



Global Programme of Action for the Protection of
the Marine Environment from Land-based Activities

Wastewater, is a valuable resource

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Wastewater is a global concern!

Poorly managed wastewater:

- Loss of ecosystem services & of economic opportunities
- Affects climate change - Wastewater-related emissions of methane (CH₄) & nitrous oxide (N₂O) **more harmful than CO₂.**

Properly managed wastewater:

- Huge source of water and nutrients for crop production-
- Wastewater sludge can be used as:
 - soil conditioner/fertiliser/construction materials,
 - to generate biogas & biofuel
- **But, there is a common perception that managing wastewater is a waste of energy and money.**
- Or **Wastewater: a resource not a waste**

Why is it a need for reuse?

Worldwide, the new environmental paradigm is to eliminate the concept of **throwing away waste** and replace it with the concept of considering **waste as a resource**

Focus on “**Reduce, Reuse, Recycle**” paradigm

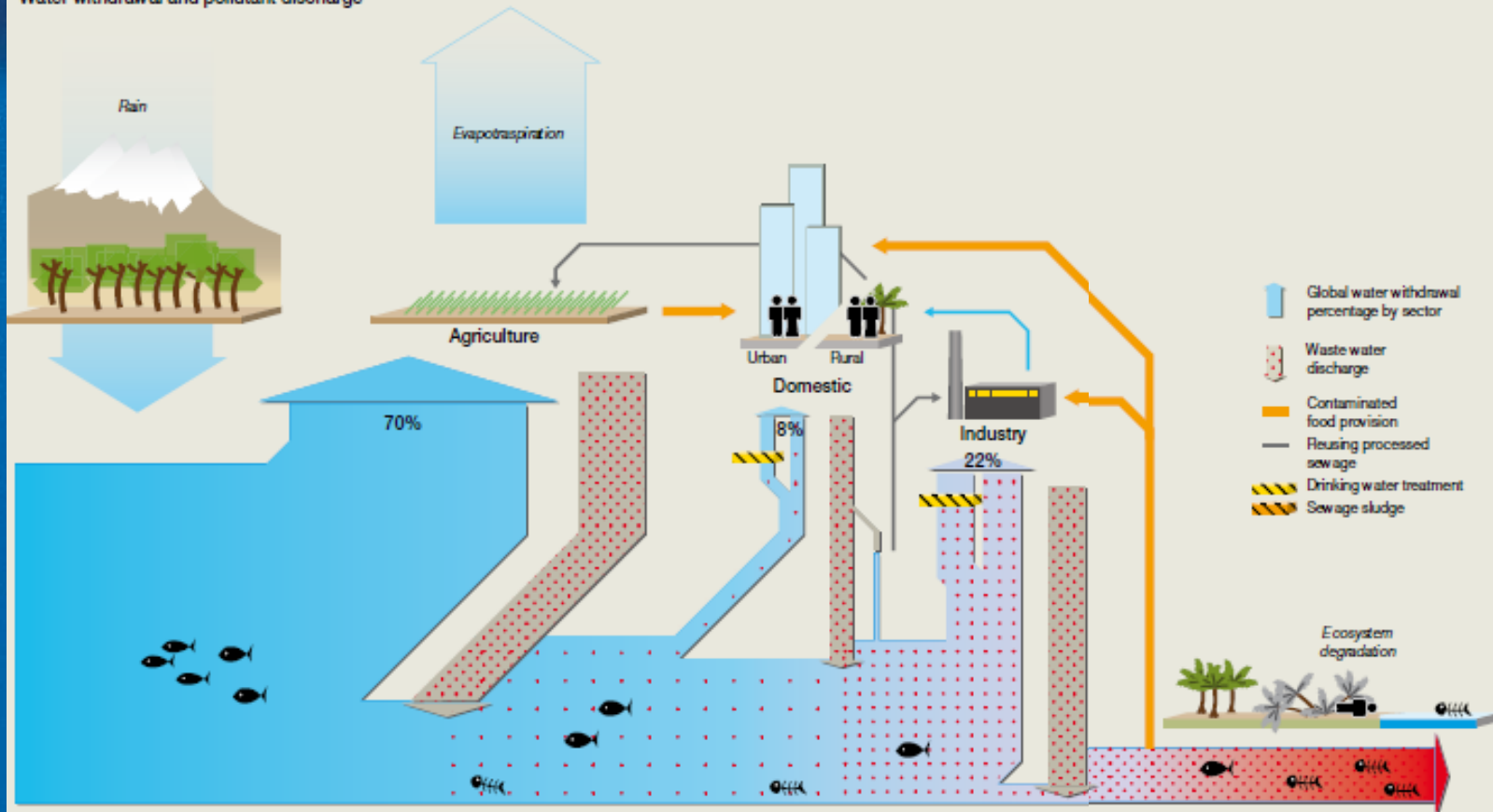
Considers both **solid waste and wastewater**

