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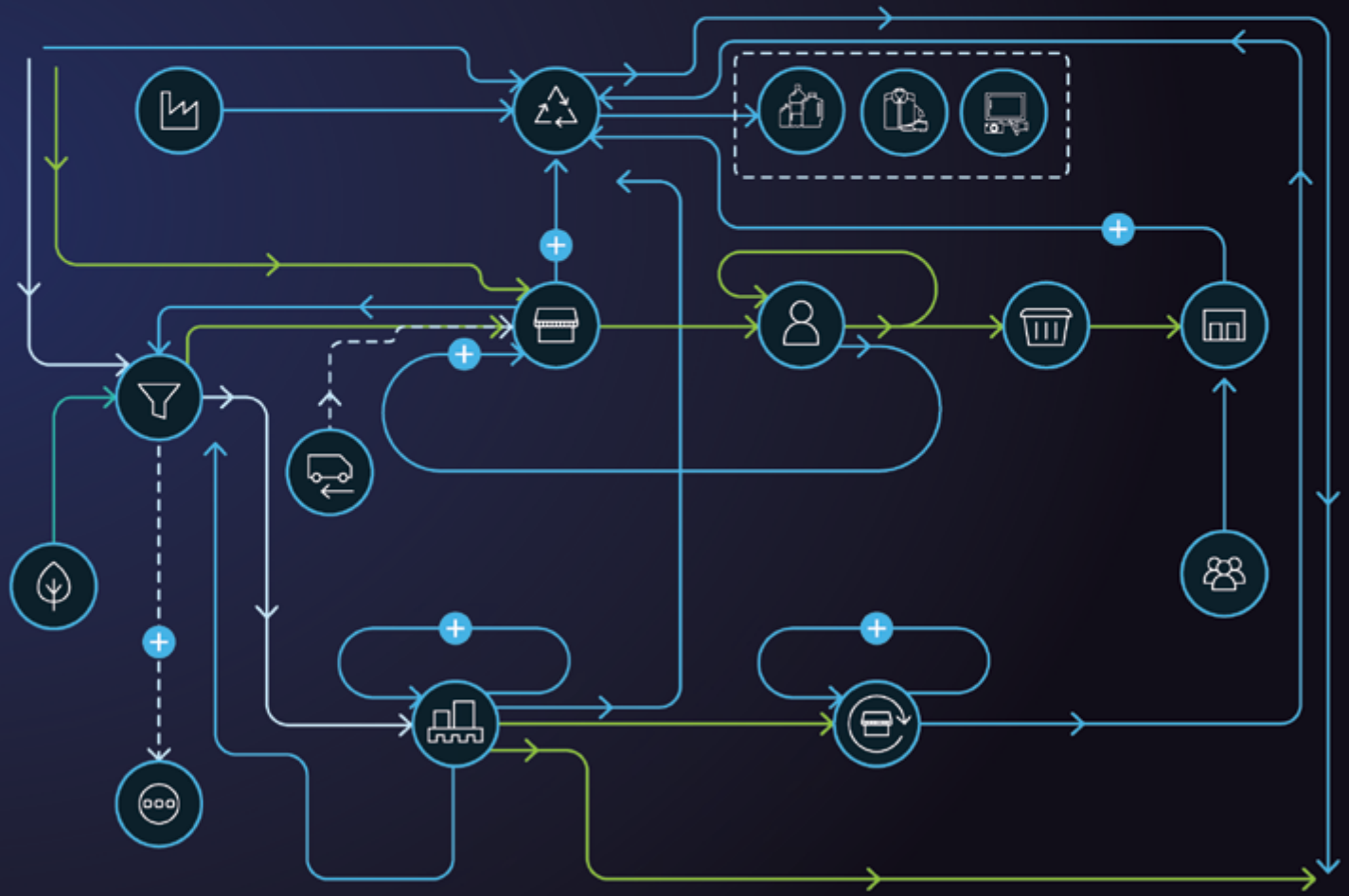
CIRCLE ECONOMY

Switching to circular global value chains: State of play and future pathways

Case studies from Morocco, Bangladesh and Egypt



switch to Circular Economy Value Chains

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About SWITCH to Circular Economy Value Chains

The Switch to Circular Economy Value Chains (SWITCH2CE) project is an initiative that assists EU multinational companies and their suppliers from developing countries to switch to more circular economy approaches and practices in three selected value chains: Plastic Packaging, Textile & Garments, and ICT and Electronics. The overall goal is to support the 'Transformation towards a circular economy', including to contribute to sustainable growth, low carbon and climate resilient development, decent jobs creation, and a safer, healthier, and pollution-free environment. SWITCH2CE is co-funded by the European Union and the Government of Finland, and implemented by UNIDO, in collaboration with Circle Economy, Chatham House, and the European Investment Bank. Learn more at: **www.switchtocircular.eu**

About Circle Economy

We are a global impact organisation with an international team of passionate experts based in Amsterdam. We empower industries, cities and nations with practical and scalable solutions to put the circular economy into action. Our vision is an economic system that ensures the planet and all people can thrive. To avoid climate breakdown, our goal is to double global circularity by 2032.

To support the overall objectives of the SWITCH2CE project, Circle Economy has conducted research into the current state of circular economy developments in the plastics packaging value chain in Morocco, the textile and garment value chain in Bangladesh, and information and communication technology (ICT) and electronics in Egypt. Circle Economy is also implementing a capacity-development programme to provide technical support and training to enterprises in these sectors.

Contents

Executive summary

To slow the accelerating polycrisis, the circular economy is needed now more than ever. Earth's natural systems are being put under increasing pressure, with the impacts of material extraction, consumption and waste driving us across several of the planet's key life-supporting boundaries. As a result, global value chains are under pressure to mitigate these impacts, with legislation rolling out around the world expected to change how manufacturers of consumer goods operate. The circular economy—a model in which waste is designed out, products and materials are kept in use at their highest value for as long as possible, and natural systems are regenerated—has been posited as a means to do so. However, special attention must be paid to ensure that policies and industry initiatives in consumer countries don't negatively impact producing countries. If well-designed, the circular economy offers producers a range of opportunities to become front-running suppliers and stay competitive in increasingly environmentally conscious export markets. To this end, the SWITCH to Circular Economy Value Chains—or SWITCH2CE—programme aims to support suppliers in lower-income countries in the value chains of large EU manufacturers and buyers in transitioning to a circular economy. The programme—and this report—take stock of three key global value chains in three countries: plastic packaging in Morocco, textiles and garments in Bangladesh and information and communication technology (ICT) in Egypt. For Morocco and Bangladesh, it explores current circular economy developments and lays out pathways for action; while for Egypt, it highlights the current state of play for waste electrical and electronic equipment (WEEE).

At its heart, the circular economy can be conceptualised through four key strategies: regenerate, narrow, slow and cycle. More simply, this means using clean, non-toxic materials and energy, using fewer resources, using resources for longer, and ultimately, using resources again once they've reached their end of life. This report uses this framework to organise research on the current state of circularity—and opportunities for change—in Morocco's plastic packaging sector, in Bangladesh's textile and garment industry, and in Egypt's ICT. Because the circular economy looks beyond a sole focus on materials—also focusing on social capital, for example—this has also been addressed in the following chapters.

Opportunities for a circular economy for plastic packaging and pathways forward in Morocco. The plastic packaging sector is vital to the Moroccan economy, but its impacts are numerous: from pollution of the country's waterways and use of toxic chemicals to impacts on human health—especially in the context of waste pickers, who often work in unsafe conditions to collect plastic waste and procure feedstock for the recycling industry. As environmental concerns begin to feature high on political agendas around the world, the plastic packaging sector will face a number of challenges, but shifting to a circular economy can boost the industry's competitiveness and local capacity for innovation—while ensuring a just transition for informal workers and protecting human health.

Many circular solutions are available to transform Morocco's plastic packaging sector:

Regenerate—Make clean: Shift away from fossil-based plastics in favour of bioplastics, and shift to other conventional alternatives such as glass, paper and aluminium where appropriate; Eliminate the leakage of plastics into the environment through, for example, Extended Producer Responsibility schemes and devices that intercept and collect floating debris; Give a voice to workers in the informal waste sector to ensure a just transition.

Narrow—Use less: Ban single-use plastics, such as plastic bags; Reduce the demand for virgin plastic through strategies such as lightweighting and other material efficiency measures.

Slow—Use longer: Offer reuse business models—in the form of refillable or rentable packaging, for example—for both consumer-facing and industrial packaging.

Cycle—Use again: Formally employ waste pickers to carry out the collecting and sorting of plastic waste in safe, controlled environments; Improve collection systems to increase feedstock availability for recycling plants, which have vastly underutilised capacity; Recycle plastic packaging at its highest value, rather than down-cycling it for low-value

applications; Roll out circular design strategies to boost recyclability, such as avoiding the use of colourants.

While the Moroccan Government and key players in the plastic packaging sector have made strides in accelerating circular economy efforts, additional steps may still be taken. Strengthening the data and evidence base, for example, will be needed to overcome data gaps and support targeted efforts to boost circularity; while a strong circular economy vision and strategic direction that covers different materials and sectors can support better cohesion and ensure the transition is as holistic as possible. Encouraging innovation and entrepreneurship—through capacity-building activities that embed circular principles in entrepreneurship programmes, for example—can also serve to ingrain more circular attitudes in value chain actors. Finally, giving a voice to the informal sector, improving working conditions and investing in traceability and safety solutions will help ensure the circular transition is as just as possible.

Opportunities for a circular economy for textiles and pathways forward in Bangladesh. Bangladesh's textile and garment industry has driven economic growth—but it also poses a number of risks and threatens the country's resilience, especially in the wake of global shocks like the covid-19 pandemic. Driven by rapidly increasing consumption in high-income markets, the industry's production model also generates severe environmental and social impacts: from the production of vast quantities of wastewater—containing toxic chemicals, dyes and heavy metals—to lacking living wages and prevalent child labour. By shifting to a circular economy, Bangladesh's textile and garment industry can boost its resilience, lessen its impact and rethink the role it plays in the global textile economy.

To transform its textile and garment industry, Bangladesh can:

Regenerate—Make clean: Boost the use of locally recycled fabrics by supporting fibre-to-fibre recycling in the country; Reduce toxic inputs by supporting the use of natural, biodegradable dyes and rolling out ambitious regulations to prohibit the discharge of harmful chemicals into water bodies; Employ more regenerative approaches to water use—such as rainwater harvesting—to reduce water stress; Boost renewable energy use—such as solar—in the industry; Protect workers by tackling issues such as overtime and harassment and providing a living wage.

Narrow—Use less: Continue to improve already-present resource-efficient practices in manufacturing, and tackle brands' harmful buying practices, such as over-ordering.

Slow—Use longer: Roll out design strategies that boost the durability and repairability of garments, by using better quality fabrics, for example; Boost reuse business models—which are not common beyond occasionwear; Ensure unavoidable scraps from manufacturing are reused or remanufactured.

Cycle—Use again: Develop a local market for recycled fabrics while boosting capacity for local recycling; Increase the use of recycled water in factories to reduce freshwater use.

Although numerous circular initiatives are already underway in Bangladesh, this research identified five pathways for progress. First, creating a cross-sectoral vision can help uncover new, unexplored opportunities and align stakeholders around mutually beneficial initiatives. To underpin this vision, a stronger evidence base will be needed: current inconsistencies in data are hindering action, but improving this along with boosting the traceability of materials can help steer future action. Preserving already-present circular practices in Bangladesh will also be essential, especially as economic growth causes consumption—and waste—to rise within the country. Working with the informal sector and creating decent, green employment opportunities will also be crucial by, for example, prioritising tailored training, knowledge, and technical capacity in the circular economy space. Finally, it must be recognised that transforming the textile and garment value chain will require coordination between stakeholders across borders: as the EU rolls out circular economy legislation, workers in producing countries will feel an impact. This underscores the need for international collaboration so that new fashion systems are designed with *all* partners of the value chain in mind.

Opportunities for a circular economy for ICT in Egypt. Egypt is a heavy consumer of electrical and electronic equipment (EEE), with market value only set to increase in coming years. At the same time, waste-EEE (WEEE) generation levels are also high, posing environmental risks to the country. If better valorised, WEEE has the opportunity to become a valuable commodity and profitable business opportunity due to the presence of substances such as iron, copper, aluminium and some rare and precious metals. Currently, the vast majority of WEEE in Egypt is collected

by workers in the informal sector, while sorting activities are carried out in both formal and informal sectors—with informal sorting greatly undertaken by women and children. Circular strategies—such as repair, refurbishment, recycling and resale—are also prevalent in the informal sector, although there is a significant opportunity to boost this: only 1% of WEEE in Egypt, for example, is recycled, with the vast majority instead managed through a combination of incineration, landfilling and illegal disposal in open environments. There is already a strong foundation for improvement: brewing legislative changes, shifting consumer preferences and the dominant informal sector all contribute to a promising market for ICT refurbishment in Egypt.

All countries studied boast a strong foundation for the circular transition—but this will not be without challenges. Reuse and repair are already commonplace across countries, and capacity for recycling is significant. However, these activities are not yet carried out to their full potential: a lack of organised waste management systems means that there's often not enough feedstock for recycling companies to run at capacity, while the informal sector's involvement in 'circular' activities means that these are often not valorised to the extent they should be and that products and materials can 'fall through the cracks'. Moving forward, Morocco, Bangladesh and Egypt may aim to bridge data gaps and better capture these activities to move the circular transition forward at the necessary speed and scale. Ultimately, the circular economy will provide each value chain and each country with different opportunities and should be viewed as a tool to meet various sustainability goals both at home and abroad.

1

Introduction

GLOBAL VALUE CHAINS IN A CHANGING WORLD

With looming climate breakdown, biodiversity loss and pollution, we are feeling the daily effects of Earth's boundaries being pushed to their limits now more than ever. A healthy planet is essential for life on Earth to not just survive but thrive, and the imperative is becoming increasingly clear: governments and industries around the world must adjust their activities accordingly. At present, global value chains for everyday goods—from clothing and packaging to electronic equipment—are entrenched in linear 'take-make-waste' modes of being, which consume massive quantities of materials and generate unnecessary waste from production to post-consumer phases. Social concerns are also coming to the fore: although these value chains do create employment opportunities around the globe, hidden undercurrents like unlivable wages and child labour are all too prevalent. But now, as key actors are making incremental changes towards sustainability, global value chains are under increasing pressure to align with environmental and social objectives. The circular economy—an economic model in which waste is designed out, products and materials are kept in use at their highest value for as long as possible, and natural systems are regenerated—has been posited as a means to do so. With its toolbox of strategies that make the most of what we already have and prioritise materials, energy and processes that are healthy for people and the planet, it's been proven that the circular economy can bring economic activities back within our planet's healthy limits across the globe.[1]

However, global circularity is trending in reverse: it has fallen from 8.6% just a few years ago to 7.2% in 2024. To transition to a circular economy at the speed and scale necessary to prevent irreversible changes to Earth's natural life-supporting systems, transnational cooperation and public-private partnerships across global value chains will be essential—especially as well-meant action towards circularity in one country or region may cause unwelcome effects to pop up in another. Circular value chains are systems in which products are made, used, collected and reintroduced into the system as secondary raw materials. Connected loops both within and across value chains can reduce reliance on virgin material extraction and—if designed well and with this purpose in mind—can promote social justice.

A CIRCULAR ECONOMY FOR THREE GLOBAL VALUE CHAINS

Recognising the crucial role global value chains will play in the transition to a circular economy, this report takes stock of the current state of circular economy developments in three global value chains across three countries: plastic packaging in Morocco, textiles and garments in Bangladesh, and information and communication technology (ICT) in Egypt. It aims to build consensus on the current state of play in these nations and disseminate findings to help orient local and international stakeholders around new circular initiatives. Across all three nations, data gaps and disparities in crucial circular indicators are prevalent, pointing out a need to build a sufficient evidence base that can inform the development of future circular economy strategies. Such strategies must go beyond a tunnel vision on waste management: transitioning to circularity must be a holistic process that tackles all phases—from design and production to retail and end-of-life—and includes a multitude of actors.

Chapters two and three of this report deep dive into the plastic packaging and textile and garment value chains in Morocco and Bangladesh, respectively. They synthesise available knowledge on how each value chain is structured and the impacts they have, as well as assessing current circular economy developments. They also dig into circular economy opportunities, taking both environmental and socioeconomic impacts into account, and highlight both key drivers of and barriers to change. Pathways forward and recommendations for action are provided for each context. **Chapter four** has a different approach and gives insight into the current state of waste electrical and electronic equipment (WEEE) in Egypt without giving recommendations on circular economy intervention or pathways forward. **Chapter five** explores similarities and differences between each country's case study, and gives concluding remarks.

1 Circle Economy. (2023). *The circularity gap report 2023.* Amsterdam: Circle Economy. Retrieved from: CGRi website

2

Morocco: State of play and future pathways for a circular plastic packaging value chain

Endorsers of this chapter

Nasser Alanssari

General Manager at the *Centre Technique de Plasturgie et de Caoutchouc*

'I would like to express my full support for the efforts made as part of this project aimed at promoting the circular economy in Morocco. The quality, perseverance and consistency of the work accomplished are essential to promote positive changes in this area'.

Monsif Charai

President of the *Moroccan Association for the Recycling and Recovery of Plastic Waste*

'The circular economy will play a crucial role in Morocco's plastic packaging value chain. This report makes a strong case for the Moroccan industry to urgently adopt more circular practices and provides valuable insights into how Moroccan players have already started collaborating towards these goals, as well as the road ahead'.

Ali Benryane

PAGE National Coordinator at UNIDO

'As PAGE Morocco's National Coordinator, I support the Switch2CE project's insights on advancing Morocco's circular economy for plastic packaging. Their strategies for regenerative flows, resource optimisation, and inclusive waste management are crucial for our sustainable development and pollution reduction, and will undoubtedly bolster Morocco's transition to a green economy, aligning with our national strategies and targets'.

1. Background

Plastic packaging is a vital sector of the Moroccan economy, contributing a turnover of 28 billion Moroccan dirhams.[2] As in many countries, however, the sector is also under multiple pressures. The industry's reliance on imported—and highly volatile—virgin inputs threatens the competitiveness of the industry, particularly in light of competition from foreign actors from oil-producing countries, which is seen as unfair by some.[3] Likewise, plastic waste and marine pollution sit high on political agendas both domestically and internationally, with plastic packaging one of the main products routinely leaking into Moroccan rivers and seas.[4] [5] This is already translating to financial consequences for the plastics sector as a whole, which pays an additional 'eco-tax' in addition to VAT. The sector has many additional challenges to contend with: increased attention to the industry's use of chemicals—some of which can be toxic—and its impacts on human health, as well as reliance on waste pickers working in unsafe and unsanitary conditions to collect plastic waste and procure feedstocks for recycling industries.[6]

These challenges are only set to grow as international pressure to transition to a circular economy ramps up. As countries around the world boost their own recycling capabilities and as major Fast-Moving Consumer Goods (FMCG) companies set circularity targets, the global plastic waste trade will become increasingly competitive.[7] This trade will also become increasingly regulated and restricted: note, for example, the emerging EU Waste Shipment regulations and Harmonised System (HS) code updates.[8] While both imports and exports of plastic waste are currently restricted in Morocco, these waste materials may soon become strategic resources. The costs of linear production are increasingly pushed onto producers through instruments such as Extended Producer Responsibility (EPR) schemes and taxes, and the global treaty to end plastic pollution currently under negotiation promises to address plastic pollution through ambitious measures that take the full lifecycle of plastics into account. Finally, circularity is increasingly becoming a requirement to access European markets—an important trading partner.[9]

Beyond aligning with international trends, standards and regulations, the circular economy provides many opportunities for Morocco and its plastic packaging industry. By mitigating the risks associated with the volatility of virgin, fossil-fuel-based plastic materials, circularity can boost the industry's competitiveness and local capacity for innovation.[10] The transition to a circular economy can also cement Morocco's leadership position in environmental protection and human development; and, if designed with social inclusion and safety in mind, it can ensure a just transition for informal waste workers and be a driving force for the protection of human health.[11]

2 Chahid, S. (2023). Plastic industry: A sector at a crossroads! [INTEGRAL]. Retrieved from: L'Opinion Website

3 Policy Center for the New South. (2020). *Le Maroc a-t-il bénéficié de l'accord de libre-échange conclu avec l'Union européenne?* (pp. 8-9, Rep.). Retrieved from: Policy Center Website

4 Zero Zbel. (2021). AUDITS DE DÉCHETS AUTOUR DES RIVIÈRES – 2020/2021. Retrieved from: Zero Zbel Website

5 World Bank. (2022). Rapport d'identification des hotspots liés aux déchets plastiques marins: Réduction de la pollution plastique marine et promotion des approches de l'économie circulaire (pp.1-36, Rep.). Retrieved from: World Bank

6 World Wide Fund for Nature (WWF). (2019). *Stop the Flood of Plastic: A guide for Policy-makers in Morocco* (pp 8, Rep.). Retrieved from: WWF Website

7 McKinsey & Company. (2022). Playing offence on circularity can net European consumer goods companies €500 billion. Retrieved from: McKinsey & Company Website

8 European Topic Centre on Circular Economy and Resource Use (ETC CE). (2024). *Drivers of EU plastic waste exports* (pp. 2-3, Rep.). Retrieved from: Eionet Portal

9 World Bank. (2018). *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. (pp. 60-62, Rep.). Retrieved from: Open Knowledge Repository

10 World Bank. (2023). *Morocco Climate Change Institutional Assessment Framework* (pp. 29, Rep.). Retrieved from: World Bank Website

11 Campitelli, A., Aryoug, O., Ouazzani, N., Bockreis, A., & Schebek, L. (2023). Assessing the performance of a waste management system towards a circular economy in the Global South: The case of Marrakech (Morocco). Waste Management (Elmsford), 166, 259–269. doi:10.1016/j.wasman.2023.05.003

Many of the key ingredients to a successful transition to a circular economy are already present. Both the Moroccan Government and the private sector are already actively engaged in making the circular economy a priority.[12] The circular economy is part of both national industrial recovery plans (*Plan de relance de l'industrie*) as well as decarbonisation plans.[13] [14] The government is also evolving national regulation and aligning it with the EU, as well as supporting pilot projects to demonstrate the potential savings that can stem from integrating circular principles at the industrial level.[15]

A holistic, multi-stakeholder and full value chain approach is guiding ongoing efforts. Many challenges are shared by all recycling industries and go beyond plastic packaging: collection and sorting processes, for example, as well as the need to formalise and integrate the informal sector.[16] To this end, initiatives such as *Ecosystème vert* are highlighting the need for collaborative solutions that are adapted to national and cultural contexts, as well as the need to think globally when it comes to plastics and plastic waste.[17] Members of the ministries of *Transition Énergétique et du Développement Durable* and Economic Interest Groups (EIGs), such as COVAD, were involved in a number of collaborative initiatives aiming to boost the availability of feedstock, particularly post-industrial waste

Finally, Moroccan consumers are willing to play their part, too. A forthcoming SWITCH2CE study on the attitudes of Moroccan consumers about the circular economy, led by Chatham House and Ipsos, found that Moroccan consumers generally positively regard the role of waste pickers, with many respondents expressing concern for their safety and livelihood. Respondents showed willingness to prioritise reuse and recycling in their own lives: taking back containers to stores for a reward, for example, and are familiar with reusable food containers for takeaway.

