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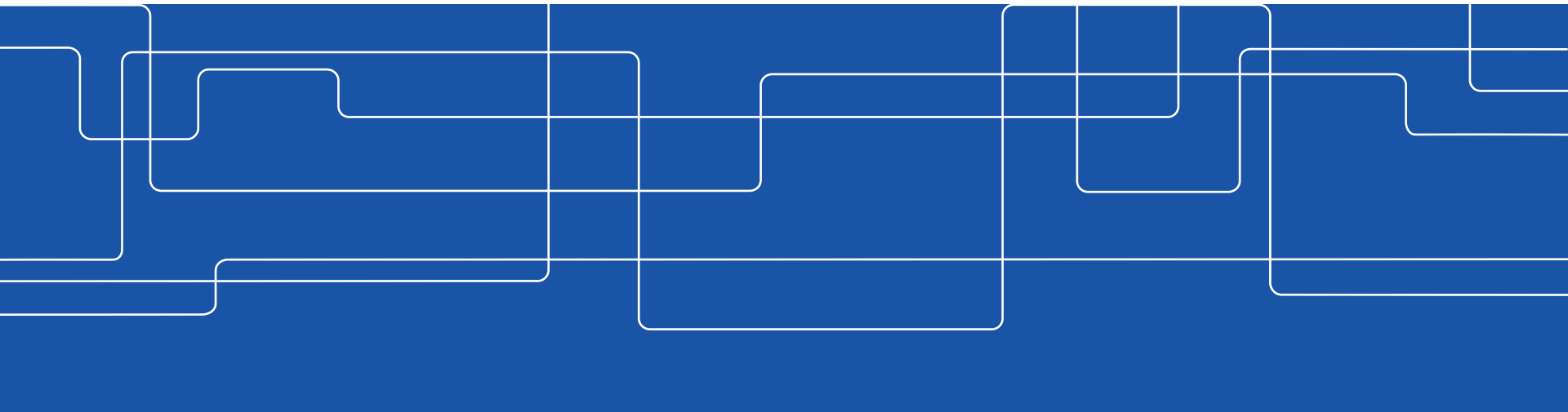
Water, Sanitation, and Hygiene: A Development Challenge

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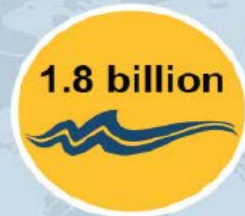
Water & Sanitation - Key Facts



Empowered lives.
Resilient nations.



800 million
Number of people without access to an improved water source



1.8 billion
Number of people that use a faecally contaminated water source



40 billion
Number of hours per year spent by women and girls in sub-Saharan Africa collecting water



50%
Projected increase by 2050 in demand for water as countries grow and urbanize



80%
Amount of untreated waste water directly discarded into water bodies



1.7 billion
Number of people who live in river basins where water use exceeds recharge

Global Water Usage



20%
Global groundwater sources already overexploited



75%
Estimated percentage of the world population that could be living in water-stressed countries by 2025



2.5 billion
people lack adequate sanitation facilities



1 billion
people practice open defecation



\$260 billion/year
losses due to inadequate water and sanitation services

Proportion of the global population using improved sanitation in 2012

Where the challenge is greatest

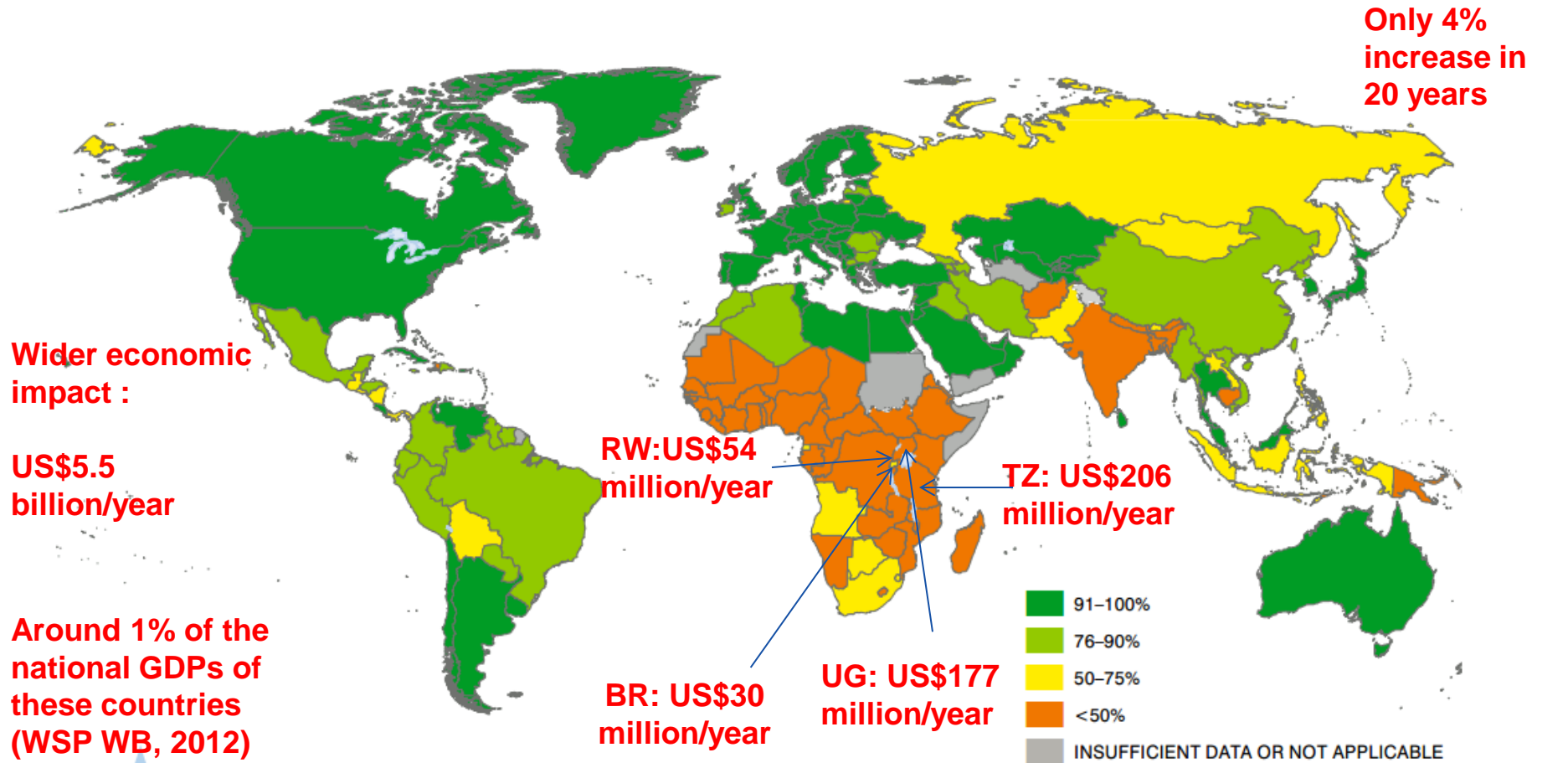
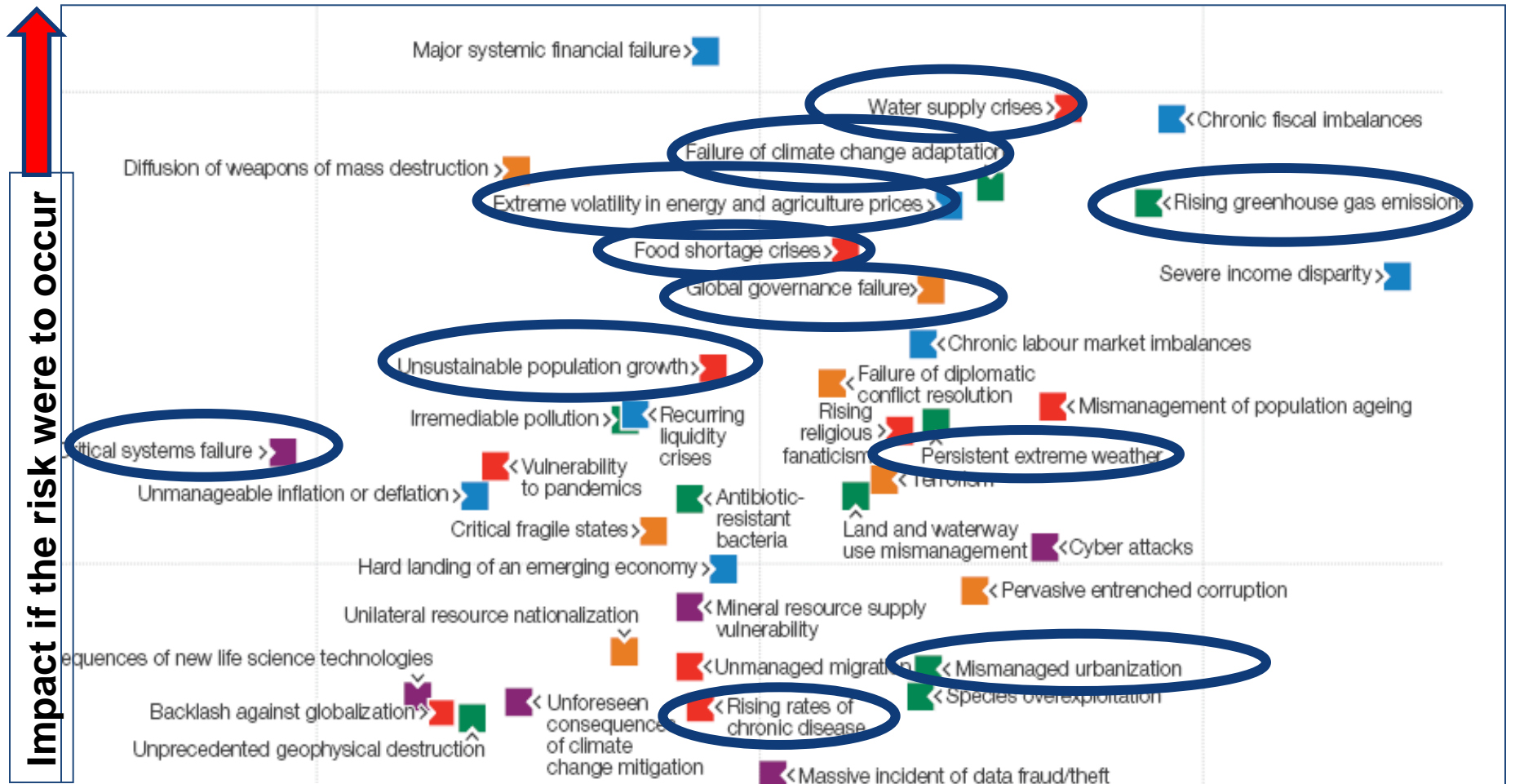