- Solid waste
- Wastewater
- Faecal sludge

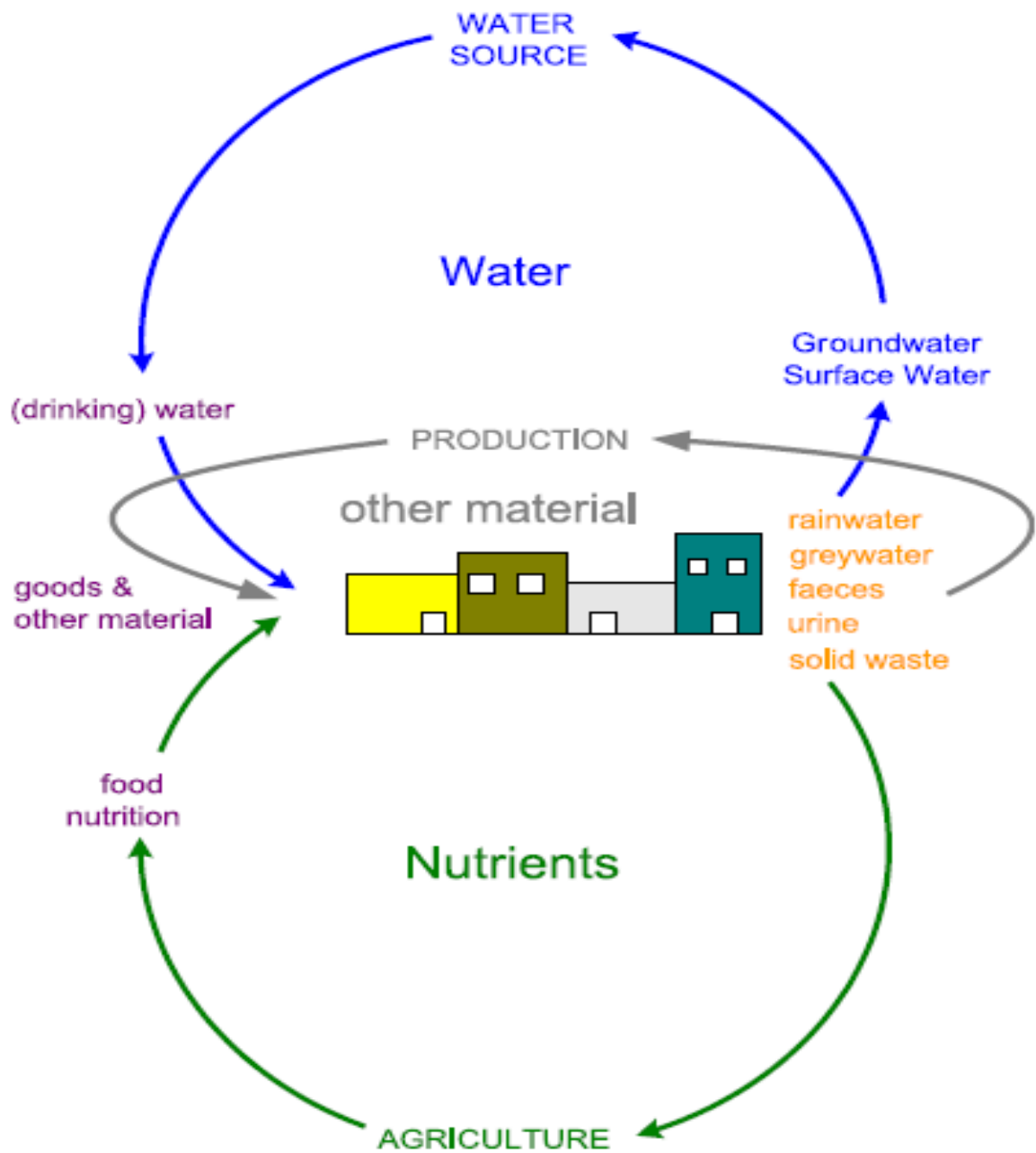


1- Some facts

Freshwater and wastewater cycle
Water withdrawal and pollutant discharge

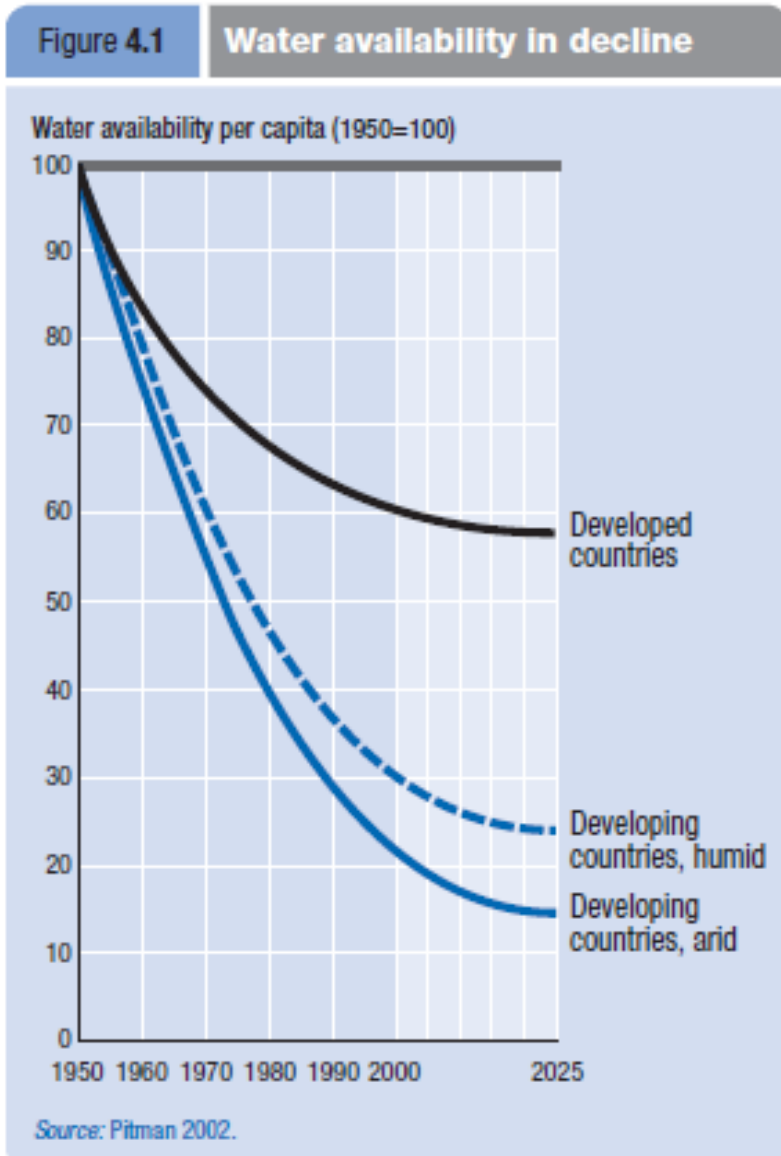


Sources: WHO; FAO; UNESCO; WWL



Many drivers to resource recovery...

Water scarcity --- reuse



Water availability in decline, while **agriculture** accounts for more than **70%** of global **water use**



