Circular Economy

NATIONAL STUDY – Jordan

EXECUTIVE SUMMARY

October 2021

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

التعاون الألماني
DEUTSCHE ZUSAMMENARBEIT

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

ACTED

In cooperation with:
Ministry of Local Administration

CIRCULAR ECONOMY NATIONAL STUDY IN JORDAN

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Funded by the European Union, through the EU Regional Trust Fund in response to the Syrian crisis, the EU Madad Fund and the German Federal Ministry for Economic Cooperation and Development (BMZ).

This publication was produced with the financial support of the European Union and the German Federal Ministry for Economic Cooperation and Development. Its contents are the sole responsibility of ACTED and do not necessarily reflect the views of the EU or BMZ.

This publication may be referenced as: ACTED (2021), *Circular Economy National Study in Jordan. Executive Summary.* EU Trust Fund (Madad), ACTED, GIZ, MoLA.

Contents

Background

In a linear economy, resources go from extraction to consumption to final disposal and are proven as an unsustainable model of consumption globally. The urge to shift to circular economic models is more evident than ever in countries such as Jordan, where municipal solid waste management (MSWM) infrastructure is strained by an increasing amount of waste generation. Instead, the waste generated could be avoided in the first place and turned into economic opportunities for actors, such as second-hand and rental shops, repair workshops, waste recovery stakeholders, as well as the municipalities themselves, while yielding environmental benefits.

A circular economy is based on three principles[1]:

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

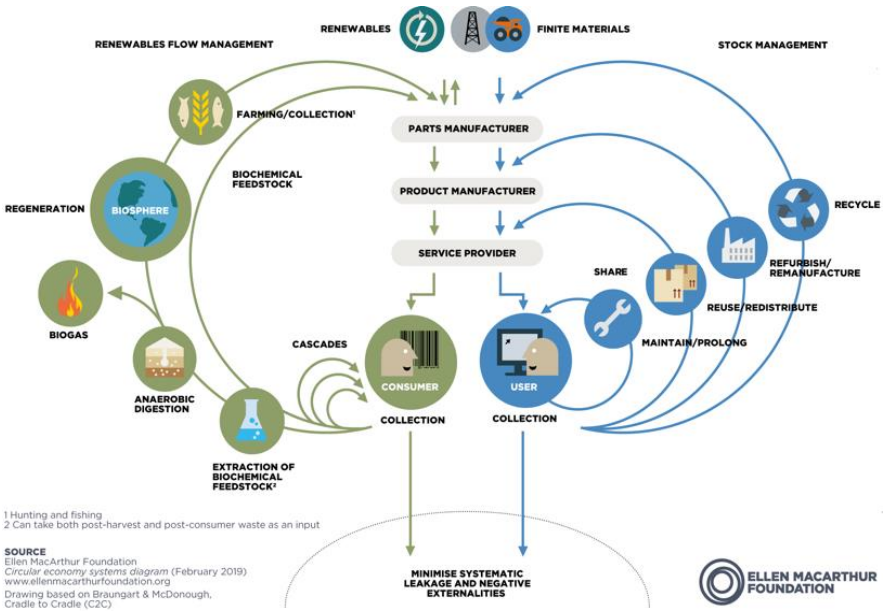

Figure 1: The circular economy system diagram. Ellen MacArthur Foundation, 2019

In essence, circular economy models aim at keeping materials flowing through their market systems for as long as possible, to extract their maximum value and prevent negative externalities on natural resources. Figure 2 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. At the top of the diagram, materials are extracted from non-renewable or renewable resources and are carried down to the consumer. After use, the aim is for the materials to follow the loops of reverse collection and recovery/regeneration.

Stemming from the findings of ACTED's scoping study conducted in 2019, 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:

1. Assess Jordanian **municipalities' solid waste management processes and waste recovery schemes**, to formulate recommendations on improving efficient service delivery while promoting livelihoods within the solid waste recovery sector, eventually **improving Solid Waste Management (SWM) cost recovery** for municipalities.

[1] Ellen MacArthur Foundation, What is the Circular Economy. Available online: https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy.. Last accessed 15 August 2021.

