

Landfill Aftercare Forum
Thursday 9 June 2016

REGULATING LANDFILLS USING MEASURED METHANE EMISSIONS

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Content

- ➔ Can we quantify methane emissions from landfills?
- ➔ How could we use methane emission measurements to regulate landfills?
- ➔ Would using methane emission measurements improve landfill regulation?

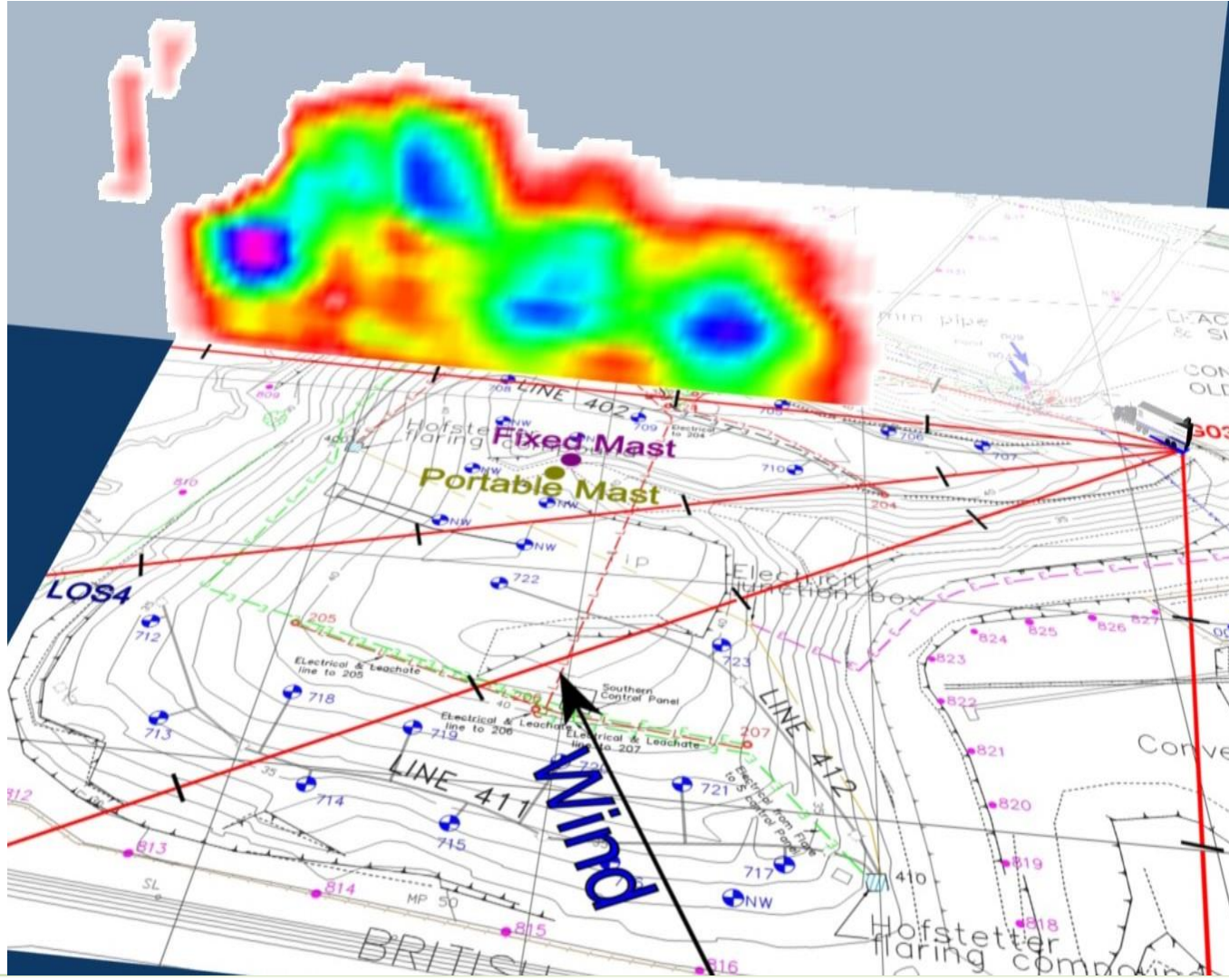
Measuring methane emissions

- ➔ Differential Absorption Lidar - DIAL
- ➔ Tracer gas dispersion
- ➔ Unmanned aerial vehicles - UAVs