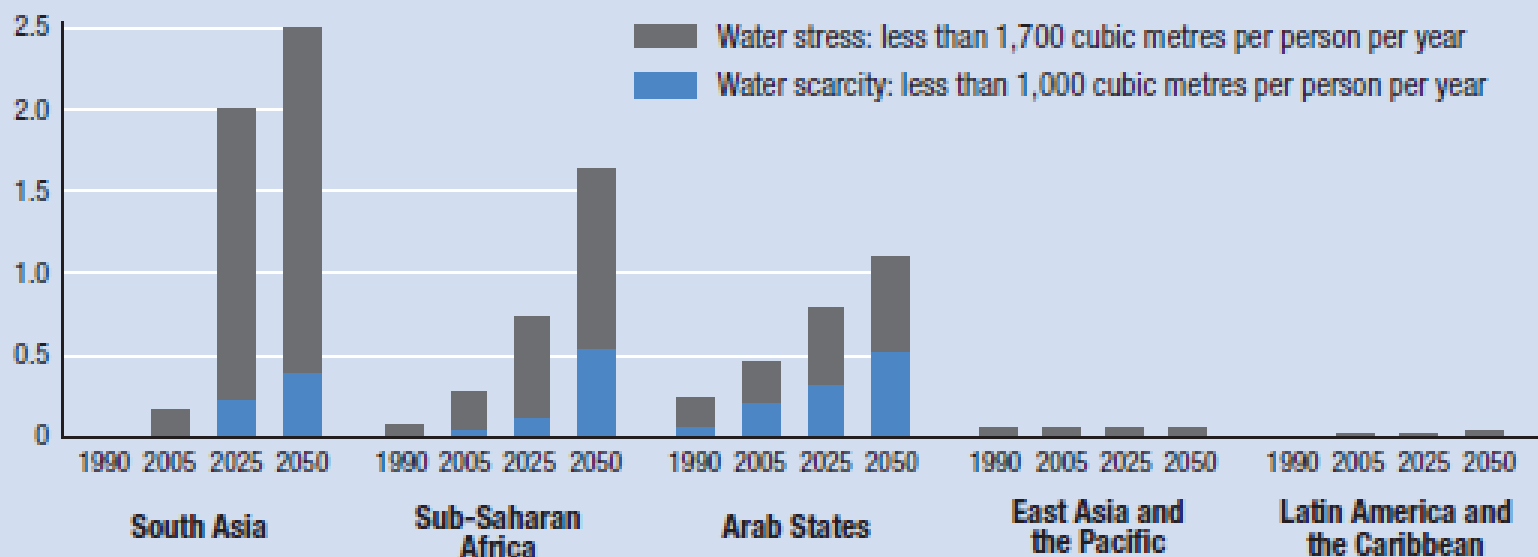
By 2025, half of the world population will live in **water stressed areas**, which makes **reuse important**

Water stress --- wastewater

Figure 4.2

Water stress is projected to accelerate in intensity in several regions

Population of countries facing water stress or scarcity (billions)



Source: Calculated on the basis of FAO 2006.

