CCS for incinerators? An expensive distraction to a circular economy

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CCS for incinerators? An expensive distraction to a circular economy

Introduction

Waste incineration for energy recovery (also known as Waste-To-Energy) has come in for some heavy criticism associated with adverse climate impacts, not least because incinerators release an average of around 1 tonne of CO_2 for every tonne of waste incinerated.[1] The release of CO_2 from incinerators makes climate change worse and comes with a cost to society that is not paid by those incinerating waste.[2] Electricity generated by waste incineration has significantly higher adverse climate change impacts than electricity generated through the conventional use of fossil fuels such as gas.[3]

Carbon Capture and Storage (CCS) is being explored in response to climate concerns. When considering CCS for incinerators, it should be kept in mind that the top rung of the carbon mitigation hierarchy is generally accepted to be the 'do not build' option, i.e. to "evaluate the basic need for the project and explore alternative approaches to achieve the desired outcome/s".[4]

Following this principle, proponents of CCS typically seek to justify their carbon capture projects on the basis that there is no viable alternative approach to delivering a necessary good or service. As there are viable alternative approaches to both resource management and energy generation, such an argument cannot be applied to defend CCS for municipal waste incinerators (MWIs).

This report presents key general and specific arguments on how CCS for incinerators is a distraction, instead of a solution, to incinerators' carbon problem.

General concerns about CCS

When it comes to CCS, one of the main concerns is that investment in this approach could draw finance away from supporting urgent systemic changes required to genuinely address the climate emergency.[5] CCS has been criticised as being a distraction from the delivery of wind and solar energy, battery storage, and demand-side measures such as better insulation.[6] CCS has also been described as a distraction from increased resource efficiency and from the transition to a more circular economy.[7] Furthermore, it is argued that CCS has a history of over-promising and under-delivering[8], and that CCS offers poor value for money.[9] Social costs associated with CCS include adverse impacts on local citizens, accompanied by anxieties that something could go wrong, with the transportation of captured carbon in particular giving rise to serious risks.[10]

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[1] Neuwahl, F., et al (2019) 'Best Available Techniques (BAT) Reference Document for Waste Incineration'. Available at: publications.jrc.ec.europa.eu/repository/bitstream/JRC118637/jrc118637_wi_bref_2019_published.pdf (Accessed: 13 September 2021).
[2] Vähk, J. & Schägg, E. (2021) 'The benefits of including municipal waste incinerators in the Emissions Trading System'. Available at: zerowasteeurope.eu/wp-content/uploads/2021/04/zwe_april_2021_policybriefing_benefits_MWI_in_EUETS.pdf (Accessed: 24 September 2021).
[3] Vähk, J. (2019) 'The impact of Waste-To-Energy incineration on climate'. Available at: zerowasteeurope.eu/library/the-impact-of-Waste-To-Energy-incineration-on-climate (Accessed: 24 September 2021).
[4] Arup and IEMA (2017) 'Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance'. Available at: www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance (Accessed: 13 September 2021).
[5] Kennedy, S. (2020) 'No more gaslighting: Let's get real about carbon capture and storage'. Available at: www.energyflux.news/p/no-more-gaslighting-lets-get-real (Accessed: 11 September 2021).
[6] Freites, S. G. & Jones, C. (2020) 'A Review of the Role of Fossil Fuel Based Carbon Capture and Storage in the Energy System'. Available at: foe.scot/wp-content/uploads/2021/01/CCS_REPORT_FINAL.pdf (Accessed: 12 August 2021).
[7] Drugmand, D. & Muffett, C. (2021) 'Confronting the Myth of Carbon-Free Fossil Fuels: Why Carbon Capture Is Not a Climate Solution'. Available at: www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf (Accessed: 12 August 2021).
[8] Friends of the Earth Scotland & Global Witness (2021) 'Briefing: Tyndall Centre, A Review of the Role of Fossil Fuel Based Carbon Capture and Storage in the Energy System'. Available at: foe.scot/wp-content/uploads/2021/01/CCS-Research-Summary-Briefing.pdf (Accessed: 12 August 2021).
[9] Drugmand, D. & Muffett, C. (2021) 'Confronting the Myth of Carbon-Free Fossil Fuels: Why Carbon Capture Is Not a Climate Solution'. Available at: www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf (Accessed: 12 August 2021).
[10] Mahgerefteh, H., Denton, G. & Rykov, Y. (2008) 'Pressurised CO_2 Pipeline Rupture'. Available at: www.icheme.org/media/9765/xx-paper-71.pdf (Accessed: 11 September 2021).

