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SOLID WASTE VALUE CHAIN ANALYSIS IRBID AND MAFRAQ JORDAN



Mitigating the Impact of the Syrian Refugee Crisis on Jordanian Vulnerable Host Communities for UNDP Jordan

June 2015



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LIST OF ABBREVIATIONS

ACTED	Agence d'Aide à la Coopération Technique et au Développement
AD	Anaerobic Digestion
CBO	Community Based Organization
CCD	Company Control Department
CEP	Community Engagement Programme
CFC	Chlorofluorocarbon
CIDA	Canadian International Development Agency
CRT	Cathode Ray Tube
DVV	Institute for International Cooperation
EU	European Union
FTA	Free Trade Area
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HDPE	High Density Polyethylene
JD	Jordanian Dinar
JCP	Jordanian Competiveness Programme
JICA	Japan International Cooperation Agency
JSC	Joint Service Council
KFW	Kreditanstalt für Wiederaufbau
LDPE	Low Density Polyethylene
MEAs	Multilateral Environmental Agreements
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoEM	Ministry of Energy and Mines
MoH	Ministry of Health
MoIT	Ministry of Industry and Trade
MoMA	Ministry of Municipal Affairs
MRF	Material Recycling Facility

MSWM	Municipal Solid Waste Management
NGO	Non-Governmental Organization
OXFAM	Oxford Committee for Famine Relief (formerly)
PCB	Printed Circuit Board
PE	Polyethylene
PET	Polyethylene Terephthalate
PP	Polypropylene
PPP	Public-Private Partnership
QIZ	Qualified Industrial Zone
SWM	Solid Waste Management
UNDP	United Nations Development Programme
UNHCR	Office of the United Nations High Commissioner for Refugees
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
USAID	United States Agency for International Development
USD	United States Dollar
WASH	Water, Sanitation and Hygiene
WB	World Bank
WEEE	Waste Electric and Electronic Equipment

1.0 EXECUTIVE SUMMARY

This Report presents the findings of a detailed Solid Waste Value Chain Analysis of solid waste in the Jordanian Governorates of Irbid and Mafrq conducted by Disaster Waste Recovery (DWR) in the period February – April 2015. The project was initiated and funded by UNDP Jordan with the objective of providing robust data and information for the design and implementation of solid waste management interventions. These interventions will support the refugee host communities in Irbid and Mafrq, whose current solid waste management systems are heavily burdened by the large numbers of refugees in these Governorates.

The Solid Waste Value Chain Analysis comprised a combination of desk study work in Amman and DWR home office with extensive semi-structured interviews of more than 110 stakeholders in Irbid, Mafrq and other locations of Jordan. These stakeholders included the full range of those persons, companies and organisations dealing with solid waste from street pickers and waste pickers at the landfills through waste brokers and recycling companies to the governmental Governorates and relevant Jordanian Ministries.

1.1 Waste Generation and Management

According to the latest study for the Jordanian MSWM National Strategy 2015, the current rate of solid waste generation in Irbid and Mafrq is a combined 649,000t with more than 75% of this waste being generated in Irbid. Approximately 85% of this waste is currently being disposed of at landfills or by uncontrolled dumping, with the remaining 15% being recycled and recovered. There is thus significant scope to increase the level of recycling and recovery for the solid waste in both Governorates.

1.2 Solid Waste Actors

Within the two Governorates of Irbid and Mafrq, there are more than 3000 people involved in and employed in the informal sector which deals with solid waste. This informal sector is mainly based on the collection and sorting phases of the solid waste cycle including street collectors and waste pickers at the landfills. Several waste brokers are also operating in the informal sector.

Within the formal private sector there are more than 200 companies registered as recycling companies nationwide, however from the interviews conducted it was evident that numerous of these had ceased trading in solid waste recycling and recovery, while some active recycling companies are not registered as such, so the actual number is difficult to assess.

As a whole, there are fairly established solid waste management systems based on commercial agreements in both Irbid and Mafrq for key waste streams such as metals, paper and cardboard as well as plastics.

However, a large proportion of the interviewees did comment on the general lack of professionalism and reliable data/information relating to solid waste management. There were numerous requests for improving the efficiency, safety and effectiveness of solid waste management across the Governorates.

1.3 Solid Waste Value Chains

Through the desk study and interviews it is evident that there are well established solid waste value chains for key solid waste streams such as metals, paper and cardboard and plastics. These value chains stretch from the initial collection (mainly by the informal sector) through to final recovery and recycling either in-country or through export. These value chains also support profitable businesses processing and trading these key waste streams, thus demonstrating a robust commercial and operational foundation on which additional value chains could be developed.

A significant gap in the solid waste management system for both Irbid and Mafrq is for organic waste (i.e. food waste from households). This waste stream constitutes more than 50% of the overall solid waste generation in both Governorates but is not being captured for recycling or recovery to any significant degree.

1.4 Solid Waste Trends

There are numerous external forces impacting on the solid waste situation in Irbid and Mafrq, which are either global trends or in-country forces. These include a significant drop in oil prices which impacts negatively on plastics recycling, growing restrictions on import of recyclables to China as well as the ongoing regional crises leading to ever increasing influx of refugees from Syria, Iraq and Palestine.

Within Jordan, the tax duties on exporting recyclable waste from Jordan have a negative impact on the financial viability of recycling certain waste items, i.e. metal and paper/cardboard.

Yet, even with these negative impacts, actors in Irbid and Mafrq are managing to create viable value chains for certain waste items and with a gradual increase in oil prices, improved efficiencies in solid waste handling and more clarity on the future of export duties there is a real potential for growth in existing and new solid waste value chains.

1.5 Solid Waste Intervention Recommendations

Drawing on the results and findings of the Solid Waste Value Chain Analysis in Irbid and Mafrq, the report proposes and details certain interventions that are recommended for implementation. These vary in waste type and value chain, waste management and size of project.

The recommendations focus on developing new value chains where none currently exists (i.e. for organic waste), supporting new technological systems as well as improving information flows and systems. Note that the recommendations do not seek to intervene in currently established value chains since these are functioning adequately.

The following recommendations are proposed:

- **Professionalization of the Recycling Sector:** Seeking to improve solid waste management organisation, coordination and support systems, with better communication throughout. In addition a focus on increasing the professionalization of the sector, in terms of greater access to formal employment, official recognition and formal training in waste management and recycling.
- **Industrial Symbiosis Programme with Resource Matching Workshops:** As fragmented information is one of the barriers to recycling becoming a systematic process within the private sector, an Industrial Symbiosis Programme could provide an opportunity for increasing knowledge across different areas of the manufacturing sector, and could enhance the potential for recycling and reuse through the resource matching workshops.
- **Corporate Environmental Stewardship Scheme:** An environmental stewardship scheme would allow companies wishing to improve the sustainability of their productive process to capitalize on this in terms of image and, eventually, in terms of added value to the final product. Such a label would contribute to raising awareness of environmental sustainability and could foster measures such as energy savings and recycling, resulting in further financial gain for the companies.
- **Waste Banks:** Waste banks would strengthen and expand the existing supply chain for recycled materials by creating collection points in more remote areas, thus reducing transport time and costs for both waste pickers and itinerant waste brokers. Depending on the nature of involvement of local government, waste banks can be

transfer and sorting stations, directly managed by the municipality, benefiting from both reduced quantities to be sent for disposal and the sale of recycled material.

Waste banks can also be managed at a community level by a CBO or simply by local waste brokers willing to expand their reach. Here lies further opportunities for greater coordination between micro/macro businesses and some further logistical involvement from the municipality regarding more effective and increased numbers of transit stations, time keeping and regularity of 'drops', so street pickers are in place to segregate waste.

- **Composting and Soap Making:** Developing a cottage industry for decentralized composting and cleaning products manufacturing would address the lack of recycling organic wastes and be a source of livelihood. Compost can be sold to local tree nurseries or employed to promote small household gardens, the final products either destined for self-consumption or for sale on the local markets. Transforming exhaust cooking oil into soap and cleaning fluids would also marginally reduce the waste quantities to be disposed of; most importantly, ecologic cleaning products would thrive with the high end, environmentally aware, consumers in bigger cities and become a stable income source.
- **Women's Market Garden Co-operative Eco-Park:** A women's cooperative can build upon the soap and composting initiatives already proposed for organic waste. However, in this case composting and biogas are an intermediate step between the kitchen waste transformation and wider livelihood and employment opportunities linked to the agriculture sector.

Following a more centralized approach would allow for increased quantities and economies of scale for composting as well as for a greater size of land to be reserved for income generating activities such as tree nurseries, seed banks, small farming, and training in composting and farming techniques.

- **Insulation Panels:** Creating a new use for the paper and cardboard waste items by manufacturing insulation boards from recycled paper and cardboard will help create and support demand for this waste stream, thus reducing quantities disposed off. Additional benefits include the increased insulation of houses, with a reduction in energy bills and the creation of employment opportunities.

Insulation panels manufacturing would follow the route of the existing energy efficiency programmes and certificates.

- **Household Biogas Digesters:** An option for organic waste diversion is anaerobic digestion. Small, household sized biogas digesters would provide several benefits in terms of reduced quantities of waste to be disposed of, reduced energy costs, and create jobs for the installation and maintenance of such systems. Building on current early stages in the Jordanian biogas industry it is proposed to support the establishment of a programme in training, installation and maintenance for an AD plant; maintain a show-case for available options; and a unified reference point for designing, financing and building of biogas plants. Marketing biogas and making the installation process easy and quick will ensure the popularity of the technology and its spread.
- **P.E.T. Recycling Plant:** The set-up of a PET recycling plant would benefit the plastic value chain in different ways. First, by investing in equipment and machinery, it would increase the installed recycling infrastructure in the country and provide for greater added value prior to export. Secondly, it would create the recycled raw material to be used in manufacturing of polyester fleece, broom wipes, and straps.

Currently, PET manufacturers in country are bound by contractual agreements to use virgin PET only. The professionalization of the recycling industry and the progressive adoption of quality standards in recycled products, however, may lead to change in such provisions and promote the demand for recycled PET in Jordan.

1.6 Conclusion

The proposed recommendations are all applicable to the solid waste management situation in Irbid and Mafrq where the report proposes some supporting activities to enhance the success for the implementation of the recommended interventions. These include awareness raising, greater access to financial support, more participation by the solid waste industry in relevant Governmental policies and amendments to the way solid waste management contracts are currently contracted by the JSCs.

2.0 SCOPE OF WORK

2.1 Objectives

The key objectives of this study are:

- Waste Value Chain Mapping;
- Waste Value Chain Market Analysis; and
- Waste Value chain Recommendations.

Terms of References included in **Annex I**.

2.2 Methodology

The methodology to be used in the waste value chain analysis was determined by the peculiar socio economic context of Jordan. The nation is a relatively stable middle-income country hosting a vast refugee population originating from three different conflicts. This layered social structure, with differentiated levels of integration among the various populations in the country, as well as the severity of the most recent humanitarian crisis in Syria, has called for a flexible approach which has been tested in emergency contexts. Among the various tools available to humanitarian agencies, the Emergency Market Mapping Analysis (EMMA)¹ was deemed the most appropriate. The specific characteristics of waste valorisation chains, more comparable to feeder markets than pure commodity markets, highlighted the limitations of using the EMMA toolbox which is more usually focused on a single product. Consequently, this analytical tool was integrated with UNDP's market assessment methodology², most notably with the Markets-For-Poor pro-poor approach.

The waste value chain analysis was then structured into several stages:

- Desk review;
- Legal Framework Analysis;
- Stakeholder assessment;
- Waste value chain mapping;
- Stakeholder mapping;
- Market assessment; and
- Entry point identification.

1 <http://emma-toolkit.org/>

2 UNDP 2010, Assessing Markets.

2.2.1 *Desk Review*

The main objective of the desk review was to identify the current state of MSWM in Jordan, the existing legal framework and stakeholders, and inform the definition of the market boundaries, target population, sampling techniques and questionnaire structure. The review process included the search of selected official government websites, regional sectorial organizations, national and international legal databases and scientific publication repositories, national and international civil society and academic organizations' research.

The review exercise further investigated other sectors having a direct or indirect impact on the recycling sector and, in general, on SWM as a whole. These included the current state of the environment and environmental challenges; economy structure and indicators (labour markets; energy sources and consumption; industrial production; agricultural production) and, above all, the impact of the Syrian crisis on the national economy.

2.2.2 *Preliminary Stakeholder Analysis*

The stakeholder analysis developed from the desk review exercise presented a fragmented institutional responsibility for the various aspects of MSWM, and a general lack of available information and publications on the recycling industry in Jordan. The initial analysis nonetheless allowed for the identification of the institutional and international actors involved (at times only loosely) in MSWM, and key civil society and academic institutions.

2.2.3 *Data Collection and Analysis*

Market boundaries, target population and sampling

The waste market can be better defined as a feeder market, with a series of activities ranging from service provision (waste collection and disposal, vehicle rental and maintenance, etc.) to commodity trading (for the single material components recycled such as metals, plastic and paper products) and even manufacturing (specifically the transformation of recovered waste products into recycled raw material). Furthermore, local and national recycling activities are strictly interconnected with frequent interchanges across governorate boundaries linked to the existing industrial capacity and to the global commodity markets for virgin raw materials, recycled materials, and end and intermediate products.

For these reasons, defining the market boundaries for Irbid and Mafrqa waste value chains was a challenging exercise, especially in light of the absence of specific information regarding the two Governorates.

After careful consideration, the following boundaries were established.

Geographically, Jordan national borders rather than governorate boundaries, were the limits of the value chain investigation.

Methodologically, the value chain origin was identified as the point of generation of waste; the end of the value chain was defined in one of the following destinations: final disposal, export, or re-introduction into the productive process.

In the absence of certain figures about the formal and informal recycling industry in Jordan, let alone the Northern Governorates, the target population was broadly defined as any person or entity participating to any extent, directly or indirectly, to waste management and valorisation activities.

Based on the unknown extent of the target population, a minimum threshold of 96 interviews was identified to achieve a 95% confidence level (that is, sample representativeness) with an expected error margin (or confidence interval) of 10%. The sampling strategy to be followed was then to be adapted to the tiered level of understanding and knowledge of the key informants identified during the preliminary stakeholder analysis.

Given the amount of available information on the institutional, international and civil society stakeholders identified through the desk review, a purposive sampling approach was determined, based on the mandate and activities of each of the key informant identified.

The unavailability of up to date data and general information on the recycling sector required a more flexible strategy. For this reason, a convenience sampling strategy was adopted, as it best suited the iterative identification process of the key informants at the various stages of the value chains. Identification of individuals/businesses to interview came initially from official registries and was then elaborated after a period of time as more information was collected on the actors on the ground.

Semi-structured interviews

Based on the stakeholder analysis and the sampling strategy, the preferred method of data collection was to undertake semi-structured interviews consisting of both shared questions and specific questioning per stakeholder role. It was important to give as much weight to the interviews within the informal sector as with the formal.

In particular, very different sets of questions were posed to institutional, international, civil society and academic key informants as compared to the key informants actively engaged in waste management and valorisation activities.

The former were better able to provide general information regarding the existing framework and administrative and socioeconomic barriers to entry, as well as to identify the potential for and limitations of perspective entry points and possibly even existing pilots. Notwithstanding the often deeper understanding of systematic issues and the characteristics of recycling activities in Jordan, the information available was sometimes fragmented and, in the case of types and volumes of valorised waste, not matching the reality on the ground.

Key informants actively engaged in recycling and waste management had, on the contrary, a clearer picture of the existing capacity, value chains and numbers of actors involved. Depending on their placement in the value chain, they sometimes had a good understanding of the linkages to global markets and general market dynamics, but not of the driving forces behind or the institutional and legal framework governing the sector.

The informal sector has greater flexibility to work around the strengths and weaknesses of a system and is therefore able to work to identify and possibly overcome some of the limitations in order to reach an improved and sometimes more successful working environment. There are other consequences of not officially registering with the relevant Government department, though this is beyond the scope of this study.

The Interviews were designed to gain an understanding of both disparities and vulnerabilities, and of individual managers' experiences and perceptions that have evolved into the present process of Waste Management. This allowed for a review of existing waste management systems, identification of further stakeholders, review the social aspects and consequently could be used to justify perspective solutions.

An outline of the interview structure and the topics covered is provided in **Annexe IV**.

Data aggregation and analysis

Quantities and type of waste collected, sources of the collected/purchased recyclables and buyers on the following level of the value chain were systematically collected through the interviews and recorded. This allowed the prevention of duplication of quantities during the data aggregation process, especially for the paper and metal sub-value chains. Not all interviewees, however, were able or willing to identify a specific buyer, thus contributing to decreasing the confidence in the results. The aggregated figures thus represent a snapshot of the valorised quantities directly identified, and not estimates.

2.2.4 Limitations

The identified sample size of 96 individuals provided a 10% confidence margin (or error) with a 95% confidence level (measuring the reflectiveness of the sample). The 110 interviews conducted provided for a 12.5% error with a 99% confidence level.

However, given the specific aspects of the sample population and the level of specialization within certain sub-value chains (e.g. for the paper sub-value chain), the margin of confidence for each sub-value chain is close to 15% for the paper sub-value chain and 25% for the metal and plastic sub-value chains.

Given the fragmentation of available information and the often incomplete knowledge of the various key informants, the identified data was supported by using the information triangulation and validation method.

The information collection process had its limitations, despite the mechanisms put in place to prevent and address them. First and foremost of these was access to key informants. The consulted registries and databases were often incomplete, with outdated or missing contact details of formal recycling companies.

The language barrier and the lack of professional interpreters was one of the main limits to the present study. This issue was particularly apparent when referring to specific terms and jargon in both Arabic and English (e.g. *nylon* to refer to plastic sheets or *khorda* to refer generally to recyclable scrap).

Other limitations to the waste value chain study included the willingness of certain actors to meet and the willingness to respond to questions related to income levels and prices.

2.3 Reports and Studies Included

This study has drawn on the following relevant solid waste assessments, reports and studies:

1. The 2010 USAID Report *Solid Waste Behaviours within the Formal and Informal Waste Streams of Jordan*
2. The SWEEP – NET 2010, 2012, and 2014 *Country Reports on the Solid Waste Management in Jordan*
3. The 2011 D-WASTE study *MSW Composition Analysis – Case Study: Amman City, Jordan*
4. The 2014 CCM/EU *Master Plan for Greater Mafrq Municipality*
5. The 2014 CCM/EU *Master Plan for Greater Irbid Municipality*
6. The 2014 CCM/EU *Local Solid Waste Master Plan for New Al-Ramtha Municipality*

Additionally, halfway throughout the study, the MoMA presented its latest study, *Development of a National Strategy to Improve the MSWM Sector in the Hashemite Kingdom of Jordan* (MoMA 2015 MSWM National Strategy).

Further reports provided additional information on the environmental impact of Al Akaidir and El Huseyniyat landfills. The complete list can be found in the bibliographic references, along with key documents from other areas identified during the review.

Among others, the following studies were identified as particularly important for the preliminary stage of the waste value chain:

1. The 2011 RSC study *Sustainable Energy Mix and Policy Framework for Jordan*
2. UNEP's 2011 *Jordan Environmental Summary*
3. The 2014 ILO study *The impact of the Syrian refugee crisis on the labour market in Jordan: a preliminary analysis*
4. The 2014 ILO analysis *Labour market transitions of young women and men in Jordan*
5. The 2014 USAID/DAI report *The Fiscal Impact Of The Syrian Refugee Crisis On Jordan*
6. The *National Strategy and Action Plan to Combat Desertification*
7. UNDP's 2014 *Municipal Needs Assessment Report*
8. The 2015 *Jordan Response Plan for the Syrian Refugee Crisis*

3.0 BACKGROUND TO THE LEGAL AND INSTITUTIONAL FRAMEWORK

The SWM Regulation 27/2005 is the main regulation specifically dedicated to MSWM. Other laws and regulations governing the sector include the Environmental Protection Law and related regulations and the laws and bylaws setting the responsibilities of municipalities, JSCs and the MoE and the MoMA. Consequently, at present there is no specific law or bylaw specifically dedicated on MSW, thus roles and responsibilities are fragmented and in need of an over-arching framework.

On the other hand, industrial and hazardous waste legislation is relatively well developed and very detailed on the production, handling, shipment and disposal of hazardous waste, such as the healthcare waste, used oils and ozone depleting substance regulations. This is a direct reflection of Jordan ratification of many MEAs including the Basel, Stockholm, Rotterdam and Minamata Conventions, among others.

Additionally, there are a range of provisions that indirectly apply to waste management services, such as the Soil Protection Regulation, the Water Protection Regulation, the Industrial Zones Corporation Law, custom and export duties regulations, and production quality standards among others.

Finally, the SWM strategy and the future development of SWM and electronic waste bylaws will consolidate and expand the existing body of laws and regulations.

Table Annex II.1 provides a full overview of the legal framework directly and indirectly applying to waste management; **Table Annex II.2** provides a picture of the institutional stakeholders with responsibilities for SWM, along with the applicable reference laws.

4.0 STAKEHOLDER ANALYSIS AND MAPPING

Unless referenced otherwise, the information and figures provided in this section are drawn from the stakeholder analysis and the 110 semi-structured interviews collated by the consultants.

4.1 Institutional Actors

The four key actors in MSWM are:

- The Municipalities;
- The Joint Service Council;
- The MoMA; and
- The MoE.

Municipalities and JSCs, both financially dependent on MoMA, are responsible for collection services and the building and management of landfills respectively. The MoE, now owner of landfill sites, has a regulatory role.

Other institutional stakeholders are the MoEM – Department for Renewable Energy, the MoA, the MoIT, and the MoH. The GAM has a special status, different from that of other municipalities, in relation to its administrative organization and the waste collection tariffs definition (SWEEP-NET 2014).

While roles and responsibilities of all institutional actors are defined in their founding laws and regulations, the lack of a framework law makes coordination and information sharing across ministries and local authorities a challenge. Increasing vertical and horizontal communication channels would allow for a more effective use of the scarce available resources, as well as for the creation of synergies between the various programmes and activities being implemented.

Table Annex II.2 provides a detailed overview of institutional stakeholders' objectives in relation to waste management.

4.2 International Actors

There are many international organizations, governmental aid agencies and international NGOs working on waste management at various levels. Because of this, a Municipal Waste Management group was created to coordinate such interventions. This was, however, short lived.

The main international donors are USAID JCP, EU, KFW, CIDA, JICA, WB, UNDP, financing infrastructure projects such as landfill rehabilitation and expansion, transfer station construction, or assisting municipalities and JSCs in acquiring new equipment and vehicles. Other organizations such as GIZ, ACTED, Global Communities (former CHP), DVV, IUCN, UN-WOMEN and UNDP, support municipal services in the host communities with emergency employment programmes, vocational training, capacity building and CBO development. The scope and level of these interventions is wide, ranging from operation and maintenance training for JSC mechanics to household composting training of trainers for women CBOs. Finally, there are smaller international NGOs working on a reduced scale with activities that can range from technical assistance provision to support of local CBOs.³

The picture of complexity is further increased by the presence of Syrian and Palestinian refugee camps, respectively under UNHCR and UNRWA mandates, and SWM activities within them. These camps are outside the scope of the present study, but they ultimately contribute to the waste arisings generation and disposal, and must therefore be taken into consideration. SWM falls under WASH cluster activities, lead by UNICEF. In Zaatari, ACTED is the focal point for waste collection. UN-WOMEN and OXFAM are also preparing to introduce some source segregation and recycling activities in their districts of responsibility. UNRWA is in charge of providing SWM services in Irbid and Al Husn (Martyr Azmi el-Mufti) Palestinian refugee camps, both located in Irbid Governorate.⁴

4.3 Civil Society

Jordan has a wide range of civil society organizations, either NGOs or CBOs, working on environmental issues, among which the Royal Conservation Society is the oldest. However most of these organizations are active pre-eminently on nature conservation, renewable energy, and advocacy.

There are some local NGOs and CBOs with activities related to SWM, with striking differences in the type of activities and the approach through which these are implemented. Clean-ups and awareness raising activities are most common, followed by small artisanal recycling and home composting promotion. Pupils in schools and the youth in general are the main target for mobilization and awareness activities, with handcraft recycling and home composting prevalently targeting women. There are a number of local environmental NGOs with planned and on-going projects in Irbid and Mafrq, such as Meezan Sustainable

³ This information was developed from the list of projects registered by the JRPSC website and further expanded through the interviews. <http://www.jrpssc.org/project-tracking/>

⁴ <http://data.unhcr.org/syrianrefugees/region.php?id=74&country=107> <http://www.unrwa.org/where-we-work/jordan>

Development, Jordanian Friends of the Environment, Jordanian Green Building Council, Amagrenith Flower CBO, and Jordanian Society for Creativity.

4.4 Private Sector

The private sector has many roles to play throughout the waste management cycle, sometimes showing high level of organization and resource efficiency.

