No major building work required.

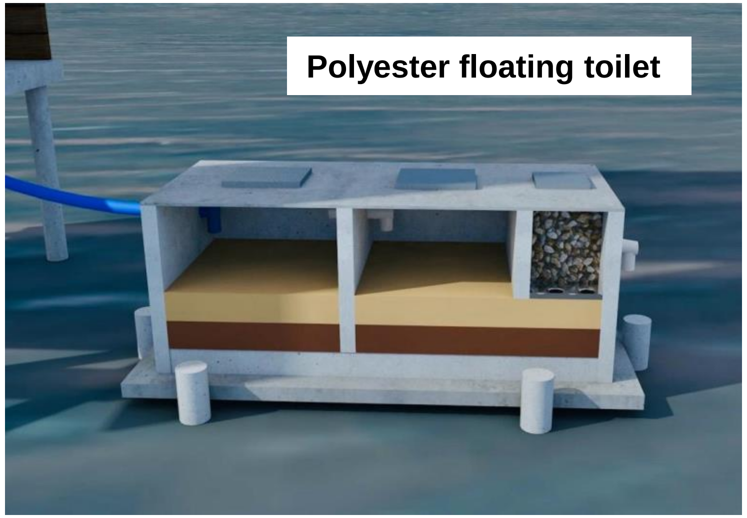
Disadvantages
Moving the barrel requires several people and possibly a vehicle. The barrel has to be transported and emptied manually at regular intervals (approximately every 3 months). Requires proximity to a treatment or disposal site. Use of the toilet interrupted during emptying unless you have a second drum. HDPE barrel replaced every 10 years.

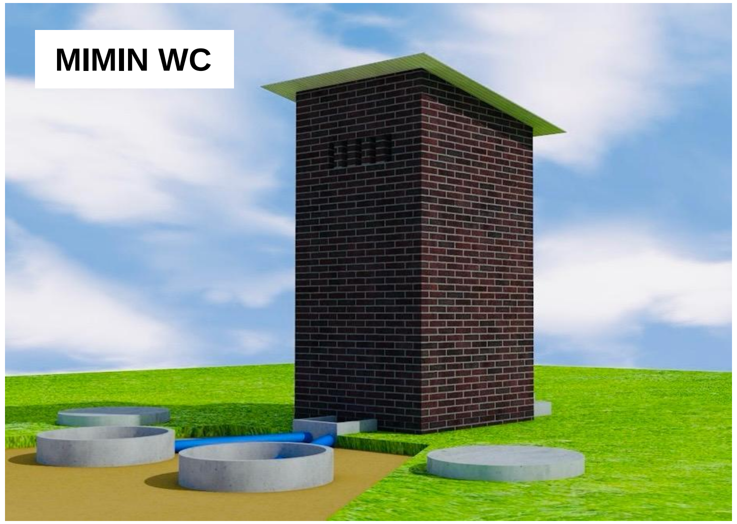
Climatic resilience
Does not require a permanent water source. Raised latrine for permanent access to the cabin, even when water levels are high. Can contain excreta and the risk of contamination in the event of flooding, even frequent flooding, thanks to its watertight, resealable and removable container. Designed for flush water tables, as it does not require deep excavation.

Quantities and estimates

Material	Cost FCFA
Wooden superstructure	140.000
Wood joinery (set)	60.000
Plumbing, piping and fittings (set)	5.000
Equipement and accessories (set)	60.000
Labour	10.000
TOTAL	275.000

various 3D drawings: **7 standard models + 12 variations**





Handwashing facilities

Name of the model

Image

Main characteristics

HANDWASHING FACILITIES

Tippy-tap	Handwashing station	WASH a LOT
		
Suitable for households and schools	Suitable for households and public institutions (schools and health centres)	Suitable for public institutions (schools, health centres, bus stations)
1 to 5 litre capacity	20 to 50 litre capacity	25 litre capacity
Up to 100 hand washes per filling	Up to 200 hand washes per filling	Up to 150 washes per filling
Between 500 and 2000 FCFA	Between 8,000 and 12,000 FCFA	Between 150,000 and 300,000 FCFA
Very affordable model, accessible to all, efficient use of water	Widespread and inexpensive model	Resilient model, allowing collective hand washing and efficient use of water

gauche

Adapting to Flood Risk in Sanitation

CASE STUDIES FROM
CAMBODIA AND BANGLADESH

Presented by:
Elise Mann
WASH Director
iDE Global

iDE Powering entrepreneurs to end poverty.

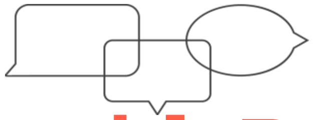
SANITATION AND THE CLIMATE CRISIS ARE INEXTRICABLY LINKED

iDE

Learning Question

How might we take an innovation & climate risk-informed approach to increase the resilience of sanitation systems in flood-prone areas?

iDE'S APPROACH

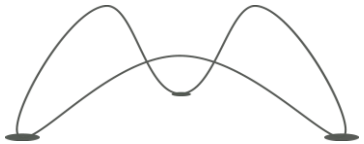


Start with People

We use Human-Centered Design to understand people's lives and the barriers and accelerators to access and sustained use of WASH services.

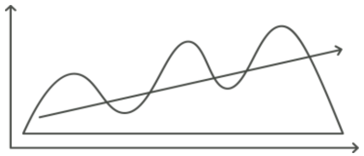
Design to Context

We ask people what they want in WASH products and services. We prototype and iterate on designs until we have a final product that is affordable and desirable.



Business Delivers

We mobilize the private sector by building a strong business case for WASH in the bottom of the pyramid market. We reduce the risk of market entry for entrepreneurs and connect market actors.



Results Rule

We collect and analyze real-time data on quality, cost-effectiveness, and performance using a cloud-based information system, allowing us to prioritize investments and adapt our approach.

CASE STUDY #1

Tonle Sap Lake Area

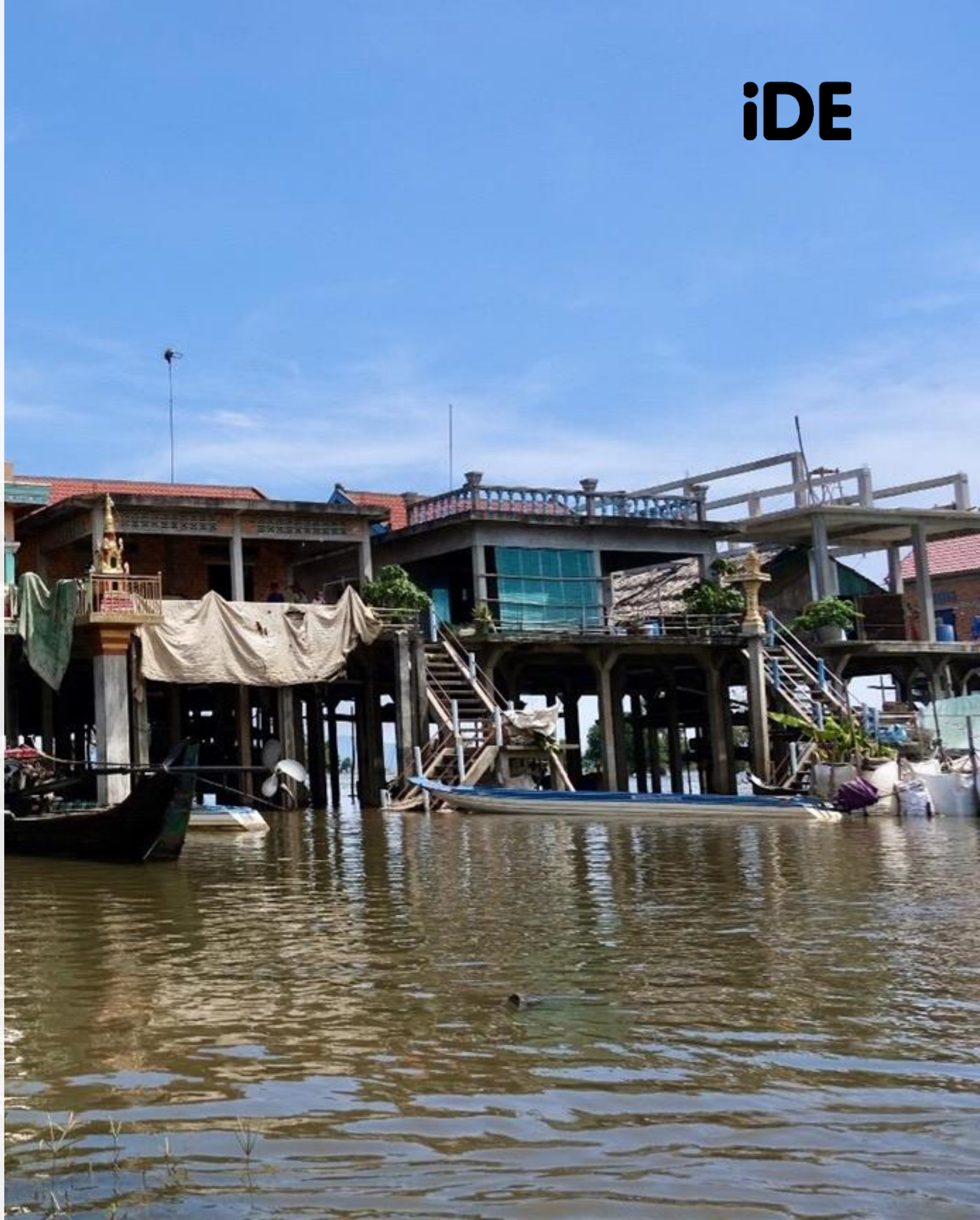
CAMBODIA

iDE

BACKGROUND

Despite a significant increase in sanitation coverage across rural Cambodia over the past decade, stilted households living in flood prone areas bordering the Tonle Sap Lake are lagging behind.

These areas are considered one of the most climate vulnerable in the country, faced with seasonal floods that last up to six months each year.



THE SKY LATRINE

With a durable, elevated, and low-cost design, families can use the toilet year-round, despite flooding that would inundate conventional systems.