Still, there is much to do to achieve a more circular, safe and just economy for plastic packaging in Morocco. This chapter explores key circular economy developments in the sector in more detail, and highlights pathways for action to accelerate the transition to a just, safe circular economy for plastic packaging.

12 International Monetary Fund (IMF). (2023). Request For An Arrangement Under The Resilience And Sustainability Facility—Press Release; Staff Report; Supplement; Staff Statement; And Statement By The Executive Director For Morocco (pp. 63, Rep.). Retrieved from: IMF website

13 Ministry of Industry and Commerce (MCINET.) (n.d.). Plan de Relance Industrielle : Lancement du programme " Tatwir Croissance Verte " pour l'appui à la décarbonation des TPME Industrielles. Retrieved from: MCINET Website

14 Janati, R. (2023, June). Célébration de la journée mondiale de l'environnement: Atelier d'échange autour du thème « Pollution plastique : Défis et opportunités »

15 Chatham House. (2022). *The EU's Circular Economy transition for plastic and textiles: Opportunities and challenges for trade partners in emerging markets* (pp. 24-28, Rep.). Retrieved from: SWITCH to Circular Economy Value Chains Website

16 Trinomics. (2020). Circular economy in the Africa-EU cooperation - Country report for Morocco (pp. v, Rep.). Retrieved from: European Union Website

17 Eshel, L. (2023). Morocco's path to an integrated innovation ecosystem: Breaking silos, building collaboration. Retrieved from: Morocco World News Website

2. Aims of a circular economy for plastic packaging

A circular economy is an economic system where waste is designed out, everything is used at its highest possible value for as long as possible and natural systems are regenerated.[18] The concept of circularity closely mimics nature, where there is no waste: all materials have value and are used to sustain life in a myriad of ways. If we effectively deploy these strategies, we will require fewer materials to meet similar societal needs. [19]

The four strategies[20] we can use to achieve these objectives, and in particular in the context of plastics, are:

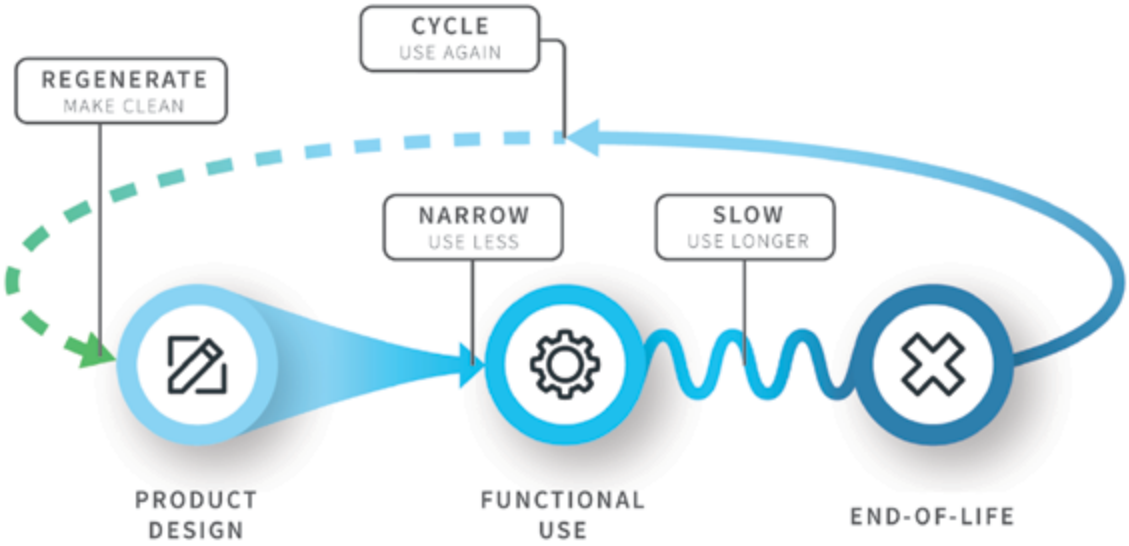


Figure one shows the four 'flows' of the circular economy.

- **Regenerate flows—Make clean:** *Regenerate ecosystems and safeguard health* by decoupling plastics from fossil-based feedstocks, using renewable, compostable and safe alternatives that protect the environment and human health and eliminating chemicals of concern and non-intentionally added substances (NIAS). Use renewable resources (water and energy) from sustainably-managed environments, eliminate plastic and microplastic leakage into natural systems and facilitate a just and inclusive transition for the informal waste sector.
- **Narrow flows—Use less:** *Reduce the size of the problem by* eliminating problematic or unnecessary and avoidable plastic packaging such as single-use plastics, and by reducing the use of virgin plastic in packaging. This can be done, for example by reducing the demand for packaging overall and by boosting resource efficiency in design and production.
- **Slow flows—Use longer:** *Make the most of existing packaging* by tapping into Morocco's reuse culture in Morocco and promoting reusable packaging products and business models; and by extending the lifetime of plastic packaging products through repair and durable materials and designs.
- **Cycle flows—Use again:** *Bring plastics back into the loop by* dealing with the legacy of existing plastic pollution and boosting plastic packaging recycling, while creating a market for recycled plastics.

18 Ellen MacArthur Foundation (EMF). (n.d). Circular economy introduction. Retrieved from: EMF Website

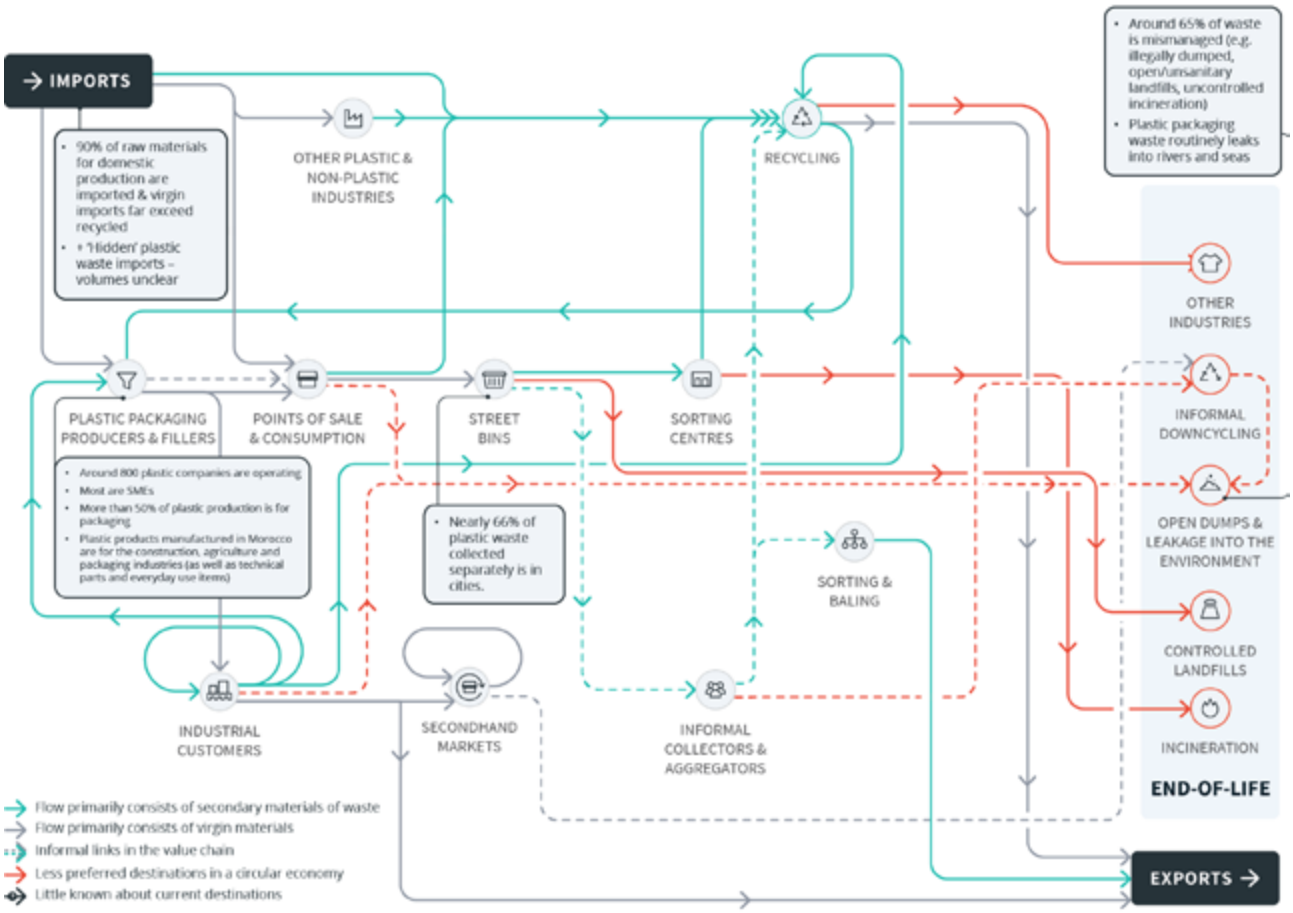
19 EMF. Circular economy introduction. Retrieved from: EMF Website

20 These four groups of strategies are based on the work of Bocken et al. (2016) and applied to the context of textiles based on the various strategies highlighted by leading institutions and platforms such as the Ellen MacArthur Foundation (2016), the European Commission (2018), the Platform for Accelerating the Circular Economy (2021), UNEP (2023), as well as SWITCH2CE project partners Circle Economy (2021) and Chatham House (2022).

3. Current state of circularity in the Moroccan plastic packaging value chain

The plastic production market in Morocco includes about 800 companies, approximately 300 of which are active in packaging, and with over 400 plastic companies inventoried by the *Centre Technique de Plasturgie et de Caoutchouc*.[21] Of these, the vast majority are plastic converters (for example, injection moulding and extrusion companies), some focus on distribution, and a small number (about fifteen, of which four or five are foreign actors) focus on mould production. Key plastic products manufactured in Morocco are products for the construction, agriculture and packaging industries, as well as technical parts and everyday-use plastic objects. Other sub-sectors include recycling, automobiles, medical supplies and textiles.[22] The plastics sector imports most of its raw materials from the Middle East and produces an estimated 0.71[23] million tonnes of plastics per year in Morocco. More than 50% of plastic use can be attributed to packaging.[24] According to an industry representative, most companies in the plastics sector are small and medium-sized enterprises, where a company of 120 employees with a production capacity of roughly 10,000 to 20,000 tonnes per year would be considered medium-sized. They describe the sector as a relatively collaborative sector with an appreciation for 'healthy competition'. [25]

MOROCCO CURRENT VALUE CHAIN



After Circle Economy in Switching to circular global value chains: state of play and future pathways, 2024

Figure two illustrates the plastic packaging value chain in Morocco. Dotted lines indicate informal links.

21 Centre Technique de Plasturgie et de Caoutchouc (CTPC). (2024). Internal database.

22 ETC CE. (2024). Drivers of EU plastic waste exports (pp. 12-20, Rep.). Retrieved from: Eionet Portal

23 World Wildlife Fund (WWF). (2019). *Stop the flood of plastic: a guide for policy-makers in Morocco* (pp.1-68, Rep.) Retrieved from: WWF website

24 World Bank. (2022). Plastic-Free coastlines: A Contribution from the Maghreb to Address Marine Plastic Pollution (pp. 40, Rep.). Retrieved from: Food and Agriculture Organization of the United Nations Website

25 Charai, M. (2022). Interview.

3.1 Regenerate flows—Make clean

3.1.1 Renewable, compostable and safe alternatives to fossil-based plastics

Virtually all the plastic produced in Morocco is fossil-based:[26] this polluting material can take up to 500 years to biodegrade,[27] damages marine ecosystems and poses serious health issues—from endocrine disruption and decreased reproductive health to cancer.[28] As such, alternative materials that can replace fossil-based plastics in packaging applications are a crucial means to mitigate these risks. In this section, we explore both innovative materials ('bioplastics') as well as the increased use of 'conventional' alternatives such as glass, paper and aluminium. The use of recycled inputs is further discussed under the **'Cycle'** section.

Bioplastics and innovative materials

'Bioplastics' often refer to a combination of i) fossil-based, biodegradable polymers, ii) bio-based biodegradable polymers and iii) bio-based non-biodegradable polymers.[29] Here, we will primarily focus on bio-based and compostable materials. The biodegradability of plastic packaging is high on political and corporate agendas (see Textbox one). Bioplastics, however, are still an emerging field, and are prohibitively expensive in many parts of the world:[30] this prevents them from being an economically viable alternative for most manufacturers in Morocco at the moment.[31]

Still, considering Morocco's biomass availability, there are high-value opportunities for local innovation: better valorising agricultural residues, for example, or through the blue economy. Innovative packaging organisations around the world are already using seaweed, for example, to make food containers, films and sachets, as well as rigid packaging.[32] In Morocco, 'The Seaweed Company' is already growing and harvesting seaweed for the production of high-value products (though not specifically packaging), and the Work Bank has recently approved a US$350 million loan to support the Government of Morocco in the launch of its Blue Economy programme.[33] Financing to support these research, development and innovation efforts will be crucial, as will safeguards to ensure bioeconomy developments are sustainable and non-toxic.[34]

Conventional alternatives (glass, paper, aluminium)

Although plastics' versatility and lightweight properties make it a unique and cost-effective material, evolving regulations may soon make other renewable and safe materials more economically attractive, particularly in the case of single-use plastics. Paper and glass packaging industries are already seeing a significant increase in investments.[35]

Some Moroccan manufacturers have already proven themselves to be adaptable in light of new regulatory constraints, shifting their entire processes from plastic to paper bag production after the Zero Mika law was introduced, for example.[36]

26 WWF. (2019). Stop the Flood of Plastic: A guide for Policy-makers in Morocco (pp. 4, Rep.). Retrieved from: WWF Website

27 Helian Polymers. (2023). Try PHA - innovate with sustainable biodegradable pha materials. Retrieved from: Hellan Polymers Website

28 United Nations Development Programme (UNDP). (2023). Microplastics on Human Health: How much do they harm us?. Retrieved from: UNDP Website

29 Scientists' Coalition. (2023). The global plastics treaty: What is the role of bio-based plastic, biodegradable plastic and bioplastic? (pp. 1, Rep.). Retrieved from: Scientist's Coalition Website

30 Rosenboom, JG., Langer, R. & Traverso, G. (2022). Bioplastics for a circular economy. Nature Reviews Material, 7, 117–137. doi:10.1038/s41578-021-00407-8

31 PlastExpo exhibitors. (2023). Interviews.

32 Notpla. (n.d.). Notpla Disappearing packaging. Retrieved from: Notpla Website

33 World Bank. (2023). World Bank Support for the Development of Morocco's Blue Economy. Retrieved from: World Bank Website

34 Indeed, some bio-based plastics can be as unsafe as their fossil-based counterparts. Zimmermann, L., Dombrowski, A., Völker, C., & Wagner, M. (2020). Are bioplastics and plant-based materials safer than conventional plastics? In vitro toxicity and chemical composition. *Environment International*, *145,* 1-11. doi:10.1016/j.envint.2020.106066

35 North Africa Post. (2022). Casablanca an export hub for sustainable packaging solutions- Elopak. Retrieved from: North Africa Post Website

36 PlastExpo exhibitors. (2023). Interviews.

The production of these materials is not always more resource-efficient than plastics, however, and in order to fully realise the benefits of these materials, other strategies (such as those discussed in the **'Narrow'** and **'Slow'** sections) are required to reduce demand for materials overall. [37]

3.1.2 Plastic pollution

Considering plastic pollution's impacts on the environment, on marine life, and its associated costs, particularly for coastal areas, this has already been the subject of many studies and efforts in Morocco, not the least of which is the development of a 'plastic-free coast' strategy (*Littoral sans plastique)*.[38] LISP is a comprehensive programme dedicated to the prevention and reduction of marine pollution by plastic waste and the promotion of circular economy models in coastal regions. The strategy, developed in 2022, aims to address a wide range of issues, from the use of single-use plastics in coastal business communities to the durability and circularity of products. It does so through, for example, ecodesign, the aggregation of collection and sorting at-source (including on-ships), EPR systems, and by improving access to finance for cooperatives, integrating the informal sector, recovering of fishing gear, leading beach clean-up initiatives and more. Other measures are also being considered to target hotspots of plastic pollution: setting up devices to intercept floating debris, for example, especially from rivers, which are key hotspots.

3.1.3 Just and inclusive transition for the informal waste sector

A regenerative and circular economy also requires the inclusion and integration of those most at risk of losing out in the transition. In Morocco, this means working with informal waste workers, in particular, to develop end-of-life and recycling solutions that they can play a role in and benefit from.[39]

There is already an increasing number of cooperatives (for example, *Attawafouk*) and initiatives in Morocco working to formalise and improve working conditions for informal waste pickers, including formal sorting centres in larger cities and associations that act as a voice for waste pickers in high-level meetings and discussions. The governance of plastic waste is a crucial piece of the puzzle that still needs to be worked out. [40]

3.2 Narrow—Use less

3.2.1 Problematic or unnecessary and avoidable plastics

Despite the many criticisms it received since its implementation and the enforcement challenges it encountered, the pioneering Moroccan 'Zero Mika' law banning single-use plastic bags generated many positive results as well as lessons learnt for future application—for example, if the ban were to be extended to other single-use plastics.[41] This is particularly relevant as rising income levels and rising levels of local consumption can often result in more waste,[42] and as single-use plastics constitute a large fraction of plastic waste found on riverbanks and the coast.[43]

37 Organization for Economic Cooperation and Development (OECD). (2021). 4. Trends in the secondary plastics markets. Retrieved from: OECD iLibrary Website

38 World Bank. (2022). *Rapport de Formulation de la Stratégie : Littoral sans Plastique et de son Plan d'Opérationnalisation - Réduction de la Pollution Plastique Marine et Promotion des Approches de l'Économie Circulaire (pp. 1-55, Rep.).* Retrieved from: World Bank Website

39 Trinomics. (2020). Circular economy in the Africa-EU cooperation - Country report for Morocco (pp. 28-30, Rep.). Retrieved from: European Union Website

40 Mazout, Y. (2022). Interview.

41 Ghallab, M. (2020). Zero Mika or the Difficulty in Getting Rid of Plastic Bags in Morocco: Sometimes a law is just not enough. Retrieved from: Heinrich Böll Stiftung Website

42 OECD. (2019). Chapter 2. Trends in materials consumption and waste generation. Retrieved from: OECD iLibrary

43 Zero Zbel. (2022). AUDITS DE DECHETS AUTOUR DES RIVIERES – 2020/2021. Retrieved from: Zero Zbel Website

3.2.2 Circular design and resource-efficiency

Morocco is not a petrol-producing country. For this reason, its plastic packaging industries have a lot to gain from reducing demand for virgin plastic materials. Virtually all plastic inputs, other than PVC, have to be imported.[44] Circular design strategies that minimise inputs—such as lightweighting —can play a crucial role here—and, in fact, are already common practice among many plastic packaging manufacturers in Morocco.[45] Lightweighting is widely considered to be a cost-saving measure, as reducing material inputs also reduces costs.[46]

Demand for plastic can also be reduced through other strategies that bypass the need for single-use packaging such as reuse business models.[47] These are discussed in the **'Slow'** section. This goal is backed by many leading FMCG companies in the context of the Global Commitment, which has set targets around decreasing the use of virgin plastic in packaging, and is also a topic under negotiation in the *Global Plastics Treaty to End Plastic Pollution*[48] (**see Textbox one**).

