



El Ekaider landfill in the north of Jordan. Photo credit: Arin Alshweilat/Oxfam.

# NOT IN MY BACKYARD

## The impacts of waste disposal sites on communities in Jordan

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OXFAM IN JORDAN

Waste disposal sites across Jordan pose serious risks to the environment and to public health if not managed safely. Municipal waste decomposing in open landfills also takes an environmental and socio-economic toll on neighbouring communities. While the Government of Jordan is planning to reduce the number of operational landfills and improve waste management services, persistent issues associated with unsustainable waste practices and their associated effects on the wellbeing of surrounding communities and the environment need to be addressed.

Guaranteeing a sustainable waste management scheme for communities in Jordan should include increased consideration of the long-term effects that waste disposal sites have on neighbouring communities.

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# EXECUTIVE SUMMARY

Around the world, waste collection, disposal and treatment activities are considered essential public services. People rely on these solid waste management services to sustain the hygiene and cleanliness of their communities. While waste collection processes are more often observed by community members, waste disposal practices take place in remote locations away from highly populated areas. Communities often refrain from residing near final disposal and other waste sites, in much the same way as they do with factories and water supply and treatment facilities. For this reason, there is a general lack of knowledge on the way in which waste is disposed of, and therefore a lack of knowledge and awareness on the risks posed by unsustainable waste disposal practices.

In Jordan, municipal waste is almost exclusively stored, and to a lesser extent treated, in final disposal sites categorized as landfills and open dumpsites. Due to the lengthy decomposition process of several types of waste, final disposal sites are considered semi-permanent. Final waste disposal practices pose high risks to people and the environment if not designed and managed correctly. Problematic waste materials such as plastics accumulate in final disposal sites and could take up to 450 years to decompose. Over time, waste materials decompose and emit liquids and gases into the atmosphere if not captured, thus contributing to the country's greenhouse gas emissions. In addition, pollution resulting from unhygienic and unsustainable final disposal sites affect the water, air and soil, and therefore have a direct impact on people and the environment.

Climate change is expected to exacerbate the impacts that final disposal sites have on the environment and public health. Litter and waste carried with winds, as well as waste accumulating near key water infrastructure and resources, are expected to increase with more intense weather events. Furthermore, a rise in temperature and humidity will cause an increase in the levels of landfill gas emissions, which could become more concentrated in nearby communities.

There are approximately 20 official and unofficial final disposal sites in Jordan. All but two are unsanitary<sup>1</sup> and pose high risks to communities. With plans in place for the rehabilitation and closure of many of these sites in future, more data is needed on their environmental and social impacts to ensure the quality of this transition process. The Government of Jordan currently intends to keep approximately eight of these sites in operation and close the 12 others. This report examines the impacts that the eight final disposal sites have on communities, with a focus on their environmental and social impacts and potential solutions to address risks.

# 1 INTRODUCTION

Improper management of waste poses serious risks to people and planet alike. Considered one of the key public services to communities around the world, waste generated from households is collected and disposed of in final disposal sites. If improperly managed and disposed of, waste has detrimental effects on communities; it also emits pollutants into the natural environment, on which the livelihoods of both nearby and distant communities directly depend. Taking into consideration the complex dynamics by which our natural environment functions, pollution from waste has direct negative impacts on water, air, land and food.

Sustainable and efficient municipal waste management practices start with ordinary individuals – the generators of waste. If there is a lack of awareness and knowledge on the challenges arising from the mismanagement of waste, people are less likely to change their perceptions and behaviour. Common issues with waste generation caused by people include public littering, lack of recycling efforts and increased waste generation. The world has been experiencing a surge in unsustainable consumption patterns over the past few decades, especially in the purchasing of non-essential goods. More often than not, these goods are packaged and sold using non-recyclable materials that end up in final disposal sites. Problematic packaging includes multiple forms of plastics, which take hundreds of years to decompose. Therefore, it is imperative that communities are provided with enough information, knowledge and incentives to improve their waste practices. National and local authorities, as the main public service providers, also share responsibility when it comes to ensuring that final disposal sites meet hygiene and sanitation standards, and that the population they serve are aware of the practices and issues related to waste collection and disposal.

In 2019, Oxfam in Jordan commissioned the first country-wide survey in Jordan to better understand people's perceptions and behaviour in relation to solid waste management.<sup>2</sup> The study's key findings include the fact that only 3.8% of people in Jordan recycle daily, highlighting the need for more inclusive and sustainable recycling schemes across the country. The study also revealed that people would be more likely to recycle if suitable infrastructure, incentives and information were made available to them.

Key recommendations to promote sustainable waste management practices in Jordan include the need to:

- Increase public awareness on waste management challenges and increase knowledge on recycling and other sustainable practices.
- Provide people with incentives by showing the monetary and non-monetary benefits of recycling. This may include benefits to public health and the environment. It is also important to highlight the lost financial value of some waste materials, especially glass and metals.
- Break down key barriers to recycling in Jordan, including lack of adequate infrastructure and information, and to some extent, inadequate regulations and standards.
- Push for meaningful partnerships between public and private sector actors to improve solid waste management.

Jordan currently produces approximately 2.7 million tons of waste every year, and it is estimated that this will increase to over 6 million tons annually by 2040.<sup>3</sup> Approximately 50% of the waste generated in Jordan is organic waste, mainly composed of food waste generated by households, while 22–33% of waste is composed of recyclable materials such as paper and cardboard, metals, and plastics.<sup>4</sup> With a lack of nationwide recycling schemes, it is estimated that only 7% of the total mixed waste generated is recycled in Jordan, mostly through informal activities. The vast majority of waste generated is disposed of in final disposal sites across Jordan. Apart from two sanitary landfills, these disposal sites are characterized as unsanitary and uncontrolled, and pose serious risks to the environment and public health.

This report examines the impacts that final disposal sites have on neighbouring communities. The landfill sites in this study were selected based on the recommendations and direction of the National Solid Waste Management Strategy of 2015, as well as Regional Municipal Solid Waste Management Plans for the North and Central Regions of Jordan.<sup>5</sup> In the selection of the sites, additional consideration was given to significant elements of each final disposal site, including environmental and social risks, volume of waste generated, areas served and the characteristics of nearby communities.

The eight final disposal sites selected for assessment are as follows:

**Table 1: Final disposal sites selected for the study**

Region	Final disposal sites
North	1. Al Ekaider 2. Al Hussainyyat 3. Al Badiyah Al Shamaliyah
Central	4. Al Azraq 5. New Dair Alla
South	6. Al Lajoun 7. Ma'an 8. Al Qwerah

## 2 INSTITUTIONAL DIRECTION AND FRAMEWORK

In 2003, the Ministry of Environment in Jordan was established with the mandate to protect natural resources. In its 2020–2022 strategic plan, it outlined the following key priorities:<sup>6</sup>

- Protecting environmental systems.
- Reducing impacts of environmental changes on people.
- Increasing knowledge and awareness on environmental issues.
- Building the institutional capacity of environmental entities.
- Engaging with the private sector.

In 2006, the Ministry of Environment issued the Environmental Protection Law, which provided the legal basis for conducting Environmental Impact Assessments (EIAs) in Jordan. As per the Environmental Protection Law, an EIA is requested prior to the construction of facilities, including solid waste management facilities. The Ministry of Environment, through the Department for Licensing and Guidance, is responsible for screening, control and follow-up of the EIA procedure.<sup>7</sup>

The National Solid Waste Strategy for Jordan, issued in 2015 by the Ministry of Municipal Affairs,<sup>8</sup> outlines multiple constraints in the country's solid waste management sector, including:

- A lack of financial resources for the waste sector, significantly affecting the effectiveness and sustainability of infrastructure such as disposal sites and waste collection.
- Municipalities and Joint Services Councils have low operational capacities to fulfil their respective roles in the waste management system, including collection and disposal.