SUBSIDIES FOR CLIMATE-VULNERABLE HOUSEHOLDS

Introduced at the right time and with consideration for market distortion effects, targeted subsidies for the lowest income and most marginalized households living in flood prone areas can accelerate WASH access to all.

CASE STUDY #2

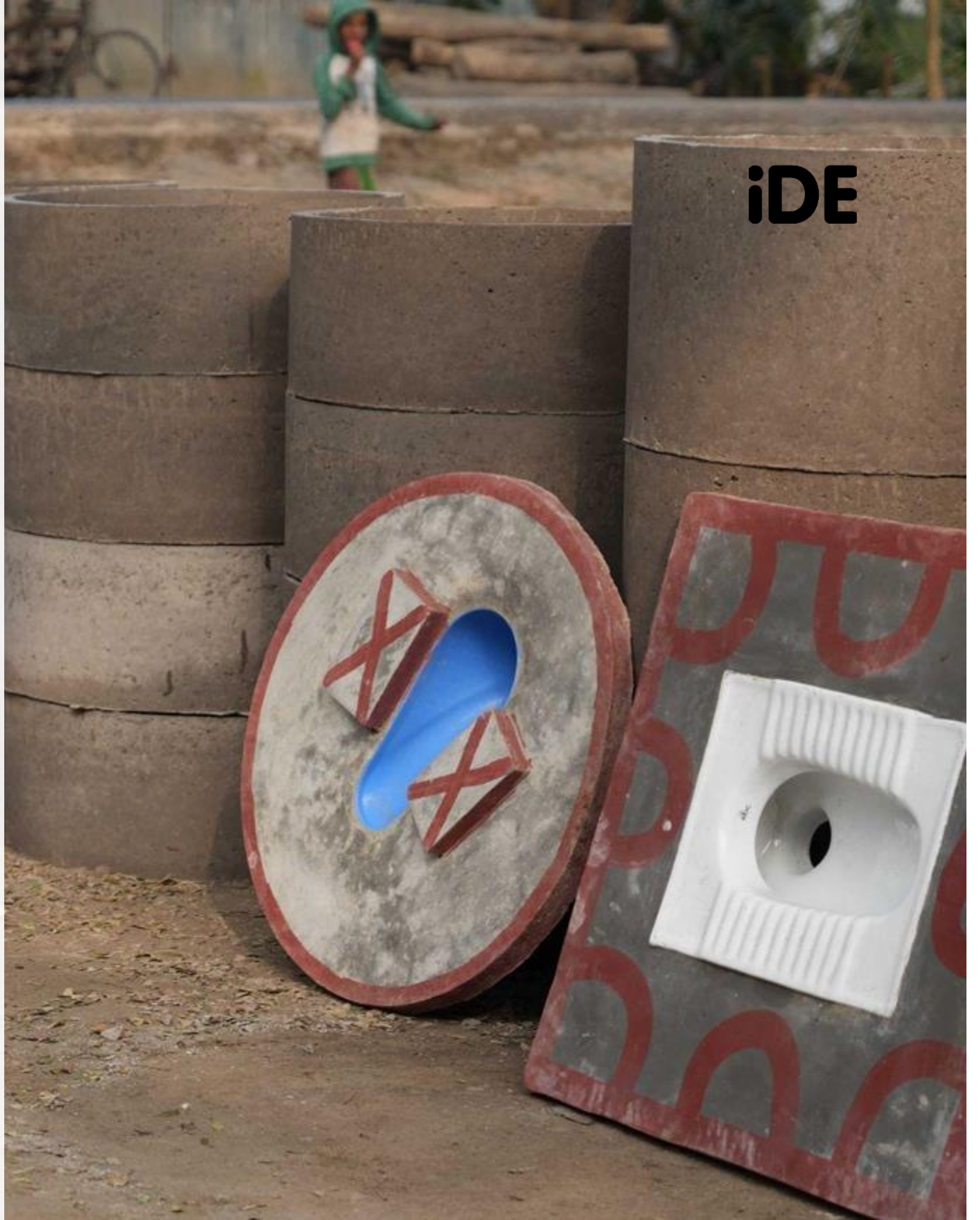
Coastal Satkhira District

BANGLADESH

BACKGROUND

Satkhira District is one of the top most climate vulnerable districts in Bangladesh due to salinity intrusion, floods, water logging, cyclones, storm surges.

The SanMarksII Project works to transform the sanitation conditions by creating demand for improved latrines in rural communities, strengthening market linkages, and building an enabling environment in 35 Districts to ensure durable change.



DISASTER RESILIENT TOILETS

Poor and marginalized people regularly affected by natural disasters have access to improved and climate resilient sanitation facilities (circular shape toilets to reduce the resistance to strong wind, and raised plinth).

NATURE-BASED SOLUTION: VETIVER GRASS

Vetiver is a resilient breed of grass that requires little care to grow abundantly. The dense deep root system helps in firmly binding the soil.

If it is planted around the latrine structure, it can increase its stability and prevent soil erosion.

CALL TO ACTION

Without safe, climate resilient sanitation, there is no safe, climate resilient water.

We must develop inclusive markets and services for climate resilient sanitation to ensure no one is left behind.

Thank you

Elise Mann

emann@ideglobal.org

iDE Powering entrepreneurs to end poverty.

TIME FOR
Q&A

EXPRESSO PRESENTATION

EMISSION & MITIGATION

sustainable sanitation alliance

GHG Baseline sanitation emissions in Lake Victoria basin riparian countries

Ruth Kennedy-Walker
Senior Water Supply and Sanitation Specialist
August 2024

WORLD BANK GROUP
Water

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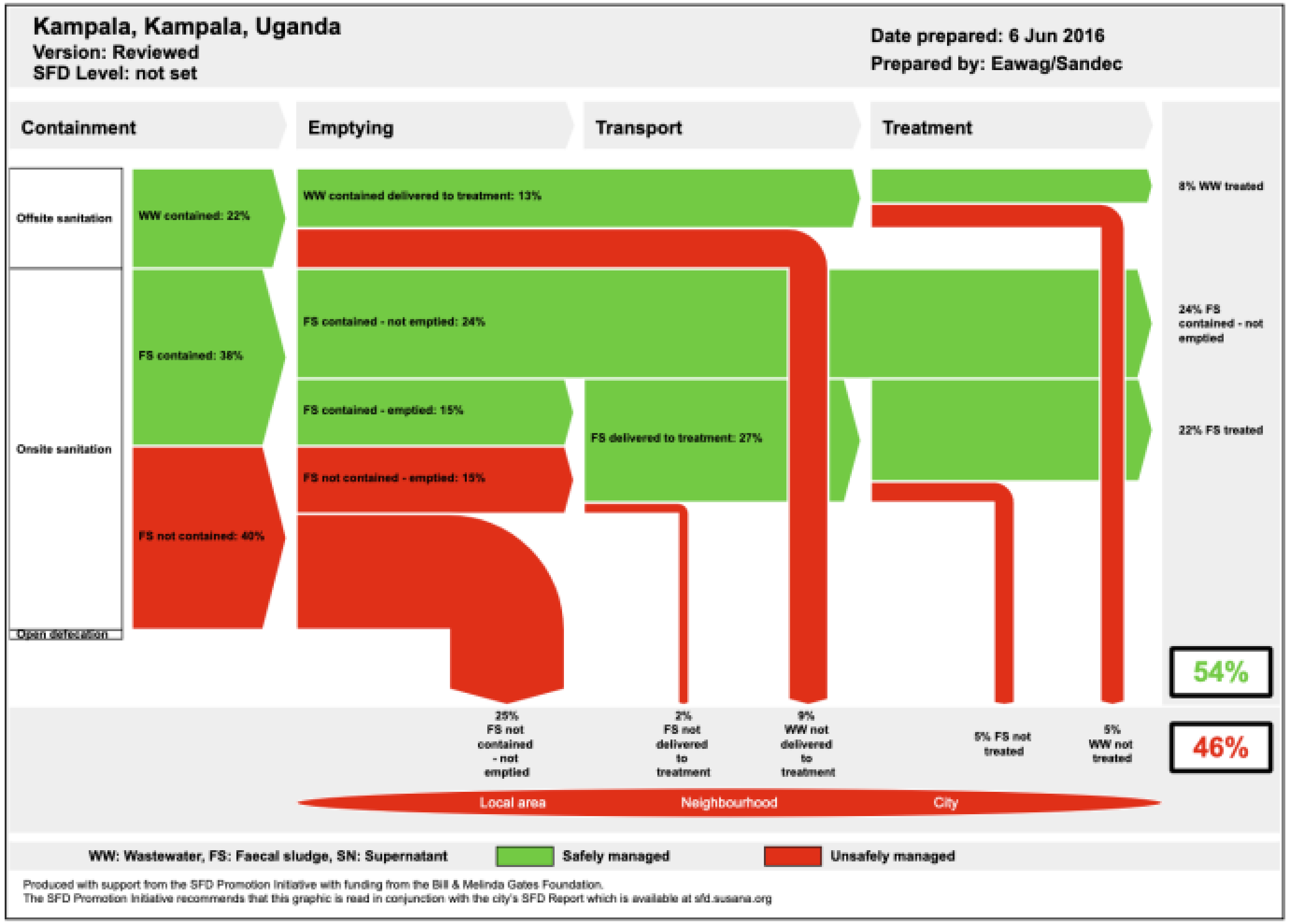
The Challenge



Kampala's (Uganda) Shit Flow Diagram (SuSanA SFD)

The **2019 IPCC Guidelines cover off-site sanitation** but on-site sanitation technologies were not thoroughly explored.

LVB countries rely mainly on on-site sanitation systems.

