



SUMMARY FOR POLICYMAKERS  
**THE ECONOMIC, SOCIAL, AND ENVIRONMENTAL BENEFITS OF A CIRCULAR ECONOMY IN INDONESIA**

## Foreword

Entering a decade towards the sustainable development goals and the target of reducing greenhouse gas (GHG) emissions of Paris Agreement by 2030, the Government of Indonesia is further strengthening its commitments and efforts in overcoming economic, social and environmental problems through a low carbon development and circular economy.

Circular economy is a closed loop economy system approach in which raw materials, components, and products are maintained as useful and valuable as possible so as to reduce the amount of waste material that is not reused and disposed of to landfills. The Circular Economy encourages higher green economic growth compared to the business as usual (BAU) scenario by designing systems and products that require fewer resources, ensuring that the extracted raw materials are used as efficiently and maximize its lifespan. The circular economy is one of the instruments that can support the achievements of the Sustainable Development Goals. The circular economy is also one of the drivers for Indonesia towards economic transformation, in particular supporting the green economy and low-carbon development strategies.

Indonesia has adopted the Circular Economy concepts into its vision and development strategies. Vision Indonesia 2045 has elaborated on the Circular Economy concepts as the policy going forward. As an initial step in implementing the circular economy concept, the Government of Indonesia in collaboration with the United Nations Development Program (UNDP) with the support of the Danish Government has established an analysis study of the environmental, economic, and social potential for the implementation of a circular economy in Indonesia in 5 (five) industrial sectors, namely food and beverages, construction, electronics, textiles, and plastics. This circular economy development study will be followed by further development stages, such as developing the National Action Plan and including the circular economy in the next National Medium Term Development Plan (RPJMN) 2025-2029.

The challenges and gaps with the current actual conditions will certainly be shared big work together. However, with comprehensive strategy development and collaboration of stakeholders, the implementation of a circular economy will be a concrete solution to the problems we face today. We also express our appreciation to Ministries/Institutions, Regional Governments, Academia, and development partners who have supported the preparation of the study.

Hopefully, this document can become a common reference and provide an overview of the Indonesian Government's efforts in implementing a circular economy that supports low carbon development and its contribution to achieving development targets, both at the national and global levels.

**Suharso Monoarfa**

*Minister of National Planning and Development Indonesia/Bappenas*



We initiated the study on Circular Economy in the beginning of 2020. A lot has happened since then. The corona pandemic has changed the world. Including how we see our economy and the way we produce and consume. We now see Green Recovery and Building Back Better as smart ways to get through the pandemic. The Pandemic has shown that we can change the way we live. We know it remains more important than ever to ease the burden on our common environment, and the current rethinking of value chains and economic restart after the pandemic presents clear, green opportunities.

The Circular Economy puts a framework around this change. It is a change that requires huge efforts from not only producers and consumers, but from every entity in the entire value chain.

Investing in a more Circular Economy is not only necessary seen from an environmental point of view, but also a sound investment for the economy! It helps our economy, boosts our employment rates and reduces our carbon footprint. And that is exactly what we need after the corona pandemic. In

Denmark, we estimate that the transition to a Circular Economy will increase GDP by more than 7 billion USD, increase the net export with 3-6% and reduce CO2 emissions by 3-7%. The report you are about to read will show some of the Indonesian potentials of circular Economy in five key economic sectors of Indonesia – and the conclusions are no less stunning. Investing in Circular Economy is a smart way for recovery after COVID – and with a positive return on the investment, in contrary to seeking to uphold the old ways of consuming and producing.

I am happy that Denmark has been able to support this study as part of the long-term Danish-Indonesian environmental cooperation.

I believe this study provides a good foundation to develop a National Strategy and Action Plan for Circular Economy in Indonesia. Formulating such a National Strategy and Action Plan for Circular Economy is a big task involving a lot of support from both public and private, national and international institutions. I call for further action by our Indonesian and international colleagues and partners.

Let me end by thanking BAPPENAS, UNDP and the consultant team for their outstanding engagement in this study. I express a hope that it will form the basis of a Strategy and Action Plan for Circular Economy in Indonesia.

**Lars Bo Larsen**

*Ambassador of Denmark to Indonesia*



This Report on the circular economy comes at an opportune moment as we enter the 'decade of action' to fast-track the achievement of the Sustainable Development Goals (SDGs). Furthermore, Indonesia currently stands at a critical juncture, where more resources and energy may be needed, to reinvigorate its post COVID-19 economy. As the clock ticks towards 2030, a key question remains as to how a resource-rich country like Indonesia strives to improve people's lives, whilst at the same time reduce its carbon emissions and waste. Balancing energy use and resource utilization to sustain growth is indeed a tricky question that could lead to setbacks, if not handled strategically. Under the circular economy, companies and manufacturers can be successful by producing zero waste and re-use any by-products from their production. Consumers value such products and services, and new technologies and techniques generate jobs. Hence, with its massive potential in cost efficiency, a circular economy is a win-win model for all stakeholders in Indonesia to boost growth, address climate change and create new jobs at the same time.



The analysis and policy recommendations in this report are focusing on five sectors: food and beverages, textiles, wholesale and retail trade (with focus on plastic packaging), construction, and electronics. I am pleased to note that some encouraging findings have transpired: Indonesia's GDP stands to increase by IDR 593 - 638 trillion (USD 42- 45 billion) in 2030, if those five sectors fully adopted the circular economy model.

The COVID-19 pandemic has forced Indonesia to refocus its national budget on cushioning the impacts of the pandemic, including budget for climate change mitigation, where health and economic sectors become the priority. This is where the circular economy model can come in to provide an alternative for Indonesia to accelerate its efforts to meet emission reduction target and to achieve green and sustainable recovery from COVID-19 crisis.

UNDP Indonesia stands ready to support Indonesia in realizing a circular economy, by providing evidence-based studies, and policy advocacy, including this Report. Our sincere gratitude goes to the Government of Indonesia, in particular the Ministry for Development Planning, BAPPENAS, for their solid commitment to advocate for the adoption of circular economy in Indonesia. We thank the Government of Denmark for its generous contribution without which this Report would not have been completed.

As you study the Report, I encourage you to assume a more active role in our joint effort to advocate for the implementation of circular economy. It is my sincere hope that all stakeholders work together to unleash the massive potential of the circular economy to create a greener and more prosperous Indonesia and improve the lives of millions of people in Indonesia.

**Norimasa Shimomura**

*UNDP Indonesia Resident Representative*

Several experts provided valuable input on the approach and findings throughout the development of this report. The experts include Dr Tammara Soma (Food & Beverage), Maria Chahboune (Textiles), Prasetyo Adi (Construction), Arthur Neeteson (Wholesale & retail trade), and Dr M Akbar Rhamdhani (Electrical and electronic equipment). Apart from sector-specific experts, valuable feedback was also provided by local and international circular economy experts, including Maria Dian Nurani, Lydia Napitupulu, Helga Vanthournout, and Jelmer Hoogzaad. The team is grateful for all the experts' immense contribution to this report.

## SUPPORTED BY



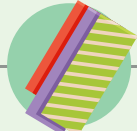
# The circular economy opportunity for Indonesia



## 5 SECTORS IN INDONESIA HAVE LARGE POTENTIAL TO ADOPT A CIRCULAR APPROACH



FOOD & BEVERAGE



TEXTILES



CONSTRUCTION



WHOLESALE & RETAIL TRADE



ELECTRICAL & ELECTRONIC EQUIPMENT

These five sectors represent **1/3** of Indonesia's GDP and employed **>43 million** people in 2019

CURRENT PRACTICES IN THESE SECTORS ARE INEFFICIENT AND GENERATE LARGE AMOUNTS OF WASTE

	Waste today millions of tonnes	Projected increase in waste in 2030 (%)
Food & beverage (Food loss & waste)	57.5	54%
Textiles (Textile waste)	2.3	70%
Construction (Construction waste)	29.0	82%
Wholesale & retail trade (Plastic packaging waste)	5.4	40%
Electronics (E-waste)	1.8	39%

A CIRCULAR APPROACH COULD GENERATE MEANINGFUL ECONOMIC, ENVIRONMENTAL AND SOCIAL BENEFITS BY 2030 COMPARED TO A "BUSINESS AS USUAL" SCENARIO



### Economic benefits

Potential to generate an additional economy-wide GDP of **IDR593 - 638 trillion** in 2030; the direct GDP impact on the 5 sectors could vary from **IDR -1,563 trillion to IDR312 trillion** based on different scenarios



### Environmental benefits

Reduce waste in each sector by **~18-52%** in 2030  
Reduce CO<sub>2</sub>e emissions by **126 million tonnes** and water use by **6.3 billion cubic metres** in 2030



### Social benefits

Create **4.4 million** net cumulative jobs by 2030  
Create annual household savings of almost **9%** of their budgets (**IDR4.9 million annually**)<sup>1</sup> in 2030

<sup>1</sup> Based on IO methodology.

SOURCE: BPS; Ministry of Environment and Forestry; World Economic Forum (see Annex)

## Executive Summary

A circular economy is more than just an opportunity for Indonesia to reduce waste and improve the environment. Like governments around the world, Indonesian policymakers are seeking to support the economic recovery from the COVID-19 pandemic. However, a key question remains as to whether these recovery policies reinforce the existing “business-as-usual” economic structures with their associated negative impacts on the environment, or whether there is an opportunity to “build back better” where efforts are placed to maximise the shared benefits between the economy and the environment. This analysis shows that fully adopting circularity opportunities in five key sectors of the economy (food & beverage, textiles, construction, wholesale and retail trade, and electrical and electronic equipment) could be a key component of the economic recovery, helping to strengthen the economy, create new jobs, lower household costs, and preserve the environment. By adopting circular economy opportunities in these sectors, Indonesia’s GDP could increase by IDR593 to 638 trillion (USD42 to 45 billion) in 2030 (than it would under a “business-as-usual” approach) in 2030; 4.4 million cumulative net jobs could be created economy-wide between 2021 and 2030, out of which 75 percent could be for women; CO<sub>2</sub>e emissions and water use could be reduced by 126 million tonnes and 6.3 billion m<sup>3</sup> in 2030, respectively (equivalent to 9 percent of the current emissions and 3 percent of the current water usage); and the average Indonesian household could save IDR4.9 million (USD344) annually, representing almost nine percent of the current yearly household expenditure. By creating new job opportunities, making supply chains more resilient, and providing business opportunities (particularly for Micro, Small and Medium Enterprises), a circular economy can be a key component of Indonesia’s economic recovery. However, this analysis also highlights some challenges, including potential job losses and reduced demand for upstream production in the five focus sectors (under some scenarios). A robust multi-stakeholder roadmap is envisaged as the next step in this work and will be crucial for tackling these concerns and addressing the barriers for capturing the circular economy opportunities.

## RETHINKING VALUE CREATION

A circular economy aims to generate economic growth by maintaining the value of products, materials, and resources in the economy as long as possible, thereby minimising the social and environmental damage caused by a linear economic approach. It is not just a better form of waste management with more recycling. A circular economy embraces a broad set of interventions across all economic sectors, and activities focused on the 5Rs: Reduce, Reuse, Recycle, Refurbish, and Renew (Exhibit E1). The good news is that many Indonesian businesses are already adopting elements of the 5R principles in their operations. For instance, Danone has made a 100 percent recyclable bottle for its packaged drinking water brand, Aqua.<sup>1</sup> CupKita, a start-up based in Jakarta, provides a reusable container service in an attempt to eliminate the use of single-use plastic cups.<sup>2</sup> PT Sigin Interactive Indonesia provides repair and refurbishing services for used electronics and home appliances, dead-on-arrival (DOA) products, and printed circuit boards.<sup>3</sup> The informal sector also plays a substantial role in the adoption of the 5Rs in Indonesia.<sup>4</sup> For example, in the electrical and electronic equipment sector, the reuse and recycling of electronic products are dominated by small and informal players.<sup>5</sup> Elsewhere, around seven percent or nearly 500,000 tonnes of Indonesia’s plastic waste is collected informally.<sup>6</sup> A circular economy could build upon the progress made by the informal sector. For example, upskilling of informal workers could substantially increase the economic value associated with end-of-life electronic products and e-waste recovery.

