Circular Economy – Transforming Waste into Resources

*From linear to circular water and sanitation models*

Results from the 33rd AGUASAN Workshop
June 26th to 30th 2017, ABZ Spiez, Switzerland

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Executive Summary

- The **circular economy** concept is not only about **closing cycles** in production systems, but also about applying a **business perspective**, thereby shifting the focus from **coverage towards value** and efficiency.

- Although circular economy requires a **mind-set at the organisational level**, it must be applied at the **regional level** to achieve meaningful **integration of production and consumption systems**.

- As circular economy has the capacity to drive **strained labour markets** and to tackle **resource scarcity**, it presents a prerequisite for development for both **developing and developed countries** alike.

- The consideration of relevant **flows** for circular economy in WASH must go beyond the conventional water, nutrients, material and energy flows to also include **value** (revenues, societal benefits etc.) and **information** (e.g. health data) streams.

- Circular economy is a **multi-stakeholder** approach, requiring co-development and partnerships in which each stakeholder has a **distinct role to play**. Circular economy will only work in practice, if **private and public sector** agendas and funding schemes are **reconciled and blended**. Successful stories need to be reinforced and adequately **communicated** to private and public stakeholders. The **language** used around waste is key to support the transition to circular economy.

- Although embedded in a **global and holistic** concept, circular economy is eventually implemented on the **local level**, thereby requiring **contextualisation and customisation** of products and services as well as user engagement in order to build social acceptance and to initiate a paradigm shift. An **iterative and step-wise** approach building on **longterm commitment** is required to achieve sustainable economies of scales.
Abbreviations

- B2B: Business-to-Business
- CBO: Community-based Organisation
- CCS: Carbon Credit Scheme
- CoP: Community of Practice
- CSO: Civil Society Organisation
- CSR: Corporate Social Responsibility
- DINEPA: Direction Nationale de l'Eau Potable et de l'Assainissement, Haïti
- DWR: Disaster Waste Recovery
- FSM: Faecal Sludge Management
- FSTP: Faecal Sludge Treatment Plant
- ISW: International Secretariat for Water
- IWA: International Water Association
- IWMI: International Water Management Institute
- IWRM: Integrated Water Resources Management
- KN: Keynote
- KPI: Key Performance Indicator
- NGO: Non-governmental Organisation
- PEPA: Plateforme Eau Potable et Assainissement, Haïti
- PI: Practical insight presentation
- PPP: Private-Public-Partnership
- RRR: Resource Recovery and Save Reuse
- R&D: Research and Development
- SDC: Swiss Agency for Development and Cooperation
- SDG: Sustainable Development Goal
- SHA: Swiss Humanitarian Aid
- SME: Small and Medium sized Enterprises
- UNDP: United Nations Development Programme
- USTB: University of Science and Technology Beijing
- WASH: Water, Sanitation and Hygiene
- WSP: Water and Sanitation Program
Workshop Background
The AGUASAN Community of Practice

- AGUASAN is an interdisciplinary Swiss Community of Practice (CoP) that brings together a broad range of specialists to promote a deeper understanding of water and sanitation issues in developing and transition countries.

- Since 1984, the CoP provides an exemplary exchange platform and constitutes an essential link to the innovation and knowledge management strategy of the Swiss Agency for Development and Cooperation (SDC).

- Besides convening quarterly knowledge sharing events, members of the AGUASAN CoP organise annual international AGUASAN workshops to collectively reflect and exchange experiences on cutting-edge topics of the water sector.

- The workshops build on the broad knowledge of the participants to create outputs of practical use for development work and sector interventions at local, national and global level.

- The 33rd AGUASAN workshop was jointly organised by seecon gmbh and the workshop steering committee and tackled the topic: “Circular Economy – Transforming Waste into Resources”.

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Objectives, guiding question and expected outputs

- The **overall objective** of the event was to **exchange and generate knowledge** to assist practitioners and policy makers in transitioning towards circular water and sanitation models.

- An **overarching question** guided the workshop methodology and the results: How can the **transformation** from linear to circular water and sanitation (business) models **be fostered**?

- The following **outcomes** were expected from workshop:
  - Participants understand the relation between the concept of circular economy and the water and nutrient cycles.
  - Participants have identified **drivers and barriers** in transitioning to circular economies and **approaches** to overcome these.
  - Participants have learnt from concrete successful and failed circular economy approaches in the water and sanitation sector (such as business models, software and hardware tools).
  - Participants have identified and prioritized entry points and **courses of action** for the transition towards a circular economy in the water and sanitation sector.
  - Participants have been enabled to strengthen their **networks** and build partnerships for the transition to a circular economy.
Methodology

- Creating a **common understanding** on the topic through introductory and keynote inputs
  - Marc-André Bünzli: “The Story of Linearstan”
  - Heinz-Peter Mang: “The Research Perspective to Promoting the Circular Economy Concept”
  - Pritha Hariram: “The Utility Perspective to Circular Economy”
  - Cheryl Hicks: “Sanitation in the Circular Economy from the Business Perspective”

- **Learning** from practical insights:
  - Miriam Otoo, Cesarina Quintana Garcia, Eileen Hofstetter: ”Experiences from RRR in Uganda and Peru”
  - Tim Foster: “Using Fuel Briquettes in a Conflict Setting, Syria”
  - Sasha Kramer: “Reconnecting Urban and Rural Communities in Haiti through Circular Sanitation”
  - Dimitar Sekovski: “Transforming Threats into Opportunities in the Prespa Lake Basin, Macedonia”
  - Rajendra Shrestha: “Faecal Sludge Treatment and Resource Recovery: A Case Study from Lubhu, Nepal”
  - Teddy Gounden: “Transforming Waste into Resources: The Durban Experience, South Africa”
  - Georges Burri: “As Samra Wastewater Treatment Plant, Jordan”
  - Thorsten Reckerzügl: “Transforming Sewage into Resources. An Insight into BORDA’s Field Experiences from India and Nicaragua”
  - Field excursion to Henniez

- **Exchanging** experiences and good practice examples in a market place

- **Exploring and developing** clinical cases: turning linear or early-stage circular models into circular models
## Agenda

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KN: Keynote, PI: Practical insight presentation
Workshop Participants

- The event was joined by **47 participants from 26 countries** (44% women); 16 of which contributed keynote inputs, clinical cases or practical insight presentations.

- Most participants represented an **NGO or CSO** (19 representatives). Next best represented were **donor agencies** incl. SDC cooperation offices (11 representatives) followed by **governmental organisations and academia** (6 representatives respectively). 5 representatives joined from other institutions such as private companies.

- The majority of participants joined an AGUASAN workshop for the very **first time** (see fig. 1)

- Workshop photos are available via [https://www.flickr.com/gp/152456265@N06/muLg7e](https://www.flickr.com/gp/152456265@N06/muLg7e)

- A collection of flash-light reports on the workshop from selected participants were captured in daily **AGUASTAN news**.

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**Estimated distribution of AGUASAN workshop experience among participants**

- More than 10 workshops  
- 4 to 10 workshops  
- 1 to 3 workshops  
- First workshop  

*Fig. 1: Estimated distribution of AGUASAN workshop experience among participants*
Knowledge

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Introductory Presentation and Keynotes

As a means to tune-in the participants into the workshop topic, the event featured an introductory thought-piece by Marc-André Bünzli as well as three keynote presentations, which offered three distinct perspectives on circular economy. The aim of these introductory presentations was to clarify terminologies, to foster a holistic understanding of the workshop topic (including involved water, material, energy and financial flows and stakeholders) as well as to identify risks and opportunities as well as drivers and barriers linked to circular economy.

Click on the PowerPoint icons do download the presentations.

The Story of Linearstan
Marc-André Bünzli – SDC/SHA
Alpha Bravo Zoulou from the country of Aguastan (a.k.a. Marc-André Bünzli), presented the fictional case of Linearstan, a war-ridden country facing rapid service decline as a consequence of an unfavourable, linear mindset in the population, as well as the cumulative negative impacts of conflicts. This worst-case scenario was painted to trigger the motivation among participants to work towards circular approaches.

The Research Perspective to Promoting the Concept of Circular Economy
Heinz-Peter Mang - University of Science and Technology, Beijing (USTB)
In the first keynote of the workshop, Heinz-Peter Mang presented the work of his team at USTB as well as the Chinese top-down approach for promoting circular economy.

The Utility Perspective to Circular Economy
Pritha Hariram - International Water Association (IWA)
In her keynote address, Pritha Hariram presented alternative pathways for water utilities to linear “take-make-dispose-models”. She emphasised the utilities’ key role as drivers of change and pointed out the push factors and obstacles for circular economy.

Sanitation in the Circular Economy from the Business Perspective
Cheryl Hicks – The Toilet Board
In the third and final keynote speech, Cheryl Hicks presented the business perspective on circular economy by introducing the Toilet Board, a coalition lead by large corporations and businesses that see biocycles and toilet resources as business opportunities of the decade.
Practical Insights

For providing the base upon which the workshop topic could be tackled in an in-depth and practical way, the event featured a set of practical insight presentations. The practical insights illustrated different approaches to transforming waste into resources as well as to creating demand and social acceptance for unconventional products and processes. They allowed the audience to gain lessons learnt on up-scaling as well as on how to overcome drivers and barriers, how to create demand and manage health risks, how to address public perception and how to design the change process. They also served to reflect on the water, material, energy and financial flows involved and the multi-stakeholder partnerships required. The findings of the practical insights were used for group work sessions as well as to draw recommendations.

Click on the thumbnails for graphic summaries or on the PowerPoint icons for full presentations

Experiences from RRR in Uganda and Peru
Miriam Otoo - IWMI, Cesarina Quintana Garcia – SDC, Eileen Hofstetter – SDC
The first practical insight presentation was split into three parts: while Miriam presented the general framework of the Resource Recovery and Safe Reuse (RRR) Programme, the inputs by Cesarina and Eileen highlighted key aspects and outcomes of the programme in Lima and Kampala respectively.