Some of the dangers associated with the transportation of captured CO_2 are highlighted by the UK Government's Health and Safety Executive (HSE), who raise concerns about "the hazards, mechanisms, consequences and probabilities of pipeline failures...[and the] Uncertainties [that] remain around the conveyance of dense or supercritical phase CO_2 in pipelines which are likely to be associated with CCS projects".[11]

The HSE notes how "During a loss of containment event significant quantities of CO_2 are likely to be released from a pipeline associated with CCS...a loss of containment event from a dense or supercritical phase CO_2 pipeline presents a similar level of risk to a release from a high pressure natural gas pipeline..."[12]

The HSE's Assessment of Major Hazard Potential of CCS includes the following: "In a CO_2 capture facility the amount of CO_2 on the site at any one time is likely to be less than 50 tonnes, a point to point CO_2 pipeline from capture plant to injection facility could hold as much as 10,000 tonnes of CO_2 and a large pipeline cluster perhaps 100,000 tonnes".[13]

There are numerous accounts of dramatic pipeline failure, with first-hand descriptions of "a pipeline carrying compressed carbon dioxide mixed with hydrogen sulfide [that] ruptured, engulfing the small town of Satartia, Mississippi, in a green haze, leaving many residents convulsing, confused, or unconscious..."[14]; accompanied by the suggestion that: "That explosion serves as a vivid warning about the risks posed by what could be the next generation of pipelines...".

Such accounts appear to reinforce public scepticism about the viability and desirability of CCS, adding further to the current lack of social acceptance of CCS due to the associated risks to public health.

CCS is associated primarily with otherwise unavoidable process-related emissions

CCS is often described as a technology intended for use with otherwise unavoidable emissions associated with industries that provide essential products deemed necessary to support the economy.[15,16] CCS is most commonly associated with primary industries such as iron, steel, lime, fertilizer, cement, chemicals, and refining.[17]

The association between CCS and energy generation is increasingly being undermined by the rapid rise in renewables, which reflects the general approach of adopting lower carbon alternatives in preference to using high-carbon processes accompanied by CCS.[18] In the words of the European Commission: "Carbon Capture and Storage (CCS) was originally viewed as a major decarbonisation option for electricity production. Today the potential need for it seems lower, due to the fall in the costs of renewables [and the emergence of] other options to reduce emissions in industrial sectors combined with the low social acceptability of CCS..."[19]

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[11] HSE (2021) 'Guidance on conveying carbon dioxide in pipelines in connection with carbon capture and storage projects'. Available at: www.hse.gov.uk/pipelines/co2conveying-full.htm (Accessed: 11 September 2021).
[12] HSE (2021) 'Guidance on conveying carbon dioxide in pipelines in connection with carbon capture and storage projects'. Available at: www.hse.gov.uk/pipelines/co2conveying-full.htm (Accessed 28 September 2021).
[13] Harper, P. (2020) 'Assessment of the major hazard potential of carbon dioxide (CO_2)'. Available at: www.hse.gov.uk/carboncapture/assets/docs/major-hazard-potential-carbon-dioxide.pdf (Accessed: 11 September 2021).
[14] Calma, J. (2021) 'Go read the harrowing story of the world's first CO_2 pipeline explosion'. Available at: www.theverge.com/2021/8/26/22642806/co2-pipeline-explosion-satartia-mississippi-carbon-capture (Accessed: 11 September 2021).
[15] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2019) 'Climate Action Programme 2030'. Available at: www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/klimaschutzprogramm_2030_en_bf.pdf (Accessed: 12 August 2021).
[16] IN4climate.NRW (2021) 'Carbon Capture'. Available at: www.in4climate.nrw/en/topics/technologies/carbon-capture-capturing-co2-emissions (Accessed: 12 August 2021).
[17] CCSA (2021) 'Capturing CO_2' Available at: www.ccsassociation.org/discover-ccus/explore-ccus (Accessed: 12 August 2021).
[18] Greenpeace (2021) 'Net Expectations: Assessing the role of carbon dioxide removal in companies' climate plans'. Available at: www.greenpeace.org.uk/wp-content/uploads/2021/01/Net-Expectations-Greenpeace-CDR-briefing.pdf (Accessed: 12 August 2021).
[19] Directorate-General for Climate Action, European Commission (2019) 'Going climate-neutral by 2050'. Available at: op.europa.eu/en/publication-detail/-/publication/92f6d5bc-76bc-11e9-9f05-01aa75ed71a1 (Accessed: 12 August 2021).