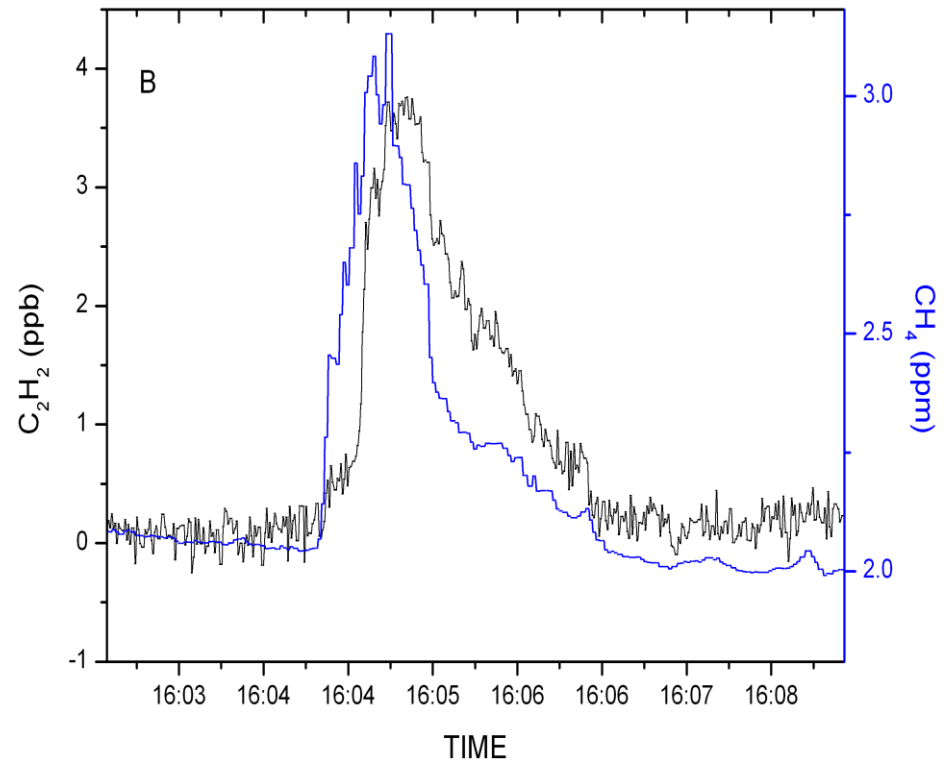
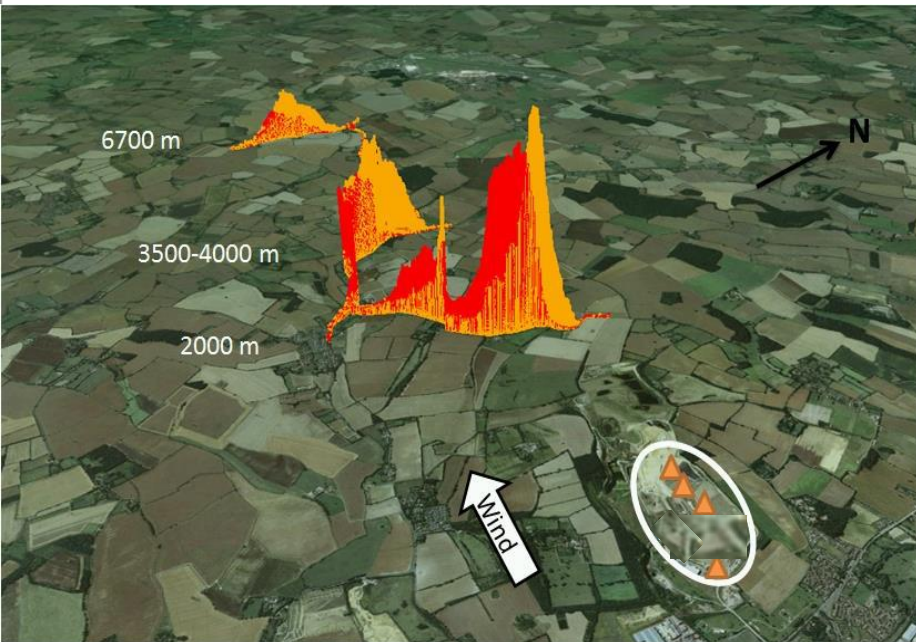
DIAL Differential Absorption LiDAR



