The circular economy and its impact on developing and emerging countries

An explorative study

07.04.2022

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Selected Highlights

- **Reduction in waste flows:** Circular economy policies can help reduce waste flows to developing and emerging economies. In the case of valuable waste, such as metal scrap, this reduces income and raw material supply for developing and emerging countries. A reduction of less valuable, low quality waste streams helps reducing negative environmental and social effects.
- **Keeping resources affordable:** Increasing circularity can help cushion the projected increases in demand and related price increases for raw materials. This keeps raw materials more affordable for developing and emerging countries. Substitution of raw materials may impact countries that rely strongly on the export of the substituted raw material.
- **Right to repair:** The 'right to repair' that is part of the revision of the EU's Ecodesign Directive can help shifting treatment from hazardous recycling to repair in e-waste importing countries.
- **Increased demand for biomass:** The shift to biobased materials will increase demand for biomass from industrialised countries. This provides a trading opportunity in developing and emerging countries, but also the risks of land use changes and biodiversity loss.

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Citation

Langsdorf, Susanne; Duin, Laurens (2022). The circular economy and its impact on developing and emerging countries. An explorative study. Ecologic Institute, Berlin.

This study was carried out for German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE). The responsibility for the content of this publication lies with the authors and does not necessarily reflect the opinion of the German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE).

Credits

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Glossary and abbreviations

CEAP	Circular Economy Action Plan
CRM	Critical Raw Materials
Decoupling (relative, absolute, impact)	In relation to resource use relative decoupling means using less resources per unit of economic output. Absolute decoupling describes a reduction in resource use, while economic output stays the same or grows. Impact decoupling describes a reduction of environmental impact of resources use or economic activities (based on UNEP 2011. Decoupling natural resource use and environmental impacts from economic growth).
DRC	Democratic Republic of the Congo
EV	Electric vehicle
GDP	Gross domestic product
NDCs	Nationally Determined Contributions
Resource vs. raw material	The terms resource and raw material are used differently depending on the context. In environmental policy discourse, "resource" is often interpreted broadly to include all natural resources: biotic and abiotic raw materials, air, water, soil, and land. In some cases, ecosystems and biodiversity or flowing resources such as wind or thermal energy are also included (Langsdorf 2021). Abiotic raw materials include all raw materials that are not biotic, i.e., do not originate from living organisms, unless they have been converted into a fossil raw material. These include ores, salts, and fossil raw materials. The biotic raw materials are therefore, as biomass, all living raw materials, such as wood or other renewable raw materials (UBA 2012, Glossar zum Ressourcenschutz).
RMC	Raw Material Consumption. Key indicator: In the economic area-based material flow calculation, the RMC is calculated from the total mass of primary raw materials extracted domestically and the imported raw materials, semi-finished and finished goods - converted into raw material equivalents - minus the exported raw materials, semi-finished and finished goods - converted into raw material equivalents (UBA 2012, Glossar zum Ressourcenschutz).
UNIDO	United Nations Industrial Development Organization

1. Introduction

The world – already approximately 1°C warmer compared to pre-industrial levels due to human-induced warming[1] – is now consuming more than 100 billion tons of materials per year.[2] The current dominant linear economy, in which raw materials are processed into products and thrown away after use ("take-make-waste model"),[3] requires the extraction and processing of large amounts of raw materials, which results in a rapid deterioration of the environment.[4] Half of global greenhouse gas emissions and more than 90 % of biodiversity loss and water stress are associated with raw material extraction and processing.[5]

Resource extraction and consumption has increased ten-fold since 1900[6] with resource use varying considerably between countries: high-income countries currently consume ten times more per capita than low-income countries.[7] Future projections show material use is still expected to rise: between 2015-2050 global material resource use may more than double. Annual municipal solid waste generation is expected to increase by 70 % by 2050.[8] Altogether, the equivalent of almost three planets would be needed in 2050 to provide the natural resources needed and the capacities to absorb the generated waste.[9]

The circular economy, as an alternative to the linear economy, is often presented as a key solution to solve this resource crisis. There is no consensus on the exact definition of the circular economy, but most describe it as a combination of reduce, reuse, and recycle activities.[10] In 2013, the Ellen MacArthur Foundation defined the circular economy as "*[…] an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.*"[11] This definition emphasises the rethinking of upstream processes and does not mention recycling.[12] The definition coined by the first EU Circular Economy Action Plan (CEAP) from 2015 focuses on retaining value and waste minimisation. The CEAP described the circular economy as an

[1] IPCC. FAQ Chapter 1. Link: https://www.ipcc.ch/sr15/faq/faq-chapter-1/.
[2] Haigh, Laxmi et al. 2021. The Circularity Gap Report 2021, p. 9. Link: https://drive.google.com/file/d/1MP7EhRU-N8n1S3zpzqlshNWxqFR2hznd/edit.
[3] Ellen MacArthur Foundation. What is a circular economy? Link: https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview.
[4] International Resource Panel (IRP) 2019. Global Resources Outlook 2019, p. 8. Link: https://www.resourcepanel.org/reports/global-resources-outlook.
[5] Ibid.
[6] OECD 2015. Material Resources, Productivity and the Environment. OECD Green Growth Studies, p. 9. Link: https://www.oecd-ilibrary.org/docserver/9789264190504-en.pdf?expires=1635169359&id=id&ac-cname=oid042004&checksum=47D534B555FE6F8C8E581AB1A34F0EF0.
[7] IRP 2017. Assessing Global Resource Use. A systems approach to resource efficiency and pollution reduction, p. 8. Link: https://www.resourcepanel.org/reports/assessing-global-resource-use.
[8] Kaza, Silpa et al. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050, p. 17. World Bank Group. Link: https://openknowledge.worldbank.org/handle/10986/30317.
[9] Assuming global population reaches 9.6 billion by 2050. Source: Sustainable Development Goals. Goal 12: Ensure sustainable consumption and production patterns. Link: https://www.un.org/sustainabledevelopment/sustainable-consumption-production/.
[10] Kirchherr, Julian et al. 2017. Conceptualizing the circular economy: An analysis of 114 definitions, p. 221. Link: https://dspace.library.uu.nl/handle/1874/355985.
[11] Ellen MacArthur Foundation 2013. Towards the Circular Economy – Economic and business rationale for an accelerated transition. Link: https://ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an, p. 7.
[12] Ekins, Paul et al. 2019. The Circular Economy: What, Why, How and Where, p. 12. Link: https://www.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf.

economy "*[…] where the value of products, materials and resources is maintained […] for as long as possible, and the generation of waste minimised […].*"[13] Based on an analysis of 114 definitions, Kirchherr et al. (2017) established the circular economy as an "*economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers.*"[14]

Many different perceptions also exist as how to establish the circular economy and with what purpose.[15] Ekins et al. 2019 describe the slow depletion of scarce natural resources, reducing environmental damage from extraction and processing virgin material, and reducing pollution from the processing, use and end-of-life materials as key advantages of the circular economy.[16] For example, by recycling one kg of steel scrap, 73 % CO_2-eq., 64 % primary energy and 90 % iron ore can be saved compared to conventional production.[17] In the 2020 Circular Economy Action Plan, the European Commission also highlights the economic significance of increased circularity, including through GDP growth and job creation, as well as opportunities for individual businesses with reduced expenditures on materials and protection from resource-price fluctuations.

Nevertheless, linearity remains widespread: The Circularity Gap Report highlighted that the world was 8.6 % circular in 2020,[18] compared to 9.1 % two years earlier, i.e., the world is becoming less circular. The rate of circularity would need to double to ensure a path towards a well below 2-degree world by 2032. Indeed, climate politics are likely to be a key driver for increased circularity in the coming years as ambitious targets in National Determined Contributions (NDCs)[19] will require the integration of circular-economy measures to be reachable.[20]

The goal of this report is to shed some light on current trends and associated risks and opportunities, as opposed to offering an exhaustive overview. It presents several selected (inter)national and regional initiatives for the circular economy, highlights their relevance for developing and emerging countries and explores some of the key effects that come with

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[13] European Commission 2015. Closing the loop - An EU action plan for the Circular Economy. Link: , p. 2.
[14] Kirchherr, Julian et al. 2017. Conceptualizing the circular economy: An analysis of 114 definitions, p. 229.
[15] Ekins, Paul et al. 2019. The Circular Economy: What, Why, How and Where, p. 17.
[16] Ibid., p. 18.
[17] Broadbent, Clare 2016. Steel's recyclability: demonstrating the benefits of recycling steel to achieve a circular economy, p. 1. Link: https://www.researchgate.net/publication/299356218_Steel%27s_recyclability_demonstrating_the_benefits_of_recycling_steel_to_achieve_a_circular_economy.
[18] Calculation methodology can be found here: https://assets.website-files.com/5e185aa4d27bcf348400ed82/5e4d0a24eb0887b1ddfa59b9_Measuring%20and%20Mapping%20Circularity%20-%20technical%20methodology%20document.pdf.
[19] The 2015 Paris Agreement requests countries to formulate post-2020 climate actions. These Nationally Determined Contributions (NDCs) constitute the efforts of each country to reduce national emissions and adapt to the impacts of climate change. More information can be found here: https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs.
[20] Diaz-Bohne, Harald et al. 2021. Circular Economy as a Cornerstone for Meeting the Goals of the Paris Agreement A roadmap towards CE-smart NDCs Programme: Concepts for Sustainable Solid Waste Management and Circular Economy, p. 11. Link: https://www.researchgate.net/publication/356087223_Circular_Economy_as_a_Cornerstone_for_Meeting_the_Goals_of_the_Paris_Agreement_A_roadmap_towards_CE-smart_NDCs_Programme_Concepts_for_Sustainable_Solid_Waste_Management_and_Circular_Economy.

increased circularity. The report also provides a brief analysis of selected specific measures from the EU's Circular Economy Action Plan of 2020, with a special focus on their potential impact on developing and emerging countries.

2. Presentation of selected national and regional initiatives for the circular economy

Various national governments, the EU, regions, and cities are making systematic policy attempts to move towards a circular economy, as an alternative to the linear economy.[21] In the following section, we will present the EU's 2020 Circular Economy Action Plan and the Circular Economy in the current Chinese Five-Year-Plan, as China and the EU have been the two most important players in terms of ambition and economic weight in recent years. Subsequently, we present the Circular Economy Programme of the Netherlands, which aims to be fully circular by 2050. Finally, we present the latest Environment Communiqués of the G7 and G20.

The Circular Economy Action Plan (2020)

Introduction: The Circular Economy Action Plan (CEAP) is the key document of the current European resource policy. It shall contribute to the goals of the European Green Deal to reach climate neutrality by 2050 and to decouple resource use and economic growth.

Key content: The 2020 CEAP reflects the importance of product policy and the design phase for increasing circularity, estimating that up to 80 % of a product's environmental impact is determined by the design. The key initiative foreseen is a revision of the Ecodesign Directive[22] beyond energy-efficiency to also include criteria for circularity, such as durability, repairability and recyclability. The so-called "sustainable products initiative" was put forward with a "Communication on making sustainable products the norm" end of March 2022 and a proposal for a regulation establishing a framework for setting ecodesign requirements for sustainable products and repealing the Ecodesign-Directive (2009/125/EC). [23]

Similar to earlier European resource strategies the CEAP identifies several key product value chains: Electronics and ICT; batteries and vehicles; packaging; textiles; construction and buildings; food, water and nutrients; and textiles, with textiles being the latest addition to the relevant products family.