<sup>1</sup> Aqua. Available at:

<https://aqua.co.id/en/brand/aqua-100-recycled-1>

<sup>2</sup> Eco-business (2020), “Indonesia’s first reusable cup rental service launches in Jakarta.” Available at:

<https://www.eco-business.com/news/indonesias-first-reuseable-cup-rental-service-launches-in-jakarta/>

<sup>3</sup> Sigin Interaction Indonesia, “Services”. Available at:

<http://sigininteractive.co.id/index.php/sigin-pressings/capability-competence/repair-electronic-and-telecommunication-devices/>

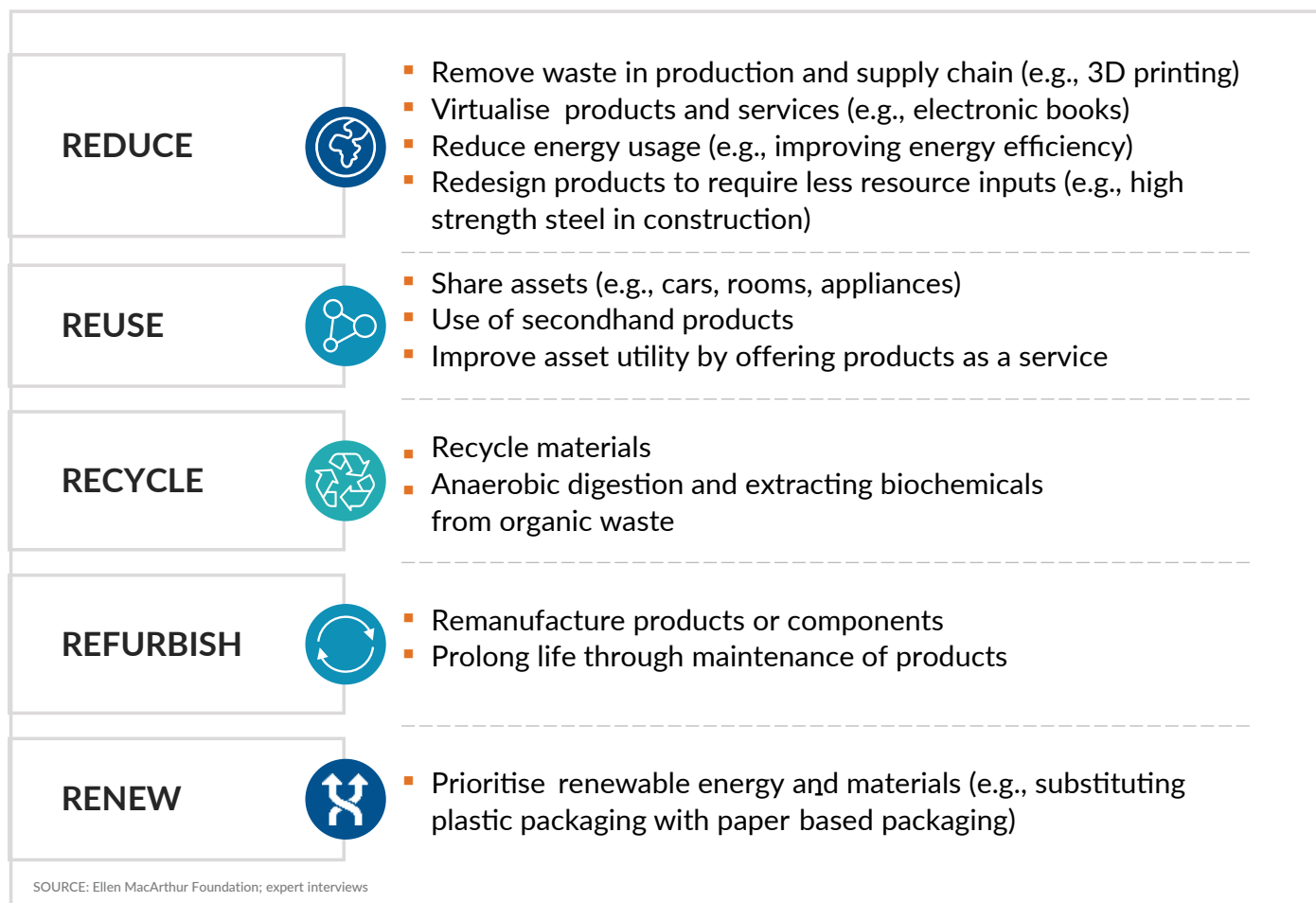
<sup>4</sup> Enri Damanhuri (2012), Post-Consumer Waste Recycling and Optimal Production.

<sup>5</sup> Fauziah F. Rochman et al (2016), E-waste, money and power: Mapping electronic waste flows in Yogyakarta, Indonesia.

<sup>6</sup> World Economic Forum (2020), Radically reducing plastic pollution in Indonesia: A multistakeholder action plan; National Plastic Action Partnership. Available at:

<https://globalplasticaction.org/wp-content/uploads/NPAP-Indonesia-Multistakeholder-Action-Plan-April-2020.pdf>

## A circular approach comprises the 5Rs

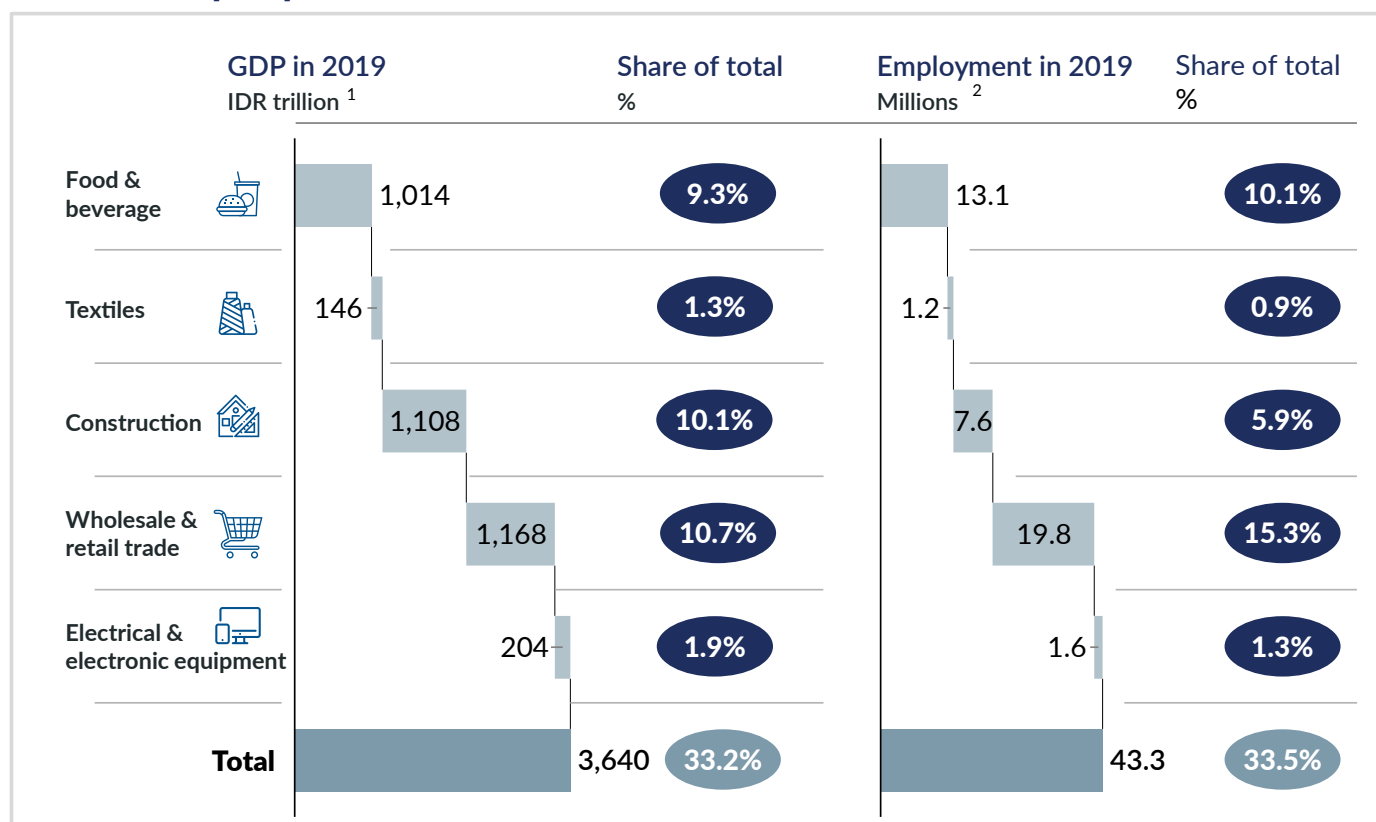


## FIVE KEY SECTORS OFFER LARGE OPPORTUNITIES FOR A CIRCULAR APPROACH IN INDONESIA

This analysis identified five sectors with high potential to create a circular economy approach in Indonesia: food & beverage, textiles, construction, wholesale and retail trade (focused on plastic packaging), and electrical and electronic equipment. The high potential was driven by each sector's economic importance (e.g., five-year average Gross Value Added), the amenability of its production systems to a circular approach (e.g., material intensity), and the level of stakeholder support, both private and public, in advancing circularity within the sector (e.g., government priority based on whether the sector was mentioned in important government plans). More details about the sector prioritisation approach are available in the Annex.

These sectors play a pivotal role in Indonesia's economy. Based on data published by Badan Pusat Statistik (BPS), the five sectors contributed over 30 percent to Indonesia's current GDP and employed more than 43 million people or one-third of Indonesia's workforce in 2019 (Exhibit E2).