Using Fuel Briquettes in a Conflict Setting, Syria
Tim Forster – Oxfam/DWR
In his presentation, Tim talked about the benefits of fuel briquette business models in conflict settings such as Syria, where agro-waste fuel briquettes allow to reduce waste, create employment and provide a much-needed cooking and heating alternative to expensive fuel.

Reconnecting Urban and Rural Communities in Haiti through Circular Sanitation
Sasha Kramer - SOIL, Cécil Mazaleyrat – PEPA, Edwige Petit - DINEPA
Sasha presented her social business SOIL, with which she aims to build up an entire “from toilet to compost” value chain in dense urban areas of Haiti.

Transforming Threats into Opportunities in the Prespa Lake Basin, Macedonia
Dimitar Sekovski - UNDP
Dimitar presented the 15-year-long UNDP initiative around transboundary lake Prespa, which aimed to improve ecosystem health and livelihood security in a basin-scale approach, involving – amongst other – a composting facility.
Practical Insights

Click on the thumbnails for graphic summaries or on the PowerPoint icons for full presentations

Faecal Sludge Treatment and Resource Recovery: A Case Study from Lubhu, Nepal
Rajendra Shrestha, Bipin Dangol, Reetu Rajbhandari – Enpho
Rajenda presented the case of a faecal sludge treatment plant, which operates in symbiosis with a local Nepali orphanage.

Transforming Waste Into Resources. The Durban Experience, South Africa
Teddy Gounden – eThekwini Municipality
Teddy presented different circular economy initiatives that were implemented in and around eThekwini municipality iteratively. The step-wise approach allowed the municipality to respond to the ever changing framework conditions and rising challenges in urban, informal and rural areas.

As Samra Wastewater Treatment Plant, Jordan
Georges Burri - SDC
In his presentation, Georges talked about a wastewater treatment plant in a severely water-stressed country, which produces irrigation water for an increasingly export-oriented agriculture. The insight provided an example of a situation, where closing the water and nutrient cycles is not sufficient to build up a sustainable and contextually appropriate circular economy.

Transforming Sewage into Resources – An Insight into BORDA’s Field Experiences from India and Nicaragua
Thorsten Reckerzügl – Borda
In the last practical insight presentation, Thorsten presented two cases of decentralised wastewater treatment and reuse from India and Nicaragua.
Market Place

The market place provided an open space for participants to present posters about their tools, approaches or study results. The aim was to foster exchange between participants on new and innovative tools or approaches applied in practice. During the market place, participants were “selling” (i.e. sharing or pitching a project, tool, approach or study result) and “buying” (i.e. crowdsourcing a solution or gathering new in-sights). The participants were given colour cards and were encouraged to post feedback or thoughts on the posters: blue for “positive feedback”, yellow for “question/ need for clarification”

Click on the thumbnails to enlarge
Field Trip

During the half-day field trip, the participants visited and learned about different components of a circular economy initiative installed by Nestlé Waters in and around Henniez (see the field trip package and extended reading material for more information).

Fig. 2: Graphic representation of the circular model explored during the field trip.
Field Trip

Fig. 3: Impressions from the field trip
Movie Corner: Films screened or recommended during the workshop

- "Re-thinking Progress: The Circular Economy" by the Ellen McArthur Foundation: the film introduces the reuse of metals, polymers and materials aspects of circular economies by showing the nutrient cycle, talks about new ownership models and presents industrial symbiosis.  
  → https://www.youtube.com/watch?v=zCRKvDyyHmI

- "Circular Cellular": 6 minutes to explain circular economy? This video is a good start.  

- "Lake of Apples": summarises more than 15 years of concentrated work to reverse pollution in one of the oldest freshwater ecosystems on earth, the Prespa Lake, a Balkan biodiversity hotspot. A key component of the work was applying a circular economy approach to fertilizer and organic wastes. It follows UNDP work on ancient Lake Prespa (biodiversity hot spot) – where a program was put in place to recycle organic waste as compost. The initiative managed to take pressure of the lake and saw significant improvements of water quality and indigenous fish populations as well as benefits for local apple farmers.  
  → Available for download via UNDP soon. Please contact dimitar.sekovski@undp.org.

- "Haiti 2013": Film by Artefacthaiti presented in the practical insight presentation on SOIL  
  → https://www.youtube.com/watch?v=5W9KZ3bCj50

- "Learnings from the Faecal Sludge Treatment Plant (FSTP) at Devanahalli"  
  → https://www.youtube.com/watch?v=osLAQcKHx9M

- "Valuing water – water is in everything": Water is fundamental for the ecosystems and for all production processes. A message from the Swiss Embassy in Colombia, SDC's Global Program Water, United Nations Global Compact in Colombia, National Business Association (ANDI), CECODES (Colombian chapter of WBCSD) and ANDESCO.  
  → https://www.youtube.com/watch?v=Fmp52PQe5_A
Group work on circular models

To bridge back to last year’s AGUASAN workshop dedicated to the Water Goal of the 2030 Sustainable Development Agenda (and the publication developed afterwards), as well as to create an understanding of the relevant flows for circular economy, the participants developed circular water and sanitation models by defining the ideal water, nutrient and energy flows. Additionally, they depicted the involved stakeholders and the financial flows between them. The participants also identified opportunities and threats in their models, related to the transition to circular water and sanitation models. The circular water and sanitation models were developed as resource documents to be later consulted during group work on clinical cases.

Click on the thumbnails to enlarge
Clinical Cases

To tackle the workshop topic in an in-depth and practical manner and to apply the lessons learnt from practical insights, the event featured clinical cases. These real-life water and sanitation models (either linear or early stage circular models) were studied and further developed during group work sessions that took place throughout the week. The groups a) analysed threats and opportunities in the environment of the case, b) developed a business model for a circular water and sanitation model and c) developed a plan for transitioning the current linear model into the circular model or for scaling up the current early stage circular model (depending on the stage of the case).

Click on the titles to explore the clinical cases

• **Clinical case 1**: “Reuse of wastewater for irrigation in Cochabamba’s Valleys, Bolivia” (case owner: Martin Del Castillo - Helvetas)

• **Clinical case 2**: “Energy from grease, Bulgaria” (case owner: Ana Manyarova - Sofiyska voda)

• **Clinical case 3**: “Re-use of wastewater in the context of hospitals in Tajikistan and Uzbekistan” (case owner: Olivier Normand - ISW)

• **Clinical case 4**: “Private sector engagement on faecal sludge management in Maputo, Mozambique” (case owner: Odete Muximpua - World Bank)

• **Clinical case 5**: “Environmental sanitation in refugee camps, Kurdistan” (case owner: Thorsten Reckerzügl - Borda)

• **Clinical case 6**: “Blue school concept 2.0. How to foster learning on water and nutrient cycle in a blue school in Kenya” (case owner: Lucie Leclert - Caritas)
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Results
Answers to Key Questions

Click on the outer circles to navigate to the answers

1. What does the **concept** entail?

2. Which are the relevant **flows**?

3. Who are the **stakeholders** and what are their roles?

4. What are the **drivers** for circular economy and how can they be exploited?

5. What are the **barriers** and how can they be overcome?
What does the circular economy concept entail?

• Circular economy models…
  • …are alternatives to linear “make-use-dispose” models that were established during the industrial revolution.
  • …are cost-recovering and resource efficient
  • …close industrial loops to turn outputs from one manufacturer into valuable inputs for another.
  • …derive value from technical and biological waste streams, be it nutrients, oils, proteins, energy, bioplastics or information such as health data.
  • …offer a solution to decoupling population and economic growth from resource consumption and pollution.

• Circular economy is not a new concept, but entails taking up a holistic perspective:
  • Considering different waste streams, contexts and technologies.
  • Overcoming silos and achieving cross-sectoral cooperation.

• Circular economy is rolled out on different levels:
  • Management level: seeking higher efficiency through reduction, reuse and recycling
  • Industry level: clustering in industrial parks
  • Regional level: integrating production and consumption systems

“Memorable Quotes”

“If food waste was a nation, it would rank as the third-largest greenhouse gas emitter after the US and China.” – Miriam Otoo

“If you keep going linear, you’ll run into a dead end. On our planet, everything is interconnected and once you realise this, you can achieve a circular system” - Marc-André Bünzli
What does the circular economy concept entail? (cont.)

- The **cumulative negative impacts** of linear models are often rooted in societal values and beliefs (e.g. trust in nature to recover from any pressure, short-term vision etc.)
  - Circular economy requires a **paradigm shift**
  
- The concept provides a welcome **new theoretical framework** for progress and development to shift the focus away from questions about “who benefits and at which time scales?” towards “what is out there and what can we do with and about it?”

- Circular economy and the **2030 Sustainable Development Agenda** are closely intertwined and drive each other:
  - SDG 6.3 (improving water quality and substantially increasing recycling and safe reuse globally)
  - SDG 6.4 (substantially increasing water-use efficiency across all sectors and ensuring sustainable withdrawals).

  → The SDGs provide the **theoretical framework** and **business case** for optimisation and efficiency

- Circular economy is **not a noble quest** for developed countries but a necessity for developing and developed countries alike to cope with resource scarcity.

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### Memorable Quotes

“The SDGs are a complete no-brainer. They tick all the boxes for circular economy” – Pritha Hariram

“Reuse is a necessity from a sustainability or scarcity point of view.” – Thorsten Reckerzügl

“Even utilities that are struggling to provide basic services need to transform, for circular economy is part of basic service provision, too. No more band-aiding, we can’t just sit and wait!” - Pritha Hariram
What does the circular economy concept entail? (cont.)

- Both, supply and demand for circular economy solutions are there, the current **challenge lies with up-scaling**.

- Circular approaches are mainly **implemented from the bottom up**, but – as the China experience shows – can also be **enforced top down**. In fact, most developed countries have followed this leadership pattern on sanitation solutions in the past.

- Water and sanitation have a **key role** to play in enhancing a circular economy and ensuring sustainable development
  - Under a business-as-usual-scenario, a **40% gap** between fresh water supply and demand must be expected by 2030, while **90%** of wastewater is **dumped into the environment** without prior treatment or reuse.