Fig.16 Proportion of the population using improved sanitation facilities in 2015

(WHO/UNICEF JMP, 2015)

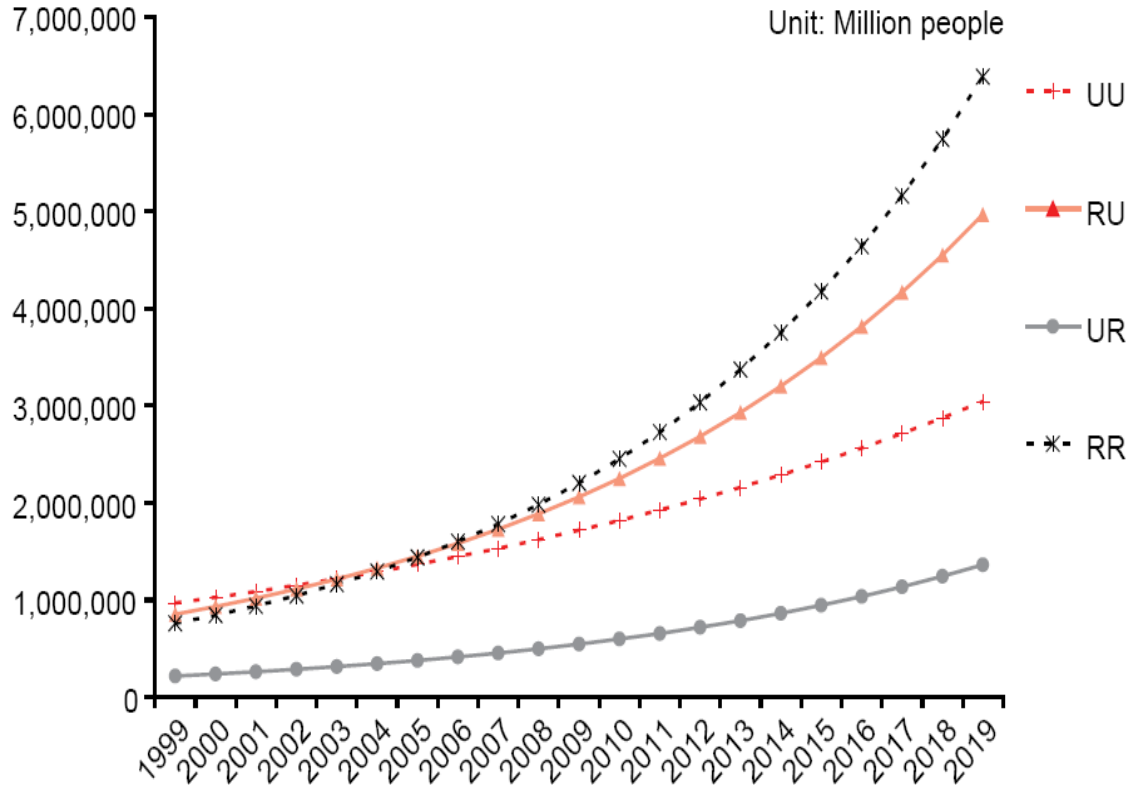
Global risk landscape



(Source: World Economic Forum)

Likelihood to occur in the next 10 years

Challenges of rapid urbanisation



**Vietnam population and housing
census, 2009**



- Adequate shelter
- Sustainable urban development needs sustainable water and sanitation services