CO_2 emissions from MWIs should be avoided by moving towards a circular economy

As noted above, the incineration of one tonne of municipal waste generates around one tonne of CO_2.[20] While this could be lower than the direct climate impacts of sending untreated municipal waste directly to landfill, MWI has greater adverse direct climate impacts than sending plastic and/or biostabilised waste to landfill.[21]

More importantly, reliance on incineration is inferior to minimising and progressively eliminating residual waste. Changing waste management practices to ensure materials are continually cycling through the economy avoids leakages of materials into residual waste treatments and delivers significant climate change benefits.[22, 23]

The concept that there will always need to be high levels of waste disposal through either incineration or landfill is premised on the long-term perpetuation of a linear 'take-make-dispose' economy that requires ever more resources to be extracted. Governments and others increasingly acknowledge that this linear paradigm is both unsustainable and undesirable.

Assumptions that depend on growing, or even stable, quantities of residual waste arising run contrary to the European Commission's Circular Economy Action Plan commitment to halve residual waste generation by 2030.[24] Indeed, in their report on the Circular Economy Action Plan, the European Parliament has called for a residual waste target to be set.[25]

The rejection of the linear approach is resulting in moves towards a circular economy that ensures products and materials are designed to last longer and to be reused or recycled rather than landfilled or incinerated. Given that much of what is currently incinerated could be reused, repaired, recycled, or substituted (see below), there are serious concerns that perpetuating incineration would be accompanied by an unacceptable opportunity cost through delaying or displacing these more desirable alternatives that could deliver significantly better climate change and environmental outcomes.

Most of the material currently used as incinerator feedstock could and should have been recycled or composted. For example, of the total residual waste from household sources in England in 2017, an estimated 53% was readily recyclable; 27% was potentially recyclable; 12% was potentially substitutable; and only 8% was difficult to either recycle or substitute (not all of which was necessarily combustible).[26]

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[20] Neuwahl, F., et al (2019) 'Best Available Techniques (BAT) Reference Document for Waste Incineration'. Available at: publications.jrc.ec.europa.eu/repository/bitstream/JRC118637/jrc118637_wi_bref_2019_published.pdf (Accessed: 13 September 2021).
[21] Favoino, E. (2021) 'Building a bridge strategy for residual waste'. Available at: zerowasteeurope.eu/wp-content/uploads/2020/06/zero_waste_europe_policy-briefing_MRBT_en_with-annex.pdf (Accessed: 13 September 2021).
[22] Hogg, D. & Ballinger, A, (2015) 'The Potential Contribution of Waste Management to a Low Carbon Economy'. Available at: zerowasteeurope.eu/wp-content/uploads/2019/10/zero_waste_europe_report_The-potential-contribution-of-waste-management-to-a-low-carbon-economy_en.pdf (Accessed: 22 September 2021).
[23] Ballinger, A., Chapman, L. & Fletcher, D. (2021) 'Waste in the Net-Zero Century: How Better Waste Management Practices Can Contribute to Reducing Global Carbon Emissions'. Available at: www.eunomia.co.uk/reports-tools/waste-in-the-net-zero-century-how-better-waste-management-practices-can-contribute-to-reducing-global-carbon-emissions (Accessed: 10 September 2021).
[24] European Commission (2020) 'A new Circular Economy Action Plan For a cleaner and more competitive Europe'. Available at: eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN (Accessed: 22 September 2021).
[25] European Parliament (2021) 'Report on the New Circular Economy Action Plan'. Available at: www.europarl.europa.eu/doceo/document/A-9-2021-0008_EN.html (Accessed: 22 September 2021).
[26] Department for Environment, Food & Rural Affairs (2020) 'Resources and Waste Strategy: Monitoring Progress'. Available at: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/907029/resources-and-waste-strategy-monitoring-progress.pdf (Accessed: 10 September 2021).

