Use of Excreta Nutrients – Opportunities and Knowledge Gaps

Photo: Peter Morgan

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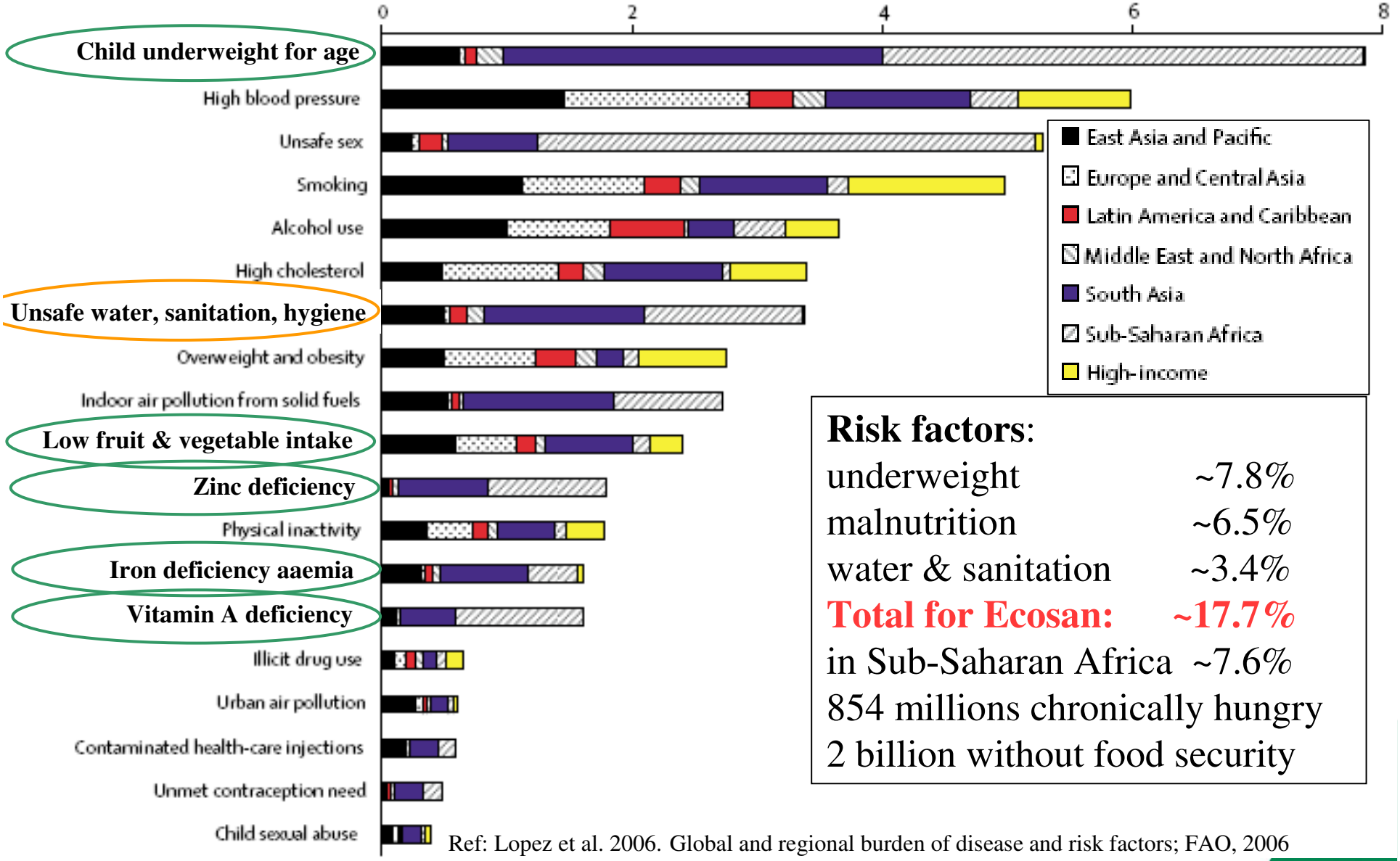
Global risk factors for disease and premature deaths (% of DALYs)



Risk factors:

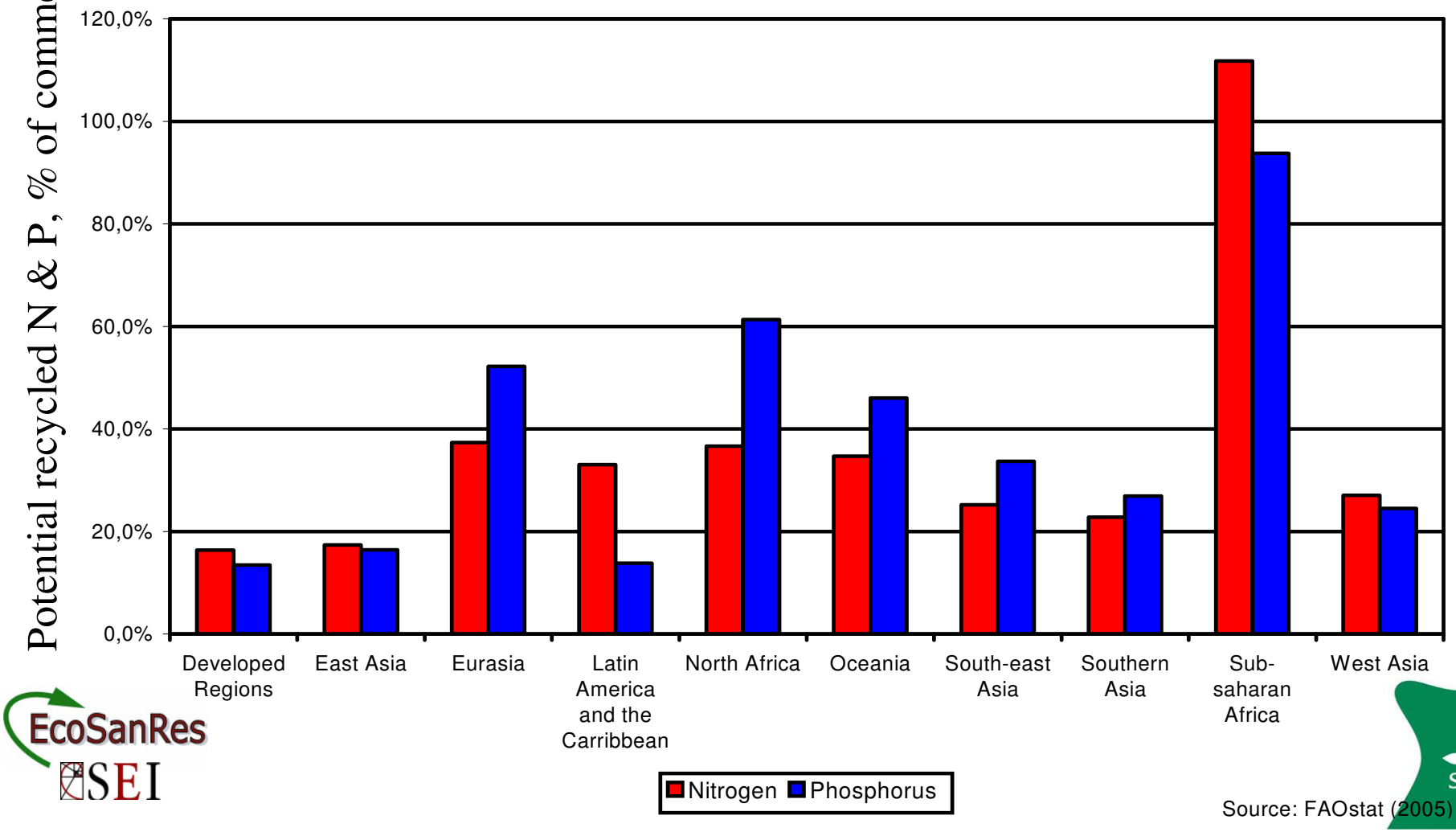
underweight	~7.8%
malnutrition	~6.5%
water & sanitation	~3.4%
Total for Ecosan:	**~17.7%**
in Sub-Saharan Africa	~7.6%

854 millions chronically hungry

2 billion without food security

Ref: Lopez et al. 2006. Global and regional burden of disease and risk factors; FAO, 2006

Potential recycled N & P as % of used commercial fertilizers



Source: FAOstat (2005)

Also the most poor excrete!
Nutrients can pay for the toilet

Ecological Sanitation – an (un)affordable option (D. Mara, April 2005; H. Jönsson et al., June 2005 in Water 21)

- Pour flush toilet 1900 INR
- EcoSan toilet 4200 INR
- Present value during years 2-10: 5070 INR!
  - Excretion by 6 person family (= 4 grownups)
    N 18.2 kg/yr, P 2.3 kg/yr
  - Value 880 INR/year – 2005 prices!
- Leverage fertilized products! Fertilizer valued 4000 CF/person, yr gives additional maize crop worth 27500 CF/yr (Dagerskog, pers. com.)
- **Can promote toilet as investment, pay-off in productivity (health and crop production)**

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Good examples needed!