Textbox one: International levers for circular packaging

Trends and policies in the European Union

The EU is a key trading partner for Morocco's plastic industry: in 2020, Morocco exported 71,000 tonnes of plastics to the EU for nearly US$765 million, or 87% of the total value of the country's plastic exports.[49]

In November 2023, the EU published the *Packaging and Packaging Waste Regulation*, which, as of March 2024, is in the process of being formally adopted. The Regulation aims to reduce packaging waste and accelerate the introduction of more sustainable packaging options on the market. Importantly, it sets ambitious objectives to reduce packaging and also requires all packaging on the EU market to be recyclable. It also sets mandatory targets for recycled content of plastic packaging.[50]

In addition, some EU countries have also introduced their own specific regulations. For instance, France is planning to phase out single-use plastic packaging by 2040, while polyethylene (PE) and polypropylene (PP) packaging with at least 50% recycled content benefits from a 50% reduction in their Extended Producer Responsibility (EPR) contributions—the payments producers have to make to fund the management and disposal of the goods they manufacture at the end of their useful life.[51]

44 Berahab, R. & Dadush, U. (2020). Le Maroc a-t-il bénéficié de l'accord de libre-échange conclu avec l'Union européenne? (pp. 8-10, Rep.). Retrieved from: Policy Center For The New South

45 Mordor Intelligence. (n.d.). Morocco flexible packaging market size & share analysis - industry research report - growth trends. Retrieved from: Mordor Intelligence Website

46 Liu, Y., Lai, J., Ma, S., Feng, Q., Yang, G., Zhao, Z., & Zhou, C. (2023). Supply chain plastic footprint analysis. Circular Economy, 2(2), 1-9. doi:10.1016/j.cec.2023.100037

47 EMF. (n.d.). Plastics and the circular economy – deep dive. Retrieved from: EMF Website

48 UNDP. (2023). A global treaty to end plastic pollution is in sight. Retrieved from: UNDP Website

49 Chatham House. (2022). The EU's Circular Economy transition for plastic and textiles: Opportunities and challenges for trade partners in emerging markets (pp. 27, Rep.). Retrieved from: SWITCH to Circular Economy Value Chains Website

50 European Parliament Research Service (EPRS). (2023). Revision of the Packaging and Packaging Waste Directive (pp. 1, Rep.). Retrieved from: European Parliament Website

51 Diaz Lopez, F.J., Veillet Lavallée, M., Renaud, G. & Saes, L. (2021). Circular plastics in France (pp. 7, Rep.). Retrieved from: Ministry of Foreign Affairs of the Netherlands

The Global Plastics Treaty to End Plastic Pollution

In March 2022, United Nations Member States agreed on a mandate to negotiate a legally binding global plastics treaty to end plastic pollution. The ambitious instrument aims to address plastic pollution across the full lifecycle, from feedstock production to end-of-life.

Key topics under negotiation include:

- Phasing out and reducing the supply of, demand for and use of primary plastic polymers;
- Banning, phasing out and reducing the use of problematic and avoidable plastic products;
- Banning, phasing out and reducing the production, consumption and use of chemicals and polymers of concern;
- Reducing microplastics;
- Strengthening waste management systems;
- Fostering design for circularity;
- Encouraging reduce, reuse and repair of plastic products and packaging;
- Promoting the use of safe, sustainable alternatives and substitutes;
- Eliminating the release and emission of plastics to water, soil and air;
- Addressing existing plastic pollution;
- Facilitating a just transition, including an inclusive transition of the informal waste sector; and
- Protecting human health from the adverse impacts of plastic pollution.

The treaty negotiations will conclude at the end of 2024 and will have important consequences for plastic industries around the globe.

The Global Commitment

Finally, the Global Commitment,[52] led by the Ellen MacArthur Foundation, in collaboration with the UN Environment Programme, has united more than 500 organisations behind a common vision: a circular economy for plastics. Driven by the goal of tackling plastic pollution at its source, companies representing 20% of all plastic packaging produced globally have committed to ambitious 2025 targets to help realise this common vision.

Targets and actions include:

- Decreasing the use of virgin plastic in packaging;
- Eliminating problematic or unnecessary plastic packaging;
- Moving from single-use towards reuse models where relevant;
- Ensuring 100% of plastic packaging is reusable, recyclable, or compostable; and
- Increasing the share of post-consumer recycled content target across all plastic packaging used.

52 EMF. (n.d.). The Global Commitment 2022. Retrieved from: EMF Website

Textbox two: Beyond materials: Water and energy in a circular plastic packaging economy

A circular economy also looks beyond materials to consider all resources and natural and social capital that systems of production and consumption rely on. This includes resources such as water and energy, as well as the people powering production, all the way to the ecosystems provisioning services that we rely on (EMF, n.d.).[53] As such, all four strategies ('Regenerate', 'Narrow', 'Slow' and 'Cycle') equally apply to them.

Water

Morocco is a climate hotspot and one of the world's most water-stressed countries.[54] Circular water management strategies, such as greywater reuse, therefore, hold a lot of promise in terms of making the most of a limited resource.[55] In 2016, industrial water use only accounted for 6% of total water use in Morocco and 16% of all the wastewater reused overall, or 18.36 million cubic metres per year. These figures, however, pale in comparison to the nearly 800 million cubic metres of wastewater (all sources included) that were discharged untreated into the environment in that same year[56] and that *could* have been revalorised for industrial uses such as closed-loop water systems and water recycling technologies. As noted by the Economic, Social and Environmental Council,[57] strategically prioritising wastewater reuse and rainwater harvesting would be very beneficial.

Renewable energy

Morocco's plastic-related oil consumption accounts for just 1.9% of the North African region's total;[58] however, its industrial activities are not negligible, accounting for about 19% of the country's total energy use.[59] Morocco has set a goal to source 52% of its electricity needs from renewables by 2030, including a mix of solar, wind and hydrogen production.[60] The country's solar and wind resources have helped make it an ideal location for investments in renewable energy, including green hydrogen.[61] Industry stakeholders have also been engaging in the development of a decarbonisation effort led by UNIDO and the Ministry of Industry and Trade.[62]

53 EMF. (n.d.). The Circular Economy in Detail. Retrieved from: EMF Website

54 World Bank. (2023). New World Bank Program in Morocco Supports Efforts to Boost Water Security and Resilience for all. Retrieved from: World Bank Website

55 Trinomics. (2020). Circular economy in the Africa-EU cooperation - Country report for Morocco (pp. 10-12, Rep.). Retrieved from: European Union Website

56 Alhamed, H., Blad, M., Saad, S. & Masaki, M. Business Opportunities Report for Reuse of Water in Morocco (pp. 52-55, Rep.). Retrieved from: RVO

57 Conseil Economique, Social et Environnemental. (2022). *Intégration des principes de l'économie circulaire aux traitements des déchets ménagers et des eaux usées.* Retrieved from: **CESE website**

58 WWF. (2019). Stop the Flood of Plastic: A guide for Policy-makers in Morocco (pp. 9, Rep.). Retrieved from: WWF Website

59 Amegroud, T. (2022). Quelles sources d'énergie utilisées au Maroc et pour quels usages? (pp. 4, Rep.). Retrieved from: Heinrich Böll Stiftung

60 Rahhou, J. (n.d.). Report: Morocco's 2030 Green Energy Target is "most credible" in mena. Retrieved from: Morocco World News Website

61 Mohseni-Cheraghlou, A, (2023). Four Reasons Why Morocco Is Becoming a Renewable Energy Powerhouse. Retrieved from: Columbia SPS Website

62 United Nations Industrial Development Organization (UNIDO). (2024). Morocco: developing an industrial decarbonization roadmap framework. Retrieved from: UNIDO Website

3.3 Slow—Use longer

While packaging's function might inherently be limited in time, many strategies exist to extend the lifetime of packaging products and keep them in circulation for as long as possible.[63] Here, we distinguish between different types of plastic packaging most suitable for this type of strategy: larger business-to-business (B2B) packaging items, such as pallets or crates, that are typically highly durable and already boast high reuse rates and consumer-facing (B2C) packaging, particularly for fast-moving consumer goods. Other plastic packaging (for example, straps) is often scattered widely across locations, making take-back a logistical challenge and not economically feasible, or is not logically reusable (for example, food-grade films). In Morocco, the plastic packaging industry primarily operates on the basis of selling new packaging products. Reuse business models such as refill, rental and resale are not commonplace, but some exceptions do exist, as do many untapped opportunities for innovation.

3.3.1 Consumer-facing packaging

Our stakeholder interviews revealed that some deposit-return systems (*systèmes de consignes*) exist in Morocco, particularly in B2B settings (for example, glass bottles are commonly used by the catering industry, where branded bottles are sold in hotels and restaurants and taken back for refilling by bottling companies). This is less common in B2C settings—in which the consumer is expected to return the packaging themself—but still available in the case of some small-scale stores, as well as in some rural areas, where the traditional 'milkman' delivery model still exists. These typically concern glass packaging. Buying in bulk remains the norm in souks and smaller shops, although packaged fresh foods are increasingly on offer in supermarkets. This may lead to an increase in packaging.

3.3.2 Industrial packaging

Some plastic packaging manufacturers operate take-back schemes in Morocco, where packaging is recovered from clients at the end of its useful life. These are then typically destined for recycling rather than repair or reuse. Second-hand markets (*marchés d'occasion*) also exist where more durable plastic containers—such as five-litre oil containers—are resold for reuse rather than recycling. [64]

3.4 Cycle—Use again

3.4.1 Collection

For the most part, used plastic packaging products in Morocco end up in uncontrolled landfills, where high levels of contamination impact the quality of any plastics that may get collected later on. Every year, Morocco generates half a million tonnes of plastic waste.[65]

This is largely because waste is not structurally separated at the source. Instead, an estimated 10,000 to 34,000[66] informal waste pickers collect the 'valorisable' fractions of waste (plastics, metals, aluminium cans, *etcetera*), from uncontrolled landfills and from the (overground) street bins in major cities. Waste pickers often live close to the poverty line and work in environments with poor health and safety conditions, facing harassment from residents on the streets (forcing their labour into the night) as well as intense competition in the landfills, where the 'law of the strongest' reigns and puts women, children and elderly waste pickers at a disadvantage.[67]

63 Coelho, P. M., Corona, B., ten Klooster, R., & Worrell, E. (2020). Sustainability of reusable packaging–Current situation and trends. Resources, Conservation & Recycling, 10 (6), 1. doi:10.1016/j.rcrx.2020.100037

64 Charai, M. (2023). Interview.

65 World Wildlife Fund (WWF). (2019). *Stop the flood of plastic: a guide for policy-makers in Morocco* (pp.1-68, Rep.) Retrieved from: **WWF website**

66 Heinrich Böll Stiftung. (2020). *Plastic Atlas* (pp.1-68, Rep.). Retrieved from: **Heinrich Böll Stiftung Atlases**

67 Mazout, Y. (2022). Attawafok. On-site visit.

Materials collected are then sold to *'grossistes'*—intermediaries that further sort and process the waste before reselling it to recycling companies. Only 7 to 13% of available plastic waste is collected.[68]

Some exceptions to these informal collection models exist:

- At least four sites formally employ waste pickers to carry out the sorting in controlled and safe conditions, in Meknes, Rabat (Oum Azza), Sidi Bernoussi and Tamelest.
- 20 cooperatives[69] are working to improve socioeconomic outcomes for informal waste pickers. A federation was also created to unite the voices of different stakeholders (*la Fédération de recycleurs de collecteurs et chineurs*).
- As discussed in the **'Slow'** section, some industrial players collect used plastics directly from other industry players, both from packaging as well as other plastics industries. The company Valplast, for example, collects plastics from the agricultural industry to feed into their recycling process.
- An EIG, representing around 80% of recyclers in Morocco, aims to set up sorting centres closer to industrial zones, where larger quantities of plastic waste can be collected, to make the economics for collection logistics work. Part of their mission is to also support suppliers of waste, including associations of informal collectors, to act as suppliers for the EIG centres.[70]

3.4.2 Recycling

Only 7% of all plastic waste in Morocco is recycled[71]—but this is not for lack of recycling capacity. According to a plastics industry representative, recycling capacity in Morocco is estimated at 300,000 tonnes per year.[72] However, these recycling plants are vastly underutilised, running at 40% of their capacity. One of the main barriers is the challenge recyclers face in securing feedstock, especially as many recyclers specialise in the recycling of specific plastic types: for example, PET, films, HDPE, flexible or rigid packaging, *etcetera*. Collectors, however, often collect all types of plastics—hindering sorting and incurring additional costs, meaning that these activities are not currently economically viable.[73]

Current legislation forbids the use of recycled inputs for materials that come into contact with foods and beverages in Morocco (Law 28.00).

Instead, a handful of formal recycling companies—as well as smaller, informal recyclers—process collected materials into low-value applications such as crates and tubes, garbage bags and tarpaulins, fibres and straps.[74] Additionally, it is common for plastic packaging manufacturers to recycle their own plastic waste. Some organisations sell the waste to external recyclers (sometimes shredding it beforehand), while others have in-house capacity to recycle it themselves.[75]

Amendments to Law 28.00 are currently underway, which also consider the establishment of an EPR sys-

68 Water and Environment Support (WES) in the ENI Southern Neighbourhood Region. (2021). *Initiative conjointe pour la mise en place de la filière de gestion des emballages de bouteilles en PET dans le cadre de la REP au Maroc* (pp.1-47, Rep.).

69 Chatham House. *Policy, stakeholders, and impact opportunities for circular plastics in Morocco: a rapid assessment.* (pp.1-26, Rep.)

70 Charai, M. (2022). Interview

71 World Wildlife Fund (WWF). (2019). *Stop the flood of plastic: a guide for policy-makers in Morocco* (pp.1-68, Rep.) Retrieved from: **WWF website**

72 Charai, M. (2022). Interview.

73 Charai, M. (2023, June). Célébration de la journée mondiale de l'environnement: Atelier d'échange autour du thème « Pollution plastique : Défis et opportunités »

74 Water and Environment Support (WES) in the ENI Southern Neighbourhood Region. (2021). *Initiative conjointe pour la mise en place de la filière de gestion des emballages de bouteilles en PET dans le cadre de la REP au Maroc* (pp.1-47, Rep.).

75 PlastExpo exhibitors. (2023). Interviews.

tem. This development has not been met positively by all value chain actors, some of which stand to lose out (such as established recyclers) or have expressed concerns about regulatory bodies' ability to enforce traceability and safety standards.[76]

Upstream interventions to improve recycling

Finally, bottling companies are also exploring circular design strategies to improve the recyclability of their products, such as avoiding the use of colourants. One frequently cited example is that of Sprite transitioning from green to transparent bottles.

4. Pathways for Action

The Moroccan Government and the plastic packaging sector have already made significant investments in accelerating circular economy efforts based on a collaborative, multi-stakeholder and holistic approach.[77] To build on and strengthen their efforts, and based on stakeholder input collected through the 'State of play and circular economy opportunities' workshop held by Circle Economy, Chatham House and the *Coalition pour la valorisation des déchets* on the 18th of December 2023, we have identified the following additional avenues for action:

1. Strengthen the data and evidence base

Thanks to the efforts of many actors on the ground, data on the scale of plastic production and, especially, plastic pollution is becoming increasingly available in Morocco. Other initiatives are aimed at visualising the collection rates and engaging stakeholders to develop strategies aligned with the country's Industrial Acceleration Plan (PAI) in the country. On this matter, the *Ecosystème Vert* study by COVAD, in collaboration with the Ministry of Industry, Investment, Commerce, and the Green and Digital Economy, reveals that the gross collection rate stands at 17%, whereas the net collection rate is 9 to 10%. Moreover, the study highlights that the informal sector accounts for 60 to 65% of sorting activities and handles 90% of collection procedures.[78] Still, it remains a challenge to chart the composition and volumes of plastics in detail and to understand exactly how these flow and shift through the Moroccan value chain.

Many data gaps exist, and existing studies may not always reflect the reality of industry stakeholders[79] and may have even encouraged premature investments in recycling plants that are running under capacity today. An in-depth study into packaging material flows, broken down by material types and including different plastic types, sectoral users and end-of-life destinations, would support more targeted efforts to increase circularity. Multi-stakeholder initiatives to establish and continuously manage databases on industrial wastes available for recycling would also support this goal.

76 Workshop participant. (December 2023). *'État actuel et opportunités circulaires pour la chaîne de valeur des emballages plastiques'*, Casablanca.

77 Trinomics. (2020). Circular economy in the Africa-EU cooperation - Country report for Morocco (pp. 1-102, Rep.). Retrieved from: European Union Website

78 World Bank. (2022). Rapport d'identification des hotspots liés aux déchets plastiques marins: Réduction de la pollution plastique marine et promotion des approches de l'économie circulaire (pp.1-36, Rep.). Retrieved from: World Bank

79 One recycler noted that a World Bank study on plastic waste availability in Morocco mentioned the 'wide availability' of agricultural plastic waste, which did not reflect the experience of many recyclers, who have struggled to secure this type of feedstock because of the high reuse rates for this type of plastic (for example, second-hand 'baches', 'tubes', 'gaines' and '5L bidons' are resold as is on second-hand markets (marchés d'occasion) to be reused rather than recycled). Charai, M. (2023, June). Célébration de la journée mondiale de l'environnement: Atelier d'échange autour du thème « Pollution plastique : Défis et opportunités »

Textbox three: Data gaps in the Moroccan plastic packaging value chain

- *Imports and exports of plastic packaging.* Trade figures available through the *Office des Changes*, for example, share insights on imported granules, plastic resin and other plastic packaging trade, but these figures do not account for the plastic packaging that comes with finished product imports. Trade data also does not distinguish between plastics that are re-exported directly and those that actually enter the market and contribute to the total amount of plastic waste available domestically. This issue of the 'hidden plastic waste trade' is not unique to Morocco,[80] and this data gap is increasingly being studied. One study, for example, found that overall plastic trade could be more than 40% higher than previous estimates—and could in fact be even higher still.[81]
- *Material and product types.* While PET and PET bottles in particular have been the subject of numerous studies—likely due to their recyclability potential[82]—data on other types of plastics is less readily available. Additionally, while plastic waste has been the subject of many investigations, the exact contribution of packaging to this waste is unclear, and it is unclear whether this packaging is consumer-facing or industrial.
- *End of life and destinations.* Data at the end-of-life stage is limited and data collection is more challenging due to the presence of large informal waste dumps and trading networks and markets—both for post-industrial as well as post-consumer waste. Some field studies (for example, in Casablanca)[83] are increasingly aiming to fill this gap through primary data collection. Disagreements also exist as to the actual availability of some feedstocks for recycling. For example, some estimate that the Souss Massa region generates upwards of 550,000 tonnes of agricultural plastic waste,[84] but whether this waste is actually 'available' for recycling industries is a question, as it could often find uses in second-hand, reuse markets.
- *Post-industrial waste.* Data on the availability of post-industrial plastic waste is also missing, but filling this gap through a collaborative industrial initiative could be a 'low-hanging fruit'.

80 International Institute for Sustainable Development (IISD). (2021). New database helps track trade across the life cycle of plastics. Retrieved from: SDG Knowledge Hub Website

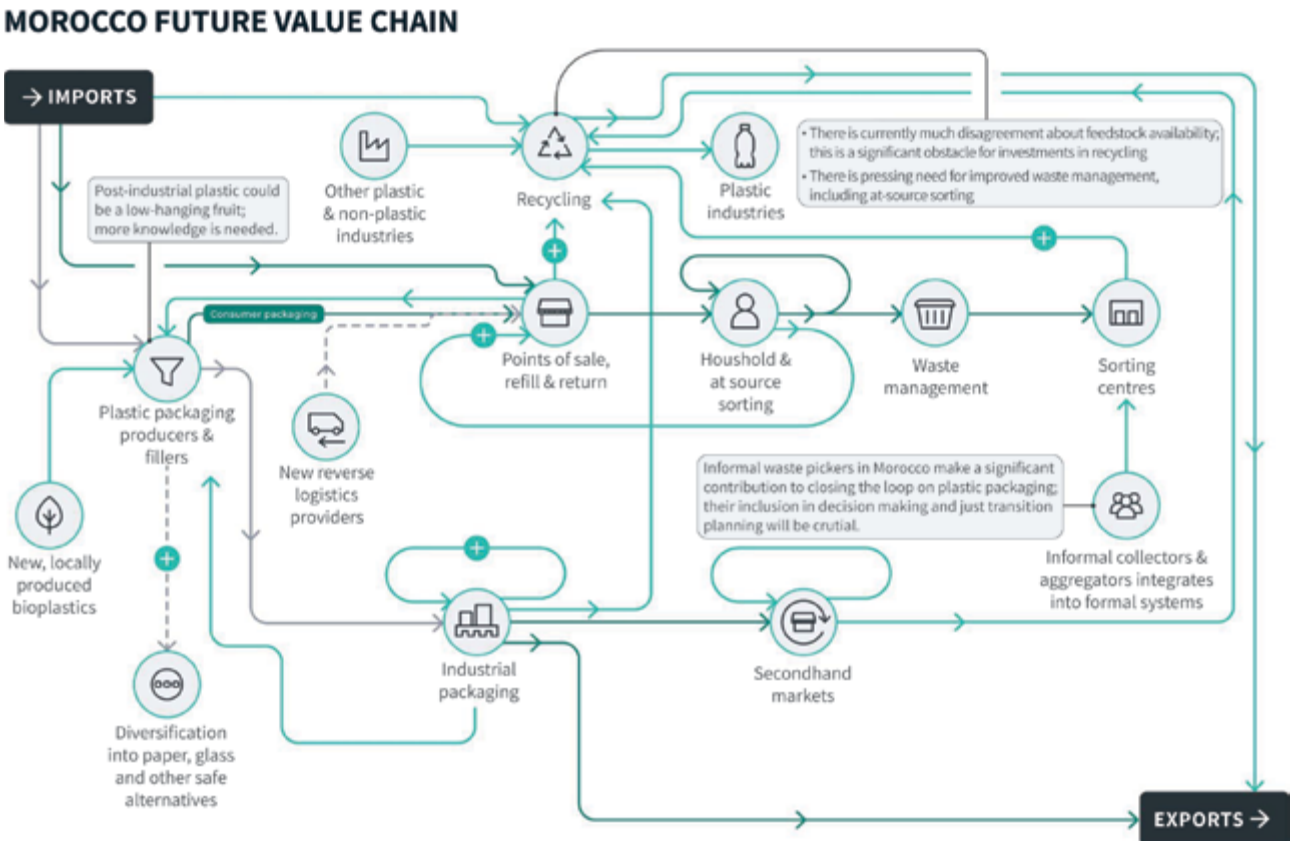
81 International Pollutants Elimination Network (IPEN). (2023). *Plastic Waste Trade: The Hidden Numbers.* Retrieved from: IPEN Website

82 Natural Mineral Waters Europe. (2022). *Pet plastic recycling: Not "just" plastic but a valuable resource.* Retrieved from: Natural Mineral Waters Europe Website

83 Impact+. (2014). Étude les acteurs de la récupération/revente de déchets valorisables à Casablanca et les scénarii de leur intégration dans un système de collecte sélective.