## The five focus sectors account for ~33% of GDP and employ over 43 million people



1. GDP figures are in 2010 prices

2. The employment for the focus sectors was estimated using the sector employment data published by BPS. Due to the limited data availability on sub - sector employment, it was assumed that the labour productivity is constant across the sub-sectors

SOURCE: Bank Indonesia; BPS

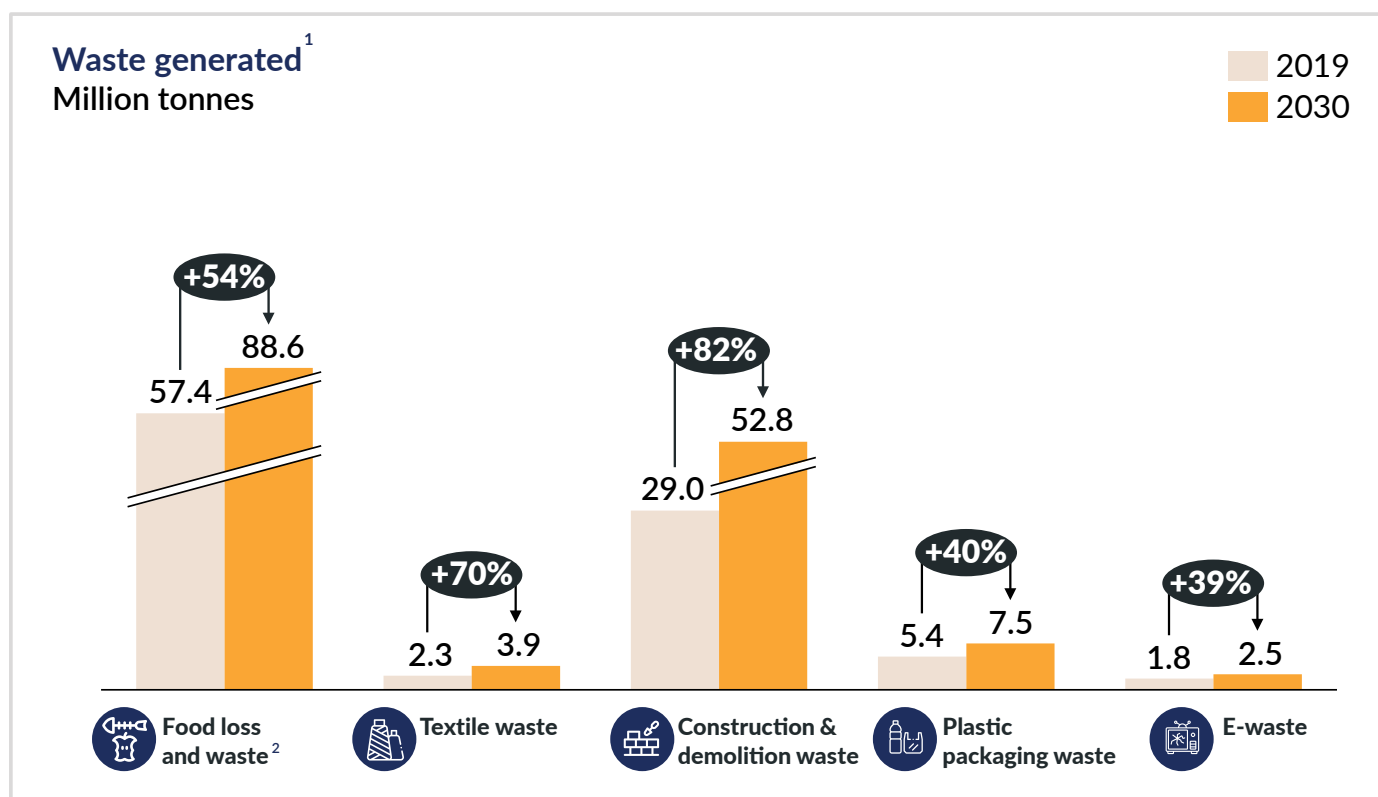
Based on estimates calculated from data and inputs shared by the Government of Indonesia (e.g., Ministry of Environment and Forestry), academics, and civil society representatives, these sectors generated a significant amount of waste in 2019 (e.g., the food loss and waste, excluding food loss at production, was nearly 57.4 million tonnes). The volume of waste could increase by up to 82 percent by 2030 in some sectors (Exhibit E3). The growth in waste is not just physical waste, such as food waste or textile waste, but also structural waste, such as unoccupied office space or inefficient energy use in the built environment. Two key factors could drive the growth of waste generation over the next decade. First, more than 90 million Indonesians could join the consuming class by 2030,<sup>7</sup> fuelling demand for consumer staples (e.g., packaged food) and discretionary consumer products (e.g., electronics and clothing). Second, more than 35 million people could move to cities in Indonesia between 2019 and 2030.<sup>8</sup> According to government estimates, 67 percent of Indonesia’s population could live in urban areas in 2045.<sup>9</sup> Urbanisation drives not only the demand for consumer products but also the construction of homes and other public infrastructure, generating associated waste in the process.

7 McKinsey Global Institute (2012). *The archipelago economy: Unleashing Indonesia’s potential*. Available at: [https://www.mckinsey.com/~/media/mckinsey/featured%20insights/asia%20pacfic/the%20archipelago%20economy/mgi\\_unleashing\\_indonesia\\_potential\\_executive\\_summary.ashx](https://www.mckinsey.com/~/media/mckinsey/featured%20insights/asia%20pacfic/the%20archipelago%20economy/mgi_unleashing_indonesia_potential_executive_summary.ashx)

8 United Nations Department of Economic and Social Affairs, *World Urbanization Prospects 2018*. Available at: <https://population.un.org/wup/Download/>

9 Minister of National Development Planning, “General Statements: Urban Development to Decrease Disparity, Alleviate Poverty and Create Jobs.” Available at: [https://www.bappenas.go.id/files/4315/1814/3479/180205a\\_General\\_Statements\\_Menteri\\_PPN\\_Bappenas\\_WJF9.pdf](https://www.bappenas.go.id/files/4315/1814/3479/180205a_General_Statements_Menteri_PPN_Bappenas_WJF9.pdf)

## Under a “business-as-usual” approach, waste generated by the 5 key sectors could increase by up to 82% in 2030



1. Percentages are rounded to the nearest percent

2. Excludes food loss generated at the production stage

SOURCE: BPS; WRI ; Ellen Macarthur Foundation; World Economic Forum ; ITU (see annex for more details)

## THE WASTE FOOTPRINT IN THE FIVE FOCUS SECTORS COULD BE TRANSFORMED BY CIRCULAR ECONOMY OPPORTUNITIES

Based on the circularity potential of the 5Rs for each sector, sector-specific circular opportunities were prioritised (Exhibit E4). These opportunities were identified based on the available evidence on which opportunities were likely to generate the largest impact in the sector and were revised based on stakeholder consultations. For instance, for the food & beverage sector, “Reduce” and “Recycle” were found to have the highest potential. Hence, four opportunities were prioritised: i) Reduce post-harvest food loss; ii) Reduce supply chain food loss and waste; iii) Reduce consumer food waste; and iv) Process food loss and waste.

To understand the impact of each prioritised opportunity, the current adoption rates in Indonesia were estimated. For example, the current e-waste recycling rate in Indonesia is estimated to be five percent.<sup>10</sup> Based on local and international benchmarks, the potential for each circular economy opportunity was assessed for Indonesia in 2030. For example, based on stakeholder consultations, it was assessed that Indonesia could increase its current e-waste recycling rate and match India’s recycling rate of 21 percent by 2030.<sup>11</sup> Elsewhere, case studies were used to understand this potential. For instance, pilot efforts in Benin, Cape Verde, India, and Rwanda have documented reductions of food loss by more than 50 percent during field trials of a variety of low-cost storage techniques and handling practices.<sup>12</sup> Hence, it was assumed that if Indonesia were to invest in improved infrastructure and food handling (e.g., temperature control during storage), it could reduce its post-harvest food loss by 50 percent by 2030.

<sup>10</sup> Mairizal et al, *Electronic Waste Generation, Distribution Map, and Possible Recycling Routes in Indonesia*. Forthcoming.

<sup>11</sup> The Hindu (2017); “E-waste recycling has doubled, says Centre”. Available at: <https://www.thehindu.com/news/national/e-waste-recycling-has-doubled-says-centre/article30983383.ece>

<sup>12</sup> World Food Logistic Organization (2010), *Identification of appropriate postharvest technologies for improving market access and incomes for small horticultural farmers in Sub-Saharan Africa and South Asia, Part 2: Postharvest Loss Assessments*.

## Sector-specific opportunities were selected based on the circularity potential of the 5Rs

THIS TABLE IS NOT EXHAUSTIVE OF ALL CIRCULAR ECONOMY OPPORTUNITIES

Circular economy opportunities prioritised for each sector based on the 5Rs

- High potential
- Moderate potential
- Low potential

5R	F&B	Textile	Construction	Wholesale & Retail Trade	Electrical and electronics equipment
REDUCE	Reduce post-harvest food loss	Reduce waste in production	Generate less C&D waste through existing processes	Reduce plastic packaging	Virtualise and dematerialise physical goods
	Reduce supply chain food loss and waste		Generate less C&D waste through new processes		
	Reduce consumer food waste		Optimise building usage		
REUSE		Reuse products	Reuse materials	Reuse plastic packaging	Reuse products
RECYCLE	Process food loss and waste	Recycle materials	Recycle materials	Redesign plastic packaging for improved recyclability	Recycle materials
				Increase recycling rate of recyclable packaging	
REFURBISH					Increase product lifespan and reduce obsolescence
					Refurbish products
RENEW		Use more sustainable materials	Use more sustainable materials	Replace with more sustainable packaging	
			Design and build more resource-efficient buildings		

SOURCE: Expert interviews; focus group discussions

To estimate the current volumes of household and household-related waste, and industrial waste, both local and international sources were used (Exhibit E5). More details can be found in the Annex.

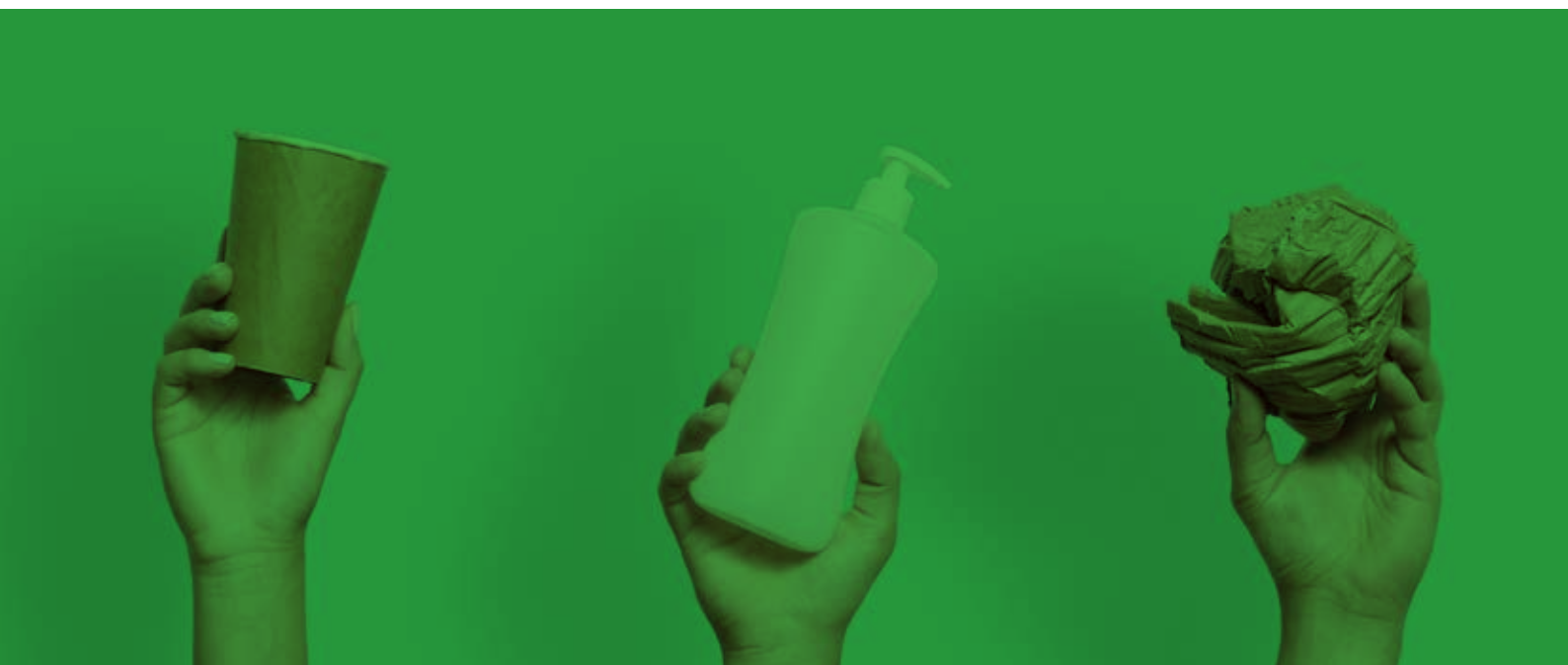


## A variety of data sources were used to estimate the current waste volumes and recycling rates in Indonesia

- Based on local data
- Estimated based on local proxies
- Estimated based on international proxies
- Not relevant / out of scope