→ Implementing IPCC-based tools under this scenario would **underestimate GHG emissions.**

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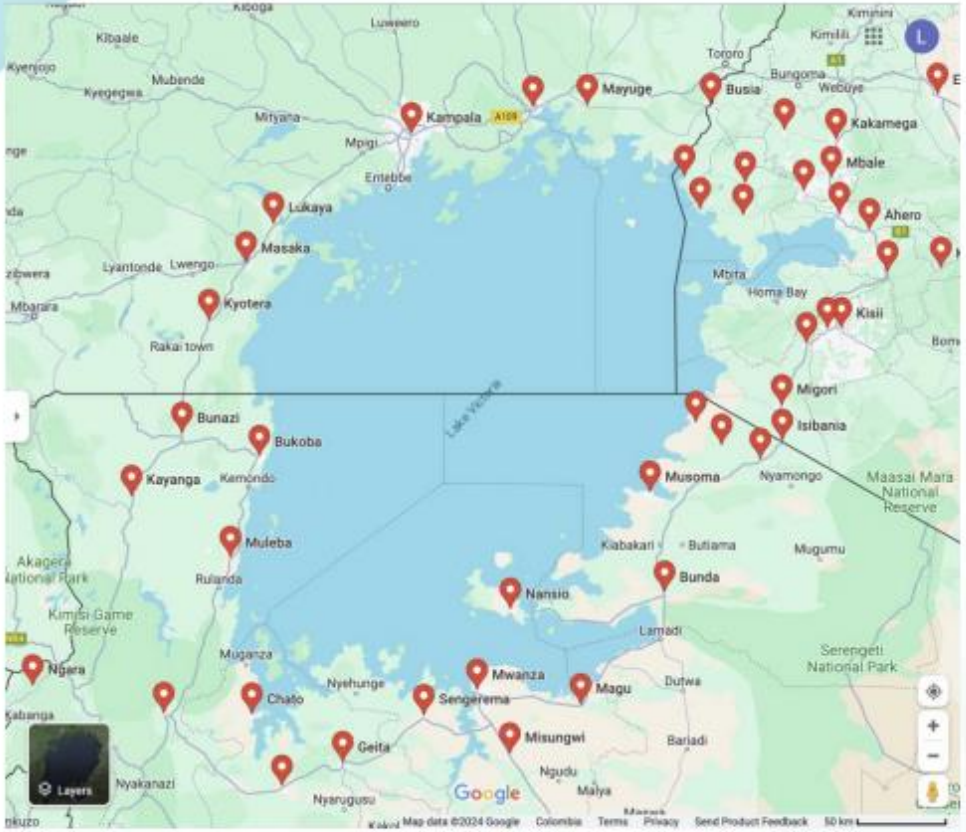
Baseline Scenarios



- **Input data:** SuSanA SFD data and baseline rapid assessments delivered by the World Bank to the consulting team.
- **Geographical boundary:** 44 settlements in total, distributed across Kenya (19), Tanzania (19), and Uganda (6).

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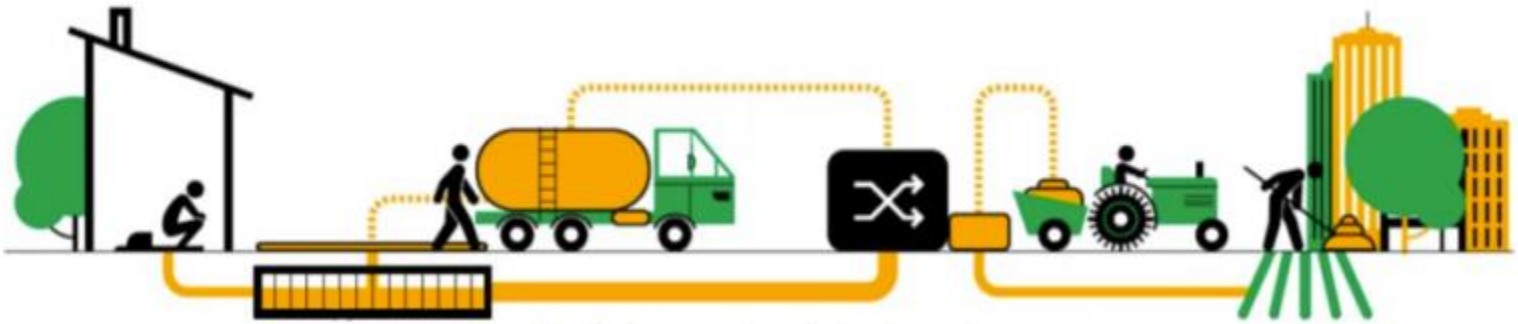
Tool Methodology

Built on the 2019 IPCC Guidelines complimented peer-reviewed literature (Johnson et. al., 2022).

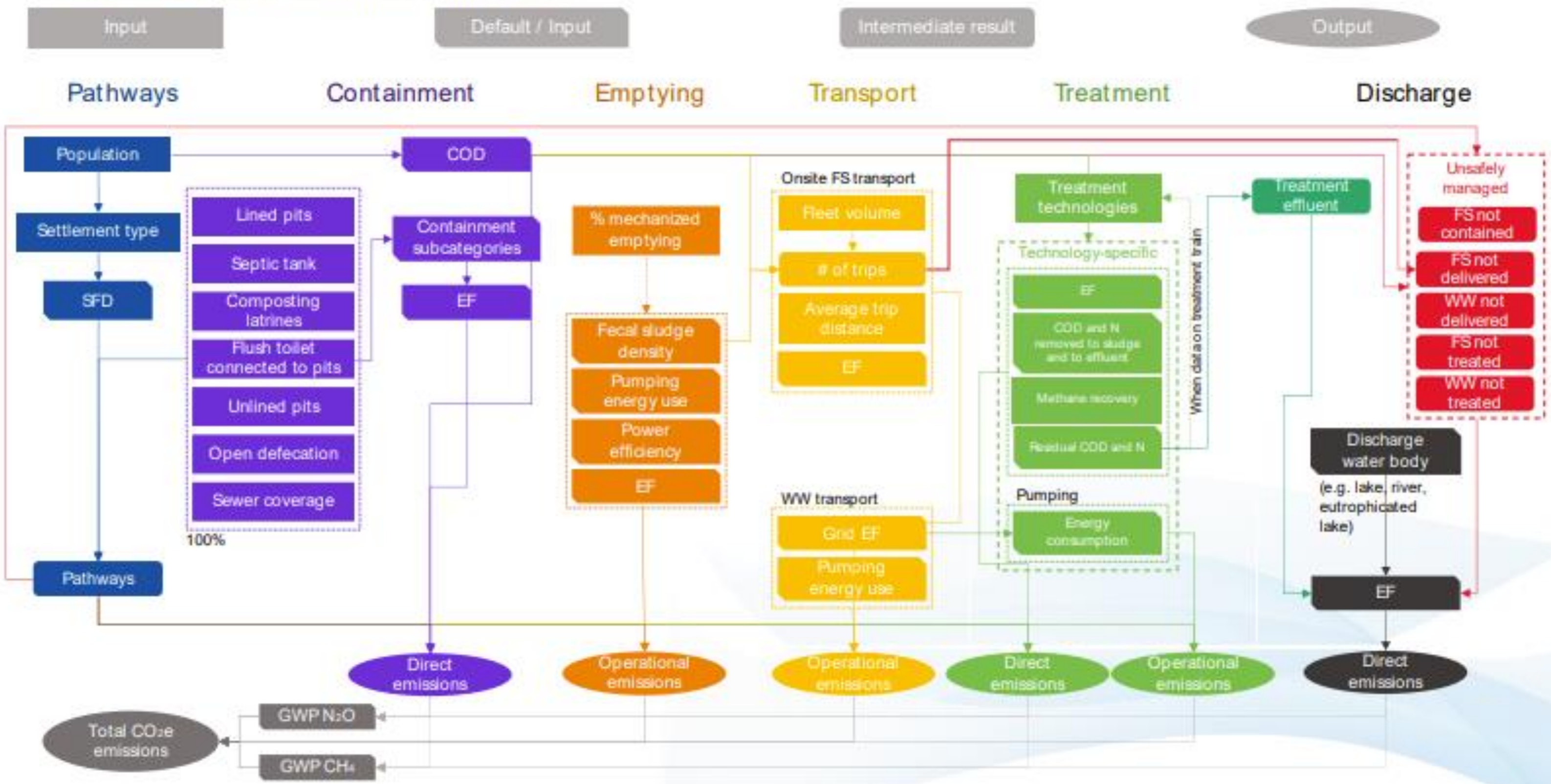


Sanitation service chain element

	Category of emissions	Containment	Emptying	Transport	Treatment	Discharge
Onsite sanitation	Direct	CH_4 and N_2O from pits and tanks	-	-	CH_4 and N_2O of faecal sludge/wastewater treatment	CH_4 and N_2O from discharge
	Operational	-	CO_2 from diesel/electricity consumption during mechanized pumping	CO_2 from truck fuel combustion	CO_2 from diesel/electricity consumption during treatment	-
Sewered sanitation	Direct	-	-	-	CH_4 and N_2O of faecal sludge/wastewater treatment	CH_4 and N_2O from discharge
	Operational	-	-	CO_2 from sewage pumping	CO_2 from diesel/electricity consumption during treatment	-