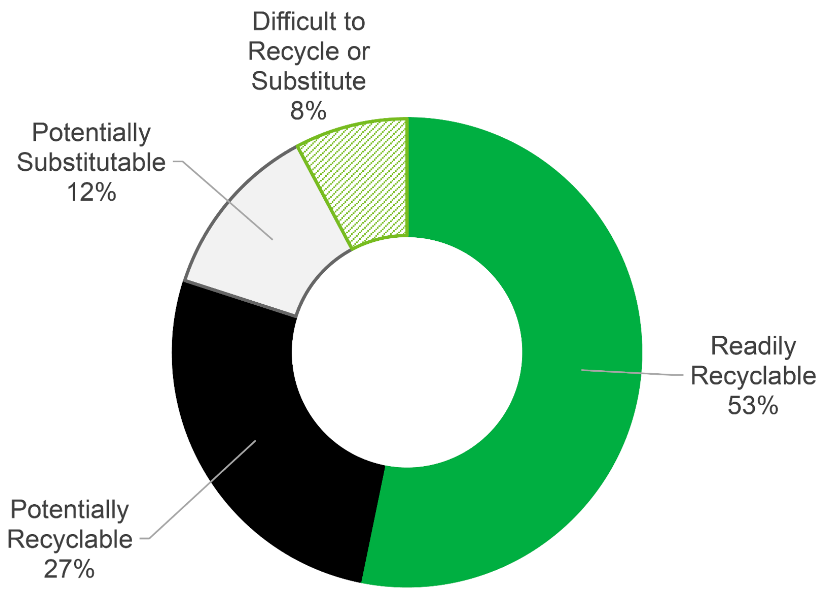

Image 1 - Chart 13. Avoidable residual waste from household sources, England, 2017, proportion of total residual waste, by category, (WP2a). Source: Department for Environment, Food and Rural Affairs - Resources and Waste Strategy Monitoring Progress (2020).
assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/907029/resources-and-waste-strategy-monitoring-progress.pdf

Concerns have been expressed by the EU Technical Expert Group on Sustainable Finance about the "large portion of waste currently incinerated that could be recycled, the reliance of some individual [EU] Member States on the incineration of municipal waste, and the risk that further increasing capacities risk overcapacity and could result in lock-in effects. This would in turn discourage more reuse and recycling, options higher in the waste hierarchy that could deliver higher climate mitigation benefits".[27]

CCS at MWIs could give rise to worse overall environmental outcomes by encouraging the construction of new incineration capacity or the continued use of existing capacity at the expense of options such as reduction, reuse, and recycling that result in lower environmental impacts as well as greater social and economic benefits.[28] These already-deliverable options are clearly preferable to CCS for a range of reasons, not least because of the nature of the risks and the costs associated with CCS.

In accordance with circular economy principles, as items that are repairable or reusable, and materials that are recyclable or compostable, are increasingly diverted from becoming incinerator feedstock, capacity will be freed-up at existing MWIs. This, in turn, gives rise to increasing opportunities to progress an incineration exit strategy through the prevention of new incineration capacity and through taxation and managed closure of existing facilities.

