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Climate Change, Sustainable Energy & Environment

Policy brief

LOCALISING THE CIRCULAR ECONOMY IMPERATIVE IN A POST COVID-19 ERA: PLACE, TRADE AND MULTILATERALISM

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ABSTRACT

Resource extraction and consumption is projected to double by 2060. However, today only 8.6% of raw materials extracted are put back into circulation, which worsens pressure on ecosystems, intensifies pollution and waste issues, and accelerates climate change. The transition from a linear to a circular economy opens a pathway for a green, more sustainable and resource-conscious future. To this end, we recommend that the Group of Twenty (G20): (1) acknowledges the value of circular cities for the G20, (2) embeds circularity into multinational supply chains, (3) boosts circularity through digitalisation and (4) implements a just transition through context-sensitive, localised approaches.

CHALLENGE

ACCELERATING THE MULTILEVEL, MULTILATERAL RECOGNITION AND UPTAKE OF CIRCULAR ECONOMY

Global resource extraction is expected to double by 2060, driven by demographic and economic growth (OECD 2018, p. 22). Yet only 8.6% of our economy is circular while over 90% of the raw materials used are not returned to circulation (Dhawan and Beckmann 2018, p. 4; PACE 2021). At the current pace, there could be more plastic than fish in the oceans by 2050 (Ellen MacArthur Foundation 2016). In 1972, *The Limits to Growth* report already warned about the limits of the linear economy and the "take, make, dispose" models of production and consumption (IRP, 2019 p. 11). However, this did not prevent the extensive development of global supply and value chains along linear economy principles.

Taking action at the global level is critical to address the three planetary crises that we are facing – climate change, nature and biodiversity loss, and pollution and waste (Andersen 2021) – and to accelerate the transition towards a circular economy. However, creating multilateral alliances among nations and international institutions (EC 2021a), and revising industrial production and consumption models (Lacy et al. 2014) will not suffice, as the geography of growth also matters greatly. It is also critical to tackle combined patterns of production, consumption and urbanisation (World Bank 2021). Localising the circular economy is as much an imperative as developing it, as the transition from linear to circular means creating a new doctrine for economic geography and the "infrastructure for growth" narrative that has long structured G20 macroeconomics (Cohen 2021).

Since the end of the Cold War, the worldwide adoption of the paradigms of "infrastructure for growth" (World Bank 1994) and "agglomeration economies" (World Bank 2009) has enlarged the space for production and consumption. Continuous expansion of interconnectivity has allowed for widespread dispersal of waste, including plastic and other chemicals, triggering land degradation and stressing the Earth system to unprecedented levels (Ellen MacArthur Foundation 2016). Growth policies and market transitions in many countries in the Global South are still based upon these inherited paradigms. Circular economy is still a novel concept, particularly in low- and middle-income countries (Schroeder, Anggraeni, and Weber 2018, Appendix 1).[1] The challenge is to align the "infrastructure for growth" narrative with the circular economy imperative and maximise the multilevel co-benefits of innovations, driven globally by business partnerships or multilateral institutions and locally by cities and subnational governments, including the civil society.

In parallel, the COVID-19 crisis has highlighted the value of digital technologies and big data across all sectors of society and the economy, including food supplies, health, education, energy management, environmental monitoring and global logistics. The fourth industrial revolution is developing at an exponential speed, fundamentally impacting entire systems

of production and consumption. Although digitalisation, Industry 4.0 and Internet of Things are recognised by the G20 and other fora as drivers for economic growth, their development is also highly unequitable across geographies and societal groups, and the pandemic has exacerbated these digital divides. There is still a long way to go to transfer the progress made in many industrial and services sectors towards digital integration to wider society and to harness the impacts of digitalisation to develop the circular economy.

The United Nation's 2030 Agenda includes a series of targets referring to circular economy.[2] G20 leaders have also moved from "recognising" the importance of resource efficiency (G20 Osaka 2019) to "endorsing" a Circular Carbon Economy (CCE) platform (G20 Riyadh 2020; KAPSARC 2020),[3] a transformation reflected by the growing recognition of the circularity issue by the Urban 20, the G20 engagement group for cities. Following regional initiatives such as the European Union's identification of the circular economy as a potential source of green jobs, multilateral alliances such as the Global Alliance on Circular Economy and Resources Efficiency (GACERE 2021) have been launched. Yet, to maximise leverage, they need to (1) be rapidly extended to developing and emerging countries and (2) address local issues.