- The western ideal “flush toilets for everyone” won’t work in all contexts (e.g. dense urban areas)
  - alternatives are required..
  - …but waste recycling in water and sanitation is still in its infancy and yet to be scaled-up

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**Memorable Quotes**

“The circular economy could transform sanitation from a costly service to a self-sustaining and value adding system of resources” – Cheryl Hicks

“The business perspective on water and sanitation is not about coverage but about adding value and efficiency through scale. It all about the customer, not the beneficiary” – Cheryl Hicks
Which are the relevant flows?

- **Examples for water flows**
  - Wastewater (grey- and blackwater)
  - Process water
  - Irrigation water
  - Drinking water

- **Examples for nutrient and material flows**
  - Nutrients (phosphorous, nitrogen etc.)
  - Biomass
  - Material resources (glass, plastic, oils, bioplastics etc.)

- **Examples for energy flows**
  - Heat
  - Solar energy
  - Hydropower
  - Biogas

- **Examples for value flows**
  - Capital investment
  - Credit support
  - Returns on Investment
  - User payments
  - Taxes and tariffs
  - Societal values
  - Environmental values

- **Examples for information flows**
  - Knowledge
  - Data
  - Skills and know-how
  - Experience
  - Communication and marketing
  - Legal framework conditions (laws and regulations, standards etc.)
Who are the stakeholders and what are their roles?

- **Public sector and regulators**
  - Leadership
  - Safeguarding of public health and communication of public (health) benefits of circular economy
  - Provision of enabling framework, enforcement and monitoring
  - Part-financing of services and leveraging of private sector financing (risk reduction)

- **Utilities**
  - Driving process through iterative implementation
  - Informing and influencing regulation and policy making

- **Private sector and industry**
  - Reuse / recycling of resources
  - Provision of skills, capacities and services
  - Fast and non-bureaucratic roll-out of tested technologies and approaches → Localising and catalysing circular economy
  - Part-financing of services (e.g. through CSR or CCS)

- **International financing institutions and bilateral donors**
  - Part-financing of services (credit support, start-up facilitation, impact investment etc.)
  - Leveraging private sector financing (risk reduction)

- **Academia**
  - Research and development (feasibility studies etc.) → knowledge transfer, informing legal frameworks
  - Adapting technologies (design and construction of user interfaces) to local contexts → Paving the way for scale-up
  - Testing, prototyping and monitoring

- **NGOs and CSOs**
  - Awareness raising and consumer engagement
  - Monitoring of public health
  - Facilitating partnerships and Communities of Practice (CoP) for knowledge transfer

- **Public / communities**
  - Exertion of social pressure
  - Part-financing of services (user fees)
  - Reuse / recycling of resources

- **Agriculture**
  - Reuse of nutrients for food production
  - Part-financing of services (user fees)
  - Enhancement of food security

→ By design, circular economy is a multi-stakeholder approach in which everybody has got a role to play.

Memorable Quotes

“Research and business development for circular economy are really about one and the same question: how can we maintain growth while improving the environment?” – Heinz-Peter Mang

“We’re beginning to see private sector investment in Faecal Sludge Management and reuse but subsidies continue to have a role to play.” – Miriam Otoo
Who are the stakeholders and what are their roles?

- NGOs and CBOs
- Research
- Public sector
- Private Sector
- Financers and Donors
- Public sector

> Click to start animation <
What are the drivers for circular economy?

**Economic/business dimension**
- Strained labour markets → craving for job opportunities in circular economy
- Healthy competition → need for resource efficiency, cost reduction, resource diversification, optimisation of operations, resource recovery and added value
- Growing awareness of business risks by multinationals and large corporates
- Awareness of leapfrog opportunities for lower income countries

**Ecological dimension**
- Scarcity/pollution of resources → resource efficiency
- Climate change → driver of innovation and change

**Societal dimension**
- Community engagement and participation → user acceptance
- Societal pressure for resource stewardship and corporate responsibility

**Institutional dimension**
- Enabling and ambitious regulatory and legal frameworks, including realistic and transparent standards and incentive-based Key Performance Indicators (KPI)
- Government leadership
- High national R&D expenditures (e.g. for eco-industrial development, integrated transportation, sustainable farming, etc.)
- Access to technology
- Integrated governance approaches (e.g. Watershed approaches)
- Radical movements (“no waste strategies”, “zero discharge” regulations, etc.)
- Global development frameworks (e.g. 2030 Sustainable Development Agenda)

"Memorable Quotes"

"Necessity is the mother of innovation and invention. Circular economy grows from local challenges." – Teddy Gounden

"Cost reduction is a powerful incentive for industries – cost avoided is funding saved! But not all benefits can be monetarised. Environmental savings, food security, job creation etc. need to be included in the equation, too." – Teddy Gounden

"2.4 bio. people without toilets are 2.4 bio. potential customers of toilet paper." – Cheryl Hicks
What are the barriers (✔) and how can they be overcome (✔)?

✔ Public health risks
   - Strict hygienisation of resources
   - Monitoring, standardisation and quality control
   - Capacity building (training and guidelines)

✔ Lack of demand and willingness to pay for (sometimes previously free) goods
   - Ensuring ownership and community engagement
   - Contextualisation of technologies and approaches with consideration of sustainability and affordability aspects from the beginning
   - Active communication of health benefits
   - Involvement of vulnerable groups in decision-making through establishment and support of Community-based Organisations (CBOs)
   - Blending affordable taxes and tariffs with other private and public funding mechanisms

✔ Societal resistance (yuk factor / taboos)
   - Early consideration of socio-cultural, esthetical, olfactory etc. aspects
   - Early and continuous engagement with consumers, building of longterm visions
   - Contextualisation of “front ends” of technologies
   - Promotion of environmental education to overcome the “price over quality”-culture
   - Active communication of health benefits

Fig. 7: Managing health risks is a key aspect of circular economy (© SOIL)

Memorable Quotes

“At a municipality you can’t just do business as usual and sit back, you need to think creatively.” – Teddy Gounden
What are the barriers (✓) and how can they be overcome (✓)?

✔ Fast changing environment
  ✓ Adopting a **decentralised and iterative** approach
  ✓ Taking up a **system’s approach** to consider different waste streams, contexts and technologies

✔ Lack of political will / unfavourable political or regulatory framework
  ✓ **Communication** and reinforcement of successful stories, using arguments of specific interest for the public sector
  ✓ Empowerment and strengthening of **civil society** to counter vested interest
  ✓ Creation of **awareness** for existing basis in the regulatory framework on which can be built upon
  ✓ Promotion of **coordination, co-development and partnership** between different departments, across administrative levels and sectors and between stakeholders to create motivation and shared values, leadership and longterm commitment as well as organisational skills and collaboration

✔ Fear of dependency on subsidies
  ✓ **Accepting necessity** of subsidies and public contributions
  ✓ Implementation of **bootstrapping solutions** (where possible)
  ✓ Implementation of **blended funding mechanisms** for segmented customers

“Memorable Quotes”

“We need to change the conversation. Let’s stop talking about human waste and start talking about toilet resources.” – Cheryl Hicks

“As soon as externalities are created, subsidies are involved, somewhere, sometimes”. – Johannes Heeb
What are the barriers (√) and how can they be overcome (√)?

✓ Solutions fail to go to scale

✓ Reduction of costs through optimisation of operating parameters (e.g. adaptation of emptying frequency, approaching treatment plants and industrial areas, simplification of operation and maintenance, etc.)

✓ Implementation of business thinking → Focus on value propositions

✓ Development of services around products → achievement of double revenue streams

✓ Implementation of blended financing mechanisms based on long-term visions and commitments and contributions by all beneficiaries (e.g. tourism)

✓ Consideration of sustainability and affordability aspects at the beginning of all projects (including development projects)

✓ Provision of adequate incentives (e.g. free compost or irrigation water) and reinvested revenues for O&M

✓ Fostering of Public-Private Platforms

✓ Building-up of circular economy ambassadors in local or regional governments

✓ Facilitation of match-making between start-ups/small businesses and financial opportunities and of B2B partnerships (Multinationals: knowledgeable in up-scaling but poor in innovation; SME’s: knowledgeable in innovation and local markets but poor in up-scaling).

Memorable Quotes

“Water and compost can be powerful incentives for communities to take care of O&M.” – Rajendra Shrestha

“Risk and quality management are compulsory elements for any circular economy initiative.” – Thorsten Reckerzügl
Recommendations for regulators

- **Take leadership**: Promote clear, neutral and independent regulations that are favourable to PPPs for circular economy
- **Do not reinvent the wheel but build on the existing regulatory framework**
- **Be multi-sectoral**:  
  - Develop regulations **jointly with different ministries** (health, environment, energy, agriculture, commerce etc.) and in consultation with stakeholders  
  - Foster and support **Integrated Water Resources Management**
- **Invest in decentralised systems** for enforcement, controlling and monitoring to generate results for circular economy  
  - Use **clear** indicators and instruments  
  - Assess and benchmark **impacts on baseline and goal achievement**  
  - Consider **risk factors**
- **Develop realistic and incentive-based Key Performance Indicators (KPI) and standards** that are favourable to circular economy  
  - Adapt KPI and standards to the **target group** to avoid the informal sector  
  - Conduct **periodic and dynamic** reviews
- **Improve information on rules and regulations**  
  - Make it **simple, accessible and available** for all  
  - Inform and familiarise relevant stakeholders
- **Push healthy competition** to improve performance in services and compliance
- **Ensure that public health is never jeopardised**, not even during the foggy transition period, where technologies and approaches are keenly tried and tested.
- **Provide space for utilities to drive and prepare** themselves for regulations
Recommendations for utilities

