35th SuSanA Meeting

Saturday 23. August 2025

sustainable sanitation alliance

Adress by the German Ministry - Lars Selwig



Climate-Resilient Sanitation



Climate Resilient Sanitation

Next Presentation:

George Wainaina – EAWAG - SANDEC



Organize to Adapt: Capabilities for Resilient Water & Sanitation Services

George Wainaina, Eawag – Sandec

George.wainaina@eawag.ch



















 Netflix understood potential users in new markets by exploring unconventional but freely available data from Pirate Bay, acted on this information by licensing popular films by context, and reorganized to build capability subsequently making this a policy for new market entry

 Organizations that survive risks and threats, and explore opportunities, leverage proactive sensing and seizing new opportunities and transforming themselves over time – adaptation to build resilience



Necessary capabilities for organizations to adapt and build resilience:



Sensing – Proactively identify opportunities, threats & risks

Seizing – Leverage identified opportunities

Transforming – Feed to strategy and influence routines



Questions for water/sanitation organizations wrt climate adaptation/resilience



- How does your organization sense threats, risks, and opportunities?
- How does your organization leverage/adapt to these new knowledge?
- How does your organization embed/routinize the above to inform strategic direction/poeitioning?

These are the questions that the Organizations & Climate Group will explore











What do all these have/not have in common?

Organize to Adapt! No resilient interventions, without resilient organizations.

28 August

Time: 09:00 - 10:30

Location: Room 24/25, Level 2

Climate Resilient Sanitation

Next Presentation:

Andrés Huego Gonzáles – WaterAid

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

Climate Resilient Sanitation in the Green Climate Fund



GCF Guidelines on Climate Resilient Sanitation



Annex 3 to the GCF Water Security Sectoral Guide.

The Water Security Sectoral Guide describes what is to be achieved.

Annex 1 covers water-climate-resilient projects
Annex 2 IWRM, CR-WASH, Drought and Flood management

The Annex 3 "Practical guidelines for designing climateresilient sanitation projects" describes how to design sanitation projects suitable for GCF finance - meeting GCF's investment criteria and delivering results in GCF's areas.

Targeted at
Direct Access Entities at the national levels
International Access Entities
Accredited Entities

bit.ly/climate_sanitation





Annex III | Water Security Sectoral Guide

GCF Water Project Design Guidelines

Part 3: Practical guidelines for designing climate-resilient sanitation projects

GCF WATER SECURITY SECTORAL GUIDE | WATER PROJECT DESIGN GUIDELINES PART 3

Contents of the Annex



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 climate-resilient sanitation (CRS)
- 2 Building the Climate Rationale for Sanitation Projects: Adaptation
- 3 Building the Climate Rationale for Sanitation Projects: Mitigation
- 4 Potential interventions to support CRS across the Sanitation Service Chain
 - Adaptation
 - Mitigation
 - Strengthening systems to enable CRS
- 5 Developing a GCF proposal





Annex III | Water Security Sectoral Guide

GCF Water Project Design Guidelines

Part 3: Practical guidelines for designing climate-resilient sanitation projects

GCF WATER SECURITY SECTORAL GUIDE | WATER PROJECT DESIGN GUIDELINES PART 3

What's next



Since the guidelines were published

- Dissemination efforts
- Preparation of training materials
- Preliminary engagements with governments

Going forward

- Roll-out of the training
- Support to interested countries / entities in applying for GCF projects
- Engaging with other climate funds / donors





Annex III | Water Security Sectoral Guide

GCF Water Project Design Guidelines

Part 3: Practical guidelines for designing climate-resilient sanitation projects

GCF WATER SECURITY SECTORAL GUIDE I WATER PROJECT DESIGN GUIDELINES PART 3

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

The Climate Resilient Sanitation Coalition is working collectively towards improved prioritisation, capacity and investment in climate resilient sanitation.

For more information, facts and figures and how to join, visit: www.susana.org/vJGhn1



Climate Resilient Sanitation

Next Presentation:

Sam Drabble - WSUP

CLIMATE RESILIENT SANITATION: COALITION FOR ACTION

New training materials to support sanitation proposals to Green Climate Fund

Presented by: Sam Drabble, WSUP SuSanA meeting, Stockholm 23rd August 2025

Training Objectives



Training Objectives

- 1. Participants gain a thorough understanding of CRS and the GCF proposal process
- 2. Participants learn the necessary steps for developing a CRS proposal for GCF
- 3. Participants understand where they can access support and resources in developing a proposal

Training Output

Participants will leave the training with an **initial outline of a GCF concept note** as a critical first step towards developing a proposal, as well as familiarity with key resources, and the confidence and motivation to develop a full concept note as a basis for future GCF funding

Structure of the Training



Session 1: Vision on CRS

Session 2: Articulate the climate science basis for the project and resulting problem statement:

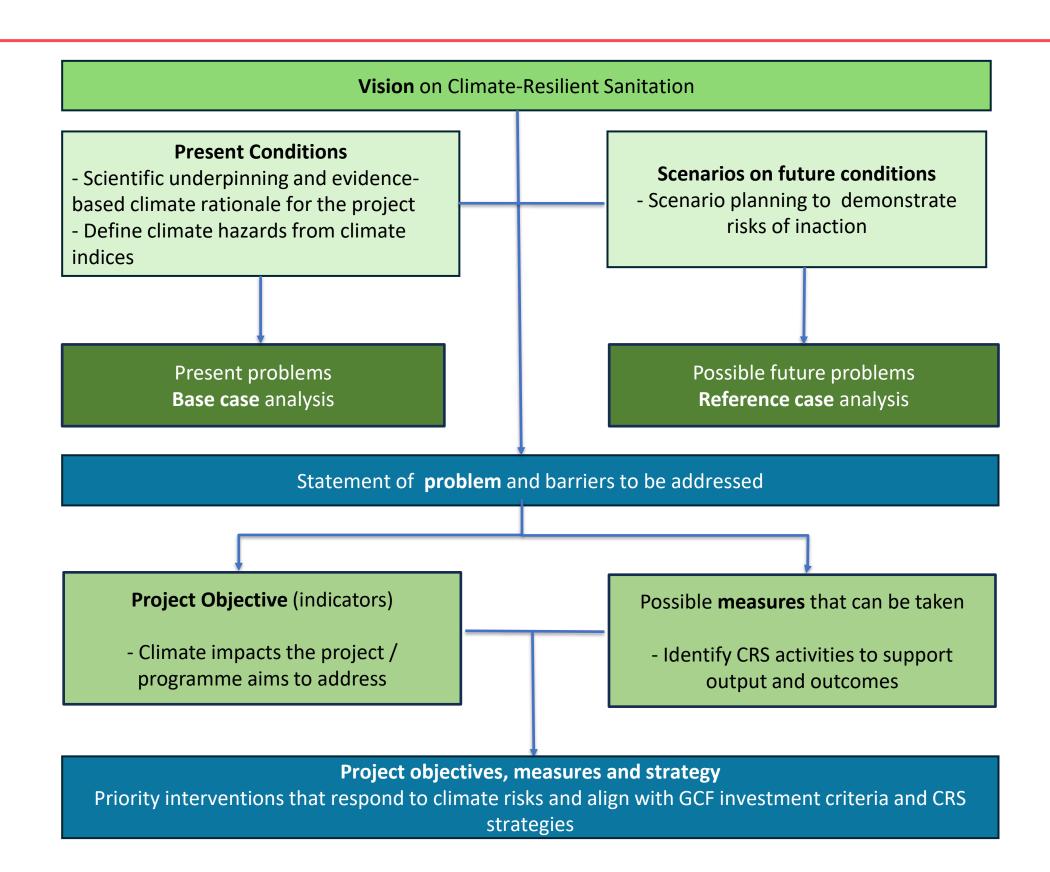
Part 1 - Adaptation

Session 3: Articulate the climate science basis for the project and resulting problem statement:

Part 2 - Mitigation

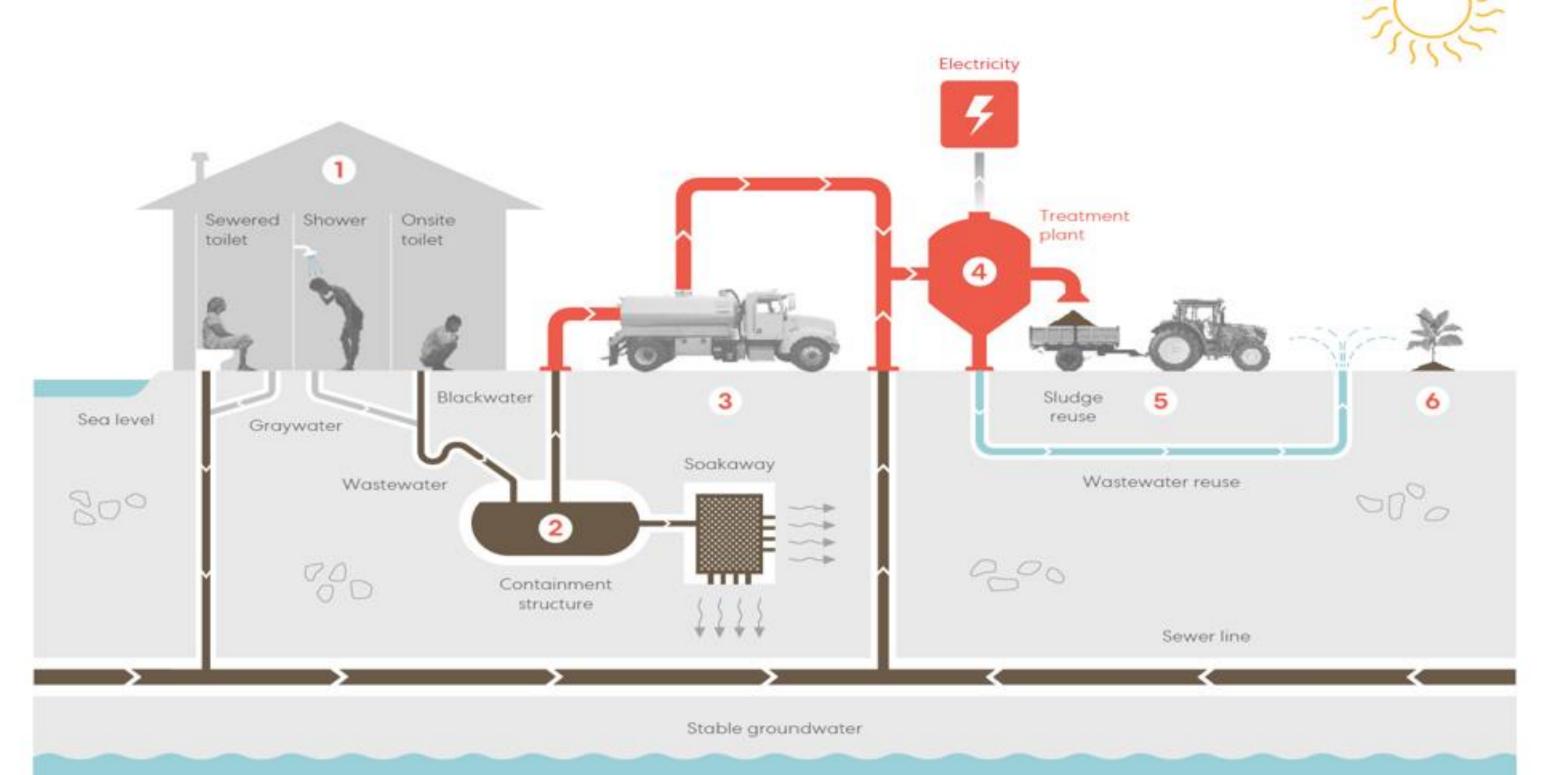
Session 4: Identify priority measures and strategies

Sessions 5, 6: Development of an initial outline for a CRS Concept Note to GCF



Climate-Resilient Sanitation Service Chain (Sewered and Non-Sewered)