- Lack of private sector interest and participation in the waste sector due to high costs and high risks.
- Lack of coordination among the various governmental entities responsible for different aspects of solid waste management.
- Aging and inefficient waste infrastructure, including unsanitary disposal sites that are reaching the end of their life cycles.
- Lack of an effective and long-term scheme for separation of waste at source, recycling, etc.
- Prominence of an unregulated informal sector across Jordan.
- A lack of capability in municipalities to promote sustainable waste management practices through awareness programmes and community engagement.

The Government of Jordan is willing to improve solid waste management in the country through transitioning from an old and inefficient system to an integrated solid waste management system that considers resource recovery and cost-efficiency. According to the National Solid Waste Strategy, the waste recycling and materials recovery sector presents an economic opportunity to sustain landfill infrastructure, improve the livelihoods of many poor and marginalized Jordanians, and offer green jobs and teach new skills to Syrian refugees. In addition, the government's comprehensive national strategy, Jordan 2025, commits it to developing a system for the sorting, reuse and recycling of solid waste.

In 2020, the Government of Jordan officially endorsed the Waste Framework Law, which defines the roles and responsibilities of actors in the solid waste management sector as well as outlining key considerations and measures for the solid waste management system in Jordan. Article 6 of the Law includes the following key measures to reduce pollution and ensure protection of public health and the environment in the management of solid waste:

- Separation of waste at source.
- Reduction in the amount of waste generated, including municipal waste.
- An increase in opportunities for waste recovery.
- Disposal of waste that cannot be recovered, reused or recycled through compaction and storage, as per the specified standards.

With the launch of the National Green Growth Strategy for Jordan in 2017, the Ministry of Environment is advocating strongly for the creation of green jobs in the country. The Strategy outlines how economic growth can be increased and sustained in the various sectors in Jordan (water, waste, energy, tourism, transportation and agriculture), while ensuring that the action plan for each sector is green and considers environmental sustainability and climate change adaptation and mitigation. The associated Green Growth National Action Plan for the Waste Sector, published in 2020, aims to improve the solid waste management sector in Jordan by achieving the following key actions between 2021–2025:<sup>9</sup>

- Increasing the diversion rate of waste away from final disposal sites through promoting separation of waste at source and resource recovery schemes.
- Building a sustainable business model that would offset the costs of waste management in urban areas.
- Encouraging private sector investment and the creation of jobs in a circular economy.
- Increasing consideration for other waste categories, including construction, hazardous and electronic waste.

### 3 CHALLENGES IN THE SOLID WASTE MANAGEMENT SECTOR IN JORDAN

There are multiple challenges impeding the efficiency of the current solid waste management sector in Jordan. First and foremost, there is a general lack of public awareness and knowledge on the problems associated with improper waste management practices. According to Oxfam's country-wide survey on waste practices and behaviour, approximately 18% of people in Jordan attributed the lack of participation in recycling schemes to a lack of available information. The survey also noted the following key perceptions regarding solid waste management in Jordan:<sup>10</sup>

- Inefficient solid waste management processes, including collection and disposal.
- Limited landfill or disposal site capacities to meet waste generation rates.
- Lack of technical and financial resources for effective and efficient waste collection.
- Pollution caused by waste disposal processes and final disposal sites.

Within the solid waste management sector in Jordan, there is a lack of nationwide recycling schemes and waste recovery processes. Existing schemes and activities are isolated across the country and localized to specific contexts, and these are considered short-term, exploratory pilot projects. Most recycling activities and initiatives in Jordan are operated by INGOs, local and international implementing agencies, civil society organizations and municipalities. There is a lack of engagement of key local stakeholders in terms of initiation and ownership of recycling activities. There is also a lack of local investment in recycling schemes in a sector which is highly dependent on donor aid.

According to recent data, only 3.8% of people in Jordan recycle daily.<sup>11</sup> This number increases to approximately 17% for people recycling on a weekly or monthly basis. The main driver for recycling in Jordan is the economic benefit, as people perceive recycling as an activity that will yield personal financial gains. Individuals across Jordan, especially informal actors in the solid waste management sector, are aware of the financial benefits of the collection and sale of recyclable waste, and take part in these activities to earn income. Another key consideration for participation of the public in recycling schemes is their perceived interest in environmental protection and safeguarding. However, for most people in Jordan, economic and societal concerns precede environmental concerns.<sup>12</sup> High unemployment rates and high costs of living – both of which are now being exacerbated by the COVID-19 pandemic – explain the driver of financial returns for many people who do recycle.

Among the key challenges outlined in the National Solid Waste Strategy for Jordan (2015) is the complex legislative framework for solid waste management, which falls within the mandate of multiple line ministries. Consequently, inefficiency in coordination has often caused issues with the disposal and overall management of waste across Jordan. As the key legislative body, the Ministry of Environment sets the legislative framework for the solid waste management sector, including all relevant laws, regulations, instructions and penalties. The Ministry of Local Administration is the body responsible for the overall management, monitoring and operational control of solid waste management activities across Jordan. Municipalities are responsible for the collection, treatment and disposal of waste in their respective areas. Other ministries, such as the Ministry of Health and Ministry of Agriculture, are responsible for the collection and treatment of waste generated from work in their respective domains.

Accountability for and oversight of the collection and safe disposal of waste has been lacking in many areas of waste management across Jordan, mainly due to lack of resources and effective coordination. This causes increased risks of pollution from unsustainable waste management. Furthermore, coordination with other actors including the private sector, informal sector actors and

local initiatives is also often disregarded in the current operational and strategic scheme of waste management. This results in a lack of data, ineffective management of financial and technical resources, and many instances of duplication of efforts in the same geographical areas.

The new Waste Framework Law of 2020 outlines the structure of an inter-ministerial Steering Committee for improving the coordination and management of solid waste across Jordan. The Steering Committee is to be led by the Ministry of Environment and includes representation of other key actors including the Ministry of Local Administration, Ministry of Planning and International Cooperation, Ministry of Water and Irrigation, Ministry of Health, Ministry of Agriculture, and the Greater Amman Municipality among other key government actors. The Steering Committee is also set to have representation from the private sector. However, other significant actors are not represented in the Committee, including the informal sector and civil society organizations. This could lead to misrepresentation of various interests that play key roles in the solid waste management sector, and limit effective coordination.

It should be noted that most of the final disposal sites selected for this study were opened prior to the establishment of the Ministry of Environment in 2003. Of the final disposal sites selected for this study, only one EIA was carried out, for the rehabilitation of Al Ekaider landfill in the North Region of Jordan. Another EIA is currently underway for the rehabilitation of Al Azraq landfill. The implementation of an EIA is mandatory under the Environmental Protection Law of 2006. However, the final disposal sites selected for this study were established between 1981–2001; therefore, an EIA was not conducted. The Environmental Protection Law of 2006 requires all project proponents to employ local consulting firms to complete an EIA for proposed projects. The Law assigns the Ministry of Environment to grant approvals and licensing to proposed projects after the EIA has been reviewed, analysed and approved. The approval of an EIA is a prerequisite for granting licences and approval for construction projects across Jordan. Unfortunately, in practice, EIA studies are often completed within the construction period of projects and sometimes after they have concluded. This does not allow for mitigation of identified environmental risks, and exposes surrounding communities and the environment to risks.