First and foremost, companies are generators of waste, but they do also provide specialized collection services, sorting and commercialization of recovered materials, recycling and, as manufacturers, they are end users of recycled products too. Such circular value chains are nonetheless very limited and the product of market forces in Jordan rather than an organic strategy.

In Jordan, with the notable exception of Aqaba, MSWM services are rarely contracted out and PPPs are not common other than in their simplest forms. For instance both Mafrq and Irbid JSCs have agreements with contractors to sort the MSWM on Al Akaideer and Al-Husaineyat sites. The contract is awarded every year through an open bidding procurement procedure, with price being the only choice parameter. This procedure provides no incentive to the contractor to invest in equipment, creating unreliable income throughout the years to JSCs.

Irbid Municipality has an agreement with a local businessman to collect the sorted waste in a pilot project whose outcomes are mixed. The construction and running of Amman's MRF plant, one of the most important PPP contracts in recent years, has been put on hold and shows all the difficulties of engaging the private and public sector on a partnership level.

Commercial entities and manufacturers use a variety of means to dispose of their waste: selected waste streams (plastics, cardboard, metals) are segregated at source then sold to waste brokers or directly to recycling companies; hazardous waste management is contracted out to specialized companies; and any remaining waste is collected as MSW by Municipalities. For instance, in Al Hassan Industrial Estate, a sole contractor collects the waste in the area and then sorts the recyclable materials prior to disposal at Al Akaideer.

Finally, internal recycling is a very common practice among manufacturers. This is especially true of plants processing food grade plastic, who are mandated to use virgin materials only (either by law or by contractual provisions). Such pre-consumer recycling is however very difficult to measure, and thus is likely to remain undetected.

There are over 200 companies in Jordan registered with the CCD as recycling businesses⁵. Of these, 6 are in Irbid, and 5 in Mafrq. This low number, compared to the number of actual formal companies operating in the sector, is due to several factors. On a minor scale, businesses are registered under a manufacturing or service company, thus not appearing on CCD or Chamber or Industry databases. But the principal reason is the predominance of informal actors in most levels of the valorisation chain. Similarly, the Jordan Chamber of Industry database has registered less than 50 recycling businesses, none of which based in any of the two target areas.

Informal actors range from individual waste pickers in the streets to the contractors employing pickers as daily workers in Al Ehsneyiat and Al Akaideer dumpsites. In between these two extremes, there are itinerant scrap collectors with trolleys or trucks, small and medium scrap dealers, generalist and specialized waste brokers, up to semi-formal recycling plants reprocessing thermoplastics into granules. There are over 1,000 such informal businesses in the Mafrq and Irbid Governorates.

5 Extract of CCD registration database, courtesy of CCD office

5.0 LOCAL SOLID WASTE MARKET TRENDS

Unless stated otherwise, these findings are based on the semi-structured interviews conducted during two missions.

5.1 Waste Marketplace Trends

The recycling sector as a whole has undergone a dramatic evolution in the last three years, in response to the following events: the protraction of the Syrian conflict and its spill over in Iraq; the arrival of Syrian, Palestinian and Iraqi refugees; the sudden drop in the oil price; and the introduction of export duty taxes on scrap metal and paper.

The conflict in Syria and the closure of the border impacted the existing valorisation activities in Jordan by cutting off one of the trade routes for export of recycled materials and products. The extension of the conflict to Iraq led to the closure of a second border, with similar, but more limited, effects on trade. Today much of the recycled waste being exported transits through Aqaba, to be shipped by boat, or through the Jordanian Saudi border by land. This evolution has had negative repercussions in terms of transport costs, affecting particularly those companies operating in Northern Jordan.

The influx of refugees had a threefold impact: first, it dramatically increased waste generation in the two Governorates, putting local authorities' waste collection systems to the test; secondly, the refugees also brought a different way of relating to waste, which has sometimes brought a change in attitudes among the host communities too; lastly, Syrian refugees actively contributed to the expansion of the informal sector by entering the value chain at different levels.

Sustained oil prices in the past five years drove the growth in plastic recycling in Jordan, as all the manufacturers able to do so switched to recycled plastic granules from virgin ones. At its peak, recycled plastic would cost half the price paid for virgin plastic. The drop in oil prices consequently lowered the cost of using virgin materials, reducing the price difference to less than 30%. In view of the reduced price gap, and the better quality of virgin materials, producers are now gradually switching back to virgin plastic. Several plastic manufacturers and recycling businesses confirmed this trend, which was further confirmed by the virtual halt of all PET recovery activities in the Northern districts.

Export duty taxes took a toll mainly on the recycled cardboard and paper value chain, in light of its export oriented nature; specialised waste brokers had to lower the prices paid to their suppliers, producing a cascade affect down the supply chain. All interviewed informants

identified the recently introduced taxation as a major barrier, but the levels of taxation were often not reflective of the current levies. The metal value chain, however, has been only partially affected by the introduced export duty because of the higher value of metal scrap compared to paper, as well as the greater national recycling capability installed.

Besides these three major events, several others had an impact on the waste value chains in Jordan: the global economy slowdown following the 2008 financial crisis; the introduction of new import regulations in China, and; the increase of electricity bills after the decrease of oil price.

The economic recession in Europe and North America resulted in decreasing demand for raw materials from emerging economies. This trend was further accentuated by the introduction of the so called 'China Green Fence, introducing restrictions on the imports of unsorted waste and scraps. This reduced prices in the global commodity markets for steel, paper and cardboard, and plastics, ultimately resulting in lower demand for recycled materials. This downward trajectory was further accentuated by the following oil price reduction.⁶

Contrary to expectations, the fees for electricity in Jordan were not reduced following the drop in fuel prices. On the contrary, energy prices increased, especially for heavy users such as industrial and commercial entities. This situation has particularly affected energy intensive processes and put the recycling industry in Jordan at a comparative disadvantage with its regional and international competitors. For instance, one of the informants active in paper recycling, stated that they moved two of their three plants to Saudi Arabia because of the high energy costs and that they were planning to move their last plant within the year.

Driven by such forces, the sector has undergone radical changes.

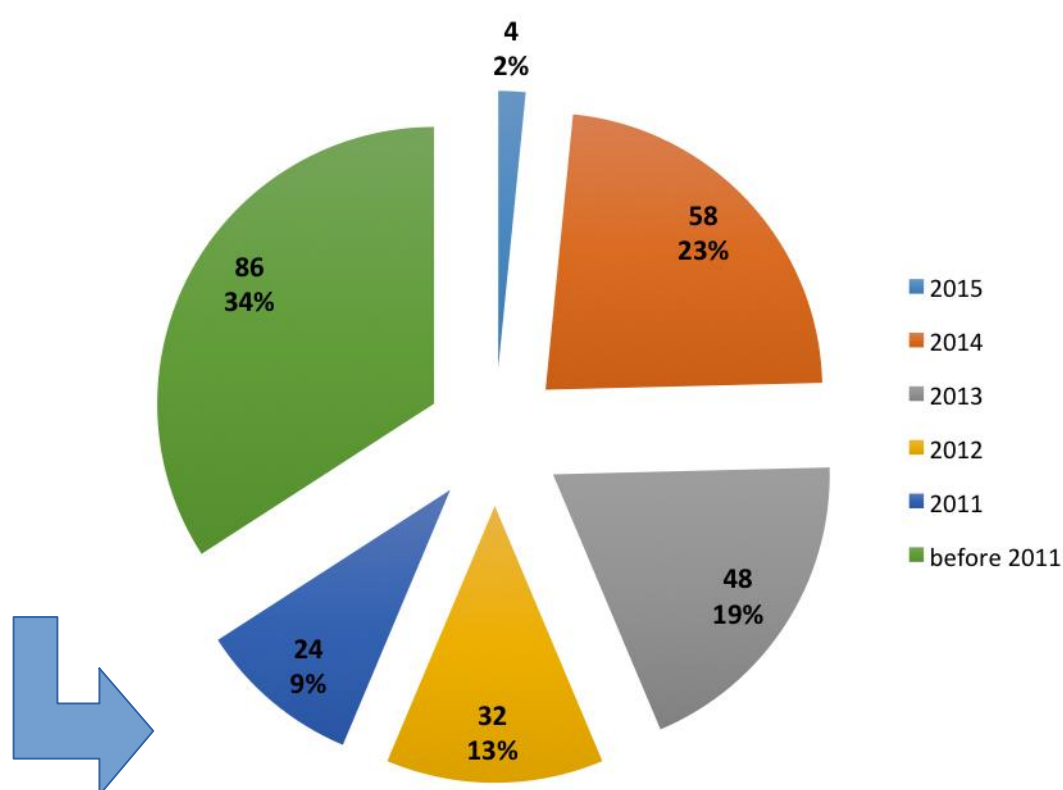
By expanding waste generation and the waste valorisation activities, Syrian refugees created new opportunities for livelihoods, and increased competition in a market dominated by a handful of traditional players. Such market growth went unnoticed by authorities due to the limitations to employment faced by Syrian refugees, driving the latter to join the ranks of informal recyclers. All Syrian street waste pickers interviewed in Mafrq identified in the police presence one of the main constraints to their work. Existing actors, however, would be increasingly aware of such presence, either in terms of increased competition or of expansion of their supply base, depending on the relative position within the value chain.

6 World Bank, 2015. Commodity Markets Outlook

To respond to the joint pressure of increased competition, rising costs, and shrinking margin profits, the sector underwent an important restructuring process.

To begin with, the rapid expansion of the sector was put to a virtual halt, with less than five new recycling companies registered in the first trimester of 2015 compared with 58 registered throughout 2014; many existing companies also exited the market, or transitioned to a different business area. The figure below shows the companies registered with the CCD as recycling businesses by year of registration.

**Figure 5.1: Formal recycling companies by registration year
(as of March 2015)**



Those who kept their recycling operations had to adopt different coping strategies.

In some instances, such as for smaller scrap dealers and waste brokers, this entailed a stop in trading certain materials such as PET or paper and cardboard, and specialising in fewer materials. Specialist businesses had to maintain profit margins by adding processing capacity to their operations and introduce quality considerations in the choice of their feedstock to improve the overall efficiency. For instance, the PE sheets recycling plant stopped buying material retrieved from the landfills to reduce costs and is now accepting only waste plastic segregated at source.

Another response to the new environment was to increase profits and extend the reach across the value chain. For plastic recycling, this brought some of the waste brokers to undertake activities in most stages in the value chains, from collection to re-processing, and in one case even manufacturing. In the case of steel makers, on the contrary, it was the companies managing the mini steel mills such as Nasrallah Steel or Manaseer Iron and Steel that expanded their activities down the sub-value chain by acquiring scrapyards and junkshops.

The drop in global commodity prices and the introduction of export duty levies pushed such sectorial growth to its limit. In the case of the paper sub-value chain, this resulted in a real demand shock.

The paper recycling sector was already undergoing a transformation process following the closure of the Syrian border, which led to the shutdown of the paper mill located in Irbid governorate. The increase of electricity prices contributed in further reducing the national recycling infrastructure, as two recycling plants were moved to the other side of the Saudi border.

The resulting decrease in internal demand and sudden drop of prices for export drove many generalist waste brokers to stop trading cardboard, and led many specialized scrap dealers to exit the market. Following a major reorganization, the paper sub-value chain is today much more concentrated with a handful of export oriented specialized brokers making up for the bulk demand for recycled paper and three paper recycling plants left in the country playing an ancillary role.

High electricity prices are the main driving force behind metal recycling too: the reduction in commodity prices has indeed brought the cost of recycled steel to the level of its imported equivalent. The foundries currently operating in Jordan are still active, although working at a reduced capacity, mostly by virtue of their actions to improve storage: the existing supply chain for imported steel is unreliable, creating periodic shortages in the country addressed through national production.

5.2 International Competition

The Jordan recycling sector faces tough competition, both internally and on the international markets, with raw virgin materials and imported recycled products being a viable substitute to the products recycled within national borders. In general, Jordan's competitiveness in the recycling sector is affected by the country's service-based economy and a reduced industrial base.

As already highlighted in the previous sections, there are several concurring causes behind such phenomenon. High electricity prices and transport costs are the main factor impacting competitiveness of Jordanian recycled products. Notwithstanding that, prices are usually in line with those found in the international commodity market and it is the exported recyclables and final product quality that is making the ultimate difference.

The paper and cardboard marketplace is a good example of this. Despite an existing production of recycled paper in the country, some Jordanian cardboard manufacturers prefer to use imported substitutes as they present a better quality with a minimal price difference (525 USD per metric ton against 500 USD per metric ton). Such recycled paper, along with many other paper products like paper towels, is imported from Saudi Arabia, Israel, and even Europe. Saudi products mainly benefit from reduced transportation costs, lower energy prices and increased economies of scale. As highlighted during the interviews, electricity prices bear the biggest burden on Jordanian companies, to the point that most exported paper is shipped to Saudi Arabia to be then reimported after recycling, and some businesses actually moved their production sites to the country.

European paper recyclers, on the other hand, take advantage of a unified and expanding EU waste marketplace, reduced inputs costs, better quality of diverted paper and cardboard, and in general a more advanced legal framework and infrastructure.⁷ Finally, in the case of Israeli paper products, one key informant reported export subsidies as a compensation mechanism for higher labour costs.

The metallurgy industry is similarly facing tough competition from Chinese and Indian producers driven by the high costs associated with electricity, in particular for steel bars, an intermediate product for many steelworks. In this regard, the imported products remain competitive, notwithstanding the higher transport costs. Other than the higher proportion of electricity in the operational costs, Jordanian producers suffer from the relatively small scale of the plants in the country: mini steel mills such as those found in the country (with a capacity of 500 tons per day) do not produce economies of scale comparable to those enjoyed by international competitors.

Plastic recyclers' main challenge is not posed by foreign recycling companies but by the price of the virgin plastic granules, which is in turn directly derived from the price of oil. High electricity fees also contribute to the general competitiveness of recycled plastic against virgin polymers, but in this case they are not the main driver for substitution. Plastic

7 EEA, 2012. Movement of waste across the EU's internal and external borders.

granules are imported mainly from Saudi Arabia and Europe, as well as from other Gulf States, all of which enjoy a well-established petrochemical industry.

6.0 WASTE VALUE CHAIN MAPPING

The recycling sector in Jordan has been growing despite (or in light of) the loose legal framework regulating it and the low environmental awareness of the Jordanian population. There is nonetheless an increasing interest in the matter, and there is a growing recognition of the role played both at an economic and environmental level by resource recovery activities. This is especially true in the private sector.

6.1 General Overview

6.1.1 Waste Generators

To assist in the presentation of the overall solid waste value chain map in Irbid, Mafrq and as a whole, please refer to **Annex III** which provides an overview of each of these Governorates.

The waste value chain starts at the source: households, shops and markets, industries, and farms. Already at this level there are several valorisation activities taking place, depending on the type of generator and waste produced. Internal recycling is common among manufacturing industries, as is sorting and selling cardboard, plastic, and metal scraps produced. Clean packaging and cardboard is also segregated and sold by commercial entities, although on a minor scale compared to the industrial sector. Households contribute to the value chain in several ways: the sale of unwanted furniture and old/broken household appliances to itinerant collectors; sorting of unwanted bread (which is then set aside in the streets for waste pickers), and sometimes even home composting. However, other than these examples, there is little source segregation happening among Jordanian families.

Per capita generation rates and characterization figures vary significantly according to different studies. This is easily explained by different assessment procedures, position of sampling within the waste management cycle, timing of the sampling, as well as the inclusion or not of industrial and abattoir waste within the definition of MSW. Lacking a recent waste assessment specifically targeting the waste generation and characterization for the regions of Mafrq and Irbid, the latest estimates from the National MSWM strategy have been adopted. This is because the study includes institutional, commercial and non-hazardous industrial waste arisings within its MSW. However, such figures are estimates, and not the result of a waste characterization study.

Table 6.1 provides a summary of the several waste generation and waste composition values according to different sources. As one can see, there are great variations in the

figures. From a methodological perspective, however, it is worth mentioning that only the MehSIP 2012 and the SWEEP-NET report figures are based on actual waste assessments. The EU Masterplan and the National Strategy figures are only estimates provided by the consultants based on regional averages, rapid visual assessments, and personal experience.

Table 6.1: Waste generation rates and composition from different studies

	MehSIP 2012	SWEEP NET '14	EU Master plan (2014)		MoMA National SWM strategy (2015)			
	Al Akaidir	National	Irbid (est.)	Mafrq (est.)	National (est.)	Irbid (JSC)	Irbid (est.)	Mafrq (est.)
Generation (kg/p/day)	n/a	0.9 (u) 0.6 (ru)	0.5	0.5	0.99 (ur) 0.87 (ru)	n/a	n/a	n/a
Organic	54.9%	50%	51%	51%	59%	60%	50%	65%
Plastic	12%	16%	7%	7%	10%	12%	15%	9%
Paper	13.2%	15%	10%	10%	14%	8%	15%	9%
Metal	2.2%	1.5%	2%	2%	5%	6%	4%	2%
Glass	3%	2%	6%	6%	4%	4%	4%	2%
Textile - Cloth	5.6%	-	5%	5%	5%	1%	1%	3%
Wood & yard waste	3.9%	-	-	-	5%	6%	1%	5%
Other	5.2%	15.5%	19%	19%	11%	3%	10%	5%
Source: SWEEP NET 2014, CCM/EU 2014, MOMA 2015								

6.1.2 *Street Waste Pickers and Itinerant Waste Buyers*

At the bottom of the value chain, there are street waste pickers and itinerant waste brokers, who use either a trolley/pushcart or a truck.

The itinerant waste brokers play a pivotal role in the whole system, as they are the main driver for source segregation among commercial and industrial actors; they also prevent many objects entering the waste stream from households. They provide the link between generators and second hand goods markets, recovered spare parts workshops, and scrap dealers. Items that are widely re-used include fruit and vegetable boxes, household appliances, window and door fixtures. Itinerant waste brokers who own a truck usually buy all kinds of materials and appliances, only limited by their own availability of cash and the loading capacity of their vehicles. A minority of them prefer to specialize in a single or reduced range of materials, such as cardboard, plastic sheeting ("nylon"), tyres, or construction and demolition (C&D) waste. Finally, some of these itinerant buyers are simply drivers hired by scrap dealers and brokers and paid by the day or by the number of rounds they make. Across the two governorates, there are several hundred of these itinerant waste brokers and together they account for the bulk of recovery activities occurring before waste is brought to the street containers by households.

Street waste pickers are the first resource recovery step once the recyclables, also referred to as *khorda* (scrap), enter the waste cycle. They usually work alone, in a very individualistic and territorial way. However, there are cases of two or more pickers working as a team, mostly among non-Jordanians and in particular among the Roma community. The interviews showed that Syrian waste pickers, many of whom already operated in the recycling sector as junkshop owners, operate their recovery activities as a family business, with men collecting the *khorda*, and the families sorting it out in the homes.

Plastic, cardboard, and metals are all recovered, with aluminium, copper, and bread preferred for being lightweight and more profitable. Waste pickers are, on the one hand, appreciated to a certain extent for their contribution on reducing waste quantities, with private actors, in particular manufacturers and recycling companies, being very well aware of the positive role they play. On the other hand, waste pickers are also perceived in negative ways. Many Jordanians consider working with waste to be *'ayb* (shameful), especially for those in direct contact with garbage. Also, a minority of residents are afraid pickers will engage in criminal activities, and are ready to blame waste pickers whenever a theft occurs (USAID 2010).

Table 6.2 demonstrates the large quantity of generated waste produced in Irbid and Mafrq, based from the MSWM National Strategy estimated generation rates for the two governorates. The figures for quantities disposed of come from the figures provided by the relevant JSC during the interviews. Figures for the recovered, exported and recycled quantities were identified by the author of the study by aggregating the amounts identified during the interviews. The strong interest of stakeholders to achieve further organisation and support along the waste value chain suggests a far greater local economy in this line of work could be achieved. The strong interest of stakeholders to achieve further organisation and support along the waste value chain suggests a far greater local economy in this line of work could be achieved.

Table 6.2: General figures for the waste management cycle

	Waste value chain in numbers (Tons per year)					
	Generated (MOMA 2015)	Disposed (JSC)	Recovered* (interviews)	Recycled (interviews)	Exported (interviews)	Dump & Burned (Estimates)
Irbid	496000	438000	38000 - 45000	47190 - 50400	1958 - 2060	> 13000 - 20000
Mafrq	153000	80000	48600 - 53400	34550 - 40070	11190 - 13990	<19000 - 24000
Total	649000	518000	86600 - 98400	81740 - 90470	13148 - 16050	≈ 32000 - 44000
* Includes recovered metals, plastic, and paper and cardboard						
Source: (MoMA 2015; JSC interviews; value chain study)						

Municipal employees working in MSWM find waste pickers problematic because they spread the waste out of the bins and dumpsters when sorting it and vandalize trash containers in the streets, especially by setting them on fire to recover metal. While the relationship between waste pickers and municipal employees is not confrontational, there is some level of competition between street waste pickers on foot and itinerant waste buyers with trucks. Such tension is due to mutual distrust and antagonizing attitudes rather than an actual competition for the same resources.

While exact numbers are difficult to define, several informants from various levels from different backgrounds consistently identified the presence of over 1,000 street waste pickers in Mafraq city, the vast majority of whom are Syrian refugees, and over 100 operating in Irbid, who on the contrary are mainly Jordanian. This is especially important information, as the nationality of waste pickers affects their work modality. Jordanians and Egyptians can move freely during the day, so they have little limitation on their ability to work. Syrian refugees, on the contrary, are severely limited by their refugee status; they will not work in broad daylight, and will stop any collection activity during days when the police are most active. For this reason, the quantities they recover are limited (maximum 20 kilos per day), the sorting operations take place in their houses, and do not bring the collected recyclables directly to the scrapyards, they must recur to the intermediation of an itinerant waste buyer (either from Mafraq or Irbid) who collects the waste directly from their homes.

6.1.3 Landfill Waste Pickers

Landfill waste pickers directly depend on the two JSC recycling contractors: there are 35 to 50 in Al Ehsnyiat and 15 to 30 in Al Akaidir, the difference being due to the rehabilitation and expansion plans. The recycling contractors operating in the dumpsites are directly employing these waste pickers, paying them daily wages of 5 JD. However, while the contract awarded by the JSC is official, such workers are not formally employed by the contractor, and thus do not receive any social security coverage from their work nor other form of benefits other than minimal and often inadequate protective equipment.

The on-the-spot interviews showed waste pickers origin and composition is very different between the two dumpsites. In Mafraq, the proximity to Zaatari camp results in an increased number of women and refugees working in Al Ehsnyiat, including a significant proportion (20 – 30%) of children under the age of 18. In Al Akaideer virtually all waste pickers are Jordanian nationals, with only 2 Egyptians; most workers are aged 18 to 30 years old, and there is only one woman working on the site.

The working conditions are also quite different between the two sites: Al Akaideer contractors seem more organized, providing washing and sanitation facilities located just outside the dumpsite, as well as dedicated tents acting as changing rooms. Working conditions in Al Ehsnyiat dumpsite provide little for the waste pickers' benefit: there is no changing or washing facilities inside or outside the dumpsite, or toilet facilities. This fact, combined with the pervasive presence of stray dogs in Al Ehsnyiat, is disproportionately affecting women in terms of personal security when addressing the most basic human needs.

Contractors at both sites are providing rudimentary personal protective equipment (PPE) in the form of gloves and boots. However, there is no consistency in the type, quality, and protection given by such items. In fact, in Al Akaideer dumpsite the pickers reported to have found their boots by themselves during the sorting operations.

6.1.4 *Small Scrap Dealers and Waste Brokers*

Small scrap dealers and waste brokers are the next link in the valorisation chain: usually located in the cities peripheries, within the industrial areas, they buy *khorda* from itinerant waste brokers and waste pickers. Given their location at the heart of industrial clusters, big waste generators often sell their waste directly to them. Small scrapyards carry out sorting and dismantling activities, but hardly any processing. In the few instances where processing does occur it is limited to labour intensive activities not requiring complex machinery. Bigger dealers and waste brokers usually have some processing capacities, either in the form of a press and baler (for cardboard, or tin scrap), or shredders and flakers for plastics.

From the interviews, it was found that most junkshops trade in all available materials, with a prevalence of metals and plastics. In some cases, they trade in a wide variety of materials, but will have a specific focus (and relative investment in equipment) on a single one. Conversely, for selected waste streams such as cardboard, e-waste and tyres there are specialized small brokers who deal with only one of these streams, as there is less competition for these less profitable materials. The profitability of such operations is maintained by compensating with higher trade volumes and shorter and more concentrated value chains for the lower profit margins.

Table 6.3 reflects the numbers of actors, formal and informal, supporting the waste economy of Mafrq and Irbid, for a total of over 4,000 workers of which 12% are female. The number of actors involved and employment levels were collated throughout the interviews identifying the average workforce size and numbers of actors.