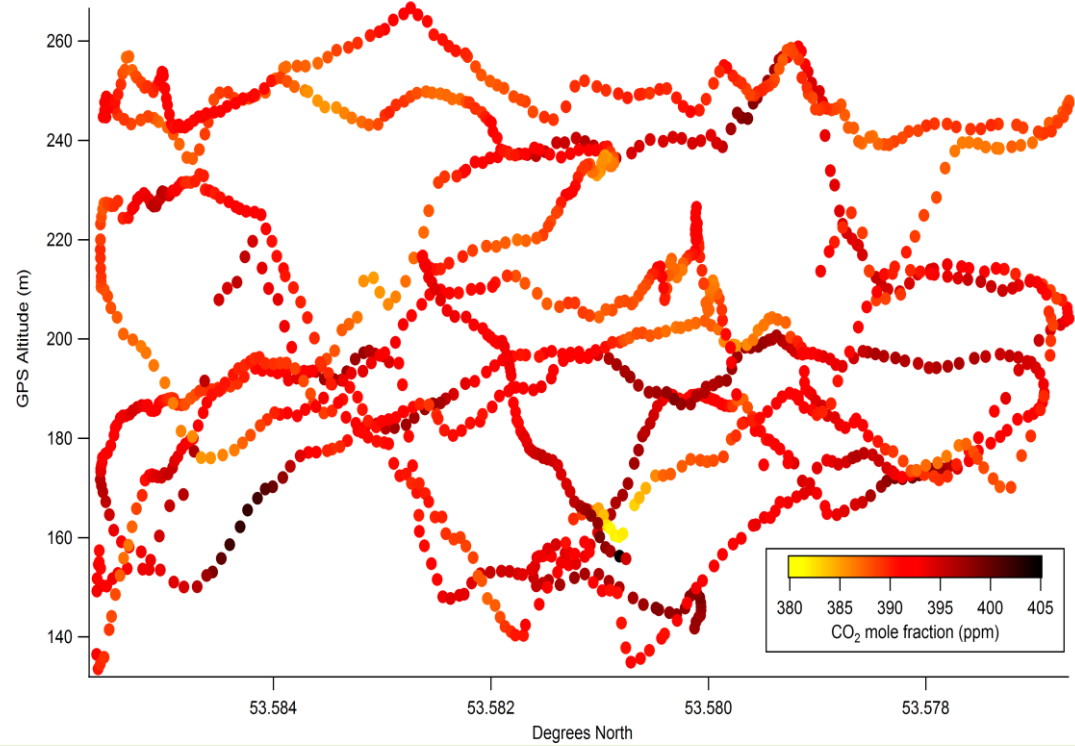
DIAL Technique



Tracer gas dispersion method

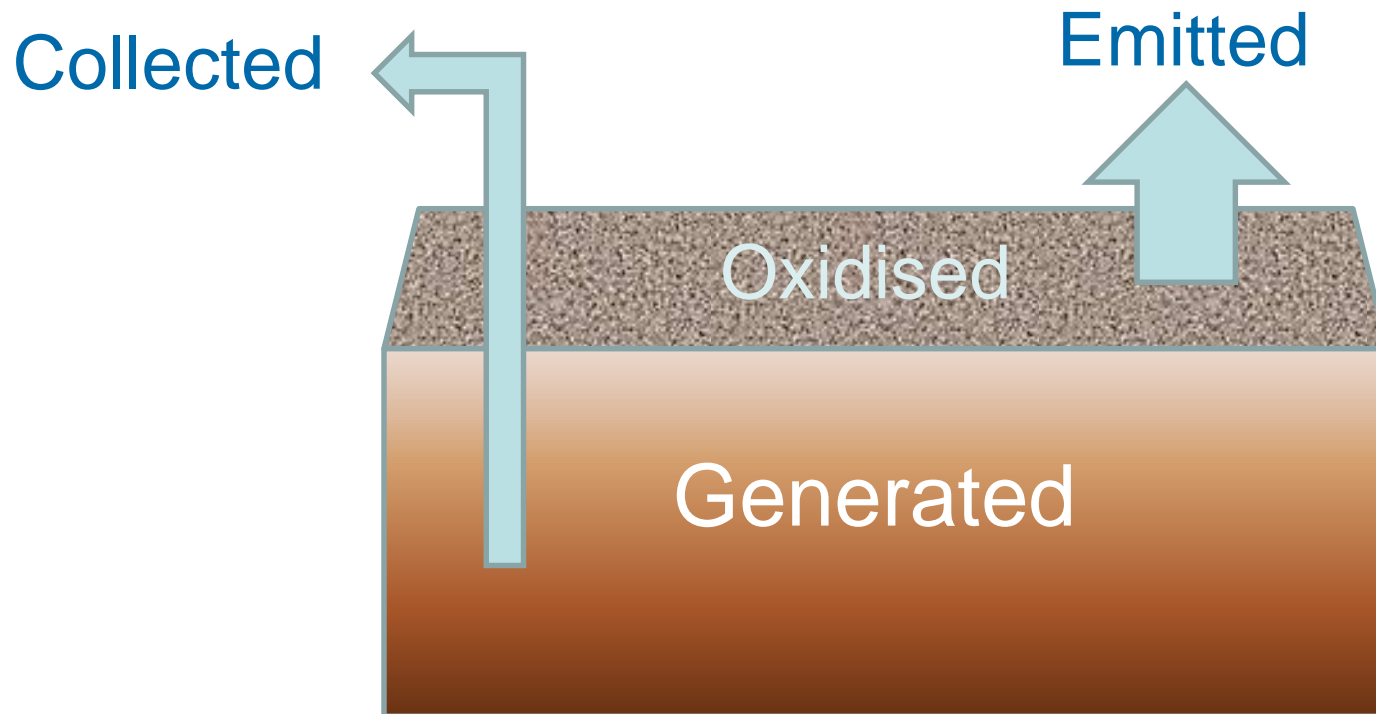


Unmanned aerial vehicle method



How can we use the methane emission measurements?

How can we use the methane emission measurements?



$$\text{CH}_4 \text{ generated} = \text{CH}_4 \text{ oxidised} + \text{CH}_4 \text{ emitted} + \text{CH}_4 \text{ collected}$$

Landfill methane balance

$$\text{CH}_4 \text{ generated} = \text{CH}_4 \text{ oxidised} + \text{CH}_4 \text{ emitted} + \text{CH}_4 \text{ collected}$$