Natural disasters

Drought

Earthquake

Epidemic

Flood

Wet and dry mass movement

Storm

Volcanoes

Living with floods

Raised houses,
Mekong region



Raised toilet, Bangladesh

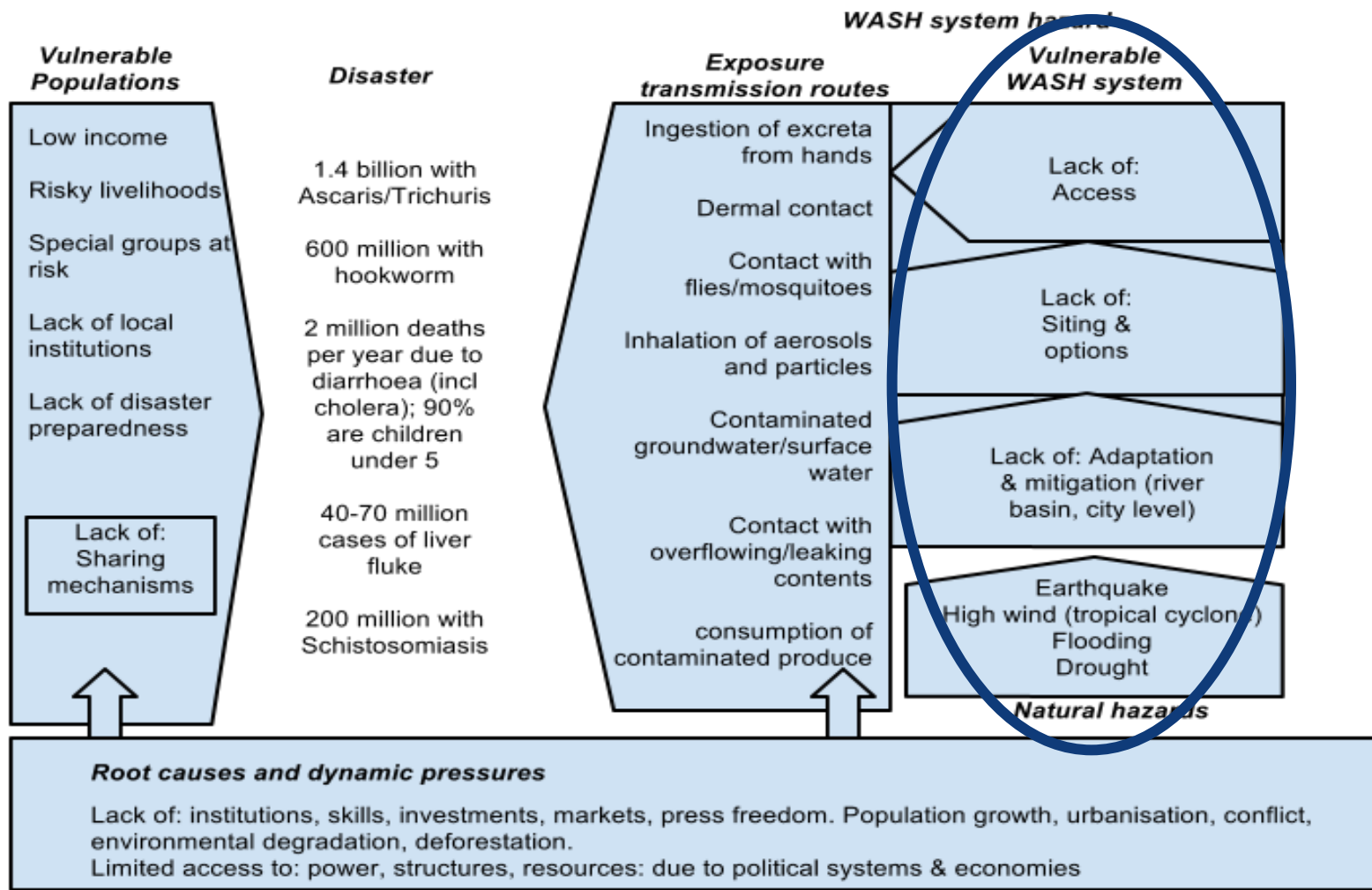
Dysfunctional systems



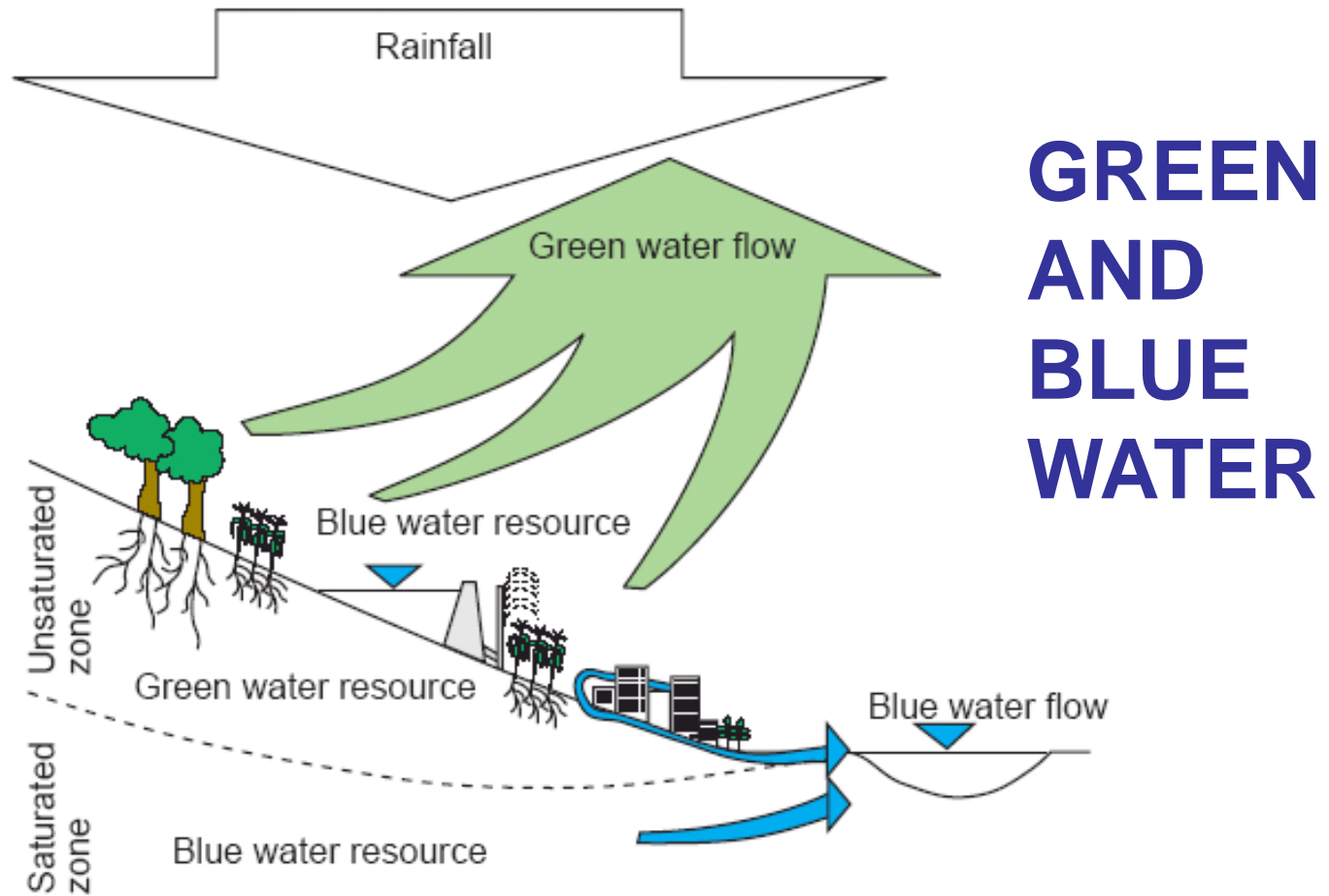
Dumping of Sludge = "Advanced Open Defecation"



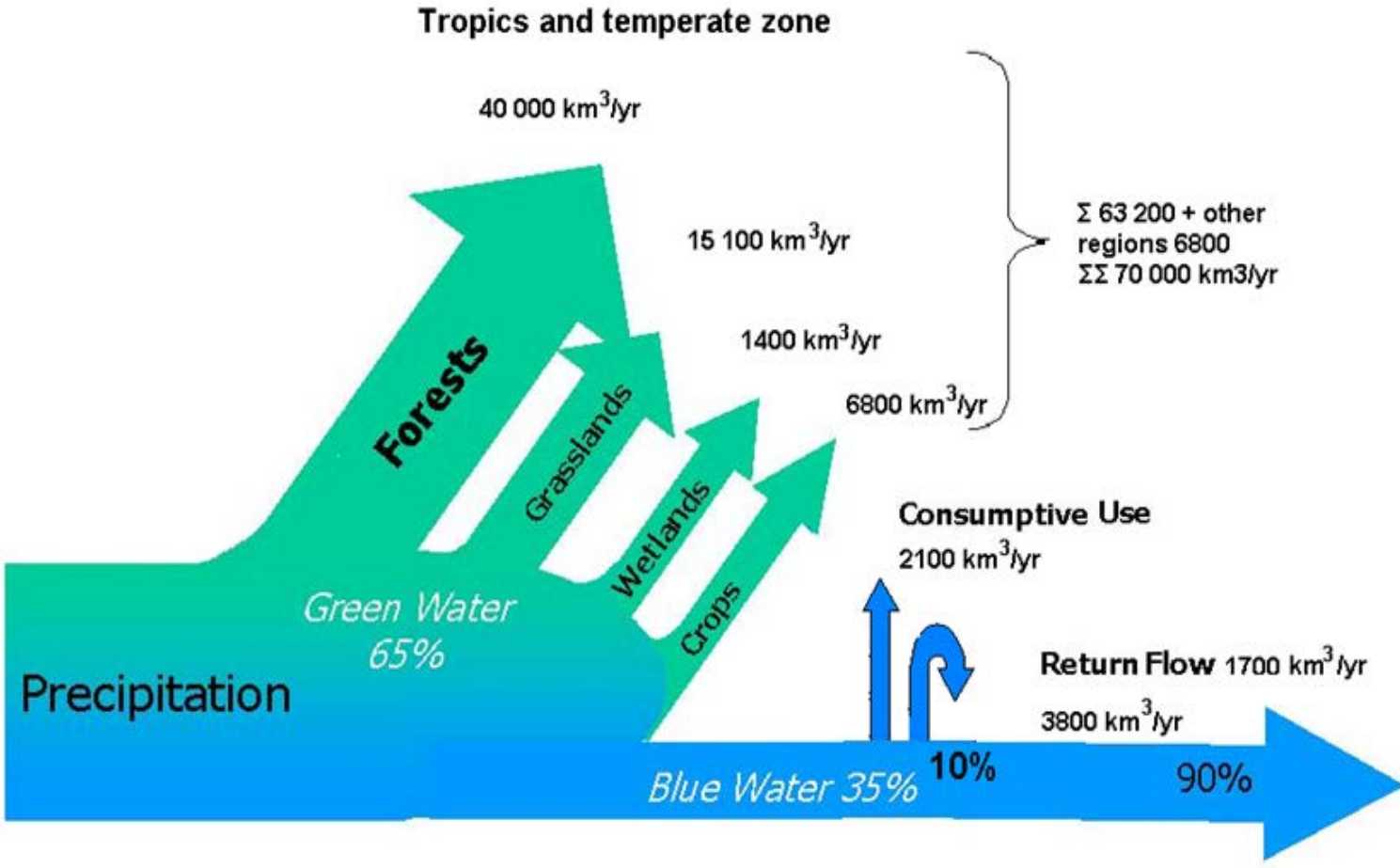
Water, Sanitation, and Hygiene and disasters



