CAMBRIDGE ZERO

Hard to Decarbonise Technologies
Special Interest Group

Methane Source Abatement and Sink Solutions
27 April 2022

Panel

Academic lead: Shaun Fitzgerald, Director, Centre for Climate Repair at Cambridge

Pablo Salas, Prince of Wales Global Sustainability Fellow in Radical Innovation and Disruption, Cambridge Institute for Sustainability Leadership

Andrew Scullard, Business Development and Innovation – Clean Air, Johnson Matthey

Raul Quesada Cabrera, Senior Research Fellow, Dept of Chemistry, University College London

Euan Nisbet, Professor of Earth Sciences, Royal Holloway University of London; visiting fellow at the Centre for Atmospheric Science, University of Cambridge

Rapporteur: Stefanie Mack

For more information, contact decarbnetwork@admin.cam.ac.uk

Challenges

- Sources of methane emissions are varied (~40% natural), and solutions for methane abatement depend on concentration and require multiple approaches.
- Policies focus mainly on abatement in the energy sector; some methane sources are not well regulated.
- Agriculture emissions are directly linked to food production in the global south.
- There are currently no viable, artificial ways to tackle excess methane in the atmosphere.

Discussion Points

- Atmospheric methane concentrations are close to 2ppm, doubling in the past 2,000 years with growth accelerating since 2007.
- Methane emissions are driven by the tropics: mainly cattle, wetlands, and landfills in the tropics or sub-tropics
- Arctic permafrost: an important source of methane, but methanotrophs are oxidising methane in the water or soil. Must continue monitoring, especially with the growth of new Arctic wetlands.
- Cutting emissions is more straightforward for oil and gas, it is much harder to deal with agricultural emissions and waste burning.
- Policy discussions focus on methane in the fossil fuel/energy sector, we need to add a focus on the agricultural sector.
- Solutions for methane vary by concentration. It is more viable to deal with methane at source than at atmospheric concentrations. Methane has useful applications above 0.5% concentration (e.g. fuel source). Catalytic combustion is an option from 0.1 - 0.5% concentrations. Lower concentrations (e.g. atmospheric) need options like photocatalysis.
- Alternative proteins market is showing signs of upcoming disruption, as the cost of cultivated meat is falling exponentially. The environmental impact is largely around energy requirements since material inputs are less than those needed for traditional meat.
- There are not enough hydroxyl radicals to efficiently degrade methane already in the atmosphere. Challenge: use photocatalytic oxidation to degrade methane, which requires high efficiency, specific properties to target methane, as well as sufficient contact area.
- Concerns over pasture land: some areas are overgrazed and could have higher biodiversity (e.g. be partially forested, as in the past) and still support grazing animals. However, cattle are incredibly important for both food and culture (e.g. India). It is extremely difficult to change agricultural practice
- Methane emissions in developing countries (e.g. most of Africa): this is a challenge connected with the “just transition”. We need to be careful with the policies we put in place, not disrupt food supply, respect cultural practices, and recognize carbon-related problems are due to over-consumption in the global north not the global south

Opportunities

- Materials engineering – use photocatalytic or electrochemical oxidation to degrade low concentration sources and atmospheric methane, post-emission.
- Take advantage of upcoming disruption to agricultural sector around alternative proteins to address methane abatement.
- Introduce policy and regulations in non-energy sectors.
- Utilize higher concentrations of methane for fuel; ensure lower concentrations use green energy to degrade methane.

UNIVERSITY OF CAMBRIDGE