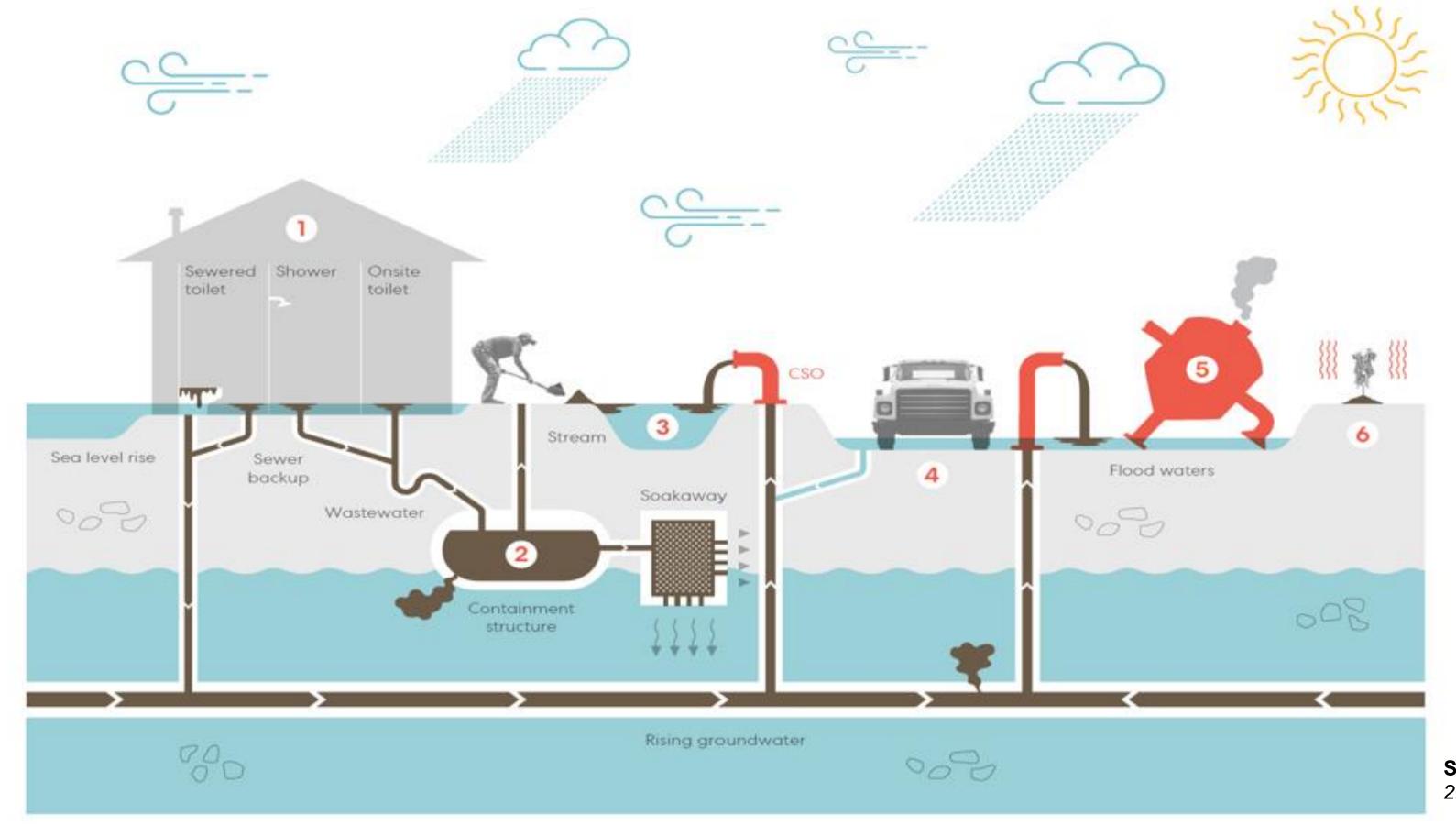




Source: World Bank 2025, forthcoming

Non Climate-Resilient Sanitation Service Chain (Sewered and Non-Sewered)

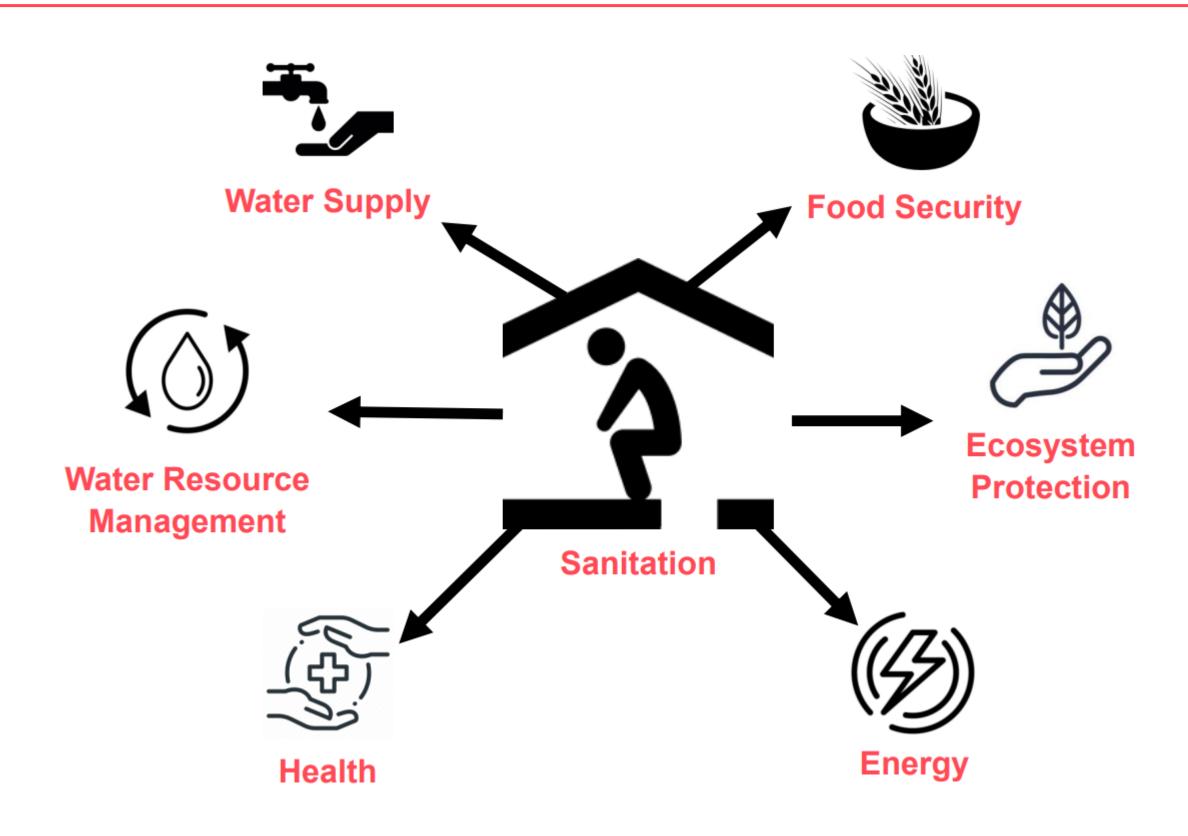




Source: World Bank 2025, forthcoming

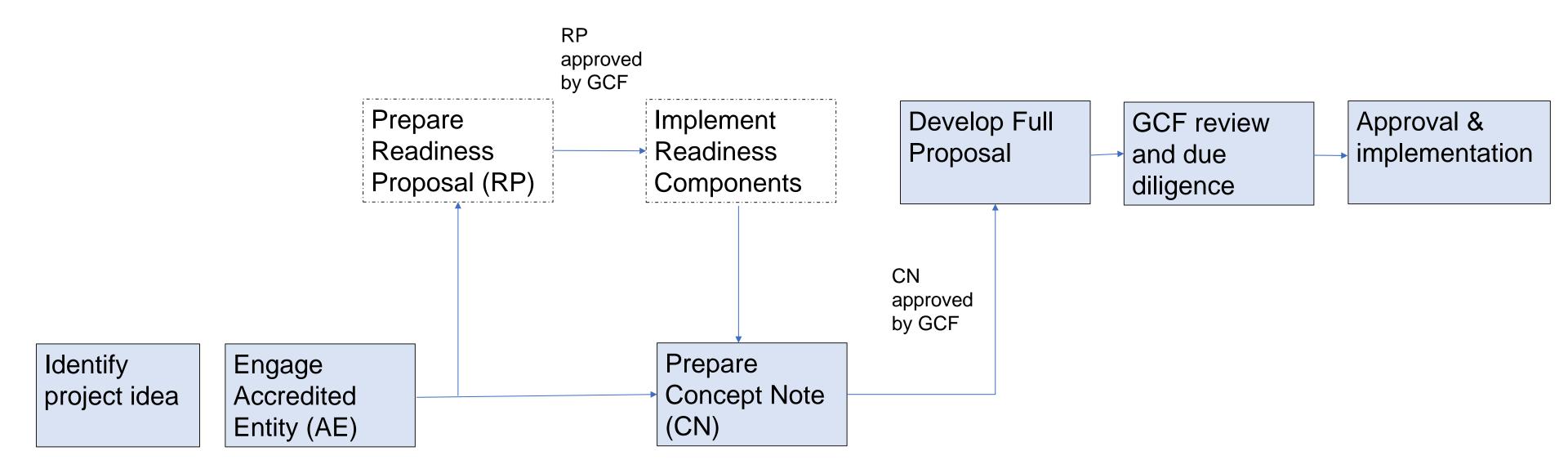
The transformative potential of sanitation