Particularly in water stressed areas, an integrated water resources management is needed that involves considering **waste water reuse** as an important **opportunity**

Wastewater --- opportunity

- An approximate estimate of global wastewater production is **1,500 km³ per day**
- **Recycling wastewater** for peri-urban agriculture already **happens around 4 of 5 cities** across the developing world
- Wastewater is estimated to directly or indirectly irrigate **about 20 million hectares** of land **globally—almost 7%** of total irrigated areas

**“Wastewater: tomorrow a resource rather than a problem
- Rationale for a shift in thinking” (Malin Falkenmark)**

Wastewater --- opportunity

Wastewater reuse

Involves: **direct** use of **untreated** wastewater; **indirect** use (diluted wastewater); **direct** use of **treated** wastewater; **planned** wastewater reuse; **unplanned** wastewater; **controlled** or **uncontrolled** wastewater reuse

Wastewater reuse Advantages

- **Reliable source of water (not seasonal)**
- **Nutrient content; reduce of demand of chemical fertilizers**
- **Contribution to food production; food security**
- **Economics gain**
- **Many direct and indirect beneficiaries in the chain (farmers; transporters; vendors; processors; inputs suppliers; consumers)**

Wastewater --- opportunity

- **Cost-recovery/ income generation**
- **Food security**
- **Environmental benefits/
ecosystem services**
- **Social benefits**

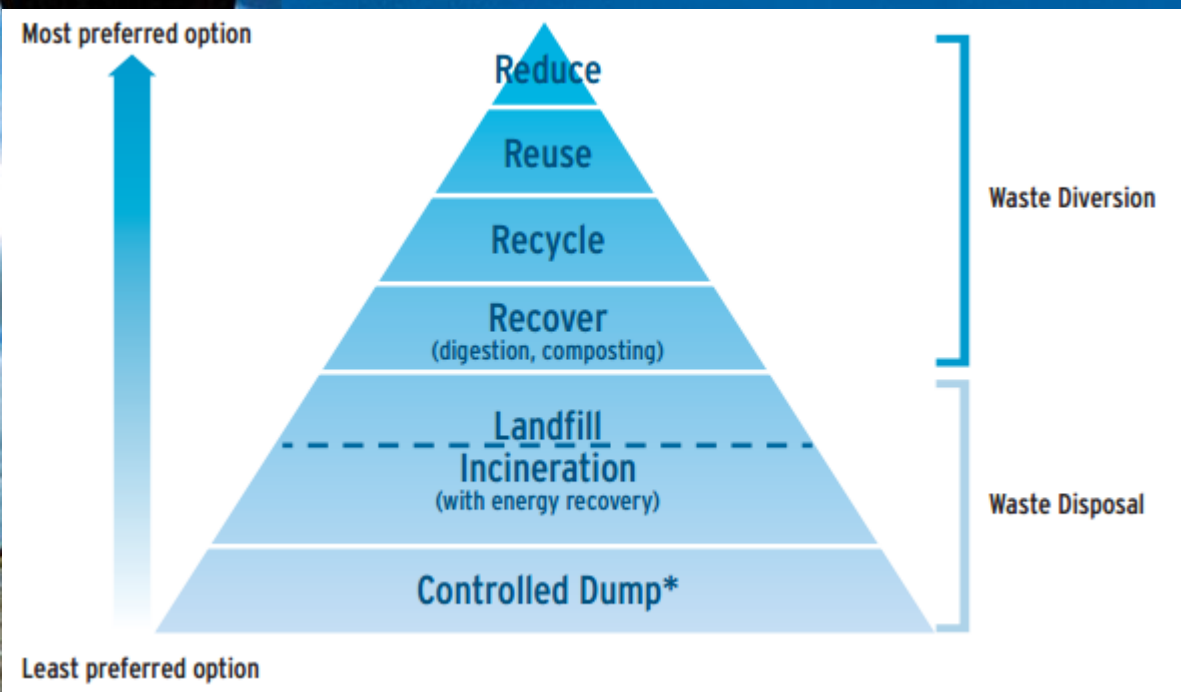
Worldwide

**Informal, private,
Traditional, modern, ...**

**Informal waste pickers at scattered collection
points**

Urban and peri-urban agriculture ...

Several options....