2. Provide insight into the **potential of selected value chains** – namely, agricultural and organic waste (also referred to as biological cycles), paper, plastics, textiles and used tires – for implementing quick-impact interventions to **improve circularity of material flows**.
3. Investigate **engagement of the private sector within the circular economy**, i.e. provide an overview of the current status of Extended Producers Responsibility (EPR) initiatives in Jordan and potential to pilot Circular Credit Systems in the country.

Methodology

To pursue such objectives, ACTED collected data utilizing a mixed methodology approach, including both secondary data / desk reviews and primary data collection. Qualitative and quantitative interviews were performed across Jordan between December 2020 and September 2021, comprising of 90 between Key Informant Interviews (KIIs) and semi-structured interviews and 522 quantitative surveys.

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

<table>
<tr><th colspan="5">Study methodology overview per research objective</th></tr>
<tr><td colspan="5">Jordanian municipalities' solid waste management processes and formal and informal waste recovery</td></tr>
<tr><td></td><td colspan="4">- 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</td></tr>
<tr><td colspan="5">Potential of biocycles, paper, plastics, textiles and used tires, to improve circularity of material flows</td></tr>
<tr><td>Biocycles</td><td>Paper</td><td>Plastics</td><td>Textiles</td><td>Tires</td></tr>
<tr><td>- 4 KIIs with compost units, experts, ministries
- 45 quantitative surveys with farms
- 2 KIIs with non-conventional agriculture stakeholders</td><td>- 1 KII with packaging actor
- 23 quantitative surveys with paper industries
- 1 KII with upcycling actor
- 1 KII with recycling company</td><td>-60 quantitative surveys with plastic industries
- 1 KII with upcycling actor</td><td>- 10 KIIs with second hand textile shops
- 2 KII with clothing charity and social enterprise
- 3 KIIs with upcycling actors</td><td>- 3 KIIs with tires recovery actors</td></tr>
</table>

Multiple value chains	
- 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

Limitations

Most data was collected through phone or skype due to the restrictions imposed by the COVID19 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 the Ministy of Local Administration, which also functions more efficiently. This does not affect the quality of the study to a large extent as the assessment aimed at focusing on most vulnerable municipalities in Jordan.

Non-probability sampling with waste pickers, paper and plastics manufacturers and farms engaged in the assessment biased the data collection and nation-wide representativeness of the sample. Additional research can further delve into each of the research objectives, while the data collected by ACTED can be taken as an indication of the role that such actors play within the value chains of interest. In addition, questions addressed to private sector actors (paper and plastic companies) aimed at collecting types of information that can be generalized to such types of stakeholders, capturing common trends that have indeed been observed across sampled companies.

The study found that virtually no municipality conducts waste audits to characterize waste by type and quantity. This has resulted in waste characterization data being based on the individual perceptions of the municipal focal points interviewed as part of the assessment. 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.

The quantitative consumer survey was administered online resorting to non-probability sampling and based on willingness to participate; however, additional KIIs were conducted to triangulate the information.

Municipal Solid Waste Management (MSWM)

Waste collection poses difficulties for 97% of municipalities in Jordan, who mentioned key MSWM-related challenges (see Figure 2), particularly concerning the availability of fleet, bins and labour.

Inefficiencies in waste collection were reported as waste trucks do not accurately follow collection schedules[2], which are also not always available when mapped waste collection routes and container

[2] KII with Federation of Canadian Municipalities, March 2021

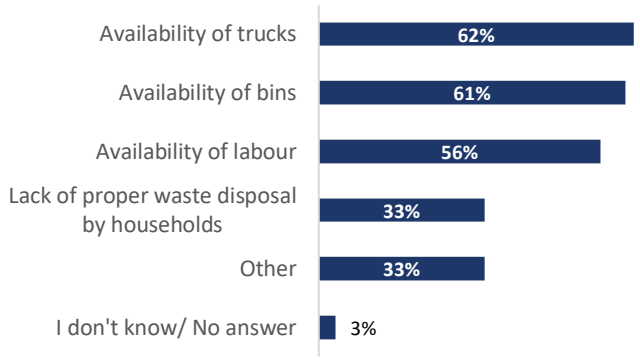

Figure 2: Main SWM-related challenges reported by Jordanian municipalities. More than one answer was possible

locations do not exist[3].

