Position Paper

NO PLASTIC IN NATURE • JANUARY 2022

WWF Position: Chemical Recycling Implementation Principles

Purpose of this Document:

This document is not an endorsement of any chemical recycling technologies. Its purpose is to establish clear implementation principles, aimed at protecting people and nature, should these technologies be pursued. It is our hope that these principles inform decision-making and help actors make choices which result in transformative change to the global plastic system to build sustainable, circular plastic use, and support WWF's vision of No Plastic in Nature.

Introduction:

In order to achieve a circular economy where materials are recirculated and waste and negative impacts are designed out, we must prioritize reduction and reuse as our top strategies. For materials that are still necessary but for which there are no viable reuse systems yet, increasing recycling will be critical in keeping materials and value circulating in the system and reducing the amount of plastic being landfilled, incinerated, or littered in nature.

Mechanical and Chemical Recycling:

Mechanical recycling is the most common form of recycling today. It refers to mechanical processing (sorting, washing and drying, chopping, grinding, and reprocessing) of material. Chemical recycling (also sometimes referred to as Advanced or Molecular recycling) in the plastic space refers to chemical, thermochemical, and combustion processes whereby some of the plastic waste undergoing treatment is turned back into its chemical building blocks enabling some of the waste material to be recycled into another plastic including plastic that can be used for food-grade applications. This paper lays out considerations for plastic-to-plastic recycling, not plastic-to-fuel applications. Plastic-to-fuel activities should not be considered recycling, nor a part of the circular economy.

Examples of chemical recycling processes include conversion, decomposition and purification technologies of which pyrolysis, gasification, and solvent-based extraction are specific examples. These technologies vary significantly in what they can and cannot achieve, though for the purposes of these high-level principles, these technologies will be broadly referred to as "chemical recycling". For more information on chemical recycling technologies see either the Eunomia report *Chemical Recycling: State of Play* or the Closed Loop Partner's report *Accelerating Circular Supply Chains for Plastics: A Landscape of Transformational Technologies that Stop Plastic Waste, Keep Materials in Play and Grow Markets.*

Context:

Chemical recycling has been positioned by proponents as a potential solution to the dual issues of our dependence on fossil fuels and the global plastic pollution crisis because, in theory, chemical recycling could reduce our demand for virgin fossil-based plastic and bolster the waste management system. Advocates of chemical recycling often highlight the potential for these technologies to fill a gap in current recycling by: providing an alternative waste management option for items that are not currently recycled (including textiles, electronics, and other goods that do not currently fit into municipal waste recycling), and recycling back to virgin-like quality.

Despite the theoretical potential of chemical recycling technologies to recycle more waste and post a smaller environmental footprint compared to mechanical recycling alone, this potential is unproven, and it is unclear whether it is possible in practice for chemical recycling to deliver these benefits. First and foremost, there is a general lack of transparency or robust evidence base that can be used to verify claims of environmental performance. **Based on currently available evidence, there are significant concerns that these technologies are energy-intensive, pose risks to human health, and/or will not be able to practically recycle plastic beyond what mechanical recycling already achieves.**

If these risks are not addressed, these technologies therefore pose a risk of increasing carbon emissions compared to the status quo, while not fundamentally increasing current recycling rates. At worst, these technologies could undermine current recycling infrastructure and reverse progress made towards circularity including reductions to plastic production and reductions to plastic waste generation. It may also divert attention away from upstream solutions, and create an incentive to keep generating plastic waste, by building new supply chains that are dependent on this waste for inputs. This would ultimately disincentivize investment in upstream solutions like reduction and reuse.

Finally, protection of worker health and safety at recycling operations are not consistent around the world. For those working in the recycling value chain in the Global South - particularly in the informal sector – there exists high risk of human rights abuses, and working for low incomes in poor conditions. Engaging with these groups to address these issues must be a prerequisite for future investment in collection and recycling (as per the UN Guiding Principles on Business and Human Rights), whether mechanical or chemical.

Given the increased calls to grow investments in recycling infrastructure and technologies, and the current commitments by businesses, governments, and other stakeholders to increase the recyclability and recycled content of products and packaging it is clear that recycling will play a role in a future circular economy for plastics. However, it is important to recognize that only 9% of all plastic waste ever produced has been recycled, and a narrow focus on recycling alone will not provide the solution to the plastic pollution crisis. **We cannot recycle our way out of this problem**. In fact, estimates from PEW and Systemiq project plastic-to-plastic chemical recycling could potentially offset only 5% of our total demand for virgin plastic by 2040 due to technical and financial challenges of scaling up (see *Breaking the Plastic Wave* for more information). A systemic approach prioritizing reduction and reuse, implemented across the whole value chain, and consistent with the circular economy will be necessary to address global plastic waste.

Guidance:

As with all technology, the impact of chemical recycling will depend on how it is implemented and designed. To be a credible part of a sustainable material system for the future, chemical recycling must be implemented in a way that maximizes environmental benefits and safeguards communities against negative impacts. As interest and investment in chemical recycling technologies grow, there is an urgent need to establish principles for implementation to ensure that these new technologies provide a meaningful contribution towards the circular economy and are not misused.

We have established the following principles to help ensure that chemical recycling technologies will serve a useful, complementary role in the circular economy. These principles are intended to help decision-makers identify conditions under which chemical recycling approaches could provide value to the system and contribute to overall improvements in circularity and environmental benefits. All ten principles are necessary considerations, they are not in priority order.

