



Circular Economy

NATIONAL STUDY – Jordan

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CIRCULAR ECONOMY NATIONAL STUDY IN JORDAN



Co-Funded by the European Union
بتمويل مشترك من الاتحاد الأوروبي



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ACTED

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3 List of abbreviations

AMEI: Appraisal, Monitoring and Evaluation Intern

AMEO: Appraisal, Monitoring and Evaluation Officer

AMEU: Appraisal, Monitoring and Evaluation Unit

B2B: Business to Business

CCBP: Controllo e Certificazione Prodotti Biologici (Control and Certification for Organic Products)

CSR: Corporate Social Responsibility

DOS: Department of Statistics of the Hashemite Kingdom of Jordan

EMRC: Energy & Minerals Regulatory Commission

EPR: Extended Producer Responsibility

FAO: Food and Agriculture Organization of the United Nations

FTA: Free Trade Area *or* Free Trade Agreement

JCI: Jordan's Chamber of Industry

JFDA: Jordan Food and Drug Administration

JREEEF: Jordan Renewable Energy and Energy Efficiency Fund

JSC: Joint Service Council

JSMO: Jordan Standards and Metrology organization

GCC: Gulf Cooperation Council

GIM: Greater Irbid Municipality

HH: household

KII: Key Informants Interviews

LULUCF: Land-Use Change and Forestry

MoEnv: Ministry of Environment

MoEMR: Ministry of Energy and Mineral Resources

MoLA: Ministry of Local Administration

MRFs: Material Recovery Facilities

MSMEs: Micro, small and medium enterprises

MSW/M: Municipal Solid Waste / Management

NERC: National Energy Research Centre

NGO: Non-Governmental Organization

PPP: Public Private Partnership

PRO: Producer Responsibility Organization

RSS: Royal Scientific Society

SMEs: Small and Medium Enterprises

SWM: Solid Waste Management

TWW: Treated Wastewater

UNFCCC: United Nations Framework Convention on Climate Change

USP: Unique Selling Point

WEEE: Waste from Electrical and Electronic Equipment

WW: Wastewater

4 Executive summary

Solid Waste Management poses increasing challenges in Jordan, urging for a shift to circular economic models, where **waste can be avoided in the first instances, and turned into economic opportunities** for actors, such as second-hand and rental shops, repair workshops, waste recovery initiatives, as well as the municipalities themselves, **while yielding environmental benefits**.

ACTED, in partnership with GIZ under the BMZ-EU Madad co-financed project *“EUTF support for an integrated Solid Waste Management system in Syrian refugee camps and neighbouring communities affected by the Syria Crisis”*, conducted a nation-wide circular economy assessment to identify opportunities to:

- 1) Improve SWM processes in Jordanian municipalities;
- 2) Identify key **economic and social gains from implementing quick impact interventions** within selected value chains, including biowaste, paper, plastics, textiles and used tires; and
- 3) Investigate **potential of engagement of the private sector** into circular initiatives, such as the Extended Producer Responsibility (EPR) and the Circular Credits System.

The report both presents current initiatives in Jordan that generate economic gains through circular economic models and introduces opportunities for improved circularity of material flows. As part of the data collection, ACTED engaged with **public stakeholders**, such as municipalities and ministries, **private actors**, such as manufacturers and retailers, and **consumers**. This allowed a thorough understanding of the potential for improved circularity at policy, private sector, and consumer level. Recommendations, provided at the end of each key section of the report, are divided likewise.

The report findings start with a section on **municipalities’ solid waste management challenges**, and current and untapped opportunities for **waste recovery** at municipal level by formal and informal actors. The report continues by analysing **circular economic potential of the selected value chains** of interest. Value chains are broken down between a) biological materials (bio-based materials, including organic waste), with an eye on natural resources extraction for agriculture and regenerative models of production; and b) technical materials (non-renewable resources), presenting opportunities for reduction in resource use, reuse, recovery through upcycling and recycling. Lastly, **the EPR and Circular Credits system** are presented as solutions to improve engagement of the private sector into circular economic models that support and sustain economic viability of circular initiatives.

Key findings show that **if** targeted policy measures support the private sector actors and **if** consumer level initiatives are undertaken, **then** the circular economy can further be streamlined in Jordan, yielding environmental benefits, as well as economic opportunities generating employment, with consequential social gains.

At municipal level, findings show the burden posed by SWM on Jordanian municipalities, whose cost recovery from service fees represents less than half of the budget spent, can be turned into a resource providing economic opportunities to municipalities while generating jobs. While 15% of the municipalities already sort some of their waste, obstacles in the amount and quality of waste sorted can be solved through a combination of sensitization efforts to improve accuracy of **household level sorting**, create **partnerships with industries** for sourcing high quality waste, and provide infra-red sorting **technologies**

to sorting centres operated by municipalities, particularly the ones working with plastics. Crucially, **informal actors play a key role in the Jordanian waste recovery economy**. Integration of such actors into municipal initiatives is crucial to avoid both competition between formal and informal initiatives and disruption of the informal economy, which provides jobs to vulnerable individuals. Lastly, with a current **waste recovery economy mainly targeting export markets**, efforts can be directed to promoting localized recovery and processing of waste, through preferential waste tendering processes that prioritize local actors over exporters.

Within value chains of interest, **ACTED identified the potential for improved recovery of organic waste and cooking oil for energy generation through anaerobic digestion**, where some initiatives are already ongoing in the country. In addition, opportunities exist for **setting up composting stations** with appropriate technology that can provide high quality output, in parallel with targeted marketing strategies to secure demand.

In Jordan, **current agricultural models of production, which largely do not recognize the importance of regenerating systems that produce such resources, risk jeopardizing agricultural production and food security**. Unsustainable soil management practices, such as overgrazing, monocropping, tillage, over-pumping groundwater, ploughing of marginal soils and deforestation in the rainfall zones, in addition to climate change, have caused degradation of 41% of all Jordanian land¹. Regenerative models of agriculture can provide a viable solution for this pressing issue. Potential practices that may be tested in country include integrated pest and crop management, water harvesting through soil workings, seed saving, and preservation of soil biota to avoid the overuse of chemical fertilizers and pesticides. **Research and development can demonstrate which practices effectively work in Jordan and how to promote the adoption of regenerative agricultural models in country**. In addition, since alternative agriculture generally produces a lesser cultivar per dunum of land (**organic farming, for example, yields around 50% less produce according to KIIs**), a strong advertising and marketing strategy is essential to target the appropriate customers.

While the current linear economic model in non-renewable value chains provides job opportunities that should not be disrupted, investment to manufacture alternative products to technical materials – both reusable and bio-based – would guarantee environmental benefits while promoting additional job creation. The growth of such an industry can be supported through governmental regulations, such as **bio-based plastic standards, fiscal and other incentives for companies using fully bio-based or bio-degradable materials as well as support to existing plastic companies to transition into bio-based materials**.

In Jordan, 73% of consumers surveyed by ACTED regularly reuse items, such as plastic packaging reused as food containers and pieces of clothing passed on to other household members or friends. **Further promotion of sharing economy models, such as the rental of tools for agriculture or clothing such as wedding dresses, could reveal both environmental and economic success**.

Second-hand and refurbishing markets are also viable circular solutions, with almost half of Jordanians having purchased second-hand or refurbished products at least once, mainly due to economical savings

¹ MoE, LDN, UNCCD (2018) *Final Country Report of the Land Degradation Neutrality Target Setting Programme*.

(82%). Within value chains of interest, **re-treading worn out car tires and purchasing second hand clothing are exemplary**. To further promote such initiatives, fiscal incentives can be provided to repairing and second hand shops, as well as marketing support to expand to middle to high income consumers.

Upcycling initiatives also provide a solution to the recovery of waste types, particularly textiles and plastics in Jordan. While current initiatives are very fragmented, significant potential exists if investments are directed to **improving design, marketing and communication of upcycling initiatives**, which continues to face competition from commercial products.

Jordanian paper and plastics industries engaged in the assessment largely obtain their raw materials from **virgin sources**. Greater incorporation of recyclates within manufacturing processes requires improved guarantee of quality of recycled available in Jordan. This can be obtained by appropriate sorting, **investing in structures to enhance sorting efficiency and providing testing labs for recyclates**. Within manufacturing companies, energy, water and technology gaps were highlighted as the main challenges to incorporate waste into production lines. Provision of **affordable energy, improved machinery, dedicated production lines, as well as storage availability** to allow purchase waste when market prices are convenient, are some of the immediate investments that could be promoted. In parallel, at design stage, **improved labelling standards for plastics, ensuring plastics are classified by type, and implementing de-inkability grades** regulations among paper industries can greatly support the recycling industry.

As for the Jordanian tire waste, recycling is a generally profitable activity, either by shredding tires into their rubber and steel components, with applications ranging from production of nails and asphalt, as well as playground surfaces; and producing diesel through pyrolysis. The latter presents several challenges as it is a complex process requiring trained workforce and technology. **Further capacity building to improve local technical knowledge on the diesel extraction process is reported as a need**. For both applications of recycled tires, **fiscal incentives and policy support measures** have been highlighted as critical needs by KIIs.

Engagement of private sector into circular economy is currently gaining momentum in Jordan, with the EPR law planned to be released in 2022. However, the law will only target larger producers in the first years of implementation. With a Jordanian **industrial system dominated by SMEs, devising ways to support the latter to participate into the EPR without adding an economic burden to the industry is crucial, in order not to affect their sustainability**. As waste recovery actors will be contracted to recover Jordanian waste, this will represent an opportunity to **prioritize local recovery facilities**.

Lastly, the circular credit system is identified as a viable **solution to the financial sustainability challenges of many waste recovery actors that were engaged within the assessment**. Jordanian recycling facilities, sorting centres and waste pickers could post their project on the hub and seek investors' support, in partnership with formal actors if needed.

5 Background

Global economic models have so far largely relied on linear schemes, with production extracting materials from natural resources and manufacturing products that will be discarded and generate waste. This model, based on early models of industrializations, is simply unsustainable. The amount of raw materials extracted and entered into the economic system is only set to increase, from figures of 65 billion tonnes in 2010² to more than 100 billion tonnes in 2020³. Should the global population reach 9.6 billion by 2050, the equivalent of almost three planets could be required to provide the natural resources needed to sustain current lifestyles⁴. Hence, it is mandatory, globally, to explore sustainable economic models that push forward circularity of materials. A **circular economy** is based on three principles⁵:

- 1) **Designing out waste and pollution**, considering waste at the product design stage by making decisions that will avoid creating waste that will not be sustainably recovered. For example, producing bio-degradable packaging or reducing the amount of packaging used.
- 2) **Keeping products and materials in use**, by increasing product lifespan, including reusing or sharing the use of products (through second-hand markets, renting tools), ensuring possibility of repair and refurbishing of products.
- 3) **Regenerating natural systems**, restoring the natural resources extracted to produce something. For example, converting hazardous raw manure into biogas and fertilizer, or promoting integrated farm management models that ensure not only doing no harm to natural systems, but perpetuating and regenerating them.



Figure 1 Mushroom-based packaging, an example of circular design



Figure 2 A permaculture project in Jordan: Greening the Desert's farm (©MEE/Marta Vidal)

² Ellen MacArthur Foundation, (2010), Towards the Circular Economy, Vol. 1. Economic and Business Rationale for an Accelerated Transition

³ Carrington, D. (2020), "World's consumption of materials hits record 100bn tonnes a year", the Guardian, <https://www.theguardian.com/environment/2020/jan/22/worlds-consumption-of-materials-hits-record-100bn-tonnes-a-year>

⁴ United Nations Sustainable Development Goals; Sustainable Consumption and Production: <https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>

⁵ Ellen MacArthur Foundation, <https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy>

In essence, circular economy models aim to keep materials flowing through their market systems as long as possible to extract the maximum value and prevent unnecessary burden on natural resources and the environment, as well as reduce the cost of waste management services, while sustaining profits and generating jobs. Figure 3 illustrates the circular loops of material flows, including technical (i.e., non-renewable) and biological (i.e. renewable) material cycles, as defined by the Ellen MacArthur Foundation. Materials are extracted from non-renewable or renewable resources: while in a linear economic model, they are extracted, used and discarded, in a circular one, materials follow the loops of reverse collection and recovery/ regeneration after use.

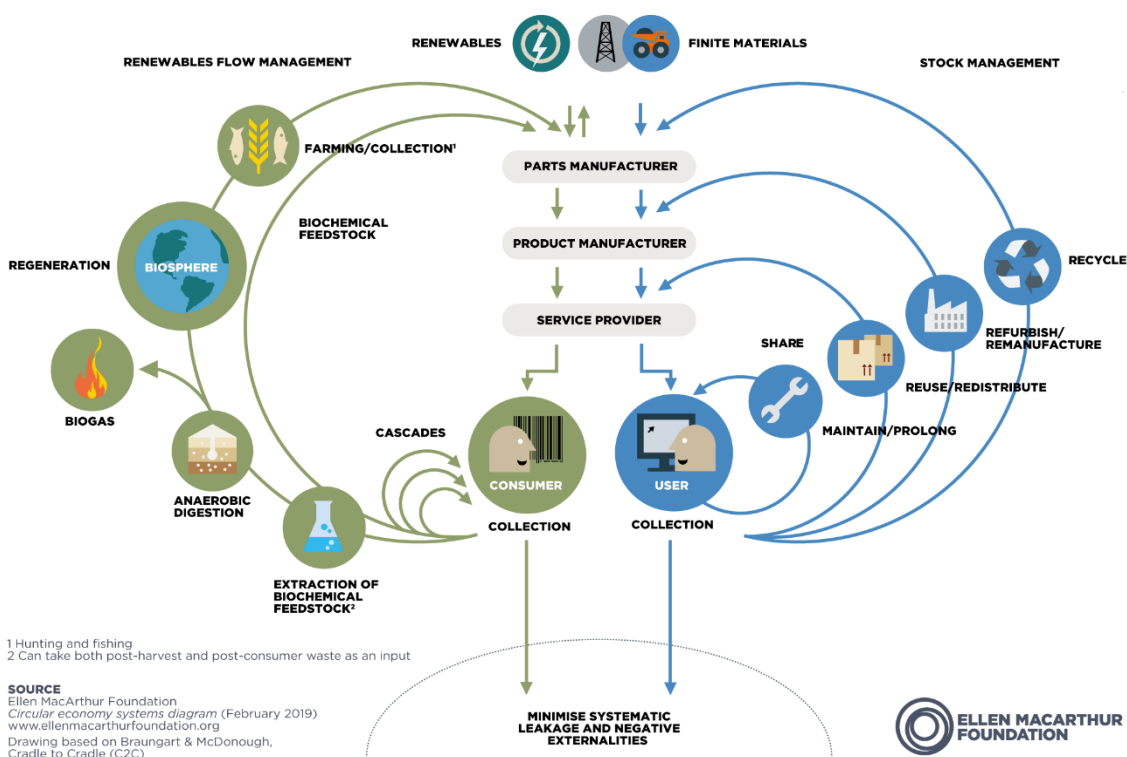


Figure 3 The circular economy system diagram. Ellen MacArthur Foundation, 2019

Systems for keeping materials in use and regenerating natural systems are different for biological and technical cycles, due to the intrinsic differences that characterize these two types of resources. Within **biological cycles** bio-based materials can be extracted as biobased feedstock and feed back into the ecosystem through processes, such as digestion or composting. The extraction of renewable resources should be mindful of the system within which such resources are created and should aim not only at extracting the resources sustainably, but also actively regenerating natural systems.

Within **technical cycles**, circularity of finite resources can be promoted by repairing, reusing (and sharing), refurbishing and (in the last resort) recycling materials. Circular actions should avoid the extraction of new resources as much as possible when recovering technical materials: larger loops are more resource intensive, while inner loops utilize less resources (e.g. recycling a plastic bottle into a new product entails

adopting a set of mechanical and chemical processes that are much more resource intensive than producing a plastic bottle that can be reused). For this reason, resource recovery through inner cycles is more desirable, and circular economy actions should always be mindful of what is the most efficient way to keep resources in use with the minimum possible amount of resource leakage.

While the circular economy is gaining momentum in Jordan, most of the resources in country follow a linear economic model. Indeed, waste generation remains a problem in the country, which was estimated in 2018 to **produce 0.81 kg of waste per capita per day, above the average in the MENA region (0.75)**⁶. Its annual production of solid waste has been steadily increasing over the years, with the Syrian refugee crisis straining municipal SWM services, particularly in the northern governorates where the highest number of Syrian refugees and Jordanian host communities live⁷. SWM is a priority within the Jordan Response Plan for the Syria Crisis 2020-2022 (JRP), which mentions a dire need to improve waste collection processes, as well as management of hazardous waste⁸. The circular economy can offer social, environmental and economically sound solutions to lessen the burden that SWM currently represents for municipalities. This can be achieved by limiting the amount of waste ending up in landfills and eventually improving municipalities cost recovery rate on SWM fees, which currently rarely reaches 50%⁹. At the same time, **circular economy initiatives could turn into economic opportunities** for actors, such as second-hand and rental shops, repair workshops, waste recovery actors, as well as the municipalities themselves. Indeed, waste recovery already offers income-generating opportunities for vulnerable populations, such waste pickers.

In addition to yielding economic opportunities, transitioning to circular models of production has obvious **positive environmental impacts and could decrease Jordan's contribution to GHG emissions** (composed of energy, including transport - 73%, waste and industrial activities - 10 and 9% respectively, and agriculture and Land Use, Land-Use Change and Forestry (LULUCF), with 5 and 3% respectively¹⁰).

To understand the market potential for integrating circular economy approaches in Jordan, ACTED launched a scoping study in 2019-2020¹¹. The study adopted a qualitative approach through 23 Key Informant Interviews (KIIs) and aimed at assessing the current circular value and potential for improving circularity of key material flows, including: organic waste, plastic, paper, glass, metal, e-waste, water and energy.

Key findings are listed below, disaggregated by waste value chain:

⁶ World Bank (2018) *What a Waste 2.0*

⁷ See UNHCR: <https://data2.unhcr.org/en/situations/syria/location/36> and DoS: http://dosweb.dos.gov.jo/DataBank/Population_Estimates/PopulationEstimates.pdf

⁸ GoJ, Ministry of Planning and International Cooperation (2020) *Jordan Response Plan for the Syria Crisis 2020-2022*

⁹ ACTED Key Informant Interviews with municipalities in North Jordan (2019, 2020); Abu Qdais (2007) *Techno-economic assessment of municipal solid waste management in Jordan*.

¹⁰ GEF, UNDP (2014), *Jordan's Third National Communication on Climate Change*, Submitted to the UNFCCC

¹¹ The study methodology included literature review and 23 key informant interviews from various stakeholder groups in Jordan, including waste collection, sorting and recycling actors, organisations for the preservation of the environment, SME incubators, municipalities and ministries.

Organic and agricultural waste: This is the least valorised waste stream in Jordan, with little recovery in place due to lack of separation at source, as well as causing contamination to other potentially recoverable waste types. To reduce waste, recovery and separate collection schemes should be explored.

Plastics: With a high number of plastics companies in Jordan and a strong market for plastics products, this is a key value chain where circular models should be explored. While returns of recycling initiatives are low due to the high cost of processing and the limited quality of the recycled material, plastics still constitute the main material in municipal solid waste. Consumer and producer awareness initiatives to reduce the use of plastic should be promoted, as well as research into the promotion of sustainable recovery and recycling of plastics.

Paper: A number of paper companies are already present in country, some of which recycle paper but also export their scrap paper. Further research is recommended to identify key initiatives to improve the efficiency of the recycling processes and the quality of the final processed product, as raw virgin materials and imported recycled substitutes appear to dominate the market.

Glass: Due to the need to sort glass by colour for recycling, glass does not offer a sufficient value to be considered for recycling. Small reuse and upcycling initiatives are already present in Jordan, while buy-back systems could be established to improve circularity of glass streams.

Metal: This resource is a well recovered material stream, both formally and informally, due to its relative ease to recycle and high economic value.

E-Waste: Separate collection of e-waste is mainly taking place informally, where refurbishing and repairing initiatives are thriving, and the high economic potential of e-waste sorting is recently gaining attention, as proven by a number of initiatives being started in the country¹². It is important to provide trainings for proper handling of e-waste and formal job opportunities in modern e-waste dismantling facilities to ensure safe management of hazardous components.

Water: As one of the most water-scarce countries in the world, water use reduction and recycling initiatives yield high potential in Jordan, such as wastewater reuse in water intensive sectors like agriculture and construction, and decentralised wastewater management plants in remote areas not connected to wastewater treatment plants.

Energy: While energy constitutes one of the main costs for micro, small and medium enterprises (MSMEs), incentives and subsidies for the use of renewable energy and energy efficiency technologies in buildings, as well as trainings for construction workers on such technologies, which are not sufficiently applied in Jordan, are highly recommended.

Stemming from these findings, ACTED launched a nationwide circular economy assessment focusing on the value chains identified with the most circular potential, or where the need is most urgent to promote circular approaches. The study, conducted in partnership with GIZ under the EU Madad Trust Fund project *“EUTF support for an integrated Solid Waste Management system in Syrian refugee camps and neighbouring communities affected by the Syria Crisis”*, studies municipal waste management services to

¹² UNDP and Ministry of Environment are launching an e-waste recovery project at country level, for the separate collection of e-waste and sustainable management of such hazardous waste stream.

understand challenges and shortcomings to efficient service delivery, as well as current waste recovery initiatives in place at municipal level, both formally and informally. In addition, the circular economic potential of the following value chains was researched: **organic and agricultural waste** (also referred to as biological cycles within the assessment), **paper** and **plastics** (selected based on untapped potential and need to further promote circularity within selected value chains), **textiles** (due to the crucial economic importance of clothing as a key growing industry in Jordan producing a large amount of fabric waste that is often illegally burnt) and **used tires** (identified as a priority waste stream for actors such as MoLA, constituting a large volume of waste that is often illegally dumped and burnt, with release of chemicals and pollutants into the soil and groundwater). **Water** and **energy** were considered as cross-cutting components across value chains.

The assessment adopted a market-based approach, seeking to understand the status quo within the selected value chains, but also looking at the possibility to generate revenue and create employment within circular economic models in the above-mentioned value chains.

Lastly, the potential for further involvement of private actors into circular economy was explored. The National Strategy of the Jordan's Ministry of Environment 2020-2022 mentions, among other projects, the **Extended Producer Responsibility (EPR)**. In addition, models such as the **Circular Credits Systems** can connect investors to waste recovery actors, so that the latter can be supported to sustain their operational costs.

The present assessment, building on the findings of the scoping study, aims to reach the objectives outlined in the next chapter.

6 Objectives

This GIZ-funded assessment aimed to understand key market potential and investment opportunities in Jordan for promoting circular approaches to technical and biological cycles of selected materials value chains and identify environmental and social gains from investing in circular economy initiatives within such value chains. The assessment was country-wide, and its objectives included:


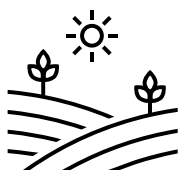


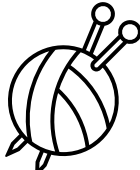

- 1) Assessing Jordanian municipalities' solid waste management processes and formal and informal waste recovery schemes and formulate recommendations at the municipal level regarding the promotion of efficient processes and decent livelihoods in the field of solid waste recovery, to eventually improve SWM cost recovery for municipalities.
- 2) Provide insight into the potential of selected value chains' - namely, agricultural and organic waste, paper, plastics, textiles and used tires, in addition to water and energy as cross-cutting components – for implementing quick-impact interventions to improve circularity of material flows. Particularly, the study aimed to identify current ongoing initiatives and their successes and constraints across the market chain (from producers to consumers), as well as untapped opportunities that could be further promoted.
- 3) Provide an overview of the current status of Extended Producers Responsibility initiatives in Jordan and investigate the piloting of Circular Credit Systems in the country.

7 Methodology

The study was implemented through mixed methods approach, using both secondary data / desk reviews and primary data collection. ACTED employed both quantitative and qualitative approaches to gather data. Qualitative and quantitative interviews were performed across the twelve governorates of Jordan between December 2020 and September 2021 through surveys conducted with a variety of stakeholders, including ministries (MoLA, MoEnv, MoEMR), chamber of industry, private companies operating in selected value chains, farmers, research bodies, municipal and private sorting/recycling centres and companies, municipalities, scrap dealers, waste pickers, individual consumers.

The table below summarizes number and type of primary data collection performed by ACTED, by research objective.

Table 1 Data collection activities undertaken per research objective

Study methodology overview per research objective				
Jordanian municipalities’ solid waste management processes and formal and informal waste recovery				
	<ul style="list-style-type: none">- 2 KIIs with ministries and aid agencies- 17 KIIs with sorting centres and Joint Service Councils- 61 quantitative surveys with municipalities- Quantitative surveys with 50 waste pickers and 27 scrap dealers			
Potential of biocycles, paper, plastics, textiles and used tires, to improve circularity of material flows				
				
Biocycles	Paper	Plastics	Textiles	Tires
<ul style="list-style-type: none">- 4 KIIs with compost units, experts, ministries- 45 quantitative surveys with farms- 2 KIIs with non-conventional agriculture stakeholders	<ul style="list-style-type: none">- 1 KII with packaging actor- 23 quantitative surveys with paper industries- 1 KII with upcycling actor- 1 KII with recycling company	<ul style="list-style-type: none">- 60 quantitative surveys with plastic industries- 1 KII with upcycling actor	<ul style="list-style-type: none">- 10 KIIs with second hand textile shops- 2 KII with clothing charity and social enterprise- 3 KIIs with upcycling actors	<ul style="list-style-type: none">- 3 KIIs with tires recovery actors
Multiple value chains				
<ul style="list-style-type: none">- 3 KIIs with research institutes, recycling companies- 256 quantitative surveys + 36 KIIs with consumers				

Extended Producers Responsibility initiatives and Circular Credit Systems



- 2 KIIs with Ministry of Environment
- 2 KII with Circular Credit Hub actors

The following tools were developed and administered:

- **Semi-structured Key Informant Interviews:** Conducted with 19 stakeholders. The surveys were developed by ACTED's Sr. Appraisal, Monitoring and Evaluation Officer (AMEO) specifically for each stakeholder and administered in English by the Sr. AMEO and the Appraisal, Monitoring and Evaluation Intern (AMEI) to each stakeholder, between February and August 2021. The table in section 10.2 of the Annexes includes the list of stakeholders interviewed through these semi-structured interviews. Most interviews were conducted remotely, via Zoom or Skype, except for number 38 and 53 of the table.
- **Municipalities quantitative survey:** This tool aimed at investigating municipal solid waste management collection processes and presence of waste recovery, sorting and recycling initiatives at municipal level, their strengths and weaknesses from both a process and market perspective. The survey was translated in Arabic, coded in Kobo, and administered via phone by a team of three male and female enumerators to 61 municipalities out of the total 100 municipalities in Jordan, selected through a simple random sampling strategy, representing a 95% confidence level and a 7.8% margin of error.
- **Structured KIIs with Joint Service Councils (JSCs):** The interviews with JSCs looked at SWM collection and dumping processes and presence of waste recovery initiatives at the landfill level. A total of 9 JSCs out of the 14 in the country were interviewed by ACTED's AME Assistant via phone and answers were recorded via note-taking.
- **Semi-structured KIIs with municipal sorting centres:** This tool investigated what kind of waste streams are recovered by Jordanian municipalities' sorting centres and how they are processed, current and expected market potential of recovered waste, and key challenges faced by said centres. The tool was translated in Arabic, coded on Kobo to allow for easier note taking and administered by ACTED's AME Assistant via phone to 8 sorting centres currently supported by GIZ under the Waste to Positive Energy Programme.
- **Waste pickers and scrap dealers quantitative survey:** The survey looked at types and quantity of waste recovered and organisation of the market for such waste. The survey was translated in Arabic and coded on Kobo. A sample of 50 waste pickers and 27 scrap dealers reached through field outreach (in streets where such actors recover waste and at landfills) via snowball sampling was interviewed face to face¹³. Confidence level and margin of error cannot be estimated as there exists no comprehensive list of such actors in Jordan, also due to the informal character of their work. However, findings with a high confidence level (i.e. those for which more than 70% of the stakeholders

¹³ 30% from Amman, 23% from Zarqa, 23% from Irbid, 10% from Mafraq, 7% from Balqa, 3% from Karak and 3% from Aqaba.

interviewed agreed) can be considered as representative of this category of stakeholders and will be presented in the report; the rest will be discarded due to low confidence. As regards to waste pickers, a key limitation lied in the fact that many waste pickers, particularly those working at the landfills, did not agree to take the interview, likely linked to their informal working status. In addition, some of the waste pickers interviewed work for the municipality and therefore their responses could not be used to capture the market value of the recovered waste.

- **Paper quantitative survey and plastics quantitative survey:** While the two surveys were largely overlapping, two separate data collection tools were developed to allow for slight adaptations of the tools to their respective value chain of reference. The objective of the two surveys was to consult Jordanian industries producing paper and plastics products to understand to which extent circularity is integrated in their productive processes, including at the design, manufacturing, and sale stage. Questions spanned from principles of increasing product lifespan and promoting reuse schemes, to recyclability and integration of recycled materials in manufacturing paper and plastic products and aimed at shedding light on challenges and opportunities to improve circularity of said value chains. The survey was translated in Arabic, coded on KOBO, and administered via phone by a team of three male and female enumerators in March and April 2021 to a sample of 23 paper companies and 60 plastics companies, selected through a simple random sampling technique from the Jordan's Chamber of Industry database of Jordanian industries. The list was randomized and companies were selected in order. As willingness to participate to the survey was limited, in case of lack of consent to be interviewed, the next company on the list was contacted.
- **KIIs with upcycling actors:** Semi-structured interviews were conducted with 5 upcycling actors working in the paper, plastics, and textiles value chains, to identify current upcycling initiatives being implemented in the country, their strengths and weaknesses, and opportunities for promoting upcycling businesses in Jordan. Interviews were administered by the AMEI, partially in person and partially via Zoom or Skype. The interviews were conducted in English with the help of note taking or recording upon the interviewees' consent, between March and April 2021 by the AMEI and Sr. AMEO
- **Structured KIIs with second-hand clothing shops:** The tool investigated the current environment for second-hand clothing in Jordan, from collection to sale, looking at opportunities to increase success of such actors and enable increased recovery and reuse of clothing items. It was translated in Arabic and coded on KOBO. The tool was administered face to face by a team of 3 male and female enumerators to 10 second-hand clothing shops in Jordan, identified through field outreach and a convenience sampling technique through snowballing. In addition, one semi-structured interview was conducted with one second-hand clothing initiative
- **Farmers quantitative survey:** This tool focused on principles of regenerative and sustainable agriculture, investigating circularity of biological materials cycles in the Jordanian agricultural sector, and included questions on inputs and resource use, land management practices and farm waste produced. The tool was translated in Arabic, coded on KOBO, and administered by a team of three male and female enumerators to a sample of 45 farmers outreached via snowball sampling. While confidence level and margin of error cannot be estimated as ACTED did not retrieve the total number

of farms existing in Jordan, findings will only be presented in the study when confidence is high (i.e. those for which more than 70% of the stakeholders interviewed agreed).