A cross-cutting focus of the CEAP 2020 is waste policy. Waste is generally one of the most intensively regulated policy areas on EU level, but the CEAP 2020 recognises that stagnating levels of waste generation across the EU call for further action. At the time of writing (November

[21] Ekins, Paul et al. 2019. The Circular Economy: What, Why, How and Where, p. 18.

[22] The Ecodesign Directive covers energy-related products, with the main aim to increase energy efficiency Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy – related products (recast), Article 1.2.

[23] European Commission 2022. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. On making sustainable products the norm. COM(2022)140 final; European Commission 2022a. Proposal for a regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM(2022) 142 final.

2021) the European Commission is gathering information on further waste reduction targets and priority waste streams, first study results are expected end of 2021.

Ambition and targets: While the CEAP describes an ambitious "*transition to a regenerative growth model that gives back to the planet more than it takes*",[24] it does not contain quantitative goals, with the exception to "*reduce its consumption footprint and double its circular material use rate (today ~ 11 %) in the coming decade*".[25] This means that in 2030 over 75 % of raw materials would still be mined conventionally.[26]

Relevance for developing and emerging economies: The CEAP is a non-binding strategic document. Regarding possible effects on developing and emerging economies the focus here is on 1) elements of the CEAP that will most likely result in legislation (and possibly lead to effects beyond the EU) and 2) to any specific mention of developing and emerging countries in the CEAP.

1) Selected planned measures and possible effects on developing and emerging economies include the "Sustainable Product Initiative". In this context emerging economies may lose out on trading opportunities vis à vis countries that have higher ecological standards already (see chapter 4). The "right to repair", on the other hand, could benefit countries that import European e-waste (see chapter 4). And waste reduction targets for specific waste streams could affect waste importing countries in various ways (see chapter 3).

2) Regarding "emerging economies", the CEAP expects that advancing the circular economy could create business and employment opportunities. This claim is not concretised in the CEAP. A reference is made to the Commission staff working document "Leading the way to a global circular economy: state of play and outlook" in which "emerging countries" are not specifically mentioned, but several business opportunities and circular economy projects are mentioned.[27] "Developing countries" are not specifically mentioned in the CEAP either. However, in a related working document opportunities for developing countries such as financial savings and leapfrogging to sustainable technologies are mentioned.[28]

Based on the CEAP the EU initiated the Global Alliance on Circular Economy and Resource Efficiency (GACERE) to advance knowledge and partnerships for a global circular economy. Furthermore, the CEAP proposes "*stronger partnerships with Africa to maximise the benefits of the green transition and the circular economy"*, e.g., via the African Circular Economy Alliance. Furthermore, the European Commission wants to mainstream circular economy objectives in "*free trade agreements, in other bilateral, regional and multilateral processes and agreements, and in EU external policy funding instruments*".[29]

Observations: The CEAP 2020 is possibly the most ambitious circular economy strategy in the world considering the size of the economy and the depth of the transition envisioned. It describes a comprehensive transformation of the European economy to circularity. With regards to the targeted population and economic area it is minor only to the Chinese circular economy strategy. However, while the narrative of the CEAP is highly ambitious, the

[24] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe, p. 4. Link: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdfp.4.
[25] Ibid.
[26] NABU. Weniger Abfälle, mehr Recycling, Schutz der Ressourcen. Link: https://www.nabu.de/umwelt-und-ressourcen/abfall-und-recycling/kreislaufwirtschaft/27943.html.
[27] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe, p. 22.
[28] European Commission 2020b. Commission Staff Working Document. Leading the way to a global circular economy: state of play and outlook, SWD(2020) 100 final, p. 19.
[29] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe, p. 27.

prospective quantitative goals are not. The contribution of the strategy to transforming the economy stands or falls with the establishment of binding rules for the circular economy in the next years.

Circular economy in China's 14th Five-Year Plan

Introduction: China's 14th Five-Year Plan was adopted in March 2021 and lays out the Communist Party's plan for China's development until 2025. The references to the circular economy are short and provide limited detail.

Key content:

Circular economy and related topics, such as sustainability, infrastructure, and urbanisation, are less pronounced in the 14th Five-Year Plan than in the last two Five-Year Plans. At the same time, economic growth objectives have lost significance compared to the last decades. Instead, the plan focuses on strengthening the domestic economy and reducing foreign dependencies, be it on technologies or imported resources.[30] This more inward looking and consolidating approach seems to demand a shift to a more circular economy. The respective chapter "Article XXXIX Accelerate the green transformation of the development model. Section 2 "Build a resource recycling system"" claims "*we will fully implement the concept of the circular economy and build a multi-level efficient resource recycling system*". Measures regarding the circular economy in the respective half page chapter include the circular transformation of [industrial] parks, the promotion of cascade utilisation of energy resources, strengthening the utilisation of bulk solid waste, the standardisations in the manufacturing industry, planning and constructing recycling facilities, and the expansion of extended producer responsibility systems. The most concrete measure is the planned promotion of reducing, standardising and recycling express delivery packaging.[31]

Ambition and targets:

The 14th Five-Year plan contains no quantitative and concrete goals, despite the overarching goal to fully implement the circular economy.

Relevance for developing and emerging economies: The 14th Five-Year Plan does not mention developing or emerging countries in the context of its plans to implement the circular economy. However, as the country with the biggest raw material consumption (RMC) worldwide and a high raw material consumption per capita of ~ 21 t raw material equivalent (Germany 15,7 t), China naturally impacts other countries.[32] When China introduced their waste import ban in 2018, waste streams shifted to other countries, including Malaysia, Vietnam, and India. A key goal of the current 14th Five-Year Plan is to reduce dependencies on foreign resources. This implies improving the circular economy, building on the more ambitious policies of the last decade.

Observations: China was the first country that adopted national legislation which described decoupling as a strategic goal (Circular Economy Promotion Law, 2009).[33] Resource

[30] MERICS 2021. China's 14th Five-Year Plan – strengthening the domestic base to become a superpower. Link: https://merics.org/en/short-analysis/chinas-14th-five-year-plan-strengthening-domestic-base-become-superpower.
[31] Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035. Translation provided by the Center for Security and emerging technology. 2021, p. 101.
[32] Dittrich, Monika et al. 2020. Monitoring internationale Ressourcenpolitik, UBA Texte | 51/2020, p. 50.
[33] Dittrich, Monika et al. 2020. Monitoring internationale Ressourcenpolitik, p. 50.

productivity (or relative decoupling) has increased in the last decades, but a large and growing[34] population, higher material prosperity and a massive infrastructure build up have made China the world's biggest consumer of raw materials. The circular economy has received attention in all recent five-year plans and has been a relatively prominent environmental policy field, especially since 2009. In the latest Five-Year plan, the circular economy has lost in prominence.

The Circular Economy Programme of the Netherlands from 2016

Introduction: The Dutch Circular Economy Programme ("Rijksbreed programma Circulaire Economie") from 2016 is a key document laying down the Dutch ambition to achieve a circular economy by 2050. It contains the government's vision for a circular economy and provides direction for follow-up steps up to 2050.[35]

Key content: The Circular Economy Programme highlights the importance of a circular-economy transition and the associated opportunities for the Netherlands, describes how to realise the ambition and vision of the Dutch government, introduces the overarching measures the Dutch government plans to take and describes the ambitions, targets and efforts of the selected priority sectors and value chains.[36] The Dutch government stresses there is a need to strive for a circular economy due to the confluence of three developments: the 'explosive' demand for resources, the resource dependency of both the Netherlands and Europe on third countries, and the connection to climate protection.[37]

Ambition and targets: With the Circular Economy Programme, the Dutch government has set the goal to establish a fully circular economy by 2050. By 2030, the Netherlands should use 50 % less primary raw materials (minerals, metals and fossils).[38] In addition, the Dutch government formulated three strategic goals: (1) raw materials in existing value chains are put to high-value use[39]; (2) where raw materials are needed, fossil, critical and non-sustainably produced raw materials are replaced by sustainably produced, renewable and generally available raw materials; (3) developing new production methods, designing new products and rearranging areas. Promoting new ways of consuming.

Relevance for developing and emerging economies: The Circular Economy Programme states that the circular economy transition will help the Netherlands to realise the Sustainable Development Goals.[40] Moreover, there is a dedicated section (4.5) that addresses international cooperation and explains that for the Dutch circular economy to materialise, the transition also needs to take place at the European and global level. The Programme mentions that the Netherlands, within the UN framework and international public-private partnerships, is pushing for an "*ambitious agenda for an international circular economy without having negative effects on low-income countries*" and places three goals central regarding international cooperation: creating international prerequisites (both legal and economic) for a circular economy,

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[34] 2021 is reported to be the first year of population decline in five decades. See: Financial Times 2021. China set to report first population decline in five decades. Link: https://www.ft.com/content/008ea78a-8bc1-4954-b283-700608d3dc6c.

[35] For more information on the Dutch Circular Economy Programme, see Langsdorf & Duin 2021 (available in German only). Link: https://www.ecologic.eu/18148.

[36] Rijksoverheid 2016. Nederland circulair in 2050 – Rijksbreed programma Circulaire Economie, p. 9. Link: .

[37] Ibid., pp. 11-12.

[38] Ibid., p. 7.

[39] Note: „High-value use" is the wording used by the Dutch government. The Circular Economy Programme does not further define its general meaning, but for each priority sector and value chain (five in total) it provides more detail on how this translates into practice. For example, for the priority biomass and food, it mentions "cascading" and "multiple valorization" in the context of a more efficient use of biomass.

[40] Rijksoverheid 2016. Nederland circulair in 2050 – Rijksbreed programma Circulaire Economie, p. 9.

establishing an international market for Dutch frontrunners, and contributing to an international circular economy without shifting the burden.

The Circular Economy Programme explains that the latter aspect includes sharing knowledge and expertise, especially with countries and local communities that are not able to cope on their own with the social and environmental consequences of the linear economic system and where the circular economy contributes to strengthening the local sustainable economy and security of supply of critical materials. The Dutch government also indicates that impact analysis shall be used to identify in an early stage the effects of circular policy options on global sustainable development and low-income countries, and that they will pay attention to the export of recyclable waste and the risk of shifting this burden to low-income countries. The Dutch government explains that they are committed to cooperation with countries that export raw materials and countries with large waste flows around rapidly developing cities, based on the "mutual gains approach". As an example, they mention their relationship with Morocco, which has a strong position as a phosphorus exporter but is also vulnerable in water management due to climate change.

The Circular Economy Programme also highlights a study of the Centre of Expertise on Resources,[41] which demonstrates that the negative impacts of an EU circular-economy transition for most resource exporting, developing countries will be limited; the EU's share of exports is generally relatively small, contributing less than 5 % to the GDP of these countries. However, the Programme indicates this will change if other resource importing countries will also make the transition and to avoid negative effects, resource exporting countries that are more dependent on the extraction and export of primary resources require "special attention".