Principles for Credible and Effective Chemical Recycling

1. **Chemical recycling should not divert resources from efforts to implement existing proven approaches to address the global plastic pollution problem.** While there is a need for stronger regulatory frameworks, innovation, and funding mechanisms to improve global waste management of plastic, there is much that can and must be done **now** to address plastic pollution. Investments should be prioritised towards successfully implementing identified priority solutions - **reduction and reuse.** These strategies are higher priority in the waste management hierarchy; any companies pursuing chemical recycling strategies should as first priority be already investing in and acting on these upstream solutions. Recycling can serve as one part of a much larger suite of solutions but chemical recycling should not divert focus from upstream solutions that go beyond recycling and reducing the use of single use plastic in the first place.

2. **Chemical recycling processes should demonstrate a reduced carbon footprint compared with the production of virgin resin.** It is important that chemical recycling processes deliver greenhouse gas (GHG) improvements over virgin-fossil plastic. It is recommended that any chemical recycling technologies pursued should achieve at minimum a 20% reduction in GHG emissions at demonstration scale compared to the virgin production system. As chemical recycling technologies scale up, this reduction should be higher – these technologies should achieve emissions reductions in line with what is needed to meet commitments to limit global warming to 1.5° C above pre-industrial levels. GHG emissions should be verified with an independent Life Cycle Assessment, in accordance with *ISO 14040*, and shared publicly and transparently.

3. **Chemical recycling must not negatively impact local communities and must demonstrate their operation is safe for human health.** Environmental justice principles should be observed throughout the implementation of any chemical recycling activities. Chemical recycling may involve high levels of heat, pressure, and/or chemical solvents and may generate potentially hazardous residues; these variables can pose risks to human health and must be carefully controlled. Chemical recycling technologies should not be used in contexts where effective, well-resourced, and independent regulation is not available. In all contexts, those implementing the technology should (i) adopt or initiate an independent auditing body that can certify the processes for safety and efficacy, and the recycled plastic produced for safety; and (ii) adopt a full duty of care towards residues and waste substances generated. For more information on the safety profile of plastic recycling operations (especially in low and middle-income countries), see Tearfund's *Safety First*.

4. **Safeguarding nature – chemical recycling technologies must not adversely impact our air, water, and environment.** Although chemical recycling technologies are an attempt to address the plastic waste crisis, there is a risk of unintended consequences; we cannot trade one issue for another. Chemical recycling should only be used in circumstances where this decision demonstrates net environmental benefit.

5. **The use of chemical recycling should be complementary to existing waste management systems and not compete for feedstocks with mechanical recycling.** As there are already successful value chains and infrastructure for recycling of plastics that are collected, these systems should continue to be used and scaled up. Increased use of chemical recycling technologies should not undermine these established, lower-carbon systems. Chemical recycling should be used only for plastic that cannot be efficiently recycled by mechanical recycling systems. In order for chemical recycling to add value to waste management systems, plastic processed by chemical recycling should be **additional**, representing a new processing stream for waste that would have otherwise not been recycled.

6. **Plastic waste streams should be matched to the most environmentally efficient technology available.** Guiding each waste stream to the most environmentally preferable process available for the specific polymer/format in question will ensure the whole system operates with the smallest environmental footprint possible. This consideration should include the effective yield of the recycling process, as process loss may differ substantially across technologies. Chemical recycling operators should be transparent with all requirements, including energy and water requirements and yield information.

7. **Only material-to-material applications of chemical recycling should be considered recycling and part of a circular economy.** Technologies that recirculate products or packages in the economy fulfil their circularity mission. These plastic-to-plastic technologies ensure that recycled content is being used in place of virgin material. Chemical recycling only contributes to a circular material system when it is applied to material-to-material production; activities such as plastic-to-fuel should not be considered recycling, nor a part of the circular economy (I*SO 18604:2013 — Packaging and the environment — Material recycling, modified* defines material recycling as "Reprocessing, by means of a manufacturing process, of a used packaging material into a product, a component incorporated into a product, or a secondary (recycled) raw material; excluding energy recovery and the use of the product as a fuel.") Chemical recycling operators should not count fractions of material that are converted to energy, fuel, or otherwise lost in processing as "recycled". Plastic-to-fuel technologies do not offset virgin plastic entering the system.

8. **Chemical recycling systems should not transform recyclable material into non-recyclable material.** In an ideal case, chemical recycling will upcycle a feedstock into more valuable material. Using a feedstock that is recyclable in practice to produce a material that is not recyclable in practice does not support circularity. This will incentivize design for recycling as well as accelerate the scaling of technologies for hard to recycle formats and materials.

9. **Claims made regarding chemical recycling should be true, clear, and relevant.** Public facing claims about content that is recycled using a mass-balance approach should clearly distinguish that content from physically segregated recycled content. Additionally, recycled content should only be claimed on products that are, in turn, recyclable themselves in practice. Requiring new plastic materials made from chemical recycling to be recyclable themselves discourages the production of new plastics that do not fit in existing recycling streams. All claims should comply with local legal guidelines.

10. **Plastic recycled with chemical recycling technologies should be verified with chain of custody.** Because plastic recycled with these technologies cannot be distinguished from virgin fossil plastic by the public, 3rd party verification of chain of custody to ensure the authenticity of the amount and distribution of chemically recycled content is necessary. Credible chain of custody is required as proof for any claims made on plastic that has been recycled using chemical recycling technology. See *WWF's Principles for Credible Certifications and Standards* for more information.

For more information:

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