Research Paper

Environment and Society Programme

September 2022

The role of international trade in realizing an inclusive circular economy

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Contents

	Summary	2
01	Introduction	4
02	What is circular trade?	6
03	Overview of circular trade flows	11
04	Global dynamics of circular trade	44
05	Enhancing transparency and traceability	62
06	A pathway forward: Conclusion and recommendations for collective action	71
	Acronyms	77
	Glossary of terms	78
	About the authors	81
	Contributing authors	81
	Acknowledgments	82

Summary

- Unsustainable production, consumption and disposal of the world's resources are primary causes of the triple threat of pollution, climate change and biodiversity loss. This linear model is also a significant cause of social injustice, with most resource consumption and wealth accumulation occurring in the Global North and the worst environmental impacts and threats to human health in the Global South. Increasing geopolitical tension and the likelihood of further global supply-chain shocks and disruptions exacerbate these issues. A transition to an inclusive circular economy is essential to help address these challenges.
- An inclusive circular economy seeks to achieve absolute decoupling of resource use and environmental impact from equitable economic prosperity and human development. It does this by slowing, narrowing and looping the flow of materials through the economic system, while regenerating natural systems and designing out toxicity. By focusing equally on environmental issues, human needs, sustainable livelihoods, decent work and social justice, an inclusive circular economy can make important contributions to human development, to poverty reduction and to improved well-being around the world.
- International trade will play a key role in delivering an inclusive circular economy. Circular trade encompasses any international trade transaction that contributes to realizing a circular economy at the local, national and global levels. This includes trade in circular economy-enabling goods, services and intellectual property (IP); second-hand goods for reuse, repair, remanufacturing or recycling; refurbished and remanufactured goods; secondary raw materials (biotic and abiotic); and non-hazardous waste, scrap and residues (biotic and abiotic) that can be safely recovered or valorized.
- Circular trade offers many economic, environmental and social benefits. Trade in circular economy-enabling goods, services and IP allows countries and companies to access the necessary knowledge, skills and equipment to implement new circular business models (such as leasing and renting), or to conduct reuse, repair, remanufacturing and recycling activities. Trade in used goods for reuse, repair or remanufacturing enables affordable access to essential goods and services for those in secondary markets, and generates local demand for industry and employment. Trade in secondary raw materials and waste destined for recovery enables the aggregation of materials in areas of highest demand to maximize economies of scale, making it economically attractive to transform waste into resources for new production.
- However, poorly regulated circular trade can have negative impacts. Many grey areas and loopholes currently exist in the global trading system – enabling high levels of illicit waste shipments, causing pollution and increasing human

exposure to toxic chemicals. Meanwhile, high volumes of used goods can also flood secondary markets – threatening local industries and overwhelming local waste management systems. Under certain circumstances, overdependence on circular trade flows may also increase exposure to supply-chain risks and shocks.

— The distribution of value captured from circular trade flows is currently highly uneven, with most of the value remaining in the Global North. Growing geopolitical trends – such as economic nationalism and deglobalization – will likely lead to countries pursuing resource security in their circular strategies, rather than collective sustainability objectives. The resulting actions will inevitably create ripple effects along global value chains, potentially having a negative impact on other countries and exacerbating existing inequities.

— Any solution to overcome circular trade barriers will therefore require a collaborative and coordinated global response to ensure that all countries and territories benefit equally from the transition. This research paper presents an alternative pathway for the circular transition – towards a global trade regime that enables fair, inclusive and circular societies worldwide.

— The paper identifies five areas where collective action is necessary. First, the development of a shared language on circularity, starting with the definition and classification of goods. Second, the lowering or removal of technical barriers to trade. These include regulatory divergence and contradictory trade requirements among different jurisdictions. Third, the improvement of trade facilitation measures to address the complexities of product classification and cumbersome permitting processes, particularly for those products classified as hazardous. Fourth, dedicated capacity-building support from the international community to mitigate the impacts of increasing circular trade barriers and changing patterns of demand through targeted assistance programmes. Finally, a concerted effort by governments to embed circularity and inclusivity within trade and economic cooperation agreements.

01 Introduction

Greater collaboration at the global level is necessary to ensure that international trade contributes to an inclusive circular economy.

The transition to a circular economy is essential to address the triple threat of pollution, climate change and biodiversity loss. No single country can achieve a circular economy on its own, as interconnected global value chains and trade play a critical role in the concept. In addition, domestic circular economy actions can create ripple effects along entire value chains, with the potential to negatively impact other countries. Greater collaboration at the global level is necessary to ensure that international trade contributes to an inclusive circular economy that supports global environmental and human development goals. Despite the importance of circularity, there remains limited awareness or consideration of the circular economy among global trade actors.

This research paper aims to fill this knowledge gap by: (i) presenting a definition of circular trade; (ii) discussing why inclusivity must be embedded into circular economy-related trade initiatives and governance mechanisms; and (iii) identifying areas for strategic collective action to realize inclusive circular trade.

Chapter 2 of this paper offers a working definition of circular trade and demonstrates the importance of international trade for realizing a global circular economy. Chapter 3 explains five different types of circular trade flow and the benefits and challenges they present.

Chapter 4 outlines the current geographical inequities in participation and value capture from circular trade and how five different geopolitical trends will impact circular trade dynamics and fairness. It then discusses different national strategies to balance the benefits and risks of opening up to circular trade, and provides examples of how the domestic circular economy actions of one country can directly impact others.

Recognizing the interconnectedness of the circular economy transition, and the benefits and challenges outlined in previous chapters, Chapter 5 conducts a deep-dive into the importance of improved supply-chain transparency and traceability. It discusses current leading efforts in this area and proceeds to identify other necessary improvements.

Finally, Chapter 6 outlines five areas for collective action to ensure that international trade facilitates a transition to an inclusive circular economy.

02 What is circular trade?

Despite the topic's importance, awareness and understanding of the complex links between trade and the circular economy, and of the associated opportunities and risks, remain limited.

2.1 Overview of the circular economy

The global economy is structured around a linear model of production and consumption in which the world's resources are extracted, consumed and then thrown away. More than 90 per cent of the 100 billion tonnes of resources consumed each year are eventually discarded into landfill or incinerated.[1] This extremely inefficient approach to resource use is the primary driver of pollution, climate change and biodiversity loss – extraction and processing of resources alone contribute to 50 per cent of all carbon emissions and 95 per cent of all terrestrial biodiversity loss.[2] Therefore, systemic change in the way humanity uses natural resources is critical.

The circular economy is increasingly recognized as essential to bring about such a system change. While the exact definition of a circular economy remains contested, the concept is generally considered to be an economic system that achieves absolute decoupling of economic activity from environmental impact. It would fulfil this aim by: (i) slowing the rate of flow of materials through the economy (by extending the lifetime of products through designing for durability); (ii) regenerating natural systems by avoiding the use of non-renewable energy and material resources, and by preserving or enhancing renewable resources (such as using renewable energy instead of fossil fuels or returning valuable nutrients to the

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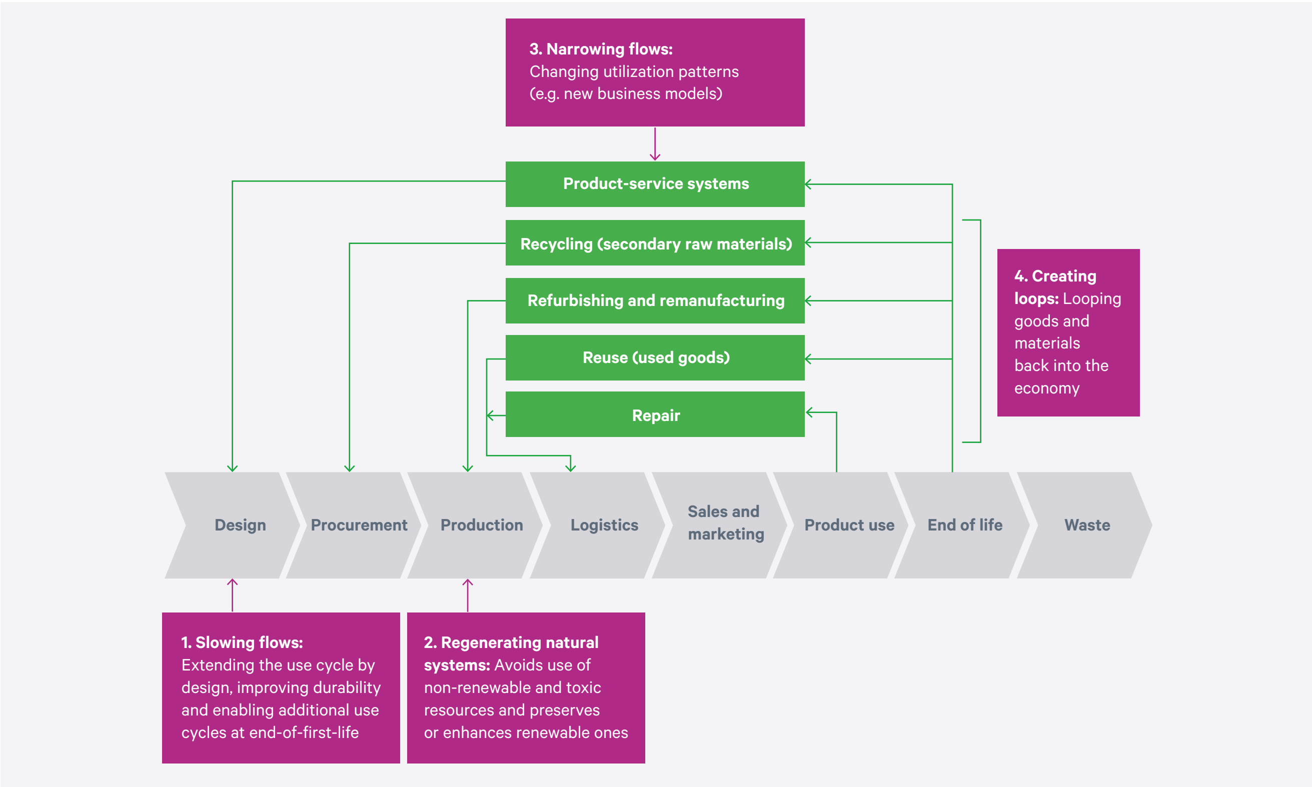
1 de Wit, M., Verstraeten-Jochemsen, J., Hoogzaad, J. and Kubbinga, B. (2019), *The Circularity Gap Report 2019: Closing the Circularity Gap in a 9% World*, Circle Economy, https://www.legacy.circularity-gap.world/_files/ugd/ad6e59_ba1e4d16c64f44fa94fbd8708eae8e34.pdf.
2 International Resource Panel (2019), *Global Resources Outlook 2019: Natural Resources for the Future We Want*, Nairobi: United Nations Environment Programme, https://www.resourcepanel.org/reports/global-resources-outlook.

soil to support natural ecosystems), as well as ensuring that all materials flowing through the economy are non-toxic and safe; (iii) narrowing material flows by doing more with less (i.e. changing consumption patterns to deliver the same service with fewer materials, such as via leasing and renting or by digitizing services); and (iv) looping materials back into the economy at the end of their life cycle (through reuse, repair, refurbishing, remanufacturing and recycling – see Figure 1).

Figure 1. Overview of the circular economy – slowing, narrowing, regenerating and creating loops



Source: Adapted from Preston, F., Lehne, J. and Wellesley, L. (2019), *An Inclusive Circular Economy: Priorities for Developing Countries*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/2019/05/inclusive-circular-economy.

With growing supply-chain volatility and exposure to shocks – brought about by rising geopolitical tensions, the COVID-19 pandemic and extreme weather events – the circular economy is increasingly being seen (by governments, industry and multilateral organizations) as an approach that can deliver on environmental goals while reducing exposure to, and the impact of, supply-chain shocks. At the international level, the circular economy is incorporated in the UN's Sustainable Development Goals (SDGs). For example, target 8.4 is to ensure 'global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation' and target 12.2 aims to achieve 'the sustainable management and efficient use of natural resources' by 2030. Additionally, the UNEA 5.2 resolution on '[e]nhancing circular economy as a contribution to achieving sustainable consumption and production' recognizes the importance of inclusive multilateral and multi-stakeholder dialogues on sustainable consumption and production, resource efficiency and the circular economy to promote sustainable development.[3] Governments are also increasingly including the circular economy in their nationally determined contributions strategies to meet commitments under the 2015 Paris Agreement on climate change.[4]

More recently, multilateral and regional alliances have been established to accelerate the global circular transition. These include the African Circular Economy Alliance (ACEA), the Circular Economy Coalition for Latin American and Caribbean (CECLAC), the Global Alliance for Resource Efficiency and Circular Economy (GARECE) and the Platform for Accelerating the Circular Economy (PACE).

At the national or regional level, over 520 policies and regulations are linked directly to enabling a circular economy,[5] with more than 33 national circular economy roadmaps being launched in Europe alone. The European Commission, for example, made the circular economy a key pillar in its European Green Deal with the launch of the Circular Economy Action Plan (CEAP)[6] – a comprehensive body of legislative and non-legislative measures aimed at increasing supply-chain competitiveness and resilience.

At the national or regional level, over 520 policies and regulations are linked directly to enabling a circular economy.

Public and private circular economy policy agendas to date, both in the Global North and the Global South, have mainly focused on capturing the economic gains and environmental benefits, and have failed to adequately consider critical societal elements. As observed in the transition to renewable energy, if the circular transition is not inclusive (i.e. allowing all members of society participate and share in the benefits equally), then it will not deliver on important social goals such as decent working conditions, improved health or reduced inequality. A key objective should therefore be to mitigate the adverse impacts of the transition on the most vulnerable. Mitigation includes reducing the pollution burden of the poorest in society, especially communities affected by mismanaged waste and degraded environments in developing countries,[7] and creating dignified sources of income and safe living conditions not predicated on waste generation or management.

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3 UNEP (2022), *Resolution adopted by the United Nations Environment Assembly on 2 March 2022 – 5/11. Enhancing circular economy as a contribution to achieving sustainable consumption and production*, Nairobi: United Nations Environment Assembly of the United Nations Environment Programme, https://wedocs.unep.org/bitstream/handle/20.500.11822/39747/K2200701%20-%20UNEP-EA.5- Res.11%20-%20ADVANCE-.pdf?sequence=1&isAllowed=y.
4 Deutsche Gesellschaft für Internationale Zusammenarbeit (2017), *Sectoral implementation of nationally determined contributions (NDCs)*, briefing series, https://transparency-partnership.net/system/files/document/NDC%20Brief%20-%20Circular%20Economy%20and%20Solid%20Waste%20Management.pdf.
5 Chatham House circulareconomy.earth (2022), 'Policies', https://circulareconomy.earth.
6 European Commission (undated), 'Circular economy action plan', https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en.
7 Schröder, P. (2020), *Promoting a Just Transition to an Inclusive Circular Economy*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/2020/04/promoting-just-transition-inclusive-circular-economy.

2.2 Defining circular trade

The link between trade and the circular economy is increasingly being recognized as an important issue for further discussion and action within national and international policy forums, such as the recently established circular economy and trade informal working group within the WTO's Trade and Environmental Sustainability Structured Discussions (TESSD). Nonetheless, understanding of the complex links between trade and the circular economy, and of the associated opportunities and risks, remains limited.[8] Box 1 gives a preliminary working definition of circular trade. The remainder of this chapter provides a detailed overview of each circular trade flow as outlined in this definition.

Box 1. Definition of circular trade

Circular trade encompasses any international trade transaction, either material or immaterial, that contributes to circular economy activities* at the local, national and global levels. This includes the trade in circularity-enabling goods, services and intellectual property; second-hand goods for reuse, repair, refurbishment, remanufacturing or recycling; refurbished and remanufactured goods; secondary raw materials (biotic and abiotic**); and waste, scraps, and residues (biotic and abiotic) that can be safely recovered or valorized.

**Circular economy activities: Any activity that results in the decoupling of economic activity from the consumption of finite resources. This includes refusing, rethinking, reducing, reusing, repairing, refurbishing, remanufacturing, repurposing, recycling, recovering and regenerating.*[9]

***Biotic: derived from biological materials; abiotic: derived from non-biological materials.*

It is important to acknowledge that the definition in Box 1 has some limitations. First, it omits trade in primary raw materials (both biotic – i.e. derived from biological materials – and abiotic – derived from non-biological materials). This is primarily for pragmatic reasons related to maintaining a reasonable scope of definition. However, the authors acknowledge that trade in primary resources will always be required in a circular economy, albeit to ever-decreasing degrees, as 100 per cent circularity is not scientifically possible due to entropy (i.e. natural material degradation and unavoidable losses). Trade in primary resources is also essential to enable the short- to medium-term transition towards circularity by distributing the necessary resources for production of circular economy-enabling infrastructure or goods (such as remanufacturing equipment, renewable energy or digital technologies) where sufficient secondary resources are unavailable.

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8 Barrie, J. and Schröder, P. (2021), 'Circular Economy and International Trade: A Systematic Literature Review', *Circular Economy and Sustainability*, 2, pp. 447–71, https://doi.org/10.1007/s43615-021-00126-w.
9 Potting, J., Hekkert, M., Worrell, E. and Hanemaaijer, A. (2017), *Circular Economy: Measuring Innovation in the Product Chain*, The Hague: PBL Netherlands Environmental Assessment Agency, https://www.pbl.nl/sites/default/files/downloads/pbl-2016-circular-economy-measuring-innovation-in-product-chains-2544.pdf. In addition to Potting et al. (2017)'s 9r framework, activities which target land regeneration are also considered a circular activity.

Discussion on the role primary resources play within a circular economy is emerging.[10] However, further discussion and research is required to consider how the trade in primary resources intersects with, and contributes to, the realization of an inclusive circular economy.

Second, for the purposes of this paper, the proposed definition of circular trade is narrowly framed from a *materials flow*, rather than *economic* or *social*, perspective. As such, it focuses on the flow of materials, goods and services that contribute to a circular economy. However, as long as circular trade activities (and the circular economy) are pursued within a global economic system that is driven by continuous economic growth and which lacks respect for fundamental planetary boundaries, the net contribution of circular trade to absolute global resource consumption reduction is likely to remain small.[11] To be truly sustainable, policymakers – particularly those in high-income and high-consuming countries – must explore how circular trade can both reduce consumption of raw materials and provide sufficient breathing space for low- and middle-income countries to meet the human development needs of their citizens.

Circular trade includes any international trade transaction that contributes to circular economy activities at the local, national and global levels.

Finally, the authors drew from Potting et al.'s 9r framework – one of the most widely cited for defining circular activities. The 9r framework is not a legal definition, nor is it formally recognized by any government. However, this topic is evolving rapidly: for example, the EU taxonomy for sustainable activities has produced a detailed list of economic activities that have been identified as contributing significantly to delivering a circular economy. The International Organization for Standardization (ISO) is also in the process of developing a global standard on the circular economy. As such, it is recommended that the definition of circular economy activities evolves in line with such developments.

In addition to the three limitations above, trade not conducted according to relevant international law (for instance, WTO rules and multilateral environmental agreements) cannot be considered as circular trade.

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10 Smart Prosperity Institute (2021), 'Circularity Across the Mining and Metals Value Chain', Event at the Accelerator Session at the World Circular Economy Forum 2021, 15 September 2021, https://institute.smartprosperity.ca/events/circularity-mining-metals.

11 The authors recognize the need for continued growth in low- and middle-income countries to deliver on essential human development goals. Therefore, the onus is on the highest-consuming and highest-income countries to shrink their material footprints to levels that provide breathing space for low- and middle-income countries to grow, while also ensuring net global consumption levels remain within planetary boundaries. See also Dussaux, D. and Glachant, M. (2019), 'How much does recycling reduce imports? Evidence from metallic raw materials', *Journal of Environmental Economics and Policy*, 8(2), pp. 128–46, https://doi.org/10.1080/21606544.2018.1520650 and Parrique, T. et al. (2019), *Decoupling Debunked: Evidence and arguments against green growth as a sole strategy for sustainability*, European Environmental Bureau, https://eeb.org/wp-content/uploads/2019/07/Decoupling-Debunked.pdf.

03 Overview of circular trade flows

Circular trade encompasses trade flows ranging from circular economy-enabling goods, services and IP, through to second-hand goods, secondary raw materials and waste. Each offers unique benefits and challenges in terms of inclusivity.

Most international trade transactions facilitate the linear model of production and consumption. This includes the trade in primary commodities, new goods and services directed towards traditionally linear activities, and the trade in waste destined for disposal (such as landfill or incineration) (see Figure 2). As discussed above, some linear flows – primarily the use of raw materials – will remain important in realizing the circular transition, as they provide the necessary resources and goods to conduct domestic circular activities. They will also be necessary in the long term to replenish resources lost to the gradual and unavoidable degradation over time that cannot be avoided via circular approaches.

Despite the dominance of linear flows, circular trade is a complex and growing component of global trade overall. For example, the value of trade in second-hand goods, secondary raw materials and waste for recovery rose by more than 230 per cent between 2000 and 2019, with the global export value of trade in all goods rising by around 195 per cent over the same period.[12]

As outlined in Figure 2, circular trade flows can either directly displace or complement linear trade. For example, imports of remanufactured or second-hand goods may displace imports or domestic production of new equivalent goods. Similarly, imports of secondary raw materials (such as steel) may displace or complement primary goods production. There also exists a complex dynamic between domestic circular activities (and trade flows) and international circular trade flows (discussed further in section 3.3). Circular waste, secondary

12 Chatham House circulareconomy.earth (2022), 'Trade flows', https://circulareconomy.earth/trade?year=2000&category=2&units=value&autozoom=1.

raw materials, second-hand goods or enabling goods and services may be imported to input into domestic circular industrial activities. For example, waste and scrap for recovery can be fed into domestic recycling activities or may be exported to take advantage of demand, economies of scale and expertise elsewhere.

Despite the dominance of linear flows, circular trade is a complex and growing component of global trade overall.

Circular trade flows offer many benefits in terms of achieving necessary economies of scale to make circular activities (such as reuse, remanufacturing, repair and recycling) more profitable. They could also help displace demand for new materials and products, providing affordable access to essential used and refurbished goods and secondary raw materials, and improving access to goods and services necessary to achieve a domestic circular transition.[13]

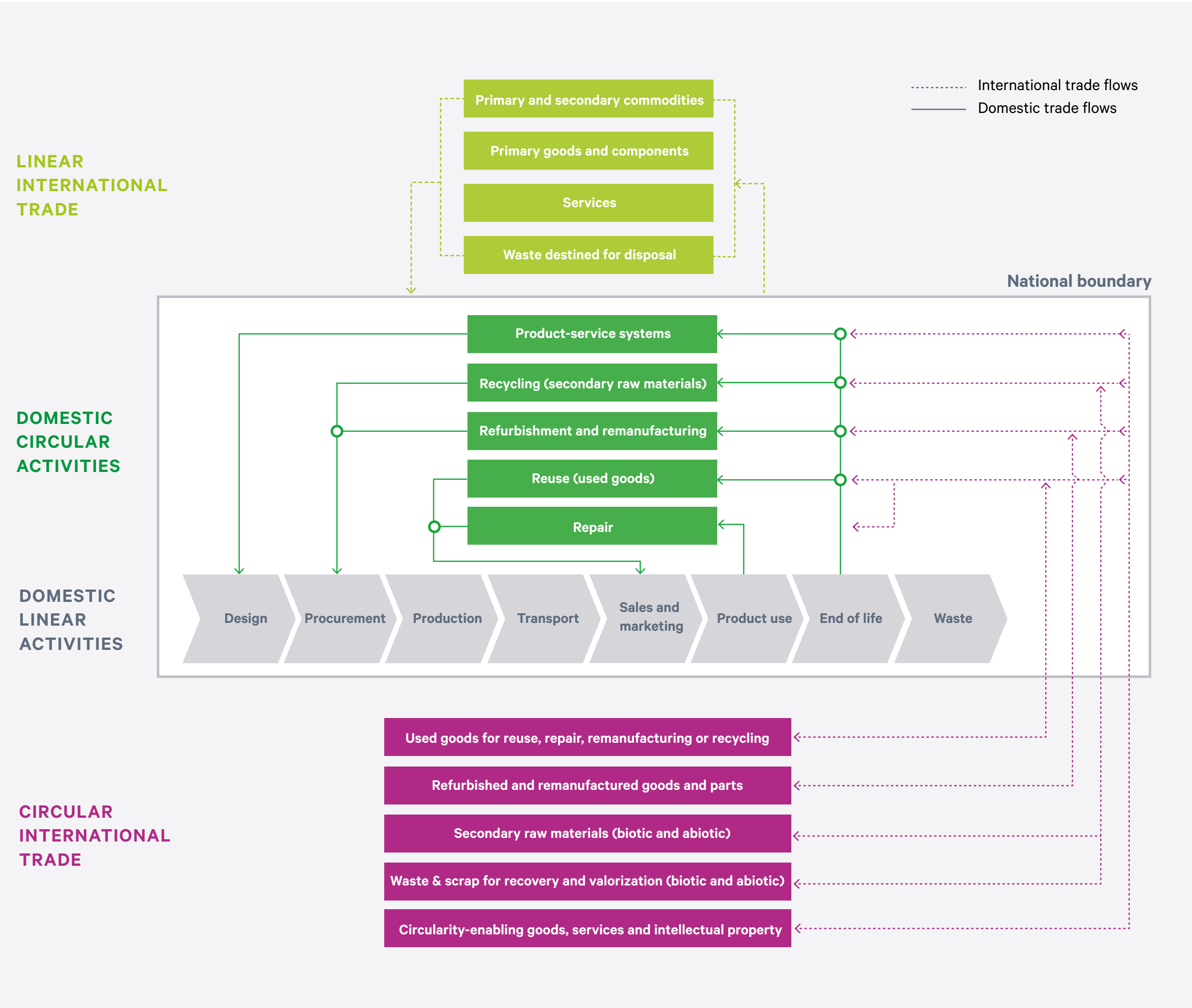
Yet each type of circular trade flow outlined in Box 1 also faces, to varying degrees, challenges linked to the lack of shared regulation and standards, poor supply-chain transparency and traceability and increased trade protectionism, among others. Circular trade flows can bring additional risks, including exposure to supply-chain shocks under certain circumstances, additional domestic waste management costs and potential erosion of domestic industry. (See Table 1 for further discussion on the benefits and challenges.)