Reduce: reduce the amount

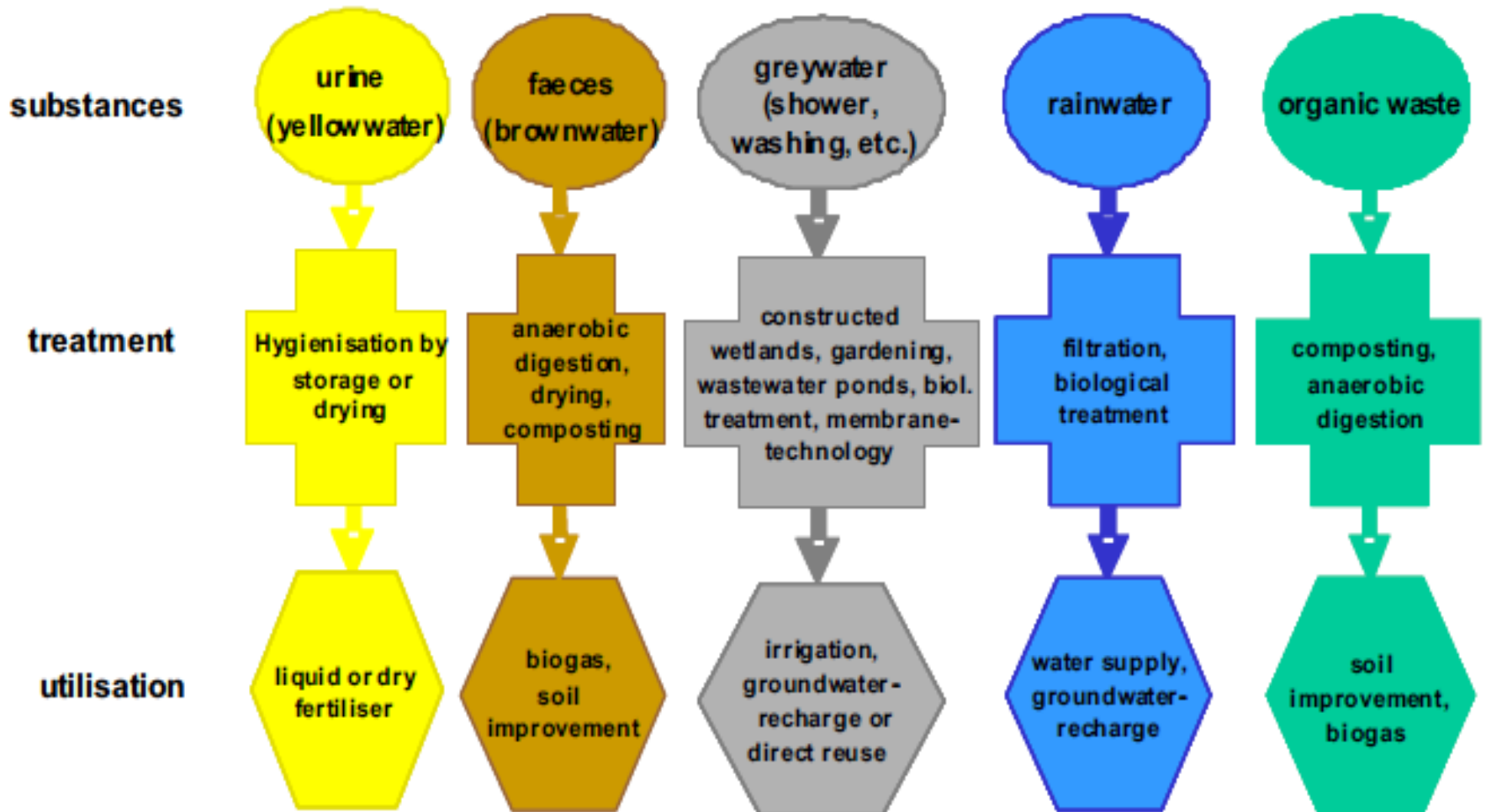
Reuse : someone's waste used else

Recycle: use in another way or process

Recover: handle, keep, clean, transform, improve, return to the economy

- Many other R's: reduce, reuse, recycle, recover, repair, rethink
- Repair: take old and little defected things and repair them
- Rethink: environmentally sound management of waste

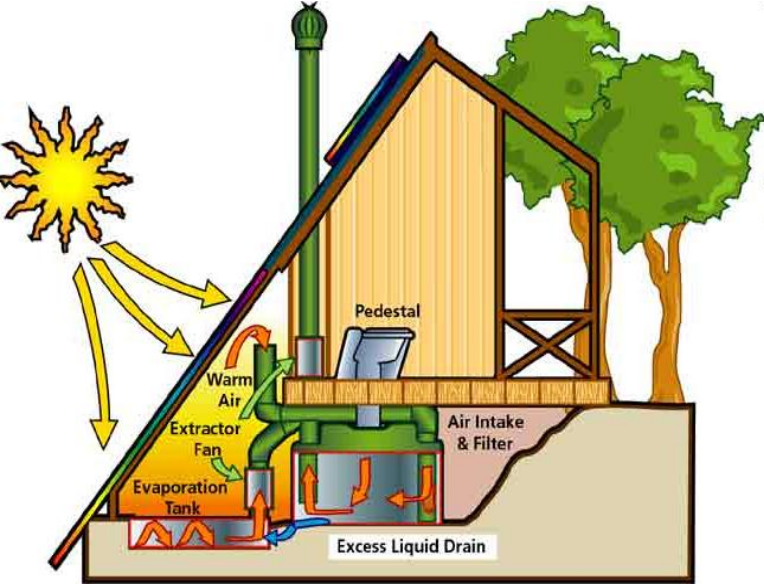
Ecological Sanitation (EcoSan) Stages (or Phases)