In addition, the lack of a structured municipal SWM unit and consequently dedicated SWM budget[4], coupled with coordination challenges with electricity providers to transfer the adequate amount of SWM fees (collected as part of the electricity bills), result in budget expenditure inefficiencies and insufficient funds. In fact, only 54% of the municipalities engaged in the assessment were able to indicate the amount of their monthly municipal SWM budget, which was estimated at 1.2 JOD per person. This is more than double the service fee paid by the households (HHs), considering an average HH size of 4.8 persons[5]. To improve SWM efficiency in municipalities, **establishing a dedicated SWM unit within municipalities**, at least for those over a certain population, **would enable improved budgeting and more efficient allocation of resources for MSWM**.

75% of the municipal focal points interviewed were also not able to define disaggregated quantities of waste produced by stream type, as waste audits are very rarely conducted[6]. Those who could reported an average of 1.2 kgs of MSW is produced per person on a daily basis in Jordan, with organic waste making up more than half of the total solid waste in country, followed by paper and plastics (10-15% of the total waste), metal (5%) and other (20%).[7] **Waste characterization studies (waste audits) would not only allow enhance allocation of SWM resources, but also support the municipalities in determining the actual economic potential of waste that can be recovered**.

Municipal Waste Recovery

The recycling industry is an energy intensive process, resulting in high electricity costs and putting Jordan at a comparative disadvantage to regional and international competitors. [8]. In fact, most of the sorted waste streams are shipped abroad for recovery, to Saudi Arabia and the Gulf in most cases.

15% of the municipalities engaged in this study reported to perform separate collection of certain types of waste, primarily paper (13%), plastics (8%), and organic waste (8%), followed by metal (3%) and glass (1%). Normally, such waste is brought to sorting centres for manual sorting. This is reported to cause lack

[3] 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

[4] The SWM budget is part of the overall municipal budget. For example, waste trucks are part of the general fleet budget of the municipality.

[5] Government of Jordan, DOS (2019) *Jordan in Figures*

[6] KII with FCM, March 2021

[7] The considerable amount of waste categorized by municipalities as "other" stems from municipalities' lack of waste characterization data and accurate estimations of quantities of different waste streams.

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

"Around 25% of sorted waste is contaminated with organic or liquid waste and is eventually sent to the landfill"

Municipal sorting centre, May 2021

of accuracy in sorting, thus **technologies, such as Infra-Red sorting, are advocated for to improve the quality of the output materials**[9]. In addition to quality, limited quantities of materials with significant value is reported. For example, metal is a high value material already well recovered by informal waste actors. Prices fluctuations in the market of certain materials (i.e. plastics and paper) also challenges the profitability of sorting centres.

Municipal waste recovered is usually sold through municipal tenders. The non-existence of 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. In addition, local recyclers cannot offer a competitive price for waste compared to exporters, due to their higher running costs compared to facilities abroad. However, **preference for local waste recovery actors when tendering could be advocated for to keep recovery localized as much as possible**, and therefore shortening the value chain and saving resources while stimulating the local economy. Lastly, coordination between formal waste recovery centres and informal waste recovery actors is a commonly reported challenge. This both threatens the availability of waste for formal sorting centres, which report "competition" with informal workers on waste recovery; and market viability of formal waste recovery initiatives, which sell their sorted waste at a higher price than informal scrap dealers due to their higher running costs.

The informal waste recovery sector guarantees a source of income for many vulnerable individuals who work as waste pickers in towns or at landfills. However, the informality of the sector and the individual nature of the waste pickers' work limits opportunities for economies of scale. Scrap dealers buying from waste pickers prioritize waste types with higher value, which are also dependent on prices fluctuations, namely metals (85%) and plastics (78%), followed by electronic waste (22%), old furniture (15%), glass (11%), tires (7%) and paper (4%)[10]. Unsold waste or waste with lower to no market potential tends to be dumped, rather than stored until price is convenient. High transportation costs, market saturation, lack of market linkages (difficulty to identify available actors to sell waste to), waste contamination and sorting accuracy (especially for plastic waste) and volatility of waste prices are reported as main challenges by scrap dealers. Integration of **informal labour into formal waste recovery initiatives is essential to avoid disruption of the existing market that offers employment opportunities, albeit informal, to vulnerable individuals**.

[9] ACTED KII with selected sorting centers, May 2021

[10] 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.

Biological cycles

Extraction of bio-feedstock

Bio-feedstock is defined as anything extracted from natural systems and used to produce something else, such as energy, bio-based plastics or plant-based packaging. ACTED identified a number of bio-feedstocks[11] that either are already used or have potential for increased use in Jordan.

