

# A Wider Circle? The Circular Economy in Developing Countries

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## Summary

- There is growing optimism about the potential of the ‘circular economy’ (CE) as a new model for sustainable growth in developing countries. A CE is one in which products are recycled, repaired or reused rather than thrown away, and in which waste from one process becomes an input into other processes. In recent months there has been CE-related activity in countries as diverse as Laos, Rwanda and Colombia.
- A CE strategy could help lower-income countries ‘leapfrog’ to a more sustainable development pathway that avoids locking in resource-intensive practices and infrastructure. But a stronger evidence base is needed to show how the agenda can deliver opportunities for industrialization, as well as addressing environmental insecurity.
- Lower-income countries are in many ways more ‘circular’ than their developed-economy counterparts – the question is how to turn this into a development opportunity. Much economic activity in lower-income countries revolves around sorting and reusing waste. However, higher-value, employment-generating opportunities for reuse and remanufacturing are yet to be captured.
- The existence of circular activities in developing countries provides excellent political ‘entry points’, which could enable governments, the private sector, civil society and other actors to promote innovative economic models. The CE could provide a powerful narrative, helping to build momentum around a set of ideas that can be applied in and tailored to multiple sectors or cities.
- There is a window of opportunity in which to align the efforts of development organizations and partner countries. Donors are exploring how the agenda should be aligned with the Sustainable Development Goals (SDGs) and the Paris Climate Agreement. Wider international cooperation on the CE could involve trade partnerships, regional hubs or pilot zones.

*Developing countries are facing a growing waste crisis, which has major consequences for environmental and health outcomes*

### Introduction

In recent months the concept of the ‘circular economy’ (CE) has been gaining traction with the international development community. Governments in Rwanda, Nigeria and South Africa, for instance, are working with the World Economic Forum and the EU, and have recently launched the African Alliance on Circular Economy.<sup>1</sup> Multilateral development banks (MDBs) are exploring the potential of CE approaches with Colombia and Turkey.<sup>2</sup> The Indian Resource Panel (InRP), an advisory body on natural resource use, recently unveiled an action agenda on resource efficiency highlighting the CE.<sup>3</sup>

This reflects increasing optimism about the potential for the CE to help lower-income countries ‘leapfrog’ to more sustainable development pathways. A CE is one in which products are recycled, repaired or reused rather than thrown away, and in which waste from one industrial process becomes a valuable input into other industrial processes. Both the EU and China already have major legislative frameworks focused on the CE. Three-quarters of China’s top industrial parks, for example, must implement CE practices under the government’s current five-year plan.<sup>4</sup>

Better management of natural resources is a key component of poverty eradication, climate change mitigation and resilient economic growth. Natural resource management is directly tied to at least 12 of the 17 Sustainable Development Goals (SDGs), according to the International Resource Panel.<sup>5</sup> Meeting commitments under the Paris Climate Agreement will also be impossible without renewed emphasis on natural resources. More efficient practices could cut greenhouse gas emissions by 60 per cent by 2050.<sup>6</sup>

In addition, developing countries are facing a growing waste crisis, which has major consequences for environmental and health outcomes. It is projected that dumpsites will account for 8–10 per cent of global greenhouse gas emissions by 2025.<sup>7</sup> A recent *Lancet* report estimated that 6–16 million people per year are exposed to

<sup>1</sup> Kilian, A. (2017), ‘South Africa starting to embrace a circular economy’, *Creamer Media’s Engineering News*, 4 May 2017, <http://www.engineeringnews.co.za/article/south-africa-starting-to-embrace-a-circular-economy-2017-05-04> (accessed 23 Oct. 2017); Circular Economy Club (2017), ‘PAST: EU Dialogue on Sustainability Transition: the Role of Circular Economy – South Africa’, 4 May 2017, <https://www.circulareconomyclub.com/eu-dialogue-sustainability-transition-role-circular-economy-south-africa-4-may-2017/> (accessed 23 Oct. 2017); Department of Environmental Affairs Republic of South Africa (2017), ‘Minister Molewa’s speech during launch of Africa Alliance on Circular Economy’, 16 November 2017, [https://www.environment.gov.za/speech/molewa\\_cop23africaalliance\\_circular\\_economylaunch](https://www.environment.gov.za/speech/molewa_cop23africaalliance_circular_economylaunch) (accessed 17 Nov. 2017).

<sup>2</sup> Rosca, O. (2015), ‘EBRD to promote innovative waste recycling projects in Turkey’, European Bank for Reconstruction and Development, 22 July 2015, <http://www.ebrd.com/news/2015/ebd-to-promote-innovative-waste-recycling-projects-in-turkey-.html> (accessed 23 Oct. 2017).

<sup>3</sup> Although the boundaries between the CE and resource efficiency are sometimes unclear, the CE is often differentiated on the basis that it has more of an emphasis on innovation and competition than on resource efficiency. The CE concept goes beyond resource efficiency, bringing together familiar principles such as reuse, recycling and remanufacturing with more novel approaches such as the development of new business models and design standards for products to encourage repair, durability and reuse.

<sup>4</sup> National Development and Reform Commission (2016), *The 13th Five-Year Plan for Economic and Social Development of the People’s Republic of China (2016–2020)*, <http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf> (accessed 11 Sep. 2017).

<sup>5</sup> Ekins, P. and Hughes, N. (2017), *Resource Efficiency: Potential and Economic Implications*, UN Environment Programme, <https://europa.eu/capacity4dev/unep/documents/resource-efficiency-potential-and-economic-implications> (accessed 19 Oct. 2017).

<sup>6</sup> Ibid.

<sup>7</sup> Mavropoulos, A. (2015), *Wasted Health: The Tragic Case of Dumpsites*, International Solid Waste Association, June 2015, [https://www.iswa.org/fileadmin/galleries/Task\\_Forces/THE\\_TRAGIC\\_CASE\\_OF\\_DUMPSITES.pdf](https://www.iswa.org/fileadmin/galleries/Task_Forces/THE_TRAGIC_CASE_OF_DUMPSITES.pdf) (accessed 26 Oct. 2017).

dangerous concentrations of lead at battery recycling sites.<sup>8</sup> Each year an estimated 270,000 people die prematurely due to the open burning of waste.<sup>9</sup> These figures illustrate the urgency of finding new ways to meet development goals while reducing resource consumption.

To warrant the attention of leaders in developing countries, CE advocates will need to demonstrate how circular approaches can unlock new opportunities for industrialization and accelerate efforts to create solutions to other critical development challenges, such as the expansion of access to energy. The African Development Bank, for instance, is examining how the CE can support the industrial development pillar of its strategy.<sup>10</sup> In collaboration with UN Development Programme (UNDP), the government of Laos is exploring how CE strategies can be used to support local industries.<sup>11</sup>

Although developing countries are often more ‘circular’ than wealthier countries – in the sense that few things left on the street are not retrieved for recycling or repairs – this is largely out of economic necessity. A key question is how the CE will affect people employed in informal sectors who play significant roles in waste-management processes; whether or how to ‘formalize’ such jobs is a well-known development challenge.<sup>12</sup> Looking to the future, developing countries also need to address rapidly rising consumption among the middle classes.

Developing countries are also closely watching CE-related policymaking in wealthier countries, as new policies could significantly affect trade. For instance, the EU Circular Economy Action Plan is likely to reduce exports of electronic and plastics waste and scrap metal from the EU to developing countries. It is also likely to undermine import demand within the EU for raw and processed materials from developing countries.<sup>13</sup> Similarly, China’s proposed ban on 24 types of secondary material, set to come into force on 1 January 2018, will have a profound impact on the ability of its trade partners to meet their recycling targets.<sup>14</sup>

There is a limited window of opportunity in which to shape the emerging CE agenda and align it with SDG implementation (see Appendix 1 for an initial mapping of CE approaches against the SDGs). Many international organizations, donors and MDBs

*China’s proposed ban on 24 types of secondary material will have a profound impact on the ability of its trade partners to meet their recycling targets*

<sup>8</sup> Estimating the health impacts of poor waste management is complicated. Looking simply at pollution more broadly, and defining this as leakage into the natural environment from the mismanagement of waste and industrial processes, one ends up with a much larger figure. The *Lancet* commission on pollution finds that pollution kills at least 9 million people each year. *The Lancet* (2017), ‘The Lancet Commission on pollution and health’, 19 October 2017, <http://www.thelancet.com/commissions/pollution-and-health> (accessed 26 Oct. 2017).

<sup>9</sup> Kodros, J. K., Wiedinmyer, C., Ford, B., Cucinotta, R., Gan, R., Magzamen, S. and Pierce, J. R. (2016), ‘Global burden of mortalities due to chronic exposure to ambient PM<sub>2.5</sub> from open combustion of domestic waste’, *Environmental Research Letters*, 11 (12): pp. 1–9, doi: 10.1088/1748-9326/11/12/124022 (accessed 17 Nov. 2017).