- Ecosan in Kabale, promising example.
- Arbor Loo promising – toilet with reuse even cheaper than conventional toilet
- **Enter your case study on successful reuse on www.susana.org**

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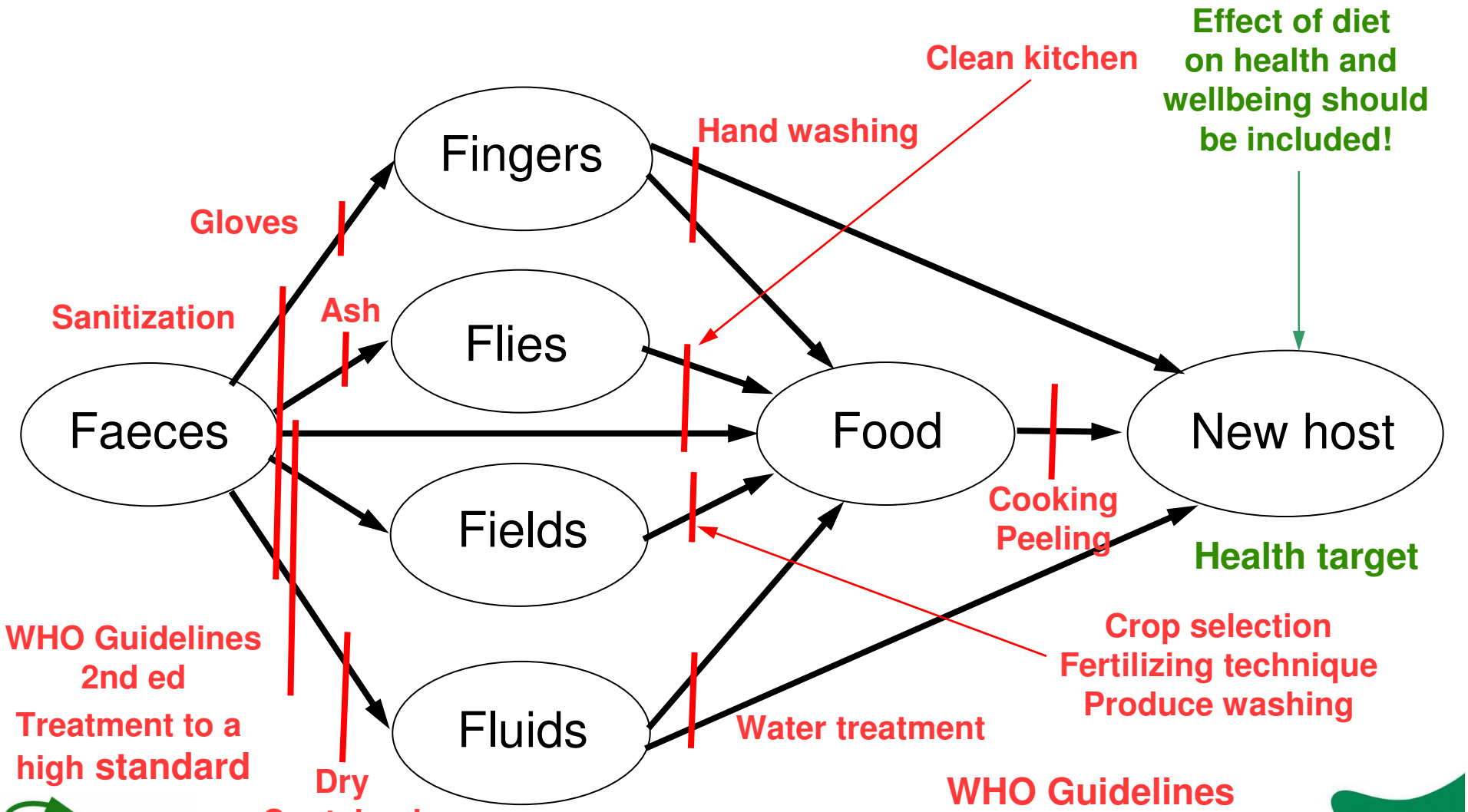
WHO guideline – new opportunity