Figure 3: A small scale biodigestor. ©Homebiogas

Amongst these, organic waste, constituting around half of the waste collected and dumped in Jordanian landfills, yields great potential for energy generation through anaerobic fermentation[12]. This process results in **biogas,** as well as a by-product which can be used as a fertilizer[13]. While biogas' contribution to electricity production is increasing in Jordan, it is still not utilized to its full potential in country. **Biomass production could also be increased using animal manure** (96% of total biomass in Jordan), **slaughterhouse waste, peat from olive oil, sludge from wastewater treatment plants**[14]. In addition to large scale biogas facilities, **smaller scale biogas units can be piloted for restaurants, households and farms**.

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 megawatt to be produced[15]. Jordan's energy policy framework currently defines all biofuels as non-renewable sources of energy; therefore, not only excluding general biofuels, which might release negative externalities, but also biogas produced from waste, to benefit from the renewable energy law and tax redemption Bylaw No. 13 of 2015[16]. Given that biofuels have differentiated environmental impacts depending on the feedstock, **fiscal incentives can be used to support** processing organic waste for the production of energy.

Biodiesel production is another option to chemically convert biomass or cooking oil through transesterification into biodiesel, diverting such waste from landfills or harmful practices (i.e. **dumping cooking oil into water systems)**. In the formal sector, ACTED could identify two companies collecting cooking oil – mainly from chain hotels, restaurants and malls.

To improve recovery of available biofeedstock, **segregated collection systems could potentially be expanded at users' level, by setting up organic waste and used oil collection points within**

[11] A feedstock is defined as a material that can be used to produce something else. A bio-feedstock is a feedstock made of renewable, biological materials. For example, organic waste can be bio-feedstock for biogas-derived energy.
[12] Anaerobic fermentation refers to the processing of glucose from feedstock by microorganisms in the absence of oxygen.
[13] 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
[14] Ibid.
[15] KII with Ministry of Energy and Mineral Resources, April 2021
[16] Al Kurdi, L. (2021) *Biofuels in Jordan: Perspectives*. EcoMENA. Available online: https://www.ecomena.org/biofuels-jordan/ . Last accessed 15 August 2021.

municipalities. Given the lack of household level sorting practices, awareness raising campaigns are crucial to encourage household level sorting.

Composting organic waste is also another option that can be implemented in households and farms. However, inaccurate composting practices and the usage of raw manure directly on land (implemented by 11% of farmers) need to be discouraged in favour of the promotion of initiatives producing high quality compost. Some of these are already ongoing in Jordan[17] and, despite competition from cheaper imported compost, its high-quality drives demand in the country.

Regenerating natural systems

Conventional agricultural practices tend to treat the farm like an industrial machine, focusing on growing high volumes and faster. However, applying this type of approach to natural systems risks degrading the 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 recognize the complexity and resilience of the natural resources from which agricultural yields are generated[18]. This approach is called regenerative agriculture, which builds upon pre-industrial models of food production and has a better understanding of the soil, water and relationship within natural ecosystems, thus shifting from a linear to circular model of production. The current dominating model of production in Jordan is based on conventional agriculture and monocropping. This, added to the lack of implementation of planning calendars, often results in surplus, wasted produce and consequent produce depreciation. If avoiding surplus is not possible, **farmers could be supported with food processing solutions, as well as storage facilities**. Regenerative and alternative farming provides an alternative to monocropping. One of its several principles includes polyculture, which makes use of interactions of different agricultural crops being for pest and disease control. In Jordan, non-conventional agricultural practices are rarely used, and indeed 63% of farmers do not believe that is possible to farm in Jordan without the use of intensive inputs and by making use of nature-based techniques such as polyculture, mentioning that the production would not guarantee profitability.

> *"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

Unsustainable soil management practices are also common in traditional farming models in Jordan, such as overgrazing, monocropping, tillage, over-pumping of groundwater, ploughing of marginal soils and deforestation in the rainfall zones. All of these, in addition to climate change, have caused degradation of 41% of all Jordanian land[19]. While 18% of farmers interviewed during ACTED's assessment do not regularly

[17] ACTED could identify several composting stations in Jordan, set up by GiZ and UNDP.