Table 6.3: Identified actors in the solid waste value chain in Irbid and Mafrqa Governorates

Actors	Numbers	Workers (of which female)	Quantities Recovered t/y
Street waste Pickers	1080 - 1100	1080 – 1100 (200)	n/a
Itinerant waste brokers	535 - 650	535 - 650	7990 - 12840
Small scrap dealers	200 - 300	600 - 1200	2207 - 3257
Specialized scrap dealers	13 - 18	52 - 108	9900 - 12600
Waste collection contractors	1	200 (40)	2100 - 2400
Municipal collection	-	1553	0
Generalist waste brokers	30 - 40	150 - 320	3774 - 5870
Specialized waste brokers	8 - 13 (>30)*	50 - 100	31408 - 35680
Landfill Pickers	50 - 80	50 - 80 (6)	2921 - 4160
Recycling plants	5 - 8 (20 - 40)*	250 - 255 (70)	81740 - 90470
Exports	-	-	13148 - 16050
Total	-	-	86600 - 98400
* National figures in brackets			

6.1.5 *Big Scrap Dealers and Specialized Waste Brokers*

With few notable exceptions, most materials recovered in the regions of Irbid and Mafrqa end up with big scrap dealers and specialized waste brokers either located in Amman, Zarqa, or to a lesser extent in Aqaba.

These companies are mostly formal businesses, although they may not be registered as such or may have undergone several name and ownership changes throughout the years. This is a reflection of the dynamism characterising the recycling sector as well as the growing attention to the economic opportunities it provides.

Such specialized businesses can have their own processing capacity most commonly in terms of shredders and balers, but for plastics they often have more advanced machinery such as crushers, extruders, granulators and pulverisers. In this case, they then sell the final product (usually granules) to plastic manufacturers, and can therefore be labelled as recycling firms.

Many specialized scrap dealers have a less advanced capacity in terms of equipment, and thus either sell their material to local smelters (in the case of ferrous and aluminium scrap) or they are export oriented, competing in the global recycled commodity market. This is especially true for certain waste streams such as cardboard, paper and PET.

6.1.6 *Private Contractors*

Given the characteristics of Jordanian industrial capacity and the location of industries, most private contractors providing for waste collection services are based in Amman and Zarqa governorate. This is consistent with the difficulties encountered in the implementation of

PPPs in the field of waste management, and the preference for such private actors to provide services to the private sector. Furthermore, as previously mentioned, many manufacturers have informal agreements with itinerant waste buyers to sell their segregated recyclable waste, with the remaining quantities either collected by the municipalities or, in the case of hazardous waste, by registered specialized contractors based in Amman and Zarqa.

The only exception is the contracting company providing collection services to the Al Hassan Industrial Zone, and the refugee camps in Zaatari and Azraq. While it was reported in one occasion other private contractors may exist in the Governorates of Irbid and Mafrq, it was not possible to neither identify such private companies nor validate such information by other means of verification.

6.1.7 *Recycling Plants*

There are over 200 registered recycling businesses in the CCD database, many of which were registered in recent years. However, this does not fully reflect the extent of the sector, as there are many formal companies that process scrap metal and plastics into post-consumer recycled material who are registered as manufacturers, thus not appearing in the registry as recyclers. There are only 6 registered recycling companies in Irbid, coupled with a handful of formal businesses registered otherwise, and another 5 – 10 informal businesses. Similarly, there are only 5 registered companies in Mafrq, with few other recycling businesses (notably a steel smelter and an aluminium factory) registered as manufacturers. Most of these companies do not fit the description of recycling plants, as they provide little or no processing of the recovered materials, and have thus been considered as scrap or waste brokering operations. There are nonetheless a handful of businesses that do match the definition of recycling plants, even though they may not be officially registered as such.

The bulk of the recycling capacity is outside these two regions, located in the industrial areas between Amman and Zarqa: there are about 3 paper and cardboard recycling plants, 8 - 10 metal recycling plants (aluminium smelters and steel mills), and at least 20 plastic recycling plants. Most of the waste is reprocessed into recycled raw materials and then reintroduced into the national productive system.

Table 6.4 identifies number of actors, both nationals and foreigners involved in the waste business within the municipalities.

Table 6.4: Disaggregated employment levels across the waste value chain

Category	Actors	Workers	Women	Jordanian	Foreigners
Irbid					
Street waste pickers	80 - 100	80 - 100	n/a	60 - 80	20
Landfill waste pickers	15 - 30	15 - 30	1	13 - 28	2
Itinerant buyers	500 - 600	500 - 600	0	500 - 600	n/a
Small scrap dealers (junkshop owners)	200 - 300	400 - 900	0	300 - 600	100 - 300
Big scrap dealers (scrapyard owners)	8 - 10	40 - 70	0	30 - 45	10 - 25
Generalist waste brokers	30 - 40	90 - 200	0	45 - 100	45 - 100
Specialized waste brokers	7 - 11	70 - 165	n/a	40 - 100	30 - 65
Private waste collection contractors	5	250 - 300	40	225 - 260	25 - 40
Small recycling factories	2 - 5	8 - 75	0	6 - 45	2 - 30
Mafrq					
Street waste pickers	1000	1000	200	n/a	1000
Landfill waste pickers	35 - 50	35 - 50	5	10 - 15	25 - 35
Itinerant buyers	35 - 75	35 - 75	0	35 - 75	0
Small scrap dealers (junkshop owners)	1	3	0	3	0
Specialized waste brokers	3	6 - 16	0	4 - 10	2 - 6
Recycling factories and smelter	2	76	6	29	47

6.2 Waste Paper and Cardboard Sub-value Chain

The waste paper and cardboard sub-value chains for Irbid and Mafrq are presented in **Annex III** to this report. The following findings were identified during the study.

The lower prices and profit margins associated with waste paper and cardboard has created reduced numbers of street waste pickers and itinerant and generalist waste brokers dealing with such materials. Nonetheless there are a number of specialized scrap dealers and itinerant waste brokers that collect segregated waste cardboard and paper from the main generators - i.e. shops and malls (commercial waste), schools and offices (institutional waste), and manufacturers (industrial waste) - while there is little recovery of waste paper and cardboard at household level. At the dumpsites, interviews with waste pickers and exporters confirmed cardboard is only recovered in Al Husayiniat site, and not in Al Akaidir.

Specialized scrap dealers and itinerant waste brokers then sell the recovered waste paper and cardboard either directly to recycling plants, or to specialized, export-oriented waste brokers. There are two large scale recycling plants, in Amman and Zarqa as well as an artisanal size plant in Azraq. The specialised export oriented brokers are sometimes local subsidiaries of foreign paper manufacturers, and they often have branches in Irbid.

The paper mill in Zarqa, The Jordanian Paper and Cardboard Company, buys from all kind of actors, from street waste pickers, to itinerant waste brokers, to specialized scrap dealers and brokers. Conflicting information was gathered concerning this plant during the research exercise. During the interview it was stated that the plant often worked at 75% capacity due to the limited access to waste cardboard. However, one of the specialised brokers in Amman reported having been unable to sell to the plant, apparently due to over capacity. This shows how information in the waste market place is fragmented, incomplete and often discordant, making improvements in information management and sharing being one of the identified recommendations.

Finally, there are 8 cardboard manufacturers using locally produced and imported recycled paper in their production processes. According to a number of testimonies, it seems the recycled paper produced is not enough to cover the full extent of the demand, and the quality of the material is inferior to that of imports, nonetheless some of the export oriented brokers stated, on the contrary, that the recycling plants would not buy their product as they had already enough to process.

The introduction of an export duty tax and the closure of the Syrian border due to the crisis had a serious and varied impact on the sector. One paper mill in Irbid has closed, and many specialized scrap dealers and waste brokers reportedly stopped trading. The number of informants reached from the official registries and databases who reported to have ceased operations confirms such reports. There has also been considerable downsizing in those businesses that have remained open, including employee lay-offs and branch closures.

Overall, the study found there are over 1,500 people employed at the various levels of the sub-value chain nationwide from waste pickers to cardboard manufacturers. In Mafrq there are up to 50 waste pickers involved in paper and cardboard collection at dumpsite level. At the street level, there are over 1,000 waste pickers (predominantly Syrian refugees) collecting cardboard and paper, although such recovery is not systematic but rather opportunistic. The cardboard is only collected when shops put it on the side of the road already sorted, as the low prices do not provide a sufficient incentive for sorting the material once placed in the dumpsters, commingled with other waste streams. 35 itinerant waste brokers provide for most of the valorisation collecting cardboard and paper from offices, institutions, shops, and industries and then selling it either directly to the recycling plants outside the governorate or to 2 specialized scrap dealers. Finally, the recycled paper makes its way to a cardboard box manufacturer located in the Mafrq Development Area.

In Irbid employment related to the value chain is much lower, due to an increased specialisation. There are around 80 – 100 waste pickers active at street level who recover cardboard, but as in Mafrq not systematically, while there is no recovery taking place at Al Akaidir dumpsite. Furthermore, there are 3 to 6 itinerant waste brokers collecting from the various manufacturers and shops, sometimes working directly at the dependence of 6 specialised cardboard scrap dealers. The latter are often simply a local branch, or collection points, of the specialised, export-oriented brokers based in Amman or, in one case, of a foreign paper manufacturing company whose mills are based in Saudi Arabia. Only a minority of specialized cardboard and paper brokers are actually working independently and providing the recovered cardboard and paper to the recycling plants outside the Governorate. In total, the paper valorisation chain employs about 100 people in Irbid.

Table 6.5,

Table 6.6 and **Table 6.7** clearly show the market value and market potential of a waste Resource Paper and Cardboard - presently of limited value, yet can still affect a healthy economy of scale. Added to which is a workforce of considerable size supported by a resource considered of minor value.

Table 6.5: Price for paper and cardboard along the value chain

Actor	Buy (JD/t)	Sell (JD/t)
Street waste pickers	-	15 - 20
Al Husainiyat contractor	-	25
Itinerant waste brokers	n/a	15 - 50 or paid 4 -5 JD/trip
Specialised scrap dealers	15 - 20	30 - 35
Specialised waste brokers	40	60 - 130
Recycling companies	35 - 75	350 - 500
Cardboard manufacturers	280 - 325	-

Source: Interviews

Table 6.6: Paper sub-value chain figures in Mafrq Governorate

Actors	Number of actors	Workers (of which female)	Quantities recovered t/y
Street waste Pickers	80 - 100	80 - 100 (n/a)	n/a
Itinerant waste brokers	3 - 6	3 - 6 (0)	4500 – 6000
Specialized scrap dealers	6	15 - 20 (0)	8700 – 11400
Waste collection contractors	1	200 (40)	1500
Municipal collection	18	994 (n/a)	0
Paper Mills and recycling plants	0 (3)*	250 - 255 (70)	3306 - 5106
Specialised waste brokers	0 (6)*	107 (10)	8700 - 12500
Cardboard and paper product manufacturers	0 (8)	160 - 165 (8)	n/a
Recycled nationally	-	-	3306 - 5106
Export	-	-	10800 - 13500
Total	-	-	14106 – 18606

* Local figures nationwide figures in brackets **Source:** Interviews

Table 6.7: Paper sub-value chain figures in Irbid Governorate

Actors	Number of actors	Workers (of which female)	Quantities recovered t/y
Street waste Pickers	> 1000	40 - 50 (n/a)	n/a
Itinerant waste brokers	35	35 (0)	3240 – 6300
Specialised scrap dealers	2	n/a	1200
Waste collection contractors	1	200 (40)	0
Municipal collection	10	169 (0)	0
Paper Mills and recycling plants	0 (3)*	250 - 255 (70)	3240 – 6300
Specialised waste brokers	0 (6)*	107 (10)	1708 – 1760
Landfill Pickers	35 - 50	35 - 50 (5)	208 – 260
Cardboard and paper product manufacturers	1 (8)	160 - 165 (8)	<6**
Recycled nationally	-	-	3240 - 6300
Exported	-	-	1708 - 1760
Total			4948 – 8060
<p>* Local figures nationwide figures in brackets ** Cardboard scraps sent back to paper recycling mill Source: Interviews</p>			

From collating the capacity of the three identified plants, country has a local recycling capacity of 27 – 32,000 tons per year, with the bulk of the paper and cardboard recovered (over 100,000 tons per year) being exported. Of these, between 5,000 and 8,000 tons per year originates in Mafrqa Governorate, and 11,000 to 13,500 tons per year from Irbid. Some of the exports are then reimported into Jordan as finished good or intermediary products, for instance as toilet paper and tissues, or as recycled paper for corrugated cardboard manufacturing.

6.3 Plastic Sub-value Chain

The plastic sub-value chains for Irbid and Mafrqa are presented in **Annex III** to this report.

Plastic is characterised by a fairly developed valorisation chain, due to the relative abundance of both plastic waste, the reduced investment requirements for treatment and recycling, and the abundance of manufacturers providing an end use to the recycled material. The only notable exception within the sub-value chain is PET, whose only end destination, at present, seems to be export. Several manufacturers using PET as a raw material were visited during the interviews, none of which using PET due to local regulations and contractual agreements.

At the source of the value chain, prior to plastic refuse entering the waste stream, plastic manufacturers operate very high levels of internal recycling. This phenomenon has several reasons, mostly of economic nature. Certain production lines (such as moulding) can produce high quantities of plastic scrap, reprocessing the scrap internally reduces the raw material expenditures. Internal recycling is also practiced within the food grade plastic packaging industry. The legal provision that this packaging only contain virgin material does not include pre-consumer material recovered from the same plant. Such practices are widespread among plastic manufacturers and can achieve very high levels of efficiency, with only 0.1 – 0.2% of the raw material being discarded as waste in the end.

When waste plastic is produced at the manufacturing level (either as defective products, contaminated plastic, or packaging from raw materials) and, in some case, at commercial level, this is segregated and sold to specialized scrap dealers and brokers, as well as itinerant waste brokers. Several interviewees operating at industrial level reported practicing source segregation for resale purposes. The recovered plastic eventually ends up in local, small recycling plants, often managed by the same specialised scrap dealers (or in one case by one landfill recycling contractor), who extended their control over the valorisation chain as a strategy to increase profits and minimise the risks associated with price fluctuations. This recent evolution has resulted in a segmentation of plastic scrap bought by quality, with pre-consumer and source segregated plastic now being preferred (attracting a higher price on the market) to post consumer plastic, sorted after it enters the waste flow.

The increase of plastic packaging and the absence of institutionalised source segregation activities at household and commercial level have meant that much of this waste stream ends up either in temporary storage containers or dumped in the streets. Itinerant waste brokers are widespread and thus contribute in a meaningful manner to reducing the amounts being disposed of at household and commercial level. The amount of generated waste is nonetheless greater than such informal recovery activities can manage, so it leaves enough quantity to be recovered either at city level by street waste pickers (who collect mostly HDPE and LDPE bottles and sometimes plastic sheets) and at the dumpsites, where the waste pickers, organised under a recycling contractor, sort the plastic scrap by type.

The recovered material is traded up through the value chain through small and medium scrap dealers and specialised waste brokers, eventually making its way to local plastic recycling plants or ending up in Zarqa and Amman, where most of the recycling capacity is located. After reprocessing into granules, the recycled plastic enters the productive process again, with manufacturers preferring the raw recycled material for its lower price compared to the virgin one.

The most notable exception to the value chain just described is PET. PET packaging (predominantly in the form of water bottles), is produced in country, but as already mentioned manufacturers cannot use recycled raw materials in their plants. Because of the lack of alternative manufacturing processes in the country (such as for the production of fleece textile or broom brushes), this results in the material being collected only for export. The recent drop in oil prices, however, reduced the prices so much that only a handful of specialized waste brokers are still buying the materials. Most generalist scrap dealers and waste brokers now don't trade PET bottles anymore, and only a handful of actors with access to cheap storage space (most notably contractors operating inside the dumpsites) are still collecting it. They are waiting for the global price of this commodity to rise again.

Table 6.8, Table 6.9 and Table 6.10 reflect a healthy recycling market in all types of plastic products

Table 6.8: Prices of plastic waste along the sub-value chain

Actor	Buy (JD/t)	Sell (JD/t)
Street waste pickers	-	100 - 150
Itinerant waste brokers	n/a	150
Small scrap dealers	90 - 150	125 - 200
Generalist waste brokers	180	250
Specialised scrap dealers / small recycling plant	230 - 400	500 - 700
Big recycling plants	200 - 300	500 - 700
Source: Interviews		

Table 6.9: Plastic sub-value chain figures in Mafrq Governorate

Actors	Number of actors	Number of workers (of which women)	Quantities recovered t/y
Street waste pickers	40 -50	n/a	n/a
Landfill waste pickers	35 - 50	35 - 50 (5)	300
Itinerant waste brokers	n/a	n/a	150 - 300
Municipal Street sweepers	-	119	n/a
Municipal Compactor trucks	-	50	0
Private contractors	1	200 (40)	0
Small scrap dealers	n/a	n/a	n/a
Generalist waste brokers	n/a	n/a	n/a
Specialised waste brokers	2	11 -30 (0)	550 - 600
Small recycling plants	2	11 -2 6 (0)	450 - 600
Big recycling plants	0 (n/a)	n/a	n/a
Total	-	-	700 - 900
Source: Interviews			

Table 6.10: Plastic sub-value chain figures in Irbid Governorate

Actors	Number of actors	Number of workers (of which women)	Quantities recovered t/y
Street waste pickers	80 - 100	80 - 100	n/a
Landfill waste pickers	15 - 30	15 - 30 (1)	1800
Itinerant waste brokers	500 - 600	500 - 600 (0)	n/a
Municipal Street sweepers	-	783 (n/a)	n/a
Municipal Compactor trucks	-	201 (n/a)	0
Private contractors	5	200 (40)	600 - 900
Small scrap dealers	200 - 300	600 - 1200 (n/a)	2000 - 3000
Generalist waste brokers	30 - 40 *	n/a	3000 - 5000
Specialised waste brokers	5 - 10	16 - 35	2450 - 2820
Small recycling plants	2 - 5	16 - 35 (0)	2100 - 3270
Big recycling plants	0 (n/a)**	n/a	n/a
Recycled nationally	-	-	4100 - 7820
Exported	-	-	350 - 450
Total	-	-	4450 - 8270
* Formal brokers			
** Local figures, nationwide figures in brackets			
Source: Interviews			

6.4 Metal Sub-value Chain

The metals sub-value chains for Irbid and Mafrq are presented in **Annex III** to this report.

Among the three sub-value chains taken into consideration, metals are the oldest and most established. This is due to a long-standing tradition of metal recovery across the world and throughout history, the relative ease of recycling metals, and the high value of the materials compared to others. In particular, the presence of several aluminium smelters and steel mills in Jordan (SWEEP-NET 2014), along with a developed metallurgy manufacturing sector and the wide variety of use for metal products in both consumer products and constructions, create the ideal conditions for the development and maintenance of such recycling sector.

Manufacturing plants segregate metals at source, although such practices are more widespread in metallurgy manufacturers than in others, due to higher amounts of scrap produced. Similarly, machine and repair workshops, car scrap dealers and construction firms operate source segregation of the metal scrap produced. Depending on the quantities, this is then sold either to itinerant waste brokers (some of which specialises in construction and demolition sites), directly brought to small and specialised scrap dealers, or, in a minority of cases, it is the specialised waste broker or even the smelter operator who provides the skips for temporary storage and takes charge of the transport.

Table 6.11, Table 6.12 and Table 6.13 demonstrate the high value for all metals.

Table 6.11: Ferrous scrap prices throughout the value chain

Actor	Buy (JD/t)	Sell (JD/t)
Street waste pickers	-	70 - 150
Landfill waste pickers	-	100
Itinerant waste brokers	70 – 80	90 - 190
Small scrap dealer	90 - 130	100 - 150
Generalist scrap dealer	70 - 80	150 - 190
Specialised scrap dealer	130 - 150	150 - 180
Specialised waste broker	90 - 150	180
Steel Mill	90 - 180	-
Source: Interviews		

Table 6.12: Copper scrap prices throughout the value chain

Actor	Buy (JD/t)	Sell (JD/t)
Street waste pickers	-	2700 - 2800
Landfill waste pickers	-	3000
Itinerant waste broker	3 - 50 JD (piece)*	2700 - 3000
Small scrap dealer	2800	3000
Specialised scrap dealer	3000	3300
Generalist waste broker	2700 - 2800	3000
Specialised waste broker	3000	3300
* WEEE Source: Interviews		

Table 6.13: Aluminium scrap prices throughout the value chain

Actor	Buy (JD/t)	Sell (JD/t)
Street waste pickers	-	700
Landfill waste pickers	-	700
Itinerant waste broker	600	700
Small scrap dealer	700	770 - 800
Specialised scrap dealer	700	770 - 800
Generalist waste broker	700	770 - 800
Specialised waste broker	700	770 - 800
Aluminium smelter	770 - 800	-
Source: Interviews		

Waste aluminium and tin cans are amongst the main source of revenue for street waste pickers and itinerant waste brokers, due to the vast quantities produced (albeit with high seasonal variability) and the high prices paid. Aluminium cans and tins are then passed on to small and generalist scrap dealers, the latter usually having hydraulic presses to minimise transport costs.

Specialised waste brokers are usually located outside the Irbid and Mafrq Governorates, and closer to the industrial heart of Jordan, in Zarqa and Amman, or to its main export route, Aqaba port. It is not uncommon for companies to have decentralized branches in major cities to ensure privileged access to generalist and specialised scrap dealers. This is indeed

the case for two of the main metal recycling companies in Jordan, El Bireh Iron and Steel and Manaseer Iron and Steel.

Metal recovered by recycling contractors operating within the dumpsites is often a minor stream compared to that recovered from source and in the streets. This is especially true for aluminium cans and ferrous scrap other than tin cans.

Ferrous and aluminium scrap is mainly recycled in country, although there are a number of specialized waste brokers who also sell on the international regional and global markets. Additionally, the low specialized industrial and manufacturing capacity and the high commodity price drive copper to be exported rather than recycled in country.

Error! Reference source not found. and **Table 6.14** show the metal recycling to be the most organised of waste resource collection as demonstrated by the quantities processed.

Table 6.14: Available figures for metal sub-value chain in Irbid

Actors	Number of actors	Number of workers (of which women)	Quantities recovered t/y
Street waste pickers	80 - 100	80 - 100 (n/a)	91.5 - 153
Landfill waste pickers	15 - 30	15 - 30 (1)	313
Itinerant waste brokers	500 - 600	500 - 600 (0)	120 - 240
Municipal Street sweepers	-	783 (n/a)	n/a
Municipal Compactor trucks	-	201 (n/a)	0
Private contractors	5	200 (40)	0
Small scrap dealers	200 - 300	600 - 1200 (n/a)	207 - 257
Generalist waste brokers	30 - 40	n/a	774 - 870
Specialised waste brokers	8 - 10	6 (0)	18000
Smelters	8 -10	70 (6)	19294 - 19367
Recycled nationally	-	-	19254 - 19327
Exported			40
Total	-	-	19294 - 19367

Source: Interviews

Table 6.15: Available figures for metal sub-value chain in Mafrq

Actors	Number of actors	Number of workers (of which female)	Quantities recovered t/y
Street waste pickers	40 -50	n/a	n/a
Landfill waste pickers	35 - 50	35 - 50 (5)	300 - 1500
Itinerant waste brokers	15 - 25	15 – 25 (0)	n/a
Municipal Street sweepers	-	119	n/a
Municipal Compactor trucks	-	50	0
Private contractors	1	200 (40)	0
Small scrap dealers	1	n/a	n/a
Specialised waste brokers	1 (8 – 10)	n/a	n/a
Smelters	1 (8 – 10)*	70 (6)	42000**
Recycled nationally	-	-	42300 - 43500
Exported	-	-	-

Total	-	-	42300 - 43500
* 1 Steel Mill located within Mafraq Development Zone ** Includes scrap from Mafraq governorate as well as scrap brought from Zarqa and Amman from the whole country			

7.0 WASTE VALUE CHAIN – MARKET ANALYSIS

7.1 Added Value and Income Levels

The recycling sector presents a predominance of informal actors and a strong participation of a foreign workforce, with a myriad of self-made entrepreneurs and informal micro enterprises at the bottom of the value chain, building up through a series of intermediaries on both sides of the formal – informal economy boundary. Registered companies dominate this end of the value chain: these are large dimension specialist waste brokers, sometimes directly owned by the local or foreign recycling companies, who provide raw materials for the national recycling companies or on the global market.

7.2 Income Levels

Income levels differ greatly among the various actors active throughout the value chain, depending on the relative position within the valorisation processes, the geographic location, as well as workers nationalities. However, data is available only for the base of the chain, as many registered enterprises active in recycling were unwilling to share sensitive information such as profit margins and revenues. As the recycling marketplace follows the typical price dynamics linked to global commodity markets, losses are not uncommon among waste brokers and scrap dealers following sudden price drops quickly exacerbated by local tax hikes.