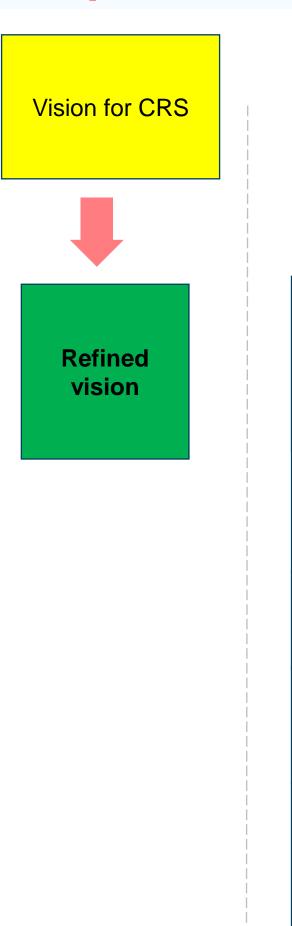


Critical path for funding applications to GCF





Group Work: Developing Initial Outline Concept Note for GCF



Climate Science Basis: Adaptation

Climate Science Basis: Mitigation

Problem statement

Priority measures and strategies

Reflection: interlinkages with other sectors





Climate Risk Assessment for your project location

Mapping of potential emissions from sanitation systems in your country context

Refined problem statement

Priority interventions

Interlinkages with other sectors

Hazards

Exposure

Vulnerability

Resulting key risks

Adaptation

Systems Strengthening

Mitigation

Introduction to climate risk assessments



Four steps involved in undertaking a risk assessment

Hazards Identify climate hazards and their

potential impacts on area/system

under consideration

Exposure Map the systems and populations most

likely to come into contact with the

hazards

Vulnerability Evaluate likelihood of systems and

populations suffering adverse effects

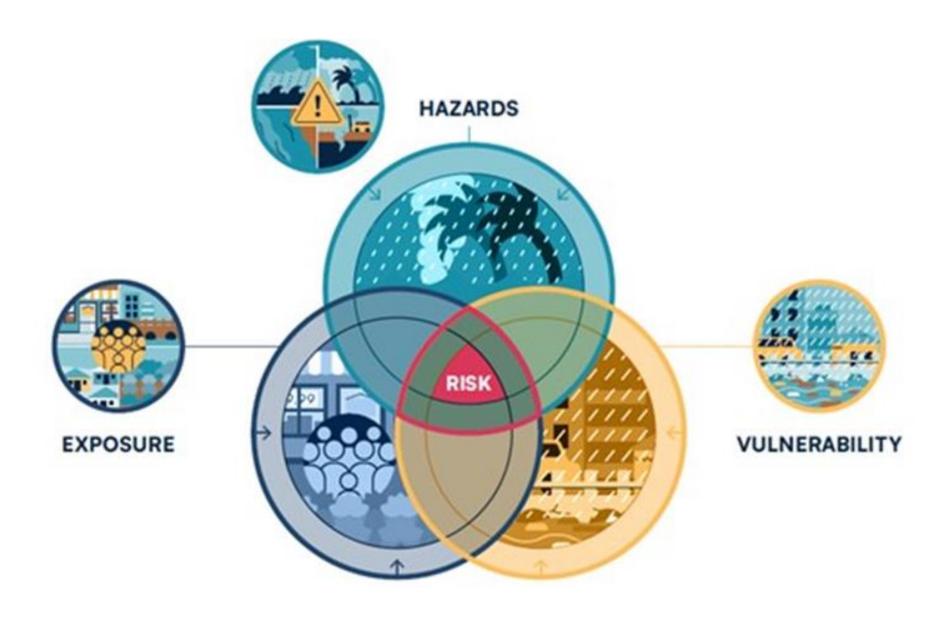
when exposed

Responses Analyse how responses to climate

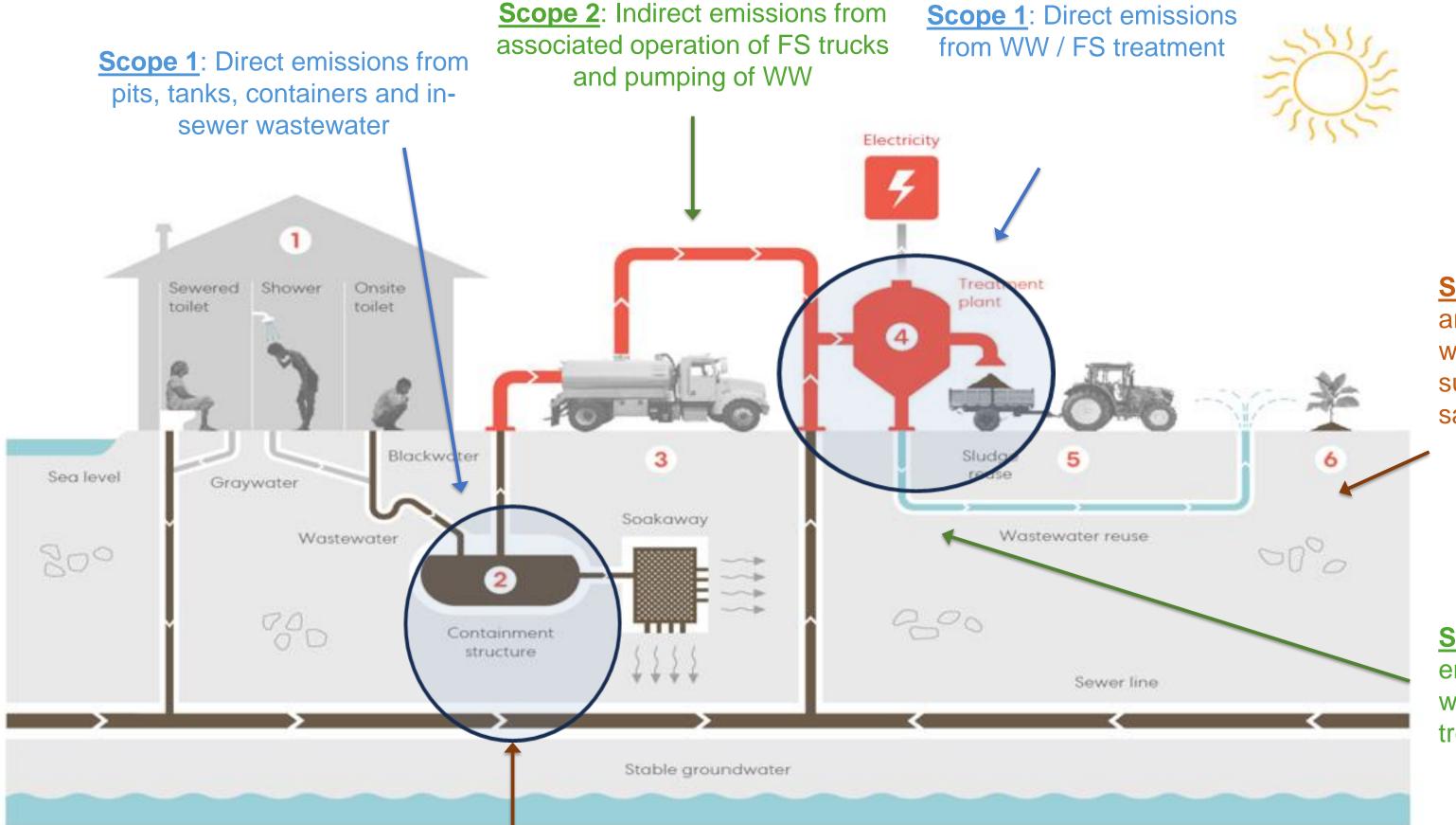
events and their interaction with other

responses can generate additional

risks



Scopes of GHG emissions mapped to sanitation service chain (Sewered and Non-Sewered)

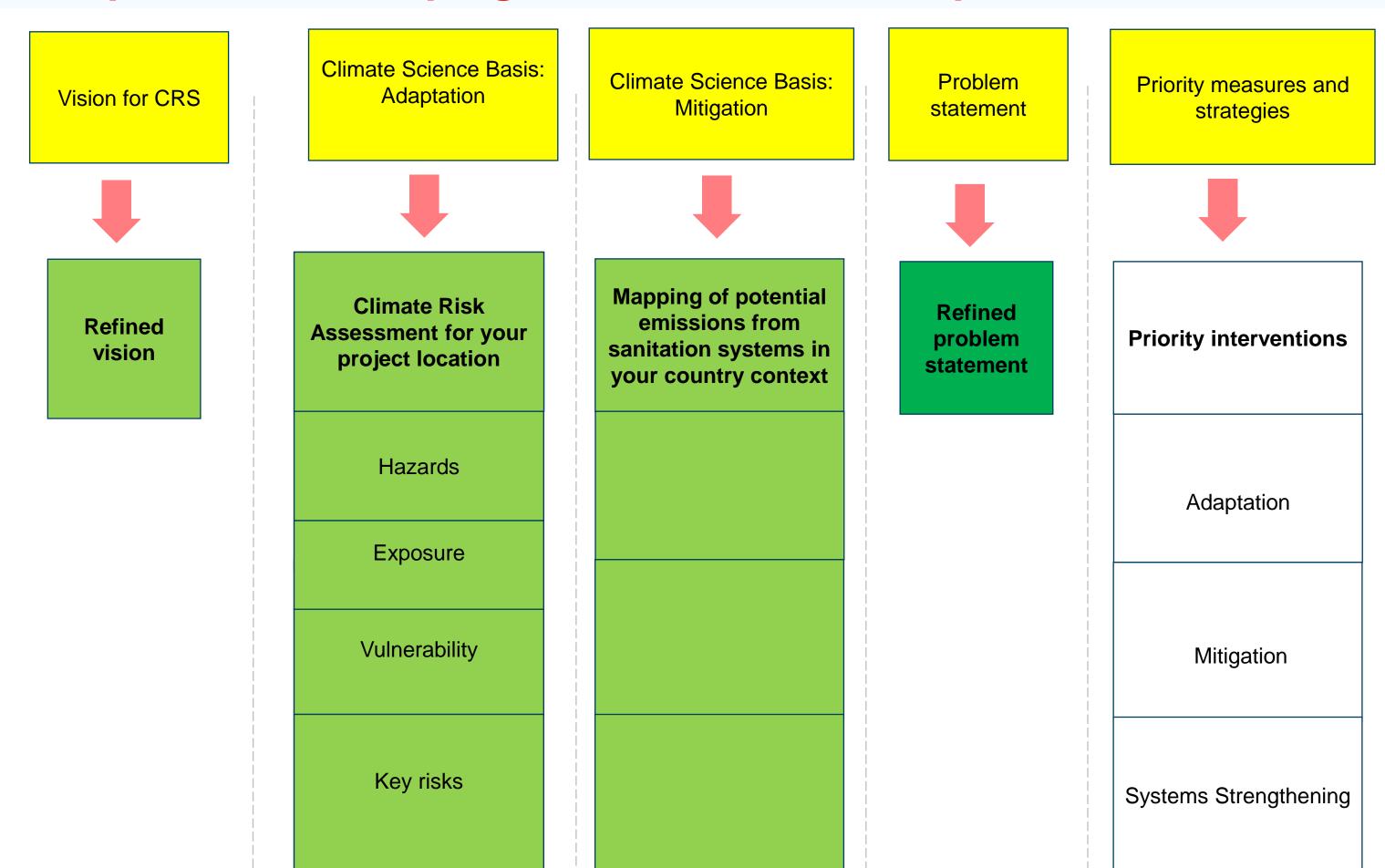


Scope 3: Embedded carbon in constructed sanitation facilities and waste management infrastructure

Scope 3: Emissions arising from products which could be substituted by sanitation by-products

Scope 2: Indirect emissions associated with pumping and treatment of WW

Group Work: Developing Initial Outline Concept Note for GCF



Reflection: interlinkages with other sectors



Interlinkages with other sectors

Sanitation Adaptation Responses



Type of Response

Technical modifications to new or existing infrastructure

Active management of the infrastructure or service

Preparing sanitation systems for cascading impacts of failures in other systems

Containment

Raised latrines / containment - CRIS

Robust and resilient latrines / containment - CRIS

Low or no water latrines - CRIS

Sealable and removable containment - CRIS

Alternative water sources for flush toilets – CRIS / IM

Emptying and Conveyance

Simplified sewers - CRIS

Vacuum sewer systems - CRIS

Treatment of sewer overflows – **CRIS** / **IM**

Sustainable Drainage Systems – CRIS /

Scheduled or more frequent emptying for OSS - CRIS

Preventative O&M of sewer systems - CRIS

Alternative emptying vehicles and equipment for OSS - CRIS

Treatment, Reuse and Disposal

Site selection and flood prevention - CRIS

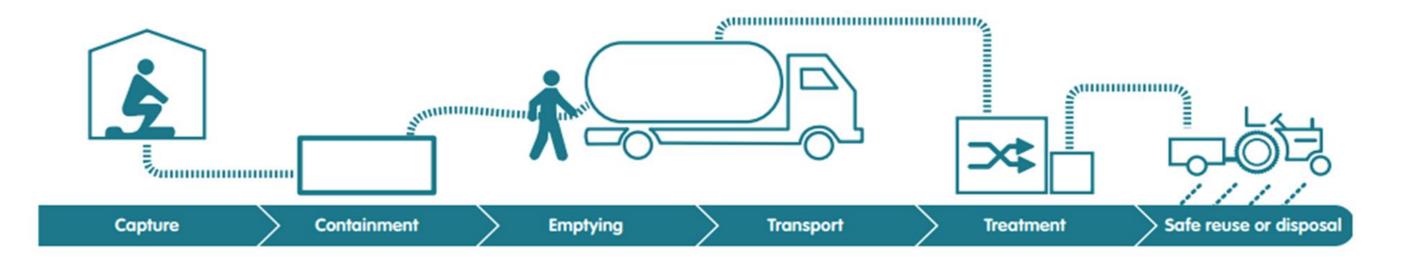
Corrosion resistant design - CRIS

Modular FSTP/WWTP design - CRIS

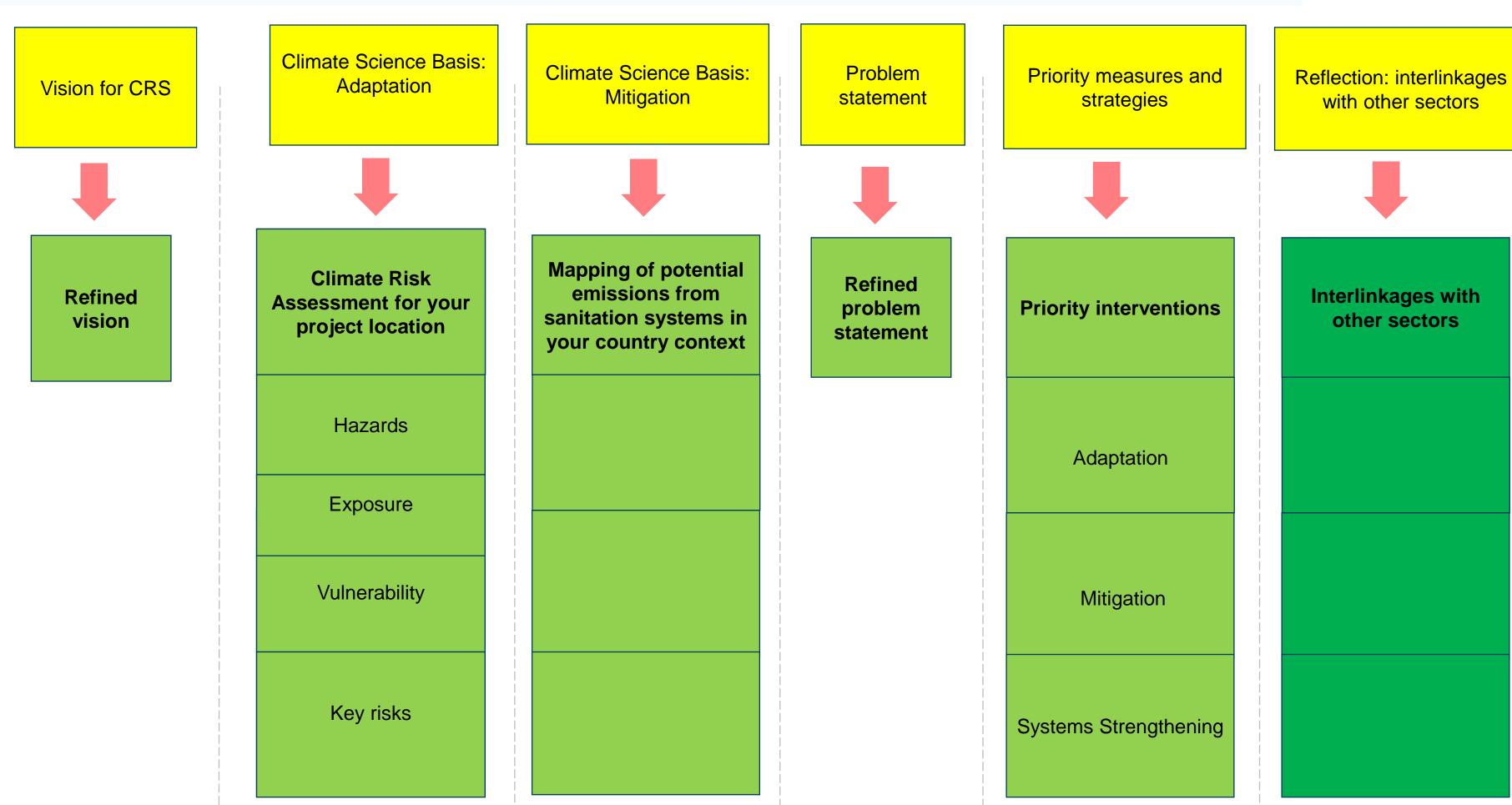
Decentralised/ distributed FSTP/WWTPs - CRIS

Application of treated wastewater and faecal sludge – **CRIS / IM**

Alternative power sources for FSTPs and WWTPs - **CRIS**



Group Work: Developing Initial Outline Concept Note for GCF





Climate Resilient Sanitation

Next Presentation:

Rémi Kaupp – CBSA



Carbon credits for sanitation: recent successes!