84 Zakri, R. (2023, June). Célébration de la journée mondiale de l'environnement: Atelier d'échange autour du thème « Pollution plastique : Défis et opportunités »

2. Set a holistic vision and strategic direction



After Circle Economy in Switching to circular global value chains: state of play and future pathways, 2024

Figure three illustrates a future vision for a circular plastic packaging value chain in Morocco.

A circular economy vision and strategic direction that takes different materials and sectors into account can support better cohesion and the alignment of different circular economy initiatives across the country.[85] This would ideally address the question of which destinations are considered 'preferable' for plastic waste, whether that be specific applications or sectors as a whole.86 Closed-loop applications such as bottle-to-bottle recycling, for example,[87] are often championed by larger multinationals—which stand the most to benefit from them [88]—but the normative and cost barriers to the adoption of recycled content in food packaging have led to criticism, for example from existing recycling actors in Morocco.[89] The use of plastic waste as feedstock in other industries—such as textiles—will also be important to address.

3. Pair innovation and entrepreneurship with the existing reuse culture

Experimentation and piloting are crucial to inform the development of a strategy that is grounded in lived experiences and concrete lessons learnt. Here, innovation and entrepreneurship are particularly interesting avenues to explore, as many new circular business models exist that aim to radically change the way products are delivered to consumers and to minimise material use. These do not seem to be a current priority for existing value chain actors but are an un-

85 United Nations Environment Programme (UNEP) & International Resource Panel (IRP). (2011). Decoupling natural resource use and environmental impacts from economic growth (pp. 101, Rep.). Retrieved from: UNEP Website

86 UNEP & IRP. (2011). Decoupling natural resource use and environmental impacts from economic growth (pp. 117, Rep.). Retrieved from: UNEP Website

87 Plastics Europe. (2023). A closed-loop system for recycled plastic bottles saves materials and CO2. Retrieved from: Plastics Europe Website

88 Project Breakthrough. (n.d.). Closed-loop: How to do radically more with dramatically less. Retrieved from: Project Breakthrough Website

89 Trinomics. (2020). Circular economy in the Africa-EU cooperation - Country report for Morocco (pp. 1-102, Rep.). Retrieved from: European Union Website

tapped opportunity for new entrants, especially in light of the reuse culture that is so integral to Morocco.[90] Capacity-building activities that embed the concept of circularity within entrepreneurship programmes may also encourage circular practices from the onset.

4. Include the informal sector

Informal waste pickers in Morocco make a significant contribution to closing the loop on plastic packaging. Although their presence makes it more challenging for traceability purposes, their inclusion in future circular economy solutions is an integral piece of the puzzle. As pilots to demonstrate the effectiveness of at-source sorting[91] and return systems[92] are being explored, the development of a just transition plan for informal waste workers[93] to guarantee access to better working conditions would be beneficial. This plan could be co-created with informal waste picker association representatives and include capacity-building actions to support their formalisation and to share essential business skills, such as accountancy.

5. Invest in traceability and safety solutions

Recycled plastic can be more toxic than virgin alternatives[94] and requires traceability protocols and standards to be established and followed to guarantee the safety of final products. These standards ideally need to be progressive and adapt to changing requirements. This is currently not typically the case in Morocco, where standards are set within legislative texts and therefore take much longer to update if and when needed. Instead, legislation should ideally set essential guidelines (for example, health protection) and refer to standalone standards that can adapt to the times.[95] Beyond standards, digital traceability solutions also exist that can be further explored—some of which work directly with informal waste pickers to improve their visibility, such as BanQu.

90 Various stakeholder meetings. (2023).

91 Association des Enseignants des Sciences de la Vie et de la Terre (AESVT.). (n.d.). *La gestion des déchets au Maroc: Approche alternative.*

92 Searious Business. (n.d.). Moroccan Supermarkets Tackling Single-Use Plastics. Retrieved from: **Searious Business website.**

93 UNEP. (2023). Topic Sheet Just Transition (pp. 1-5, Rep). Retrieved from: UNEP Website

94 Gayle, D. (2023). Recycled plastic can be more toxic and is no fix for pollution, Greenpeace warns. Retrieved from: The Guardian Website

95 Institut Marocain de Normalisation (IMANOR) representative. (2023, June). Célébration de la journée mondiale de l'environnement: Atelier d'échange autour du thème « Pollution plastique : Défis et opportunités »

3

Bangladesh: State of play and future pathways for a circular textiles value chain

Endorsers of this chapter

Mohammed Masum Billah

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The reasons for shifting to a circular economy are obvious, but doingso is challenging. Today, consuming fewer natural resources and finished products can slow down economic growth, going against Sustainable Development Goals 1, 2 and 8. However, with innovative ideas, a positive mindset, and a clear understanding of the circular economy, along with integrated action plans, we can better integrate business and society to build a more sustainable world.

Mohammad Shamsul Arafin

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After recognising and embracing circularity as an enabler for sustainability, the next phase for Bangladesh is to focus on how to catalyse the transition. This entails formulating and implementing pertinent policies, developing supportive infrastructure, gaining commitment from industry leadership, using AI, the Internet of Things and big data for decision-making and, finally, making impact investments available and accessible.

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The circular economy model can help achieve multinational brands' sustainability goals, but production and consumption are often dispersed across global value chains. While brands aim to reconfigure supply chains to ensure circularity, their success largely depends on how brands, suppliers and institutional actors collaborate to develop conducive policies and circular innovation ecosystems in manufacturing countries. Connecting production and consumption in global circular systems requires brands not only to upgrade capabilities, strategies and structures but also to develop more ambitious commitments and share resources, technologies and long-term plans with their suppliers to support them in the green transition. Only by ensuring upstream and downstream value chains are in the transition together can we eliminate waste, prioritise workers' wellbeing and deliver economic benefits for all actors.

Shamiul Hoque

Impact Programmes Manager

Global Fashion Agenda (GFA)

This report on circular textiles in Bangladesh is pivotal for global sustainable development. It emphasises the urgency of transitioning to circular practices, aligning with the GFA's Circular Fashion Partnership and BESTSELLER's circular economy pilot in the country. Its insightful analysis offers strategies to decouple economic growth from material use, enhancing industry competitiveness and resilience. GFA applauds its comprehensive approach, marking a significant step towards sustainability.

1. Background

Bangladesh's export-oriented textile and garment industry has been a tremendous source of economic development for the country, increasing access to currency and foreign investments, lifting people out of poverty, and providing a source of income for many women, who make up the majority of garment workers.[96] [97] Moreover, the textile and garment industry contributes an important share of the country's economic output (GDP), national exports and industrial employment (16, 80 and 40%, respectively)[98] [99] and manufacturers of textiles and readymade garments represented nearly half of all enterprises in Bangladesh in 2013.[100] However, this economic model has placed Bangladesh in a fragile position where it is highly dependent on the exports of a single product, threatening the country's overall resilience.[101]

The country's reliance on the industry is particularly concerning, as it is based on a double dependency: first, on ready-made garment (RMG) exports to European and other high-income markets; second, on imports of raw materials, especially from cotton-rich countries like India and the US.[102] The impact of global shocks—such as the covid-19 pandemic—on Bangladesh best illustrates the risks involved in such dependencies, with the decrease in demand for RMG products hitting workers the hardest.[103]

This production model is also a significant source of social and environmental issues that have long been the subject of international scrutiny. In addition to fuelling overconsumption in high-income countries, the global textile industry is also the poster child for unsafe and unfair working conditions, as well as being a key driver of environmental degradation. For example, while only a little over half of Bangladesh's population has access to safely managed water sources,[104] the country's textile industries generate around 217 million cubic metres of wastewater containing toxic chemicals, dyes and heavy metals. This, in turn, severely pollutes water and causes ecological damage.[105] Meanwhile, a lack of living wages, child labour, and several other human rights breaches at various stages of the value chain characterise work in these industries—a double-edged sword for women, who suffer disproportionately due to their over-representation in the workforce. Scrutiny of garment production in the wake of the 2013 Rana Plaza factory tragedy led to the implementation of several interventions. Multi-stakeholder initiatives, such as the Bangladesh Accord on Fire and Building Safety and the Alliance for Bangladesh Worker Safety, have significantly improved working conditions, particularly in comparison to other manufacturing hubs,[106] however, social issues remain endemic to the sector.[107] [108] With climate change threatening the production capacity of the highest cotton-producing

96 Al Mamun, A., & Hoque, M. (2022). The impact of paid employment on women's empowerment: A case study of female garment workers in Bangladesh. World Development Sustainability, 1, 1-11. doi: 10.1016/j.wds.2022.100026

97 World Bank. (2018). Bangladesh: Reducing poverty and sharing prosperity. Retrieved from: World Bank Website

98 Giz & Tüv Rheinland. (2022). A pre-feasibility study on industrial textile waste in Bangladesh, Pakistan, Vietnam, Cambodia-streams and Regional linkages (pp. 1-100, Rep.). Retrieved from: TUV

99 FCG Swedish Development AB. (2021). *Facilitating the identification of Entry Points for Sida in the Textile & RMG sector in Bangladesh* (pp. 1-24, Rep.). Retrieved from: FCG Website

100 Bangladesh Bureau of Statistics. (2019). বাংলাদেশ পরিসংখ্যান ব্যুরো. Retrieved from: Bangladesh Bureau of Statistics Website

101 Kathuria, S. (2021). Bangladesh Is Clothes-Minded: The country's obsession with garments takes an increasingly heavy toll on the rest of its economy. Retrieved from: Foreign Policy Website

102 Observatory of Economic Complexity (OEC). (2021) .Bangladesh.. Retrieved from: OEC Website

103 Asia Floor Wage. (2021). Money Heist: Covid-19 Wage Theft in Global Garment Supply Chains (pp. 1-181, Rep). Retrieved from: Issue Website

104 World Bank. (2018). Bangladesh: Reducing poverty and sharing prosperity. Retrieved from: World Bank Website

105 Sakamoto, M., Ahmed, T., Begum, S., & Huq, H. (2019). Water pollution and the textile industry in Bangladesh: Flawed corporate practices or restrictive opportunities?. Sustainability, 11(7), 1-14. doi:10.3390/su11071951

106 International Labour Organization (ILO). (2015). Improving working conditions in the ready made garment industry: Progress and achievements. Retrieved from: ILO Website

107 Prentice, R., De Neve, G., Mezzadri, A., & Ruwanpura, K. N. (2018). Health and safety in garment workers' lives: Setting a new research agenda. Geoforum, 88, 157-160. doi: 10.1016/j.geoforum.2017.11.024

108 Sinkovics, N., Ferdous Hoque, S., & Sinkovics, R.R. (2016). Rana Plaza collapse aftermath: are CSR compliance and auditing pressures effective?. Accounting Auditing & Accountability Journal, 29(4):617-649. doi:10.1108/AAAJ-07-2015-2141

countries[109] and with key export markets such as the EU making circularity a requirement for access,[110] Bangladesh is actively investing in strengthening the resilience of its economy and rethinking the role it plays in the global textiles economy.

The circular economy provides a good opportunity to make these changes, and many initiatives in the country are increasingly focusing on the topic: from high-profile events attracting the international textiles and apparel community such as the Sustainable Apparel Forum and the Bangladesh Circular Economy Summit, to projects such as the Circular Fashion Partnership, the Switch to Circular Economy Value Chains project and more.

This document aims to provide an overview of circular economy developments in Bangladesh's textile value chain to orient local and international stakeholders in the public, private and civil sectors looking to establish new initiatives on this topic. The report is structured as follows: Section one provides background knowledge on the garment and textile industry in Bangladesh; Section two clarifies the aims of a circular economy for textiles; Section three details the current state of circular play in Bangladesh's textile and garment industry; and Section four highlights pathways for action.

2. Aims of a circular economy for textiles

The circular economy is an economic system where waste is designed out, everything is used at its highest possible value for as long as possible and natural systems are regenerated.[111] The concept of circularity closely mimics nature, where there is no waste: all materials have value and are used to sustain life in a myriad of ways. If we effectively deploy these strategies, we will require fewer materials to meet similar societal needs.[112]

The four strategies we can use to achieve these objectives, particularly in the context of textiles, are:[113]

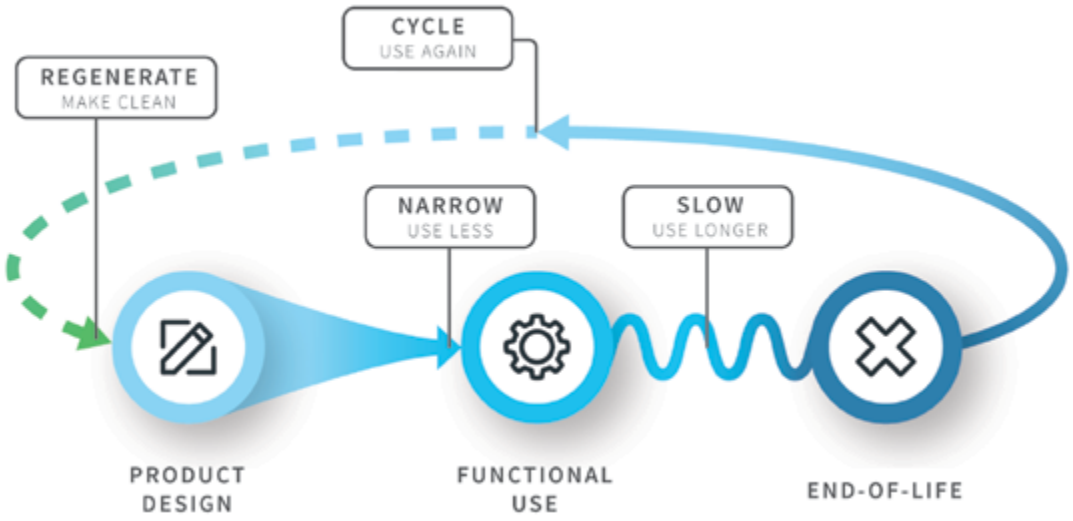


Figure four shows the four 'flows' of the circular economy.

109 WTW. (2021). Cotton 2040: Planning for Climate adaptation. Retrieved from: WTW Website

110 Chatham House. (2022). The EU's Circular Economy transition for plastic and textiles: Opportunities and challenges for trade partners in emerging markets (pp. 1-56, Rep.). Retrieved from: SWITCH to Circular Economy Value Chains Website

111 Ellen Macarthur Foundation (EMF). (n.d). Circular economy introduction. Retrieved from: EMF Website

112 EMF. Circular economy introduction. Retrieved from: EMF Website

113 These four groups of strategies are based on the work of Bocken et al. (2016) and applied to the context of textiles based on the various strategies highlighted by leading institutions and platforms such as the Ellen MacArthur Foundation (2017), the European Commission (2022), the Platform for Accelerating the Circular Economy (2021), the Global Fashion Agenda (2021), SITRA (2022), the United Nations Environment Programme (UNEP) (2023), as well as SWITCH2CE project partners Circle Economy(2021) and Chatham House (2022).

- **Regenerate flows—Make clean:** *Regenerate ecosystems and safeguard health* by using renewable resources (fibres, water and energy) from sustainably-managed environments, eliminating substances of concern in the production of textiles, addressing microfibre release from synthetic textiles and eliminating textile pollution and waste.
- **Narrow flows—Use less:** *Reduce the size of the problem* by reversing the overproduction and overconsumption of textiles and reducing demand for resources through resource efficiency in the production process.
- **Slow flows—Use longer:** *Make textiles last* by designing products for longevity and durability, repairability and recyclability by investing in new circular models for reuse and repair and by engaging citizens to extend the lifetime of their textile products through, for example, better care, maintenance and repair.
- **Cycle flows—Use again:** *Bring textiles back into the loop* by dealing with the legacy of the existing textile waste mountain and boosting textile recycling and markets for recycled fibres.

A circular economy also looks beyond materials to consider all resources and natural and social capital that systems of production and consumption rely on. This includes resources such as water and energy, as well as the people powering production, all the way to the ecosystems' provisioning services that we rely on. As such, all four strategies ('Regenerate', 'Narrow', 'Slow' and 'Cycle') equally apply to these resources and natural and social capital and are also addressed throughout the following sections.

3. Current state of circularity in Bangladesh's textile and garment value chain

The textile and garment industry is fundamental to Bangladesh's economy, accounting for 84% of the total national exports and formally employing 4.6 million people across more than 4,000 factories.[114] [115] The industry integrates various actors across the formal and informal sectors, and it remains dominated by smaller entities, even though large textile and apparel companies have technologically upgraded and introduced more complex products.[116] Bangladesh's textile and garment sector now faces new challenges as the UN announced its graduation from the least developed countries (LDC) group, meaning that the country will lose certain trading privileges.[117] Fast fashion embodies another concern, as the growing demand for ready-made garments and textiles has resulted in higher consumption of energy and natural resources, contributing to high post-production and consumption waste streams.[118]

Moreover, the extensive production in the sector yields significant pre-consumer textile waste, known as 'jhut', totaling around 600,000 tonnes annually, with only 5% being recycled primarily by informal businesses.[119]

114 Bangladesh Investment Development Authority. (n.d.). Readymade garments. Retrieved from: Bangladesh Investment Development Authority Website

115 Alam, H., Schröder, P., & Reaz, M. International Circular Economy Policy trends: Implications for Bangladesh's Circular and Textile Policy Development Retrieved from: SWITCH

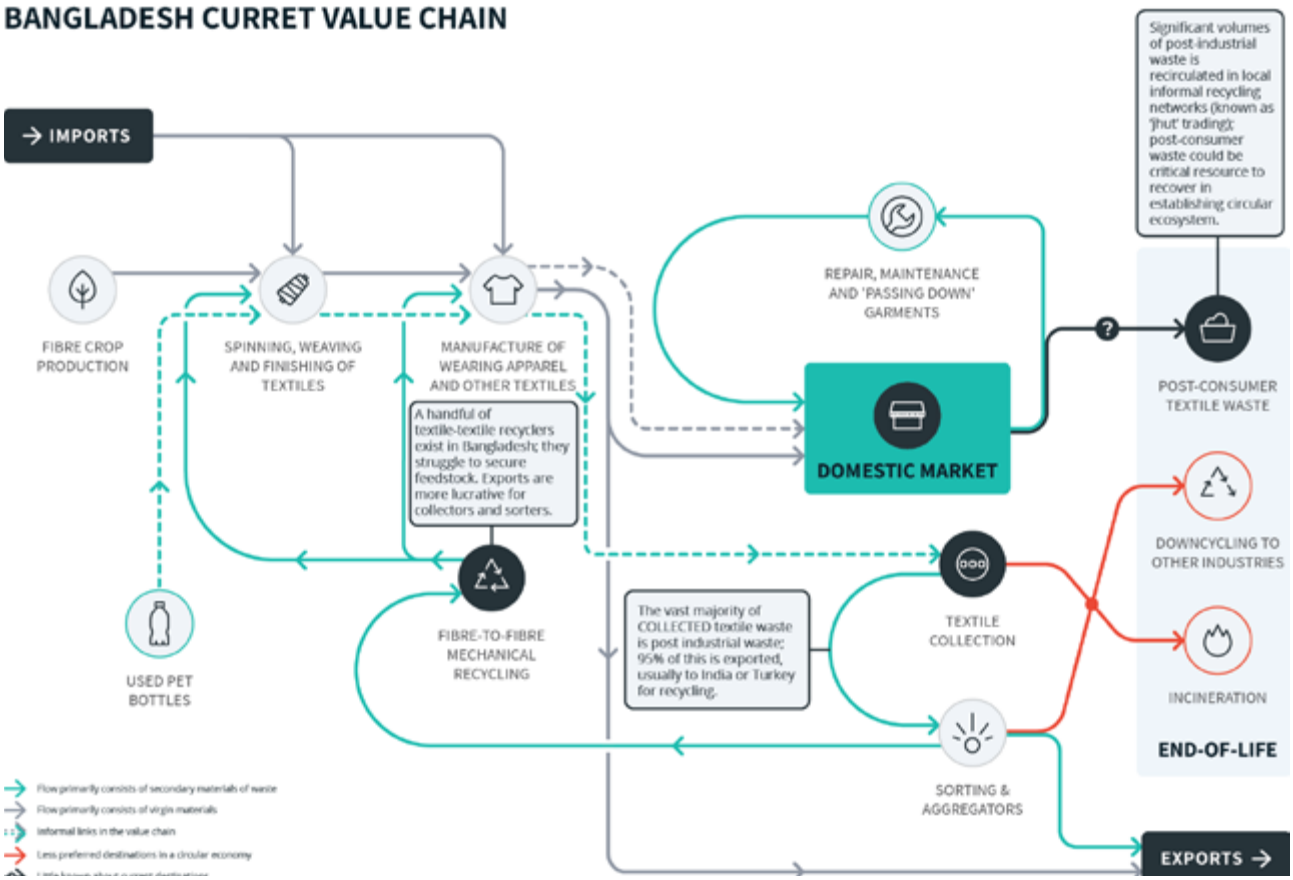
116 Bangladesh Bureau of Statistics. (2019) Economic census 2013. Retrieved from: Bangladesh bureau of statistics website

117 International Economics. (2021). Impact of LDC Graduation on the Textiles and clothing Sector. Retrieved from: International Economics Website

118 Alam, H., Schröder, P., & Reaz, M. International Circular Economy Policy trends: Implications for Bangladesh's Circular and Textile Policy Development Retrieved from: SWITCH

119 UNIDO (2023). Bangladesh: Circular Opportunities in the Textiles Value Chain. Retrieved from: UNIDO Website

Nonetheless, there are various circular initiatives in the country, demonstrating its resilience and adaptability to surging sustainability demands.