This chapter introduces the five different types of trade flows that can directly contribute to realizing a global circular economy (as outlined in Figure 2). It outlines each flow, the potential benefits and drawbacks and the current barriers in terms of scaling. The chapter then describes the differences between biotic and abiotic resources, and how trade in biomaterials intersects with the circular economy.

Quantitative data on the value and weight of different circular trade flows are also presented. Unless otherwise specified, these are derived from the Chatham House Circular Economy Trade database.[14]

13 OECD (2018), *International Trade and the Transition to a Circular Economy*, Policy Highlights, RE-CIRCLE Project, https://www.oecd.org/environment/waste/policy-highlights-international-trade-and-the-transition-to-a-circular-economy.pdf; UNEP and IRP (2020), *Sustainable Trade in Resources: Global Material Flows, Circularity and Trade*, Nairobi: United Nations Environment Programme, https://wedocs.unep.org/bitstream/handle/20.500.11822/34344/STR.pdf?sequence=1&isAllowed=y.
14 For more information on the methodology used to calculate circular trade flow values and weights, see Chatham House circulareconomy.earth (undated), 'About', https://circulareconomy.earth/about.

Figure 2. Linear, domestic circular and international circular trade flows



Note: Domestic linear trade flows not included to aid clarity.
Source: Adapted from OECD (2018), *International Trade and the Transition to a Circular Economy*, Policy Highlights, RE-CIRCLE Project, https://www.oecd.org/environment/waste/policy-highlights-international-trade-and-the-transition-to-a-circular-economy.pdf.

Table 1. Overview of five different circular trade flows

Circular trade flow	Description	Benefits	Challenges
Circular goods, services and intellectual property (IP)	Finished goods, services and IP that enable a country (or company) to conduct circular activities.	• Ability to develop circular business models (access to design software, product-system-services (leasing and renting), and real-time condition-monitoring); • Ability to conduct reuse, repair, remanufacturing or recycling activities (access to equipment and spare parts or components); • Improved supply-chain traceability (access to digital hardware and software and physical sensors); and • Ability to produce circular materials domestically (access to material science and biorefining equipment and infrastructure).	• Lack of global agreement on what constitutes CE goods and services in relation to trade; • Perceived risk of undercutting domestic production of 'like' goods; and • Geopolitical tensions regarding trade of advanced technologies (and IP control) may result in additional trade barriers to certain CE-enabling goods and services.
Used goods for reuse, repair, remanufacturing and recycling	Used goods and parts can be traded with the intention of being sold into a secondary market: (i) directly; (ii) after being repaired, within the secondary market (otherwise referred to as 'cores'); (iii) to be remanufactured; or (iv) to be recycled. Used goods that cannot be reused, repaired, remanufactured or recycled should be classified as waste.	• Presents export opportunity; • Provides affordable access to high-quality goods to importing country; • Can extend the useful lifetime of goods; • Generates demand for local repair industry; • Provides source of valuable secondary raw materials; and • Enables access to remanufacturing cores, spare parts and components.	• Risk of lock-in to inefficient and polluting products (for example, used diesel and petrol cars or energy-inefficient electronic equipment); • Risk of undercutting domestic production of similar goods; • Risk of shorter product lifespan putting pressure on domestic waste management services; • Risk of increased maintenance and repair costs and poor access to spare parts; • Risk of receiving damaged or obsolete goods through misclassification or damage in transit; and • In some cases, can increase total consumption of primary goods.
Refurbished and remanufactured goods	Refurbished goods go through a less rigorous testing process in which only broken parts are replaced, and therefore cannot be compared to new equivalent goods. Remanufactured goods are goods that have been restored to useful life. The most common types of refurbished or remanufactured goods traded come from the automotive and aviation, electronics, furniture, industrial machinery and medical equipment sectors.	• Provides affordable access to high-quality goods (both consumer goods and industrial equipment); and • Provides value-added export opportunities for those undertaking remanufacturing.	• Most countries do not distinguish between remanufactured and second-hand goods (or waste and scrap), leading to high tariffs and technical barriers to trade; • Lack of universally recognized standard for remanufacturing, despite existing standards being available; • Difficult for importers to identify high-quality from low-quality remanufactured goods; • Unpredictable supply of remanufacturing cores; and • Not applicable to all goods – rather to a subset of high-value, long-life goods.
Secondary raw materials	Secondary raw materials are commonly referred to as materials that can be used in the manufacturing process that directly displace or complement the use of new materials.	• Enables aggregation of secondary materials in areas of highest demand to maximize economies of scale for processing and manufacturing to ensure they are reintegrated back into the economy most efficiently; and • Displaces, in some cases, use of new raw materials.	• Unpredictable supply (in terms of both quality and volume); • Price volatility tied to supply and demand of new materials; and • Lack of harmonization on waste definitions, standards, regulations and conformity assessments increases transaction cost and risk.

Circular trade flow	Description	Benefits	Challenges
Waste and scrap for recovery or valorization	Waste is considered non-hazardous if it (or the material or substances it contains) are not harmful to humans or the environment. It is considered circular if the waste and scrap materials are recovered or valorized.	• If a country does not have the specialized facilities or cannot afford to recover value, such waste can be shipped to a country that is able to carry out this process at an affordable price in an environmentally and socially safe manner; and • Valuable feedstock at low prices for industry (particularly in developing countries).	• Difficult to police due to heterogeneity of material stream, resulting in high levels of illegal waste trade; • Lack of harmonization on waste definitions, standards, regulations and conformity assessments increases transaction cost and risk; • Strengthening waste trade regulations raises transaction costs and reduces access to low-value material feedstock for domestic production; and • Difficult to determine if waste (hazardous or non-hazardous) produced from recovery and valorization activities can be adequately managed in importing country.

3.1 Circular economy-enabling goods, services and intellectual property

The transition to a circular economy requires a profound restructuring of local, regional, national and global value chains and production systems. Such a transformation is dependent upon the development and scaling of new technologies, infrastructure, business models, approaches to financing and specialist services. The trade in finished goods, services and intellectual property (IP) that are essential to performing these activities may be considered as part of this flow.

Trade in circular economy-enabling goods

To conduct circular economy activities, governments and organizations need access to a wide range of essential goods. However, many of these goods currently face high customs duties, making them more – sometimes prohibitively more – expensive than new equivalent goods. Reducing or removing such duties would greatly accelerate their adoption and therefore the transition to a circular economy. High customs duties are not particular to circular economy goods, but also to a wider range of environmental goods. It is for this reason that 46 WTO members have engaged in discussions on the need to establish an environmental goods agreement (EGA).[15]

Despite the discussions, little priority has been given to identifying, defining and including circular economy-enabling goods as a subset of overall environmental goods. As a result, circular economy-related goods included within the EGA have largely been limited to those applicable to recovery of waste or end-of-pipe pollution control, recycling equipment, spare parts for industrial equipment

15 WTO (undated), 'Environmental Goods Agreement (EGA)', https://www.wto.org/english/tratop_e/envir_e/ega_e.htm.

and a narrow range of resource-efficiency equipment.[16] Despite several rounds of discussions, participating members have failed to reach a consensus, and the negotiations have been inactive since December 2016. The formation of TESSD and the Informal Dialogue on Plastics Pollution (IDP) at the WTO has since brought renewed momentum to the topic, with increasing calls to find ways to facilitate trade in environmental goods and services.

Although there is no official agreement by WTO members on what constitutes a 'circular economy-enabling good', at the highest level, the following could be considered under such a category:

- Equipment, machinery, spare parts and tools for conducting circular activities (such as reuse, repair, remanufacturing, recycling and waste management), or sustainable agricultural activities;
- Monitoring and tracking equipment and sensors to map the flow of materials along the entire value chain;
- Digital hardware necessary to store and retrieve supply-chain data, as well as conduct product-service system business models;
- Specialist equipment for producing circular materials (such as industrial biotechnologies and materials science);
- Goods related to achieving energy efficiency and the provision of renewable energy (such as energy efficiency technologies, renewable energy generation and storage technologies); and
- Finished goods designed to be circular over their life cycle (i.e. durable, easy to recycle, non-toxic, repairable and reusable), produced via circular production methods, and complying with strict product standards such as 'cradle-to-cradle' certification, national eco-design standards or the planned EU Sustainable Products Initiative (SPI) requirements.

Should there be renewed momentum in the development of an EGA, there will be value in considering how the circular economy can be better embedded within the discussions.[17]

Trade in circular economy-enabling services

The trade in circular economy-enabling services receives less attention than trade in goods, yet is no less vital. This is due to the expected increase in movement towards services over sales of goods, as companies increasingly adopt business models based on product-service systems such as leasing and renting, which replace product ownership and the demand for lifetime extension services like repair and refurbishment.[18]

16 Barrie, J. et al. (2022), *Trade for an inclusive circular economy: A framework for collective action,* Recommendations from a global expert working group, London: Royal Institute of International Affairs, https://doi.org/10.55317/9781784135294.
17 Ibid.
18 Yamaguchi, S. (2021), *International trade and circular economy - Policy alignment*, 19 February 2021, OECD Trade and Environment Working Papers, https://doi.org/10.1787/ae4a2176-en.

The 1995 General Agreement on Trade in Services (GATS) outlines four modes of supplying services.[19] These are cross-border trade (mode 1); consumption abroad (mode 2); commercial presence abroad (mode 3); and temporary presence of natural persons abroad (mode 4).

Circular services cut across all four modes – for example, online services such as remote monitoring of equipment, provision of online sharing applications and platforms or circular design expertise (mode 1); conducting repair, refurbishment, remanufacturing, recycling or waste management services (modes 2 and 3); or assembly, installation, maintenance, repair and testing of circular equipment and infrastructure (mode 4).[20]

Growing digital interconnectivity and recent technological advancements (such as remote monitoring and real-time communications via 5G networks) have meant that even those services traditionally considered to be geographically constrained are being traded globally. Therefore, trade in circular services will play a critical role in enabling companies to conduct circular activities along the value chain, as well as in allowing multinational companies to efficiently transfer skills and technologies to overseas subsidiaries. However, trade in circular-enabling services currently faces several challenges, such as divergent regulations across jurisdictions on secondary material and waste trade,[21] and limitations on international data transfer.[22] This significantly increases the cost of compliance, particularly for micro-, small and medium-sized enterprises (MSMEs) and firms in developing countries.

No estimate has been produced for the global traded value of CE goods and services, owing to a lack of recognized definition for such a category of trade and of collected data. However, global trade in maintenance and repair services increased in value from a total of $73.8 billion in 2015 to $108.1 billion in 2019, before falling to $87 billion in 2020 (likely due to COVID-19-related restrictions).[23] In addition, the global market value for recycling equipment and machinery in 2019 was $852 million[24] and is expected to rise to $917.5 million by 2027. When the trade in reuse, repair, remanufacturing and CE-enabling digital equipment is combined with that in remanufactured goods and software, the value of CE-enabling goods and services is likely to be in the range of hundreds of billions of dollars per year.

19 WTO (undated), 'The General Agreement on Trade in Services (GATS): objectives, coverage, and disciplines', https://www.wto.org/english/tratop_e/serv_e/gatsqa_e.htm.
20 Tamminen, S. et al. (2020), *Trading Services for a Circular Economy*, Report, Helsinki: International Institute for Sustainable Development and the Finnish Innovation Fund Sitra, https://www.iisd.org/system/files/2020-10/trading-services-circular-economy.pdf.
21 Ibid.
22 Ibid.
23 WTO (2022), 'WTO Stats', https://timeseries.wto.org (accessed 3 Mar. 2022).
24 Grand View Research (undated), 'Recycling Equipment Market Size, Share & Trends Analysis Report', https://www.grandviewresearch.com/industry-analysis/recycling-equipment-market.

Trade in circular economy-enabling intellectual property

A global circular economy requires innovation and collaboration (particularly in the form of technology- and knowledge-transfer) along entire value chains spanning multiple jurisdictions. The rules governing the transfer and sharing of circular economy-enabling IP – otherwise referred to as intellectual property rights (IPR) – play an important role in enabling or restricting such collaboration.[25]

IPR relate to works that are the result of human intellectual creativity, such as copyright over creative works, patents for new inventions, registered designs and trademarks distinguishing goods and services. The enforcement of IPR is considered a key safety measure to incentivize investment in, and the diffusion of, innovation.[26] Harmonization of IPR at the global level provides a baseline set of rules concerning registration, certain levels of protection and a level playing field with respect to foreign IP holders vs national equivalents. This is particularly important for ensuring the development and diffusion of sustainability-related IP.

The rules governing the transfer and sharing of circular economy-enabling IP play an important role in enabling or restricting collaboration.

The WTO agreement on trade-related aspects of intellectual property rights (TRIPS), established in 1995, provides this important baseline to support international knowledge and technology transfer.[27] The TRIPS agreement remains the most comprehensive multilateral agreement on IP and continues to play a central role in facilitating global trade in knowledge and creativity. Nonetheless, some opponents have argued that strict control of IPR has, in some cases, slowed down the rate and diffusion of the innovation that underpins a functioning circular economy.[28]

For example, the protection of trade secrets and the minimal licensing of patents – particularly by original equipment manufacturers (OEMs) – on the functional design of products, their material composition and associated manufacturing technologies can restrict third-party organizations from undertaking circular activities on the goods that would otherwise end up as waste (such as condition-monitoring and fault inspection, disassembly, repair, remanufacturing and recycling).[29] Restricted sharing of IP becomes a particular problem globally when the holders, such as OEMs, trade goods into markets where they have

25 Eppinger, E. et al. (2021), 'Sustainability transitions in manufacturing: the role of intellectual property', *Current Opinion in Environmental Sustainability*, 49, pp. 118–26, https://doi.org/10.1016/j.cosust.2021.03.018.
26 Schniederig, T., Tietze, F. and Herstatt, C. (2012), 'Green innovation in technology and innovation management – an exploratory literature review', *R&D Management*, 42(2), pp. 180–92, https://doi.org/10.1111/j.1467-9310.2011.00672.x.
27 Bond, E. W. and Saggi, K. (2019), 'Patent protection in developing countries and global welfare: WTO obligations versus flexibilities', *Journal of International Economics*, 122, https://doi.org/10.1016/j.jinteco.2019.103281.
28 Eppinger et al. (2021), 'Sustainability transitions in manufacturing'.
29 Hartwell, I. and Marco, J. (2016), 'Management of intellectual property uncertainty in a remanufacturing strategy for automotive energy storage systems', *Journal of Remanufacturing*, 6, 3(2016), https://doi.org/10.1186/s13243-016-0025-z.

limited presence or capacity to collect such goods at the end of their life, and therefore limited ability to extract additional value from them. By overly restricting IP access (such as availability of repair manuals),[30] local third parties are disincentivized from performing the necessary circular activities and therefore increasing the likelihood that the goods end up as waste. This is not only inefficient, but it also risks contributing to environmental pollution and human exposure to hazardous chemicals if it occurs in countries with poor waste management systems. It also curtails the potential for job creation in emerging markets.

An example of a circular economy-related IPR challenge is BMW's choice to restrict access to its patented tools for recycling used cars, including a technology for draining oil from end-of-life shock absorbers and a process for recycling printed circuit boards.[31] These restrictions limit the recovery of valuable materials from the global fleet of BMW vehicles, as BMW is capable of recycling only a small proportion itself. The same is the case for many manufacturers of electronic goods, which are required to provide neither instructions on how to repair or remanufacture those goods nor the necessary tools and spare parts to do so.

For the circular economy to grow at the rate necessary to meet global environmental and human development goals, it is important that third-party operators specializing in circular activities can access the relevant IPR.

Another challenge related to IP is that circular economy policies to date have tended to neglect the challenges associated with IPR, an example being the EU's eco-design regulations.[32] In addition, a more ambitious set of circularity policy and regulatory measures is now under development, to which efficient IP transfer is essential for delivery. An example is the EU's SPI (an evolution of the Ecodesign directive), which will require companies to provide minimum information requirements on the life cycle, durability, repairability and recyclability of their products. This will be underpinned by the rollout of digital product passports (DPP). The products themselves will also need to meet technical criteria for durability, repairability and recyclability.

The EU's 'right to repair' resolution, planned for the end of 2022, will also seek to empower customers and third parties to be able to repair products.[33] It will do this by requiring manufacturers to disclose proprietary information that would otherwise have remained inaccessible to consumers.

However, in some cases, the right to repair and disclosure of relevant IP has faced resistance from companies concerned that enabling consumers to repair their products could result in the loss of trade secrets or lead to malfunction, reputational risk and exposure to litigation as a result of poor-quality repair work.[34]

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30 Rosborough, A. (2020), 'Unscrewing the Future: The Right to Repair and the Circumvention of Software TPMs in the EU', *JIPITEC – Journal of Intellectual Property, Information Technology and E-Commerce Law*, 11(1), pp. 26–48, https://www.jipitec.eu/issues/jipitec-11-1-2020/5083.
31 Wiens, K. (2014), 'Intellectual property is putting circular economy in jeopardy', *Guardian*, 4 June 2014, https://www.theguardian.com/sustainable-business/intellectual-property-circular-economy-bmw-apple.
32 Eppinger et al. (2021), 'Sustainability transitions in manufacturing'.
33 European Parliament (2022), 'Right to repair In "A European Green Deal"', legislative train schedule, 23 June 2022, https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-right-to-repair.
34 Grinvald, L. C. and Tur-Sinai, O. (2019), 'Intellectual Property Law and the Right to Repair', *Fordham Law Review*, 88(1), https://ir.lawnet.fordham.edu/flr/vol88/iss1/3.

Furthermore, producers may be able to ensure minimal compliance with legislation by providing instructions on how to repair a product without the relevant IP on the specialist equipment and machinery required to undertake the repair. It remains unclear as to whether the challenges associated with IPR have been adequately considered and – importantly, in terms of inclusivity – how the right to access relevant IP extends to third parties outside the EU.

Despite the importance of trade-related aspects of IPR on the restructuring of global value chains towards circularity, hardly any circular economy research addresses IPR-associated issues either from a corporate or policy perspective. As such, many questions are still to be addressed. For example, whether anyone selling a remanufactured product (such as a computer or mobile phone) is required to pay an additional licensing fee to the original IP owners. A similar issue relates to the leasing of goods to multiple owners. More broadly, questions exist around how the TRIPS agreement could be better utilized to enable and accelerate circular economy-related IP transfers, particularly to less-developed countries. Further research and discussion on this topic by the international trade community is necessary.

3.2 Used goods for reuse, repair, remanufacturing or recycling

The trade in used goods can occur in three main ways. They can be traded with the intention of being sold into a secondary market: (i) directly for reuse; (ii) to be repaired, refurbished or remanufactured (otherwise referred to as 'cores');[35] or (iii) to be recycled to recover secondary raw materials. Any used good that cannot be reused, repaired, remanufactured or recycled should be classed as waste.

Trade in used goods in accordance with the above criteria offers numerous economic, environmental and social benefits. First, it provides an export opportunity to the primary consumer country – for example, the total value of the global used furniture market is expected to reach $47 billion by 2025.[36] Second, trade can provide affordable access for citizens in secondary markets to high-quality goods that would have been unaffordable as new.

An example is the export of used railcars from Japan. Due to strict domestic environmental regulations and high costs relating to the recycling and scrapping of trains, Japan has become one of the largest exporters of used rolling stock in Asia. One of the biggest recipients is the Indonesian city of Jakarta, which by 2018 had received over 1,500 used Japanese railcars. This supply has helped the city meet growing demand for public transport brought about by rapid urbanization and has been well-received by the local populace, which prefers the better-quality, air-conditioned Japanese railcars to those previously used. Furthermore, the cost

35 A remanufacturing 'core' is a used product that is due to be remanufactured. See Wei, S., Tang, O. and Sundin, E. (2015), 'Core (product) Acquisition Management for remanufacturing: a review', *Journal of Remanufacturing*, 5, https://doi.org/10.1186/s13243-015-0014-7.
36 Research Nester (2022), *Off the Shelf Second Hand Furniture Market*, report, 6 April 2022, https://www.researchnester.com/reports/off-the-shelf-second-hand-furniture-market/1230.

is estimated to be around one-tenth of that for procuring new railcars. However, Jakarta faced some challenges in terms of obtaining spare parts for maintenance. In some instances, entirely new parts had to be fabricated locally, which is costly and time-consuming.[37]

The combination of recent advancements in ICT, widespread internet access, increased globalization and reduced tariffs has dramatically reduced transaction costs for conducting trade in second-hand goods.

Finally, the need to repair, refurbish, remanufacture or recycle imported second-hand goods generates demand for local industry and jobs in the importing country, as well as providing a source of valuable secondary raw materials to meet domestic production demand. For example, the trade of second-hand tractors from Japan to Vietnam created a local industry of alteration and repair shops to make the tractors suitable for the Vietnamese climate and terrain.[38]

The combination of recent advancements in information communication technology (ICT), widespread internet access (enabling the growth of second-hand online markets like eBay), increased globalization and reduced tariffs has dramatically reduced transaction costs for conducting trade in second-hand goods (see Box 2). This is particularly the case for developing countries, which have received continued pressure to reduce trade barriers as a condition of international free trade agreements.

Box 2. Growth of customer-to-customer cross-border trade of second-hand goods

Trade in customer-to-customer (C2C) second-hand goods is growing rapidly, fuelled by e-commerce platforms such as eBay, Facebook Marketplace, Gumtree and Vinted. According to McKinsey, both Gumtree and French site leboncoin have experienced more than 50 per cent growth in listings of second-hand items since the start of 2020, with fashion and family items (such as toys) the biggest categories. McKinsey also estimates that C2C trade in second-hand goods could currently be worth much as €6 billion, and expects annual growth in the sector of roughly 35 per cent over the next four years, reaching a market value of €20 billion by 2025.[39]

37 Kawamura, K. (2021), 'International Trade of Used Trains: The Case of Japanese Used Rolling Stock in Indonesia', in Kojima, M. and Sakata, S. (eds) (2021), *International Trade of Secondhand Goods Flow of Secondhand Goods, Actors and Environmental Impact*, IDE-JETRO Series, Cham: Palgrave Macmillan.
38 Sakata, S. (2021), 'Economic Impact of Imported Secondhand Agricultural Machinery in Rural Vietnam', in Kojima and Sakata (eds) (2021), *International Trade of Secondhand Goods Flow of Secondhand Goods, Actors and Environmental Impact*.
39 Goddevring, V., Schumacher, T., Seetharaman, R. and Spillecke, D. (2021), 'C2C e-commerce: Could a new business model sell more old goods? McKinsey, 23 September 2021, https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/c2c-ecommerce-could-a-new-business-model-sell-more-old-goods.

Growth in C2C trade in second-hand goods is beneficial for the circular economy, as it provides an easy route for consumers to choose second-hand items over new equivalents. However, it also increases complexity with regards to cross-border trade in these goods.[40] For example, since individual items are shipped directly to consumers by post, rather than in large batches to national distributors, it makes it more difficult for customs officials to conduct the necessary regulatory and compliance tests and inspections. Customs officials lack visibility not only of what is in each package, but also of the small businesses and individuals sending and receiving them. As a result, millions of parcels traded by post often bypass customs processes altogether via *de minimis* regimes.[41]

There is no simple solution to deal with this growing circular trade flow. However, some trading countries do share information on package shipments, and are developing solutions that combine AI with risk assessment, computer vision and smart sensors to identify packages that do not match the descriptions provided. Light-touch transparency and traceability requirements are also a solution – for example, through linking a blockchain record to a printed QR code for any large package sent by post abroad.

Despite the benefits, trade in used goods can have negative consequences in some cases – particularly for middle- and low-income countries. First, in sufficient quantities, such trade risks locking a domestic market into inefficient and polluting products (for example, the trade in used diesel and petrol cars discussed in Box 3).[42] It may also undercut domestic production of similar goods, resulting in the recipient country retaliating with increased trade restrictions such as high import tariffs or even total bans on the import of used goods.