- Ensure a **financial plan** to sustain circular economy
  - Argue with **revenue generation and cost reduction**
  - Consider **different revenue streams** and financing mechanisms
  - **Reinvest revenues** in operation and maintenance to ensure long-term sustainability
- Position yourself **between the beneficiary and politicians**
  - **Communicate** actively
  - Be **transparent**
- **Change your image** and branding towards «ecological and innovative stakeholder» → Drive and influence the regulatory framework
- Create a **reactive customer care** service for new products and services
  - **Follow up** on complaints
  - Provide adequate **information**
  - Invest in **monitoring and controlling**
- **Be inclusive for all**
  - Do **not cherry-pick**
  - Consider the ones that are hard to reach
- Move towards **change**, keep improving
  - Follow a **trial-and-error** strategy
  - Take **risks**
  - Form **partnerships**
- **Remove bureaucracy barriers** to enter an open space for innovation in which research and the private sector can contribute
- Explore and be sensitive to the **local environment**
- Embrace **evolving standards and norms** but continue to allow for innovation for different ways of doing
- **In-source** skills and capacities from research and the private sector
Recommendations for NGOs

• Adopt a **step-wise approach** towards implementation of circular economy approaches
• Plan for **self-sustaining projects**, consider sustainability and affordability aspects from the start
• **Adapt** locally developed and implemented technologies to circular models
• **Connect** to different stakeholders and communicate
  ➢ Develop **positive narratives** and reinforce best practices, demonstrating how easy it is for stakeholders to engage
  ➢ Provide and promote **knowledge and know-how transfer**
  ➢ Support the initiation of **political dialogue** for scaling-up
• **Build capacities**
• **Be inclusive**:  
  ➢ Reflect the **voice of the people** at all levels  
  ➢ Involve and engage **vulnerable groups** through CBOs
• **Inspire youth** around circular economy principles to become water sector professionals and to generate positive trickling effects into communities and households
• **Embrace** the private sector
  ➢ **Decouple** the «for-profit concept» from exploitation  
  ➢ Incorporate **private sector mentality** towards cost recovery
• **Build ambassadors** within local authorities for nation-wide scale up
• **Monitor and safeguard** public health
• **Advocate and influence** policy-makers to integrate circular economy in school curricula
Recommendations for donors

• Engage in long-term commitments and funding
  ➢ Become a share-holder
• Follow a step-wise approach for transforming from a linear to a circular economy
• Focus support towards capital investment and capacity building
  ➢ Allow local operators to run services with the income raised through circular economy
• Adapt funding criteria
  ➢ Refuse linear projects
  ➢ Consider affordability and sustainability aspects at the beginning of all projects
  ➢ Request good governance and enforce quality control to influence accountability and to tackle corruption
• Invest in practice research
  ➢ Support the identification, adaptation and promotion of appropriate technology
  ➢ Support technology transfer
• Encourage PPP’s through blended financing models
  ➢ Recognize that everyone has a role to play in financial sustainability
  ➢ Facilitate participation
• Do not substitute for government responsibilities
• Facilitate match-making between start-ups/small enterprises and available financing mechanisms
Recommendations for the private sector

• Implement new circular economy **business models**
  ➢ Build up **services around products** and develop value propositions to achieve **double revenue streams**
  ➢ Take **risks** and fail quickly

• Research and tap into the opportunities of **new markets**, analyse product, cost reduction and market **expansion potentials** (e.g. construction of dry toilets, consulting on circular economy, production of school books etc.

• Stick to your core business but look for **synergies** to leverage business opportunities
  ➢ Partner up with **international donors** for capital investments
  ➢ **Collaborate** with research
  ➢ Engage in **B2B partnerships**

• **Communicate added value** of circular economy to customers and consumers at all levels
  ➢ Invest in **social acceptance** (e.g. through CSR commitments)
  ➢ Explore **voluntary standards**, certifications and labels for publicity and learning purposes
  ➢ Work towards **environmental and social sustainability** of the operation and supply chain

• Consider the **public sector a customer** segment
  ➢ Position yourself as a **local partner**
  ➢ **Adapt your language.** Include in arguments of interest for the public sector
  ➢ Nurture good relationship with the government and ministers, **stay clear of integrity risks**
  ➢ **Contribute skills and know-how** to PPP initiatives
Recommendations for policy makers

- Take **leadership**
- Use the **SDGs as a framework** for cross-sectoral engagement
  - Message: Circular economy generates **co-benefits** for everyone
- **Build capacities** on circular economy within the government and be participatory
  - **Engage** with research, the private sector and the community,
  - **Involve vulnerable** communities in decision-making.
- **Co-develop a vision** and integrated policies for safe and productive resource management
- **Steer and review existing policies** to identify enabling and disenabling factors and to achieve cross-sector buy-in
  - **Build** on what is already in place
  - **Prioritise** and move step-by-step
- **Co-develop policy instruments** to enable the transition and to safeguard public health (e.g. polluter pays principle, green subsidies, cost efficient hybrid subsidy/incentive instruments)
- Promote and foster **standardisation**
- **Exchange knowledge and lessons learnt** on good and bad practices from different levels, sectors and topics
- **Adapt school system and curricula** to take up circular economy

Fig. 12: A coherent framework from the international to the local level is key for circular economy (© AGUASAN)
Recommendations for research and development

• Initiate a **paradigm shift** to catalyse private sector investment
  ➢ Promote **waste as resource** for industry and business
  ➢ Be proactive, applied, action-oriented, demand-driven, integrative and participatory
  ➢ Learn from other sectors

• Never forget about the users
  ➢ Compare, evaluate and develop simple, appropriate and effective solutions for **context specific application**
  ➢ Standardise back-ends of technologies but **contextualise front-ends** and user interfaces.
  ➢ Promote **consumer awareness** for tested solutions
  ➢ Ensure that **public health is safeguarded** (even during the testing and transition phase!)

• Think **beyond technology**
  ➢ Develop and test business solutions for **effective reuse** practices
  ➢ Develop analytical models for **financial solutions**

• Promote **accessible research**
  ➢ Be **open-source**
  ➢ Package and communicate results in forms that are **understandable to the target audience**
  ➢ **Open up** the scientific community to other intersectoral stakeholders
  ➢ Use and promote **research platforms** (IWA, SuSanA)

• **Sustain** research and be continuous

• **Engage** with the private sector but don’t be compromised

• Provide **backstopping and feedback** to development interventions, influence the legal framework and decision-making with evidence, data, guidelines and requirements
Conclusions
Conclusions

→ It’s time for a paradigm shift. The global development agenda provides the theoretical framework to move the conversation from the mere closing of water and nutrient cycles towards deriving new products and services from reusing water, material and energy flows again and again. It is time to think beyond sustaining practices and perceptions towards regenerating communities and ecosystems.

→ A chance for vulnerable communities. But not only. Protracted humanitarian crises and urban growth are inevitable events and trends in which alternatives to flush-toilets are not required as transitional solutions but long-term realities. Such environments can be among the most fruitful grounds for circular economy innovations (if communities are adequately safeguarded from exploitation!) from which entire regions can leapfrog development phases. At the same time, scarcity of time and resources as well as growing user awareness and evolving global development frameworks will continue to drive countries around the globe towards efficient, compliant and reuse-oriented societies.

→ It’s all about the language. The language used around waste is key to support the transition to a circular economy. Positive examples should be communicated and tangible narratives created to convince and influence private and public leaders and to foster an enabling ecosystem. We should be talking about new societies and ecologies, about toilet resources instead of waste and about green incentives instead of subsidies. The legal, technological and normative basis is there to move circular economy forward, we do not have to start from scratch.
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Conclusions

→ **Cooperation marks the sweet spot.** Circular economy cannot be achieved by any one stakeholder alone but is leveraged through co-development and win-win-win partnerships between and across stakeholders and institutions, development and for-profit agendas as well as administrative levels and sectors. The management of stakeholders and the balancing of interests will have an important role to play in the transition towards a circular economy to ensure that the initiatives together work towards achieving *water and sanitation for everyone, everywhere, anytime.*

→ **Circular economy is local.** Although embedded in a global and holistic concept, circular economy initiatives are implemented on the local level. Unless users adopt new technologies, products or services, circular economy initiatives will fail to go to scale. Solutions need to be contextualised and user acceptance must be built by engaging and involving users - especially vulnerable groups. Youth can present a particularly favourable avenue to trigger behavioural change. The enabling environment and social factors are key success factors of any circular economy project.

→ **We need to be patient and perseverant.** Enabling environments, acceptable returns on investment or functional partnerships are not created over night. Circular economy initiatives must take a step-wise and iterative approach and build on long-term commitments and common visions.
Conclusions

There is a role to play for everyone. Circular economy is a promising approach for water and sanitation and beyond. While there is evidence for valid business cases in circular economy, it is important to remember that the private sector can and will sustain service delivery only for as long as invested efforts are cost recovering or profitable. However, the required willingness and ability to pay for prices that reflect all externalities may not always be available in all market segments. The public sector continues to play an important role in leveraging and complementing private and international donor funding – be it in high or in low-income countries. The development and for-profit agendas need to be reconciled to serve segmented markets through customised and blended public-private financing mechanisms, supported by all beneficiaries and supported by evidence-based research and monitoring.
EXPERIENCES FROM RRR IN UGANDA AND PERU

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RESOURCE RECOVERY AND SAFE REUSE

LIMA

PERU

KAMPALA

UGANDA

3 PHASES

PHASE 1
RESEARCH IDENTIFIED RRR UNDERTAKINGS WITH POTENTIAL TO SCALE UP

PHASE 2
EXECUTE MODELS IN LIMA

PHASE 3
SCALE-UP & REPLICATE

LEGAL & INSTITUTIONAL FRAMEWORK

RRR BUSINESS PLANS

SANITATION SAFETY PLANNING

KEY COMPONENTS

FOCUS ON:
Fecal Sludge

3 PROBLEMS

- WASTEWATER GOES DIRECTLY INTO THE SEA
- ORGANIC WASTE IN PUBLIC PLACES
- SLUDGE TAKEN TO LANDFILLS

3 SOLUTIONS

- REUSING IT FOR IRRIGATION
- PRODUCTION OF BIODIESEL
- PRODUCTION OF COMPOST

LESSONS LEARNED

- LACK OF FINANCIAL FUNDING
- LACK OF TECHNICAL KNOWLEDGE
- INSTITUTIONAL FRAMEWORK HINDERS DEVELOPMENT OF RRR
- PRICE OVER QUALITY THINKING