After Circle Economy in Switching to circular global value chains: state of play and future pathways, 2024

Figure five displays the textile value chain in Bangladesh

3.1 Regenerate flows—Make clean

3.1.1 Material inputs

Renewable fibres

Although the exact fibre composition of Bangladeshi textiles and garments is hard to assess, the industry is widely understood to be primarily cotton-based—a renewable, albeit land- and water-intensive fibre that can provide a valuable feedstock to existing fibre-to-fibre recycling markets. Every year, 8.5 to 10 million bales (or approximately 1.8 to 2 million tonnes) of cotton are used to meet the industry's demand.[120] [121] Over 95% of this cotton is imported from cotton-growing regions in Africa, India, the Commonwealth of Independent States and the US.[122] [123] However, cotton, despite being renewable, has a considerable environmental impact on cultivating countries concerning water scarcity, GHG emissions, depletion of natural resources, and biodiversity.[124]

Other natural fibres grown in Bangladesh—albeit to a much smaller extent—include wool (3,000 tonnes per year) [125]

120 Dhaka Tribune. (2022). Bangladesh aims to increase cotton production fivefold by 2030. Retrieved from: Dhaka Tribune Website

121 Industrial Development Leasing Company (IDLC). (2021). The Local Textile Industry of Bangladesh: A Signature of Our Culture (pp. 1-32, Rep.). Retrieved from: IDLC Website

122 Observatory of Economic Complexity (OEC). (2021). Raw Cotton in Bangladesh. Retrieved from: **OEC Website**

123 Maritime Gateway. (2022). Africa Overtakes India As Major Cotton Supplier To Bangladesh. Retrieved from: **Maritime Gateway Website**

124 Šajn, N. (2019). Environmental impact of the textile and clothing industry: What consumers need to know. (pp. 1-10). Retrieved from: European Parliamentary Research Service (EPRS)

125 Chowdhury, M.R. & Khan, A.N. (2022). Study on the Possibilities to Produce Sustainable Wool Fibre in Bangladesh. International Journal of Engineering, Business and Management (IJEBM), 6(1), 42-46. doi: 10.22161/ijebm.61

and silk (7 to 40 tonnes per year,[126] a figure that has been steadily in decline). Jute is also an important natural fibre crop grown in Bangladesh (7 to 8 million bales annually or approximately 1.6 million tonnes on average).[127] Once the 'golden fibre' of the country and the heart of its exports, jute is now primarily used outside of apparel applications, largely for packaging and some non-apparel textile uses. The jute industry still exports over half a billion dollars worth of jute every year, but this pales in comparison to the $42.63 billion of RMG exports in 2023.[128] Nevertheless, it should be noted that, according to process-based LCAs, the production stage of jute fibre is the main contributor to local environmental impacts related to land use, marine ecotoxicity, and the withdrawal of heavy metals resulting from the use of fertilisers and pesticides during its cultivation.[129]

Non-renewable fibres

Local production of synthetic fabrics—such as those made of polyester staple fibre (PSF) and viscose staple fibre (VSF)—is still relatively limited in Bangladesh. In 2021, only 27 of the country's 433 spinning mills produced synthetic yarn.[130] Likewise, synthetic imports pale in comparison to cotton imports: in the 2019–2020 fiscal year, raw cotton imports were 17.85 million tonnes, compared to 96,077 tonnes and 53,289 tonnes, respectively, of PSF and VSF. But this is changing.

Today, about 24% of annual apparel exports are garment items made of synthetic fibres,[131] often blends of cotton and other types of yarn—and this is only set to increase in the future as the government and foreign investments support this trend.[132]

Indeed, investments in the local production of synthetic fibres are currently on the rise; the Bangladesh Garment Manufacturers and Exporters Association (BGMEA) aims to increase the percentage of annual apparel exports of garment items made of synthetic fibres to 40% by the end of 2030;[133] while government incentives are also available to encourage the manufacturing of garments from synthetic fibres.[134]

Recycled fibres

The recycling of fabric and the use of locally recycled fabrics is still relatively low in Bangladesh, but this is rising gradually to match the international trend towards a circular economy for textiles.[135] Recycled fibres are primarily imported and spun in Bangladesh, although a handful of fibre-to-fibre mechanical recyclers (such as Recover and Cyclo) are now also operational in the country. The volume of rPET fibre (or recycled polyester fibre) is significantly higher than recycled cotton, however, rPET fibre is often more readily available, cheaper and of better quality. There are 46 Global Recycled Standard (GRS)-certified spinning facilities in Bangladesh, for example, but the majority of these companies spin rPET fibre from plastic bottle recycling.[136]

While the adoption of recycled fibres presents benefits in terms of waste reduction and water consumption, it's important to consider that rPET fibre may contribute to water microplastic pollution. For instance, in one load of laun-

126 Siddique, A. (2023). Extreme temperatures and erratic weather disrupt Bangladesh's famous Rajshahi Silk Industry. Retrieved from: Mongabay Website

127 Dhaka Tribune. (2022). Jute millers want withdrawal of 2% source tax. Retrieved from: Dhaka Tribune website

128 Fibre2Fashion. (2023). Bangladesh sees 10.67% rise in garment exports, hits $42.6 bn in FY23. Retrieved from: Fibre2Fashion website

129 United Nations Conference on Trade and Development (UNCTAD). (2021). The role of exports in manufacturing pollution: Bangladesh fact-sheet. Retrieved from: UNCTAD

130 Rahaman, M.M. (2021). Harnessing man-made fibre potential vital for Bangladesh economy. Retrieved from: Financial Express Website

131 Mirdha, R.U. (2023.)Investment dried up in textile and garment in 2023. Retrieved from: Daily Star Website

132 Khan, A. K. (2021). RMG makers turning to artificial fibers. Retrieved from: Textile Today Website

133 Textile Today. (2022). Bangladesh locally can produce 50% of its synthetic fiber demand. Retrieved from: Textile Today Website

134 Mirdha, R. U. (2023). Garment of man-made fibre: Ministry for 10% cash incentive on export. Retrieved from: Daily Star Website

135 Siddique, A. (2023). Extreme temperatures and erratic weather disrupt Bangladesh's famous Rajshahi Silk Industry. Retrieved from: Mongabay Website

136 Circular Fashion Partnership. (2024). Circular Fashion Partnership. Retrieved from: Global Fashion Agenda Website

dering, approximately 700,000 microplastic fibres are discharged, posing risks to water bodies, food chains, marine life, and human health.[137] This issue is further reflected in the production, processing and washing of synthetic fabric (non-renewable fabrics), where microplastics are also released and accumulated in the environment.[138] Additionally, the reliance on plastic bottle recycling may introduce challenges related to resource competition, considering that recycling plants are not receiving enough plastic bottles for the production of polyester yarn and polyester fabric.[139] Therefore, efforts to expand the use of recycled fibres should be accompanied by strategies to address these environmental and supply availability concerns and promote sustainable practices across the textile industry.

3.1.2 Toxic inputs

Fabric dyeing is a chemically intensive industry—and the most chemically intensive stage in the manufacturing process—with more than 8,000 chemicals used throughout.[140] These chemicals include many toxic substances, including carcinogenic and hormone-disrupting chemicals that never break down and accumulate in the environment, known as PFAS.[141] These cause substantial water pollution and ecological damage. Large textile dumps around Dhaka and Chittagong[142] also contribute to further water pollution as excess waste clogs river flows and drains, and microplastics leach into water bodies, resulting in higher levels of PFAS in seafood and water near the Cox's Bazar and Chittagong areas presenting an environmental hazard for human health and marine biodiversity.[143]

The industry has recognised the need to and taken steps to reduce toxic inputs, with more sustainable alternatives such as natural and biodegradable dyes entering the market,[144] [145] and with regulations and guidelines in place to control the discharge of harmful chemicals into water bodies (for example, the *Bangladesh Standards and Guidelines for Sludge Management*). In 2022, Bangladesh, Indonesia, Pakistan and Vietnam also jointly launched a $43 million programme to manage and reduce hazardous chemicals in their textile industries and fight chemical pollution, with the goal of phasing out PFAS and other chemicals of concern.[146] The government is not allowing new garment factories outside industrial zones and has made it mandatory to invest in effluent treatment plants (ETP). Likewise, new special economic zones have also made it mandatory to invest in ETPs, although these are often not properly operated.[147] International buyers have also woken up to the urgency, with the Zero Discharge of Hazardous Chemicals (ZDHC) initiative tackling key challenges on the road to its ambitious titular goal. Regulations in the EU and the US also aim to limit toxic chemicals in consumer products to 'safe' levels.

Despite over a decade of efforts, however, there is still a long way to go, as tests of textile products still show that high levels of toxic chemicals are present[148] and chemical industries continue to hinder more ambitious regulation in export markets.[149]

3.1.3 Water inputs

The fashion industry is the second largest consumer industry of water, requiring about 2,700 litres to produce one

137 van Elven, M. (2018). How sustainable is recycled polyester. Retrieved from: **Fashion United Website**
138 Wastiaux, M. (2024). The environmental impact of the textile sector. Retrieved from: The Hedgehog Company
139 Shawkat, A. (2021). Not enough plastic waste for recyclers. Retrieved from: The Business Standard
140 Kant, R. (2012). Textile dyeing industry is an environmental hazard. Natural Science, 4(1), 22-26. doi: 10.4236/ns.2012.41004
141 Wicker, A. (2023). Your clothes could be toxic. fashion urgently needs to address this. Retrieved from: Vogue Website
142 Circular Fashion Partnership. (2024). Circular Fashion Partnership. Retrieved from: Global Fashion Agenda Website
143 Environment and Social Development Organization (ESDO). (2019). PFAS: Bangladesh Situation Report (pp. 1-37). Retrieved from: ipen.org
144 Abudullah, S. (2023). Proklean partners with Sameet Dye-Chem to promote sustainable alternatives for Bangladesh's textile. Retrieved from: **Textile Today Website**
145 Textile Today. (2018). Eco-friendly chemicals paving the way for Sustainable Textile Industry. Retrieved from: **Textile Today Website**
146 United Nations Environment Programme (UNEP). (2022). Textile-producing nations unite to reduce chemical waste. Retrieved from: UNEP Website
147 Hossain, L., & Khan, M. S. (2020). Water footprint management for sustainable growth in the Bangladesh Apparel Sector. Retrieved from: **MDPI Website**
148 Wicker, A. (2023). Your clothes could be toxic. fashion urgently needs to address this. Retrieved from: Vogue Website
149 Nelsen, A. (2023). EU to drop ban of hazardous chemicals after industry pressure. Retrieved from: The Guardian Website

cotton shirt and over 10,000 litres of water to produce a pair of jeans.[150] After the cultivation of cotton—most of which occurs outside of Bangladesh—the dyeing process is one of the most water-intensive stages of textile production, requiring 30 to 50 litres of water per kilogramme of dyed cloth alone.[151] As a result, around 217 million cubic metres of wastewater[152] is generated in Bangladesh, putting stress on Bangladesh's already insecure water supplies.[153]

To mitigate this, supportive policies have been put in place, including the *Water Act 2013:* a framework law to integrate and coordinate water resources management for the protection, improvement and sustainable use of rivers, lakes, estuaries, coastal waters and groundwater. More regenerative approaches to water use, such as rainwater harvesting, also hold tremendous potential: a study found that some RMG factories are already meeting up to 60% of their production requirements using harvested rainwater, but significant investment costs prevent smaller factories from following suit.[154] The same report found that some of Bangladesh's green garment factories have been saving an annual average of 40% on their power and water costs by introducing rainwater harvesting.

3.1.4 Energy inputs

Textile production is energy-intensive and primarily based on fossil fuel energy. Worldwide, the industry accounts for 2 to 8% of all global greenhouse gas emissions, with the bulk (40%) of these emissions stemming from the production phase. In Bangladesh, the RMG and textile sectors account for 15.4% and 12.4% of greenhouse gas (GHG) emissions respectively. The carbon emissions of the industry pose a challenge in achieving GHG reduction targets of the Paris Agreement and restoring air pollution in the country. The reliance on fossil fuels and natural gas, operational inefficiencies, outdated machinery, and ineffective energy management exacerbate the industry's carbon footprint, contributing to environmental degradation.[155] Shifting to renewable energy sources will be particularly important to decarbonise textile production and restore air quality, considering that Bangladesh ranked as the country with the most polluted air in the 2020 World Air Quality Report.[156]

In Bangladesh, policy supports these shifts, with ambitious targets around solar energy outlined in the *National Solar Energy Roadmap, 2021–2041*, and with the *Mujib Climate Prosperity Plan* introducing exemptions from corporate income tax for renewable energy businesses, for example. Indeed, Bangladesh aims to generate at least 40% of its total electricity from renewable sources by 2041. This ambition is translating at the factory level, too, with the textile sector leading the way in on-site renewable energy generation.[157] In 2022, almost 50 firms had installed solar panels on their factory rooftops with a combined power generation capacity of 50 megawatts—more than 70% of these were textiles and garments units.[158]

3.1.5 Social impacts

Since the Rana Plaza disaster in 2013, Bangladesh's RMG industry has made significant progress, particularly in areas such as factory safety, working environments and infrastructure risk mitigation. The *Accord on Building and Fire Safety in Bangladesh* and the *Alliance for Bangladesh Worker Safety*, for example, have played a key role in driving these im-

150 Chapagain,A.K., Hoekstra, A.Y., Savenije, H.H.G., & Gautam, R. (2005). The water footprint of cotton consumption: An assessment of the impact of worldwide consumption of cotton products on the water resources in the cotton producing countries. Ecological Economics, 60(1), 186–203. doi: 10.1016/j.ecolecon.2005.11.027

151 Kant, R. (2012). Textile dyeing industry is an environmental hazard. Natural Science, 4(1), 22-26. doi: 10.4236/ns.2012.41004

152 Sakamoto, M., Ahmed, T., Begum, S., & Huq, H. (2019). Water pollution and the textile industry in Bangladesh: Flawed corporate practices or restrictive opportunities?. Sustainability, 11(7), 1-14. doi:10.3390/su1107195

153 International Labour Organization (ILO). (2021). Effective regulations? Environmental impact assessment in the textile and garment sector in Bangladesh, Cambodia, Indonesia and Viet Nam (pp. 1-55, Rep.). Retrieved from: ILO Website

154 Mathews, B. (2022). Study outlines water-harvesting potential in Bangladesh. Retrieved from: Apparel Insider Website

155 Shuvra Halder, E. & Alam Raju, M.N. (2024). Bangladesh's struggle with GHG emissions in textile and RMG. Retrieved from: The Daily Star

156 ILO. (2022). A Just Transition in the Textile and Garment Sector in Bangladesh Technical Stakeholder Workshop. (pp. 1-18). Retrieved from: ILO Website

157 Shah, J. (2023a). As Bangladesh's textile sector makes Green Switch, Lessons for India's export giants too. Retrieved from: SaurEnergy Website

158 Textile today. (2022). Textiles and garments entrepreneurs focusing on solar energy battling energy crisis. Retrieved from: TextileToday Website

provements.[159] From the more holistic perspective of worker wellbeing, however, there is still much work to be done. As in other textile-producing countries, issues such as lack of living wages, lack of workers' representation and voice, sexual abuse and child labour still persist at various stages of the value chain (Al Alam et al., 2023).[160] In general, nearly one in five factories struggle to pay a minimum wage of £2.30 per day, and overtime and harassment are common. This is often the result of purchasing practices by brands such as order cancellations or delayed invoice payments that are deemed unfair by many[161] and that were exacerbated by the covid-19 pandemic. Then, garment factories only employed 75% of the workers they had before, suggesting that up to 900,000 workers could have lost their jobs.

Finally, it is particularly difficult to enforce workers' protection standards in informal settings, which dominate post-industrial waste trading networks. This primarily involves networks of informal actors (often operating in hierarchies), who often manually sort collected waste in 'chaotic and unhygienic' conditions.[162] Approximately half a million workers are involved in the textile waste value chain (handling, sorting, recycling and reusing) in several districts in Bangladesh, including Dhaka (at Konabari and Mirpur), Gazipur, Narayanganj, Chittagong, Pabna, Rangpur, Saidpur and Thakurgaon. Challenges related to this informal activity are often addressed through initiatives that sit outside circular economy developments, but the latter could benefit from building on and joining forces with other social responsibility movements.

3.2 Narrow—Use less

3.2.1 Production volumes

RMG exports

With more than 500 spinning mills, 900 weaving mills, 300 wet processing and finishing mills[163] and 4,000 factories,[164]

Bangladesh has positioned itself as a key sourcing hub for the global apparel industry and is now the second-largest exporter of RMG globally, second only to China.[165] Indeed, in 2021, Bangladesh exported over $40 billion worth of garments.

Exactly how many garments or tonnes of textiles this figure corresponds to is hard to pin down, however. This is a common issue in fashion,[166] as 88% of the industry does not disclose their annual product volumes[167] and because data is challenging to translate from financial to physical units, or even across physical units, given the complexity and diversity of textile and garment products. Regardless of exact figures, Bangladesh heavily relies on ever-higher production volumes and could be at risk of significant value loss if these volumes were to be reduced due to shifts in consumption patterns.

159 Biswas, P. (2023). Bangladesh's garment industry, a decade after the Rana Plaza collapse. Retrieved from: The Diplomat Website

160 Alam, M. A. A., Biswas, M. K., Mahiat, T., Chowdhury, R. B., Biswas, K. F., Hossain, M. M., & Sujauddin, M. (2023). Taking stock of the share of global environmental burden of knitwear production in Bangladesh: Constructing the life cycle inventory. Journal of Cleaner Production, 412, . doi:10.1016/j.jclepro.2023.137376

161 University of Aberdeen. (2023). Impact of Global Clothing Retailers Unfair Practices On Bangladeshi Suppliers During Covid-19 (pp. 1-39, Rep.). Retrieved from: ABDN

162 Khairul Akter, M. M., Haq, U. N., Islam, Md. M., & Uddin, M. A. (2022). Textile-apparel manufacturing and material waste management in the circular economy: A conceptual model to achieve sustainable development goal (SDG) 12 for Bangladesh. Cleaner Environmental Systems, 4, 100070-. doi:10.1016/j.cesys.2022.100070

163 Bangladesh Textile Mills Association (BTMA). (2023). Basic Data of Primary Textile Sector. Retrieved from: BTMA

164 Bangladesh Investment Development Authority (BIDA). (n.d). Readymade Garments. Retrieved from: BIDA website

165 Habib, Md. A., Bao, Y., Nabi, N., Dulal, M., Asha, A. A., & Islam, M. (2021). Impact of Strategic Orientations on the Implementation of Green Supply Chain Management Practices and Sustainable Firm Performance. Sustainability, 13(340), 1-21. doi: 10.3390/su13010340

166 Robinson, F. (2023). No one knows how many clothes are made. why won't brands tell us? Retrieved from: Good on You Website

167 Fashion Revolution. (2022). Fashion Transparency Index 2023. Retrieved from: Fashion Revolution Website

Domestic market

Beyond the export-oriented RMG sector, Bangladesh's textile mills also serve the local market, which mostly focuses on woven items such as sarees, three-pieces, scarves and bed sheet fabrics, among others (Haque, 2021). A small number of small local brands design and produce their own garments for the local market in small factories. A significant portion of garments sold in informal markets also come from *'stock lots'*: unsold stock from larger brands that are sold informally and at heavily discounted prices, sometimes against brands' regulations.