## 4 FINAL WASTE DISPOSAL SITES IN JORDAN

Final disposal sites can take the form of engineered and non-engineered landfills or open dumpsites, with the latter referring to disposal methods that lack environmental and health safeguards. The primary methods of waste disposal in Jordan are landfilling and disposal in open dumpsites. Landfilling is often considered among the least desirable methods in the management of waste, including by the International Solid Waste Association (ISWA). Within the waste management hierarchy and life cycle approach to waste, disposal in itself is the least desirable waste management approach after the preferred methods of prevention, recycling, reuse and other waste recovery methods.<sup>13</sup> Engineered landfills provide a disposal solution whereby waste is compacted, lined and buried for many years while decomposition occurs. This process is costly, as it often entails complex infrastructure, equipment and operational requirements. This results in increased environmental and public health risks due to uncontrolled processes. Open dumpsites are areas in which waste is disposed of in the complete absence of sanitary design, planning and oversight. In Jordan, only two sites are considered engineered sanitary landfills, with the remainder of sites classified as unsanitary landfills and open dumpsites.

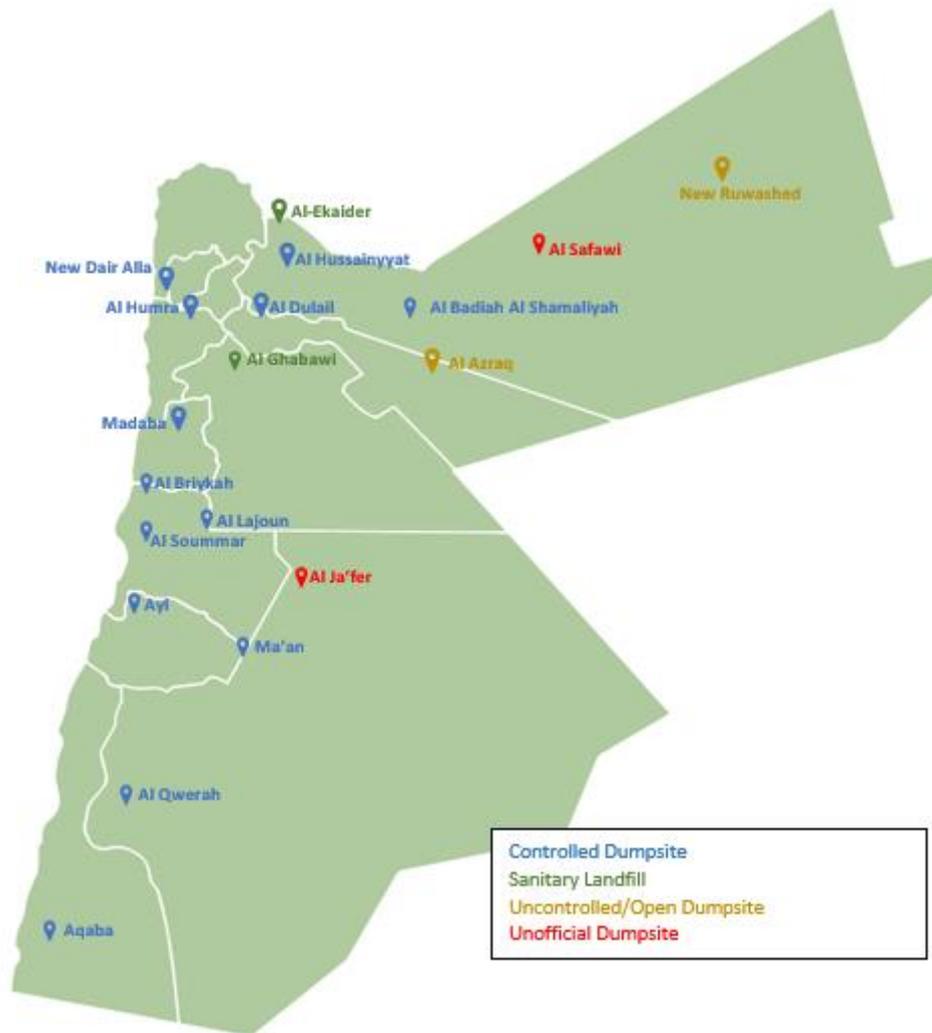
The landfills and other disposal sites in Jordan are currently operated by Joint Services Councils<sup>14</sup> under the supervision of the Ministry of Local Administration and the Ministry of Environment.

According to the Ministry of Local Administration, there are 20 final disposal sites in Jordan. These are classified as follows:

**Table 2: Types of final disposal sites in Jordan**

Type of disposal	Description	No. of sites in Jordan
Uncontrolled/open dumpsite	Waste is disposed of in random locations. Operations are not monitored or controlled.	2
Unofficial	Waste is collected and taken to designated areas where it is disposed of randomly. There are no measures for protection from pollution or adequate control over operations.	2
Controlled	Waste is removed from immediate environments and taken in vehicles to a designated site away from residential areas. These sites often lack precautionary pollution measures.	14
Sanitary	Includes sound engineering and design to trap and capture leachate and gases. Waste is spread in thin layers, compacted, and closed in compacted cells.	2

Figure 1: Current final disposal sites in Jordan



Source: Data retrieved from the Ministry of Local Administration in 2020. Map created by LDK Consultants.

These sites were selected based on recommendations and direction of the Ministry of Local Administration through the National Solid Waste Management Strategy of 2015, as well as the Regional Municipal Solid Waste Management Plans for the North and Central Regions of Jordan.<sup>15</sup> In the selection of sites, additional consideration was given to significant elements of each final disposal site, including environmental and social risks, volume of waste generated, areas served, and the characteristics of nearby communities.

The eight final disposal sites selected for assessment are as follows:

Table 3: Final disposal sites selected for the study

Region	Governorate	Final disposal sites
North	Irbid	1. Al Ekaider
	Al Mafraq	2. Al Hussainyyat
	Al Mafraq	3. Al Badiyah Al Shamaliyah
Central	Zarqa	4. Al Azraq
	Al Balqa'a	5. New Dair Alla
South	Al Karak	6. Al Lajoun
	Ma'an	7. Ma'an
	Aqaba	8. Al Qwerah

**Table 4: Characteristics of final disposal sites**

Final disposal site	Expected closure	Distance to nearest community (km)	Municipalities served	Waste scavengers on disposal site
Al Ekaider	2034	2	32	No
Al Hussainyyat	2040	0.7	8	Yes (contract)
Al Qwerah	2030	3.5	2	No
Ma'an	2035	14	5	No
Al Badiah Al Shamaliyah	2045	4	4	No
Al Azraq	2021	3.5	1	Yes
New Dair Alla	N/A	4	4	Yes (contract)
Al Lajoun	2030	5	9	Yes (contract)

## CHALLENGES ASSOCIATED WITH CURRENT WASTE DISPOSAL PRACTICES IN JORDAN

Unsanitary and uncontrolled waste disposal methods pose the biggest challenges in the solid waste management system in Jordan. Apart from the two sanitary landfills, final disposal sites across Jordan are identified as having a high risk of pollution due to uncontrolled disposal, treatment and operational management. Sanitary landfills ensure that environmental and social safeguards are in place and meet the following standards:<sup>16</sup>

- Designed according to engineering best practices.
- Include the spreading, compaction and covering of waste.
- Include careful site selection, preparation and management.
- Land is engineered before use, including leachate lining and a capturing mechanism for emitted gases.
- Future planning for land use and closure are considered in the design.

Non-engineered waste disposal is considered more affordable than sanitary landfills and is the most common disposal system in developing countries.<sup>17</sup> Engineered landfills require large sums of capital expenditure, a reliable revenue stream, and affordable and accessible land. In the absence of such financial resources, low- and middle-income countries tend to opt for non-engineered disposal options for waste disposal solutions, as is the case for Jordan, where many sites are considered open dumpsites. However, non-engineered waste disposal poses multiple risks to environmental and public health, including air and water pollution, the spread of rodents and insects, degradation of land and the spread of disease. Furthermore, rapid increases in solid waste generation across the country coupled with unsanitary waste disposal practices puts additional stresses on surrounding environments and communities.