Observations: Since sustainably sourced biomass is a limited resource,[42] the strong focus on the substitution of abiotic resources of the Dutch approach could lead to increased biomass imports. In turn, this could result in e.g., competition with food production or biodiversity losses in exporting countries,[43] especially if other (larger) countries decide to follow this approach. Accordingly, the Dutch circular-economy transition cannot be viewed in isolation from its potential impact on developing and emerging countries. The CE Programme acknowledged this explicitly and states a clear ambition to avoid shifting the burden of the circular-economy transition upon developing and emerging countries, highlighting the importance of European and international cooperation. It also already introduces some of the tools/frameworks the Netherlands is using/will use to this end (public-private partnerships, SDGs, etc.).

[41] de Jong, Sijbren et al. 2016. The Circular Economy and Developing Countries. A Data Analysis of the Impact of a Circular Economy on Resource-Dependent Developing Nations. Link: https://hcss.nl/wp-content/uploads/2016/07/CEO_The-Circular-Economy.pdf.

[42] Hanemaaijer, Aldert et al. 2021. Integrale Circulaire Economie Rapportage 2021, p. 207. Link: https://www.pbl.nl/sites/default/files/downloads/pbl-2021-integrale-circulaire-economie-rapportage-2021-4124.pdf.

[43] CE Delft. How sustainable is biomass import? Link: https://cedelft.eu/publications/how-sustainable-is-biomass-import/.

Communiqués from the G7 and G20

The G7 Climate and Environment Ministers Communiqué from 2021

Introduction: On 21 May 2021, the G7 Climate and Environment Ministers published a Communiqué following a virtual exchange on 20-21 May 2021.[44]

Key content: The Ministers express their dedication to solving the climate change and biodiversity crises, by putting climate, biodiversity and the environment at the heart of their COVID-19 recovery strategies and investments. Improved resource efficiency by promoting a circular-economic approach should contribute to this end.

Ambition and targets: The Communiqué lists many joint commitments for a wide array of themes, which in some cases are accompanied by concrete targets. The circular economy does not have a separate section in the Communiqué, but is part of a short section on resource efficiency: "*We reaffirm our commitment to progress actions to increase resource efficiency and transition to a more circular economy, in line with the Bologna Roadmap,*[45] *to reduce the pressure and adverse impacts on our natural environment, reduce resource use, maximise the value of materials through a life-cycle approach, curb biodiversity loss, and support climate mitigation and adaptation action and in doing so are determined to reduce pollution from all sources*."

Relevance for developing and emerging economies: On a more general level, the Ministers state that global challenges require urgent and ambitious global action at all levels and reaffirm their commitment to international cooperation and multilateralism. Regarding achieving a "global green recovery" from COVID-19, the Ministers acknowledge that developing countries are heavily impacted and that increasing debt burdens potentially limit their ability to provide stimulus for a green recovery, besides other development objectives. Moreover, they also ensure to "leave no-one behind" in the transition to net zero emissions and nature positive economy.

Observations: The Communiqué implies that a circular economy is mainly a tool to increase resource efficiency and does not explicitly discuss moving away from linear economies (lack of a paradigm shift).

The G20 Environment Communiqué from 2021

Introduction: On 22nd of July 2021, the G20 Environment Ministers published a Communiqué following an in-person and remote meeting in Naples.[46]

Key content: Commitment to continue and increase efforts to address the interconnected challenges of climate change, biodiversity loss, and pollution as well as habitat loss degradation and fragmentation, invasive alien species, land degradation and desertification, decline in ocean and seas health, and the unsustainable use of freshwater and other natural resources.

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[44] G7 UK 2021. G7 Climate and Environment Minister's Communiqué. Link: https://www.g7uk.org/g7-climate-and-environment-ministers-communique/.

[45] The G7 Ministers adopted the 5-year Bologna Roadmap in June 2017, which describes next steps on how to "advance resource efficiency" More information and the Final Declaration can be found here: http://www.g7italy.it/en/environment-ministerial-meeting/.

[46] G20 Italia 2021. G20 Environment Communiqué – Final. Link: https://www.g20.org/wp-content/uploads/2021/07/2021_07_22_ITG20_ENV_Final.pdf.

Ambition and targets: Regarding circular economy, the Ministers strive to build forward better in alignment with the 2030 Agenda in a way that "*[…] increases resource efficiency through circular approaches according to national priorities and circumstances*". However, the Communiqué does not contain concrete targets in this regard. Instead, it mainly lists encouragements, such as on the implementation of circular economy practices and approaches by promoting dialogue, cooperation, partnerships and joint learning.

Relevance for developing and emerging economies: The Communiqué concludes with a general commitment to a just and equitable transition ("leaving no one behind") as well as to providing financial, technological and capacity-building support to developing countries, especially the least developed countries.

Observations: The Communiqué explicitly states that circular approaches can be used to increase resource efficiency. It highlights several times throughout the section on sustainable and circular resource use that the listed encouragements should be in line with national priorities and policies, which reflects the varying levels of ambition of the G20 countries. The Communiqué highlights the 2030 Agenda for Sustainable Development.

Short summary: The analysis of these five key circular economy initiatives has shown that the effects on developing and emerging countries are rarely considered, with the exception of the Dutch Circular Economy Programme. In the rest of this paper, we will shed light on some of the possible interactions. As the effects on developing and emerging countries are complex and as diverse as the countries themselves, we will illustrate the interconnections using concrete examples.

3. Key effects of the circular economy in industrialised countries on developing and emerging countries

Effects on trade in primary raw materials

Mining in Europe only accounts for a minor share of Europe's demand for metal, which is mainly met by imports instead. Resource-rich countries and European companies are often interlinked through material flows along complex and international value chains, encompassing flows of raw materials (ores and concentrates), refined metals, processed metal compounds and alloys, and intermediate and end products.[47] Recovering critical and other raw materials from extractive waste and landfills is not widely practiced in the EU.[48] Accordingly, increased global circularity could reduce the exposure of resource-importing countries to supply risks, while also reducing the environmental pressures associated with mining of virgin raw materials. Increasingly circular economies could lead to a (relative) reduction in demand on foreign raw materials in the long term, leading to lower raw material prices compared to a linear economy. On the one hand this could benefit emerging countries' access to raw materials for their

[47] Schüler, Doris et al. 2017. EU raw material import flows – acknowledging non-EU environmental and social footprints, p. 1. Link: https://www.stradeproject.eu/fileadmin/user_upload/pdf/STRADEPolBrf_02-2017_RawMaterialFlows_Mar2017_FINAL.pdf.

[48] Blengini, G.A. et al. 2019. Recovery of critical and other raw materials from mining waste and landfills, p. 5. Link: https://publications.jrc.ec.europa.eu/repository/handle/JRC116131.

development, which would otherwise often be outcompeted in a world of rising materials demand and commodity prices.

On the other hand, the export of raw materials provides a significant source of income and wealth for some countries.[49] These countries, which include many developing and emerging countries, could potentially be negatively impacted by increased circularity in industrialised countries, considering that the growth of their economies strongly relies on global demand for virgin raw materials. For example, the Republic of Congo relies for 34.9 % of its public revenue on the exports of raw materials.[50] Moreover, for at least six African countries, such exports account for more than 15 % of their GDP.[51]

Some factors amplify the risks associated with the circular transition for developing and emerging countries heavily relying on raw material exports. They include security (e.g., number of conflicts), political (e.g., control of corruption), sociodemographic (e.g., female labour force participation) and economic (e.g., GDP growth) factors.[52] In this context, the resource curse is a relevant phenomenon. It refers to the inability of many countries that are rich in natural resources to maximise the benefits of their wealth, as well as to cover public welfare needs. Instead, such countries tend to have higher rates of conflict and authoritarianism, and lower rates of economic stability and economic growth, compared to countries that do not possess as much natural resource wealth.[53] Moreover, compared to more advanced economies, the exports of developing and emerging countries are also increasingly limited to a small number of products.[54]

The United Nations Industrial Development Organization (UNIDO) has expressed their concern that the circular economy is at risk of not considering inclusiveness – the crucial third pillar of sustainability – and could restrict the access of developing and emerging countries to global supply chains. UNIDO points out two factors that play a role here:

- Wealthy countries will be able to reduce their dependency on imported raw materials and other products.
- Developing and emerging countries may have trouble gaining access to the knowledge and technologies enabling the circular economy. They will, to a lesser degree, be able to export their products to markets with increasingly stricter circular-economy requirements (including services such as reclamation and remanufacturing).[55]

However, the aforementioned study by the Centre of Expertise on Resources concludes that establishing a circular economy in the EU – considering both critical raw materials and non-critical raw materials exports to Europe – would not significantly affect raw material exporting developing countries due to their relatively low share of exports to the EU.[56] For 24 developing countries the contribution of raw material exports to the EU accounts for more than 1 % of their GDP (ranging between 1-8.1 %); Guinea, Liberia, Mozambique, Mauritania, Niger, Namibia,

[49] OECD (n.d.). Trade in raw materials. Link: https://www.oecd.org/trade/topics/trade-in-raw-materials/.
[50] de Jong, Sijbren et al. 2016. The Circular Economy and Developing Countries. A Data Analysis of the Impact of a Circular Economy on Resource-Dependent Developing Nations, p. 25.
[51] Ibid., p. 26.
[52] Ibid., pp. 29-32.
[53] NRGI 2015. The Resource Curse – The Political and Economic Challenges of Natural Resource Wealth, p. 1. Link: https://resourcegovernance.org/sites/default/files/nrgi_Resource-Curse.pdf.
[54] UNDP (n.d.). Export Dependence and Export Concentration. Link: https://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Inclusive%20development/Towards%20Human%20Resilience/Towards_SustainingMDGProgress_Chapter1.pdf, p. 25.
[55] UNIDO (n.d.). Circular Economy, p. 6. Link: https://www.unido.org/sites/default/files/2017-07/Circular_Economy_UNIDO_0.pdf.
[56] de Jong, Sijbren et al. 2016. The Circular Economy and Developing Countries. A Data Analysis of the Impact of a Circular Economy on Resource-Dependent Developing Nations, p. 35.

Republic of the Congo, Suriname, the DRC, South Africa, Guyana, Madagascar and Sierra Leone are countries most exposed. The study points out that whether the former will establish circularity remains the “big question”.

The following section focuses on different raw materials sourced from two developing and emerging countries, namely cobalt from the DRC and copper from Peru.