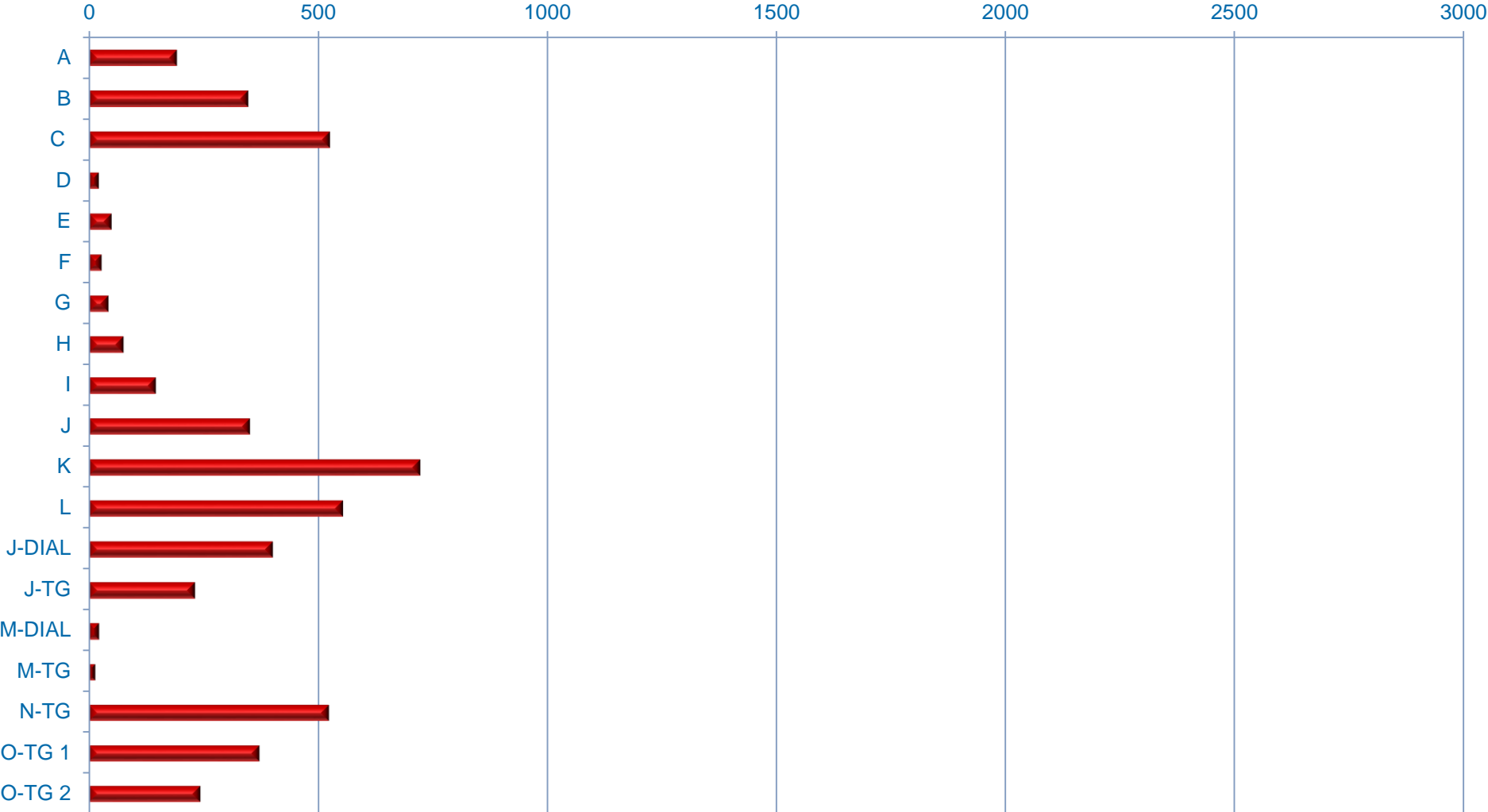
Generated	Not known - can be modelled but not measured
Oxidised	Not known - no standard whole site method
Emitted	Not known - but can be measured
Collected	Known - routinely measured

Methane collection index

- ➔ Use the known methane collection rate with the measured rate of methane emissions
- ➔ Calculate a methane collection index – MCI