- **KIIs with tires recovery actors**: This semi-structured key informant interview aimed at exploring what kind of initiatives are undergoing in Jordan within the tires recovery sector, including retreading and recycling. The tool was administered to 3 waste recovery actors reached through snowball sampling, partially in English and partially in Arabic, by the Sr. AMEO and the AME Assistant. Interviews were conducted in August 2021 both in person and via phone, with the help of note-taking.
- **Consumers' quantitative survey**: This tool aimed at capturing the extent to which circular economy concepts are not only known but also endorsed by consumers in Jordan, within their buying, using, and discarding practices. The tool was translated in Arabic coded on Kobo and the link was advertised online through ACTED's social media, disseminated to ACTED's beneficiaries and staff through word of mouth. A sample of 256 individuals voluntarily participated and self-administered the online survey. This represents a 95% confidence level and 6% margin of error out of the total country population above 19 years of age, (6,019,660 million¹⁴), which are considered to be active consumers in the country.
- **Structured KIIs with consumers**: Similar to the above, the KIIs were conducted with consumers selected through field outreach in market areas of Jordan where representativeness was sought for three income ranges (low, mid and high). The tool was translated in Arabic and coded in Kobo to allow for easier note taking when conducting face to face data collection. A total of 36 informers were interviewed by a team of three male and female enumerators face to face.

7.1 Limitations

Most interviews were conducted remotely due to the restrictions imposed by the COVID-19 pandemic and as a health-related cautionary measure. This made it more difficult to reach out to certain stakeholders and at times may have affected the quality and depth of the data obtained.

Within the municipal assessment (objective 1), Amman, Aqaba and Petra were excluded from primary data collection within the scope of this study because they have a SWM system independent from MoLA, which also works more efficiently compared to other governorates and municipalities. Since the assessment aimed to focus on the most vulnerable municipalities in terms of waste management efficiency and availability of resources, this does not affect the quality of the study to a significant extent. Nevertheless, Amman represents the most populated city in Jordan and data from a KII conducted in 2019 with GAM representatives was included within section 8.1.2.

Waste pickers engaged in the assessment cannot be considered representative to a nation-wide extent. Indeed, ACTED could not perform a full mapping of the informal sector initiatives and actors at a nation-wide level. Challenges included the lack of access to data on such sector due to the non-existence of comprehensive databases on such category of stakeholders as well as the impossibility to access data from other actors (INGOs and donors) active in the informal economy due to data protection and sharing policies. Consequently, ACTED adopted a non-probability sampling strategy to reach out to such actors,

¹⁴ Source DoS population surveys

limiting the representativeness of the sample. Additional studies should further delve into the informal waste recovery sector, and research efforts should focus on providing a full mapping of the sector at the national level. Nevertheless, the data collected by ACTED can be taken as an indication of the role that such actors play within the value chains of interest.

The study found that only a few municipalities have conducted waste audits to characterize waste by type and quantity, supported by development actors. This has resulted in waste characterization data being based on the individual perceptions of the municipal focal points interviewed as part of the assessment. Such data, as explained in the report, might therefore be unprecise or biased. Triangulation with literature has however showed some overlaps and supported findings of this study.

Due to the lack of a national waste marketplace in the country, pricing information on the main waste streams was based on self-reports by KIIs; in case of conflicting data, the average price was calculated.

Non-probability sampling biased the pool of paper and plastics manufacturers involved in the assessment, the majority of which are also based in Amman, compromising the geographical representativeness of the sample. However, data collection efforts aimed to collect types of information that can be generalized to such types of stakeholders, capturing common trends that have indeed been observed across sampled companies. In addition, some industry actors were hard to reach out to and/or did not wish to disclose information. Hence a number of KIIs and quantitative assessments could not be conducted or lacked information. Further, more granular studies can complement findings related to the private sector in case the need is highlighted for comprehensive sectoral assessment.

The sample of farms engaged in the assessment was based on non-probability snowball sampling through a research of contact details of farms in Jordan, with most of the farms being of large size (average size: 347 dunums). This might have biased the results of the data collection in that they cannot be representative of the whole agricultural sector in Jordan, which is dominated by small farms (average size: 30 dunums).¹⁵ However, ACTED complemented the results of this assessment with additional data from KIIs and from quantitative surveys performed with small vulnerable farmers in Jordan as part of a separate ACTED's assessment.

The consumer survey resorted to non-probability sampling and the quantitative component was taken online by willing participants from ACTED contact list, whose profiles are not necessarily fully representative of the consumers of Jordan (for example the sample of respondents possess higher education and literacy levels than the national average).

¹⁵ Bureau Leeters, ProVerde Trade Strategies (2016) *Export Value Chain Analysis - Fruit and Vegetables Jordan*

8 Findings

8.1 Solid Waste Management and the Economics of Waste Recovery in Jordan

Solid waste is often reported as a burden by Jordanian municipalities, which struggle to sustain the costs of its management, with consequent negative effects such as infrequent collection and waste burning by citizens. This shows a dire need for promoting circular economy approaches that not only prevent the generation of waste, but can also provide a means to recover costs for Jordanian municipalities. This section will first explore current policy frameworks that include circular economy approaches; then it will look at current status of municipal solid waste management, including challenges and opportunities for improved service cost recovery by municipalities. Lastly, it will outline current waste recovery initiatives implemented in the country by both formal and informal waste recovery actors, including sorting centres and waste pickers and scrap dealers.

8.1.1 Circular Economy: Regulatory frameworks and strategies

In addition to the development and humanitarian sectors¹⁶, Circular Economy is gaining momentum in Jordanian public discourse, which has integrated Circular Economy in a number of public policies and strategies, falling under several Ministries, including MoLA, MoEnv, MoEMR, including:

- The [Green Growth National Action Plan 2021-2025](#), which outlines a strategy to greening the growth of 6 priority green growth sectors (Energy, Transport, Water, Waste, Agriculture and Tourism) in Jordan, identifying four priority projects per sector for which a cost benefit analysis was conducted. A strong focus is placed on the importance of developing and enforcing policies that facilitate implementation of the green growth plan.
- The [Jordan Vision 2025](#), including a section dedicated to environment that focuses on safe disposal of solid waste in landfills in accordance with the Montreal Protocol, promotion of sorting, reuse and recycling initiatives through private sector investments, green economy within the sectors of energy (renewable and energy efficiency), transport, water, waste management, organic and sustainable agriculture, sustainable and environmental tourism.
- The [National SWM strategy \(2015-2034\)](#). The strategy is based on the “three Rs” approach (Reduce – Reuse – Recycle) with short, medium and long-term objectives. The short-term planning (2015 - 2024) promotes recycling and reuse activities through the establishment of pilot separate collection systems for recyclables (at least paper, metal, plastic, and glass) and bio-waste, as well as closure of dumpsites and construction of new transfer stations and sanitary landfills. By 2024, the strategy seeks to expand street-cleaning and collection services to the entire population and reduce the amount of bio-waste landfilled by 75%. By 2034, the construction of mechanical and/or biological treatment facilities, and other sophisticated material recovery systems are to

¹⁶ UNEP (United Nations Environment Programme) is currently conducting a study through IMPACT Initiatives and ACTED to map humanitarian actions under the Jordan Response Plan (JRP), which incorporate elements of circularity and develop a toolkit of actions by sector. These reference points will be used to articulate definitions of circularity by sector to encourage further integration of circularity under the JRP.

be achieved¹⁷. The SWM strategy also aims to incorporate the hierarchy of integrated SWM practices (i.e. prevention, re-use, recycling, other recovery, and disposal) and other to-date missing principles (i.e. extended producer responsibility/polluter-pays/proximity/precautionary principles) as well as improve the cost recovery by implementing a tariff system proportional to household income and increasing the participation of the private sector to MSW management operations as well as reducing operation costs through the above-mentioned interventions.

- [National Strategy and Action Plan for Sustainable Consumption and Production in Jordan 2016-2025](#), which promotes sustainable waste management and service provision practices in the sectors of agriculture and food production, waste management and transportation. The strategy encourages transition to more sustainable, efficient, and productive agriculture through investment in agricultural technologies, as well as best practices on appropriate and efficient input use, maintain sustainability of agricultural resources and biodiversity, and ensure a healthy and safe agricultural production. Within the transportation sector, a public transport system should be implemented that takes into account green energy and energy efficient technologies. Lastly, the strategy tackles waste management, prioritising safe disposal of solid waste and developing a system for sorting, reuse and recycling, with an increased participation of the private sector to SWM.
- The **Solid Waste Management law No. 12 of 2020** is built on 5 principles (i) prevention, i.e. adopting measures to avoid or limiting the generation of waste; (ii) precautionary principle, to avoid threats or risks to the environment; (iii) principle of extended producer responsibility; (iv) polluter pays principle; and (v) proximity principle, i.e. the treatment or disposal of the waste should occur at the nearest site taking into account economic and environmental efficiency. Although circular economy as a concept is not formally addressed, the SWM framework law does include circular concepts within principles (i), (ii) and (iii). Indeed, the legal framework's approach to waste management in Jordan follows the hierarchy of waste recovery, aiming to reduce/reuse, then recycling and landfilling as a last resort. Article 11 of the framework mandates entities (e.g. municipalities) producing over 1,000 tons of waste annually to implement circular actions for waste, including taking measures to recover and sort waste in environmentally sound manners before final disposal.
- Jordan is a signatory to the **Paris Agreements** and published its [Nationally Determined Contribution \(NDC\)](#) to the UNFCCC in November 2016, aiming to reduce Jordan GHGs emissions by 14% by 2030, 1.5% of which with own resources and 12.5% conditional to availability of international aid. Key strategic priorities include¹⁸ the increase in use of renewable sources of energy and promote energy efficient initiatives, including the implementation of green building codes; implement sustainable public transport and transportation of goods; promote sorting, reusing and recycling to reduce waste disposed in landfills from 80% to 60% in 2025 and treated and re-used solid waste from 20% to 40% in 2025; encourage investment in alternative energy sources among industries; improving energy efficiency in water utilities, and increase use of

¹⁷ Aldayyat et al (2019), European Commission (2016)

¹⁸ GoJ (2016) *Jordan Intended Nationally Determined Contribution (INDC)*, submitted to the UNFCCC

biogas and energy production from sludge; Afforesting 25% of barren forest areas in rain belt areas in which precipitation exceeds 300 mm.

While all of the strategies encompass circular economy concepts, most of them focus on recycling and recovering post-consumer waste, with less emphasis on upstream actions aimed at designing out waste and pollution. As explained in the background section, circular economy actions are more efficient when targeting the inner loops of the circular economy diagram (Figure 3). Designing products, services and systems in a way that keeps technical and biological materials circulating in the loop for as long as possible, as well as regenerating natural systems, is more desirable.

8.1.2 Municipal Solid Waste Management

Municipal Solid Waste (MSW) includes solid and semi-solid materials produced by households, as well as other waste similar in nature and composition resulting from any activity (commerce, offices, public institutions, etc.). MSW does not include harmful and hazardous waste, which is collected by municipal authorities or by the private sector on their behalf and disposed of through the waste management system.

GREATER AMMAN MUNICIPALITY

The Greater Amman Municipality (GAM) has a SWM system independent from MoLA. Amman, with almost 5 million inhabitants in 22 districts, produces 3,000 tons of solid waste per day. While the efficiency of the collection schedule could be improved, a large budget allows the municipality to deploy a fleet of trucks to collect waste 24/7, in addition to around 4,500 waste pickers in the city.

In Jordan, the Solid Waste Management (SWM) system is managed by municipalities overseen by the **Ministry of Local Administration** (MoLA), with the exception of Amman, Aqaba and Petra, which have an independent SWM system. The municipalities are responsible to collect MSW from residential, commercial, and industrial areas. They then work hand in hand with their local operators “Joint service councils” (JSC), who operate landfills and are sometimes involved in waste transport from transfer stations to landfills.¹⁹

Waste collection poses difficulties for 97% of municipalities in Jordan who reported the following MSWM-related challenges (see Figure 4): concerns about fleet availability (62%), availability of bins (61%), and labour (56%). Other challenges mentioned include maintenance costs and landfill located too far away.

On average, one truck is available for each 4,270 inhabitants in Jordanian municipalities. Interestingly, it is not smaller municipalities that have less trucks available per population/area. Municipalities with less than 10,000 people have an average of 3.5 trucks (one per 1,416 people); those with a population between 10,000 and 20,000 use an average of 5 trucks (one per 3,697 people); and those between 20,000 and 50,000 have an average of 6 trucks (one per 4,943 people). The funding for the SWM fleet is part of the overall municipal budget because there is no dedicated SWM budget. The waste trucks are part of the general fleet budgeting of municipalities, probably indicating that the number of trucks assigned to waste collection is not based on a study of the waste quantities generated.

¹⁹ ACTED KII with nine JSCs (2021)

Overall, **66% of municipalities collect waste daily** from residential areas, 31% collect waste 2-5 times a week (most often these are smaller municipalities with up to 20,000 inhabitants), and 3% collect waste weekly. While there is a **schedule for the waste trucks**, it is **not accurately followed** which leads to inefficiencies in the use of time and fuel.²⁰ The non-availability of mapped waste collection routes and container locations²¹, results in collection routes being determined based on the fleet capacity of the municipality rather than a study of the waste production per area. Consequently, first category²² municipalities, which have a higher population and higher funding, have municipal SWM plans: including a higher number of staff and more efficient waste collection systems (see textbox: Greater Amman Municipality). Second and third categories municipalities have lower resources that mostly end up covering only the salaries of staff.

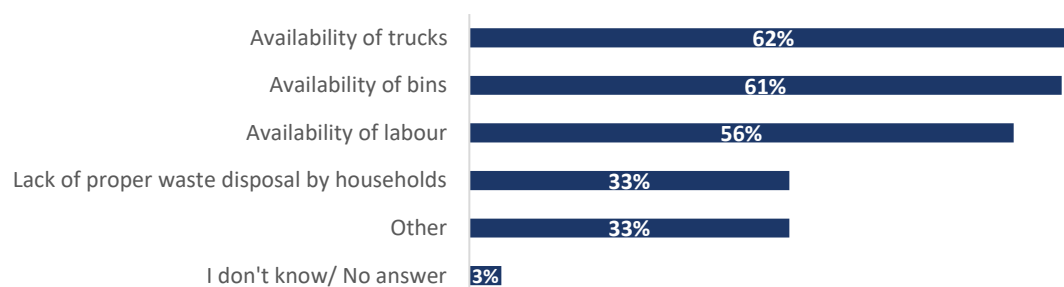


Figure 4 Main SWM-related challenges reported by Jordanian municipalities. More than one answer was possible

Following waste collection from municipalities, the waste that is not recovered for sorting at the municipal level (see section 8.1.4.1) is normally brought to transfer stations as an intermediary step to centralize and disseminate waste into landfills, however the landfills are usually established dozens of kilometres away from urban areas²³. Waste recovery also happens at the landfill level. JSCs interviewed by ACTED, reported that on a yearly basis, municipalities contract companies through a tender to collect recoverable waste from landfills through their waste pickers. Price seems to be the only deciding factor for selection of such tenders²⁴. While Mafraq and Tafleh have liaison with waste recovery actors through the process described above, this is not reported in Karak, Ajloun and Aqaba, where the JSCs interviewed by ACTED reported no waste recovery happening at their landfills. In Irbid, the municipality issued a tender but no bidders applied. However, small and medium sized dumpsites struggle to function because of lack of interest from waste picking bidders linked to high transportation costs to access remote sites and too little amounts of waste. **Opportunities exist to optimize the transportation costs by diverting recoverable**

²⁰ KII with FCM, March 2021

²¹ Aldayyat, E.A., Saidan, M.N., Abu Saleh, M.A., Hamdan, S. and Linton, C., 2019. Solid Waste Management in Jordan: Impacts and Analysis. *Journal of Chemical Technology and Metallurgy*. 54, 2, 2019, 454-462

²² The Law of Municipalities (2015) categorizes municipalities into the following three categories:

- First Category: Municipalities of the centres of governorates and any other municipality with a population of more than one hundred thousand people.
- Second Category: Municipalities of the centres of counties (Liwa's) and municipalities with a population of more than fifteen thousand and not more than one hundred thousand people.
- Third Category: Other Municipalities not listed within the first and second categories.

²³ ACTED KII with MoLA (2021)

²⁴ UNDP, DWR (2015) *Solid Waste Value Chain Analysis – Irbid and Mafraq*

waste away from landfills or setting up sorting centres closer to municipal areas or transfer stations, closer to urban centres, so that scrap dealers can more easily access and collect materials.

The increase in municipal waste generation in the last few years is primarily due to population increase following the Syrian refugee influxes and particularly in the North of Jordan. This has strained the capacity of the country to dispose of waste at its 21 landfills. JSCs interviewed by ACTED report the main drivers of their costs to be associated with excavating new waste trenches in landfills, as well as fleet operation and maintenance.

Within the landfills, **contamination by both hazardous and organic waste make recovery after household disposal very difficult**. Jordan produces at least 1,000 tons of hazardous recyclable waste per year, mainly from batteries by industries and battery recycling centres²⁵. After consumption, such waste is normally not separated and safely disposed, it ends up in landfills and contaminates the rest of the waste. This poses a strong concern to contamination of soil and groundwater, as well as health and safety conditions of landfill waste pickers. In addition, organic waste constitutes more than half of the total municipal waste in Jordan, with no separate collection at source that could allow resource recovery.

A large part of the municipalities’ SWM cost recovery comes from service fees, which are paid as part of electricity bills by (a) residential units (per household, depending on their electricity consumption²⁶), (b) commercial and industrial units, and (c) others (depending on size, type, and quantity of SW generated), rather than from material recovery costs²⁷. Challenges are sometimes reported in coordination between the electricity companies and the municipalities in transferring the adequate amount of fees²⁸, as well as arrears in paying electricity bills by some households²⁹, which results in municipalities not receiving the amount of fees that they are entitled to. Nevertheless, the service fees alone are not enough

SWM fees only cover about 29% of MSWM costs as estimated by municipalities.

to cover the SWM costs for the municipality.

Lastly, there is **no dedicated SWM unit and consequently SWM budget** within the municipality. SWM costs are included within the overall municipalities’ budgets, which results in municipalities not being able to estimate their SWM costs, compromising efficiency of SWM processes. Only **54% of the municipalities** who engaged in the assessment were able to **indicate how much their monthly municipal SWM budget is**, which is estimated at 1.2 JOD

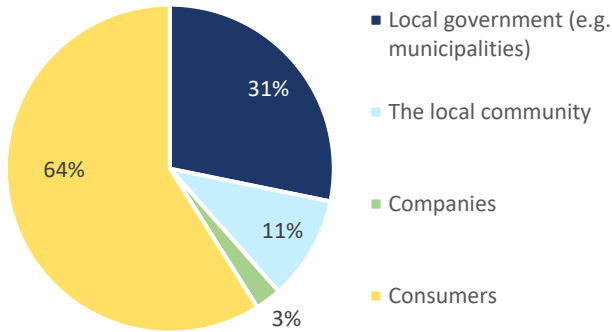


Figure 5 Outlook of Jordanian consumers on who bears the responsibility to reduce waste

²⁵ MoEnv. (2020) “Waste Sector. Green growth National Action Plan 2021-2025”. Amman, The Hashemite Kingdom of Jordan.

²⁶ 20 JOD per year per HH if less than 200 kWh a month are consumed, or .005 JOD per each additional kW

²⁷ Regulation for Nuisance Prevention and Waste Collection Fees within Municipal Borders No. 68 (2016)

²⁸ KII with MOLA, April 2021

²⁹ ACTED’s Validation workshop, 18 August 2021

per person, more than double the service fee paid by the HHs³⁰.

Notably, based on a consumer survey conducted by ACTED, 91% of consumers consider there is a need to decrease the amount of waste generated in Jordan. Among consumer Key Informants, a majority consider it to be the consumers responsibility to reduce waste (Figure 5). On average,

municipalities estimate that **1.2 kgs of MSW is produced per person on a daily basis** in Jordan, most of which is residential and commercial waste (see Figure 6). Such estimations are based on individual perceptions of the municipal focal point interviewed which is higher than literature, that reports 0.8 kgs of waste produced per capita in Jordan in 2018 daily³¹. Exact figures are difficult to estimate, as **waste audits are very rarely conducted by Jordanian municipalities.**³²

75% of the municipal focal points interviewed, were not able to define quantities of waste produced disaggregated by stream type. Those who could, based their estimations on perceptions and 20% of the waste quantities fell into the “other” category. Despite this, municipalities are aware of quantities produced particularly for some types of waste, such as paper, plastics, metal and organic. Triangulation with another study by the Green Building Council, seemed to confirm waste composition data estimations

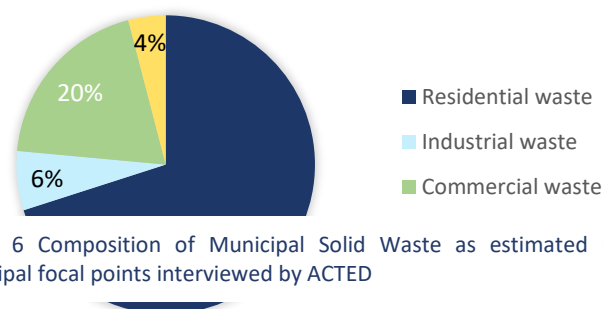


Figure 6 Composition of Municipal Solid Waste as estimated by municipal focal points interviewed by ACTED

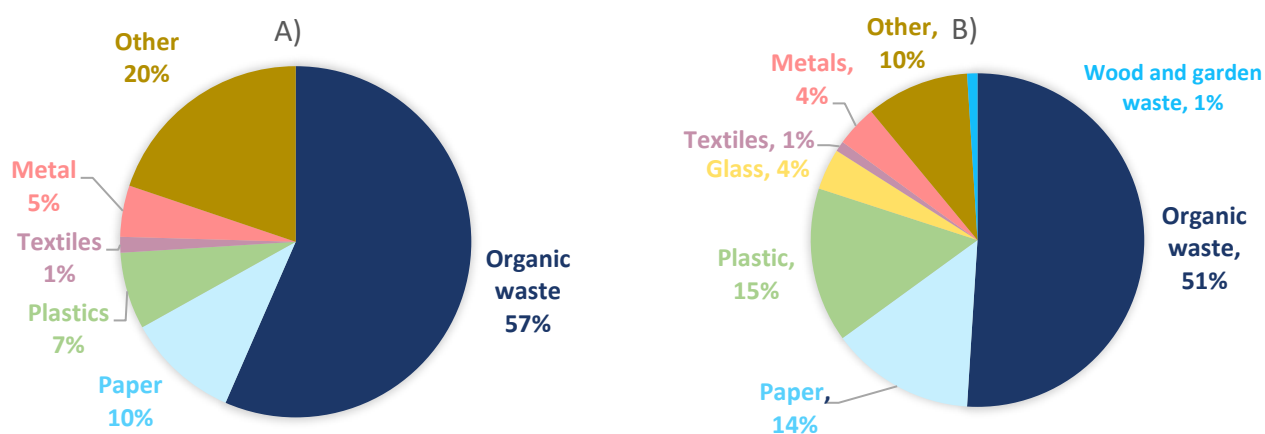


Figure 7:

A) Municipal waste composition in Jordan as estimated by Municipalities. Source: ACTED Quantitative assessment with Municipalities, April 2021;

B) Municipal waste composition. Source: Green Building Council, 2016

by municipalities (Figure 7), with organic waste being more highly represented in the current study. Although mainly not based on waste characterization studies, the above data confirms a dire need to

³⁰ Estimations have been based on an average HH size of 4.8 members (Jordan DoS, 2019, Jordan in Figures), who estimate paying 20 JOD per year (see footnote 26) but require an annual budget of 69 JOD (1.2* 4.8*12 - monthly individual SWM budget * HH size * 12 months).

³¹ World Bank (2018) *What a Waste 2.0*

³² KII with FCM, March 2021. FCM is supporting 12 municipalities in the centre and south of Jordan to conduct waste audits and establish SWM plans utilizing data from the audits.

decrease the amount of waste that ends up in Jordanian landfills. In parallel, **raising institutional awareness on the importance to conduct municipal waste audits**, that can be implemented with a relatively limited budget³³, is essential. Based on such audits, **material recovery from specific waste streams could not only help municipalities reduce expenditure and have environmental benefits, but also create jobs and foster economic growth**. This assessment primarily considered market factors that affect material recovery and seek to identify economically viable waste streams that could benefit from immediate investment.

8.1.3 Waste recovery

Only an estimated **5% to 10% of the total amount of municipal waste produced annually in Jordan is recovered and/or recycled**, mainly by the informal sector³⁴. Interestingly, for municipalities located in most economically vulnerable areas, landfills do not have high quantities of valuable materials, because a lot of the waste is recovered, reused, or upcycled before reaching the landfill³⁵. Overall, 10% of the municipalities report to interact with informal waste recovery actors, mainly in the north of Jordan (in Irbid, Jarash, Karak, Madaba, Mafraq and Amman governorates). Interaction typically takes the form of informal waste recovery actors picking some types of waste for free. Additionally, in Karak and Amman, sale of waste to informal scrap dealers is also reported. No municipality reported to try and integrate informal workers within municipal formal waste recovery activities. Due to the lack of waste audits, municipal waste recovery actions (e.g. sorting or recycling centres) are sometimes established without a prior waste composition study, jeopardising the success of such initiatives. High electricity costs have affected the recycling industry in Jordan, as its energy intensive processes puts Jordan at a comparative disadvantage with its regional and international competitors³⁶. As a result, most of the sorted waste streams are shipped abroad for recovery, to Saudi Arabia and the Gulf in most cases.

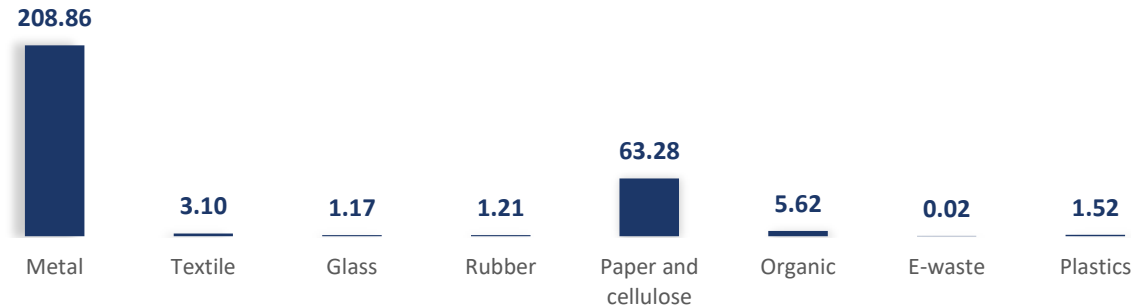


Figure 8 Value of waste exported in 2019 from Jordan, million JOD. Source: DOS

Globally, some materials such as metals have higher market value due to ease of recycling and high demand as well as market prices paid for these items. Data from the Jordan’s Department of Statistics

³³ Based on KIIs, waste audits can cost around 600 to 800 JOD of material costs in addition to cost of labour.
³⁴ UNDP (2018) *New Municipal solid waste Recovery and Recycling contract Improves Livelihood of waste Pickers in Jordan Landfills*; Jordan Green Building Council (2016) *Your Guide to Waste Management in Jordan. Waste Sorting Informative booklet*.
³⁵ KII with FCM, March 2021
³⁶ UNDP (2015) *Overview of waste value chains in Irbid and Mafraq, including opportunities and barriers*

(2019) report that only some materials are currently recovered and exported (see Figure 8); the highest value comes from metals, of which aluminium is the main component. Very little export of e-waste can be noticed, with most of the recovery likely taking place in country and informally; actors working with WEEE (Waste from Electrical and Electronic Equipment) need to be licensed to export such waste³⁷.

Exported waste is most often from industrial waste, due to the lack of a nation-wide municipal recovery and sorting system at household level. Only **15% of the municipalities engaged in this study reported to perform separate collection of certain types of waste**. As far as ACTED could identify, all of the HH level segregated waste collection initiatives are currently supported by NGOs or donors, which primarily includes **paper** (13%), **plastics** (8%), **organic waste** (8%), followed by metal (3%), and glass (1%). 5% reported to sell recyclables to companies whose names were shared by municipalities are located in Jordan. On average, segregated waste is picked 5 times per week by municipalities³⁸, almost a totality of which report that segregated collection happens in certain areas of the municipality only and that segregated waste is normally picked from segregated bins, governmental institutions, schools, NGOs and private companies, and brought to a sorting centre. While such data is promising, **further research into sorting centres** (see section 8.1.4.1) **demonstrates how additional sensitizations campaigns are needed to promote appropriate sorting of waste at source, to avoid waste contamination and increase the value of waste recovered**.