Box 3. Global trade in used vehicles

International trade in used vehicles is big business. Roughly 14 million used vehicles were exported by the EU, Japan and the US between 2015 and 2018, while 70 per cent of used vehicles traded are exported to developing countries. Trade in used vehicles can provide affordable access to those in secondary markets. However, it can also lock countries into a fleet of high-polluting vehicles nearing end-of-life, which can incur high maintenance and repair costs. Some countries have attempted to find a balance between the benefits and drawbacks of importing used vehicles by implementing trade measures such import restrictions based on a vehicle's age. In Kenya, only cars less than eight years' old are allowed for import. In Uganda, the limit is 15 years, while

40 OECD (2018), 'Small shipments and counterfeits: Ever greater challenges', https://www.oecd-ilibrary.org/docserver/fa304fbf-en.pdf?expires=1660572699&id=id&accname=guest&checksum=87571E98C7291EFBBDA7E9BF289551B8.
41 Souminen, K. (2019), *Revolutionizing World Trade: How Disruptive Technologies Open Opportunities for All*, Redwood City: Stanford University Press.
42 UNEP (2020), *Used vehicles and the environment: A global overview of used light duty vehicles – flow, scale and regulation*, Nairobi: United Nations Environment Programme, https://www.unep.org/resources/report/global-trade-used-vehicles-report.

Rwanda has no limit. Consequently, these two countries have a much lower quality fleet in which the average fuel consumption and CO_2 emissions are about one-quarter higher than in Kenya.[43]

An interesting question is how trade in used vehicles may evolve as the world transitions to low-carbon alternatives (predominantly electric vehicles or EVs). In the medium term, exports of used internal combustion engine (ICE) cars to emerging markets may increase as domestic demand for second-hand ICE cars in high-income countries reduces, but demand in developing countries continues to increase. In the longer term, trade in used EVs may remain low, as OEMs seek to recover significant value from their battery packs and motors, which can be cost-effectively refurbished and remanufactured either for new EVs or alternative applications such as home energy storage. Alternatively, second-hand EVs may also be exported to other developed countries to meet rapidly growing demand. For example, the US has already begun exporting used EVs to Norway (with exports totalling 4,232 in 2019).[44] Nonetheless, the trade dynamics of used EVs are difficult to predict as they are dependent upon the economics of domestic value-recovery vs demand from developed and emerging economies. For the reasons outlined above, those flows are unlikely to mirror the trade flows observed with ICE vehicles.

Second, even if the product could be repaired and resold on the open market, many categories of products may still result in a shortened lifespan, thereby incurring greater costs associated with end-of-life disposal. (Shortened lifespans are particularly an issue for electronic equipment, which can quickly become obsolete and for which spare parts are difficult to source.) This puts additional pressure on domestic waste management infrastructure and services.

Third is the challenge of illegal trade in used goods, whereby exporters intentionally ship used goods that: (i) are broken or obsolete and cannot be reused, repaired or easily recycled; or (ii) cannot be handled safely as a waste item (see Box 4). Illegal trade compounds the challenges outlined above and increases the risk of environmental harm through goods being dumped or social harm through informal waste-workers being exposed to hazardous materials. The 'misdeclaration' of used goods occurs, in part, due to the inadequacy of the current Harmonized System (HS) of codes,[45] which does not allow traders to differentiate between the categories of used goods outlined above, creating a grey area. The HS is a standardized method of classifying traded products of the World Customs Organization. It is used by customs authorities around the world to identify products when assessing duties and taxes, and for gathering statistics.

43 Ibid.
44 Doyle, A. (2019), 'From California to Oslo: foreign subsidies fuel Norway's e-car boom, for now', Reuters, 21 March 2019, https://www.reuters.com/article/us-autos-norway-insight-idUSKCN1R20HN.
45 International Trade Administration (2022), 'Harmonized System (HS) Codes', https://www.trade.gov/harmonized-system-hs-codes.

Box 4. Regulating the global waste trade via the Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal ('Basel Convention') entered into force in 1992. It is the most comprehensive regulation governing the transnational movements of hazardous and other waste. At the time of writing, 189 states and the EU are parties to the Basel Convention. Both Haiti and the US have signed the convention but not ratified it.

The convention aims to protect the environment and human health against the adverse effects of hazardous wastes, and sets out obligations on signatories in terms of restricting the movement of transboundary shipments of hazardous and 'other' wastes and ensuring their environmentally sound management. These include corrosive, ecotoxic, explosive, flammable, infectious, poisonous and toxic wastes (hazardous) and household and incinerator ash (other).

The Basel Convention also has a particular focus on preventing (absent express approval) the shipments of hazardous (plastic) waste from developed to less-developed countries (LDCs). A key mechanism to do this is the prior informed consent (PIC) procedure that requires exporters of some (mostly hazardous) waste to receive prior consent from the national environmental agency in the recipient country. Moreover, if illegal waste shipments are identified by recipient customs agencies, under the Basel Convention they can be shipped back with the full cost attributed to the exporting country.

Notable recent amendments to the Basel Convention include: (i) the Ban Amendment, which entered into force in December 2019 and prohibits the export of hazardous waste from developed countries to developing countries; and (ii) the more recent Plastic Waste Amendments, which entered into force in January 2021 and require most plastic waste trade to be controlled using PIC.[46]

Ambiguity relating to the rules laid out in the Basel Convention can also result in barriers to trade. First, current guidelines for used electrical and electronic equipment outline that 'used equipment is not considered as waste, if the equipment is destined for failure analysis, for repair and refurbishment, with intention of extended reuse'. But the guidelines also state that parties are able not to allow the export or import of used equipment destined for failure analysis or repair. Such ambiguity regarding the definition of used goods vs waste has led to numerous cases in which used goods have been shipped to developing countries supposedly with the intention of resale for reuse, but most of the goods in the shipment have then been deemed unsuitable for reuse and marked for disposal. This puts additional strain on waste management services within recipient countries, many of which lack the specialist facilities to dispose of certain items safely (such as electronic equipment containing hazardous substances).

46 Basel Convention (2022), 'Amendment of the Basel Convention (Article 17)', http://www.basel.int/TheConvention/Amendments/Overview/tabid/2759/Default.aspx.

This ambiguity also makes it difficult for border agencies to conduct necessary conformity assessment procedures (CAPs). CAPs are conducted by importing countries to inspect products, services or systems and verify that they conform to relevant regulations and standards. Differences in conformity assessments between jurisdictions can also result in duplicate testing procedures and ultimately in additional costs and barriers to exports (particularly for MSMEs). A lack of transparency around the use of CAPs adds risk to participating in circular trade flows.

Ambiguity relating to the rules laid out in the Basel Convention can result in barriers to trade.

Second, the Basel Convention currently does not clarify the difference between waste electrical and electronic equipment (WEEE) and used electrical and electronic equipment (UEEE). Technical guidelines were published in 2019 by the Basel Convention that outline the differences between the two,[47] but there remains a lack of consensus among members.

Third, parties to the convention can classify additional wastes as hazardous under their national laws, despite the convention annexes defining what constitutes hazardous and other waste. Parties can also specify in national laws any requirements concerning the transboundary movement procedures applicable to such nationally defined hazardous wastes. As a result, the classifications of hazardous waste, non-hazardous waste and non-waste goods destined for reuse, repair and refurbishment may differ significantly from country to country. This patchwork of regulatory requirements – combined with the externalization of costs, lack of enforcement of existing rules and low financial risk (because of weak regulatory mechanisms) – may deter investment in high-quality repair, refurbishment and recycling infrastructure, and may enable illicit trade.

The drawbacks outlined above have resulted in some countries imposing bans or restrictions on used goods. In Brazil, for example, imports of used consumer goods are currently prohibited, while imports of used machinery and equipment are allowed only in circumstances in which there is no domestic equivalent. But the Brazilian government is seeking to revise the regulatory framework for used and remanufactured goods to better capture the potential economic value these trade flows offer.[48] Meanwhile, in 2020, the 15 members of the Economic Community of West African States (ECOWAS) announced strict new rules for vehicle emissions and fuel efficiency that bar the import of light-duty vehicles more than five years old.[49]

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47 UNEP and Basel Convention (2019), *Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention*, technical guidelines, addendum, Geneva: United Nations, http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW.14-7-Add.6-Rev.1.English.pdf.
48 HKTDC Research (2021), 'Brazil Seeks Input on Modernisation of Investment Agreements and Import Requirements for Remanufactured Goods', regulatory alert, 13 July 2021, https://research.hktdc.com/en/article/Nzk4NTg4MzEz.
49 UNEP (2020), 'Used vehicles get a second life in Africa – but at what cost?', 26 October 2020, https://www.unep.org/news-and-stories/story/used-vehicles-get-second-life-africa-what-cost.

A handful of initiatives are attempting to help address the burden put on governments in low-income countries to safely manage and process these used goods at their end-of-life. One approach is for developing countries to conduct the initial collection, pre-processing and straightforward recycling of the goods, while shipping hard-to-recycle or hazardous items and components to advanced facilities overseas (mostly in OECD countries). This is particularly the case for electronics, of which increasing numbers of valuable but hard-to-recycle components are being shipped to developed countries to be recycled as developing countries improve their e-waste collection systems.[50]

An initiative offering circular services for IT hardware, Closing the Loop, is using such an approach, whereby consumers in developed countries pay a waste-compensation fee when purchasing their item (in this case, batteries). The revenue raised is then used to fund collaboration with local informal waste collectors in countries with poor waste management capacity. This model has resulted in more than 30 tonnes of waste batteries and flat panel screens being collected in Nigeria.[51] Despite being a small number relative to the total tonnage of such waste in that country (approximately 461,000 tonnes per year), the model could be standardized and expanded across the region or to national level.

However, there are some issues associated with some of these approaches. For example, developing countries have expressed concern that such models could result in them 'losing' their resources twice, first through mining and then again through recycling abroad. It also requires increased transportation of goods, which may then become inefficient compared with local activities under certain circumstances.

3.3 Refurbished or remanufactured goods and parts

The third circular economy-enabling trade flow is the trade in refurbished or remanufactured goods or parts. Remanufacturing is defined by British Standard BSI BS 8887-2:2009 as 'return[ing] a used product to at least its original performance with a warranty that is equivalent or better than that of the newly manufactured product'.[52] During the remanufacturing process, the core passes through several steps – including inspection, disassembly, part-replacement or refurbishment, cleaning, reassembly and testing – to ensure it meets the desired product standards.[53]

50 Forti, V., Baldé, C. P., Kuehr, R. and Bel, G. (2020), *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential*, United Nations University (UNU), United Nations Institute for Training and Research (UNITAR), SCYCLE Programme, International Telecommunication Union (ITU) and International Solid Waste Association (ISWA), https://www.itu.int/en/ITU-D/Environment/Documents/Toolbox/GEM_2020_def.pdf.
51 World Economic Forum (2020), *Facilitating Trade Along Circular Electronics Value Chains*, White Paper, https://www3.weforum.org/docs/WEF_Facilitating_Trade_Along_Circular_Electronics_Value_Chains_2020.pdf; Wang, F. et al. (2012), 'The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies', *Waste Management*, 32(11), pp. 2134–146, https://doi.org/10.1016/j.wasman.2012.03.029.
52 BSI (2009), *BS 8887-2:2009: Design for manufacture, assembly, disassembly and end-of-life processing (MADE) – Terms and definitions*, BSI Standards Publication, https://landingpage.bsigroup.com/LandingPage/Standard?UPI=000000000030182997.
53 Sundin, E. (2004), *Product and Process Design for Successful Remanufacturing*, Linköping Studies in Science and Technology, Dissertation No. 906, Linköping: Linköping University, http://liu.diva-portal.org/smash/get/diva2:20932/FULLTEXT01.pdf.

Refurbished goods go through a less-rigorous testing process, in which only broken parts are replaced, and therefore cannot be compared to new equivalent goods.

The most traded refurbished or remanufactured goods include automotive and aviation parts, electronics, furniture, industrial machinery, and medical equipment. To add a sense of scale, in 2018, the global market for refurbished consumer electronics was estimated to be worth around $10 billion.[54] Currently, the overall value of the UK remanufacturing industry is estimated at £2.4 billion, with the automotive sector being one the most established parts of that market.[55] One study estimated that the value of the global remanufacturing market for automotive parts alone could grow to $24 billion by 2025.[56] Trade patterns in remanufactured automotive parts may be significantly changed by the transition to electric vehicles, which require entirely different equipment and skills to conduct remanufacturing (see Box 3).

If shipped goods follow relevant refurbishing or remanufacturing standards,[57] trade in refurbished or remanufactured goods or parts could offer the benefit of improved quality control. Remanufacturing also promises significant economic and environmental benefits by displacing the production of new products (as well as the energy, land, raw materials and water required to manufacture them) and creating demand for high-skilled jobs. The OECD estimates that remanufacturing processes can lead to energy savings of more than 50 per cent and to a reduction in waste generation of more than 80 per cent.[58] Remanufacturing also offers a safe way to close the loop in terms of handling of toxic materials.[59]

Despite these benefits, trade in refurbished and remanufactured goods faces many barriers. The first is that most countries do not formally distinguish between new, refurbished, remanufactured and second-hand goods (or waste and scrap), resulting in a lack of data about cross-border trade of remanufactured products. This is due to a combination of lack of awareness of the remanufacturing process, distrust of the term remanufacturing or perceived threat to local industry. Governments tend therefore to interpret remanufactured goods as equivalent to used goods. As such, remanufactured goods can be subject to high import tariffs or non-tariff trade restrictions such as import prohibitions, core export prohibitions and complicated bureaucratic processes.[60] These barriers make it difficult for remanufacturing plants to operate, as they increase transaction time and costs, and can make the supply of cores more unpredictable. Further hampering trade

54 Rallo, J. (2018), *The Rise of Refurbished Products*, Liquidity Services, https://www.liquidityservices.com/wp-content/uploads/2018/07/wp_rtcb0101_1502.pdf.
55 SMMT (2021), 'Remanufacture, reuse, repeat; sustainability benefits for the CV sector', feature, 18 February 2021, https://www.smmt.co.uk/2021/02/remanufacture-reuse-repeat-sustainability-benefits-for-the-cv-sector.
56 PR Newswire (2020), 'Global Automotive Parts Remanufacturing Industry', 20 April 2020, https://www.prnewswire.com/news-releases/global-automotive-parts-remanufacturing-industry-301043347.html.
57 Examples include ISO 10987-2:2017, BS 8887–240: 2011 The process of reconditioning and BS 8887–220: 2010 The process of remanufacture.
58 OECD (2018), *Business Models for the Circular Economy: Opportunities and Challenges from a Policy Perspective*, Policy Highlights, RE-CIRCLE project, https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf.
59 Sundin, E. and Lee, H. M. (2012), 'In what way is remanufacturing good for the environment?', in Matsumoto, M., Umeda, Y., Masui, K., and Fukushige, S. (eds) (2012), *Design for Innovative Value Towards a Sustainable Society*, Dordrecht: Springer.
60 Snodgress, D. (undated), *Remanufacturing – Sustainability for the 21st Century*, presentation, https://www.wto.org/english/forums_e/public_forum12_e/session40snodgress_e.pdf.

in remanufactured goods is the lack of recognition within the formal HS, under which only one remanufactured good – retreaded tyres – has a universally accepted code.[61] Improved recognition and data would allow monitoring of material flows and would help develop an understanding of the international trade patterns in remanufactured products and the localization of remanufacturing processes.

If shipped goods follow relevant refurbishing or remanufacturing standards, trade in refurbished or remanufactured goods or parts could offer the benefit of improved quality control.

To overcome this limitation in HS codes, some countries that favour trade in remanufactured goods have included a formal definition of what constitutes a core or remanufactured good in bilateral trade agreements. For example, the US has the world's largest remanufacturing industry (valued at around $43 billion and generating 180,000 full-time jobs)[62] and now has over 14 bilateral trade agreements – including those with Costa Rica, Morocco, Peru and South Korea – that contain definitions of cores and remanufacturing.[63] In 2011, the US exported $11.7 billion of remanufactured goods and imported $10.2 billion.[64] The EU–Vietnam Free Trade Agreement also introduced the concept of remanufactured goods, enabling coordinated action on trade in such goods.[65]

Singapore is another country advocating for reduced barriers to trade in cores and remanufactured goods. Currently, used goods to be remanufactured can be imported freely into Singapore. As a result, US manufacturer Caterpillar Inc. established a remanufacturing plant there in 2011 to serve demand from the surrounding regions for mining machinery and equipment.[66] The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) also explicitly distinguishes between remanufactured and second-hand goods and makes clear that the former should not be subject to import prohibitions or restrictions.[67]

3.4 Secondary raw materials

The fourth circular trade flow is that of secondary raw materials (SRMs). Although there is no formal legal definition of SRMs, they are commonly referred to as materials that can be used in the manufacturing process which substitute or complement the use of new materials. SRM trade encompasses both biotic and

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61 Kojima, M. (2017), 'Remanufacturing and Trade Regulation', *Procedia CIRP*, 61, pp. 641–44, https://doi.org/10.1016/j.procir.2016.11.251.
62 Ibid.
63 Ibid.
64 Parker, D. et al. (2015), *Remanufacturing Market Study*, Brussels: European Commission, https://www.remanufacturing.eu/assets/pdfs/remanufacturing-market-study.pdf.
65 Pham, D. M. et al. (2020), *Vietnam: Deepening International Integration And Implementing The EVFTA*, report, Washington, DC: World Bank, https://documents.worldbank.org/en/publication/documents-reports/documentdetail/866871589557725251.
66 Parker et al. (2015), *Remanufacturing Market Study.*
67 Government of Canada (2022), 'How to read the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)', https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/cptpp-ptpgp/chapter_summaries-sommaires_chapitres.aspx?lang=eng.

abiotic materials. The shipment of metals and textiles is one of the most common forms of this type of trade, both in economic value and weight (not including secondary raw biomaterials discussed in Section 3.6). The EU saw growth of 61 per cent in exports of secondary raw materials between 2004 and 2019, with SRMs making up over one-third of all waste trade exported from the EU.

Trading enables SRMs to be shipped to, and aggregated in, areas of highest demand to maximize economies of scale, making it more profitable to transform waste streams into secondary resources. Maximizing economies of scale is particularly important given the thin profit margins and fluctuating market prices associated with selling SRMs. Reliable access to high-quality SRMs can increase security of supply if new equivalents are subject to shortages or price volatility.

The trade in SRMs faces a particular challenge associated with the lack of a legal definition or supporting standards. This makes importers and potential users of SRMs (particularly those involving high-specification production, such as electronic or medical equipment) wary, as it can be difficult to determine and guarantee quality. Some products due to be recycled may also contain harmful chemicals, making it costly and more dangerous to produce SRMs.

Current policy developments aim to help overcome such barriers. For example, the European Commission has announced plans to develop EU-wide standards for SRMs to ensure quality, as well as measures to improve the identification and tracking of chemicals. More widely, efforts to increase recycled content will also cause increased demand for SRMs. However, there are also counter-examples – including in the EU, where the acceptable level of lead content in recycled plastics is much higher than that in new plastics.

3.5 Waste, scrap and residues for recovery

The fifth circular trade flow is the trade in waste, scrap and residues for recovery or valorization (see Box 2). First, it is important to make the distinction between hazardous and non-hazardous waste. Waste is considered non-hazardous if it (or the materials or substances contained within) is not harmful to humans or the environment.[68] Hazardous waste should in most circumstances be treated locally when conforming to the Basel Convention's strict requirements and for the purposes of this topic. Nonetheless, traded waste materials remain extremely heterogeneous, making them difficult to regulate.

Waste and scrap are often costly to manage and process due to increasing compliance costs. Both also tend to require large-scale processing operations and significant quantities to make them economically viable. As such, rather than treat them domestically, high-income countries with stringent waste-disposal requirements have tended to ship lower-value waste abroad – typically to low- or middle-income countries with lower labour costs and more relaxed environmental standards, and therefore lower compliance costs.

68 A full list of items considered hazardous is given in Annex I of the Basel Convention.

Trade in waste (including scrap and residues) which can be recovered or valorized is an important element in realizing a circular economy. The term 'recovery', when applied to waste management, is most often considered to be energy recovery from burning the waste. However, recovery can also be in the form of extracting materials for processing into SRMs, such as valuable metals like aluminium, copper, gold and tantalum from e-waste. Where feasible, this offers greater potential for circularity than energy recovery.

The global value of trade in waste, scrap and residues has increased from $90 billion to $294 billion between 2000 and 2020.

Valorization applies to the extraction of residual value from waste products of organic origin. For example, sewage and wastewater recovery can provide nutrients such as nitrogen, phosphorus and potassium, as well as micro-nutrients like sulphur and organic matter, that can be processed into fertilizers and traded. Recovery of SRMs is inherently more circular than waste-to-energy and should be incentivized where possible. If a country does not have the specialist facilities or cannot afford to recover value from such waste itself, the waste can be shipped to a country that can handle and process it at an affordable price and in a safe manner. Non-hazardous waste for recovery can also provide a valuable feedstock for industry at low prices for developing and advanced countries.[69] However, it remains unclear as to what proportion of globally traded waste is recycled vs downcycled (i.e. degraded in quality and value), particularly that which is intended for energy recovery. Additional research or initiatives that help to clarify this knowledge gap and distinguishes between these two categories would be valuable.[70]

The global value of trade in waste, scrap and residues has increased from $90 billion to $294 billion between 2000 and 2020. However, it is difficult to determine what proportion of non-hazardous waste trade for recovery is recovered vs that being incinerated or ending up in landfill. The more frequently observed types of waste and scrap trade include e-waste, metals, plastics, rubber and tyres, slag and ash, and textiles (see Figure 3). Waste, scrap and residue trade from agriculture and forestry is another large trade flow. Global trade in forestry and paper waste and scrap was valued at $51 billion in 2020. Section 3.6 discusses biomaterial trade in further detail.

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69 Higashida, K. and Managi, S. (2013), 'Determinants of trade in recyclable wastes: evidence from commodity-based trade of waste and scrap', *Environment and Development Economics*, 19(2), pp. 250–70, https://doi.org/10.1017/S1355770X13000533; and Mulder, N. and Albaladejo, M. (eds) (2020), *El comercio internacional y la economía circular en América Latina y el Caribe* [International trade and the circular economy in Latin America and the Caribbean], ECLAC International Trade Series #159, https://repositorio.cepal.org/bitstream/handle/11362/46618/S2000783_es.pdf?sequence=1&isAllowed=y.
70 Yamaguchi (2021), *International trade and circular economy.*

Figure 3. Fluctuations in trade values and weights for six different waste and secondary raw material categories

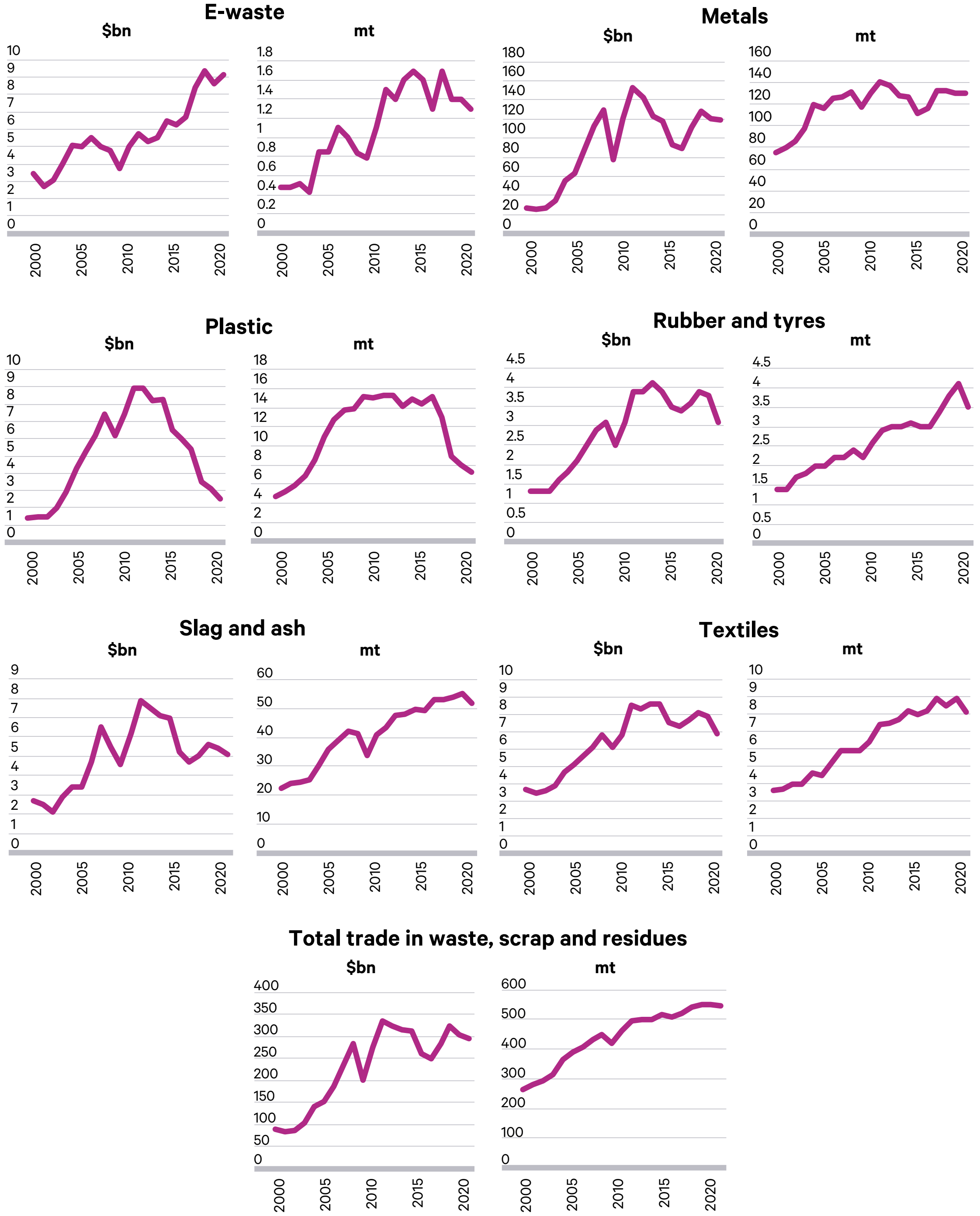

Figure 3 outlines the fluctuations in trade values and weights for the different categories of waste. Trade in plastic waste saw a rapid decrease in value and weight between 2015 and 2020 (declining by 60 per cent and 51 per cent, respectively; see Box 4). Similarly, textiles experienced an overall decline in value from 2014 to 2020 but an increase in weight. E-waste was the fastest growing waste stream during that period, but metal waste and scrap remained the largest by both value (equating to $119 billion in 2020) and volume. Scrap metal, however, fluctuated significantly in value – for example, between 2016 and 2019, the traded value of scrap metal increased by 30 per cent.