Reported incomes are usually above the Jordanian minimum wage, with the notable exception of waste pickers. Price volatility, transport costs, and fluctuations in quantities recovered all lead towards a great variability in the reported earnings. Salaries range between 100 – 150 JD per month for waste pickers in dumpsites, to 75 – 200 JD per month for waste pickers in the street. Besides those working in Al Ehsnyiat dumpsite, Syrian refugees are generally experiencing significantly lower revenues in light of the constraints due to their refugee status, namely working hours, freedom of movement, and access to buyers.

Itinerant waste brokers earn 300 – 400 JD/month on average, net of transport costs; small scrap dealers and junkshop owners have very variable income levels, from 300 – 500 JD / month for those located in Mafrq to over 1,000 TD/month for intermediaries operating in Irbid. This chiasm reflects the socio-economic characteristics of the two governorates, in terms of population size, productive base and waste composition and generation rates. Private recycling contractors, big waste brokers, and recycling companies based in Zarqa

and Amman can easily have a turnover exceeding 1 million USD per year, although they would not be keen on sharing information on their profits, which are nonetheless likely to exceed 18,000 JD per year.

On average, the target profit margin across the informal sector (street waste pickers and itinerant waste brokers) is between 10% and 25% for simple trading operations, which also coincides with added value rates. For formal sector actors there is the tendency to extend the reach across the value chain by adding processing capacity to both increase the added value and reduce expenses. Higher added value rates (from 30% to 300% depending on the type of material and processes involved) allow to compensate for the fluctuations in price and trade volumes throughout the year. Notwithstanding this, higher capital and running costs (in terms of machinery, rent, salaries and above all electricity) produce profit margins in the range of 5 – 15%.

Table 7.1 identifies the economies of scale. At the lower end of the chain the more meagre income is still a regular virtual dependable asset to poorer families.

Table 7.1: Reported income across the waste value chain

Actor	Mafrq	Irbid
Street waste pickers	60 - 150 JD/month	120 – 240 JD/month
Landfill waste pickers	100 – 450 JD/month	n/a
Itinerant waste buyers	300 JD/month	160 - 500 JD/month
Scrap dealer(s)	n/a	500 – 1000 JD/month
Waste broker(s)	300 – 500 JD/month	1000+ JD/month
Source: Interviews		

7.3 Internal Competition

The size of actors involved in recovery activities, from waste pickers to itinerant buyers and intermediaries, means there are no visible monopolies. Even in Mafrq, where there are only a handful of brokers and scrapyards, itinerant buyers from Irbid contribute in increasing competition and keeping prices in range with those paid elsewhere in the country as well as sustaining the internal demand for recovered waste products.

Competition is lower at the top of the value chain, as there are a reduced number of specialised waste brokers and, especially for the metal and paper sub-value chain, an even lower number of recycling plants. Such concentration does not translate to dominant positions within the recycling industry. Access to the global commodity markets for both import of recycled products and export of recycled materials keeps prices in line with those in the global market and is a major source of competition, ultimately preventing the creation of unearned income opportunities. This is true even in the paper sub-value chain, where

one paper mill is effectively holding the bulk of the national recycling infrastructure: as export oriented brokers have a greater turnover capacity, the potential for the creation of a monopoly position is neutralised.

Some of the historic recycling entrepreneurs, nonetheless, do possess a dominant position when it comes to JSC open bidding, and it has been reported they have operated as a cartel from time to time, by deciding in advance who should manage a given disposal site. This behaviour is not systematic, but rather reflects the evolution of the recycling industry in Jordan, which was originally composed of a handful of entrepreneurs. The entry of several new players in the value chain over the past decade is increasingly challenging such traditional structure and makes the waste market place more dynamic.

8.0 CONDITIONS AND BARRIERS TO MARKET ACCESS

The recycling industry in Jordan operates in a fluid national market reactive to both endogenous and exogenous variables and shocks. Internal market prices are determined by global commodity prices, internal demand and transport costs. Several barriers apply to newcomers into the recycling industry, notably export duty taxes on metal and paper and cardboard exports; limited national recycling capacity for paper and metals; and high energy, rent, and transport costs. Additionally, there is a systematic lack of data on the recycling industry in Jordan in terms of active companies, national recycling capacity, exported quantities, and employment levels. This results in the sector itself being characterised by fragmented information on competitors, existing legislation and national and international trends, ultimately hindering the development of the industry itself.

Registered companies are directly affected by administrative transaction costs, and specifically taxation, on top of all other barriers experienced by the informal sector too. However, greater dimensions and the extent of these businesses across the value chain allows for increased synergies, better access to information, and economies of scale that are impossible to achieve in the informal economy.

Logistic and financial barriers, such as access to capital, rent, transport costs, and price fluctuations, impact informal and semi-formal actors more, but lack of representation and incomplete information are the greatest challenges for those operating in this sector.

8.1 Formal Sector

Registering a recycling business at the MoTI is a relatively simple procedure requiring minimum capital (less than 1,000 JD for Jordanian nationals companies). However, after registration one must obtain the required licences from the MoE, which is not an automatic process. It is worth noting that many companies active in recycling are not registered with the CCD of MoTI under such categories, while many companies in the registry ceased operations or transitioned to other areas of work. Similarly, even the Jordan Chamber of Industry databases are not always up to date with the companies actively engaging in recycling.

As the current monitoring and law enforcement capabilities for environmental laws are limited, the administrative burden of creating a new business is then minimal and conditional to the owners' attitudes towards respecting the rule of law. This is further exemplified by the proportion of informal actors compared to formal.

8.1.1 *Taxation*

Other operating costs incurred by all formal economy players are licences and waste collection fees from the Municipalities; 16% VAT on final product price (ultimately paid by the customer), and 21% social security contribution on all workers salaries. Environmental regulations and production standards also have some impacts on the recycling industry, which depends on the type of regulation and its level of enforcement. For instance, the ban on the use of raw manure on farmland is loosely respected. The ban on recycled materials for plastic bags, on the contrary, seems to be taken very seriously by manufacturers.

The most impacting administrative measure is, however, the export duty taxation on metals and paper, albeit limited to export oriented brokers. The amount of such levies has been progressively reduced over time (from 70 JD/ton to 30 JD/ton), but the abrupt introduction and uncertainty regarding the levels of taxation are a major constraint faced by export oriented brokers, in particular those trading paper and cardboard, who are consequently less prone to investments. Lack of consultation and uncertainty, in this regard, have a much more detrimental effect on the industry than the increased financial costs of the tax itself.

8.1.2 *Energy*

The greatest challenge to Jordanian recycling companies by far is the high electricity prices. The cost of energy multiplies its effect across the value chain, and specially affects paper mills and metal foundries, making the imports of recycled raw material a competitive option to that recycled in Jordan.

High internal electricity prices combined with the reduced international price for steel made many steel manufacturers turn to overseas suppliers, with prices for imported steel pellets being comparable with those produced nationally. Steel foundries are nonetheless still active due to the periodic shortages and delays in delivery, effectively providing a buffer against market shocks.

Paper is being exported to Saudi Arabia and other Gulf countries to be recycled and reimported into Jordan as recycled paper for cardboard manufacturers, egg trays, and tissues and toilet paper. Competitive imports are not limited to the Gulf region: recycled paper products from Europe and Israel are commonly traded too. The preference for foreign recycled materials is based on price (around 400 – 500 USD per ton for recycled paper) and higher quality compared to those produced in Jordan.

8.2 Informal Sector

Actors belonging to the informal sector are less affected by customs regimes with the notable exception of the export duty tax on paper, which depressed both trading prices and, consequently, the national demand and offer in. In light of their limited access to information and limited storage space availability, however, informal businesses are much more vulnerable to price fluctuations. When facing a sudden drop in global prices, it is often the case they will have to sell at a loss to avoid incurring further losses; when facing a demand side shock, such as in the case of carton and PET, they will even stop trading specific materials, if not exit the market altogether. JSC recycling contractors are the least vulnerable in this regard because they have access to plenty of storage capability either within disposal sites or in their proximity, and the costs for recovered materials cost coincide with those for labour.

8.2.1 Waste Pickers

Waste pickers have no particular barriers to entry, especially for those who work in the streets, at city level: anyone can freely start sorting the trash dumped in the streets and in the dumpsters. There are nonetheless several constraints to such activities, from the amount and timing of working hours, to accessibility of waste (in terms of temporary storage and residential areas) and the seasonal variations in waste composition. These are mitigated with various strategies. For instance, some pickers will specialize in selected waste streams only (aluminium cans, or repair workshops scrap), or focus on determined areas only where recyclables are more easily found. As already mentioned, Syrian waste pickers face different issues stemming from their status of refugees, ultimately resulting in a reduced ability to move around to pick the recyclables in the streets.

Waste pickers sorting waste in dumpsites incur several limitations to their ability to work, but none from an administrative source: as the contractors are not formally employing them, waste pickers don't pay for social security, and consequently do not receive its benefits. In fact, most Jordanian waste pickers identified access to social security as the main aspiration towards the improvement of their working conditions. In both sites, contractors are providing some basic PPEs, which are nonetheless of varying quality and inadequate to the hazards waste pickers are exposed. Besides this common point, the two disposal sites are quite different.

In Al Akaidir, where changing and WASH facilities are present outside the site, the main barrier is the lack of time and dedicated space to conduct the sorting operations in a systematic manner. Introducing a more systematic sorting operation would then allow them

to work more efficiently and substantially increase the quantities of recovered waste. A greater working space would also reduce the risks of incidents.

In comparison, pickers at Al Ehsnyiat dumpsite are more organised, with two separate groups for collecting the recyclables and sorting them, which allows for greater employment levels. The main issue is the lack of changing rooms and sanitation infrastructures, which disproportionately affects women. The presence of Syrian refugees among the waste pickers is, to this day, not an issue as police forces keep out of the site and there is no formal employment contract.

8.2.2 *Itinerant Waste Buyers*

Itinerant waste buyers experience a different set of limitations and barriers. They often own their vehicle, but it can also be the case they rent it only when a congruent quantity of waste is to be moved. The main barrier to entry is to obtain the initial capital required to buy or rent the truck, followed by acquiring a valid driver's licence. Access to credit lines can indeed be challenging for such small entrepreneurs. From an operational point of view, the biggest obstacle remains the availability of money for buying recyclables and second hand goods. Consequently, some of the itinerant waste brokers develop different adaptation strategies as an alternative to their traditional *modus operandi*. For instance, it is typical to put in place a set of informal outstanding contracts with manufacturers to buy source-segregated recyclables. Other itinerant buyers specialize in certain waste streams only, such as cardboard and C&D waste, collaborating with other fellow brokers to rent demolition machinery or sort through vast amounts of waste in shorter time. Finally, it is not uncommon for scrapyard owners to lend money to the itinerant buyers to increase their recovery capability.

8.2.3 *Scrapdealers*

Informal intermediaries such as scrap dealers and generalist waste brokers need conspicuous investments to enter the business. Securing a viable location is nowadays a major challenge: rent already is one of the biggest operating costs, and the influx of refugees drove up land prices, sometimes up to 500% such as in Irbid city. Depending on the type of equipment employed, electricity bills also have a relevant impact on operation costs, their incidence directly proportional to the processing and transformation capacity.

8.3 Information and Awareness

Information on the recycling industry in Jordan is difficult to track and triangulate due to the lack of systematic data collection at government and associative levels combined with the

predominance of the informal sector in many recovery activities. This is true at institutional levels, with civil servants often unaware of the existing infrastructures and the extent of recycling activities, as well as within the sector itself, with recycling entities having only partial and sometimes inaccurate information on their industry.

The lack of information among decision makers can be problematic at various levels. From stakeholders' involvement in the decision-making processes to the recognition of the strategic importance of the recycling industry, the absence of reliable data impacts the Jordan government's ability to define supportive policies and an environment to foster the sector's growth.

The same problem applies to the recycling industry itself, but results in deeper repercussions: without comprehensive figures on the sector dimension and economic impact, formal economy companies have serious limitations in informing government decisions. This is especially true for those operating within the informal sector, who have the least influence in any decisions affecting their source of livelihoods. Limited access to information impacts the economic performance of the sector as a whole, and particularly in its ability to forecast international market trends and, ultimately, its resilience to demand side shocks.

In addition to that, public perception of those working in waste management is variable among various stakeholders, ranging from appreciation and acknowledgment of the positive role of recycling, to general lack of interest for such issues. Among households, however, a "culture of shame" associated with working with waste is common, which can in certain cases be coupled with further negative stereotypes such as association with thefts, disease, and poverty.

For these reasons, culture and perception are likely the biggest limiting factors towards the strengthening of recycling and the introduction of source segregation and sorting at household level. Change at institutional level can be as hard to achieve as behaviour change. Yet, as the exchanges between the Syrian refugees and the host communities have happened to generate change in Jordanians attitude towards waste, enhanced data collection and dissemination on the recycling activities in Jordan would positively impact government attitudes too.

9.0 GAPS IN THE VALUE CHAIN

Generally, most recyclable materials are being recovered at different stages of the waste management cycle; there are nonetheless some relevant exceptions, namely glass, PET, synthetic textile, and organic waste.

9.1 Glass

Before the Syrian crisis, glass was exported via Syria to Lebanon for recycling into local furnaces. This practice ended with the start of the Syrian civil war and consequent closure of the border with Syria.

Nowadays, glass is reported to offer too little value to be considered for recycling, and therefore there is no glass recycling taking place in Mafrq and Irbid, nor in the rest of the country. Weak internal demand led to the absence of glass factories in Jordan, with most manufacturing capacity concentrated in treating and processing imported glass, rather than producing the material. High transport costs in relation to the very low profit margins are another major constraint to glass recycling, a factor accentuated by the absence of regional alternative destinations to Lebanon.

There are nonetheless minor re-use and recycling activities taking place. It is reported that beer bottles are recovered, possibly in connection to existing buyback schemes for sodas and other drinks. Window panes are also being recovered for re-use along with other objects and materials from building demolitions.

9.2 Synthetic Textile

Textile waste originates mostly from garment industries operating in the FTAs (FTAs, formerly QIZs), and its final destination depends on the scraps' size and composition.

The biggest cloth cuttings (10x10 cm minimum) are sorted by manufacturers and then directly re-exported to Asia for reuse and recycling. The smaller scraps are discarded by factories and end up in the waste streams. They are gathered by waste collection contractors and then sorted, based on their composition and final destination.

Cotton is sold to specialized brokers and exported to Egypt for reprocessing; white cotton scraps being especially sought after for the ease of dying. The market for recycled textiles experience seasonal variations and can sometimes exceed current demand, thus making final disposal an alternative option to recycling. Synthetic scrap, by contrast, is sometimes

sold to local companies for furniture fill. However, lacking a buyer for it, it's often the case it ends up in Al Akaidir dumpsite for disposal.

Industrial waste from FTAs is not accepted in Al Akaideer, so the textile scraps are then dumped and burned just outside the site boundaries. This is due to FTA inputs being exempt from import duties. Consequently, disposing of such by-products on Jordan territory is prohibited under the Customs Law. It is the view of Irbid JSC that to be disposed of in Al Akaidir site, waste generated within the FTAs should pay the import duties and levies first. Finally, as Al Akaidir disposal site is not accepting industrial waste anymore, this raises the question of how the industrial waste will be managed in the future in the absence of alternative destinations within the governorate.

9.3 Organic Waste

Organic waste is the predominant waste fraction within MSW, ranging between 50 and 65 % of generated waste arisings.⁸. It is also the least valorised waste stream, and due to current disposal infrastructures, it's the most problematic in terms of negative environmental impacts.

The only food waste being recovered is bread, which is then sold to goat/sheep farmers for feedstock. For this reason (and possibly as a form of *zaka*) leftover bread is not thrown away directly in the trash bins, but is put in a bag next to it. Even in this case, such bags end up being transferred to the disposal sites. Waste pickers operating there sort them along with other materials.

9.3.1 Composting

There is evidence of composting taking place on a small scale in selected locations, to support small orchards at household level. Cultural shame (*'ayb*) and the lack of market for compost (as opposed to raw manure that is collected and transported systematically) are the two main limiting factors. The price of compost has reported to be literally "the cost of transporting it". The question of compost marketability is somewhat controversial. While many actors would agree there is no market for the product – a statement corroborated by the closure of the only two composting plants in the country – others disagree. Compost is indeed being imported to supply the demand for it driven by tree nurseries, landscaping, and even some commercial operations such as mushroom farms. The main obstacle is then from the supply side, rather than the demand: weak enforcement of environmental

8 MOMA, 2015. Development of a National Strategy to Improve the Municipal Solid Waste Management Sector in the Hashemite Kingdom of Jordan

regulations, lack of policies targeting organic waste, and the absence of composting plants all contribute to this gap in the waste value chain.

9.3.2 *Anaerobic Digestion (AD) (biogas)*

Anaerobic Digestion (AD) also suffers from similar problems, in spite of the huge potential offered by livestock, agriculture, and the share of organic waste in MSW. AD plants do exist in the country, but only as small, pilot projects. The biggest of such plants is located in Amman, but is currently not in operation due to a lack of consistent and quality feedstock and faulty construction materials. There are many artisanal manure digesters throughout the countryside (up to 5,000 nationwide), although many of these would not qualify as biogas digesters.

The lack of an enabling environment is to blame for such market failure: the absence of a coordinated waste management and energy policy on biogas generation between MoE, MoTI, and MoEM; the lack of dedicated resources to promote sectorial growth; and insufficient promotion of the technology among potential users are all contributing to the present situation. Jordan, as demonstrated by the number of pilot plants built, has in fact the necessary know how, expertise and human capital to embark on an ambitious plan to develop its high biogas potential, providing the political will to sustain the process is present.

9.4 PET

Among thermoplastics, PET (mostly in the form of plastic bottles), seems not to have a market in Irbid and Mafrq at the moment. This is an unusual situation relative to other middle-income countries, where PET is one of the most widely traded plastic resins. This is due to a number of factors. First there is no internal market for recycled PET flakes as there is gap in the productive system: currently, there is no PET manufacturer employing recycled PET (rPET).

At the same time, the recent drop in oil prices has led to a major slowdown in rPET exports, with the exception of a handful of specialized brokers, mostly based in Zarqa and Amman. Consequently, the reduced prices paid to waste brokers had a knock-on effect on PET collection, due to the logistical costs of transporting the material from the North. Nonetheless, some actors who can afford to spare the required storage space are still accumulating PET bottles, waiting for commodity prices to rise again.

9.5 Low Density Polyethylene (LDPE) and Polyethylene (PE)

Nylon, as LDPE and PE bags and other plastic sheeting are commonly referred to in Jordan, is currently recovered to be recycled in country, but only to a minor extent compared to other plastics. The recent introduction of a ban for recycled plastic in plastic bags destined to contain food items will likely depress an already declining market for recycled PE.

Lack of source segregation and, consequently, contamination is the main limiting factor to recovery, as it introduces new costs to the recycling process in terms of cleaning and consequently, with stricter production standards in place, reduced marketability. For these reasons recyclers are now increasingly favouring pre-sorted waste from factories to plastic sheets recovered in the dumpsites

This is symptomatic of a general weakness of Jordan's waste market place, which is in its infancy, where there is segmentation of materials diverted from the waste stream based on origin, quality and contamination levels.

9.6 Construction and Demolition (C&D) Waste

Most excavation material and debris is dumped on the side of the streets, in illegal dumps, or simply next to the construction sites, with steel rods and wood being systematically recovered. Steel bars are either directly re-used after manual re-processing or sold as scrap to local scrapyards. Wood is recovered as fuel, or shredded and then sold as bedding to chicken farms. Any recoverable items in the house, such as doors, door and window frames, windowpanes, roof tiles, bathroom fixtures and so on are systematically recovered and bought by the specialised second hand trade.

Table 9.1 clearly identifies the route taken for waste and the large amount that is exported. Some of the exported items could prove more of an asset nationally if facilities and demand existed. Also, if national facilities were in place and local demand existed, this could help avoiding export and transportation fees.

Table 9.1: MSW streams and main destinations

Waste streams	Average	Materials recycled	Final destination
Organic waste	50 – 65% ¹	Bread, kitchen waste ³	Goat/sheep feed; composting; energy recovery ³
Plastic	9 - 15% ¹	HDPE, LDPE, PP, PE, PET, PC, PVC ³	Recycling, Export (PET) ³
Paper	9 - 15% ¹	Paper, carton, old corrugated cardboard, paper and cardboard scraps ³	Recycling, export, bio-char ³
Metal	2 - 4% ¹	Ferrous: iron, steel, tin Non ferrous: aluminium, copper, brass ³	Recycling, export ³
Glass	2 – 4% ¹	No glass recycling ³	Landfill, open dumping ³
Textile	1 – 3% ¹	Clothes; big fabric off cuts; cotton scraps ³	Export, reuse ³
Wood and yard waste	1 – 5% ¹	Wood boxes, pallets, saw dust ³	Downcycling, energy recovery ³
Tyres	1,000,000 ² pieces/year	Rubber; metal mesh wire ³	Recycling, energy recovery ³
WEEE	8,700 ² pieces/year	PCs, white goods, batteries, CRTs & flat screens ³	Recycling, export ³
C&D	n/a	Re-bars, frames, furniture & bathroom fixtures ³	Re-use, recycling ³
¹ MoMA 2015 ² SWEEP-NET 2014 ³ Interviews			
Source: SWEEP-NET 2014, MoMA 2015)			

10.0 GROWTH POTENTIAL

The low levels of recycling achieved leave plenty of scope for sectorial growth in terms of quantities of the recovered material, quality of segregated recyclables, and, most importantly, types of materials currently valorised.

10.1 Expansion of Existing Value Chains

First, while the existing value chains for waste are fairly developed, they are far from optimal and present room for improvement, especially in terms of reach of the existing supply chains. Indeed, transport costs and access to the waste market are two major limiting factors outside the main cities. Itinerant waste buyers are a partial solution to such problem, but their iterative working method does not support a structured value chain in more remote populated areas.

These zones do enjoy reduced land prices compared to the cities of Irbid and to a lesser extent Mafrqa, and usually lack any entrepreneur active in recycling, thus being serviced by itinerant brokers only on a call basis. Consequently, the creation of small collection points, or waste banks outside the main urban centres would, on one hand, increase the quantities recovered at source and increase households available income; on the other, this would allow itinerant buyers to act as a connection belt with the existing value chain, increasing their range and effectiveness per trip.

Similarly, the approach on e-waste management adopted by the Jordanian government is likely to impact current disposal and recycling practices for WEEE. The inclusion of private sector actors in the drafting of the proposed legislation, along with the introduction of a new WEEE regulation, should lead to the set up of a diffused e-waste collection network through cell-phones boutiques and other electric appliance retail stores. This will in turn increase the collection rates for waste electronics specifically targeting those appliances currently not collected by the informal sector, such as mobile phones. At the same time, e-waste should be diverted from scrap dealers and recycled in modern facilities, ultimately reducing detrimental dismantling and recycling practices commonly found within the informal sector.

10.2 Sectorial Professionalization and Development

Introducing quality considerations into current recycling practices has the potential to increase the competitiveness of the sector, as well as to address the increasing requests for professionalization of waste management and recycling professionals. Several interviewees stressed the need for an increased specialization and training in the field of health and safety

(including the correct use of PPE), sectorial recognition and representation, processing capacity improvement and quality standards and controls.

Metal recycling, being more established than other sub-value chains, is already characterized by a segmentation of traded materials by type, quality and level of contamination. However, such practices are not universally adopted and there are no sectorial standards or best practices being currently enacted in Jordan. Rather, there are different internal standards within each company.

Paper and cardboard recycling, in light of the major restructuring it has undergone, is now increasingly attentive to segmentation of recovered materials based on origin, quality and contamination. However, such practices are more common among brokers exporting paper, as they compete on the global markets, and not among local recycling companies and the lower levels of the sub-value chain. Establishing different prices based on contamination and point of diversion and common standards for quality of the recyclables would allow for an increased quality of the recycled end products, expanding revenues throughout the whole sub-value chain, and promoting segregation at source.

10.3 New Value Chain Creation

Among the various waste streams not currently valorised (glass, PET, synthetic textile, organic waste), organic waste is the one showing the greatest growth potential.

Organic waste is the largest waste fraction within MSW, and current disposal practices, namely controlled dumping at the Al Akaidir and Al Ehsnyiat dumpsites, are a major source of leachate and landfill gas. Alternative treatment and disposal options, that is composting and AD, offer a wide range of alternative technical processes adaptable to a variety of settings in terms of scale, location and processed quantities. Furthermore, the MoA, MoEMR and NERC implemented in recent years a number of small and medium-scale pilot biogas plants, providing proof Jordan currently has the necessary technical expertise and knowhow to set up alternative organic waste treatment facilities. Besides, most materials required for such installations are readily available in the country and are locally sourced.

Other than the technical feasibility, there are several factors expanding the potential for composting and biogas, from a political and administrative perspective, to evolutions in environmental and economic settings.