The following sections provide an overview of the waste recovery initiatives implemented by sorting facilities, recycling centres and informal actors. The table in Annex 0 outlines a mapping overview of all of the formal waste recovery and recycling initiatives that ACTED identified through this study. As regards the informal sector, as mentioned in the limitations' section, ACTED did not perform a comprehensive mapping reflecting the scale of the informal waste workers on a nation-wide level. Hence, further research is recommended within the informal sector, with research efforts focusing on providing a full mapping of the sector at the national level. Nevertheless, the data collected by ACTED can be taken as an indication of the role that such actors play within the value chains of interest.

8.1.4 Sorting at source

Waste sorting at source is easier to implement in commercial and industrial areas, where quantities are higher, waste types are more homogeneous with almost no contamination. With regards to residential areas, the main constraints considered by KII is households' acceptance that segregated waste is not collected daily, as well as lack of trust in the community about waste recovery initiatives³⁹. Awareness campaigns through social media and direct messaging to the communities can offer a successful solution to promote household level sorting, in addition to the provision of incentives. However, the latter might be challenging for both municipalities needing to dedicate resources to this and the sustainability of the system that eventually needs to rely on households' willingness to sort beyond incentives being provided. Socio-cultural components such as *wajeb* (good deeds) can be integrated in the campaigns to increase

³⁷ KII with MoE, 2019

³⁸ The average frequency of collection of segregated waste is higher than the average frequency for mixed waste. This might be due to the fact that current municipal waste segregation projects are supported by aid agencies (e.g., labour intensive Cash for Work programmes)

³⁹ KII with FCM, March 2021; KII with UNDP, May 2021

their effectiveness.⁴⁰ In addition, experience from stakeholders working with Jordanian municipalities on such topics have shown that sharing evidence with the community of residents might help raise their awareness and interest to contribute to waste reduction, for example by sharing results of waste audits with the community or scheduling visits to landfills⁴¹.

At the household level, certain types of waste recovery is commonly practiced, often by women who hold responsibilities for housekeeping. For example: food waste is sometimes given to cattle keepers, plastic yogurt and beverages containers are reused for keeping food, containers are refilled with detergents and sold, and old tires are used for planting.⁴²

Segregated waste pickup services offered by private recovery actors often require users to pay for them.

Based on the findings of ACTEDs consumer preference survey conducted online in May 2021 across eight governorates, **31% of consumers** (27% of females and 33% of males, 34% of urban vs 27% of rural population) **sort some kind of waste at household level for recovery or recycling**. Among them, the most commonly sorted materials are: plastics (80%), glass (63%), metal (55%), paper (41%), organic waste (36%), e-waste (24%), rubber (21%), and yard and garden waste (18%). Due to the lack of availability of recycling services in most of the country, **waste is likely not recycled**. For example, plastic containers or glass jars can be saved

for refilling. Food and bread waste tends to be disposed on the side of the streets, but none of the scrap dealer KIs involved in the assessment have reported to recover it. Other types of waste are likely sorted to be recovered but not recycled, i.e. are probably reused or upcycled. Findings from Consumer KIIs confirm that only a minority of consumers sort waste for recycling.

Daily waste sorting habits among the public in Jordan lacks presumably due to in the inadequacy of well-functioning sorting and recycling processes in country. Subsequently, 78% of consumers surveyed do not consider recyclability of a material to be a decisive factor for making purchasing decisions.

Nevertheless, household level waste segregation is currently gaining more interest in addition to the above-mentioned municipal segregated collection initiatives, which mainly implemented through NGOs/donor support, as a variety of initiatives in Jordan and the MENA region are being developed. For example, a few private actors offer pickup of segregated waste through mobile application. In some cases, households receive a small monetary incentive for their waste, while other times the collection service is paid. Generally, however, most **recovery actors** who collect segregated waste interviewed as KIs, **cannot offer a free pickup service** as the returns of the business cannot cover running costs. Private sector involvement in solid waste management could yield opportunities for innovative models of waste management, recovery, and innovative practices. However, PPP initiatives remain very limited in Jordan

⁴⁰ KII with UNDP, May 2021

⁴¹ KII with FCM, March 2021; October 2021.

⁴² LDK Consultants, Mostaqbal, 2014, *Development of a National Strategy to Improve the Municipal Solid Waste Management Sector in the Hashemite Kingdom of Jordan. Baseline Study*.

due to a lack of engagement and understanding between the public and private sector, which could boost profitability of the latter while reducing SWM issues for the former.⁴³

8.1.4.1 Waste sorting facilities

Amongst formal waste sorting municipal infrastructure, ACTED could identify **nine pilot sorting centres being set up in municipalities in Jordan**, all of them with the support of development actors. In terms of waste types, sorting centres mostly collect paper and plastics followed by metals. Some also receive sorted organic waste, electronics, and wood. Sometimes, sorting centres stipulate formal waste collection agreements with private companies, malls, government institutions and schools.⁴⁴

A key challenge for **profitability** of public sorting centres in Jordan is the lack of **quantities of materials**, as well as quality of materials.

Furthermore, some initial collaboration with waste pickers was also noted, whereby the centres would buy waste from pickers at the market price. However, the latter is not always feasible as sorting centres report that **the market price for waste is higher than what the sorting centre can afford while maintaining profitability**. Indeed, **coordination between such formal waste recovery centres and informal waste recovery actors** is a commonly reported challenge that also threatens the market viability of sale of sorted waste. Sorting centres can only sell their sorted waste at a higher price than scrap dealers, due to their higher running costs, which challenges the market viability of current formal waste recovery initiatives. Devising ways to incorporate informal waste workers into such municipal initiatives could be an essential solution for the survival of formal waste recovery. Currently, MoLA and GIZ are working on integration of such waste actors within the EU-ISAR (Informal Sector Integration and Awareness Raising)⁴⁵ project.

Usually, the materials received by sorting centres have already been partially sorted. Waste sorting facilities, use manual sorting through visual inspection, which is performed by daily workers (often engaged through a Cash for Work scheme). This creates a high potential for error in the sorting process and requires an extensive workforce, which is one of the main cost drivers. Sorting centres report **lack of labour and accuracy in sorting**, followed by a lack of technology to sort, as the main challenges faced⁴⁶. In addition, one municipality mentions that around 25% of the separated materials are contaminated with organic and liquid waste and is therefore sent to the landfill.

Additionally, a lack of quantities of materials that have significant value is reported – for example, metal is often lacking as it is already well recovered by informal waste actors.

Once sorted, materials are normally crushed (plastics), compressed into bales (paper, metals) or processed (organic waste into fertilizers). Sorting centres mention that the lack of labour and modern machinery, combined with water and electricity cost hamper processing of waste within their facilities.

⁴³ ACTED KII, 2021. MoEnv. (2020) “Waste Sector. Green growth National Action Plan 2021-2025”. Amman, The Hashemite Kingdom of Jordan.

⁴⁴ ACTED KII with selected sorting centres, May 2021

⁴⁵ EU Support to the Implementation of the National Solid Waste Management Strategy - Informal Sector Integration and Awareness Raising

⁴⁶ ACTED KII with selected sorting centres, May 2021

These processes do not result in a recycled output, but rather into a raw material that can be then recycled by other facilities with dedicated machinery. **The lack of such recycling facilities in Jordan results in most of the waste being sold to exporters or manufacturing companies who are able to process post-consumer waste by including it within their production lines.** The waste is sold by sorting facilities through a tendering process, whose main challenges include: 1) the lack of bidders, 2) low quantity of waste for bidders, or 3) bidders propose a much lower price, which reflect the main informal market prices (an example reported by a sorting centre was an offer of 12/JOD per tonne for cardboard against expected 45JD), considering costs of the auction and transport of waste.⁴⁷ This results in sorting centres having to sell the waste at a lower price than the minimum required for them to be profitable.

Price fluctuations in the market of certain materials (i.e. plastics and paper) also challenges profitability of such activities. The table below summarizes average prices of most common materials collected as reported by sorting centres and scrap dealers that ACTED could include in the assessment.

Table 2 Market prices of most commonly sorted materials in Jordan

Material	Average market price per tonne
Plastics (HDPE)	90-130 JOD
Plastics (PA)	40 (coloured) – 90 (transparent) JOD
Paper	10 (carton) – 90 (paper) JOD
Iron	100-250 JOD
Aluminium	400-800 JOD
Copper	4000 JOD

As a result of the above-mentioned challenges, most sorting/recycling centres are not self-cost recoverable nor profitable. Out of the 8 interviewed by ACTED for the purpose of the study, only two were reporting being profitable respectively located in Amman and Aqaba, one of which could only cover operating costs. Lack of reliable waste supply, efficient technology for sorting, and an inability to sort at the source (both in terms of users' awareness and lack of infrastructure to sort, i.e. sorting bins) were identified by KIs as the main reasons for sorting/recycling centres' limited profitability. The sorted **waste market remains volatile due to high dependency on global price fluctuations including prices of water and energy**, variations in supply and demand, as well as in export and import fees (locally and internationally)⁴⁸. Storage facilities next to sorting centres that can be utilized to store materials until price is convenient can support economic profitability of such initiatives.

⁴⁷ KII, Greater Mafrqa Municipality, 2019

⁴⁸ ACTED KII with selected sorting centres, May 2021

8.1.4.2 Waste picking and scrap dealing

There are 6,400 formal waste workers in Jordan⁴⁹, employed by municipalities for street cleaning, but an additional **6,000 to 7,000 people** (Jordanian and Syrians) are estimated to be involved in **informal recycling and material recovery** in Jordan⁵⁰. Informal waste pickers are most commonly males. Female participation in this sector is limited by sociocultural norms and fostered only by dire economic needs to provide for the households, as well as development initiatives through cash for work projects⁵¹. Waste pickers can be found:

- 1) *In the cities*, where they often work alone, in an individualistic and territorial way. In Amman, informal waste pickers are estimated to be in the order of 5,000⁵², in Irbid and Mafraq 100 and 1,000 respectively⁵³, and seem to collect mostly **packaging waste**, which is found in municipalities to be 35% of the total waste produced⁵⁴. They play an important role in reducing waste quantities, and usually sell the scrap to middlemen such as scrap dealers. They source their waste from retailers, which often have quantities of well sorted packaging waste (corrugated carton mainly), and waste bins. In addition, they also buy waste from households, who have contact with such informal actors and call them to pick up their waste regularly.
- 2) *At the dumpsite level*, they either:
 - a. Are directly employed by the **waste recovery companies**, to which the dumpsites are leased by the Joint Service Councils (JSCs)⁵⁵ through the process described under section 8.1.2. Such companies do not stipulate formal contracts with waste pickers, who therefore have no social security coverage nor use protective equipment while working. Moreover, they do not have proper equipment to compress waste. Waste pickers are usually paid daily wages of 5JD⁵⁶.
 - b. Informally sell the waste to middlemen who play a big role in the purchase and sale of waste, determining the price of scrap for waste pickers⁵⁷.

Even when hired at landfills by waste recycling companies, waste pickers have no formal contracts or decent labour conditions.

⁴⁹ MoEnv. (2020) "Waste Sector. Green growth National Action Plan 2021-2025". Amman, The Hashemite Kingdom of Jordan.

⁵⁰ UNDP (2018) *New Municipal solid waste Recovery and Recycling contract Improves Livelihood of waste Pickers in Jordan Landfills*

⁵¹ LDK, GIZ (2019) *Consulting Services for the Preparation of a Concrete Detailed Inception Report that Paves the Way to Achieve Project Goals*

⁵² Sweepnetwork, GIZ (2014) *Country report on the solid waste management in Jordan*

⁵³ Waste management in MENA regions, 290

⁵⁴ Ibid.

⁵⁵ Ibid.; LDK, GIZ (2019) *Consulting Services for the Preparation of a Concrete Detailed Inception Report that Paves the Way to Achieve Project Goals*

⁵⁶ Disaster Waste Recovery, 2015, *Solid waste value chain analysis. Irbid and Mafraq, Jordan*

⁵⁷ LDK Consultants, Mostaqbal, 2014, *Development of a National Strategy to Improve the Municipal Solid Waste Management Sector in the Hashemite Kingdom of Jordan. Baseline Study.*

A number of landfills in Jordan are being innovated and equipped with modern facilities. In some cases, this has affected waste pickers who were then denied access to the landfill⁵⁸; however, this could represent an opportunity to integrate waste pickers within municipal segregated waste collection staff.

As explained in the limitations, ACTED’s assessment could not reach a representative sample of informal waste pickers across governorates. Nevertheless, those who were reached, reported to utilize wheelbarrows and trucks to transport their waste, which includes mainly metal, paper, and plastics. These are either sold to middlemen or directly to manufacturing companies. Whenever pickers are employed by middlemen, they receive a daily salary of 10 to 15 JOD a day.

Whilst waste picking is a key source of income for many vulnerable individuals, **the informality of the sector and the individual nature of the waste pickers’ work limits opportunities for economies of scale.** In addition, a few pickers mention that the lack of unions, benefits, and labour rights challenges workers wellbeing.

Scrap dealers act as middlemen agents within the waste landscape, buying waste from various sources to resell it to other intermediaries, based on expected profit margin. They tend to focus on waste types with the highest selling price or that can be easily refurbished, namely metals (85%) and plastics (78%) followed by electronic waste (22%), old furniture (15%), glass (11%), tires (7%) and paper (4%).⁵⁹ Depending on price fluctuations - **unsold waste or waste with lower to no market potential tends to be dumped, and not stored until price is convenient.** Scrap dealers receive the waste material already sorted from a variety of sources (both formal and informal); the most commonly mentioned are municipality-employed street cleaners and scrap pickup trucks followed by segregated bins and landfills. The reported average monthly net profit of scrap dealers is 160JD; however, this activity is not always profitable due to high transportation costs, market saturation / lack of linkages (difficulty to identify available actors to sell waste to), waste contamination and sorting accuracy (especially for plastic waste), and volatility of waste prices (see Figure 9). Since reselling waste to manufacturing companies requires a specific license, scrap dealers mostly resell to scrap shops, scrap markets, or specialized scrap spaces, as well as to other middlemen – these actors are primarily identified based on price and secondly on the basis of previous experience or agreement and are based in nearby locations.

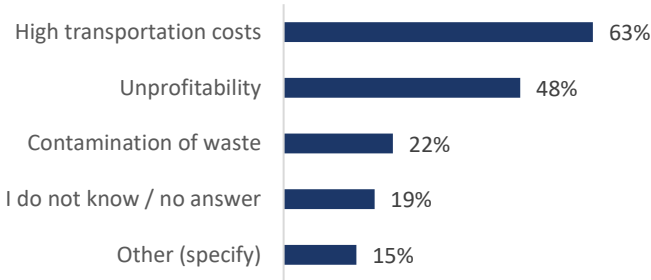


Figure 9 Main challenges faced by scrap dealers

⁵⁸ LDK, GIZ (2019) *Consulting Services for the Preparation of a Concrete Detailed Inception Report that Paves the Way to Achieve Project Goals*

⁵⁹ Percentages are based off a sample of 26 scrap dealers interviewed and are therefore only limitedly statistically representative. However, they can be taken as an indication.

RECOMMENDATIONS: Municipalities' solid waste management processes and waste recovery initiatives

Institutional and Policy Level

- 1) The need to conduct **waste audits** in Jordanian municipalities should be institutionalized. Municipalities conducting such audits should then utilize results as an evidence to develop waste recovery initiatives based on the actual challenges and potential of waste generated within each municipality.
- 2) Continue support to Jordanian municipalities in **designing SWM plans**, including **optimizing schedules and routes for waste pickup trucks** to improve their efficiency and thus the use of SWM budget within the municipalities.
- 3) Establish a **dedicated SWM unit within municipalities**, particularly for those over a certain population, to improve budgeting and more efficient allocation of resources for MSWM.
- 4) Effective collection of SWM fees by a combination of enhanced supervision on users on **service fees arrears and household level awareness campaigns** is imperative to guarantee improved cost recovery by municipalities.
- 5) Due to the transport-intensive character of MSWM, switching to **green vehicles for waste trucks** can provide a circular opportunity, while reducing GHG emissions.

User and Consumer Level

- 1) **Household level waste segregation** can be further promoted based on waste recovery findings from waste audits and market analyses.
- 2) **Household sensitization campaigns** should be devised to improve the quality of waste recovered and processed by municipal sorting centres and obtained from households. **Specifically, to capitalize certain types of waste** that are recovered/sorted, such as bread or reusable containers of at least one fourth of Jordanian consumers.

Private Sector Level

- 1) Support private waste recovery actors, such as scrap dealers and waste pickers, to **develop a viable solution to reduce the amount of waste ending up in landfills** in Jordan, and therefore reducing the burden of MSWM on municipalities
- 2) **Public Private Partnerships** between private waste recovery actors and municipalities can offer a means to increase revenues for the first while offering a waste management service to the second.
- 3) As an exit strategy to labour intensive practices in sorting centres, **provide technologies to automate the waste sorting** to improve quality of sorting as well as offset costs of labour and increase profitability.
- 4) **Integrate informal labour into municipal-led initiatives** to mitigate competition and avoid disruption of the existing market that offers employment opportunities, albeit informal, to vulnerable individuals.
- 5) Integration of waste pickers and scrap dealers into the formal economy could guarantee decent labour conditions.
- 6) Setup of **waste banks or storage spaces** that formal scrap dealers can utilize to scale up recovery initiatives, as well as mitigate against global waste prices fluctuations, thereby addressing the diffused nature of such initiatives in country.
- 7) **Optimize transportation costs** by diverting recoverable waste away from landfills through the **setup of sorting centres closer to municipal areas or transfer stations** that are more easily accessible for scrap dealers.

8.2 Circular market systems for selected value chains in Jordan

Enhancing circular markets does not only mean fostering waste recovery or recycling after waste disposal, but also requires looking at the entire material value chain from product design to sale. The following sections highlight findings specific to the value chains of study, including biological cycles (agriculture, food, and organic waste), plastics, paper, textiles and used tires. In addition, a look at consumer preferences and behaviours in Jordan sheds light on the demand for circular elements in the Jordanian market. The potential for improving circularity of material flows within selected value chains in Jordan is analysed and recommendations are presented.

8.2.1 Consumers circular market potential

To gain a comprehensive overview of circular value chains and understand potential for implementation from a market system perspective, ACTED investigated Jordan's consumer attitudes and practices towards circular economy through an online quantitative survey and KIIs (see section 0).

Label literacy was considered as a factor, to indicate whether consumers look at eco elements when making purchases. According to self-reports by consumers in Jordan, product labels are an important source of information for purchasing decision making. The majority of surveyed consumers declared they usually read labels for food products (83%), electronics (43%) and large household appliances (40%), in addition to products that are made from textile/fabric, plastic and paper materials (29%, 25% and 18%

Consumers in Jordan prefer products made from **virgin** rather than recycled **materials** due to their assumed **higher product quality**.

respectively). Consumers look for information about what **material or ingredients the product is made of (74%), country origin (49%)**, if the product can be recycled (23%), whether it has an eco-label (22%), and/or if it can be composted (14%) or biodegraded (13%). Consumer KIIs confirmed that country of origin is an important dimension for making purchasing decisions, in addition to expiration date (37%). On the other hand, companies tend not to display eco-labelling elements on their labels, even though 65% of companies manufacturing

plastic products interviewed by ACTED declared to offer products that are fully recyclable. **39% of companies do not have a label on their products that states the recyclability of the material**, the percentage increases to 52% for paper manufacturing companies. **78% of consumers surveyed do not consider recyclability of a material to be a decisive factor for making purchasing decisions**. Instead, consumers in Jordan favour products that are affordable and of greater quality (42%), regardless of the recycled or virgin nature of the material. Consumers tend to prefer products made from virgin material (22%) over products made from recycled materials (16%), as they perceive that the products are of higher quality.

Consumers in Jordan have highlighted the need for more information, in a clearer format, in appropriate language (written in Arabic or multiple languages), with colour coding, and larger text on the product labels can help improve product labels to display information that is of greater use for making purchasing decisions.

Second hand markets can provide a solution for reuse of materials that consumers discard while still in good condition, keeping materials in use in the inner loop of the Circular Economy diagram (see Figure 3).

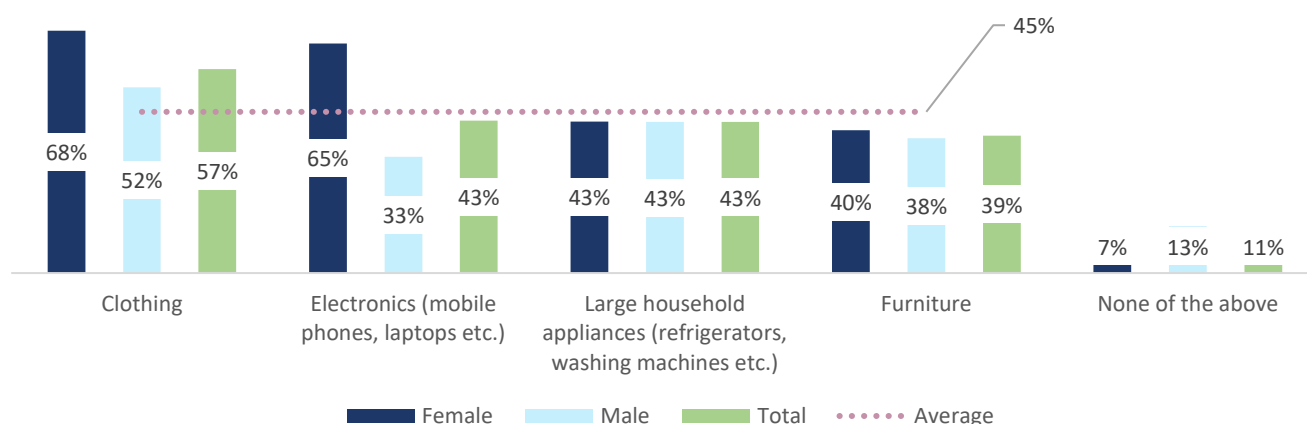


Figure 10 Total, average and gender distribution in percentage of consumers and product types that consumers have, at least once, bought second hand or refurbished

Globally, the second hand and refurbishment markets have seen a growth in the past few years⁶⁰, and particularly as a result of the economic crisis linked to the COVID-19 pandemic, online second hand markets saw a surge in sellers and consumers⁶¹.

In Jordan, **almost the totality of consumers surveyed by ACTED declare to have, purchased at least one of the following second hand or refurbished products**, in order of frequency: clothing, electronics, large household appliances, furniture (Figure 10). Women seem to lead this trend, being 32% more likely to buy electronics and 16% more likely to buy clothing second hand or refurbished, in comparison to men. The **principal reason** for consumers in Jordan to buy second hand or refurbished items **is economic** (to save money, as confirmed by 82% of online surveyed consumers and corroborated by KIIs) rather than by virtue of conscious consumerism. Besides the benefit of saving money, having unique things, and more sustainable consumption (environmental reasons / to reduce waste) are also contributing reasons (23% respectively). Other factors, like quality and durability, were mentioned occasionally as **reasons** for purchasing second hand or refurbished items (4%).

Still, there remains a pool of consumers in Jordan who declare they would not buy certain items second hand or refurbished, in the following order: electronics, such as mobile phones and laptops (41%), large household appliances (35%), clothing (28%), and furniture (14%). Main reasons for this are: **lack of warranty for technology** (63%), followed by a **perceived lower quality** (50%), perceptions of **hygiene** for clothing and beauty items (50%), and product would **look old** for furniture items (54%).

⁶⁰ Moss, K, Bapna, M. (2021) *4 Indicators that the Reuse and Resale Market is on the Rise*. World Resources Institute. Accessed online: <https://www.wri.org/insights/4-indicators-reuse-and-resale-market-rise> (accessed 15 August 2021)

⁶¹ *Global Secondhand E-Commerce Market 2021*, Research and Markets

Consumers, in both surveyed and KIs, mentioned second hand shops (52%) and markets (e.g. souqs (45%) and *bastat*⁶² (28%) as the main places where they buy items second hand or refurbished, followed by friends and other social relations, and other informal and formal channels (Figure 11). KIs also highlighted purchasing items second hand or refurbished online⁶³.

Other dimensions of circular thinking and sustainable consumption (e.g., principles of reuse and sharing economy) are also common among consumers in Jordan. Specifically, **reusing items is practiced among most consumers (73% of consumers surveyed regularly do)** and more frequently among consumers living in cities (78%) in comparison

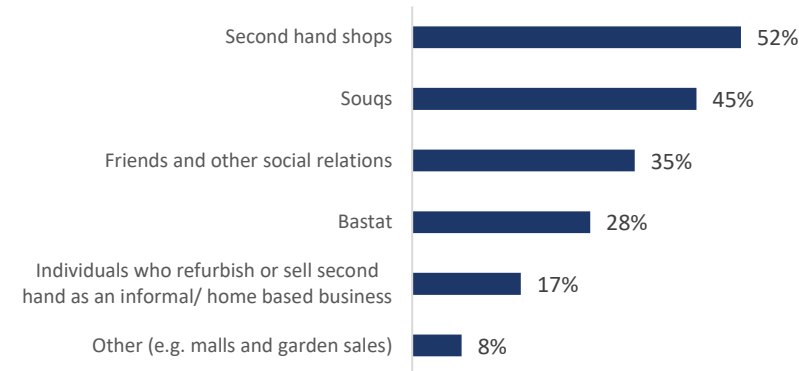


Figure 11 Where consumers in Jordan purchase items second hand or refurbished

to those living in villages (66%). Most frequently cited examples include the reuse of plastic containers (e.g. food containers) and the use of pieces of clothing by more than one person.

Donating belongings that are no longer needed or wanted is a common end for 34% of consumers for clothing items while repairing broken items is common for furniture (79%) and electronics (60%), as Figure 12 shows. These trends were largely documented through KIs, which also highlighted how electronics and furniture are often sold, possibly through scrap dealers that collect such items from households and resell them after refurbishment/repair.

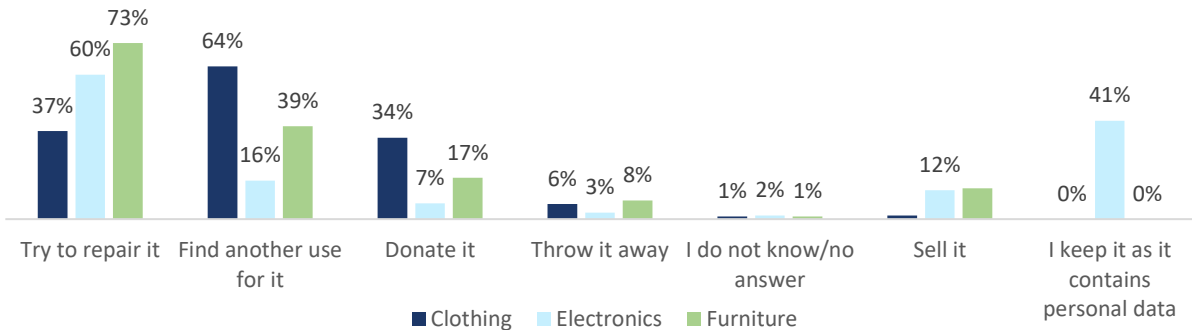


Figure 12 Consumer behaviours when different products break or reach the end of their life cycle

Additionally, only **26% of consumers** surveyed by ACTED reported that they **would not be comfortable to borrow or rent items from a shop or business offering those services**. This indicates that there is market potential in Jordan for businesses to engage in principles of a sharing economy. The main reasons for not feeling comfortable with renting or borrowing services include preference to own needed items (13%),

⁶² A bastat is a type of informal market in Jordan. During the COVID-19, the operation of bastats have not been allowed.

⁶³ There are two main B2C and C2C websites selling second hand items in Jordan: OLX <https://olx.jo/en/> and Open Sooq: <https://jo.opensooq.com/en>

never having tried the services before (9%), and a lack of trust (6%). Availability of such services is also a possible constraint. Among the consumers who feel comfortable, most would consider borrowing or renting gardening or maintenance tools (32%), clothing (30%), electronics (17%), furniture (16%), and large household appliances (14%). Some consumers raise concerns about possible consequences invoked on them if an item that they borrow or rent is damaged. Others have highlighted a societal stigma and sense of embarrassment as reasons that prevent them from using such services.

RECOMMENDATIONS: Consumer's Circular Potential

Institutional and Policy Level

- 1) **Introduction of and promotion of eco-labelling standards and certifications** that are currently rarely adopted by Jordanian companies can foster customers attention towards such matters, in turn promoting sustainable consumption models.
- 2) Implementation of **safety and hygiene standards and labelling** for second hand items or products containing recovered and / or recycled materials can promote demand for such products.

Private Sector Level

- 1) To mitigate against the lack of trust towards buying second hand electronics and appliances, **e-repair and refurbishment shops** in Jordan could be supported to **offer a warranty service** that certifies the product for a number of years and offers repair services for free or at reduced prices.
- 2) Investing in the **sharing economy** holds potential in the country, particularly for **tools and certain clothing items**.

User and Consumer Level

- 1) The already existing second hand/refurbishment market in the country, currently driven by economic and fiscal reasons, demonstrates potential to further promote circular models amongst **mid to higher end consumers by focusing on environmental gains** of said products, as well as **marketing strategies** that incorporate appealing elements, such as a catchy packaging or design and better shop facilities.

8.2.2 Biological cycles

Organic waste constitutes approximately half of the waste collected and dumped in Jordanian landfills. Food waste is reported to be one of the key issues in Jordan⁶⁴ as it can often be observed around municipal waste bins. In addition, 600 tons of manure are estimated to be produced every day in Jordan by livestock farms, in addition to slaughterhouse waste. Olive oil mills produce 200,000-250,000 m³ of olive mill wastewater per year.⁶⁵ This calls for urgent actions to sustainably deal with such waste and promote extraction of feedstock from it based on feasibility studies that consider the specificities of what is available or can be grown in Jordan. In addition, circular economy approaches to the extraction of biological materials from the environment (for agricultural purposes) require regenerating the natural systems that biomaterials come from.