# 5 IMPACTS OF FINAL DISPOSAL SITES ON COMMUNITIES IN JORDAN

## IMPACTS ON NEIGHBOURING COMMUNITIES

The North Region of Jordan in particular has faced increased pressure in the delivery of public services in recent years, including solid waste management services. According to UNHCR, Jordan currently hosts 662,790 Syrian refugees, 45.5% of whom are currently residing in the governorates of Irbid and Mafraq in the north of Jordan.<sup>18</sup> It has been estimated that waste generation has increased by approximately 3% since the influx of Syrian refugees to Jordan started in 2011.<sup>19</sup> Municipalities, as per the national solid waste management legislation, are responsible for the collection, treatment and disposal of waste in their respective areas.

Municipalities in the North Region of Jordan have been experiencing significant changes in solid waste management operations in recent years, including increasing rates of littering, decreasing standards of collection services, aging infrastructure and equipment, and a lack of recycling schemes. Local landfills have faced additional pressure from increased waste generation rates, mostly in disposal sites that are considered unsanitary and uncontrolled. Al Hussainyyat final disposal site in the governorate of Mafraq currently receives waste from eight municipalities as well as Al Za'atari Refugee Camp, which hosts almost 79,000 Syrian refugees.<sup>20</sup> According to data published by the Department of Statistics in Jordan in 2019, refugees residing in Al Za'atari Refugee Camp make up 23% of the population currently served by Al Hussainyyat landfill and account for approximately 10% of waste disposed of in the landfill.<sup>21</sup>

People in Al Azraq Municipality have complained of aesthetic damage to the area due to the inefficiencies of the Al Azraq final disposal site. Al Azraq Municipality is home to the Azraq Wetland Reserve. The wetland has been known as a key location for migratory birds over the years; it is a natural habitat for unique terrestrial and aquatic species and represents a significant ecological tourism site which benefits the local economy.<sup>22</sup> Tourism to the reserve has reduced over the years, with communities placing the blame on the nearby final disposal site. An increase in the amount of waste and litter entering into the community and the deteriorating health of the wetland are among the concerns of the people living near the Al Azraq final disposal site.

Members of the communities surveyed near the selected disposal sites have complained of decreasing values of their properties. Decreasing value has also been reported for agricultural, residential and industrial lands. Pollution in the form of dust, odours and emitted gases was reported to have decreased the quality of agricultural lands near the final disposal sites. In Al Azraq, it was reported that agricultural and horticultural lands have suffered from increased pollution to key water resources due to the nearby landfill, which further reduces the productivity and quality of arable land.

Traffic has also increased in areas close to the final disposal sites. Complaints were made by members of nearby communities about the frequency of traffic from solid waste vehicles, which have caused some infrastructure damage to the roads from the heavy weight of the waste in the collection and transport trucks. There were also multiple complaints about noise pollution.

## IMPACTS ON PUBLIC HEALTH

Members of the community consultation sessions conducted for this study all complained about odours and gases emitted from the final disposal sites. People reported fears of respiratory diseases and other health issues arising as a result of the odours and gases, but to date no specific scientific studies have been conducted to affirm claims about these health impacts.

Uncontrolled incineration of waste has been reported on final disposal sites. Waste incineration reduces the volume of waste and increases land available for further disposal and is therefore a common practice in uncontrolled landfills in Jordan. Waste incineration has a direct impact on the health of people working inside the final disposal sites, as they inhale and are exposed to harmful gases and liquids resulting from emitted gases and leachate. In the absence of proper personal protective equipment (PPE), workers are at high risk of developing illnesses from their working environment. Workers at the final disposal sites reported that PPE is mostly available on site. However, many reported that there is no monitoring or compliance with requirements on the use of PPE. Nearby communities are also at risk from waste incineration as they are affected by the fumes and odours resulting from the associated fires. This could increase the potential of developing respiratory illnesses such as asthma.<sup>23</sup>

Complaints of medical waste being disposed of in Al Azraq final disposal site were made by people living in the nearby municipality of Al Azraq.<sup>24</sup> This may cause health risks to waste scavengers operating at the landfill site. This could be attributed to the fact that this site is not controlled and lacks supervision in the evening hours. Uncontrolled solid waste incineration also takes place at Al Azraq, sending fumes and gases in the direction of nearby communities and posing direct risks to people's health.

Members of the community near the Al Lajoun final disposal site complained of random discharge of sewage at the site. This increases the risk of contamination of the water resources the community relies on for municipal use, irrigation and watering livestock. It also has a direct impact on the soil and land quality of the surrounding areas.

## IMPACTS ON BIODIVERSITY

Community members reported that pollution has caused an increase in more invasive pests such as certain species of flies and other insects, and has reduced tourism in the area. People expressed fears that these pests would spread diseases to people as well as plants and animals in the surrounding areas.

Communities surrounding Al Ekaider landfill reported that local species of birds and other animals have greatly reduced in number and have been replaced with species that feed on waste, such as rats and crows. The final disposal sites have also caused changes in the vegetation in surrounding areas, affecting both the aesthetic and economic value of these lands. This could be caused by the change in soil structure resulting from waste pollution. Gaseous and acidic pollutants resulting from landfill sites can seep through soil and air, and have a direct effect on soil and vegetative health.<sup>25</sup>

Most of the people consulted from the nearby communities complained about an increase in the number of stray dogs in areas surrounding final disposal sites. Stray dogs gather around the sites because of the abundance of food waste. People in the nearby communities reported that the stray dogs have been injuring and killing their livestock, directly affecting their livelihoods. Community members also expressed fear that the stray dogs will cause direct harm to them and their children.

Waste drifting away from final disposal sites has been reported to accumulate in the nearby communities. Farmers reported cases of death among their livestock due to consuming and/or

suffocating from waste from the final disposal site. This has been particularly reported in communities near Al Hussainyyat and Al Lajoun final disposal sites.

Foul odours resulting from the gases emitted from solid waste at final disposal sites concentrate in nearby communities. These odours are the direct result of decomposing waste, which produces dangerous gases such as methane, ammonia and sulphides. Many communities living adjacent to final disposal sites complain about the odours and fear the health risks associated with the emitted gases. This is especially the case in two communities that are only 2–3km away from the Azraq landfill, as members of the community reported very intense odours coming from the final disposal site.

Workers in the final disposal sites have also complained of the foul odours they experience during their work. They are in a dire situation during their work, and may also be directly exposed to gases emitted from the site. Given the absence of proper gas-capturing methods in all but two of the final disposal sites as well as the lack of proper PPE, the risk of developing health problems is particularly high for site workers. Informal actors, especially those involved in scavenging activities at final disposal sites, are also at risk from emitted landfill gases (LFGs), especially if PPE is not used. Ensuring compliance with PPE use in final disposal sites is the responsibility of the site operators, usually the municipality or the Joint Services Council. For contracted informal scavenging in final disposal sites, the contractor is responsible for ensuring that informal workers are supplied with the necessary PPE. In both cases, there is a lack of monitoring and control of the use of PPE.

## SOCIO-ECONOMIC IMPACTS

Respondents reported that residential property values have decreased due to their proximity to final disposal sites and increased pollution. As a consequence, landowners are either less willing to sell their property due to fear of losing their initial investment, or find that it is more difficult to sell. Some members of the community have reported an increase in migration of residents away from the communities due to the impacts of the final disposal sites. This was particularly reported in Al Azraq and Al Hussainyyat.

Near the Al Hussainyyat, Ma'an and Al Lajoun final disposal sites, members of the community reported a decrease in acceptable agricultural land due to the deteriorating quality of the soil and air close to sites. This has reduced agricultural activities in the areas, thus affecting the local economy and decreasing the availability of local produce. Employment rates could also be affected by the decrease in agricultural activities, especially in communities such as those near the New Dair Alla landfill in the Jordan Valley, Jordan's most productive agricultural land. Given the already high rate of informality in the agricultural sector, the limited ability to enforce decent work conditions for farmhands, and the very limited social protection schemes offered to agricultural workers, whether Jordanian or foreign, continued degradation of land is likely to drive already poor families and individuals further into poverty. This could result in a reduced number of work opportunities over time and increased competition for low-paid, difficult and hazardous jobs. Degradation of land will also have a range of different impacts on large-scale landowners, small-scale farmers and farmhands.