The introduction of a ban on raw manure use on farmland, for instance, would be a major driver for composting and AD plants if it were to be implemented thoroughly.

Notwithstanding this, there are several other developments in the existing legal framework driving such potential growth. The 2010 Renewable Energy and Energy Efficiency law and the Sustainable Energy Mix and Policy Framework for Jordan lay the ground for an increased attention to energy security and renewable energy, including biogas. The legal framework is to become complete once the draft Waste Bylaw is approved, creating a coherent legislation and introducing the concept of a waste hierarchy into Jordanian legislation.

The state of soils in Jordan, threatened by both desertification and depletion, creates a great potential for using compost, bio-char and digestate in farmland and rangeland remediation.

The rise of organic farming in Jordan, with over 40 farms now in transition from conventional to organic methods, will increase the demand for organic fertilisers, which are currently either produced on site or imported from Europe. As not all farms will be able to produce the quantities of compost required autonomously, this will create the basis for an organic waste value chain. From this perspective, composting offers potential growth as it requires minimal infrastructure and can be adapted to various sizes and space availability. Land availability will nonetheless be a key aspect in starting small and medium sized composting plants.

There are several plans to develop a series of biogas plants in Mafrq governorate, lead by JFOE and Noiva International Foundation, and Northern Jordan as a whole by KFW.

The focus of KFW's planned interventions is not on solid waste, but rather in the construction and rehabilitation of wastewater treatment plants. As such plants will include biogas digesters to treat the biosolids in the sewage sludge, the potential for co-digestion or organic waste exists, with the additional benefit of higher gas yields generation.

Noiva International Foundation plans to invest about USD 6 million into a state of the art AD plant that will use slaughterhouse waste, agricultural residue and the organic fraction of MSW to produce heat and energy. The project is now concluding its feasibility study stage and the plant should be online and fully operational by the end of 2016.

Finally, JFoE, a Jordanian environmental NGO, has recently got a community empowerment project approved by MoPIC. The project aims at training over 500 women, identified among vulnerable families' registries, in the installation and maintenance of micro AD digesters, which would then generate cooking gas and fertiliser for rural households.

Table 10.1 is a log frame summarising the existing Waste Management framework - its success to date, the strategy for improvement from both government bodies and stakeholders, plus existing limitations that may hinder progress.

Table 10.1: SWOT analysis

	Positive	Negative
Internal	Strengths <ul style="list-style-type: none"> • Lively and well integrated supply chains for recyclables in Irbid • Widespread source segregation at industrial level • Source of livelihood and employment • Request for professionalization and sectorial representation • Planned investment in AD plants • Planned Al Akaidir dumpsite rehabilitation • Developed and expanding legislation on hazardous waste 	Weaknesses <ul style="list-style-type: none"> • Limited quality segmentation for recycled material • Lack of sorting equipment at disposal site • Short duration of JSC contracts • Low health & safety awareness • Minimal PPE use among workers • Limited local processing capacity for paper & cardboard, metal scrap, and plastic • Lack of manufacturing capacity and demand for glass, PET, organic waste • Fragmented institutional responsibilities • Poor coordination and communication among institutional stakeholders
External	Opportunities <ul style="list-style-type: none"> • Spread of organic farming techniques • Existing RE & EE legislation and policies • Existing know-how and expertise on AD • Organic waste proportion (50 – 65%) • Soil degradation and desertification intervention 	Threats <ul style="list-style-type: none"> • Reduced export routes and regional instability • Uncertainty on tax regulations and levels • Low environmental awareness among local population • Lack of systematic data collection on recycling • High electricity and rent costs • Global commodity prices volatility • Virgin materials competition

11.0 WASTE VALUE CHAIN RECOMMENDATIONS

Based on the mapping of the existing waste market and value chains in the Mafrq and Irbid Governorates and the economic analysis of the recycling sector in Jordan, this study has identified gaps, limitations and opportunities within the current MSWM practices.

This allows identification of several recommendations, or interventions, within three key conceptual areas:

- **Community:** Interventions that aim to improve SWM, handling and efficiencies;
- **Waste:** Projects that focus on implementing systems or activities specifically for certain waste streams or group of wastes; and
- **Infrastructure:** Projects that are more capital intensive requiring potential private sector investment.

For each of the recommendations, the potential actors that could support the implementation of the recommendation have been identified. Many of these are Jordanian people and organisations already active in SWM or recycling initiatives.

It should be noted that the recommendations do not seek to intervene in the currently established value chains but rather look to either compliment these value chains or develop new value chains (i.e. for organic waste).

To support the implementation of the recommendations, this section also proposes the pre-conditions needed to be in place for a specific recommendation to have an opportunity to succeed in Irbid and/or Mafrq.

To provide a livelihoods framework to the recommendations, each of the recommendations includes a matrix setting the recommendation against principles of the “Markets for Poor” (M4P) pro-poor approach.

11.1 Markets for Poor (M4P)

A successful pro-poor intervention leads to economic growth, better opportunities, incomes and choices for the most vulnerable. Well functioning markets that support competition and lower costs of doing business, provide incentives for trade and investment leading to growth and poverty reduction.

The ideal is to expand opportunities, choices, access and benefits. This will provide outcomes of higher quality jobs, greater affordability of key products and services, and risk

reduction, - all of which are indicators of success. By stimulating and aligning incentives and capacity for market players, they have the opportunity to play a more efficient role in the market system.

Intervention needs to stimulate change from the bottom up, from the waste picker and street collector to the exporter, especially as there are at least four times more informal businesses than formal registered businesses. Information and incentives will help introduce more effective management of the waste in the North of Jordan, and throughout the country.

Improvements in existing market systems will increase productivity or add value such as better employment opportunities. In addition, new market systems will be encouraged to open up.

To enhance the prospects of bringing about durable pro-poor change, the key questions include:

- Are there reasonable prospects of affecting significant numbers of poor people?
- Which market systems are important to the target group and what is the nature of their engagement in those systems?
- In which ways might improving the market system(s) enhance access and growth?
- Is intervention likely to be feasible, given the resources available?

Most of the projects will have a direct effect on livelihoods, develop greater profitability in existing working practise, increase employment opportunities, present ideas for new business start-ups and offer free training courses and apprenticeships.

11.2 The UNDP 3x6 Approach

UNDP Jordan has adopted the model of the 3x6 Approach to promote sustainable livelihoods for vulnerable groups living in transition countries and/or areas affected by disasters or conflicts. DWR have approached the intervention objectives with this in mind. Alongside integrating the Markets for Poor objectives, the elements of the 3x6 Approach are also integrated into the intervention scope, to justify their contribution in local economic recovery and the transition to longer term development. To clarify the elements of the Approach:

- Promoting social cohesion by encouraging members of the community to organise themselves into collective economic activities.
- Creating ownership at individual and community level.

- Promoting individual savings.
- Engaging entrepreneurs in joint economic ventures.

The three phases and 6 steps of the 3x6 Approach are recorded by each of the interventions to justify their likely effect in local economic development and market and community resilience.

1. INCLUSION (3-6 months)
 - a. Engaging
 - b. Generating Income
2. OWNERSHIP (approximately 6 months)
 - a. Saving
 - b. Business Venturing
3. Towards SUSTAINABILITY (approximately 12-24 months)
 - a. Investing
 - b. Accessing Markets

11.3 Community Focussed Recommendation

11.3.1 Professionalization of the Recycling Sector

After interviewing many key informants on the ground at all levels of market activity in the waste sector, our research demonstrated the overwhelming desire of the waste management industry to improve its organisation, coordination and support systems, with better communication throughout. In addition, interviewees repeatedly showed a desire to increase professionalization of the sector, in terms of greater access to formal employment, official recognition and formal training in waste management and recycling.

Table 11.1: Community Project: Specific Waste Portal - E-Waste, App, SMS, Website

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> • All sectors gain insight into trading practices. • Employment and training opportunities visible on the portal. • All businesses at local and national level should be aware of the portal.
Improved Access and Growth	<ul style="list-style-type: none"> • Expands market. More access to the community and businesses by knowledge sharing and up to date information. • Local business and individuals pay for waste to be removed. Bigger economic opportunities. • Evolving Innovation in collaboration with public and private business and stakeholders. • Free training days (such as hazardous materials at all levels of waste value chain). Signed certificate - improves future employability.
Market System Change	<ul style="list-style-type: none"> • Greater networking, informed opportunities for greater profitability. Improved coordination at all levels will evolve. Greater incentives to work as teams.
Systemic Intervention	<ul style="list-style-type: none"> • Develop a portal for waste professionals at all levels. • A number of paid researchers to input data, could be paid through small registration payment such as 1 JD, to have online 'membership'. • Be developed as a project within MoMA or MoE • Relevant to Jordan as a whole - local municipality could support local SMS information advising of local business waste or specific households with required waste collection of items. • Portal can be advertised with stickers on bins, plus local media information. • Information of opportunities.
Time Frame	4-6 months.
Beneficiaries	All members of the waste value chain, but of particular importance to waste pickers/street collectors.
Contact	Tech Companies Hello Spring and/or Souketel.

Table 11.2: Community Project: Specific Waste Portal – E-Waste, App, SMS, Website

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	Already a call from the waste pickers and street collectors for better cohesion on the ground, knowledge of hazardous waste, information on waste to be collected. Advantages of teamwork with heavier or numerous items - therefore increased individual profitability by collective working – reviving/re-inventing this service sector
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	<p>Saving schemes can be organised within groups with advice on the portal. Equipment loaned at special rates through the portal/SMS, supporting profitability in the equipment hire trade, and the value chain associated with it.</p> <p>A proportion of savings can be invested for example, to improve carrying equipment, or vehicle rental for larger items. These savings possibly multiplied and small business plans developed under the UNDP 3x6 Approach.</p>
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	The project can facilitate access to microfinance institutions. Training in business development, specialising or diversifying. Beyond waste collection and segregation, the portal can help identify with new direct and indirect markets.

Such aspirations could be met by an official Professional Association in waste management for all levels of the workforce. This would promote credibility for the undoubtedly important work they do to counter waste build-up in Jordan. Information and networking is strong, but simple support systems could elevate the recycling and waste management industry to be considerably more effective.

A representational body for the profession would provide several benefits to both informal and formal recycling actors. To begin with, it would be in a better position than its single associates to engage with institutional actors at a national and local level and be consulted on waste related issues and legislation. Secondly, it would provide some sort of official recognition to those active in informal recycling activities, creating the starting point to transition to a formal business. Finally, through the input of its members, an association would be able to develop and offer the training and certifications required to comply with waste law and regulations, and collect data on the recycling industry in terms of number of actors, people employed, and quantities of recycled material.

Gathering, managing and disseminating information relevant to the sector is possibly the most important task such a professional association must accomplish to support the sector.

Greater input is required to all stakeholders from governing bodies both at Ministry and municipality level. This might be accomplished through free certified vocational training initiatives (for instance in hazardous waste), a dedicated website/App, and SMS texting information system.

Professional waste managers and recyclers organizations are a standard practice throughout the world, from UK's Chartered Institute of Waste Managers (CIWM) to the US Solid Waste Association of North America (SWANA), the International Solid Waste Association (ISWA) or the GIZ-sponsored SWEEP-NET, the closest equivalent to a professional organization in the MENA region. Such sector associations have been developed in several other contexts, including at the informal actors level: the South Africa Waste Pickers Association (SWAPA), Amelior association in France, and the waste picker cooperatives of Brazil. In all these cases the organizations were born out of the need for recognition, implementation and monitoring of professional standards, the development of standards and practices as well as the need for a forum through which relate with national government and other institutional actors.

11.3.2 Industrial Symbiosis Programme - Resource Matching Workshops

Systemic change in the functioning of the Waste Market will 'overcome' market failures, improve access, opportunities and benefits. The waste market is very much alive in Jordan: it is profitable (and considering there is little source segregation taking place at household level) effective in its sorting, recycling, and export. Improvements can be made by creating more jobs, further investment and having a greater effect on waste quantities in landfill.

The willingness to cooperate at all levels of waste enterprise exists and an improved system (sustainable employment, thriving markets) will involve some relatively small changes. Working more closely with enterprises, promoting greater participation and information and improving benefits to the individuals, plus market-based incentives are paramount. Incentives must not be seen to be led by outside agencies, but internally by participatory focus groups and governing bodies locally and nationally.

As fragmented information is one of the barriers to recycling becoming a systematic process within the private sector, an Industrial Symbiosis Programme could provide an opportunity for increasing knowledge across different areas of the manufacturing sector, and could enhance the potential for recycling and reuse through the resource matching workshops.

Table 11.3: Community Project: Industrial Symbiosis Programme - Resource Matching Workshops

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	• Save money on resources.
	• Improve business profitability.
	• Support all sizes of business and start-ups.
	• Employment network of facilitators and information registered on a website of business needs and requirements.
Improved Access and Growth	• Redefining one businesses waste as another's resource. Expanded to include sharing of transportation, premises and machinery hire.
	• Raising awareness in local market systems.
Market System Change	• Ability to create regular demand for workshops.
	• Improved networking and understanding of local business markets.
	• Understanding of waste materials and those that can be used as a resource.
	• Ability to catalyse or bring other players into market system.
Systemic Intervention	• Process marketed as free event for all types of large and small business, charities and start-ups.
	• Run by local municipality.
Time Frame	2-4 months
Beneficiaries	All size businesses gaining free resources, and likely reducing their waste footprint.
Contact	Initial Training of facilitators and training of the trainers - and further comment from Peter Laybourn International Synergies Peter.Laybourn@international-synergies.com

Table 11.4: Community Project: Industrial Symbiosis Programme – Resource Matching Workshop

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	Workshops organised for all sizes and types of business - in itself an opportunity for organisations to voluntarily network who might otherwise not be likely to. Money saved on resources from another business as a 'waste' product, can be a source of re-investment in the business including increase in staff.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	Money saved from gaining a free/cheap resource will be invested back into the business with potential to diversify or partner with similar organisations; an example being the sharing of transport and premises. May well allow an increase in workforce from money saved, and reinvestment. This is where UNDP might choose to support investment through the 3x6 Approach programme
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	The intervention in existing business practice creates opportunity to save money over time, as long as there continues to be a resource that is considered waste and of zero value from another outlet. Plus a regular attendance of workshops, maybe annually. New market opportunities and identification of viable value chains can be identified longer term, when businesses choose to re-engage in the symbiosis programme and meet different sectors of their own market, or may identify opportunities to diversify or partner other participating businesses

11.3.3 Corporate Environmental Stewardship Scheme

The waste value chain mapping process identified source segregation of recyclable waste for re-sale as a widespread practice within industrial manufacturers; similarly factories were ready to switch to recycled raw material instead of virgin ones the moment it provided financial or operational advantages. However, in spite of the presence of recycled products among consumer goods, there seemed to be little advertising of such characteristics, nor a product made of recycled materials presented any added value in the eyes of the consumer.

There is growing attention to environmental issues stemming from the presence of tourists, which is gradually changing Jordanians attitudes. Some international companies do already take part in international sustainability and environmental certifications (e.g. the Green Key eco-label for hotels), and there are now similar standards being developed in the country on energy efficiency for buildings and manufacturers.

An environmental stewardship scheme would allow companies wishing to improve the sustainability of their productive process to capitalize on this in terms of image and, eventually, in terms of added value to the final product. Such a label would contribute to

raising awareness of environmental sustainability and could foster measures such as energy savings and recycling, resulting in further financial gain for the companies.

If a market can better respond to what a consumer wants and consumers are willing to pay for it, business is much easier and more successful throughout the chain. By making public such resource and energy efficiency improvement, information flow is richer, there is greater trust, and more businesses stay in business for longer. It has been the case that socially responsible or ethical businesses are usually more prosperous and long-lived than those with looser business practices.

Table 11.5: Community Projects, Corporate Environmental Stewardship Scheme

Poverty Reduction Objectives	<ul style="list-style-type: none"> • Businesses save money on energy bills, help with waste segregation to sell to waste collectors. • New ethical market evolves for the business and attracts like-minded businesses • More profitable businesses from energy savings, can re-invest creating more employment
Improved Access and Growth	<ul style="list-style-type: none"> • Increased market in eco products for businesses seeking to gain award. • Businesses work with like-minded ethical companies/organisations.
Market System Change	<ul style="list-style-type: none"> • Businesses would actively seek the credential for their website, headed paper etc (especially if Royal approval can be sought for this scheme).
Systemic Intervention	<ul style="list-style-type: none"> • Training of auditors for local businesses to promote environmental stewardship awareness and 'behaviour change'. • Promoted and encouraged by MoMa, MoI and MoE jointly, re recycling, up cycling, conscious purchasing, building improvements such as eco-bulbs, light sensors, insulation panelling, waste segregation, water harvesting, vegetable plots on roof using compost from their organic waste etc.
Time Frame	1-2 months
Beneficiaries	Auditor training Waste segregated at source for street collectors to immediately transport to brokers.
Contact	BushraHattab, Jordan Green Building Council

Table 11.6: Community Project: Corporate Environmental Stewardship Scheme

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	<p>Businesses voluntarily participate in the scheme - appreciating the ethos of the scheme is to support youth in the Arab world and their future by reducing the impact the business has on the environment.</p> <p>Businesses will pay for audits to be done, which provides an income for the auditors. Investment is made to train auditors who might be funded to receive more specialised skills training.</p>
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	<p>Newly qualified auditors may voluntarily save a portion of their income and develop small business projects that support environmental conservation.</p> <p>Multiplied savings by UNDP under the 3x6 Approach may be offered to those whose business planning holds the greatest potential for success.</p>
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	<p>Individual or groups developing successful business plans from their auditing experience may well be further supported to integrate in markets and develop viable value chains, under the UNDP 3x6 Approach</p>

11.4 Waste Specific Focussed Recommendation

11.4.1 Waste Banks

The waste cycle of Northern Jordan depends to a great extent on effective markets in Amman and Zarqa as this is where most of the recycling and manufacturing capacity of Jordan is located. This identifies the increasing transport costs of the middleman the further they are located from the capital, and the weakening of the value chain in the peripheral areas of the country.

Waste banks would strengthen and expand the existing supply chain for recycled materials by creating collection points in more remote areas, thus reducing transport time and costs for both waste pickers and itinerant waste brokers. Depending on the nature of involvement of local government, waste banks can be transfer and sorting stations, directly managed by the municipality, benefiting from both reduced quantities to be sent for disposal and the sale of recycled material.

Waste banks can also be managed at a community level by a CBO or simply by local waste brokers willing to expand their reach. Here lies further opportunities for greater coordination between micro/macro businesses and some further logistical involvement from the municipality regarding more effective and increased numbers of transit stations, time keeping and regularity of 'drops', so street pickers are in place to segregate waste.

Waste banks are the ideal solution in locations where a valorisation chain already exists but are underdeveloped for logistical reasons, or to target specific waste streams such as e-waste. By providing some sort of incentive (either monetary or in kind) waste banks introduce the idea of waste segregation at household level and become a new, gender inclusive source of livelihood. Waste banks have been successfully implemented in a variety of contexts, including Germany, India, Nepal, Haiti, Senegal, Mali, Kenya, Ghana, and South Africa

Table 11.7: Waste Project: Waste Bank Segregation and Organic Waste Collection Service

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> Improved efficiency of collection, and regular income promoting more stable livelihoods for the disadvantaged.
Improved Access and Growth	<ul style="list-style-type: none"> Greater quantities of waste bought and sold. Some may work more closely with local businesses to expand local collections, work more as teams, and invest in stronger barrows or vehicle hire. More profit goes in to waste chain as the collection process is more effective.
Market System Change	<ul style="list-style-type: none"> Sites size might offer additional collection of organic waste from local businesses, restaurants, cafes etc. Reduced distances to waste brokers yard means increased collection and selling in a working day.
Systemic Intervention	<ul style="list-style-type: none"> Promote health aspects and pride in the community. Purchase waste banks and train vendors, consider sites and local opportunities for each area. Research sites with best opportunities for waste collectors, i.e. near residential, shopping and business areas. Allow local waste businesses to collect some material from the waste banks themselves.
Time Frame	4-6 months
Beneficiaries	Waste pickers

Table 11.8: Waste Project: Waste Bank Segregation and Organic Waste Collection

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	Voluntary participation in using the waste bank facility stabilises livelihoods and develops community cohesion. It will help inject money into the local economy and revive the service sector.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	Groups of individuals may decide to form a working partnership and could be encouraged to specialise in waste collection and be supported to develop a business plan under the UNDP 3x6 Approach
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	Successful business development plans may facilitate access to Microfinance Institution loans and further support new businesses integration in other markets through the UNDP 3x6 Approach

11.4.2 Composting and Soap Making

The organic waste fraction is the predominant waste stream and the one being least valorised within the study area. Given its contribution to disposal sites' environmental impacts in terms of increasing leachate production and greenhouse gas emissions, organic waste diversion is paramount. In the long run, its alternative uses would reduce the total quantities of waste to be disposed of and reduce the overall transport and maintenance costs incurred by municipalities.

Developing a cottage industry for decentralized composting and cleaning products manufacturing would address the problem and be a source of livelihood. Compost can be sold to local tree nurseries or employed to promote small household gardens, the final products either destined for self-consumption or for sale on the local markets. Transforming exhaust cooking oil into soap and cleaning fluids would also marginally reduce the waste quantities to be disposed of; most importantly, ecologic cleaning products would thrive with the high end, environmentally aware, consumers in bigger cities and become a stable income source.

The relatively low equipment requirements and know how required by such activities make them ideal to be replicated both at household level or, in a more centralized way, managed at community level within a neighbourhood or village.

Table 11.9: Waste Project: Soap, Cleaning fluids and Composting Cottage Industry

MARKET OBSERVATION	STRATEGY
The relatively low equipment requirements and know how required by such activities make them ideal to be replicated both at household level or, in a more centralized way, managed at community level within a neighbourhood or village. overty Reduction Objectives	<ul style="list-style-type: none"> • Products support the welfare of disadvantaged families and poorer families with school children.
Improved Access and Growth	<ul style="list-style-type: none"> • With proper marketing and campaigning to support local community initiatives and disadvantaged families at schools and college. • Promotion of the natural ingredients in products helping Jordan's environment, can be sold as eco-products on the local high street, and potential to expand its market
Market System Change	<ul style="list-style-type: none"> • Schools and colleges continue to ask for more training from the Women's network in soap making and composting. • A marketing campaign plus informative labelling will promote further investment and help support more disadvantaged families. • Olive Tree farms provide both grey water used in the oil production, and the fibre to support composting initiatives; a steady supply of free resources. • Used cooking oil from local restaurants is one of the main components of the floor cleaner.
Systemic Intervention	<ul style="list-style-type: none"> • Better Labelling and marketing of materials. • Increased support with training-the-trainers as market expands; plus transportation of supplies (such as those supplied to businesses under the Corporate environmental auditing scheme project). • Campaign needed to support scheme run through the MoMa office in the municipality. The Irbid Programme is already expanding to more schools, colleges and Universities in the area. The Women's group in Mafrq can replicate the model as they already provide vocational training, and have previously conducted composting training.
Time Frame	1-2 months
Beneficiaries	Women CBO's, students and disadvantaged families
Contact	Eman Al Zoubi Amagrenate Flower Womens CBO Irbid, International Youth Foundation CBO Mafrq

Table 11.10: Waste Project: Soap, Cleaning fluids and Composting Cottage Industry

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	<p>The cottage industry already exists as groups of women supporting vulnerable families at schools and colleges.</p> <p>Income from the products made by women in their homes, allows further purchase of items to help in production, plus costs of labelling, travel etc. Training provided in schools can promote business development.</p>
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	<p>Those wishing to pursue a business in the production and selling of items can be guided toward Phase II of the UNDP 3x6 Approach. Both the existing producers and trainers and new participants at the schools.</p>
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	<p>With support from the 3x6 Approach individuals from the programme who wish to take their training further and submit a viable business plan may have support from the scheme to identify further markets for the products.</p>

11.4.3 *Women's Market Garden Co-operative Eco-Park*

A women's cooperative can build upon the two diversion options for organic waste presented above. However, in this case composting and biogas are an intermediate step between the kitchen waste transformation and wider livelihood and employment opportunities linked to the agriculture sector.

Following a more centralized approach would allow for increased quantities and economies of scale for composting as well as for a greater size of land to be reserved for income generating activities such as tree nurseries, seed banks, small farming, and training in composting and farming techniques.