8.2.2.1 Extraction of biochemical feedstock

ANAEROBIC vs AEROBIC DIGESTION

Anaerobic digestion refers to the processing of glucose from feedstock by micro-organisms in the absence of oxygen (through sealed tanks), producing methane and carbon dioxide. In an aerobic system, digestion happens in the presence of oxygen from the surrounding atmosphere and the main output products are carbon dioxide and methane. Studies have observed that anaerobic digestion is preferable as there is less of an impact from dust, bioaerosol and odours, thanks to the enclosed nature of the process

(Source: <https://www.biocycle.net/aerobic-composting-and-anaerobic-digestion/>).

Overall, 42% of Jordan's waste and residues are estimated as available sources for energy generation through biogas, thermal energy, and electricity production⁶⁶. One of the constraints identified for the successful valorisation of biowaste in Jordan is the lack of sorting at source. Although biodegradable substances can be extracted from mixed waste, this is a complex process and produces a contaminated product. To divert biodegradable waste away from landfills and make composting or biogas production viable, it is essential to sort bio-waste at its source. Some municipalities such as the Greater Amman Municipality (GAM) have recently expanded to collection of organic waste, but only 11% of consumers surveyed by ACTED report sorting their organic waste (and as explained above, this does not mean that such waste is recovered). In addition to municipal solid waste, biowaste is largely available from agricultural

(crop and yard waste, olive pomace) and livestock waste (animal manure, slaughterhouse waste)⁶⁷ as well as wastewater.

At present, there are two main opportunities available for recycling of bio-waste: production of energy (through anaerobic digestion) and composting/production of soil amendments (aerobic composting).

Energy generation through **biogas** (methane and carbon dioxide) **production** uses anaerobic fermentation to produce biogas from biomass; the by-product released from biogas extraction can be used as a fertilizer

⁶⁴ ACTED Validation Workshop, 18 August 2021

⁶⁵ ACTED's KII with MoE, 30 August 2021

⁶⁶ Al-Hamamre et al. (2016) *Wastes and biomass materials as sustainable-renewable energy resources for Jordan*

⁶⁷ Ibid.

to improve soil aeration, moisture holding and water infiltration capacity⁶⁸. Biogas can be used directly for heating, lighting, or electricity generation. While the biogas contribution for producing electricity is increasing in Jordan, the country's potential is still not utilized at full. Biomass can be mainly produced from animal manure (96% of total biomass in Jordan), slaughterhouse waste, peat from olive oil, sludge from wastewater treatment plants⁶⁹.

The North of Jordan region holds the most potential for biogas production, as most of the animal farms gather there. Currently, Jordan is running four large scale biogas facilities⁷⁰: two treat wastewater (al-Samra, Zarqa, and Wadi Shalala, Irbid), while two treat organic waste collected from slaughterhouses, restaurants and hotels (al Rusaifah, Zarqa, which is reportedly facing challenges in terms of technology use and lack of technical skills⁷¹, and Ghabawi, Amman). An additional biogas plant was constructed in Za'atari camp by FAO (January 2016 – April 2021). RSS and NERC are piloting biogas units for livestock breeding farms in Jordan to produce biogas for heating and generating electricity using small-scale biodigestors. While the environmental gains of such projects are evident, key challenges include a high initial investment for a long payback period (around 8 years⁷²), due to the lack of in-country technology providers and the low bioenergy tariffs, making annual incomes from bioenergy generation low.

Currently, more than 20% of energy in Jordan is extracted from renewable sources, with a target to reach 30% by 2030 and a total 3,200 megawatts to be produced⁷³. The Jordanian Renewable Energy and Energy Efficiency (REEE) Law No. 13 of the year 2012 defines all biofuels as non-renewable sources of energy, therefore excluding not only general biofuels from feedstock, but also biogas produced from waste, to benefit from the Renewable Energy law and Tax Redemption bylaw No. 13 of 2015⁷⁴. In addition, the law only focuses on biowaste use for electricity generation and not for other sources of energy. Given that biofuels have differentiated environmental impacts depending on the feedstock, such fiscal incentives can be used to support organic wastes as feedstock for production of energy.

Biodiesel production is another option to chemically convert biomass or cooking oil through transesterification into biodiesel, in addition to diverting such waste from landfill or unsustainable practices, such as the dumping of cooking oil into water systems. Indeed, one litre of oil recycled into biofuel avoids the emission of 3 kg of CO₂, a reduction of 92% compared to diesel fuel⁷⁵. Biofuels made from waste vegetable oils can also be used for home heating. While biodiesel cannot be used for transportation in Jordan due to the EMRC and MoEMR's regulations, which do not allow to mix biodiesel

⁶⁸ Ababneh, S. (2019) *The Climate Effect of Biomass and a Roadmap for Development of Bioenergy Projects in Jordan*. National Energy Research Centre, Royal Scientific Society

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ KII with research expert, January 2020

⁷² KII with Suhaib Ababneh, RSS, March 2021

⁷³ KII with Ministry of Energy and Mineral Resources, April 2021

⁷⁴ Al Kurdi, L. (2021) *Biofuels in Jordan: Perspectives*. EcoMENA. Available online: <https://www.ecomena.org/biofuels-jordan/> (last accessed 15 August 2021)

⁷⁵ Veolia, web, accessed July 2019 <https://www.veolia.com/en/newsroom/thematic-reports/veolia-committed-climate/our-climate-solutions/biofuels-waste-recovery>

with fossil fuel according to international standards⁷⁶, there are existing schemes for the recovery of cooking oil. In the formal sector, several recycling companies (e.g., BE, Walkerson Group) collect cooking oil from chain hotels, restaurants, and malls. Cooking oil is processed by Walkerson into three types of products: UCO oil, tallow, and acid oil, which can be used for biodiesel production.

Composting organic waste is also another option that can be implemented at both household and farm level. Indeed, 22% of consumer households surveyed compost their organic household waste (22%; 32% of females, 17% of males); and 51% of Jordanian farmers assessed mention that they use animal manure as compost, while 4% use farm or kitchen waste. However, some of them (11% of total farmers) use raw manure directly on their lands and are unaware of the negative effects this has on the crops in terms of pests and diseases. While this is forbidden by MoA, the regulation is often disregarded by farmers⁷⁷. More than half of farmers surveyed by ACTED who use compost, do not compost in their farms⁷⁸ due to limited space availability, the long duration of traditional composting practices and the easy availability and low cost of commercial compost and soil amendments⁷⁹. Those who compost in their farms also supplement with additional quantities of compost in most cases.

THE COMPOSTING FACILITY IN AL HUSEINIYAT

The composting facility in al Huseiniyat landfill (Mafraq governorate) was built by UNDP in 2016 and is currently operated by actors under GIZ's support. It represents the first Jordanian composting facility. Compost is produced through a turner machine to process cow and chicken manure into compost using an aerobic process involving sawdust and water. Inputs are collected from farmers free of charge (farms benefit from service of waste collection, while the facility only pays for transportation costs), allowing to process 40 tons / day of input producing the same output quantities. The product can successfully compete in the Jordanian market, which was dominated by cheaper but lower quality imported compost, thanks to early engagement with farmers to promote the product's quality as unique selling point.

Compost purchased by Jordanian farmers is often imported, as the cost of locally produced compost is more expensive – a driver of the price is transportation (diesel trucks) to collect organic waste material to compost⁸⁰. Ongoing initiatives in composting include a government-funded composting plant in Deir Alaa where farmers can buy compost on subsidised prices and compost station in al-Huseiniyat landfill, Mafraq. Another bio-feedstock currently untapped is olive mills wastewater. The wastewater has proven to function as an effective organic fertilizer viable in Jordan⁸¹, while avoiding the need to treat such wastewater for sustainable disposal.

⁷⁶ Ababneh, S. (2019) *The Climate Effect of Biomass and a Roadmap for Development of Bioenergy Projects in Jordan*. National Energy Research Centre, Royal Scientific Society

⁷⁷ KII UNDP, May 2021

⁷⁸ Quantitative assessment with farmers, ACTED, May 2021

⁷⁹ KII Emad Khaleel, November 2019

⁸⁰ KII with researcher, January 2020

⁸¹ Ayoub, S., Al-Absi, K., Al-Shdiefat, S., Al-Majali, D., Hijazeen, D. (2014). Effect of olive mill wastewater land-spreading on soil properties, olive tree performance and oil quality. *Scientia Horticulturae*, 175: 160–166.

8.2.2.2 Improving Farm Management as a pathway to Regenerative Agriculture

Conventional agricultural practices tend to treat the farm like an industrial machine, focusing on growing more and faster. However, applying this approach to natural systems risks degrading the natural elements that agriculture is extracting, jeopardizing the sustainability of the whole food production system. Indeed, not only does the food system need to provide sufficient food for everyone, but also it is important to recognize the complexity and resilience of the natural resources from which agricultural yields are generated⁸². This approach is called regenerative agriculture, which builds upon pre-industrial models of food production, and has a better understanding of soil, water, and relationship within natural ecosystems. Thus, regenerative agricultural models shift from a linear model of food production to a circular one.

Monocropping and conventional agriculture is the dominant model in Jordan. This, added to the limited use of planting calendars, often results in **excess production and as a consequence, produce depreciation**. Climate change has exacerbated this problem, causing harsh variations in weather conditions leading to sharp fluctuations in production (e.g., unexpected high yields followed by low yields, rather than a stable production across seasons).⁸³

More than one quarter of farmers in Jordan have surplus that they cannot sell. Half of them **throw away** all of part of it.

In fact, 36% of farmers engaged in the assessment mentioned that during the past year they have had surplus that they could not sell, including primarily tomatoes, cucumbers, peppers and other fruits and vegetables⁸⁴. 50% of the farmers who had surplus reported they had to throw away all or part of it, while 13% sold it to processing facilities or donated it. Farmers suggested surplus is primarily **exported or use**

*“You can only get a good, fast and **profitable** agricultural production that covers production costs by using **chemical fertilizers and pesticides**”*

Farmer, Jordan Valley, May 2021

for food processing. Export of Jordanian products, particularly to the Gulf and Saudi Arabia, already represents a thriving market for Jordan’s farmers, consuming most of Jordanian produce. Main challenges include a volatile market (exports to neighbouring countries, such as Syria and Lebanon, stopped with border closures following political instability), competition, and challenges in respecting quality standards required to export. As for food processing, opportunities include setting up food processing factories in Jordan; farmers report that some tomato paste factories existed in Jordan but have failed⁸⁵. Additional suggestions to decrease discarded surplus include increasing the **availability of communal refrigerated**

⁸² Jeffries, N. (2019), *Regenerative agriculture: how it works on the ground*. Medium. Circulate News. Available online: <https://medium.com/circulatenews/regenerative-agriculture-how-to-grow-food-for-a-healthy-planet-9a5f637c0f3e> Last accessed 22 August 2021

⁸³ KII with research institute, August 2021

⁸⁴ Agricultural experts at the validation workshop mentioned that this percentage might be conservative and that the actual proportion of farmers having surplus might be much higher.

⁸⁵ The reason why such companies failed was not specified.

storages where farmers could store their crops until sale, implementing planting calendars and ensuring cultivation is organized across farmers in the same areas.

An alternative solution to monocropping, as well as a regenerative concept of agriculture, is polyculture, which leverages the interaction between different agricultural crops for mutual benefits, avoiding recurrence to chemicals for pest and disease control. However, **63% of farmers do not believe that is possible to farm in Jordan without the use of intensive inputs**, and thus do not believe use of nature-based techniques, such as polyculture, would be beneficial as **production would not guarantee profitability** because market demand for non-conventionally grown products is low due to consumers privileging price convenience over quality⁸⁶. Even farmers who support alternative agricultural techniques, report challenges, noting farmers need to be sensitized and trained on such techniques as they lack the expertise and resources. In addition, harvesting different types of crops at different times results in lower opportunities to create economies of scales, particularly for smallholders. Hence, availability of supporting infrastructure, such as refrigerated storage until crops reach the market or market platforms that collect smaller quantities from different farmers, are essential to such models.

At market level, non-conventional agricultural models, such as regenerative agriculture, require an enabling environment to thrive. Regenerative models of farming, as opposed to monocropping, can yield fewer output quantities, particularly during the transition period, when piloting regenerative agricultural techniques and testing out what works best in a certain environment. While a number of pilots are already being tested in the country, such as the Greening the Desert project⁸⁷, or holistic grazing through the Savory Method⁸⁸ by IUCN, the Badia Fund and the Royal Botanical Garden⁸⁹, **research and development can demonstrate what works effectively in country and how to promote regenerative agricultural models among the population.**

One of the key principles of regenerative agriculture entails maintaining healthy soils. Soil stores more carbon than the atmosphere and all plant life combined: practices, such as tillage, release carbon and therefore, contribute to increasing greenhouse gas emissions, as well as threaten the microbial life benefitting soil vitality. Hence, carbon sequestration within the soil allows both a reduction in carbon emissions and crucially contributes to sustaining the life of beneficial microbes that stimulate the soil cycles that have been interrupted by use of insecticides, herbicides, or fertilizers.⁹⁰ In Jordan, **unsustainable soil management practices, such as overgrazing, monocropping, tillage, over-**

"In the organic farm when walking around we notice if something is wrong with the soil and do not need to perform lab tests unless we are piloting a new variety. The foot of the farmer is the best cure."

KII with organic farm, April 2021

⁸⁶ KII with NARC, August 2021

⁸⁷ See: <https://www.greeningthedesertproject.org>

⁸⁸ See: <https://savory.global/holistic-management/>

⁸⁹ See: <https://www.iucn.org/regions/west-asia/projects/current-projects/healthy-ecosystems-rangeland-development-herd>

⁹⁰ Schwartz, J. (2014) *Soil as Carbon Storehouse: New Weapon in Climate Fight?*. Yale Environment 360. Available online: https://e360.yale.edu/features/soil_as_carbon_storehouse_new_weapon_in_climate_fight (last accessed 22 August 2021)

pumping of groundwater, ploughing of marginal soils and deforestation in the rainfall zones, as well as climate change, have caused land degradation. Currently, 41% of all Jordanian land is classified as degraded.⁹¹ If investments are not urgently made, this could cause huge losses for the country.

Sensitization campaigns among farmers, supported by research on sustainable land management practices and administration of demonstration plots, can crucially solve these issues. Visual assessments, such as FAO's Visual Soil Assessment⁹², are easy implementation tools that can help farmers evaluate the health of their soil. However, 18% of large farmers mention they do not regularly check their soil for any criteria (from visual to chemical), reporting that farm workers understand soil quality well and there is no need to perform soil checks. When looking at small vulnerable farmers, the percentage increases to 84%.⁹³ The remaining percentage that do soil assessment, mainly use visual inspection methods to check the structure, colour, texture of soil, as shown in Figure 13. KIIs⁹⁴ confirm that farmers do not tend to perform lab tests on soils, except on occasions when a disease appears.

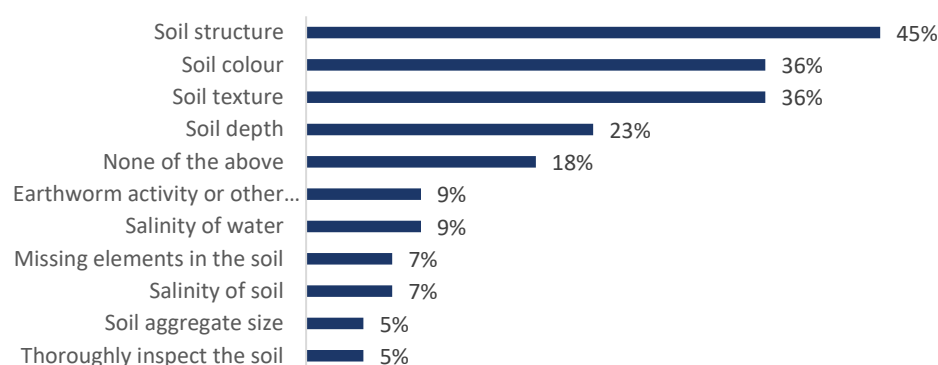


Figure 13 Soil parameters that farmers report to check regularly on

Another common practice within regenerative farming is the usage of **heirloom seeds**, which allows farmers to save from their own seeds, while also maintaining genetic diversity and allowing plants to adapt to diverse environments. In Jordan, at present, seed saving is only practiced by 14% of the farmers engaged in the assessment. Most seeds are normally bought from local nurseries (89%) or distributors (34%), while 9% import seeds directly and 2% obtain them from cooperatives.

Regenerative agriculture aims to make more efficient use of natural resources, thereby, avoiding overexploitation. Currently, **more than 50% of Jordan's water resources and 70% of its groundwater are consumed by agriculture.** To improve circularity of water-use in Jordan, the Ministry of Water and Irrigation plans to substitute freshwater used within the agricultural sector with treated wastewater (TWW) to supply 235 million m³ of water by 2025 from figures of 240 million m³ in 2016⁹⁵. However, **only 13% of farms engaged in the assessment are willing to reuse greywater**; the rest mention that they expect the quantity of greywater would be too little (86%), water would be contaminated (19%), there

⁹¹ MoE, LDN, UNCCD (2018) *Final Country Report of the Land Degradation Neutrality Target Setting Programme*.

⁹² See FAO's Visual Soil Assessment Toolbox: <http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1197602/>

⁹³ ACTED (2021) *Market and competency assessment: the agriculture and artisan sector*. Irbid, Mafraq Balqa.

⁹⁴ KII with agricultural research expert, August 2021

⁹⁵ Ministry of Water and Irrigation (2016), *National Water Strategy 2016-2025*.

would be high treatment (8%) or transportation costs (3%), and/or the quality and quantity of the outputs grown with TWW is lower.⁹⁶ Another constraint is the fact that TWW can only be used for fodder and tree crops as per MoA's regulations, therefore excluding vegetable and field crops. Some violations of this law are reported, as farmers mention that the Zarqa river dam greywater is still used by some farmers for irrigation of vegetables, while has not been tested as safe for agriculture.⁹⁷ Another water conservation practice is **rainwater harvesting**, which is a solution that would bypass the quality issue with TWW; however, quantities remain limited and dependent on the rainy season. None of the farmers engaged in the assessment reported storing rainwater, while 5% reported having rain fed crops. The majority of farmers use open irrigation channels (49%) or their own wells/boreholes in farms (23%).

Additionally, conventional agriculture is characterized by the (over)use of chemical pesticides on farms. Indeed, **93% of farmers engaged in the assessment reported using pesticides**. In 2017, Jordan's farming sector suffered a severe setback when the UAE and several other gulf countries imposed a ban on Jordan's main vegetable exports due to pesticide contamination⁹⁸. With regards to fertilizers, FAO statistics show that the actual use of fertilizer per ha of land in Jordan remains low⁹⁹:

- 69 kg/ha (10 dunums) of Nitrogen (World Average: 69.9)
- 4.81 kg/ha (10 dunums) of Potash (World Average: 24.2)
- 5.61 kg/ha (10 dunums) of phosphate (World Average: 28.03)

KIIs¹⁰⁰ report that actually fertilizers are heavily applied on larger farms, as this is the conventional practice in the country, while smallholders / home-based agriculture tend to rely only on the application of raw manure or compost. Indeed, reports by large farms¹⁰¹ engaged by ACTED in the assessment confirm that **73% of them use chemical fertilizers**, while 58% use manure or organic fertilizers, sometimes in combination with the former. Generally, farmers confirm that their fertilizer application practices are based on traditional methods, highlighting the need for further promotion of non-conventional agricultural practices: specifically, they seek information about input use from experience and education, particularly from large agricultural companies, the internet and social media, as well as exchanges with other farmers and input supply shops. None reported to rely on governmental support services, which are also said to have a very small budget dedicated to investment in research.¹⁰²

Therefore, the study shows that regenerative farming requires a considerable behavioural change, given the current practices within Jordanian farms, as well as a market conditions, and that a swift change to regenerative agriculture is not only difficult, but might be not desirable to farmers as an enabling environment is currently missing. A sustainable alternative to regenerative agriculture is organic farming, which can be considered an entry point towards circular agricultural practices and is already implemented in Jordan. For this reason, ACTED included organic agriculture within the current study. In addition, organic

⁹⁶ WANA Institute (2019) *Water and Agriculture in Jordan: Understanding Current Water and Agricultural Priorities and Futures*

⁹⁷ KII with Organic Farm, April 2021

⁹⁸ Source: <https://www.jordantimes.com/news/local/jordan-stops-exports-several-vegetables-uae-ban-begins>

⁹⁹ Source: FAOSTAT, see: <http://www.fao.org/faostat/en/#data/EF/visualize> (Last accessed 16 August 2021)

¹⁰⁰ KII with NARC, August 2021

¹⁰¹ Average land size: 347 dunums, 34,7 hectares

¹⁰² KII with Organic Farm, April 2021

agriculture regulations and certification exist, enabling a better of study organic farming in a systematic manner. At present, Jordan has around 1,558 hectares of organically cultivated land, split among 23 farms¹⁰³ and producing olives, palms, citrus, grapes, vegetables, stone fruit, as well as eggs and dairy products. While organic certification is available in Jordan through CCBP certification body, not all farms that self-define as organic actually have a certification; licensing requires paying a 60 JOD fee for each sample.¹⁰⁴ Several farmers reported that they want to obtain a certification, but do not know where to start. While alternative farming generally produces a lesser cultivar per dunum of land (for example, **organic farming yields around 50% less produce according to KII**), a strong advertising and marketing strategy would allow farmers to sell the products at **up to 3 times the price of conventionally grown crops in Jordan**¹⁰⁵. Weak marketing leads to overproduction for some organic farms consulted as part of the assessment, who refuse to sell organic products at central markets, where prices are fixed and aligned with conventionally grown crops, therefore leading to profit losses; and lack of economies of scale due to small size of farms. Both challenges could be mitigated by utilizing e-commerce platforms, such as *Dibeen* in Jordan. *Dibeen* is an online marketplace with a strong marketing strategy that offers locally grown products from several small-medium scale farmers who comply with a set of standards for quality assurance defined by the company.

Lastly, improving circularity within farms also requires looking at waste produced in farms. Among farmers engaged by ACTED in the assessment, 84% reported to produce **plastics** waste (including containers for pesticides and fertilizers, greenhouses covers, mulch and weed retardants that are often replaced every few years, and plastic irrigation pipes), 73% **yard waste** and 36% **pruning** waste. Most farmers entirely dispose of such waste or do not recover it within their farms, thus following a dominantly linear model of waste management that can certainly further include circular elements (see Figure 14).

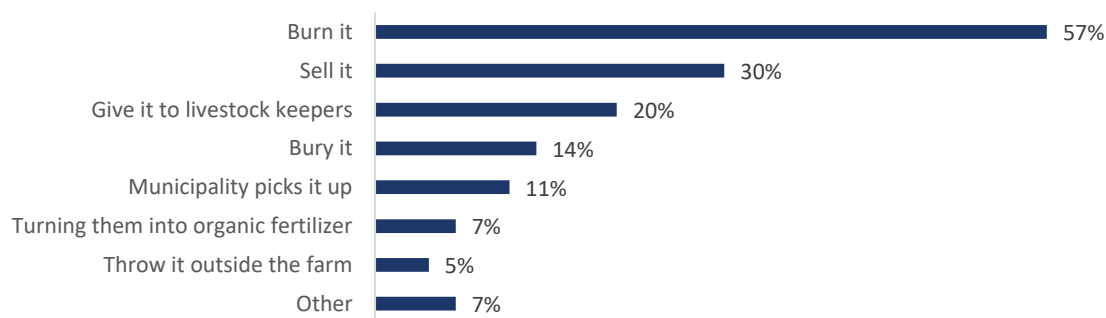


Figure 14 Agricultural waste disposal methods

The plastics section of the report will look at options to replace plastic, particularly much, with biobased materials. Biowaste is sometimes recovered, particularly pruning and yard waste, which is employed for fertilizing soil, occasionally after mixing it up with urea. 30% of farmers report to sell (or donate) the waste, particularly plastics, to scrap dealers, while 20% sell or donate biowaste to livestock keepers as feed.

¹⁰³ KII with Agricultural Engineer, 2019

¹⁰⁴ Ibid.

¹⁰⁵ KII with Local Farmers Marketplace, April 2021

RECOMMENDATIONS: Biological Cycles

Institutional and Policy Level

- 1) Capitalize on the existence of bio-waste treatment plants and cooking oil recovery actors by **incentivizing the separate collection of bio-waste as well as cooking oil** through campaigns for household level sorting. Thereby, supporting Jordan's National SWM Strategy's aim to reduce the amount of bio-waste landfilled by 75% by 2025.
- 2) Invest in research on identification of viable feedstock to replace technical materials, such as plants for producing energy or biobased materials to replace plastics.
- 3) Promote a **cultural shift towards regenerative agricultural models** through research and evidence-based pilots to showcase results.
- 4) **Governmental regulations** can provide **market incentives for regenerative agriculture**, such as certifications and labelling for regenerative produce, support access to global funding instruments (e.g. the Land Degradation Neutrality Fund), and direct financial support for farms implementing integrated farm management methods.

User and Consumer Level

- 1) **Disseminate information** among Jordanian households on the **negative impact of dumping cooking oil into sinks**, in parallel with the establishment of cooking oil collection schemes in the country.
- 2) **Improve market access** for farms implementing circular agricultural practices through linkage between farmers and marketing platforms to ensure economic sustainability of such farms while conducting **awareness raising campaigns among consumers on the benefits of organic and non-conventional agriculture**.

Private Sector Level

- 1) Support the **installation of small scale biodigesters in large farms** (possibly food processing companies as well) to recover produced organic waste and generate bioenergy for operations, as well as fertilizers for the crops.
- 2) Recover surplus production of Jordanian farms by **promoting food processing initiatives or providing refrigerated storage** to farmers. To create economies of scale, these initiatives could be established within cooperatives in order to serve multiple farms.
- 3) **Build the capacities of farmers** and provide **seed grants on integrated farm management practices**, such as seed saving, organic waste for composting, soil and water management, crops maintenance and pest control (e.g., through companion planting and crop rotation to reduce use of chemical pesticides).
- 4) **Support the costs of organic certifications** for farms to enable access to niche markets and increased revenues.
- 5) **Raise awareness** amongst farmers on the **benefits of quality compost** (and drawbacks of use of raw manure) to secure demand for this product and continued investments in composting plants in Jordan, as well as ensure **implementation of MoA regulations** on harmful agricultural practices (e.g., the use of raw manure on land).
- 6) Implement **greywater recycling systems for fodder and fruit crops** and disseminate information amongst farmers on the safety of greywater reuse for said cultivars.
- 7) Build the capacities of farmers to **recover yard and pruning waste** produced in farms **for compost and as mulch**.

8.2.3 Technical cycles

As mentioned above, technical materials are non-renewable, finite resources. ACTED included four technical materials' value chains in the assessment: plastics, paper, textiles and used tires. Within technical cycles, inner loops (see Figure 3, page 10) of reduction in extraction/use, reuse and repair/refurbishing are to be preferred to more resource intensive processes, such as recycling. This section will present opportunities for circularity per value chain. The last section will illustrate upcycling options, which are relevant across value chains and present similar challenges and opportunities for different materials.

8.2.3.1 Plastics

Plastic is the preferred material of choice for a variety of uses, generally because it is inexpensive, light, and durable. Globally, the use of plastics has increased by 20 times over the past 50 years, from 15 million tonnes in 1964 to 311 million tonnes in 2014¹⁰⁶. Plastics can be made of fossil-based, renewable and recycled sources, with the vast majority pertaining to the first category. Although fossil-based plastics are often considered a favourable material economically, the cost of plastics rarely reflects the true cost of their use when taking environmental and social dimensions into account. This is due to the use of crude oil and natural gas for the manufacturing of a variety of plastic materials, that can cause leakages of the materials in the environment that contaminate agricultural soils, rangelands, and marine ecosystems.

Jordan has a relatively large plastics manufacturing industry that contributes to its national economy and provides employment opportunities. There are 614 registered industries, with a steady rise of over 6.6% in the number of firms over the past 10 years¹⁰⁷; it is estimated to employ around 10,757 people with over 80% of them being Jordanians and almost 6% of this being women¹⁰⁷. With the introduction of a variety of Free Trade Agreements (FTAs), this sector is only set to increase in size. For example, the agreement with the EU with regards to the Relaxation of Rules of Origin includes plastics as a key sector¹⁰⁸.

However, the plastic value chain in Jordan is characteristically linear. Jordanian companies engaged in the assessment use from 60 to 100% of their total inputs from virgin plastics. While some plastics are designed to be reused, most of it is single use: in Jordan, around 13,750 tons of plastic bags are used per year¹⁰⁹, more than 20% of which are discarded into the environment¹¹⁰. At landfills, plastics is the third most recurrent material as reported by municipalities, representing from 7%¹¹¹ to 16%¹¹² of the country's total solid waste generation. The below calls for a strong urgency to improve circularity of plastics material

¹⁰⁶ Ellen McArthur Foundation (2016) *The New Plastics Economy. Rethinking the Future of Plastics*

¹⁰⁷ Jordan Chamber of Industry (2020). Plastic Sector Profile: Industry Overview. <https://www.jci.org.jo/Exportf/img/Plastic.pdf>

¹⁰⁸ Jordan Investment commission (2017). Sector profile: Industry. <https://www.jic.gov.jo/wp-content/uploads/2018/07/Sector-Profile-Industry-Final-Mar-2018-JIC-1.pdf>

¹⁰⁹ Saidan, M., Ansour, L.M., and Saidan, H. (2017) Management of Plastic Bags Waste: An assessment of scenarios in Jordan. *Journal of Chemical Technology and Metallurgy*, 52, 1, 2017, 148-154

¹¹⁰ Source UNEP: <http://www.info-rac.org/en/communication/news/wes-press-release-roadmap-to-reduce-use-of-single-use-plastics-in-jordan>

¹¹¹ ACTED's municipal survey, March 2021. Such data are based on estimations by municipalities.

¹¹² Aldayyat, E.A., Saidan, M.N., Abu Saleh, M.A., Hamdan, S. and Linton, C., 2019. Solid Waste Management in Jordan: Impacts and Analysis. *Journal of Chemical Technology and Metallurgy*. 54, 2, 2019, 454-462

flows in Jordan. This section of the report will explore current practices in the Jordanian plastics materials sector and opportunities to enhance circularity of such key value chain in the country.