Tool Methodology

- Excel-based tool modelled with Python



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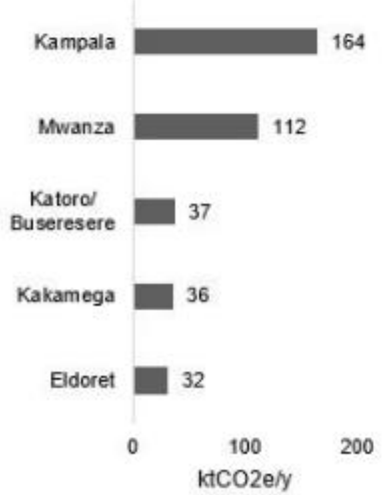
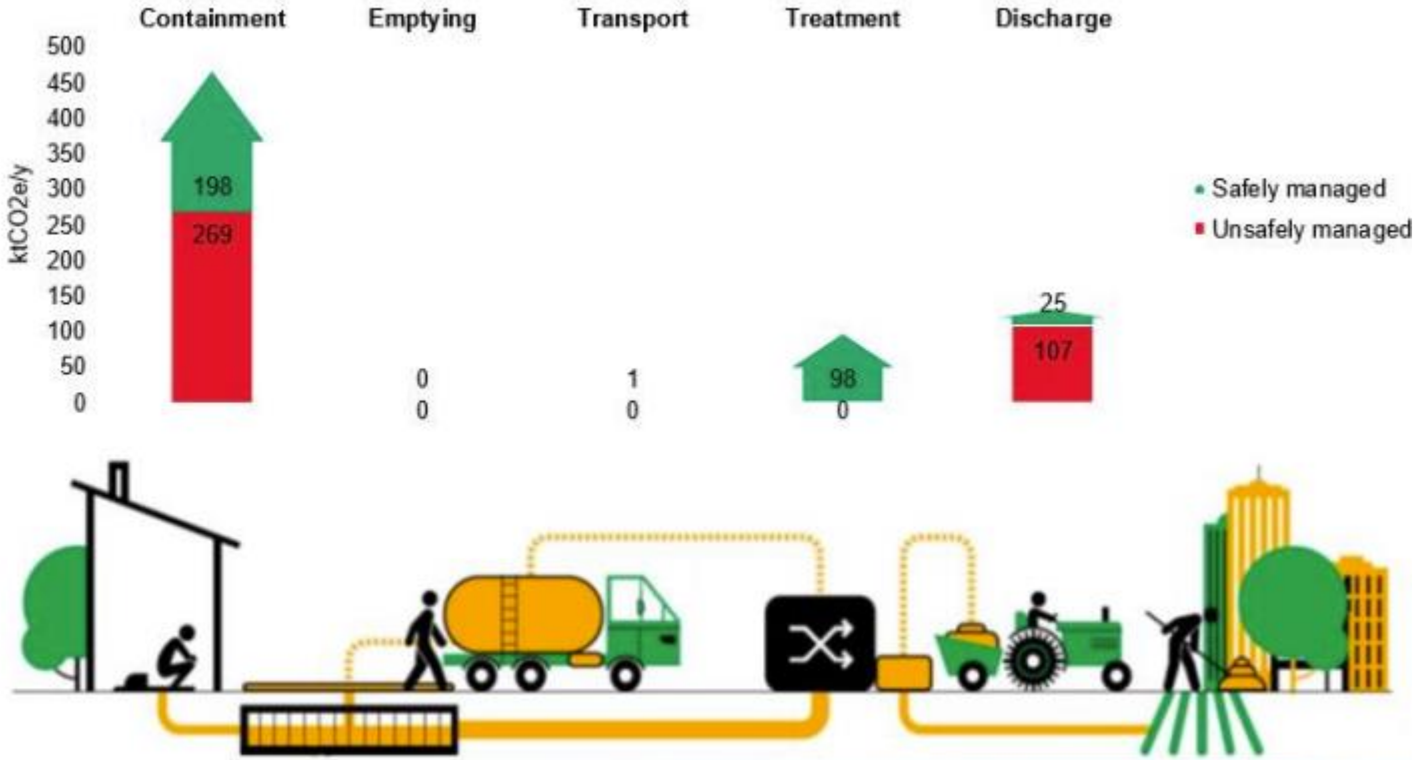
Baseline emissions

Total emissions

697,198 tCO_2e/y

Top 5 settlements





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GHG Tool's potential

The GHG tool developed in this consultancy allowed us to:

- Model the baseline scenario for **44 settlements** in LVB riparian countries
- Easily design and test scenarios to **identify potential interventions** and **model their impact on** the sanitation **GHG emissions**

And will allow any user to:

- Calculate onsite and off-site **sanitation systems' baseline emissions**
- Include modeling parameters (i.e., EF) as **new literature emerges**
- Identify the **main intervention stages** of the sanitation chain
- Model the **emission impact of interventions** along the sanitation chain

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Thank you

With special thanks and acknowledgment of CLIMATE FOCUS

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Combining the SFD and the ECAM tool to create a Sanitation GHG emission calculation tool

34th SuSanA Meeting, Stockholm Environment Institute (SEI), Stockholm, Sweden

Saturday 24. August 2024

Present by: Prit Salian / Oscar Veses (i-San Consulting)

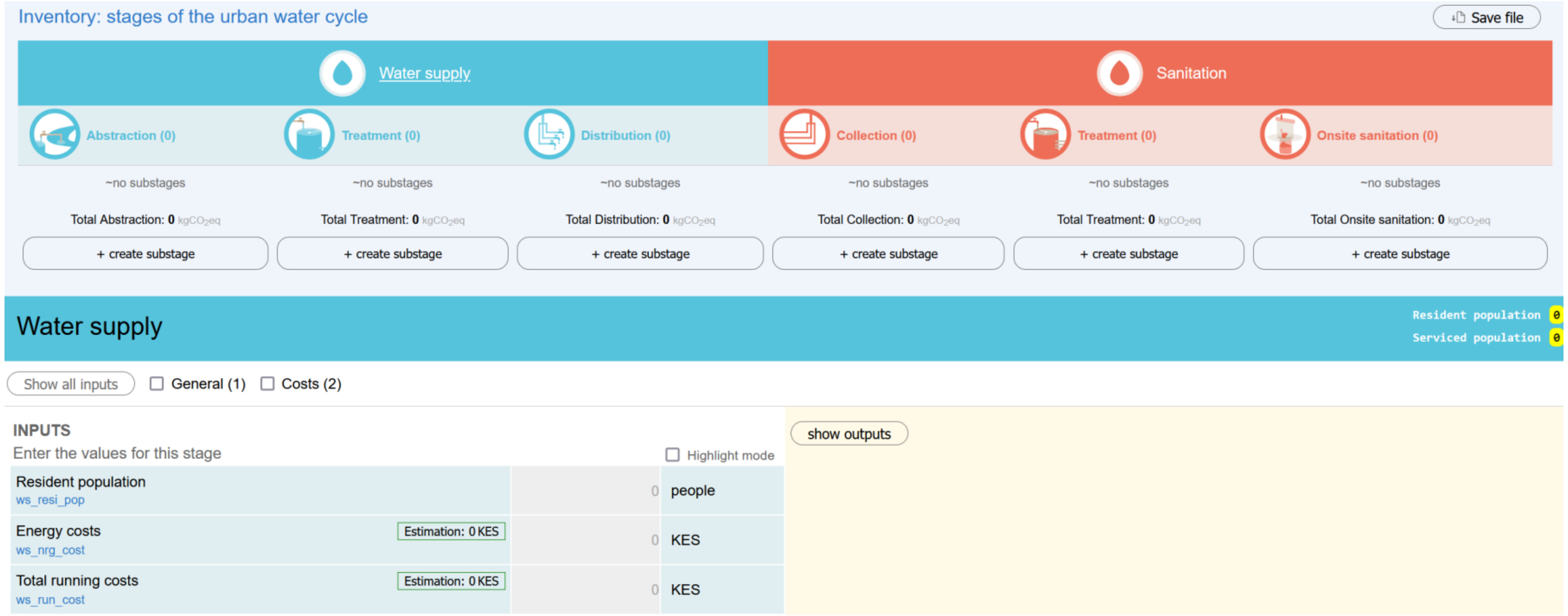
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

i-san

Introduction

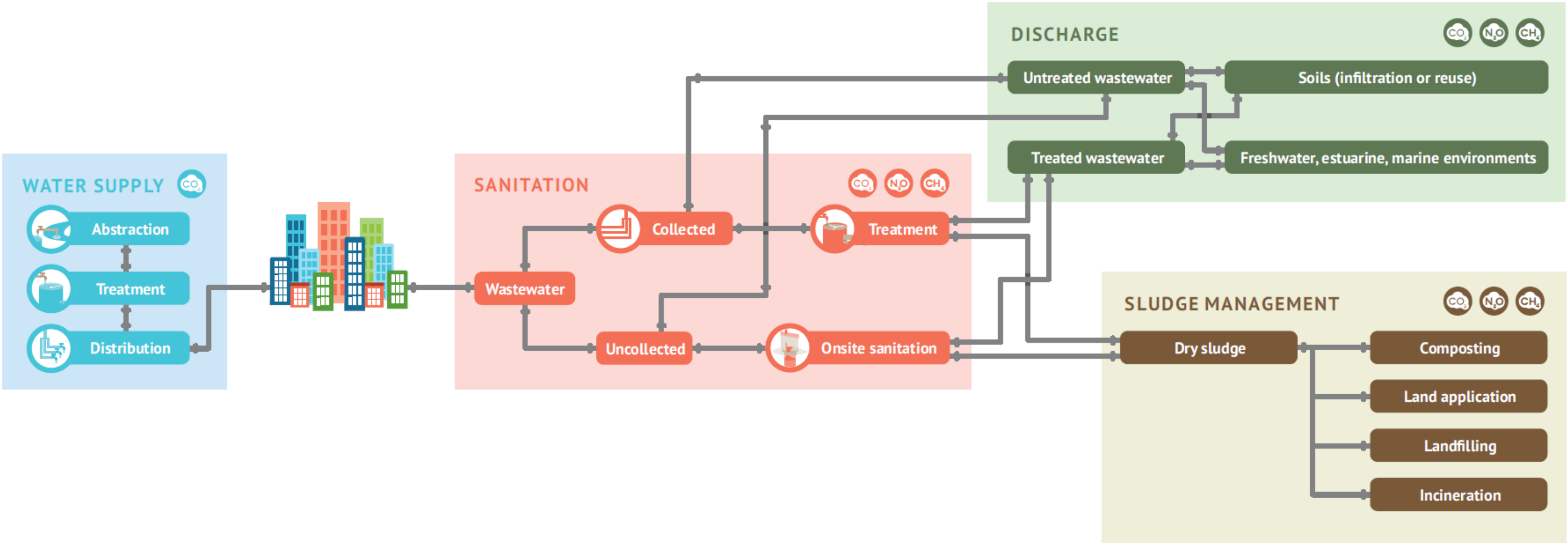
The 'Energy Performance and Carbon Emissions Assessment and Monitoring Tool' (ECAM)

- Developed by Catalan Institute for Water Research (ICRA) and GIZ.
- Online and open access.
- User-friendly interface, with easy-to-use dropdown menus
- Link: https://climatesmartwater.org/ecam/



Main features of the ECAM Tool for GHG Emission Assessment

- Estimates based on energy audits and management practices.
- Consistent with the IPCC Guidelines for National Greenhouse Gas Inventories and peer-reviewed literature.
- Includes water supply and sanitation systems.
- Outputs (Sankey diagrams and charts).