Table 11.11: Waste Project: Women's Market Garden Co-operative Eco-Park

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> Community owned and developed by women and vulnerable Jordanians with free produce for them Agriculture training and provision with seed banks, compost, and young plants; enhancing business profitability in markets
Improved Access and Growth	<ul style="list-style-type: none"> Disadvantaged groups can receive free training in permaculture farming methods and composting Networking at trainings and set up partnerships in selling vegetables, farming and markets.
Market System Change	<ul style="list-style-type: none"> Generate seed banks of vegetables/flowers, for purchase. Supply of compost free to disadvantaged groups or others willing to purchase. Free training in composting and simple farming methods, promoting better vegetable produce for market. Excess compost can be used as a topsoil in areas of poor soil.
Systemic Intervention	<ul style="list-style-type: none"> Site to find just outside either Mafrq and/or Irbid. Local businesses with specific organic waste (vegetable matter, eggshells) can deliver directly. Training in composting methods and which to use for different soils. More detailed training required from an organisation such as JerashEcoFarm, Permaculture training. Biogas demonstration model.
Time Frame	2-4 months
Beneficiaries	Womens CBO's, disadvantaged families and individuals
Contact	Eman Al Zoubi Amagrenate Flower Womens CBO Irbid, International Youth Foundation CBO Mafrq, Meezan Sustainable Development (Jerash Eco Farm)

Table 11.12: Waste Project: Women's Market Garden Co-operative Eco-Park

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	An area owned and run by and for the community. Training and production of quality compost, seed banks, business skills, and ideas put forward and shaped by the community that the park could support, through its space and vision.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	This project focuses more on improving livelihoods rather than being directly a business platform. It would be ideas-focused and may facilitate further opportunity in the community/locality.
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	The co-operative by its nature would be open to finding and supporting partnerships through its networking ability and as a hub in the area, with its free skills training and sharing its produce. It might well be able to inform on microfinance institutes in the area for those wishing to invest in farming/produce or biogas/biofuel projects.

Promoting organic and permaculture farming is instrumental to the cooperative's activities as it will increase the existing momentum organic farming is gaining in Jordanian agriculture sector as well as increase the base of potential customers for compost.

11.4.4 *Insulation Panels*

Synthetic textile scrap is produced in large quantities in Irbid FTA and is currently disposed of in Al Akaidir dumpsite, where it is burned just outside its boundaries, as industrial waste is no longer accepted at the site.

Similarly, within the existing paper and cardboard value chain there is room for improvement, as plenty of waste paper and cardboard generated at household and commercial level is not diverted by the informal sector and makes its way to the dumpsites.

Creating a new use for such materials will help create and support demand for them, thus reducing quantities disposed of. Additional benefits include the increased insulation of houses, with a reduction in energy bills and the creation of employment opportunities.

Insulation panels manufacturing would follow the route of the existing energy efficiency programmes and certificates.

Table 11.13: Waste Project: Waste Paper/Plastic/Textile Insulation Panels

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> • Save money on energy bills • Cheap/free solution to insulation, either being made themselves with training or purchased from provider • A business opportunity once trained
Improved Access and Growth	<ul style="list-style-type: none"> • Can affect significant numbers both as employees and those receiving panelling. • Promoted through Building companies that support Greener Credentials • Existing companies listed with the Green Building Council, Amman, that are certified with their Lead Certificate
Market System Change	<ul style="list-style-type: none"> • Local supplies from business waste in Irbid/Mafrq. Developed initially for schools, and homes for most vulnerable. With awareness programme and training.
Systemic Intervention	<ul style="list-style-type: none"> • Training programme required and run as Cottage Industry for women and disadvantaged groups - to make panelling for walls ceiling either stand-alone or fixed. Can be personalised with art, design, or plain. • Collection of relevant recycled materials from source rather than dumped - so cleaner product. • Would need research to measure heat retention in winter, cooling ability in the summer, to help marketing. Figures may already be available.
Time Frame	2-4 months
Beneficiaries	Disadvantaged individuals, families. Training skills and savings on fuel bills with possible business opportunities.
Contact	BushraHattab, Jordan Green Building Council

Table 11.14: Waste Project: Waste Paper/Plastic/Textile Insulation Panels

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	Training provided for the most vulnerable to be able to have insulation from both heat and cold throughout the year. Training would be ongoing with participants invited to train as trainers, plus business skills. Money would be saved on the high cost of energy used to heat homes.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	Those wishing to take the training further and develop a business will be invited to invest a small portion of their income in a small business project individually or as part of a group with support from the UNDP 3x6 Approach.
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	Good business planning may secure a number of diverse markets, from – schools, hotels, hospitals, business facilities, storage facilities etc. Organisations may be encouraged to further develop this idea and invest in the product and small business start-ups.

11.5 Infrastructure Recommendation

11.5.1 Household Biogas Digesters

An option for organic waste diversion is AD. Small, household sized biogas digesters would provide several benefits in terms of reduced quantities of waste to be disposed of, reduced energy costs, and create jobs for the installation and maintenance of such systems.

The biogas industry in Jordan is in its early stages, but there are nonetheless many initiatives taking place around the country, albeit in an uncoordinated fashion. Both the NERC and the MoA have several farm-sized pilot plants, and in Mafrq Governorate there are two major initiatives in the pipeline, namely a centralized biogas plant planned by Noiva International Foundation, and the training of 500 women in biogas plant installation and maintenance by JFoE. Because of the high quality of the Jordanian higher education system, there is currently a sufficient local capacity and knowhow in the country to develop small-scale digesters, even in terms of the required material, most of which can be locally sourced.

The main obstacle to overcome is the lack of an enabling environment. This can be broken down into several components: a lack of marketing and consumers awareness regarding the option; a lack of policies and incentives for the adoption of the technology; and finally challenges in accessing the financial instruments to allow for such an investment.

The solution could be a one-stop-shop that would provide the necessary training in masonry, installation and maintenance for an AD plant; maintain a show-case for available options;

and a unified reference point for designing, financing and building of biogas plants. Marketing biogas and making the installation process easy and quick will ensure the popularity of the technology and its spread.

The potential for biogas has already been assessed by the NERC and would be integrated perfectly within the RE and EE guidelines, as well as the general energy security strategy of Jordan. Furthermore, small AD technologies are best suited to serve the rural areas and, once in place, require very little maintenance with a high (10 to 20 years) infrastructure duration. Finally, the high organic waste content of MSW in Irbid and Mafraq, combined with the potential of co-digestion, make biogas a versatile solution to increase disposable income and foster agricultural production among the rural poor. China and India have been the leaders in small biogas plants and the technology, scaled up to industrial facilities, has resulted in a renewed attention from industrialized countries such as Germany and the United Kingdom.

Table 11.15: Infrastructure Project: Household Biogas digesters - Training and Installation

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> Poorer rural households targeted. Savings on energy bills. Apprenticeship in installations, maintenance and business skills for disadvantaged youths.
Improved Access and Growth	<ul style="list-style-type: none"> Market demand for biogas should develop with proper marketing and confidence in the product. Municipality support for installations in residential areas/schools/public buildings/ministerial buildings etc.
Market System Change	<ul style="list-style-type: none"> Components already made locally in Jordan. The market and requirement for trained installers will increase as demand rises.
Systemic Intervention	<ul style="list-style-type: none"> Local factory site for Irbid and/or Mafraq. Application of systems already happening in Mafraq (via NOIVA and another scheme run by Jordan Friends of the Environment) Some initial equipment purchased and installations to support disadvantaged families in the first instance. Training engineers and apprenticeship programmes, arranged with possibly the two existing organisations (mentioned above) working on similar projects in the area. One-stop shop for designing, financing, and buying the materials for biogas digesters installation
Time Frame	3-6 months
Beneficiaries	Disadvantaged family households, reducing energy costs. Apprenticeships for unemployed individuals
Contact	Basel Burgan President, Jordan Friends of the Environment, NOIVA International Foundation

Table 11.16: Infrastructure Project: Household Biogas digesters – Training and Installation

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	The project supports apprenticeships to unemployed individuals plus provides an opportunity for vulnerable households to benefit from the appliance. Money is saved on energy bills improving livelihoods. Apprentices can then decide to go into business individually or as a group. Or continue to train others under the scheme.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	Under the 3x6 Approach, they are asked to save a small portion of their incentive – and supported in developing a business plan to invest their savings that show they can self-manage and the business is economically viable.
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	With the investment required for machinery and parts there is likely a need for facilitation to access Microfinance Institutions, and for any necessary diversification of the business to access new markets and viable value chains.

11.5.2 P.E.T. Recycling Plant

PET is not currently recycled in Jordan and, due to the drop in prices for recycled PET, rPET, on the international markets, profits margins are so low only a handful selected specialized brokers still trade in it, in addition to the landfill contractors who can afford the space to store sorted PET bottles waiting for the prices to rise again.

All PET still traded in Jordan is sorted, collected, baled and exported, with none remaining in the country because there is no recycling plant for the material and, most importantly, there are no manufacturers employing rPET in their production process.

The set up of a PET recycling plant would benefit the plastic value chain in different ways. First, by investing in equipment and machinery, it would increase the installed recycling infrastructure in the country and provide for greater added value prior to export. Secondly, it would create the recycled raw material to be used in manufacturing of polyester fleece, broom wipes, and straps.

Currently, PET manufacturers in country are bound by contractual agreements to use virgin PET only. The professionalization of the recycling industry and the progressive adoption of quality standards in recycled products, however, may lead to change in such provisions and promote the demand for recycled PET in Jordan.

Table 11.17: Infrastructure Projects: P.E.T Factory

MARKET OBSERVATION	STRATEGY
Poverty Reduction Objectives	<ul style="list-style-type: none"> Individuals throughout the waste chain will financially profit. There will be increased value on the street from P.E.T. waste, and landfill waste, plus increased employment all the way up the chain due to increased profitability
Improved Access and Growth	<ul style="list-style-type: none"> Local Jordanian waste brokers could reduce costs of exporting P.E.T waste. Local businesses are ready to invest in local PET – such as the existing garment industry and polyester fleece trade. Examples are plastic shop canopy's, broom bristles etc all P.E.T. products Local plastic recycling factories to expand over time and create jobs.
Market System Change	<ul style="list-style-type: none"> P.E.T was once profitable and continues to be stored in vast quantities where premises/space will allow. A new recycling factory based in the region will help employment levels and reduce landfill from P.E.T
Systemic Intervention	<ul style="list-style-type: none"> Interest has been shown in recent years to develop a P.E.T factory in Jordan, but business taxes at the time were too high. Tax incentives for new factories involved in recycling initiatives in the first 2 or 3 years of production, may encourage future investment.
Time Frame	Up to 6 months
Beneficiaries	All members of the waste value chain

Table 11.18: Infrastructure Project: P.E.T Factory

3X6 APPROACH	PROCESS
INCLUSION a. Engaging b. Generating Income	Although the factory is an identified business, it supports the collection of PET Waste at the lower end of the Value chain who now have an increased profit in their collection of waste PET, improving to a degree the most vulnerable livelihoods. Apprenticeship training could be supported to allow expansion of the factory, plus new business ventures alongside with the PET products produced locally rather than bought in, and/or smaller processing factory units.
OWNERSHIP (approx 6 months) a. Saving b. Business Venturing	If run as a community venture savings could support further training in factory skills, plus opportunities to support the factory indirectly by setting up small businesses using the product.
Towards SUSTAINABILITY (approx 12-24 months) a. Investing b. Accessing Markets	Indirect business ideas may develop from individuals involved already trained and working on the factory floor. This is to be encouraged as well as savings to further their business ideas supported by UNDP 3x6 Approach – the scheme supporting integration into markets and viable value chains.

12.0 SUPPORTING THE RECOMMENDATIONS

The following actions have been identified as instrumental in supporting the existing waste value chains and the recommendations included in this study. As they do not have a direct impact in terms of increased livelihood and employment opportunities, they have been listed separately. However, these components are crucial to the establishment of the enabling environment required by the M4P pro-poor approach.

12.1 Awareness Raising and Behaviour Change Campaign

For a change in the perceived belief that waste, and those professionals working in waste management, engenders a 'culture of shame', an overarching campaign needs to be incorporated in the design of most of the projects listed. A national campaign should be encouraged with emphasis on health, society, environment and children, culminating in a 'progressive Jordan' that is seen to be protecting its citizens by dealing with its waste. As youth make for a great share in Jordanian population, the interviewing and campaign should be run 'by the youth for the youth of Jordan'.

Community leaders, mayors, ministerial bodies all need to embrace such a campaign. Other than advertising, it would need airtime on radio stations and in all media outlets. The University of Yarmouk's Mass Communication Unit have previous experience with such interventions, and have said they would be willing to take part in its design and implementation. An example of content might be interviews with all sectors of the waste chain, putting a human face to a cleaner and healthier Jordan, working for the children of Jordan; plus interviews with organic farmers, eco programmes that already exist etc.

Important in implementing this programme would be greater awareness (both of materials and markets). To this end an effective national campaign run in parallel to local campaigning in the North will support sustainable employment opportunities and markets in Northern Jordan.

12.2 Improved Access to Financial Instruments

Dedicated green credit lines from certain financial institutions exist in Jordan, available from both international donors and national banks. However, it is not clear what the effective reach of such credit lines is in the areas of Mafrq and Irbid.

There is the need for a greater awareness about the opportunity they offer to lend for waste and recycling business investment. Informative sessions concerning available banking

products and conditions would enable scrap dealers and waste brokers to invest more in equipment, and thus increase added value and quantities processed.

At the same time, as green credit lines focus is mainly on renewable energy, financial institutions should be made more aware of the growth potential of the recycling sector, and their financing needs.

12.3 Participatory Decision Making Process

Tax on paper and carton has fluctuated in recent times. Feedback from businesses working in recycling this material comment on their inability to plan and invest in machinery and jobs as future prices are so volatile. There were two common complaints regarding the introduced export duty: the first is that it reduced profit margins and, consequently, the prices paid to buy paper; the second is that the uncertainty regarding the level of taxation prevented any planning whatsoever of the economic activities.

One businessman firmly believes he could set up 3 or 4 more factories with greater stability in this tax, allowing businesses to plan and invest in their companies and create many more employment opportunities.

Beyond scrapping export duties altogether, a decision that would have budgetary consequences, an alternative solution would be to increase transparency and consultation within the decision making process. A greater engagement of the private sector, and in particular of the recycling sector, by Jordanian government would facilitate the transfer of information from both sides, and allow for paper brokers to plan revenues and investments more easily. In addition, a guaranteed fixed period during which the set level of taxation would apply would bring greater financial certainty for those wishing to invest in their businesses.

12.4 Alternative JSC Bidding Procedure

The current JSC mechanism to assign yearly contracts to a recycling contractor is a simple open bidding, with no other criteria for awarding other than that of the highest bidder. This system is problematic in several ways: by not having other criteria, there is no room for innovation, and the JSC has no power to direct investments by the contractors for the improvement of the sites. At the same time, contractors have no incentives in making any substantial investment, as the short duration of the contracts (and thus returns) doesn't justify any major capital expenditure. Changing the modalities of the bidding process would then allow for better working conditions in the dumpsites, and increased investments.

In al Ehsnyiat, changing and washing areas and latrines for women are needed. The contracts out for tenure to run the landfill should contain elements of welfare conditions that the manager of the waste pickers must agree in the contract, and adhere to. These could be introduced in an incremental way, focusing on working conditions at first, to move then towards longer and more articulated contracts. If the contract was longer than one year, there would be greater inclination to invest in small pieces of equipment to segregate the landfill resources with greater effect, such as proper tools, protective gloves, clothing etc.

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ANNEXES

- ANNEX I: TERMS OF REFERENCE**
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ANNEX I

TERMS OF REFERENCE

Term of Reference

Value Chain Analysis -Municipal Solid Waste



Empowered lives.
Resilient nations.

1.1. Introduction and background

Since the beginning of 2013, the UNDP Jordan Country Office has been implementing a programme to improve livelihoods and create employment opportunities for host communities affected by the influx of Syrian refugees, as well as to enhance basic service deliveries through supporting the municipalities. The objective of this project, ***“Mitigating the impact of the Syrian refugee crisis on Jordanian vulnerable host communities”*** is to support **vulnerable Jordanians** in the host communities of the Northern governorates of **Irbid, and Mafrq**.

The overall programme is designed to respond to urgent needs of crisis-affected people in a timely and efficient manner, with emphasis on Jordanians in host communities, to increase their absorption capacity and mitigating any possible tensions between Syrian refugees and hosting communities, through two pronged approach:

- To invest in interventions for rapid employment creation and support to basic social services, that are geared towards sustaining stability, in particular in the Northern governorates of Mafrq and Irbid– Pillar I; and
- To strive to translate this into longer-term gains and durable solutions to contribute to some of the issues addressed in national development plans and strategies, in particular with regard to sustainable employment creation, enhanced capacity for service delivery and local economic development – Pillar II.

Solid waste management (SWM) was identified as one of the highest priorities (identified by local actors and partners alike) that the crisis-affected municipalities are facing due to the influx of the Syrian refugees. Around 2.13 million tons of wastes are produced with already increasing by around 3 % annually, and it is estimated that an additional 10 % is added due to the influx of the refugees. While immediate assistance can be provided, for instance, provision of compactors and containers to the municipalities, it is equally important that the support provided be aimed at offering durable solutions for improvement of SWM as a whole including improving the capacity of Alakedir landfill on solid waste disposal in linking to livelihoods and employment creation.

Using a market-led approach, interventions within pillar II helps analyse needs and emerging opportunities of a selected number of high-impact sectors and sub-sectors related to municipal solid waste that are aligned with national priorities with the highest potential for employment creation in particular for the poor, as well as women and youth. Doing so will support their entry into viable markets and expand commercial activity in northern governorates on MSWM with a focus on Mafrq and Irbid under the host community programme (through 2015).

The objective is to identify and support appropriate market linkages within the MSWM sector that will allow to:

- foster commercially viable activities related to the collection and processing of waste;
- strengthen capacity of relevant MSMW actors

- expand access to financial services and support business development service (BDS) that focus on waste processing
- develop stronger enabling environment to foster growth of micro, small, and medium enterprises (MSME's)

Given that less than 5 % of solid waste is recycled and around 60 % of the waste is organic in Jordan, recycling, using, composting, and bio-gas products will be of economic value to the local economy and offer an opportunity to create income generating opportunities. With respect to recycling, there is an informal work force of waste pickers which recovers secondary materials. However for a waste picker to become a middle man or agent would require access to capital for investment in storage and transport facilities, as well as access to the network of end users. To most waste pickers, becoming an agent would be impossible without external assistance or collective action (i.e. through trainings and formulation of a cooperative). Sustainable improvement must involve enabling the market place to offer environmentally acceptable working conditions (including conditions acceptable for women to work) and adequate income to workers at every level of the recycling system. Therefore an analysis of the market for recyclables is required, including an identification of specific entry points for the creation of (self-) employment opportunities for women and youth and the factors which affect market demand, market price, and price stability.

Therefore, the UNDP Jordan intends to conduct an in-depth value chain analysis⁹ on Solid Waste under pillar II of the UNDP Host Community Programme to:

- support livelihoods opportunities and improve access to markets for female and male entrepreneurs in the municipal solid waste sector;
- identify constraints and opportunities to the solid waste market system, in particular recycling, reusing and composting;
- design interventions that would enhance the functioning of the chain, including public-private-partnerships (PPP) and enhancing the private sector's role in local development and employment creation with the due consideration of gender¹⁰ and diversity sensitivity.

1.2 Objective of the study

The aim of the study is to examine the existing municipal solid waste management cycle and value chain in Mafrq and Irbid and identify entry points to create additional livelihoods and self-employment opportunities (in particular targeting women and youth) through the processing of waste (e.g. recycling, reusing of waste in products, composting and bio-gas production from waste etc). .

⁹ A value chain is a sequence of target-oriented combinations of production factors that create a marketable product or service from its conception to the final consumption.

¹⁰ "International research has shown that women face unique gender-based constraints in addition to the usual ones that affect almost all small enterprise owners. A study implemented by UNDP defines constraints as "the challenges that stand in the way of women unleashing their full and productive potential to fairly participate in trade and entrepreneurship." These include: Inequitable macro-economic policies and strategies, Limited access to financial resources and collateral; Lack of access to information about existing opportunities for business; Lack of training ; Cultural confinement and exclusion, including stereotyping women to lower level business operations; Minimal education, and Limited opportunities for developing meaningful business networks".

1. The primary objective of the assessment is to understand the current municipal solid waste cycle and value chain including actors and systems;
2. Identify opportunities and constraints for municipal solid waste related products and processing opportunities in Mafraq and Irbid Governorates, that have a high potential for employment creation
3. The study will provide recommendations on specific entry points for UNDP to support livelihoods initiatives in the solid waste value chain in the rural areas of Mafraq and Irbid Governorates.

1.3 Research Methodology and Approach

In order to analyze the municipal solid waste cycle and value chains in Mafraq and Irbid and identify entry points for employment creation, the following four basic tasks should be carried out:

- 1) **Solid Waste value chain mapping:** to identify existing business operations and functions around municipal solid waste; chain operators and their linkages, as well as the chain supporters within the value chain. Solid waste cycle and value chain maps need to be developed as the core of analysis.

Key steps and questions:

- a) Visualize the three elements, presenting the micro, meso and macro level of the cycle and value chain:
 - The sequence of production and marketing functions related to solid waste currently performed;
 - The municipal solid waste value chain key actors taking these functions; and
 - The vertical business links between operators.
- 2) **Broad assessment quantifying and describing the municipal solid Waste volumes:** to attach numbers to the basic chain map-e.g. numbers of actors, it will be important to identify the volume of produce and the market shares of particular segments in the solid waste chain, in order to make the map for decision making and planning. Such as assessment will be important to help identify specific opportunities for employment creation for specific groups, such as women and youth within areas of recycling, reusing and composting waste. The political and institutional and legal framework conditions around solid waste enabling or hindering chain development should be be addressed in this part of the analysis.

Key steps and questions:

- a) Complementing the value chain map with quantitative information and analysis, the analysis should include:
 - Number of existing and potential operators (differentiating size of enterprises);
 - Market share and number of potential employees for each category of operators (gender segregated);
 - Prices paid at each chain link between stages;

- Shares of product flow of the different sub-chains/distribution channels of solid waste;
 - Market share of the value chain defined as percentage of the sales value in the overall market.
 - Zoom in on the basic value chain map to generate thematic chain maps on recycling; reuse and composting.
 - Special value chain studies on the stakeholder groups specific for the poor (including informal waste pickers) as well as women and youth.
- 3) **Economic analysis of solid waste value chains** to assess value chain performance in terms of economic efficiency. This includes determining the value added along the stages of the value chain, the cost of production and, to the extent possible, the income of operators. In addition to that, this part of the analysis should look into the transaction costs, such as the cost of doing business related to solid waste, collecting information and enforcing contracts. The economic performance of a value chain should be benchmarked-i.e. the value of important parameters to be those of competing chains in other countries in the region.
- 4) **Market research on solid waste related goods and services: This part of the assessment should** look into the growth potential on goods and services around solid waste and identify market opportunities and formulate an upgrading and objectives action in line with demand condition specific for women and youth.

Key steps and questions:

- a) Demand analysis of the municipal solid waste value chain in Mafraq and Irbid:
 - Demand of final consumers of waste products
 - Demand of industrial customers and exporters
- b) Demand trend analysis:
 - Recent trend demand over time (in terms of value, volume, variety)
- c) Growth potential:
 - Positive/potential growth trend of the municipal solid waste value chain and unmet market demand;
 - Scope for expanding productions and value-addition through processing or product improvement of municipal solid waste;
 - Competitive advantage of the solid waste value chain (unique product/local specialty, low cost of production);
 - Share of poor people, women and youth that can be employed in the solid waste value chain;
 - Low entry barriers for small-scale and poor entrepreneurs (low start-up cost, not requiring major capital investment, using low-tech skills);
 - Covering locations where poor population live;
 - Offering chances for women;
 - Significance for the rural economy.
- d) The conditions of market access:
 - Existing distribution channels (e.g. industry, export or end consumer markets);

- Power of market participants (e.g. monopolies);
 - Infrastructure of roads and market places (e.g. storage facilities);
 - Products standards (e.g. laws/regulations on product safety);
 - Tax and tariff regimes (e.g. customs tariffs on inputs);
 - Service offers facilitating market access (e.g. financial and information services).
- e) Products profiles of products from solid waste-e.g. recycled/reused products:
- Availability in the market (domestic and/or imported);
 - Processed by the Jordanian industry for the domestic and/or export market;
 - Possible new products having a market potential in Jordan.
- f) Market access requirement :
- Types of products around municipal solid waste in demand;
 - Market size and trends (e.g. volumes traded, consumption of different consumer groups);
 - Product prices (e.g. max and minimum prices, price trends, fluctuations, price range);
 - Requirements of buyers in terms of quality, price, volume and reliability.
- g) The competitors and performance:
- Competing producers and value chains (e.g. imports, supplies from other regions);
 - Performance of competing market participants (e.g. quality, price)
 - Competitive advantages of competitors (e.g. market distance)
 - Competing products (e.g. products currently used);
- h) SWOT analysis on the solid waste market regime in Jordan, including, amongst others, and provide :
- processing capacities and technology;
 - Physical infrastructure;
 - Logistics/transport/recycling and compositing facilities in processing and trade;
 - Technical barriers to process solid waste products;
 - Marketing services;
 - Policy and regulatory impediments, administrative requirements.
- 5) **Entry points of intervention** to facilitate upgrading of municipal solid waste value chain targeting the women and youth in particular, based on the information of the value chain analysis. In particular on recycling, it is crucial to understand how to enhance the level of recycling and resource recovery based on local market demand for recyclables, the factors affecting local market demand, and the availability of competitive materials (including imported recyclables from industrialized countries); how to enable key agencies to better understand how to upgrade the status, income, productivity, and working conditions of waste pickers and others involved in recycling on the picker-to-buyer-to-end-user network and the factors affecting pricing and profits in recycling; and how to enable key agencies to develop policies, institutional changes, and financial incentives which would support improved and increased recovery of recyclables, and improved and increased market demand for recyclables.