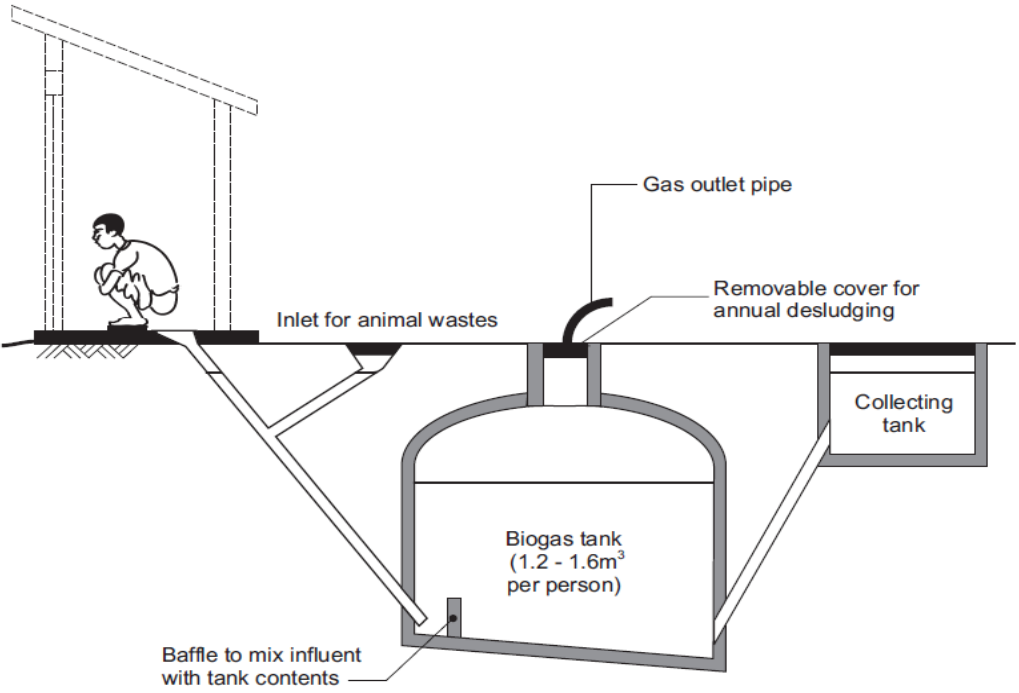
Waste segregation and possible utilization options. (UNESCO/IHP & GTZ, 2006)

Composting Toilets

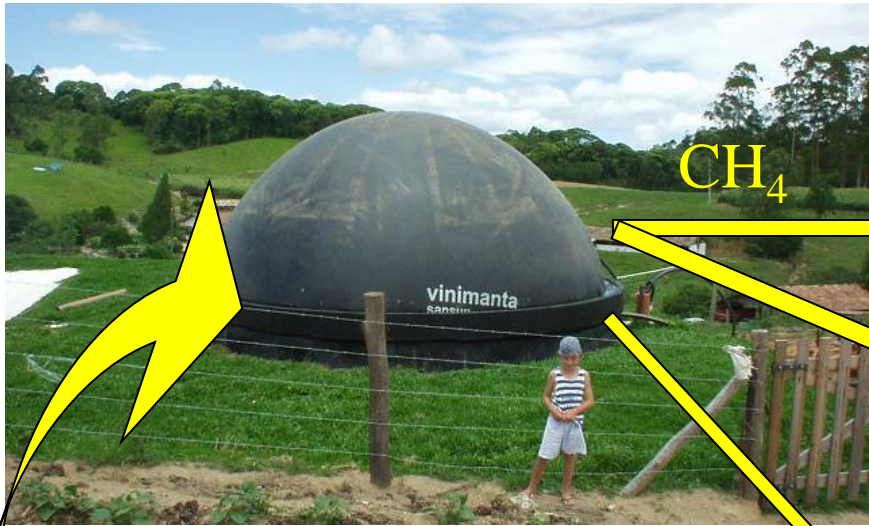
- A composting toilet system contains and processes excrement, toilet paper, carbon additive, and sometimes, food waste.
- As a nonwater-carriage system, a composting toilet relies on unsaturated conditions where aerobic bacteria break down waste.