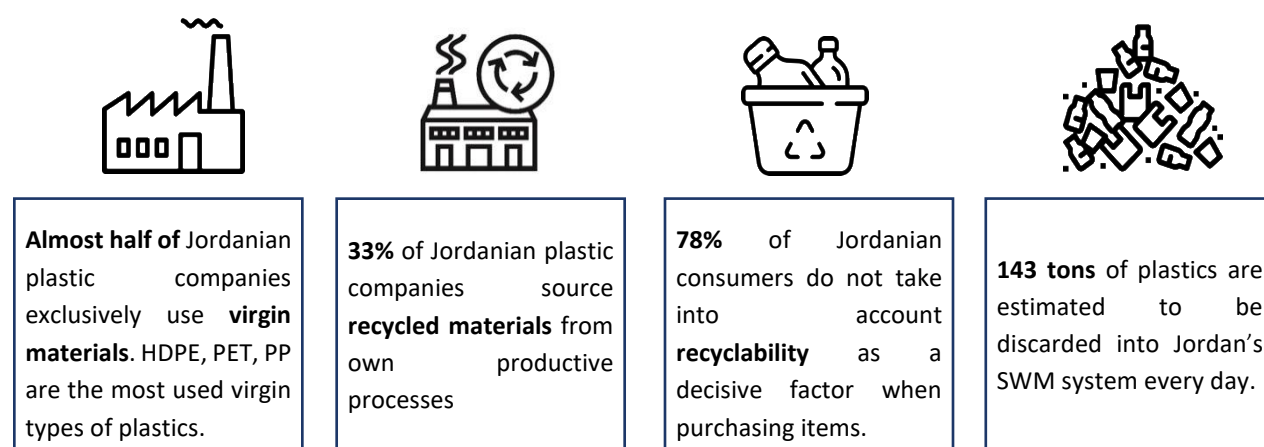


Figure 15 Overview of the plastics economy in Jordan: a linear model of production and consumption

8.2.3.1.1 Reducing resource extraction: bio-based plastics and reuse schemes

Eliminating unnecessary plastics is a key step into promoting circular economy approaches for plastics. This report considered regulatory and educational gaps in reduction of plastics both among upstream and downstream actors within the plastics value chains.

Among upstream actors, **companies can minimize production and therefore avoid inputting new plastics into the environment**, for example by minimizing the plastic content of packaging. However, given the relative importance and employment potential of this sector, regulation using fiscal and other incentives/penalties have to consider the economic impacts along with environmental impacts. Where reductions in production of plastics are not possible due to contextual barriers, one alternative that could offer both environmental and economic benefits is **investment in manufacture of alternative products – both reusable and bio-based plastics**.

Activities to promote plastic reuse and recycling are part of Jordan's National Solid Waste Management Strategy (2015 – 2024), including addressing legislative policies, investing in educational programs and raise public awareness. Reuse business models can prove a valid opportunity for at least 20% of all the plastic packaging globally¹¹³, with refill or return models¹¹⁴ such as:

- Refill at home, e.g. tablet detergents that should be mixed with water is kept by the users
- Refill on the go, e.g. beverages dispenser machines
- Return from home, e.g. reusable water gallon jugs that are returned by the users
- Return on the go, e.g. packaging for online retailers is returned

¹¹³ Ellen MacArthur Foundation, 2016, *Plastics and the Circular Economy*, last accessed 30 March 2021: <https://www.ellenmacarthurfoundation.org/explore/plastics-and-the-circular-economy>

¹¹⁴ Ellen MacArthur Foundation, New Plastics Economy, 2019, *Reuse. Rethinking packaging*.

Such models obviously need incentives for the users, such as **buy-back schemes or discounts on purchase for returns, or attractive packaging and designs for refill models**. The potential for reuse models in Jordan is promising when considering consumers' shown interest in such services. KIIs showed that consumers in Jordan, especially women and from mid-range market segments, are inclined to use bring-back schemes if such services are offered (61% of KIIs), mainly for environmental reasons followed by economical savings.

OXO PLASTICS

Oxo plastics have increasingly gained momentum globally as they can degrade faster than conventional plastics. However, evidence suggests that the duration of biodegradation for such plastics is not predictable at the moment, and no sufficient body of research is available to demonstrate its compliance with principles of circular economy such as designing out waste and pollution – oxo plastic fragments contribute to microplastics pollution particularly in oceans – and keeping products and materials in use – oxo plastics are not suitable for long term reuse (Source: New Plastics Economy Statement, Oxo-Degradable Plastic Packaging is not a Solution to Plastic Pollution, and does not fit in a Circular Economy). Indeed, the EU has already imposed a ban on such type of plastics due to such evidence (See directive EU 2019/904).

Some KIIs expressed hygiene related concerns, supporting the model only in case the plastics containers would be clean and sterilized.

An alternative to conventional fossil-based plastics, bio-based plastics are made from renewable materials – for example sugar cane processed into ethylene which is then used to make polyethylene. Products can also be manufactured partially using bio-based materials. Some such products can be fully composted at home, while others bio-degrade under industrial conditions. The use of such materials could create additional employment opportunities while reducing environmental impacts. New manufacturing technologies, such as **the introduction of biodegradable plastics**, are also advocated by MoEnv's National Strategy, for plastic bags in particular¹¹⁵. For instance, plastic mulch for agriculture could be replaced with natural and organic mulches (e.g., bark, leaves, wool, straw, manure) made from locally sourced materials, or biodegradable plastics, starch, and paper, and offer a cost-effective alternative which has economic and environmental gains. Despite this, its potential is currently unrealized in Jordan, likely linked to the lack of awareness of negative impact of improper disposal of mulch as well as lack of formal collection and disposal channels and absence of a manufacturer of biodegradable mulch in Jordan, as

well as studies that confirm its cost efficiency¹¹⁶. In addition, some pilots are already underway in Jordan. For example, a polymer produced by LG Chem that uses bio-materials (e.g. renewable waste oil and palm by-products) is currently used in Jordan to produce baby diapers¹¹⁷. The growth of such a nascent industry can be supported through governmental regulations, such as **bio-based plastic standards, improved labelling standards for plastics, fiscal and other incentives for companies using fully bio-based or bio-degradable materials and supporting existing plastic companies to transition into bio-based materials**.

¹¹⁵ Ministry of Environment (2016). *National Strategy and Action Plan for Sustainable Consumption and Production in Jordan. 2016 - 2025*

¹¹⁶ U.S. Environmental Protection Agency (US EPA), Battelle, and EcoPeace 2019. Effects of Plastics in Agriculture in the Jordan Valley: Utility, Impact, and Alternative Approaches. August 2019

¹¹⁷ See: <https://www.lgcorp.com/media/release/23687>

Indeed, some regulatory initiatives are already underway. The Jordan Standards and Metrology organization (JSMO) have introduced regulations such as JS EN 13432:2012 Packaging - Requirements for packaging recoverable through composting and biodegradation¹¹⁸; and JS 2004:2012 Packaging - Specifications for Oxo-biodegradable plastics and packaging¹¹⁹. Additional labelling regulations in addition to consumer and industry awareness campaigns for labelling literacy could also help expand this sector, as 20% of plastics companies are not aware of any standards for recycling plastics. For example, the EU has introduced bio-degradable plastic standards such as - Industrial composting; Home Composting; Bio-degradability in Soil; Bio-degradability in Marine Environments etc. which help consumers make informed choices and adopt appropriate disposal measures for such plastics. In order for innovative materials to contribute to reduced waste, appropriate management is required and poor management of the disposal of new materials (e.g. when landfilled or dumped) can have undesired consequences such as increased GHG emissions¹²⁰. For instance, in the case of biodegradable plastics, decomposition depends on a set of conditions usually obtained within industrial composters¹²¹, and in the absence of the required conditions the biodegradable plastic can fail to fully decompose.

Additional investments could also be made for reducing plastic use among downstream actors in the plastics value chain. **Rules and regulations implemented by local governments to improve solid waste management systems for plastics**, such as source separation, fees or bans on plastics, and designated disposal sites can also contribute to reduced plastic use and subsequent waste generation.

8.2.3.1.2 Plastics recycling

As mentioned previously, Jordan has a relatively large plastics industry which is both contributing to the plastics pollution, and can offer solutions for ensuring market viability of recycling.

Integrating recycled plastics into plastics manufacturing processes contributes to reducing the amount of virgin plastics that is extracted from the environment. In Jordan, **45% of the plastic product manufacturers** consulted as part of this assessment fabricate products that are made from **virgin raw material exclusively. Virgin plastic pellets are usually (80%) imported from one of the gulf countries** (e.g., Saudi Arabia, Qatar, Kuwait, or UAE), with the largest share being bought from Saudi Arabia. The remaining imports are from Asia (8%), North America (5%), the Middle East (5%), and Europe (3%) (more than one answer possible).

45% of Jordanian plastic industries only use **virgin plastics** raw materials

There exist seven different types of plastics, which require different, separated, and dedicated processing when recycled. Table 3 presents them and summarises key information related to each type in Jordan.








¹¹⁸ See: <http://www.jsmo.gov.jo/En/EServices/Standards/Pages/stdDetails.aspx?mfn=5100>

¹¹⁹ Ibid.

¹²⁰ The World Bank, 2018. What a waste 2.0 – A Global Snapshot of Solid Waste Management to 2050

¹²¹ Ellen McArthur Foundation (2016) *The New Plastics Economy. Rethinking the Future of Plastics*

Table 3 Types of plastics, applications, and recycling statuses. Source: Green Building Council, 2016. Your guide to Waste Management in Jordan. Waste Sorting Informative Booklet.

Code	Plastic type name	Recycling status and common applications
	Polyethylene Terephthalate	A readily recyclable material in most of Jordan, except for in Mafraq and Irbid where a market gap is the case. Common in plastic bottles (e.g., water, shampoo, and soda bottles), and peanut butter jars.
	High Density Polyethylene	Recyclable in some areas in Jordan. Found in plastic jugs (e.g. milk or juice), bottles for laundry detergent and grocery bags.
	Polyvinyl Chloride (i.e. Vinyl)	Found in clear food containers (e.g. bottles for cooking oil) and blister film for product packaging.
	Low density Polyethylene	Currently recovered to be recycled to minor extent when compared to other plastics in Jordan. Includes a variety of film products such as frozen food packaging, trash and grocery bags, and squeezable bottles (mustard, honey).
	Polypropylene	Includes many food packaging (e.g. yogurt containers and margarine tubs) and also found in cereal box liners and rope.
	Polystyrene	Limited recycling in Jordan due to low valuation and weight-to-volume ration. In foam applications (sometimes referred to as EPA, or expanded polystyrene) such as Styrofoam coffee cups and food trays, also in some yogurt tubs and plastic cutlery.
	Other	Plastics that use some of the six outlined plastic types in combination, can also be refer to collection of individual resins as mixed plastics. While it is possible with dedicated technology to make use out of mixed plastics, still plastics are generally more valuable when separated in respective resin types.

Plastic manufacturers in Jordan use PP (48%), HDPE (45%), PET (38%) and LDPE (32%). PVC and PS are reported to be used less (8% respectively) and other plastic materials (e.g. cast acrylic sheets) are also used (10%). Most common types incorporating recyclates include PS, LDPE, PET, PP. As shown in the chart below, there is considerable overlap between the type of plastics that Jordanian factories already use, and the types of recycled plastics already used in Jordan. Given this, there are opportunities to invest in strengthening the recycling value chain for of specific types of plastics such as PP which have the highest manufacturing demand in Jordan, while also having an established history of recycling in the country.

According to plastic industry stakeholders **the average price for one ton of raw virgin plastic material is 1,529 JOD, which is about four times as much as the average price of one tone of recycled plastic material (350 JOD)**. The price volatility of plastics, by virtue of virgin plastics dependency on crude oil, has

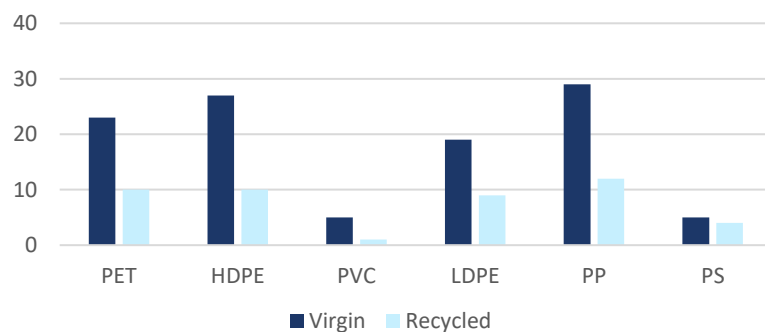


Figure 16 Number of companies reporting using virgin vs recycled plastics materials, by plastic type. Source: ACTED's quantitative survey with plastic companies

contributed to fluctuation in the incorporation of recycled plastics in plastic manufacturing in Jordan. Essentially, when the price of oil is stable, the price of recycled plastics is more affordable than virgin plastics, allowing for higher incorporation of recyclates¹²². Additionally, plastic is a non-perishable item which allows for bulk purchase when prices are

low and storage over a longer period of time, which can protect against price volatilities.

Currently, **54% of the Jordanian manufacturers for industrial plastic products and 32% of manufacturers for consumer plastic products use recycled plastics** to some extent in their production processes. However, obstacles persist for plastic companies that wish to incorporate recyclates in their production (see Figure 17). First, the reprocessing of plastics to produce pellets would require energy investments by most plastic companies engaged in the assessment, as **47% of Jordanian plastic industries said that the incorporation of more recycle in their final products would increase their energy consumption**. However, processing recycled plastics actually entails a lower energy consumption than extracting the virgin material. A study focusing on PET and HDPE showed that mechanically recycled PET flake can contribute to greenhouse gas emission saving between 25% to 75% (depending on allocation method and system boundaries) when compared to that of resin made of virgin PET flake¹²³. The reason behind perception of increased energy consumption linked to incorporation of recycled plastics could be the fact that virgin plastic is normally imported in the form of pellets, thus externalizing the cost of energy to countries abroad that produce such pellets. However, for local recycling, the industries would be required to pay in country for the reprocessing of recyclates to produce pellets which could add to their costs. Further research is needed to indicate whether there is a knowledge or technology gap among plastic companies in Jordan and understand how to promote greater incorporation of recycled plastics in the industry.

Another constraint is quality: while **most plastics companies (45%) consider the quality of plastics recyclates available in Jordan as average, 22% consider it to be bad or very bad**¹²⁴, mentioning that recyclates are chemically or mechanically contaminated. Plastic waste can contain additives, dyes or mixed plastics that make them difficult to recycle. Some countries, such as in the EU, have attempted to improve the recyclability of products through regulating the additives and dyes that may be used in this industry. For example, certain additives such as fire retardants, or dyes used to give plastics their distinctive colours may be impossible to remove. For example, Jordanian MoEnv's bylaw No. 45 of 2017

¹²² UNDP (2015) *Overview of waste value chains in Irbid and Mafraq, including opportunities and barriers*

¹²³ Bataineh, K.M., 2020. Life-Cycle Assessment of Recycling Postconsumer High-Density Polyethylene and Polyethylene Terephthalate. Hindawi – Advances in Civil Engineering.

¹²⁴ ACTED's quantitative assessment with plastic companies, April 2021

prohibits the use and production of all black plastic bags, except black bags used for waste collection and agriculture. It also requires manufacturers to indicate with a symbol that bags are biodegradable under 50 microns of thickness. Plastic bags in the market need to have obtained the approval of the Environment Ministry and other official entities related to plastic bag recycling¹²⁵. The rationale behind this regulation is linked to the prohibition of use of recycled plastics for food grade products by the Jordan's Food and Drug Administration (JFDA), as black bags normally include a high percentage of recycled materials, with the black dye used to cover the impurities.¹²⁶ While such regulations guarantee the health and safety of plastics for consumers, they could be expanded to limit the use of additives and dyes that make plastic recycling difficult.

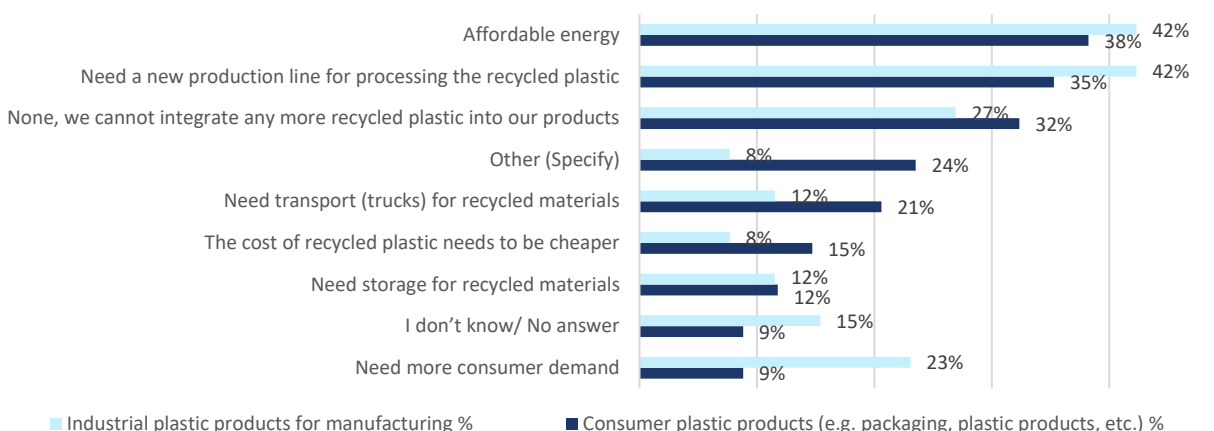


Figure 17 Type of support needed by Jordanian plastics companies to incorporate additional recyclates into production

In addition, **60% of plastic industries say that the quality of their final products is reduced when recycled plastic is incorporated**. 63% of manufacturers engaged in the assessment do not know if it is technologically possible to mitigate this quality reduction, while only 25% assure that it is possible, and 12% mention that it is not possible. Therefore, not all factories are willing to mix in shredded plastics into their existing production lines, or mainly use industrial wastes with low levels of contamination. Food grade plastics materials cannot incorporate recycled plastics unless it is pre-consumer industrial waste.¹²⁷ Just as for post-consumer recovery of other materials, **the quality of recycled plastics depends on a well-managed waste stream, specifically by washing and appropriate sorting of the plastic**¹²⁸. In Jordan the absence of an effective system to segregate plastics at source causes contamination, introducing additional costs for the recycling process and posing a main limiting factor to plastic recovery. Local recyclers are more interested in acquiring pre-sorted waste from factories than plastic recovered at

¹²⁵ Weldali, M. (2020), "Environment Ministry tightens enforcement of biodegradable plastic bag regulations", see <https://www.jordantimes.com/news/local/environment-ministry-tightens-enforcement-biodegradable-plastic-bag-regulations> (last accessed 19 August 2021)

¹²⁶ KII with Ministry of Environment, August 2021

¹²⁷ ACTED's quantitative assessment with plastic companies, April 2021

¹²⁸ Bataineh, K.M., 2020. Life-Cycle Assessment of Recycling Postconsumer High-Density Polyethylene and Polyethylene Terephthalate. Hindawi – Advances in Civil Engineering.

dumpsites¹²⁹. One key reason for such sorting issues could include lack of proper labelling. The plastic industry identifies seven types of plastics coded in a number format from 1 to 7. The indication of the type of plastic is commonly found on the bottom of plastic containers inside a three-arrowed recycling symbol¹³⁰. Based on the plastic resin type, the plastics' recycling process is different, therefore requiring methodical sorting. In addition, the dyes used to colour plastics introduce an additional sorting variable for plastics of the same resin¹³¹. In Jordan, while 65% of the plastic manufacturers report that all of their products are recyclable, 39% of them do not report this in the product label.

Lastly, as confirmed by consumer surveys (see section 8.2.1), **70% of plastic industries** shared the perception that **consumers are not aware or care about products that contain recycled plastic**, and indeed 76% do not label their products as containing recycled plastics. **In contrast, 60% said that investors do.** Awareness campaigns amongst Jordanian consumers can support creating demand for recycled plastic products, while investors demand already provides an incentive to the plastics recycling industry in Jordan.

There are 3 types of plastics recycling processes for plastics: chemical, mechanical and energy recycling. In Jordan, **most recycling lines identified for plastics by this study used mechanical recycling processes**, while a minority uses chemical recycling. Mechanical recycling required shredding of clean plastics using grinding machines. In Jordan, ACTED's study confirmed that plastics (alongside with paper which displays equal frequency) are the materials **most commonly collected and processed by Jordanian sorting centres**¹³² as it was found to be processed by all centres. As opposed to some other materials such as metals which are often collected and re-sold without processing, all centres also confirmed their ability to process plastics themselves (which usually consists in mechanical processing, i.e., sorting, shredding and then compacting it into bales). The next key step in recycling plastics is to reprocess them to produce pellets through agglutination (clumping together of the plastics to form clusters), extrusion (melting the plastics, mixing them to have a uniform profile, and then forcing them into a die to give it a shape) and then cooling. These plastic pellets are generally mixed with virgin plastic, likely also imported in the form of pellets, to make final products. **However, this study identified only limited investment in Jordan in this key step for reprocessing of plastic as a separate value-chain.** Some plastic industries in Jordan already use extrusion moulding to create their end products. As a result, the shredded plastics are simply integrated into the same production lines. **This only works if the shredded plastics have uniform composition, for example on types of dyes, additives etc.** While this reduces need for investments in additional machinery, and more importantly additional energy given the energy intensive nature of this step, it also has major limitations. One of the key limitations is that the factory will have to have a high level of confidence in the quality of the input plastics (it needs to be not contaminated and of the same type) to ensure no damage occurs to their machines and the quality of the final products is not affected. Given that the previous step in the recycling process (namely sorting and shredding) is done outside the

¹²⁹ UNDP Jordan, 2015. Solid Waste Value Chain Analysis, Irbid and Mafraq – Jordan. Final Report, June 2015.

¹³⁰ Ibid

¹³¹ U.S. Environmental Protection Agency (US EPA), Battelle, and EcoPeace 2019. Effects of Plastics in Agriculture in the Jordan Valley: Utility, Impact, and Alternative Approaches. August 2019

¹³² ACTED KII with sorting centres (2021)

factories with little regulations or penalties for contamination levels etc, the confidence in such products is likely to be greatly reduced.

Such obstacles among upstream actors in the plastic value chains, then affect the viability and ability of downstream actors from participating in effective recycling. For example, **without proper labelling of plastics at manufacturing stage, it will be impossible for actors such as municipal sorting facilities to sort waste effectively.** One way to overcome this is through improvements in technology. As majority of the sorting is done manually based on visual inspection which requires a large workforce and skills and does involve a probability of human error. Improved sorting could in turn result in higher quality of recovered plastics, increased profits for the sorting centres / actors, and more incentives for the industry to use recycled plastics as input. For example, infra-red sorting could increase purity levels to over 95% in most plastics.

Although only 30% of the assessed stakeholders indicated the use of recyclates in their manufacturing process, this presents a unique opportunity to scale up on lessons learnt and best practices in the country. Of those stakeholders that incorporated recyclates, **80% source them from own company**, while 20% source it locally, and 8% internationally (specifically Saudi Arabia, Kuwait, or Turkey). Most of the recyclates are from post-industrial recycled plastics, and some from post-consumer recycled plastics. Post industrial waste, including waste from own industry is preferred due to cheaper costs as well as a guarantee of higher quality of the plastics incorporated in the productive processes as mentioned in sections above.

In summary, while a number of investments have been made in Jordan for regulating downstream collection and sorting, there needs to be much higher level of investment upstream in order to improve plastics recycling in country and reduce the amount of leakages into the environment. Such upstream investments also effectively would shift the burden from consumers to producers of the plastics, thus aligning with the '*polluter pays principles*' that already guides the national strategies of the government as mentioned in previous sections.

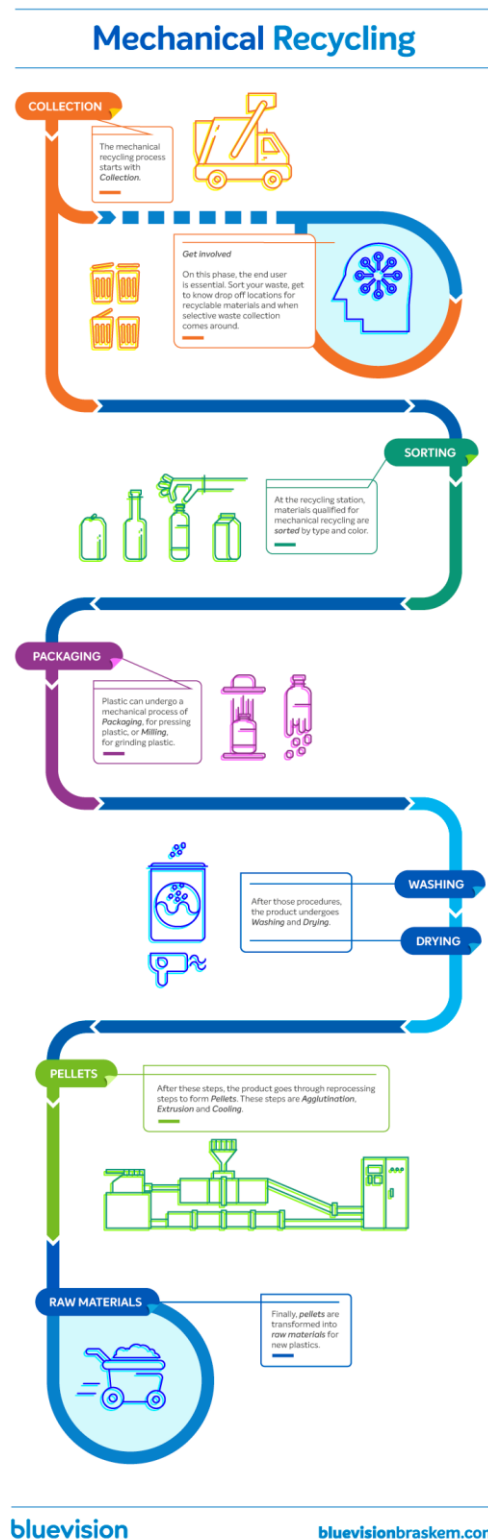


Figure 18 The process of mechanical recycling of plastics. Source: Bluevision.

RECOMMENDATIONS: Plastics

Institutional and Policy Level

- 1) **Reuse and refill schemes** can provide a viable alternative to the production of single use plastic (in line with the CSR and EPR strategies) accompanied by **incentives for customers** to promote such practices.
- 2) Improve **labelling standards for plastics**, including stricter regulations on differentiating between types of plastics and eco-labelling.
- 3) Introduce regulations to **prevent the use of additives and dyes** that limit/prevent plastics recyclability.
- 4) Establishing a **national marketplace for trading post-consumer waste**, which is publicly regulated and overseen, to improve price transparency and ensure regulations are enforced (e.g. max. allowable contamination standards).
- 5) Several investments can be made to **improve the reverse logistics of post-consumer and post-industrial waste collection / recycling**, to make the cost of recyclates more competitive. This includes more **efficient transport logistics** over pre-determined service areas to reduce costs for municipalities and other waste recovery actors.
- 6) **Fiscal and other incentives/penalties** can be provided to promote inclusion of **recycled over virgin plastics**, particularly for types of plastics whose incorporation entails higher costs or specific technology (e.g. PET).

Private Sector Level

- 1) While reducing plastics production would disrupt the Jordanian plastics industry economy and affect related livelihoods, **investing in sustainable alternatives such as bio-based plastics** can provide both an environmental and economically viable solution. Prioritizing research and development is also crucial to identify suitable bio-feedstock that can be produced in country.
- 2) In plastics sorting centres, **technologies such as infra-red** can provide a solution to mitigate against contamination and consequent quality defects of post-consumer recycled plastics
- 3) **Investments in local HDPE, PP and PET recycling structures** could contribute to increased availability and affordability of recycled raw materials processed in country, as they are commonly used in their virgin form.
- 4) In order to support manufacturing actors in Jordan to incorporate more recycled plastics into their production processes, **affordable energy, improved machinery, dedicated production lines and storage availability** are some of the immediate investments that could be promoted.
- 5) Establishing **robust and affordable testing facilities** would allow industries to test the quality and strength of products incorporating recyclates.

User and Consumer Level

- 1) Plastic reuse can be promoted amongst consumers in Jordan through buy-back schemes or discounts on purchase for returns, as well as attractive packaging and designs for refill models.
- 2) In an effort to improve quality of post-consumer plastics', initiatives to **sort post-consumer plastics at household level** should be accompanied by **awareness campaigns on proper sorting and cleaning materials before disposal**.
- 3) Investments should be made in consumer **awareness campaigns to create demand for recycled products**, awareness on **the importance of recycling** and against the use of single use plastics, as well as on **label literacy**.

8.2.3.2 Paper

The paper industry is a solid sector globally, noticeably, its prominence has remained undeterred by technological innovations and growth in usage of online means of communication (e.g., computers, mobiles, and e-readers). On the contrary, paper consumption worldwide has increased by 400% over the past 40 years¹³³. The paper industry in Jordan operates effectively with a well-developed manufacturing cluster for paper-product derivatives, including paper bags, paper cups, hygienic paper (napkins, toilet paper), and packaging. 235 paper companies currently operate in the country, employing 8,894 workers with a total capital of 158.8 million JOD; although the sector is registering a slight decline¹³⁴, it still constitutes a key sector within the economy. In addition, within municipal solid waste, **paper constitutes 14% of the total waste generated¹³⁵ and 2% of the industrial sectors' non-hazardous waste composition.** For the latter, the percentage equates to 208 tons per month¹³⁶.