ECAM method system boundary, showing terminology

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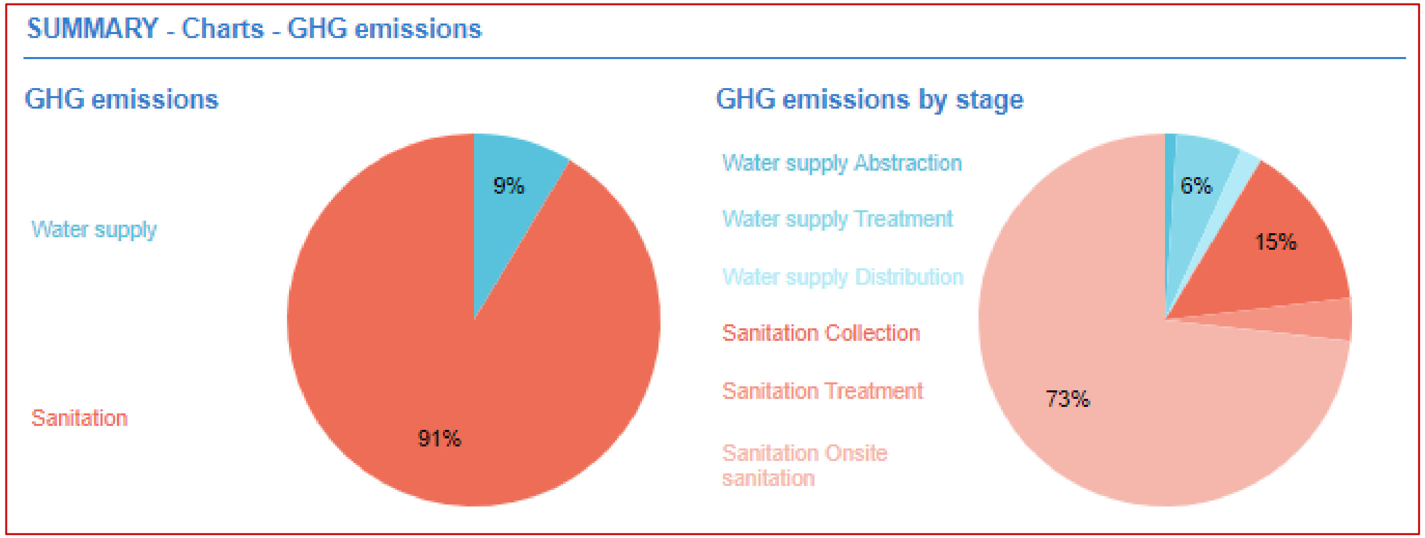
Gaps encountered in the ECAM Tool

- Generic IPCC emission factors (not city-specific).
- Does not include N_2O emissions or embedded carbon emissions.
- Limited customization for specific sanitation systems (pit latrines and septic tanks).
- Simplified transport emissions calculation (only the total fuel used by vacuum trucks).
- Lack of sensitivity analysis (impact of changes in key variables on overall emissions results).



ECAM tool output in chart

Integration and Improvement Proposals

- Integrate emissions data into a sanitation chain graphic (possibly SFD graphic).
  - ➢ Include all sanitation systems from SFD methodology.
  - ➢ Add emissions factor values for all sanitation systems in the SFD.
- Include N_2O and embedded carbon emissions.
- Enhance transportation emissions calculation (include truck size, # of trips, distance, etc.).
- Consider adding sensitivity analysis.
- Automate the results presentation using the SFD graphic generator or some other tool.

Conclusion and Next Steps

- ECAM is a **user-friendly, open-source** tool that does not need very detailed knowledge for the user.
- ECAM tool, could be potential **used as an advocacy tool** to increase awareness of GHG emission from the sanitation sector
- Integrating it with data from the SFDs could provide us with **GHG emissions from around 300 cities**
- Next steps involve collaboration among stakeholders to finalize tool integration. Ideas:
    1. Visualize emissions per capita and time unit, showing CO_2 equivalant volume relative to familiar objects (e.g., a person, building).
    2. Compare emissions from activities from other sector, like agriculture, transport, etc.
    3. Conduct pilot tests in selected cities to validate the integrated tool's accuracy.

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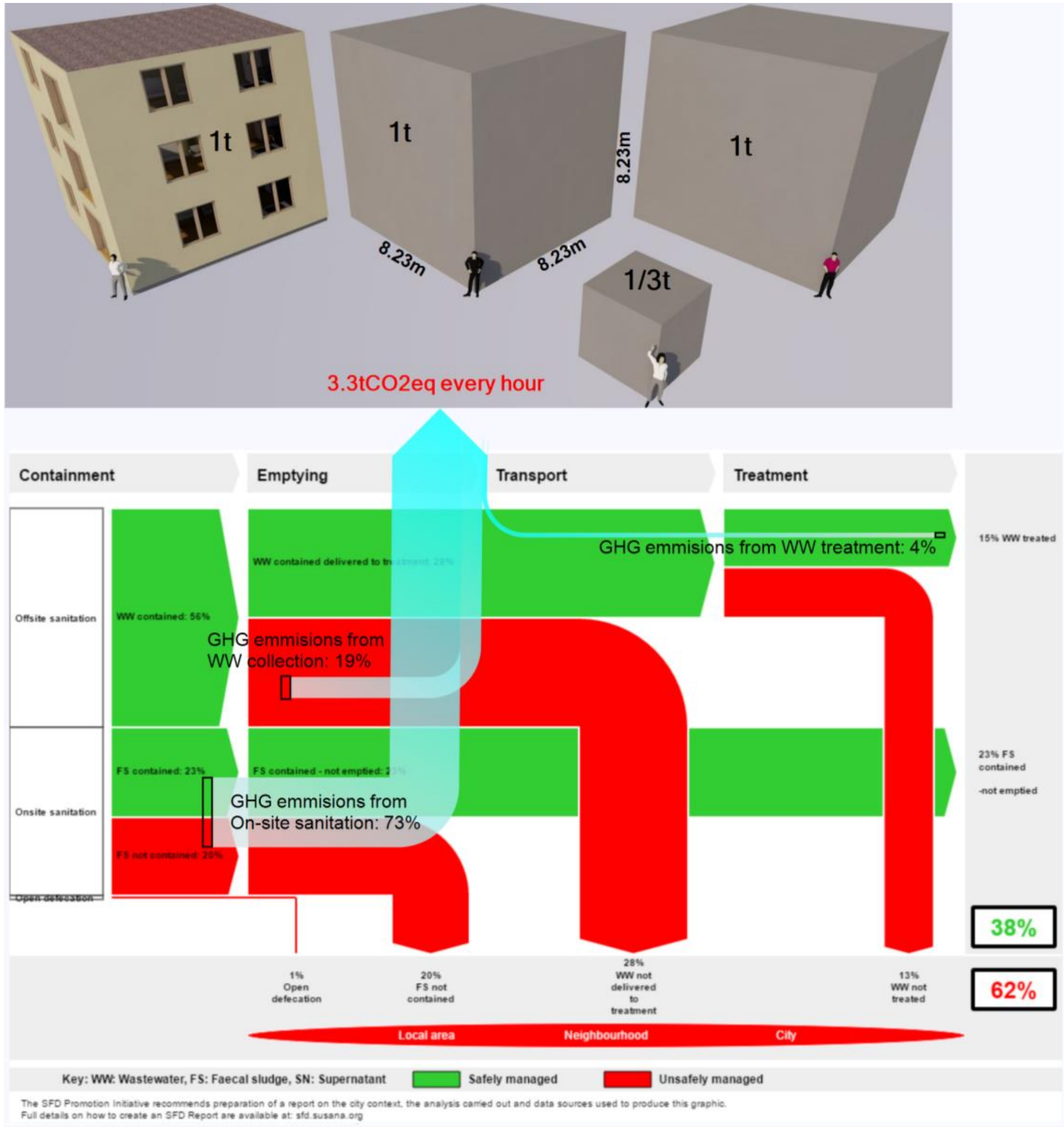
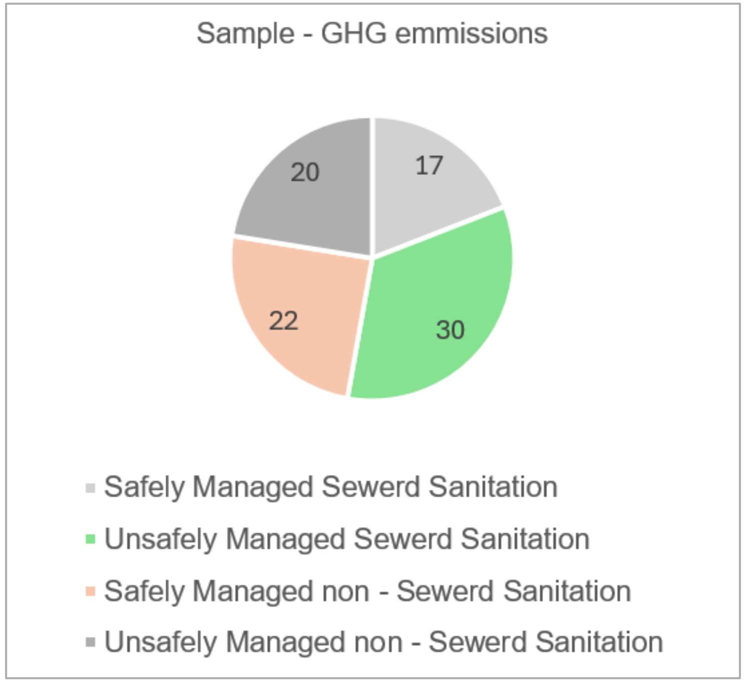
Examples - CO_2 emissions (tons) in perspective/comparison



Presents/compares the GHG emissions in a comparative perspective to tangible objects – three storey building



Visualisation based on SFDs

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Advancing GHG measurements in sanitation & wastewater systems

Daniel Ddiba

daniel.ddiba@sei.org

SEI Stockholm Environment Institute

2024-08-24

We need more empirical data on GHG emissions from sanitation systems

For empirical work to happen, we need more awareness of existing methods for measuring GHG emissions, their potential as well as gaps and limitations

New SEI report on this topic

Ddiba, D., Rahmati-Abkenar, M., & Liera, C. (2024). **Methods for Measuring Greenhouse Gas Emissions from Sanitation and Wastewater Management Systems:** A review of method features, past applications and facilitating factors for researchers, practitioners and other stakeholders. SEI Report. https://doi.org/10.51414/sei2024.030

Categories of GHG measurement methods in the report

Category	Sub-category	Examples
Enclosure -based methods	Static and flow-through flux chambers	Flux chambers
	Methods for outlets of well-defined point sources	Point source enclosure methods
	Ex situ fluxes—incubations	Incubation methods
Open methods	Open approaches at point sources	
	Micrometeorological methods by point measurements in ambient air	Eddy covariance
	Open methods based on column density, tracers or inverse modelling	Tracer flux measurements
	Open methods based on mass balances	Modified mass difference
	Optical methods with potential to map GHG concentrations and fluxes	Infrared spectroscopy

Based on Bastviken et al 2022; https://doi.org/10.1088/1748-9326/ac8fa9

Insights and Implications

- Applications of methods across the sanitation chain in various geographical areas
- Method features including scale & resolution, mobility, costs etc.
- A need for holistic approach to GHG emissions across the chain
- Call for collaboration on methodology development, improvement and adaptation
- A balance between the demand for empirical data on emissions vis a vis costs for acquiring the data

Find out more in our report!