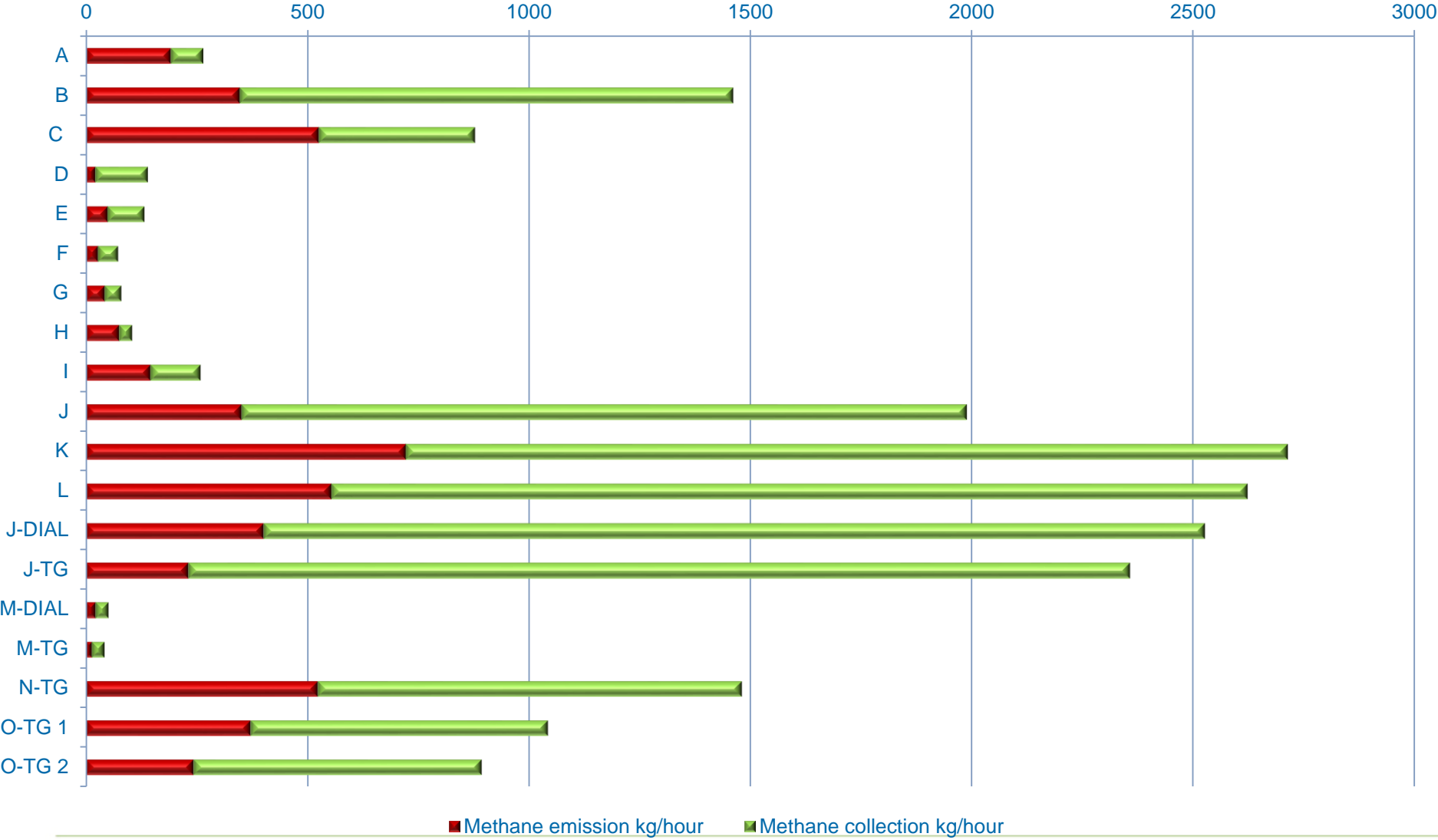
$$\text{MCI} = \text{CH}_4 \text{ collected} / (\text{CH}_4 \text{ emitted} + \text{CH}_4 \text{ collected})$$