Rémi Kaupp, Container Based Sanitation Alliance

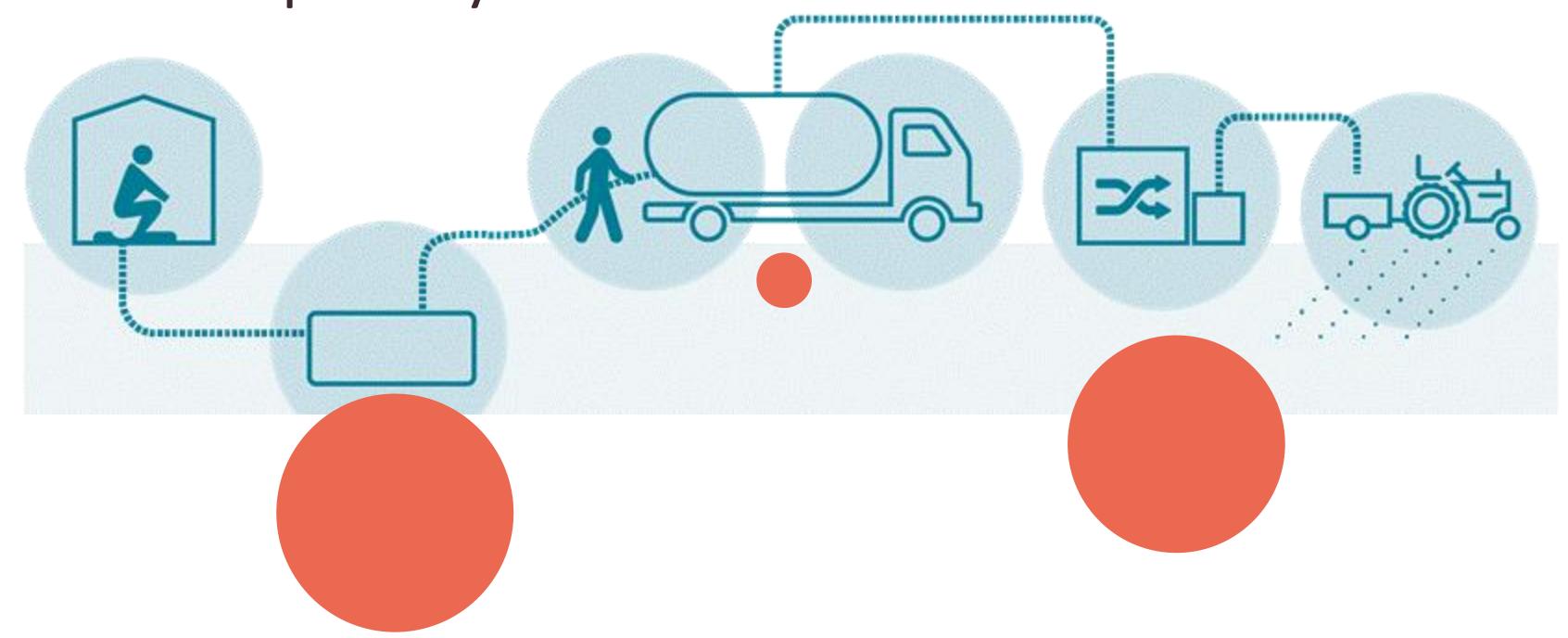
SuSanA day 23 August 2025





Our journey so far

2019-2020: Measuring & modelling emission reduction potential especially for CBS



Our journey so far

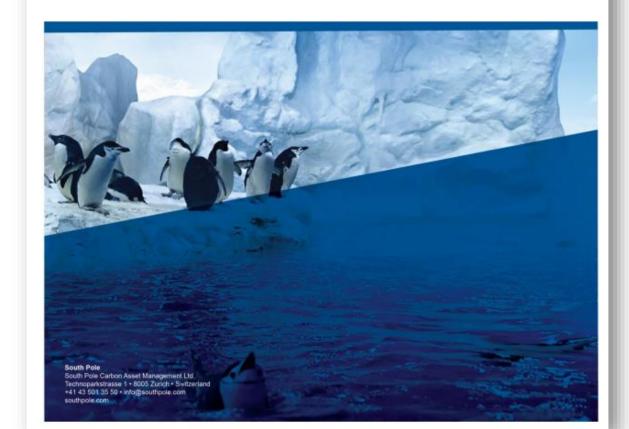
2021-2023: Estimating the potential of carbon credits for CBS

Final Report

Final report

Container Based Sanitation Alliance (CBSA) feasibility study

Zurich, 07 Jul 2022





BRIEFING PAPER September 2023

Unlocking carbon credits for sanitation

Study finds carbon credits can provide a viable revenue stream for containerbased sanitation providers in urban areas

Key messages

Unmanaged sanitation is a major contributor to the climate crisis

Sanitation is estimated to contribute <u>2-6% of global methane</u> and <u>1-3% of global nitrous</u> <u>oxide</u> emissions. These largely stem from anaerobic digestion in pit latrines and septic tanks that are not frequently emptied, and from wastewater treatment plants lacking methane capture.

Active management through frequent emptying almost eliminates emissions

By quickly collecting and treating waste, <u>actively managed sanitation systems such as Container Based Sanitation (CBS) reduce the anaerobic degradation that produces these gases</u>. Working with the carbon finance consultancy South Pole, we studied five CBS operators and found that their projects would eliminate 79% to 93% of baseline emissions, depending on the treatment methods used and contextual parameters.

Five CBS services studied could earn carbon credit income of US\$2.4 million over five years, at US\$3-30 per toilet per year, at current scale up projections

Our study of five CBS operators shows that carbon credits can provide a viable revenue stream for providers operating at a sufficient scale, particularly when co-treating other waste. Modelling CBS scale up projections using existing carbon credit methodologies, the five services examined would collectively earn US\$2.4 million in eligible carbon credit revenue over five years for approximately 81,000 toilets and co-treated solid waste, using average 2022 carbon prices.

Profitability is limited by the exorbitant cost of certification, which reduces potential profit by 40%, and the significant monitoring burden

The annual cost of validation and verification alone is around US\$53,000 per organisation under the Gold Standard. Add to that issuance fees, revenues for the services examined reduced by 40% over five years, at close to a million US dollars, leaving a surplus of US\$1.4 million. To reach a surplus after paying these fees, the five CBS operators studied would need to install and operate an additional 4,000 to 20,000 toilets to their current operations (depending on the type of toilet and treatment process used). The study did not include monitoring costs, which can be significant (unless registries allow new digital approaches).

Improving baseline data, co-treating other waste and monetising social impact can substantially increase revenues

The carbon credits that can be claimed could increase by 30% with more accurate baseline data, as current IPCC figures significantly underestimate the full extent of emissions in containment. Collecting and treating additional waste such as food or animal waste can significantly improve the viability of a carbon credits project for sanitation providers due to the large increase in scale of treated waste and resulting emission reductions, highlighting

Recent successes – Sanergy in Kenya

We've registered our methane avoidance as carbon credits with Verra – the first-of-a-kind credits globally.

We are selling credits from our first organic waste recycling facility in Nairobi, Kenya and our second facility in Kakamega, Kenya.

- Methodology UNFCCC Clean Development Mechanism, method ACM0022: Alternative waste treatment
- Registry and Standard Verra and the Verified Carbon Standard, Project ID: 4015
- First issuance completed in 2024 Issued 6,640 credits, vintage 2022. Second issuance of 20,000 credits is expected in September. Targeting 30,000 credits/year for future issuances 2027 onward.
- Big plans to scale
 Ten factories planned for a total of 300,000 credits per year by 2035.



WALI MWALUGONGO

ASSOCIATE DIRECTOR,
PARTNERSHIPS & ADVISORY



ASSOCIATE DIRECTOR,
COMMUNICATIONS & MARKETING

Recent successes – SOIL in Haiti





Partnership duration: 2022 - 2025

Carbon offsets purchased: ~3,000 MT

Funds raised: \$87,622 USD

% offsets sold annually: ~30%



Direct sale based on peer-reviewed research

No need for expensive consultants and annoying registries

But takes times and not easily scaleable

Next steps



- Creating a new methodology for sanitation with Gold Standard
- > Documenting lessons so far & creating a how-to guide
- Need to explore article 6 funding

To know more:

Session on Wednesday at 2pm – or chat to us! cbsa.global/carboncredits



Climate Resilient Sanitation



Leanne Casey – University of Technology Sydney











Emissions Measurement to Improve Sanitation in Indonesia (EMISI)

An Overview of Building a National Estimate to Inform Mitigation

35th SuSanA meeting in Stockholm – 23 August 2025









Emissions Measurement to Improve Sanitation in Indonesia

- 19-month activity from July 2024 to February 2026
- 5 project partners/organisations
- 3 Project Components

i i	Emissions data collection: Using field-based methods to determine emissions factors (EF) for
	diverse sanitation systems in Indonesia

- National estimates: Produce a national estimate base-case and model predicted emissions under future scenarios
 - **Policy engagement**: To support uptake and use of findings for technical and policy purposes by relevant stakeholders











Sanitation and GHG emissions in Indonesia

- Recent studies show that sanitation is a significant but under-recognised source of GHG emissions
- Users are predominantly served by on-site sanitation systems that vary significantly in design and operational conditions
- Many on-site systems are poorly constructed and non-functioning



- EMISI is advancing the evidence base to quantify emissions from different sanitation technologies
- EMISI will support co-design of policy and technical recommendations with key government stakeholders





Off-site communal systems



Narrow openings to on-site systems



Overflowing systems











C1: Direct Measurement of CH₄ and N₂O













C2: National Estimate Modelling

Category	Emission Source in Sanitation
Direct	 CH₄ and N₂O from contents of pits, tanks and sewers CH₄ and N₂O from treatment plants
Operational	 Fuel for pumping or trucking fecal waste (mostly CO₂) Energy input to treatment plants
Embodied Carbon	 Concrete and steel in infrastructure CO₂ associated with production and use of chemicals











C3: Suggestions for Recommendations

These are initial ideas – a mix of technical and policy options to be refined through co-design with stakeholders.

· Service contracts or local regulation for periodic desludging

DAK support for containment

containment standards with

Targeted investment in flood-

prone/high water table zones

quality

Regulation linking

desludging schedules

 Behavioural change campaigns

Increased **Desludging** Service

FSTP & **WWTP Optimisation**

- Performance monitoring & benchmarking
- Technology guidelines (e.g., oxidation ditches)
- Renewable energy integration planning

Improved

Household Sewer Connection

- Infrastructure investment in networks
- Connection incentives/subsidies
- Integration of climate-smart WWTP technology

Containment Units











Building the Evidence Base of Sanitation Emissions EMISI and the Wider Context

Early Evidence

Expanding Scope

EMISI

Looking Ahead

Focus on emissions from centralised systems in high-income countries

Orowing attention
on on-site
sanitation
systems in lowand middleincome countries
(SCARE, EAWAG)

National scale
effort to quantify
emissions across
full sanitation
chain, field data,
modelling and
policy
engagement in
Indonesia to build
foundation for
policy-relevant
mitigation
scenarios

More research in this area to measure emissions from all system types, research on design improvements and management practices, working with the IPCC on updating defaults and assumptions











Thank you!