The main raw material needed to produce paper is cellulose, an organic compound extracted primarily from plants (e.g. trees) or waste paper. In Jordan, the limited availability of timber resources and sufficient agricultural residue (e.g. straw) suitable for paper pulp production makes waste paper the main source of raw material for manufacturing cardboard¹³⁷. Although the virgin materials needed to produce paper (i.e. timber and water) are renewable resources, since they are both highly recyclable (e.g. cellulose fibres can be recycled up to seven times before the fibres are worn out) and easily degradable in nature, the production process of paper still requires a substantial amount of energy, water, and a combination of chemicals to achieve desired paper quality and property¹³⁸. In addition, renewable resources should be used responsibly at a pace that allows for reforestation of consumed wood. Currently, the paper industry uses 40% of the total industrial wood traded globally¹³⁹. This linear economy model in the paper industry reinforces deforestation, extensive water consumption, and wastewater generation, leaving landfills as a common end-of-use destination for paper products. In Jordan, the National Municipal Solid Waste Management Strategy 2015-34 highlights paper as one of the key waste streams to include into waste sorting at source programmes, to keep recyclables from landfills¹⁴⁰.

Research on enhancing circularity in the paper value chain show substantial potential for economic revenue viability, improved resource use efficiency, and reduction in waste generation. For example,

¹³³ Ozola, Z., Vesere, R., Kalnins, S. & Blumberga, D., 2019. Paper Waste Recycling. Circular Economy Aspects. *Environmental and Climate Technologies*. 23. 260-273. 10.2478/rtuct-2019-0094.

¹³⁴ Jordan Chamber of Industry, see: <https://www.jci.org.jo/Chamber/Sector/80071/التغليف-التعبئة-صناعات-قطاع> (last accessed 16 August 2021)

¹³⁵ Jordan Green Building Council, 2016. Your guide to waste management in Jordan – Waste sorting informative booklet.

¹³⁶ Saidan, M.N., 2019. Cross-sectional survey of non-hazardous waste composition and quantities in industrial sector and potential recycling in Jordan. *Environmental Nanotechnology, Monitoring & Management* 12 (2019) 100227

¹³⁷ Abbasi, G.Y. & Abbassi, B.E. 2004. Environmental assessment for paper and cardboard industry in Jordan – a cleaner production concept. *Journal of cleaner production*, vol. 12 (4), pp. 321-326 Elsevier Ltd.

¹³⁸ Ozola, Z., Vesere, R., Kalnins, S. & Blumberga, D., (2019). Paper Waste Recycling. Circular Economy Aspects. *Environmental and Climate Technologies*. 23. 260-273. 10.2478/rtuct-2019-0094.

¹³⁹ WWF, see: <https://www.worldwildlife.org/industries/pulp-and-paper>

¹⁴⁰ Ministry of Municipal Affairs, Cities and Villages Development Bank, LDK, Mostaqbal (2015). *Report on the Implementation Arrangements for the Recommended MSWM Strategy in the Hashemite Kingdom of Jordan (3rd draft report)*

recycling paper is reported to contribute to reduced aerial emissions, specifically carbon dioxide (CO₂), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), and water pollution by abated contamination levels (e.g., from chlorine compounds and other chemicals)¹⁴¹.

8.2.3.2.1 Manufacturing of paper products: improving circularity of a linear model

Reducing dependency on virgin resources is an imperative dimension for greater circularity, particularly for the paper industry which is a major contributor to the global economy but is strained by substantial initial investment yet low profit margins. In Jordan, paper cellulose, carton, kraft paper is imported from

DEINKING

It is the chemical process of removing ink or toner from a printed product, restoring the paper to its unprinted appearance. Degrees of deinkability can vary greatly depending on ink type, paper type and processing conditions. For example, water-soluble inks may discolour or darken the recovered pulp fibres, thus reducing the quality of final recycled paper.

outside of the country (mainly China, the Gulf, and the EU) to be processed into paper products of different kinds. While upstream actors are mostly based abroad, most actions to improve circularity should be focused downstream.

The usage of oil-based inks that cannot be easily removed is a key limitation for paper recycling actors and affects the quality of the final recycled output. While ACTED could not identify the existence of deinking regulations in Jordan, **implementation of standards and regulations related to deinkability grades** can greatly support the recycling industry at the paper product design stage.

Another key limitation to processing paper is its water intensive processes, which constrains this industry in one of the most water scarce countries in the world. In terms of **reuse at the manufacturing stage**, the process to produce paper generates a large volume of still usable **wastewater** that represents a lost opportunity because it is usually disposed of. In Jordan, a research study published in 2004 conducted a waste audit for the Jordan Paper and Cardboard Factory (JPCF) which showed that the greatest economic advantages in terms of water, energy, and fuel savings can be achieved through onsite reuse of wastewater and technological investments¹⁴². A recent study found that the water and mineral load, when captured from the wastewater (WW) sludge, can be reintroduced into the production system, thus confirming the benefits of greater circularity of wastewater in the paper industry¹⁴³. A main challenge in the implementation of WW recycling in the paper industry is technology, since WW from paper operation is contaminated with toxic pollutants, treatment of water is done by removing larger particles followed by flocculation (i.e., sedimentation of suspended particles in the form of a floc), this is normally performed

¹⁴¹ Ozola, Z., Vesere, R., Kalnins, S. & Blumberga, D., 2019. Paper Waste Recycling. Circular Economy Aspects. *Environmental and Climate Technologies*. 23. 260-273. 10.2478/rtuct-2019-0094.

¹⁴² Abbasi, G.Y. & Abbasi, B.E., 2004. Environmental assessment for paper and cardboard industry in Jordan – a cleaner production concept. *Journal of cleaner production*, vol. 12 (4), pp. 321-326 Elsevier Ltd.

¹⁴³ Molina-Sánchez, E., Leyva-Díaz, J.C., Cortés-García, F.J., & Molina-Moreno, V., 2018. Proposal of Sustainability Indicators for the Waste Management from the Paper Industry within the Circular Economy Model. *Water* 2018, 10, 1014. <https://doi.org/10.3390/w10081014>

through electrocoagulation or through flocculants¹⁴⁴. At this stage, the water may be good for safe disposal according to the Jordan Standard 202:2004¹⁴⁵, but not necessarily good for reuse within productive systems, which requires (pricy) technologies to further treat water up to the quality standards for production.

Further down the value chain, consumer behavioural change can also improve circularity. For example, digital technology can support reducing paper waste while simultaneously optimizing information storage, security, and communication efficiency. Investing in alternatives, both in relation to consumption and production practices, can also have a considerable impact on reducing paper waste. Changes in lifestyle habits such as **replacing single use paper products for more durable alternatives** (e.g., cloth towels instead of kitchen paper to wipe surfaces) can have a great impact when implemented widely on a large scale. In this respect, considerable efforts have to be spent on **raising awareness of Jordanian consumers, as only 20% of them declare avoiding purchasing single use items**¹⁴⁶.

Similarly, **advancements in technology** can support innovations to build **reuse systems within the paper value chain**. For instance, a new technology offered by an Israeli company combines advanced materials and laser deinking which creates a reusable copier paper system. Both economic and environmental benefits are noteworthy, since the technology allows users to reuse paper up to 10 times, office expenses are reduced by 50% while carbon emissions and paper waste are decreased by over 90%¹⁴⁷.

8.2.3.2.2 Paper recycling

Paper manufacturing companies largely prefer virgin materials, which mainly come from China, Germany, Saudi Arabia, UAE, USA, and Italy. Importing of scrap or recycled paper is common (usually from Saudi Arabia, but even USA and Europe); most of it is imported readymade and not recycled in country. In 2018, Jordan imported 206 tons of pulp of fibres derived from recovered waste and scrap paper, from Saudi Arabia (137 tons, 32% of imports value) and USA (20 tons imported in 2018, representing 31% of import values due to the higher cost of imports from the USA)¹⁴⁸.

More than half of the paper companies interviewed by ACTED do not use any recycled paper material. **Companies find paper products made from recycled paper material less appealing due to a lower final quality (e.g. reduced durability and strength) and decreased visual appeal (e.g. colour and impurities)**. While 18% of consumers generally prefer to buy virgin paper products, when it comes to hygiene paper products (e.g. tissues, toilet paper) the proportion increases to 46%, due to perceived lack of hygiene (90%), and lower quality (22%).

Incorporating recycled pulp is 20% more expensive than working with virgin pulp.

KII with Jordanian paper company, April 2021

¹⁴⁴ Genesis Water Technologies: <https://genesiswatertech.com/blog-post/pulp-and-paper-wastewater-treatment-innovative-treatment-for-efficient-water-management/>

¹⁴⁵ See: <http://www.ismo.gov.jo/En/EServices/Standards/Pages/stdDetails.aspx?mfn=2143>

¹⁴⁶ ACTED's consumer preference survey, May 2021

¹⁴⁷ Solar Impulse Foundation, 2021. Reusable Paper System. Available at: <<https://solarimpulse.com/efficient-solutions/reusable-paper-system>>

¹⁴⁸ International Trade Center Trade Statistics, <https://www.trademap.org/Index.aspx>

In addition, since there is no national legal requirement or formal scheme to incentivize companies to incorporate more recycled material in the manufacturing of products, there is a lack of stimulus for greater circularity in the paper value chain in Jordan. Indeed, the industry environment does not make paper recycling in Jordan a financially viable business model. According to a company producing industrial paper products for manufacturing (e.g. rolls of paper) in Jordan, incorporating recycled paper materials is 20% more expensive than using virgin raw material.

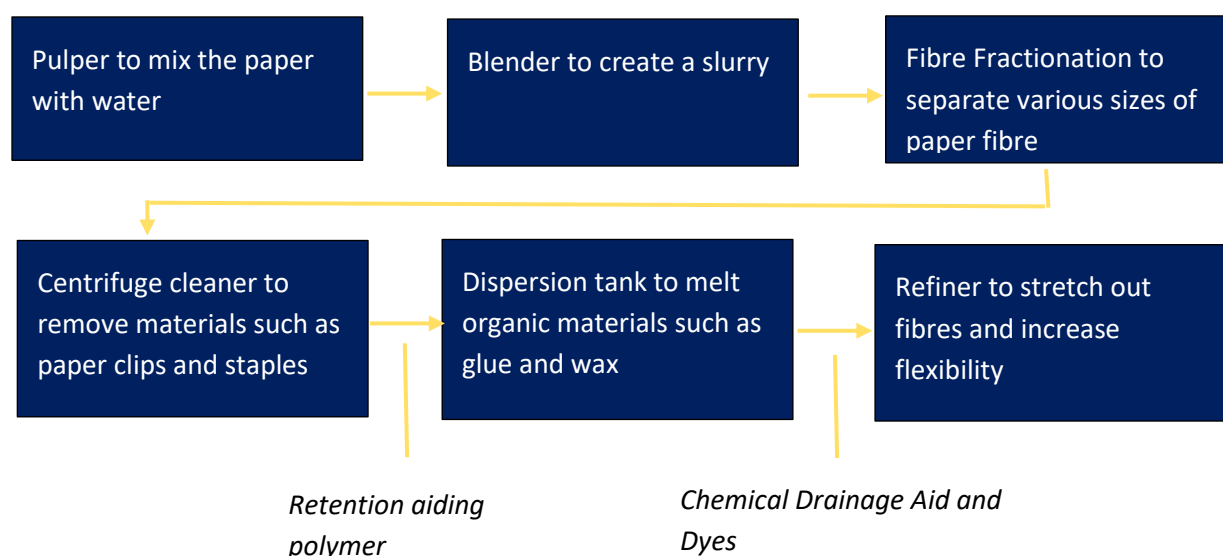


Figure 19 Process and equipment needed to recycle paper.

While paper recycling was an active sector in Jordan in the 1990s, following the increase in fuel prices, this industry migrated to neighbouring countries like Saudi Arabia and Egypt¹⁴⁹. Currently, a few paper companies recover their own waste and recycle it to re-incorporate it as part of their production; however, this is a relatively small proportion (9%). **Most paper industries report to sell their paper waste to recovery actors who then export it for recycling**, mainly in the UAE, India, and Saudi Arabia¹⁵⁰. In addition to paper companies reusing industrial waste. ACTED could identify only one currently active paper recycling company that processes paper (all types except for coated paper) into egg carton boxes, which are sold within Jordan at a competitive price compared to imported egg boxes. However, the company is struggling with **financial sustainability due to the high cost of paper supplied by scrap dealers**. In fact, paper waste exporters can offer a much more competitive price to paper scrap dealers or sorting centres compared to the local recycling companies. As a result, most paper waste recovered in country is shipped abroad. The case with municipal waste tenders is exemplary in this respect. As mentioned in section 8.1, municipalities sell their recovered waste through a tender where price is the main criteria for selection, which makes it difficult for local recycling facilities that already struggle with high operational costs, to

¹⁴⁹ ACTED's KII with Recycling Company, May 2021

¹⁵⁰ Source: TradeMap Statistics, 2019:

https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c400%7c%7c%7c%7c4707%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1

compete. Giving preference to local recyclers in municipal tenders could offer opportunities to shorten the loop of the paper waste stream, by recycling in country rather than exporting waste. Additionally, the fluctuation in the price of paper is a risk for the industry: in Jordan, the cost of paper scrap increased from 35 JOD per tonne in 2015 to up to 120 in 2021.¹⁵¹

For example, a sorting and recycling facility established in Irbid by JOECO, a consulting firm partnered with the EU, processes paper waste. In 2019, the facility purchased paper waste from the Greater Irbid Municipality (GIM) sorting facility located close to it in order to process newspaper and white paper into cellulose insulation materials. Those were mainly exported to the Gulf, which has an established market for recycled cellulose. One of the key constraints they identified was lack of proper sorting at source which leads to contamination of the waste. **Investing in structures to enhance sorting efficiency is a proven means of addressing issues of quality in paper products that incorporate paper waste**, because the lack of sorting mechanisms results in different paper grades being incorporated, thus reducing the quality of the final product.

Sorting at household level in particular is not yet prevalent in Jordan as there lacks an established segregated waste collection mechanism. Only 13% of consumers report to segregate paper, and while 78% of interviewed Jordanian paper companies KIs offer products that are fully recyclable, yet 52% do not have a label on the product that says that the product is recyclable.

¹⁵¹ ACTED's KII with Recycling Company, May 2021

RECOMMENDATIONS: Paper

Institutional and Policy Level

- 1) Implementation of **national regulatory standards of deinkability** of paper products as well as **maximum allowed contamination level**, can enhance recovery of such waste streams, while reducing costs of processing for paper recycling companies.
- 2) **Optimizing mechanisms for paper waste recovery**, at both post-industrial and post-consumer level, such as the **establishment of waste disposal service areas** to reduce reverse logistics costs, would support waste recovery for both export and in country processing
- 3) To support the local recovery of paper waste, which is currently mostly exported, **incentives and support** should be provided to **local recovery actors**. Crucially, **preferential mechanisms for the sale of paper waste** through municipal tenders to local facilities, should be implemented.

Private Sector Level

- 1) Support paper industries and recycling companies to enhance resource efficiency by **reducing energy and water consumption** through e.g. **biogas-generated energy** and technologies for onsite **wastewater reuse**. These initiatives would both reduce these industries' carbon footprint and make their products more competitive.
- 2) Support **B2B models of exchange** between paper manufacturers, generating high quality industrial paper waste and paper recycling facilities in country.

User and Consumer Level

- 1) Building consumers' **awareness on the safety and hygiene of recycled paper products** to stimulate demand for such products is crucial to support recycling initiatives.
- 2) Support national efforts to implement **household level sorting of paper by engaging users in campaigns** for appropriate sorting at source, which would also mitigate against quality issues with recycled paper products linked to waste contamination.

8.2.3.3 Textiles

The textile and clothing industry are significant contributors to national economies globally. Textile fibres are either natural (e.g. cotton) or manufactured (e.g. polyester). The condition and type of textile fibre, the production process, and thus environmental impact, is characterised by a diverse set of dependencies. Despite a recent growth in consensus among consumers and producers alike around the need for greater sustainability in the apparel economy, the debate on what type of fibre offers the greatest potential in terms of eco-efficiency has not been agreed¹⁵².

Nowadays, the production, consumption and disposal of textiles and clothes is largely linear. An increasingly competitive market (both in terms of supplying actors and consumer demand), results in the continuous extraction of raw material to produce fabrics. These dynamics deepen the already extensive pressure on natural resources, pollute the environment, and perpetuate systematic exploitation of people¹⁵³. In effect, the industry is contributing to negative social and environmental impact that could be mitigated. Globally, every second the equivalent of one garbage truck of textiles is landfilled or burned.¹⁵⁴

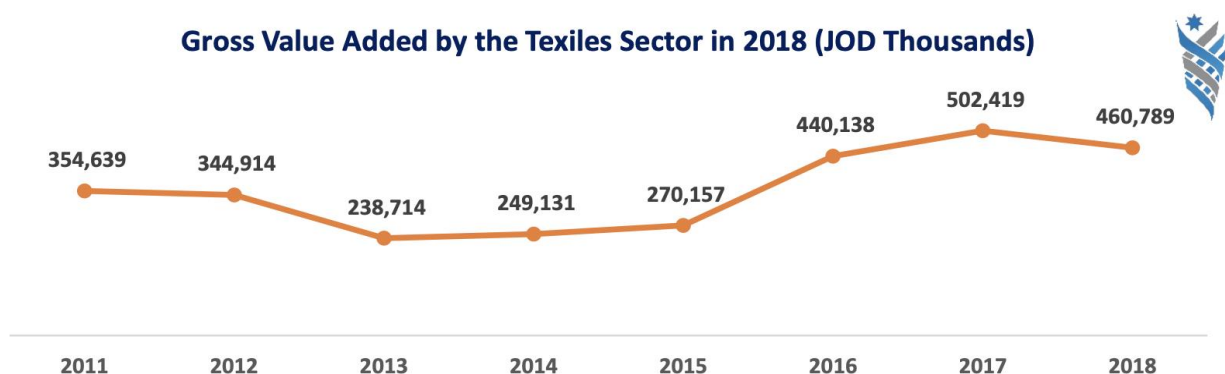


Figure 20 Gross Value Added by Jordan's Textiles Sector in 2018. Source: Jordan Strategy Forum, 2021

Before the 2000s, Jordan did not have a significant apparel and textile industry. Today, the fabric industry is a key economic sector with a high volume of exports, particularly as **the country is now one of the top twenty suppliers of garment to the United States** (largely as a result of a preferential trade agreement signed in 1996)¹⁵⁵. One of the key textile industrial areas is the al-Hassan Industrial Zone (Irbid governorate), established as a Qualifying Industrial Zone¹⁵⁶ in 1998 and employs 17,000 garment factory workers¹⁵⁷. The zone produces 40 tons of textile waste daily, which is reportedly poorly managed: with illegal burning being frequently employed to get rid of such waste¹⁵⁸.

¹⁵² Ütebay B, Çelik, P and Çay, A, 2020. Textile Wastes: Status and Perspectives. Chapter in Waste in Textile and Leather Sectors. DOI: <http://dx.doi.org/10.5772/intechopen.92234>

¹⁵³ Ibid

¹⁵⁴ Ellen Mac Arthur Foundation, <https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy>

¹⁵⁵ European Bank for Reconstruction and Development (EBRD) 2020. Global Value Chain Diagnostic – Case Study. Apparel – Made in Jordan.

¹⁵⁶ Qualifying Industrial Zones are industrial areas that benefit from tax free export to the US.

¹⁵⁷ ILO, 2015, https://www.ilo.org/dyn/migpractice/migmain.showPractice?p_lang=en&p_practice_id=100

¹⁵⁸ ACTED's validation workshop, 18 August 2021

Fabric waste constitutes 4.3% of solid waste composition in Jordan,¹⁵⁹ the largest share derives from **garment industries located in the Free Trade Areas (FTAs)**¹⁶⁰. For instance, synthetic cloth textile waste that is at least 10x10 cm in size, is usually sorted at source and then exported to Asia to be processed. The remaining scraps are discarded and end up in the local waste stream.¹⁶¹ Due to the increased importance of the clothing industry in Jordan, solutions are imperative to promote sustainable and safe management of textile waste. Currently, MoEnv is implementing two projects on textile waste management: the first, in partnership with GIZ, aims at identifying the best solution for management of textile industrial waste (such as the set-up of a local shredding facility, local recycling or exporting) through a cost-benefit analysis; the second, in partnership with UNDP, will build RDF (Refuse Derived Fuel) plants to reduce the illegal random burning of textiles, and produce energy from textile waste for industrial use.¹⁶² The latter can be a solution for the high quantities of waste produced in the FTAs, to prioritize inner loops of recovery. Companies could donate such waste to upcycling initiatives such as the one piloted by the Clothing Bank in cooperation with Tarabot, to produce chairs, puffs and rugs from shredded clothing items¹⁶³.

Currently, small scale and informal initiatives exist in Jordan for the recovery of clothing or textiles. With no institutionalized system for the separation and collection of clothes, actors that focus on textile upcycling or clothing redistribution often start as homebased initiatives and offer drop-off for used clothing at their place of residence or leave collection boxes in public places. These initiatives are still limited in scope. Nevertheless, people in Jordan generally distribute their clothes that are in good conditions to neighbours in need or relatives, and to charities such as the Clothing Bank. Economically vulnerable individuals (particularly Syrians) sometimes recover clothing and sell them to second hand shops.

8.2.3.3.1 Reduce

The “fast fashion” phenomenon (i.e. mass production response of new trends contribute to inexpensive clothing and an increased consumption culture) has added to the linearity of the textile value chain. With the growth of clothing production (which has almost doubled during the past 15 years) and simultaneous decline in period of time that clothing item is used before disposed of, the linear value chain causes a substantial amount of textile material to be lost at landfill or incineration¹⁶⁴. This consumption trend for textile and apparel is also present in Jordan, **with the average of household expenditure on clothing and shoes having increased by 36% from 1992 to 2017** (Figure 20).

Change in consumer behaviour is a fundamental leverage to a more sustainable textile and clothing economy. For example, sharing the use of clothes or footwear by renting them on occasion (e.g. wedding

¹⁵⁹ Aldayyat, E.A., Saidan, M.N., Abu Saleh, M.A., Hamdan, S. and Linton, C., 2019. Solid Waste Management in Jordan: Impacts and Analysis. *Journal of Chemical Technology and Metallurgy*. 54, 2, 2019, 454-462

¹⁶⁰ Jordan Green Building Council, 2016. Your guide to waste management in Jordan – Waste sorting informative booklet. There are several FTAs in Jordan, including Aqaba, Karak, Karama, Queen Alia International airport, Sahab, and Zarqa.

¹⁶¹ Ibid

¹⁶² KII with MoE, August 2021

¹⁶³ KII with Clothing Bank, September 2021

¹⁶⁴ Ellen MacArthur Foundation, 2017. A new textiles economy: Redesigning fashion's future.

dressess) allows to reduce consumption of such goods. In Jordan, **30% of consumers¹⁶⁵ report that they would be comfortable borrowing or renting the use of clothing** – further awareness and advertisements on the clothing sharing economy can further boost such positive trends, not only driven by economic reasons, but also environmental.

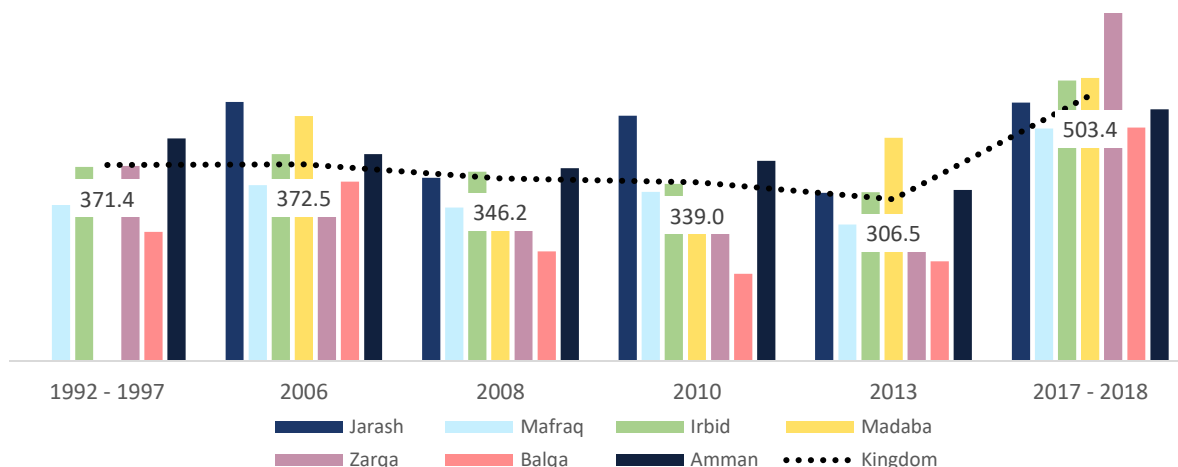


Figure 21 Average of annual household expenditure on clothing and footwear by governorate (JOD). Source: DOS

8.2.3.3.2 Reuse: clothing charities and second hand shops

Globally, it is estimated that as much as **95%** of the textile products discarded by consumers could be used again¹⁶⁶. Charities donating old clothes, second-hand shops, and other resale models for used clothing (e.g. markets, online platforms) contribute to stimulating circularity in the textile economy.

In Jordan, the main charity working with clothes is the Clothing Bank. The charity obtains used clothes from boxes placed in institutions and malls, as well as private donations from individuals. While as many clothing items as possible are directly recovered and donated to vulnerable individuals, a challenge lies in the fact that most items do not match the demand for clothes (e.g. there is a lack of *dishdash* or *abaye* among donated items), requiring the charity to purchase new items – around 40 to 80% of the clothing given out by the charity is new.¹⁶⁷

In Jordan, **second hand shops are widespread throughout the country and can be found in neighbourhoods of different income ranges** (i.e. including low, middle and high income areas). One KI¹⁶⁸ explained that differences in the quality of second-hand items sold depending on district. The price of second-hand clothing varies according to clothing type and quality and consumers of across all socio-economic backgrounds are targeted. A few second-hand clothing shops mentioned that second-hand imports from European countries are favoured because of higher quality clothing.

¹⁶⁵ ACTED's consumer preference survey, May 2021

¹⁶⁶ Ütebay B, Çelik, P and Çay, A, 2020. Textile Wastes: Status and Perspectives. Chapter in Waste in Textile and Leather Sectors. DOI: <http://dx.doi.org/10.5772/intechopen.92234>

¹⁶⁷ ACTED's KII with Clothing Bank, August 2021

¹⁶⁸ ACTED's KII with second hand shops, March 2021

While there is an increasing demand in the market for second hand clothing in Jordan, there seems to be a polarity in the perception of second-hand clothing among consumers. **Some people (particularly people with lower incomes) have a necessity rather than preference, to purchase clothing second-hand, while other consumers prefer used clothing because of higher quality, the brands, uniqueness, and affordability.** One KI explained that sometimes the use of second-hand clothing is stigmatized in Jordan and associated to a culture of shame. In contrast, clothes bought at malls are associated with a higher status, even if the quality of second-hand clothes can be greater. Indeed, low local purchasing power is one of the challenges mentioned by second-hand clothing shops. Therefore, there seems to be space in Jordan for business models that also include higher end markets in the clothing recovery economy, focusing on marketing elements such as the vintage character and the uniqueness of the item as well as environmental factors.

Most second-hand clothing shops in Jordan target lower income customers and generally buy batches of mixed clothes from local wholesaler that import clothing from abroad. Although the origin of the imported clothing varies, imports are typically from Europe (e.g. UK, France, Germany, and Belgium), North America (e.g. USA or Canada), or Asia (e.g. Korea). When importing closed batches of clothing, dealers face the possibility of acquiring a small percentage of damaged or low-quality clothes, which is another constraint mentioned by second hand shops interviewed by ACTED.

Normally, imported clothes are sold by kilo¹⁶⁹ and graded in accordance with quality¹⁷⁰ (classified as: first, second, and third class, ranging from 100 to 300 JOD per batch). Price also varies depending on the brands, supplier country (e.g. European imports are more expensive in comparison to Dubai imports), and labour.

Prior to reaching retailers, imported clothing is completely sterilized and proper documentation is required at customs¹⁷¹ before clothing is allowed to enter Jordan. Next, clothing is ironed at a temperature of 60-70 ampere with steam. Lastly, clothing that has not been sorted at source is sorted and separated by workers in Jordan, according to type (skirts, trousers etc.) and grade (first, second, third).

Profits are mainly made up of sales of high-quality pieces (e.g. trousers that can be sold for 15JD). Almost all second-hand shops engaged in KIIs normally have remaining unsold items and several sell them at discount prices at street stalls (commonly known as *bastat*), that can be informal or formal. In the latter case, resellers typically need to rent the space and target lower end customers. One KI estimated that the percentage of unsold clothes is between 10-15%, but emphasized that the percentage varies due to several factors (e.g. season, customers purchase ability, quality of goods). Generally, **second hand shops seem to be able to reallocate unsold clothing in the market, as none of them report to throw away clothing.** At the end of the season, unsold clothes are stored in warehouses until the following year. COVID-19 and the subsequent economic crisis and restrictions have affected sales of second hand clothes as well, making storage of clothing more common.

There are no subsidies in Jordan that support imports or locally sourced second-hand textiles, which second hand shops also mention as a main challenge. One of the KIs explained that a 16% tax is paid on

¹⁶⁹ The price per kilo refers to batches by 40kg

¹⁷⁰ Example given; jeans or linen with the grain, 100 trousers for 100JD

¹⁷¹ Sterilization paper

clothes and customs and taxes are paid on imported clothes according to the items. The total amount to be paid in customs is estimated by the customs employee and can reach 3,000JD. The cost of customs and taxes is a great burden on the traders because about 50% of the profit goes to cover such costs.

FABRIC AID: A PROMISING MODEL FOR GREATER CIRCULARITY IN THE LEVANTINE APPAREL SECTOR

Founded in Lebanon in 2016, Fabric Aid is a social enterprise that strives to redefine the market for second hand clothing by introducing a circular model. Essentially, Fabric Aid addresses a locally missing link between the apparel industry and the needs of marginalized communities, potentially saving fabrics that would otherwise be considered waste.