Cobalt from the Democratic Republic of the Congo

Cobalt is a silvery-blue metal,[57] which is often produced as a by-product of other major metal extraction processes (mainly copper and nickel).[58] The EU included cobalt in their 2020 Critical Raw Material (CRM) list. A bit more than half of global cobalt demand (56 %) is used for chemical applications (batteries, catalysts, colours), with metallurgical applications (superalloys for aircrafts, military equipment and gas turbines) accounting for the remaining part of the demand.[59] It is a key element for lithium-ion batteries, which are used in electric vehicles (EVs). In 2020, more than 2 million EVs were registered in the EU,[60] with existing projections indicating the number will rise to 7-20 million in 2025 and 18-61 million in 2030.[61]

A Briefing of the European Parliament states that 22 % of all cobalt used in batteries within the EU is recycled.[62] In the new proposal for the batteries and waste batteries regulation[63] no targets to increase recycling are set, but targets for minimum recycled cobalt content in batteries.[64] The proposal suggests a minimum share of 12 % by 2030 and 20 % in 2035. Technically, a recovery of over 90 % of cobalt is already possible today.[65] Furthermore, there is a constant search for cobalt substitutes mainly as result of high price volatility, geopolitics of supply, cost and environmental benefits.[66] This work has been making great advances in recent years. If the cobalt-free battery will be the norm in the mid-future is impossible to say at the present date, but with cobalt being the main driver for high battery prices, major companies

[57] Royal Society of Chemistry. Cobalt. Link: https://www.rsc.org/periodic-table/element/27/cobalt

[58] Fischer, K. G. 2011. Cobalt Processing Developments, p. 237. Link: https://www.911metallurgist.com/blog/wp-content/uploads/2016/02/Cobalt-processing-developments.pdf.

[59] Tsurukawa, Nicolas et al. 2011. Social impacts of artisanal cobalt mining in Katanga, Democratic Republic of Congo, p. 6. Link: https://www.oeko.de/oekodoc/1294/2011-419-en.pdf.

[60] European Alternative Fuels Observatory. AF FLEET M1 (2020). This includes both Battery Electric Vehicles (BEVs) and Plug-in-Hybrids (PHEVs). Link: https://www.eafo.eu/vehicles-and-fleet/m1.

[61] Alves Dias, P. et al. 2018. Cobalt: demand-supply balances in the transition to electric mobility, p. 77. Link: https://publications.jrc.ec.europa.eu/repository/handle/JRC112285. For more information on the assumptions underpinning the projections for EV deployment in the EU, please see Box 4.

[62] European Parliament 2021. New EU regulatory framework for batteries – Setting sustainability requirements, p. 3. Link: https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689337/EPRS_BRI(2021)689337_EN.pdf. Albeit the reference value of the 22 % remains somewhat unclear, the wording is: “While closing the material loops as much as possible would help reduce raw material supply risks, within the EU, the volume of recovered metals that are used in battery manufacturing is currently low. Only 12 % of aluminium, 22 % of cobalt, 8 % of manganese, and 16 % of nickel used within the EU is recycled.” A link in the document presumably referring to the reference value is no longer working.

[63] European Commission 2020f. Proposal for a Regulation of the European Parliament and of the Council concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020, COM(2020) 798 final, 2020/0353 (COD).

[64] “Industrial and electric-vehicle batteries with internal storage“.

[65] European Parliament 2021. New EU regulatory framework for batteries – Setting sustainability requirements, p. 3; Interviews with representatives of battery recyclers (Duesenfeld GmbH, 26.11.2021; Umicore, 15.12.2021).

[66] Roberts, S. and Gunn, G. 2014. ‘Cobalt’, in Gunn, G. (ed.) Critical Metals Handbook. Chichester, UK: British Geological Survey, John Wiley & Sons, American Geophysical Union.

push for the shift to cobalt-free batteries.[67] This possible shift may affect battery recycling in general – as currently cobalt recovery is the main reason why battery recycling is economical.[68]

In 2019, the top three biggest exporters of cobalt were the Democratic Republic of the Congo (60 % global supply)[69], Canada and the United States.[70] The EU relies for 68 % of its cobalt sourcing on the Democratic Republic of the Congo (DRC),[71] with annual demand already being nine times greater than the EU internal supply.[72] Cobalt trade is a key source of revenue for the DRC. Over the period 2014-2017, natural resource extraction accounted for 25-26 % of the country's GDP, with natural resources generating 95 % of its export earnings.[73]

So how will the developments described above affect exporters such as the DRC and what does it imply for development cooperation? Firstly, the projected growth rates for EVs are likely to lead to accompanied growth in demand for cobalt in the near to mid-term future, even a supply-demand gap may still occur.[74] The targets for recycled content in EV batteries in the EU would most likely have a cushioning effect on demand and thus price rises in the mid-term, considering that large amounts of secondary cobalt from EV batteries can only be recycled after they have reached the end of their lifespan (from 2025 onwards).[75]

The possible substitution of cobalt in batteries however is something of a wild card – if it would reduce cobalt demand and price by a high margin it could potentially be disastrous for the DRC; the COVID-19 pandemic already demonstrated that a lack of demand for cobalt would leave the country very vulnerable to the outbreak of economic and social crises.[76] Actors of development cooperation therefore should keep a close eye on the development of the cobalt-free battery. Especially if the substitution would also be applicable in other technical functions, cobalt trade could be affected with dramatic consequences for mining regions in the DRC. With the huge demand increases for cobalt still expected today market forces may provide a mix of cobalt containing batteries and cobalt free batteries, but development cooperation should not be caught unprepared in case of a different development.

Copper from Peru

Copper is a reddish-gold metal,[77] which the EU only considered a candidate material for the 2020 critical raw material list. It is the third most widely used metal (after iron/steel and

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[67] CNBS 2021. Here's why battery manufacturers like Samsung and Panasonic and car makers like Tesla are embracing cobalt-free batteries. Link: https://www.cnbc.com/2021/11/17/samsung-panasonic-and-tesla-embracing-cobalt-free-batteries-.html.

[68] Nature 2021. Electric cars and batteries: how will the world produce enough? Link: https://www.nature.com/articles/d41586-021-02222-1.

[69] Mancini, Lucia et al. 2021. Assessing impacts of responsible sourcing initiatives for cobalt: Insights from a case study, p.1. Link: https://publications.jrc.ec.europa.eu/repository/handle/JRC121719.

[70] OEC (n.d.). Cobalt. Link: https://oec.world/en/profile/hs92/cobalt.

[71] European Commission 2020c. Study on the EU's list of Critical Raw Materials (2020), p. 135. Link: https://rmis.jrc.ec.europa.eu/uploads/CRM_2020_Factsheets_critical_Final.pdf.

[72] European Commission (n.d.). Cobalt: supply and demand balances in the transition to electric mobility, p. 1. Link: https://ec.europa.eu/jrc/sites/default/files/cobalt_infographics_one-pager.pdf.

[73] Davies, Victor 2019. Democratic Republic of the Congo: Selected Issues, p. 11. Link: https://www.elibrary.imf.org/view/journals/002/2019/286/article-A002-en.xml.

[74] European Commission (n.d.). Cobalt: supply and demand balances in the transition to electric mobility, p. 2.

[75] European Commission 2020d. Critical Raw Materials Factsheets (Final), p. 136. Link: https://rmis.jrc.ec.europa.eu/uploads/CRM_2020_Factsheets_critical_Final.pdf.

[76] Reid, Helen / Holland Hereward 2020. Congo mine closures would cause economic and social crisis, minister says. Link: https://www.reuters.com/article/us-health-coronavirus-congo-mining-idUSKBN21Z1Z4.

[77] Royal Society of Chemistry 2021. Copper. Link: https://www.rsc.org/periodic-table/element/29/copper.

aluminium).[78] Its applications are widespread, covering sectors such as electrical engineering, automobiles, construction, machinery, shipbuilding, aircraft, precision instruments, watches and clocks.[79] In 2020, the top three biggest exporters of copper ore were Chile, Peru and Australia.[80] The EU buys 82 % of its copper on international markets.[81]

Copper is the most widely used material for clean-energy technologies.[82] For example, a three megawatts wind turbine contains up to 4.7 tons of copper[83] and EVs can require up to three and a half times as much copper compared to a conventional car with a combustion engine.[84] Copper consumption in the EU is projected to increase by more than 40 % by 2035, partially due to the increased uptake of such technologies.[85] The substitution of copper by graphene or similar materials for electrical conduction might partially replace demand,[86] even though this is difficult due to the superior performance of copper in electrical applications.[87] Copper is 100 % recyclable without performance losses, requiring 85 % less energy compared to primary production.[88] The mining process is highly energy intensive because copper ore contains relatively small concentrations of copper.[89] The EU has a relatively high recycling rate for copper; and its processing industry sources approximately half of its copper from EU recycling.[90] However, global demand for copper is rising faster than can be sourced from secondary sources,[91] requiring significant increases in copper mining and processing.[92] This is all the more urgent as current copper mines are approaching their peak because of declining ore quality and reserves exhaustion.[93]

In 2019, Peru was the second largest exporter of copper in the world. More than two-thirds of Peru's copper exports were imported by China (68.3 %), European import countries included Germany (4.31 %), Bulgaria (1.72 %) and Spain (0.85 %). Peru sustains much of its development based on this industry.[94] The western part of South America (mainly Chile and

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[78] Ecorys 2021. Mapping resource prices: the past and the future, p. 32. Link: https://ec.europa.eu/environment/enveco/resource_efficiency/pdf/report_mapping_resource_prices.pdf.
[79] European Copper Institute 2018. Europe's Copper Industry. Link: https://copperalliance.eu/about-us/europes-copper-industry/.
[80] OEC (n.d.). Copper Ore. Link: https://oec.world/en/profile/hs92/copper-ore.
[81] European Innovation Partnership on Raw Materials. Import reliance, p. 33. Link: https://rmis.jrc.ec.europa.eu/uploads/scoreboard2018/indicators/3._Import_reliance.pdf.
[82] IEA 2021. The role of Critical Mineral in Clean Energy Transitions, p. 135. Link: https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf.
[83] Copper Development Association Inc. (n.d.) Copper and the Clean Energy Transition, p. 3. Link: https://www.copper.org/resources/market_data/infographics/copper-and-the-clean-energy-transition-brochure.pdf.
[84] Wood Mackenzie (n.d.). Copper: Powering up the electric vehicle. Link: https://www.woodmac.com/news/opinion/copper-powering-up-the-electric-vehicle/.
[85] European Copper Institute (n.d.). Copper + Circular Economy. Link: https://copperalliance.org/wp-content/uploads/2021/10/Circular-Economy-Cube.pdf.
[86] Elshkaki, Ayman et al. 2016. Copper demand, supply, and associated energy use to 2050, p. 15. Link: https://www.sciencedirect.com/science/article/abs/pii/S0959378016300802.
[87] IEA 2021. The role of Critical Mineral in Clean Energy Transitions, p. 133.
[88] European Copper Institute. Europe's demand for copper is increasingly met by recycling. Link: https://copperalliance.eu/benefits-of-copper/recycling/.
[89] Elshkaki, Ayman et al. 2016. Copper demand, supply, and associated energy use to 2050, p. 2.
[90] Schüler, Doris et al. 2017. EU raw material import flows – acknowledging non-EU environmental and social footprints, p. 2.
[91] "Science for Environment Policy": European Commission DG Environment 2016. News Alert Service, edited by SCU, The University of the West of England, Bristol, p. 1. Link: https://ec.europa.eu/environment/integration/research/newsalert/pdf/copper_demand_increase_up_to_341pc_2050_470na1_en.pdf.
[92] Ibid.
[93] IEA 2021. The role of Critical Mineral in Clean Energy Transitions, p. 133.
[94] Andújar-Palao, José Miguel et al. 2021. Copper mining in Peru: analysis of exogenous and endogenous variables to manage its development, p. 785. Link:

Peru) accounts for 40 % of the global output of mined copper,[95] which has exacerbated water scarcity and arsenic pollution.[96] The EU depends for two thirds of its copper imports on Latin American countries.[97] Considering the (increased) future significance of copper and its broad applicability, as well as the difficulties associated with its substitution, it is probable that Peru would be able to – albeit perhaps in smaller quantities – continue their copper exports to the EU even when a circular economy is in place.