<sup>10</sup> African Development Bank Group (2013), *At the Center of Africa’s Transformation: Strategy for 2013–2022*, [https://www.afdb.org/fileadmin/uploads/afdb/Documents/Policy-Documents/AfDB\\_Strategy\\_for\\_2013%E2%80%932022\\_-\\_At\\_the\\_Center\\_of\\_Africa%E2%80%99s\\_Transformation.pdf](https://www.afdb.org/fileadmin/uploads/afdb/Documents/Policy-Documents/AfDB_Strategy_for_2013%E2%80%932022_-_At_the_Center_of_Africa%E2%80%99s_Transformation.pdf) (accessed 23 Oct. 2017).

<sup>11</sup> Ministry of Energy and Mines Lao PDR and UNDP (2017), *Circular economy strategies for Lao PDR: A metabolic approach to redefine resource efficient and low-carbon development*, <http://www.undp.org/content/undp/en/home/librarypage/climate-and-disaster-resilience/circular-economy-strategies-for-lao-pdr.html> (accessed 23 Oct. 2017).

<sup>12</sup> Gower, R. and Schroeder, P. (2016), *Virtuous Circle: How the circular economy can create jobs and save lives in low and middle-income countries*, London: Tearfund, [http://www.tearfund.org/~/media/files/tilz/circular\\_economy/2016-tearfund-virtuous-circle.pdf](http://www.tearfund.org/~/media/files/tilz/circular_economy/2016-tearfund-virtuous-circle.pdf) (accessed 23 Oct. 2017); Ellen MacArthur Foundation (2016), *Circular Economy in India: Rethinking growth for long-term prosperity*, <http://www.ellenmacarthurfoundation.org/publications/> (accessed 23 Oct. 2017).

<sup>13</sup> De Jong, S., Van der Gaast, M., Kraak, J., Bergema, R. and Usanov, A. (2016), *The Circular Economy and Developing Countries: A data analysis of the impact of a circular economy on resource-dependent developing nations*, COE Resources Issue Brief 3, [https://hcss.nl/sites/default/files/files/reports/CEO\\_The%20Circular%20Economy.pdf](https://hcss.nl/sites/default/files/files/reports/CEO_The%20Circular%20Economy.pdf) (accessed 1 Nov. 2017).

<sup>14</sup> Cole, R. (2017), ‘China Ban on Plastic and Paper Imports Raises Urgent UK Quality Questions’, *Resource*, 19 July 2017, <http://resource.co/article/china-ban-plastic-and-paper-imports-raises-urgent-uk-quality-questions-11987> (accessed 17 Nov. 2017).

are already discussing the CE as a potential new framework or focus area. So far, there are interesting projects but few detailed strategies, so opportunities for greater alignment are significant. Meanwhile, businesses are looking closely at the opportunities that the CE presents in terms of enhanced resilience and value creation – the types of firms exploring these areas are varied, ranging from major corporates with global supply chains to small businesses introducing innovative waste-management practices in cities.

### About this briefing

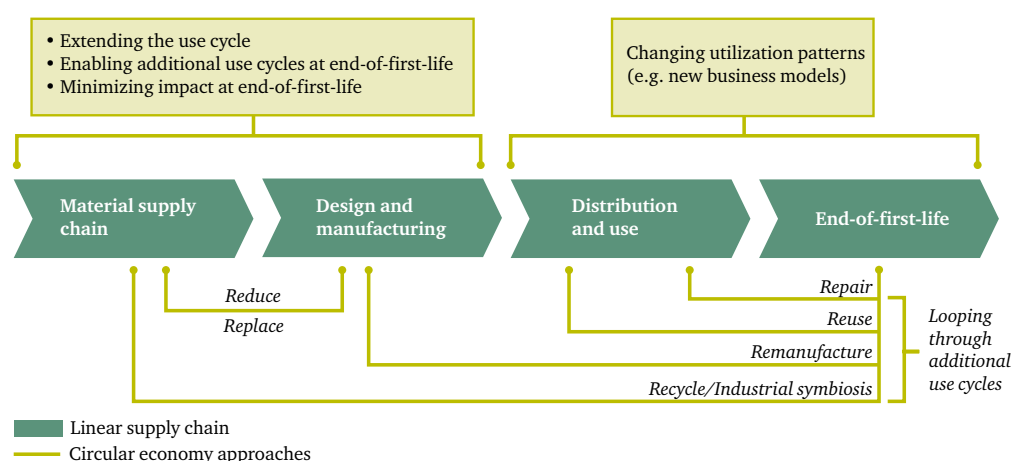
This briefing sets out some of the key issues and questions around the CE for decision-makers, drawing on more than 30 semi-structured interviews conducted by the authors between May and August 2017. The interviews targeted stakeholders in governments, development agencies, donor organizations, international organizations, MDBs and development finance institutions. We assessed levels of awareness of the CE inside each organization and among its partners, and explored where stakeholders perceive specific opportunities and challenges to lie.

### The circular economy

The basic idea of the CE is to shift from a system in which resources are extracted, turned into products and finally discarded towards one in which resources are maintained at their highest value possible. This might involve reusing and repairing products, or recovering their component materials at the end of each product's life for repurposing into new goods or for new uses. Equally, the CE might mean restructuring an industrial or agricultural system so that waste from one process becomes the feedstock for another, or replacing non-renewable materials with renewable and biological materials. Overall, CE approaches could significantly reduce the need for extraction of primary resources and use of energy inputs.

Figure 1 identifies different types of activities that fit within a CE, and indicates the point in the value chain at which each activity plays a role. Innovations can occur all the way from the material input stage to the 'end-of-first-life' stage.

**Figure 1: Circular economy activities**



Source: Authors' own analysis adapted from a diagram by InnovateUK.



*A recent study focused on the US finds that \$2 trillion in annual US revenues could be generated by shifting to circular manufacturing*

The scale of the economic opportunity is highlighted in recent studies focused on OECD countries. A McKinsey analysis for the Ellen MacArthur Foundation found material cost savings worth up to \$630 billion per year by 2025 in EU manufacturing sectors.<sup>15</sup> Accenture has identified a \$4.5 trillion global opportunity before 2030 through avoiding waste, making businesses more efficient and creating new employment opportunities.<sup>16</sup> A recent study focused on the US finds that \$2 trillion in annual US revenues could be generated by shifting to circular manufacturing.<sup>17</sup> The Ellen MacArthur Foundation also finds that opportunities in India amount to \$218 billion per year by 2030.<sup>18</sup>

Advances in digital technology constitute important enablers for CE business models.<sup>19</sup> With affordable ‘asset-tracking’ technology and predictive analytics, for example, it is possible to optimize when products should be repaired, upgraded or recycled. Using digital platforms to manage product-sharing between consumers increases the ‘utilization rate’ of each product, and also tends to decrease the total number of products needed. Companies leasing products to consumers – through what are known as ‘product as a service’ models – also have an incentive to make these products more durable and easy to repair.<sup>20</sup>

In a bid to capitalize on such opportunities, public- and private-sector decision-makers around the world have set out policies on the CE (see Figure 2), though these vary in how they refer to the CE and in their approaches.<sup>21</sup> The British Standards Institution has set out BS 8001 as the first standard for implementing the principles of the CE in organizations.<sup>22</sup> At the government level, the EU, Japan and China have all developed ambitious CE strategies.<sup>23</sup> Perhaps the most important of these is the new EU Circular Economy Action Plan.<sup>24</sup> Although progress on implementation has so far been slow,<sup>25</sup> the action plan could eventually affect not only waste-management policy but also product design standards and extended producer responsibility. This will have potentially large knock-on effects for the EU’s trading partners.<sup>26</sup>

<sup>15</sup> Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015), *Growth Within: A Circular Economy Vision for a Competitive Europe*, <https://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/europes-circular-economy-opportunity> (accessed 1 Nov. 2017).

<sup>16</sup> Lacy, P. and Rutqvist, J. (2015), *Waste to Wealth: Creating advantage in a circular economy*, New York: Palgrave Macmillan.

<sup>17</sup> Closed Loop Partners (2017), *Capital Landscape for Investment in Circular Supply Chains*, September 2017, [http://www.closedlooppartners.com/wp-content/uploads/2017/10/Investing-In-Circular-Supply-Chains-Capital-Landscape\\_FINAL-PUBLIC-1.pdf](http://www.closedlooppartners.com/wp-content/uploads/2017/10/Investing-In-Circular-Supply-Chains-Capital-Landscape_FINAL-PUBLIC-1.pdf) (accessed 17 Nov. 2017).

<sup>18</sup> Ellen MacArthur Foundation (2016), *Circular Economy in India: Rethinking growth for long-term prosperity* (accessed 10 May 2017).

<sup>19</sup> Ellen MacArthur Foundation (2016), *Intelligent Assets: Unlocking the Circular Economy Potential*, [https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation\\_Intelligent\\_Assets\\_080216-AUDIO-E.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Intelligent_Assets_080216-AUDIO-E.pdf) (accessed 23 Oct. 2017).