PROPOSAL

2021 is an opportune year to start assembling the pieces of the circular economy puzzle and initiate a global transition towards resource conscious development. In line with the G20 Italy promoting "green circularity", this policy brief endorses a universal approach to circular economy, covering developed as well as emerging and lower-income countries. It presents concrete proposals for the development of G20 guidelines on a socially inclusive circular economy, with a focus on circular cities**,** global value chains, technological advancements, just energy transition and sustainable and equitable recovery from the COVID-19 crisis.

ACKNOWLEDGING THE VALUE OF CIRCULAR CITIES FOR THE G20

We propose to establish G20 guidelines for circular cities. Today, already more than 55% of the world's population lives in urban areas. This share is expected to rise to 70% by 2050, with the urban population doubling from today's 4.2 billion (World Bank 2021). The corresponding urbanisation patterns have been detrimental for the environment and have led to habitat losses (McDonald et al. 2018, p. 23). Cities already generate about 1.3 billion tons of solid waste every year, and this is projected to increase to 2.2 billion tons by 2025, likely even doubling in lower-income countries in the next two decades (World Bank 2018; Chul et al. 2020). Yet, while urbanisation is the root cause of multiple environmental challenges, cities are also catalysts in the transition to a circular economy.

The first step to establishing G20 guidelines for circular cities would be to explore the many possibilities to close material (EEA 2020) and energy loops (Tomic and Schneider 2018), and connect multiple societal and ecosystem services (Ellen MacArthur Foundation 2019; Kay Plat and Perret 2018; Interreg 2016). Cities are at the right scale to integrate function and material flows (Perrotti and Stremke 2018) through circular urban metabolism and multifunctional land use (Broekhoven and Vernay 2018; Ellen MacArthur Foundation 2017). The public sector in general and cities in particular can lead the way through the procurement of circular products and services. Policymakers have a wide array of options at hand to increase the share of goods based on circular principles, such as awareness raising, amending standards and legal requirements, and changing supplier selection criteria (Sönnichsen and Clement 2020)

The second step would be for the G20 to improve the macro-economic valuation and assessment of ecosystem services. Although calculations remain complex because they include multiple dimensions of value contribution to human quality of life (IPBES 2019; Costanza et al. 2014), converging research estimates the total value of ecosystem services worldwide at over US$140 trillion (OECD 2019). We argue that this is a relevant way to turn the circular economy focus from theoretical principles to concrete economic, and possibly, macro-economic, dimensions. For instance, estimates from Costanza et al. dating back to a decade

ago noted that global land use changes between 1997 and 2011 had resulted in a loss of ecosystem services worth between US$4.3 and US$20.2 trillion per year. Recent analyses indicate that human impact on ecosystems and biodiversity would need 1.6 Earths to maintain our current standards of living (Dasgupta 2021).

The economics of biodiversity emerges along with the need to fully incorporate the assessment and valuation of the negative and positive impacts (externalities) of economic activities on nature and to fully consider the benefits provided by nature to human activities (Dasgupta 2021). Therefore, a more refined valuation of nature-based solutions and ecosystem services at all scales could be potential game changers (Croci, Lucchitta, and Penati 2021). They are also necessary to reinforce the case for sustainable urban and inter-urban infrastructure, thereby closing the loop between urban transformation and infrastructure transformation, the two key ingredients for circular cities development (Buchoud et al. 2020).

The third area for the G20 relates to the urgent need to reverse urbanisation's detrimental footprints on natural and rural environments. Annually, 24 billion tons of fertile soil is lost due to erosion from unsustainable farming and livestock breeding practices, inappropriate agricultural technology and unregulated land conversion (Lopes et al. 2020). Left unchecked, almost 95% of all agricultural land will be degraded by 2050, posing a serious challenge to food security and intensifying the pressure on natural land, water and coastal ecosystems (Buchoud, Cohen, and Sonobe 2021).

