Global Alliance on Circular Economy and Resource Efficiency
(GACERE)

GACERE WORKING PAPER[1]

# Circular Economy and Climate Change

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The present document explores the nexus between circular economy and climate change and offers insights on how circular approaches can strengthen climate action.

We are confronted with three interrelated environmental crises: climate change, biodiversity loss, and pollution. The report *Making Peace with Nature*[2] highlights how urgently transforming our social and economic systems is necessary to ensure that humanity's use of land and oceans becomes sustainable.

## 1. More ambitious climate action is required[3]

According to the 2020 UNEP Emissions Gap Report[4], global greenhouse gas (GHG) emissions continued to grow for the third consecutive year in 2019, reaching a record high. A dramatic strengthening of ambition is needed if the Paris Agreement goals are to be achieved. In line with the findings of previous editions of the Report, countries must collectively increase the ambitions of their nationally determined contributions (NDCs) threefold to get on track to achieve the 2°C goal and more than fivefold to get on track for the 1.5°C goal.

The extraction and transformation of the materials that are vital to society are an important source of greenhouse gas (GHG) emissions. According to the International Resource Panel (IRP)[5], approximately half of global GHG emissions (not including climate impacts related to land use) are due to the extraction, and processing of the world's material resources[6], while at the same time impacting biodiversity loss and leading to higher rates of pollution. The projected doubling in the use of primary materials by 2060[7] – would result in substantial additional stress on resource supply systems and unprecedented environmental pressure

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1 This document is a concise paper offering relevant facts and figures, and arguments outlining key benefits of the circular economy to address planetary crises or a sustainable development challenge. It is a knowledge product, part of the toolbox, which members of the Global Alliance on Circular Economy and Resource Efficiency (GACERE) have developed, to support their advocacy at political level and multilateral fora for transitioning towards a circular economy. It is not a negotiated document and as such it does not necessarily represent the views of all GACERE members. Furthermore, it does not, nor is it intended to, create any binding, legal or financial obligations under international or domestic law.

2 UNEP (2021). Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. Nairobi.

3 Building on existing key information sources, this section shows that the climate crisis continues to increase its urgency.

4 UNEP (2020). Emissions Gap Report 2020.

5 IRP (2019). Global Resources Outlook 2019: Natural Resources for the Future We Want

6 Biomass, including food, metals, non-metallic minerals, and fossil fuels.

7 OECD (2018), Global Material Resources Outlook to 2060. Highlights.

and impacts, unless improvements in managing their extraction, cultivation, regeneration, use and disposal are made.

Climate change and the extraction, transformation and use of materials are interrelated. Climate change may impact material production positively or negatively through longer growing seasons for trees or extreme weather events, affecting, among others, mining areas[8]. In addition, climate change adaptation strategies may also lead to higher demand for materials, for example for the rebuilding and increased frequency of repair efforts after natural disasters[9].

Although 2020 emissions were lower than in 2019 due to the COVID-19 crisis and associated responses, GHG concentrations in the atmosphere continue to rise, with the immediate reduction in emissions expected to have a negligible long-term impact on climate change[10].

## 2. Circular economy can help translate climate ambition into action[11]

As recognised by the United Nations Environment Assembly[12], a circular economy retains the value of products, materials and resources in the economy for as long as possible and aims to regenerate natural systems. A circular economy aims at reflecting the circularity of nature. It transforms the current economic model towards sustainability, as materials and products are kept at their highest possible value as they move and are retained within the economy through value retention processes (e.g. rethink, refuse, reuse, repair, refurbish, remanufacture, repurpose, recycle) and innovative business models (e.g. circular supplies, product lifetime extension, product-as-service[13], sharing platforms etc.). In key economic sectors, including energy generation and transmission, water, construction, consumer goods or agriculture and food production, the circular economy can bring multiple benefits, including for climate change mitigation.

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8 IRP (2020). Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.

9 *Ivi,* p. 20.

10 UNEP (2020). Emissions Gap Report 2020.

11 This section outlines the potential impacts of a profound transformation of our consumption and production patterns in moving towards the 1.5° C goal set by the Paris Agreement. It builds on on-going initiatives and research conducted by the International Resource Panel, the Organisation for Economic Cooperation and Development, Material Economics, the European Commission, UNEP, UNIDO and GACERE strategic partners (the Ellen MacArthur Foundation, the Platform for Accelerating the Circular Economy, and the World Circular Economy Forum)

12 UNEP/EA.4/Res.1 'Innovative pathways to achieve sustainable consumption and production'.

13 See for instance, www.chemicalleasing.org, promoted by UNIDO since 2004 as an industrial circularity model.

2.1 Accelerating and scaling up our shift to circularity, sustainable consumption and production patterns and inclusive and sustainable industrialization pathways can accelerate the low carbon and just transition and ensure a healthy planet[14].