Key steps and questions:

- a) Analyze opportunities and constraints to the municipal solid waste chain upgrading;
- b) Identify actors implementing the solid waste value chain upgrading strategy;
- c) Formulate potential matrix on prioritized interventions, using market for poor approach.

In order to conduct the above tasks, scope of work will include:

- review available literature;
- interview key players of both governmental (e.g. Municipalities, Ministries of Municipality and Environment, landfills etc.) and non-governmental entities (NGOs and companies who have ongoing activities);
- locate major markets of municipal waste related products, including industries involved with: fertilizer for agriculture products, paper production (waste paper), glass manufacture (glass cullet), plastic product production (waste plastic), steel making (scrap ferrous metals), aluminum product production (used cans), and glue manufacture (bones); interviews with Industries, local middle men (Agents) and waste Importers as well as waste pickers.

1.4 Duration:

The study should be conducted within a maximum of 60 working days.

1.5 Key deliverables :

- Municipal solid waste value chain analysis, including value chain maps and market research focusing on Mafraq and Irbid Governorates;
- Identification of critical gaps and priority entry points for UNDP support;
- Identification of main livelihoods/ employment opportunities within the MSWM value chain for women and youth;
- Potential action plan and timelines on prioritized interventions

1.6 Qualifications:

- Education: A bachelor's degree in economics, development, livelihoods and private sector development, social development, sociology/anthropology, gender in development or any related field. A master's degree is a plus.
- Experience:
 - 8 years of work experience in analysis of market, in particular value chain analysis; community and business network relationships; industrial processing; assessing industrial markets and pricing policies.
 - Experience in/with private sector is an asset.

Language Requirements: Fluency in English and Arabic.

ANNEX II

Table Annex II.1: Legal Framework Table

Table Annex II.2: Institutional Framework Table

Table Annex II.1: Legal Framework

Name	No./Year	Agency	Goal	Description
Environment Protection Law and related regulations	52/2006	MoE	Protects the environment.	Sets the direct responsibilities for the MoE and overarching principles for environmental protection.
SWM regulation	27/2005	MoE	Regulates waste management sector in Jordan	It's a general framework discusses the main principles of waste management practices and requirements such as; manpower, equipment, monitoring, container management, separate collection of hazardous wastes, documentation, and final treatment or disposal control.
Waste oil handling and management instructions	2014 (52/2006)	MoE	Regulates the management and circulation of used oil.	It has 16 Articles covering requirements related to waste producers and transporters, and disposal authorities, storage requirements, sampling and analysing, health and safety of workers, and penalties and offences.
Hazardous waste handling and management instructions	24/2005	MoE	Regulates hazardous waste handling and management.	It has 11 Articles covering requirements related to hazardous waste classification, establishment of a technical committee, Licensing requirements.
Instructions on levying/fees for the treatment and final disposal of the hazardous waste	2004	MoE		Sets fees for transport, treatment, and disposal of hazardous wastes.
Organic compost (animal and plant origin) storage, production, trading, and use instructions	2009 (No. 52/2006)	MoE	Regulates composting industry in Jordan.	Technical requirements for processing, storage, and use, Licensing requirements for compost plants and trading.
Waste management framework law	DRAFT	MoE	Provides a policy instrument to apply the waste hierarchy.	Sets the legal basis for solid waste reduction, material and energy recovery, treatment, and final safe disposal in terms of priorities, general principles, responsibilities, planning, technical requirements, and penalties.
Municipalities Law	13/2011 (Amended 7/2012)	Ministry of Municipal Affairs	Supervises municipal functions and service delivery; Regulates MSW management.	Sets municipal responsibilities including municipal cleaning, waste collection, and disposal.
Joint services council regulation	75/2009	Joint services councils	Operates waste management disposal sites.	States responsibility of JSC to construct, and operate landfills/dumpsites.

Medical waste management instructions	1/2001	Ministry of Health	Regulates medical waste management.	Defines and Classifies medical waste items, and lists technical requirements for segregation, central storage, transport, and treatment/disposal technologies.
Interim Agriculture Law	44/2002 (Amended 22/2005)	MoA	Regulates agriculture waste management.	Sets the mandate for agriculture waste management.
Renewable Energy and Energy Efficiency Law	13/2012	Ministry of Energy and Mineral Resources	Regulates renewable energy market.	Development of waste to energy projects in cooperation with municipalities.
Nuisance prevention	2003 (Interim Environmental Protection Law 1/2003)	MoE		9 Articles To prevent nuisance in public spaces The ministry of labour has its own version to prevent/reduce nuisance in work sites
Regulation No. (43) Of the Year 1998 - Regulation of Protection and Safety from Industrial Tools and Machines and Work Sites	Labor Law Regulation No. (43) of the 1998	The Ministry of Labor		Lists requirements and specifications to ensure the safety of labour working in industrial facilities.
Underground Water Regulation	85/2002.			The 85/2002 Law has 44 Articles. It lists issues related to water resources discovery, straction, monitoring, sampling and analysis.

Table Annex II.2: Institutional Framework

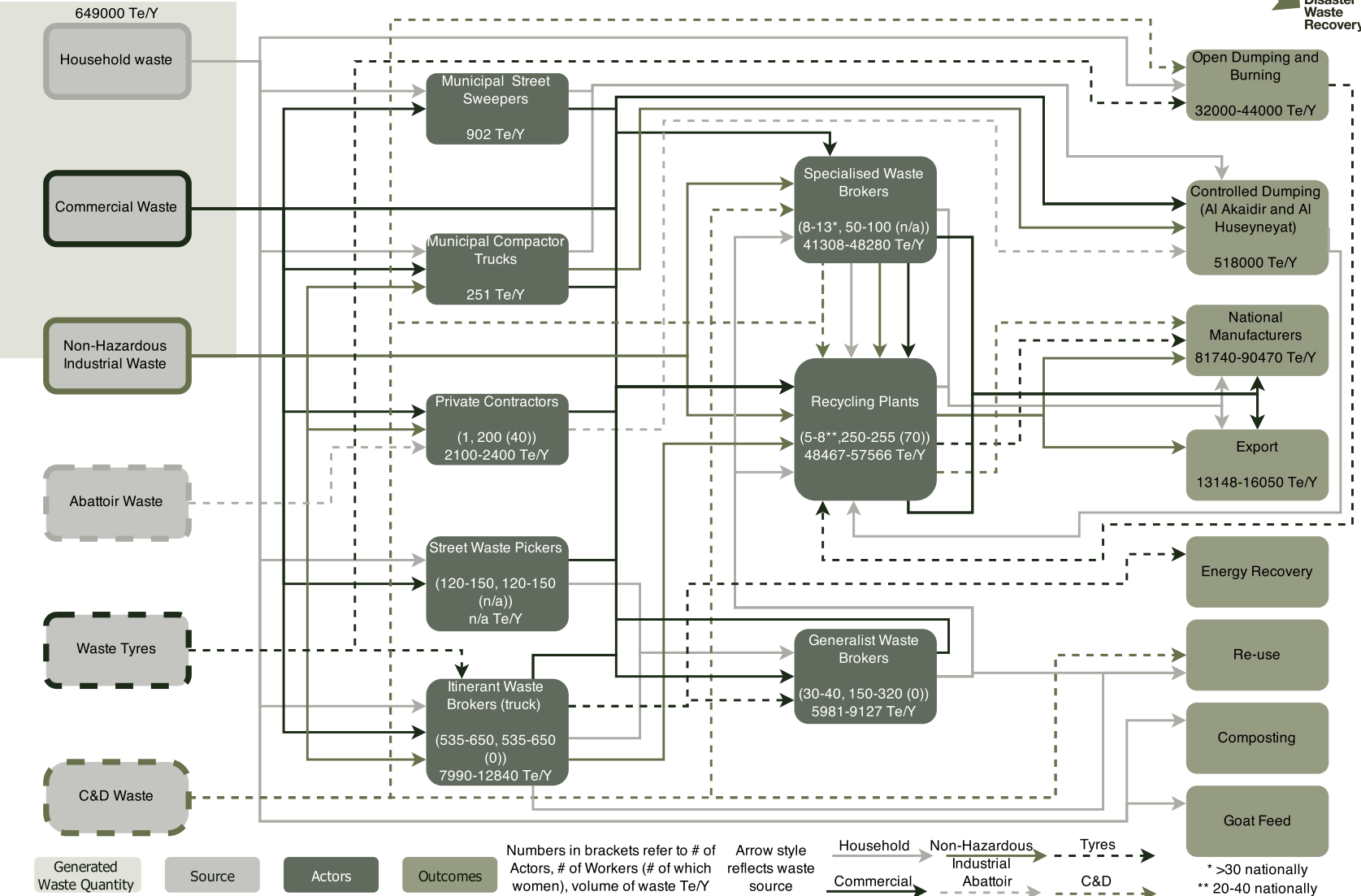
Agency	Responsibility	Reference Laws
MoE	To set policies concerning waste management	Organic compost (animal and plant origin) storage, production, trading, and use instructions (2009)
		Environment Protection Law No. 52/2006 and related regulations
	To regulate the overall waste management sector	SWM regulation No. 27 /2005
		Fee collection for hazardous waste treatment and disposal instructions (2004)
	To monitor compliance and enforce laws and regulation	Waste oil handling and management instructions (2003)
		Hazardous waste handling and management instructions (2003)
		Draft waste management framework law
Ministry of Municipal Affairs	Supervises municipal functions and MSW service delivery Regulates MSW management;	Municipalities Law No. 13/2011 and amendments (last amendment No. 7/2012)
Joint Services Councils	Operates MSW final disposal sites	Joint services council regulation No. 75/2009
Municipalities	Operate MSW collection and transport to disposal sites	Nuisance prevention and waste collection fees for Municipalities No. 1/1978 and amendments (latest No. 72/2009)
Ministry of Health	Regulates the management of healthcare waste	Medical waste management instructions No. 1/2001
Ministry of Agriculture	Regulates agriculture waste management	Agriculture Law No. 44/2002 and amendment No. 22/2005
Ministry of Energy and Mineral Resources	Regulates the energy markets, including the renewable energy market	Renewable Energy and Energy Efficiency Law No. 13/2012
Source: adapted from SWEEP-NET, 2014		

ANNEX III

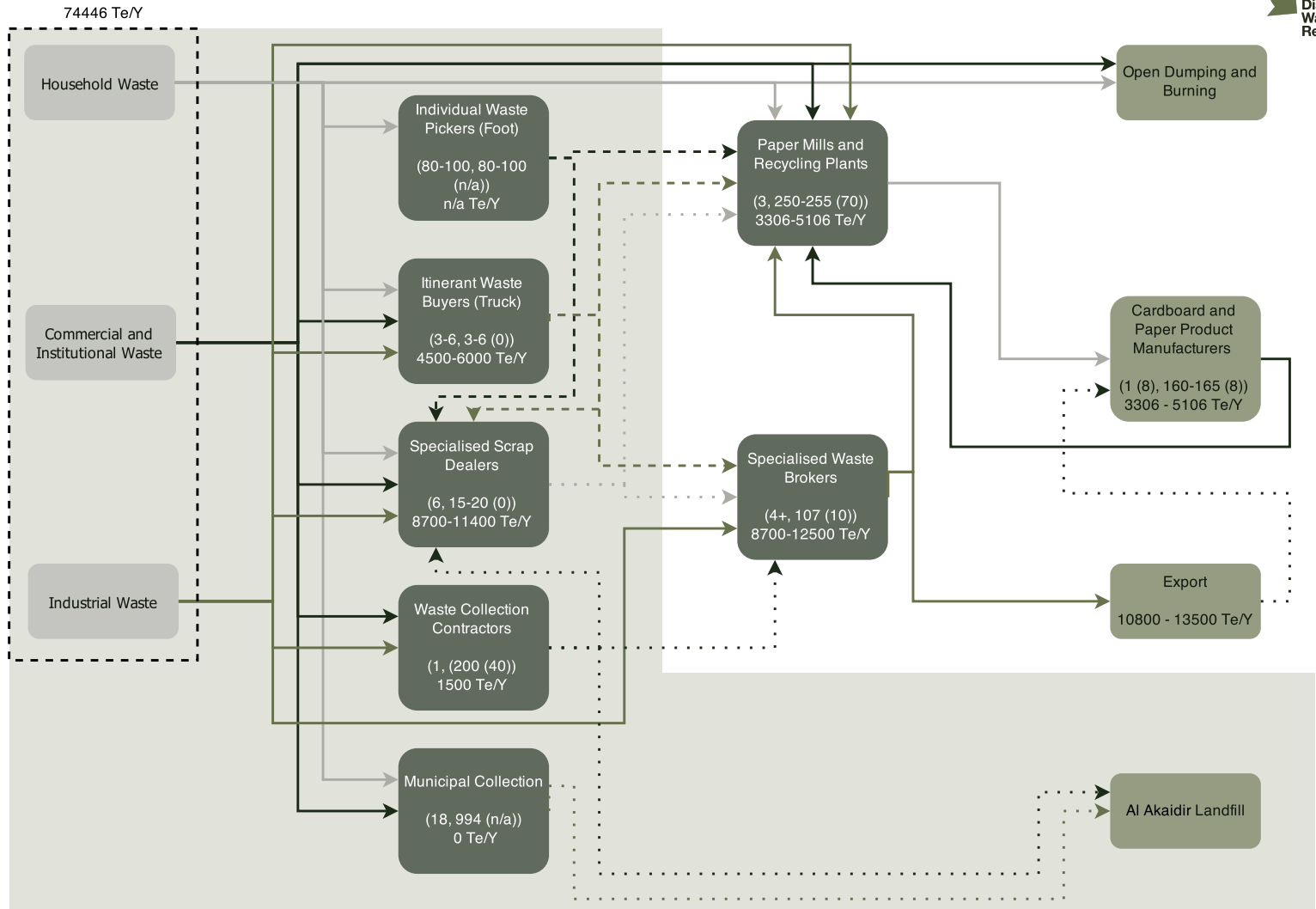
VALUE CHAINS

- 1. General Value Chain**
- 2. Paper Sub Value Chain - Irbid Governate**
- 3. Paper Sub Value Chain - Mafrq Governate**
- 4. Plastic Sub Value Chain - Irbid Governate**
- 5. Plastic Sub Value Chain - Mafrq Governate**
- 6. Metal Sub Value Chain - Irbid Governate**
- 7. Metal Sub Value Chain - Mafrq Governat**

General Value Chain



Paper Sub Value Chain - Irbid Governate **Number of Actors, Workers and Waste Quantity Recovered**



Governate Boundary

Source

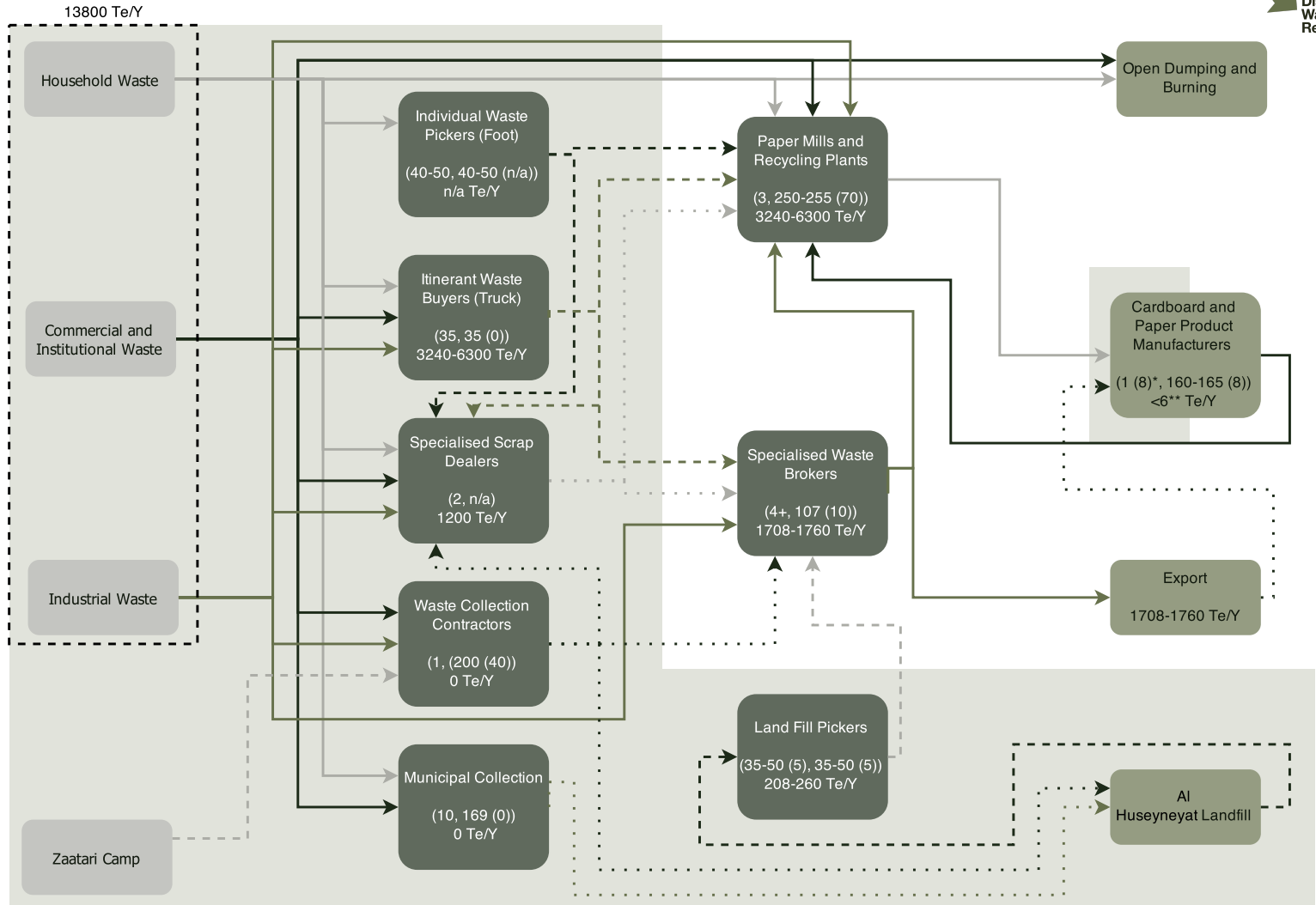
Actors

Outcomes

Arrow style has no significance

Numbers in brackets refer to (# of Actors, #of workers (#of which women), volume of waste Te/Year

Paper Sub Value Chain - Mafrq Governate **Number of Actors, Workers and Waste Quantity Recovered**



Governate Boundary

Source

Actors

Outcomes

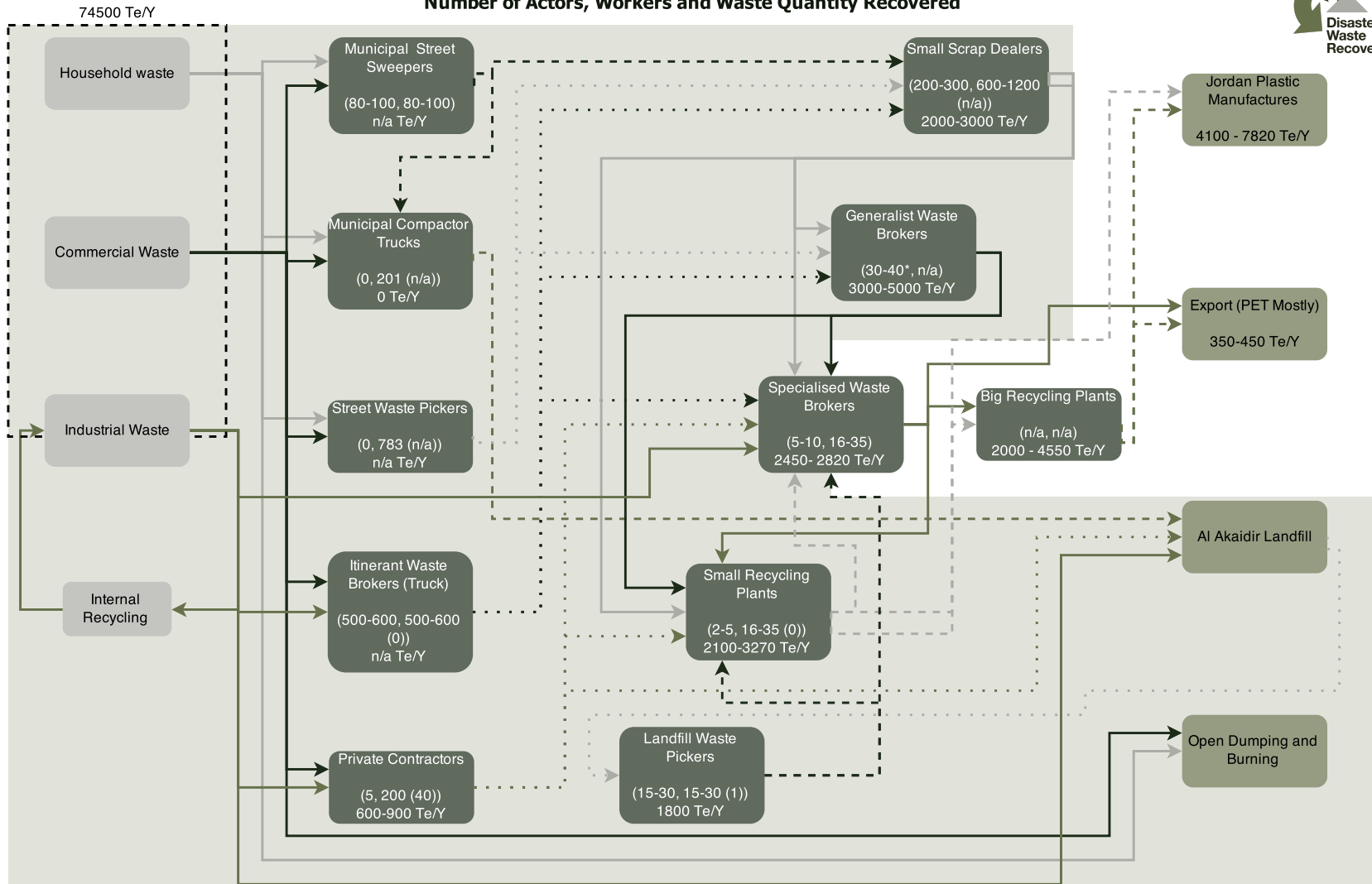
Arrow style has no significance

Numbers in brackets refer to (# of Actors, #of workers (#of which women), volume of waste Te/Year

* 1 cardboard manufacturer in Mafrq, 8 in Jordan

** Cardboard scraps sent from Mafrq cardboard manufacturer to paper recycling mill

Plastic Sub Value Chain - Irbid Governate Number of Actors, Workers and Waste Quantity Recovered