In brief, the model Fabric Aid operates within is based on collecting, sorting, and distributing new and used clothing, shoes, and accessories through different channels. By utilizing a combination of clothing collection bins, partnerships with relevant stakeholders (e.g. local NGOs, charities), and agreements with local apparel actors (e.g. brands donating leftover stock). Fabric Aid taps into a valuable pool of apparel resources that otherwise would go to waste. After sorting according to relevant parameters (e.g. winter/summer, female/male, type of item) the different articles are cleaned, ironed, price tagged, then packaged, and sent to stores to be sold.

In Lebanon, the brand Fabric Aid manages four different ventures, each with a different function and target group. The principal objective of all Fabric Aid's operations is to maintain and expand the Souk El Khlanj, which is the space where second hand clothing is offered at affordable pricing for those in need. For example, clothing that is not culturally appropriate (constituting about 6% of donated clothes) is sold at a store branch and online platform named Second Base, while clothing that cannot be reused (about 16% of donations) is upcycled at FabricBASE through collaboration with local designers, disadvantaged tailors, and international brands. Consequently, the diversification of operations under the brand Fabric Aid contributes to the financial sustainability of the business model. Specifically, the combined revenues from the different branches (i.e. the four sub-brands) are used to cover expenses and invest in the growth of the enterprise.

Part of the vision of Fabric Aid is to provide a dignified shopping experience for second hand clothing (a dimension that is often lacking in the second-hand market). For that reason, all stores within the different branches of Fabric Aid are design with the customer experience in mind.

Considering the similarities between the Lebanese and Jordanian markets, the success of Fabric Aid in Lebanon could be replicated in Jordan. Hence, the planned expansion of Fabric Aid to the Jordanian market in 2021 can be considered a positive indicator for growth in conscious consumerism in the region.

8.2.3.3.3 Recycle

Practically, all textiles can be recycled, however current recovery rates, globally, do not reflect this potential. Recent estimates suggest that only about 13% of total material used in fibre production in the

textile economy is recycled in some way. Of this 13%, less than 1% of is recycled into new clothing¹⁷²; other applications of recycled textiles include insulation materials for buildings, mattresses fillings, furniture lining. Recycling textiles offers meaningful environmental benefits, since the production of new fabrics using virgin material requires extensive amounts of water (e.g., irrigation, washing fabrics), pesticides (e.g. to grow cotton), and chemicals (e.g. producing fibres, dying fabrics)¹⁷³. However, recycling technologies for fabric fibres are, as for most value chains, not always available or constructive for the intended repurpose of the imminent waste. Additionally, textile recycling is not yet a prominent industry, in comparison to recycling of other materials. Textile recycling is considered not economically beneficial in many countries to date due to a lack of technological advancements, passive scientific progress in the field, the need for technically skilled human resources, and inopportune regulatory environment¹⁷⁴. KIIs confirmed that a possible reason for the gap in the local market is because it is costly to process textiles in Jordan and more affordable to recycle them in the country of origin (e.g. China, India).

In Jordan, pre-consumer fabric waste is sold to specialized brokers who, act as middlemen, and export to processing actors abroad. Fabrics that are more easily processed (e.g. white cotton) or repurposed (e.g. synthetic scrap used for furniture fill) are favoured. The market for textile recycling is limited and often the supply of fabric waste offered exceeds demand. For that reason, a considerable amount of fabric waste ends up in landfills. **One of the issues for industrial textile waste generated within FTAs is the Jordan Customs Law, which dictates that in order to allow such a by-product to be disposed of at Al Akaidir landfill, import duties and levies need to be paid first. The often results the dumping or burning of textile waste outside the premise of the landfill¹⁷⁵.**

None of the KIIs engaged from the textile economy (second hand shops and upcycling initiatives) know of any companies in Jordan that recover and process textile and clothing waste. However, the Clothing Bank does shred clothing items, that will not be donated or upcycled, into a material used for furniture filling and sold to industries within Jordan.¹⁷⁶ One KI interviewed collaborates with women in Aqaba who recycles used clothing (i.e. knitted items, sweaters) into balls of yarn that is hand-spun into double thread. The collaboration is particularly favourable since the thread is suitable for weaving using a ground loom, which is a tradition still practiced by some Bedouin women in Jordan. The combination of this knowledge produces a colourful and always unique weaved fabric that is made into different products (e.g. bags, household décor, accessories) and sold both nationally and internationally. However, because Aqaba is an FTA, the upcycling actor needs to pay customs for the material to be moved and processed at a different location. Furthermore, while this way of recycling fabrics is a custom to preserve, it is resource and time intensive, making it difficult to ensure a stock output with a standardize colour scale. Thus, the final products are not 100% recycled, and even the target of 70% is only partly achieved. Supplementing with a factory recycle thread could aid in enhanced circularity in the textile economy.

¹⁷² Ütebay B, Çelik, P and Çay, A, 2020. Textile Wastes: Status and Perspectives. Chapter in Waste in Textile and Leather Sectors. DOI: <http://dx.doi.org/10.5772/intechopen.92234>

¹⁷³ Ibid.

¹⁷⁴ Ibid.

¹⁷⁵ Jordan Green Building Council, 2016. Your guide to waste management in Jordan – Waste sorting informative booklet.

¹⁷⁶ KII with Clothing Bank, September 2021

RECOMMENDATIONS: Textiles

Institutional and Policy Level

- 1) Implementation and **overview of appropriate waste disposal for textile fabric cuts around the free trade areas** is essential to reduce the negative impact of fabric waste on Jordanian environment.
- 2) **Tax deductions and incentives** for companies working on textile and clothing recovery can support the second-hand clothing economy, a large part of whose profits are currently spent on taxes.

User and Consumer Level

- 1) **Targeted advertisement** on the possibility to **rent clothing** items can support such positive trend both amongst lower and higher end consumers, with messaging strategies focusing on economic, environmental or fashion related elements according to the customers targeted.

Private Sector Level

- 1) Investments in **storage facilities** for second hand clothing shops can support the clothing recovery economy in Jordan, allowing shops to store unsold items until the following year.
- 2) Foster **linkages between local clothing shops or factories** which produce clothing and fabric waste, **and recovery actors** (second hand shops, upcycling initiatives).
- 3) Investing into **higher end vintage second hand clothing retailers** can support in expanding such sector to higher end customers, while increasing the recovery of high value products.
- 4) Supporting facilities shredding textile waste through the **provision of shredding machinery**, which are not available in country, and support **to reduce energy costs**, can promote inner loops of circularity of this value chain as well as increased local recovery.
- 5) The establishment of **RDF facilities to convert textile waste into energy** can be a solution for large amounts of waste that cannot be recovered through reuse or upcycling.

8.2.3.4 Used tires

Millions of used tires are still disposed of (buried, stored, abandoned/dumped) each year globally. Tires are made of flexible elastomeric rubber (around 40 to 50%), carbon black (25 to 30%), oil and vulcanizing agents (10-12%), reinforced with metallic materials (steel inserts 10-12%), and textile (3-6%).¹⁷⁷ The tire decomposition period ranges between 80 and 100 years, making it a significant environmental threat. **In 2012, over 1,200,000 vehicles were licensed in Jordan, which is estimated corresponds to 2.5 million scrap tires per year¹⁷⁸**, whose handling and management is regulated under the Environment Protection Law No. 52/2006¹⁷⁹. According to key informants¹⁸⁰, a large volume of used tires is illegally dumped in Jordan's landfills, which contributes to their rapid filling. Disposed tires can be regularly seen burning in open fires by informal waste recovery actors, such as waste pickers and scrap dealers. Tires are burnt to retrieve metal wires, causing environmental and health issues¹⁸¹. This constitutes a major problem for JSCs who are responsible for the landfills that tires are thrown in, as well as a lost economic opportunity for the country.

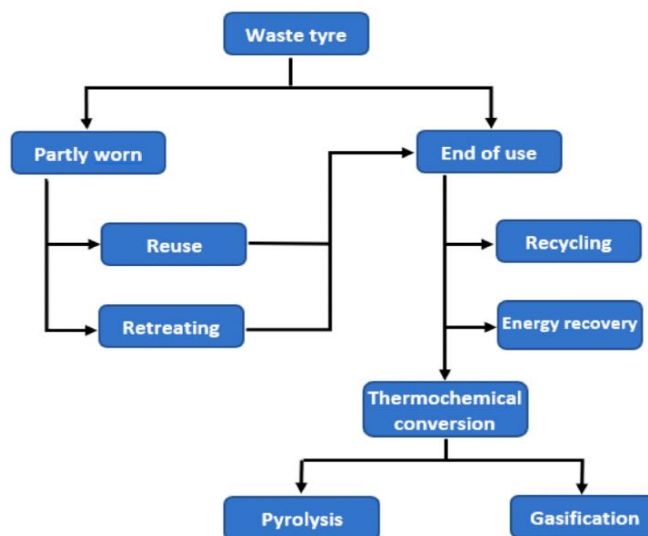


Figure 22 Tires recovery diagram flow. Source: Jahirui et al, 2021

8.2.3.4.1 Re-treading tires

Before disposal, tires can be retreaded, e.g., the worn out tread is replaced with new tread, which can extend the lifespan of the product. However, the possibility to reuse tires is limited in occurrences (up to 3 retreadings max for higher quality tires). In Jordan, there are a number of SMEs that retread tires, by obtaining **the worn-out materials from the gulf area and western countries mainly** (likely where stronger regulations exist for replacing tires more frequently). **Only a very minimal number of worn-out tires are locally sourced because they are reported to be too worn out to be retreaded normally¹⁸²**. Retreaded tires are currently sold at around half of the price of the new tires. The quality of retreaded tires remains high as customers trust the product and obtain a warranty of up to 12 months, according to KIs interviewed by ACTED¹⁸³. Demand for retreaded tires is mainly driven by the cost of new tires, which are

¹⁷⁷ C Bulei et al (2018) "Directions for material recovery of used tires and their use in the production of new products intended for the industry of civil construction and pavements", IOP Conf. Ser.: Mater. Sci. Eng. 294 012064

¹⁷⁸ Sweepnetwork, GIZ (2014) *Country report on the solid waste management in Jordan*

¹⁷⁹ Ibid.

¹⁸⁰ ACTED KII with MoLA (2021)

¹⁸¹ MoEnv. (2020) "Waste Sector. Green growth National Action Plan 2021-2025". Amman, The Hashemite Kingdom of Jordan

¹⁸² ACTED's KII with tire retreading actors, August 2021

¹⁸³ Ibid.

normally imported, primarily from China (a lead producer), which reportedly increased following COVID 19-driven increase in international shipping costs. **However, at certain times the cost of new tires can be so low that retreaded tires only offer a saving of around 5% compared to the new tires, pushing down demand for such a product.** In addition, the 16% sale tax imposed in 2009 made the economic returns of this activity unprofitable for most Jordanian retreading companies, which shut down¹⁸⁴. Technologies such as laser machines that identify air gaps before retreading could improve the tire processing mechanism.

8.2.3.4.2 Recycle

Recycling old tires allows the recovery of more than 70% of rubber of automobile or truck tires. Based on key informant interviews and secondary data, there is untapped market potential for used vehicle tire recycling. While large quantities of tires still end up in Jordanian landfills, a 2014 study estimated that at least 80% of the annual scrap tires in Jordan are already recovered¹⁸⁵. Indeed, tires are a well demanded raw material in Jordan, where recyclers produce two main types of outputs:

- 1) Shredded components of the tire, including steel and rubber
- 2) Diesel fuel produced through pyrolysis

As per the first output, only one factory could be identified in Jordan processing tires into such products - ATRM Co., Ltd.'s tires recycling plant (located in Zarqa, operating since 2006). ATRM Co., Ltd.'s purchases old tires to extract steel wires and shred rubber into different sized **rubber crumbs**. The steel wires are sold as such or as **steel fibres and ground steel**, which has different applications, including the production of nails and asphalt. The rubber crumb is used for sport fields, such as playground and sport surfaces, rubber mats or insulation materials for buildings as well as a binder component in the asphalt industry. However, to limit costs of production, some asphalt companies in Jordan do not use the rubber binder, which causes a significant decrease in the quality of the output asphalt in addition to not complying with standards for asphalt production. Another challenge is the import of materials made from recycled tires (e.g. rubber crumbs) from abroad, in violation of the MoEnv's regulation to prevent this aimed at protecting the local recycling companies. In fact, some companies import such materials from neighbouring countries which can compete with locally produced ones thanks to lower production costs. Lastly, some of the export markets for Jordanian products, primarily GCC countries, faced a crisis following the COVID 19-triggered economic crisis¹⁸⁶.

Recycling of tires into **fuel** (synthetic diesel) presents several challenges as it is a complex process requiring trained workforce and technology¹⁸⁷. Converting tires into sources of energy involves a pyrolysis process that thermochemically extracts oil from tires, which can be used for heating by industry and refined or blended with other fuels for diesel engines¹⁸⁸. **This industry is particularly dependent on the price of oil: when the latter goes up, demand for cheaper tires-sourced oil increases.** Further capacity building to

¹⁸⁴ A KI reported that 18 retreading companies were open in Jordan, of which only four are still currently operating. ACTED's KII with tire retreading actors, August 2021

¹⁸⁵ Sweepnetwork, GIZ (2014) *Country report on the solid waste management in Jordan*

¹⁸⁶ ACTED's KII with tire recycling factory, August 2021

¹⁸⁷ Jordan TV news report (2019); <https://www.youtube.com/watch?v=FQnUx6ShQ8I> Last accessed on 12 July 2021.

¹⁸⁸ Jahirul, M. et al (2021) A review on the Thermochemical Recycling of Waste Tires to Oil for Automobile Engine Application, *Energies*, 2021, 14, 3837.

improve local technical knowledge on the process of diesel extraction from waste tires is needed to promote such an industry¹⁸⁹.

For both applications of recycled tires, the **lack of fiscal incentives**¹⁹⁰ and **policy support measures** have been highlighted as critical obstacles. For example, supply of tires is currently dependent on private scrap dealers and is relatively expensive (up to 35 JOD per ton). It was reported that the current tax environment is not conducive to allow more companies to venture in this business.

RECOMMENDATIONS: Used tires

Institutional and Policy Level

- 1) Implementing regulations for tires disposal, involving the **setup of dedicated tires disposal sites** where private tire recycling companies could source their tires while ensuring recovery of such waste stream. This could happen through **PPPs** between municipalities managing waste disposal or **B2B agreements** between garages disposing of tires and tires recovery companies. It is important to **incentivize the sale of tires to local recycling companies** through e.g. municipal tendering processes that give higher preference to local businesses.
- 2) **Tax incentives for tires retreading companies** can support such businesses, many of whom have reportedly closed as they could not sustain operational costs due to tax increases.
- 3) Enforcing **quality standards for asphalt** can stimulate market demand for raw materials extracted from tires recycling, such as rubber crumbs used as a binder in the asphalt industry, which are reportedly not always making use of such inputs, resulting in decreased quality of the asphalt.
- 4) As part of the implementation of Jordan's EPR, **increased linkages** can be promoted between **large tires manufacturing companies in Jordan and tires recycling company**, which have potential for crucial impact on increasing tires' recovery rate.

Private Sector Level

- 1) Supporting tires recycling companies with the **installation of renewable energy sources** could help offset their energy costs, which are reported to be one of the main drivers of running costs for tires recycling companies.
- 2) **Tires recycling companies located in areas where tires waste generation is high**, such as the Aqaba free economic zone, would reduce costs of transportation and improve profits for such actors.

User and Consumer Level

- 1) **Awareness raising campaigns** should focus on the importance of **proper disposal of used tires** at dedicated sites. This would in turn optimize costs of reverse logistics and promote recovery of such waste stream.

¹⁸⁹ ACTED's validation workshop, 18 August 2021

¹⁹⁰ Jordan TV news report (2019); <https://www.youtube.com/watch?v=FQnUx6ShQ8I> Last accessed on 12 July 2021.

8.2.3.5 Upcycling initiatives in Jordan across selected technical cycles' value chains

Upcycling offers the potential of giving new life and value to waste, with the added benefits of less energy requirement compared to that of the recycling processes, targeting the inner loops of technical materials' cycles. ACTED interviewed upcycling actors in Jordan working across the technical value chains included in the assessment, i.e. plastics, paper, textiles, and used tires.

Examples of upcycling within these value chains identified in Jordan include reusing plastic to create art pieces and other artisanal products (e.g. bags), designing jewellery from paper scrap and magazines, upcycling fabrics into quilts, accessories and clothing items, and manufacturing used tires into furniture.

Jordanian KIs working in upcycling often highlighted that initial ideas and designs do not always mature as intended. For instance, one KI tried to upcycle soda bottles into jewellery, but the final product did not sell, and the effort was discontinued. The **lack of an attractive design (i.e., picking patterns, colours and textures that work) is often mentioned as a challenge by upcycling actors**¹⁹¹. One KI tried to collaborate with three different tailors before finding the right match. Hence, connecting upcycling initiatives to designers can boost the marketability of upcycled products and secure demand. In addition, Jordanian handicrafts makers often do not perform a market analysis for what they plan to produce, they often end up “copying” an idea that is thought to sell well, but not testing it before selling. Simple market tests could be performed to enhance the success of handmade upcycled products.

In addition, **sourcing appropriate waste for upcycling purposes is, at times, difficult**. Both paper and textile upcycling actors engaged in the assessment reported such challenges. Upcycling actors mentioned that arrangements with establishments that can provide some type of waste (e.g., multiple copies of a publication, specific type of fabric) on an ad hoc basis or small amounts regularly can solve such an issue.

One KI mentioned that working with retailers generates stable revenue streams, but requires high quality assurance processes (e.g. remove yellowed parts of a magazine). This is because retailers appeal to products that are identical, which is difficult to achieve with handmade items¹⁹²; this seems to imply that the **upcycled character of the item is not a unique selling point**. Inexpensive (although less sustainable)



Figure 23 Used tires upcycled into furniture by a Jordanian company. ©Re.Tire.Jo, Instagram



Figure 24 Bag made from upcycled plastic bags. © Shantet Sabaya, Instagram

¹⁹¹ ACTED's KII with fabric upcycling actor, April 2021

¹⁹² KII with paper upcycling actor, April 2021.

alternatives compete with upcycled products and can be a threat to upcycling initiatives. Consequently, many upcycling actors set the product price to just reflect the costs of production, without a substantial profit margin. Many initiatives are homebased and usually part-time engagements on the side of other income generating employment or work. Hence, **while upcycling initiatives are very fragmented, significant potential exists if investments are directed to improve marketing and communicate their social messaging and ensure their Unique Selling Point (USP) over commercial products.**

Many of the upcycling initiatives currently active in Jordan also have a social character (e.g., involving vulnerable women or youth in the production). The **lack of a regulatory framework** enabling a productive business environment for social ventures (e.g., proportional tax schemes, attractive funding opportunities, etc.) is often highlighted as an issue. **One KI suggested to incentivize service companies (e.g. legal entities, bookkeeping firms, etc.) to adapt prices (e.g. tax write-offs) to make collaboration and investment in social businesses more interesting¹⁹³.** Registering as a business entity is also required to apply for funds/grants, which is a time-consuming process that also necessitates a certain level of bureaucratic/legislative literacy.

Selling at both local and international markets (for the latter essentially through online platforms like [Etsy](#)) is another way in which upcycling actors can establish diversified revenue streams. At present, **well-functioning marketplaces for sustainable ventures are missing in Jordan.** Scattered spaces do exist, such as markets on occasion organised at Swefieh Village or online through local platforms like [Virtual Bazaar](#). However, marketing and access to markets was identified as a common challenge for Jordanian artisans and handicraft makers¹⁹⁴, not only limited to upcycling actors. Many handicraft makers do not invest in marketing and branding elements because of traditional knowledge and fear that their ideas will be copied. Furthermore, many refuse to pay marketing platforms (e.g. e-marketing platforms, or simply retailers) and prefer to sell directly to customers, consequently this gives them little access to a variety of customers. The closure of fairs and exhibitions since March 2020 due to COVID-19 regulations has exacerbated the importance of e-marketing. In Jordan, the reputation of a brand is built through social relations and trust. Specifically, for initiatives with a shared value purpose (i.e., creating a blend of social, environmental and economic value) consumers expect impact to be transparent. Therefore, initiatives that can communicate a clear message through concept and documentation (e.g. testimonies, social media content) do better.

¹⁹³ ACTED's KII with fabric upcycling initiative, April 2021

¹⁹⁴ ACTED's Competency and Market Assessment with Artisans, March 2021

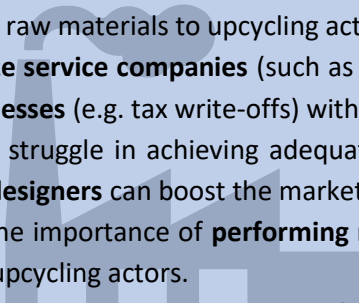
RECOMMENDATIONS: Upcycling Initiatives

Institutional and Policy Level



- 1) **An enabling environment** for social enterprises can support upcycling initiatives that have a social character. For example, **tax write-offs or facilitated prices from service companies** can support such ventures.

Private Sector level



- 1) **Linkages between waste producers** (manufacturing companies, sorting centres) **and upcycling actors** can be promoted to provide high quality raw materials to upcycling actors while diverting waste away from
- 2) Advocacy can be made to **incentivize service companies** (such as legal entities, bookkeeping firms etc.) to have **adapted prices for social businesses** (e.g. tax write-offs) with an environmental character.
- 3) As upcycling actors in Jordan often struggle in achieving adequate market demand due to weak design, **connecting upcycling initiatives to designers** can boost the marketability of upcycled products.
- 4) Sensitizing upcycling initiatives on the importance of **performing market tests** before the products enters the market can enhance success of upcycling actors.
- 5) As demand for upcycled products is likely to be geographically fragmented, integration of such initiatives within **national and international e-marketing platforms** can boost profitability.

User and Consumer Level



- 1) **Marketing campaigns focused on testimonies and social media content** are more appealing to customers and can create demand for upcycled products.

8.3 The Extended Producer Responsibility and Circular Credits: opportunities for private sector engagement in Circular Economy

This section will explore opportunities for engagement of the private sector into Circular Economy initiatives in Jordan. The Extended Producer Responsibility (EPR) can effectively involve Jordanian producers to support Jordanian waste recovery and recycling actors while offsetting their waste footprint in country. Furthermore, investors globally can be connected to Jordanian waste recovery actors through the Circular Credits system, supporting financial sustainability of waste recovery initiatives.

8.3.1 The Extended Producer Responsibility in Jordan

Per OECD's definition¹⁹⁵, the EPR is a "policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products".

In Jordan, the EPR framework law is underway by MoEnv, with plans to be released by 2022. According to KII at MoEnv, the EPR in Jordan will be based on a Producer Responsibility Organization (PRO), formed at the Jordanian Chamber of Industry (JCI), headed by MoEnv. The PRO will be responsible to determine the economic contribution that the producers will need to pay as part of their EPR, based on the amount and type of waste they input into the economy. The amount will take into account collection, transportation, and processing costs (recycling, treatment and disposal). Tax incentives for this are also under consideration at the government level. The committee will also be responsible for launching tenders to identify service providers to recover waste materials. **Priority will be devoted to service providers that can ensure maximum recovery of the waste material targeted.**

The waste management hierarchy described under Art. 4 of the Waste Management Framework Law of MoEnv¹⁹⁶, which considers landfilling only as a last resort for types of waste that cannot be recovered. MoEnv generally encourages contracting service providers that can ensure the local processing or recycling of waste. However, **a major challenge lies in the fact that little to no recycling facilities are available in Jordan for key waste streams such as plastics (particularly PET) or paper, which could absorb the total amount of waste produced in the country** (e.g. 12 to 15,000 tons of paper and cardboard waste per month). Hence, contracting exporters to just collect and compress the waste in country, in order to ship it abroad for recycling, might be an option.

PRODUCER RESPONSIBILITY ORGANIZATIONS

The Jordan EPR is planned to be Producer Responsibility Organisation-based (PRO) similarly to other existing EPR globally. PROs are usually non-profit collective entities, set up and fully owned by the industry which are tasked with meeting recovery and recycling obligations on the industry's behalf, specifically by launching tenders and collecting quotations to contract out the collection, sorting and recycling aspects on behalf of the concerned industry actors, ensuring cost efficiency of the EPR scheme (*source: Extended Producer Responsibility Alliance*).

¹⁹⁵ See: <https://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm>

¹⁹⁶ See section 8.1.1

The EPR will target any type of industry that works with packaging, including packaging companies but also any type of producers that use packaging (including fillers and importers). For the first year of implementation, the law will involve voluntary participation by the producers, before becoming mandatory gradually, starting from largest companies in the first years (i.e. in the first year, companies with annual revenue of over 50 million JOD and producing at least 1,000 tons of packaging waste annually; in the second year, companies with annual revenue of 25 million JOD and producing 500 tons of packaging; and so on). Some international firms are reported to have committed to pilot the EPR in the first year. During implementation, the steering committee of the PRO will review the process and receive feedback from the industry and take corrective measures as necessary to gradually involve producers into EPR. **Given the industrial system in Jordan dominated by SMEs, the steering committee must crucially devise ways to support such companies to participate in the EPR without adding an economic burden to the industry which might affect their sustainability.**

8.3.2 The Circular Credits Mechanism and the KOLEKT Application

The [Circular Credit Mechanism \(CCM\)](#) is a market tool developed and used since 2013 by BVRio, a Brazilian non-profit organization. It aims to connect buyers and sellers of environmental services related to waste collection, sorting, and appropriate disposal of recyclable post-consumer waste. The system operates through the Circular Action Hub, an international online platform which connects sellers (e.g. projects for sustainable waste recovery, waste pickers) to buyers (e.g. companies, individuals) interested in compensating for their environmental footprint. This happens through the purchase of Circular Credits: 1 Circular Credit represents the service of recovery (removal, collection, sorting) and appropriate destination of 1 metric tonne of recyclable material that is inappropriately discarded. While in some situations the Credits may assign the same value to the recovery service of any type of waste, the CCM also allows and incentivizes the generation of more expensive Credits for materials that require more resources to be recovered. Circular Credits can be created for two types of activity:

- 1) Waste collection or removal. Environmental service happens when waste recyclable material is collected from the environment and is appropriately disposed so that it won't return to pollute the environment. For instance, it could be sent for recycling, disposed in a landfill, or incinerated in a power plant.
- 2) Waste recovery. Environmental service happens when recyclable material that would otherwise be landfilled or incinerated is recovered and recycled or reused. For example, the work that waste pickers do in recovering plastic from waste dumps or landfills and selling it to recycling plants.

As the Hub adopts an inverted project cycle, waste collection and recovery actors seeking financial support can post their initiative on the Hub's website and base their offers on self-declarations that are verified after their projects secure financial support. At that stage they will have to pass an auditing protocol, that ensures both qualitative compliance with the principles and criteria of the Hub as well as a quantitative verification of the amount of solid waste that each project is able to recover. Once projects are registered online, buyers/investors can express interest, and the Hub will facilitate negotiations to finalize the

transaction¹⁹⁷. The Hub will also oversee the transparency of the transaction, in addition to ensuring that safeguarding and decent labour principles are implemented by the waste recovery actors contracted¹⁹⁸.

The Circular Credits Mechanism seems to provide a viable solution to the financial sustainability challenges of many waste recovery actors that were engaged within the assessment. Jordanian recycling facilities, sorting centres, waste pickers could post their project on the hub and seek investors' support. When such actors are completely informal, it may be important that a formal entity (e.g. an NGO) becomes part of the project to make actors eligible to sell Circular Credits on the Hub. The growth of the sector could eventually generate further employment opportunities in Jordan for the skilled and unskilled labour force.

Another circular economy initiative, BVRio launched KOLEKT (www.kolekt.app), a mobile application that connects buyers and sellers of waste at the local level. The app functions as a marketplace where waste generators, including households, schools, shops, and offices can sell a variety of waste types (Plastics, Paper/Carton, Beverage cartons, Metals, Rubber, e-Waste, Glass, Foam, Medical waste, Bio waste) in different conditions (clean, sorted, bagged, baled, contaminated, shredded, mixed). The waste seller would also specify quantity of waste it aims to sell, alongside a picture of the waste, and a proposed price. Waste buyers can find the materials they are looking for through the application and bid for them in an auction-like model. A waste seller or buyer that do not have a smartphone can still use the app if the other part is able to register the transaction on the application platform. Actors located further down the value chain (e.g., the recycling plants processing the materials) can also record the transaction with the waste pickers without smartphones, to allow for full traceability along the chain.

Once the buyer and the seller agree on the transaction, credits (related to the selling of the physical material) would be transferred in the app from the buyer to the seller; the app is linked to credit cards networks to allow for payments and withdrawal of credits.

By offering the potential to certify the quantities of waste generated and sold, the app **could allow PROs and businesses to prove waste recovery targets achieved and measure waste footprint reduction.**

While the application is still not used in Jordan, it does have potential to be introduced in the country, with local language and currency features. With the KOLEKT for Business license, the app also offers the possibility to **track quantities and types of waste traded in a certain geographical area**, e.g., municipal or governorate level. This allows to track offers, requests, sales, and purchases of waste, as well as monitor prices of waste. Should the app be extensively used by informal waste recovery actors, **it could provide an opportunity to map and overview types and number of actors working in the waste recovery economy in the country.**

¹⁹⁷ BVRio (2020), *Circular Action Hub and Circular Credits Mechanism (CCM) – Principles & Criteria v1.2, July 2020*. Available at: <https://www.circularactionhub.org/archives/assets/publications/CAH-Principles-Criteria-v1.2.pdf>

¹⁹⁸ ACTED's KII with BVRio, June 2021

RECOMMENDATIONS: EPR and Circular Credits

Institutional and Policy Level

- 1) Given the industrial system in Jordan dominated by SMEs, the PRO's steering committee should be crucially devising ways to **support SMEs to participate into the EPR** without adding an economic burden to the industry which might affect their sustainability.
- 2) While little availability of **local recycling facilities** is a limitation to the involvement of local actors into the management and recovery of producers' waste, they could be still **prioritized within the tendering process** that will be launched by Jordan's PRO.
- 3) The EPR legislation could allow companies included in the EPR system to **organize for their own waste recovery and audit, or invest into waste recovery projects in Jordan** (including through platforms such as the Circular Credits Mechanism) to meet their waste recovery targets.