Contact: daniel.ddiba@sei.org

https://www.sei.org/publications/methods-greenhouse-gas-emissions-sanitation/

Miller Alonso Camaro-Valero

SCARE
SANITATION & CLIMATE:
Assessing Resilience & Emissions

BILL & MELINDA GATES foundation

Progress on the SCARE project

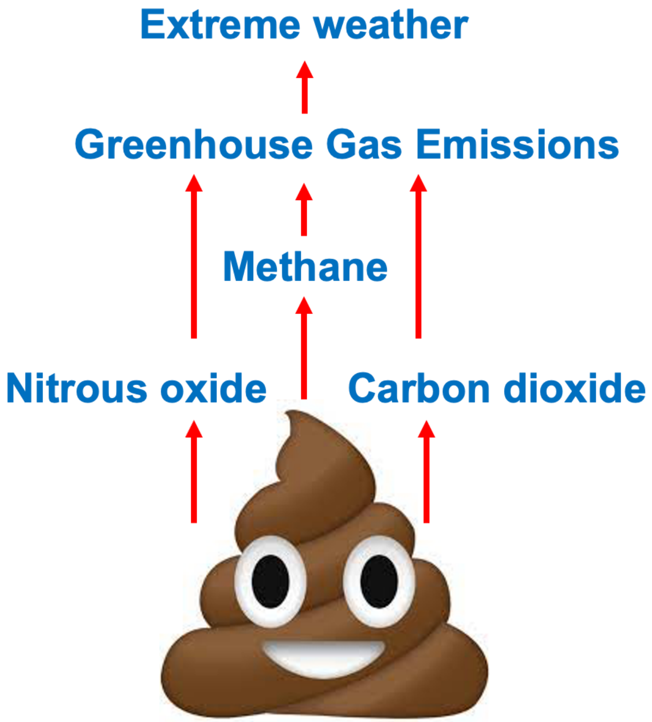
Climate change and sanitation: assessing resilience and emissions

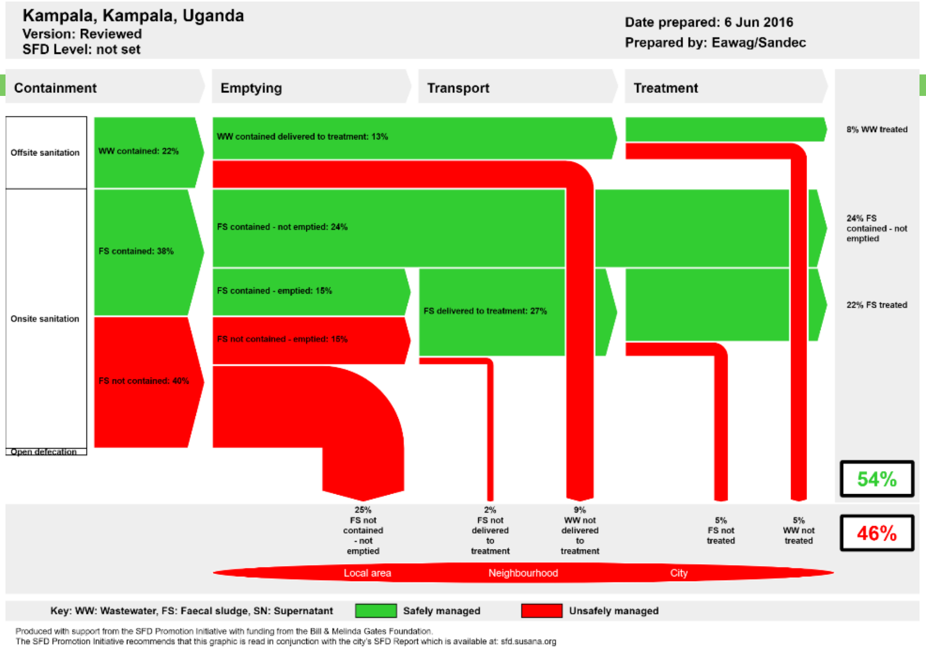
Dr Miller Alonso Camargo-Valero – on behalf of the SCARE project team

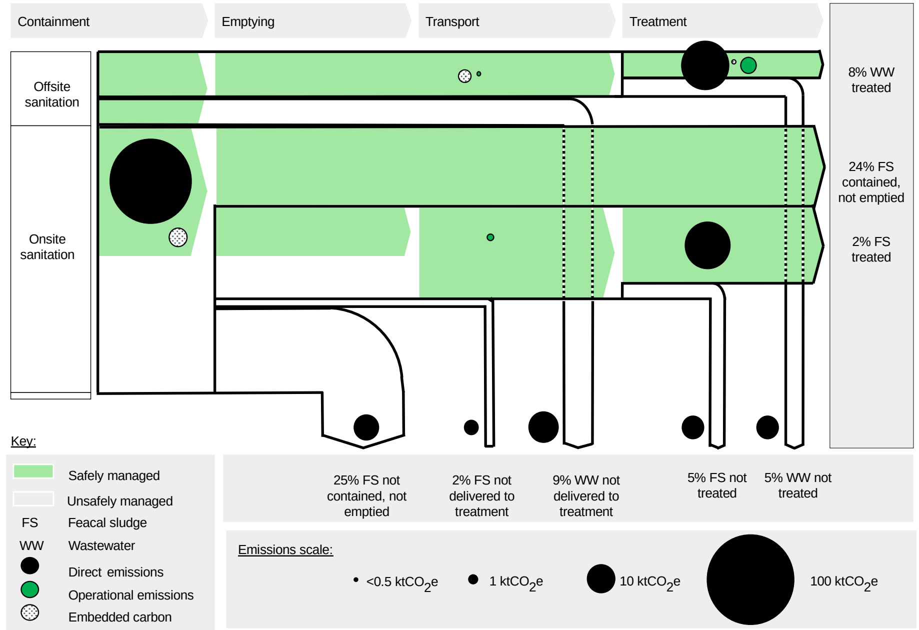
Stockholm World Water Week - 2024

University of Bristol | Ecole Polytechnique Thiès | GGGI | Haramaya University | Kyambogo University | University of Leeds | UTS

GHG emissions from sanitation



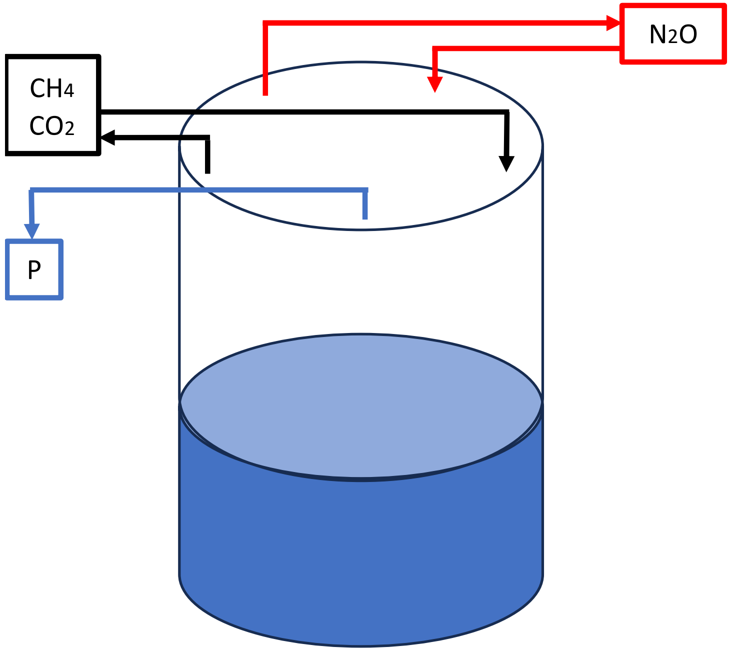




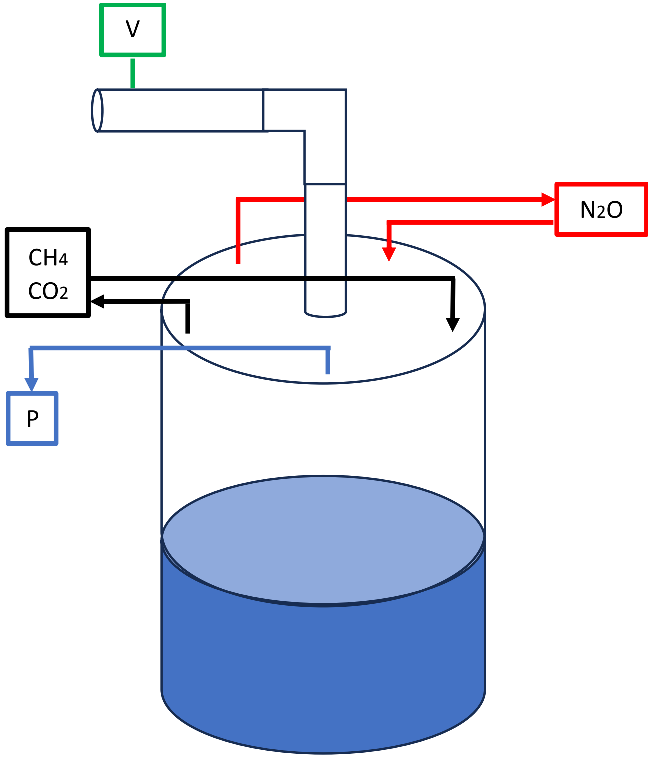
SCARE: Climate change and sanitation: assessing resilience and emissions. PI Professor G Howard (University of Bristol); University of Leeds Co-Is: Professor B Evans and Dr M A Camargo-Valero. Partners from Australia, Nepal, Senegal, Ethiopia and Uganda. Funder: Bill and Melinda Gates Foundation, £1.2M (£400K UoL).(2020-2024).