[18] 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

[19] MoEnv, LDN, UNCCD (2018) *Final Country Report of the Land Degradation Neutrality Target Setting Programme.*

check their soils, easily implementable soil assessments, such as FAO's Visual Soil Assessment[20], could help farmers evaluate the health of their soil and encourage sustainable land management practices.

Regenerative farming solutions, such as **the usage of heirloom seeds that more easily adapt to the environment, the use of soil biota for fertilization and integrated pest management practices**, can be further promoted in Jordan, where heavy use of chemical pesticides (93%) and fertilizers (73%) is reported.

In addition, **practices, such as terracing and soil workings to improve water retention, as well as rainwater harvesting and treated wastewater reuse,** can be further incentivized in a sector that currently consumes more than 50% of Jordan's water resources and 70% of its groundwater. However, some challenges persist to promote the adoption of these practices. For example, only 13% of farms engaged in the assessment are willing to reuse greywater due to concerns on quantity and quality of treated water affecting quality and quantity of the outputs[21]. In addition, this is compounded by limitations in the use of treated wastewater for fodder and tree crops only, as per Ministry of Agriculture's regulations.

In conclusion, while alternative farming can be a solution to regenerate natural systems, transition to such practices should be performed gradually. Regenerative models of farming, as opposed to monocropping, can yield fewer outputs, 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[22], **research and development can demonstrate what effectively works in the country and how to promote regenerative agricultural models in Jordan**. In addition, as alternative agriculture generally produces less cultivar per dunum of land (**organic farming for example yield around 50% less produce according to KIIs**), a strong advertising and marketing strategy is essential to target the appropriate customers. Weak marketing indeed leads to overproduction for some organic farms consulted as part of the assessment, which refuse to sell organic product at central markets, where prices are fixed and aligned with conventionally grown crops, leading to profit losses; and lack of economies of scale due to small size of farms.

Technical cycles

Technical materials are non-renewable, finite resources. ACTED included four technical materials' value chains in the assessment, i.e. plastics, paper, textiles and used tires. Within technical cycles, inner loops (see Figure 1) of reduction including extraction/use, reuse and repair/refurbishing are preferrable to more resource intensive processes such as recycling.

Reduce, redistribute and prolong

Reducing extraction of finite resources through investment to manufacture products– both reusable and bio-based – as alternative to technical materials would guarantee environmental benefits while promoting job opportunities. For instance, plastic mulches used in farms could be replaced with bio-based

[20] See FAO's Visual Soil Assessment Toolbox.
[21] WANA Institute (2019) *Water and Agriculture in Jordan: Understanding Current Water and Agricultural Priorities and Futures*
[22] Such as the Greening the Desert project or holistic grazing through the Savory Method by IUCN, the Badia Fund and the Royal Botanical garden.

ones (e.g. bark, leaves, wool, straw) made from locally sourced materials or biodegradable plastics, starch, and paper. The growth of such industry can be supported through governmental regulations, such as **bio-based plastic standards[23], 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.**

Reuse and keeping materials in use is the key principle of sharing economy models. 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 successful both environmentally and economically.**

Second-hand and refurbishing markets are also a viable circular solution, with almost half of Jordanians having, at least once, purchased second-hand or refurbished products, including clothing, electronics, large household appliances, furniture, mainly by reason of economical savings (82%). This suggests that these markets tend to target lower income range customers. The textiles value chain is an exemplary model in Jordan. Second-hand clothing shops are widespread throughout the country, and while they can be found in neighbourhoods of different income ranges, the purchase of second-hand clothes is mainly driven by economic reasons as mentioned by KIIs second-hand shops interviewed by ACTED**. To further promote second-hand markets amongst mid to higher income consumers, focusing on marketing elements such as the vintage character and the uniqueness of the item as well as environmental factors can support targeting higher end markets. In addition, incorporating appealing elements, such as a catchy packaging or design and better shop facilities, would ensure stronger outreach to such pool of customers.**

UPCYCLING

Upcycling offers the potential of giving new life, and value, to waste with the added benefits of less energy requirement in comparison to recycling processes. Examples of upcycling initiatives in Jordan include turning plastics into art pieces or bags, designing jewellery from paper scrap, upcycle fabrics into quilts, and used tires into furniture.

While upcycling initiatives in Jordan are very fragmented, significant potential exists if investments are directed to improving marketing and communication of upcycling initiatives, which continue facing competition from commercial products.