Such an incineration exit strategy is simply a manifestation of the circular economy, which recognises incineration ('energy recovery') as a leakage - breaking the circle - to be minimised.[29]

[27] EU Technical Expert Group on Sustainable Finance (2020) 'Taxonomy Report: Technical Annex'. Available at: ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf (Accessed: 24 September 2021).
[28] Department for Business, Energy & Industrial Strategy (2021) 'Carbon Capture, Usage and Storage: An update on the business model for Industrial Carbon Capture. Available at: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984119/industrial-carbon-capture-icc.pdf (Accessed: 10 September 2021).
[29] Ellen MacArthur Foundation (2013) 'Towards the Circular Economy (Volume 1)'. Available at: emf.thirdlight.com/link/x8ay372a3r11-k6775n/@/preview/1?o (Accessed: 10 September 2021).

FIGURE 6 **The circular economy—an industrial system that is restorative by design**

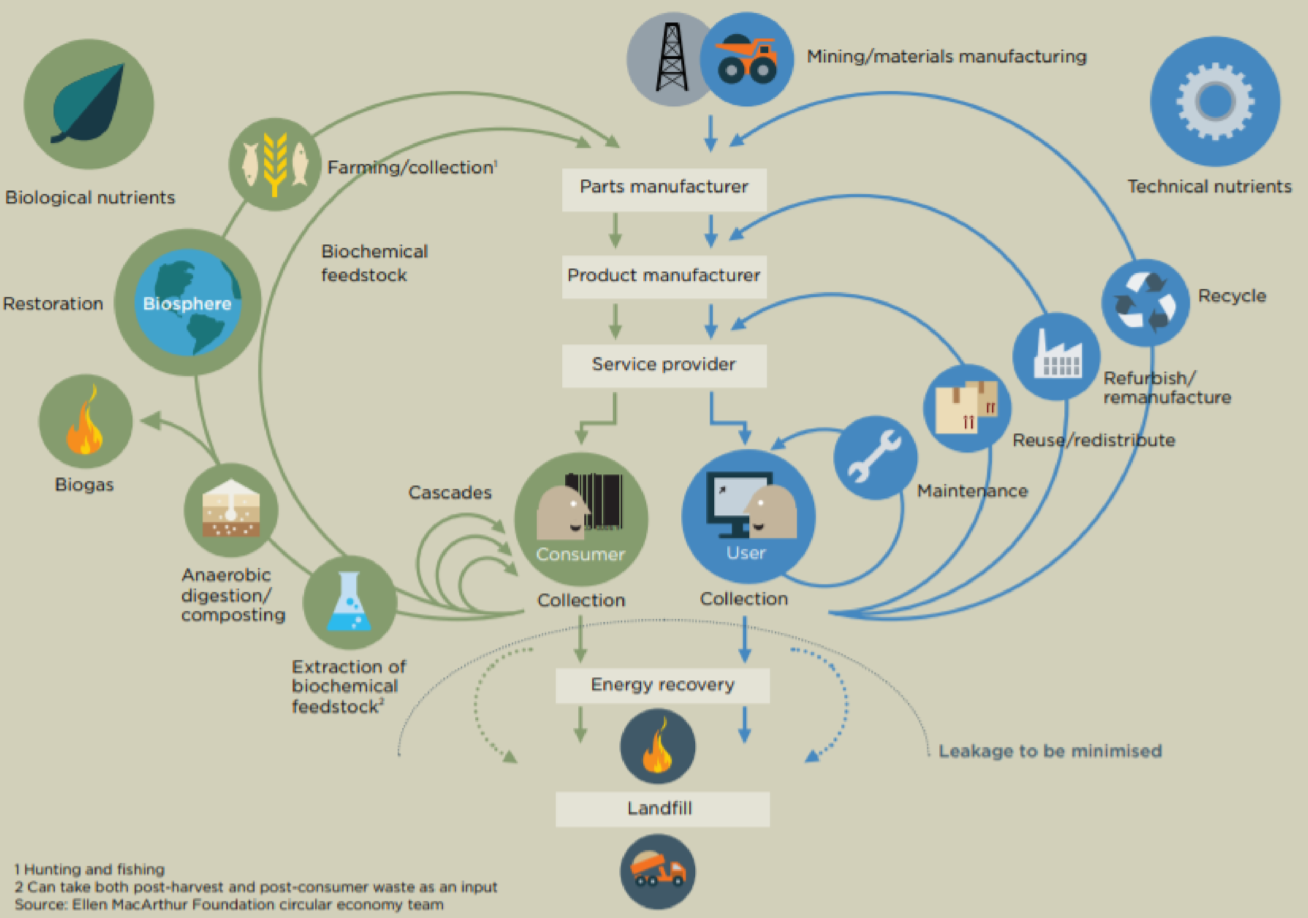

Image 2: The circular economy—an industrial system that is restorative by design. Source: *Towards the Circular Economy - Volume 1*, page 24, Ellen MacArthur Foundation, 2013. emf.thirdlight.com/link/x8ay372a3r11-k6775n/@/preview/1?o

Value for Money concerns about CCS for MWIs

As incineration gives rise to adverse climate impacts[30,31,32] – including substantial costs to society from the CO_2 emitted by MWIs that are not being paid for by incinerator operators[33] – it is easy to see how reducing the quantities of material, especially plastic, that is incinerated is an effective, efficient, low-cost, and ethical way of contributing to a low-carbon circular economy. Such an incineration exit strategy is incompatible with significant investment in carbon capture technologies for MWIs.

To align with the genius of the circular economy, any assessment of the impacts associated with the use of carbon capture at MWIs would have to extend beyond the CO_2 directly emitted by incinerators to include otherwise 'hidden' costs, such as the adverse impacts of replacing useful material lost through incineration. In stark contrast to an incineration exit strategy, CCS does nothing to address these adverse impacts. CCS exacerbates the many problems associated with overconsumption, resource inefficiency, and the linear economy that give rise to significant losses to the wider economy.[34]