Johnson, J., Zakaria, F., Nkurunziza, A. G., Way, C., Camargo-Valero, M. A., & Evans, B. (2022). Whole-system analysis reveals high greenhouse gas emissions from citywide sanitation in Kampala, Uganda. *Communications Earth & Environment*, *3*. doi: 10.1038/s43247-022-00413-w

Purpose



(A) Tested Static Flux Chamber set up



(B) Tested Dynamic Flux Chamber set up

Key:

CH_4: Portable analysers for methane

CO_2: Portable analyser for carbon dioxide

N_2O: Portable analyser for nitrous oxide

P: Absolute manometer

V: Anemometer

The SCARE project aims to improve estimates of greenhouse gas (GHG) emissions associated with on-site sanitation in urban areas and small towns in Low- and Middle-Income Countries (LMIC). We have overcome current hurdles linked to the collection of empirical GHG emissions data by redesigning a key piece of equipment, the flux chamber, and repurposing portable gas analysers, to make data collection accessible and affordable.

Field work

Country	Nepal	Senegal	Uganda	Ethiopia
Sampling sites	27	35	119	30

Findings (to date)

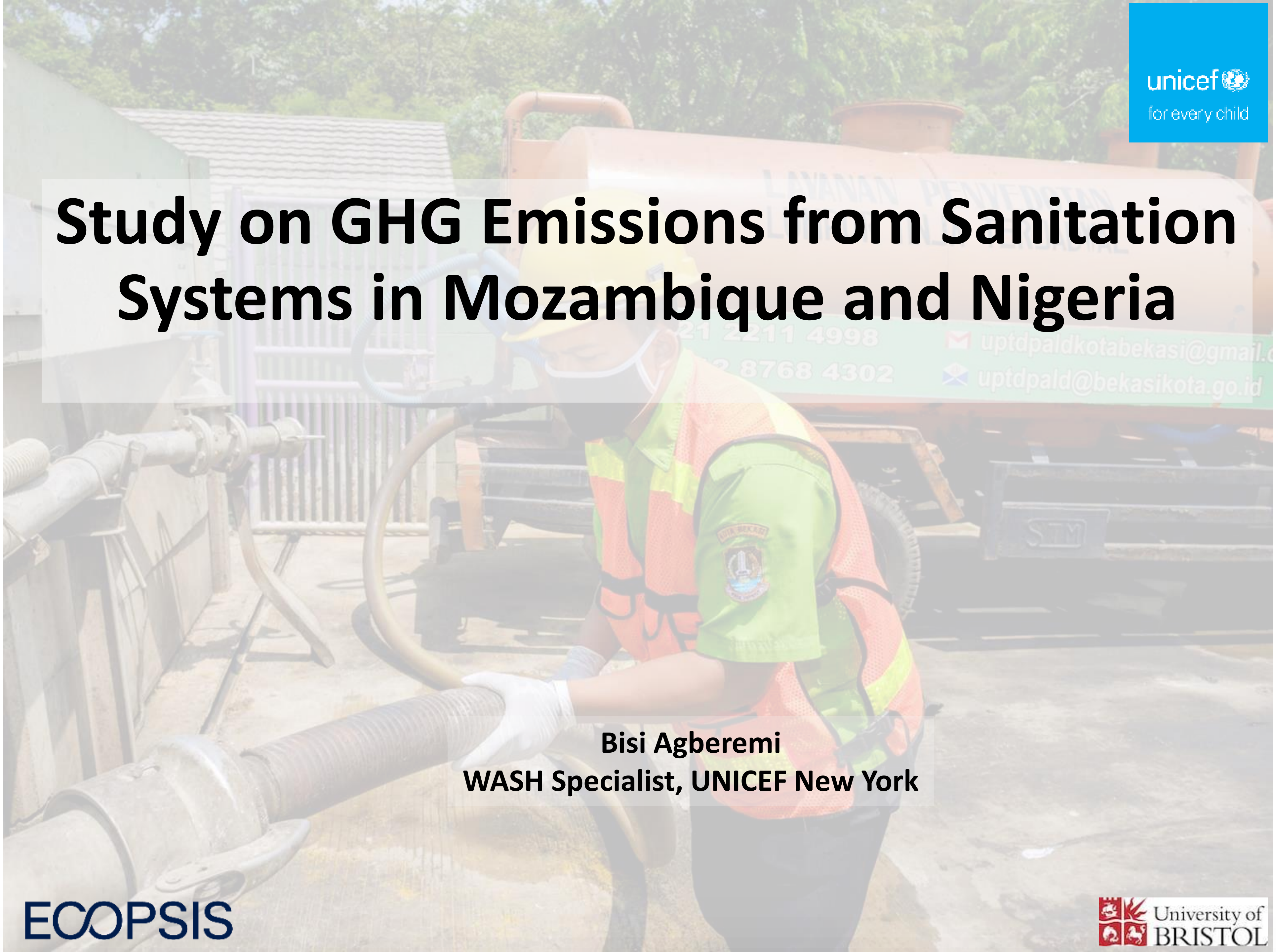
	Pit latrine	Holding tank	Septic tank
Methane emissions in g CH_4 per person per day (+/ one standard deviation)	32.1 (16.0 - 75.3)	8.1 (3.2 - 25.3)	6.8 (3.9 - 17.9)

- There is a need to consolidate a unified definition of onsite containment units
- Methane emissions are higher from pit latrines than from holding or septic tanks
- There is no statistical significant difference between empirical methane emissions from holding and septic tanks

Key-take aways

On-site sanitation options often do not follow standardised design/construction criteria but still are commonly classified under a generic category (i.e., holding tanks are usually referred as septic tanks). This creates a challenge when using theoretical emission factors referring to specific on-site sanitation typologies.

Portable, low-cost CH_4, CO_2 and N_2O analysers are reliable enough to report accurate data, within their own limitations, but fieldwork and calculation of empirical GHG emissions required well trained personnel to overcome the limitations from combining such equipment with flux chamber methods.



Study on GHG Emissions from Sanitation Systems in Mozambique and Nigeria

Bisi Agberemi
WASH Specialist, UNICEF New York

unicef for every child

ECOPSIS

University of BRISTOL

Purpose

- To increase the understanding of the contribution of sanitation to GHG emissions (in particular from on-site sanitation) and how these emissions can be effectively reduced.

- Generate more evidence on the importance of sanitation to GHG emissions and enhance UNICEF capacity with relevant guidance for calculating GHG emissions to strengthen the climate rationale for sanitation.

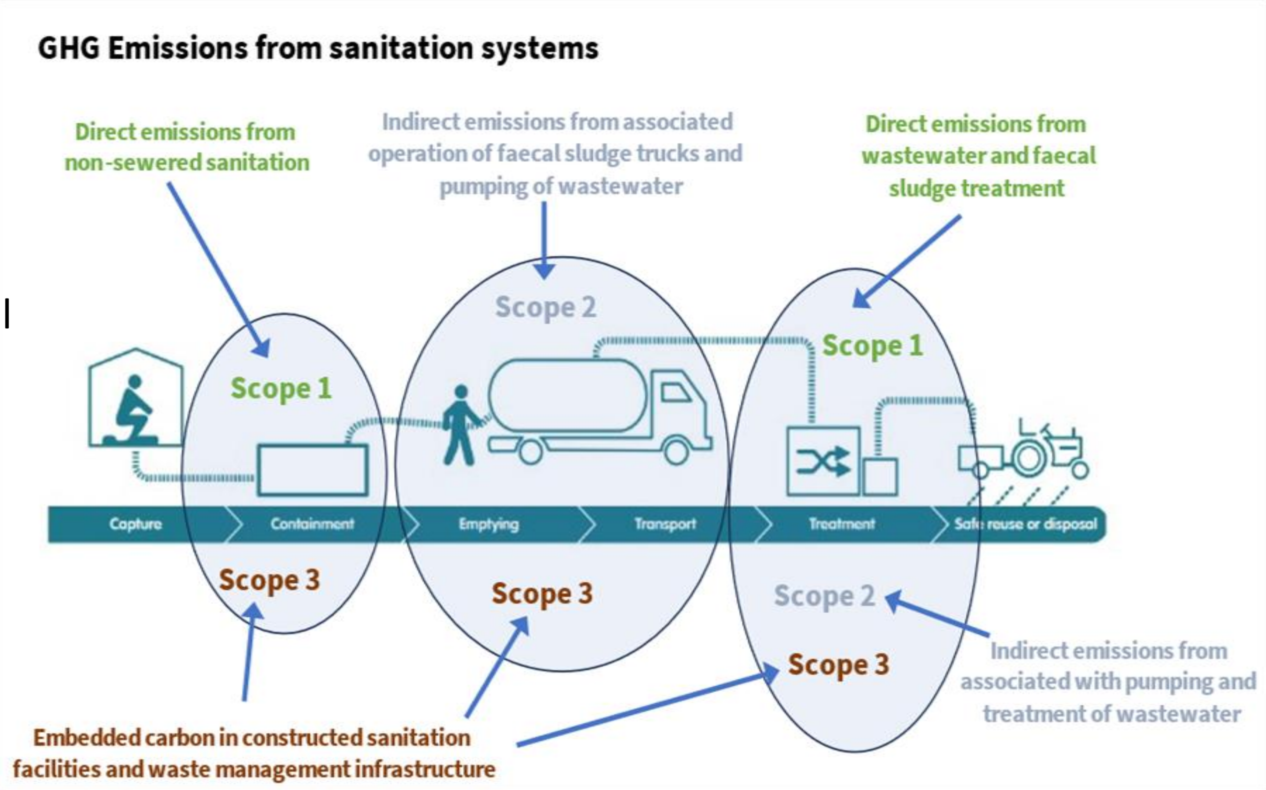
- Advance inclusion of sanitation in national climate policies and strategies and strengthen the case for climate finance investments for safely managed sanitation.