3R PURSUITS INNOVATIVE AND SUSTAINABLE BUSINESS MODEL

3R ENTREPRENEURIAL MODEL IS CIRCULAR

STRENGTHEN CAPACITIES

NEXT STEPS

CUSTOMISED COACHING, WORKSHOP ON SANITATION SAFETY PLANS, FRRPPLICATION AND SCALE-UP INSTITUTIONALIZATION

FOCUS ON:
PUBLIC INSTITUTIONS

LACK OF MONEY KNOWLEDGE IS A BIG PROBLEM

LACK OF KNOWLEDGE

- INADEQUATE ENGAGEMENT
- PREPARED INFORMAL SETTING TO BECOME PERMANENT
- LACK OF MINIMUM STANDARDS

ACHIEVEMENTS

- INFLUENCE ON THE POLICY
- LOCAL GOVERNMENTS

RESULTS

- INFLUENCE ON THE POLICY
- LOCAL GOVERNMENTS
EXPERIENCES FROM RRR IN UGANDA AND PERU

AGUASAN Community of Practice

LIMA → KAMPALA

RESOURCE RECOVERY AND SAFE REUSE

3 PHASES

PHASE 1: RESEARCH IDENTIFICATION OF RRR OPPORTUNITIES
- OFFICE OF THE ROB.
- LITTLE NEW ENTERPRISES
- POTENTIAL MARKET FOR RRR

PHASE 2: SCALE-UP, REPLICATE
- FUNDING FOR A UNITATION
- LACK OF TECHNICAL KNOWLEDGE
- INSTITUTIONAL FRAMEWORK HINDERS DEVELOPMENT OF RRR

PHASE 3: LEGAL & INSTITUTIONAL FRAMEWORK
- EXECUTE MODELS IN LIMA & KAMPALA
- ADDRESS 3R ENTREPRENEURIAL MODEL: CIRCULAR

LESSONS LEARNED
- PRODUCTION OF BIODYNAMIC
- PRODUCTION OF COMPOST
- REUSING IT FOR IRRIGATION
- SLUDGE TAKEN TO LANDFILLS
- WASTEWATER GOES DIRECTLY TO LANDFILLS
- ORGANIC WASTE IN PUBLIC PLACES

RESULTS
- HIGH EXPECTATIONS
- LACK OF INVESTMENT
- LACK OF DATA ON WHERE TO FIND FINANCING

ACHIEVEMENTS
- AWARENESS ENHANCED
- PREPARED INFORMAL SETTING TO BRIDGE FORMAL
- ETIC OF MINIMUM STANDARDS
- CUSTOMISED COACHING WORKSHOPS ON SUSTAINABILITY

NEXT STEPS
- CUSTOMISED COACHING WORKSHOPS ON SUSTAINABILITY
- PREPARED INFORMAL SETTING TO BRIDGE FORMAL
- ETIC OF MINIMUM STANDARDS

LACK OF MONEY KNOWLEDGE IS A BIG PROBLEM

LEGAL & INSTITUTIONAL FRAMEWORK
- RRR BUSINESS PLANS
- SUSTAINABILITY PLANNING

FOCUS ON: Fecal Sludge

Graphic recording by Sketchy Solutions

Graphic recording by Sketchy Solutions
TRANSFORMING WASTE OPPORTUNITIES FOR SYRIA

**SOLUTION?**

**BRIQUETTES**

- For cooking
- For heat

**ADVANTAGES**

- Engages people to call the ‘waste’ ‘resources’
- Trai/people → empowers them
- Presses to produce briquettes are locally made
- Can get a lot of participation from community and authorities

**CONCLUSION**

**Big scale-up potential opportunity to turn waste into resources**
Reconnecting urban and rural communities in Haiti through circular sanitation

**Context**
- Haiti
- Formerly known as the 'Pearl of the Antilles'
- How did it become one of the most degraded areas of the world?
- Environmental scars from postcolonialism
- "Huge debt to pay a deforestation"

**Human Waste**
- Goes straight to the ocean

**Sanitation Coverage**
- Only 26% coverage
- No sewers, pits
- Cholera epidemics, childhood diarrhea

**急需**
- Soil's mission: transform waste into resources
- Voluntary toilet management doesn’t work

**Design a sanitation solution for informal settlements**

**Opportunities**
- For the private sector
- Need for public financing

**EcoLakai**
- Transformation: reuse
- Collection: 1x/week
- Transport

**Grow**
- Ecosan
- Sanitation cycle
- Excrete
- Compost
- Increase nitrogen by 4x

**Put the excretions back in our plates**
- Have a smell at the bag of compost

**Challenges/Goals**
- Creating willingness to pay
- Engaging the government
- Covering the costs
- Finding professionals willing to work in this low margin market

**Opportunities**
- Selling compost reduces cost
- If product is available there is willingness to pay
- Disaster resistant

Graphic recording by Sketchy Solutions
Reconnecting urban and rural communities in Haiti through circular sanitation

Context:
- Haiti, formerly known as the 'pearl of the Antilles'
- Environmental scars from postcolonialism
- Huge debt to pay a deforestation
- How did it become one of the most degraded areas of the world?

Human waste goes straight to the ocean:
- Cholera epidemics
- Childhood diarrhea
- No sewers → pits

Only 26% sanitation coverage

How did they get to Ecopark?
- After earthquake
- Oxfam asked SOIL to do container toilets

Voluntary toilet management doesn’t work

Design a sanitation solution for informal settlements

Opportunities for the private sector

Ecolakai
- Collection
- Transformation
- Reduce
- Treatment
- Transport
- 2 buckets

Cultural cycle
- Eat
- Excrete
- Grow
- Compost
- Increase nitrogen by 12%

Challenges/Goals:
- Creating willingness to pay
- Engaging the government
- Covering the costs
- Finding professionals willing to work in this low-margin market

Opportunities:
- Selling compost reduces cost
- If product is available there is willingness to pay
- Disaster resistant

Put the excretions back in our plates

Making of human excretions

Sketchy Solutions
CLOSING THE CYCLE: TRANSFORMING THREATS INTO OPPORTUNITIES IN THE LAKE PRESPA BASIN

LAKE PRESPA - FACING SERIOUS ECOLOGICAL CHALLENGES

LAKE RESTORATION CONCEPT

DRIVERS

- POLO-ECONOMIC
- ENVIRONMENTAL
- ACCESS TO KNOWLEDGE AND TECHNOLOGY
- LEGAL & INSTITUTIONAL (EU ADOPTION PROCESS)

RESTORED LAKE ECOLOGICAL FUNCTIONS

WHERE TO PUT THE MONEY?

- IMPROVED TRANSPARENCY
- MORE PHOSPHORUS RECOGNITION BY NATIVE SPECIES

LESSON LEARNED

- MORE DONORS
- AVAILABILITY OF EXPERTISE
- SUSTAINABILITY OF THE SYSTEM HAS BEEN THE VERY ESSENCE

WE EVEN GOT THE GOVERNMENT TO WENT NEW LAWS!

LAKE RESTORATION CONCEPT

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WE EVEN GOT THE GOVERNMENT TO WENT NEW LAWS!

LAKE RESTORATION CONCEPT
FAecal Sludge Treatment and Resource Recovery: A Case Study from Lubuhmetal

Goal: Implement a faecal sludge treatment plant in the city.

Context:
- 13.5 million people are homeless.
- 15% of the population is residing in campsites.
- Temporary toilets are full and overflowing.
- 2 earthquakes in 2015.
- Most houses have toilets with a single pit.
- Sewerage network is not present.
- Landfills and solid waste management are not practiced.
- Heavy reliance on burning and dumping.
- GHG emissions and pollution.

FSTP: Transforming waste into resources.

Creation of FSTP:
- Creation of a faecal sludge treatment plant.
- Work is going well.
- Only one in Kathmandu Valley.
- MAHALAXMI MUNICIPALITY.
- Sallgram Orphanage.
- Enpho CDD (Social) Borda.
- Technical financial logistic support.
- Vegetable farming to help and sell at market.
- Water scarcity.
- Low cost in fertilizer.
- Health risks.
- FSTP.

FSTP:
- Treated wastewater for irrigation.
- Biogas as fuel.
- Sludge as compost.

Benefits:
- Cash in vs. Cash out.
- Savings in fuel.
- Income from compost.
- Income from vegetable selling.
- Income from water selling.
- Income from vegetable buying.
- Home visitors fee.
- Municipal matching fund.

Challenges:
- Limited capacity (5 trucks per week).
- Social acceptance.
- Willingness to pay for FST disposal.
- Not very good design of septic tank.
- Risk of desludging provided.
- Role of desludging.
- We must allow more than 6 months per week.