[30] Dowen, J. (2018) 'Evaluation of the climate change impacts of waste incineration in the United Kingdom'. Available at: ukwin.org.uk/files/pdf/UKWIN-2018-Incineration-Climate-Change-Report.pdf (Accessed: 10 September 2021).
[31] Dowen, J. (2021) 'Good Practice Guidance for Assessing the GHG Impacts of Waste Incineration'. Available at: ukwin.org.uk/files/pdf/UKWIN-2021-Incinerator-GHG-Guide.pdf (Accessed: 10 September 2021).
[32] UKWIN (2021) 'Fossil CO_2 released per tonne of plastic incinerated'. Available at: ukwin.org.uk/facts/#co2fromplastic (Accessed: 10 September 2021).
[33] UKWIN (2021) 'Unpaid cost to society from fossil CO_2 released from UK incinerators'. Available at: ukwin.org.uk/facts/#unpaidcost (Accessed: 10 September 2021).
[34] Fauset, C. (2008) 'Techno-fixes: a critical guide to climate change technologies'. Available at: corporatewatch.org/wp-content/uploads/2017/09/Technofixes.pdf (Accessed: 10 September 2021).

Municipal waste incinerators are expensive to build, and carbon capture technologies are expensive to add or retrofit. It is estimated that, for a 350,000 tonne per annum municipal waste incinerator, the use of CCS would increase capital expenditure by more than 45% - from £220m to £320m (€257m to €374m) - and would increase operational expenditure by more than 33% - from £12m to £16m (€14m to €19m).[35]

As such, the introduction of CCS at MWIs raises 'value for money' concerns and gives rise to risks that investments and subsidies directed towards CCS at MWIs could displace support for the necessary systemic changes to resources and waste management. Furthermore, the scale of the costs involved carry the risk of creating perverse incentives to maintain the status quo so as to avoid investments becoming 'stranded assets', i.e. the cost of CCS could result in increased incinerator lock-in.[36]

The problem of incinerator lock-in is widely recognised, including by the C40 Knowledge Hub[37] and by the European Parliament, who note how "the EU and Member States must strengthen prevention and preparation for reuse, increase high-quality recycling and move away from landfilling waste, while minimising incineration, in line with the waste hierarchy; [the European Parliament] calls on the Commission to define a common EU-wide approach for the management of residual municipal waste that is non-recyclable to ensure its optimal treatment and to avoid building overcapacity of waste incineration at the EU level that could cause lock-in effects and hamper the development of the circular economy..."[38] (***emphasis added***).