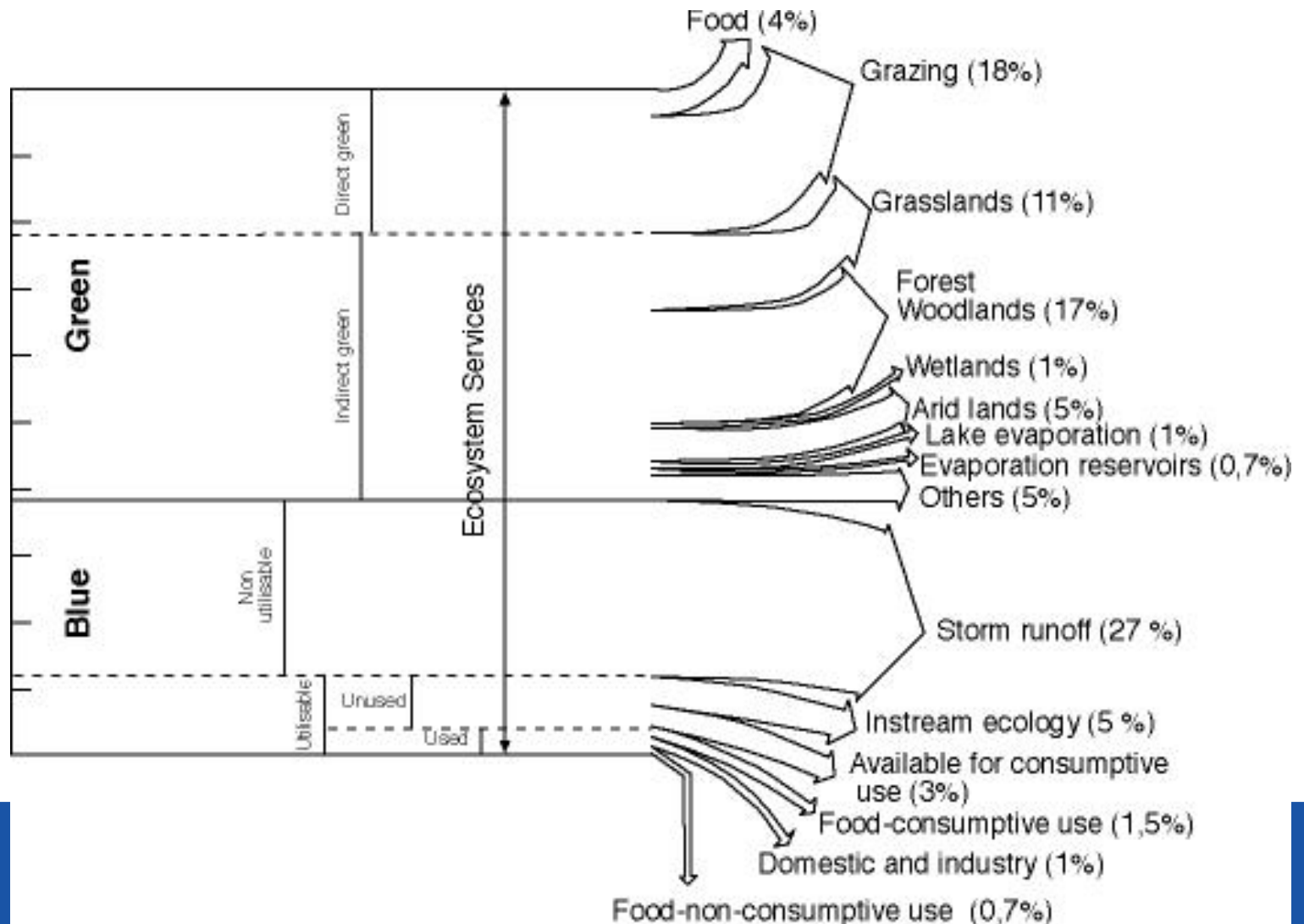
How much water is there?



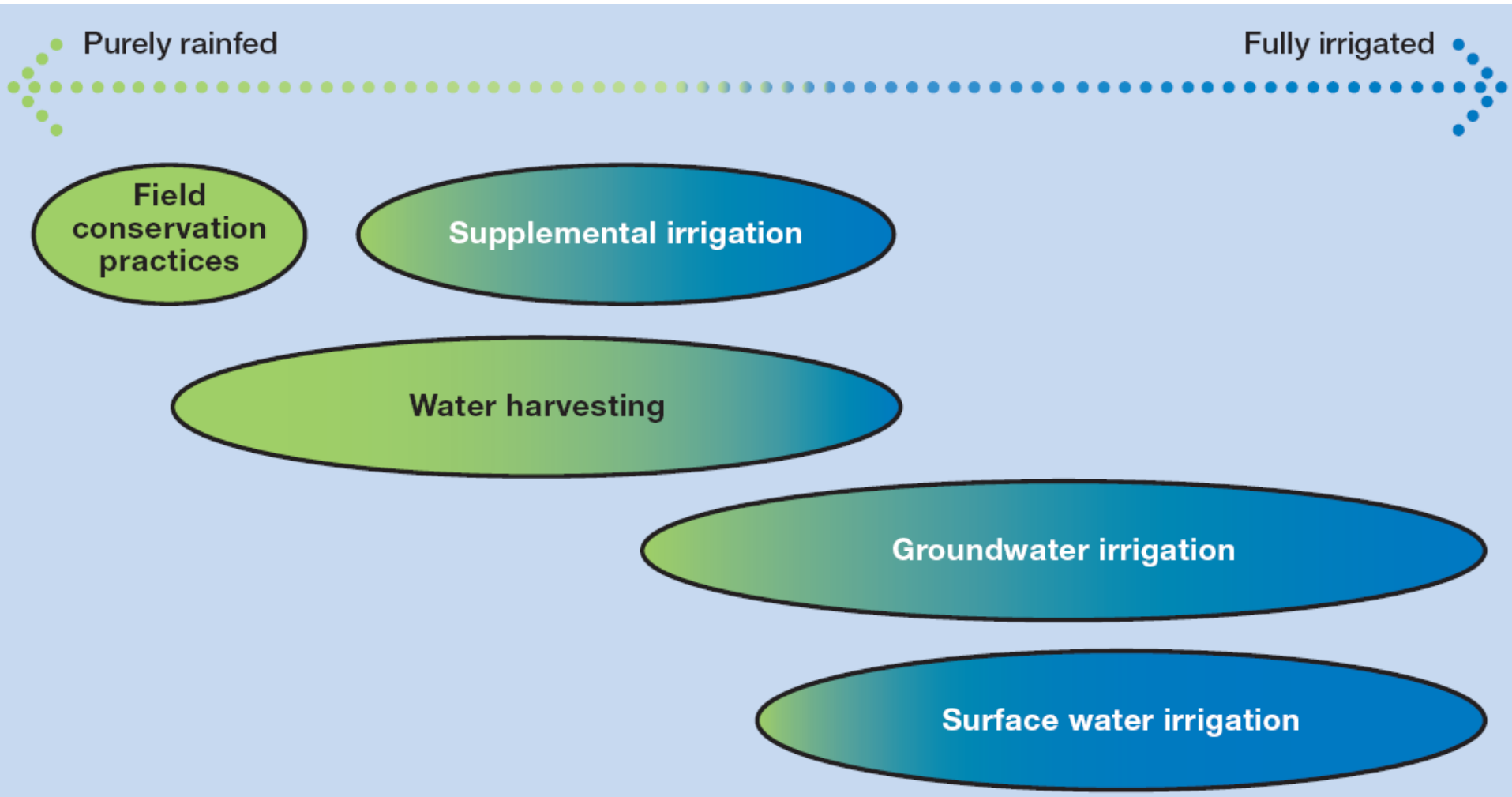
Green and Blue Water Flows



What is the water used for?