3.2.2 Resource efficiency in manufacturing

Lean manufacturing practices that aim to optimise material use are already widely practised in the industry: for example, fabric-laying techniques to minimise fabric losses on the cutting table, which can enable significant savings[168] and reduce waste. Bangladesh has over 200 Leadership in Environmental and Energy in Design (LEED) certified garment units across the country—a testament to the industry's commitment to resource efficiency. Still, there is significant room for improvement: research from Reverse Resources finds that upwards of 25% of resources spill out of textile production chains and are downcycled or incinerated for a variety of reasons—some more preventable than others—and along the value chain, from the design stage to retail. For example, CREATE study found that manufacturers can claim up to 29% of the fabric they import and waste as duty-free—up from only 7% a few years ago. It is commonly understood that garment-making inevitably incurs some production waste. The government dictates the acceptable ratio of waste beyond which manufacturers are subject to taxes. Today, high-end items for export markets require even more waste—more fabric is wasted in the sampling, development and approval process, and less fabric is used in the final product. [169]

Brands, in particular, play a role in stimulating unnecessary demand for more materials through their buying practices: for example, over-ordering or requesting upwards of 45 samples when a handful could be sufficient.

Since manufacturers can make a small margin on this waste, these linear practices are incentivised and higher levels of waste are normalised both by current pricing structures and a lack of tracking and transparency around waste data.

Current efforts on resource efficiency and cleaner production include the PaCT Programme, which is working towards sustainable textile production. According to data from PaCT, at least 338 factories have been saving 28.7 billion litres of water along with 2.9 million megawatt-hours (MGh) of electricity over a year by adopting their programme. As a result, factories have succeeded in avoiding the emission of an astounding amount of CO2, totalling 558,391 tonnes.[170] These achievements highlight the potential for significant resource savings and environmental impact reduction within the textile industry.

3.3 Slow—Use longer

Durability of export products

The garments that come out of Bangladesh's textile and garment industry fuel the overconsumption of high-income countries and consumers. They are short-lived fast fashion or higher-end items for the European and US markets, which account for over 60% and 15%, respectively, of Bangladesh's annual apparel exports. Once they reach their end markets, these garments are, on average, used just a handful of times[171]—as low as seven times according to one UK

168 Reverse Resources. (2017). The Undiscovered Business Potential of Production Leftovers within Global Fashion Supply Chains: Creating a Digitally Enhanced Circular Economy (pp. 1-32, Rep.). Retrieved from: Reverse Resources

169 RMG Bangladesh. (2020). Govt likely to ease rules on duty-free fabric use to export high-end apparels. Retrieved from: **RMGBD website**

170 Textile Focus. (2021). Achievement of the PaCT Program, Towards a Sustainable Textile Production. Retrieved from: Textile Focus

171 EMF. (2017). A new Textiles Economy: Redesigning Fashion Future (pp. 1-150, Rep.). Retrieved from: ELF Website

study[172]—before making their way to the landfill or to a textile collection bin where they are, at best, sorted for local reuse or recycling. At worst, they are exported to countries like Ghana or Chile without proper sorting, where they add to the crushing weight of growing textile waste mountains that are neither suitable for reuse nor can be recycled locally.[173] [174]

Circular economy developments in the EU, however, may drive demand for 'higher quality, affordable clothing'. The EU's Ecodesign for Sustainable Products Regulation, for example, emphasises product durability, while reuse business models such as rental and resale are becoming increasingly popular, both in the EU and in the US. To sustain these business models, clothing will need to be made to last, especially compared to current models, where clothing is seen as disposable. Design strategies to boost the durability and repairability of garments—such as using better quality fabrics, ensuring components such as buttons or zips can withstand dry cleaning processes, or using production techniques that can withstand repeated use—will be especially crucial.

Reuse and repair on the local market

While little information was found on the durability of products made for the local market, there is a strong reuse culture in Bangladesh, much in line with the high clothing utilisation rates commonly found in lower-income countries.[175] Clothes are used and passed down to family members or less advantaged members of society. Reuse business models are not common beyond the rental of tuxedos and other occasionwear.

Reuse and remanufacturing

Unavoidable fabric scraps left over from lean manufacturing practices should preferably be reused or remanufactured before recycling is considered. Remanufacturing involves integrating bigger scrap fabric pieces back into the same production process without undergoing shredding and recycling by using production leftovers on internal sections of a garment where they are 'invisible', using leftover fabrics for small details on the outside of a garment, or designing a garment with a specific waste stream in mind. Reverse Resources research[176] finds that this is relevant to more than a quarter of production leftovers.

Manufacturing practices are estimated to have the potential to reduce production waste by more than 20% and displace 3% of virgin fabrics from conventional production, at no significant cost (investments) in technology, and can allow producers to maintain a high level of standardisation and efficiency without scale restrictions. This could be key to economically incentivising transparency.

3.4 Cycle—Use again

Post-industrial cotton waste

Each year, textile value chain actors produce considerable volumes of pre-consumer textile waste, known as *jhut*: 500,000 tonnes, according to some estimates. This *jhut* consists of leftover textiles and scraps from the production process in garment manufacturing, defective or rejected apparel, or cancelled shipments.

172 Barnardos. (2015). Once worn, thrice shy – British women's wardrobe habits exposed!. Retrieved from: Barnardos Website

173 Circle Economy. (2022). Thinking beyond borders to achieve social justice in a global circular economy (pp. 1-38, Rep.). Retrieved from: Circle Economy Website

174 Ricketts, L. (2021). This Is Not Your Goldmine. This Is Our Mess. Retrieved from: Atmos Website

175 EMF. A new Textiles Economy: Redesigning Fashion Future (pp. 1-150, Rep.). Retrieved from: **ELF Website**

176 Reverse Resources. (2017). *The Undiscovered Business Potential of Production Leftovers within Global Fashion Supply Chains: Creating a Digitally Enhanced Circular Economy.* Retrieved from: **RR website**

Large *jhut* scraps are used to produce children's clothing or for bedding and seating, while smaller scraps are sold on the domestic market or are slated for export. An annual volume of around 500,000 tonnes of pre-consumer waste is produced per year, at times comprising 47% of the total raw material input of its production.[177] Half of textile waste is currently represented by pure cotton fabric.[178] However, the precise quantity and ratio of pre-consumer textile waste is unknown.

In Bangladesh, most factories' collected textile scraps are given or sold to informal businesses that have political capital and muscle, which have monopolised this segment of the garment recycling industry value chain. These informal companies consist of networks of factory owners and micro and small enterprises, consisting of sorters who are paid by the day and by weight of sorted or shredded textiles, which are baled and sent to recycling or downcycling destinations.

Around 10% of production waste was recycled locally in 2023 (up from around 5% in 2021), according to CREATE.

Formal recycling capacity in Bangladesh is increasing: there are four active closed-loop recycling companies (two multinationals and two local companies), in addition to a company making hand-crafted goods from textile waste, which is sold to global brands.[179] Estimates suggest that a further 30% of production waste is recirculated in the informal sector in Bangladesh. The remaining production waste (roughly 60%) is exported to India or Turkey,[180] as this remains financially more lucrative than domestically investing in such capabilities. Despite this growth, there are significant challenges in developing domestic recycling markets, such as their limited capital and the overall decreasing *jhut* quality.

Further structural challenges for waste segregation and recycling include: the inverse and highly volatile relationship between oil prices and recycling, which can make PET recycling less lucrative; the fact that recycled yarns still perform less well than virgin materials; policies incentivising the export of textile scraps and the incineration of fabric waste; and the lack of financial incentives to encourage factories to sell waste through formal rather than informal markets. However, international interest in Bangladesh's cotton waste is increasing, which is likely to impact these factors.

A study found that if domestically produced cotton and elastane waste were recycled in Bangladesh, imports could decrease by around 20%, saving almost three-quarters of a billion US dollars that would have been spent on cotton imports.[181]

The Bangladesh Garments Manufacturers and Exporters Association has also recently signed an agreement with H&M—the country's largest readymade garment buyer—to reduce carbon emissions by 30% by 2030 by using recycled materials.[182] Parallel advances in traceability technologies (including blockchain) are also likely to have an influence on the movements of these waste materials.

177 Runnel, A. (2019). *Production leftovers- a new market opportunity in Bangladesh*.

178 Circular Fashion Partnership. (2021). Pre-feasibility Analysis of Post Industrial Textile Fier-2-Fiber Recycling in Bangaldesh. Retrieved from: GFA website

179 Create. (2023). Phone interview

180 Bansal, R. (2022). Recycling for circularity: Bangladesh shows the world how to do It. Retrieved from: texfash.com

181 Circular Fashion Partnership. (2021). Pre-feasibility Analysis of Post Industrial Textile Fiber-2-Fiber Recycling in Bangladesh (pp. 1-32, Rep.). Retrieved from: Circular Fashion Partnership

182 Siddique, A. (2023). Bangladesh ramps up use of recycled fabrics in ready-made garments. Retrieved from: Mongabay Website

Water recycling

Looking beyond post-industrial cotton, brands and retailers are increasingly advocating for water recycling and sustainable water management in their supply chains.[183] This is a move away from traditional wastewater treatment and discharge approaches towards more circular approaches of water reuse and recycling that prevent half the water shortages Bangladesh is expected to experience up to 2050, or 20 billion cubic metres of water annually.[184] Some manufacturers are already pioneering the use of recycled water in their factories to reduce freshwater use.[185]

183 Sarker, K. (2022). Wastewater Recycling in Textile Industries. Retrieved from: **Earth Org Website**

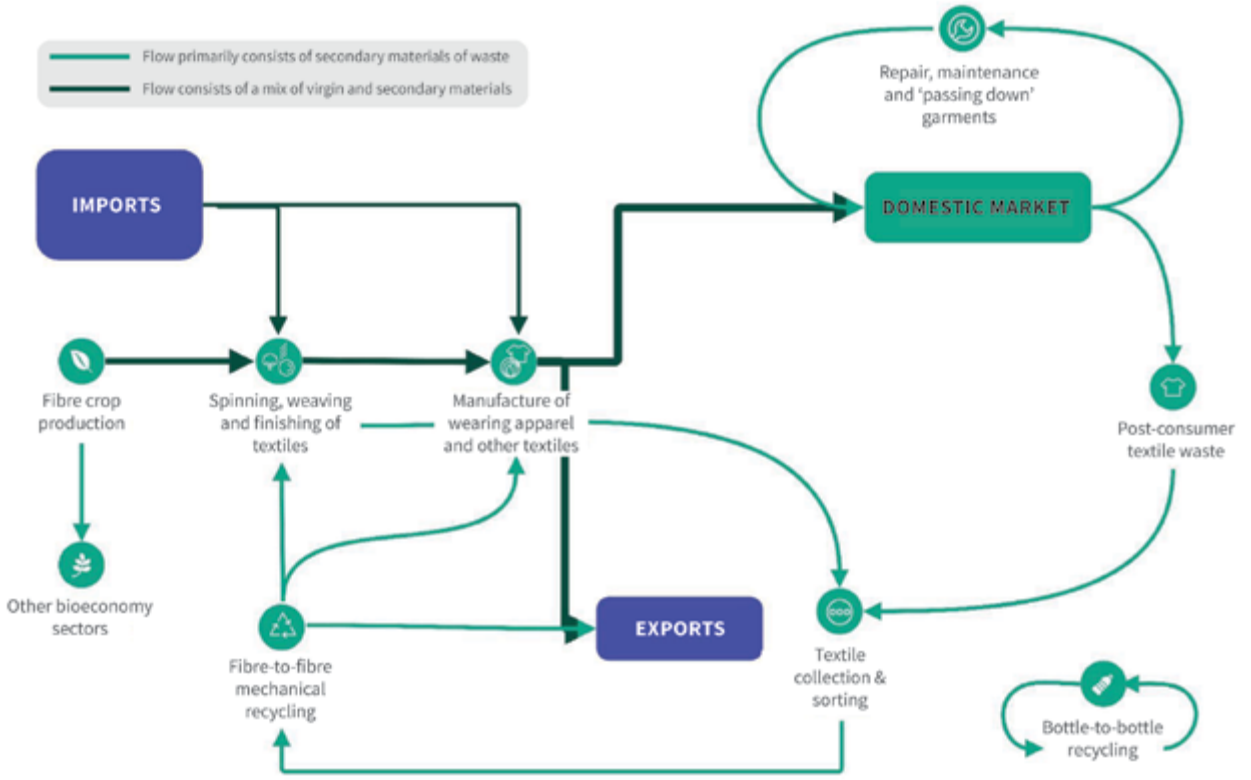
184 ING. (2017). Less is more: circular economy solutions to water shortages (pp. 1-31, Rep.). Retrieved from: **ING**

185 Textile Today. (2019). Water recycling at Cute Dress Industry Ltd. Retrieved from: **Textile Today Website**

4. Pathways for action

This section presents five pathways for action that have been identified in this research. Policy actions are not specified at this stage; the SWITCH2CE project is exploring policy responses in Bangladesh in more detail, the results of which will be shared in a future publication.

...To circular value creation and retention



After Circle Economy in Switching to circular global value chains: state of play and future pathways, 2024

Figure six illustrates the shift towards a more circular textiles economy in Bangladesh.

1. Create a cross-sectoral vision to rally stakeholders around

A systemic vision and approach to circularity—one that takes into account the full textile and garment value chain as well as the various value chains it overlaps with—can help uncover new and unexplored opportunities and align stakeholder efforts. So far, the public debate on circular textiles in Bangladesh has predominantly focused on the recycling of post-industrial cotton waste—and for good reason. This waste is an important opportunity for Bangladesh's fibre security and economic resilience and has focused the efforts of both local and international stakeholders. However, the textile value chain does not operate in a vacuum, and a truly circular system goes beyond end-of-pipe solutions such as recycling. Other value chains and materials—from fibre production to packaging, transport and machinery—would both benefit from more circular approaches as well as an integrated approach to circularity.

For example, while PET bottles are currently integrated into the textile value chain, other actors in Bangladesh are working to set up different destinations for this feedstock: initiatives to improve bottle-to-bottle recycling, which may reduce availability of this feedstock for use in the textile value chain. In addition, discussions on the most optimal destinations for these feedstocks could benefit from more inclusive approaches that involve actors from government and civil society. This can help ensure that the benefits of circularity are distributed more evenly amongst a greater number of players and closer to the land, labour and resources on which production depends.

Fibres grown locally could also provide opportunities to both reduce the impact of other value chains and realise savings on imports. For example, utilising jute pulp for the production of paper could help reduce dependence on the import of wood pulp and mitigate significant deforestation in the country,186 while a shift back to jute bags and sacks could help reduce reliance on plastic bags made from fossil fuels.

Developing a cross-sectoral vision and roadmap for the circular economy can rally stakeholders around objectives that support one another.

2. Strengthen the evidence base

To underpin this vision, a stronger evidence base is needed. While data is increasingly available, the broad range and diverse focus of traceability frameworks have created a confusing landscape that is insufficient for understanding industry developments and impacts in the country. For instance, there are various global initiatives, such as the Transparency Index, KnowTheChain, Transparency Pledge, and Fair Wear Foundation, focusing on different aspects of textile value chain transparency and corporate accountability for brands, retailers, and factories. Additionally, local efforts like the BRAC Mapped in Bangladesh initiative provide an opportunity to capture information on the RMG sector. Numerous other initiatives have been launched by local organisations like BGMEA and BKMEA, as well as the Global Fashion Agenda under the Circular Fashion Partnership with Reverse Resources, to increase data availability on the textile and garment value chain in Bangladesh. However, considering that participation or engagement with such initiatives is not a regulatory requirement, its scope remains limited to parts of the industry or participating organisations only. Improvements in the traceability and transparency of the movement of waste materials through value chains will be crucial enablers for circular developments.

Currently, however, data is often not consistently available for the same years, with wide variability across years (particularly after the covid-19 crisis); data is also often provided in different units across different stages of the value chain (for example, dollar amounts, tonnes, bales, metres of fabric, number of items produced etcetera) or aggregated following different conventions (for example, some trade data differentiates between raw fibres, yarns and fabrics, whereas some industry factsheets focus on the 'woven sector's demand for raw materials' overall). This makes it challenging to chart exactly how the composition and volumes of textiles flow and shift through the Bangladesh value chain.

A stronger evidence base and mechanisms to support greater traceability of materials—particularly where there has been little attention so far—can serve to better steer action in the future.

3. Hold on to Indigenous circularity

Rising consumption—and waste—present important opportunities for robust local and regional markets—but efforts need to be made to maintain and valorise current circular practices in Bangladesh. Bangladesh is developing fast, and its economic growth is fueling consumption. For a long time, brands have ignored the Bangladesh market as a place of consumption, but the tides are turning. As incomes and the purchasing power of Bangladesh's 170 million residents rise, the local consumption of textiles and garments is also set to continue rising.[187] The opening of a Puma store—the first international brand to open a retail store in the country—is perhaps the most recent testament to this.[188]

This presents many opportunities for the domestic market, as well as risks for existing local circular systems. A stronger domestic market for textiles and garments offers many opportunities for Bangladesh—not the least of which is the counteracting of potential losses from export markets like the EU due

186 Hashim, S.M. (2023). Jute pulp can revive golden fibre's prospect. Retrieved from: Financial Express Website

187 Daily Star. (2023). Fabrics market swells on rising consumption. Retrieved from: Daily Star Website

188 Puma. (2019). Puma retail goes Bangladesh. Retrieved from: Puma Catch Up Website

to potential reductions in demand, or due to stricter access requirements linked to circularity.

When consumption rises, waste, too, typically increases,189 and so can a throwaway culture replace existing reuse cultures. While reuse should be safeguarded, rising volumes of post-consumer textile waste could become a crucial resource for Bangladesh to recover. At the moment, however, little to no information is currently available on post-consumer textile waste in Bangladesh, and no formal collection or sorting system has been established—both crucial elements to make progress on.

This rise in consumption also comes with a rise in demand for synthetic fibres, as previously mentioned. While this trend can help boost fibre security and reduce dependence on cotton imports, it could, perversely, also undermine the quality of both post-industrial and post-consumer textile waste available in Bangladesh and their potential for high-value recycling within the country. This waste, as mentioned earlier, is currently cotton-rich and highly suitable for mechanical recycling.

Finally, international players have so far played a positive role in raising the social and environmental ambitions of global value chains—from brands' voluntary commitments and national or EU due diligence regulations to global awareness-raising campaigns by groups like Fashion Revolution. The successes that these efforts have secured should be safeguarded in producing for local markets so that the local economy can build on them. Indeed, discussions of responsibility in the context of a circular economy have traditionally pointed the finger at large multinational brands, thanks to their influential role both upstream—designing and setting product requirements—as well as downstream—influencing consumer behaviour and providing a crucial link for the take-back of garments through retail stores.

As local brands develop and increasingly serve the local market, ensuring they build on the positive, not the negative, legacy of other brands is important.

Here, many lessons can be learned from India, where rising consumption rates have boosted the local economy, increasing volumes of domestic post-consumer textile waste as well as post-industrial textile waste being collected and sorted,190 enabling the development of a strong recycling industry.

4. Work with the informal sector

Informal waste traders in Bangladesh make a significant contribution to closing the loop on textiles on the regional scale. Although their presence makes it more challenging to secure a stable supply of waste for formal recycling actors in Bangladesh—with exports providing a more lucrative route to traders at the moment—their inclusion in future circular economy solutions is an integral piece of the puzzle. Indeed, if transitions to a circular economy are to be just, the public, private, non-governmental and informal sectors need to develop the requisite skills, knowledge, and technical capacity in the circular economy. Bangladesh's agenda is clear: green jobs need to be decent, and developing workers' capacity and skills must be a top priority to ensure the transition to a circular economy is also just. To adopt green activities in key economic sectors and boost the creation of decent employment in green jobs, tailored training, knowledge, and technical capacity in the circular economy space should be a priority, alongside developing a deeper understanding of the impacts of the circular economy on employment and decent work.

5. Drive international cooperation

Transforming the global textiles and garments value chain requires coordination and cooperation between stakeholders across borders, both up and downstream. The EU—a key export market for Bangladesh—is increasingly shifting towards a circular economy. By curbing overconsumption, extend-

189 Organization for Economic Cooperation and Development (OECD). (2008). Resource Productivity in the G8 and the OECD: A Report in the Framework of the Kobe 3R Action Plan (pp.1-43, Rep). Retrieved from: OECD Website

190 Fashion for Good. (2023). Sorting for circularity India Toolkit. Retrieved from: Fashion for Good Website

ing the active lifetime of products through new business models and promoting a consumer shift towards durability, longer use, repair and reuse,[191] EU demand for apparel production may decline in the future, with significant implications for manufacturing hubs.

Indeed, a study estimates that a shift to circularity for the apparel industry in the EU is associated with a decline of over 400,000 jobs in value chains outside Europe, for example.[192] Consumers in high-income countries are also increasingly starting to reject fast fashion business models and embracing degrowth principles[193]—a topic that is being discussed on the European political stage more and more as of late.

These trends are slowly starting to become more widely discussed as a legitimate risk to manufacturing countries,[194] [195] and the Bangladesh textile industry in particular (The Daily Star, 2023[196]; CFP, 2021). They clearly underline the need for international collaboration so that new fashion systems are designed with all partners of the value chain—not only with those in the Global North.