The pandemic has further exacerbated food shortages and extreme hunger, and highlighted patterns of dependencies between urban and rural environments, with massive flows of people leaving cities either by choice or forced by economic closures. Echoing the call of the Food Coalition set up by the Food and Agricultural Organization (FAO) to recognise the key role of rural ecosystems in supporting carbon capture and biodiversity protection, there is a need to halt land conversion for urbanisation, industry and related infrastructure;[4] promote the uptake of new technologies for rural ecosystem services; and refine urban biodiversity and food and raw resources production and consumption strategies (Buchoud and Bernede 2021; Grossouvre et al. 2021).

Thus, 1) planning and land use, 2) developing digital technologies for smart and efficient mobility systems and urbanisation patterns, 3) creating an economy of well-being, 4) valuation of urban ecosystem services, and 5) building sustainable infrastructure systems are areas of investment and operations that could contribute to the development of a circular economy.

EMBEDDING CIRCULARITY INTO MULTINATIONAL SUPPLY CHAINS

A shift to circular production, distribution and consumption models will allow resources to be utilised more efficiently, products and materials kept in use for as long as possible, and resources and materials embedded in products to be recovered for reuse, recycling and

repurposing (Bakker, Hollander, and Hinte 2019). Multilateral arrangements between stakeholders such as governments, private sector and civil society can level the playing field to help companies across supply chains, from MSMEs[5] to multinational corporations, adopt circularity in their practices. This transition would make them more resource-efficient, gaining value instead of generating waste at every step of the chain, and consequently, more resilient in crises. This includes establishing policies based on commonly agreed on circularity principles, regulatory frameworks, and techno-commercial standards to align resource supplies and use, manufacturing and service facilities, and end-of-life systems. While more corporates are investing in developing sustainability strategies and social responsibility, effort must be made to develop bridges with cities and civil society.

Harmonising requirements, standards and protocols for design, including circularity metrics across value chains, would help cascade the circular economy principles upstream and downstream. This would make it significantly easier for companies in a global market to adopt a common set of compliance parameters by sector, leading to streamlined supply and use of raw materials and finished goods. Standardised systems will also make it easier for multinationals to verify such compliance, thereby introducing greater traceability and transparency in the value chains, and facilitate integration between value chains, thus multiplying circularity (Potting, Hekkert, Worrell, and Hanemaaijer 2017; WBCSD 2021).

Engagement of coalitions of industry players and associations, such as the Responsible Business Alliance, is encouraged at the multinational level (RBA 2021). There are promising engagement opportunities at the international, governmental, and regional levels as well (Delahaye, Ganzevles, Hoekstra, and Lijzen 2018; EC 2020a; Ellen MacArthur Foundation 2021; PACE 2021). Notwithstanding potential limitations in emerging economies, efforts are needed to foster service- or user-oriented business models over product-oriented ones to incentivise companies to retain the value of their materials and products and keep them in the market for as long as possible.

Circularity can also enhance value chains' efficiency, traceability and resilience through technological innovations that leverage digital platforms, Internet of Things (IoT), big data and analytics, blockchain and artificial intelligence. Ledger technologies using blockchain to share information through RFID, QR codes, etc. can track materials and products along the value chain (Upadhyay, Mukhuty, Kumar, and Kazancoglu 2021), thus facilitating eco-industrial clustering/symbiosis (ERIA 2020).

Policy frameworks accompanied by technologies and innovations could incentivise companies to measure and report vital circular metrics across value chains. This would, in turn, stimulate circularity in product design and resource management. Integrating circularity principles in policy interventions to enhance the "ease of doing business" can encourage industries across sectors and geographies to accept them as value propositions that directly improve business performance.

We propose an ecosystem approach to scale up circular economies, where policymakers, industries, investors and technology providers share capacities and capabilities on opera-

tional policies, processes, standards, supply chain mechanisms, technological innovations, intellectual property rights and circularity metrics to design and deploy circular networks across multiple countries or regions. Multinationals, by virtue of operating across geographies and industries, have the leverage, experience and competence to steer the setting up of such networks. They are usually backed by policy and fiscal government support through national regulations but are also increasingly operating at urban levels.