A circular economy offers cost-effective ways of achieving deep emission cuts. These cost benefits are made possible by ensuring that products and materials are not wasted, and loss of value is minimized across the value chain. A circular economy could also involve mechanisms that encourage greater resource use synergies across different value chains (e.g., transforming typical waste materials from one value chain to become resources for other value chains).

It is estimated (under an ambitious scenario) that applying circular economy strategies in just five key areas (cement, aluminium, steel, plastics, and food) can eliminate almost half of the emissions from the production of goods – 9.3 billion tonnes of CO2e in 2050 – equivalent to cutting current emissions from all transport to zero[15].

Considering that about 50% of the urban environment needed by 2050 is not yet built[16], different **building techniques**, including embedding carbon through the use of wood, and a more circular cement, steel and aluminium production and use will have a large potential for mitigation with upgraded construction materials and techniques[17].

Global **food loss and waste** generate annually about 8% of total anthropogenic GHG emissions, almost equivalent to global road transport emissions[18]. Agricultural and food waste must be reduced, and that which is unavoidable needs to be treated to extract nutrients and biogas, rather than be allowed to degrade in landfills, where it is a significant source of methane. Designing out waste along the whole value chain can also serve to sequester carbon in the soil through regenerative agricultural practices and avoid emissions related to uneaten food and unused by-products[19].

The world is producing and consuming more **textiles** than ever before with many garments never or seldom worn. The current very low reuse and recycling rates mean that more textiles are also being thrown away at unprecedented rates: less than 1% of material used to produce clothing is recycled into new clothing, representing a loss of more than USD 100 billion worth of materials each year[20]. Climate impact of the global apparel industry is substantial, with over 3.3 billion tonnes of greenhouse gases emitted across the value chain per year, which is more than all international flights and maritime shipping combined[21]. By developing circular design measures, ensuring the uptake of secondary raw materials, including innovations in technologies for recycling of mixed fibers, tackling the presence of

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14 This sub-section offers examples of potential impacts of circular solutions at design, production, consumption and end of life stages in key sectors which were identified as resource-intensive in existing reference reports and in the UNEP/EA.4/Res.1 on Innovative pathways to achieve sustainable consumption and production.

15 Ellen MacArthur Foundation (2019), Completing the Picture: How the Circular Economy Tackles Climate Change

16 IRP (2018), The Weight of Cities: Resource Requirements of Future Urbanization.

17 IRP (2020), Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.

18 FAO, Food wastage footprint & Climate Change.

19 Ellen MacArthur Foundation (2019), Cities and Circular Economy for Food.

20 Ellen MacArthur Foundation (2017), A new textiles economy: Redesigning fashion's future

21 UNEP (2020), Sustainability and Circularity in the Textile Value Chain - Global Stocktaking.

hazardous chemicals, and providing consumers with easy access to reuse and repair services, the circular economy model can contribute to the sustainability and greenhouse gas emission reduction in the global apparel industry.

The contribution of **information and communication technology** (ICT), including infrastructure like data centres and communication networks, to the total global carbon footprint is set to reach more than half of the relative contribution of the entire transportation sector worldwide by 2040[22]. The relative emissions share of smartphones was expected to grow from 4% in 2010 to 11% by 2020, dwarfing the individual contributions of PCs, laptops and computer displays. The vast majority of emissions are associated with the smartphone production phase[23]. A circular approach to improving the durability of electronic devices as well as promoting reparability and upgradability through circular designs (e.g., availability of spare parts, software support and material recovery) can thus contribute substantially to the fight against climate change.

Some of the most economically attractive options are to be found in circular economy strategies that focus on increasing the utilization and lifetime of products and are often based on innovative business models. For example, in the **transport sector**, a shared and circular mobility system could reduce the cost of travel by as much as 70%[24]. In addition, material efficiency strategies could reduce greenhouse gas emissions from the material cycle of passenger cars (i.e., at production, use and disposal stages) in 2050 by up to 70% in G7 countries and 50 to 60% in China and India. The largest savings would come from a change in patterns of vehicle use (through ridesharing and/or car-sharing) and a shift towards more intensive use and trip-appropriate smaller cars, among others[25].