Monitoring and assessment

1. Identifiction of best practice

   System description – critical steps – total assessment

2. Operational monitoring
3. Verification of full system

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Identification of best practice
Example: barriers in wastewater irrigation (IWMI, 2006)

Control measure	Reduction (logs)	Notes
Wastewater treatment	1-6	
Localized irrigation (low crops)	**2**	**Root crops, crops grown above, partially in contact with the soil**
Localized irrigation (high crops)	**4**	**Crops where harvested part is not in contact with the soil**
Pathogen die-off	0,5-2 per day	Die Die-off on crop surfaces; between last irrigation and consumption. Depends on climate (temperature, sunlight), crop type, etc.
Produce washing in water	1	Washing salad crops, vegetables and fruit with clean water.
Produce peeling	2	Fruit, root crops
Produce cooking	6-7	Immersion in boiling or close-to to-boiling water until ensures destruction.destruction.

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Knowledge gap - barriers in source separation systems

Control measure	Notes
Urine storage	**Die-off at different temperatures, pH and concentrations known**
Faecal composting	>50°C, >1 week (WHO, 2006), but thermal composting of faeces with lots of ash/soil requires skill
Ammonia treatment	Die-off at different temps, pH and concentrations somewhat known
Faecal storage with ash	**>6 months, pH >9, temp >35°C or moisture <25%, (WHO)**
Faecal storage	**Other conditions, according to WHO (2006) 1-2 years at 2-20°C, but some ova may survive, >1 yr at 20-35°C.**
Simple resource efficient sanitization	**Research on worm composting, mango beetle and dung bug ongoing, as is work on solar latrines/undulating temperatures**
Withholding time 1 month	**4-6 log reduction (WHO,2006)**
Non-food crops & crops that are boiled	**Maize, sorghum, millet, wheat, cotton, energy**
Material worked directly into soil	**1 log reduction (WHO, 2006)**

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Knowledge gap – how to build cheap & sustainable UDD in urban setting

- **In-doors**
- **No smell** – even without electrical fan
- **No flies**
- No ash
- Accommodate anal washing
- Accommodate urination standing up

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System gap – wet low cost ecosan

- Goal: mass collected =urine + faeces +1 litre flush water per day ≈ 2.5 liter/p,d ≈ 800 liter/p,yr

  Contained until sanitizised

  + Water as odor lock

  + Accommodate anal washing

  + Accommodate urination standing up

  + Social acceptance

  - 2 * volume of urine – handle like urine?

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Knowledge gap – sustainable recycling system for urine, faeces, blackwater

In urban setting

– Suitable technology

– Organization

– Driving forces for actors

– Sustainable economy

– Institutional and legal arrangements

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Knowledge gap – costs benefit analysis for different ecosan systems

- Private economy
- Societal economy
- WSP study, Richard Schuen, a good start!!

Knowledge gap – effects on gender and equity

- Time saved or more work for women?
- Improved diet and economy for whom?
- Systems accommodating menstruation and pads etc.
- Economic stratification increased or decreased?

Knowledge gap – effect on food security, diet, well-being and health

- Operational monitoring -> die-off in parts of system
- Total system verification - epidemiological study
  - Effects on diet, well-being and health **MUST** be included!!

Knowledge gap – appropriate greywater treatment and reuse

- Simple, easy to maintain systems
- Preferably on-site (ownership, private sector and investment, saving on municipal capacity)

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Knowledge gap - user prioritization of sustainable sanitation

- Mobilize the users, the 2.6 million non–served – tremendous resource
- Fertilizer and toilet domonstrations
- CLTS – Community Led Total Sanitation – good inspiration

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Summary of opportunities and gaps

- Holistic approach – **Health – Food & Sanitation**
- **Total health at stake – 4-6 x that for safe water & sanitation –** evaluations of total health
- **Safe reuse system,**
  - **Faecal treatment,** simple and robust
  - **Systems with several barriers**
  - **Sustainable urban UDD**
  - **Wet ecosan**
  - **Sustainable greywater handling**
  - **Logistics, organisation, institutions for reuse**
  - **Gender**
  - **Economy**
- **Mobilization of unserved –** and rest of society

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Lots of fascinating work ahead!
THANK YOU FOR YOUR ATTENTION

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