<sup>20</sup> Lacy and Rutqvist (2015), *Waste to Wealth: Creating advantage in a circular economy*.

<sup>21</sup> Kirchherr, J., Reike, D. and Hekkert, M. (2017), ‘Conceptualizing the circular economy: An analysis of 114 definitions’, *Resources, Conservation and Recycling*, 127: pp. 221–32, doi: 10.1016/j.resconrec.2017.09.005 (accessed 20 Nov. 2017).

<sup>22</sup> British Standards Institution (2017), ‘The rise of the circular economy’, <https://www.bsigroup.com/en-GB/standards/benefits-of-using-standards/becoming-more-sustainable-with-standards/Circular-Economy/> (accessed 20 Nov. 2017).

<sup>23</sup> The EU passed a major package on the CE in late 2015. China has identified 10 CE priorities in its 13th Five-Year Plan (2016–20). Japan passed its Law for the Promotion of Effective Utilization of Resources in 1991.

<sup>24</sup> European Commission (2015), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*, 12 December 2015, <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015DC0614> (accessed 11 Mar. 2017).

<sup>25</sup> Wijkman, A. and Bastioli, C. (2017), ‘Squaring the circle of plastics recycling’, EURACTIV, 27 September 2017, <https://www.euractiv.com/section/circular-economy/opinion/squaring-the-circle-of-plastics-recycling/> (accessed 10 Oct. 2017).

<sup>26</sup> Wilson, S., Benton, D., Branmayr, C. and Hazell, J. (2017), *How will Europe’s Ecodesign Measures affect the circular economy in low-income countries?*, London: Tearfund, [http://www.green-alliance.org.uk/resources/Europe\\_Ecodesign\\_Affect\\_Circular\\_Economy\\_Low\\_Income\\_Countries.pdf](http://www.green-alliance.org.uk/resources/Europe_Ecodesign_Affect_Circular_Economy_Low_Income_Countries.pdf) (accessed 23 Oct. 2017).

**Figure 2: Circular economy activity around the world**



Sources: Authors' own analysis, multiple sources.

*If developing countries were expected to simply follow in the footsteps of developed economies, the CE would be decades away*

Despite this growing momentum, many barriers stand in the way of businesses seeking to capture the value found in modelling exercises. Developed economies, in particular, are locked into existing resource-intensive industrial systems and infrastructure. For larger businesses, a lack of consumer awareness of the CE concept is one reason for caution when investing in new product lines, but perhaps the greatest challenge is how to introduce new business models without undermining existing revenue streams. Potentially disruptive smaller firms, meanwhile, often lack access to the necessary data, logistics and knowledge to make a breakthrough.

Consequently, even in countries with high rates of traditional recycling, such as Germany or the Netherlands, there is some way to go before a CE takes shape.<sup>27</sup> If developing countries were expected to simply follow in the footsteps of developed economies, the CE would be decades away. Fortunately, this is an agenda on which developing countries can forge their own paths, supported through cooperation with others.

## Developing countries

Developing countries are all too familiar with the sustainability challenges associated with urbanization and industrialization – challenges that include pollution, water scarcity and soaring volumes of waste. In the absence of new approaches, these stresses will only increase alongside population and economic growth, and will be exacerbated by climate change. A study by the Indian Council for Research on International Economic Relations found that economic progress

<sup>27</sup> De Jong, Van der Gaast, Kraak, Bergema and Usanov (2016), *The Circular Economy and Developing Countries*.

is slower in cities that are not growing in a ‘compact’ way.<sup>28</sup> These cities face severe natural resource pressures, infrastructure deficits and mounting pollution crises.

New development models that support economic and social objectives at the same time as avoiding these significant risks to development are therefore needed. The CE could help to resolve this dilemma by increasing economic productivity, generating employment and reducing exposure to volatility in raw materials prices. At the same time, CE strategies could avert some of the major pressures facing developing countries – including health and environmental effects from unmanaged waste – with clear benefits in terms of lives saved as a result of reduced air, water and soil pollution.<sup>29</sup>

Until recently, however, the CE has been seen as a rich-country agenda. Few studies have explored the demand for CE approaches among stakeholders in poorer countries, or have sought to understand where the concept might complement or conflict with existing priorities.<sup>30</sup> A critical next step is the development of a more robust evidence base that moves beyond the current emphasis on case studies – and that recognizes trade-offs and risks as well as potential upsides.

Technology- and capital-intensive approaches, or approaches that require a strong policy signal and institutional capacity for implementation, may be more difficult to achieve in developing countries. But in some key areas, such as e-commerce and off-grid renewable energy, there are many examples of developing countries leading, rather than following, developed countries. And since many sectors are already undergoing profound disruption,<sup>31</sup> CE approaches, such as those explored in Table 1, could be integrated within existing reform agendas.

### A competitive advantage?

*The presence of widespread existing practices and skills raises an important question: could developing countries have a competitive advantage in some areas of the CE?*

Today, lower- and middle-income economies are in many ways more ‘circular’ than their counterparts in the developed world. A higher share of economic activity revolves around repairing and reusing or sorting waste. In some cases this may be down to different mindsets or norms around recycling, but the evidence base for this is often weak. More ‘circular’ behaviour is often born out of economic necessity, while higher-value opportunities for reuse and remanufacturing are relatively rare.

Nevertheless, the presence of widespread existing practices and skills raises an important question: could developing countries have a competitive advantage in some areas of the CE? One example is the practice of reusing and recycling textiles: currently this is more economically viable where there is an abundance of low-cost labour, as is the case in many developing countries.<sup>32</sup> Making the shift towards a CE might also be more ‘intuitive’ in developing countries, in the sense that it may require less of a change in behaviour than in many advanced economies.

<sup>28</sup> Twari, M., Godfrey, N. et al. (2016), *Better Cities, Better Growth: India's Urban Opportunity*, London, Washington, DC and New Delhi: New Climate Economy, World Resources Institute and Indian Council for Research on International Economic Relations, <http://newclimateeconomy.report/workingpapers> (accessed 12 May 2017).

<sup>29</sup> Suez (forthcoming), *Towards a waste crisis in emerging countries: impacts and solutions*, briefing paper.

<sup>30</sup> Two notable exceptions include Gower and Schroeder (2016), *Virtuous Circle: How the circular economy can create jobs and save lives in low and middle-income countries*; Ellen MacArthur Foundation (2016), *Circular Economy in India: Rethinking growth for long-term prosperity* (accessed 23 Oct. 2017).

<sup>31</sup> Workshop participant, Kolkata Workshop, Jadavpur University, 25 July 2017.

<sup>32</sup> Morley, N. J., Bartlett, C. and McGill, I. (2009), *Maximising Reuse and Recycling of UK Clothing and Textiles: A report to the Department for Environment, Food and Rural Affairs*, London: Queen's Printer and Controller of HMSO 2007, Oakdene Hollins Ltd.

Such a shift is all the more urgent in the developing world given that the traditional path to industrialization and development – gradually moving from labour-intensive, lower-value manufacturing to higher-value-added technology and service sectors – is under threat from automation and advanced manufacturing techniques. A significant upside for CE approaches is that it will be a long time before tasks such as disassembly, repairs and remanufacturing can be widely performed by robots.<sup>33</sup>

**Table 1: Examples of circular economy approaches in developing countries**

	<b>Shelter</b>	<b>Mobility</b>	<b>Food</b>	<b>Waste</b>
<i>Extending the use cycle</i>	El Salvador – a housing NGO partnered with the government to use more durable earthquake-resistant building technologies in social housing. <sup>i</sup>	India's Tata Steel set up an Advanced Materials Research Centre along with the Indian Institute of Technology to develop lightweight, high-strength materials for automobiles. <sup>ii</sup>	Vietnam's government is working with the World Bank on a supply chain for frozen food, to reduce losses and improve food quality. <sup>iii</sup>	In Nigeria, about 70 per cent of all imported e-waste is functional – it is now sold to consumers after testing. <sup>iv</sup>
<i>Enabling additional use cycles</i>	Modular construction is being used for low-cost housing solutions in New Delhi, enabling more efficient disassembly at product end of life. <sup>v</sup>	In Brazil, a number of companies are active in the market to replace car parts through the National Association of Auto Parts Remanufacturers. <sup>vi</sup>	In Nigeria, tractor sharing among smallholder farmers is being used to improve agricultural productivity. <sup>vii</sup>	In India, a new e-waste Extended Producer Responsibility system requires companies to set targets for collection and repairs. <sup>viii</sup>
<i>Minimizing impact</i>	In Vietnam, building materials from rice husks are used in Ho Chi Minh City to build more fire-resistant, heat-insulated and sound-insulated buildings. <sup>ix</sup>	Fiat cars exported to Brazil contain polyurethane seat foams with 5 per cent soy polyol. <sup>x</sup>	An entrepreneur in Indonesia is experimenting with bioplastic food packaging to reduce plastic waste in Jakarta. <sup>xi</sup>	In India, EnviGreen has created a 100 per cent organic, biodegradable and eco-friendly plastic bag. <sup>xii</sup>
<i>Changing utilization patterns</i>	In India, new digital platforms such as Airbnb and OYO are allowing users to share rooms and homes. <sup>xiii</sup>	7 million km of driving may have been cut by the introduction of UberPOOL in Bangalore and Delhi. <sup>xiv</sup>	In Tanzania, the government is working with the World Bank to develop more water-efficient practices among smallholder farmers. <sup>xv</sup>	In India, the government has passed new e-waste handling rules to divert waste away from local scrap merchants. <sup>xvi</sup>
<i>Looping an asset through additional use cycles</i>	In Haiti, debris from natural disasters has been converted into concrete building blocks to build affordable homes in Port-au-Prince. <sup>xvii</sup>	In India, trials are under way to evaluate the potential to bury shredded plastic in roads, both reducing amounts of waste sent to landfills and increasing the durability of roads. <sup>xviii</sup>	In Brazil, Procomposto, an SME start-up, provides waste collection and composting services to generators of organic waste in cities. <sup>xix</sup>	In Tanzania, BORDA, ISWA and the Dutch government have given technical and financial support to municipal governments to improve municipal waste-management processes. <sup>xx</sup>

Sources: Authors' own analysis, see Appendix 3.