Collaborations with designers and market analyses prior to the marketing are also important or such initiatives, which struggle due to the lack of an attractive design. Lastly, connection with e-marketing platforms is key to reaching a pool of customers that is normally geographically spread out.

Re-treading worn-out car tires is another circular initiative to keep materials in use and is already in practice in Jordan. However, used tires are normally imported from the gulf area and Western countries due to their higher quality[24]. Re-treaded tires are currently sold at around half of the price of the new tires, and customers' trust towards the product remains high, also thanks to warranty of up to 12 months

[23] Some plastics standards already exist in Jordan (JS EN 13432:2012 Packaging - Requirements for packaging recoverable through composting and biodegradation and JS 2004:2012 Packaging - Specifications for Oxo-biodegradable plastics and packaging)
[24] ACTED's KII with tire re-treading actors, August 2021

obtained by the customers[25]. Difficulties linked to fiscal burdens made the economic returns of such activity unprofitable for most Jordanian re-treading companies[26]; hence **tax incentives can be provided to such waste-diverting initiatives to promote such markets.**

Recycle

Recycling is not preferred within the circular economy hierarchy. However, greater incorporation of recyclates within manufacturing processes can be promoted to avoid extraction of virgin resources. Existing thriving industries in Jordan are **plastics and paper companies**, which ACTED interviewed as part of the assessment. Both mainly source their raw materials from virgin inputs (60 to 100% of total plastic input materials of Jordanian plastic manufacturers are composed of virgin plastics, while more than half of the paper manufacturing companies do not use any recycled paper material).

The main reason for the lack of incorporated recycled inputs is reduced quality of final output products (e.g. reduced durability and strength) and visual appeal (e.g. colour and impurities). Indeed, particularly for plastics, the quality of recycled material depends on a well-managed waste stream, specifically by washing and appropriate sorting[27]. **Investing in structures to enhance sorting efficiency is a proven means of addressing issues of quality in products that incorporate paper and plastics waste**. To avoid quality issues, 33% of plastics and 9% of paper companies source recycled materials from their own industrial waste, which offers guarantees of little contamination compared to post-consumer waste. Integrating plastics waste within production lines is easier than integrating paper waste: while paper waste requires dedicated processing, plastic waste can be simply shredded and inputed alongside virgin plastics. However, this only works if the shredded plastics have uniform composition, i.e. types of dyes, additives etc., to ensure no damage occurs to machines and the quality of the final products is not affected. This is why 38% of plastics companies are not willing to mix in shredded plastics into their existing production lines and require a dedicated production line to utilize recycled plastics.

> *"I don't know the origin of recycled plastic inputs, what processes it went through, therefore I prefer to use virgin plastics"*
>
> Jordanian plastic manufacturer, March 2021

In addition, 47% of Jordanian plastic industries said incorporating more recyclates in their final products would increase their energy consumption (see Figure 4). While processing recycled plastics actually entails a lower energy consumption than extracting the virgin material, normally the cost of energy for virgin plastics is externalized because the raw material is imported, while local recycling would require industries to pay in country to process the recyclates, which could add to their costs. Hence, **to support manufacturing actors in Jordan to incorporate more recycled plastics into**

[25] ACTED's KII with tire r-etreading actors, August 2021

[26] A KII reported that 18 re-treading companies were open in Jordan, of which only four are still currently operating. ACTED's KII with tire re-treading actors, August 2021

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

their production processes, affordable energy, improved machinery, dedicated production lines and storage availability are some of the immediate investments that could be promoted.

Regarding paper recycling, paper companies mostly import ready-made recycled paper because the recycling process is very water and energy intensive. In fact, existing paper recycling companies in country struggle with financial sustainability, which in turn challenges their competitivity in the scrap paper market. **Providing Jordanian paper companies with technologies for the treatment of industrial wastewater could enhance opportunities for circularity within this value chain.** In addition, improving recyclability at the design stage is recommended for both paper and plastics industries. For example, **improved labelling standards for plastics, ensuring that plastics is classified by type, and implementing de-inkability grades** regulations amongst paper industries can greatly support recycling initiatives.