We therefore propose promoting an open, transparent and standardised approach to identify risks and opportunities for all actors in each value chain related to the utilisation of resources like land, water, energy and raw materials at each stage of a product or project lifecycle, and in related business model adaptations or efficiency improvements. This will build the trust of consumers, investors and policymakers and help harness and harmonise local initiatives and regulations. Key circularity metrics are usually linked with driving higher productivity and resource efficiency, addressing safety issues or responding to consumer concerns, and can drive sustainable economic growth, fostering livelihoods as well as ecological benefits.

BOOSTING CIRCULARITY THROUGH DIGITALISATION

Various national initiatives worldwide to enhance industrial productivity have recognised the international importance of Industry 4.0. The European Commission's New Industrial Strategy aims to increase the share of gross value added to 20%, based on Industry 4.0 initiatives (EC 2020b). Various elements under regional cooperation frameworks such as the ASEAN Economic Community (AEC) Blueprint 2025 (ASEAN 2015), from global megatrends, intellectual property, consumer protection and science and technology to e-commerce, serve as the building blocks of an Industry 4.0-ready community. The scope, scale and complexity of the impacts of Industry 4.0 on the circular economy are expected to be significant (Anbumozhi and Kimura 2018). Complementing the development of G20 guidelines on circular cities, G20 leaders could endorse the creation of a circular economy knowledge hub to facilitate uptake of new technologies. Guided by three main priorities, the hub would document critical knowledge on digital technology and data architecture, and provide expertise to translate best practices from business and society into policymaking.

As a priority, policymakers should champion international technological governance structures to support Industry 4.0-enabled circular economy solutions and open architecture models to use technological advances to maximise resource efficiency. Intellectual property considerations will need to be taken into account along with environmental, social and governance investment architecture.

The second focus should be on the promotion of global digital technology campaigns for the circular economy outlining the benefits and values for all stakeholders, including ordinary citizens and their daily lives. Member governments could encourage the industry to develop sectoral assessment and deployment tools for Industry 4.0-centric digital technologies and guidelines to incorporate them into various value chains.

Another priority of the circular economy knowledge hub would be to create a working group or taskforce to provide expert inputs on Key Performance Indicators of Industry 4.0-aided circular economy. Several such taskforces exist within the G20 for sectors like energy transition, climate finance and food security. The circular economy working group, which consists of global experts from T20 think tanks, industry leaders and bi- and multilateral organisations, could be cross-linked with working groups such as those on digital economy and 2030 Agenda to build synergies.

IMPLEMENTING A JUST TRANSITION THROUGH CONTEXT-SENSITIVE, LOCALISED APPROACHES

A just transition to a circular economy relevant to the developing world must be compatible with poverty eradication, job creation and improvements in access to safe water, sanitation, healthcare and electricity (Schroeder 2020). Technological advances and innovation, like digital platforms and automation, are increasingly impacting business and employment globally (Manyika 2017) by leading to changes in the labour market through (job) substitution, creation and transformation. A strong social consensus on the goals and pathways to sustainability is fundamental to the transformation process (ILO 2015).

To create jobs and generate sustainable incomes, awareness of the benefits of a circular economy must be raised among the workforce, and local executive and managerial staff should be trained. The transition to a circular economy offers a multitude of new business opportunities for the private sector. Often, they tend to be more labour-intensive than their linear economy counterparts, which is conducive for countries with low labour costs. Despite the relatively limited evidence regarding circularity impacts on developing economies globally, recent projections on a circular economy transition in Africa indicate overall positive employment effects, estimating a net increase of around 2.7% in employment in 2030 relative to the business-as-usual scenario (EC 2021b). Building appropriate skill sets in the workforce is a prerequisite for these projections (Rademaekers et al. 2020), although in many cases, initiatives at local, city or community levels already provide a wealth of experiences which are undervalued and rarely consolidated at a global scale (Chul et al. 2020).