Despite the potential benefits of trade in recoverable waste, regulating cross-border trade of these material streams is rife with complexities. One such complexity is the current lack of harmonization between the HS and the Basel Convention. Waste definitions outlined in the Basel Convention are focused on the intention to discard, while the primary aim of the HS is to classify the nature and composition of the goods. This makes inspection and classification difficult for customs services. However, since 2013 there have been attempts to better link the lists outlined in the Basel Convention with the HS codes. This would not only help improve the efficiency of trade in circular trade flows but would also improve the granularity of data collection on global waste shipments.

The Basel Convention secretariat also adopted technical guidelines on distinguishing between waste and non-waste when used equipment is moved across borders.[71] However, these guidelines will not necessarily be adopted by all parties, while even where they are adopted, officials can lack sufficient training and resources to implement them effectively. Mixed wastes are also common and difficult to regulate: for example, e-waste is often stuffed inside used vehicles for export and classed under one code.

The lack of interoperability between definitions is made worse by the incomplete incorporation of different waste categories in the HS. For example, six-digit HS codes used for international trade do not always permit border officials to discriminate between waste and used goods for reuse or SRM-recovery. This is because the HS codes do not align perfectly with the definitions of hazardous, non-hazardous and other wastes as outlined in the Basel Convention (see Box 2). For example, there are several instances where the same code could concurrently be applied to waste, scrap materials and even primary resources. This problem is compounded by the constrained capacity (i.e. availability of skills, technologies and time) of customs officials, particularly those in low-income countries, to conduct thorough inspections in cases where HS codes do allow for distinction.

This is in part because the HS was designed to classify traded goods and materials based on their physical characteristics – a pragmatic approach to allow goods to be easily inspected and tested by customs officials. However, such a simplistic method means that there is no mechanism for traders to declare the state of goods new or used, their intended end-use or an easy way for officials to verify such claims. This method of classification also prevents the assessment of imported goods based on their level of circularity – i.e., if they were produced via sustainable methods or if they are repairable or recyclable. Therefore, a globally interoperable system must be developed to better capture and communicate relevant information at national borders.

Adding to the complexity, countries can also choose to create additional tiers of codes for traded goods (up to eight and 10 digits), offering a higher level of granularity and the ability to differentiate between circular trade flow types. For example, the US has introduced a series of 10-digit codes to differentiate between

71 Basel Convention (2022), 'Previously adopted technical guidelines', http://www.basel.int/Implementation/Publications/TechnicalGuidelines/tabid/2362/Default.aspx.

new and used industrial equipment, while the EU has created eight-digit codes for used buses. Yet, as these codes are applied unilaterally, their use risks further entrenching divergence in classifications around the world.

Box 5. Global decline in plastic waste trade

Despite continuous growth since 2000, international waste trade declined by $30 billion between 2019 and 2020. Plastic waste experienced the greatest reduction, from 15 mt ($6 billion) to 7.3 mt ($2.5 billion) from 2016 to 2020. It is difficult to determine whether this signals a plateauing, a reduction in plastic waste trade (and waste trade in general) over the medium- to long-term, or whether it is a short-term phenomenon. However, certain global developments explain at least part of this reduction.

The first is China's National Sword initiative, introduced in 2017, which placed strict controls on the import of several types of waste including metal, plastics, paper and textiles. This initiative created immediate ripple effects on global waste trade. Perhaps the most affected was the trade in plastic waste, as China imported nearly one-half of all globally traded plastic waste prior to 2017. After the introduction of National Sword, large volumes of plastic waste were diverted to South and Southeast Asian countries. Those recipient countries then moved swiftly to impose their own restrictions on waste imports, forcing exporting countries to take emergency measures such as stockpiling, incinerating or sending waste to landfill.

A second factor is the Basel Convention Ban Amendment, which entered into force in December 2019 and that prohibits the export of hazardous waste from developed countries to developing countries. The January 2021 Plastic Waste Amendments require most plastic waste trade to be controlled using the PIC procedure and will therefore also reduce the volume of plastic wastes traded. At the same time, the EU introduced a ban on the export of hazardous and hard-to-recycle plastic waste to non-OECD countries.

A third possible explanation is a rise in illegal shipments to circumvent stricter regulations. In 2020, a report by INTERPOL indicated a considerable increase in illegal waste shipments during the previous two years,[72] particularly to countries in South Asia.

On 9 March 2022, at the UN Environmental Assembly, nearly 200 nations passed a resolution titled 'End Plastic Pollution: Towards An International Legally Binding Instrument'.[73] This resolution establishes an intergovernmental negotiating committee that will develop the specific content on a global plastics treaty designed to provide a framework for reducing plastic pollution worldwide. Although the treaty will focus specifically on ending plastic pollution, when in place it will likely have profound consequences not only on the global trade in plastic waste, but also for the entire plastics value chain.

72 INTERPOL (2020), 'INTERPOL report alerts to sharp rise in plastic waste crime', 27 August 2020, https://www.interpol.int/News-and-Events/News/2020/INTERPOL-report-alerts-to-sharp-rise-in-plastic-waste-crime.
73 UNEP (2022), *End Plastic Pollution: Towards An International Legally Binding Instrument*, draft resolution, https://wedocs.unep.org/handle/20.500.11822/38525;jsessionid=025BD721B6AB2B1D2EECC0F707FBE53E.

Despite the limitations of the HS, it is revised and updated every five years. The most recent revision took place in 2022 and made notable advancements in addressing some of the issues outlined above. For example, it introduced a new heading for HS 8549 'Electrical and electronic waste and scrap' that will allow declared trade in different categories of e-waste to be recorded and analysed for the first time.[74] Nonetheless, additional work is required on the HS to ensure it facilitates, rather than inhibiting, the broad range of circular trade flows.

Illegal shipment of waste is a serious and growing crime globally. Illegal waste trade can come in many forms, including 'transporting waste on the black market, mixing different types of waste, declaring hazardous waste as non-hazardous, or classifying waste as second-hand goods'.[75,76] Illegal waste shipments that successfully make it through customs inspections are commonly burned in open landfill or dumped in the environment, potentially polluting waterways and creating vectors for disease.[77] Despite the 'Ocean Dumping Act', it is also common for waste to be dumped at sea – dumped waste accounts for 10 per cent of the overall pollutants entering the world's oceans.[78]

Informal workers collecting, sorting or valorizing such waste often have little to no access to personal protective equipment (PPE). They are therefore exposed to toxic chemicals, via both direct contact with the chemical itself or with dust and soil, and indirect contact such as inhalation of fumes or oral intake of contaminated food and water. Exposure can result in serious health problems ranging from cancers and hormone disruptions to damage to internal organs, reproductive illnesses and skin diseases, among others.[79]

Although accurate data on the volume of illegal waste trade is not available, a 2021 Financial Action Task Force report stated that 'environmental crime is estimated to be among the most profitable proceeds-generating crimes in the world, generating around $110 to $281 billion in criminal gains each year. Forestry crime, illegal mining, and waste trafficking… account for 66%, or two-thirds of this figure'.[80] One-third of all shipments from the EU are estimated to contain illegal

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74 Omi, K. (2020), *Current situation, analysis and observations on waste control at borders by Customs*, World Customs Organization Research Paper No. 50, http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/research-paper-series/50_waste_control_at_borders_by_customs_omi_en.pdf?la=en.
75 Basel Action Network (2018), *The 'Scam Recycling' Continues: E-waste Exportation From The U.S. To Developing Countries,* e-Trash Transparency Project and Basel Action Network, Update #2, 18 January 2018, http://wiki.ban.org/images/1/17/ScamRecyclingContinuesUpdate_2.pdf.
76 WCO Secretariat (2019), 'Illegal waste trafficking: more data is key to getting a better grip on this trade', WCO News, 88, February 2019, https://mag.wcoomd.org/magazine/wco-news-88/illegal-waste-trafficking-more-data-is-key-to-getting-a-better-grip-on-this-trade.
77 Williams, M. et al. (2019), *No Time to Waste: Tackling the plastic pollution crisis before it's too late*, Tearfund, Fauna & Flora International (FFI), WasteAid and The Institute of Development Studies (IDS), https://learn.tearfund.org/-/media/learn/resources/reports/2019-tearfund-consortium-no-time-to-waste-en.pdf.
78 Mead, L. (2021), *"The Ocean Is Not a Dumping Ground": Fifty Years of Regulating Ocean Dumping*, IISD Earth Negotiations Bulletin, Brief #28, December 2021, https://www.iisd.org/system/files/2021-11/still-one-earth-ocean-dumping.pdf.
79 Frazzoli, C., Orisakwe, O. E., Dragone, R. And Mantovani, A. (2010), 'Diagnostic health risk assessment of electronic waste on the general population in developing countries' scenarios', *Environmental Impact Assessment Review*, 30(6), pp. 388–99, https://doi.org/10.1016/j.eiar.2009.12.004.
80 FATF (2021), *Money Laundering from Environmental Crimes*, report, Paris: FATF, https://www.fatf-gafi.org/media/fatf/documents/reports/Money-Laundering-from-Environmental-Crime.pdf.

waste shipments,[81] and, according to the Global E-waste Monitor, 82.6 per cent of global e-waste flows are not documented.[82]

One of the main reasons for illegal waste shipment is to avoid high domestic costs of waste-disposal compliance by shipping waste to countries that have more relaxed, if any, environmental regulations pertaining to the handling of waste. As such, illegal waste tends to flow from high-income to low- and middle-income countries.[83,84] A recent example is the prosecution of an organized crime group based in Italy which shipped significant quantities of non-recycled plastics to Slovenia, for which Slovenian companies provided forged documents claiming the plastic was recycled. The waste was then re-exported to China.[85]

One of the main reasons for illegal waste shipment is to avoid high domestic costs of compliance by shipping waste to countries that have more relaxed, if any, environmental regulations on the handling of waste.

Under the Basel Convention, illegal waste shipments can be shipped back to the originating country, with that country bearing the full cost. However, it can take years to resolve disputes, leaving the waste stranded in importing countries' ports. For example, in such a dispute between the UK and Sri Lanka, it took two years for 263 containers of illegally traded waste to be shipped back to the UK. The shipment purported to contain used carpets, mattresses and rugs, but in fact comprised biowaste from hospitals (including body parts from morgues), causing serious health and safety risks.[86]

Trade statistics also highlight a growing 'shadow economy' in the waste trade – particularly involving scrap plastics. This is a result of an inconsistency in reporting between exporters and importers.[87] Despite illegal waste trade becoming an increasing problem, there remains a serious data gap as it is not mandatory for countries to report seizures of illegal waste under the Basel Convention, meaning that both reporting between countries and the timing of reports are highly uneven.

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81 EU Waste Shipment Regulation implements the Basel Convention and lays down rules for transboundary movements of waste destined for both 'recovery' and 'disposal'. Technically, only waste destined for recovery is allowed to be shipped to non-OECD countries.
82 Forti, Baldé, Kuehr and Bel (2020), *The Global E-waste Monitor 2020.*
83 High-, middle- and low-income countries as defined by the World Bank (see Glossary of terms).
84 Pratt, L. A. (2011), 'Decreasing Dirty Dumping? A Re-evaluation of Toxic Waste Decreasing Dirty Dumping? A Re-evaluation of Toxic Waste Colonialism and the Global Management of Transboundary Hazardous Waste', *William & Mary Environmental Law and Policy Review*, 35(2), https://scholarship.law.wm.edu/cgi/viewcontent.cgi?article=1519&context=wmelpr.
85 Europol (2019), 'Trash worth millions of euros – From trash to treasure: the growing illegal waste trafficking market', 18 September 2019, https://www.europol.europa.eu/media-press/newsroom/news/trash-worth-millions-of-euros.
86 Carbonaro, G. (2022), 'Return to sender: Sri Lanka ships tonnes of illegal waste back to the UK', Euronews, 22 February 2022, https://www.euronews.com/green/2022/02/22/return-to-sender-sri-lanka-ships-tonnes-of-illegal-waste-back-to-the-uk.
87 Yeoh, T. N. and Pacini, H. (2021), 'Governing the Trade of Secondary Materials', Chatham House circulareconomy.earth, 4 February 2021, https://circulareconomy.earth/publications/governing-the-trade-of-secondary-materials.

Box 6. Ship-breaking and the trade in end-of-life ships

The trade in end-of-life ships for material recovery and recycling brings very different opportunities and challenges. On the one hand, ship-recycling supplies the world with a significant amount of secondary steel. However, ship-recycling is a highly volatile industry in which businesses depend on several supply-and-demand factors, including operating costs of old ships, end-of-life ship prices and global demand for scrap metals.[88] It is estimated that 26 million gross tonnage (GT) of ships were demolished in 2012 – accounting for one-quarter of all scrap metal traded globally. In 2013, that amount dropped by 50 per cent to 13 million GT. In 2014, the volume rose by about 90 per cent and increased again in 2016 to 27 million GT. The COVID-19 pandemic significantly disrupted the global shipping industry, with many ships being scraped prematurely. An estimated 300 million GT of vessels will become available for demolition in the next five years.

Ship-breaking has also become an important economic sector for many emerging economies, including in Bangladesh, India, Pakistan and Turkey. Nearly 90 per cent of the global world tonnage is scrapped in South Asia.[89] These ships are commonly dismantled by low-paid migrant workers, who lack PPE or adequate tools and machinery. Some have therefore described ship-breaking as one of the world's most dangerous jobs – up to 470 fatalities were estimated in India alone between 1983 and 2013.[90]

Regulating the recycling and trade of end-of-life ships is particularly challenging. Ships are considered hazardous waste under international environmental law, as they contain many toxic materials and substances such as asbestos, cadmium, lead and mercury. However, the decision to scrap a ship is often made in international waters, over which the Basel Convention has no jurisdiction. Meanwhile, the EU's 2012 revision to its Waste Shipment Regulation, requiring any ship registered with an EU flag to be recycled in pre-approved facilities have been circumvented by owners simply changing the flag registration or using other measures.

Delays in the introduction of national legislation providing the necessary powers to regulators to enforce the Basel Convention are another limiting factor. Even in places where such legislation has been introduced swiftly, such as in the EU, regulators still tend to lack sufficient resources or capability to control such shipments. For example, EU member states are required to establish penalties and fines (under EC No 1013/2006), but in practice can struggle to convince prosecutors to take on a case. Few countries (with the exception of England, the Netherlands, Sweden and soon, France) have dedicated prosecutors for

88 Rahman, S. M. M., Kim, J. and Laratte, B. (2020), 'Disruption in Circularity? Impact analysis of COVID-19 on ship recycling using Weibull tonnage estimation and scenario analysis method', Resources, Conservation and Recycling, 164, https://www.sciencedirect.com/science/article/pii/S0921344920304560.
89 NGO Shipbreaking Platform (2021), 'Platform publishes list of ships dismantled worldwide in 2020', press release, 2 February 2021, https://shipbreakingplatform.org/platform-publishes-list-2020.
90 European Commission (2016), *Ship recycling: reducing human and environmental impacts*, https://ec.europa.eu/environment/integration/research/newsalert/pdf/ship_recycling_reducing_human_and_environmental_impacts_55si_en.pdf.

environmental crime.[91] As a result, fines and penalties issued by courts tend to be low and inconsistent in value. Enforcement against illegal waste shipment at the national level is also further complicated by the fact that waste regulation is commonly sub-divided between several national bodies, increasing the complexity of monitoring the whole life cycle of waste shipments.[92]

Attempts are being made at preventing illegal waste shipments. An example of successful international collaboration in this area is Project Demeter, a global operation involving 75 customs administrations. Other examples include the Green Customs Initiative, the Regional Enforcement Network for Chemicals and Waste (Project REN), and most recently, the UNODC and UNEP 'Unwaste: tackling waste trafficking to support a circular economy' initiative. Despite these projects, a longer-term, globally coordinated and well-resourced approach to policing and enforcement is necessary to genuinely tackle the illegal waste trade.[93]

3.6 Biomaterial trade and the circular economy

Sections 3.1–3.5 have discussed the five main types of circular trade flow without differentiating between biotic and abiotic resources. The differences in characteristics and dynamics between the two are not widely understood or discussed.[94] This final section attempts to address the intersection between trade in biomaterials and the circular economy.

What is biomaterial trade?

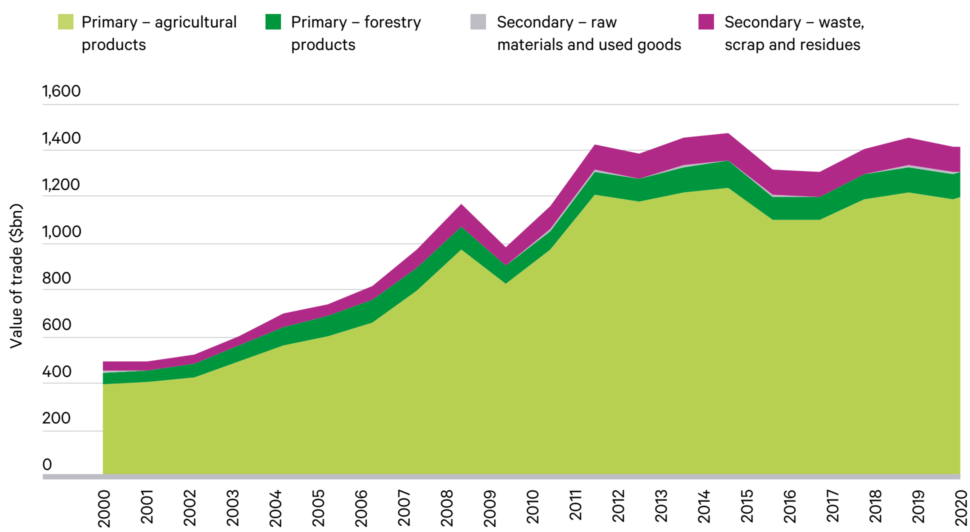
Biomaterial trade is defined as trade in raw and intermediate biological materials and goods (including renewable resources from land and sea used for construction, feed, food and the generation of bioenergy). In 2020, biomaterial trade made up approximately 30 per cent of all global commodity trade by value and 17 per cent by weight.[95] Despite its importance in global trade, biomaterial trade is often overlooked in circular trade policy discussion and literature. This is, in part, due to the complexity and heterogeneity of biomaterial trade flows. Therefore, it is necessary to better understand how biomaterial trade and the global transition to a circular economy intersect. First, this section presents the overall composition of biomaterial trade and then explores what proportion of this trade may be considered circular biomaterial trade, and the associated challenges in conducting and regulating such trade.

91 Olley, K. (2021), *Illegal waste shipment: An overview*, The Veolia Institute Review: Facts Reports, 23, p. 26, https://www.institut.veolia.org/sites/g/files/dvc2551/files/document/2021/11/26%20Illegal%20waste%20 shipment.pdf.
92 Ibid.
93 For more detail on these initiatives, see Green Customs (undated), 'Home page', https://www.greencustoms. org; UNEP (2019), *Regional Enforcement Network for Chemicals and Waste (REN): Final Project Report - December 2011 - February 2018*, report, 20 February 2019, https://www.unep.org/resources/report/regional-enforcement-network-chemicals-and-waste-ren-final-project-report-december; and European Commission (2022), 'Unwaste: The challenges posed by the illicit flows of waste from Europe to Southeast Asia', webinar, 27 January 2022, https://fpi.ec.europa.eu/unwaste-challenges-posed-illicit-flows-waste-europe-southeast-asia_en.
94 Barrie, J. and Schröder, P. (2021), 'Circular Economy and International Trade: A Systematic Literature Review', *Circular Economy and Sustainability*, 2, pp. 447–71, https://doi.org/10.1007/s43615-021-00126-w.
95 Authors' own calculation using data from Chatham House circulareconomy.earth, https://circulareconomy. earth and Chatham House resourcetrade.earth, https://resourcetrade.earth.

The composition of global biomaterial trade

As outlined in Figure 4, biomaterial trade has grown almost three-fold over the past two decades, from a market value of $500 billion to $1.4 trillion. The vast majority of that growth has been realized in the trade of primary agricultural products, which comprised 84 per cent of biomaterial trade in 2020.[96] Horticulture, oilseeds and cereals are the most valuable primary agricultural trades in aggregate, with the Netherlands and Spain dominating horticulture exports (with Germany and the US similarly dominant in imports), Brazil and the US the largest countries in oilseed exports (China in imports), and Russia and the US predominant in cereal exports (China and Egypt in imports). Primary forest products, raw materials and secondary wastes each account for 8 per cent.

Figure 4. Growth in biomaterial trade, 2000–20



Trade in secondary waste and raw biomaterials

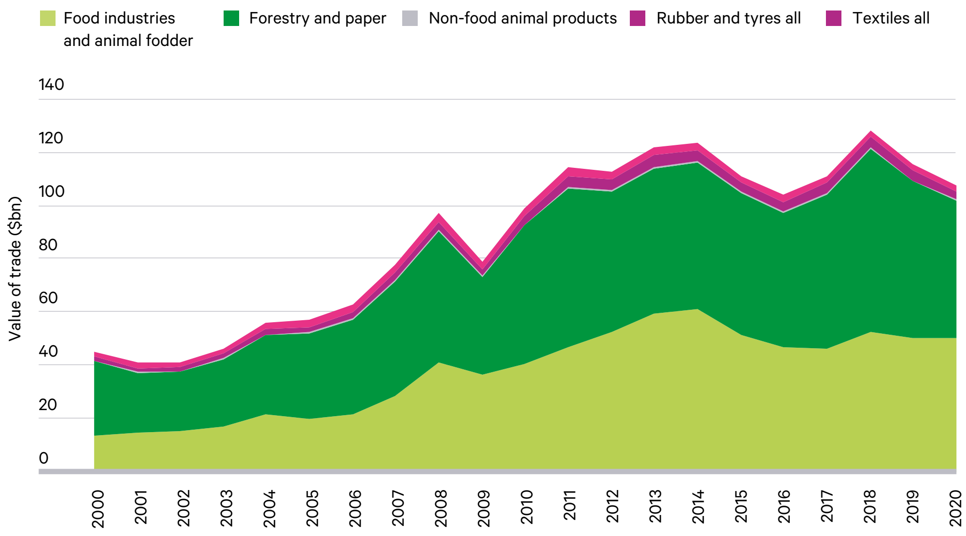
Trade in secondary biomaterial waste and secondary raw biomaterials makes up an important and sizeable component of circular trade (see Figure 5). Secondary raw biomaterials are materials derived from the revalorization of waste biomaterials intended for use in primary production of goods, and which displace primary raw materials. An example is recycled pulp (for more on the production of paper, see Box 7). Examples of biomaterial waste, scrap and residues include soya bean oil-cake (from which the oil can be extracted for multiple applications) or waste construction wood which can be revalorized into furniture.

As outlined in Figure 5, the total value of trade in secondary waste and raw biomaterials grew in value by 230 per cent between 2000 and 2020. Waste, scrap, residue and secondary raw material trade in forestry and paper and food and animal fodder accounts for nearly all of the traded value. Textiles, non-food animal

96 Includes raw and intermediate bioeconomy products (including renewable resources from land and sea used for food, feed, construction and the generation of bioenergy).

products and rubber and tyres making up the rest. The most-traded secondary forestry and paper products are chemical wood pulps (see Box 7). However, trade in these products has declined in the past two years.

Figure 5. Growth in biomaterial trade in waste, scrap, residues and secondary raw materials, 2000–20



Source: Chatham House resourcetrade.earth (undated), https://resourcetrade.earth.