Short summary: The EU's demand for cobalt and copper is likely to increase strongly in the coming decades, driven by the ambition to become climate neutral in 2050 and associated developments, such as the electrification of the transport sector and the clean energy transition. Even if the EU were to make great advances towards the circular economy, it would still likely import these raw materials from the DRC and Peru because achieving high recycling rates would not be sufficient to meet the projected demand in the short to midterm.[98] However, providing a conclusive answer to what degree raw material exporters will experience a reduced demand for their commodities is not possible, because the EU has not indicated a clear timeframe for the circular-economy transition.[99] Furthermore, a reduction of raw material use in one application may also lead to rebound effects.

Nevertheless, resource exporting countries depending heavily on the export of primary raw materials remain vulnerable to demand shocks. The high demand for these materials is accompanied by higher prices and bigger supply risks, which prove to be driving forces for finding substitution materials. Especially the development of the so-called cobalt-free battery has made advances in the past year. If this were to become the standard in battery production, the DRC and especially its artisanal miners would be hit hard. Actors in development cooperation should therefore keep an eye on the effects especially on developments regarding substitution and prepare accordingly.

The shift to bio-based products

Advanced circular economy programmes include a shift towards bio-based products, to reduce the demand for abiotic raw materials, achieve greater circularity and reduce CO_2 emissions at the same time. Currently, biomass for products plays just a minor role in the so-called "bioeconomy". The lion's share of the production of biomass is for food, feed, and bioenergy.[100]

The four main types of biomaterials used in the EU are wood-based materials, polymers, textiles, and fibres/polymers in composite materials. A key growth area for biomass use in the coming years is construction, mainly with the aim to substitute CO_2 intensive materials, such as concrete and steel, with carbon binding wood. But materials and possible applications are manifold: car manufacturers turn to using hemp or sisal instead of synthetic light construction

https://repositorio.ulima.edu.pe/bitstream/handle/20.500.12724/13353/And%c3%bajar_Ormachea_Ruiz_Chirinos.pdf?sequence=1&isAllowed=y.

[95] IEA 2021. The role of Critical Mineral in Clean Energy Transitions, p. 135.

[96] Ibid., p. 137.

[97] European Commission 2016. EU takes legal action against export restrictions on Chinese raw materials. Link: https://ec.europa.eu/commission/presscorner/detail/en/IP_16_2581.

[98] Dolega, Peter et al. 2021. Green technologies and critical raw materials, p. 24. Link: https://www.oeko.de/fileadmin/oekodoc/Green-technologies-and-critical-raw-materials.pdf.

[99] de Jong, Sijbren et al. 2016. The Circular Economy and Developing Countries. A Data Analysis of the Impact of a Circular Economy on Resource-Dependent Developing Nations, p. 36.

[100] European Commission (n.d.). What is the Bioeconomy. Link: https://ec.europa.eu/research/bioeconomy/policy/bioeconomy_en.htm.

materials;[101] packaging and to-go-containers from biomaterials, such as bamboo, are on the rise since the ban on single-use plastics in the EU came into effect; biobased chemicals find new applications,[102] and in the next years tires made from dandelion rubber will roll through Germany.[103]

Almost two-thirds of biomass supply in the European Union come from agriculture, 36 % from forestry and less than 1 % from fisheries. Cropland makes up around 24 % and grassland 17 % of the EUs land cover.[104] Due to high land competition, it is unlikely that this area is going to increase in response to the increased demand for biomass. In the contrary, agricultural land has been threatened by land take in the EU, and Germany has increased its area for settlements and traffic by 11,184 km^2 between 1992 and 2019,[105] mainly at the expense of agricultural land.[106] Furthermore, the EU plans to increase organic farming to 25 % of all European farming by 2030. Organic farming has lower yields than conventional farming, which will reduce European agricultural production, if no solution to close the yield gap is found.[107]

Forests make up ~160 million hectares or ~40 % of the EU's land surface. Over 70 % of the net annual increment of forests is currently harvested in Europe.[108] While this seems to indicate that a further increase is possible, harvests may change from year to year, with massive calamities (e.g., from beetle infestations) and an oversupply in wood in some years and reduced wood supply in the following years. The effects of climate change induced "forest conversion" on productivity is not yet fully clear.

An analysis of a range of bioeconomy pathways for Germany has shown that only a fraction of the current abiotic resource use can be substituted with home-grown biomass. Increasing demand for biomass will inevitably lead to higher imports and land-use outside of Germany – and often outside of Europe. Already 2015 land use outside Germany related to German

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[101] Hemp, among other natural materials, has been used in a Ford model already in the 1930s. See: BASF 2021. Natürlich gut? Auf der Suche nach Biorohstoffen für die Industrie. Link: https://www.basf.com/global/de/media/magazine/archive/issue-6/naturally-good-searching-for-new-bio-based-raw-materials-for-industry.html.

[102] Möller, Martin 2020. Nachhaltige Ressourcennutzung – Anforderungen an eine nachhaltige Bioökonomie aus der Agenda 2030/SDG-Umsetzung. Abschlussbericht, UBA Texte 181/2020, p. 63.

[103] Fraunhofer IME 2021. Löwenzahn - die neue Kautschukquelle. Link: https://www.ime.fraunhofer.de/de/trendthemen/wissenschaftsjahr-2020-2021_biooekonomie/loewenzahn---die-neue-kautschukquelle.html.

[104] Eurostat 2021. Land cover statistics (in 2018). Link: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Land_cover_statistics. The source "Eurostat 2018. Farms and farmland in the European Union – statistics" (Link: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statistics) states 173 million hectares of land for agricultural production in 2016, which it calculates to be 39 % of the total land area of the EU. The underlying calculatory differences are unclear, here we decided to state the former source, as to build on the same reference for woodland and agricultural land. It was assumed that the latter source calculates grassland and cropland as agricultural land, with the remaining difference possibly resulting from the difference of the base years (2016 and 2018).

[105] Umweltbundesamt 2021. Siedlungs- und Verkehrsfläche. Link: https://www.umweltbundesamt.de/daten/flaeche-boden-land-oekosysteme/flaeche/siedlungs-verkehrsflaeche.

[106] Statista 2021. Landwirtschaftliche Nutzfläche in Deutschland bis 2020. Link: https://de.statista.com/statistik/daten/studie/206250/umfrage/landwirtschaftliche-nutzflaeche-in-deutschland/.

[107] It seems adequate to add that the higher land use of organic farming could be offset, if food waste could be reduced and if diets became less meat and dairy intense. Food waste accounts for around a third of all food produced for human consumption worldwide, FAO 2011, see: https://ec.europa.eu/food/safety/food-waste_en); a calorie of beef requires around 100 times as much land as a plant-based alternative (see: https://ourworldindata.org/land-use-diets).

[108] EEA 2018. The circular economy and the bioeconomy. Partners in sustainability. EEA Report No 8/2018, p. 6.

biomass demand was over 14 million hectares.[109] European consumption of wood products is – minor only to soy, palm oil and beef – already one of the key contributors to deforestation and ecosystem transformation worldwide.[110] While some experts expect that the increased demand for (construction) wood in Germany would be mainly met by European neighbours or should be imported from certified (FSC or PEFC) sources,[111] there is no guarantee to that, as wood is a freely traded commodity. Developments in 2021 have shown this impressively: masses of German calamity wood have been exported to better paying American or Chinese firms, leaving the German market empty.[112] In a world of rising wood demand and prices, increased deforestation and conversion of primeval forest to timber plantations in developing and emerging countries could be expected.[113]

On the agricultural side the bioeconomy is connected to an increased conversion of natural habitats to agricultural land and the intensification of agriculture, destroying eco-systems and reducing biodiversity. Pesticide and fertiliser run-off from agriculture increase water and soil pollution.

For developing and emerging countries, the bioeconomy first of all provides an opportunity to generate income. Unfortunately, apart from the ecological effects, today's bioeconomy has frequently had negative social effects on developing and emerging countries. As a result of large land acquisitions in the Global South, local food security has been impaired and people got displaced, often hitting women hardest.[114] Furthermore, in a world of climate change many developing and emerging countries might need their biomass production for their own economic transition. Take, for example, Indonesia, which is the world's biggest producer of palm oil. The effects of palm oil production on deforestation and biodiversity loss have gained international media attention. But at the same time palm oil trees are by far the most productive oil crop and palm oil and palm kernel oils can be used in a wide range of products.[115] Indonesia has developed a strategy for a national "agricultural bioindustry", which is very similar to the bioeconomy concept. The strategy shall contribute to higher incomes for farmers, food security, higher quality of life and energy security. Palm oil plays an important role in the energy strategy of Indonesia, with a 30 % biodiesel blending already in place. Increased demand for palm oil from well-paying European customers may lead to biomass exports, which would be needed for sustainable development and for tackling climate change in the origin countries, and to a further increase of monocultures of the respective biomass crop. In the case of Indonesia research has shown that palm oil monocultures reduce agricultural productivity for crops that are cultivated by small farmers.[116]

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[109] Möller, Martin 2020. Nachhaltige Ressourcennutzung – Anforderungen an eine nachhaltige Bioökonomie aus der Agenda 2030/SDG-Umsetzung. Abschlussbericht, UBA Texte 181/2020, p. 64, 68.

[110] WWF 2021. Stepping up. The continuing impact of EU consumption of nature worldwide, Brussels, p. 5.

[111] Wolf, Tobias et al. 2020. Potenziale von Bauen mit Holz, UBA TEXTE 192/2020, p. 22.

[112] Deutscher Bundestag Wissenschaftliche Dienste 2021. Nationaler und internationaler Handel mit Bauholz aus Deutschland, WD 5 - 3000 - 066/21, Berlin, S. 7; Frankfurter Allgemeine Zeitung 2021. 132.000 Menschen fordern Exportverbot für Holz. Link: https://www.faz.net/aktuell/wirtschaft/unternehmen/dachdecker-in-not-132-000-menschen-fordern-exportverbot-fuer-holz-17400711.html.

[113] This report was written in November 2021. November 2nd of 2021 the "Glasgow Leaders' Declaration on Forests and Land Use" has been signed, with 141 signatories as of 25th of November. As it is as of now unclear if the declaration will change trade rules regarding wood it is assumed that wood will be traded freely in the upcoming years.

[114] Wolff, Franziska/Zoritza Kiresiewa/Martin Möller 2020. Wo ein Wille ist, ist auch ein Weg. Gelegenheitsfenster. Politische Ökologie 162, p. 95.

[115] WWF (no date). 8 things to know about palm oil. Link: https://www.wwf.org.uk/updates/8-things-know-about-palm-oil.