Green skill formation and green entrepreneurship aspiration are key for the shift towards circularity (EC 2020a). While they are important in Europe, they are even more critical in the developing world for building bridges between the public and the private sectors, urban and rural environments, policy advocacy and civic initiatives and institutions. There must also be sufficient institutional capacity, especially in public administration and financial institutions. Likewise, considerable capacity building and awareness boosting is needed for circularity principles to contribute to the achievement of SDGs on water and sanitation (6), economic growth (8), industry, innovation and infrastructure (9), sustainable cities (11), sustainable consumption and production (12), climate change (13) and life on land and water (14 and 15).

Governments from many countries in the Global South have made promising steps towards a low-carbon energy mix by increasing the share of renewables (IEA 2020). However, this process creates new challenges with photovoltaic modules and wind turbine blades reaching their end of life (e.g., Heath et al. 2020; Hao et al. 2020; Schoden et al. 2020). Thus, energy transition and the eradication of energy poverty need to be interwoven with technology and business models that foster a circular economy, which in turn require considerable development of green skills, entrepreneurship and institutional capabilities.

The GACERE[6] alliance, recently initiated by the European Union, the United Nations Environmental Programme (UNEP) and the United Nations Industrial Development Organization (UNIDO) (EC 2021a), includes some African and Latin American governments, but overlooks developing Asian countries. These must also be provided multilateral support and included in the global regulatory framework to achieve the transition to a global circular economy. Moreover, multilateral support for a circular economy must not only encompass financial support and knowledge transfer but should also raise awareness and build capacities.

CONCLUSION

Our policy brief has outlined the status quo in resource extraction and consumption, its negative environmental implications, and why the G20 needs to transition from linear to circular economies. To turn this structural change into reality, we suggest that G20 leaders:

1. Acknowledge the value of circular cities for the G20
    - Close material and energy loops and connect societal with ecological services
    - Improve the macro-economic valuation and assessment of ecosystem services
    - Reverse urbanisation's detrimental footprints on natural and rural environments

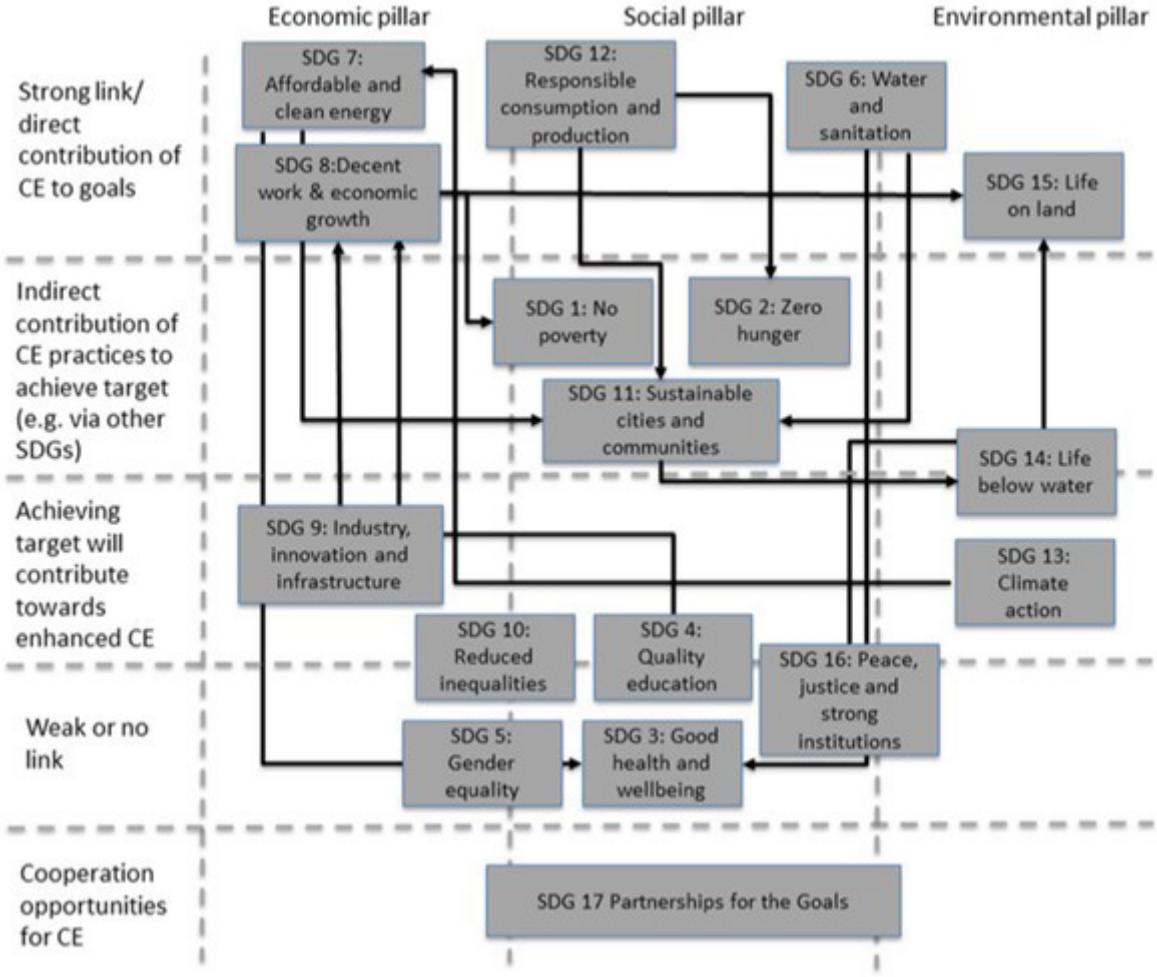
2. Embed circularity into multinational supply chains
    - Establish arrangements between governments, private sector and civil society
    - Harmonise multinational companies' requirements, standards and protocols
    - Build coalitions of industry players and associations on a multinational level