Climate Resilient Sanitation

Next Presentation:

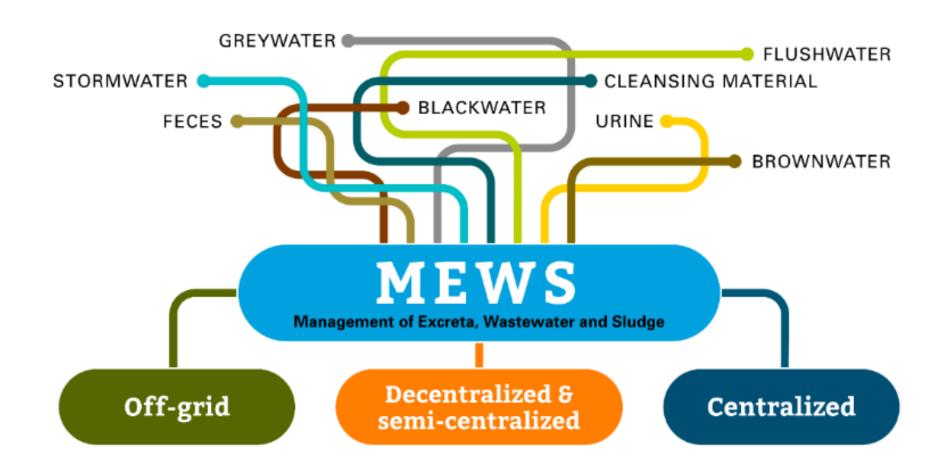
Linda Strande – EAWAG

Population Equivalents (PEs)



- → Why does PE not make sense for non-sewered sanitation
- → Relevance for estimating greenhouse gas (GHG) emissions
- → Research in our group, to improve estimated emissions

Dr. Linda Strande Sandec Head of Department MEWS Research Group Leader





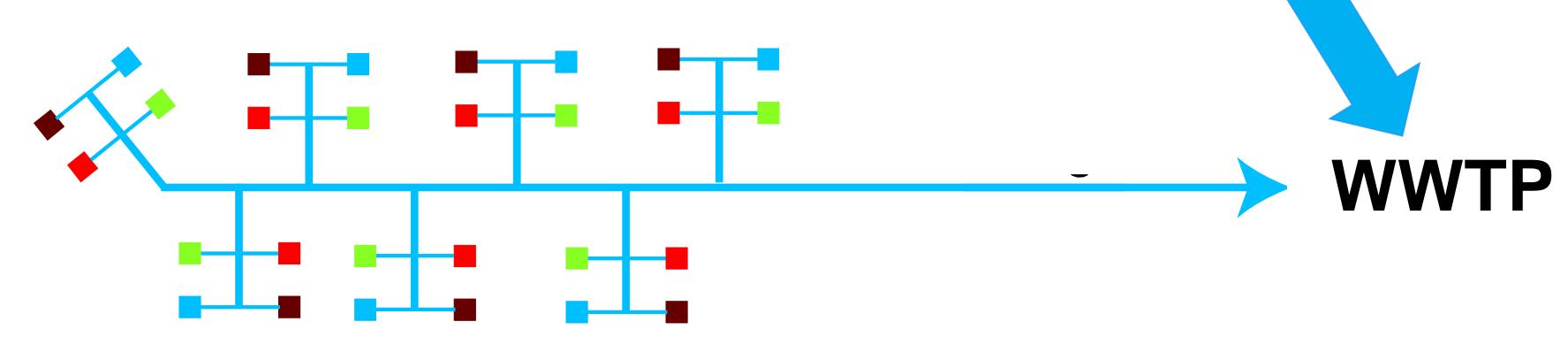
www.sandec.ch/mews

inda.strande@eawag.ch

What are population equivalents (PEs)?



Pollution load, where PE represents a standard amount of organic matter (BOD)



- Concept works well for a sewershed, where every toilet is connected to a centralized sewer
- As people move around in a city, or in and out of sewershed, differences are balanced out
- Used for: design loadings, normalizing GHG emissions, wastewater based epidemiology

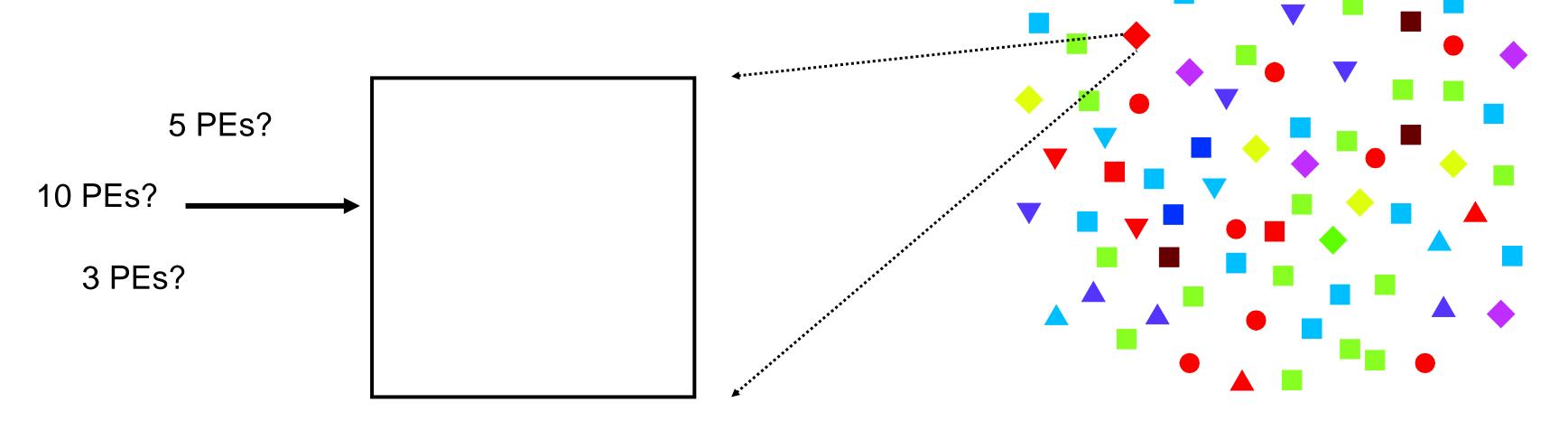
linda.strande@eawag.ch

PE not transferable to non-sewered sanitation (NSS)?



How many different toilets do you use in a week?

10 people in a household with a pit or tank



10 people = 10 PEs?

Or = 3 PEs, 2/3 of time outside house?

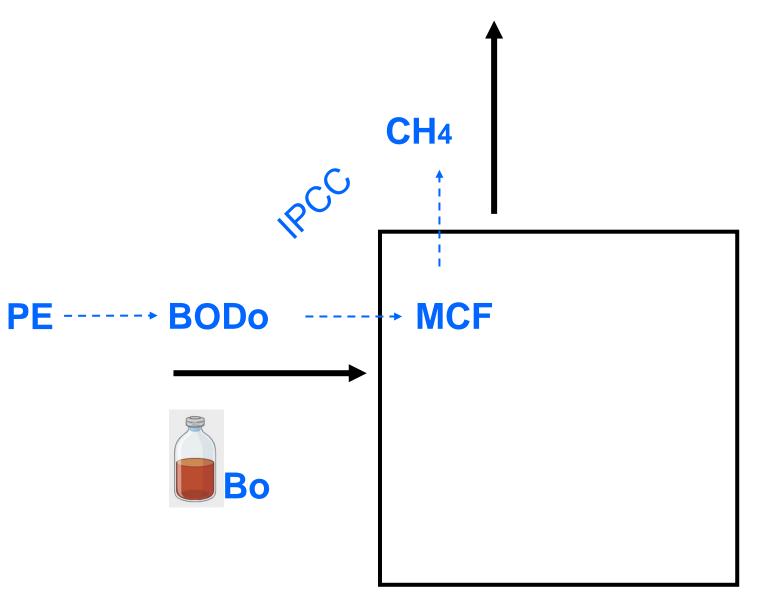
Or = 5 PEs, more long-calls at home?

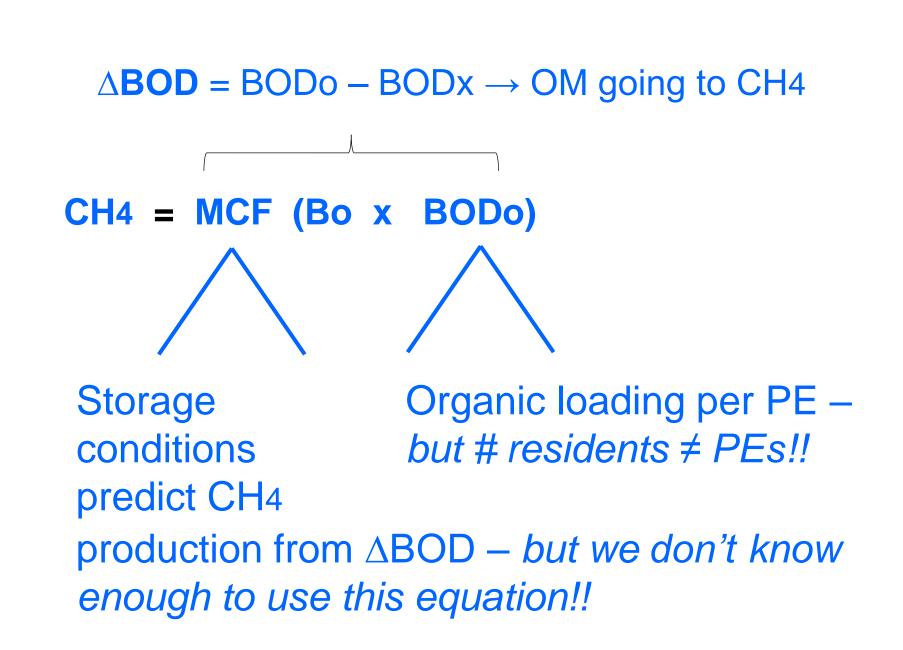
linda.strande@eawag.ch

IPCC – uses PE, BODo, MCF for CH4 emissions from NSS



Steady-state model







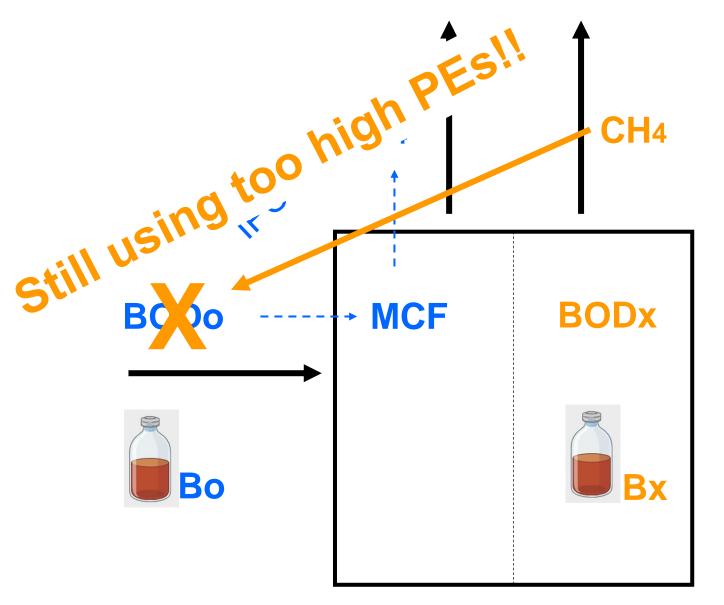


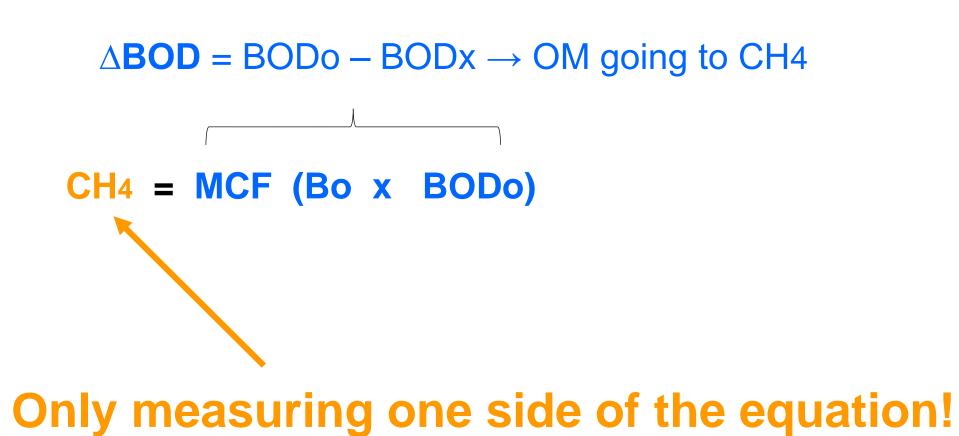
Maximum conversion to CH4

Research measurements to improve GHG estimates?