LEARNINGS:
- Motivated caretakers.
- Attractive for viewers.
- It looks like a garden or farm.
- Engagement of local stakeholders is important.
- Role of desludging.
- Monitoring and research.
- Make a business plan.
- Advocacy on FST.
- Potential replication.
Nutrient harvesting by eThekweni Water and Sanitation

**Context**
- Mostly hilly
- 3.6m people
- 53% rural
- 13% self-humbled housing
- But you can't provide the same services everywhere
- Need for innovative solutions
- Learning by doing approach

**Durban Shut Flow**
- 2012
- 25%
- 75%
- Safe disposal

**Timeline**
1. **2000**
   - Durban Water Recycling
2. **2008**
   - Ladea Plant for processing of VIP sludge
3. **2011**
   - Vuna Research on collection of urine from UD toilets and nutrient recovery
4. **2015**
   - Black Soldier Fly facility to recover nutrients from UD waste

**Path to Circular Economy**
- Industry use
- Sold to industry
- Sanitation treatment works
- Water recycling
- Wastewater effluent

**Lessons learned**
- Increased user acceptance
- Improved user satisfaction
- Nutrient recovery
- Very effective for agriculture
- No urine delivered
- Much urine is delivered

**Why?**
- Water-stressed nation
- Industries saw the value
- Reduce environmental impact
- Reduced cost of ocean outfall

**Future?**
- Let's stop it there!
Nutrient harvesting by eThekwini Water and Sanitation

Context
- Mostly hilly
- 3.6 million people
- Housing
- 53% rural
- 18% informal
- But you can’t provide the same services everywhere
- Need for innovative solutions

Learning by doing approach

Durban Sanitation
- 25%
- 75%

Path to circular economy

Timeline
1. 2000
   Durban water recycling
   Industry use
   Sold to industry
   Wastewater effluent
   Durban water recycling

2. 2001
   LADEPA plant for processing of VIP sludge
   Urine dehydration and pasteurisation unit
   Membrane separator
   Integrated drying
   Nutrient rich liquor
   Plant cost: R10,000,000
   Only a few words

3. 2007
   VUNA research on collection of urine from UD toilets and nutrient recovery
   Nutrients extraction
   Urine collection
   Very effective for agriculture
   Much urine delivered
   Lessons learned:
   Improved user acceptance
   Collection is a hurdle
   Wastivation of pathogens

4. 2015
   Black soldier fly facility to recover nutrients from UD waste
   Processing UD & pack sludge
   Microbial treatment
   Work with that have tech and market
   Compost
   UD waste food waste, paper & sludge
   MIXER
   GROWING
   SEPARATION
   REPRODUCTIVE
   DRIED SLUDGE
   Feed mix
   Residences
   Thermal processing
   PROTOBACTER
   Feed mix

Lessons learned:
- Need seed funding
- Different approval processes
- Variable input waste

Why?
- Water-stressed nation
- Industries saw the value
- Reduce environmental impact
- Reduced cost of ocean outfall
- City income: R85,000/year

Future?
- Let’s stop it there!
- Start cooperation early!
AS SAMRA WASTEWATER TREATMENT PLANT (JORDAN)

JORDAN

- Semi-arid
- Highest water scarcity country in the world
- 60 km from Amman
- 750,000 people

Construction:

**Step 1**
- (2008)
- 26,500 m³/day
- 37,500 m³/day
- 2.5M people covered

**Step 2**
- (2016)
- 36,500 m³/day
- 3.2M people

**Step 3**
- (2027)
- 44,000 m³/day

70% water recovery → used for irrigation

**Particularity**

- Generates energy for own operation
- Water in → biogas → water out

- 25 years contract for Suez Company
- Water to Amman pumped from the other side of the country

Why?

- No agricultural tradition of water management
- Mismanagement
- Since 1942 they received several refugees waves
- Now Jordan is mainly populated by refugees
- Overpopulation stress → services overload
- Project (500 Mio. $)
- Red dead project to transport water from the Red to the Dead Sea to supply Israel

但他们过度用水于农业

- Some areas have drop of aquifer of 2 m per year

Graphic recording by Sketchy Solutions
Transforming sewage into resources: An insight into Borda’s field experiences

1. Devanahalli, India
   Treatment & reuse of faecal sludge
   - Reuse of WW is a century years old tradition in India
   - Health issues are no concern for production
   - Consumers don’t know what they are buying
   - Settler
   - Truck
   - Treatment process
   - The main advantages are:
     - Risk mitigation
     - Economic efficiency
   - Conclusions
   - PLUS: Low awareness for perception from consumers
   - LESS: Poor cooperation with local government

2. Beedi, India
   Effluent reuse from Dewats
   - Reuse is a necessity
   - WW & FS are valuable resources
   - To reuse human waste is difficult but manageable
   - Dewats is an option for reuse, technically and economically
   - Reuse can have an added value (depending on FW)

3. Leon, Nicaragua
   Reuse of slaughterhouse waste
   - pork reactor
   - Vertical culture
   - Vegetable gardens
   - Low health risks
   - Risk mitigation
   - Conclusions
   - Plus: Better community acceptance
   - Changes had exceptionally positive influence
   - New income streams
   - New nutrition streams
   - Improved waste management
   - Improved reputation on animal welfare and productivity

Graphic recording by Sketchy Solutions
AGUASAN Community of Practice

Morocco is committed to implement the Sustainable Development Goals including the 6.5 target.

National Challenges:
- Exploitation of water in some regions (economic, agronomic) and climatic variability.
- High level of water consumption.
- Degradation of water quality in some areas (pollution).
- Growing and increased drought scenarios due to climate change.

Strategies for the execution of a sustainable growth of the sector of energy, transport, industrialization, and waste water management are an important part in the process of being implemented:
- Protection of the Water Law
- Guarantee of the Sustainable Plan for Morocco
- Economic Policy: 25% of FIT

Institutional and Legal Framework Evolution:
- In 1994, legislative reforms created the framework in a process of determination and implementation of a comprehensive management of water resources and the integrated management of the hydrographs basins (Law 19.05).
- A new model was piloted in the integrated water management of Greater Casablanca region.
- Water law

1. Pilot Project: Waste reuse to produce biogas for a household study (Canal and Sebesaquilla):
   - The village wanted an animal excretion system, the owners of the cattle produce biogas which would be used for energy.
   - The digester is connected to a gasification and a biogas control.
   - Challenges:
     - The technology is still being experimented and learned.
     - The project had to be demonstrated to the villagers to be convinced of the existence of such technology and its use on a regular basis and with sufficient guarantees.
   - Highlights:
     - Making a sufficient amount of biogas.
     - New mixed biohybrid (gas biogas energy recovery system - Gasigas).

2. Pilot Project: Waste water reuse to irrigate (Other water supplies):
   - The Water Treatment Plant in Casablanca receives polluted wastewater with a lot of organic material.
   - It is a highly arid region with extremely poor rainfall.
   - Sustaining families have been using the waste water to irrigate their fields.
   - Risk of waste water to reach the closest Draa which provides drinking water for the region.
   - The local authorities in charge of managing forests and technical solutions decided to use the treated water in order to improve the water supply.
   - Challenges:
     - Technical: insufficient level of treatment of the water for agricultural use.
   - Institutional: the ownership/management of the released wastewater management is not clear, in other words, the firefighting department manager is responsible for the quality standards.
   - People's doubt: conflicts arise related to forbidding farmers who suffer from water scarcity to reuse their water.

Highlights:
- In response to discussion forum: Capturing low cost treatment actions in a catalogue that can be used by different water engineers.
- In response to knowledge transfer: Capturing low cost treatment actions in a catalogue that can be used by different water engineers.
- In response to water scarcity: Using treated waste water to reduce irrigation to prevent desertification would be a good option in regions where the regulations of quality for agricultural use are not available.

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Strategy & Process of Village Waste Transformation

Setup of Actors

Issues

Villages taken on pilot basis:

Associated Benefits

Project Conception

Preparation of RFF

Preparation of PPP

Transboundary Village Waste Transformation

Reduction in pathogen load

Reduction in pathogen load

Reduction of organic load

Reduction of organic load

Improving soil health

Improving soil health

Diversification of diet by different crops & vegetables

Diversification of diet by different crops & vegetables

Great thing for India. Think about 0.47%!
Slow Pyrolysis of Urban Biowaste in Dar es Salaam (Tanzania)

Rationale

Problem 1:
- unsustainable cooking fuel
- 94% of households use wood-based charcoal
- cause of deforestation

SOLUTION
- Biowaste Valorization through Slow Pyrolysis

Problem 2:
- inadequate solid waste management
- 60% of waste is biodegradable
- impact on environment and hygiene

The thermochemical process of slow pyrolysis converts organic material into char and pyrolysis gases in the absence of air at temperatures 300-700°C.

Objectives
- Build a externally heated slow pyrolysis reactor
- Run experiments with 2 feedstocks: sawdust and coffee husks
- Measure proximate analysis of the char (gross low VM content and HHV > 20 MJ/kg)
- Compare the energy ratios (ER) of using 1 or 2 barrels
- Assess impact of moisture content on char quality and ER (one barrel)

Reactor system
- Contains furnace, two oil barrels containing metal pipes, chimney and crane.
- Pipes are welded together, sealed at one end and closed with lid.
- Heat is supplied from the furnace fuelled by LPG (HHV= 50 MJ/kg).

Pyrolysis process
1. Feedstock is dried and pyrolyzed in lower barrel
2. Produced pyrolysis gas burns and provides additional heat (LPG flow is stopped)
3. O₂ supply is monitored with a lambda sensor
4. Excess heat from the lower barrel dries the feedstock in upper barrel
5. When dried, upper barrel is put on the furnace and a new upper barrel is set to start the process again.

Energy balance

Results

Conclusions
- This reactor system turns biowaste into good quality char and produces more energy than what consumed.
- All chars showed promising proximate analysis and similar HHVs to black coal (30.5 MJ/kg in average).
- Biowastes with moisture up to 20% can be used in the lower barrel without previous drying. Common suitable biowastes are corn-cobs, coco-shells, paper & cardboard, bagasse, etc. Further experiments are planned to test the drying capacity of the upper barrel.
- If operated in a semi-continuous manner, the reactor could be energetically self-sustaining.

Investment costs of 950 USD. Improvements on the financial feasibility forecasts.

More information: imanol.zabaleta@eawag.ch; www.sandsc.ch

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Main messages

- Through meso-waste, co-composting, enrichment and pelletization, faecal sludge (FS) is converted to an organic fertiliser cum soil ameliorant, Fortifier™, which has been certified for agricultural use in Ghana.
- A new Fortifier™ production enterprise in Accra, Ghana, enables the treatment of 15,000 m³/year of FS and 700 metric tonnes (MT) of sorted organic solid waste to generate 500 MT of a safe fertiliser product.
- Fortifier™ application to soils increased the yield of vegetables and cereals by up to 80%, suppressed nematode infections and improved water use efficiency by crops.

The challenge

- In developing countries, use of on-site sanitation systems generate huge volumes of FS.
- FS yield per capita: 4.56 kg N/year; 0.55 kg P/year; 1.23 kg K/year.
- Tropical soils have low inherent soil fertility; fertiliser use is less than 10 kg/ha, thus, agricultural productivity remains low.