Measured methane emissions



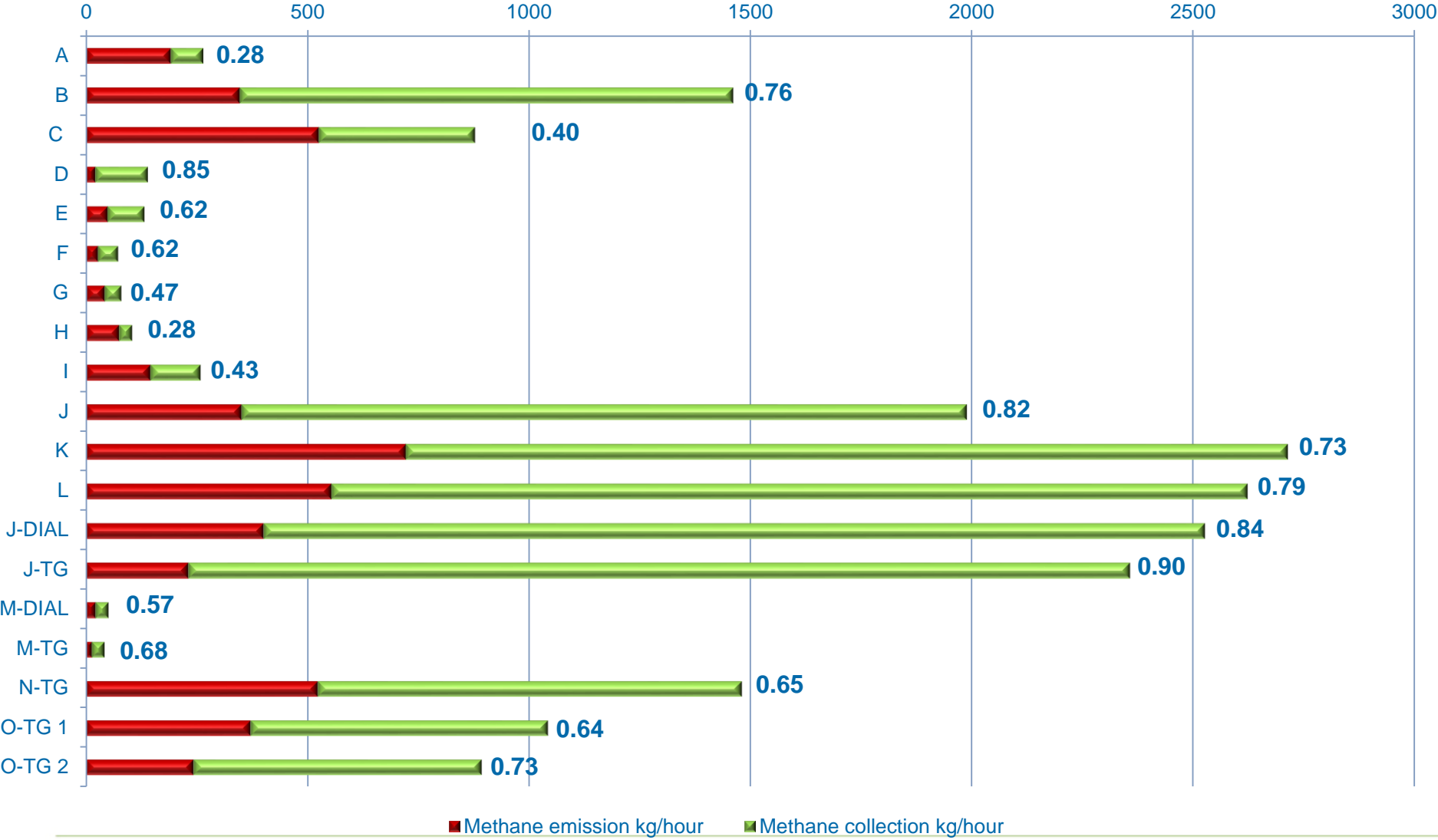
■ Methane emission kg/hour

Measured methane emissions and collection



■ Methane emission kg/hour ■ Methane collection kg/hour

Methane collection index

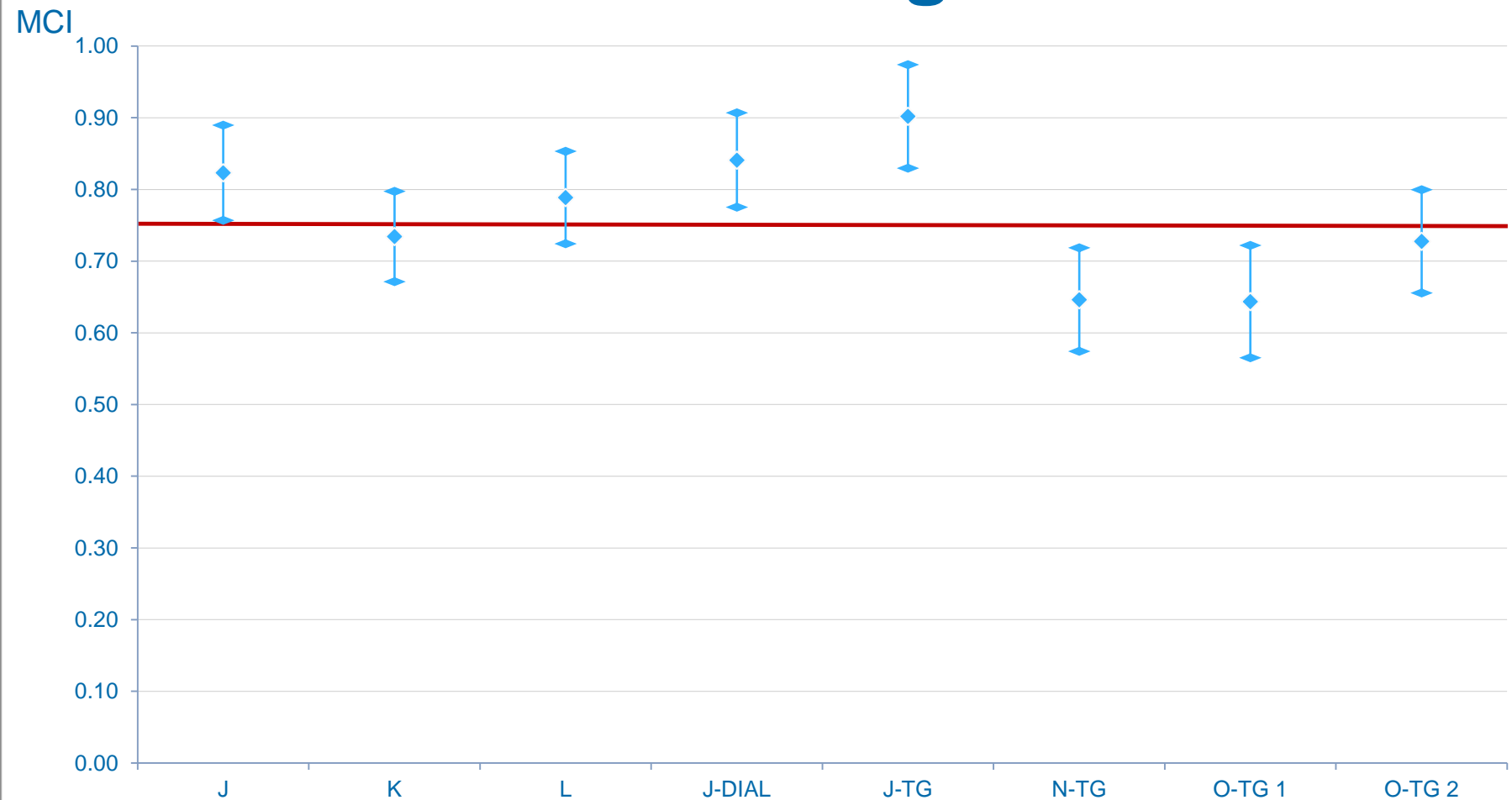


■ Methane emission kg/hour ■ Methane collection kg/hour



$$MCI = \frac{CH_4 \text{ collected}}{CH_4 \text{ emitted} + CH_4 \text{ collected}}$$

How can we use the methane collection index for regulation?



Possible regulatory approach

- ➔ Annual methane emission measurements
 - ➔ Modern permits already contain this requirement
- ➔ Flexibility on the measurement method
- ➔ Calculation of the methane collection index
- ➔ Comparison of the MCI to a limit
- ➔ An action plan for improvements in landfill gas management

But would this approach improve landfill regulation?

- ➔ Closed sites
- ➔ Sites with active landfill gas collection
- ➔ Methane oxidation
- ➔ Variation in methane emissions
- ➔ Setting a limit for the MCI

Conclusions

- ➔ Can we quantify methane emissions from landfills?
 - ➔ Yes, but further validation work is needed
- ➔ How could we use methane emission measurements to regulate landfills?
 - ➔ Combining the emission with the rate of collection gives an effective measure of performance

Conclusions

- ⇒ Would using methane emission measurements improve landfill regulation?
 - ⇒ Yes, this could provide a significant contribution to reducing methane emissions from landfills
 - ⇒ But we need to understand the variability in emissions
 - ⇒ Could support rather than replace the current approach to regulation

Thank you