Steady-state model









Maximum conversion to CH4

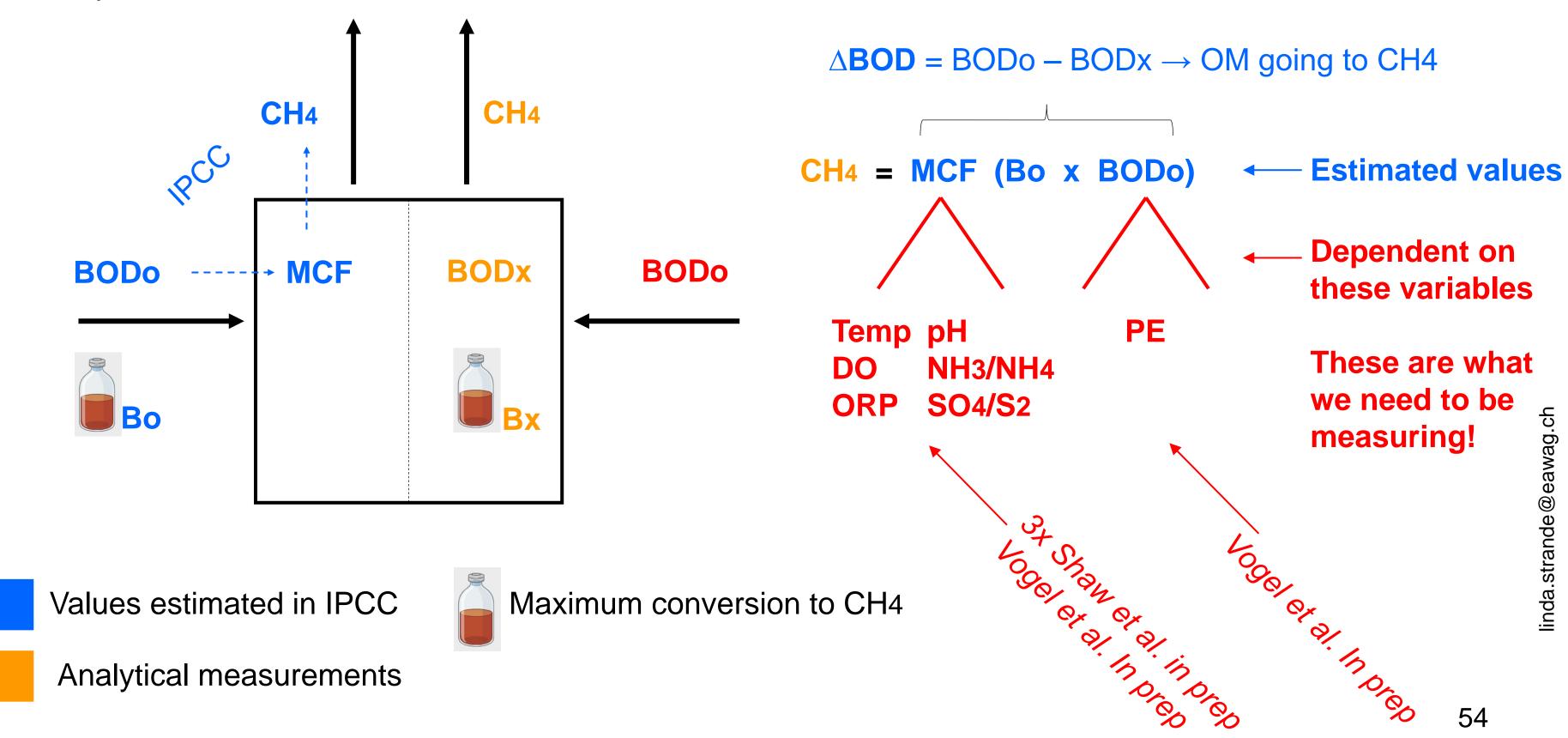


Analytical measurements

How to improve estimates?



Steady-state model



inda.strande@eawag.ch

Preliminary results of PE study in Kampala, Uganda



Vogel et al., in preparation

700 surveys, households and on the street

In households where people are working outside the house

- 34% of feces and 59% of urine outside the home
- Outside the home -> totally missed by PE!

In very-low income households in Kampala

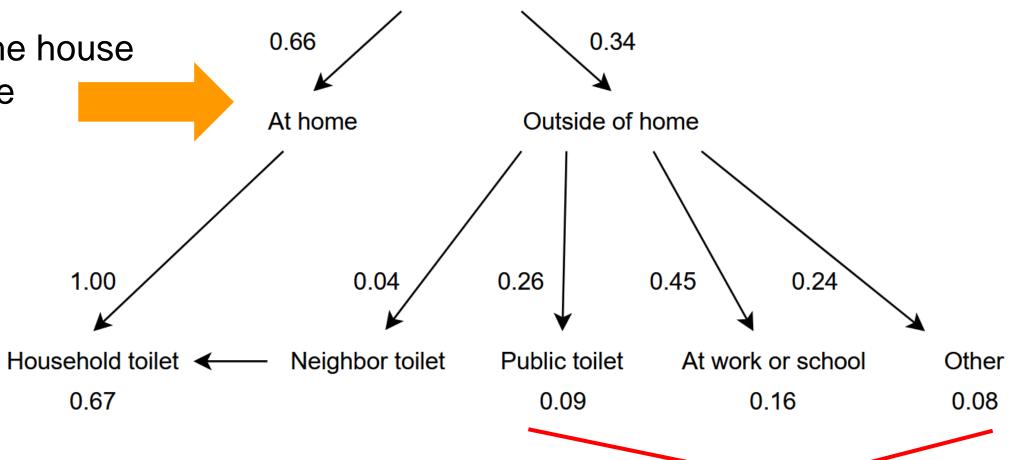
43% of long calls outside the home

In high-income households in Kampala

13% of long calls outside the home

On the street in Kampala

- 27% of respondents are not residents of Kampala
- -> totally missed by PE!



Excreta

50% of municipal wastewater from non-household sources

In addition to GHG emissions, PE helps interpret our findings of environmental surveillance, or wastewater based epidemiology, in urban areas with non-sewered sanitation *Kang et al., in preparation*



www.sandec.ch/mews























Kelsey Shaw

Ednah Kemboi

Kayla Coppens Natalia Montoya

Seju Kang

Julian Frizstche







































Cooperation







FONDS NATIONAL SUISSE SCHWEIZERISCHER NATIONALFONDS FONDO NAZIONALE SVIZZERO SWISS NATIONAL SCIENCE FOUNDATION



Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra



Climate Resilient Sanitation

Next Presentation:

Muyatwa Sitali – SWA



Defining Climate-Resilient WASH Services:

A Foundation for Monitoring and Implementation

Why Do We Need a Definition for Climate-Resilient water supply, sanitation and hygiene services?

- Growing climate risks require stronger adaptation and mitigation action related to water supply, sanitation and hygiene.
- No sector-wide agreed definition existed before, leading to inconsistent approaches.
- COP28's UAE Global Climate Resilience Framework highlights climate-resilient water supply and climate-resilient sanitation as a key global target.
- A clear definition helps governments, climate finance mechanisms, and water and sanitation stakeholders work towards common objectives.



November 2024

Definition of climate-resilient water sanitation and hygiene services

DEFINITION:

Climate-Resilient Water, Sanitation and Hygiene (WASH) services anticipate, respond to, cope with, recover from, adapt to or transform based on climate-related events, trends and disturbances, all while striving to achieve and maintain universal and equitable access to safely managed services, even in the face of an unstable and uncertain climate, where possible and appropriate, minimising emissions, and paying special attention to the most exposed vulnerable groups.

The need for a de

Given the increasing climate ri sanitation and hygiene stakeh integrating climate change ad: mitigation into their operations no universally agreed definitio constitutes a climate-resilient i sanitation or hygiene service.

The adoption of the <u>UAE Glot</u>
<u>Resilience Framework</u> at CC
prioritizes working towards "di
supply and dimate-resilient sa
target, has created an urgent i
stakeholders to align on a cles
comprehensive definition.

To address this, the Sanitatio All (SWA) Climate Action Ta provided a consultation platfor its diverse members to work or reach broad consensus on a c reflects the sector's collective expertise.

This definition will help standa the sector and support the dev

¹ Decision 2/CMA.5 on the Global gos paragraph 9

SANITATION AND WATER FOR ALL Climate Task Team

Noviembre 2024

Definición de los servicios de agua, saneamiento e higiene resilientes al clima

DEFINICIÓN:

Los servicios de agua, saneamiento e higiene (WASH) resilientes al clima anticipan, responden, afrontan, se recuperan, se adaptan o se transforman en función de los eventos, las tendencias y las perturbaciones relacionados con el clima, todo ello mientras se esfuerzan por lograr y mantener un acceso universal y equitativo a servicios gestionados de forma segura, incluso frente a un clima inestable e incierto, cuando sea posible y apropiado, minimizando las emisiones y prestando especial atención a los grupos vulnerable: más expuestos.

La necesidad de una definición

En vista de los crecientes riesgos climáticos, las partes interesadas en el sector de agua, saneamiento e higiene están integrando la adaptación y mitigación del cambio climático en sus operaciones. Sin embargo, no existe una definición universalmente aceptada de lo que constituye un servicio de abastecimiento de agua, saneamiento o higiene resiliente al clima.

La adopción del <u>Marco de los EAU para la</u>
<u>Resiliencia Climática Global</u> en la COP28¹, que
prioriza el trabajo hacia un "abastecimiento de agua

Esta definición ayudará a estandarizar los esfuerzos en todo el sector y apoyará el desarrollo de indicadores que se alineen con los procesos globales existentes, incluidos:

 El Programa Conjunto OMS/UNICEF de Monitoreo Conjunto (JMP) y el Análisis y Evaluación Mundial del Saneamiento y el Agua Potable (GLASS) de ONU-Agua), trabaj en curso para revisar y desarrollar indicadores, medidas y métodos para el monitoreo clobal de

la resiliencia climática de los servicios WASH

• El programa de trabajo bienal de los





0

The Definition of Climate-Resilient Water Supply, Sanitation and hygiene services

Climate-resilient water supply, sanitation, and hygiene services anticipate, respond to, cope with, recover from, adapt to, or transform based on climate-related events and trends, while striving to maintain universal and equitable access to safely managed services, minimising emissions where possible, and prioritising the most exposed, vulnerable populations.











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How This Definition Strengthens WASH Climate Action



Supports National Policies → Aligns WASH planning with NAPs and NDCs.



Unlocks Climate Finance → Strengthens eligibility for GCF, Adaptation Fund, and other financing mechanisms.



Standardizes Monitoring → Integrates with UNICEF-WHO JMP & the upcoming global resilience monitoring framework.



Promotes Global Alignment → Helps countries meet COP28 & UAE Framework goals on WASH resilience.

Concluding remarks- Moving from Definition to Action



- Strengthen Global Collaboration: Engage with UNFCCC, COP30, and UN-Water processes to institutionalize this definition.
- Develop Metrics & Indicators: Align with UN-Water Expert Groups and WHO-UNICEF JMP to track progress.
- Mobilize Climate Finance: Domestic, work with donors, multilateral climate funds, and development banks to scale investments.



THANK YOU

SWA has about 500 partners and our work is supported by:



Co-funded by the European Union









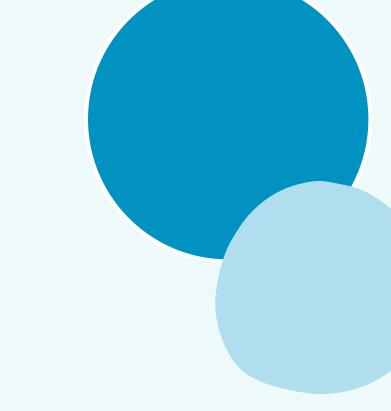








Climate Resilient Sanitation



Next Presentation:

Rick Johnston – WHO

Towards Global and National Indicators for Monitoring Climate Resilient WASH

WHO/UNICEF JMP/GLAAS Joint Review of Indicators

August 2025

















JMP/GLAAS Review

- 2024
- Consortium engaged (March 2024)
- Kick-off meeting with Technical Working Group members (22 and 23 July 2024)
- Public webinar launch (29 and 30 July 2024)
- 1st working group meeting on the scope, evidence review and discussion paper prepared by the research partners (December 2024)
- Public webinar and consultation on findings of reviews (February 2025)
- 2nd working group meeting to discuss the long list of indicators (2.0) prepared by the research partners (March/April 2025)
- Public consultation on the long list of indicators (2.1) (April 2025)
- Revision of long list based on feedback to produce refined long list (3.1, 3.2) (May-June)
- Prioritization and shortlisting (June September 2025)
- 3rd working group meeting to finalize the **short list of proposed indicators** (17-19 September 2025)
- Public consultation on the short list of indicators
- 4th working group meeting to review the **indicator pilots** (May 2026)