The Jordanian recycling industry is also constrained by a lack of consumers' demand for recycled products: Jordanians tend to prefer products made from virgin material (22%) over recycled ones (16%), due to perceived higher quality. When it comes to hygiene paper products (e.g. tissues, toilet paper), the proportion of consumers preferring virgin paper increases to 46% due to perceived lack of hygiene (90%) and lower quality (22%). **Awareness raising campaigns on the environmental benefits of recycled products over virgin ones, as well and the safety and hygiene of recycled paper products, can reassure consumers and stimulate demand for such products.**

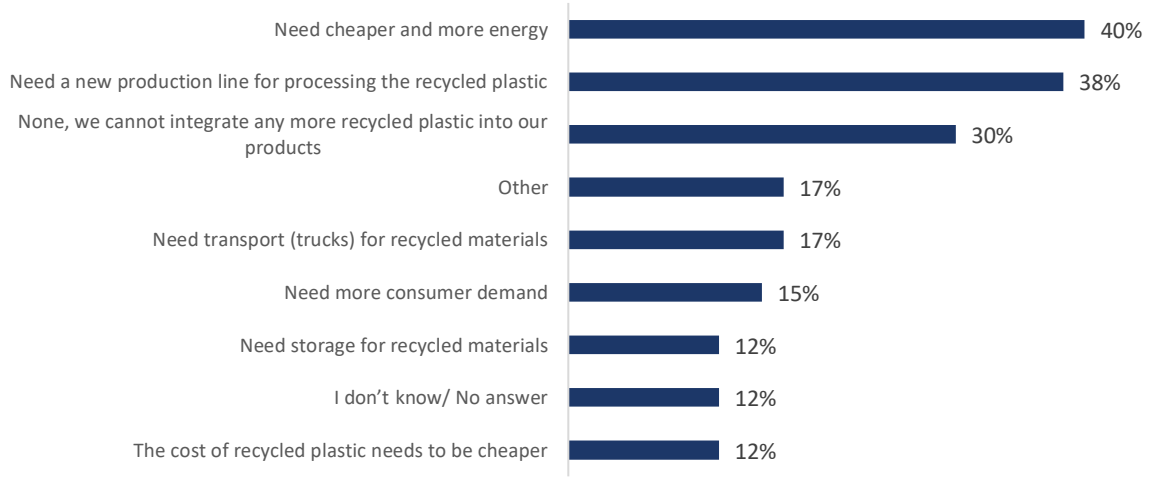

Figure 4: Support advocated for by Jordanian plastics companies to incorporate more recycled plastics

As for the Jordanian tire waste, recycling is a generally profitable activity, to either shred tires into their rubber and steel components, with applications ranging from production of nails and asphalt, as well as playground surfaces; or to produce diesel through through pyrolysis. The latter presents several challenges as it is a complex process requiring trained workforce and technology[28]. **Further capacity building to improve local technical knowledge on the diesel extraction process from waste tires is reported as a need to promote such industry**[29]. For both applications of recycled tires, **fiscal incentives and policy support measures** have been highlighted as critical needs by KIIs. For example, supply of tires

[28] Jordan TV news report (2019). Last accessed on 12 July 2021.
[29] ACTED's validation workshop, 18 August 2021

is currently dependent on private scrap dealers and relatively expensive (up to 35 JOD per ton) mainly due to transportation costs, and the high cost of energy constrains the tires recycling industry.

While a high amount of fabric waste is available in Jordan, due to the presence of numerous clothing companies in the Free Trade Areas in particular, recycling technologies for fabric fibres locally might not be convenient. Lack of technology, need for technically skilled human resources, and inopportune regulatory environment, are some factors that make textile recycling not economically beneficial[30]. Hence, pre-consumer textile waste is often exported to processing actors abroad. **Investments directed at incentivizing local processing and recovery of textile waste through upcycling initiatives or simple shredding technologies to produce furniture fillings that can be used in Jordan are recommended.**

Opportunities for private sector engagement in Circular Economy

Extended Producer Responsibility

The Extended Producer Responsibility (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".[31] In Jordan, the EPR framework law is currently underway and is planned to be released by 2022. In the initial years, only very large sized producers will be targeted, while the law will be extended to smaller actors gradually. **Given the industrial system in Jordan dominated by SMEs, the steering committee should be crucially devising ways to support such companies to participate into the EPR without adding an economic burden to the industry which might affect their sustainability**.