Informality in the agriculture sector, along with the lack of integration of women in the waste management sector, is expected to increase greatly during and after the pandemic. Women are actively involved in the agriculture sector in Jordan, especially in rural areas, but receive little to no social protection and health and safety protection during work. The lack of availability of gender-disaggregated data during the pandemic offers little insight into the discrimination women face in the sector or the protective measures provided to them. The lack of women's representation in waste management, along with their participation in informal agricultural work, further contributes to gender discrimination in this sector.<sup>26</sup>

Employment of people from local communities in facilities was reported as important by the members of the community. While many communities residing near final disposal sites reported that members of their community were employed in the sites, many said that the employment rate from the community is insufficient. People residing near the Al Hussainyyat and New Dair Alla final disposal sites expressed that more community members should be employed in nearby solid waste management facilities. Local employment is important as it benefits local economies and could also create a sense of responsibility for the final disposal sites and the solid waste sector. It could also address the increased unemployment rate across Jordan, which stands at 24.7% as of the last quarter of 2020.<sup>27</sup> Local employment in the waste management sector through private and public sector actors also increases opportunities for green jobs in Jordan, with the need to emphasize safe and fair working conditions, social protection, and adherence to health and safety measures.

In tourist areas, such as Aqaba, initiatives to train hotel and restaurant staff on proper waste management practices to cut landfill use proved helpful in enabling the community to implement more sustainable methods. For hotels, the reduction of fees for waste collection incentivized participation. These initiatives empower local communities, including women, by contributing to improved livelihood and job-creation opportunities. However, while hotels may benefit from these incentives, proper monitoring of their practices must be implemented to ensure that sustainability is not only on paper. Expanding these practices and reflecting these incentives across Jordan will contribute to efforts to improve practices and create employment opportunities for more local communities.<sup>28</sup>

However, such initiatives may not be feasible, especially in rural areas. Because the solid waste recycling industry in Jordan remains untapped, especially in rural and underserved areas, partnerships between public and private sector corporations to collaborate with community and civil society organizations should be explored. The development of local employment opportunities through solid waste management and other sustainable development practices can be implemented through several initiatives. In some developing countries in Africa, such as Zimbabwe, a subcontracted agreement between the public sector and community-based organizations offers employment opportunities for community members to serve as street sweepers or work in other areas of solid waste management. Implementation of these initiatives involved awareness sessions, lectures and meetings for local community members to incentivize participation.<sup>29</sup> If such measures are implemented properly, with decent work conditions and protection benefits for subcontracted community members, they can provide a path to formal work through these organizations.<sup>30</sup>

## INFORMAL ACTIVITIES IN THE SOLID WASTE MANAGEMENT SECTOR IN JORDAN

The waste management sector in Jordan involves both formal and informal actors. It has been estimated that approximately 6,400 people work in the formal waste management sector in Jordan, including waste collectors and street sweepers in municipalities.<sup>31</sup> It has also been estimated that there are approximately 6,000–7,000 informal workers engaged in solid waste management activities across Jordan, 4% of whom are refugees.<sup>32</sup>

Studies indicate that around 1% of the urban population in developing countries (approximately 15 million people) rely on waste-picking for their livelihoods.<sup>33</sup> Informal workers in the solid waste management sector are usually involved in the collection, sorting and sale of valuable waste materials, such as metals and plastics. It has been estimated that informal actors recover approximately 20% of waste in developing countries around the world.<sup>34</sup> While the value of informal activities is not considered in the formal economy, these activities certainly contribute to the overall economy of a country like Jordan, as recyclable waste collected by informal actors is sold back to the local economy for reprocessing and/or reuse.

Informal actors operate a self-financing and self-sustaining system of solid waste management, and many rely on scavenging activities for their livelihood. However, these informal actors face dire working conditions and suffer from a lack of protection, healthcare, pension schemes or other social protection benefits.<sup>35</sup> In addition, there is often a stigma associated with informal work in Jordan, as people regard the activities of workers in the sector as unhygienic and disorganized, especially for those workers who scavenge through street waste containers.

There are risks associated with this field of work for many informal actors; these could be summarized as economic, social and health risks. Functioning informally, actors in this sector tend to be more susceptible to livelihood losses and weak social protection due to unregulated employment and safety conditions. Many informal workers in this sector rely completely on salvaging recyclable waste for securing their livelihood. With little to no social safety nets or social security protection, they are therefore more exposed to socio-economic shocks, such as the COVID-19 pandemic. Throughout the pandemic, informal workers in the solid waste management sector were particularly affected. Curfews, lockdowns and the fact that they could not secure movement permits in the early days of the pandemic impeded their ability to sustain their livelihood.<sup>36</sup> The effects of the pandemic have been felt acutely by informal workers as they were not able to access the social protection benefits offered to individuals with social security subscriptions, which include healthcare, unemployment benefits and retirement pensions. In rural and underserved areas, day labourers in the agriculture and informal sectors struggled to provide for themselves. Many relied on financial loans from neighbours and other community members, and on credit for groceries and other essentials from local supermarkets.

Informal solid waste management workers are also often exposed to very unhygienic and dangerous working conditions while collecting recyclable waste, and are often working without the necessary PPE. Scavenging through waste materials puts workers at high risk of injury and disease especially from the potential presence of hazardous and medical waste among municipal waste products. Handling such materials exposes workers and their families to hazards. Operators of final disposal sites in Jordan, usually the Joint Services Councils, are responsible for ensuring that proper PPE is used by all site workers, both formal and informal. Respondents in this study reported that compliance and monitoring is lacking in this regard.

Child labour has also been observed in informal sector activities in Jordan, especially in the scavenging for recyclable materials. While children should not be working at all, the absence of proper PPE puts them at even higher risk of being injured or contracting disease from informal activities, especially when unmonitored.

Four of the eight final disposal sites selected for this study currently allow informal sector activities onsite. Sometimes this takes place through formal agreements between the landfill site management and a private contractor who hires informal workers to salvage high-value materials from the waste. However, in most sites in Jordan, informal activities take place through uncontracted and uncontrolled scavenging by individual actors. In both cases, informal workers are susceptible to economic, social and health risks. In most cases, informal actors employed under private contracts in final disposal sites are not registered for social security and healthcare benefits. As informal workers do not have formal working contracts, this causes constant employment instability and risks in providing for their families.

Informal waste workers rely more on large final disposal sites, as these are deemed more profitable than smaller sites. Al Ekaider is considered one of the largest final disposal sites in Jordan. Up until 2015, many informal sector actors relied on the site to salvage recyclable waste. When the rehabilitation of Al Ekaider landfill began in 2015, all informal scavenging work was prohibited, and this remains the case to date. Considering the size of the site, it can be assumed that a large number of informal workers were impacted by this, although the number cannot be estimated due to lack of reliable data.

## 6 IMPACTS ON CLIMATE CHANGE

Jordan is characterized as a resource-scarce country. With limited sources of primary energy and water, the country imports a large amount of such resources to meet the needs of its population. In 2015, 97% of energy resources and 87% of food was imported.<sup>37</sup> Jordan is also considered the second most water-scarce country in the world in terms of water per capita.<sup>38</sup> The extraction rate from underground water aquifers is at 149%,<sup>39</sup> stressing these valuable resources beyond their ability to recharge. Precipitation is uneven across the country, as only 20% of Jordan receives the minimum precipitation for rainfed agriculture (200mm of rainfall per year).<sup>40</sup> The demand for water is increasing due to high population growth, an influx of refugees, urbanization, industrialization and agricultural development. Meeting this increased demand for water is difficult, as Jordan receives only a small share from transboundary water resources including the Jordan River, the Yarmouk River and the Disi Aquifer. These key challenges make Jordan highly vulnerable to climate change. Increased pollution, changes to precipitation patterns and increased temperatures will place additional pressure on the country's ability to provide secure and equitable resources for its people.