<sup>33</sup> Merdan, M., Lepuschitz, W., Meurer, T. and Vincze, M. (2010), 'Towards ontology-based automated disassembly systems', IECON 2010- 36th Annual Conference on IEEE Industrial Electronics Society.



CE activities may also improve the competitiveness of export-oriented sectors in developing countries. Circular agricultural practices, such as recycling nutrients and organic matter to reduce the use of synthetic fertilizers, or practices such as crop rotation and cover cropping that minimize tilling and retain natural capital, can play an important role in building resilience while increasing yields for farmers.<sup>34</sup> Introducing resource-efficient practices has led to record rice yields in some of India's poorest regions.<sup>35</sup>

### Better jobs?

*New jobs are being created as waste streams shift or new business models emerge. In Kenya, an e-waste recycling scheme is estimated to have created over 2,000 jobs within four years of its launch*

The employment potential of circular activities, particularly around waste management, is already clear in many developing countries, although the jobs involved are largely in the informal sector. According to one paper, 0.5 per cent of urban populations are working in informal-sector recycling.<sup>36</sup> In India, 1.5 million people are involved in informal waste management.<sup>37</sup> According to various sources, Kenya's second-hand clothing market is estimated to employ anywhere between 10,000 and hundreds of thousands of people.<sup>38</sup> New jobs are also being created as waste streams shift or new business models emerge. In Kenya, an e-waste recycling scheme is estimated to have created over 2,000 jobs within four years of its launch.<sup>39</sup> In India, 30,000 new jobs have been generated by car-sharing firms in the state of Tamil Nadu.<sup>40</sup>

As CE activities are scaled up, these positive employment effects are likely to increase. The remanufacturing and repair of products tend to require more labour than does manufacturing from raw materials.<sup>41</sup> Deconstruction, a necessary prerequisite to scaling up the reuse of building materials, is typically more labour-intensive than demolition.<sup>42</sup> Resource-efficient and organic farming practices also tend to require significant labour, particularly in rural areas, and could thus help to support more balanced economic

<sup>34</sup> EIP-Agri (2015), *EIP-AGRI Workshop 'Opportunities for Agriculture and Forestry in the Circular Economy': Workshop Report 28-29 October 2015*, [https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri\\_ws\\_circular\\_economy\\_final\\_report\\_2015\\_en.pdf](https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_ws_circular_economy_final_report_2015_en.pdf) (accessed 17 Nov. 2017).

<sup>35</sup> Ellen MacArthur Foundation (2016), *Circular Economy in India: Rethinking growth for long-term prosperity* (accessed 23 Oct. 2017).

<sup>36</sup> Velis, C. (2015), 'Circular economy and global secondary material supply chains', *Waste Management & Research*, 33(5): pp. 389–91, doi: 10.1177/0734242X15587641 (accessed 1 Nov. 2017).

<sup>37</sup> WIEGO (2010), *Organizing Informal Waste Pickers: A Case Study of Bengaluru, India*, <http://www.wiego.org/sites/default/files/resources/files/Chengappa-Organizing-Informal-Waste-Pickers-India.pdf> (accessed 12 Sep. 2017).

<sup>38</sup> Crowe, P. (2014), 'The global business of secondhand clothes thrives in Kenya', Reuters, 15 October 2014, <https://www.reuters.com/article/us-kenya-textiles/the-global-business-of-secondhand-clothes-thrives-in-kenya-idUSKCN0I41DS20141015> (accessed 17 Nov. 2017); Kubania, J. (2015), 'How second-hand clothing donations are creating a dilemma for Kenya', *Guardian*, 6 July 2015, <https://www.theguardian.com/world/2015/jul/06/second-hand-clothing-donations-kenya> (accessed 17 Nov. 2017).

<sup>39</sup> Fox, N. (2014), 'Hewlett-Packard introduces large-scale e-waste recycling in Africa', *Guardian*, 15 May 2014, <https://www.theguardian.com/sustainable-business/sustainability-case-studies-hewlett-packard-ewaste-recycling-africa> (accessed 15 Oct. 2017).

<sup>40</sup> Retamal, M. and Dominish, E. (2017), *The Sharing Economy in Developing Countries*, London: Tearfund.

<sup>41</sup> Dervojeda, K., Verzijl, D. and Rouwmaat, E. (2014), *Clean Technologies: Circular supply chains*, Brussels: European Commission; UN Environment Programme and International Resource Panel (2017), *Promoting Remanufacturing, Refurbishment, Repair, and Direct Reuse*, Workshop Report, 7–8 February 2017, Brussels, [http://ec.europa.eu/environment/international\\_issues/pdf/7\\_8\\_february\\_2017/workshop\\_report\\_Brussels\\_7\\_8\\_02\\_2017.pdf](http://ec.europa.eu/environment/international_issues/pdf/7_8_february_2017/workshop_report_Brussels_7_8_02_2017.pdf) (accessed 25 Oct. 2017).

<sup>42</sup> Fraunhofer IRB (2001), *Deconstruction versus demolition*, <http://www.irbnet.de/daten/iconda/CIB1459.pdf> (accessed 25 Oct. 2017); Cooper, S., Skelton, A. C. H., Owen, A., Densley-Tingley, D. and Allwood, J. (2014), 'A multi-method approach for analysing the potential employment impacts of material efficiency', *Resources, Conservation and Recycling*, 109(2016), pp. 54–66, doi: 10.1016/j.resconrec.2015.11.014 (accessed 1 Nov. 2017).

growth.<sup>43</sup> Digital platforms for secondary products and new, more service-oriented business models could, in theory, provide opportunities to people in all segments of society, especially in 'reverse logistics'.<sup>44</sup>

But will these be better jobs? Research on employment opportunities in OECD countries suggests that there may be opportunities at a variety of skill levels. Collecting, handling and processing waste will offer low-skilled employment,<sup>45</sup> whereas remanufacturing requires a skilled workforce.<sup>46</sup> Studies investigating the quality of jobs in the sharing economy suggest that these are often jobs with fewer benefits, less security and fewer opportunities for advancement and skills development.<sup>47</sup> For the most part, it is too early to tell how this will play out in developing-country contexts.

At the same time, the CE could have negative impacts on employment in some heavy industries – politically sensitive sectors that are often important regional employers. In India, for example, the steel sector employs 230,000 people.<sup>48</sup> China is already in the process of retraining and relocating 800,000 people in its coal and steel industries, due to massive overcapacity. Although higher-value-added opportunities for products from these industries could create more jobs overall, incumbent sectors may push to delay or weaken policy frameworks for the CE. This is akin to the situation in the energy sector, where some countries have tried to hold back renewable energy for fears of the impact on existing fossil fuel generators and grid companies.

Careful approaches are also needed to avoid rapidly displacing employment in informal sectors without addressing the near-term social impacts. In India, roughly 80 per cent of waste is collected and processed by informal workers.<sup>49</sup> Each year 30,000 informal workers dismantle abandoned oil tankers for scrap metal in Bangladesh.<sup>50</sup> Ride-sharing companies such as Uber are competing with informal minibus services in cities such as Addis Ababa, Nairobi and Jakarta. Here the most exciting opportunities may lie in hybrid approaches that provide access to finance for the informal sector and only gradually introduce people into formal tax structures.<sup>51</sup>

<sup>43</sup> The labour intensity of organic farming tends to be assessed relative to mechanized agricultural systems, which are not generally in place at scale in developing countries. Nink, E. (2015), 'Study Reveals Organic Farming Is Financially Sustainable Around the World', Food Tank, 9 June 2015, <https://foodtank.com/news/2015/06/study-reveals-organic-farming-is-financially-sustainable-around-the-world/> (accessed 17 Nov. 2017); Hetemaeki, L., Hanewinkel, M., Muys, B., Ollikainen, M., Palahi, M. and Trasobares, A. (2017), 'Leading the way to a European circular bioeconomy strategy', *From Science to Policy*, 5, [http://www.efi.int/files/attachments/publications/efi\\_fstp\\_5\\_2017.pdf](http://www.efi.int/files/attachments/publications/efi_fstp_5_2017.pdf) (accessed 17 Nov. 2017).