The European Union's commitment to reducing residual waste arisings, amplified by the growing citizen opposition to waste incineration, makes the potential prospect of incinerators becoming stranded assets increasingly likely, and this weighs heavily against supporting investment in expensive and experimental carbon capture technologies for MWIs.

The notion that public funding for a few MWI CCS demonstrator projects would act as a catalyst for significant levels of private investment in CCS for MWIs is flawed. In addition to the certainties associated with opportunity costs -i.e. that the same money invested in CCS cannot also be spent on the top tiers of the waste hierarchy - there are also a host of uncertainties and risks surrounding CCS technologies in general, and the application of CCS to MWIs in particular.

CCS at MWIs could fail to attract private funding due to potential investors' concerns about the future of MWI technologies; for example, anticipated reductions in residual material to be used as incinerator feedstock as the result of increasing competition within the resource sector, in combination with increasing diversion from MWI's (as per requirements of the circular economy).

With respect to the public funding of CCS for MWIs, it should be noted that the EU is turning away from incineration "with major European financial institutions excluding it from financial support...The construction of new waste incinerators was presented as an example of non-compliance with the ['do no significant harm'] DNSH principle [enshrined in the Recovery and Resilience Facility]...". Financial support for incineration is also excluded from the European Regional Development Fund and the Cohesion Fund, as well as from the Just Transition Fund and the EU Taxonomy Regulation.[39]

Incinerator operators hoping to install carbon capture technologies at a MWI can expect to face competition both within the waste management sector and from other sectors, e.g. steel and cement industries. Governments may need to step in to resolve some of the problems associated with a 'rush to CCS', including shortages of components, expertise, lorry drivers, etc. In such circumstances, governments should be expected to adopt a 'technology neutral' approach to reducing GHG emissions across the economy[40]. This

[35] Gammer, D. & Elks, S. (2020) 'Energy from Waste Plants with Carbon Capture'. Available at: es.catapult.org.uk/reports/energy-from-waste-plants-with-carbon-capture (Accessed: 13 September 2021).
[36] European Commission (2017) 'The role of Waste-To-Energy in the circular economy'. Available at: eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0034 (Accessed: 24 September 2021).
[37] According to the C40 Cities Climate Leadership Group (2019) 'Why solid waste incineration is not the answer to your city's waste problem'. Available at: www.c40knowledgehub.org/s/article/Why-solid-waste-incineration-is-not-the-answer-to-your-city-s-waste-problem?language=en_US (Accessed: 10 September 2021): "incineration is among the worst approaches cities can take to achieve both waste reduction and energy goals. It is expensive, inefficient, and creates environmental risks. It locks cities into high-carbon pathways by requiring them to continue producing lots of waste to feed the incinerator, undermining efforts to reduce waste generation or increase recycling rates..."
[38] European Parliament (2021) 'Report on the New Circular Economy Action Plan'. Available at: www.europarl.europa.eu/doceo/document/A-9-2021-0008_EN.html (Accessed: 22 September 2021).
[39] Makavou, K. (2021) 'The EU is clear: Waste-To-Energy incineration has no place in the sustainability agenda'. Available at: zerowasteeurope.eu/2021/05/wte-incineration-no-place-sustainability-agenda (Accessed: 24 September 2021).
[40] Gates, B. (2021) 'How to avoid a climate disaster'. Available at: www.penguin.co.uk/books/317/317490/how-to-avoid-a-climate-disaster/9780241448304.html

means that, instead of favouring incineration, priority would be given to those applications of CCS that would be hoped to mitigate the largest quantities of genuinely unavoidable CO_2 emissions arising from the provision of essential goods, such as building materials.