The second most important secondary forestry trade by value is wood waste, scrap and sawdust. Much of this is exported from North America, particularly from the US, and imported into Europe, particularly by the UK, and used in pelletized formats as feedstocks for biomass power plants. Research by Chatham House found that US-sourced pellets burnt for energy in the UK were responsible for a net contribution of between 13 million and 16 million tonnes of CO_2 emissions in 2019.[97] This estimate accounted for emissions from their combustion and their supply chain, forgone removals of CO_2 from the atmosphere due to the harvest of live trees and emissions from the decay of roots and unused logging residues left in the forest after harvest. Further consideration should be given to the environmental benefits and impacts of trade in secondary biomass for energy and to alternative, more sustainable uses.

The total value of trade in secondary waste and raw biomaterials grew in value by 230 per cent between 2000 and 2020.

The most-traded secondary food industry and animal fodder product is soya bean oil-cake – a residue from the extraction of soybean oil. Total trade in soya bean oil-cake was valued at $25.8 billion in 2020. Oil-cake is predominantly

97 Brack, D., Birdsey, R. and Walker, W. (2021), *Greenhouse gas emissions from burning US-sourced woody biomass in the EU and UK*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/2021/10/greenhouse-gas-emissions-burning-us-sourced-woody-biomass-eu-and-uk.

used for animal feed, but there is also significant potential to valorize it to extract oil, protein and residual fibres. Once extracted, these can be reintegrated into the manufacturing process to make bioplastics and fuels, as well as foodstuffs and pharmaceuticals.[98] As the world's leading producer of soybeans, the Latin America and the Caribbean (LAC) region is naturally also the largest exporter of soya bean oil-cake, accounting for $16 billion of global exports in 2020. Of this amount, $5.9 billion was exported to Europe and $6.1 billion to East and Southeast Asia (excluding China).

Defining circular biomaterial trade

The growing trade in secondary raw biomaterials and waste, scrap and residues has also received little attention in circular economy trade discussions, resulting in a lack of understanding on the crucial differences in how and where the circular economy intersects with biomaterial trade vs non-biomaterial trade.

As a first step, this paper defines circular biomaterial trade as that in: (i) secondary raw biomaterials; and (ii) waste, scrap or residues that can be revalorized.[99] Secondary raw biomaterials are materials derived from the revalorization of biological waste materials intended for use in primary production of goods that displace primary raw materials. An example is recycled pulp (see Box 7) or recycled textile fibres. This is a very narrow definition of circular biomaterial trade and further consideration should be given to whether additional trade flows may also be incorporated, as discussed below.

Box 7. Trade in recycled pulp

Pulp is a renewable, biodegradable raw material made from the cellulose fibres of various forms of biomass, though the predominant form is wood pulp from trees. As one of the most versatile materials around, uses for pulp range from the everyday (e.g., baby wipes, books and tissues) to the more innovative (such as car-engine air filters and LCD screens). Pulps can also be produced from recovered paper products and have the potential to displace large proportions of new wood pulp. Indeed, recovered paper has increased its market share in the paper industry by 28 per cent over the last 35 years, while the share of wood pulp has decreased by 27 per cent.[100]

98 ECLAC (2021), *International Trade Outlook for Latin America and the Caribbean 2021*.
99 Second-hand goods for reuse, repair or recycling comprised (almost) entirely from biomaterials (such as furniture or construction materials) are not included in this definition as they are implicitly covered in the broader circular trade definition presented in Section 3.2.
100 Martin, J. and Haggith, M. (eds) (2018), *The State of the Global Paper Industry*, Asheville: Environmental Paper Network, https://environmentalpaper.org/wp-content/uploads/2018/04/StateOfTheGlobalPaperIndustry2018_FullReport-Final-1.pdf.

Creating loops within paper supply chains makes economic and environmental sense. One tonne of paper produced from recycled secondary inputs saves up to four times the volume of wood from new inputs. The use of recycled inputs also reduces emissions of greenhouse gases, dioxins, mercury and other pollutants associated with production from new raw materials.[101]

However, obstacles currently hold back further circularity in this sector. With global demand for paper products – especially packaging – still increasing, decoupling pulp demand from increased resource use remains challenging, given the difficulty of producing paper and paper board from recycled material alone. Unlike in other production chains – for example, those based on recycled minerals or metals, in which the quality of products does not degrade with each cycle – fibres are shortened in the recycling process, resulting in end products of progressively lower quality and strength. This means that paper can only be recycled between five and seven times. In the absence of demand reduction, the industry will remain dependent on new materials.

In terms of international trade, new pulp still accounts for the majority of the market. Nonetheless, recycled pulp exports have been growing much faster this century, increasing by 14 per cent by value from 2002 to 2019, compared with 5 per cent for new pulp.[102] In 2020, trade in pulp derived from recovered waste or scrap paper was valued at about $750 million.[103] The market has grown almost five-fold in size since 2017, largely due to increased demand from China following the introduction of National Sword (see Box 5). The policy has severely limited Chinese imports of recovered paper products, which were crucial to producing pulps for its large paper industry. However, as pulps themselves are not affected by the policy, China is increasingly reliant on importing pulps derived from recycled fibres. Countries such as Laos and Malaysia have expanded facilities to turn recovered paper into fibre and pulp to satisfy Chinese demand.[104]

Sustainably produced primary or intermediate biomaterial goods

Although primary and intermediate products make up 92 per cent of all biomaterial trade (as opposed to waste and secondary raw materials), this does not imply that most trade is linear – in this respect, it differs from the trade in non-renewable abiotic goods and materials. Rather, the level of circularity of this trade should be determined on the extent to which these biomaterials were sustainably produced and on their intended end-use.

101 Economic Commission for Latin America and the Caribbean (ECLAC) (2021), *International Trade Outlook for Latin America and the Caribbean 2021: Pursuing a resilient and sustainable recovery*, Santiago: ECLAC, https://repositorio.cepal.org/bitstream/handle/11362/47536/4/S2100997_en.pdf.
102 Chatham House circulareconomy.earth (2022), 'Trade flows'.
103 Ibid.
104 Staub, C. (2018), 'China faces 'staggering' shortfall in recovered fiber supply', *Resource Recycling*, 30 May 2018, https://resource-recycling.com/recycling/2018/05/30/china-faces-staggering-shortfall-in-recovered-fiber-supply.

Achieving consensus on what constitutes sustainable agricultural production is complex, as agriculture can impact the environment in various ways (for example, pollution of air, soil and water, greenhouse gas emissions or soil or habitat degradation).[105] Additionally, the extent of the impacts is, in many respects, context-dependent (for example, local differences in climate or environment). Therefore, the same practice can result in different outcomes in different places. The relative impact of practices can also vary according to the scale of intervention. For example, an intensively managed field in a large area of agro-ecological farmland may not affect, to a measurable extent, the local biodiversity. But, if that same practice was scaled up to landscape level, it would. Hence, it is difficult to determine whether a practice is sustainable or not, without reference to scale.

Finally, the aggregate impacts of activities are also difficult to estimate. For example, ceasing an impactful activity in one region could simply displace it, through market demand, to another region with lower environmental protection standards – resulting in an overall negative impact on the environment.

The lack of agreed definition of sustainable agriculture makes it difficult to estimate what proportion of primary agricultural and forest products traded is produced using sustainable agricultural practices. However, as an example, a 2014 analysis estimated that almost one-half of global deforestation between 2000 and 2012 was a result of illegal land-use conversion to enable commercial agriculture. Nearly one-quarter of this deforestation was driven by land conversion for export markets – equating to $61 billion in trade in 2014;[106] $10 billion of that was attributable to timber and wood products.[107]

It is therefore open to question whether the trade in primary or intermediate biomaterials and goods, which have been produced using sustainable agricultural and industrial processes, can be considered a circular biomaterial flow.

Another challenging aspect to defining what is circular biomaterial trade is that even if these goods are produced in a ‘sustainable’ way, their end-use may not be entirely sustainable – for example, wood produced sustainably but then traded for use in an inefficient biomass-to-energy plant abroad or soybeans traded for use as livestock feed. The global trading system does currently not require a product’s intended end-use to be declared, and it would be incredibly difficult for border agencies to verify such claims even if they were required.

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105 Benton, T. G. and Harwatt, H. (2022), *Sustainable agriculture and food systems: Comparing contrasting and contested versions*, Research Paper, London: Royal Institute of International Affairs, https://doi.org/10.55317/9781784135263.
106 Lawson, S. (2014), *Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations*, Forest Trends Report Series, Washington, DC: Forest Trends Association, https://www.forest-trends.org/wp-content/uploads/imported/for168-consumer-goods-and-deforestation-letter-14-0916-hr-no-crops_web-pdf.pdf.
107 Ibid.

Goods and services that enable sustainable agricultural processes

A second flow for discussion is the trade in goods and services that enable sustainable agricultural processes in the importing country. Examples may include equipment and machinery for 'no-till' planting (thereby protecting soil health), bio-digestion, bio-fermentation or composting of agricultural waste (to aid revalorization), drip-irrigation systems (to conserve water); or services such as training courses or satellite-monitoring (to improve efficiency). This trade flow faces the same challenges as that around the lack of a shared definition of sustainable agricultural processes.

3.7 Summary

This chapter has outlined why a global circular economy transition is essential to addressing the triple environmental threat of pollution, climate change and biodiversity loss and explored the role of the global trading system in enabling this transition. It has provided a working definition for what constitutes circular trade and set out some of the challenges that need to be addressed for each circular trade flow type. Finally, it has offered an initial discussion on the intersection between the trade in biomaterials and an inclusive circular economy.

04 Global dynamics of circular trade

Whether through economic nationalism or by forging geopolitical alliances, countries and regions are increasingly likely to pursue domestic resource security over collective and inclusive circular economy objectives.

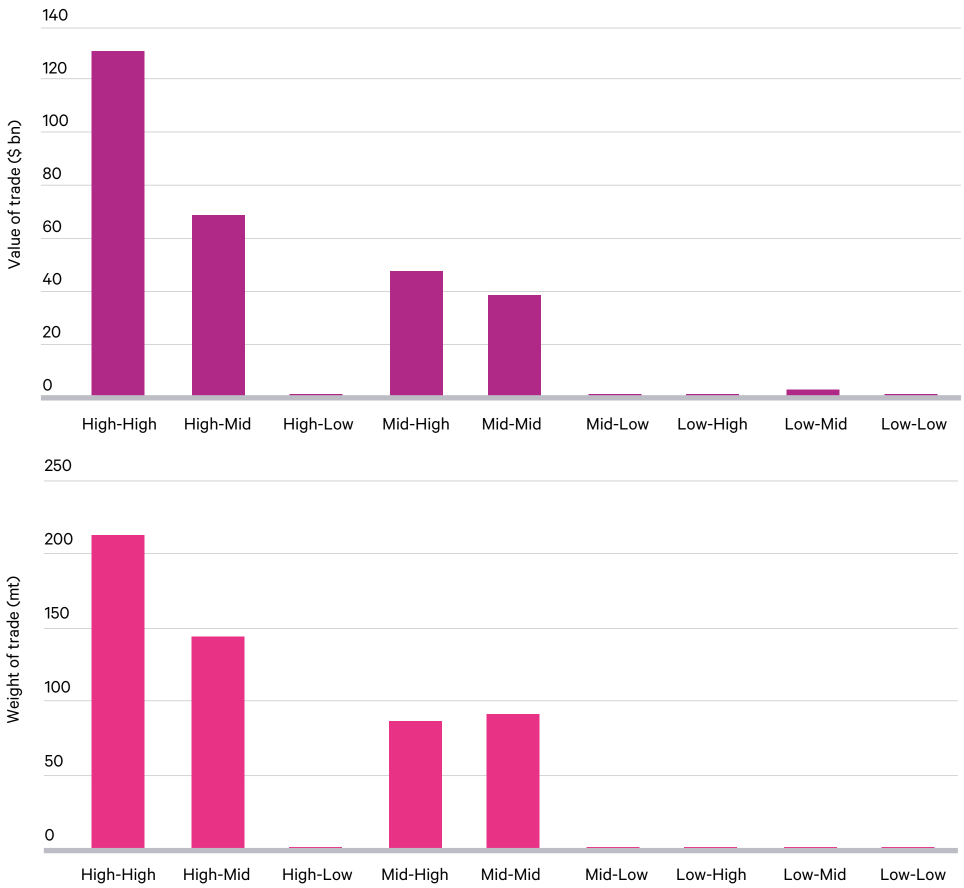
This chapter explores the geopolitical dynamics of circular trade and discusses their significance in governing an inclusive circular economy. It discusses: (i) how evenly (or unevenly) circular trade is distributed geographically; (ii) the impact of current geopolitical trends on circular trade; (iii) how different countries and regions may seek to maximize the benefits of circular trade while minimizing the risks; and (iv) the impact of domestic circular economy policy and legislation on international circular trade dynamics, plus the resultant, unintended impacts (particularly those on low-income countries).

4.1 Geographic distribution of circular trade

The value of circular trade flows is distributed highly unevenly across the world. According to available data, around 99 per cent ($287 billion) of the total value of trade in secondary goods, materials, waste, scrap and residues in 2020 was traded between and among high- and middle-income countries, with trade between China, Europe and the US being most prominent (see Figure 6).[108] Around 45 per cent ($131 billion) of the total trade value was traded solely between high-income countries. Conversely, trade to and from low-income countries comprised only approximately 1 per cent ($4 billion) of the total value.[109,110]

108 China being the predominant middle-income country – with imports of secondary goods, materials and waste, scrap and residues valued at $38 billion, and exports valued at $12.7 billion in 2020.
109 A caveat to this finding is the lack of clarity on the extent of informal trade (particularly between low-income countries) in these trade flows, which is not formally captured in trade databases.
110 Chatham House circulareconomy.earth (2022), 'Trade flows'.

Figure 6. Geographical inequity in circular trade flows between high-, middle- and low-income countries, value and weight

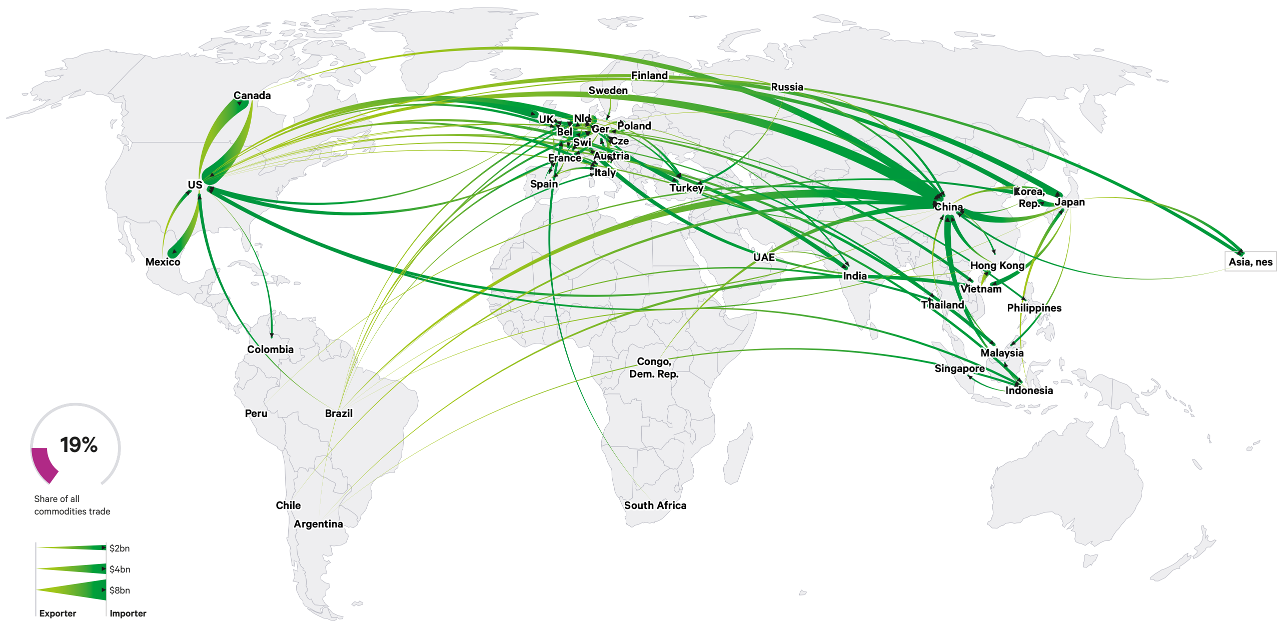


Although the proportion of circular trade flowing to and from low-income countries is small, the share of global trade in secondary raw materials and used goods to sub-Saharan Africa between 2000 and 2019 rose from 1 per cent to 16 per cent.[111] The most valuable trade flows from high-income countries to low-income countries are those for post-consumer textiles ($267 million in 2020) and used tyres ($13.8 million in 2020)[112] – the latter being costly and technically challenging to manage, recycle and repair. The sheer volume of post-consumer textiles, combined with cheap, low-quality textiles from East Asia,[113] has also been observed to undercut domestic production and create significant amounts of waste. As such, it has been subject to particularly strong pushback from countries in sub-Saharan Africa – which received approximately $1.4 billion of imported textiles waste in 2020 – through the introduction of import bans, quotas and other restrictions.

111 Barrie, J. and Schröder, P. (2021), *Trade, technology and a just circular transition*, UNIDO Industrial Analytics Platform, September 2021, https://iap.unido.org/articles/trade-technology-and-just-circular-transition.
112 It is difficult to accurately determine what proportion of traded used tyres are subsequently retreaded, but trade statistics do not distinguish between cores for retreading and used tyres destined for reuse. See Kojima (2017), 'Remanufacturing and Trade Regulation'.
113 Brady, S. and Lu, S. (2018), 'Here's why the used clothing trade deserves more attention', AGOA.Info, 11 December 2018, https://agoa.info/news/article/15539-here-s-why-the-used-clothing-trade-deserves-more-attention.html.

It should also be noted that sub-Saharan Africa is fast becoming a favoured destination for e-waste. For instance, sub-Saharan e-waste imports (not counting illegal e-waste trade) increased by 280 per cent in value and 290 per cent by weight between 2010 and 2020 (compared to the global average of 183 per cent and 165 per cent in value and weight, respectively). This raises questions around the environmental and social risks associated with the lack of e-waste management in such countries.

Figure 7. Map of highest-value international flows of secondary goods, materials and waste



Source: Chatham House circulareconomy.earth (2022), 'Trade', https://circulareconomy.earth.

There are additional considerations on the findings suggested by the data presented above. First, data is not available on the value of trade in circular economy-enabling goods and services between the three categories of country. However, it is likely to show the inequity in value-capture from circular trade, as most flows are expected to occur between high- and middle-income countries that have the capacity to develop the technologies, manufacture them and control the associated IPR.

Second, there is also a stark imbalance in the trade in remanufactured goods between high-, middle- and low-income countries. One study found that high-income countries are more open to, and encouraging of, imports of remanufactured cores and goods,[114] while low-income countries are likely to allow imports of both second-hand and remanufactured goods. By contrast, some middle-income countries actively restrict imports, as they are seen as a direct competition to domestic production and as an additional cost in terms of waste management.

114 Kojima (2017), 'Remanufacturing and Trade Regulation'.

Finally, illegal waste trade is also likely to exacerbate existing inequities. The direction of trade tends to flow from high- and middle-income countries to low-income ones, thus reducing waste management costs for developed countries, but exacerbating environmental and social costs in developing countries where there is inadequate capacity to safely handle and dispose of the waste.

It is possible therefore to draw parallels with value creation from resource use in general being accrued in the Global North, and the environmental impacts occurring in the Global South. As such, there is the risk that transition to a circular economy falls into the same inequity traps as the linear economy – a risk this paper refers to as the 'circular trade divide'.

Global inequities in power relations, digital trade capabilities, trade infrastructure, access to circular finance and industrial and innovation capabilities all risk further exacerbating the existing linear trade divide.

Global inequities in power relations, digital trade capabilities, trade infrastructure, access to circular finance and industrial and innovation capabilities all risk further exacerbating the existing linear trade divide. If an explicit goal to reduce inequality is not embedded into the processes behind the global circular economy transition, then it is highly likely that these inequities will create a circular trade divide to match – one in which the gains accrued from circular trade are highly unevenly distributed between developed and least-developed countries. Such a divide, should it persist and grow, will significantly restrict a globally inclusive transition to a circular economy, and undermine the UN's 2030 Agenda for Sustainable Development and SDGs.

The findings presented above raise questions as to why the significant circular trade divide exists, and what impact it will have on the development trajectory of low-income countries and their ability to transition to a circular economy. The following section explores how five major geopolitical trends may impact the dynamics of global circular trade.

4.2 Global geopolitics and circular trade

The existing linear trade system based on unsustainable extraction and resource use has contributed to the geopolitical tensions and conflicts the world is currently experiencing. Moving the world economy towards circularity will have implications for the dynamics of global trade and the geopolitical landscape. At the same time, the increasingly complex and fragmented geopolitical landscape will continue to affect the scope and scale of circular economy trade flows and therefore the trajectory of the global circular economy transition. The complex interplay between geopolitical dynamics and this transition sets the context for this section.[115] The five trends outlined will be particularly important in determining the trajectory of the global circular economy transition and the dynamics of circular trade flows.

Economic nationalism and deglobalization

Economic nationalism and the turn towards protectionism are not new, as demonstrated for example by the 'Make in India' scheme launched in 2014, the 2016 Brexit referendum and the election of Donald Trump as US president. US–China tensions over trade and technology have continued under the administration of President Joe Biden (see Box 8). Great power competition – and economic and technology decoupling – between the world's two largest economies, as well as a wider trend towards deglobalization accelerated by Russia's 2022 invasion of Ukraine, will have important repercussions for both global trade and the circular economy. These elements of deglobalization could limit the exchange of goods and services, including those that enable the circular transition.

The COVID-19 pandemic has caused significant disruption to global supply chains and led to a new drive for supply-chain resilience. Much of the focus is on securing strategic supply chains, targeting critical raw materials essential for national security, as well as on the transition to digital and green economies. There is a risk that securing supply leads to actions aimed at increasing influence over countries that export critical raw and secondary materials. Export-dependent developing economies are particularly exposed to this risk. The circular economy can be part of a broader strategy to reduce exposure to volatile global supply chains and foster economic competitiveness.

The European Commission placed the circular economy front and centre in its EU economic strategy via the launch of the CEAP, but faced criticism due to the plan's primary focus on boosting competitiveness, economic resilience and jobs within the EU.

Economic nationalism is also resulting in a fragmented approach to global trade and the circular economy. Despite a set of modest outcomes achieved at the 12th WTO Ministerial Conference in June 2022, the organization faces multiple challenges to its rule-making function, and its dispute-resolution mechanism remains in paralysis. While the WTO could help to ensure the international trade regime facilitates the circular transition, the circular economy is unlikely to become a priority for the organization amid an already full agenda of reforms.

Moreover, many countries are developing their own rules and approaches to circularity. For example, labelling schemes and standards have traditionally been developed in isolation, which affects the building of global value chains in companies operating transnationally. International co-operation on circular economy value chains is needed and could include efforts for greater mutual recognition or harmonization of standards and the removal of unnecessary trade barriers, while at the same time safeguarding the environment and society worldwide. However, international cooperation on circular trade faces many obstacles.

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115 The findings from this chapter are derived primarily from a Chatham House-hosted workshop with 32 trade and circular economy experts, and from semi-structured interviews.

Box 8. Implications of China's circular economy push for trade and relations with the US

The Biden administration's 100-day Supply Chain Review from June 2021 acknowledges that developing a circular economy – for example, in advanced battery materials – can help tackle multiple challenges, including reducing vulnerabilities in critical supply chains and meeting environmental objectives. China's new 'Dual Circulation' strategy adds a new dimension to its circular economy policy framework, although the strategy is not explicitly linked to environmental objectives.[116] It partly reflects a response to China–US trade tensions and partly China's long-standing goal of increasing self-sufficiency. The Dual Circulation strategy aims to insulate the Chinese domestic market from an increasingly volatile world, to reduce bottlenecks in supply as much as possible (whether in terms of natural resources or technology), to vertically integrate domestic production and to achieve self-reliance in consumption.

A related new policy direction since 2021 is China's 'Common Prosperity' drive, through which the Chinese government will manage the economy and society more tightly. Aimed at narrowing the growing wealth inequality gap, the goal of Common Prosperity is to move away from a resource-intensive and investment-reliant growth model to one driven by the spending power of Chinese consumers. Through this strategy, China's economy is expected to downshift to much slower but 'quality' growth.[117] In 2021, the policy already led to crackdowns on real estate speculation and Chinese tech companies in fields from e-commerce to fintech-lending.

Green tech is a cross-cutting strategic goal that runs through both policies. It includes several areas highly relevant for circular technology trade: battery storage, EVs, plastics, power equipment, steel, solar and wind power, and zero-carbon cement. China is world-leading in many applications required to achieve net zero targets.

The potential implications for circular trade include, on the negative side, tighter investment environments for innovation, further tech and trade decoupling between the China and the US, and export restrictions on key technologies needed for the transition to circular systems across many industries. On the positive side, a focus on balancing domestic production and consumption can enable local and national circularity (e.g. via strengthened industrial networks), while the need to deal with waste domestically could lead to more effective waste reduction strategies.