Scope & Focus of the work

The aim is to estimate the **annual GHG emissions from sanitation systems** in 2 countries (Nigeria & Mozambique)

For each country, assessment will be undertaken at :

- **National level (Scope 1)**
- **City-level** (in Maputo, Mozambique and Bauchi, Nigeria)-**Scope 1,2,3**



Progress to date

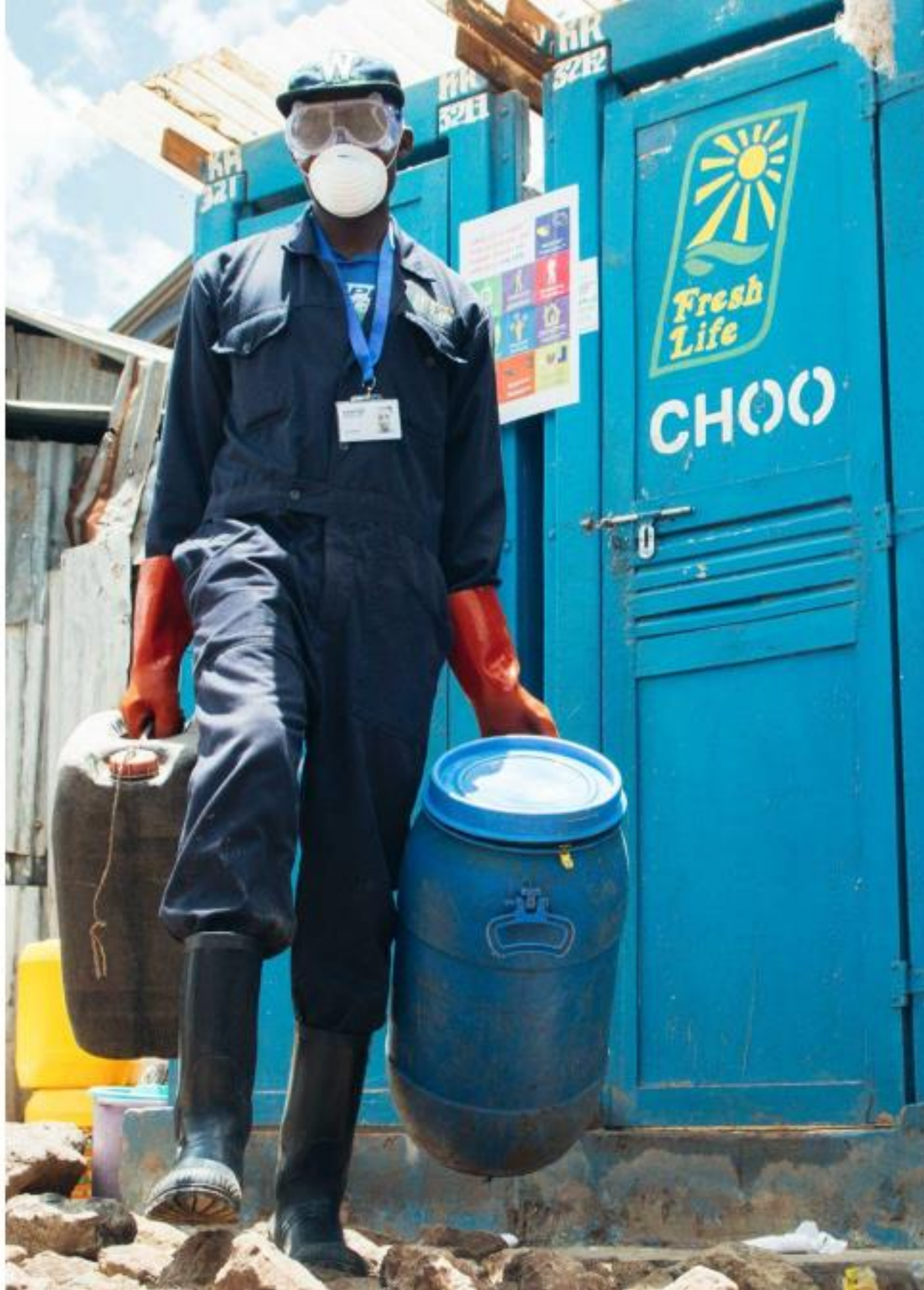
- Data collection and analysis being finalized.
- Finalizing plans for in-country dissemination of findings
- Advocacy and mobilization of relevant stakeholders on GHG emissions from sanitation systems
- Ongoing discussion on the use of findings for the NDCs in Nigeria & Mozambique
- Study to be finalized latest by October 31, 2024

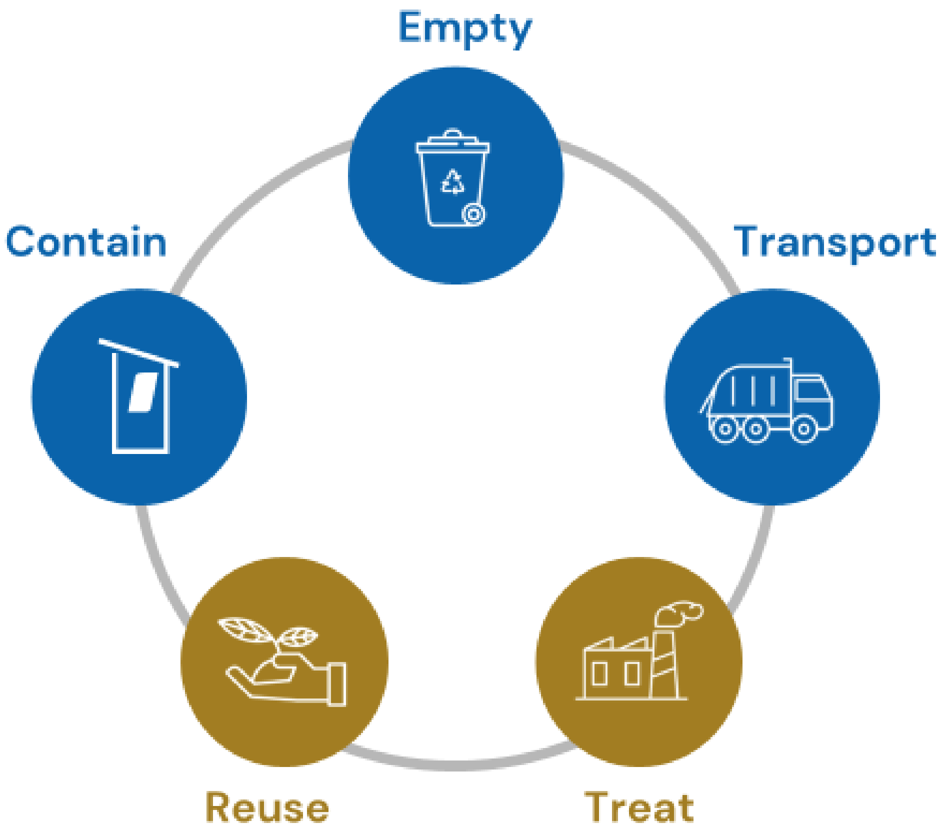
Thank You

SANERGY | COLLABORATIVE

Sanergy & Climate Change Mitigation

Presented by:
Rémi Kaupp
Executive Director, CBSA





The Sanergy Collaborative utilizes a circular economy approach to address sanitation access, waste management and regenerative agriculture.

Comprising of two founding partners – Fresh Life and Regen Organics, they provide container based sanitation, and thereafter upcycle human, animal and other organic waste into organic fertilizer, protein-rich animal feed and bio-fuels, while significantly reducing methane emissions.

Container Based Sanitation is a low-GHG approach to containing and managing sanitation waste

Contain

Containing sanitation waste in small quantities (i.e., small containers) prevents anaerobic conditions which lead to methane production

Empty and Transport

Fresh Life toilets are emptied every 1-2 days, and the waste is immediately transported for treatment at a central site

Treat

Treating sanitation waste by Black Soldier Flies and composting guarantees decomposition under aerobic, low-GHG emitting conditions

- **Overall, this management of CBS waste generates a significant reduction in methane emissions versus a baseline of, for example, fecal waste decomposing in pit latrines – this reduction can be quantified and monetized through carbon credits**

Sanergy is exploring the use of climate financing in sanitation through carbon credits

While climate finance can help subsidize the cost of safe sanitation, it can be a **costly** and **time consuming** process to undertake, and requires a certain **scale of operations** to justify the effort.

Given this, carbon financing can be better suited for **larger-scale** sanitation initiatives

~$20k avg. cost per year on issuance and MRV costs, as well as significant upfront costs

~18-24 months from start of registration to credit issuance

~200 tonne per day is the size of factory that Sanergy is attempting to register; smaller is possible, but less profitable

Climate financing is a step in the right direction toward sustainable subsidies for sanitation

ILLUSTRATIVE NUMBERS

0.1 tonnes of fecal waste removed per toilet/month

~1.0 tCO2e avoided per tonne of fecal waste treated

$15+ per tCO2e attainable through carbon financing

~$18+

per toilet per year in climate subsidies for safe sanitation

Two statistics to contextualize:

1. True costs of safely managed sanitation services have been measured to be between **$250-500 per household per year**. [Igarashi et al, 2023]

2. However, current waste reuse efforts (e.g., composting alone) typically generate <$5 per person per year. [Mallory et al, 2020] Using 4 people per HH, that's **$20 per household per year.** Carbon financing is one way to increase this.

Join our movement today!

QUESTIONS?

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www.fresh-life.org

sustainable
sanitation
alliance

TIME FOR
Q&A


Lunch Break