Beyond the use of captured gases to flush out oil (and/or gas) from existing oil wells (a process known as 'enhanced oil recovery' or EOR), it is difficult at present to see how CCS at MWI could deliver profitable financial returns on investment. It is, however, easy to see how increased competition for climate mitigation funding (government subsidies), combined with increased demands on carbon capture technology providers (e.g. for components and expertise), could drive up costs and/or cause delays.

In order to store carbon captured at MWIs that are not connected by some sort of pipeline to undersea storage 'facilities' such as saline aquifers, the gases would need to be transported and would therefore require liquefaction to enable transport. Subjecting gases to the pressure required to convert them to a liquid form would require substantial quantities of energy, over and above the energy that would be required to operate the carbon capture technology itself. These energy demands would greatly increase the incinerator's parasitic load (the energy used by the incinerator). Indeed, according to industry sources, "...the net electricity production [of MWIs fitted with carbon capture technology] would be almost halved due to the carbon capture energy requirement".[41]

Measuring CCS impacts

In circumstances where CCS technologies are applied to MWIs, there is a need to measure the real-world impacts of this application in order to understand how this contributes or inhibits net decarbonisation. There are a number of criteria that could be applied to measure the success, or otherwise, of the transformation to a low-carbon circular economy through the decarbonisation of the resources and the waste management sector. Criteria could include:

- measures of achievement of carbon reductions against both the current baseline and carbon reduction targets (efficacy);
- measures of actual costs alongside assessments of benefits and opportunity costs (efficiency);
- measures of contribution towards achieving a low-carbon economy (effectiveness); and,
- measures of (beneficial and detrimental) impacts on the local and global population and on future generations (ethicality).

The ability to measure some of these outcomes would depend on the degree of transparency required of CCS operators. Such honesty would be in the public interest and would be consistent with the need for transparency in environmental matters recognised by the Aarhus Convention. The Aarhus Convention includes the right of access to environmental information held by public authorities - and this includes information about CO_2 emissions - which would be expected to override commercial confidentiality.

Very high degrees of transparency and accountability, including the imposition of regulatory requirements to report promptly into the public domain, should be mandatory conditions of any permission to experiment with CCS for MWIs, e.g. in the event demonstrator funding is made available for CCS at an incinerator.

Conclusion

The analysis shows that CCS is not a suitable approach to be applied to incinerators, not least because CO_2 emissions from municipal waste incinerators are avoidable through the diversion of material away from incineration; and because the benefits of such diversion contrast with the many shortcomings associated with CCS for MWIs.

[41] International Energy Agency (IEA) Technology Collaboration Programme (2020) 'IEAGHG Technical Report: CCS on Waste to Energy'. Available at: www.club-co2.fr/files/2021/01/2020-06-CCS-on-Waste-To-Energy.pdf (Accessed: 11 September 2021).

Diverting material from incineration would deliver lower carbon outcomes for much less money, and with much less risk, than through the use of carbon capture technology. CCS for municipal waste incinerators would come with significant opportunity costs, undermining more systemic change to resource and waste management, as well as creating perverse incentives to incinerate material that should otherwise be reduced, reused or recycled.

Investing in CCS for incinerators would create an additional barrier to the achievement of a low-carbon circular economy, for example by exacerbating the lock-in effect of incinerators, and would come at the expense of the significant environmental, economic and social benefits that such a transition would deliver.

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Editor(s): Janek Vahk, Ana Oliveira

Zero Waste Europe, 2021

Zero Waste Europe is the European network of communities, local leaders, experts, and change agents working towards the elimination of waste in our society. We advocate for sustainable systems and the redesign of our relationship with resources, to accelerate a just transition towards zero waste for the benefit of people and planet.

Only Solutions LLP is a UK-based environmental consultancy, comprising three partners with combined experience of more than four decades in the resources and waste management sector. Our clients include community groups, local authorities, national and international environmental non-profit organisations.

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