The Approach

Enabling Commercialization

Market assessment

Customer needs

Business planning

- Pricing
- Marketing
- Distribution

Technical process

Results

Lessons Learned

- Generic Fortifier production can be replicated in other tropical regions.
- Formulations and use efficiency need to be tailored to soil and crop type as well as local socio-economic conditions.

Financial analysis of using FS-based fertilisers for the production of lettuce (IWMI, 2016)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (ton/ha)</th>
<th>Application cost (US$)</th>
<th>Total Revenue (US$)</th>
<th>Gains (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral (NP: 15:3:15)</td>
<td>3.9</td>
<td>463.3</td>
<td>4493.9</td>
<td>4030.6</td>
</tr>
<tr>
<td>Poultry</td>
<td>4.0</td>
<td>61.4</td>
<td>4566.5</td>
<td>4525.1</td>
</tr>
<tr>
<td>Manure</td>
<td>6.1</td>
<td>1360.1</td>
<td>7088.3</td>
<td>5728.2</td>
</tr>
<tr>
<td>Fortifier™ (regular)</td>
<td>5.9</td>
<td>725.0</td>
<td>6810.3</td>
<td>5085.3</td>
</tr>
<tr>
<td>Fortifier™ (pellets)</td>
<td>5.9</td>
<td>725.0</td>
<td>6810.3</td>
<td>5085.3</td>
</tr>
</tbody>
</table>

This does not include the cost of all other agronomic practices apart from the different fertiliser sources used. US$ 1 = GH¢ 4.22
INTEGRATED WATER MANAGEMENT
IWRM-P/HELVETAS Swiss Inter-cooperation Nepal; approach and practices

Integrated Water resource management Program in Nepal is working for the better improvement in the access of drinking water, sanitation and hygiene, small irrigation, water conservation andaji and water governance and advocacy in the rural areas with priority considerations of gender issues and climate change.

Construction
- Supply of water for
  - Domestic purposes
  - Irrigation purposes
  - Livelihood purposes
- Water management
  - Water harvesting systems
  - Water conservation
  - Rainwater harvesting

Investment
- Acceptable
- Awareness

HARDWARE
- Scheme/Household
- Interventions

SOFTWARE
- Income
- Software
- Intervention of IWRM

Income generating activities
- Sludge management
- Hygienic aspects

What is the overall impact on catchment safety (resources)?

Too ambitious

Multi-functional Water Uses

What is the role of the government?
Country of eOntRaStS:
- Mining and Agriculture;
- Desertification and Water and CC issues;
- 3 million population – (1.3 million in a capital and 57.8% in peri-urban area)

Peri-urban settlements:
- Latrines
- Water kiosks
- Waste
- Coal Stove
- Heating

Problems:
- Soil pollution
- Hygiene
- Environment
- Air Pollution

Looking for solutions:
- Practical
- Time Bound
- Pragmatic
- Partnership

Solutions?
- Grey Water
- Ash Recycling
- Gas Collection
- Organic Waste
- Recycling
- Thermal Heating

(Soil recovery using organic waste – might be a solution?)
Circular economy - transforming waste into resources
From linear to circular water and sanitation models
June 26th to 30th 2017, Spiez, Switzerland

Faecal Sludge Management (FSM) in rural areas of Nepal
An experience of Nepal-Swiss Red Cross

Raj Kumar Kshetri
WASH Programme Manager
CEHP Program
Nepal - Swiss Red Cross
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Background:
- Nepal has developed National Sanitation and Hygiene Master Plan-2011 aiming to attain Open Defecation Free (ODF) status at country level by 2017 and GOs. NGOs have been promoting for building toilets to achieve the national sanitation target.
- More than 70% of families in rural area have single pit toilets and when toilet pit is filled, either the sludge from the pit is dumped randomly on the field without any treatment or is covered with soil digging a next pit which is another form of open defecation.
- A study shows that about 32% families go outside, 27% see the neighbours’ toilet and remaining dig the simple pit for defecation for 1-2 weeks after filling the toilet pit.
- It is important to promote socially and culturally acceptable Faecal Sludge Management (FSM) option which may transform the waste into resources.
- Project is trying to address the issue of FSM promoting simple and affordable technologies in rural area of Nepal.

Interventions (Local initiatives and approaches):
- Double pit pour flush toilet is being promoted in rural areas for faecal sludge management so that when one pit is filled, the toilet is connected to another pit. Sludge of first pit is converted into manure after about 5 months and the dry manure is used in field as fertilizer or sold for income generation. The following activities are performed to make it happen.

Awareness raising:
- Interaction sessions are conducted in the community based networks to trigger the community people to close the open defecation.
- Household visit campaigns are held in the community to encourage the community people for suitable latrine construction and proper faecal sludge management.
- Mass campaigns are organized to sensitize the community people for the regular use of toilet, proper hand washing and making clean environment.
- Various national and global days are celebrated to sensitize the community people on the importance of toilet use and FSM.
- Experience sharing interaction sessions as well as exchange visits are organized so that people realized the benefit of double pit pour flush toilet.

Capacity building:
- Mason trainings for local people are organized in community level and form (module) for converted ring were provided to the group of masons so that toilets were built using local masons and locally available construction materials.
- Demonstration sessions are conducted to disseminate the importance of double pit pour flush toilet.

Sustainability:
- Community Led Total Sanitation School Led Total Sanitation approach are applied for sanitation and hygiene behavior promotion.
- Community based government’s networks and schools are facilitated to develop WASH plan. While developing these plans, options for faecal sludge management are discussed and actions are planned to execute the selected option.
- Periodic household visits by local monitoring group/network are made to ensure the functionality of the toilet and proper faecal sludge management.

Opportunity:
- Double pit pour flush toilet is easy to construct, operate and maintain. So it’s highly acceptable in the rural area.
- Only single pit can be constructed in the beginning of the toilet construction, if there is fund assured but just space should be left for next pit and family can construct second pit after few years.
- It reduces disposal cost as family member can easily bring out the dry manure from the pit themselves and use in their field.
- It minimizes potential health hazards that occur from unsafe disposal of faecal sludge.
- Waste is converted into resource as people can use dry manure as fertilizer and grow the crops or can sell same to others and earn money.

Challenges:
- Bit more land is needed for double pits of the toilet. So, it is bit difficult to construct for the families who do not have enough space.
- Constructing double pit toilet is bit expensive comparing with single pit. So, sometimes people raise the funding issue before internalizing the benefit of double pit toilet. Some contribution can be linked for ultra poor family.
- It’s not so suitable technology for the places where water table is high as the seepage may contaminate the water source.

Conclusion:
- Simple and cost effective interventions are locally accepted.
- The positive results can be achieved, if locally accepted simple mechanism is promoted.
- If people know waste is transforming into resources, they adopt it.
ZIMBABWE HANDWASHING CAMPAIGN

TIPPI-TAP MODEL: RESOURCE RECOVERY RE-USE

RAHAS MODEL

THEORY OF CHANGE

BUILDING/ CONSTRUCTION

RESOURCE: WATER MGT

BENEFIT 1: HEALTH & WELLNESS

LOCALLY AVAILABLE MATERIALS

BENEFIT 2: IMPROVED HYGIENE STATIONS

RE-USE CONTAINERS

BENEFIT 3: TRAJECTORY HYGIENE ATTITUDES BEHAVIOUR

EAWAG

GOZ

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REVAMP - Resource Value Mapping
A tool to support integrated urban waste resource planning

TARGET USERS: Policy makers and planners, water, sanitation and waste managers, entrepreneurs and investors, development practitioners, students and researchers

1. Waste resource inventory and resource demand mapping

2. Developing resource-oriented waste management scenarios

3. Estimating and visualizing co-benefit generation

Initial REVAMP testing in Kampala, Uganda

Annually around 750 million kg of waste is generated in Kampala, Uganda. Approximately 70% of the population use open or semi-open dumps for waste disposal, which results in pollution and health risks. The remaining 30% use formal or semi-formal waste management systems.

Next steps:
- Prioritize using participatory process to involve stakeholders, local communities and experts in the planning
- Develop new functions to align waste management with local economic and social needs
- Expand tool functions and waste streams (e.g., food waste, and data integration)
- Foster partnerships to collaborate with urban models and tools

Potential nutrient recovery

Potential resources

Potential energy content

SOJOURNER, are these graphs? They are great! IDEA! VISUALISATION

Back to overview
Circular Economy - conversion of organic MSW into fertilizer: enabling factors and profitability

K. Doegg, C. Zielhues, R. Ramesch, B. Borfink, I. Kinter

The combination of urban organic waste and urban agriculture as a means of waste management is rarely practiced in African cities, where the organic fraction of municipal solid waste is high.

Main objectives: (i) to assess the outputs, outcomes, and ownership of composting technology by various local stakeholders and (ii) to evaluate composting profitability.

Approach/Tools
- Low- and high-scale approach involving various methods, including:
  - Exploratory visit
  - Stakeholder analysis and feedback
  - Field work involving expert surveys, laboratory analysis and statistical modeling

Innovative action
- Composting is a viable and relevant issue for improving resource recovery and reuse interventions in African settings.
- Source segregation is a key condition for the implementation of the composting technology. This, however, is only possible and feasible in African settings if communities are well informed and interested about it. This should be done through appropriate participatory training and feedback workshops.
- Investing in urban organic waste composting is an opportunity to contribute to the legal and economic viability of some countries to adapt and become more sustainable.

Lessons learned
- Composting is a renewable source of fertility for African agriculture.

Result

Institute of Water and Enviroment (Akwab) 

Costs

- Project costs: 60%
- Materials: 40% (plastic, sand, others)

Opportunities

- Resource recovery by composting
- Composting as a cost-effective and sustainable solution to waste management
- Link between composting technology and urban agriculture and health mitigation issues

Acknowledgements
The author would like to thank the Volkswagen Foundation for financing this project.
Has AGAIN the solutions for complex nutrient capture from households and reuse in a circular food production system?