[116] Umweltbundesamt 2020. Nachhaltige Ressourcennutzung – Anforderungen an eine nachhaltige Bioökonomie aus der Agenda 2030/SDG-Umsetzung. Abschlussbericht, UBA Texte 181/2020, p. 193f.

Short summary: The shift to biobased products can create an income opportunity for developing and emerging economies. However, it is likely to lead to further land use changes in the biomass producing countries generating income at the cost of the local environment and sometimes with negative social impacts on vulnerable citizens. Furthermore, domestic biomass would be needed to transform the economy in the developing and emerging economies.

Reduction in waste exports

Waste exports from the EU have increased significantly in recent years and reached 32.7 million tons in 2020, a plus of 75 % since 2004. At the same time the waste trade map has changed: While China imported ~ 10 million tons of European waste a decade ago, its waste import ban 2018 shifted the market. Today Turkey is by far the biggest importer of EU waste (13.7 million tons in 2020), having doubled its waste imports since 2015.[117] Turkey is followed by India (1.8 million tons), United Kingdom, Switzerland, Norway, Indonesia (1.4 million tons) and Pakistan (1.4 million) tons.

Exports of ferrous metal waste make up the bulk of waste exports (53 % in 2020, 17,4 million tons), followed by paper and cardboard; plastic and rubber; copper, aluminium and nickel; and textile waste.[118] The distribution of waste streams among importing countries is uneven, for example, Turkey imports over two thirds of the ferrous metal waste, while the paper waste goes primarily to India (26 %) and Indonesia (20 %), with Turkey being the third biggest importer (15 %). Using the examples “ferrous metal waste exports” and “plastic waste exports” we aim to illustrate some important effects of a reduction in waste exports on developing and emerging countries.

Ferrous metal waste (iron and steel) from the EU is exported mainly to Turkey (12 million tons), Egypt (2 million tons) and India (1.9 million tons). Effects of a reduction of metal scrap exports are illustrated in the following for the Indian example.

India is the world’s second largest producer of steel and follows the goal to become the largest producer. It’s “Self-Reliant India” plan aims to make India a hub for manufacturing for the automobile, defence, aviation, and other industries that require a huge input of metals.[119] These plans will be thwarted or at least slowed down if metal supply isn’t sufficient. During Covid-19 lockdowns in 2020 manufactures halted scrap metal shipments clearance, and Indian collection stopped. The resulting shortage of supply quickly led to an increase in finished goods prices in India. The EU is not the biggest exporter of scrap metal to India: The US International Trade Administration (ITA) estimates that in 2019 32 million tons of ferrous scrap were used by steel producers (+ 11.4 % from 2018) of which 25 million tons were sourced in India and 7 million tons were imported. Interestingly, the ITA does not mention the EU as a main exporter to India, but rather mentions China, the US, and the United Arab Emirates among others. With a scrap metal import of almost two million tons, it can nevertheless be assumed that a reduction of scrap metal flow from the EU would hurt the Indian economy. Especially as India has been struggling to meet demand lately: This year the Indian government cut the customs duty on ferrous scrap imports to 0 % until April 2022 and justified that it was in the public interest; the

[117] Statista 2021. Waste exports by the EU-27 2005-2020, by destination. Link: https://www.statista.com/statistics/1235811/annual-waste-exports-destinations-european-union/.
[118] Eurostat 2021. Where does EU waste go? Link: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210420-1. There are further waste streams, but the above are the waste streams bigger than one million ton per year.
[119] US International Trade Administration 2021. Indian Ferrous Scrap Market Overview. Link: https://www.trade.gov/market-intelligence/indian-ferrous-scrap-market-overview.

Indian Finance Minister noted that "*micro, small and medium enterprises and other industries have been severely hit by a recent sharp rise in iron and steel prices*".[120] [*Please see chapter 4 on further information on the scrap metal market, ongoing European legislative activities, and the effects they may have on developing and emerging economies.*]

Exported **plastic waste** accounts for a third of reported plastic recycling in the EU.[121] The EU's Waste Framework Directive requires that the exported waste is treated under conditions that are broadly equivalent to those in the European Union,[122] but in practice there is little knowledge or transparency about the treatment of plastic waste in importing countries.[123] While EU operators must receive documentation that confirm the equivalent recycling standards, they have no control powers in third countries. The European Environment Agency assumes that treatment in non-EU countries will often cause higher CO_2 emissions and environmental pressure and lead more often to plastic leakage to the environment.[124] In 2021, the European Commission put its proposal for reforming the waste shipment regulation forward. The revision has the key aims of preventing the transfer of EU waste problems to third countries, facilitating the transport of waste for recycling and reuse in the EU, and better combating illegal waste shipments. If the regulation will be updated, the coming years will show to what extent it can improve the current situation (see next chapter for further information).[125]

In recent years plastic waste trade has shifted significantly, mainly due to the Chinese ban on plastic waste imports and the addition of some types of plastic to the Basel Convention. In 2016 China imported around 2.4 million tons, or 77 % of the EU's plastic waste. As China announced an import ban for plastic waste to come into effect in 2018, this amount dropped quickly, redrawing the map of worldwide plastic trade, increasing not only inter-European plastic trade, but also trade to other, mostly Asian countries. Between 2016 and 2018 Thailand experienced an eightfold increase in plastic waste imports, Turkey a sevenfold increase and Indonesia a threefold increase.[126] According to Statista, in 2019 the biggest importers of EU plastic waste in Asia became Malaysia and Indonesia. Exports to Malaysia from Europe increased from ~ 40,000 tons in May 2018 to ~ 325,000 tons in May 2019 and Indonesia from 17,000 to 181,000 tons.[127] In 2020 the main destinations for plastic waste exports were Turkey (~700,000 tons), Malaysia (362,567 tons) and Morocco (~161,000 tons).[128]

Similar to other waste materials that are imported, plastic waste theoretically has a value as a resource for developing countries. The trash can be sent in containers that would otherwise be empty on their way back to Asian manufacturers. Lower labour costs in the importing countries should allow plastic waste being sorted, recycled and reused in new products. However, in practice the global trade in plastic waste often leads to grave environmental, health and social

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[120] Recycling Today. 2021. India lowers tariffs on some inbound scrap metals. Link: https://www.recyclingtoday.com/article/india-scrap-steel-copper-lower-duty-2021/.
[121] European Court of Auditors 2020. Review No 04/2020: EU action to tackle the issue of plastic waste, Brussels.
[122] Waste Framework Directive. Article 11a (8). Link: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1594032312283&uri=CELEX:02008L0098-20180705.
[123] EEA 2019. The plastic waste trade in the circular economy. Link: https://www.eea.europa.eu/publications/the-plastic-waste-trade-in.
[124] European Court of Auditors 2020, p. 39.
[125] European Commission 2021c. Fragen und Antworten zu den neuen EU-Vorschriften über die Verbringung von Abfällen. Link: https://ec.europa.eu/commission/presscorner/detail/de/qanda_21_5918.
[126] Ibid., p. 40. Please note that these numbers do not fit to numbers provided by Statista, which reports only a mild and temporary increase in plastic imports. See: https://www.statista.com/statistics/987221/eu-28-plastic-waste-exported-to-asia/.
[127] Statista 2020. Plastic waste exported monthly by EU-28 to Asia 2017-2018 . Link: https://www.statista.com/statistics/987221/eu-28-plastic-waste-exported-to-asia/.
[128] Statista 2021. Plastic waste exports by the European Union EU-27 2020, by destination. Link: https://www.statista.com/statistics/1269996/plastic-waste-export-destinations-european-union/.

problems. The plastic waste that reaches developing countries is often too contaminated (e.g., with food remainders) or consists of compound materials, both of which make it unfit for high value recycling.[129] Therefore, much of the plastic is openly burned, releasing dioxins, furans, mercury and polychlorinated biphenyls (PCBs), or ends on landfills or ultimately in nature. Working conditions on waste sites are often harmful to health.[130] Reliable data around plastic waste recycling is scarce, but as more developing and emerging countries try to fend off Western plastic trash and sending containers back into origin countries, it becomes obvious that plastic waste is often not of a quality that allows for a sustainable business model. Instead, few individuals benefit from the trash trade, with local communities and environment being impacted negatively.[131] Under European law it is illegal to ship waste that is then landfilled, and recycling of plastic should be done with similar standards to the EU. The implementation of the rules seems to be deficient. The rapid shift of waste exports to other Asian countries after enactment of the Chinese waste import ban should have alerted the EU – it could not be expected that these countries would have time to build up recycling capacities fast enough to take over the massive waste flows that went previously to China. Interpol reckons that with many of the new import destinations also adopting import bans, the waste trade will shift to even less developed countries in the near future.[132] The proposal for a revision of the waste shipment regulation includes the requirement that facilities which will manage waste in destination countries have been subject to an audit by an independent and accredited third party with appropriate qualifications. Once adopted, this might help improve enforcement.

Short summary: As waste streams and national waste treatment and management capacities differ strongly between countries, so will the consequences of a shift to a circular economy in Europe be different in each case. On an overarching economic level, a reduction in waste exports can mean a significant loss of income for developing or emerging economies, if the imported waste can be recycled into a highly demanded resource (as in the case of metal scrap recycling and recycling steel production in India) or if the recycling material allows for a sustainable business model, creating new products from the recycled material, thus keeping value added in the country. To give an illustrative example: the Chinese Zhang Yin, who became the world's richest self-made woman in 2010, made her fortune recycling imported paper waste and producing packaging from the recycled paper. Materials that are more difficult to recycle and of lower value in general (such as plastic), and that have negative environmental and health effects if not managed with high technical standards, are likely to lead to negative economic and social effects in the waste importing developing and emerging countries.

Technology and knowledge transfer – the sharing economy

The circular economy is associated with different types of innovation, including social (e.g., ownership and sharing models), technological (e.g., new digital technologies) and policy innovations (e.g., regulation on the "right to repair"). These types of innovations are closely interlinked and interplay with one another. Regarding social innovation, the 'sharing economy' (also referred to as the 'collaborative economy') has quickly gained momentum in recent years

[129] DW 2020. German plastic floods Southeast Asia. Link: https://www.dw.com/en/german-plastic-floods-southeast-asia/a-47204773.
[130] Le Monde diplomatique 2021. No more plastics in Southeast Asia paradise. Link: https://mondediplo.com/2021/05/10plastics.
[131] Ibid.
[132] Interpol 2020. Interpol Strategic Analysis Report. Emerging criminal trends in the global plastic waste market since January 2018, Lyon, p. 40.

and is generally perceived as a subset of the circular economy.[133] The scientific service of the German parliament defines the sharing economy as *"[…] the joined use of goods by sharing, exchanging, lending, renting or donating, as well as the mediation of services"* and notes that important goals are a better utilisation of existing capacities, the reduction of resource consumption and more social contact and cohesion in society.[134] Many new companies base their business model on this concept (sharing houses, cars, tools etc.), which also raises new questions regarding market access requirements, consumer protection, liability, labour law and tax.[135]

Theoretically, the advantage of spreading solutions of the sharing economy in developing and emerging countries is obvious: it should allow providing more people with services at lower costs for each person, as goods don't have to be purchased. Again theoretically, this allows to provide services to societies at a fraction of the resource use. [136] However, it should be added that the effects are complex. Research on car-sharing in Germany and Europe, for example, has brought mixed results: while research indicates that car-sharing helps reduce car-ownership,[137] studies also indicate that users tend to make more trips by car. These results show that any sharing model requires the embedment in other policies, if e.g., the model should also help achieve environmental goals.[138] In developing and emerging countries the effects are not yet well researched, but effects will be different, especially if the sharing scheme gives access to a service that people would otherwise not have. Well designed, schemes may help leapfrog the ownership phase of certain products. The OECD recommends governments in this regard to, among others, *"Re-think policy incentives, better understand the policy environment and test new approaches, including a greater use of policy or innovation labs that bring together diverse stakeholder interests to brainstorm, and adopt an end-user mind-set"*.[139]

Respondents to a Chatham House-UNIDO survey indicated that the greatest challenges for developing and emerging countries in scaling up the circular economy are limited institutional capacity and a lack of access to finance and technology. Many countries are struggling with establishing and enforcing regulation to govern circular activities, the majority of (foreign) investments are directed at linear resource extraction and processing, and citizens do not have access to relevant digital technologies (e.g., access to internet or owning mobile phones).[140] For the sharing economy specifically, key barriers are likely to include: a lack of trust, social and cultural norms (i.e., preference for ownership as opposed to sharing), technology, electric

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[133] Henry, Marvin et al. 2021. The battle of buzzwords: A comparative review of the circular economy and the sharing economy concepts. Link: https://www.sciencedirect.com/science/article/pii/S2210422420301271.