Review of emerging frameworks, tools and indicators

JMP/GLAAS

- Research partners
- Technical working group

Stakeholder consultation

Long list of potential tools and indicators for monitoring CR WASH

- JMP/GLAAS
- Research partners
- Technical working group

Stakeholder consultation

Short list of priority indicators for national and global monitoring JMP/GLAAS

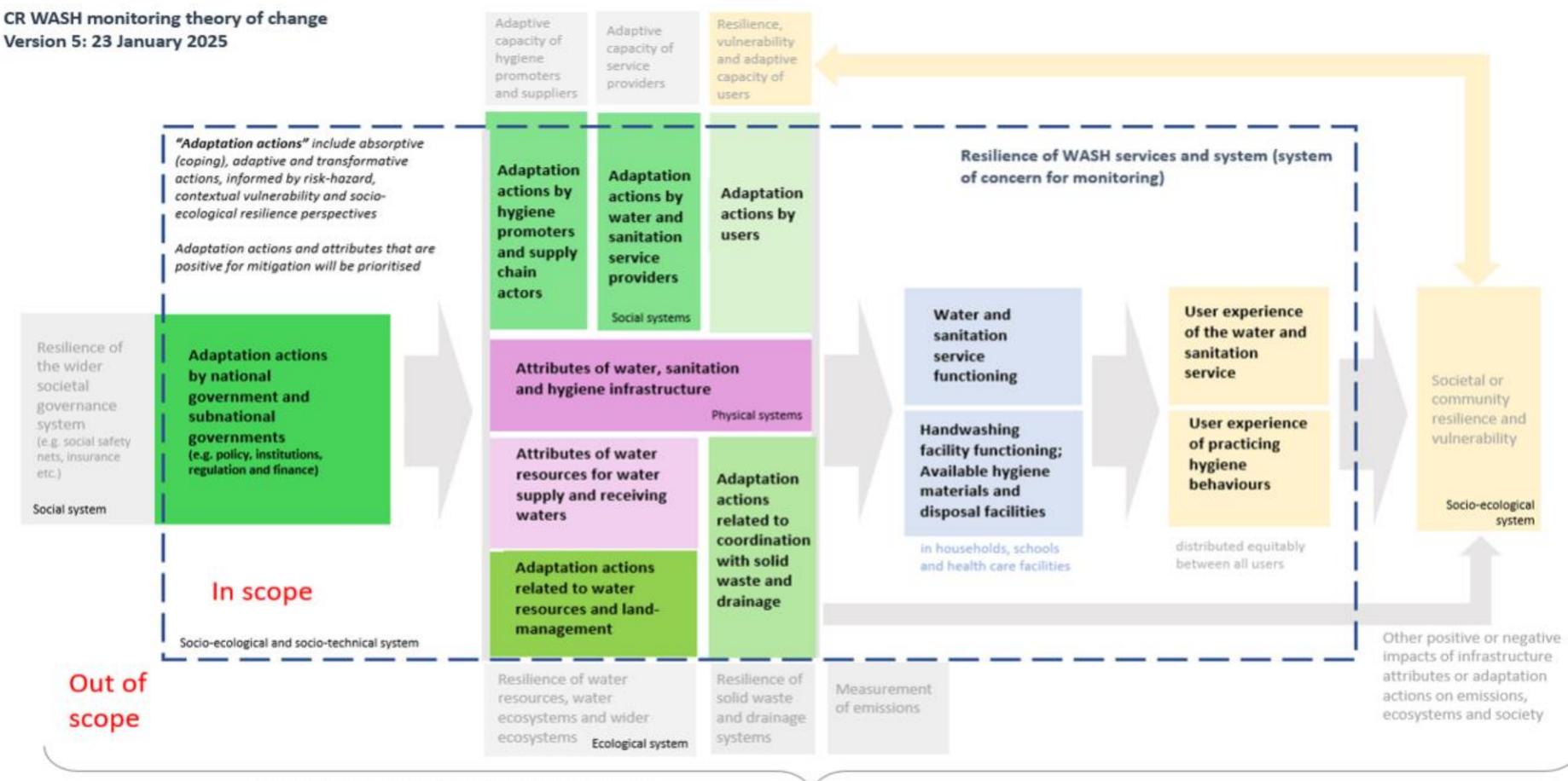
2025

- Research partners
- Technical working group

Stakeholder consultation

Piloting of priority indicators in national monitoring systems

- JMP/GLAAS
- Research partners
- Technical working group



Varied levels of exposure (changing over space and time)

Example candidate indicators (adaptation actions)

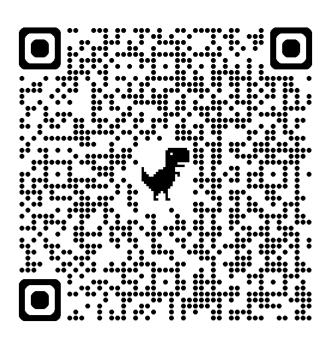
- Adaptation actions by national or subnational governments (PIRF: 92)
 - Sufficient budget allocation/expenditure for WASH climate adaptation
 - LL478 Percentage of WASH capital budget which is earmarked for projects where climate change is a significant objective (OECD CRS Rio Marker RM 1)
 - NL005 Finance and appropriate mechanisms are in place to support national priorities for climate risk management and adaptation in the WASH sector
- Adaptation actions by service providers (65)
 - Emergency response protocols/plans/back-ups in place
 - LL058 [Proportion of sanitation service providers with] well-defined, event-specific action plans ready for execution on receiving early warnings
- Adaptation actions by users (9)
 - Users prepare themselves for climate events by securing household water storage
 - LL252 Proportion of households with a water storage container on site that is secured against hazards

Example candidate indicators (attributes, functioning, experience)

- Attributes of WASH infrastructure (48)
 - Assets and systems have reduced sensitivity to climate shocks and stresses
 - NL109 [Proportion of population served by treatment facilities] where infrastructure conforms to national regulations and standards for climate resilience
 - LL117 [Proportion of population with a sewer connection served by a] separate sewer systems (rather than combined sewers)
- WASH services functioning (49)
 - Time for services to be restored is minimized
 - NL086 Time to restore water supply service [to 100% of the population in the service areas] to minimum, baseline or transformative levels following a climate event
- User experience of WASH services (34)
 - Users are protected from psychosocial distress related to service interruptions
 - NL054 [Proportion of household OR population reporting a] change in the frequency of times that they
 worried about not having access to hygiene products and facilities in the preceding 4 weeks during and
 following a climate event

Next steps and opportunities for engagement

- Draft shortlist to be discussed by Technical Working Group in September
 - Some challenges encountered in the short-listing process include:
 - What to do about indicators monitoring good WASH practices but not necessarily climate-specific?
 - E.g. NL095 [Percentage by length of] water supply network (storage and distribution) new or refurbished within the last X (25-30?) years
 - Appropriate level of specificity (global monitoring vs. sub-national or project level monitoring; DRM-specific)
 - Refining/adapting existing indicators from the longlist
- Revised short list following TWG meeting will be published online for public consultation (October 2025)
- Piloting of the short list of indicators in countries starting early 2026



Thank you!

washmonitoring@who.int











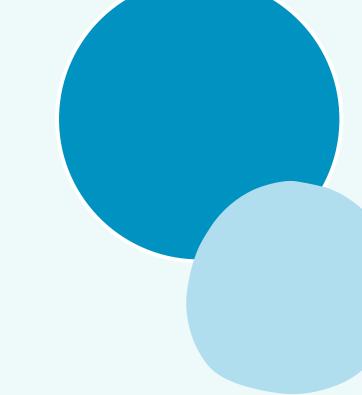






Session 2

Climate Resilient Sanitation



Q&A and Discussion

Coming Up: Resource Recovery



Resource Recovery

Resource Revocery

Next Presentation:

Daniel Ddiba - SEI



A collaboration between:



sustainable sanitation alliance



With funding from: FORMAS ::

What is this Toolbox?



 An open-access web platform that gathers and curates tools for planning and implementing resource recovery from wastewater and organic waste

 Developed over the past year to support circularity in sanitation and organic waste management systems



Curated content in the Toolbox (examples)

By type of tools

- Software tools
- Decision support frameworks
- Datasets
- Manuals
- Guidelines
- Standards
- Training courses
- Case studies
- Serious games
- Audio-visual content

By type of resource recovery

- Energy
- Nutrients
- Water
- Chemicals
- Metals
- Materials
- Feed & Food

By type of waste stream

- Wastewater
- Blackwater
- Greywater
- (Faecal) sludge
- Urine
- Food waste

Also:

- By region
- By type of technology
- By themes
- By language etc.

Over 100 tools available now in the Toolbox!

Brief demo...

Toolbox link:

www.resource-recovery.info

Target audience





Wastewater, waste management and recycling professionals at municipalities and their environmental services utilities

Sanitation/Wastewater management sector

Waste management sector

Agricultural sector

Energy sector

Other relevant resource usage and management sectors



Professionals at **environmental services companies and consultancies** that work in the sanitation, waste management and recycling sector



Students who study topics related to sanitation, waste management, circular economy and resource management, as well as the **teachers** and **researchers** who provide training to the students

Explore, and get in touch!

Thank you.

Daniel Ddiba

- daniel.ddiba@sei.org
- contact@resource-recovery.info

Toolbox link:

www.resource-recovery.info





sustainable sanitation alliance



With funding from: FORMAS ::

Resource Revocery

Next Presentation:

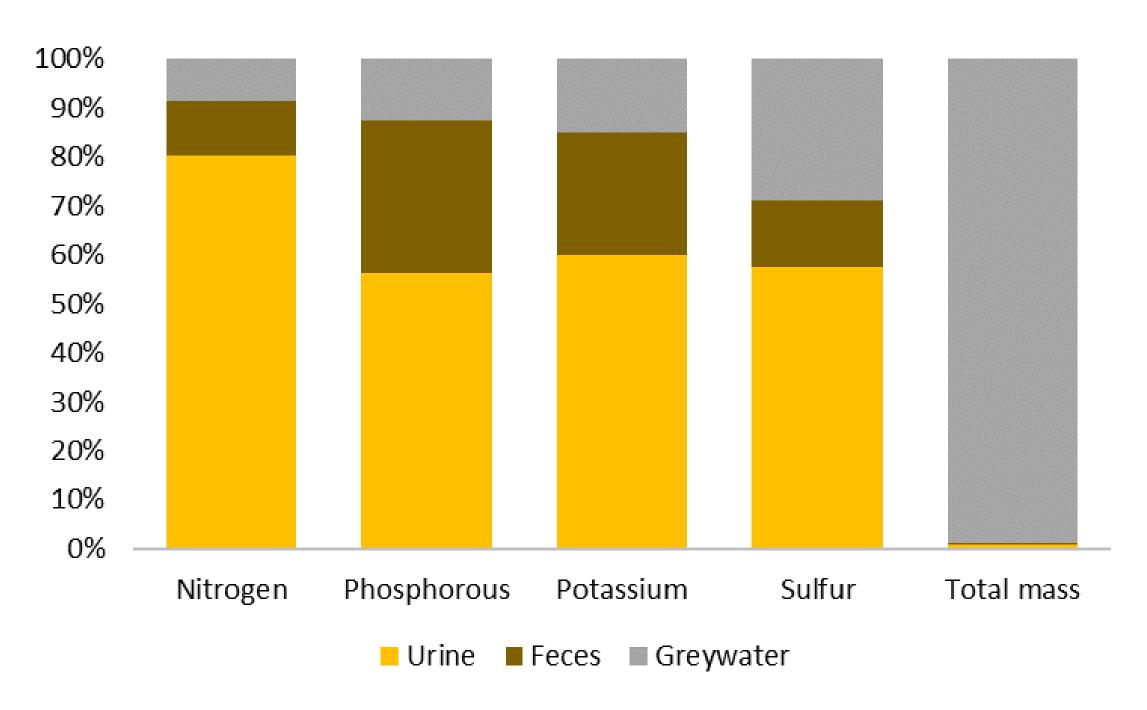
Chibambila Simbeye - Sanitation 360

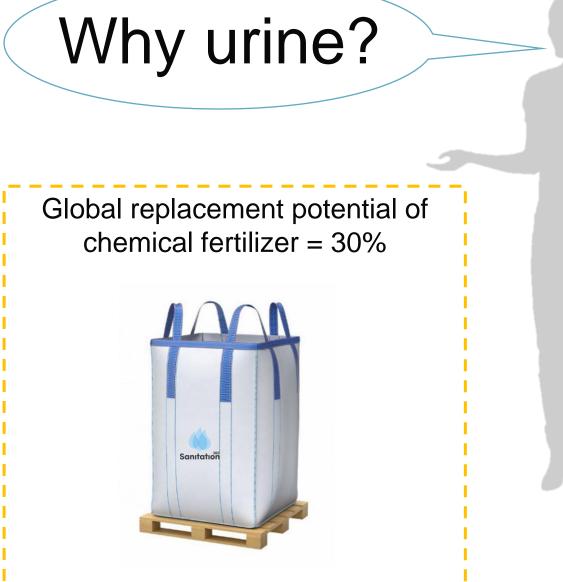






At Sanitation 360, we convert waste (urine) into a valuable product (fertilizer).









The Process



Stabilizer (added to the toilet or urinal's urine collection tank)

Urine diverting toilet or urinal

Stabilized urine

Urine Drying System (concentrates the urine x 25)





Applied on fields

Dry Fertilizer Pellets (achieved NPK = 15-2-4)

Production Facility (Stabilizer blending and packaging, In-house manufacturing; Fertiliser factory)

Customer Segments

Household system



Large-scale system



Household System

Value proposition

Integrated solution under the toilet that captures, stabilises and processes urine into fertilizer

Retail price

29,500 kr

per unit (ink moms) +99kr per month



80 kg fertiliser per year



4 yrs



Supports up to family of 8



Large-Scale System

Value proposition

Urine is collected and concentrated on-site with final processing at central location

Retail price

950,000 kr

per unit (exkl moms)

+ 800 kr per m³ urine treated



2200 kg fertiliser per year



3 yrs



Supports >500 daily urinations



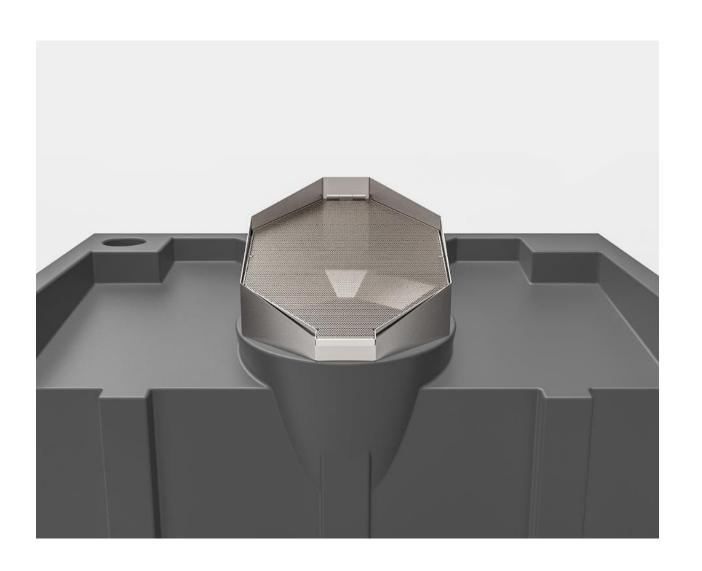














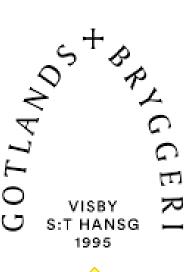
The Fertiliser





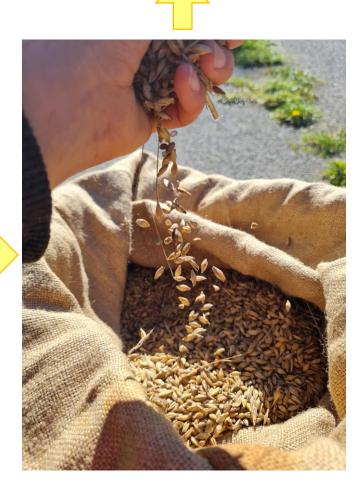


Fertiliser Treatment	N-P-K Content (%)	Mass fertilizer applied (kg/ha)	Barley Harvest (kg/ha)
S360 Fertilizer	15-2-4	567	6 500
NPK fertilizer	24-4-5	370	6 500
Fresh urine	0,6-0,07-0,2	14 167	5 500
Control	0-0-0	0	4 500















