

Scientific Workshop on GHG Emissions in Sanitation Systems

EBNet GHG Emissions Scientific Workshop 27-29 Jan 2025 University of Leeds

EBNet N₂O working group led by **Tom Curtis**
Event led by **Barbara Evans** (Leeds hosting)

Aims of the workshop:

- Devise a strategy to curate and share data on emissions
- Position paper

Agreed outcomes

1. Position paper on 'Microbiological Theory' – to be led by Bill Sloane
2. Leverage RAEng/Policy Centre
3. Grant proposals e.g. Marie Curie Training Network

Globally, on site sanitation (OSS) is thought to be almost as large a source of GHG emissions as centralised Waste Water Treatment Plants, despite the fact that in US and EU only around a quarter of the population are using OSS systems. Whereas 25 years ago it was assumed that OSS was a 'temporary fix' it is now thought that half the world will still be using OSS in 2050. Smaller scale OSS get built on a regular basis, WWTP very rarely, thus there is significant scope for innovation in OSS.

On site sanitation systems are just storing excreta, not treating it. >60% of human excreta enters environment without being treated. There is containment of solids, but most of the volume is liquid – systems drain into rivers, canals. If waste is draining into the environment, emissions will be from the wider environment.



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OSS is regarded as 'primitive' but this is not the case in terms of the research needed, the fundamentals are very complex:

- Faecal sludge is highly variable
- Key drivers of emissions include system design, volume, depth but systems are heterogeneous.
- Major terminology problem: 'centralised' vs 'decentralised' not helpful
- Outputs completely different at different times of day/season. Changes during day and night very complex.
- Emissions be affected by level of toilet use before sampling.
- Scum layers are important variables for measurement of emissions.
- Are emissions occurring in heavy rain? Indications are there are some variations during rainfall but not significant.
- Antibiotics affect tank community. Unexpectedly, in a recent study readings for antibiotics were high in African countries – explained by HIV treatment.

Research needed:

- Need to study fundamental microbiology of OSS microbial communities
- Need to study fundamental physics
- Need 3D structure of key enzymes present in pit latrines
- Need a CFD model of a septic tank
- Need to understand what's happening in soil systems re: sinks, sources of GHG emissions
- Need to understand space/time scales?
- Need to understand Immigration, growth, death – “the only factors that matter”

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