Tree stem greenhouse gas emissions from forested closed landfill sites

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Tree planting has the potential to increase carbon sequestration and is used as a common management strategy on former landfill sites to improve their visual appeal and manage issues such as leachates from decomposing organic matter. Tree stems mediate methane (CH₄) emissions to the atmosphere from anaerobic soils, bypassing bacterial populations that would otherwise break down CH₄ before it is released to the atmosphere. This process has been observed in wetland forests but has yet to be measured in a landfill context. We examined whether trees emitted more CH₄ and carbon dioxide (CO₂) on a closed UK landfill site relative to a more natural, comparable control site to determine the importance of this natural phenomenon in a managed environment. We measured temporal and seasonal variations in greenhouse gas emissions from landfill tree stems using flux chambers and an off-axis integrated cavity output spectroscopy analyser. Findings from this investigation suggest that conditions associated with landfill construction may increase CH₄ emissions from trees planted on their surface after closure of the site. Trees planted on former landfill sites may therefore result in additional CH₄ emissions to the atmosphere.