**Plastic** is a ubiquitous feature of modern life thanks to its various material advantages including flexibility, robustness, and versatility. Plastics production and the incineration of plastic waste is estimated to give rise globally to approximately 400 million tonnes of carbon dioxide a year[26]. Moreover, due to the cheap price of virgin plastics[27], a lack of access to technology and infrastructure, and other challenges throughout the value chain, its reuse and recycling at end-of life remains very low, particularly when compared to other material streams. With plastics production expected to double over the next 20 years, based on current production and waste management trends, an estimated 12 billion tonnes of plastic waste will be in landfills or in the natural (including marine) environment by 2050[28]. Emphasis should thus be placed on the prevention of waste, as well as on a resource-efficient and long-term circular approach. Integrating lifecycle thinking into the design, production, use and disposal of plastic products (including microplastics) is essential to implement impactful

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22 https://theconversation.com/how-smartphones-are-heating-up-the-planet-92793.

23 Including energy for manufacturing as well as for mining gold and rare-earth elements like yttrium, lanthanium and several others.

24 Ellen MacArthur Foundation (2019), Completing the Picture: How the Circular Economy Tackles Climate Change

25 IRP (2020). Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.

26 Communication of the European Commission A European strategy for plastics in a circular economy, COM(2018) 28.

27 Due to fossil fuel subsidies, https://www.imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509

28 UNEP (2018), Combating marine plastic litter and microplastics: an assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches – a summary for policymakers, UNEP/AHEG/2018/1/INF/3.

measures (including EPR) along the entire plastic value chain to reduce losses and potential impacts on climate, ecosystems and human health[29].

**Lifestyle changes** are a prerequisite for building circularity, sustaining reductions in GHG emissions and bridging the emissions gap. Around two thirds of global emissions are linked to private household activities according to consumption-based accounting. As the household emissions of the richest 1% of the global population account for more than twice the combined share of the poorest 50%[30], it is essential that lifestyle changes are based on the principle of equity. Lifestyle emissions are linked to many sources and sectors. Foremost among these are mobility, buildings and food, each of which contributes close to 20% of lifestyle emissions, thus implying strong mitigation potential in these areas[31]. Compliance with the 1.5°C goal of the Paris Agreement will require reducing consumption-based emissions through lifestyle changes, necessitating changes to both broader systemic conditions and individual actions[32].

The World Bank[33] estimates that in 2016 some 1.6 billion tonnes of carbon dioxide equivalent were caused by **solid waste treatment and disposal** – about 5% of global emissions. The circular economy model offers key opportunities for preventing waste generation, including through product lifetime extension, and reducing emissions associated with waste management, including through circular product design, product reuse and repair, recycling, and transforming waste into a resource, where possible.

## 2.2 Circular economy, a key enabler to raise the ambition of climate commitments[34]

To date, efforts to tackle the climate crisis have focused on cleaner energy and energy efficiency rather than materials efficiency as a central strategy for GHG emissions reduction[35], i.e., policies focus on impacts and consequences rather than on the drivers and pressures causing them. The transition to renewable energy, complemented by energy efficiency, though crucial and consistent with a circular economy, is likely to address only 55% of emissions. The remaining 45% comes from producing the cars, clothes, food, and other products we use every day[36]. A global just transition to a circular economy can contribute to completing the picture of emissions reduction through a systemic transformation of the way we design, make, use, and dispose of products, to ensure products and materials are kept at their highest possible value for as long as possible within the economy; addressing the embodied energy and carbon in the products and buildings we use.

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29 UNEP (2018), Mapping of global plastics value chain and plastics losses to the environment

31 UNEP (2020). Emissions Gap Report 2020

32 *Ibidem*.

33 The World Bank (2018), What a Waste 2.0. A Global Snapshot of Solid Waste Management to 2050.

34 This sub-section highlights the opportunities the circular economy offers to countries in their response to the climate crisis.

35 IRP (2020). Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future.

36 Ellen MacArthur Foundation (2019), Completing the Picture: How the Circular Economy Tackles Climate Change.

There is a significant opportunity for countries to integrate low-carbon development and a transition to circularity into the implementation plans and measures for their new or updated NDCs and long-term mitigation strategies, scheduled to be available in time for the twenty-sixth session of the Conference of the Parties (COP 26) in 2021[37].

## 3. Conclusion

The circular economy allows countries to decouple economic growth from the extraction and use of natural resources – providing benefits to people, the economy and nature. These benefits include lower emissions, less harmful resource extraction, less pollution and waste and the creation of new markets, new job opportunities as well as increased GDP and revenues for businesses[38].

As we seize these benefits, it is essential to ensure the transition is just and inclusive. It is therefore necessary to work with countries that depend on resources to diversify their economies, and ensure the burden of the transition is not transferred to the most vulnerable countries and most vulnerable people; instead striving to leave no one behind, upskill the workforce to reflect the changing nature of work under a circular economy, and ensure new jobs are safe and decent.

37 UNEP (2020). Emissions Gap Report 2020

38 Ellen MacArthur Foundation (2017), Achieving ''Growth Within''