<sup>44</sup> Reverse logistics refers to all logistical operations relating to the reuse of products and materials, i.e. any process that moves a good from its typical end-of-first-life destination to another location for reuse or proper disposal.

<sup>45</sup> Morgan, J. and Mitchell, P. (2015), *Opportunities to tackle Britain's labour market challenges through growth in the circular economy*, London: Green Alliance, [http://www.green-alliance.org.uk/resources/Opportunities%20to%20tackle%20UK%20Labour%20Market%20Challenges\\_sgl.pdf](http://www.green-alliance.org.uk/resources/Opportunities%20to%20tackle%20UK%20Labour%20Market%20Challenges_sgl.pdf) (accessed 25 Oct. 2017).

<sup>46</sup> Ibid.

<sup>47</sup> Retamal and Dominish (2017), *The Sharing Economy in Developing Countries*.

<sup>48</sup> International Labour Organization (2014), *Skills trends for green jobs in the steel industry in India*, ILO Regional Office for Asia and the Pacific, [http://www.ilo.org/asia/publications/WCMS\\_240450/lang--en/index.htm](http://www.ilo.org/asia/publications/WCMS_240450/lang--en/index.htm) (accessed 1 Nov. 2017).

<sup>49</sup> GIZ (2010), *The Waste Experts: Enabling Conditions for Informal Sector Integration in Solid Waste Management: Lessons learned from Brazil, Egypt and India*, <https://www.giz.de/en/downloads/gtz2010-waste-experts-conditions-is-integration.pdf> (accessed 1 Nov. 2017).

<sup>50</sup> Kumar, R. (2013), *Ship Dismantling: A status report on South Asia*, [http://www.shipbreakingplatform.org/shipbrea\\_wp2011/wp-content/uploads/2013/07/ship\\_dismantling\\_en.pdf](http://www.shipbreakingplatform.org/shipbrea_wp2011/wp-content/uploads/2013/07/ship_dismantling_en.pdf) (accessed 1 Nov. 2017).

<sup>51</sup> In Brazil, for example, the government has a programme encouraging formalization through waste-picker associations and cooperatives. Gower and Schroeder (2016), *Virtuous Circle: How the circular economy can create jobs and save lives in low and middle-income countries*.

### Harnessing digital disruption

Many CE ideas that have been discussed for decades are today being made possible by the digital revolution.<sup>52</sup> Mobile phones have enabled companies such as Uber and Airbnb to disrupt incumbent businesses by unlocking underutilized assets. ‘Trace and return’ processes already allow firms to track their products while in use, optimizing the timing of repairs and upgrades. Online marketplaces for waste products and materials are being piloted in several US cities.<sup>53</sup> The so-called ‘internet of things’ will bring a step-change in our ability to know where materials and products are in the economy.

Far from leaving this trend to OECD countries, companies in developing and emerging economies – such as Alibaba, Tencent and Huawei in China, or Safaricom in Kenya – are well placed to capitalize on it. The penetration of mobile payments is higher in Kenya, which also has a thriving start-up scene, than in some OECD countries.<sup>54</sup> Moreover, many companies are introducing technologies that can trace products along supply chains with end-to-end certification – including using distributed-ledger technology to help curb corruption and ensure environmental integrity.<sup>55</sup>

Balancing the benefits and downsides of digital disruption will be essential for promoting inclusive economic growth. While connectivity is spreading rapidly through lower-income countries, the ‘digital divide’ remains a major problem. Sixty per cent of the global population still has no access to the internet, and 2 billion people do not own a mobile phone.<sup>56</sup> In Africa only 12 per cent of women use or own digital technologies, versus 18 per cent of men.<sup>57</sup> Moreover, sharing-economy approaches that require beneficiaries to own physical assets such as cars or homes – or shift jobs from one part of society to another – could reinforce social inequality.

#### Box 1: Pathways to a circular and green economy

Investments made in emerging and developing economies in the next few years will shape their natural resource demand, pollution and waste-management pathways for the coming decades. A huge scaling up of infrastructure is required to provide economic opportunity and access to modern services, as envisaged within the Sustainable Development Goals (SDGs).<sup>58</sup> Yet industries essential to this process – cement, steel and energy, for example – demand significant quantities of water, land and minerals. A combination of low-carbon technology and circular systems may well be needed to deliver a more resilient, climate-friendly infrastructure roll-out.

<sup>52</sup> Ellen MacArthur Foundation (2016), *Intelligent Assets: Unlocking the Circular Economy Potential* (accessed 1 Nov. 2017).

<sup>53</sup> The Materials Marketplace (undated), ‘Join the Circular Economy’, <http://materialsmarketplace.org/united-states-materials-marketplace> (accessed 12 Sep. 2017).

<sup>54</sup> *The Economist* (2015), ‘Why does Kenya lead the world in mobile money?’, 2 March 2015, <https://www.economist.com/blogs/economist-explains/2013/05/economist-explains-18> (accessed 1 Nov. 2017).

<sup>55</sup> Abeyrayne, S. and Monfared, R. (2016), ‘Blockchain Ready Manufacturing Supply Chain Using Distributed Ledger’, *International Journal of Research in Engineering and Technology*, 5(8): pp. 1–10, doi: 10.15623/ijret.2016.0509001 (accessed 1 Nov. 2017).

<sup>56</sup> World Bank (2016), *World Development Report 2016: Digital Dividends*, Washington, DC: World Bank, doi:10.1596/978-1-4648-0671-1 (accessed 1 Nov. 2017).

<sup>57</sup> Ibid.

<sup>58</sup> The New Climate Economy (2016), *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*, Washington: World Resources Institute, [http://newclimateeconomy.report/2016/wp-content/uploads/sites/4/2014/08/NCE\\_2016Report.pdf](http://newclimateeconomy.report/2016/wp-content/uploads/sites/4/2014/08/NCE_2016Report.pdf) (accessed 15 Apr. 2017).

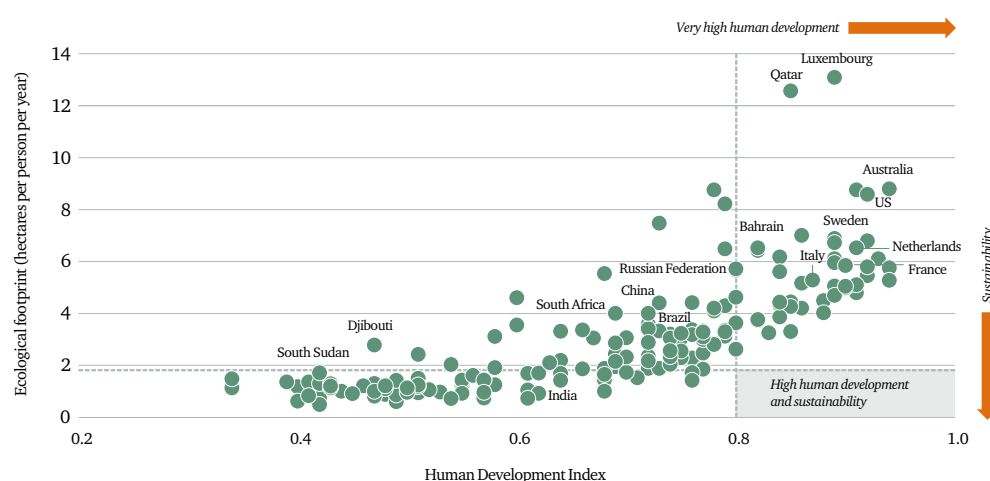
In many developing countries, raw material demand is expected to grow in line with economic development (see Figure 3). Meeting many of the SDGs will require that demand for materials in those countries increases as basic human needs are met.<sup>59</sup> Meanwhile, middle-class citizens in the developing world are already starting to consume more and reuse less – heading in the direction of wealthier people in developed countries.

It is possible that technical innovation and new business models could transform this pathway, decoupling economic growth from resource use. There is already evidence in emerging economies that future societies will need fewer resources than anticipated.<sup>60</sup>

Figure 3 shows that to achieve sustainable development at the global level, average resource intensity will need to fall even as well-being and quality of life continue to improve. For wealthier and more wasteful countries, a deep reduction in resource use will be needed. For emerging and developing economies, however, the aim could be to achieve development goals while maintaining current or similar levels of per capita resource consumption.

However, looking at individual countries separately can sometimes obscure the cross-border impacts of their varying development trajectories. The resource intensity of China's economy, for instance, in large part reflects its role as a major manufacturer and processor of natural resources ultimately consumed in other countries. Waste exported from one country can become a valuable commodity in another, or alternatively (depending on how it is managed) can lead to negative health consequences. An inclusive approach requires looking not only at the employment and access questions *within* a country, but also at the cross-border effects of alternative development strategies.