Sector	Household and household-related waste <sup>1</sup>	Industrial waste	Recycling rates <sup>2</sup>
F&B	Ministry of Environment & Forestry (2018)	World Resources Institute (2019) using the South and Southeast Asia average	Ministry of Environment & Forestry (2018) using the share of waste used to compost and for biogas production
Textile	Ministry of Environment & Forestry (2018)	Ellen MacArthur Foundation (2017) using a global average	Ministry of Environment & Forestry (2018) using the overall household waste recycling rate
Construction		Nguyen (2018) using Vietnam's C&D waste, which was scaled up to estimate Indonesia's waste	Esaet al (2017) using Malaysia's C&D waste recycling rate as aproxy
Wholesale & Retail Trade	NPAP (2020) using the estimates for plastic MSW and adjusting the estimates for plastic packaging		NPAP (2020) using the overall plastic waste recycling rates as proxy
Electrical and electronics equipment	Mairizal et al (forthcoming)		

1. Household-related waste includes waste generated by traditional markets, commercial centres, offices, and other establishments. It does not include industrial waste  
 2. Reuse rates or refurbish rates are not included in this exhibit



### Box 1. Data limitations in this analysis

This analysis leveraged local data published by the Government of Indonesia, local organisations, and academics to the extent that this information was available. For example, data published by the National Plastic Action Partnership (NPAP) was used to calculate plastic packaging waste volumes and the estimates from a working paper by Mairizal et al. (forthcoming) were used to calculate e-waste volumes. However, for some indicators, data availability was found to be limited after consultations with government and non-government stakeholders. Where data was unavailable, data from comparable countries were used as proxies. For example, to calculate Indonesia's construction and demolition (C&D) waste, Vietnam's C&D waste was used as a proxy and adjusted to Indonesia's context based on the relative Gross Value Added of the construction sector in the two countries. In the absence of suitable comparable proxies, regional or global averages were used. For example, due to the lack of robust data on the share of food loss and waste generated across the different stages of the value chain, the averages published by the World Resources Institute (WRI) for South and Southeast Asia were used as proxies.

Representatives from the textile sector highlighted that the lack of data on pre-consumer textile waste is one of the key barriers hampering the capture of circular opportunities in the textile sector. To accelerate the adoption of circular opportunities and to strengthen the analysis presented in the report, the Government of Indonesia and other stakeholders could develop sector-specific taskforces that undertake research to improve data availability.

There are ongoing initiatives in Indonesia that are addressing this data gap. For example, a joint study by UK Aid, Waste4Change, WRI, Low Carbon Development Institute, and Bappenas intends to estimate current and future food loss and waste and propose national policies to reduce food loss and waste and achieve Indonesia's greenhouse gas emissions reduction target.

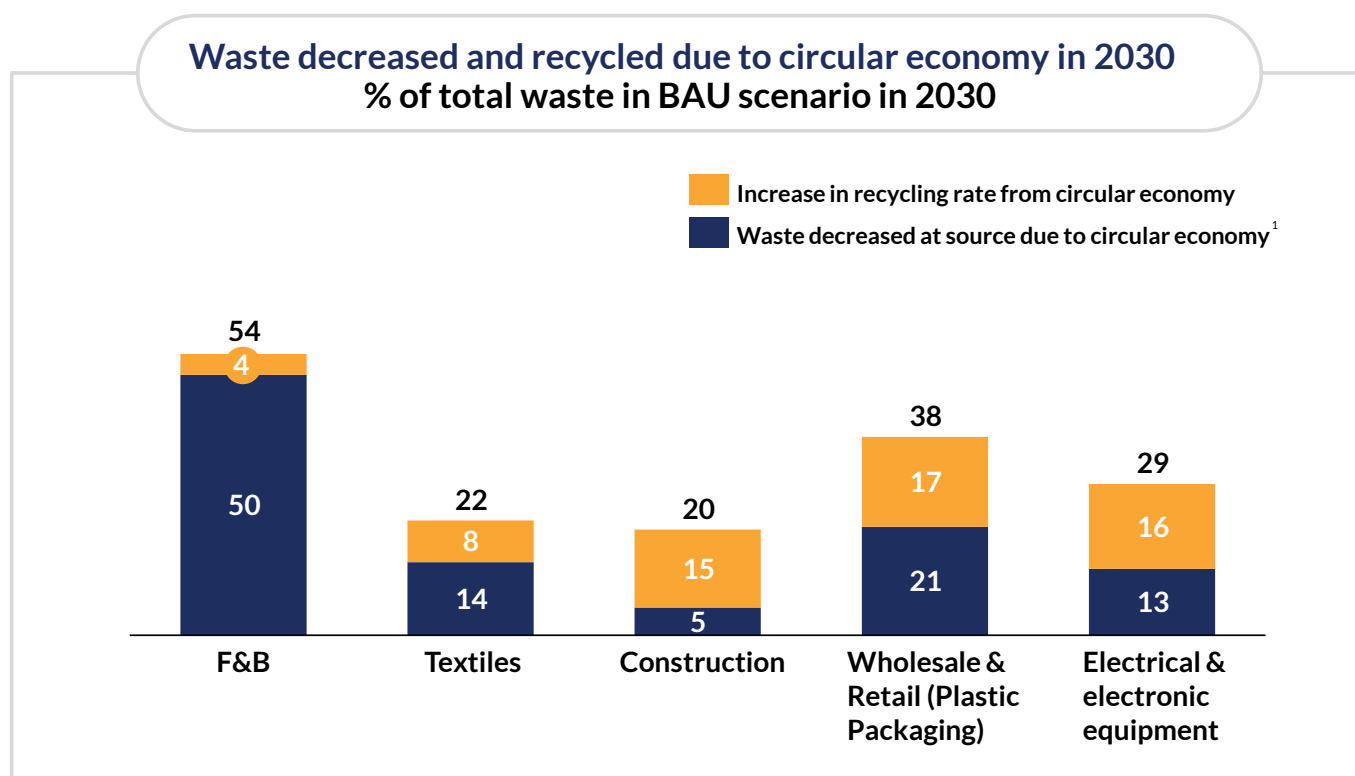
In addition, this analysis used the Input-Output (IO) table published by the OECD for Indonesia in 2015 to estimate the economic impact since the latest IO table published by the Government of Indonesia was published in 2010. While the analysis of supply chain linkages showed that these relationships are structurally robust over time – in other words, they do not change significantly over the short and medium terms – this analysis could be more robust if a more recent IO table published by the Government was available. More details on the use of the IO table and the checks carried out by the team are available in the Annex.

A successful transition towards the circular economy could help Indonesia reduce its waste generation at source and increase its waste recycling rates. A circular economy could reduce waste by up to 50 percent in 2030 (compared to a BAU scenario). Depending on the sector, it could also add between 4- 17 percent to the BAU recycling rates. This analysis shows that a circular economy could significantly contribute to the Government's efforts to reduce waste across the five sectors (Exhibit E6):

- **Food loss and waste.**<sup>13</sup> Indonesia could reduce food loss and waste by 50 percent and recycle an additional four percent of the remaining food loss and waste, relative to a BAU scenario.
- **Textile waste.** Indonesia could reduce textile waste by 14 percent and recycle an additional eight percent of the remaining textile waste.
- **Construction and demolition (C&D) waste.** Indonesia could reduce C&D waste by 5 percent and recycle an additional 15 percent of the remaining C&D waste.
- **Plastic packaging waste.** Indonesia could reduce plastic packaging waste by 21 percent and recycle an additional 17 percent of the remaining plastic packaging waste.
- **E-waste.** Indonesia could reduce e-waste by 13 percent and recycle an additional 16 percent of the remaining e-waste.

13 The FAO differentiates between food loss and food waste. Food loss is defined as all the crop, livestock and fish human-edible commodity quantities that, directly or indirectly, completely exit the post-harvest slaughter/catch supply chain by being discarded, incinerated or otherwise disposed of, and do not re-enter in any other utilization (such as animal feed, industrial use, etc.), up to, and excluding, the retail level. Losses that occur during storage, transportation and processing, as well as imported products, are therefore all included. Food waste occurs from retail to the final consumption/ demand stages.

## A circular economy in Indonesia could make significant contributions in decreasing waste generation at source and recycling waste



1. The decrease in waste generation at source takes into account the impact of reduction, reuse, and refurbishment circular economy opportunities

SOURCE: BPS; Bank Indonesia; Ministry of Environment and Forestry; WRI; World Economic Forum; ITU; Ellen MacArthur Foundation; expert interviews (see annex for more details)

## THE ECONOMIC IMPACTS OF A CIRCULAR APPROACH COULD BE SIGNIFICANT

Generating less and recycling more waste could impact the Indonesian economy significantly (Exhibit E7). Based on two methodologies (Input-Output Table modelling and Incremental Capital Output Ratio modelling), transitioning towards a circular economy could help create an additional IDR593-638 trillion (USD42-45 billion) GDP for Indonesia in 2030 (equivalent to 2.3 to 2.5 percent of its projected GDP in 2030).<sup>14</sup> This additional economic value would be above the BAU scenario where Indonesia does not actively pursue circular economy opportunities. Two aspects of this analysis are important to note:

- COVID impact.** These estimates were not adjusted for the COVID-19 crisis due to a lack of clarity on the long-term impact of COVID-19 on Indonesia's economy and waste volumes. Based on the latest government estimates, Indonesia's GDP is expected to shrink by 1.6 to 2.2 percent in 2020.<sup>15</sup> The International Monetary Fund (IMF) projects that Indonesia's GDP could rebound to 6.1 percent growth in 2021.<sup>16</sup> However, the link between GDP growth and waste volumes for the five prioritised sectors is not straightforward, and COVID-19 could have impacts on waste and circularity opportunities (which are hard to quantify) beyond its impact on the economy. For example, a fall in household income could lead to lower demand for consumer electronics, thereby, decreasing the generation of e-waste. However, a greater share of formal workers working from home and an accompanying shift toward digitisation could increase e-waste volumes.<sup>17</sup> It is unclear whether the fall in e-waste due to lower incomes could offset the expected rise in e-waste due to greater digitisation. More details

<sup>14</sup> Further details on these methodologies are provided in the Annex.

<sup>15</sup> The Jakarta Post (2020), "Govt again revises down 2020 GDP amid year-end surge of COVID-19 cases." Available at: <https://www.thejakartapost.com/news/2020/12/22/govt-again-revises-down-2020-gdp-amid-year-end-surge-of-covid-19-cases.html>

<sup>16</sup> IMF (2020), *A Crisis Like No Other. An Uncertain Recovery*. Available at: <https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020>

<sup>17</sup> The Rising (2020), "Will Social Distancing Increase E-Waste? Here's How This IT CEO Is Preparing For The Possibility." Available at: <https://therising.co/2020/04/23/social-distancing-increase-e-waste-sagent-ceo-preparing-for-possibility/>

can be found in the Annex. Hence, it is important that these numbers are updated once there is greater clarity on the impact that COVID-19 could have on Indonesia's economy and waste volumes to better understand the potential of a circular economy in a post-COVID environment.