### GREENHOUSE GAS EMISSIONS OF FINAL DISPOSAL SITES

GHG emissions play a key role in global temperature change and are characterized as key factors causing climate change. They are heat-trapping gases that remain suspended in the atmosphere and cause increases in temperature at the Earth's surface, thus leading to increased global temperatures. In turn, this causes unstable and unpredictable weather events, increased sea levels, and changes in the habitat and populations of many species of plants and animals. These changes have a direct impact on the health and wellbeing of all species on the planet, especially people.

In 2010, the waste management sector in Jordan has been reported as the country's second-largest contributor to greenhouse gas (GHG) emissions (after the energy sector),<sup>41</sup> accounting for 10% of the country's total GHG emissions.<sup>42</sup> Around 90% of the GHGs generated by the waste sector are from the disposal of municipal solid waste, with final disposal sites being a major contributor to GHGs in Jordan.

GHG emissions from final disposal sites are caused by the decomposition of organic waste. In Jordan, 50% of waste generated is classified as organic. The high organic content of waste disposed of in final disposal sites causes emissions of landfill gases (LFGs) comprised mainly of methane and carbon dioxide, which are considered the most potent heat-trapping gases in the atmosphere. The extent of LFGs at final disposal sites is mainly dependent on the quantity and composition of waste. It also depends on climatic conditions such as humidity and temperature, as well as the structural composition of the site.

According to ISWA's Landfill Operational Guidelines (2019), the following have been identified as the most common LFGs emitted from final disposal sites:<sup>43</sup>

**Table 5: Most common LFGs from final disposal sites**

Type of LFG	Concentration
Methane	40 to 60%
Carbon dioxide	35 to 45%
Oxygen	< 1 to 5%
Nitrogen	< 1 to 5%

Type of LFG	Concentration
Hydrogen	< 1 to 3%
Water vapour	1 to 5%
Trace constituents	< 1 to 3%

Source: ISWA, 2019

LFG concentration was estimated for the final disposal sites in the study by measuring quantities of the disposed waste recorded by weighbridges<sup>44</sup> at each site. The LFG potential of each category of waste (food and green waste, wood and textiles, metals, paper and cardboard, etc.) was calculated based on the history of the final disposal site including date of opening, estimated generation of waste by municipalities served, and the types of waste. Waste disposed in the final disposal sites was not adequately tracked, monitored, and recorded, further revealing the lack of data and management in the solid waste management sector in Jordan.

GHG emissions from each final disposal site are estimated as follows:

**Table 6: Estimated GHG emissions of final disposal sites**

Final disposal site	Date of opening	Estimated annual landfilled waste (tons/year)	Estimated total landfilled waste (tons)	GHG emissions (tons CO <sub>2</sub> eq/year)
Al Ekaider	1981	800,000	19,046,572	16,700,375
Al Hussainyyat	1983	113,760	2,635,506	2,310,859
Al Qwerah	1997	10,158	177,184	155,358
Ma'an	1993	43,715	844,875	740,802
Al Badiyah Al Shamaliyah	2001	18,312	280,613	246,046
Al Azraq	1990	6,049	124,605	109,256
New Dair Alla	1998	26,066	441,486	387,103
Al Lajoun	1996	95,888	1,719,803	1,507,954

Many LFGs resulting from decomposing waste at final disposal sites may react with one another or with the surrounding air and cause explosions or fires. This is a significant health risk for neighbouring communities. It is therefore an urgent requirement that gases from final disposal sites are trapped and managed. Occasional fires have been reported at Al Hussainyyat and New Dair Alla landfills from the burning of waste and animal carcasses. Illegal burning of waste is common across Jordan and sometimes occurs in neighbourhoods and other areas outside defined final disposal sites.

## IMPACT ON WATER RESOURCES

As a very water-scarce country, Jordan will be adversely affected by climate change in the years to come and will have to adapt to and mitigate predicted detrimental effects, including reduced groundwater recharge, groundwater quality deterioration, streamflow reduction and increased water demand. Other predicted impacts include groundwater salinization and depletion, surface water contamination, soil erosion, desertification, disappearance of small springs, violation of water regulations and reduced availability of arable land, with the potential for resulting social conflicts and economic stresses.<sup>45</sup>

Jordan relies on its depleted groundwater resources to provide water for approximately 60% of all water use.<sup>46</sup> Water losses due to illegal tapping, non-revenue water loss and water theft make it

harder to meet ever-increasing demands. Non-revenue water is water that is billed but lost to illegal extraction, leakages from the system and unpaid water bills.<sup>47</sup> Jordan is also hosting a significant refugee population, creating additional demand and pressure.

In 2017, the estimated environmental impact of water practices in Jordan was estimated at 7.13 million Jordanian dinars (JOD).<sup>48</sup> This represents a strain on the country's limited financial resources. Environmental damages to water infrastructure as well as to natural ecosystems increase as pollution increases.

The agricultural sector accounts for approximately 52% of water use in Jordan, 74% of which is extracted from groundwater resources.<sup>49</sup> A lack of protection of water resources threatens the long-term sustainability of the agricultural sector, and therefore threatens the food security and livelihoods of those who rely on it for nutrition and work. Although efforts are being made to promote water-use efficiency in the agriculture sector, these are currently limited in coverage.

Final disposal sites could easily contaminate nearby water resources through surface and groundwater pollution. This puts water resources in Jordan at additional risk of deteriorating quality and sustainability at a time when it already faces increased demand and low supply. Russeifa landfill, which was officially closed by local government in 2019, has been identified as causing direct pollution of the Amman-Zarqa water basin through uncontrolled leachate.<sup>50</sup> Pollution occurs through the spread of microorganisms, heavy metals and dissolved organic matter from decomposing waste. When final disposal sites are designed and operated with a lack of protective precautions, including lining for leachate, pollutants are easily dispersed to nearby environments. Leachate is formed when water percolates through waste in final disposal sites and carries harmful substances that eventually seep through cracks into the ground and to surrounding environments. Leachate carries harmful substances and has a direct impact on surface and groundwater. It moves with natural waterways into catchment areas and other water resources that people directly depend on for water provision. Furthermore, leachate continues to seep through waste long after final disposal sites have been closed and decommissioned, meaning pollution continues long after sites' operational time.

Except for Al Ekaider landfill, all final disposal sites assessed for this study lack a leachate control system. This poses very high risks to groundwater basins.