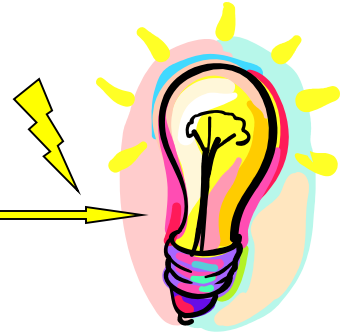
Biogas Digester



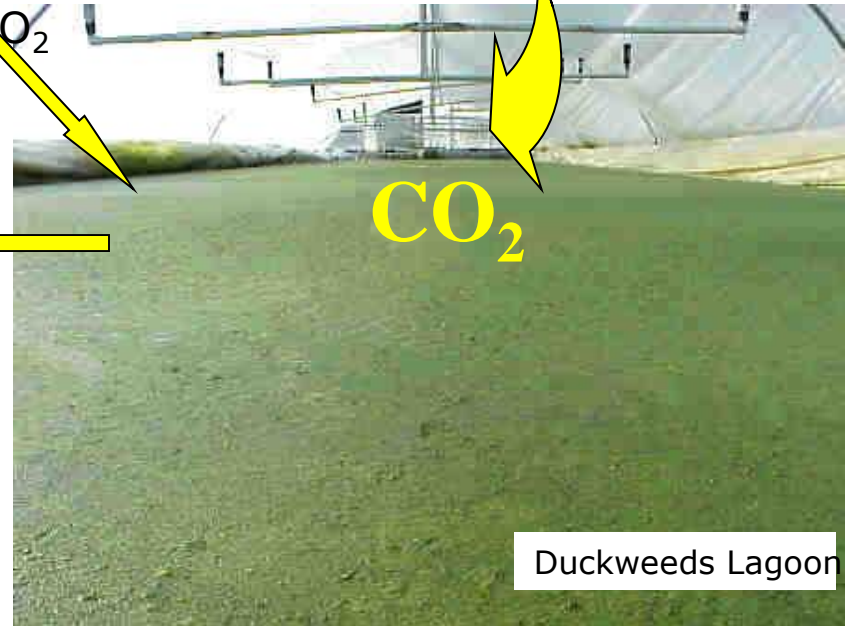
Integrated approaches....