Governate Boundary

Source

Actors

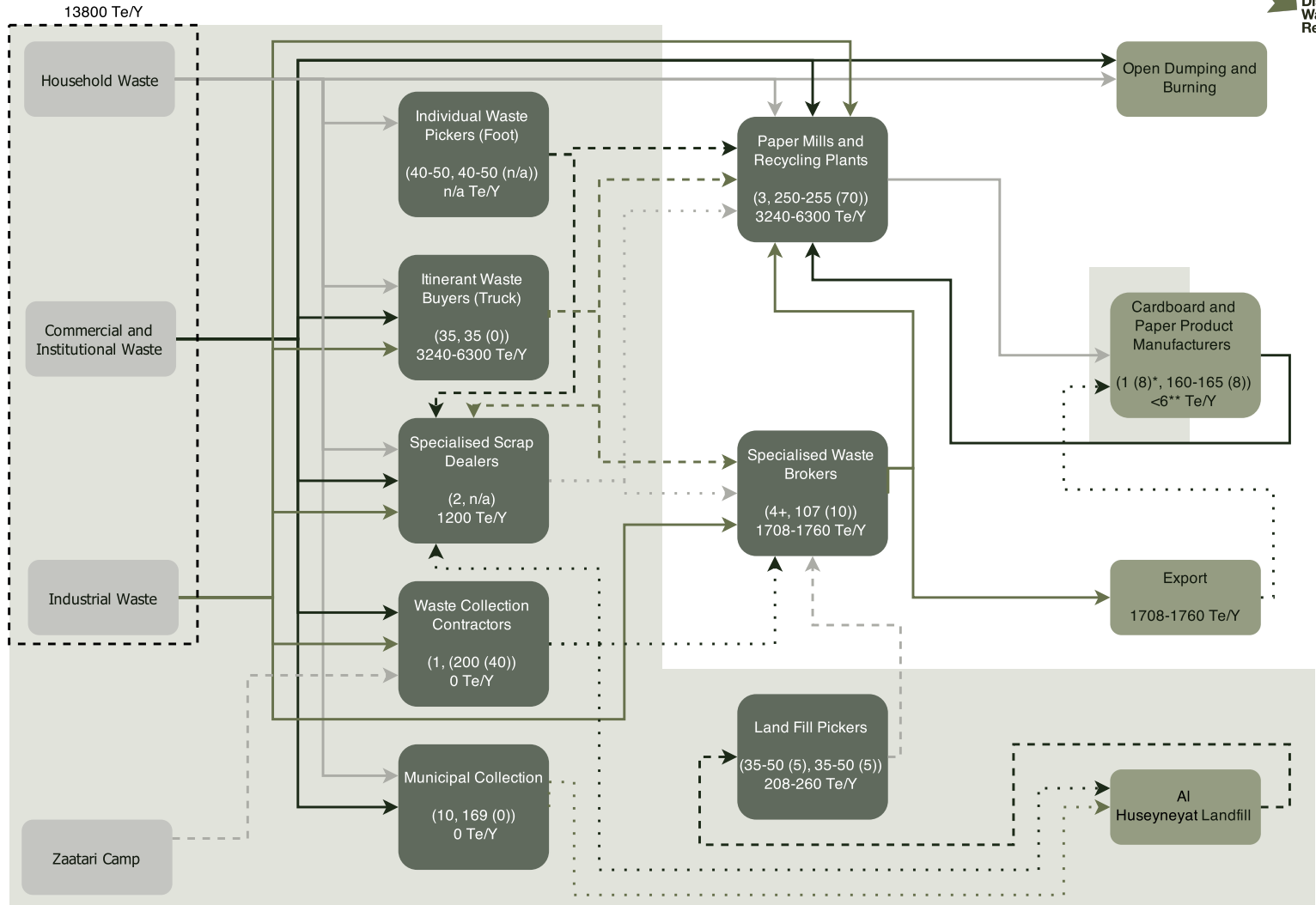
Outcomes

Arrow style has no significance

Numbers in brackets refer to (# of Actors, # of workers (# of which women)), volume of waste Te/Year

*formal

Paper Sub Value Chain - Mafrq Governate **Number of Actors, Workers and Waste Quantity Recovered**



Governate Boundary

Source

Actors

Outcomes

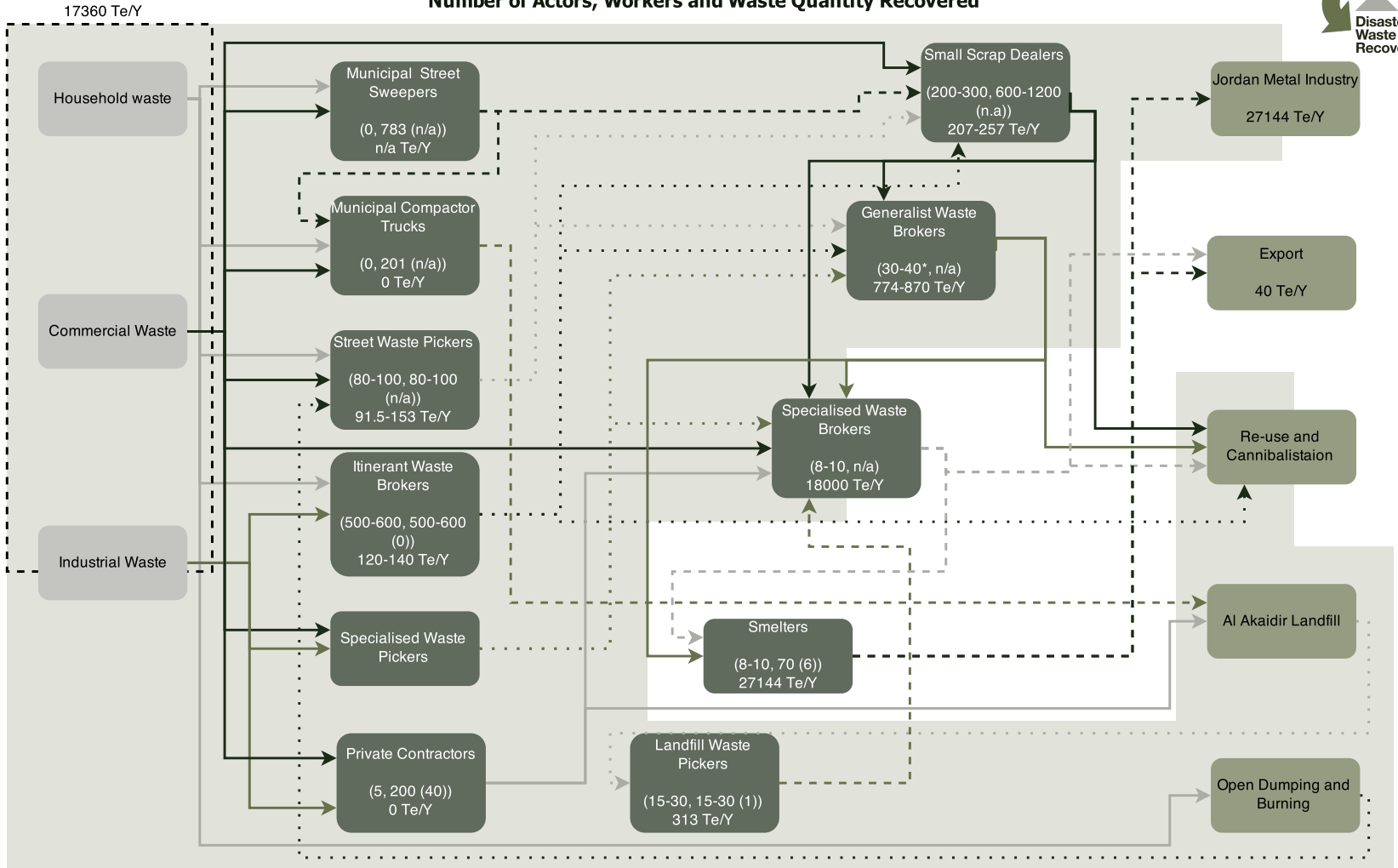
Arrow style has no significance

Numbers in brackets refer to (# of Actors, #of workers (#of which women), volume of waste Te/Year

* 1 cardboard manufacturer in Mafrq, 8 in Jordan

** Cardboard scraps sent from Mafrq cardboard manufacturer to paper recycling mill

Metal Sub Value Chain - Irbid Governate Number of Actors, Workers and Waste Quantity Recovered



Governate Boundary

Source

Actors

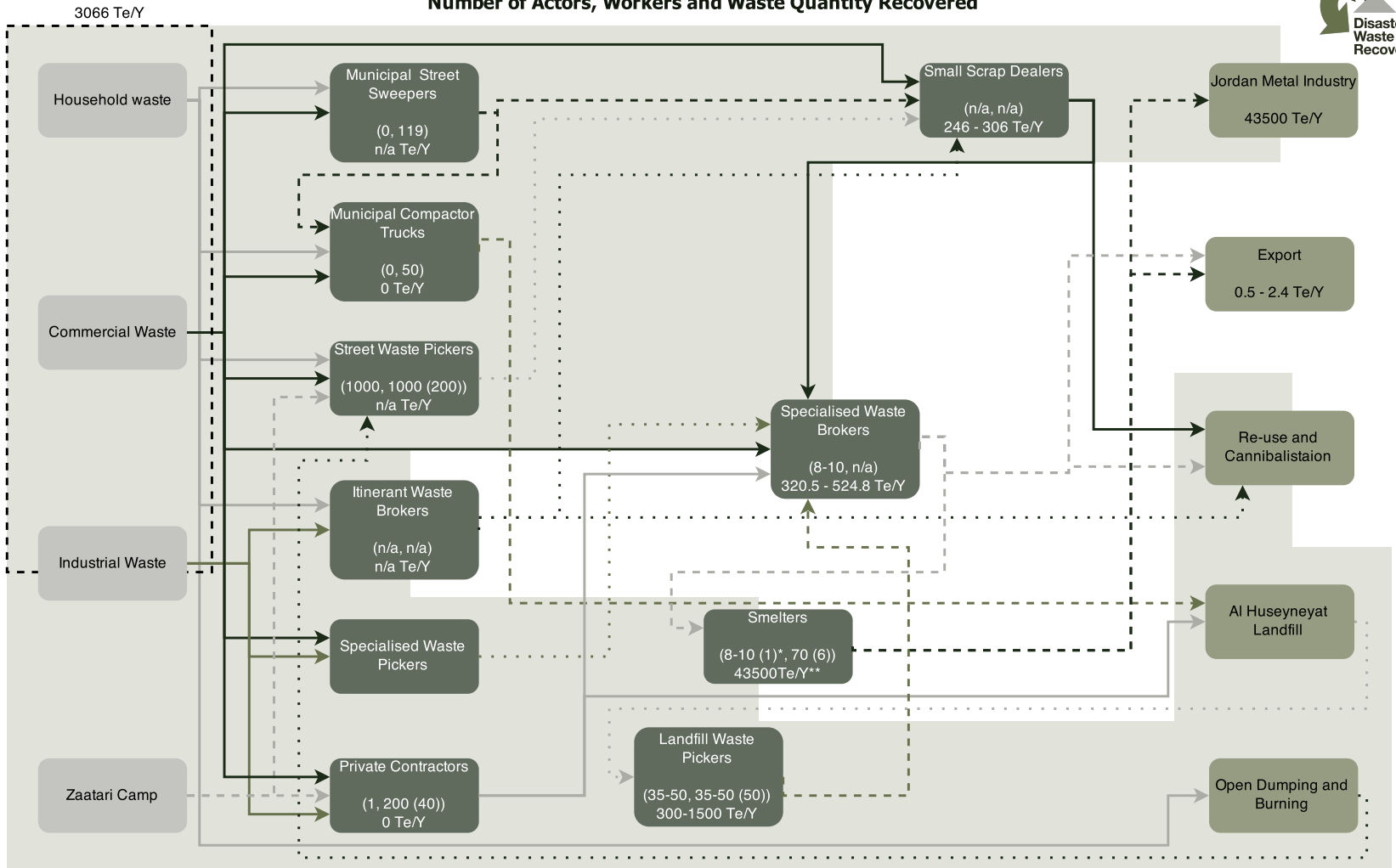
Outcomes

Arrow style has no significance

Numbers in brackets refer to (# of Actors, #of workers (#of which women), volume of waste Te/Year

*8 Medium

Metal Sub Value Chain - Mafraq Governate Number of Actors, Workers and Waste Quantity Recovered



Governate
Boundary

Source

Actors

Outcomes

Arrow style
has no
significance

Numbers in brackets refer to (# of
Actors, #of workers (#of which
women), volume of waste Te/Y

* 1 Steel mill in
Mafraq
Development Zone

** Includes scrap from Mafraq Governate as
well as scrap bought from Zarqa and
Amman originating from the whole country

ANNEXE IV

OUTLINE OF SEMI-STRUCTURED INTERVIEWS

GENERAL INFORMATION

Name:

Location:

Contacts:

Date:

Profession:

Sex:

COMPANY PROFILE

Name	Location	Employees			
		Total	Female	Foreigner	Nationalities
Established	Competitors	Profits		Processing capacity	
		Average	Variation	Machinery	Quantity
Inputs					
Electricity	Water	Materials	Labour	Capital	Other

Challenges to business:

Envisaged changes in sector:

RECYCLING ACTIVITIES

Materials	Quantity mass / time	Price		Source					Destination		
		Bought	Sold	Origin	Type of actors	# of actors	Sex	Nat.	Dest.	Type of actors	# of actors
Organic waste											
Paper Products											
Plastic (gen.)											
HDPE											
LDPE											
PET											
PP											
PS											
PVC											
"Nylon" (plastic sheets)											
Metal (gen.)											
Ferrous (iron, steel, tin)											
Aluminium											
Copper (red copper)											
Brass (yellow copper)											
WEEE											
Glass											
Textile											
Wood											
Rubber											

QUESTION THEMATIC AREAS TO INSTITUTIONAL AND CIVIL SOCIETY ACTORS

These are the cognitive areas that were investigated during the non-structured interviews with key informants who were stakeholders in the waste management sector, but not directly involved in the solid waste value chain. Depending on the type of key informant selected and his/her role in relation to existing value chain, the questions asked would gravitate more along the area(s) of expertise and specialization of the interviewee rather than other.

1. State of MSWM in Jordan/Mafrq/Irbid governorates
2. State of recycling industry in Jordan/Mafrq/Irbid governorates
3. Number and type of actors involved in MSWM
4. Number and type of actors involved in recycling
5. Locations of recycling companies
6. Relationship with waste pickers and informal sector
7. Challenges to recycling sector
8. Opportunities in recycling sector
9. Expected sector evolution and key areas of intervention
10. Impact of Syrian refugee crisis on MSWM and recycling
11. On-going and planned waste related projects
12. Existing composting / AD capacity / pilot project
13. Coordination / communication mechanisms with other stakeholders
14. Energy sector evolution in Jordan
15. Market trends in traded commodity within and outside Jordan

ANNEX V

STAKEHOLDER MAPPING

National and Local Institutions	IOs & Governmental Aid Agencies	International NGOs	Civil Society & Academia
MoMA	CIDA	ACTED	Amagrenit Flower (CBO)
Greater Mafraq Municipality	DVV International	Caritas Switzerland	Amman University
Greater Irbid Municipality	EU	Finns Church Aid	Azraq Wetland Natural Reserve, RSCN (NGO)
Mafraq JSC	GIZ	Noiva International Foundation	EDAMA
Irbid JSC	ILO	Norwegian Refugee Council	International Youth Foundation – Jordan (CBO)
MoE – Waste Management Department	IUCN	OXFAM	Irbid Chamber of Industry
MoE – Hazardous Waste Department	JICA	USAID SABEQ	Jordan University of Science & Technology
MoE – Irbid Department	KFW	USAID JCP (DAI)	Jordan Chamber of Industry
MoE – Mafraq Department	UNDP Jordan	USAID CEP (Global Communities)	Jordanian Friends of the Environment (NGO)
Ministry of Trade and Industry	UNHCR		Jordan Green Building Council (NGO)
MoEM	UNICEF	-	Jordanian Society for Expanding and Developing Natural Resources (NGO)
MoA	UNRWA	-	Mafraq Youth Centre / Old Jordan Commission (CBO)
Greathen Amman Municipality	UN WOMEN	-	Mezaan for Sustainable Development (NGO)
-	USAID	-	National Energy Research Center – NERC
-	WB	-	Yarmouk University

Manufacturing and Trading	Waste Management / Recycling (formal)	Informal Recycling
Aldogaravani Plastics	Aboura Metals	Al Akaidir recycling contractor
Al Badeer for Industrial Equipment	Aboura Brothers Trading Company	Al Akaidir waste pickers
Al Faris Mushrooms	Abu Jabal Plastics	Al Ehsnyiat recycling contractor
Al Mafraq Plastic Industries	Al Afaq Company for Minerals Industries & Aluminium	Al Ehsnyiat waste pickers
Al Manaseer Cement	Al Asseem	Irbid street waste pickers
Al Rahji Cement – Jordan	Al Badeer Plastics	Irbid Itinerant buyers
Al Shareef Plastic Industry	Al Bireh Steel and Iron	Irbid scrap-dealers
CEGCO	Albneh for Trading & Communication & Investment	Irbid waste brokers
Century Miracle	Alhedaya for Plastic Recycling and Manufacturing	Mafraq street waste pickers
Dairy and Cattle farmers	Althiqa Almuthla for Waste Management	Mafraq itinerant buyers
Delta Industry Sponges	Althulathia for Clean Cities	Mafraq scrap-dealer
Gas Canister traders	Alhulul Alasria for Engineering and Trade Industries	Mafraq waste broker
Hello Spring	Al Jamaan for Plastic Industry	
Jordan Bahrain Paper Industries	Al Madar for Trade Paper	
Jordan Industrial Estates Company	Al Majd El Alham	
Mafraq Development Corporation	Al Manaseer Steel	
Middle East Plastic Packaging Industries	Almutahda for Recycling and Trading of Junk, LL	
Poultry farmers	Al Nashal Cars	
SoukTel	Aloqab for Plastic Industry	
	Alrabee for Cardboard ,Packing Manufacturing and Printing	
	Alshamal for Natural Marble	
	Alshamal for Tires Recycling	
	Alajyal for Solid Materials Recycling	
	Arabian Metal Coating	
	Ashia Recycling and Trade for Waste Paper	
	BE Environmental Services	
	Dhafar for Recycling	
	DarHoran for Plastic Industries	
	Dawod Dawod and Partners	
	First for Paper and Recycling	
	Hassan and Ahmed Alhajaya	
	Integrated Resources for Plastic Industry	
	JoCycle	
	Jordanian Australian for Renewable Energy	
	Jordanian Biogas Company Ltd. JBCO	
	Jordanian Company for Carton Industry – JCCI	
	Jordanian Metals Melting Factory	
	Jordanian Paper and Cardboard Company	
	Jordan Ant Plastic Industry and Trade, LL	
	Jordan Holland Recycling Company	
	Jordan River for Oil Mills and Metals	
	Jordan Steel	
	Khaled Alduqs and Partners	

	Luna for Engineering and Metal Industries	
	Mamdouh Mohammed and Ra'ed Alshahwan	
	Mediterranean Steel Company	
	Metals Bank Company	
	Mohammad and Naser Abu Nassar Company	
	Mohsen & Ahmad Company	
	Mostfa & Ibraheem Company	
	Petra Steel Industry	
	Ramallah Steel	
	Rawad Madaba for Plastic Industries	
	Saudi Company for Paper Recycling	
	Sham Almustaql for Industries	
	Specialized Company for Trade Services	
	Tabarek for Plastic Industries	
	Tarek Masiri Company	
	Target Aluminium Industries	
	Yaqoot Almafraa for Plastic Trade	
	Zaid Abu Zaid and Mohammed Hamad	

ANNEX VI

LIST OF INTERVIEWED KEY INFORMANTS

The following is the list of the over 110 key informants interviewed through the two missions in Jordan. The identity of the informants has been deliberately left out as to protect the identity of those operating within the informal sector.

No	Organization / Company	Title
1	UNDP	Programme Specialist - Livelihoods & Recovery
2	UNDP	Programme Specialist - Local Governance & Municipal Development
3	UNDP	Socio-Economic Portfolio Analyst
4	UNDP	Community Outreach & Local Governance Project Officer (Mitigating Impact project)
5	UNDP	Programme Officer, Livelihoods & Employment
6	Jordan University of Science & Technology	Prof. Water & Env. Engineering - Assistant to the President
7	UNDP/MoMA	Engineer Consultant
8	MoE	MoE Director
9	MoE	Director of Hazardous Substances and Waste Directorate
10	MoIT - CCD	Director of IT Directorate
11	JSC - Irbid	JSC Irbid Director
12	MoE - Irbid	MoE -Irbid Directorate Director
13	MoE - Irbid	Director Assistant
14	Jordan Industrial Estates Company	Al Hassan Industrial City Manager
15	Specialized Company for Trade Services	Director
16	Century Miracle	Administrative Manager
17	Plastic Factory	(Deputy) Manager
18	Delta Industry Sponges	Manager
19	UNDP - Environmental Unit	Programme Officer
20	Itinerant waste collector	Informal sector entrepreneur
21	Small scrap dealer	Owner
22	Medium scrap dealer	Owner
23	cardboard dealer	Owner brother
24	JSC - Irbid	Al Akaideer Site Manager
25	Al Akaideer contractor	sons of owner
26	Amagrenit (pomegranate) flower CBO	CBO president
27	USAID - Global Communities	Program Coordinator - Community Engagement Project
28	JSC - Mafrq	Director
29	MoE - Mafrq	Al Mafrq Director of Environmental (department?)
30	Al Husaineiyat contractor	Waste picker coordinator
31	Al Husaineiyat contractor	Female waste picker
32	Al Husaineiyat contractor	Owner
33	Al Husaineiyat contractor	Owner

34	Mafrq Development Corporation	Manager
35	Middle East Plastic Packaging Industries	General Manager
36	Middle East Plastic Packaging Industries	Quality Manager
37	Jordan Bahrain Paper Industries	General Manager
38	Mediterranean Steel Company	Translator / Executive Secretary
39	Al Rahji Cement - Jordan	Production Manager
40	Al Rahji Cement - Jordan	Process Engineer
41	Mafrq Municipality	
42	International Youth Foundation - Jordan	Director
43	Jordanian Society for Expanding and Developing Natural Resources	Director
44	CEGCO	HSE Sector Head
45	Mafrq Youth Centre / Old Jordan Commission	interim representative
46	Gas Canister Trader	owner
47	Dairy Farm	owner
48	BE Environmental Services	General manager
49	Jordanian Biogas Company Ltd. JBCO	General Manager
50	National Energy Research Center NERC	Director
51	JoCycle	Director (?)
52	Azraq Wetland Natural Reserve - RSCN	Director (?)
53	USAID Jordan Competitiveness Project (DAI)	Director - Clean Technology Sector
54	Al Shareef Plastic Industry	
55	Jordan Green Building Council - GBC	Team Leader / Outreach Officer
56	Jordan Green Building Council - GBC	Green Academy Officer
57	Plastic Recycling factory	Owner
58	Al Shmal Recycling	General Manager
59	Mezaan for Sustainable Development	Founder and Director
60	KFW	Deputy Director
61	GIZ	Project Coordinator - AD HOC project
62	Greater Amman Municipality - GAM	Executive Director of District
63	Ashia Recycling and Trade for Waste Paper	Owner
64	Jordanian Paper and Cardboard Company	General Manager (?)
65	Jordanian Company for Carton Industry - JCCI	Chairman
66	Alhedaya for Plastic Recycling and Manufacturing	Owner
67	AlMafrq Plastic Industries	Senior Engineer
68	Al Faris Mushrooms	Owner
69	Modern Apparel Company - MAC / Specialized Company for Trade Services	CEO
70	JARE -Jordanian Australian Company for Renewable Energy	n/a
71	JARE - Jordanian Australian Company for Renewable Energy	n/a
72	Caritas Switzerland	MENA Regional Director
73	JFOE - Jordanian Friends of Environment	President

74	Chamber of Industry	Technical Advisor, Eco Efficiency
75	MoA	General Secretary
76	University of Jordan	Professor
77	DVV	Technical Advisor - Protection of the Environment & Biodiversity in Jordan PROTEB
78	Hardware shop	clerk
79	Samir Kharaman & Ajad Abu Suelin	Financial Manager
80	Second hand tent dealer	owner
81	Al Nashat Car dealer	n/a
82	Al Qanadeel	Sales Engineer
83	Al Bader for Industrial Equipment	Executive Manager
84	Irbid Chamber of Industry	Director
85	Amagrenith flower	Director
86	Tree nursery	Owner
87	IUCN	Project manager Sustainable Water Integrated Management Project (SWIM)
88	IUCN	Regional Programme Manager Water and Climate Change Programme
89	Saudi Jordanian for Paper Recycling	Executive Manager - Jordanian branch
90	First for Carton & Paper Recycling	Owner
91	Tarek Masiri Company c/o MODEL Co. for Maintenance & Service	Executive Manager
92	Tarek Masiri Company c/o MODEL Co. for Maintenance & Service	Executive Manager
93	First for Carton & Paper Recycling collection point	Collection point manager
94	Halo Spring	Cofounder and CEO
95	Yarmouk University - Mass Communication Department	Dean
96	Yarmouk University - Mass Communication Department	Vice Dean
97	Yarmouk University - Mass Communication Department	Vice Dean
98	waste picker	Cart waste picker
99	itinerant waste broker	Itinerant waste broker
100	waste picker	Specialized waste picker
101	generalist waste broker	Owner
102	Manaseer ready mix	Irbid Branch Manager
103	Greater Irbid Municipality	Director - Studies and Design
104	El Bireh Steel and Metals	Site Manager
105	Generalist scrap dealer	Owner
106	Cardboard scap dealer	Owner
107	Small junkshop	Owner
108	Waste picker	Street waste picker
109	Syrian waste picker	Street waste picker
110	Syrian waste picker	Street waste picker

111	Syrian waste picker	Street waste picker
112	Syrian waste picker	Street waste picker
113	Noiva International Foundation	Founder/president
114	Manaseer Iron and Steel	Business Development Manager
115	ACTED	Mafraq Area Coordinator
116	SoukTel	Director of Business Development Middle East / Africa