Russia's invasion of Ukraine and Western circular economy strategies

Russia's invasion of Ukraine, as well as China's response to Russia's actions, will likely result in a change of strategy on circular trade from the EU and the US. For instance, the Biden administration has banned the import of Russian oil, liquefied natural gas and coal to the US. Meanwhile, the EU plans to reduce linear trade

116 García-Herrero, A. (2021), *What is behind China's Dual Circulation Strategy?*, report, Bruegel, https://www.bruegel.org/2021/09/what-is-behind-chinas-dual-circulation-strategy.
117 Roberts, D. T. (2021), *What is "Common Prosperity" and how will it change China and its relationship with the world?*, issue brief, Washington, DC: Atlantic Council, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/common-prosperity.

in non-renewable energy sources with Russia, vowing to reduce gas imports by two-thirds before the end of 2022.[118] This will likely lead to an increase in demand for circular economy-enabling goods and services, especially for energy efficiency measures and renewables. As a next step, the EU may accelerate and strengthen its statutory circularity standards and fiscal incentives to promote the domestic capture and reuse of critical raw materials. This could help reduce reliance on primary materials and resource trade imports from Russia in the first instance, but likely also from China.

Although sanctions on circular trade flows have previously been rare, increasing geopolitical tensions may well encourage the use of sanctions (and/or export restrictions and tariffs) by the EU and US on scrap metals, secondary critical materials (that are important in the production of military equipment) and used goods. Russia, for example, imported $1.2 billion and exported $2 billion of scrap metal in 2020, accounting for approximately 1 per cent and 1.6 per cent of the global scrap metal trade, respectively. Trade restrictions on advanced digital technologies have already been introduced regarding Russia, and trade liberalization measures on technology equipment for renewable energy technologies necessary for conducting key circular activities could be adapted by the EU and others that seek to reduce their reliance on Russian energy.

Proprietary protection (and IP-licensing) on CE goods and services could also be strengthened by the EU, the US and allies. Controlling the diffusion of certain strategic CE-enabling technologies (particularly digital ones) – via, for example, IP-licensing – enables tighter control on their use. Yet it may constrain the extent to which the IP holders of the technology gain market share. Tighter control of IP between the EU and the US on one side and China and Russia on the other will not only impact the efficiency gains provided by opening up to circular trade, but will also likely have negative impacts on developing countries and regions that are particularly dependent upon the import of such goods and services.

Energy resource security in a net zero world

A major global trend with geopolitical implications that impacts circular trade is the race towards net zero. The low carbon transition is materially intensive, and so increases demand for certain technologies and materials. This leads to an intensification in the mining of critical raw materials such as cobalt, lithium and nickel for batteries, and copper, silicon and silver for solar PV. According to the International Energy Agency (IEA), achieving net zero will lead to a six-fold increase in mineral demand by 2040.[119] The IEA has warned that there is a risk this demand will not be met, as the mining and processing of these minerals is currently highly concentrated geographically. For cobalt, the Democratic Republic of the Congo hosts 70 per cent of the world's production, while, for rare earth

118 Bounds, A. (2022), 'EU plans to cut Russian gas imports by two-thirds in a year', *Financial Times*, 8 March 2022, https://www.ft.com/content/eac9498f-6a36-41a9-b577-fa37c0eeab76.
119 Kim, T-Y. et al. (2022), *The Role of Critical Minerals in Clean Energy Transitions*, IEA World Energy Outlook Special Report, Paris: International Energy Agency, https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.

metals, China hosts roughly 60 per cent.[120] Processing of these materials is even more concentrated, with China processing around 70 per cent of the world's rare earth metals and 50–70 per cent of the world's cobalt and lithium. Such high concentration creates supply-chain vulnerabilities – for example, those linked to geopolitical risks or natural disasters.

Both the mineral and metals supply chains for technologies and the concentration of manufacturing capacity in a small number of countries are becoming a geopolitical issue. China has the world's largest production capacity for solar PV: eight of the top 10 solar companies in the world are Chinese, supplying almost 100 per cent of solar ingots and solar wafers. Meanwhile, China's global share of solar-cell manufacturing is about 80 per cent. In the context of Russia's war on Ukraine, the EU and the UK are aiming to reduce their dependence on oil and gas, but the transition to a renewable energy system at the same time significantly increases dependence on China's solar power industry. Current trends towards increased economic nationalism and geopolitical conflict work against both energy security objectives and net zero transitions.

To build more resilient and sustainable supply chains for low-carbon technologies and to ensure access to required materials, national governments have a range of different tools. While resilient and sustainable supply chains are ultimately built at company-level, governments can, among other things, build national stockpiles for strategic products (such as rare earth elements) and encourage firms to diversify sources of supply. A multi-pronged government strategy should also prioritize demand-side reduction measures (thereby reducing overall demand for resources), as well as measures to scale up circular processes and technologies to tackle the hard-to-reduce emissions in sectors such as agriculture, aviation and construction (thereby increasing the likelihood of trade in circular economy-enabling goods and services). Such a multi-pronged approach will also need to include demand-side measures that reduce end-use energy consumption and primary resource use.

Policy measures put in place to accelerate the net zero transition may either foster or inhibit circular trade flows. For example, carbon border adjustment mechanisms under consideration by the EU and the US,[121] which seek to impose costs on imported goods comparable to the costs faced by domestic producers. These mechanisms may encourage investment not only for decarbonization of the energy sector, but also low-carbon materials such as 'green' steel and concrete. However, critics argue that they could create trade barriers or even lead to trade wars between countries. The compatibility of carbon border adjustments with WTO rules will likely also be contested. To reduce trade frictions, it would be ideal – though currently unlikely – to align domestic carbon measures with any border tax measures.[122]

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120 Ibid.
121 E3G (2021), 'Proposed Carbon Border Adjustments in the US and EU', E3G Blog, 20 September 2021, https://www.e3g.org/news/proposed-carbon-border-adjustments-in-the-us-and-eu.
122 Hufbauer, G. C. (2021), 'Divergent climate change policies among countries could spark a trade war. The WTO should step in', PIIE, 30 August 2021, https://www.piie.com/blogs/trade-and-investment-policy-watch/divergent-climate-change-policies-among-countries-could.

Increasing plurality of geopolitical alliances and trade deals

Due to the challenges in achieving multilateral consensus on trade rules, countries are increasingly moving towards bilateral and plurilateral trade agreements.[123] Such trade initiatives among groups of like-minded countries offer the chance to accelerate towards environmental (and circular) ambitions without requiring complex and often lengthy multilateral negotiations based on the principle of consensus. Plurilateral agreements could be a step towards an eventual (and ultimately preferable) multilateral solution.

Yet plurilateral negotiations still require compromise and are not always successful, as shown by the failed EGA. Some countries – notably India and South Africa – oppose the plurilateral approach. Moreover, such initiatives may discourage countries from making the multilateral concessions essential to realizing a global circular economy later on. The proliferation of bilateral and plurilateral agreements also leads to a risk of fragmentation in rules and standards, which could present obstacles to building circular economies and sustainable global supply chains.

Important initiatives related to trade, the environment and climate include the launch of negotiations in 2019 for an Agreement on Climate Change, Trade and Sustainability (ACCTS) between Costa Rica, Fiji, Iceland, New Zealand, Norway and Switzerland. In 2021, groups of WTO members announced three joint statements on TESSD, IDP and Fossil Fuel Subsidy Reform. But significant work remains, as these statements merely establish the priority areas for further discussion – including the circular economy.

South–South economic integration

The Global South plays an important and dynamic role in the global economy. South–South trade has increased over the past two decades, reaching approximately 40 per cent of global trade in 2017, compared to about 24 per cent in 2001.[124]

South–South foreign direct investment (FDI) has also become increasingly relevant. Total FDI outflows from developing economies grew from $110 billion in 2005 to $381 billion in 2017, and now accounts for almost 30 per cent of total FDI outflows.[125] The establishment of major South–South economic integration initiatives such as the African Continental Free Trade Agreement (AfCFTA), the Asian Infrastructure Investment Bank, China's Belt and Road Initiative and the South–South Cooperation Fund suggest that the growth in South–South trade will continue in the future.

123 Plurilateral trade agreements are defined as those between more than two and fewer than all WTO members.
124 Prabhakar, A. C., Erokhin, V. and Godara, R. S., 'Economic Integration of African Economies With China and India', in Prabhakar, A. C., Kaur, G. and Erokhin, V. (2019), *Regional Trade and Development Strategies in the Era of Globalization*, pp. 25–48, Hershey, PA: IGI Global, https://doi.org/10.4018/978-1-7998-1730-7.ch002.
125 See Figure 2 and UNCTAD (2018), *Forging a path beyond borders: The Global South*, New York: United Nations, https://unctad.org/system/files/official-document/osg2018d1_en.pdf.

The Global South is also playing an increasing role in global consumption and production patterns. Rapid growth in South–South trade suggests global supply chains are becoming more diverse. Rather than being concentrated in a few major emerging economies such as China and India, early production stages of many industries have relocated to lower-wage economies (though the wage differential is narrowing and becoming less of a driver for relocating production). This could impact the economies of scale required for material-recycling and -reprocessing and increase the fragility of some supply chains. But it also offers opportunities for South–South trade in both secondary goods and materials, as well as circular economy-enabling goods and services – thereby increasing the resilience of participating regions.

South–South regional trade cooperation can help individual countries with high trade-dependency rates to become more circular.

South–South regional trade cooperation can also help individual countries with high trade-dependency rates to become more circular. High trade-dependency rates can create challenges because recycling supply chains often do not reside within the country. In the case of ASEAN, the dependency rates of Brunei Darussalam, Cambodia, Malaysia, Singapore, Thailand and Vietnam exceeded 100 per cent in 2018.[126] A regional circular economy approach among ASEAN countries and in other parts of East Asia through coordinated trade agreements could overcome these challenges. In the case of the South Asian Association for Regional Cooperation (SAARC), India's economic development and regional trade have created spillover effects, contributing to the economic growth in neighbouring countries of Bangladesh, Bhutan, Nepal and Sri Lanka.[127] Advancing the circular economy through SAARC trade agreements or the likes of the Pacific Alliance agreement for sustainable management of plastics could create similar spillover effects for circularity.[128]

Looking to the future

Geopolitical risks and heightened tensions threaten the achievement of sustainable development objectives. In the case of the circular economy, the geopolitical ramifications of Russia's invasion of Ukraine will likely have a negative impact on circular economy trade. Furthermore, it will likely lead to countries prioritizing resource security over collective sustainability objectives when pursuing circular strategies. Trends such as economic nationalism and deglobalization could limit

126 Arthur, L. Hondo, D., Hughes, M and Kohonen, R. (eds) (2022), *Prospects for Transitioning from a Linear to Circular Economy in Developing Asia*, Tokyo: Asian Development Bank Institute, https://www.adb.org/sites/default/files/publication/774936/adbi-transitioning-linear-circular-economy-developing-asia-web.pdf.
127 Kumar, R. (2019), 'India & South Asia: Geopolitics, regional trade and economic growth spillovers', *The Journal of International Trade & Economic Development*, 29(1), pp. 69–88, https://doi.org/10.1080/09638199.2019.1636121.
128 Alianza del Pacífico (2022), 'Pacific Alliance signs agreement for sustainable management of plastics', 8 July 2022, https://alianzapacifico.net/en/alianza-del-pacifico-firma-acuerdo-para-la-gestion-sostenible-de-los-plasticos.

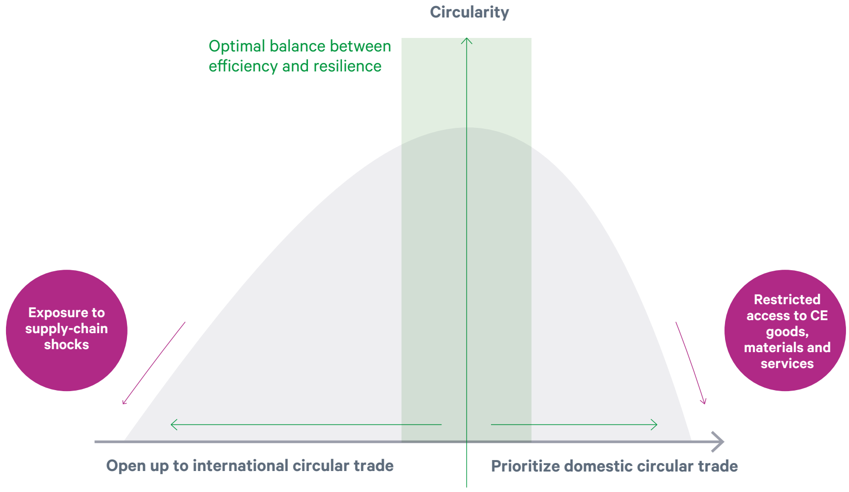
the benefits offered by international trade of goods and services, including those that enable the circular transition.

Given increasingly low levels of trust between countries, it will be difficult to achieve the collaboration necessary to agree, implement and enforce trade rules that incorporate CE at the bilateral, multilateral and regional levels. Plurilateral initiatives among groups of like-minded countries are far from perfect but offer a valuable step towards more global approaches and higher levels of ambition.

4.3 Balancing the benefits and risks of circular trade

Given the current inequity in value-capture of circular trade, combined with growing geopolitical volatility, circular economy and trade policymakers face the difficult task of maximizing the benefits offered by international circular trade flows while mitigating the risks (see Figure 8).

Figure 8. Achieving optimal circularity requires balancing circular trade flows and domestic CE material flows and activities

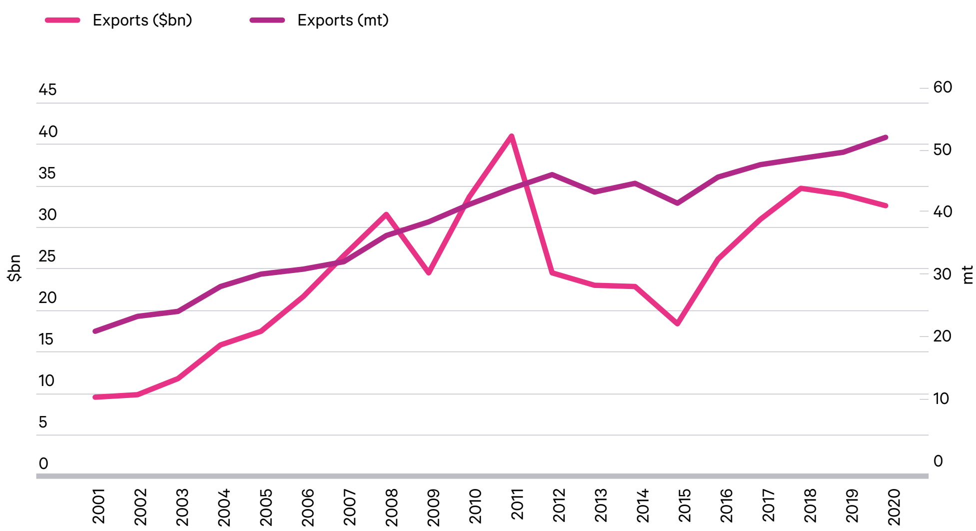


Source: Adapted from Webster, K. and Fromberg, E. H. E. (2020). 'Lessons from aspects of systems thinking for an effective, cross-scale circular economy', audiovisual presentation, International Society for the Circular Economy, https://www.is4ce.org/en/component/allvideoshare/video/lessons-from-aspects-of-systems-thinking-for-an-effective,-cross-scale-circular-economy-ken-webster-and-fromberg?Itemid=145.

Key benefits of opening up to circular trade include the ability for a country to import CE-enabling goods and services that are necessary to achieve a domestic circular economy but are either unavailable or cannot be technically or economically produced and delivered domestically. Circular trade can provide affordable access to used and refurbished goods for reuse and secondary raw materials for domestic production processes (particularly important in low- and middle-income countries). The benefits include the generation of new jobs in the processing, refurbishment, remanufacturing and repair of these used goods and materials. Trade also provides sizeable export opportunities, enabling countries to address trade deficits through the export of circular economy-enabling goods and services, secondary goods and materials, and remanufactured goods. Circular trade also allows countries to take advantage of the economies of scale offered by trade to export non-hazardous waste to geographical regions that can process and recover value from such waste in a more cost-efficient and environmentally sound manner.

Despite the many benefits offered by circular trade, it also presents several risks. For example, over-reliance on overseas circular trade could increase a country's vulnerability to global supply-chain shocks and price volatility. Supply of circular trade flows (for example, in used goods, secondary raw materials and waste or scrap) can be more difficult to predict compared to those for finished goods and new raw materials, as it is uncertain when such items will reach their end-of-life and be disposed of. The market for circular trade flows is also affected by the availability, demand for and relative price of raw materials and finished goods. For example, if the price of oil drops below a certain point, it becomes cheaper to produce new plastic than to use recycled plastic. As such, the significant fluctuations in global oil prices observed over recent decades have led to increased volatility in global recycled plastics markets. Figure 9 presents the cumulative monetary value and weight of circular trade exports between 2001 and 2020. A dramatic fluctuation in prices is particularly evident between 2011 and 2012, when the cumulative value of circular-traded goods dropped by 40 per cent, yet the total tonnage of exports increased by 5 per cent.

Figure 9. Annual value and weight of circular trade exports from the EU27, 2002–20



Access to circular trade flows is also affected by the introduction of CE-oriented policies and legislation among trading partners. An example is China's recent announcement in its 14th Five Year plan that it intends to reuse 320 million tonnes of scrap steel by 2025, thereby expanding its domestic scrap steel market by 40 per cent from 2021.[129] This will likely reduce Chinese exports of scrap metal

129 China Dialogue (2021), 'China lays out roadmap for circular economy', 8 July 2021, https://chinadialogue.net/en/digest/china-lays-out-roadmap-for-circular-economy.

and impact trading partners reliant on such a supply, like Japan, which imported $790 million of scrap metal from China in 2020. It will also increase Chinese import demand for scrap steel, thereby increasing competition with other import-reliant countries. A second example, as discussed above, is the EU's CEAP that aims to increase repair and reuse of used goods, thereby likely reducing exports to secondary markets.

Finally, there is also the risk that, by opening up to circular trade, countries can inadvertently encourage the import of low-quality or polluting second-hand goods. This presents many risks including becoming locked in to inefficient and polluting products (for example, used diesel and petrol cars), undercutting domestic production of similar goods, increasing CO_2 emissions and putting additional pressure on domestic waste management services, as well as increasing maintenance and repair costs.

The challenge of achieving a balance between maximizing the benefits of circular trade and mitigating the risks will be different for each country.

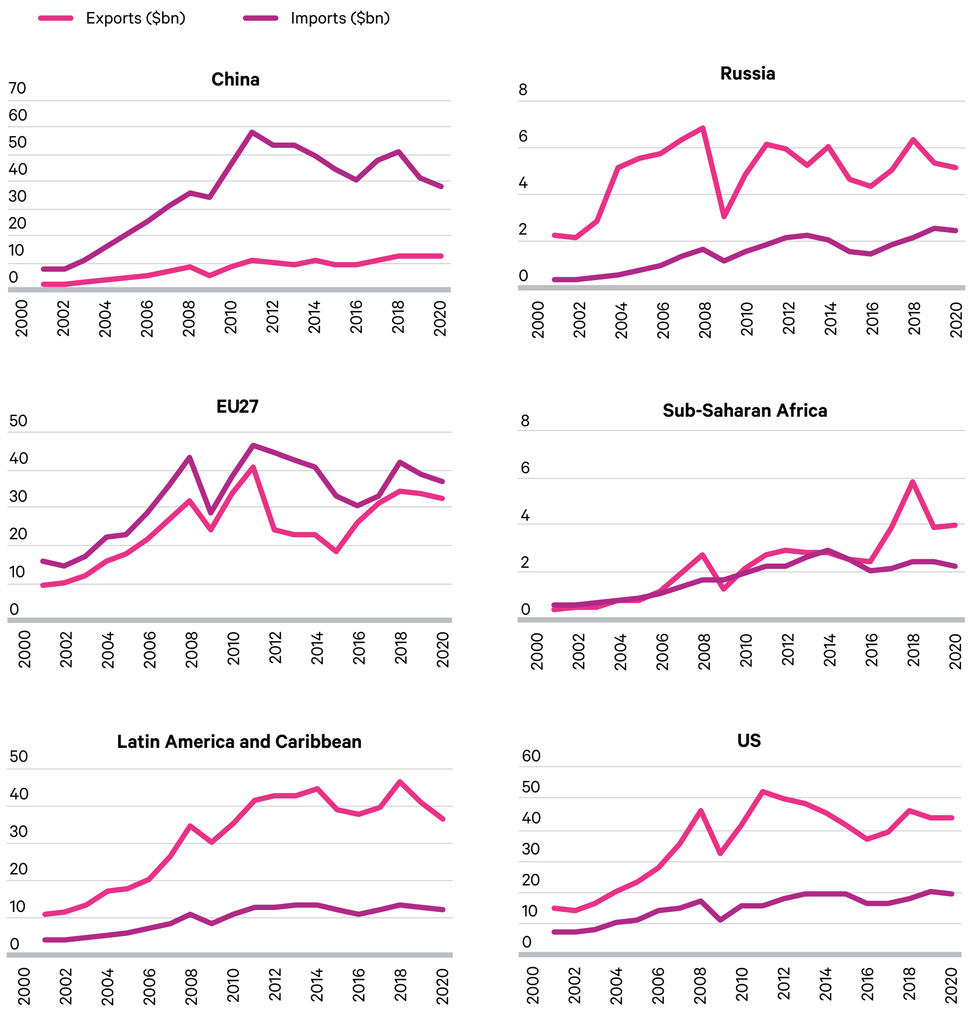
The challenge of achieving a balance between maximizing the benefits of circular trade and mitigating the risks will be different for each country. For a country with vast reserves of natural resources and a strong industrial base, the window of viability may sit more to the right of the curve in Figure 8, while for a country with few natural resources (or where growth in demand outstrips domestic supply) but strong trading relationships, it may sit towards the left of the graph. As the structure of domestic economies evolves, so will the point of optimal balance.

As high-level proxies for how countries are attempting to find such a balance, the remainder of this section builds on previous research[130] and outlines: (i) the differences in exports vs import values of secondary raw materials, used goods, and waste, scrap and residues between China, the EU27, LAC, Russia, sub-Saharan Africa (SSA) and the US between 2001 and 2020 (Figure 10); and (ii) the percentage of GDP derived from trade in secondary raw materials, used goods, waste, scrap and residues (sum of exports and imports) between 2001 and 2020 (Figure 11).[131]

130 ECLAC (2021), *International Trade Outlook for Latin America and the Caribbean.*
131 This analysis was conducted at the HS 6-digit level. At the most disaggregated HS-6-digit level, it is not always possible to distinguish primary and secondary flows, while some commodity codes simply do not differentiate between used, recycled or new products and others include waste, scrap and residues in the same commodity code as primary resource streams. In such instances, we have tended to favour inclusivity to represent all flows that are of potential significance to circular economy developments. Some countries/territories (such as China, the EU and the US) have assigned specific 8 or 10-digit codes to goods which could be classed within the circular trade definition. However, these codes are neither harmonized nor extensive, making comparison difficult. For preliminary analysis of this topic, see Mulder and Albaladejo (eds) (2020), *El comercio internacional y la economía circular en América Latina y el Caribe* [International trade and the circular economy in Latin America and the Caribbean].

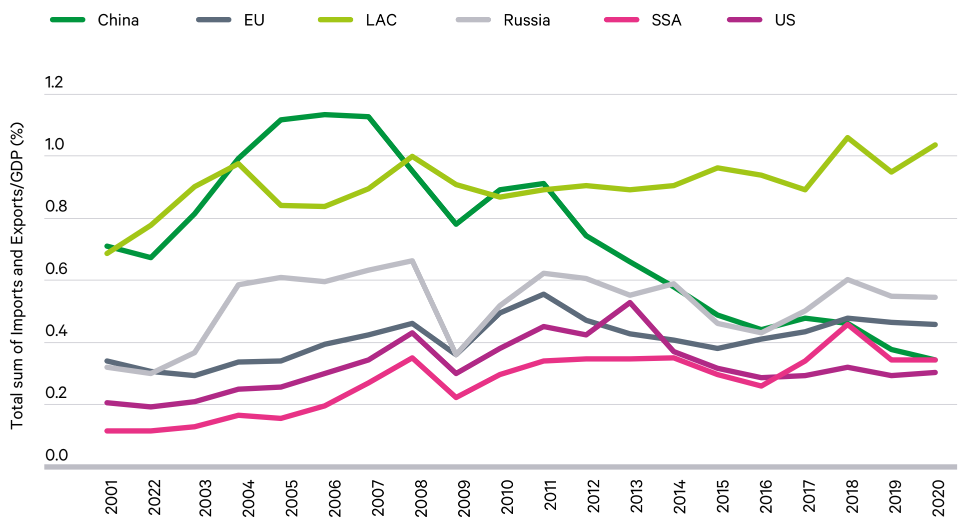
In reference to Figure 10, one trend observed across all six examples is the growth in value of both imports and exports of these goods and materials between 2001 and 2011, and a slowing or reversal of that growth from 2016 to 2020. The value of exports was much higher than imports for some (LAC, Russia and the US), while for others, it was either more balanced (Europe and SSA)[132] or imports were much higher than exports (China).

Figure 10. Comparison of monetary value of exports and imports of secondary raw materials, used goods and waste, scrap and residues, 2001–20 ($ billion)



132 The ratio of imports to exports of individual EU member states will vary significantly. For example, Germany exported $15.4 billion in 2020, while Spain only exported $3.3 billion.