JENNA SENECAL CEO

Bioresrouce Engineer leading implementation, PhD in Technology



PRITHVI SIMHA CTO

Chemical Engineer developing the stabiliser, PhD in Technology



BJÖRN VINNERÅS Chair

Professor and chair of Energy and Technology at SLU, involved with Peepoople



NICOLA PARFITT Market Developer

M. Sc., Environmental Studies and Sustainability Science



EXPANSION

Product Developer Business Developer



Thank you! Sanıtation Contact: jenna@sanitation360.se +46 700 960 668

Awards & Publications











Funders & Incubators





BILL&MELINDA GATES foundation

















Collaborators













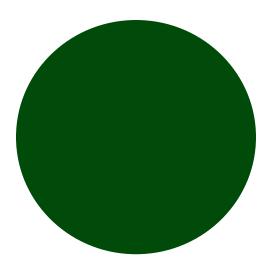




Resource Revocery

Next Presentation:

Mirko Hänel - TTZ Bremerhaven



Sustainable Sanitation – wfSRC Systems

Dr. Mirko Hänel TTZ Bremerhaven





Frame: PAVITR Project (2019-2024)







Sanitation Challenge

- 30 % of wastewater is treated & systems are expensive and not reuse-oriented
- Water scarcity = Wastewater is used to fertigate crops (9 Mha)(Thebo et al., 2017)
- Increasing political pressure & regulations & growing population
- Wastewater is freely available (supply side)
 and climatic conditions are suitable
- NB solutions are wanted but need to be developed, tested and adapted

WfSRC System



Nature-Based system that efficiently combines wastewater treatment and reuse with biomass production, enabling sustainable nutrient recycling.

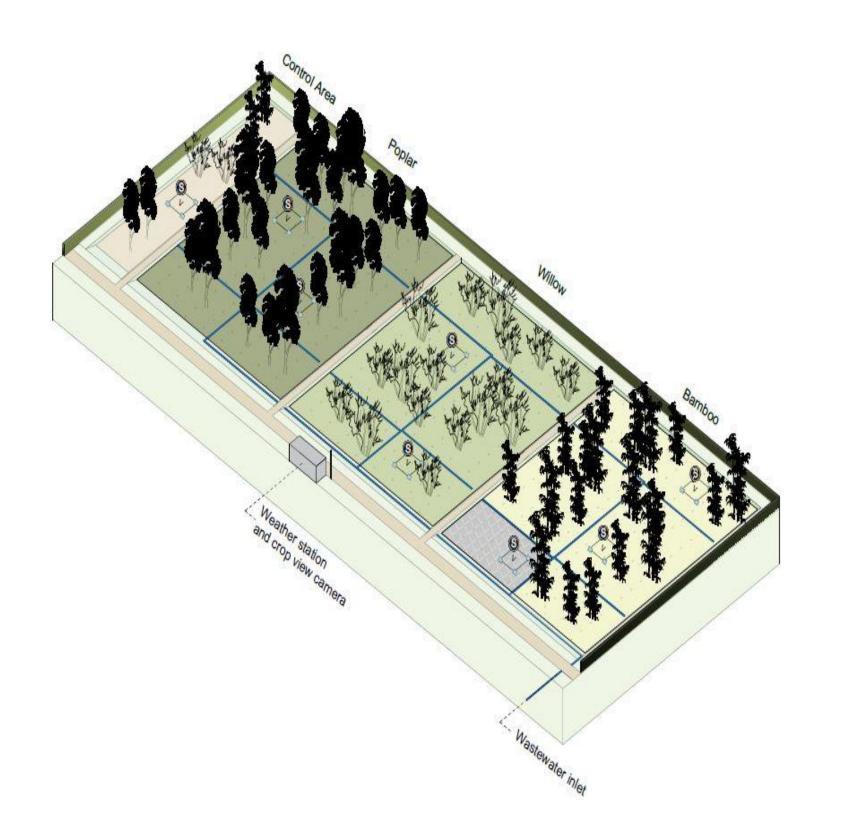
Wastewater treatment takes place through microbial decomposition, respiration, filtration, plant uptake, nitrification/denitrification, adsorption among other processes.

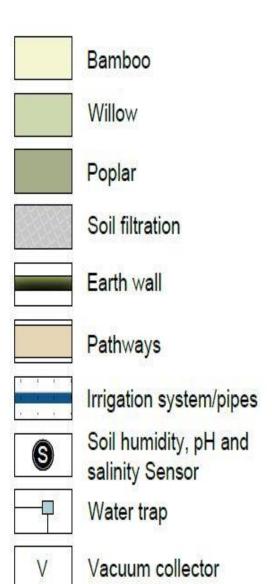




Fast-growing tree species are planted and harvested after relatively short periods depending on the plant species used, climate, nutrient availability, among other factors.

wfSRC System - India





- > Area: 7500 m2 of agricultural land in 3 sections (willow/poplar/bamboo) + not planted area + reference garden
- Capacity: 250 m3/d of screened wastewater
 (2.75 m2/PE)
- Load: Hydraulic 36.4 mm/d; 11.2 t BOD5, 7.6 t TN,0.88 t PO4-P /ha/year
- > Plants:
 - Bamboo (Dendrocalamus strictus,
 Bambusa vulgaris, Bambusa bambos)
 density 20,000 plants/ha
 - Willow (Salix alba, Salix purpurae) density of 10,000 plants/ha
 - Poplar (Populus tremula), density of 10,000 plants/ha

Poplar after planting in January 2022

Poplar in November 2023

Results

Biomass production

✓ High Biomass production up to 225 tons/hectare/year

Treatment efficiency

- √ >90-98 % removal of organic load
 (BOD/COD)
- √ ~85% removal of phosphate (PO₄-P)
- ✓ 70-80% Total Nitrogen (TN) removed
- ✓ E. coli levels reduced to <100 CFU/100mL
 at 1m depth meets discharge & reuse
 standards

Results



Willow section in November 2023

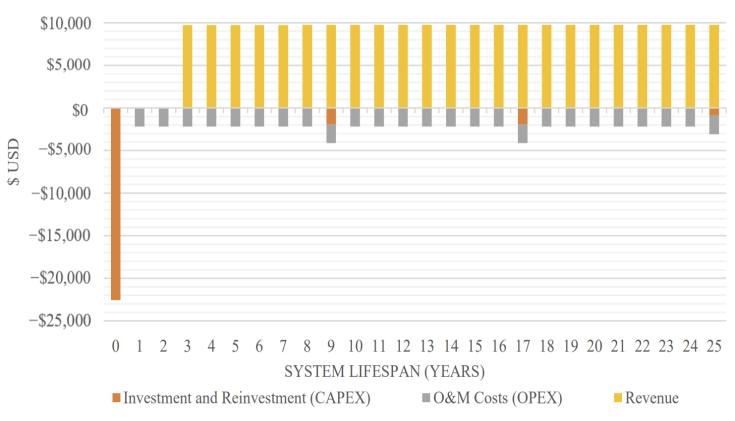
Economic Benefits

✓ Low investment and operational costs, reduced dependency on expensive infrastructure, making sanitation affordable and sustainable in underserved areas.



Bamboo in November 2023

wfSRC Cost-Benefit Estimate



At a conservative estimation: 100 DM t/ha/yr harvested

Average price of bamboo biomass → INR 8000/t DM



After initial investment

Income from the third year of cultivation:
INR 800,000 (USD 9700)/ha/ yr

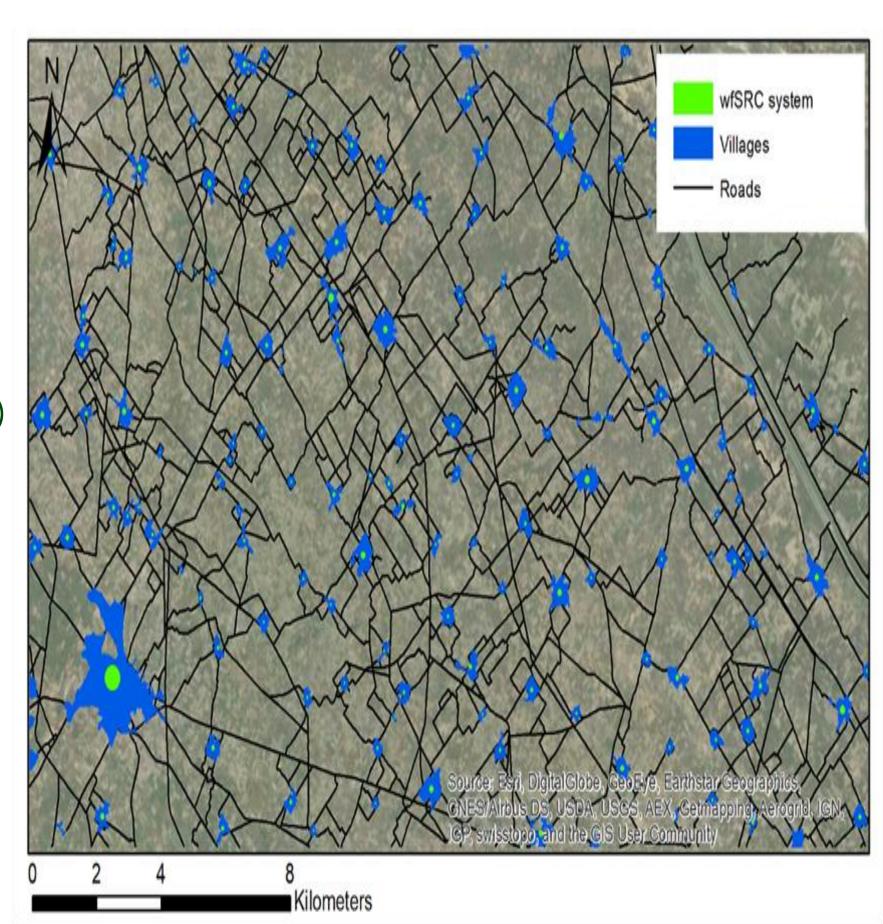


Total annual benefit estimated:

INR 465,199 (USD 5656)/ha

Regional Potential

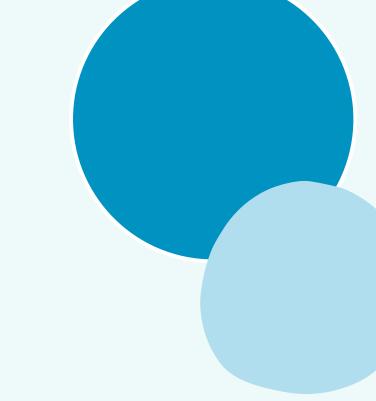
- 184 settlements, one city on 400 km2
- 218,241 inhabitants (391,324 by 2036), 100 I/day
- Area of 63 ha wfSRC bamboo systems now and 108 ha by 2036
- max. 364 ha (bamboo), 669 ha (willow), and 1006 ha (poplar) by 2036
- Between 0.27 % and 2.5 % of the total area
- Costs: \$ 0.24 \$1.4 MM/year (25 years)
- Biomass production: 6300 36,400 t/year (bamboo)
- Economic value: \$0.6 \$3.5 MM/year





WfSRC is not just a sanitation system, it's a **sustainable ecosystem solution**. Scalable, resilient, and tailored for rural transformation.

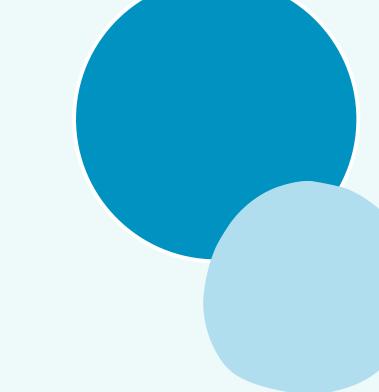
THANK YOU FOR YOUR ATTENTION!



Q&A and Discussion

Session 2

Climate Resilient Sanitation & Resource Recovery



Lunch Break