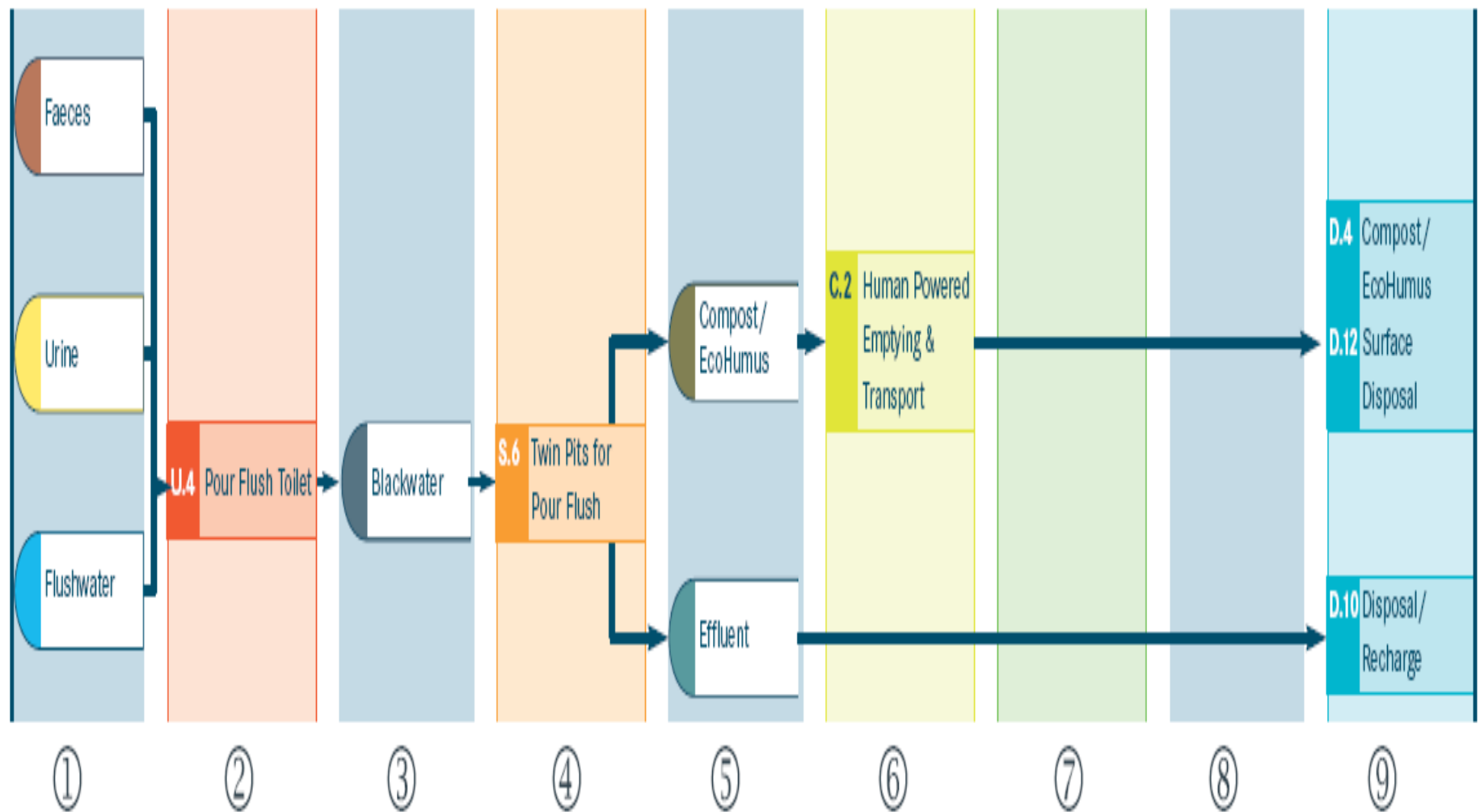
Managing water along the green – blue continuum



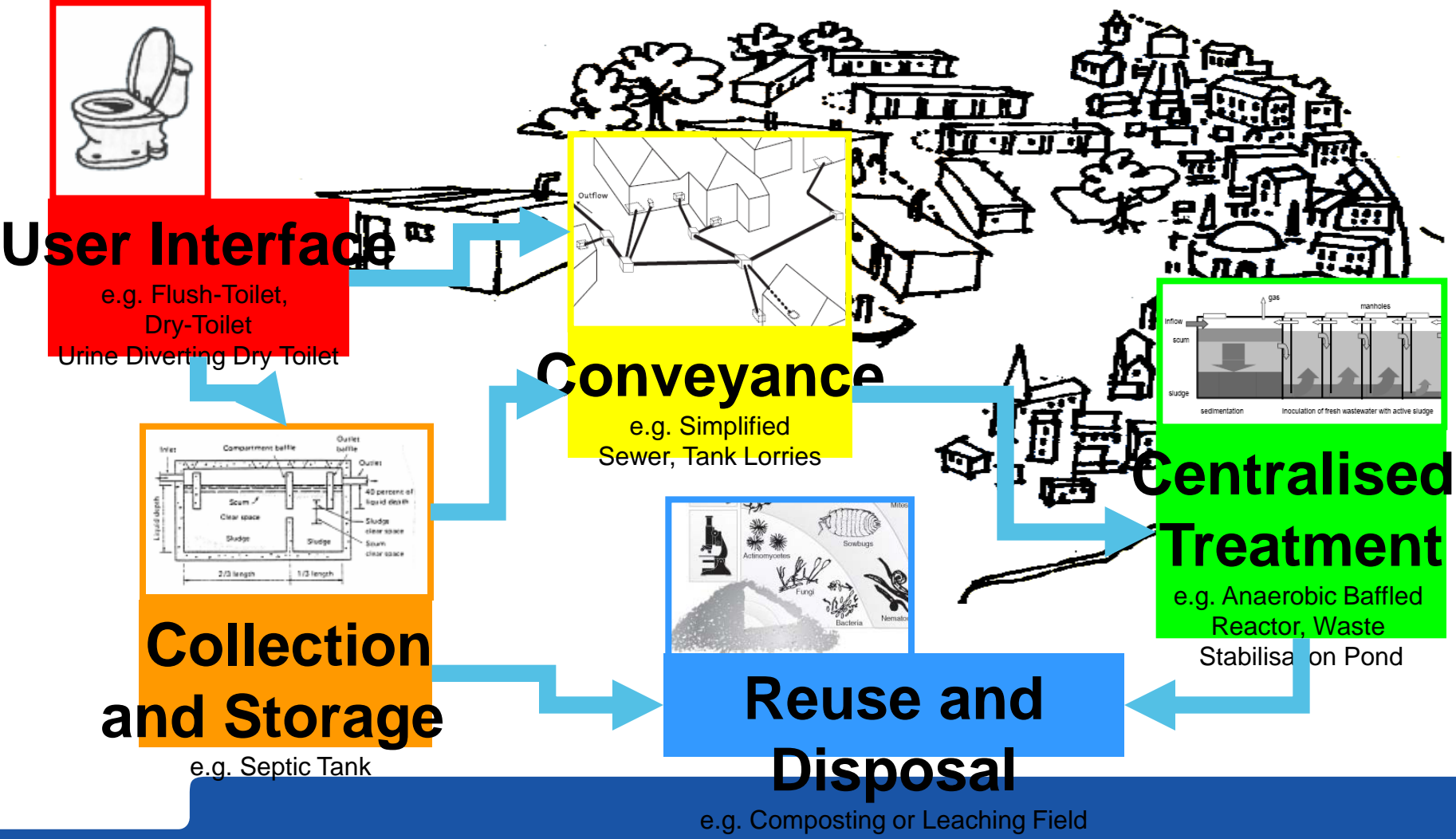
What is sanitation?

Multi-step process in which wastes are managed from point of generation to point of use/ disposal