Figure 11. % of GDP derived from extra trade in secondary raw materials, used goods and waste, scrap and residues; sum of imports and exports



When looking at the trends for individual countries and regions, it can be observed that, between 2001 and 2011, China experienced a five-fold growth in imports of these goods and materials primarily to meet the demand generated by sustained rapid economic growth. However, from 2011, China gradually started to reduce its reliance on these imports relative to total GDP, instead increasing dependence on domestically produced second-hand goods and secondary raw materials and scrap. The National Sword policy implemented in 2017 has in part caused this reduction. When comparing the amount that trade in these materials contributed to the individual country or region's GDP (see Figure 10), it is evident that between 2001 and 2005 trade in these materials contributed the most in China. However, as China's growth accelerated and import restrictions on waste and secondary materials increased from 2011, the contribution of these materials to GDP declined to the third lowest among these regions.

The EU27 experienced growth in the export and import of these goods and materials between 2001 and 2011, with growth levelling off in both exports and imports thereafter. The EU27 also has maintained a relative balance between the value of trade in secondary raw materials, used goods and waste, scrap and residues that takes place intra-EU27 ($65.4 billion in 2020) vs extra-EU27 ($69.5 billion in 2020). The EU's CEAP seeks to further enhance the union's resilience to the import of critical materials through increasing circularity within the EU and securing an internal supply of secondary raw materials and absolutely reduce demand for such resources. As such, trade between the EU27 members will likely increase further, while imports from non-EU27 countries may reduce proportionally as CEAP measures are rolled out.

LAC, Russia, SSA and the US sit in an opposite position to China in terms of prioritizing circular trade exports over imports. Despite favouring exports, the US had the lowest ratio of GDP to trade in these goods and materials throughout the period between 2001 and 2020.

The value of exports and imports in both Russia and SSA was much smaller compared to China, the EU27, LAC and the US. Interestingly, in contrast to the EU27, which maintained a relative balance between the level of internal and external trade, the value of external trade in SSA is far higher than that of internal trade among SSA countries. Between 2016 and 2020, countries in SSA traded $49 billion of these goods and materials with non-SSA countries, compared to only $4.1 billion within the region.[133] The imbalance between intra- and extra-SSA trade may change following implementation of the AfCFTA, which came into effect in 2020, and which may provide an enabling framework toward greater regional integration in CE goods trade.

It should also be noted that South Africa dominates both internal and external trade among SSA countries (primarily via the export of scrap metal). South Africa also acts as a hub for the flow of materials in and out of SSA. However, this dominance has reduced: between 2001 and 2005, South Africa accounted for 66 per cent of exports to and 35 per cent of imports from SSA. These figures fell to 43 per cent and 24 per cent, respectively, between 2016 and 2020.

As outlined in Figure 10, LAC and Russia have both significantly increased their exports in these goods and materials relative to imports. LAC's export-led approach (mainly in waste and secondary raw materials derived from agricultural waste) is the opposite to China's import-led approach, leading LAC to have the highest ratio of GDP to trade in these goods and materials (0.9 per cent in 2020). It remains unclear how Russia's export-led approach may evolve as a result of the invasion of Ukraine.

4.4 Every circular trade action has an equal and opposite reaction

The 'border' and 'within border' measures countries will adopt to find a balance between circular trade benefits and risks will have direct impacts on trading partners. This is particularly the case for the introduction of domestic circular economy policy and legislation: Chatham House research has identified more than 520 CE-related policies at the time of writing – the majority (404) of which have been introduced since 2010.[134]

However, these developments have largely failed to consider the potential impacts of such policies on trade partners (particularly on low-income countries).[135] Most rhetoric surrounding these policies claims that they will result in a win–win scenario with respect to environmental gains and improved access in secondary markets to higher-quality secondary products at an affordable price. This may be the case for some categories of goods. However, an increase in product circularity risks the opposite effect, in which high-quality secondary products (that are non-toxic, easy to repair, remanufacture or recycle) are more likely to remain

133 Note: this does not account for informal or unaccounted for circular trade between African countries.
134 Chatham House circulareconomy.earth (2022), 'Trade flows'.
135 Barrie and Schröder (2022), 'Circular Economy and International Trade'.

in circulation within the developed economies as it becomes more economically competitive to repair, recycle and upgrade them domestically.

The repair and reuse of second-hand goods within high-income countries may also be bolstered by the growing 'right to repair' movement. For example, the EU recently introduced rules requiring manufacturers of electrical goods such as fridges and televisions to make their products repairable for at least 10 years after initial production. The US administration is also considering similar legislation. However, the effects of this movement on the rights of citizens in non-EU markets has received little attention. An increase in rates of repair in high-income countries could lead to a gradual decline in the quality of used goods shipped to secondary markets, with that category becoming dominated by low-value goods which have become obsolete (with poor access to spare parts) or from which residual value cannot be easily extracted.

Another factor which may restrict the flow of second-hand goods to secondary markets is the gradual movement towards leasing- and renting-based business models. Leasing and renting shift ownership of goods from individuals to centralized organizations in both public and private sectors. The resulting economies of scale will enable owners to collect goods at their end-of-life and capture their remaining value themselves, rather than shipping the goods abroad to a secondary market.

Increased rates of repair in high-income countries could lead to a decline in the quality of used goods shipped to secondary markets.

Equally, more stringent circularity requirements for products could create additional technical barriers to trade for businesses in developing countries. Increasing standards in this way could have profound consequences for upstream and downstream supply-chain actors, particularly those in developing countries. It will require investments in cleaner production processes, systems for transparency and traceability and circular product design.

With such legislative measures expected in the near future, key questions remain as to the unintended impact they will have on suppliers – particularly MSMEs – in low-income countries. These questions have not been sufficiently addressed.

4.5 Summary

This chapter outlined that, according to the available data, the distribution of value-capture and volume of circular trade flows is highly uneven, with most of the value being captured in the Global North. However, more extensive and granular data collection is required. The chapter highlighted five geopolitical trends that could impact the dynamics of circular trade. The net result of those trends will likely lead to countries pursuing circular strategies aimed at achieving resource security rather than collective sustainability objectives.

In light of the geographical inequities and growing geopolitical uncertainties, the chapter discussed how individual countries may attempt to insulate themselves from this risk while trying to maximize the benefits of circular trade to themselves and their citizens. The resulting actions taken by each country in terms of its domestic circular economy transition and approach to circular trade will inevitably create ripple effects along global value chains, impacting others. Examples include altered trade patterns and the placing of additional compliance or conformity requirements on non-domestic suppliers.

A widening divide will be the logical consequence of failing to embed measures to reduce inequality into the global circular economy transition. The circular economy research community needs therefore to raise awareness of these issues and must consider how its research agenda can contribute to practical and political solutions.

05 Enhancing transparency and traceability

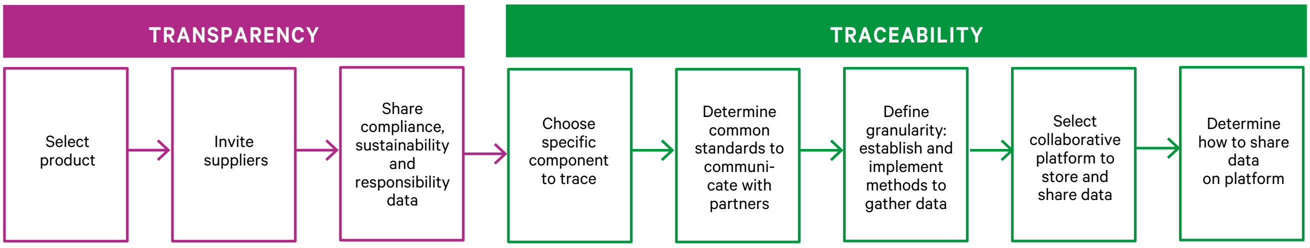
Enhanced transparency and traceability across global supply chains are necessary to overcome obstacles to circular trade. Many innovative solutions are emerging to help achieve this aim.

Supply-chain transparency and traceability is essential for realizing the full potential for circular trade. Transparency enables the capture of high-level information related to a supply chain, such as a product's components, certifications and the names and accreditation of suppliers. High levels of transparency – and therefore trust – across a supply chain means that participating businesses can easily map and interact with the supply-chain network. This allows a wider array of high-level data to be gathered, improving compliance with social and environmental due diligence requirements.

Traceability is associated with the ability to capture much more granular data on each individual product. Examples include the specific chemical composition of a product, where specific materials were sourced from and purchase order information. As such, the way to differentiate between transparency and traceability is that transparency focuses on end-to-end supply chain, while traceability focuses on specific data at the batch or product level.

However, the two are closely related: traceability solutions are more difficult to scale due to their granular data requirements, and therefore rely on a good level of supply-chain transparency to legitimize the gathering of such data (see Figure 12).

Figure 12. The relationship between transparency and traceability



Source: Adapted from Tsai, K. (2018), 'Transparency vs. Traceability: What's the Difference?', Transparency One, 12 April 2018, https://www.transparency-one.com/transparency-vs-traceability-whats-the-difference.

Enhanced supply-chain transparency and traceability support the governance and regulation of circular trade flows and streamline the customs and excise process. A transparent chain of custody informs both border officials and future buyers in secondary markets of a product's provenance, including who manufactured it, its individual components (e.g. levels of toxicity), its usage history, the level of maintenance or repair it has received, and whether it meets the necessary levels of certification.

Despite this critical role in enabling legitimate circular trade, increasing transparency and traceability is extremely challenging, as it requires collaboration, coordination and trust between a wide range of actors along the entire length of the supply chain – and often across multiple jurisdictions. There are also few legal requirements on many actors to be transparent on circularity and, as a result, little data is collected or made available. Moreover, it can be costly to develop and run supply-chain-wide transparency and traceability programmes, and for individual firms to collect and present the necessary data (particularly for MSMEs in developing countries). Finally, lack of trust between supply-chain actors to divulge data – some of which may be regarded as commercially sensitive – also inhibits progress.

5.1 EU policy as a driver for global circular trade transparency and traceability

To accelerate supply-chain transparency and traceability, particularly with respect to circularity, the EU – as part of its European Green Deal and CEAP – is introducing a series of ambitious circular economy policy and legislative initiatives. If enacted, these measures promise to have profound consequences on transparency and traceability in circular trade. The likely impact of two of these legislative developments is discussed below.

The Sustainable Products Initiative

The EU's SPI is considered an evolution of the Ecodesign directive in that it will look beyond energy efficiency requirements to a wider array of requirements on product circularity. As such, it will require all products sold on the EU market to be less toxic,[136] more durable, more reusable and easier to recycle, remanufacture and repair. Conformity with the SPI will require significant improvements in supply-chain transparency and traceability. For example, a key element of the SPI is the requirement for a DPP as a mechanism to ensure that SPI requirements are met.

The DPP will enable the gathering and controlled sharing of data on both a product and its value chain. It will be gradually deployed from 2023 and will focus initially on three value chains – batteries, electronics and one other yet to be determined. Interoperable data collection, sharing and storage protocols will be key to the success of the DPP, as will more standardized digital solutions (such as AI, blockchain and smart sensors) that enable product identification, tracking and data-sharing at each stage of the product's life cycle.

Corporate due diligence and corporate sustainability reporting

In 2021, the European Parliament adopted a resolution calling for mandatory environmental, governance and human rights due diligence standards for all companies operating within the EU single market. This will impose a duty on companies to 'identify, assess, prevent, cease, mitigate, monitor, communicate, account for, address and remediate the potential and/or actual adverse impacts on human rights, the environment and good governance that their own activities and those of their value chains and business relationships may pose'.[137] Improved supply-chain transparency and traceability will become increasingly essential to validating and verifying compliance.

5.2 Frameworks, metrics, standards and tools supporting transparency and traceability

To meet growing legislative demand for coherent and robust circularity metrics and transparent reporting – particularly in the EU – several circularity frameworks, metrics, standards and tools have emerged in recent years. Circular economy standards can be broadly divided into two categories:[138]

(i) those standardizing circular organizational and management approaches, such as implementing product-service systems, procurement, reporting and eco-design (examples include the UK's BS8001, France's Pr XP X30-901, ISO/TC 323 and the ESRS E5 standard); and

(ii) those standardizing product circularity, such as phasing out hazardous material content and toxics, and increasing material quality, recyclability, repairability and performance of second-hand or remanufactured goods, as well

136 Reporting on toxic chemicals will be underpinned by the EU Chemicals Strategy and EU Registration, Evaluation, Authorisation and Restriction of Chemicals regulation (REACH).
137 European Parliament (2021), 'European Parliament resolution of 10 March 2021 with recommendations to the Commission on corporate due diligence and corporate accountability', https://www.europarl.europa.eu/doceo/document/TA-9-2021-0073_EN.html.
138 Yamaguchi (2021), *International trade and circular economy.*

as sustainable production requirements. Examples include those for recycling and waste-handling (e-stewards, R2 Standards, WEEELABEX), and refurbishment and remanufacturing (FIRA/REMAN001: 2019, IEC TC 111, ANSI RIC001.1-2016 and BS 8887–220: 2010), as well as product-specific standards (such as the BSI PAS 141:2011 for used electrical and electronic goods).[139] In addition to standards, more than 520 policies or regulations relating to the circular economy have been passed by national governments (78 per cent of which have been produced since 2010). Many of these, such as waste management or recycling requirements or EPR schemes, have the same outcomes in mind but demand different requirements for businesses operating across multiple jurisdictions.[140] Such a complex patchwork makes it difficult for organizations to comply with, and report against, regulations and standards.

In parallel with the development of circular standards, other standards for supply-chain traceability and transparency have been produced or are under development.

In parallel with the development of circular standards, other standards for supply-chain traceability and transparency have been produced or are under development. Examples include the GS1 Global Traceability Standard (GTS2), PR3's standard for reuseable packaging, UNECE's traceability standards for sustainable garments and footwear, or the circularity.ID Open Data Standard for fashion.[141]

A range of circularity assessment and reporting tools and metrics have recently been or are under development to support companies with compliance and reporting. Leading examples include the World Business Council for Sustainable Development's 'Circular Transition Indicator', the Ellen MacArthur Foundation's 'Circulytics', the Boston Consulting Group's 'CIRCelligence' and Circle Economy's 'Circle Assessment'. Numerous companies have also emerged to help companies embed circular traceability and transparency within both their own operations and the whole value chain.[142] A. P. Møller-Maersk and IBM partnered to launch TradeLens,[143] which enables immutable transparency and traceability of supply-chain data and documents for importers, exporters and other parties involved in global transactions.

The combination of the evolving policy landscape requiring greater levels of supply-chain traceability – alongside the metric, protocols and standards developments outlined above – will play an important role in helping to address

139 Ibid.
140 Chatham House circulareconomy.earth (2022), 'Trade flows.
141 GS1 (2017), *GS1 Global Traceability Standard: GS1's framework for the design of interoperable traceability systems for supply chains*, https://www.gs1.org/sites/default/files/docs/traceability/GS1_Global_Traceability_Standard_i2.pdf; RESOLVE (2021), 'Reusable Packaging System Design Standard', https://www.resolve.ngo/site-pr3standards.htm#:~:text=PR3%2C%20the%20private%2Dpublic%20partnership,easily%20plug%20into%20shared%20infrastructure; UNECE (2022), 'Traceability for Sustainable Garment and Footwear', https://unece.org/trade/traceability-sustainable-garment-and-footwear; Circularity.id (2022), 'Enabling The Transformation To Data-Driven Circularity In Fashion', https://circularity.id.
142 Examples include Circularise (Netherlands), Circulor (UK), Reath (UK), Triangularity (US) and Valopes (Colombia).
143 TradeLens (undated), https://www.tradelens.com.

the key traceability and transparency challenges facing circular trade. However, as these developments are relatively new and reporting standards take time to evolve, awareness of circular metrics and reporting among businesses and regulators remains low. If transparency and traceability are to be realized across whole value chains, they must therefore also be accompanied by an extensive capacity-building programme to provide dedicated support to those who may incur disproportionate burdens and costs to adapt and comply (such as MSMEs in low-income countries), and to ensure the transition is inclusive.

5.3 Blockchain as a tool for transparency and traceability

Increased transparency and traceability must also be underpinned by a new generation of digital and physical tracking technologies that provide robust verification and certification records, as well as real-time identification and tracking of products and components across their entire life cycle.

Blockchain technology offers particular value in terms of enabling transparency and traceability in circular trade. In simple terms, blockchain is a digitally distributed, decentralized and public ledger that exists across a network of computer systems. It offers a way to store and retrieve data and transactions that is difficult or even impossible to change, hack or cheat. It does this by duplicating the ledger across the entire network on the blockchain. Its original purpose was supporting cryptocurrencies such as Bitcoin, but blockchain technology is now being applied to a wide range of different applications from sharing secure medical data, to anti-money laundering and supply-chain transparency and traceability.

Benefits of blockchain technology for enabling circular trade

Blockchain offers numerous benefits when it comes to improving transparency and traceability across value chains and for facilitating circular trade flows.[144] First, it can be set up to enable secure and verifiable transfer of data or information between different value-chain actors in ways which do not infringe on commercially sensitive issues. This is useful in business-to-business (B2B), business-to-customer (B2C) and business-to-government (B2G) scenarios. For example, an OEM can verify that remanufactured parts from a particular supplier do not contain hazardous substances and are certified, without the supplier having to divulge the entire material and chemical composition of the part. The OEM or supplier can also provide such data directly to customs officials when shipping these parts, which can speed up processing times and reduce risk of illegal waste trade. For example, Tradelens was created to facilitate such B2B and B2G information exchange and now has over 20 port and terminal operators

144 Kouhizadeh, M., Zhu, Q. and Sarkis, J. (2019), 'Blockchain and the circular economy: potential tensions and critical reflections from practice', *Production Planning & Control*, 31(11–12), pp. 950–66, https://doi.org/10.1080/09537287.2019.1695925.

around the globe, including in Benin, Côte d'Ivoire, Egypt, Liberia, Mauritania and Nigeria, demonstrating the demand for such blockchain-simplified solutions.

Blockchain also enables traceability right down to the individual worker, and can be used to conduct and verify due diligence on working conditions for informal workers such as waste-pickers. Several companies such as BanQu and Plastic Bank now use blockchain to serve the dual purpose of integrating waste picked by informal workers into the global recycling value chain and ensuring that those workers are rewarded accordingly.

The technology can also be used to streamline shipments from authorized economic operators (AEOs). This could be an effective way to reduce the administrative and compliance costs associated with the international shipment of high-quality secondary goods and materials for reuse or recycling via pre-verified operators. An example is the CADENA initiative between the customs administrations of Chile, Colombia, Mexico and Peru.[145]

Challenges in scaling blockchain for circular trade

Despite offering numerous benefits, blockchain also faces key challenges. First is the growing concern about its impact on climate via its high energy-consumption requirements. In response, developers are working on potential solutions such as using trusted brokers, reducing the need for transitions or moving from a 'proof of work' model of validation to 'proof of stake', which has been demonstrated to reduce energy demand by 99 per cent.[146]

Second is the challenge of dealing with the interoperability issues related to products passing through multiple blockchain protocols and systems in different countries throughout their life cycle. Numerous blockchain initiatives for circular supply chains have been established around the world within and across sectors ranging from cars to textiles.

The proliferation of different blockchain protocols creates numerous supply-chain and resource-security risks and inefficiencies. Each blockchain developed will likely use a different data-sharing protocol setting the rules for how data on that blockchain is used. It therefore creates a significant reporting and administrative burden on companies which are members of several different blockchains. Then, if a company in the supply chain or the blockchain operator itself ceases to operate, it is unclear what happens to that company's data on the blockchain or to the functioning of the blockchain itself. This could lead to supply-chain fragility and major security risks if critical materials are involved. It also remains unclear how data can transfer seamlessly between different blockchains. This is particularly important for the circular economy, where secondary materials may re-enter a market as raw materials within a completely different value chain or sector.

145 Corcuera Santamaria, S. (2018), 'CADENA, a blockchain enabled solution for the implementation of Mutual Recognition Arrangements/Agreements', WCO News, 87, https://mag.wcoomd.org/magazine/wco-news-87/cadena-a-blockchain-enabled-solution-for-the-implementation-of-mutual-recognition-arrangements-agreements.
146 Rushe, D. (2022), 'Climate groups say a change in coding can reduce bitcoin energy consumption by 99%', *Guardian*, 22 March 2022, https://www.theguardian.com/technology/2022/mar/29/bitcoin-reduce-energy-consumption-climate-groups#:~:text=Rival%20cryptocurrency%20ethereum%20is%20shifting,inaccurate%20information%20leads%20to%20penalties.

Finally, there is a risk that some governments may choose to prevent the use of blockchain technology for certain applications, citing data safety and accessibility concerns and lack of regulatory control (as has been observed for cryptocurrency bans imposed by China, Egypt and Iraq, among others).

The third challenge is the associated costs of participation, as running a large blockchain currently is expensive. This is particularly important for activities such as the trade in secondary raw materials, which as a sector operates on thin and fluctuating margins. For this reason, consortiums of public and private sector organizations often work together to pilot waste-trade blockchain solutions. An example is the 'Traca' framework pilot developed by Marine Transport International and the Recycling Association that aims to allow recycling companies in the UK to 'provide essential information to producers, recyclers, regulators, and the end destination'.[147]

Consideration should be given within multilateral forums as to how international consortiums can be financed to develop blockchain-based transparency and traceability protocols and systems across global value chains in a way that does not overburden those that may struggle to absorb the costs (particularly MSMEs and informal waste-picker cooperatives in low- and middle-income countries).

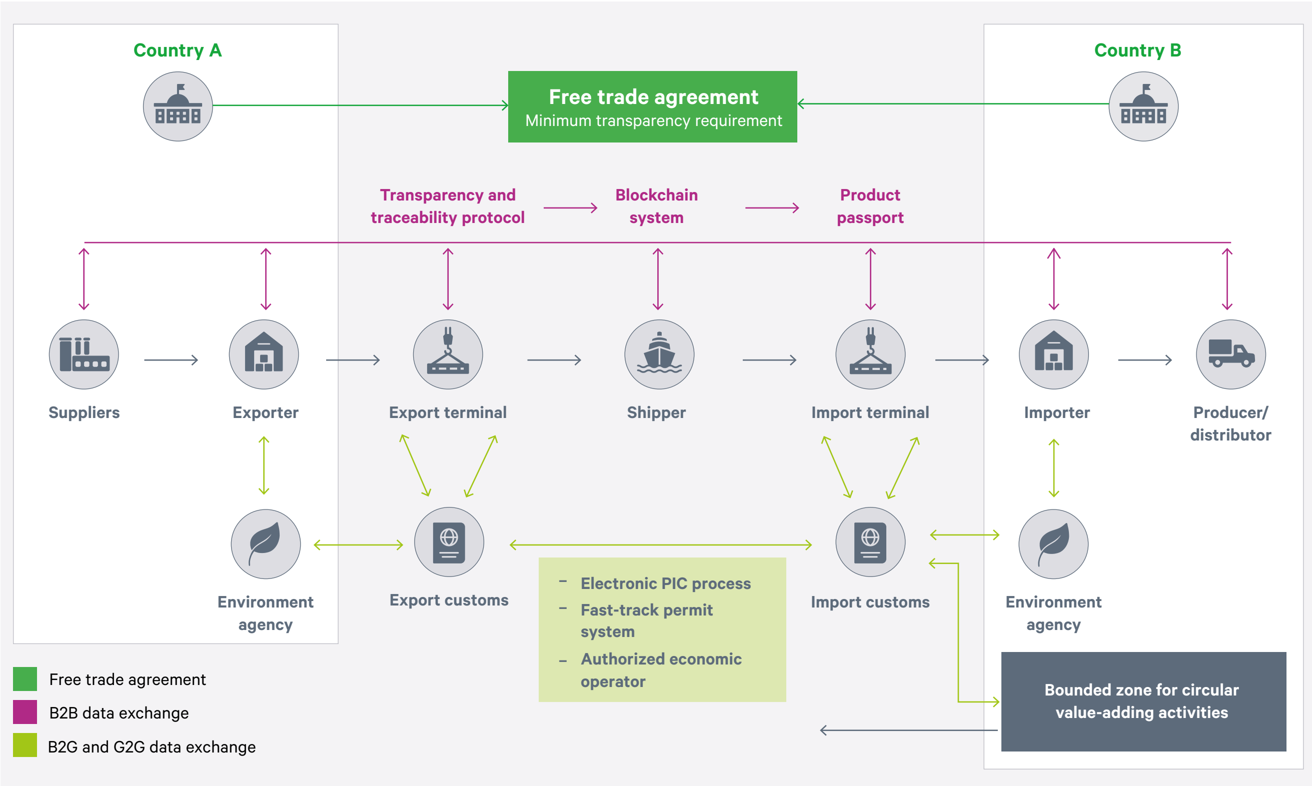
If these challenges are addressed, then blockchain can play an important role in enabling enhanced transparency and traceability in circular trade. Nonetheless, it will likely not be feasible in all cases, and simpler approaches are still viable. Moreover, the challenges associated with improved transparency and traceability cannot be fully resolved via technological solutions. Wider issues related to geopolitical tensions (particularly around data control and transfer, and economic competition) will also need to be overcome.