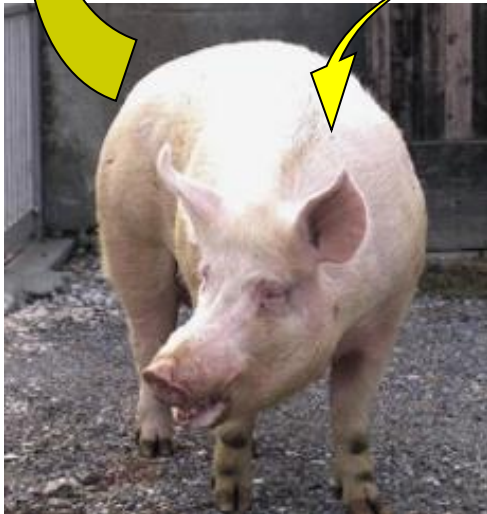
Electricity generator by Biogas



Methane Combustion = CO_2



Swine waste



Food

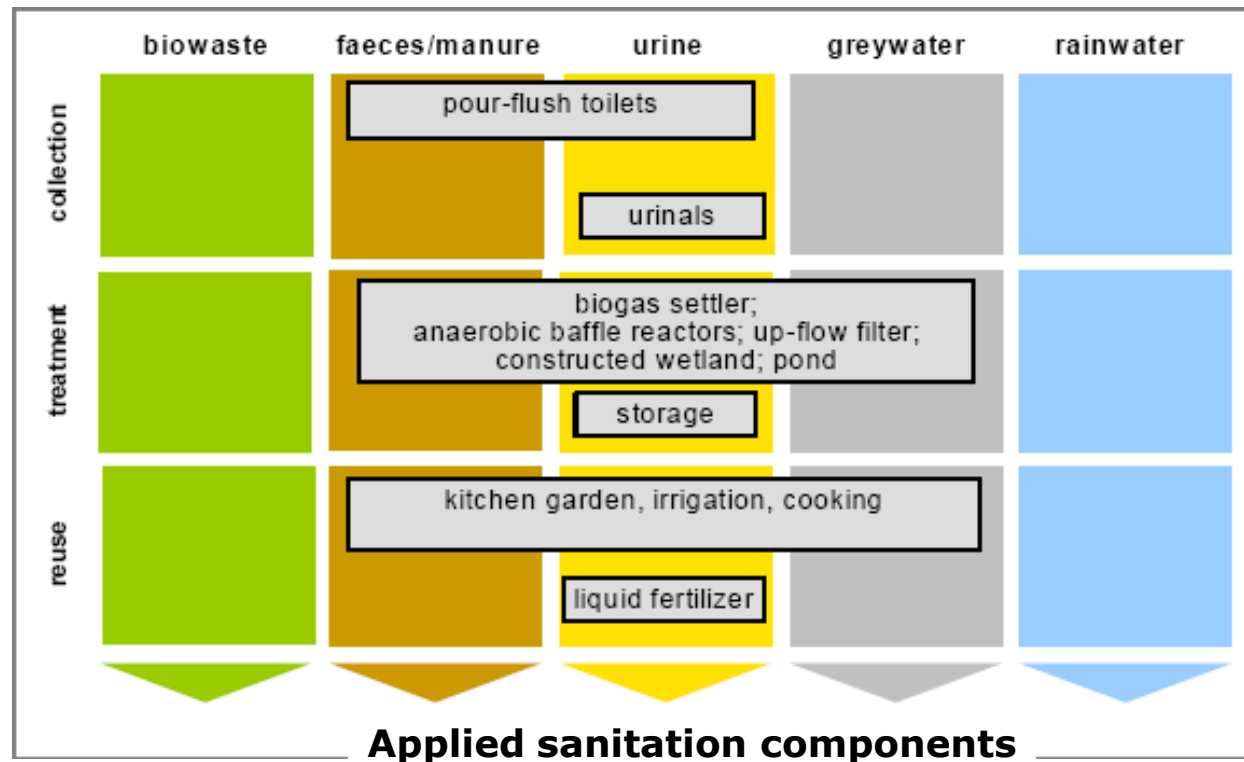


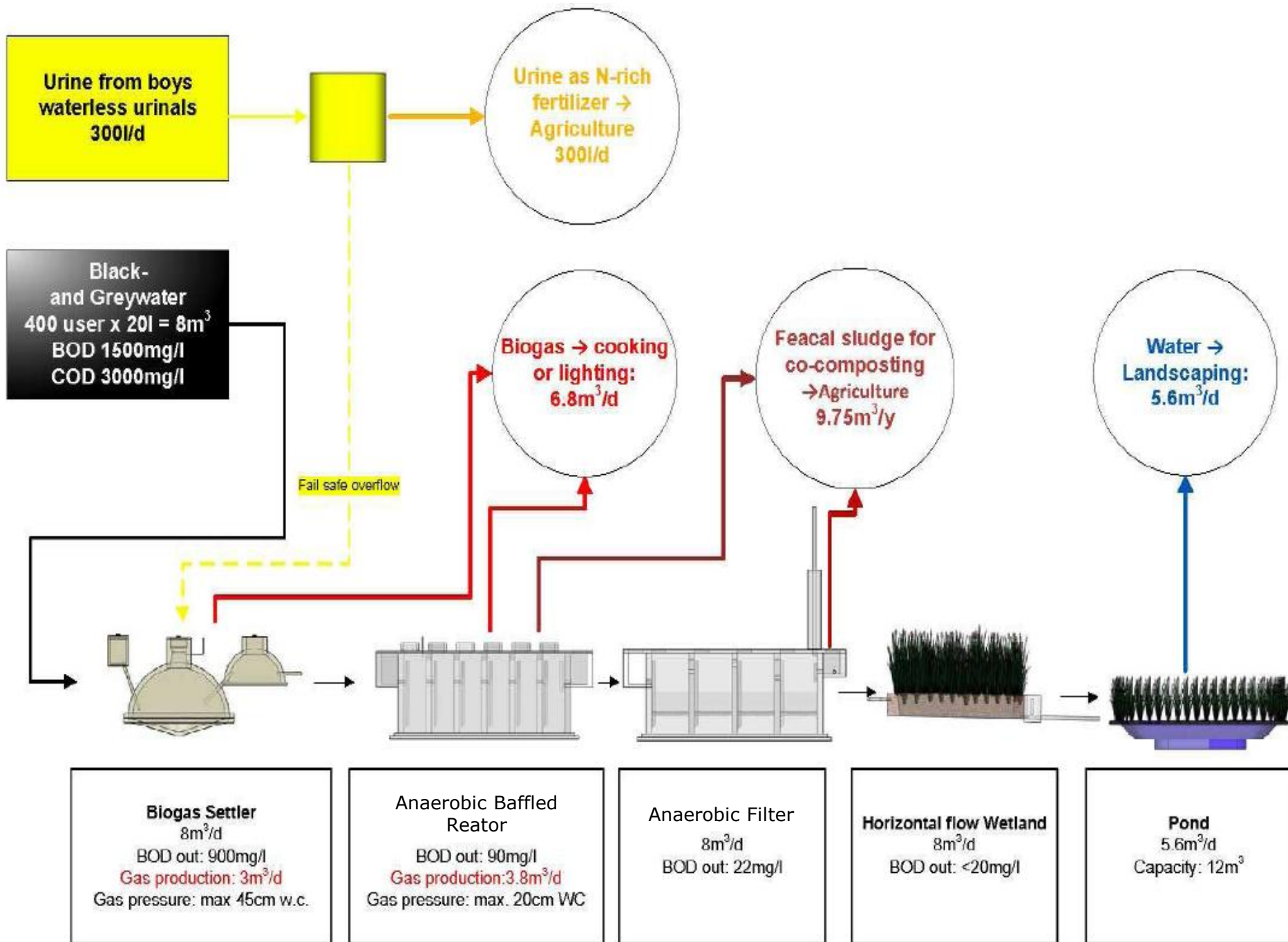
Some examples.....

Decentralized Wastewater Management at Adarsh College - India

This School Project is a Pilot Project demonstrating alternative decentralized sanitation solutions to the Badlapur Municipality Council. The Council plans to replicate the concept in other areas after evaluating the findings of decentralized reuse-oriented school sanitation project.

The number of students attending Senior and Junior College is about 1,400 and 1,200 per day, respectively.







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Some pioneers....

- Potable water use.....Namibia, Singapore
- Groundwater recharge.....Iran, Namibia
- Irrigation.....Israel, many african countries
- Industrial reuse.....UK
- Energy production.....India



- Better wastewater management at the local and national levels needs updated national data and wastewater management strategy and national and local levels
- Wastewater is a valuable resource that needs:
 - Implementation of collection, treatment, and regulated use of treated wastewater
 - Monitoring systems and implementation of WHO guidelines
 - Skilled human resources and institutional capacity
 - Pertinent and flexible policy frameworks



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Thank you for your
attention



Photo, Bay de Hann, Senegal