Private Sector Level

- 1) **Integration of informal waste recovery** within the PRO-contracted waste recovery initiatives can be promoted through models such waste banks or the creation of cooperatives of waste pickers and scrap dealers, or applications such as the KOLEKT app.
- 2) **Circular Credits** are a viable solution to support the **financial sustainability of Jordanian waste recovery actors**. When such waste recovery initiatives are informal, they could be supported by formal actors (e.g. NGOs) to develop a structured project that complies with the auditing criteria of the Circular Action Hub and Circular Credits Mechanism, and register on the Hub's platform to be **connected to international investors**.

User and Consumer Level

- 1) **Consumers' awareness campaigns on EPR systems** can drive increased demand for companies contributing to the EPR in Jordan, enhancing in turn circular economy in the country.
- 2) Promote the use of **Waste Trading applications** such as KOLEKT, to make the collection of waste an economically attractive activity and be able to monitor waste flows at the same time.

9 Conclusions

Assessing Jordanian municipalities' solid waste management processes and formal and informal waste recovery schemes (objective 1)

ACTED's assessment demonstrated that waste management remains one of the key burdens for Jordanian municipalities, which struggle to cover costs of collection, transportation, and the final disposal. This demonstrates a dire need to promote circular economy initiatives that divert waste away from landfills, including both private and public sector-led initiatives.

Public-private partnerships between Jordanian waste recovery actors and municipalities could favour the sale of municipal waste to actors that process it locally, rather than exporting it abroad, promoting more efficient recovery schemes through lower (global) resource use.

Providing supportive **regulatory frameworks and tax incentives for private actors that contribute to reducing the burden of solid waste** on the country is also recommended to sustain their operations. Given the informal nature of some of the private waste recovery actors, it is essential to devise ways to formally **integrate** such actors to grant decent labour conditions, while maintaining their livelihoods. This would also help solve the current competition between public and private informal initiatives for waste recovery. In addition, further research is recommended to delve into the informal waste recovery sector, and **research efforts should focus on providing a full mapping of the informal sector at the national level**.

At household level, **waste segregation accompanied by sensitization campaigns** on appropriate sorting at source can improve the quality of waste recovered by municipal sorting centres, which report contamination to be a key challenge in obtaining a high-quality waste to sell, therefore challenging sustainability of their operations.

The provision of Infra-Red or other technologies to sorting centres where needed (for plastics in particular) can provide a viable alternative to manual sorting, reducing the likelihood of mistakes. Investments can be made in improving the **reverse logistics of post-consumer and post-industrial waste collection and recycling in order to make the cost of recyclables more competitive**. This includes more efficient transport logistics over pre-determined service areas to reduce costs for municipalities and other waste recovery actors.

In addition to waste recovery, targeting inner loops of the circular technical material flows would guarantee waste reduction with less resource use. Promoting the **sharing economy, second hand and refurbishing/repairing initiatives** while also advertising them amongst the Jordanian public is recommended.

Provide insight into the potential of biocycles, paper, plastics, textiles and used tires, to improve circularity of material flows (objective 2).

The existence of some bio-waste recovery initiatives in Jordan can be capitalized upon for further recovery of organic waste, which represents more than half of the waste dumped in Jordanian landfills. **Anaerobic**

biodigestion to produce biogas as well as fertilizer can be further promoted both at large and small scales (e.g. in farms, restaurants, or at community level, where availability of biowaste is considerable).

In parallel, **household level campaigns for sorting of organic waste** can improve availability of feedstock for biodigestors. Similarly, the collection of **cooking oil** as a feedstock to produce biodiesel can be improved while sensitizing the public on the negative impacts of dumping cooking oil into sewages.

Bio-feedstock was identified by ACTED as already available and somewhat utilized in the country. **Research and development on the identification of additional available bio-feedstock** in Jordan can be used to either generate energy or substitute technical materials (e.g. bio-based plastics) is highly recommended, to avoid the extraction of non-renewable resources from the environment as much as possible.

In an effort to regenerate natural systems from which natural resources are extracted, promoting a **cultural shift towards regenerative agricultural models** is advocated. To mitigate against the potential negative impacts that a sudden conversion to non-conventional agricultural models can entail (e.g., sudden drops in production, lack of market demand, etc.), **research and development for evidence building and pilots to showcase results combined with market incentives and access to funding** is crucial.

Within technical material flows, the case is strong for **supporting upcycling initiatives across value chains**. Upcycling actors can obtain well sorted waste directly from industrial or municipal actors, to recover it and create a higher value-added product. While a number of initiatives already exist in Jordan, existing weaknesses can be eliminated through a combination of linkages with **designers, improved marketing approach and connections to online marketing platforms** can allow such initiatives to thrive.

An overview of the plastics value chain in Jordan highlighted the urgency to reduce the production of single use plastics by **replacing it with refill and reuse schemes or alternative biobased materials**. Crucially, to avoid having the reduction in plastics production disrupt the Jordanian plastics industry economy, investing in sustainable alternatives such as bio-based plastics can provide both an environmental and economically viable solution. **Investments in local HDPE, PP, and PET recycling structures** (which can also be integrated within plastics manufacturing companies), **combined with the provision of affordable energy, improved machinery, dedicated production lines, and storage availability** to such entities could contribute to increased availability and affordability of recycled raw materials processed in country, as these are the types of plastics that are commonly used in their virgin form.

While paper recycling is less viable than plastics in Jordan due to its water-intensive processes, paper companies can be supported with technologies **for onsite treatment and reuse of industrial wastewater**. **B2B linkages between paper industries and local paper recycling companies** to source high quality paper scrap is also recommended.

Awareness campaigns with Jordanian consumers on the safety and hygiene of recycled paper and plastics products can, in parallel, stimulate market demand for such products. On the regulatory level, the implementation of **labelling standards for both paper and plastics** (e.g. to differentiate between

different types of plastics) and regulations to **improve product recyclability at the design stage** (e.g. avoid the use of dyes or inks) can crucially support recycling initiatives.

Fabric poses a key environmental challenge in Jordanian landfills, with illegal burning reported as a common phenomenon for an industry that has been steadily growing in the past years. **Connecting waste producers to fabric upcycling initiatives** is one of the ways to reduce fabric waste. Alternatively, shredding facilities can be set up to produce **furniture filling or RDF plants to generate energy**, if feasibility studies confirm their profitability. At the same time, **support to second hand shops, targeting both lower and higher end markets, in the form of marketing support, provision of storage facilities, and tax incentives** can promote the growth of the sector.

While used tires represent a large amount of waste in Jordan that is already recovered to a good extent, efforts can be made to **improve efficiency of recovery and localized processing**. For example, this can be achieved by setting up tire recycling companies in areas where waste tire generation is higher, such as Aqaba, or facilitating **linkages with tire waste production companies and waste recovery actors**. **Tax incentives** for recycling and re-treading companies can also boost such kinds of initiatives.

Provide an overview of the current status of Extended Producers Responsibility initiatives in Jordan and investigate the piloting of Circular Credit Systems in the country (objective 3).

Jordan is paving the way for its own EPR system, which will involve larger waste producers and gradually expand to smaller actors. As the industrial system in Jordan is dominated by SMEs, it is crucial to devise ways to **support such SMEs to participate in the EPR without adding an economic burden** to the industry which could impact their sustainability. In addition, the EPR can offer a great opportunity to support **localized recycling of waste, when possible**, by prioritizing local waste recovery actors when tendering out waste generated by companies engaged in the EPR.

Circular credits also offer a means to support local waste recovery initiatives by connecting actors to international investors. Whenever such initiatives are informal, they can be supported by formal actors such as NGOs to design a structured projects complying with the hub's criteria.

10 Annexes

10.1 Assessment terms of reference

Circular Economy Assessment – ACTED Jordan

1. Background

A traditional linear economy focuses on extractive industries and manufacturing processes that generate waste. A **circular economy** on the other hand is based on 3 principles:

- 1) Designing out waste and pollution
- 2) Keeping products and materials in use
- 3) Regenerating natural systems

Circular economy models can reduce the cost of waste management services and overall pressure on the environment by reusing and optimising resources that would otherwise be wasted. In doing so, they not only ensure that the competitiveness of economies is maintained, but they can also boost the economy and create jobs.

Jordan has a waste generation rate of 0.81 kg/capita/day, above the average in the MENA region (0.75)¹⁹⁹. Its annual production of solid waste has been steadily increasing over the years, with the Syrian refugee crisis straining municipal SWM services, particularly in the northern governorates. The cost recovery rate for municipalities rarely reaches 50%²⁰⁰, representing a heavy burden for municipalities' budgets. While only 5-10% of the municipal waste is recycled²⁰¹, the sector yields a great economic potential that is largely untapped.

In fact, while ACTED's Circular Economy scoping study conducted in 2019²⁰² revealed that some recycling and upcycling initiatives already exist in the country, many of these are informal. For example, metal and paper are fairly established value chains recycled in and out of the country: formal and informal recovery and recycling initiatives take place, with scrap metal and paper recycled in country by local companies that produce such materials or shipped abroad for processing. Limited local processing capacity is reported for plastic, as the cost of virgin plastic is cheaper than the cost of the recycled product. E-waste is recently gaining increasing investors' and governmental interest, with collection points being

¹⁹⁹ World Bank (2018) *What a Waste 2.0*

²⁰⁰ ACTED Key Informant Interviews with municipalities in North Jordan (2019, 2020); Abu Qdais (2007) *Techno-economic assessment of municipal solid waste management in Jordan*;

²⁰¹ UNDP (2018) *New Municipal solid waste Recovery and Recycling contract Improves Livelihood of waste Pickers in Jordan Landfills*; Jordan Green Building Council (2016) *Your Guide to Waste Management in Jordan. Waste Sorting Informative booklet*; UNDP (2015) *Solid Waste Value Chain Analysis - Irbid and Mafraq*.

²⁰² To understand the market potential for integrating circular economy approaches in Jordan, ACTED launched a scoping study in 2019 to assess key material flows, including: organic waste, agriculture, plastic, paper, glass, metal, e-waste, water and energy. The study methodology included literature review and 23 key informant interviews from various stakeholder groups in Jordan, including waste collection, sorting and recycling actors, organisations for the preservation of the environment, SME incubators, municipalities and ministries.

established by municipalities²⁰³ and several companies in Amman and northern Jordan being licensed to disassemble e-waste in country and send it outside of Jordan for processing.

Waste recovery offers income-generating opportunities, in particular for vulnerable populations working as scavengers in cities and at dumpsites. The informal status of many of these initiatives needs to be tackled to ensure safety of workers and respect of labour rights. In the formal sector, Public-Private or Private-Private Partnerships could provide an enabling framework for private recycling and upcycling initiatives that currently lack support. The National Strategy of the Jordan's ministry of Environment 2020-2022 mentions, among other projects, the extended producer responsibility (EPR), paving the way for systems such as the Circular Credits Systems (CCS). Through the use of Circular Credits, the buyers (e.g. companies or individuals) can compensate for their waste footprint by contracting service providers (waste collection and recovery actors) to safely collect and/or recover their waste. A Circular Credit represents the service of recovery (removal, collection sorting) and appropriate destination of 1 metric tonne of recyclable material that would otherwise be inappropriately discarded²⁰⁴. The growth of the sector can eventually generate further employment opportunities for the skilled and unskilled labour force.

In addition, natural resources, including solar energy and biowaste, can be further exploited to produce sustainable energy, making use of Jordan's solar and biowaste potential: while this is partly incentivised by regulatory frameworks²⁰⁵, Jordan still imports 90% of its energy and fuel requirements, while organic and post-harvesting waste is rarely utilised for energy production. Finally, recent studies have shown untapped opportunities for reclaimed wastewater for industry use²⁰⁶, and water recycling and reuse yields potential for reducing water consumption in one of the most water scarce countries in the world.

ACTED's preliminary scoping study identified key immediate market opportunities and constraints for adopting circular economy approaches. The key findings and recommendations from the study are:

- **Organic and agricultural waste:** Organic and agricultural waste yields untapped potential, as this is the least valorised waste stream in Jordan, with little recovery of organic waste taking place in the country. Small initiatives for composting would help reduce imports of fertilisers, while large-scale biogas production plants from organic waste could potentially replace half of the energy consumed in Jordan. Oil collection schemes could be established to support already existing oil processing initiatives in country.
- **Paper:** With a fairly established solid waste management scheme and a number of paper companies present in country, paper recycling already takes place in Jordan. Further research is recommended to identify key initiatives to improve the efficiency of the recycling process and the

²⁰³ A Key Informer from the Ministry of Environment (December 2019) revealed that Jordan is going to establish five e-waste collection points in the Greater Amman Municipality in 2020.

²⁰⁴ BV RIO (2020) *Circular Action Hub and Circular Credits Mechanism (CCM) Principles and Criteria. Version 1, July 2020*

²⁰⁵ Such as the Law No. (13) of 2012 Renewable Energy & Energy Efficiency. Moreover, the Ministry of Energy has just launched the energy strategy for 2020-2030, in which renewable energy contribution to the energy sources of Jordan is planned to be increased from 21% in 2020 to 31% in 2030.

²⁰⁶ Saidan, M. et al. (2020) *Wastewater Reclamation in Major Jordanian Industries: A Viable Component of a Circular Economy*. Water 2020, 12(5), 1276.

quality of the final processed product, as raw virgin materials and imported recycled substitutes compete with the paper processed in country.

- **Plastic:** Plastic is recovered to a limited extent in Jordan, and the market can be further exploited. While returns of recycling initiatives are low due to the high cost of recycling plastics and the quality of the recycled material is not high, plastics still constitutes the first material – in terms of quantities –in municipal solid waste. To this end, consumer and producer awareness initiatives to reduce the use of plastic are recommended, as well as research into the promotion of sustainable recovery and recycling of plastics.
- **Glass:** Glass is reported to offer too little value to be considered for recycling, due to the need of sorting it at source by colour to allow for recycling. Small reuse and upcycling initiatives are already present in Jordan, while buy-back systems could be established to improve circularity of glass streams.
- **Metal:** Due to the relative ease of recycling and the high profitability of metal, Jordan has a long-established tradition of metal recovery, which suggests not prioritising this value chain for interventions.
- **Textiles:** Textiles and fabric constitute a large industry in Jordan yielding economic potential. The biggest cloth cuttings are sorted by manufacturers and re-exported for reuse and recycling. It is recommended to further explore initiatives for support to second hand clothing initiatives that have a thriving market in Jordan.
- **E-Waste:** Separate collection of e-waste is mainly taking place informally, while the high economic potential of e-waste sorting is recently gaining attention, as proven by a number of initiatives being started in the country. Notably, UNDP in partnership with the Ministry of Environment are launching an e-waste recovery project at country level to promote the separate collection of e-waste. It is important to provide trainings for proper handling of e-waste and formal job opportunities in modern e-waste dismantling facilities, to ensure safe management of hazardous components.
- **Tires:** used vehicle tires constitute a large volume of waste that is usually burnt. In addition, illegal dumping of tires constitutes an ecological threat as the tires' material components release chemicals and pollutants into the soil and groundwater. However, tires can be used to obtain fuel, or their components can be recycled for use in the civil engineering and agricultural sectors and for composite materials.
- **Water:** As one of the most water-scarce countries in the world, water use reduction and recycling initiatives yield high potential in Jordan. In particular, wastewater reuse in water intensive sectors like agriculture and construction is recommended. Setting up decentralised wastewater management plants in remote areas not connected to wastewater treatment plants is also recommended.
- **Energy:** While energy constitutes one of the main costs for micro, small and medium enterprises (MSMEs), incentives and subsidies for the use of renewable energy and energy efficiency technologies in buildings as well as trainings for construction workers on such technologies, which are not sufficiently applied in Jordan, are highly recommended.

Based on the preliminary findings from the scoping study, ACTED is proposing a phase 2 of an expansive assessment.

2. Objectives

This assessment will include both qualitative and quantitative studies to understand **key market potential and investment opportunities in Jordan for promoting circular approaches** and identify **environmental and social** gains from investing in these sectors.

First, a country-wide assessment on **municipalities' solid waste management processes** and formal and informal waste recovery schemes implemented in Jordan will reveal what can be implemented at the municipal level to promote efficient processes and decent livelihoods in the field of solid waste recovery. The solid waste assessment will also provide insight into some of the value chains selected for further research, namely, **agricultural and organic waste, paper, plastics, textiles and used tires**. Each of these will be tackled with a specific assessment, due to their strategic potential and gaps in information identified during the scoping study, and due to the possibility of implementing quick-impact interventions to improve circularity of material flows. The **water and energy** material cycles, which are **cross-cutting** and relevant within all other preselected value chains, will be assessed throughout the study to understand how to reduce their use and improve resource sustainability. Additionally, a **consumer-based assessment** will shed light on the market potential of products adopting circular economy approaches within the preselected value chains. Finally, ACTED will investigate the potentials for **piloting Circular Credit Systems in Jordan**, with waste producers subcontracting formal and/or informal waste collection and recovery actors for the sustainable management and disposal/recovery of waste.

Value-chain / Research Topic	Key Questions	Qualitative Data	Quantitative Data
1. Municipal SWM material flows mapping	a) What are the inefficiencies in the SWM collection process for municipalities? b) What are the main drivers of costs for municipalities' SWM budgets and how can these be reduced? c) What kind of waste sorting initiatives are taking place at municipal level? What waste value chains are most valorised and what are untapped waste recovery potentials, what are main challenges? d) How to integrate informal sector activities to the municipal waste recovery schemes?	Estimated 20 KIIs with: MoLA, scrap dealers and middlemen	Estimated survey of around 50 municipalities (95% confidence level and 10% margin of error on the 100 total municipalities in Jordan)
2. Formal and Informal waste recovery schemes	a) What kind of formal and informal waste recovery initiatives are taking place in Jordan? b) Which waste value chains are key in the informal waste recovery and recycling sector?	Estimated 20 KIIs with: MoEnv, MoLA, scrap dealers and middlemen	Estimated survey of around 50 waste pickers selected with snowball sampling
3. Organic and agricultural waste	a) What kind of initiatives can be put in place at household and commercial level for the recovery of organic and oil waste?	Estimated 20 KIIs with oil recycling companies, biogas production facilities, research	N/A

	<p>b) What are the returns of biowaste and oil recovery schemes in Jordan? What kind of small-scale biogas digestion initiatives could be promoted at the commercial level (e.g., in farms and restaurants)?</p> <p>c) What is the composition of agricultural produce waste in Jordan and how can such waste be reduced/recycled (e.g., surplus production, farm waste)? What can be done to reduce or recover agricultural waste?</p>	institutes (e.g. NARC), private sector agricultural companies and large farms	
4. Paper	<p>a) What are the drivers of costs for paper recycling in Jordan and how can the recycling process be made more efficient?</p> <p>b) What is the intensity of water and energy use in the paper industry and how can input use be reduced?</p> <p>c) What interventions can improve the quality of recycled paper in Jordan?</p> <p>d) What are the industrial needs of the paper sector and how can recycled paper be processed in country to replace imports?</p>	<p>Estimated 10 KIIs with:</p> <p>Packaging industries, MoEnv, paper industries paper recovery actors, municipalities</p>	<p>Estimated survey of 80 paper industries in Jordan</p> <p>(95% confidence level and 10% margin of error)</p>
5. Plastics	<p>a) What are the drivers of costs for plastics recycling in Jordan and how can the recycling process be made more efficient?</p> <p>b) What is the intensity of water and energy use in the plastics industry and how can input use be reduced?</p> <p>c) What interventions can improve the quality of recycled plastics in Jordan?</p> <p>d) What are the industrial needs of the Jordanian plastic sector and how can recycled plastics be processed in country to replace imports?</p>	<p>Estimated 10 KIIs with:</p> <p>Packaging industries, MoEnv, plastics industries, plastics recovery actors, municipalities</p>	<p>Estimated survey of 60 plastics industries in Jordan</p> <p>(95% confidence level and 10% margin of error)</p>
6. Textiles	<p>a) What initiatives are already in place and what opportunities exist in Jordan for reuse of clothing? What can be done to support second hand clothing markets?</p> <p>b) Is there a textile recycling market in Jordan? If yes, what are the textiles processed into? If yes, what is the intensity of water and energy use in the textile processing industry and how can input use be reduced?</p>	<p>Around 10 KII with stakeholders such as the clothing bank, second hand clothing shops, textile recovery and processing formal and informal actors.</p>	N/A
7. Tires	<p>a) What are the main challenges for the collection and dumping of tires in Jordan?</p> <p>b) Are technologies available to recover and recycle material components of used tires in Jordan, in a cost-effective way?</p> <p>c) In which Jordanian industries can recycled tires components be integrated as raw materials?</p>	<p>Estimated 10 KIIs with:</p> <p>MoLA, municipalities tires recovery actors (if existent), private sector companies (e.g. construction)</p>	
8. Consumer Preferences	<p>a) What are consumer preferences for second hand/refurbished products?</p> <p>b) What are consumer understandings/preferences for recycling of materials?</p> <p>c) What is the current level of label literacy among consumers?</p>	<p>16 Focus Group Discussions (FGDs) across north, centre, south Jordan and Amman</p> <p>(4 per area, gender and nationality segregated)</p>	<p>Around 100 online surveys</p>

9. Circular Credits System	a) Does the Jordanian legal framework allow for the implementation of Circular Credits Systems in the country? b) How can producers of waste and formal and informal sustainable waste recovery and disposal actors be engaged into a Circular Credits System?	10 KIIs with: BVRio, MoEnv, municipalities, formal and informal waste recovery actors	140 paper and plastics industries
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3. Data analysis and dissemination plan

Following the data collection exercise, a draft report will be prepared. A *national validation workshop* will be organised with key informants, including large industrialists, SMEs, ministries, donors etc. The purpose of the workshop is to review key data trends and obtain further feedback on strategic opportunities and gaps within circular economy approaches in Jordan. The workshop could potentially be organized online in line with COVID-19 related governmental regulations. Following the validation workshop, ACTED will further edit the report and share with GIZ for final review.

Findings stemming from the assessment will be analysed and presented in order for them to be used by various private and public sector stakeholders, as well as development actors, that they intend to serve.

In particular, findings from the **country-wide municipality assessment** on sustainable solid waste management (SWM) in Jordan will be addressed to Jordanian municipalities as well as their line ministry (the Ministry of Local Administration - MoLA) and development actors, including NGOs and donors. Recommendations could result into interventions to improve the efficiency of SWM processes in municipalities, as well as policy recommendations. Secondly, the **mapping assessment for formal and informal sector solid waste recovery interventions** will be targeted to municipalities and MoLA, MoEnv, MoL (Ministry of Labour), MoSD (Ministry of Social Development) and other interested government parties, as well as development agencies and donors. Recommendations are expected to improve the integration of waste recovery workers into the economy, potentially through the use of the Circular Credits System model. Lastly, the **circular economy assessment on selected value chains** will aim at providing recommendations for both public and private sector actors willing to invest in improving circularity of resources, as well as development agencies, donors and governmental stakeholders. The findings could result into recommendations in the realm of policy-making, market investment, and development programming.

As explained above, the data analysed will be shared at a validation workshop, whose participants will include large industrialists, SMEs, ministries, donors, with whom the final report will be shared, once drafted and approved by both ACTED and GIZ.

4. Workplan

		Month						
Activity	1	2	3	4	5	6	7	8
ToRs development								
Data collection								
Data analysis								

Report drafting								
Validation workshop								
Report finalisation								

10.2 List of KIIs

The table below provides details about stakeholders interviewed as part of the assessment with Key Informant interviews. These include Semi-structured Key Informant Interviews, Structured KIIs with Joint Service Councils (JSCs), Semi-structured KIIs with municipal sorting centres, KIIs with upcycling actors, Structured KIIs with second-hand clothing shops, KIIs with tires recovery actors, as mentioned in section 7. Methodology. Structured KIIs with 36 consumers are not included in the table.

Table 4 Semi-structured KIIs conducted

#	Stakeholder	Type of stakeholder	Data collection date
1.	Federation of Canadian Municipalities	Aid Agency	02/03/2021
2.	FabricAID	Private company (second hand clothing)	10/03/2021
3.	Ministry of Local Administration	Government	21/03/2021
4.	Second hand clothing shop 1	Retailer (second hand)	23/03/2021
5.	Second hand clothing shop 2	Retailer (second hand)	23/03/2021
6.	Second hand clothing shop 3	Retailer (second hand)	23/03/2021
7.	Second hand clothing shop 4	Retailer (second hand)	23/03/2021
8.	Second hand clothing shop 5	Retailer (second hand)	24/03/2021
9.	Second hand clothing shop 6	Retailer (second hand)	24/03/2021
10.	Second hand clothing shop 7	Retailer (second hand)	24/03/2021
11.	Second hand clothing shop 8	Retailer (second hand)	14/04/2021
12.	Second hand clothing shop 9	Retailer (second hand)	14/04/2021
13.	Second hand clothing shop 10	Retailer (second hand)	14/04/2021
14.	Royal Scientific Society – bio-based energy expert	Research Institute	30/03/2021
15.	JoPack	Private company (paper value chain)	06/04/2021
16.	Ta3zeeleh	Non-Profit Organization (second hand and upcycling clothing)	07/04/2021

17.	Royal Scientific Society – SWM division	Research Institute	14/04/2021
18.	Amman Chamber of Industry	Government	15/04/2021
19.	Fabrica	Private company (upcycling fabrics)	15/04/2021
20.	Dibeen	Marketplace for local farm products	21/04/2021
21.	Ministry of Energy and Mineral Resources	Government	21/04/2021
22.	GreenSpot Recycling	Private company (recycling company, all value chains)	21/04/2021
23.	Maria Nissan's Art	Artist (upcycling plastics)	21/04/2021
24.	Lumeyo	Private company (upcycling fabrics)	25/04/2021
25.	Green Creations	Private company (upcycling company, plastics paper and textile)	27/04/2021
26.	Mozara3 Farm	Farm (organic)	29/04/2021
27.	Mafrag Sorting Centre	Sorting Centre	04/05/2021
28.	Mafrag JSC	Municipal SWM actor	09/05/2021
29.	Badeya al Shemaliyya JSC	Municipal SWM actor	09/05/2021
30.	Irbid JSC	Municipal SWM actor	09/05/2021
31.	Tafileh JSC	Municipal SWM actor	10/05/2021
32.	Karak JSC	Municipal SWM actor	10/05/2021
33.	Modawwara JSC	Municipal SWM actor	10/05/2021
34.	Ajloun JSC	Municipal SWM actor	10/05/2021
35.	Qweera and Aqaba JSC	Municipal SWM actor	10/05/2021
36.	Karak and Madaba Sorting Centres	Sorting centre	17/05/2021
37.	Madaba Sorting Centre	Sorting centre	17/05/2021
38.	Karak Star for Recycling	Private company (recycling company, paper value chain)	20/05/2021
39.	Aqaba Sorting Centre	Sorting centre	23/05/2021
40.	Irbid Sorting Centre	Sorting Centre	24/05/2021
41.	Sorting station in Northern Shouneh	Sorting centre	26/05/2021
42.	Compost station, Huseiniyat landfill	Compost facility	26/05/2021

43.	Ministry of Environment	Government	02/06/2021
44.	Al Khalidiya Sorting Centre	Sorting Centre	30/05/2021
45.	Al Manshiya Sorting Centre	Sorting Centre	30/05/2021
46.	Taybah Sorting Centre	Sorting Centre	02/06/2021
47.	BVRio	Organization	01/06/2021
48.	Tires Recycling Company	Private Company	04/08/2021
49.	Tires Retreading Company 1	Private Company	09/08/2021
50.	Tires Retreading Company 2	Private Company	09/08/2021
51.	National Agricultural Research Centre	Governmental Research Institute	23/08/2021
52.	Ministry of Environment	Government	30/08/2021
53.	Clothing Bank	Non-Governmental Organization	05/09/2021
54.	BVRio -KOLEKT app team	Organization	30/09/2021

10.3 Mapping of formal waste recovery initiatives

Table 5 Mapping of formal waste recovery initiatives identified by ACTED through the assessment

	Name of the facility	Municipality	Governorate	Type of facility	Waste type collected
1	Municipal sorting centre	Taybah	Irbid	Sorting centre	Paper, Plastics
2	Municipal sorting centre	Al Rajib	Amman	Sorting centre	Paper, Plastics
3	Municipal sorting centre	Greater Irbid Municipality	Irbid	Sorting centre	Paper, Plastics, Metal, Organic Waste
4	Municipal sorting centre	Mafraq	Mafraq	Sorting centre	Paper, Plastics, Metal
5	Municipal sorting centre	Madaba	Madaba	Sorting centre	Paper
6	Municipal sorting centre	Karak	Karak	Sorting centre	Paper, Plastics, Metal
7	Municipal sorting centre	Al Khaldyah	Mafraq	Sorting centre	Paper, Plastics, Metal, E-Waste
8	Municipal sorting centre	Aqaba	Aqaba	Sorting centre	Paper, plastics, metal, wood and bread
9	Municipal sorting centre	Northern Shouneh	Irbid	Sorting centre	Paper, Plastics, Metal
10	Municipal sorting centre	Al-Huseiniyat	Mafraq	Compost station	Organic waste (animal manure)
11	Karak Star for Recycling	Greater Karak	Karak	Recycling company	Paper, Plastics
12	GreenJO	Amman, Zarqa	Amman, Zarqa	Segregated collection	Paper, plastics, metal
13	Green Spot Recycling	Greater Amman Municipality	Amman	Segregated waste collector	Paper, plastics, metal
14	Be Environmental Services	Greater Amman Municipality	Amman	Segregated waste collector	Paper, plastics, metal, glass, textiles, furniture, hazardous waste
15	Jordan Environment Society	Greater Amman Municipality	Amman	Segregated waste collector	Paper, plastics, metal
16	Green wheelz	Greater Amman Municipality	Amman	Segregated waste collector (non-profit initiative)	Bottles' caps and aluminium cans