5.4 Enhancing transparency and traceability for circular trade

The previous sections in this chapter highlighted a range of different political and technical opportunities and challenges associated with increasing transparency and traceability for circular trade flows. Achieving the scale of transparency and traceability necessary requires collaboration and coordination between a wide range of stakeholders across multiple jurisdictions. This section provides an outline of key areas for collective action, including: (i) trade and economic cooperation agreements; (ii) cross-border B2B supply-chain data governance; and (iii) B2G and G2G data exchange (see Figure 13).

147 Circular (2019), 'Blockchain technology to "revolutionise" the trade of recyclables', 6 September 2019, https://www.circularonline.co.uk/news/blockchain-technology-to-revolutionise-the-trade-of-recyclables.

Figure 13. Solutions to improve and streamline circular trade transparency and traceability



Source: Chatham House research.

There is significant potential to embed transparency and traceability requirements into free trade and economic integration agreements. Examples of such requirements could include: a joint commitment for minimum transparency requirements on the circularity of shipped materials and goods; or the implementation of internal traceability protocols and systems to underpin sustainability-oriented certification and conservation schemes.

In terms of B2B traceability, product passports offer significant value. An example is the Global Battery Alliance's 'Battery Passport' initiative that plans to develop a global reporting framework to govern the auditing and reporting of ESG parameters across the battery value chain. Key to the success of product passports is ensuring harmonization between different types of digital systems used across a value chain.

With regards to B2G traceability, particularly for cross-border trade, alternative approaches are also being trialled to fast-track circular trade flows. One example is the North Sea Resources Roundabout (NSRR) – a voluntary joint initiative between France, the Netherlands, the UK and the Flanders region of Belgium, aimed at facilitating trade and transportation of secondary resources.[148] Additionally, the trade association DIGITALEUROPE have proposed the introduction of a 'Circular

148 Dutch Waste Management Association (2018), 'North Sea Resources Roundabout Is Paying Off', 25 May 2018, https://www.wastematters.eu/news/north-sea-resources-roundabout-is-paying-off.

Economy Card' for any intra-EU-shipped waste destined for 'reintroduction to the circular economy'.[149] To receive the card, sufficient evidence would need to be provided that the shipment will end up in a fully certified recovery facility.

Governments could also facilitate the issue of fast-track permits to AEOs with prior authorization. This approach, combined with the use of a single-window trade system,[150] would be particularly effective for the trade in second-hand and waste trade flows, as it would help reduce time and costs associated with conducting inspections. According to the most recent AEO Compendium published in 2020, around 97 individual AEO programmes are already in place.

A third example may be the establishment of a bounded free-trade area (such as for waste for recovery, recycling or remanufacturing activities). There are more than 3,500 free-trade zones globally, but few focus specifically on facilitating circular trade. A bounded area could be used, for instance, if a country wants to prevent circular trade flows from competing with local industry, or if it has limited capacity to regulate and inspect such shipments. Circular trade flows would remain within the geographically bounded area – similar to a free-trade zone. Recovery, recycling and remanufacturing processes could then only be undertaken in that bounded area, making it much easier to regulate and inspect.[151]

In addition to these solutions, there is a need for more extensive programmes for transparency and traceability capacity-building in low-income countries. Such programmes could focus on two areas in particular: (i) improving digital trade infrastructure (e.g. digitizing the PIC procedure); and (ii) upgrading the skills capacity of trade-related institutions (e.g. the ability of law enforcement agencies to prevent, detect and return illegal shipments of waste).

5.5 Summary

This chapter has outlined why enhanced supply-chain transparency and traceability are necessary pre-conditions for inclusive circular trade. Recent regulatory mechanisms show promise in this respect. However, a concerted effort by the multilateral community is required to ensure the full benefits are realized.

149 DIGITALEUROPE (2019), *A Circular Economy Card for the Waste Shipment Regulation*, 2 October 2019, https://www.digitaleurope.org/wp/wp-content/uploads/2020/01/A-Circular-Economy-Card-for-the-Waste-Shipment-Regulation.pdf.
150 A single window is a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export and transit-related regulatory requirements. See UN (undated), 'The Single Window concept', Trade Facilitation Implementation Guide, https://tfig.unece.org/contents/single-window-for-trade.htm.
151 Kojima (2017), 'Remanufacturing and Trade Regulation'.

06
A pathway forward: Conclusion and recommendations for collective action

A concerted global effort is required to ensure that the circular trade regime fosters equity, inclusivity and mutual cooperation.

Realizing a circular economy is essential to averting environmental crises and an opportunity to stimulate inclusive economic development. Circular trade is an important piece in the puzzle in this respect, enabling the efficient redistribution of the materials, goods and services necessary to make circular activities economical.

However, unless deeply entrenched economic, financial, industrial and political inequities between the Global North and Global South are addressed, and while countries continue to focus their circular economy efforts on building national competitiveness and resilience, the further scaling of circular trade flows risks contributing to and reinforcing these inequities. A concerted global effort is therefore required to ensure the circular trade regime evolves in a way that fosters equity, inclusivity and mutual cooperation. In times of increasing geopolitical tension, this endeavour is more important than ever.

This concluding chapter offers five areas that provide a valuable starting point for collective action (see Figure 14). It outlines actions on developing shared definitions and classifications on circularity, as a shared language enables all other actions and is the most likely to be achieved in the short term. The chapter also recommends actions on facilitating circular trade, such as reducing technical barriers to trade and improving trade facilitation measures. It then presents necessary areas for longer-term political collaboration, such as enhancing capacity-building and strengthening trade and economic cooperation agreements.

The following recommendations were co-developed by an alliance of organizations spanning Africa, Europe, Latin America and the Caribbean and Southeast Asia, as part of the wider development of a framework for inclusive circular trade.[152]

Figure 14. Five areas for collective action to realize inclusive circular trade

AREAS FOR COLLECTIVE ACTION				
Definitions and classifications	**Technical barriers to trade**	**Trade facilitation**	**Capacity-building**	**Trade and economic cooperation agreements**
1. Work towards a shared set definitions for circular goods. 2. Ensure circular economy-relevant information is captured when goods or services cross borders, in a way that is globally interoperable.	1. Map circular economy standards with implications for trade, and move towards greater alignment. 2. Seek mutual recognition agreements to align conformity assessments.	1. Digitize the Basel Contention Prior (PIC) procedure for low-income countries. 2. Pilot cross-border traceability and transparency for circular economy trade flows.	1. Embed circular economy in existing multilateral capacity-building programmes. 2. Establish a global 'repairation' fund for circular solutions. 3. Create a dedicated WTO initiative for circular economy awareness-raising.	1. Embed circularity across the full spectrum of agreements. 2. Initiate discussion on impact of 'linear' vs circular subsidies. 3. Set up well-resourced and long-term initiatives to tackle illegal waste trade.

6.1 Develop shared definitions and classifications

Shared or mutually recognized definitions and classifications for circular goods are essential for enabling efficient trade that supports the circular economy transition. Yet there remains an absence, or divergence in the interpretation, of definitions and classifications of goods in terms of their circularity. For example, many countries regard remanufactured goods as equivalent to used goods. Remanufacturing is also hampered by the difficulty of moving broken or end-of-first-use goods across borders. Despite these remanufacturing 'cores' being destined for a new life, they can often be legally classified as waste. As a result, remanufactured goods (and cores) tend to be viewed as inferior to new 'like' equivalents and face higher import tariffs or non-tariff trade restrictions such as import prohibitions, core-export prohibitions and complicated bureaucratic processes (see Section 3.3). Divergence in definitions is compounded by limited incorporation of the various circular trade flows into the Harmonized System (HS) of codes (see Section 3.2).

The following actions are therefore proposed to overcome these challenges:

Work towards shared definitions for circular goods. Willing WTO member states and industry representatives can begin by conducting a stock-taking exercise on best practices, existing definitions and classification of products with respect to circularity, and by identifying potential gaps and opportunities for increasing uptake of shared definitions and classifications. Such an initiative must also specifically seek clarity

152 For the full list of areas for collective action in the framework for inclusive circular trade, see Barrie et al. (2022), *Trade for an inclusive circular economy.*

on the definitions that differentiate true 'waste' from those products that still have life left in them. The aim must be to create a path for agreeing international standards for remanufactured products and cores. Any such definitions should be based on strong conceptual work, with a clear objective of respecting planetary boundaries, rather than trying to define it on the basis of current practices.

Ensure circular economy-relevant information is captured in cross-border trade, in a way that is globally interoperable. A working group including relevant stakeholders such as the WCO and national border and environmental agencies would be able to identify practical solutions on how to better capture and communicate circular-relevant information on goods at national borders in a way that is globally interoperable and compatible with the HS system.

6.2 Reduce technical barriers to trade

Technical standards (which are voluntary) and regulations (which are mandatory), as well as conformity assessment procedures (CAPs) for products and their production or disposal methods, can enable or inhibit circular trade flows. Standards and regulations relating to circularity are growing in use and apply to multiple levels (see Section 5.1 and 5.2). They concern products and materials (e.g., recycled content, durability and information requirements such as digital passports), industrial processes and production (such as cleaner production, sharing and use of by-products and industrial symbiosis), consumer information (i.e. labelling) and recovery routes (such as quality standards for secondary raw materials). Unilateral circular economy-related standards and regulations have increased in number recently, creating a complex patchwork of requirements for companies operating across several markets.

The main challenge regarding the development of national circular economy standards and regulations relates to regulatory divergence and sometimes contradictory requirements across different jurisdictions. This divergence generates additional costs for companies and disincentivizes investment in circular solutions. In light of the challenges raised by standards, regulations and CAPs in terms of technical barriers to trade, the following actions are recommended:

Map circular economy standards with implications for trade and move towards greater alignment. Including a CE-related policy as an environmental category within the WTO notification system would help improve the mapping of circular economy standards and regulations. Alongside this, support is required to build the capacity of countries to report more frequently and accurately on such policy developments. A prioritization and knowledge-sharing exercise between a 'coalition of the willing', hosted by the likes of TESSD, GACERE or regional CE coalitions, would be useful to identify the evolving areas (or lack thereof) of regulations and standards most critical for CE trade and where opportunities for mutual recognition exist. Individual countries must proactively consider the unintended trade barriers that domestic circular policy and legislation may create, and must include those most affected in the policymaking process.

Seek mutual recognition agreements to align conformity assessments. To address the current limitations of CAPs, mutual recognition agreements (MRAs) would allow countries to recognize ahead of time the technical competence of relevant bodies to perform conformity assessment checks. Governments should also attempt to meet their obligation under the technical barriers to trade agreement[153] to provide technical assistance and facilitate knowledge-transfer to other members, particularly developing economies.[154] Support could range from providing help to create regulatory bodies for conformity assessment, to detailing necessary methods for meeting technical regulations and managing conformity assessment with standards.

6.3 Improve trade facilitation measures

Trade facilitation refers to a distinct collection of measures that help simplify the legal and technical procedures enabling products to enter or leave a country. Challenges for circular trade facilitation include the complexities of product classification and cumbersome permitting processes, particularly for products classified as hazardous. Trade facilitation can be important in overcoming current barriers to circular trade, particularly for developing and emerging economies that do not currently have as efficient measures in place (see Section 5.4).
To help achieve this, the following actions are recommended:

Digitize the Basel Convention PIC procedure for low-income countries. The PIC procedure within the Basel Convention requires exporters of certain types of waste (mostly hazardous) to receive prior consent from the national environmental agency in the importing country (see Box 5). Currently, many countries do not use an electronic PIC procedure at all, resulting in delays and lack of transparency on decisions.

Building on existing efforts in this area,[155] develop a dedicated capacity-building initiative for automating and digitizing the PIC procedure. This would enable border and environmental agencies in low-income countries lacking the resources, digital infrastructure and skills-base to participate in an e-PIC system. Such an initiative could initially focus on problematic circular trade flows like plastics and used electronics and e-waste.

Pilot cross-border transparency and traceability for circular economy trade flows. Groups of willing countries must form plurilateral pilot schemes to test technological and procedural solutions for improved transparency and traceability of circular trade flows. The pilots should compare and contrast the unique challenges related to specific trade flows (for example, the differences between e-waste and scrap metals), and also help identify technical challenges

153 The Technical Barriers to Trade (TBT) Agreement 'aims to ensure that technical regulations, standards and conformity assessment procedures are non-discriminatory and do not create unnecessary obstacles to trade'. See WTO (undated), 'Technical barriers to trade', https://www.wto.org/english/tratop_e/tbt_e/tbt_e.htm.
154 Yamaguchi (2021), *International trade and circular economy*.
155 Examples include the Circular Electronics Partnership, PACE, PREVENT Waste Alliance, The Solving the E-waste Problem (StEP) initiative, UN E-Waste and the Global Battery Alliance, as well as the ongoing work by the Working Group of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the World Customs Organization.

to secure, real-time data transfer between the many different stakeholders involved in the process of trade (from producers to logistics companies and retailers) and its regulation (from border and customs agencies to environmental agencies and port authorities; discussed in Section 5.4).

6.4 Expand capacity-building programmes to prevent a circular trade divide

Just as with the growing digital divide between the Global North and Global South, a circular trade divide is already beginning to emerge (see Section 4.1).[156] This divide will likely persist or even become wider due to existing global inequities in development, digital capabilities, finance and infrastructure. Businesses in developing countries (particularly MSMEs) will experience the biggest technical barriers to trade as a result of developed countries enhancing their circular standards and regulations and implementing further environmental measures such as the EU's carbon border adjustment mechanism. Dedicated support and targeted assistance programmes are needed to mitigate the impacts of increasing trade barriers and changing patterns of demand.

Embed circular economy in existing multilateral capacity-building programmes. Circularity must become a core pillar in the pursuit of 'greening' the WTO's Aid for Trade initiative and the agenda of UN Capacity Building Task Force on Trade, Environment and Development. Aid for Trade should focus on key areas for capacity-building, such as infrastructure investment to enable domestic circular activities; trade infrastructure and customs systems; enforcement of laws around illegal waste shipment; circular production skills and training; and policy development.

Establish a global 'repairation' fund. There remains a substantial gap between the access to circular investment funding in the Global North and that available to the Global South. The establishment of a global 'repairation' fund would provide investment and financing for local governments, social entrepreneurs and worker co-ops working on circular solutions such as recycling, remanufacturing and repair.

Create a dedicated WTO initiative for raising awareness of circular trade. As with circular investment, awareness about the potential benefits of participating in circular trade remains low among the international trade community and national policymakers. A dedicated WTO initiative on the circular economy and trade could include collective dialogue, research and information-exchange on the areas outlined in the framework for inclusive circular trade. Such an initiative could also encourage participating countries to set targets and make voluntary commitments on circularity.

156 For further information on the circularity divide, see Barrie, J., Anantharaman, M., Oyinlola, M. and Schröder, P. (2022), 'The circularity divide: What is it? And how do we avoid it?', *Resources, Conservation and Recycling*, 180, https://doi.org/10.1016/j.resconrec.2022.106208.

6.5 Embed circularity and inclusivity within trade and economic cooperation agreements

As outlined in the previous areas for action, international trade cooperation and coherent policy approaches across jurisdictions are important for delivering inclusive circular trade. Trade and economic cooperation agreements (whether bilateral, regional or plurilateral) are important mechanisms for fostering such cooperation (see Section 5.4). The following recommendations are proposed:

Embed circularity across the full spectrum of trade and economic cooperation agreements. There is a significant opportunity to further embed circularity in several specific areas of trade and economic cooperation agreements, such as on technical barriers to trade. These include: encouraging participation in the preparation and use of international CE standards; clarifying mutual areas for investments in the circular economy (such as preserving the right to establish non-discriminatory regulations); and public procurement processes and best practice. A shortlist of goods necessary for conducting activities (as defined by the EU taxonomy for sustainable activities) that contribute substantially to the circular economy, but are currently subject to high tariffs, would be valuable in this respect.

Given the many outstanding questions on this topic, a collective and extensive consultation with a wide range of relevant stakeholder groups is necessary. Such a consultation could be led by a consortium of relevant groups within the WTO such as the TESSD Working Group on Circular Economy or the Friends Advancing Sustainable Trade (FAST) Group.

Another area for consideration is that of 'like' products. The ability to differentiate measures applied to imported similar products based on their circularity (such as their durability, recyclability, repairability or use of recycled materials) would allow countries to accelerate their domestic transition to a circular economy. However, the level of circularity of products is currently irrelevant in determining 'likeness'. Relevant forums such as the TESSD Working Group and various regional circular economy alliances must initiate discussion on current rules pertaining to 'like' products and whether they restrict efforts by individual countries to transition to a circular economy and protect their environment.

Initiate discussions on the impact of 'linear' subsidies. Subsidies supporting 'linear' economic activities will reduce economic incentives for circular trade. A valuable exercise would be to evaluate the scale, nature and environmental impact of 'linear' subsidies for different kinds of circular trade flows and where opportunities exist to replace them with incentives for circularity.

Create and support long-term initiatives to tackle illegal waste trade. To genuinely tackle the trade in illegal waste, a long-term, well-resourced and globally coordinated approach to policing is necessary. Such an approach could build on the work of the Green Customs Initiative and the findings from Project Demeter, and be coordinated by existing organizations such as Europol, INTERPOL, the Secretariat of the Basel Convention, UNEP and the WCO. Individual governments must also commit to reporting illegal waste crime incidents in a timely manner.

Acronyms

ACEA	African Circular Economy Alliance
AEO	authorized economic operators
AfCFTA	African Continental Free Trade Agreement
AI	artificial intelligence
ASEAN	Association of Southeast Asian Nations
B2B	business to business
B2C	business to consumer
B2G	business to government
C2C	customer to customer
CE	circular economy
CEAP	Circular Economy Action Plan
CECLAC	Circular Economy Coalition for Latin American and Caribbean
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
DPP	digital product passport
ECLAC	Economic Commission for Latin America and the Caribbean of the United Nations
EPR	extended producer responsibility
EU	European Union
EV	electric vehicle
FDI	foreign direct investment
G2G	government to government
GACERE	Global Alliance for Resource Efficiency and Circular Economy
GDP	gross domestic product
GNI	gross national income
GT	gross tonnage
ICE	internal combustion engine
ICT	information communication technology
IDP	Informal Dialogue on Plastics Pollution and Environmentally Sustainable Plastics Trade
IEA	International Energy Agency
LAC	Latin America and the Caribbean
MRA	mutual recognition agreement
MSMEs	micro-, small and medium-sized enterprises
OECD	Organisation for Economic Co-operation and Development
PACE	Platform for Accelerating the Circular Economy
PIC	prior informed consent
PPM	process and production methods
PV	photovoltaic
SAARC	South Asian Association for Regional Cooperation
SDG	Sustainable Development Goals
SPI	Sustainable Products Initiative
SSA	sub-Saharan Africa
TESSD	Trade and Environmental Sustainability Structured Discussions
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Programme
WCO	World Customs Organization
WEEE/UEEE	waste/used electrical and electronic equipment
WTO	World Trade Organization

Glossary of terms

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention): The most comprehensive regulation governing the transboundary movements of hazardous and other waste.

Biomaterial trade: The trade in raw and intermediate biological materials and goods (including renewable resources from land and sea used for construction, feed, food and the generation of bioenergy).

By-product: Any additional product, other than the principal or intended product, which results from extracting or manufacturing activities and which has a market value, without regard to whether such additional products were an expected or intended result of extracting or manufacturing activities.

Circular economy activity: Any activity that results in the decoupling of economic activity from the consumption of finite resources. This includes refusing, rethinking, reducing, reusing, repairing, refurbishing, remanufacturing, repurposing, recycling and recovering.

Circular economy-enabling goods and services: Any good or service that contributes to the conduct of circular economy activities.

Circular trade: Any international trade transaction that contributes to circular economy activities at the local, national and global levels.

Free trade agreement: An agreement according to international law by which participating countries agree on certain obligations that seek to reduce barriers to trade in goods and services, such as tariffs.

General Agreement on Trade in Services (GATS): A 1995 treaty of the World Trade Organization (WTO) that aims to create a reliable and predictable system of international rules for trade in services and facilitate the progressive liberalization of services markets.

Harmonized System (HS) codes: The Harmonized System is a standardized numerical method of classifying traded products. Used by customs authorities around the world to identify products when assessing duties and taxes and for gathering statistics.

Low-, middle- and high-income countries: As defined by the World Bank. In 2021, low-income countries' gross national income (GNI) per capita was <$1,046, middle-income countries' GNI $1,046–$12,695 per capita, and high-income countries' GNI >$12,695 per capita.

Product-service systems: Business models that provide for cohesive delivery of products and services. Examples include leasing or sharing of goods.

Recovery: Any operation that results in waste serving a useful purpose, by replacing non-waste materials that would otherwise have fulfilled a particular function. For example, turning food waste into compost to displace synthetic fertilizers. (For the purposes of this paper, recovery does not include energy-from-waste.)

Recycling: The reprocessing of waste into materials, products or substances, though not necessarily for the original purpose.[157]

Refurbishment: Restoring used products to full working condition, including testing and verifying that they are fully functional and thus free of defects.

Remanufacturing: An industrial process whereby used products (referred as 'cores') are restored to useful life. During this process, the core passes through several remanufacturing steps, including inspection, disassembly, part replacement/refurbishment, cleaning, reassembly and testing, to ensure it meets the desired products standards.

Residue: Material or energy that is left over or wasted in industrial processes and other human activities. Many residues can be reused or revalorized to be injected back into the same manufacturing process or used for another purpose. Examples include waste heat and gaseous pollutants from electricity generation or slag from metal-ore refining. Whether the residue can be reused or not depends on whether the country or a trading partner considers it a waste or by-product.

Reuse: The using again of a fully functional product that is not waste for the same purpose for which it was conceived without the necessity of repair or refurbishment, but which may require additional steps such as cleaning or redeployment.

Scrap: Discarded or rejected material from an operation suitable for reprocessing. Items can be classified as scrap if processed by crushing, cutting, mangling, melting, shredding or tearing. Common types of scrap traded include glass, metal, paper and textiles.

Secondary raw materials: Materials that have been manufactured and used at least once, and that are recovered (from the waste stream or from used products) to be used again for further manufacturing.

Technical barriers to trade: Mandatory technical regulations and voluntary standards that define specific characteristics that a product should have, such as its design, functionality, labelling, marking, packaging, performance, size or shape.[158]

Valorization: Extracting residual value from waste products of organic origin. An example is the extraction of nutrients (phosphorous), energy and carbon (anaerobic digestion or composting) from wastewater or the extraction of enzymes for use in chemicals, fuels and plastics from agricultural or brewing by-products (such as spent grains) through biorefining.

Waste: Substances or objects that are disposed of, intended to be disposed of, or required to be disposed of by the provisions of national law.[159] For the purposes of this research paper, waste trade flows are divided into recoverable and non-recoverable. Both scrap and residues are considered to be forms of waste.

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157 Secretariat of the Basel Convention (undated), 'Small Intersessional Working Group: Mandate of the small intersessional working group', http://www.basel.int/Implementation/LegalMatters/LegalClarity/Glossaryofterms/SmallIntersessionalWorkingGroup/tabid/3622/Default.aspx.
158 European Commission Trade Department (2013), *Technical barriers to trade*, Brussels: European Commission, https://trade.ec.europa.eu/doclib/docs/2013/april/tradoc_150987.pdf.
159 Secretariat of the Basel Convention (undated), 'Small Intersessional Working Group'.

Waste recovery: Extracting valuable materials from the waste stream with the aim of displacing new material in the production process. Embedded value in the waste materials is recovered via sorting, material-processing and recycling methods. Examples of waste recovery include using bricks and crushed concrete as a form of aggregates for building foundations and roads or the use of energy, nitrogen, phosphorous and organic matter from wastewater.

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Acknowledgments

This research paper is part of a wider project exploring the intersections between the circular economy, trade, global finance, technological innovation and well-being. The publication draws on insights gained during three virtual workshops, Chatham House organized between July 2021 and February 2022, with subject-matter experts representing 53 organizations. Valuable input was also received during additional conversations with relevant stakeholders.

Chatham House and the authors gratefully acknowledge the financial support of the MAVA Foundation for this project. The views expressed in this paper do not necessarily reflect the positions of the foundation.

The authors are much obliged to three anonymous peer reviewers who offered comments and suggestions, as well as Johan Mulder of ECLAC and David Azoulay, Hélionor de Anzizu and Giulia Carlini from the Centre for International Environmental Law for providing expert legal guidance. Thanks also to Jane Patton for her technical expertise and Florie Chazarin for her comments and feedback. Finally, thanks are due to various colleagues at Chatham House – including, in particular, Melissa MacEwen, Chris Matthews, Johanna Tilkanen, Mike Tsang and Klas Wetterberg – for supporting the publication process, as well as providing feedback and edits.

ISBN 978 1 78413 539 3
DOI 10.55317/9781784135393

Cite this paper: Barrie, J., Schröder, P. and Schneider-Petsinger, M. (2022), *The role of international trade in realizing an inclusive circular economy*, Research Paper, London: Royal Institute of International Affairs, https://doi.org/10.55317/9781784135393.

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