Financing the transformation is an especially crucial piece of the puzzle and one where higher-income countries, such as those in the EU, could play a key supporting role, reflecting their greater responsibility and means.[197] This capital could be allocated to enable social innovations, channel finance to entrepreneurs, provide technical assistance and support efforts to develop and determine Bangladesh's own path towards a circular economy that works for all.

6. Technology and innovation

Adapting to emerging sustainability trends requires capacity building, enhancing local infrastructures, and securing financial resources for the transition to a circular economy. While recycling oftentimes relies on mechanical and chemical processes, the Bangladesh textile industry has a small number of recycling plants able to carry out such procedures.[198] As the adoption of recycling strategies entails the integration of new technologies, the textile sector requires funds and policy support to build the infrastructure necessary to reduce material inputs through recycling. Moreover, using renewable sources requires upfront investment to set up the infrastructure for renewable energy and water management solutions. While these strategies present an opportunity to reduce production costs, the required investment to install these systems are not easily accessible, particularly to SMEs.

In this regard, the EU provides several funding programmes to support the transition to a circular economy in the textile industry, including programmes such as European Structural and Investment Funds, Horizon 2020, and the LIFE programme. Additionally, the European Investment Bank (EIB) is offering finance and advice for circular economy projects through the European Fund for Strategic Investments and the 'EU Finance for Innovators' (InnovFin) Programme. Additionally, the ILO set up the Bangladesh Green Transformation Fund (GTF) to support MSMEs to refine environmentally friendly initiatives in the textile, leather, and jute industry. Moreover, Bangladeshi manufacturers are able to adopt the Partnership for Cleaner Textiles (PaCT) which facilitates sustainable water management and textile processing,

191 European Commission (EC). (2022). EU Strategy for Sustainable and Circular Textiles. Retrieved from: EUR-Lex Website

192 Repp, L., Hekkert, M., & Kirchherr, L. (2021). Circular economy-induced global employment shifts in apparel value chains: Job reduction in apparel production activities, job growth in reuse and recycling activities. Resource, Conservation and Recycling, 171, 1-18. doi:10.1016/j.resconrec.2021.105621.

193 Robinson, F. (2022). Degrowth: The Future Fashion Could Choose. Retrieved from: Good on You Website

194 Circle Economy. (2022). Thinking beyond borders to achieve social justice in a global circular economy (pp. 1-38, Rep.). Retrieved from: Circle Economy Website

195 Chatham House. (2022). The EU's Circular Economy transition for plastic and textiles: Opportunities and challenges for trade partners in emerging markets (1-56, Rep.). Retrieved from: SWITCH to Circular Economy Value Chains Website

196 Uddin, M. (2023). Collaboration Is In Our Collective Interest. Retrieved from: Daily Star Website

197 Circle Economy. (2022). Thinking beyond borders to achieve social justice in a global circular economy (pp. 1-38, Rep.). Retrieved from: Circle Economy Website

198 Siddique, A. (2023). Bangladesh ramps up use of recycled fabrics in ready made garments. Retrieved from: Mongabay Website

an initiative raced by the International Finance Corporation, BGMEA and the Dutch Embassy.[199]

As Bangladesh graduates from the LDC group, it will lose trading benefits with the European Union, presenting new costs to be considered for manufacturers and producers trading with the region, which will require the adoption of national measures to help them accommodate the new trading conditions. Such measures were already extended at the local level, where the corporate tax for the textile sector was reduced by 15% until 2025, and Green RMG factory owners were granted a 1% cut in corporate tax. Still, Bangladeshi manufacturers consider that financing continues to be a major challenge to meet international standards.[200]

International efforts to raise awareness of the benefits of sustainable management and to increase technology and innovation development include capacity-building strategies. Programmes like SWITCH2CE aim to cultivate initiatives in collaboration with local partners, in addition to developing and strengthening concepts and competencies to adopt circular industry practices. Locally tailored strategies are further needed to integrate formal and informal actors and to envision green skills development.

199 Alam, H., Schröder, P. & Reaz, M. (2024). International Circular Economy Policy Trends: Implications for Bangladesh's Circular Garment and Textile Policy Development. (pp. 1-41). Retrieved from: **Switch to Circular Economy Value Chains Website**

200 The Business Standard. (2024). Industrialists see financing a major barrier to investing in circular textile. Retrieved from: **The Business Standard**

4

ICT waste in Egypt: Ecosystem and circular economy interventions

1. ICT waste and WEEE

The ICT waste value chain in Egypt fits into the wider waste electrical and electronic equipment (WEEE or e-waste) value chain. WEEE can be divided into two subgroups:

- Brown goods waste: consumer electronic goods such as phones, tablets and laptops
- White goods waste: larger equipment and household appliances such as refrigerators and coffee makers

ICT waste falls under the brown goods category. However, this distinction is rarely made within the waste sector. Parts of this research take a broader perspective of all WEEE when more granular data is unavailable. The material composition of different types of e-waste is generally similar. What differs is the percentage of each component. While around 80% of WEEE is usually made of plastics and base metals such as iron, copper and aluminium, rare and precious metals are also found in smaller quantities.[201] These substances, although present in small quantities, make recycling WEEE a profitable business opportunity and a sustainable alternative to extraction and production.[202] [203] It is estimated that 43% of all the gold produced worldwide and 7,275 tonnes of silver end up in the production of electronics every year.[204]

The handling of non-hazardous materials is rather safe as long as the workers are trained and equipped with the proper Personal Protection Equipment (PPE).[205]

2. ICT waste ecosystem mapping

2.1 Market size and consumption

Egypt had the highest level of electrical and electronic equipment (EEE) placed on market (POM) among the 21 countries analysed[206] in the regions of North Africa and West Asia in absolute terms, with around 1.1 megatonnes of EEE POM in 2019.[207] On the other hand, the ICT market in Egypt was valued at around $26.66 billion in 2022 and was projected to grow to approximately $27.41 billion by 2023.[208] Moreover, the ICT market has been the highest-growing sector in Egypt for five consecutive years, showing a growth rate of approximately 75% in the current fiscal year.[209] Consequently, WEEE generation levels are also high. Egypt is the second-largest WEEE generator among the 21 countries cited above, producing about 20.1% of the e-waste generated on the African continent. Yet, the Egyptian population constitutes only 8.6% of the total population of the African continent. The generated e-waste is 5.84 kilogrammes per capita, increasing at a rate of 2.66%. On average, the e-waste generated is almost 58.7% of the amount of EEE POM, and it was estimated to be 586,000 tonnes in 2019.[210]

201 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

202 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

203 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, *10*(08), 1043-1071. doi:10.4236/jep.2019.108062

204 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, 10(08), 1043-1071. doi:10.4236/jep.2019.108062

205 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector (pp. 1-80, Rep.)*. Retrieved from: **Sustainable Recycling Industries.**

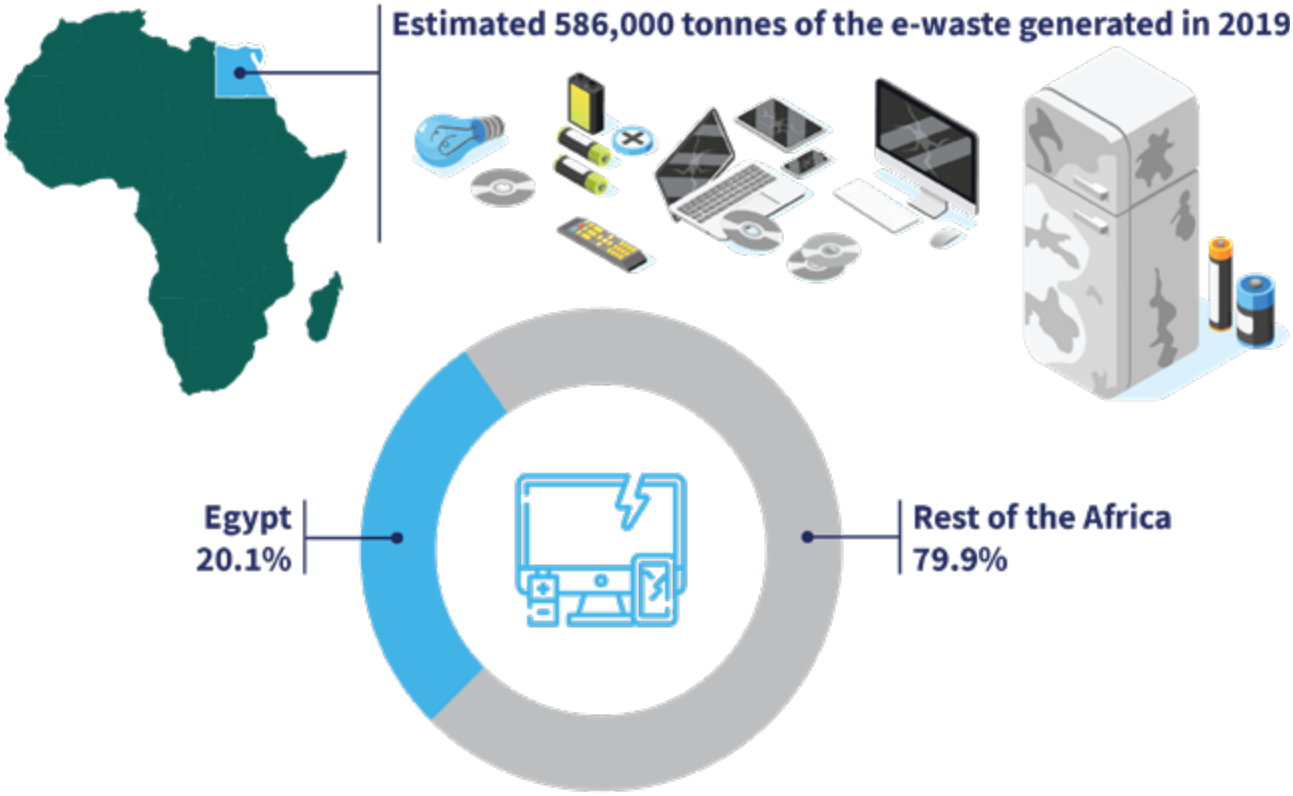
206 The 21 analysed countries were: Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, UAE and Yemen.

207 Regional E-waste Monitor for the Arab States (2021). Overview of e-waste statistics for Arab states. Retrieved from: **E-waste Monitor.**

208 Global Data. (2024). Egypt ICT Market Size and Forecast (by IT Solution Area, Size Band and Vertical) to 2027. Retrieved from: **Global Data.**

209 State Information Service (SIS) Egypt. (2024). ICT Sector. Retrieved from: SIS website

210 Sakr, H. L. H. R., Saafan, M. G., & Saraya, M. S. (2021). Current Status of the Electronic Waste Problem in Egypt. *Mansoura Engineering Journal*, 46(4), 10-19. doi:10.21608/bfemu.2021.204325



The main sources of local WEEE are governmental organisations (ministries, universities, hospitals), the private sector, small and medium-sized enterprises (SMEs), households and non-governmental organisations (NGOs).[211] [212] Businesses, especially telecommunication operators, are the largest source of WEEE in Egypt, primarily located in the Greater Cairo Area.[213]

Box one: Mobile phones market

As of Q3 2022, Samsung had the largest market share for mobile phones in Egypt, with a unit share of 26%, followed by Xiaomi and Infinix, respectively.[214]

A household survey investigating consumer choice between new and used electronic equipment showed that of the 480 respondents, 86% tend to buy new equipment, as opposed to the other 13% who buy used. The survey also showed that 60% of consumers dispose of their mobile phones within two years of purchase, with the remainder disposing of their devices within three to five years. Most consumers dispose of their mobile phones at second-hand dealers, followed by scrap dealers. A small fraction is disposed of with municipal waste. The quantity of mobile phones disposed of is estimated to be in the range of 520 to 567 tonnes per year.

Source: ***EcoConServ Environmental Solutions, 2017.***

211 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

212 Sakr, H. L. H. R., Saafan, M. G., & Saraya, M. S. (2021). Current Status of the Electronic Waste Problem in Egypt. *Mansoura Engineering Journal*, 46(4), 10-19. doi:10.21608/bfemu.2021.204325

213 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

214 Sheila Manek. (2022). Egypt's Smartphone Market Experiences Major Downturn in Q3 2022, But Recovery Is Forecast for 2023. Retrieved from: IDC Website

2.2 Import, retail and distribution

Egypt imports the vast majority of its ICT equipment, with telephones making up the largest share of imports within the category (worth $1.74 billion), followed by isolated wire ($581 million) and computers ($502 million) in 2022. White goods represent a much smaller share of imports, with refrigerators estimated at $276 million.[215][216]

While there are international treaties controlling transboundary movements of hazardous wastes and their disposal, certain traders in Egypt exploit loopholes in ministerial decrees related to used computers and laptops to facilitate the importation of electronic waste. WEEE is often imported in the form of donations of second-hand products or spare parts or through illegal dumping, where equipment can be salvaged at low costs.[217]

There are three types of waste definitions in current legislation: hazardous, non-hazardous and hazardous with special conditions. Before the 2020 ***Waste Management Law***, WEEE was considered a hazardous substance in Egypt. This meant that certified transportation was needed to transport expensive e-waste, thus creating a barrier for companies to engage with WEEE. The 2020 law changed the definition of WEEE from hazardous to hazardous with special conditions, where WEEE is only considered hazardous when it enters the factory and it can be transported normally. This new classification enabled the informal sector to compete with the formal sector, as transportation would become more affordable. Additionally, the ***Sustainable Recycling Industries*** (SRI) project has been advocating for the introduction of a mandatory Extended Producer Responsibility (EPR) scheme for single-use plastic bags, packaging and e-waste by the end of 2024.[218]

The imported ICT waste is predominantly sold to formal and informal small second-hand electronic retail shops and workshops found in populated areas and markets in the Greater Cairo Area. These shops repair and refurbish the devices when possible or sell them to informal recyclers.[219]

2.3 Collection

There is currently no formal regulation to manage WEEE in Egypt.[220] As part of the 2020 ***Waste Management Law***, an Extended Producer Responsibility (EPR) scheme that includes WEEE was introduced. This places the responsibility on EEE producers to better manage the waste created from their products. This scheme is expected to be implemented by the end of 2024 or the beginning of 2025.[221]

The formal sector typically picks the WEEE that will generate the highest revenue, leaving the rest to the informal sector.[222] Since 2019, much of the informal sector involved in collection has been formalised in a bid to improve the health and safety of workers, reduce harmful environmental impacts and facilitate the future implementation of an EPR scheme. This transformation was conducted as part of a project led by the United Nations Development Programme in Egypt alongside the Global Environment Facility (GEF). The project provided technical and administrative support to informal WEEE actors between 2016 and 2021. Prior to this, there was only one formal actor collecting WEEE (International Technology Group), who received around 2% of the WEEE through international companies with EPR schemes.

215 Telephones HS4 ID 8517; insulated wire HS4 ID 8577; computers HS4 ID8471; Refrigerators HS4 ID 8418

216 Observatory of Economic Complexity (OEC). (2022). What does Egypt import? (2022). Retrieved from **OEC.**

217 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

218 CEDARE. (2024). Interview.

219 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

220 EcoConServ Environmental Solutions. (2017). *Assessment of WEEE Management in Egypt* (pp. 1-37, Rep.). Retrieved from: **International Environmental Partnership**

221 Ministry of Communications and Information Technology (MCIT). (2024). Phone Interview

222 EcoConServ Environmental Solutions. (2017). *Assessment of WEEE Management in Egypt* (pp. 1-37, Rep.). Retrieved from: **International Environmental Partnership**

Today, there are 25 formal recyclers collecting WEEE in Egypt, primarily from government facilities and businesses, and partially from households.

Starting in 2020, these recyclers need a licence and permit to operate. However, in reality, the formalisation hasn't improved health and safety in many cases, so further work is required.[223]

Prior to major formalisation, the informal sector collected 85–90% of all WEEE in the country. This figure is likely lower now but is still concentrated in the Greater Cairo Urban Area, the Qalyubia Governorate (which includes Cairo) and Giza.[224] The informal sector is even more present in the collection of WEEE from households and consumers. These activities are mainly conducted by three informal entities: scavengers, who sort waste from formal and informal dumpsites[225] [226] street vendors, who roam the streets in carts and trade waste at lower prices;[227] [228] [229] [230] and garbage collectors, who offer door-to-door waste collection services.[231] Street vendors collect the highest quantities of WEEE.[232] This is partly due to the fact that throwing WEEE in the trash is not the first choice of most Egyptian consumers. They are more likely to resell their WEEE to regain some of the costs.[233] The waste collected is often transported to open-air transfer stations or collection centres by either donkey-led carts or small vans.[234] The WEEE collected by street vendors is estimated to primarily consist of desktop and laptop computers (59% by weight), followed by cathode ray tube (CRT) and liquid crystal display (LCD) monitors (33%), and mobiles and telephones (8%).[235]

Informal workers engaged in the collection of WEEE may consider several criteria when choosing which items to collect:

- Value—Informal workers often prioritise collecting WEEE items that contain valuable materials, such as precious metals (such as gold and silver) or rare earth metals (such as copper and aluminium). Items with higher intrinsic value, such as computers, laptops and smartphones, are typically more attractive for collection.
- Size and weight—Smaller and lighter items of WEEE are easier for informal workers to transport, handle and store compared to larger and bulkier items. This makes compact devices like mobile phones, tablets and small appliances more practical for informal collection activities.

223 Ministry of Communications and Information Technology (MCIT). (2024). Phone Interview

224 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

225 Centre for Environment for the Arab Region and Europe (CEDARE). (2011). *Needs assessment of the e-waste sector in Egypt* (pp.1-49, Rep). Retrieved from: **Sustainable Recycling Industries.**

226 Abdel Shafie, A., Fatouh, T. & Rashid, M. (2021). Trends and practices of reverse logistics in the electronic industry: a case study of Samsung company. Retrieved from: **Global Business & Management Research.**

227 CEDARE. (2011). *Needs assessment of the e-waste sector in Egypt* (pp. 1-49, Rep). Retrieved from: **Sustainable Recycling Industries.**

228 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection. Sustainable Recycling Initiative* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

229 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, 10(08), 1043-1071. doi:10.4236/jep.2019.108062

230 Abdel Shafie, A., Fatouh, T. & Rashid, M. (2021). Trends and practices of reverse logistics in the electronic industry: a case study of Samsung company. *Global Business and Management Research*, 13(3), 307-320.

231 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection. Sustainable Recycling Initiative* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

232 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection. Sustainable Recycling Initiative* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

233 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

234 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection. Sustainable Recycling Initiative* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

235 EcoConServ Environmental Solutions. (2017). *Assessment of WEEE Management in Egypt* (pp. 1-37, Rep.). Retrieved from: **International Environmental Partnership**

- Accessibility—Informal workers may target WEEE items that are readily available and accessible in their collection areas. They may focus on scavenging discarded electronics from waste bins, streets or informal recycling centres, where such items are more likely to be found.
- Demand and market opportunities—Informal workers may prioritise collecting WEEE items that are in high demand in local markets or recycling networks. They may be influenced by factors such as the availability of buyers or recycling facilities willing to purchase or process collected items.
- Condition—Informal workers may assess the condition of WEEE items to determine their potential for resale or recycling. They may prefer items that are in relatively good condition and require minimal repair or refurbishment before resale or processing.
- Hazardous materials—Informal workers may avoid collecting WEEE items that contain hazardous materials or pose safety risks during handling and processing. Items with hazardous components, such as CRT monitors, fluorescent bulbs, or batteries, may be less attractive due to the potential health and environmental hazards associated with their dismantling and recycling.[236]

2.4 Sorting and testing

In Egypt, sorting activities are carried out in both formal and informal sectors.[237] For example, logistics provider ***DSV Centre*** stacks up large volumes of Nokia radio equipment into radio towers in Cairo, where items are stored for three years, before the end of their shelf life due to weather conditions. According to DSV, these items are rarely repaired because technology keeps changing, and their functions can quickly become obsolete. All equipment is tested in a rack tester, which is a versatile device that can be used to test a range of radio equipment.[238]

Informal sorting is conducted directly in open-air transfer stations or collection centres, with great engagement from women and children (under 18 years of age).[239] A portion of the collected WEEE is traded at different stages of the value chain through well-established informal reseller markets. These markets comprise five primary markets in the lower-income and more populated areas of Cairo.[240] [241] The collected WEEE is then sold to larger traders and formal and informal recyclers.[242]

2.5 Waste management

2.5.1 Repair and refurbishment

The Egyptian refurbishment sector is mainly informal and dominated by workshops found in Cairo's markets, as well as in other cities and rural areas.[243] [244] Equipment suitable for refurbishment depends on the condition of such prod-

236 International Labour Organization (ILO). (2014). *Tackling informality in e-waste management: The potential of cooperative enterprises* (pp. 1-65, Rep.). Retrieved from: **ILO.**

237 Sakr, H. L. H. R., Saafan, M. G., & Saraya, M. S. (2021). Current Status of the Electronic Waste Problem in Egypt. *Mansoura Engineering Journal*, 46(4), 10-19. doi:10.21608/bfemu.2021.204325

238 DSV. (2024). Interview.

239 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection* (pp. 1-63, Rep.).. Retrieved from: **Sustainable Recycling Initiative.**

240 El-Nakib, I. (2012). Reverse logistics: a comparison of electronic waste recycling between Switzerland and Egypt. *Global Conference on Operations and Supply Chain Management,* 1-22

241 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, 10(08), 1043-1071. doi:10.4236/jep.2019.108062.