- **Economy-wide benefits versus sector-specific benefits.** The economic impact represents the economy-wide gains derived from the adoption of circular economy opportunities in the five sectors (not equal to the net impact in these sectors). The economic benefits were derived from reducing waste in the key sectors, with the resulting savings spent in other sectors (e.g., healthcare, education, recreation services, etc.). This is important to note because even though the overall economy may benefit significantly from circular economy adoption, this does not necessarily mean that the economic output in the five sectors will be higher. Understanding the exact economic impact for the focus sectors is difficult as it depends on where the resultant savings from business and consumer adoption of circular opportunities are spent. For example, if consumers reducing their food waste (and hence needing less quantity of food) decide to spend the resultant savings on higher-value food, then the impact on the food & beverage sector could be positive. But if those savings are spent in other sectors, then the impact could be negative. System dynamics analysis was conducted to better understand these sector-specific impacts (see Box 2 for further details). The Causal Loop Diagram and the detailed methodology related to system dynamics can be found in the Annex. The system dynamics analysis focused only on the direct impact of the five focus sectors. According to the analysis, the adoption of the business efficiency opportunities related to a circular economy could create significant benefits to GDP growth and jobs in the focus sectors. However, if the adoption of a circular economy opportunity leads to reduced consumer demand, it could lead to slower growth than under business-as-usual. These findings must be caveated given that they exclude the economy-wide multipliers from the spending of savings from a circular economy, but nonetheless, they reinforce the importance of understanding that there will be potential winners and losers from a transition to a circular economy, and businesses and policymakers must prepare accordingly to ensure that the transition does not adversely impact certain sections of the Indonesian economy and society.



## Box 2. System dynamics approach

System dynamics takes a systems approach to policy analysis and design, which can be applied to problems arising in social, managerial, economic, or ecological systems.<sup>18</sup> This approach begins by defining problems and then proceeds by mapping and modelling the different stages of the system, which are often dynamic and interconnected. System dynamics approach differs from the linear modelling processes since it takes into account the (often lagged) feedback loops that arise in complex systems.<sup>19</sup> The system dynamics approach was used in this analysis to complement the analysis shown earlier, ensuring that any potential feedback loops and other linkages between interconnected factors (e.g., waste and GDP growth) were fully incorporated. The findings from the system dynamics approach are broadly consistent with the findings estimated from the Input-Output and ICOR methodologies, showing the potential for stronger GDP and employment growth, and better environmental outcomes from a circular economy. However, it also notes the potential future growth challenges for certain sectors due to the reduction in waste.

A key finding from the system dynamics approach is that supply-wide circular economy adoption focused on reducing waste in production systems could support higher economic growth. However, reductions in waste from consumers could have a negative impact on growth and employment due to the lower demand. The analysis shows that a consumer-centric approach could lead to a negative GDP impact of IDR1,563 trillion on the five focus sectors relative to a BAU scenario in 2030 (Exhibit E8).<sup>20</sup> In contrast, a producer-centric approach could generate a positive GDP impact of IDR312 trillion in 2030. A combined consumer and producer-centric approach could lead to a modest economic impact of IDR21 trillion. Hence, an important takeaway is that the Government of Indonesia should consider prioritising efforts to encourage producers to adopt circular economy opportunities.

A key reason for the differences in the system dynamic results from the earlier findings is that the system dynamics approach in this analysis only focused on the GDP impact in the five focus sectors, whereas the economic impact analysis shown in the main report accounts for the spillover effects into other sectors (beyond the five focus sectors). This is particularly important for reduction opportunities which could lead to lower demand in the focus sectors, but the savings could be spent in other sectors, helping to drive their demand. For example, reductions in consumer food waste may lead to lower demand for the food & beverage sector. However, savings from reduced food purchases could be spent elsewhere in the economy (e.g., on health, education, recreation, etc.) contributing to growth in those sectors. Further details on the system dynamics approach can be found in the Annex.

Indonesia's MSMEs could also play a key role in supporting the economic transition. In 2018, there were close to 64 million MSMEs in Indonesia, employing approximately 61 million people (representing nearly 90 percent of all employment).<sup>21</sup> MSMEs also contributed nearly 60 percent to Indonesia's GDP in 2017.<sup>22</sup> A circular economy could enable cost savings for MSMEs from greater resources efficiency and waste reduction, and lead to the development of new business models, such as those focusing on recovery and recycling, which could provide significant opportunities to MSMEs.<sup>23</sup> Furthermore, MSMEs could be better placed than large enterprises to adopt circular economy practices. Since MSMEs are more likely to be closer to the end-consumer than large enterprises, they are better positioned to adopt circular business models that require decentralised production systems, such as business models focused on reusing, recycling, or repurposing resources locally.<sup>24</sup> However, in Indonesia, most enterprises within MSMEs are micro or small. According to the BPS, micro and small enterprises accounted for close to 98 percent of all MSMEs in 2016.<sup>25</sup> The micro and small firms could lack the knowledge and capital to adopt circular opportunities. Hence, the Government would need to draft policies that are cognizant of the variation within the MSMEs. To support micro and small firms, the Government could consider helping such firms become members of supply chain partnerships that have shown to be effective in Europe.<sup>26</sup>

18 System Dynamics Society, "Introduction to system dynamics." Available at:

<https://www.systemdynamics.org/what-is-sd>

19 Francesca Ricciardi et al (2020), System dynamics modeling as a circular process: The smart commons approach to impact management. Available at:

<https://www.sciencedirect.com/science/article/pii/S0040162519310923>

20 The estimates in the system dynamics analysis are in constant 2010 prices

21 TNP2K (2020), The Mechanism of Micro, Small, and Medium Enterprise's Data Integration in Indonesia for Targeting Social Assistance and Empowerment Programs. Available at:

<http://tnp2k.go.id/download/43209/The%20Mechanism%20of%20Micro,%20Small,%20and%20Medium%20Enterprise's%20Data%20Integration%20in%20Indonesia%20for%20Targeting%20Social%20Assistance%20and%20Empowerment%20Programs.pdf>; Badan Pusat Statistik Republik Indonesia (2016), Results of Establishment Listing Economic Census 2016. Available at:

[https://se2016.bps.go.id/Lanjutan/files/buku/00\\_Indonesia.pdf](https://se2016.bps.go.id/Lanjutan/files/buku/00_Indonesia.pdf)

22 Tulus Tambunan (2019), Recent evidence of the development of micro, small and medium enterprises in Indonesia. Available at:

<https://link.springer.com/article/10.1186/s40497-018-0140-4>

23 Plant Chicago (2020), The circular economy toolkit for small business. Available at:

[https://www.swalco.org/DocumentCenter/View/2322/Plant-Chicago-Circular-Economy-Toolkit-for-Small-Business\\_Feb2020](https://www.swalco.org/DocumentCenter/View/2322/Plant-Chicago-Circular-Economy-Toolkit-for-Small-Business_Feb2020)

24 Oliver Wyman (2017), Supporting the circular economy transition. Available at:

[https://www.oliverwyman.com/content/dam/oliverwyman/2/publications/2017/sep/CircularEconomy\\_print.pdf](https://www.oliverwyman.com/content/dam/oliverwyman/2/publications/2017/sep/CircularEconomy_print.pdf)

25 BPS (2016), Result of establishment listing economic census 2016. Available at:

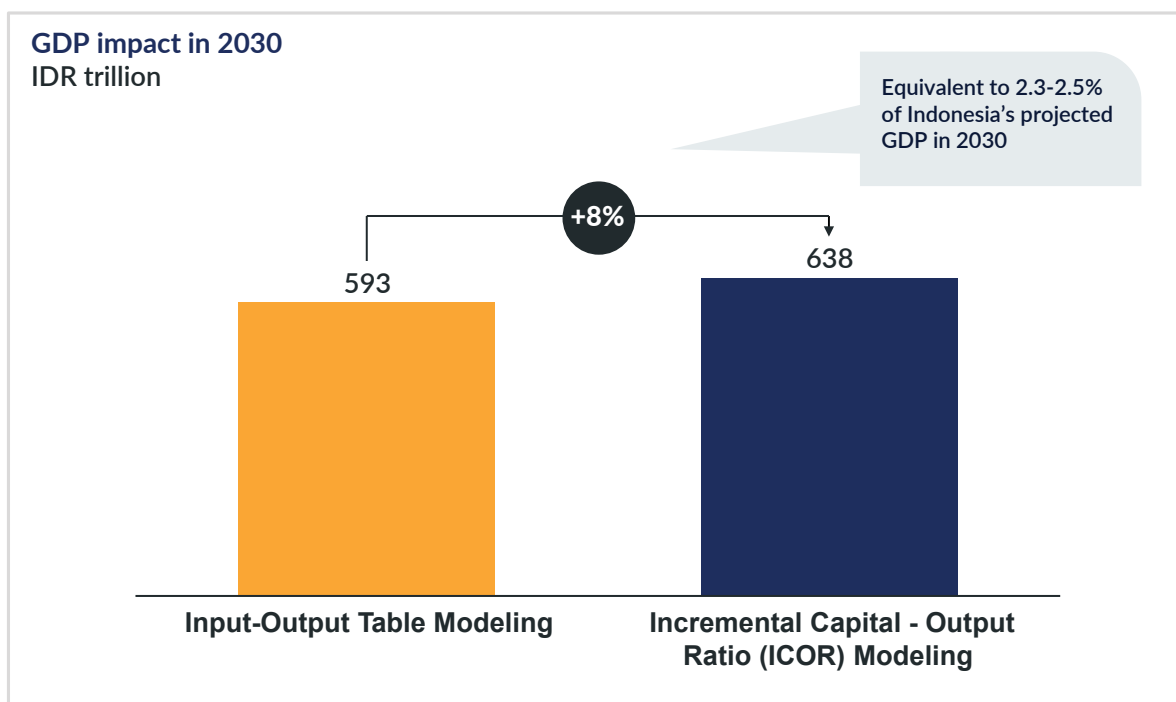
[https://se2016.bps.go.id/Lanjutan/files/buku/00\\_Indonesia.pdf](https://se2016.bps.go.id/Lanjutan/files/buku/00_Indonesia.pdf)

26 Rizos et al (2016), Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers. Available at:

<https://www.mdpi.com/2071-1050/8/11/1212>

Exhibit E7

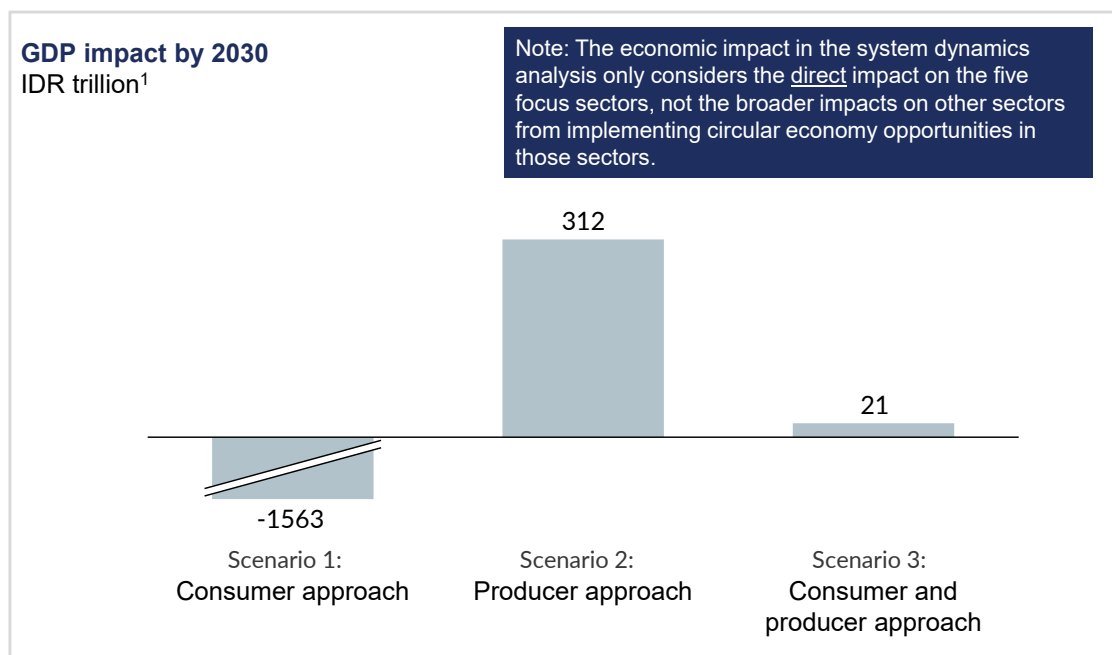
A circular economy could generate an additional economy-wide GDP impact of IDR593-638 trillion in 2030