3. Boost circularity through digitalisation
    - Create a circular economy knowledge hub facilitating uptake of emerging technologies
    - Promote Industry 4.0-centric digital technologies and solutions
    - Develop KPIs to track the transitioning progress

4. Implement a just transition through context-sensitive, localised approaches
    - Build appropriate green and circular economy skill sets in the workforce
    - Construct a conducive regulatory environment where green entrepreneurship can thrive
    - Provide support through capacity building, awareness raising and knowledge transfer

APPENDIX

Fig. 1 - Relationships between Sustainable Development Goals (SDGs) in the context of circular economy practices



Source: Schroeder, P., U. Weber, and K. Anggraeni, 2018

FIG. 2 - TECHNOLOGICAL DEVELOPMENTS FOR INDUSTRY 4.0 AND THE CIRCULAR ECONOMY

Technological Developments for Industry 4.0	Ten Disruptive Technologies for the Circular Economy
• Information and communication technology • Cyber-physical systems • Network communications: Internet of Things (IoT) • Simulation • Advanced data analytics • Robots, augmented reality and intelligent tools for the support of human workers	• Mobile technology • Machine-to-machine communication • Cloud computing • Social media for business • Big data analytics • Modular desing technology • Advanced recycling technology • Life and material science technology • Trace and return systems • 3D printing

Source: ERIA, 2020

NOTES

[1] The academic research community and international development practitioners have only recently begun paying attention to CE practices in developing countries, according to Schroeder, Weber and Anggraeni. and yet, strong relationships exist between CE practices and the targets of SDG 6 (clean water and sanitation), SDG 7 (affordable and clean energy), SDG 8 (decent work and economic growth) and SDG 12 (responsible consumption and production) and SDG 15 (life on land), according to Schroeder, Weber and Anggraeni.

[2] See SDGs 12.2, 12.3, 12.5, with most of the remaining SDG 12 targets also supporting the circular economy transition; see also SDGs 6.3, 6.4, 6.a, 8.4, 11.6 and 11.b.

[3] G20 Osaka Leaders Declaration para. 38: ‚We endorse the Circular Carbon Economy (CCE) Platform, with its 4Rs framework (Reduce, Reuse, Recycle and Remove), recognising the key importance and ambition of reducing emissions, taking into account system efficiency and national circumstances.' G20 Saudi Arabia Leaders' Declaration, para. 32.

[4] For instance, in France alone, the total surface occupied by infrastructure facilities is larger than all regional natural reserves combined.

[5] Micro, Small and Medium Enterprise (MSME).

[6] Global Alliance on Circular Economy and Resource Efficiency (GACERE).

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