**Figure 3: Resource use and development pathways**



Source: Global Footprint Network (2013), Human Development Index and Ecological Footprint (2013), <http://data.footprintnetwork.org/#/sustainableDevelopment?cn=all&yr=2013&type=BCpc,EFCpc> (accessed 23 Oct. 2017).

<sup>59</sup> Maxwell, S. (2011), 'Ten propositions on climate change and growth', <http://www.simonmaxwell.eu/blog/ten-propositions-on-climate-change-and-growth.html> (accessed 1 Nov. 2017).

<sup>60</sup> Bleischwitz, R. and Nechifor, V. (2016), 'Saturation and Growth Over Time: When Demand for Minerals Peaks', *Prisme N34*, Paris: Centre Cournot, doi:10.13140/RG.2.2.24146.15049 (accessed 8 Oct. 2017); Lee, B. (2017), 'Are we on the cusp of a demand revolution?', Hoffmann Centre for Sustainable Resource Economy, <https://hoffmanncentre.chathamhouse.org/article/are-we-on-the-cusp-of-a-demand-revolution/> (accessed 1 Nov. 2017).



### Key questions and challenges

In our stakeholder engagement for this project, a number of issues were raised by policymakers and experts. This section sets out some of the most important.

#### What's in a name?

Key stakeholders in international organizations have stressed the considerable overlap between CE approaches and currently more widely used terminology such as the 'green economy' or 'sustainable development'. Indeed, each organization that we spoke to could claim to have at least some experience of what are, in effect, CE projects. However, most such organizations are using different language to define these activities. With this in mind, focusing on delivering the desired development outcomes rather than on introducing a new set of terms could be the best option.

At the same time, many believe that 'circular economy' could prove an attractive and thus expedient umbrella term, as it ties together political priorities such as economic prosperity, job creation, industrial innovation and enhanced resilience. In both China and the EU, the CE policy agenda reflects a desire to limit imports of raw materials, as well as to develop high-quality jobs and encourage innovation. It remains to be seen whether the term is politically attractive in developing countries – but there are signs that momentum in support of its use is building, as the examples discussed in this briefing indicate.

Whatever nomenclature is settled upon – and at least to start with, this will vary by country and company – integrating CE interventions with existing development cooperation will be important to avoid confusion and frustration among already overloaded decision-makers. At the international level, this means demonstrating how the CE can contribute to meeting SDGs and national contributions under the Paris Climate Agreement. Just as importantly, CE strategies will need to be rooted in domestic industrial and social development strategies and driven by locally based organizations if they are to escape the label of being 'too theoretical'.

#### Trade-offs?

Approaches and strategies labelled as part of the 'circular economy' should not be assumed *prima facie* to be optimal from a social or environmental perspective.

In some cases there are clear trade-offs between the benefits and drawbacks of CE approaches. 'Waste-to-energy' processes, for example, are sometimes included within definitions of the CE, but whether any of these are appropriate in a given context will depend on the materials present, the emissions implications, and what opportunities exist as an alternative to combustion. Similarly, repairing a car needs to be weighed against the efficiency improvement delivered by buying a new one. Novel materials can play an important role in displacing non-renewable materials in the CE, but any gains need to be balanced against the embodied emissions and environmental impacts of those new materials – such as water use in bioplastics.

In other cases, the challenge is that CE approaches only partially address well-known barriers to economic and industrial development. In agricultural value chains, CE principles offer a useful checklist of value-creation opportunities, e.g. around recycling

*Approaches and strategies labelled as part of the 'circular economy' should not be assumed to be optimal from a social or environmental perspective*

and utilizing agricultural waste, optimizing the use of resources in the farm system, and creating closed loops to reduce water and fertilizer needs.<sup>61</sup> However, a far broader set of governance and market interventions is needed to increase productivity or reduce post-farm food losses. Since these wider issues are well known in developing countries, the risk here is that the CE concept is dismissed as naive and that its potential benefits are missed.

There are also trade-offs to consider within industrial strategies. Some countries in East Africa, for example, are considering blocking imports of second-hand textiles, concerned that these could flood the market and undermine the development of domestic textile industries.<sup>62</sup> On the other hand, many people are already employed in processing scrap textiles and reusing these in manufacturing.

Finally, there could be a trade-off around flexibility. Industrial symbiosis, the integration of different industrial processes so that waste from one becomes a valuable input for another, has been a key CE strategy for industrializing countries. In China, for example, CE industrial parks have been established to save energy and integrate the collection, treatment and reuse of waste, sewage and water.<sup>63</sup> Yet in some cases an industrial system featuring many interconnections might actually be less able to react to changing circumstances, modify processes and repurpose resources. Rather than encouraging transformative approaches, this could reinforce the influence of incumbent firms.

Path dependency within highly integrated systems could also lead to the locking-in of inefficient technologies or processes. The recycling of cathode rays from televisions offered a high-value opportunity around the turn of this century, but investors lost out when flat screens became the dominant technology a few years later.<sup>64</sup> Rather than focusing on specific sectors, processes, products or materials, it may be more useful to build up a broad capacity in reuse and remanufacturing.

### Just how circular is ‘circular’?

At present, no agreed set of metrics or methodologies exists to measure progress towards a CE. Indicators such as volume of waste per unit of economic output or material consumption per capita may give a first-order indication of the resource and waste intensity of an economy. However, these indicators are relatively rough, and have to be used with caution when comparing countries. For example, consumption of a litre of water has a much greater impact if the water comes from a drought-prone region.

Tools to track resource flows and stocks in an economy – such as material flow analysis, input–output analysis and life-cycle assessment – are useful at the national or city level but depend on data availability, which is often poor in developing countries.<sup>65</sup> A number of firms have started to record their resource use as part of what is termed ‘natural capital accounting’, but for many the available data

<sup>61</sup> Food and Agricultural Organization of the United Nations (2017), ‘Acroecology Knowledge Hub’, <http://www.fao.org/agroecology/knowledge/10-elements/en/> (accessed 15 Oct. 2017).

<sup>62</sup> TradeMark East Africa (2017), ‘EAC States Oppose Ejection from AGOA over used-clothes ban’, 17 July 2017, <https://www.trademarka.com/news/eac-states-oppose-ejection-from-agoa-over-used-clothes-ban/> (accessed 12 Sep. 2017).

<sup>63</sup> D’Escriy, A. C. (2014), ‘Can China kickstart its circular economy and kick its smog?’, *Guardian*, 15 January 2014, <https://www.theguardian.com/sustainable-business/china-recycling-waste-circular-economy> (accessed 3 Mar. 2017).

<sup>64</sup> Kojima, M. and Michida, E. (2013), *International Trade in Recyclable and Hazardous Waste in Asia*, Institute of Developing Economies, Cheltenham: Edward Elgar Publishing Limited.

<sup>65</sup> OECD (2008), *Measuring Material Flows and Resource Productivity Volume I. The OECD Guide*, <https://www.oecd.org/environment/indicators-modelling-outlooks/MFA-Guide.pdf> (accessed 12 Sep. 2017).

are patchy. Similarly, attempts to track trade in secondary materials between countries is hampered by the lack of precision within standard trade classification systems.<sup>66</sup>

Even with better data, measuring progress towards a CE would be a challenge. For a few traditional sectors, such as cement or steel, reasonable comparisons can be made between companies. However, setting benchmarks based, for example, on indicators such as tonne of resources consumed per unit of output value makes little sense for many firms. Within individual product categories, how to capture the full ‘circular’ benefits of product design is a question currently being examined within the EU Circular Economy Action Plan.

A further complication for measurement is the potential for ‘rebound effects’, where reduced resource use leads to a price decrease, in turn encouraging an increase in consumption of that commodity or in consumption of goods and services elsewhere in the economy.<sup>67</sup> This may be partly addressed by the use of technology to track and measure the impact of individual products and services. Another approach may be to focus on outcomes rather than processes: i.e. assessing whether a person’s needs have been addressed rather than measuring product circularity *per se*.<sup>68</sup>

Poor data, however, should not be an excuse for inaction. It may be possible to move forward on specific ‘circular’ activities with confidence in the outcomes, based on a combination of past experience, some basic historical data and new technologies that enable real-time monitoring so that changes can be easily implemented. Chatham House is currently exploring this idea with partners and stakeholders.

### Box 2: Does a circular economy mean a closed world?

In developed countries, the circular economy (CE) has been driven in part by the desire to reduce natural resource imports. This gives the impression that the agenda is at heart protectionist, or at least based on an ambition to achieve ‘growth within’ rather than through international exchange. However, in practice, this assessment underplays the critical role of international trade and cooperation in the CE.