SOURCE: BPS; Bank Indonesia; Ministry of Environment and Forestry; ADB; WRI; ITU; expert interviews (see annex for more details)

Exhibit E8

Based on the system dynamics analysis, the additional GDP impact on the 5 focus sectors could be up to IDR312 trillion by 2030



1. All figures in this exhibit are in constant 2010 prices

SOURCE: Ministry of Environment and Forestry; WRI; World Economic Forum; Ellen MacArthur Foundation; ITU; expert interviews (see annex for more details)

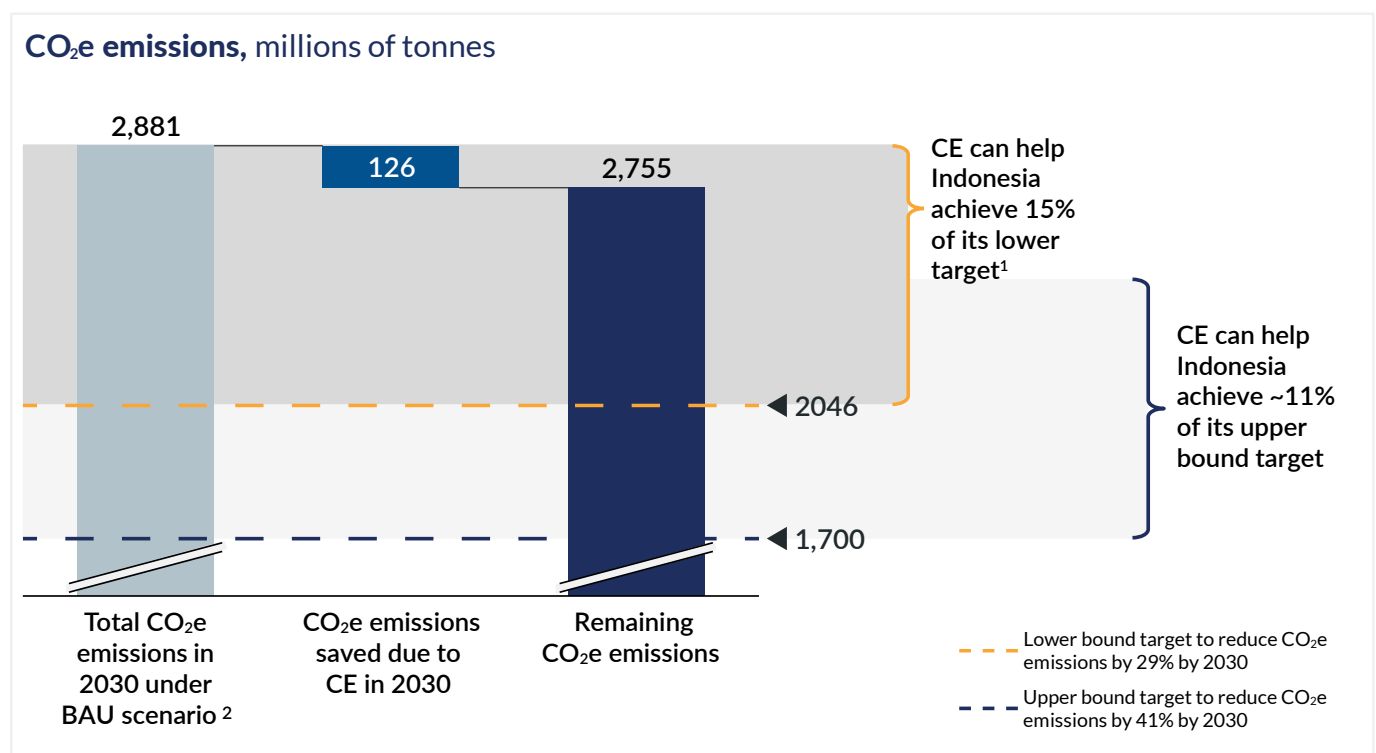
## A CIRCULAR APPROACH COULD ALSO SIGNIFICANTLY REDUCE CARBON EMISSIONS AND WATER USE

There is also substantial potential to avoid the generation of CO<sub>2</sub>e emissions and water use, which could help Indonesia reach its national targets. For example, based on the Government of Indonesia's submissions to the United Nations Framework Convention on Climate Change, Indonesia targets to reduce its CO<sub>2</sub>e emissions by 29 percent against a business-as-usual baseline scenario, and up to 41 percent subject to international assistance and financial support by 2030. Based on this analysis, a circular economy could help Indonesia achieve around 15 percent of its lower bound target of reducing CO<sub>2</sub>e emissions and around 11 percent of its upper bound target of reducing CO<sub>2</sub>e emissions by 2030 relative to the BAU scenario (Exhibit E9). The reduction in CO<sub>2</sub>e emissions is driven by several factors, including lower waste generation (e.g., decrease in consumer food waste due to improved consumer awareness, which could decrease food production), use of more energy-efficient alternatives (e.g., greater use of wood and timber-based constructions over concrete), and increasing the lifespan of resources (e.g., greater reuse of garments and increased recycling of electronic parts). The emissions released during the production of various products related to the five focus sectors (e.g., food, textiles, plastic) were estimated to calculate the emissions that could be avoided if Indonesia were to adopt circular opportunities.

Apart from avoiding carbon emissions, a circular economy could also offer several other environmental benefits. For example, the increased reuse of textile products could reduce the production of virgin textiles and the associated negative impact of wastewater discharge from the factories. Increased food waste recycling through composting could help avoid land degradation and thereby reduce the need to clear land in pursuit of new fertile agricultural land to counter the loss of soil fertility elsewhere.<sup>27</sup>

### Exhibit E9

## A circular economy could make a significant contribution in helping Indonesia achieve its CO<sub>2</sub>e emissions reduction targets in 2030



1. The lower bound target requires a reduction of nearly 835 million tonnes in CO<sub>2</sub>e emissions and the upper bound target requires a reduction of nearly 1,181 million tonnes

2. Based on Indonesia's estimate given in its UNFCCC submission that its BAU CO<sub>2</sub> emissions in 2030 will be 2,881 million tonnes

SOURCE: United Nations Framework Convention on Climate Change; WRI; World Economic Forum; Ellen MacArthur Foundation; International Energy Agency (see annex for more details)

27 FAO (2015), "Composting: let's give the soil something back." Available at: <http://www.fao.org/soils-2015/news/news-detail/en/c/280674/>

## 4.4 MILLION CUMULATIVE NET JOBS COULD BE CREATED BY A CIRCULAR APPROACH, WITH SIGNIFICANT SAVINGS IN HOUSEHOLD EXPENDITURE

Social benefits in terms of job creation may also be reaped (Exhibit E10). Circular economy opportunities in the five sectors could generate a cumulative total of 4.4 million net jobs between 2021 and 2030 in Indonesia. The additional jobs created from a circular economy could contribute to Indonesia's target of generating three million jobs every year, as set out in the omnibus bill.<sup>28</sup>

It is important to note there will be winners and losers in this jobs transition. For instance, some upstream jobs (e.g., in the manufacturing sector) are likely to be displaced, but these could be offset by the new jobs created in the downstream sectors (e.g., services sector). According to the system dynamics analysis, the direct jobs impact in the five focus sectors could vary between -13.9 to 2.5 million jobs based on different scenarios (The details about the scenarios can be found in the Annex). What is clear is that policies must be in place to support the transition of jobs by retraining displaced workers to fill new roles created by the circular transition. This policy response required will be assessed in detail in the next phase of this project.

Apart from its impact on jobs, a circular economy that limits carbon emissions and reduces environmental pollution is an investment in human capital, health, and productivity. The Pollution and Health Metrics report by the Global Alliance on Health and Pollution revealed that there were 232,974 recorded pollution-related deaths in Indonesia.<sup>29</sup> By lowering the demand for virgin materials, a circular economy could potentially reduce such pollution-related deaths.

Moreover, a circular economy could also contribute to reducing gender disparity in Indonesia. According to the Organisation for Economic Co-operation and Development (OECD), poor labour conditions facing the female workforce and greater involuntary exposure to harmful products and chemicals among women are examples of reasons why women are environmentally disadvantaged in a linear economy.<sup>30</sup> Even plastic pollution has a disproportionate impact on women. Women are more likely to be exposed to the negative effects of plastic pollution than men, such as through direct exposure to emissions from waste burning or dumping since they are more likely to be responsible for domestic tasks that expose them to waste pollution. Moreover, female workers in the informal sector waste system are often exposed to health and safety risks and face workplace violence and discrimination.<sup>31</sup>

A circular economy could also create significant economic opportunities for Indonesia's women. According to the International Labour Organization (ILO), the rise of "green jobs" could offer an opportunity to empower women.<sup>32</sup> This could be especially relevant for the textiles sector in Indonesia, where women account for 58 percent of the jobs.<sup>33</sup> This underlines the importance of a circular economy for creating benefits to gender equality in Indonesia and the necessity of a proactive women-centric approach to policy development.

Based on this analysis, 75 percent of the total net jobs created by a circular economy in Indonesia in 2030 could potentially be for women. This is driven by the potential job displacement in male-dominant sectors (e.g., construction, where women make up only two percent of the total jobs) from a circular economy and the likely job creation in female-dominant sectors (e.g., education, human health and social work, where households could reinvest their savings according to the analysis).

<sup>28</sup> The Jakarta Post (2020), "Indonesia hopes to attract \$87b investment, create 3m jobs through omnibus bill: Airlangga." Available at:

<https://www.thejakartapost.com/news/2020/02/24/omnibus-bill-to-attract-87b-investment-open-3m-jobs-airlangga.html>

<sup>29</sup> Global Alliance on Health and Pollution (2019), *Pollution and health metrics: Global, Regional, and Country Analysis*. Available at:

[https://gahp.net/wp-content/uploads/2019/12/PollutionandHealthMetrics-final-12\\_18\\_2019.pdf](https://gahp.net/wp-content/uploads/2019/12/PollutionandHealthMetrics-final-12_18_2019.pdf)

<sup>30</sup> OECD (2020), *Gender-specific consumption patterns, behavioural insights, and circular economy*. Available at:

<http://www.oecd.org/env/GFF-Gender-Issues-Note-Session-5.pdf>

<sup>31</sup> WIEGO (2018), *Violence and Informal Work*. Available at:

[https://www.wiego.org/sites/default/files/publications/files/IJC\\_WIEGO\\_Briefing%20Note%20Violence%20in%20the%20workplace%20EN%20for%20web.pdf](https://www.wiego.org/sites/default/files/publications/files/IJC_WIEGO_Briefing%20Note%20Violence%20in%20the%20workplace%20EN%20for%20web.pdf)