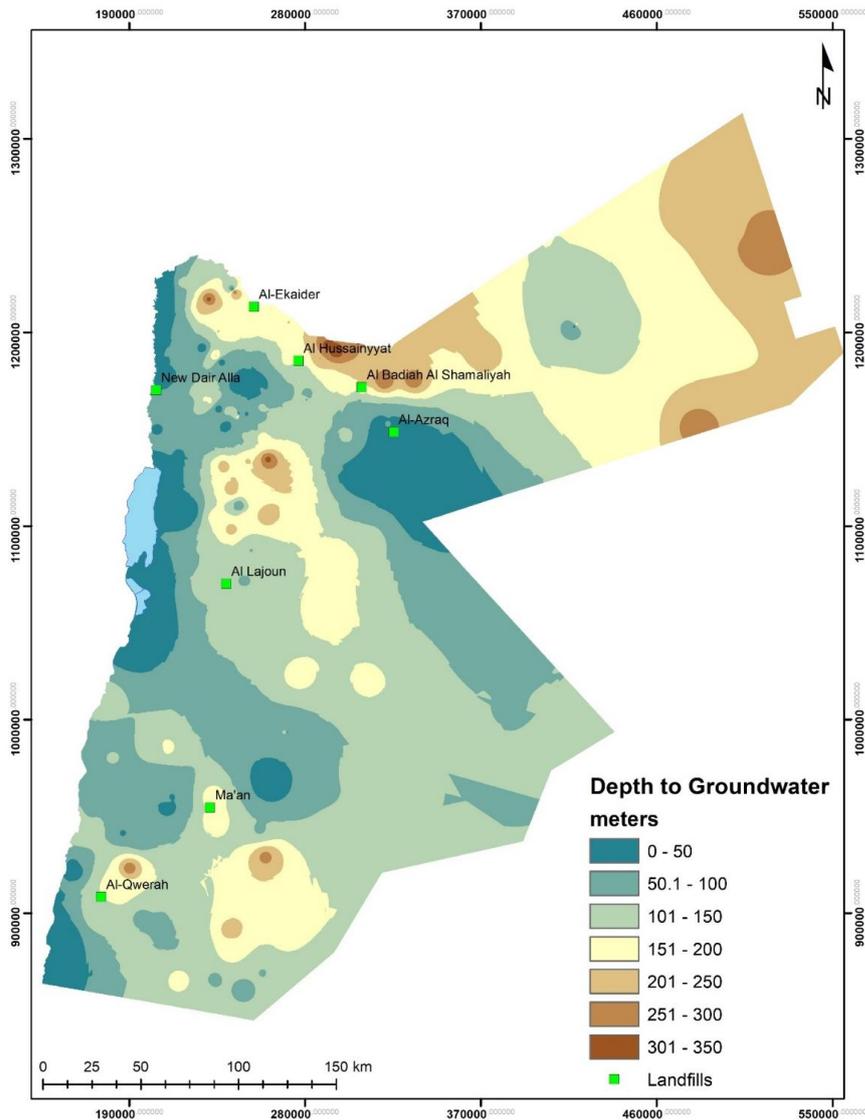
In 2020, the Ministry of Local Administration developed technical specifications for sanitary landfills in Jordan, in support of the implementation of the National Solid Waste Strategy.<sup>51</sup> These specifications outline the need for sanitary landfill sites to be at least 100–300m away from water resources. However, the International Solid Waste Association (ISWA) specifies that landfill sites should be at least 500m away from neighbouring communities and that this distance may increase depending on the landfill size, prevailing wind direction and climate of the surrounding area.<sup>52</sup>

Members of the communities surrounding the final disposal site of Al Ekaider have complained of deteriorating water quality, while communities near the final disposal sites of Ma'an and Al Hussainyyat have reported sewage discharge coming from the sites. There is an urgent need to address the issue of water contamination, given the practice of extracting water from illegal water wells in communities across Jordan. Because of a lack of monitoring and control over the quality of water from these wells, communities may be at higher risk of developing health problems from water that has been contaminated as a result of pollutants from final disposal sites. Communities residing around Al Azraq have reported the presence of illegal water wells in the area.

The treatment process for Zibar (a liquid by-product of olive oil production) in Al Ekaider landfill includes an evaporation pond and an underneath lining structure which prevents the liquid from seeping into the ground. In the final disposal site of Ma'an, there is no lining for capturing Zibar, thereby increasing the risk of seepage into groundwater and surface water resources. Zibar produces a very foul odour that reaches nearby communities.

There are 12 groundwater basins in Jordan. Figure 2 below outlines the distribution of groundwater basins, depth to the groundwater, and the locations of the final disposal sites.

**Figure 2: Depth of groundwater basins in Jordan and location of selected disposal sites**



Source: Data retrieved from the Ministry of Water and Irrigation in 2020. Map created by LDK Consultants.

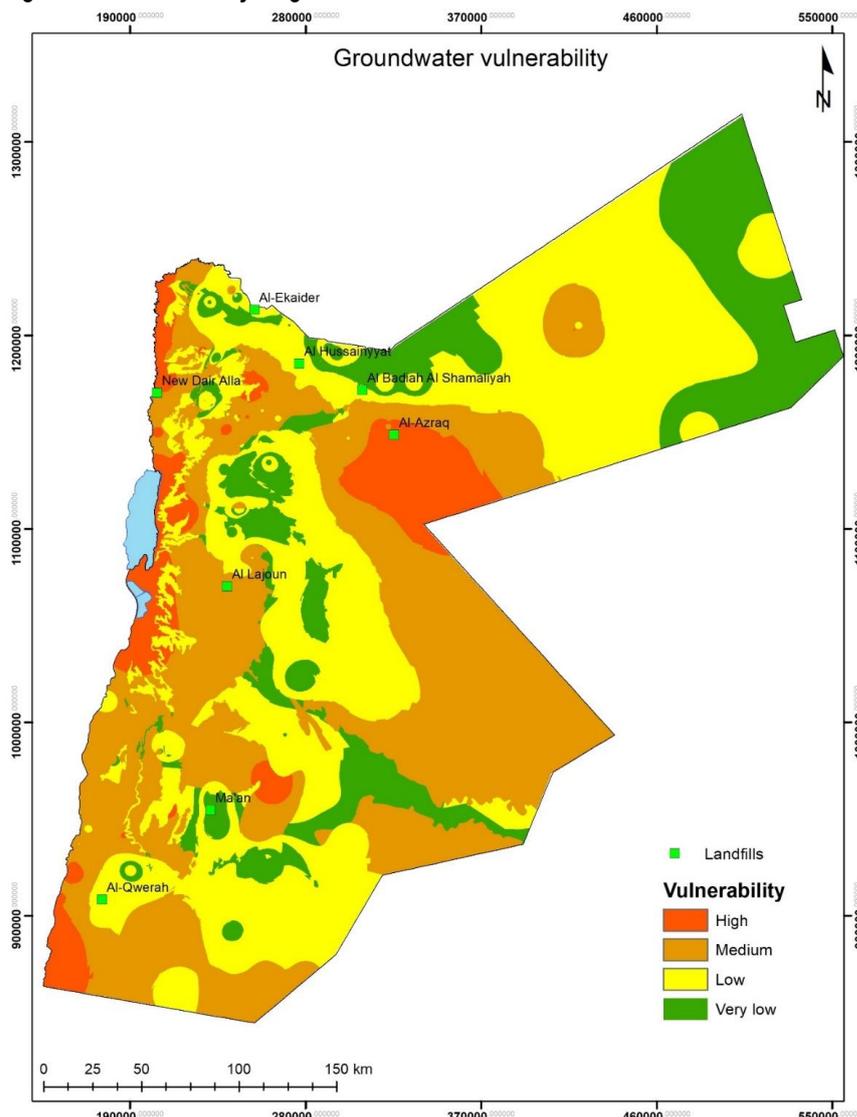
Vulnerability of groundwater basins to pollution from final disposal sites varies depending on multiple factors. These include depth of the water table, moisture content of the waste, soil structure, topography, and the hydraulic conductivity of the groundwater basin.

The vulnerability of groundwater resources from the final disposal sites selected for this study was identified and assessed, as shown on Table 7 and Figure 3 below.

**Table 7: Vulnerability of groundwater basins from final disposal sites and required mitigation measures**

Location	Vulnerability	Required mitigation measures
Ma'an	Very low	<ul style="list-style-type: none"> <li>• Standard lining and compaction</li> <li>• Leachate pumping</li> <li>• Monthly groundwater quality testing</li> </ul>
Al Badiah Al Shamaliyah	Low	<ul style="list-style-type: none"> <li>• Standard lining and compaction</li> <li>• Leachate pumping</li> <li>• Monthly groundwater quality testing</li> </ul>
Al Hussainyyat		
Al Ekaider		
Al Qwerah		
Al Lajoun	Medium	<ul style="list-style-type: none"> <li>• Standard lining and compaction</li> <li>• Leachate pumping</li> <li>• Monthly groundwater quality testing</li> </ul>
Al Azraq	High	<ul style="list-style-type: none"> <li>• Heavy lining</li> <li>• Bentonite clay lining is highly recommended</li> <li>• High efficiency leachate pumping</li> <li>• Weekly groundwater quality testing</li> </ul>
New Dair Alla	High	

**Figure 3: Vulnerability of groundwater resources in Jordan**



Source: Data retrieved from the Ministry of Water and Irrigation in 2020. Map created by LDK Consultants.