[134] Wissenschaftliche Dienste Deutscher Bundestag 2015. Aktueller Begriff Sharing Economy, p. 1. Link: https://www.bundestag.de/resource/blob/377486/21fc4300787540e3881dbc65797b2cde/sharing-economy-data.pdf.

[135] European Commission (n.d.). Factsheet on the collaborative economy. Link: https://ec.europa.eu/growth/single-market/single-market-services/collaborative-economy_en.

[136] Retamal, M., Dominish, E., 2017, The Sharing Economy in Developing Countries, p. 1. Prepared by the Institute for Sustainable Futures at the University of Technology Sydney (UTS) for Tearfund UK. Link: https://www.uts.edu.au/sites/default/files/2017-12/ISF_The%20Sharing%20Economy%20in%20Developing%20Countries_2017.pdf.

[137] Jochem, Patrick et al. 2020. Does free-floating carsharing reduce private vehicle ownership? The case of SHARE NOW in European cities. Transportation Research Part A: Policy and Practice Volume 141, November 2020, Pages 373-395.

[138] Öko-Institut e.V. 2021. A different way of being mobile: With car-sharing? Link: https://www.oeko.de/en/research-consultancy/issues/mobility-and-transport/a-different-way-of-being-mobile-with-car-sharing.

[139] OECD (n.d.). Re-thinking policies for the tourism sharing economy. Link: https://www.oecd.org/cfe/tourism/re-thinkingpoliciesforthetourismsharingeconomy.htm. While the claim was made with the tourism sharing economy, it is equally fitting for other sharing sectors.

[140] Ibid., pp. 17-20.

payment systems, a lack of assets and skills and a lack of regulations.[141] However, the challenges and opportunities associated with the circular economy transition will differ per emerging and developing country, based on their stage of development, resource endowments and political institutions, requiring tailored policy responses.[142]

In order learn about the enabling factors actors in development cooperation should pay close attention to the frontrunner countries in the developing and emerging world, especially India and countries in Latin America, such as Brazil. Regarding promising sectors, a study on sharing economy companies in developing and emerging countries has shown that most sharing companies are providing peer-to-peer trading, ridesharing and skill-matching. [143]

Short summary: The circular economy is linked to different types of innovation, including social, technological and policy innovation. The sharing economy, as part of the circular economy, has the potential to provide services to people that cannot afford ownership and – this becomes more relevant in more advanced development stages -, provides services in a more resource conserving manner.

4. Snapshot analysis of exemplary measures of the EU Circular Economy Action Plan

In the following we will present selected actions of the Circular Economy Action Plan that we consider of high relevance for developing and emerging countries. We focus on measures in Europe that are likely to be translated into legislation and where the legislative train is fairly advanced. We do not focus on actions targeted at developing and emerging countries, but on measures that are likely to develop a strong impact for the EU's circular economy and develop (unintended) effects in developing and emerging economies.

The Sustainable Products Initiative and the Right to Repair

A key measure of the Circular Economy Action Plan is the Sustainable Products Initiative. The initiative by the Commission was put forward March 2022 with a "Communication on making sustainable products the norm" and a proposal for a regulation establishing a framework for setting ecodesign requirements for sustainable products and repealing the Ecodesign-Directive (2009/125/EC). [144] At the heart of the initiative lies a revision – or rather a repealing – of the

[141] Retamal, M., Dominish, E., 2017, The Sharing Economy in Developing countries. Prepared by the Institute for Sustainable Futures at the University of Technology Sydney (UTS) for Tearfund UK, p. 8. Link: https://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/sharing-developing.

[142] Preston, Felix et al 2019. An Inclusive Circular Economy – Priorities for Developing Countries, p. 25.

[143] Hira, Andy 2017. Profile of the Sharing Economy in the Developing World: Examples of Companies Trying to Change the World, Journal of Developing Societies, p. 247, 250.

[144] European Commission 2022. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. On making sustainable products the norm. COM(2022)140 final; European Commission 2022a. Proposal for a regulation

Ecodesign Directive. The original **Ecodesign Directive** has been in force since 2005 and been updated since then. It lays down minimum mandatory requirements for energy-related products (such as household appliances) and is complemented by the Energy Labelling Regulation on mandatory labelling requirements.[145] The Directive is implemented through product-specific regulations, which are directly applicable in all Member States.[146] The proposed regulation goes far beyond the original requirements and aims to include aspects on product durability, reusability, upgradability, repairability and recycled content in products. Furthermore, information on sustainability shall be made more transparent to consumers, green public procurement shall be regulated, and the initiative shall also pave the way to ban the destruction of unsold good. [147]

Focusing on the example of mobile phones and tablets, the Commission has published an Inception Impact Assessment in December 2020, in which it introduces legislation to ensure that mobile phones and tables are designed to be resource efficient/circular. Following a public consultation, the Commission published a preparatory study to analyse the feasibility of proposing Ecodesign and/or Energy Labelling requirements for these product groups, as well as to lay the foundation for identifying policy options in the impact assessment.[148] Key areas identified for potential regulation by the preparatory study are: resistance to damage when accidentally dropped, protection from water and dust, battery accessibility and longevity, availability of software/firmware/operating system updates, product durability, ability of the product to be disassembled, availability of priority spare parts, data deletion and transfer functionalities, and appropriate information for users, repairers and recyclers.[149] The Commission is currently in the process of drafting the act for designing mobile phones and tablets to be sustainable and its adoption is planned for the 4th of quarter of 2022 (initially 2nd quarter of 2022)[150]. So, it remains unclear how ambitious the regulation will be for these product groups. Nonetheless, one can explore some of the potential impacts on developing and emerging countries, assuming the new regulation will lead to an increase in product lifetime.

The "**Right to Repair**" is a concept that has been developed in recent years as a response to an increase in products that by design cannot be repaired by consumers or independent repairers. Repair may be hindered because the opening of a product voids guarantee, due to a lack of spare parts and/or instruction manuals or due to the type of construction itself, for example when many parts are glued together and can therefore not be exchanged.[151] The "right

of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM(2022) 142 final.

[145] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe, p. 3.

[146]. European Commission 2022. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. On making sustainable products the norm. COM(2022)140 final; European Commission 2022a. Proposal for a regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM(2022) 142 final.

[147] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe.

[148] Ecosmartphones (n.d.). Introduction. Link: https://www.ecosmartphones.info/introduction/.

[149] Consultation questionnaire (archived, consultation period expired), pp. 1-2. Link: https://www.ecosmartphones.info/.

[150] European Commission (n.d.). Designing mobile phones and tablets to be sustainable – ecodesign. Link: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12797-Designing-mobile-phones-and-tablets-to-be-sustainable-ecodesign_en.

[151] European Parliamentary Research Service 2019. Consumers and repair of products. Briefing, Brussels.

to repair" is included in the Circular Economy Action Plan in the context of electronic and IT goods and also covers the right to update obsolete software.[152]

The "right to repair" plays an important role in the Communication "On making sustainable products the norm" and the proposal for a regulation "establishing a framework for setting ecodesign requirements for sustainable products", but the Commission is working on a specific initiative for encouraging repairs of consumer goods, with adoption planned for autumn 2022. More or less unnoticed by the public the "right to repair" has already taken hold in some European regulations. For example, includes legislation on electronic displays[153] already a chapter on "Design for repair and reuse", which specifies measures that manufacturers must take, including which spare parts need to be made available to professional repairers or to ensure that spare parts can be replaced with commonly available tools without permanent damage to the appliance.

The implementation of the "right to repair" can unfold positive environmental, social, and economic effects on developing and emerging economies. The Basel Action Network estimates that over 350.000 metric tons of e-waste are shipped every year illegally from the EU and UK to developing countries. The right to repair might reduce this amount as Europeans repair more of their electronic goods within the EU. However, even as countries are allowed to apply tax breaks or other measures to support repair, wages in Europe are so high, and new products often so cheap in comparison to repair that it is highly likely that a great amount of e-waste will still be generated and shipped outside Europe. In the destination countries the "right to repair" may still unfold its advantages, with fostering repair over recycling activities that aim to just recover resources and that are often harmful for health and environment. E-waste hot spots in Africa, such as Accra in Ghana, already have a thriving second-hand market and network of repair shops in place, which could be built upon. This does not only reduce the highly hazardous recycling work, but also increases the supply of affordable electronic goods. These, in turn, can have a positive effect on development: for example, alleviating time poverty and increasing labour market participation for women as household appliances free them from time consuming household labour. Another positive effect is the access to affordable second-hand laptops. Already today many university students in Ghana use second-hand laptops. This positive effect would be further improved by the right for updating old software that is part of the "right to repair". However, these positive effects can only unfold fully if the craftsmen in developing and emerging countries have access to the information and spare parts as foreseen for the EU.

Short summary: The Sustainable Products Initiative and the 'right to repair' are likely to unfold positive impacts on developing and emerging countries that import e-waste from the EU, as the initiatives should help reduce recycling activities that aim to recover the resources from e-waste in ways harmful to health and the environment and instead increase the repair of products.

[152] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe, p. 7.

[153] European Union 2019. COMMISSION REGULATION (EU) 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays pursuant to Directive 2009/125/EC of the European Parliament and of the Council, amending Commission Regulation (EC) No 1275/2008 and repealing Commission Regulation (EC) No 642/2009.