The EPR will be based on a Producer Responsibility Organization (PRO) 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 that they input into the economy. The PRO, formed at the Jordanian Chamber of Industry and headed by the Ministry of Environment will also be responsible for launching tenders to identify service providers for the recovery of waste materials. Priority will be devoted to service providers which can ensure maximum recovery of the waste material targeted, with landfilling only being considered as a last resort for types of waste which cannot be recovered. While tenders would prioritize service providers who can deal with the maximum quantity of waste possible, a key challenge lies in the fact that **it is unlikely that recycling facilities available in Jordan can absorb the total amount of waste produced in the country. Nevertheless, prioritizing local recovery facilities (even if small-sized) is recommended.**

Circular Credits

The circular credit system is a market tool aimed to connect buyers and sellers of environmental services related to waste collection, sorting and appropriate disposal of recyclable post-consumer waste[32]. The system operates through the Circular Action Hub (https://www.circularactionhub.org) an international online platform which connects interested parties (e.g. companies, individuals) to sellers (e.g. projects for sustainable waste recovery, waste pickers). Waste collection and recovery actors willing to post their initiative on the hub's website to seek for financial support, pass through an auditing protocol, that

[30] Ibid

[31] See OECD's definition of the Extended Producer Responsibility.

[32] BVRio (2020*), Circular Action Hub – Principles & Criteria for Projects v1.2, July 2020*

ensures both compliance with the qualitative and quantitative principles and criteria of the hub. Once projects are registered online, buyers/investors can express interest, with the hub facilitating negotiations and overseeing transparency of the transaction[33].

The **Circular Credits System seem 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 informal, it will be crucial that a formal entity (e.g. an NGO) would become 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.

Conclusions

Municipal Solid Waste Management and recovery

ACTED's assessment confirmed how waste management remains one of the key burdens for Jordanian municipalities, which struggle to cover their costs, from collection to transportation and final disposal. This demonstrates a dire need to promote circular economy initiatives, such as **public-private partnership to facilitate the sale of municipal waste to actors that process it locally** alongside **supportive regulatory frameworks and tax incentives**. Given the informal nature of some of the private waste recovery actors, devising ways to **integrate informal actors within formal waste recovery initiatives**, and therefore also uphold decent labour conditions while maintaining their livelihoods, is essential. This would also support mitigating the current competition between public and private informal initiatives for waste recovery. In addition to the usage of **IR or other technologies**, **household level approaches including waste segregation** accompanied by sensitization campaigns on appropriate sorting at source can contribute to improving the quality of waste recovered by municipal sorting centres. Lastly, investments can be made to improve the reverse logistics of recoverable waste collection and recycling, such as more **efficient transport logistics over pre-determined service areas**.

Biocycles

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 smaller scale (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 the availability of feedstock. Similarly, the collection of **cooking oil** to produce biodiesel can be improved while sensitizing the public on the negative impacts of dumping cooking oil into sewages.

In addition, **research and development should identify additional available bio-feedstock** in Jordan to either generate energy or substitute technical materials (e.g. bio-based plastics).

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

[33] ACTED's KII with BVRio, June 2021

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.

Technical cycles

Acting at inner loops of the circular technical material flows guarantees waste reduction with less resource use. Promoting **sharing economy, second hand and refurbishing/repairing initiatives** through strong advertising and marketing targeting both lower and higher end markets, can boost demand for such products.

In addition, supporting upcycling initiatives across value chains through a combination of linkages with **designers, improved marketing approaches and connections to online marketing platforms** can allow such initiatives to thrive, in addition to diverting segregated municipal or industrial waste away from landfills.

Investments in **local plastics recycling structures, combined with the provision of affordable energy, improved machinery, dedicated production lines and storage availability**, could contribute to increased availability and affordability of recycled raw materials processed in country. 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**.

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 products' recyclability** at the design stage (e.g. avoid the use of dyes or inks) can crucially support recycling initiatives.

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 by setting up **tires recycling companies in areas where waste tires generation is higher**, such as Aqaba, or by facilitating **linkages with tire waste production companies and waste recovery actors**. Tax incentives for recycling and re-treading companies can also boost such kind of initiatives.

Private sector engagement: Extended Producers Responsibility and Circular Credit Systems

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 into the EPR without adding an economic burden to the industry which might affect 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 into the EPR.

Circular credits also offer a means to support local waste recovery initiatives by connecting such 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.