Al Azraq and New Dair Alla final disposal sites pose the highest risk for groundwater pollution due to the small depth to the groundwater basins below as well as factors such as the geology of the groundwater basin and its permeability. Shallow water tables below the ground cause higher incidence and risk of pollution to groundwater resources. Al Azraq groundwater basin falls in three main governorates of Jordan: Zarqa, Amman and Mafraq. Since the early 2000s, communities in these three areas have complained about a decline in the water table, an increase in water salinity and a decrease in the productivity of the wells.<sup>53</sup> Unsanitary practices in Al Azraq final disposal site will continue to pose a risk of deteriorating water quality, directly affecting the use of this water for municipal and agricultural purposes.

## 8 RECOMMENDATIONS

### IMPROVED GOVERNANCE

**Increased monitoring and compliance of all solid waste disposal operations are essential for reducing negative impacts of final waste disposal sites in Jordan.**

- Line ministries should allocate adequate financial, human and technical resources to strengthen monitoring of final disposal site activities and ensure that environmental, social and health safeguards are complied with to protect all workers and communities.
- Final disposal site operators, including individual municipalities and Joint Services Councils, should ensure compliance with PPE requirements for both formal and informal workers.
- Key line ministries, including the Ministries of Environment, Water and Irrigation, and Agriculture, should increase coordination in this regard, especially with the Climate Change Directorate at the Ministry of Environment. Regular and consistent monitoring of the quality of air, water and soil around final disposal sites should take place to ensure adherence to standards for public health and environmental protection.<sup>54</sup>
- These monitoring mechanisms should be complemented by concrete action plans to decrease risks of pollution and contamination of key natural resources, and increase protection for communities. Such plans should include pollution mitigation measures at landfill sites and surrounding areas, including leachate control and monitoring of GHG emissions. Information about the quality of the nearby environment should be made easily available for communities that are affected by pollution from disposal sites, through increased engagement by municipalities and Joint Services Councils.

**Enhancing community consultation and considering community needs and concerns in decision making is essential.**

- As final disposal sites are a nuisance to nearby communities and are often unwelcome, decision makers should hold regular consultations with communities living close to disposal sites to increase efforts to identify and address their concerns and ensure that the necessary precautions and actions are taken to protect them.
- Local authorities and relevant line ministries should increase protection and formalization for informal workers, whether Jordanians, refugees or migrant workers, involved in informal waste collection and recycling activities in final disposal sites as well as in populated areas. This includes the provision of formal work contracts and social protection benefits, including subscription to social security, pension and unemployment benefit schemes. Provision of adequate PPE and monitoring of working conditions should also be part of this improvement of the work environment. There is also a need to completely eliminate child labour in informal activities to protect children from exposure to highly dangerous working conditions and school dropout.

- As stated in Jordan's Third National Communications Report for the Intergovernmental Panel on Climate Change (IPCC), there is a need to enhance community adaptive capacity in Jordan, especially through increasing women's skills and capacity-building opportunities. This should take place at the community level as well as in the political sphere to increase women's decision-making power, participation and contribution to the responses to climate change and other key environmental issues.<sup>55</sup>

**Key knowledge and information gaps in the solid waste management sector in Jordan must be addressed.**

- There is a crucial need for improved record-keeping on waste generation quantities, which is currently lacking in many final disposal sites. Periodic reporting on the amounts and characteristics of waste generated across Jordan should be put in place to increase available data and knowledge on the solid waste sector for implementing agencies and the public. This will inform relevant authorities on the impacts over time of improving recycling services and running awareness-raising campaigns on waste practices.
- There is a need to expand country-wide awareness and behaviour change campaigns focused on solid waste management in Jordan. Increased knowledge on the risks associated with unsustainable waste management should be clearly highlighted for the public alongside dissemination of messages on best practices and behaviours. Specific consideration should be given to targeting youth in these campaigns as leaders that could influence change in their communities. Harnessing the power and energy of youth will most likely lead to positive behavioural change, especially for future generations in Jordan. While young people are key drivers of change in waste practices, sensitization campaigns should also be tailored to the type of community, e.g. urban or rural, and its socio-economic status, as waste practices, consumption patterns and the types and amount of waste generated by households are likely to be influenced by geographical, economic, vocational and sociological factors.
- Gender-disaggregated data on waste collection and management should systematically be available to improve understanding of the needs of, practices undertaken and challenges faced by women involved in informal work in the solid waste management sector.

## OPTIMIZATION OF PRACTICES

**Sustainable waste management schemes that could greatly reduce the amount of waste entering final disposal sites should be introduced and implemented across Jordan.**

- Between 22–33% of waste generated in Jordan is recyclable and is composed of materials such as paper and cardboard, metals and aluminium, glass and plastics. Increasing recycling schemes across the country will not only reduce the amount of waste disposed of in final disposal sites, but will also improve local economies, preserve natural resources and improve the cleanliness of populated areas.
- Existing laws, regulations and standards should be revisited to allow for the use of mixed waste-based compost in agriculture.
- New, cost-effective methods should be sought for reuse of waste, including energy-recovery activities such as pyrolysis of unrecyclable plastics.
- Additional budget should be sought to upscale existing recycling activities and introduce new ones, in coordination with the donor community and the private sector, alongside the improvement of cost-efficiency of waste collection services at municipal level.
- Waste composting activities should be increased to significantly reduce the impact that solid waste has on the environment as well as reducing pressure on waste disposal sites. This will also contribute to the mitigation of climate change through soil improvement.

**The unexplored value of informal activities in the solid waste management sector should be documented.**

- It should be recognized that the informal sector provides many benefits to the solid waste management sector, including salvaging recyclable materials that are returned to the local economy. The informal sector encompasses a wide range of actors, including street litter pickers, waste collectors and buyers, who provide untapped potential for a nationwide recycling scheme. These actors also carry vital expertise and knowledge on the value and quantities of recyclable materials across Jordan.
- Opportunities should be developed for cross-collaboration between public and private sector solid waste management entities and community-based organizations in rural areas, to enhance awareness on waste management practices as well as managing waste and offering employment opportunities in waste management for residents.

## TO THE DONOR COMMUNITY (PRIORITIZATION OF NEEDS)

**Continued support to the Government of Jordan for improving the solid waste management sector in Jordan is essential.**

- For waste disposal sites, the donor community should support the Government of Jordan and local authorities in the rehabilitation and, where needed, closure of final disposal sites, especially those that pose high risks to local communities. This includes conducting key environmental and social assessments for the final disposal sites to ensure that environmental and social safeguards are considered in future planning.

**There should be increased support for optimization of municipal capacities.**

- Within the existing solid waste management framework in Jordan, municipalities are responsible for the collection, treatment and disposal of municipal solid waste. There is a need to improve the capacity of municipalities to deliver more sustainable waste management services to their respective areas through providing technical assistance. This includes support in optimizing and increasing the efficiency of municipal waste services to include higher waste recovery rates, improved accessibility and access for informal settlements and rural areas, and more hygienic waste disposal operations.

**Support for projects that aim to increase knowledge and awareness on solid waste management in Jordan should be prioritized.**

- There is a need for increased and improved behaviour change campaigns to address key issues in waste practices such as public littering and increased waste generation rates. Greater knowledge and awareness are likely to reduce contamination and pollution from unsustainable waste practices.

# NOTES

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