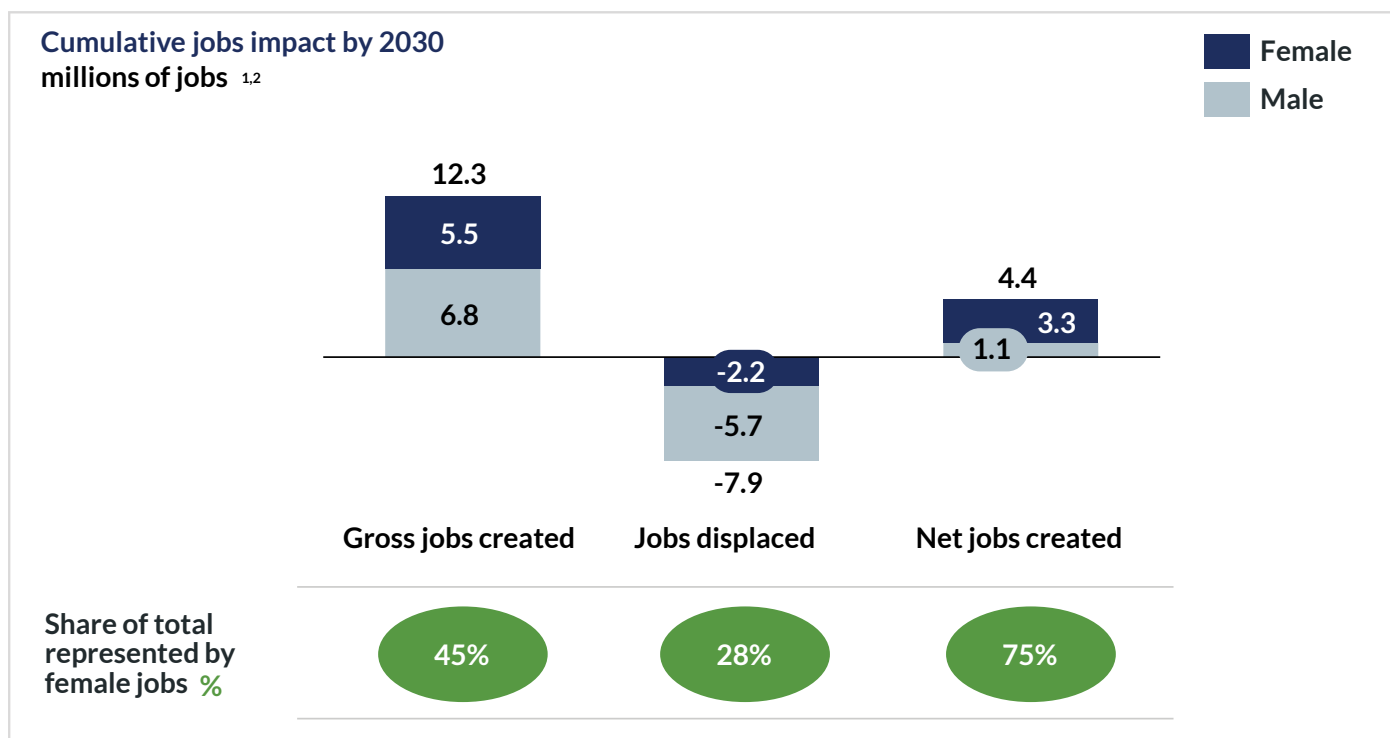
<sup>32</sup> ILO (2015), *Gender equality and green jobs*. Available at:

[https://www.ilo.org/wcmsp5/groups/public/---ed\\_emp/---emp\\_ent/documents/publication/wcms\\_360572.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_360572.pdf)

<sup>33</sup> ILO (2017), *Indonesia garment and footwear bulletin*. Available at:

[https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-jakarta/documents/publication/wcms\\_625195.pdf](https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-jakarta/documents/publication/wcms_625195.pdf)

## The circular economy could create 4.4 million net jobs by 2030, of which three-quarters could be for women



1. The total jobs in 2030 were calculated by growing the total jobs in Indonesia in 2019 with Indonesia's BAU labour force growth rate of 1.3% till 2030. The total jobs in 2030 are inclusive of the net jobs created by the circular economy in 2030  
 2. To estimate the jobs created for women in 2030, it was assumed that the gender share of jobs in each sector in 2018 would remain unchanged till 2030. The data from the Labour Force Situation report published by BPS in February 2018 on the gender share of jobs in each of the 17 sectors of Indonesia's economy was used  
 SOURCE: Bank Indonesia; BPS; World Bank; UN Population Division (see annex for more details)

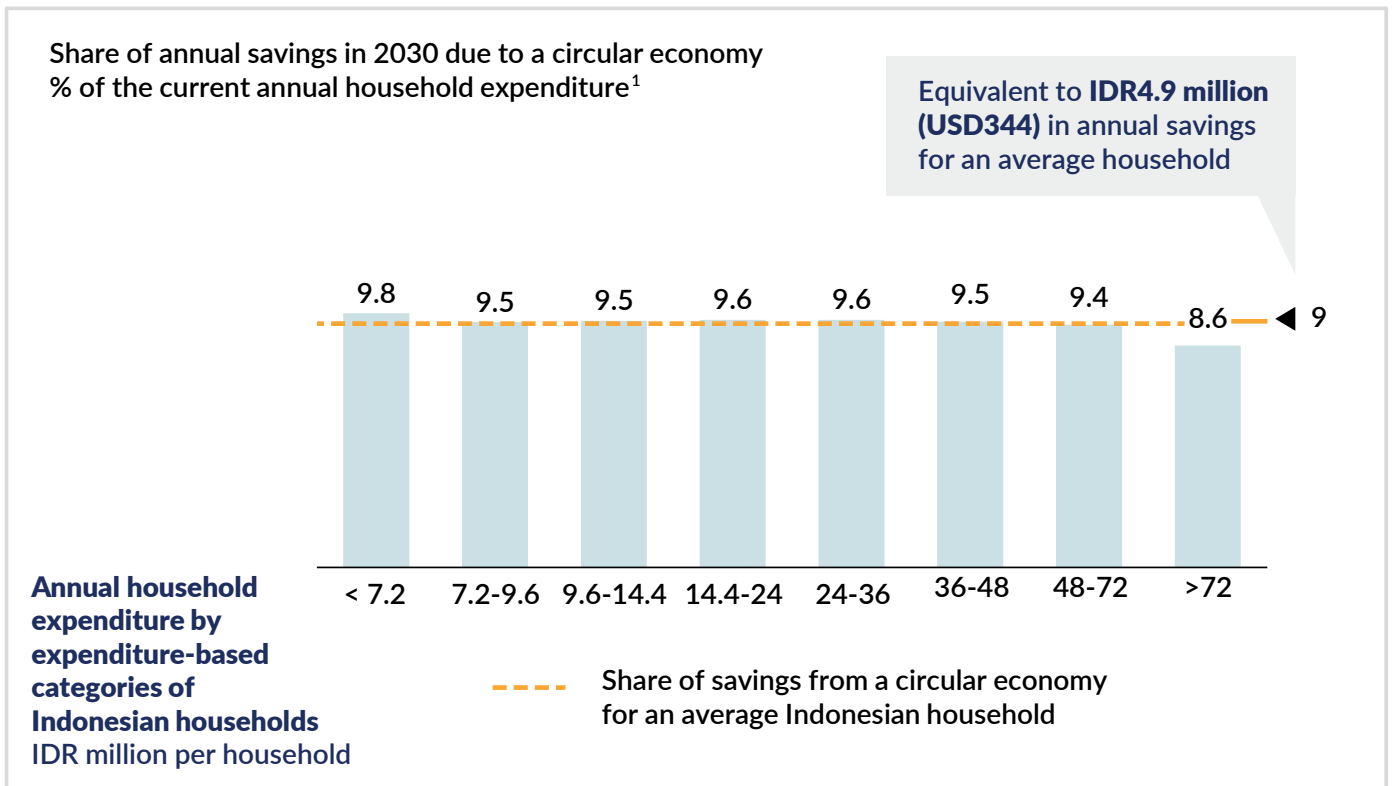
There could also be significant monetary savings for households, either through direct savings from a reduction in consumer demand (due to less wastage), or in the form of a pass-through of savings from producers.<sup>34</sup> An average Indonesian household could save around IDR4.9 million (USD344) annually or nine percent of its annual household expenditure due to the savings derived from the circular transition (Exhibit E11). These savings are particularly impactful for lower-income households. For example, the savings from a circular economy could represent 9.8 percent of the annual household expenditure of a household in the lowest expenditure class (those that spend less than IDR7.2 million annually).

It is important to note that these household savings are likely to be reinvested since a circular economy could lead to a shift in consumer demand. The demand is likely to move away from production-oriented activities to service-oriented economic activities. For example, an increase in the lifespan of electronics could decrease the demand for new consumer electronics and increase the demand for refurbishing and reusing electronics. Thus, the initial household savings created due to a circular economy could either be reinvested in the same sector or in other sectors (e.g., education, health, and recreation).

It is also important to stress that the annual household savings could be lower than IDR4.9 million (USD344) subject to the specific implementation arrangements. For example, the introduction of Extended Producer Responsibility (EPR) could increase costs for businesses, some of which could be passed down to consumers. Calculating the impact of such implementation costs on household savings is challenging since the impact would depend on the sector-specific policy responses, which would be assessed in the next phase of work.

<sup>34</sup> The exact pass-through depends on the relative price elasticities of products.

## A circular economy could generate annual savings worth 9% of the total expenditure for an average household in Indonesia in 2030



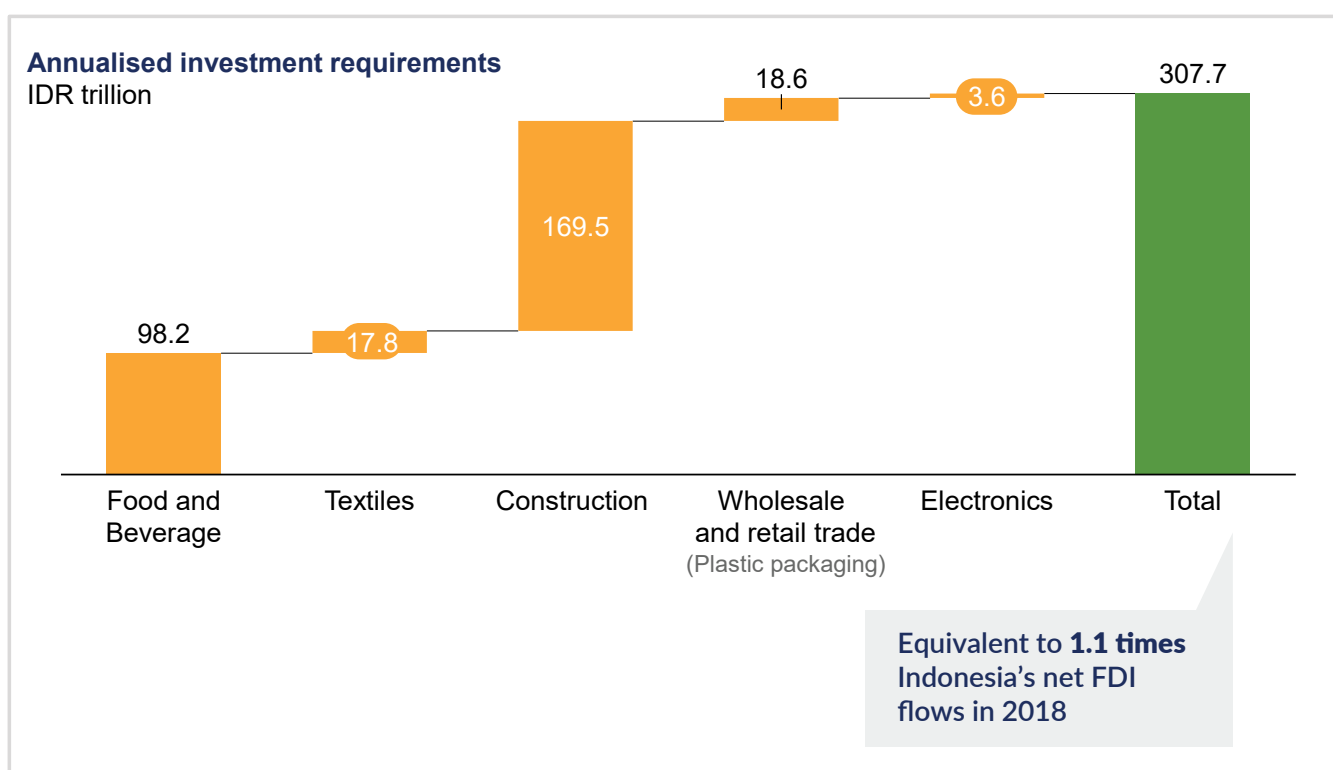
1. BPS data for an average household from 2018 was used for this purpose. The data for different expenditure-based categories of households was only available for 2016. This data was used to project household spending by item in 2018 for the different household categories. The items listed by BPS in its data were matched to the 5 focus sectors: food and beverage ("total food"); textiles ("clothing, footwear, and headgear"); construction ("housing and household facilities"); plastic packaging ("goods and services"); and electronics ("durable goods")