242 Abdel Shafie, A., Fatouh, T. & Rashid, M. (2021). Trends and practices of reverse logistics in the electronic industry: a case study of Samsung company. *Global Business and Management Research*, 13(3), 307-320.

243 CEDARE. (2011). *Needs assessment of the e-waste sector in Egypt. Sustainable Recycling Initiative* (pp.1-49, Rep). Retrieved from: **Sustainable Recycling Industries.**

244 According to the Archipel&Co Work Package 5, informal repair and refurbishment workers and the grey markets they operate in are visible, popular, and well known. Small repair and retail shops generally focus on buying and selling second hand devices, or dismantling old devices

ucts and, in some cases, the potential of such refurbished equipment to negatively interfere with new equipment due to updated network capabilities.[245] The equipment suitable for repair and refurbishment is classified as used and non-functioning but repairable EEE, while certain products may be classified as WEEE or as used and non-functioning and non-repairable EEE.

DSV receives approximately 400 units of radio equipment per year. They are currently operating at only 25% capacity, and items are usually shipped to Hungary for repair. Through their Orange Pilot, DSV aims to scale repair activities locally by receiving more equipment and sending only very damaged devices to Hungary. However, this new pilot is still based on volumes and relies on regulations on imports, which are restricted to 50 damaged devices from regional imports to be repaired.[246]

2.5.2 Resale

After collection, the electronic devices are weighed, sorted and tested, and usable components are returned for consumer use.[247] [248] The sale of WEEE is made through formal bids held by both government entities and private organisations. Although these are formal events, the participation of informal large waste dealers registered on the WMRA is allowed. The WEEE for sale in these bids is generated by the government, large organisations, and the private sector, whereas e-waste from households and other sources may be primarily handled by street peddlers or scavengers.[249] [250]

2.5.3 Recycling

Dismantling

The Waste Management Regulatory Autority (WMRA) has approved seven companies to recycle WEEE. These companies primarily work on dismantling WEEE products into their most basic components. The most valuable parts are then often exported for further separation abroad for the extraction of precious metals.[251] According to the Basel Convention (of which Egypt is a signatory), if a country has the technology for precious metals extraction, it cannot export e-waste for extraction purposes. This has led to discussions on whether or not Egypt is equipped to handle extraction. While the Egyptian Ministry of Industry prefers to keep extraction activities local, the Ministry of Environment believes recyclers do not have the expertise needed to avoid the potential environmental externalities of extraction (interview with CEDARE, 2024). The extraction activity that is currently happening at an industrial scale is the extraction of lead from lead-acid batteries (interview with MCIT, 2024).

Dismantling in the formal sector is carried out by applying strict environmental measures protecting workers and the environment.[252] However, waste resulting from the WEEE dismantling process, such as brominated flame retardants (BRFs), are sometimes dumped in municipal dumping sites. They should be disposed of in the hazardous waste dumping facility in Nassereya at Alexandria Governorate, which is the only hazardous waste facility in Egypt.[253]

for spare parts. For informal actors, oriented circuit boards (mainly from mobile phones) are the most valuable, still reusable spare parts can be dismantled and used in repair or maintenance processes. On the other hand plastics, scrap metals and obsolete parts because of their lower resale value. It should be considered that competition between shops has increased, as there are fewer customers and higher prices.

245 Ministry of Communications and Information Technology (MCIT). (2024). Phone Interview

246 DSV. (2024). Phone Interview

247 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

248 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

249 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, 10(08), 1043-1071. doi:10.4236/jep.2019.108062.

250 El Kheshen, T. (2021). *An EPR Scheme for WEEE in Egypt* (pp. 1-29, Rep.). Retrieved from: **Sustainable Recycling Industries.**

251 El Kheshen, T. (2021). *An EPR Scheme for WEEE in Egypt* (pp. 1-29, Rep.). Retrieved from: **Sustainable Recycling Industries.**

252 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

253 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

Informal dismantling consists predominantly of manual labour and is conducted by a minimum of ten workers in closed rooms of 30 to 50 square metres, on average. The dismantled fractions are grouped and packed for sale to specific dealers.[254] Informal dismantling is often carried out without any environmental protection for the workers, and it is difficult to differentiate between hazardous and non-hazardous materials which are handled without PPE. The fractions dismantled by informal workers usually contain cathode-ray tube (CRT) glass (found in old computers and TV monitors), plastics, ferrous metals, copper wires, printed circuit boards (PCBs), batteries and residual waste for dumping, including BRFs.[255]

In 2023, Eco Green Waste Management (EGWM) was launched, the first formal recycling association for WEEE in Egypt. The association aims to promote the interests of the companies in a coherent way as well as bridge the gap between the formal and informal sectors. To date, its membership includes 30 specialist recycling companies.[256]

Preprocessing

Dismantling can be followed by preprocessing activities such as shredding. In formal mechanical processing, WEEE fractions are shredded into pieces using hammer mills and machinery.[257] Preprocessing is not a mandatory step for all WEEE, and it is often avoidable for highly complex small equipment such as ICT equipment.[258] WMRA-certified formal recyclers are interested in valuable fractions that contain valuable materials. These fractions are mainly PCBs, batteries, processors, iron frames and copper cables. Not all seven certified WMRA recyclers engage in preprocessing.[259] The formal sector does not receive or deal with CRT and LCD monitors, light tubes, plastic or plastic with flame retardant, which is left for the informal sector to handle.[260] Indeed, there are currently no formal recycling options for cables (no mechanical stripping facility), plastic (no formal shredding company) and CRT leaded glass.[261] The informal sector handles plastic shredding: first, plastic is checked for potential reuse, and if it cannot be reused, the hard plastic is shredded. Shredded plastic is then washed in tanks using hot water and caustic soda or potash to remove dirt and fats. Oils are then rinsed in cold water tanks and the resulting shredded plastic is then dried in open air or sometimes by a centrifuge machine.[262] At this point, dried shredded plastic is ready to be sold to plastic processing companies[263] for reuse in injection mould machines to produce several products.[264] Conversely, CRT is sold to used glass dealers who sell the glass to manufacturing companies.[265]

254 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

255 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

256 EGWM. (n.d.). Eco Green Waste Management. Retrieved from: **EGWM**

257 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.).. Retrieved from: **Sustainable Recycling Industries.**

258 Kaya, M. (2018). Current WEEE Recycling solutions. Waste electrical and electronic equipment recycling. Waste Electrical and Electronic Equipment Recycling, 33-93. doi:10.1016?B978-0-08-102057-9.00003-2

259 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.).. Retrieved from: **Sustainable Recycling Industries.**

260 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection.* (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

261 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

262 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection.*(pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

263 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

264 Soliman, F. & Boushra, M. (2017). Mapping of Informal Sector involved in E-waste Collection (pp. 1-63, Rep.). Retrieved from: **Sustainable Recycling Industries.**

265 Soliman, F. (2017). Assessment of WEEE dismantling business opportunities: formal sector (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

End-processing

Around 1–2% of WEEE in Egypt is recycled through a series of relationships and exchanges between the formal and the informal sectors.[266] [267] Smelting and refining produce marketable raw materials from the separated and shredded parts of ICT waste, such as aluminium, copper, steel and various plastics that can be recovered in large quantities for raw resale.[268] Formal smelting is conducted by both public and private foundries, which usually focus on a single material. Private smelteries, both formal and informal, mostly treat copper. According to a sample analysis of metals, such as copper, sourced by WMRA-approved formal recyclers in Egypt and conducted by private smelters, the quality of locally processed secondary metals is low because they are not properly detached from plastics.[269]

Around 1–2% of WEEE in Egypt is recycled—the remainder is managed through a combination of landfilling and illegal disposal in the open environment.

Refining requires the export of the fractions (mainly PCBs and lithium batteries) abroad to extract precious metals. The dismantled fractions are wrapped and then packed in self-contained units (SCUs) of 14 tonnes, ready for export. PCBs and batteries are processed by dedicated companies that deal with refining precious and base metals to extract and sell the metals. Outsourcing the fractions' refining outside of Egypt is not a straightforward process. It requires diligent planning and preparation with the refining companies in order to ensure that the materials are received, processed and sold transparently. The feasible quantity for outsourced refining is about 50 tonnes per month.[270] If the exporter cannot afford this quantity, more exporters will share the deal.[271]

2.5.4 End of life

The remainder of the WEEE is managed through a combination of landfilling and illegal disposal in the open environment. The portion disposed of illegally amounts to almost 51 tonnes per year in the Greater Cairo Area.[272] Such disposal has serious environmental and human health concerns, given the prevalence of hazardous chemicals. Based on findings from Egypt's 2017 waste management assessment,[273] 20.8 tonnes of WEEE are legally landfilled in a year. A small fraction of WEEE is burned openly, usually to remove plastic parts from cables to access the more valuable metals when the machines to dismantle the plastic are not available. In some instances, lead acid batteries are also burned openly to access the lead component. Such open burning practices are only carried out by the informal sector.[274]

266 EcoConServ Environmental Solutions. (2017). *Assessment of WEEE Management in Egypt* (pp. 1-37, Rep.). Retrieved from: **International Environmental Partnership**

267 Tarek, A., & El-Haggar, S. (2019). Sustainable Guideline for Developing the E-Waste Sector in Egypt. *Journal of Environmental Protection*, 10(08), 1043-1071. doi:10.4236/jep.2019.108062

268 Marzook, M., El Khouly, S., & Al Ahmady, B. (2021). A proposed closed-loop system for solving the e-waste problem in Egypt. *Scientific Journal of Economics and Commerce,* 1-8.

269 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

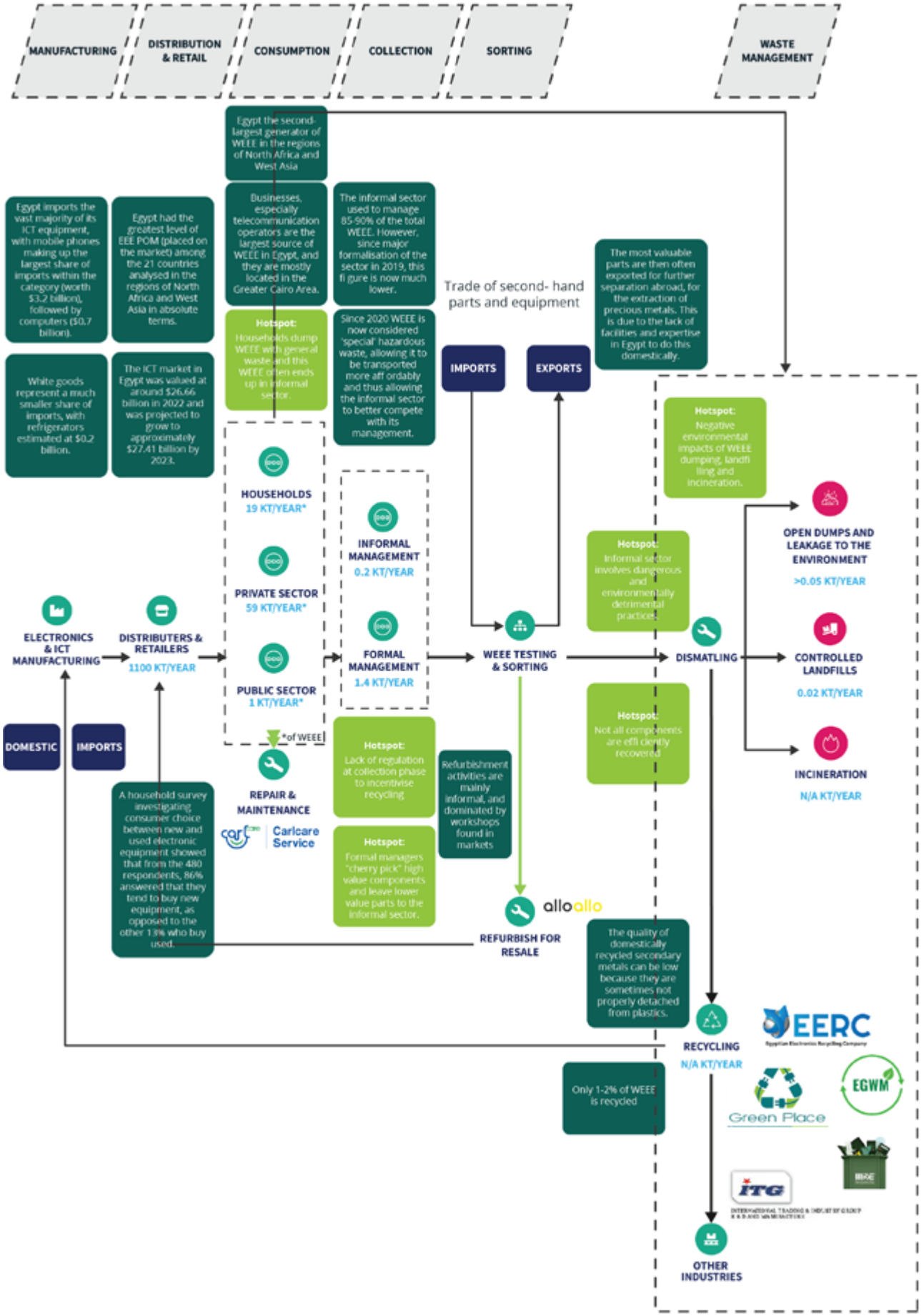
270 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.).. Retrieved from: **Sustainable Recycling Industries.**

271 Soliman, F. (2017). *Assessment of WEEE dismantling business opportunities: formal sector* (pp. 1-80, Rep.). Retrieved from: **Sustainable Recycling Industries.**

272 Soliman, F. & Boushra, M. (2017). *Mapping of Informal Sector involved in E-waste Collection* (pp. 1-63, Rep.).Retrieved from: **Sustainable Recycling Industries.**

273 EcoConServ Environmental Solutions. (2017). *Assessment of WEEE Management in Egypt* (pp. 1-37, Rep). Retrieved from: **International Environmental Partnership**

274 Ministry of Communications and Information Technology (MCIT). (2024). Phone Interview



After Circle Economy in Switching to circular global value chains: state of play and future pathways, 2024

Figure seven. Overview of the ICT waste value chain in Egypt. Adapted from Assessment of WEEE Management in Egypt by EcoConServ Environmental Solutions, 2017

3. Conclusions

Based on the research findings, the potential market for ICT refurbishment in Egypt is substantial, driven by several key factors:

- **High EEE POM:** Egypt had the highest level of EEE POM among the analysed countries in North Africa and West Asia, with around 1.1 megatonnes in 2019. This indicates a significant market for electronic devices, including mobile phones.
- **Growing WEEE generation:** The high level of EEE POM and the ICT market growth in Egypt contributes to a substantial generation of WEEE, estimated at 586,000 tonnes in 2019. This represents a significant source of potential materials for refurbishment and recycling.
- **Import of second-hand products:** Despite international treaties regulating hazardous waste movements, WEEE is often imported into Egypt in the form of second-hand products or spare parts. This influx of imported electronics provides additional opportunities for refurbishment and resale in the local market.
- **Legislative changes:** Recent changes in waste management legislation, such as the reclassification of e-waste from hazardous to hazardous with special conditions, have facilitated the involvement of formerly informal sector workers in e-waste collection and recycling. This has the potential to increase the availability of used electronics for refurbishment activities.
- **Consumer preferences:** While the majority of consumers prefer new electronic equipment, there is still a market segment (13%) that purchases used mobile phones. Additionally, a significant portion of consumers dispose of their mobile phones within a few years, providing a steady supply of used devices for refurbishment.
- **Informal sector dominance:** Despite the formalisation of many informal actors in 2019, the informal sector still plays a large role in the collection and recycling of WEEE in Egypt, particularly in urban areas like Greater Cairo. Informal workers, including scavengers and street vendors, collect a large percentage of WEEE from households and businesses, providing a constant stream of materials for refurbishment and resale. Their expertise and understanding of the market can be leveraged to scale refurbishment activities, and their involvement can be central to the development of this sector.
- **Market segmentation:** The mobile phone market in Egypt is diverse, with Samsung holding the largest market share in 2022. This indicates opportunities for refurbishment and resale of various mobile phone brands and models to cater to different consumer preferences.

Overall, the combination of high EEE POM, growing WEEE generation and ICT market, legislative changes, consumer preferences and purchasing power, and the dominance of the informal sector presents a promising market for ICT refurbishment and mobile phones in Egypt. The availability of used electronics, coupled with the potential for legislative and regulatory support, creates opportunities for businesses and stakeholders to participate in the circular economy and contribute to sustainable waste management practices.

5

Concluding remarks

Feedstock availability is limiting recycling and refurbishment efforts across nations. As seen in the previous chapters, value chains in Morocco, Bangladesh and Egypt have a solid foundation for transitioning to a circular economy—but these transitions will not be without challenges. The number one challenge facing recyclers in Morocco and Bangladesh, as well as potential refurbishment activities in Egypt, is the availability of feedstock: not enough waste is collected or sorted to meet these countries' significant recycling capacity. Here, the lack of organised waste management systems and the strong presence of the informal sectors in carrying out these activities have a strong influence.

A strong foundation for circularity is present in each country's culture. All the countries studied already boast high levels of reuse and repair, for example—although these are often carried out by the informal sector, and the true extent of their prevalence may not be captured. Building on and further valorising these activities—and ensuring that products and materials don't 'fall through the cracks'—will be essential as these countries transition to a circular economy. Funding will be essential for Morocco, Bangladesh and Egypt to secure improved waste management systems and to support research, development and innovation efforts.

The circular economy provides different opportunities to different countries, depending on the role they play in global value chains. For example, let's consider the plastic packaging and textiles industries. While both operate on a global scale, plastic packaging tends to serve more domestic markets compared to textiles. Consequently, efforts to promote more circular practices will likely have a more immediate impact at the local rather than the global level. This contrasts with Bangladesh—one of a select few manufacturing hubs in the world, where the vast majority (80%) of clothing exports are slated for clients in the Global North. Here, greater circularity at the manufacturing stage can have positive ripple effects across the world. Meanwhile in Egypt, where the production of electronics is less significant compared to other major manufacturing hubs, it is consumption, instead, where many opportunities lie: indeed, electronic products are extensively reused in local markets, and offer a lot of potential for existing and future repair and refurbishment initiatives.

Bridging data gaps will be essential to strengthen the circular transition. Data gaps currently pose challenges for all countries. Data gives important insights into the world around us—and it's crucial to build a strong evidence base before taking action, to ensure that progress is being made in the right direction, and to what extent. It also helps ensure that circular initiatives are serving the right end: reducing environmental impacts in a way that mitigates potential rebound effects and doesn't negatively affect human wellbeing. For all countries studied, current data gaps are further compounded by the strong presence of the informal sector, especially given the sector's role in circular activities like repair, refurbishment and recycling. In Bangladesh, a number of initiatives are already underway to fill current data gaps, driven by the economic opportunities stemming from the use of cotton waste as a high-quality feedstock, for example. Egypt has been similarly inspired, with the high value of electronic waste driving more initiatives to gather data on this waste and its uses. In Morocco, data collection effects are less established and are primarily driven by local efforts.

Anex: Methodology

Morocco & Bangladesh case studies

A review of the literature on circularity in the plastic packaging value chain in Morocco and the textiles and RMG value chains in Bangladesh was conducted in the period May 2023 - October 2023. Additional desk research was conducted in order to address information gaps Meetings with local stakeholders were held to validate preliminary findings in September and October 2023. Stakeholders consulted in Bangladesh include Policy Exchange, Reverse Resources and Enviu. Stakeholders consulted in Morocco include WES Med project members, COVAD, and CTPC.

In each country, an in-person stakeholder workshop was held to validate and complement findings to date and to provide input for the pathways for action sections. In Bangladesh, the workshop was held in September 2023 and united participants from the private sector (BGMEA and BKMEA), universities (BUTEX and BUFT), and support organisations (GIZ, GFA, BUILD, UNIDO). In Morocco, the workshop was held in December 2023 together with Chatham House and COVAD and brought together participants from the private sector (FMP, ECCBC, GPC Carton, Société Marocaine de Récupération et de Recyclage), civil society (AESVT, Centre Technique de Plasturgie et de Caoutchouc) and support organisations (UNIDO, EU Delegation)

The report also relies on the input of other work packages from the SWITCH2CE project, including various meetings held with different stakeholders throughout the project's lifetime, as well as insights gained at local events, such as the UNIDO-hosted *'Célébration autour de la journée mondiale de l'environnement'* in Rabat and the PlastExpo conference in June 2023, as well as the Nordic Chamber of Commerce event on *'Promoting Circularity for a Sustainable Ready-Made Garment (RMG) industry in Bangladesh'* and the Sustainable Apparel Forum In Dhaka in March 2023.

The reporting was done in the period January-March 2024.

Egypt case study

The Egypt chapter was smaller in scope and primarily relied on a literature review in December—January 2023 and interviews with local stakeholders in February—March 2024 to develop a comprehensive understanding of the WEEE value chain and a qualitative assessment of the refurbishment potential of ICT and electronics in the country. Stakeholders consulted include DSV: Global Transport and Logistics;

the Center for Environment and Development for the Arab Region and Europe (CEDARE) and the Egyptian Ministry of Communications and Information Technology (MCIT).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