The impact of the CE on trade is more nuanced than is often suggested. It is easy enough to see that as an economy increasingly relies on reuse, remanufacturing and recycling, lower *volumes* of raw materials will be needed compared with a business-as-usual scenario.<sup>69</sup> The impact on the *value* of trade, however, is less straightforward. There could be a significant increase in the value of secondary materials traded, since the thrust of the CE is to use materials in as high a value state as possible. At the same time, as heavier materials may not be exported globally for recycling, we could see the emergence of regional remanufacturing and reprocessing hubs if the added value from economies of scale exceeds the cost of transport.

<sup>66</sup> Workshop participant, Kolkata Workshop, Jadavpur University, 25 July 2017.

<sup>67</sup> Zink, T. and Geyer, R. (2017), ‘Circular Economy Rebound’, *Journal of Industrial Ecology*, 21(3): pp 593–602, doi: 10.1111/jiec.12545 (accessed 1 Nov. 2017).

<sup>68</sup> See, for example, the UNDP’s Climate Action Impact Tool, which aims to help stakeholders track the progress of actions towards climate and sustainable development outcomes. UNDP (2017), Climate Action Impact Tool, <https://climateimpact.undp.org/#!/toolbar/about-the-tool> (accessed 26 Oct. 2017); Lemille, A. (2017), ‘Optimizing Circular Value: While implementing Circular Economic strategies, value is of critical essence’, <https://www.linkedin.com/pulse/optimizing-circular-value-1-alexandre-lemille/> (accessed 11 Nov. 2017).

<sup>69</sup> European Academies’ Science Advisory Council (2015), *Circular economy: a commentary from the perspective of the natural and social sciences*, [https://www.leopoldina.org/uploads/tx\\_leopublication/2015\\_11\\_Easac\\_Circular\\_Economy.pdf](https://www.leopoldina.org/uploads/tx_leopublication/2015_11_Easac_Circular_Economy.pdf) (accessed 12 Sep. 2017).

One example of the uncertainty raised by the CE is the global trade in used lithium-ion batteries. This trade could expand considerably within the next decade, as first-generation batteries used in electric vehicles head for a 'second life' in electrical storage systems in homes or on the grid. However, at the moment it is very hard to tell whether this scenario will in fact materialize: prices of new batteries may continue to fall rapidly; or a new type of battery might emerge by 2030; it is not even certain that the market for electric vehicles will scale up as expected.

Developments in China's import policies provide another powerful example. Every day, around 1,500 shipping containers leave the US headed to China, loaded with recyclable metals, plastics and other materials.<sup>70</sup> In 2013, China announced a new, so-called 'green fence' approach. This was partly in response to the falling quality of materials being imported and to concerns about contamination of food, but the move was also intended to support the country's domestic recycling industry. Rather than introducing new regulations, China tightened inspection regimes for existing policies. Recyclers in the US had to invest hundreds of millions of dollars in new technology and processes – increasing municipalities' recycling costs – in order to be able to export sufficiently high-quality materials to meet Chinese standards. A single policy change thus led to the upgrading of the global recycling supply chain.

China is currently seeking a new ban on imports of scrap plastics and unsorted waste paper. Set to take effect in early 2018, the ban will apply to four classes and 24 kinds of solid waste. Submissions have been made to contest it, but if the ban is upheld, companies in Europe and the US may again be forced to quickly improve the quality of their recyclates or risk being shut out of the largest market for recycled materials.<sup>71</sup> The new regime will also present Europe and the US with an opportunity to improve domestic waste- and resource-management systems.

Exports of products from developing countries could also be affected by emerging CE standards. Change on this front is likely to come in two forms. First, the EU is reviewing all of its eco-design directives that ensure the environmental performance of products, in case a change in approach is needed. Traditional life-cycle assessments, for instance, do not reflect the 'next use' value of a material or remanufactured product. Second, we are likely to see the emergence of awareness campaigns and labelling around the CE, either as a single badge (in the style of organic products) or along the lines of A-to-E energy performance ratings.

All this suggests that while there will be new dynamics in international trade and the location of production, the CE will often involve – and indeed depend on – international cooperation. Unlocking the value of this trade will depend on lowering non-tariff barriers, in particular addressing the lack of clarity on the rules that apply to different waste and secondary materials; these rules currently vary between countries. Just as importantly, open dialogues are needed about the potential impacts of regulatory changes, so that countries have time to adapt. Mechanisms that allow countries to share their experiences would be helpful in this respect.

<sup>70</sup> Flower, W. (2016), 'What Operation Green Fence has Meant for Recycling', Waste360, <http://www.waste360.com/business/what-operation-green-fence-has-meant-recycling> (accessed 12 Sep. 2017).

<sup>71</sup> Cole (2017), 'China Ban on Plastic and Paper Imports Raises Urgent UK Quality Questions'.



### Towards a coordinated approach

International organizations and donors are considering how the CE fits into (or supports the delivery of) international priorities such as the SDGs and national commitments under the Paris Climate Agreement. For now, most organizations approach the CE as a potentially important framework or toolset for delivering existing priorities for sustainable development or the green economy. Several donors are actively exploring the possibility of establishing dedicated CE strategies or programmes.

*CE approaches can be complicated, requiring partnerships and collaboration that take time to build*

One challenge for CE approaches is that they can be complicated, requiring partnerships and collaboration that take time to build. At present, although there are lots of examples of ad hoc cooperation, many areas would benefit from enhanced and more formal coordination. This section of this briefing uses examples to explore four such areas. It is not intended to be comprehensive, and many organizations not mentioned here are also engaged in innovative work.

First, for UN agencies, there will be a role for the secretary-general's office given the range of agencies involved. The UN Environment Programme (UNEP) is leading in the area of green growth and sustainable production and consumption. It has projects in Chile, Sri Lanka and Brazil. UNDP is working with several countries (it has co-developed a strategy with Laos and is active in Peru). The Food and Agriculture Organization (FAO) is examining the potential application of the CE in rural areas. The secretariat of the UN Framework Convention on Climate Change (UNFCCC) is exploring the links between climate change finance and the CE. Issues around trade are being examined by the UN Conference on Trade and Development (UNCTAD) and UN Industrial Development Organization (UNIDO), together with the World Trade Organization (WTO).

Second, multilateral financial institutions (MFIs) will play a critical role in facilitating investment in resource productivity and the CE. Most are already scaling up their activities in this space. At the same time, they are finding it hard to identify a pipeline of projects at the kind of scale that they usually finance. This is partly because traditional project-based finance is not well suited to more systemic solutions involving coordination of multiple stakeholders. In some cases the problem is that institutions are mandated to work with national-level agencies, whereas interventions are often needed at the municipal or state level. MFIs vary significantly in terms of lending profile and range of activities, and partnerships between them could help to address these barriers.

The Global Environment Facility – the financial mechanism for five major environmental treaties – provides a means for countries to explore initial action as well as an outline of a results framework. Its seventh framework programme (7YP) has the CE as one of its Impact Programmes.<sup>72</sup> This has helped foster collaborations involving the African Development Bank, the World Economic Forum and the World Bank in Rwanda and Nigeria. The 7YP recognizes that the CE could not only address pollution, but also tackle greenhouse gas emissions and help protect marine biodiversity.<sup>73</sup>

<sup>72</sup> Global Environment Facility (2017), 'GEF-7 Programming Directions and Policy Agenda', First Meeting for the Seventh Replenishment of the GEF Trust Fund, 28–30 March 2017, Paris.

<sup>73</sup> Ibid.

*Leading countries and regional groupings can do more to foster international collaborations to share experiences and address potential risks*

Third, leading countries and regional groupings can do more to foster international collaborations to share experiences and address potential risks. Given its leadership in the CE agenda, the EU could play a critical role here. The European Commission is actively exploring the opportunities for the CE in emerging and developing economies, with missions already despatched to China, South Africa and Chile and more to follow over the coming year.<sup>74</sup> The OECD's work on CE modelling tools to enhance the evidence base and determine the impact of different policy levers should make it easier to bring CE practices into economic and industrial planning.

BRICS countries also have important lessons and capacities in the CE that could be pursued – for example, within the Forum on China-Africa Cooperation and the BRICS Forum. India has established the Indian Resource Panel (InRP) to help the government devise a comprehensive strategy for resource efficiency.<sup>75</sup> As mentioned above, China has well-established CE frameworks that include the Circular Economy Promotion Law and the Circular Economy Development Strategy and Near-Term Action Plan.<sup>76</sup>

Fourth, the G20 under Germany's presidency in 2017 has helped to bring together a variety of natural resource challenges into a single dialogue. Argentina takes over in 2018 and will be well placed to advance this work, including through a G20 'resource partnership' agreed in Berlin and launched in November 2017. This could be an important process for aligning action and exchanging experience on the CE among G20 countries and developing-country partners, with a continuing role for the International Resource Panel in providing the evidence and research to facilitate this exchange. Chatham House research has previously identified the need for a more sustained focus on natural resources at the G20.<sup>77</sup>

## Conclusion

The circular economy is rising up the development agenda. It appears to offer a credible industrialization pathway in an era of digital disruption and automation. It will help create value out of challenges, such as resource scarcity and pollution, that could otherwise undermine development gains. It may even provide new thinking for how to make the difficult transition from informal to formal employment.