Sanitation System

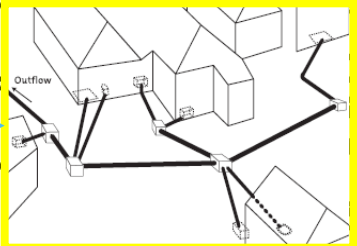


Functional Groups in a System



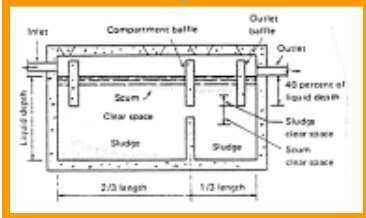
User Interface

e.g. Flush-Toilet,
Dry-Toilet
Urine Diverting Dry Toilet



Conveyance

e.g. Simplified
Sewer, Tank Lorries



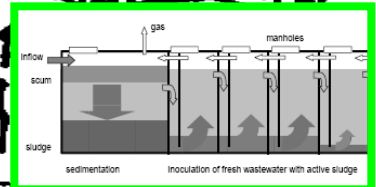
**Collection
and Storage**

e.g. Septic Tank



**Reuse and
Disposal**

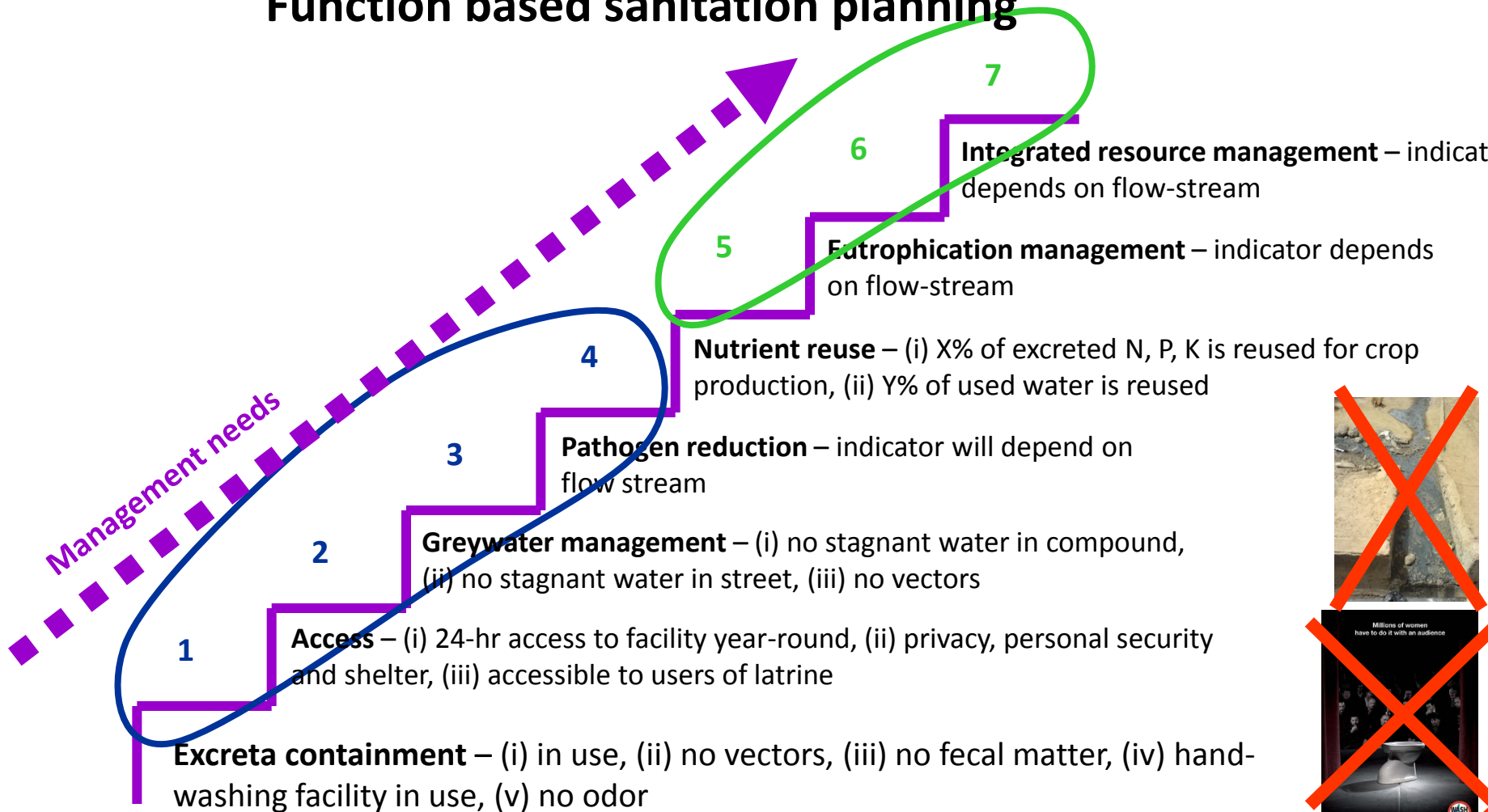
e.g. Composting or Leaching Field



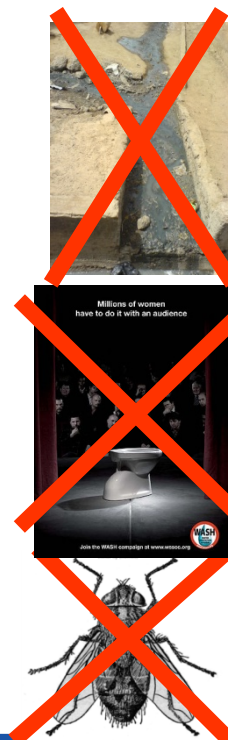
**Centralised
Treatment**

e.g. Anaerobic Baffled
Reactor, Waste
Stabilisation Pond

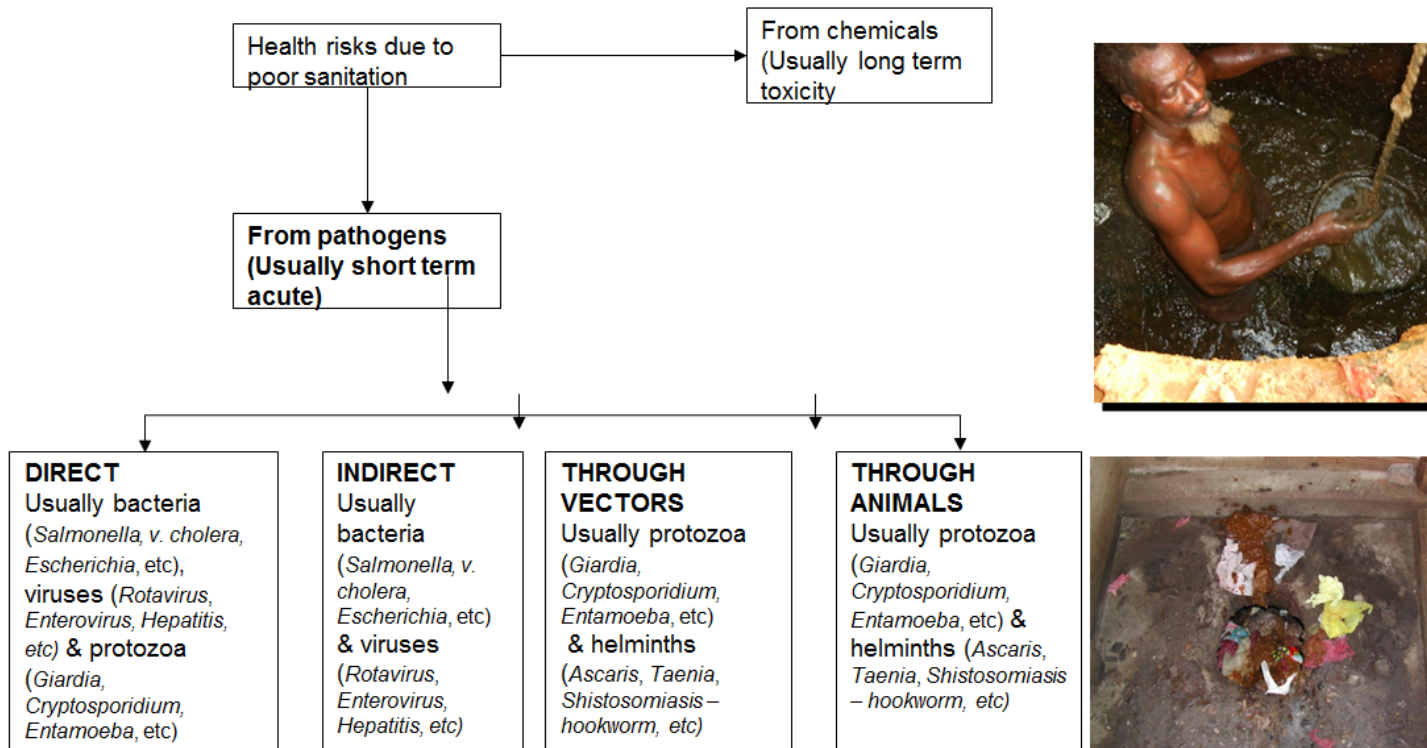
Function based sanitation planning



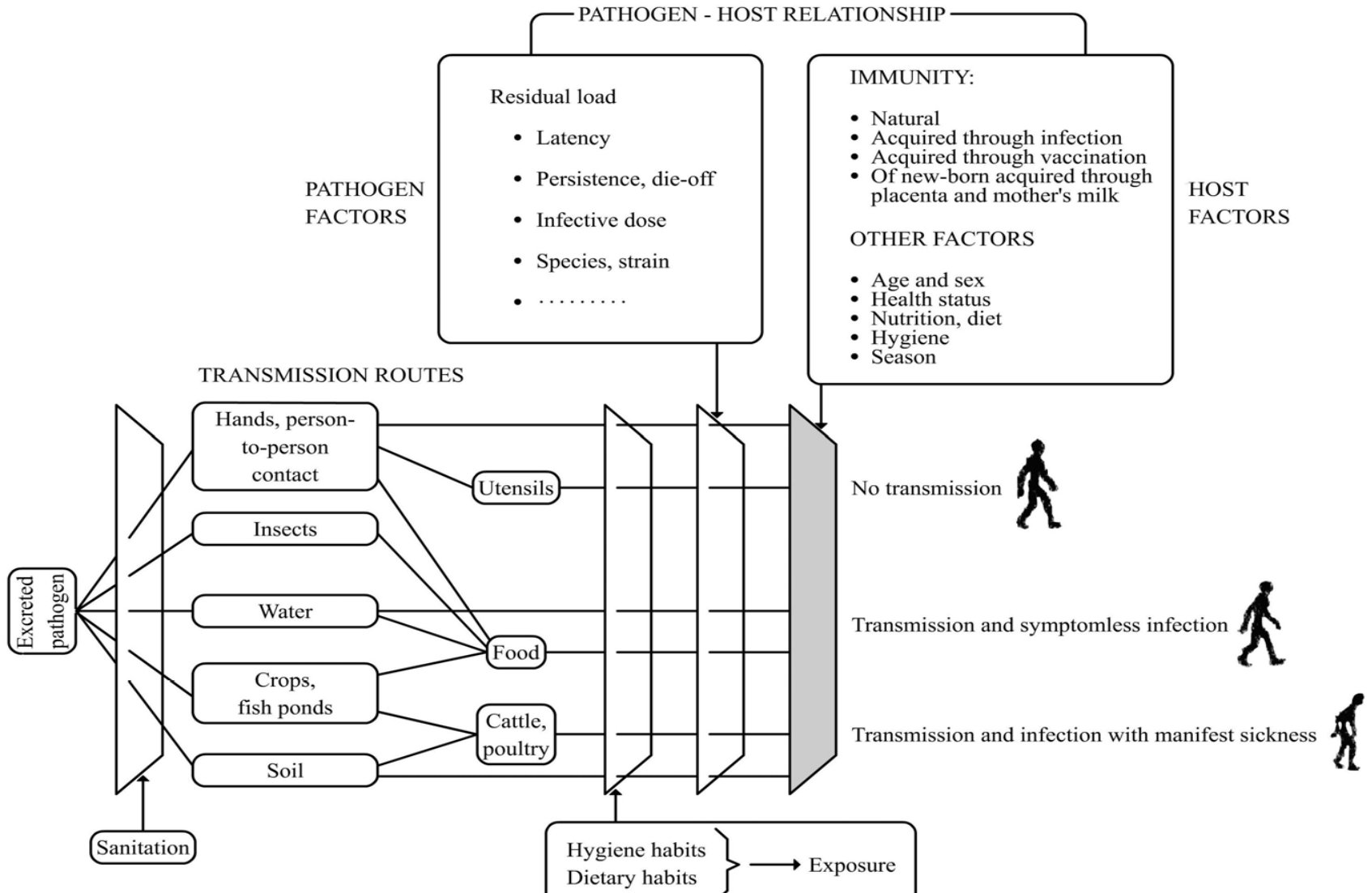
Steps 1-4 consider health aspects while 5-7 cover environmental aspects



Health implications of inadequate water and poor sanitation and hygiene conditions



Multiple barrier approach



Direct contact faeces – hand- mouth






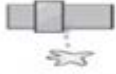



Direct contact faeces – foot
Faeces – animal – human

Water polluted - Ingestion ‘

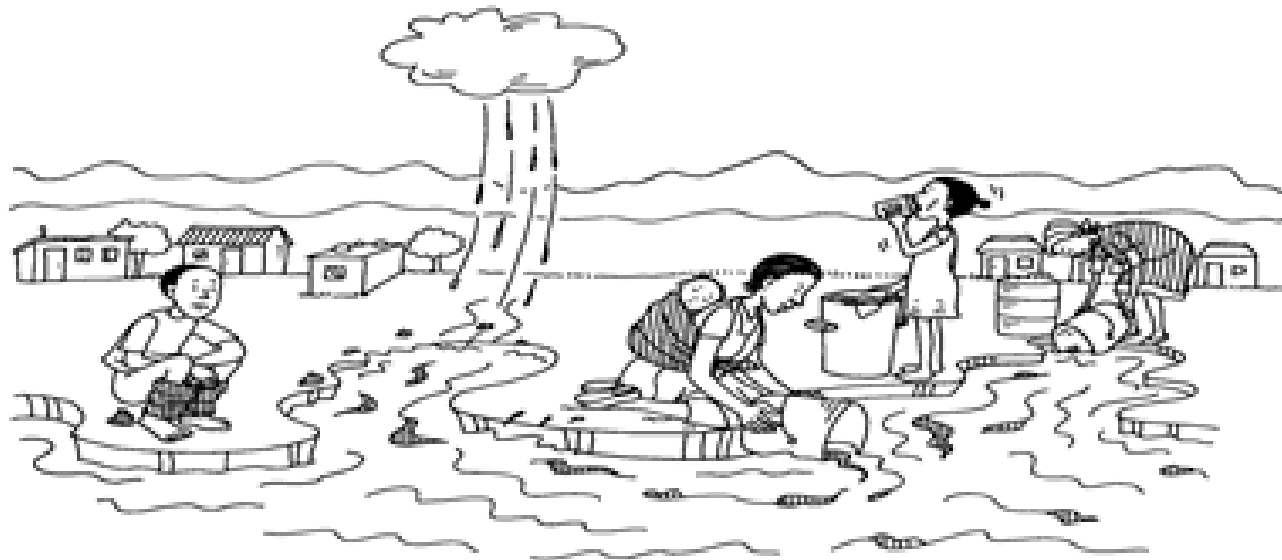
Faeces – flies – food

Faeces – air – breathing and food

Table 2: Key exposure/transmission pathways associated with sanitation technologies

Exposures	Illustration	Description
Ingestion of excreta (e1)		The transfer of excreta (urine and/or faeces) through direct contact to the mouth from the hands or items in contact with the mouth.
Dermal contact (e2)		The infection where a pathogen is entering through the skin (through the feet or other exposed body part) (Example hook-worms)
Contact with flies/mosquitoes (e3)		Includes the mechanic transfer of excreta from a fly to a person or food items. Also include bites from a mosquito or other biting insects which could be carrying a disease
Inhalation of aerosols and particles (e4)		Refers to the inhalation of micro-droplets of water and particles which may not be noticeable, but which may carry a pathogen dose and emanate from or is a result of a sanitation technology.
Contaminated groundwater/surface water (e5)		Refers to the ingestion of water, drawn from a ground or surface source, that is contaminated from a sanitation technology