The challenge

Connecting circular nutrient resources to a regenerative agricultural practice

- Globally, nutrient resources are a key challenge to sustainability, with the need to increase food production in a way that is sustainable.
- The use of nutrient resources can help increase food production and sustainability.
- Connecting circular nutrient resources is crucial for sustainable agricultural practices.

What do we all know today?

- Globally, nutrient resources are a key challenge to sustainability, with the need to increase food production in a way that is sustainable.
- The use of nutrient resources can help increase food production and sustainability.
- Connecting circular nutrient resources is crucial for sustainable agricultural practices.

Time to close the loop

Connecting organic-based nutrient resources from society to regenerative agricultural practices is a real challenge everywhere!

The solution

Again’s unique method

- Again provides a unique solution that connects nutrient resources from society to regenerative agricultural practices.
- The solution includes a closed-loop system that reduces waste and increases nutrient availability.
- The method is scalable and adaptable to different contexts.

Present and future

- By working with nutrients from society, Again is contributing to more sustainable and regenerative agricultural practices.
- Future work includes expanding the solution further, with a focus on scale-up and replication.

Has the household nutrient challenge been solved or approached in YOUR country? Can we collaborate and help you?
Reuse of Wastewater for Irrigation in Cochabamba’s Valleys, Bolivia

• Context: middle-income country with countless small and medium cities with strong interlinkages to rural and urban areas through agriculture. Farmers often have no choice but using untreated wastewater for irrigation (download introductory presentation)

• The case: how to improve the quality of wastewater treatment and water provision in municipalities of semi-arid high valleys, where wastewater is untreated and water demand high.

• Elements of the proposed circular solution, as highlighted during group presentation:
  ✓ Implementation of wastewater treatment for nutrient reuse in agriculture with a longterm vision of 100% treatment levels using locally adapted technologies (e.g. to deal with low water levels resulting from upstream water abstractions)
  ✓ Implementation of strict monitoring and quality control
  ✓ Financing: first phase through public funding, later phases blended by user fees
  ✓ Active communication of health benefits to farmers and communities to ensure willingness to pay
  ✓ Establishment of mechanisms for improved coordination between departments and authorities on different administrative levels
  ✓ Collaboration with universities to inform and influence the legal framework (e.g. effluent standards) with evidence on water availability, pollution levels etc. → informed decision-making
  ✓ Lobby and advocacy for buy-in and support from the national authority → promotion of nation-wide scale-up

Click on thumbnails to enlarge case study outputs
Bolivia clinical case. Analysis of the environment. Identified threats and opportunities.
Bolivia clinical case.
Proposed circular model
Bolivia clinical case. Business model behind the proposed circular model with identified internal strengths and weaknesses
Bolivia clinical case. Implementation/scaling plan
Energy from Grease, Bulgaria

- **Context:** city of 1.4 mio. inhabitants with large-scale infrastructure for water supply and wastewater treatment. Energy is already generated from biogas digesters (covering 100% of the energy requirements of the plant since 2014) but often the required intakes are insufficient (download introductory presentation)

- **The case:** exploration of the use of restaurant and food waste (grease and oil) for digester input to enhance biogas and energy production.

- **Elements of the proposed circular solution, as highlighted during group presentation:**
  - Use of grease and oils from restaurants and food production for increase of biogas production
  - Reuse of biogas energy in technopark constructed on unused plot on opposite river side
  - Sale of biogas energy to brewery (partly as part of a Carbon Credit Scheme (CSS))
  - Active marketing of beer as circular economy model using provocative slogans:
    - “From beer to pee, from pee to beer”
    - “A beer a day keeps the sludge away”
    - “Eau de Toilet, for the circular woman”
    - “I wish you were beer”
    - “Making Sh** great again”

*Click on thumbnails to enlarge case study outputs*
Bulgaria clinical case.
Description of the current situation.
Bulgaria clinical case. Analysis of the environment and business case.
Bulgaria clinical case. Analysis of the environment. Identified threats and opportunities.
Bulgaria clinical case. Description of the circular solution.
Bulgaria clinical case. Business model behind the proposed circular model.
Re-use of Wastewater in the Context of Hospitals in Tajikistan and Uzbekistan

- Context: two hospitals without water supply and wastewater management. Wastewater is collected in simple pits which often overflow into open channels that drain on agricultural fields and are used for domestic water supply in downstream villages. Greywater cannot be reused due to hazardous bacterial contamination from tuberculosis patients. If a solution can be found, the scale-up potential is large, as many hospitals in the region face similar challenges (download introductory presentation).

- The case: technology for efficient wastewater treatment and reuse in this complex setting.

- Elements of the proposed circular solution, as highlighted during group presentation:
  - Implementation of lagoons and ponds for evapotranspiration of black- and greywater (requiring only small constructural changes)
  - Installation of rose garden on the infiltration field for flower-sale in the hospital shop (revenues reused for operation and maintenance of the lagoons and ponds)
  - Setup of a consultancy service to facilitate nation- and region-wide scale-up
  - Nurturing good relationships with the local government and the ministry by emphasising low costs of the intervention and carefully navigating integrity risks

Click on thumbnails to enlarge case study outputs
Uzbekistan/Tajikistan clinical case. Analysis of the environment. Identified threats and opportunities.
Uzbekistan/Tajikistan clinical case. Sketches of evapotranspiration pond.
Uzbekistan/Tajikistan clinical case. Business model 1 behind the proposed circular model.
Uzbekistan/Tajikistan clinical case. Business model 2 behind the proposed circular model.
Uzbekistan/Tajikistan clinical case.
Implementation/scaling plan
Uzbekistan/Tajikistan clinical case. Implementation plan
Private Sector Engagement on Faecal Sludge Management in Maputo, Mozambique

- Context: capital of one of the poorest countries, with only 9% sewer access. The majority of the population relies on poorly constructed on-site sanitation solutions. There is limited Faecal Sludge Management (FSM), most sludge is dumped into the environment, causing significant public health risks. At the same time, irrigation water and compost are scarce resources (download introductory presentation).

- The case: exploration of the challenges relating to the promotion of FSM services, such as the affordability of services as well as the difficulty of emptying and managing dried sludge.

- Elements of the proposed circular solution, as highlighted during group presentation:
  - Implementation of a reliable Uber-model-inspired emptying and transport service that fosters a safe sanitation system along the entire value chain
  - Establishment of blended financing mechanisms including affordable and feasible taxes and tariffs and contributions from tourism revenues
  - Community engagement to prevent smell-related resistance to transfer stations
  - Capacity building for entrepreneurs

Click on thumbnails to enlarge case study outputs
Mozambique clinical case.
Current linear model
Mozambique clinical case. Analysis of the environment. Identified threats and opportunities.
Mozambique clinical case. Proposed circular model
Mozambique clinical case. Business model behind the proposed circular model.
Mozambique clinical case.
City council structure.
Mozambique clinical case. Implementation/scaling plan
Environmental Sanitation in Refugee Camps in Kurdistan, Iraq

- Context: in the “Domiz 2” camp in Kurdistan Iraq, black- and greywater is collected and discharged into the environment without prior treatment or reuse. Protracted crises, however, call for humanitarian assistance that goes beyond the provision of immediate response, but increasingly meets the requirements of development cooperation: camps and host communities must be served with longterm solutions along the entire service chain.
  (download introductory presentation).

- The case: discussion of adequate longterm and integrated sanitation approaches that close the water and nutrient cycles in “Domiz 2” camp and the neighbouring host communities.

- Elements of the proposed circular solution, as highlighted during group presentation:
  ✓ Installation of a wastewater collection and treatment system: wastewater collection with sealed tanks, trucking by local service providers, treatment with Anaerobic Baffled Reactors and Gravel Filters
  ✓ Sale of compost and effluent as well as greywater to farmers in host communities. Revenues reused for operation and maintenance of wastewater treatment system.
  ✓ Installation of vertical vegetable/fruit gardens for reuse of greywater and compost in Domiz 2 camp for self-consumption
  ✓ Active integration and engagement of local farmers and refugees in decision-making and management through Community-based Organisation (CBO)
AGUASAN Community of Practice

Kurdistan clinical case.
Current linear model
Kurdistan clinical case. Analysis of the environment. Identified threats and opportunities.
Kurdistan clinical case.
Proposed circular model
Kurdistan clinical case. Business model behind the proposed circular model.
Kurdistan clinical case. Implementation plan.

Legend:
Orange: potential risks
Yellow: mitigation strategies
Blue School Concept 2.0. How to Foster Learning on Water and Nutrient Cycle in a Blue School in Kenya

- **Context:** the blue school concept aims to foster household- and community-level behavioral change on WASH through youth and children. Although the implemented initiatives often include school gardens, they frequently neglect circular economy aspects. Kenya: frequent water scarcity, hampered learning experience for children, job insecurity for teachers (download introductory presentation).

- **The case:** exploration of means to close water and nutrient cycles within blue schools so as to better inspire the new generation of WASH professionals (optimisation of the learning experience and implementation of circular thinking).

- **Elements of the proposed circular solution,** as highlighted during group presentation:
  - Customised implementation of interrelated measures and technologies based on the specific requirements and environment of the school (e.g. installation of urine diversion or compost toilets with reuse of compost in school gardens and greywater irrigation using drip irrigation system)
  - Adaptation of school curricula to include background information and training material on implemented means and technologies
  - Establishment of partnerships with local companies and research institutions for the production, implementation and maintenance of technologies in cooperation with teachers and children. Depending on the local framework, this may be extended into a full-scale “apprenticeship”-model to improve job opportunities (advocacy and lobbying for dual education system required).
  - Documentation of evidence on behavioral change on household and community level to secure buy-in from local government Scale-up on national level through ambassadors on local government level

*Click on thumbnails to enlarge case study outputs*
Kenya clinical case. Analysis of the environment. Identified threats and opportunities.
Kenya clinical case. Proposed circular model
Kenya clinical case. Business model behind the proposed circular model.
Kenya clinical case. Implementation plan.

Legend:
Pink: potential risks
Yellow: mitigation strategies