Waste reduction targets for specific waste streams and waste shipment regulation

In line with the Circular Economy Action Plan the EU plans to elaborate new waste reduction targets for specific waste streams in the context of a revision of Directive 2008/98/EC.[154] The waste streams were not specified in the Circular Economy Action Plan. However, the European Commission tendered a report to review the Waste Framework Directive. The report should analyse the current waste prevention measures, but also recommend waste reduction targets for municipal waste, textile waste, End-of-Life Vehicles, Waste from Electrical and Electronic Equipment (WEEE), rubber waste, construction and demolition waste, and total waste. According to the original timeline the study was planned to be published in November 2021, but at the time of writing of this study (April 2022) the study is not available yet. January and February 2022 the EC opened a call for evidence for an impact assessment of waste management that shall support the revision of the waste framework directive. The call for feedback did not mention the wastes listed as above but mentioned the difficulties in the management of household wastes. Other product categories mentioned were textiles and waste oils. The EC plans to draft an impact assessment report till the end of 2022.[155] So, while these regulations will most likely develop an impact on developing and emerging countries in the next years (*see chapter 3 on reduction of waste streams*), for now there is not sufficient information available yet to substantiate any potential impact claims.

The announced revision on waste shipment regulation is of similar, if not of even greater relevance for the waste streams to developing and emerging countries.[156] The European Commission estimates that up to 30 % of waste shipments might be illegal, amounting to EUR 9.5 billion annual revenues from the illicit waste trading.[157] According to the Circular Economy Action Plan the revision should facilitate preparation for re-use and recycling of waste in the EU and restrict exports of waste that have harmful environmental and health impacts in third countries or can be treated domestically within the EU.[158] The proposal for a revision of the regulation on waste shipments published by the Commission in November 2021, may significantly alter the waste streams reaching developing and emerging economies. Under the new rules waste exports to non-OECD countries will be restricted and "*only allowed if third countries are willing to receive certain wastes and are able to manage them sustainably*". Furthermore, EU companies should ensure waste treatment facilities in the destination countries are subject to an independent audit, and electronic exchange of documentation shall be introduced.[159] The new regulation should divert waste shipments from non-OECD countries to OECD countries, but the formulation leaves room to manoeuvre and as waste shipments to non-OECD countries are not banned, as some environmental actors would have preferred, it is a lot less easy to monitor. [160] This is problematic considering the high volume of illicit trading in

[154] European Commission 2021a. Circular Economy Action Plan. Annex.

[155] European Commission 2022b. Call for Evidence for an Impact Assessment. Ref.Ares(2022)577247 – 25/02/2022. Available for download here: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13225-Environmental-impact-of-waste-management-revision-of-EU-waste-framework_en.

[156] Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste, OJ L 190, 12.7.2006.

[157] European Commission 2021a. Questions and Answers on new EU rules on waste shipments. Link: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_5918.

[158] European Commission 2020a. Circular Economy Action Plan – For a cleaner and more competitive Europe. URL: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf, p. 15.

[159] European Commission 2021b. European Green Deal: Commission adopts new proposals to stop deforestation, innovate sustainable waste management and make soils healthy for people, nature and climate. Link: https://ec.europa.eu/commission/presscorner/detail/en/ip_21_5916.

[160] EEB 2021. EU Waste Shipment Regulation falls short of fixing Europe's waste export crisis. Link: https://eeb.org/eu-waste-shipment-regulation-falls-short-of-fixing-europes-waste-export-crisis/.

the past. With the change of waste shipment rules some market actors fear that severe restrictions of scrap metal exports to non-OECD countries may be likely and warn of dramatic consequences for trade flows. Other experts consider a complete ban unlikely, reasoning either that they don't believe the EU to push through with the regulation as they want to export their low quality scrap or reasoning from an environmental viewpoint that clean scrap metal should not be classified as waste.[161] The way the new waste shipment regulation will be implemented and monitored will impact waste importing developing and emerging countries.

Short summary: The revision of the Waste Shipment Regulation aims to ensure that the EU does "not export its waste challenges"[162] and should divert waste streams away from non-OECD countries. However, as waste streams to non-OECD countries are not banned and EU regulations in the waste sector have been very difficult to enforce in the past, the actual effect on waste streams needs to be monitored closely.

5. Summary: Circular economy opportunities for developing and emerging countries

The push to a circular economy in richer countries does not only involve risks for the developing and emerging countries, but also offers opportunities. The European Commission points out that developing and emerging countries face the same challenges as more developed economies; improving the environmental and social sustainability of their economies and mitigating the economic and social costs of further environmental degradation.[163] At the same time, developing and emerging countries face these challenges with less financial or institutional resources to overcome them. The EU can assist them in capitalising on the opportunities.

Developing and emerging countries are already global centers of production and in the future will also become the global key drivers of consumption.[164] Their strong and large informal sectors are familiar with 'circular' activities (e.g., repairing phones) and could take on supply chains with higher value, if the actors of the informal sector receive sufficient support, e.g. in the form of trainings. Analysis of EU-African cooperation on circular economy has shown that there are national efforts in African countries, but that they often have a strong focus on the waste sector, energy reduction, material and water consumption and the use of secondary raw materials. The EU could support partner countries in the development of coherent circular economy roadmaps and policies that also include strategic support for circular economy business models, e.g. in the refurbish and remanufacturing sector[165] but also with regards to

[161] Fastmarkets MB. BIR 2021: EU could announce scrap metal export ban by December despite industry protests. Link: https://www.metalbulletin.com/Article/4013559/BIR-2021-EU-could-announce-scrap-metal-export-ban-by-December-despite-industry-protests.html. It should be added that other European actors, such as Eurometaux, the association of non-ferrous metals industry in Europe, would welcome such a step, as it criticizes that European metals recyclers must compete with international recyclers that are not bound by the same strict standards, which leads to the export of valuable resources from Europe with negative environmental effects. See: https://eurometaux.eu/blog/wasted-metal-what-happens-to-europe-s-scrap/.

[162] European Commission 2021a.

[163] European Commission 2020e. Leading the way to a global circular economy: state of play and outlook, p. 20. Link: https://op.europa.eu/en/publication-detail/-/publication/31079d7e-3a96-11eb-b27b-01aa75ed71a1.

[164] Preston, Felix et al 2019. An Inclusive Circular Economy – Priorities for Developing Countries, p. 3. Link: https://www.chathamhouse.org/2019/05/inclusive-circular-economy.

[165] Rademaekers, K. et al. (2020) Circular economy in the Africa-EU cooperation – Continental report. Continental report under EC Contract ENV.F.2./ETU/2018/004 Project: "Circular Economy in Africa-Eu

businesses that provide products as a service. In addition, sufficient investment could allow developing and emerging countries to 'leapfrog' and integrate sustainable production and consumption into their economies through digital and materials innovation.[166] The International Resource Panel has projected that especially low- and middle-income countries can benefit from ambitious resource policies,[167] if they establish a broad set of measures by government, business and households to improve resource efficiency, decouple economic growth from environmental degradation and promote sustainable production and consumption. Economic growth would increase on average by 11 %, while also leading to 47 billion tons of lower annual global resource extraction by 2060.[168]

The EU can support developing and emerging countries to achieve such a scenario, while also reaching their own goals. The Circular Economy Action Plan 2020 underlines that the EU cannot realise the ambition of the European Green Deal alone and confirms it will continue to take the lead to promote the circular economy at the global level.[169] With regards to developing countries, Chatham House recommends three general strings of action: aligning the circular economy with existing policy priorities in developing countries, investing in the fundamentals to support the transition to the circular economy in developing countries, and supporting an inclusive global circular economy agenda that promotes partnership and collaboration.[170] The EU already implements a variety of actions promoting the circular economy abroad, including through building a strong partnership with Africa, ensuring that Free Trade Agreements reflect circular-economy objectives, and organising Circular Economy Missions.[171]

In this paper we have shed some light on key areas via which developing and emerging countries could be specifically affected by a global shift to a circular economy: trade in raw materials, a shift to biobased products, a reduction in waste exports and technology and knowledge transfer. Regarding the latter, we focussed on the sharing economy. As for the trade in raw materials, a dramatic reduction in raw materials demand due to increased circularity seems unlikely at the current standpoint. Going circular does not happen overnight and projections for raw material demand growth in the coming decades are so high that an increase in circularity seems more likely to merely cushion the demand and a related price increase. Developing countries which export raw materials are, therefore, unlikely to be at risk of rapidly losing their market opportunities. At the same time, the cushioning effect could help the importers among the developing and emerging countries to buy the raw materials they need for their economic development. However, this outlook is only a snapshot. As demand and prices for raw materials are soaring, especially for technologies such as e-vehicles, much research and work is dedicated to substitute certain raw materials. These developments should be followed closely by actors in development cooperation, especially if they concern a raw material where supply is concentrated and the exporting country relies strongly on the respective export for its GDP. One example where such a collapse in demand is at least thinkable is cobalt, as the development of a cobalt-free battery has made great advances in the past years.

A development that offers a trade opportunity on the one hand, and the risk of environmental degradation and negative social effects on the other hand, is a shift to biobased products.

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cooperation", Trinomics B.V., Tomorrow Matters Now Ltd., adelphi Consult GmbH and Cambridge Econometrics Ltd.

[166] Ibid., p. 2.

[167] IRP 2019. Global Resources Outlook 2019, pp. 127-128. In the so-called 'Towards Sustainability Scenario' (compared to the 'Historical Trends' baseline scenario), economic growth for low- and middle-income countries would increase on average by 11 %, compared to 4 % for high-income nations.

[168] Ibid., p. 127 and p. 102.

[169] European Commission (n.d.). Circular Economy Global. Link: https://ec.europa.eu/environment/international_issues/circular_economy_global_en.htm.

[170] Preston, Felix et al 2019. An Inclusive Circular Economy – Priorities for Developing Countries, p. 4.

[171] European Commission (n.d.). Circular Economy Global.

Richer countries with ambitious circular economy policies aim to substitute a lot of their demand for abiotic materials with biotic materials. The highly advanced Dutch circular economy programme represents this development. As these countries will not be able to grow the biomass they need, a strong increase in demand for biomass from developing and emerging countries can be expected. While this offers trading opportunities, it is highly likely to lead to environmental burden shifting, especially land use changes and biodiversity loss in developing and emerging countries.

A reduction in waste exports, as planned in the context of the European Green Deal, can mean a significant loss of income for developing and emerging countries, if the waste is of high value, i.e. can be recycled into a highly demanded raw material, such as steel, or a new product, such as packaging from paper waste. Waste materials that are of low quality and value (e.g. not well separated or contaminated) cannot be recycled economically and produce more environmental, health and social burden in the importing countries. The revised European Waste Shipment Regulation aims to reduce waste streams to non-OECD countries, but enforcement of waste regulation has been difficult in the past. E-waste streams will be impacted by the 'Sustainable Products Initiative' of the EU and the 'right to repair'. The Sustainable Product Initiative will widen the scope from a focus on energy-efficiency to making products more durable, reusable, repairable and recyclable. It contains concrete rules for producers to make spare parts and instruction manuals available. Especially developing and emerging countries that have already a repair economy in place can benefit from these changes, as appliances that reach them should be more repairable, thus increasing value added and reducing the amount of waste that is recycled under harmful conditions for valuable raw materials. Actors of development cooperation could support developing and emerging countries by ensuring that the local repair economy has access to the same advantages as European craftsmen. Other opportunities include the set-up of training programmes for craftsmen or possibly even the establishment of a trade of refurbished products back to the EU.

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