Contact with overflowing/leaking contents (e6)		Refers to subsequent contact as a result of malfunction of a sanitation technology. (Example - pit or tank overflowing as a result of flooding, groundwater intrusion or general malfunction)
Falling into pit/container/escavation (e7)		
Ingestion of urine (e8)		Refers to the specific case of ingestion of urine (reference to E) from handling practices of specific technologies.
Consumption of contaminated produce (vegetables) (e9)		Refers to consumption of plants (Example lettuce) that have been grown on land irrigated or fertilized with a sanitation product or where accidental contamination is likely to occur.

We consider this: Bad Sanitation Habits



Cholera and other diarrhoeal diseases spread when people defecate near water sources.

Disease Burden

5000 - 6000 children die/day (or one child dies every 17th second) in the world due to water-borne diseases (diarrhoeal diseases)

Five times as many children die of diarrhoeal diseases as of HIV/AIDS (UNDP, 2006)

3.5 billion people are infected with helminth worm parasites. 1 billion with roundworm; 700 million with hookworm (Chan, 1997; UNESCO, 2006)

Disease burden - 60 million DALYs/years lost from diarrhea every year (DALYs = Disability Adjusted Life Years - The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability)

64 million DALYs in 2002, 44 million DALYs in 2015, 29 million DALYs in 2030 (Mathers and Loncar, 2006)



Improving water and sanitation is critical for development

MDG Goals	Linkage to environmental health/Sanitation
1	Healthy environment means healthy people; Improve livelihoods; breaks cycle of poverty/ill-health
2	Reduction in diarrhoeal diseases hence increased attendance and participation in school. School sanitation is an important determinant of girls' attendance
3	Women are more vulnerable to environmental health risks; interventions improve women's lives; increased participation
4 & 5	Reduce <5 mortality and risk of maternal mortality
6	Preventive health measures are more cost-effective than health treatment
7	Health measures such as sanitation contribute to MDGs directly
8	Cooperation between UN agencies and governments in promoting and providing sanitation and in the context of security, development, law and human rights, democracy and gender issues.