Our conversations with developing-country stakeholders suggest that the CE concept might be best articulated as an industrialization strategy that helps safeguard development gains. The CE will often support existing industrial objectives, but it may also open up new perspectives on the future of industrial strategy.

Rather than being imposed from the outside, CE approaches will need to be co-developed with and ultimately led by in-country organizations. In India, the collaboration between the National Institution for Transforming India (NITI Aayog), The Energy and Resources Institute (TERI), the European Commission and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on the InRP,

<sup>74</sup> European Commission (2017), 'Circular Economy Missions to Third Countries', [http://ec.europa.eu/environment/international\\_issues/missions\\_en.htm](http://ec.europa.eu/environment/international_issues/missions_en.htm) (accessed 12 Sep. 2017).

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*Rather than being imposed from the outside, CE approaches will need to be co-developed with and ultimately led by in-country organizations*

along with the development of a national strategy on resource efficiency, offers one interesting model for sustained collaboration. Many organizations based in developing countries have existing knowledge on issues such as waste management, industrial development and the integration of informal sectors into the formal economy; such knowledge could be expanded into the CE sphere.

For donors and governments, strengthening the business case for CE-related investments will depend on better data and the sharing of lessons from the failures as well as the successes of CE approaches in different contexts. Since the policy toolkit for the CE is still being developed,<sup>78</sup> there could be an important role for piloting to test out innovative approaches at scale in developing countries – in collaboration with OECD and BRICS countries.










Critics of the CE often question whether it is a new concept or a rebranding exercise. Many of the ideas are indeed decades old, but new technologies and increased awareness of sustainability now make it feasible to scale them up. The existence of circular activities in developing countries, and of many existing projects that seek to build on them, provides excellent political ‘entry points’ at both national and international level which can be used to advance the CE agenda. However, these initiatives are only scratching the surface at present. The ‘circular economy’ could develop into a powerful umbrella term, helping to build political momentum around a set of ideas that can be applied in and tailored to multiple sectors or cities.

A stronger criticism is that the CE is often presented without due recognition of the risks and trade-offs of particular approaches. In certain circumstances, circular approaches may be more energy-intensive or more costly than the alternatives. Or they may introduce one type of system-level thinking while missing others. Open dialogue, better evidence and more collaborative approaches can help to mitigate these concerns.

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<sup>78</sup> See, for example, a recent report by Circle Economy which explores policy levers and political entry points for accelerating the transition to a low-carbon circular economy in Europe. Circle Economy (2017), *Policy Levers For a Low-Carbon Circular Economy*, <https://www.circle-economy.com/new-report-policy-levers-for-a-low-carbon-circular-economy/#.WhBrlxO0NE4> (accessed 18 Nov. 2017).

## Appendix 1: Mapping the SDGs against circular economy approaches

SDG	Extending the life cycle of a material or product	Changing utilization patterns	Looping a material or product through additional use cycles	Introducing renewable, recyclable or biodegradable materials
<b>1 NO POVERTY</b> 		Employment opportunities from new business models involving underutilized assets could boost incomes.	Employment opportunities from scaled-up recycling and remanufacturing could boost incomes.	
<b>2 ZERO HUNGER</b> 	Reduced food waste will help combat hunger and malnutrition.	Changes to agricultural value chains – e.g. distribution practices and sharing models for farm equipment – can help reduce post-farm food losses and increase agricultural productivity.	Sustainable food production systems and agricultural practices, including closed-loop systems, will help reduce water and fertilizer use and increase agricultural productivity.	Using more natural materials and biodegradable products can reduce contamination of foodstuffs.
<b>3 GOOD HEALTH AND WELL-BEING</b> 			Better waste-management practices will reduce health impacts from pollution and waste.	Fewer toxic materials in products, in particular in electronic devices, will improve health and safety for waste pickers.
<b>4 QUALITY EDUCATION</b> 	Some CE approaches require a highly skilled workforce, necessitating additional investment in training.		Existing initiatives link SDG 4 and SDG 12 with educational approaches to teach children about waste and how to better manage resources.	
<b>5 GENDER EQUALITY</b> 				
<b>6 CLEAN WATER AND SANITATION</b> 	Using water more effectively will reduce overall consumption and wastage.		Increased recycling and scaling up safe reuse of wastewater can support manufacturing and other opportunities, and can close resource loops to reduce water wastage.	Minimizing the release of hazardous chemicals and materials, treating waste and contaminated water, and replenishing aquifers can increase the health of waterways and oceans.
<b>7 AFFORDABLE AND CLEAN ENERGY</b> 		Changing how we use products during the course of their lifetimes may reduce overall energy needs.		Renewable energy initiatives can provide cleaner energy to more people.
<b>8 DECENT WORK AND ECONOMIC GROWTH</b> 		Employment opportunities can be created as new business models develop around underutilized assets.	New employment opportunities around remanufacturing can provide more skilled jobs.	
<b>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</b> 	Infrastructure can be made more resilient through more durable design, and through the use of novel, stronger and more environmentally friendly materials.	Changes in how buildings are used or goods and people are transported could transform infrastructure needs.	Closed loops in industrial processes, e.g. via industrial symbiosis, can transform heavy industries and reduce overall resource needs.	Innovations in radical new materials will play a key role in changing the resource needs of economies.



## A Wider Circle? The Circular Economy in Developing Countries

SDG	Extending the life cycle of a material or product	Changing utilization patterns	Looping a material or product through additional use cycles	Introducing renewable, recyclable or biodegradable materials
<b>10</b> REDUCED INEQUALITIES 		As part of a broader policy framework, efficient management of resources should enable much greater access to modern services.		
<b>11</b> SUSTAINABLE CITIES AND COMMUNITIES 	Better urban planning, focused on reducing consumption and waste production, would help create more resilient and sustainable urban spaces.	How a building or part of a city is designed can influence how materials and people move around that building or location.	Urban farming could make cities more self-sufficient, reducing waste production, improving waste management and reducing land use.	Smarter decisions about what materials are used to build cities will increase the quality of life in cities over time.
<b>12</b> RESPONSIBLE CONSUMPTION AND PRODUCTION 	Extending the life cycle of a material or product through better design or choice of different materials will reduce consumption.	Sharing a product between consumers increases the 'utilization rate' of the product – and also tends to decrease the total number of products consumed.	Looping assets and materials through additional use cycles can improve their longevity and reduce virgin material needs.	Introducing renewable, recyclable or biodegradable materials can help to reduce waste and pollution.
<b>13</b> CLIMATE ACTION 		Using assets in different ways and increasing their utilization rates can reduce greenhouse gas emissions and resource consumption.	Policies and initiatives to improve resource efficiency could cut global greenhouse gas emissions by around 60 per cent, according to the International Resource Panel.	
<b>14</b> LIFE BELOW WATER 		Better practices around fishing and food production could shore up already damaged ecosystems.	Reducing the amount of waste that currently flows into oceans could reduce negative impacts on marine life.	
<b>15</b> LIFE ON LAND 		Reusing resources could reduce the amount of land we need overall, e.g. through fewer buildings, less urban sprawl and more holistic urban planning.	Lower resource demand should mean reduced environmental impacts – e.g. land degradation and loss of biodiversity – from resource extraction.	
<b>16</b> PEACE, JUSTICE AND STRONG INSTITUTIONS 			The enabling environment for CE relies on institutions able to promote longer-term investment strategies.	
<b>17</b> PARTNERSHIPS FOR THE GOALS 			CE approaches require partnerships and collaboration. Enhanced coordination via SDG channels is essential to accelerate CE adoption.	

Source: Authors' own analysis.

## Appendix 2: Interview questions and responses

Questions	Yes responses (%)
Are you familiar with the 'circular economy' concept? (Y/N)	95%
Is the 'circular economy' concept being discussed in your organization? (Y/N)	90%
If yes, is it a key priority? (Y/N)	14%
Is the 'circular economy' concept being discussed with/by other donors/organizations you work with? (Y/N)	38%
Is the 'circular economy' concept being discussed in the developing countries you work with, as a potential response/opportunity? (Y/N)	14%
Are natural resource-related pressures a priority for governments in the countries you work in? (Y/N)	90%
Where do you see the greatest opportunities for 'circular economy' approaches in developing countries? (nominate one or two from list)	
Waste	62%
Food	48%
Shelter	19%
Mobility	10%
What are likely to be the most significant barriers to implementing circular approaches in development contexts?	Key words mentioned
	• Scale
	• Lack of evidence
	• Mindsets
	• Politics
	• Trade-offs

Source: Authors' own analysis.

Note: This table sets out the results of 31 semi-structured interviews conducted by the authors between May and August 2017. This is an ongoing process. The interviews targeted stakeholders in governments, development agencies, donor organizations, international organizations, MDBs and development finance institutions. Not all organizations were asked all questions.

## Appendix 3: Additional notes

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