## REALISING THE POTENTIAL OF A CIRCULAR ECONOMY

Significant investment is needed to address the infrastructure gaps and create business models that can unlock the circular economy opportunities outlined in this study. Indonesia could need IDR308 trillion (USD21.6 billion) of annual investment across the five focus sectors between now and 2030 (Exhibit E12), more than 50 percent of which would be required in the construction sector. Indonesia would need to deploy these capital investments in a variety of channels. For example, in construction, to facilitate the development of more energy-efficient buildings, the investment would be required on on-site energy generation, distribution systems, controls technologies, space heating, lighting, amongst others.<sup>35</sup>

### Exhibit E12

## Annual capital investment required to capture circular opportunities could be IDR308 trillion (USD21.6 billion) or 1.1 times Indonesia's net FDI flows in 2018



SOURCE: World Bank; Ellen MacArthur Foundation; Business & Sustainable Development Commission; WRI; FAO; World Economic Forum (see annex for more details)

Existing government policies could also play a crucial role in creating a favourable environment for a circular economy in Indonesia. For example, Ministry of Environment and Forestry issued the Ministerial Regulation No. 75/2019 (MR 75/2019), which sets strict targets for businesses to achieve by 2029 – it obliges businesses to reduce plastic, aluminium, glass, and paper waste by 30 percent between 2020 and 2029. The Presidential Regulation No. 97 of 2017 (also known as JAKSTRANAS), aims to reduce waste by 30 percent and manage the remaining 70 percent of the waste by 2025. Moreover, the Presidential Decree No.83/2018, aims to reduce marine plastic debris by 70 percent by 2025 and has paved the way for Indonesia's National Plastic Action Partnership (NPAP).

Despite the existing policy landscape, several barriers are preventing firms from capturing circular economy opportunities. A survey of 57 Indonesian firms revealed that key barriers included the need to overcome existing habits and customs, the unintended consequences of existing regulations, and lack of infrastructure (Exhibit E13). Another

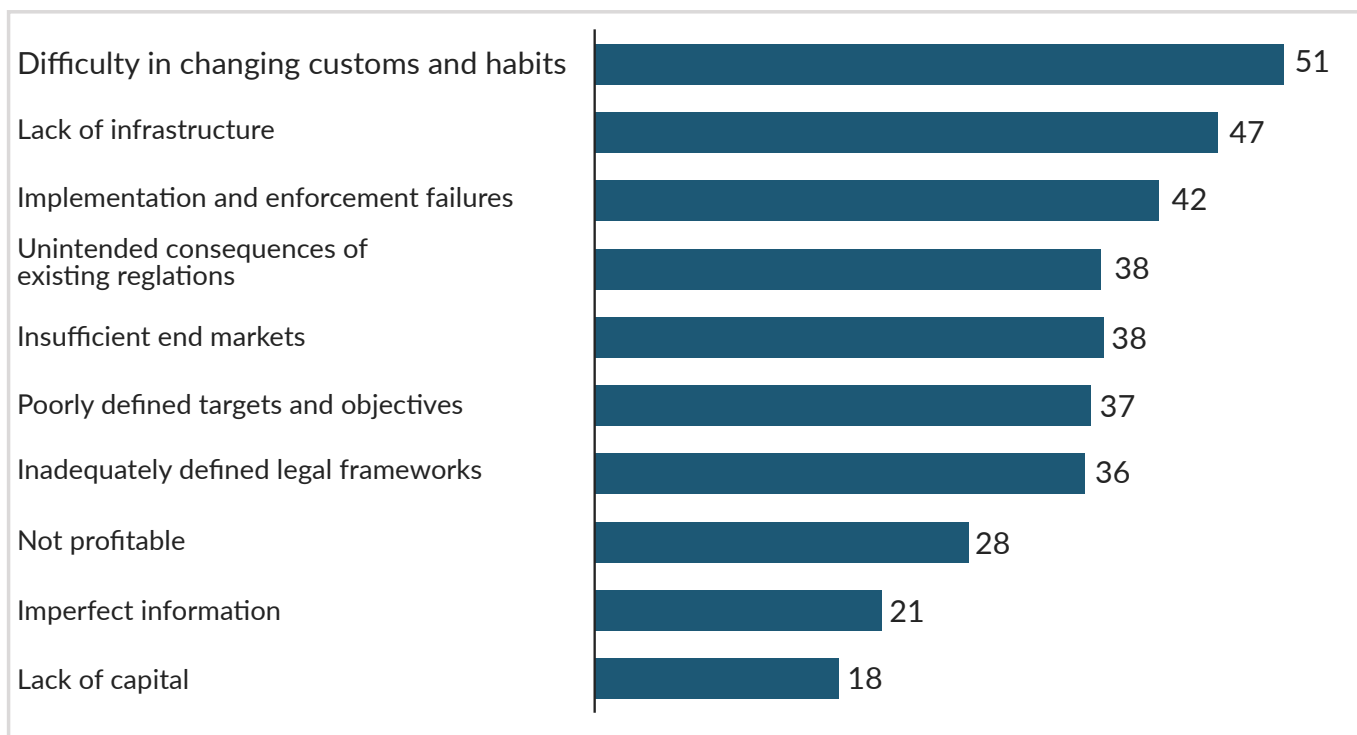
<sup>35</sup> Build up (2019), "Overview, Financing energy efficiency in buildings". Available at: <https://www.buildup.eu/en/news/overview-financing-energy-efficiency-buildings>

survey of 53 respondents conducted by the Indonesia Circular Economy Forum (ICEF) highlighted that commitment and collaboration among critical stakeholders, along with government regulations, are key challenges in implementing a circular economy in Indonesia.<sup>36</sup> Micro, Small, and Medium Enterprises (MSMEs) will be particularly important to engage in circular economy efforts. They represented around 90 percent of employment and close to 60 percent of Indonesia's GDP in 2019. MSMEs often face barriers to implementing changes due to skill gaps, lack of information, and capital requirements, but international research also shows that MSMEs can be some of the potential biggest beneficiaries from a circular economy if these challenges are overcome.<sup>37</sup> As such, ensuring MSMEs are at the heart of the circular economy roadmap development will be crucial. Based on consultations with sector-specific experts and discussions with private sector representatives, an initial list of policy solutions to overcome the barriers are outlined in this report. The next phase of this work will develop a detailed multi-stakeholder roadmap for addressing the barriers and capturing the opportunities identified in this report.

**Exhibit E13**

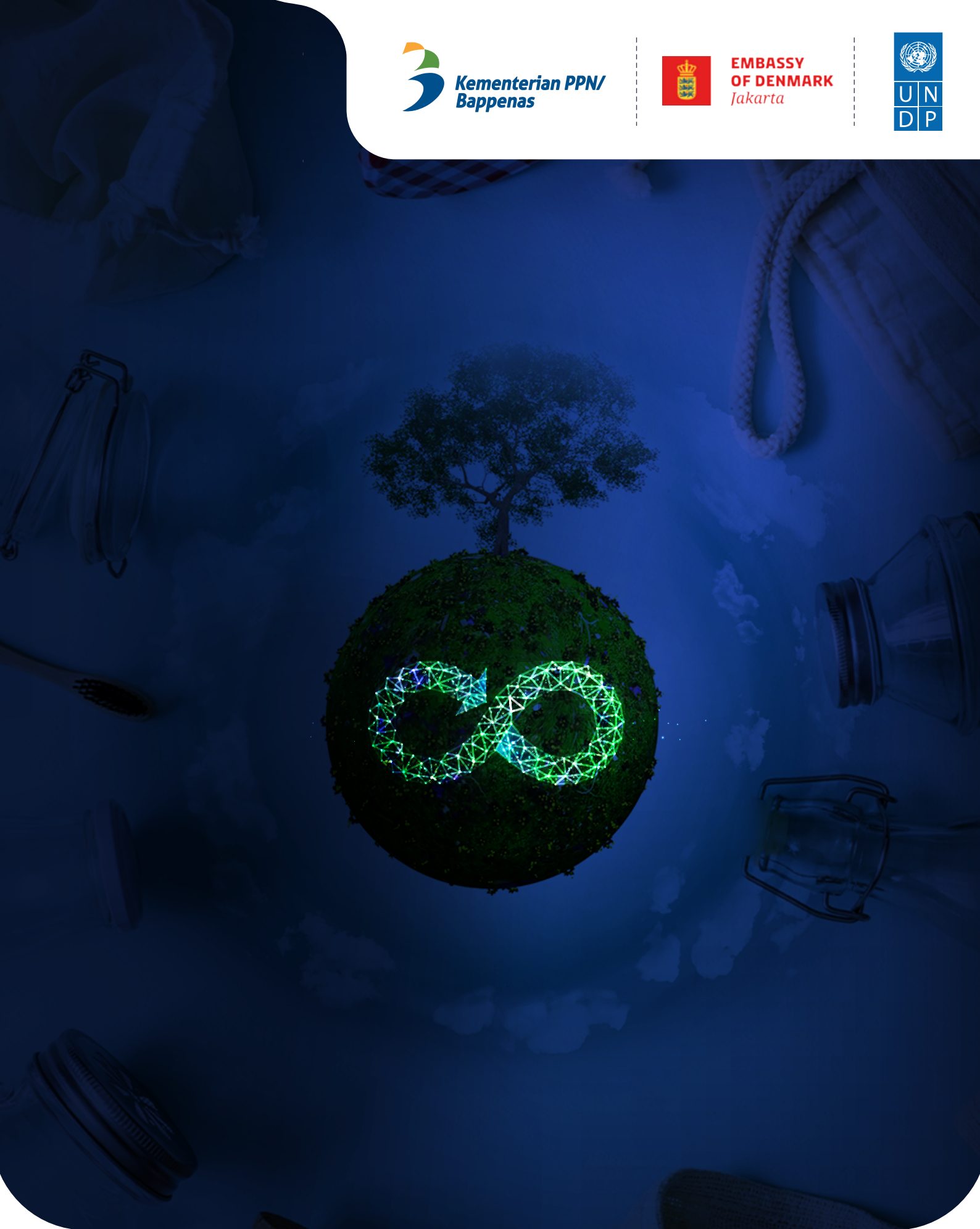
## A sample of firms in Indonesia highlighted top 10 barriers to adopting circularity actions

Share of firms highlighting barrier as very relevant  
(tick all that apply) % of firms



SOURCE: Online survey of firms in Indonesia carried out in February and June 2020 (sample size = 57)

<sup>36</sup> ICEF (2019), "The 3<sup>rd</sup> Indonesia Circular Economy Forum 2019."  
<sup>37</sup> Oliver Wyman (2017), *Supporting the circular economy transition*. Available at: [https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/sep/CircularEconomy\\_print.pdf](https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2017/sep/CircularEconomy_print.pdf)



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