MDG 7, Target 10

Goal 7

Ensure environmental
sustainability

Target 10

By 2015, halve the proportion of people without sustainable access to safe drinking water and basic sanitation

Sustainable Development Goals (SDGs)



Sustainable Development Goals (SDGs)

Global goals, targets and indicators for drinking water, sanitation and hygiene

WASH SECTOR GOAL	SDG GLOBAL TARGET	SDG GLOBAL INDICATOR
Ending open defecation	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation , paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Population practising open defecation
Achieving universal access to basic services	1.4 By 2030, ensure all men and women, in particular the poor and vulnerable, have equal rights to economic resources, as well as access to basic services...	1.4.1 Population living in households with access to basic services (including basic drinking water, sanitation and hygiene)
Progress towards safely managed services	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Population using safely managed drinking water services
	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Population using safely managed sanitation services 6.2.1 Population with a basic handwashing facility with soap and water available on premises

Relationship between the 'political' and society

Supranational policies

Macro-level

**Political leadership, policies,
institutional reforms**

Meso-level

**Coordination, communication,
M&E, enforcement mechanisms**

Micro-level

**Household/community
perceptions, preferences,
aspirations, barriers, and
incentives**

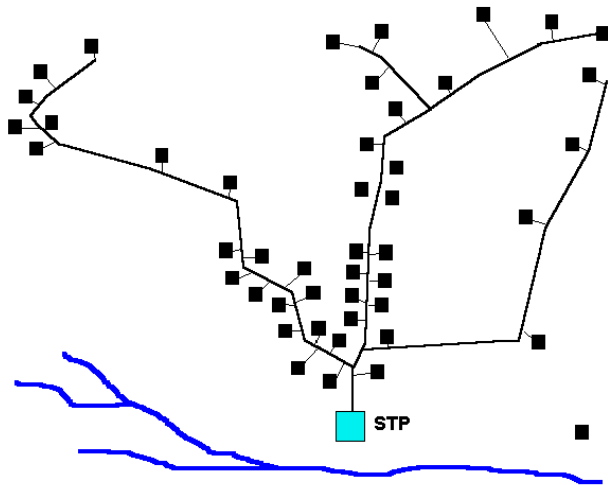


**Complementarity and/or
contradiction between
policies and practice**

A paradigm shift in waste management

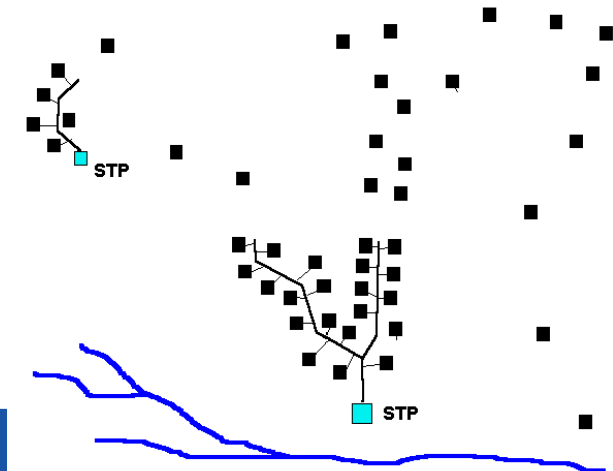
Conventional wastewater/excreta management

- Not affordable
- Big investment
- Leakage
- Difficult reuse
- Limited participation



Decentralized wastewater/excreta management

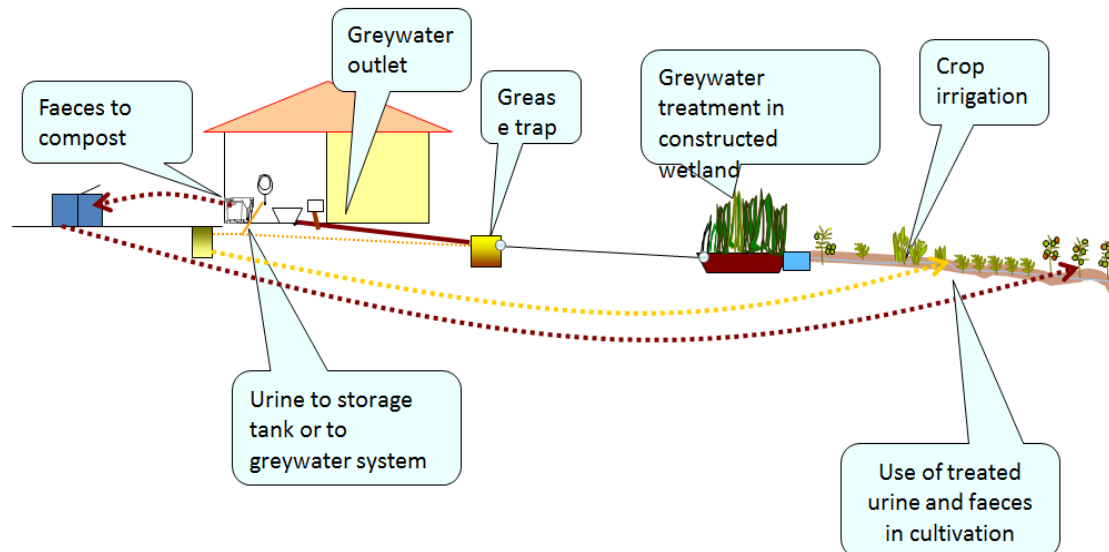
- More affordable
- Less investment and O&M costs
- On-site reuse of water and nutrients
- Encouraging participation
- Low-cost technologies
- Systems approach



Safe excreta and wastewater management systems

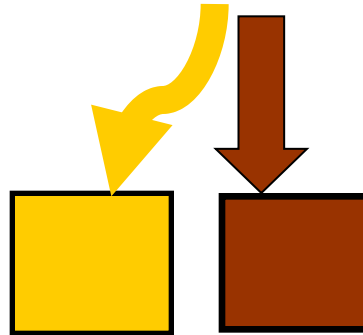


Example of system with Urine Diversion Dry Toilet (UDDT) and greywater management



NO MIX: URINE DIVERSION

– why separate urine and faeces?



- Easier to treat and handling separately
- Less odors
- Less flies
- High degree of nutrient retention

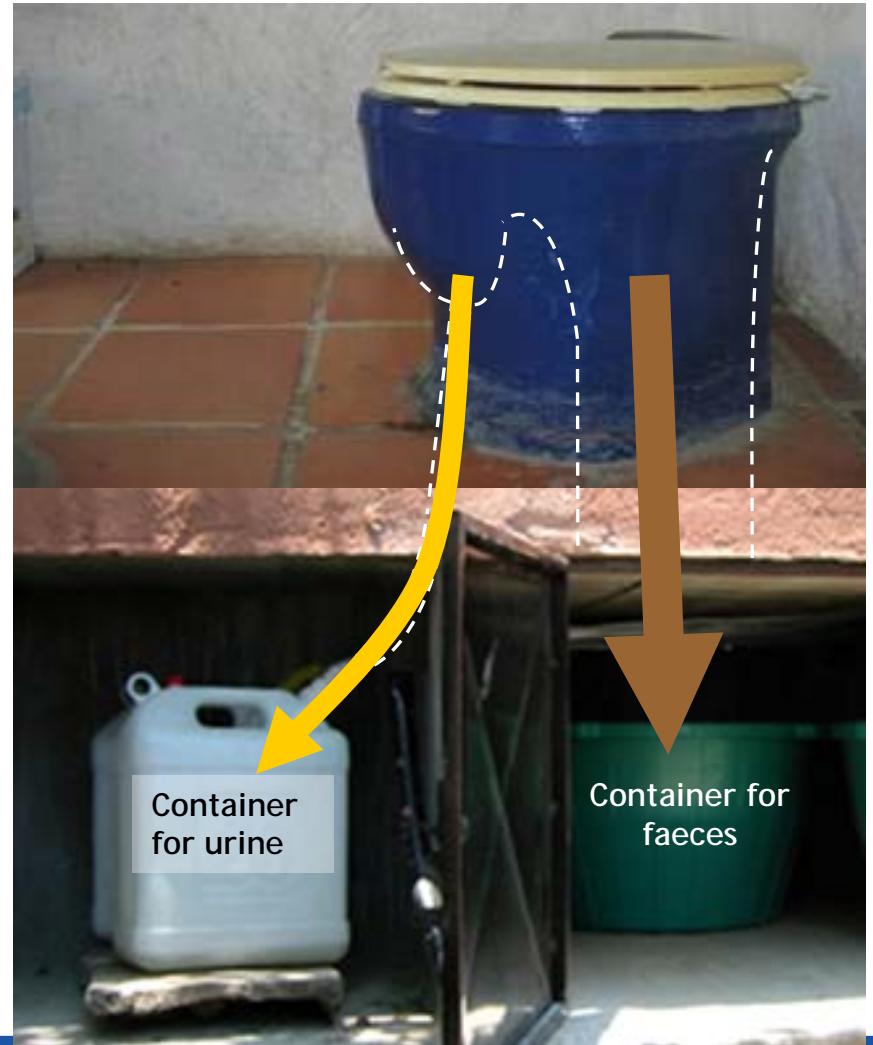
Urine Diverting Dry Toilet (UDDT) - Single vault with containers



Squatting model



Pedestal model



Urine Diverting Dry Toilet (UDDT)

- Double vault toilet

FAECES



URINE



Urine collection



Jerry can (20L)



Single-household tank (1m³)



Closed storage during 30-45 days



*Multi-household tank (2m³)
Emptied 2-3 times/year*

What first comes to your
mind when you see these?

Picture 1



Picture 2



Picture 3



Picture 4



Picture 5



Picture 6



Picture 7



Picture 8



Picture 9



Picture 10

