# JORDAN, AMMAN



#### Improving and Extending the Ghabawi Urban Municipal Solid Waste Landfill in Jordan

The Ghabawi Urban Municipal Solid Waste Landfill is a major waste management facility located 40 km away from Amman, Jordan. It serves as the primary disposal site for municipal solid waste generated in the capital city and its surrounding areas. The landfill was designed as an engineered landfill in 2001 and began operations in 2003. It is the largest waste disposal site in Jordan, receiving 55% of Jordan's entire waste, around 4,000 tonnes daily. This massive influx of waste contributes to substantial greenhouse gas accumulation and emissions, posing significant environmental challenges.

It is one of the most modern landfills in the region, incorporating various environmental safeguards and waste management technologies. Its continued development reflects Jordan's commitment to improving urban waste management and addressing environmental challenges associated with rapid urbanization. In recent years, the landfill has undergone several upgrades to improve its operational efficiency and environmental sustainability, with financial support from several institutions.

One of the major investments was the implementation of a landfill gas recovery system, through installation of a system to capture methane gas produced by decomposing waste, which was then converted into electricity. This not only reduced greenhouse gas emissions but also generated renewable energy, contributing to Jordan's energy supply. A leachate treatment facility was installed to prevent the contamination of groundwater and surrounding areas, treating the liquid that drains from the landfill, ensuring it meets environmental standards before being safely discharged. The landfill cells have been expanded and upgraded over the years, including the installation of better lining systems to prevent leaks and improve the containment of waste. Investments were made in sophisticated environmental monitoring systems to track air, water, and soil quality around the landfill while ensuring compliance with environmental regulations. Various improvements in waste management practices have been introduced, including more efficient waste compaction methods.



#### **IMPACTS TO ACHIEVE SDG 11.6.1**

- The landfill began receiving approximately 4,000 tonnes of waste daily in 2003. By the time the first operational phase was completed in 2014, three cells had been capped. Between 2014 and 2018, Cell 4 was utilized, and from 2018 onwards, operations transitioned to Cell 5.
- In general, waste received at the landfill is 50% organic, 16% plastics, 15% paper and cardboard, 8% textiles and napkins, 4% glass and metals, 1% compost material, 1% hazardous waste, 5% unclassified combustibles.
- Current lifetime is until 2035.
- 2019: With an installed capacity of 4.68 MW, an average of 106 MWh per day has been generated. The generators were running at 41.8% of rated load, an availability of 97.9% after discounting the required maintenance tasks. The power self-consumption used by the plant itself was less than 4.5% of the generated energy (results were measured after 14 days of uninterrupted operation).
- Reduction of GHG emissions from LFG emission from the existing and planned cells within the Landfill – 10,688,009 tonnes CO2eq of emissions reduction would be produced during the Landfill operation 2019 - 2035; 14,423,626 tonnes CO2eq of emissions reduction during the closure of the Landfill and aftercare up to 2075, which results in a total of 25,111,635 tonnes CO2eq of emissions reduction during the Ghabawi Landfill project lifetime, between 2019 - 2075.

### INSTITUTIONAL SUSTAINABILITY

The institutional sustainability of the Ghabawi Municipal Solid Waste Landfill Project was ensured through strong collaboration among the key beneficiaries and players. The Greater Amman Municipality (GAM) lead the project, providing essential oversight and integrating sustainable practices into the city's waste management strategy. The Ministry of Environment (MoEnv) played a crucial regulatory role, ensuring compliance with national and international environmental standards. Support from EBRD provided financial and technical resources, while technical consultants brought specialized expertise, enhancing the landfill's efficiency and environmental performance. This collective effort ensured the project's long-term viability and adaptability.

# PLANNING & MONITORING

A comprehensive monitoring plan was developed during the design phase of the Ghabawi landfill project to regularly evaluate key technical, environmental, and social indicators throughout the construction and operation phases. This plan includes specific performance indicators to track progress and assess impacts, with mitigation measures designed to reduce any negative effects to acceptable levels. Regular monitoring ensures compliance with these measures, helping to maintain the project's performance and minimize adverse impacts on the environment and surrounding communities.





Source: EBRD on Flickr





approximate area of 2 square kilometers.

weighing checkpoint, and a water well.

# CELL 5 CELL 6

The improvements works started in 2019 included connecting to the grid for power generated from cells 1, 2, and 3; capping cell 4 of the landfill and connecting it to the existing LFG recovery system and to the grid; construction and operation of the remaining cells; additional leachate lagoons; electricity generation from the LFG.

Originally designed as an engineered landfill with 9 cells, covering an

2019: 3 capped cells with a landfill gas collection network, one cell (Cell 4) pending capping and gas extraction, and a newly constructed operational cell (Cell 5); an administration building, a machinery maintenance workshop, a landfill gas extraction station with a flare, a landfill gas power

plant under construction, eight leachate lagoons, an access control and

- 2019: electricity generated from the landfill gas (4 cells) 4.8 MW capacity.
- 2022: electricity generated from the landfill gas (6 cells) 6.4 MW capacity

# STAKEHOLDER INVOLVEMENT

Stakeholder engagement required a complex approach to involve all key entities, which collaborated to ensure the successful implementation, operation, and regulation of the landfill, with each playing a crucial role in the project's overall sustainability and environmental impact management. Besides the key beneficiaries and players, GAM, EBRD and the MoEnv, additional stakeholders included the LFG (Landfill Gas) Operator, responsible for the landfill gas recovery and power generation system, IDOM, GAM's Technical Assistance Consultant, provided technical expertise and acted as the design-build engineer. The Jordanian Electric Power Company (JEPCO) ensured the integration of generated electricity into the existing grid. Lastly, ECO Consult served as the ESIA practitioner, facilitating environmental assessment and compliance.

Stakeholder engagement activities with national and governmental organisations, GAM, NGOs, and local community representatives were organized, either through bi-lateral meetings or e-mail communication, phone communication, and formal letters.

#### FINANCIAL SUSTAINABILITY

The project components were funded by loans and grants to GAM provided by the EBRD with support from European Union, the United Kingdom the EBRD's Southern and Eastern Mediterranean Multi-Donor Account (SEMED MDA) and Taipei China. A total of 87 million Jordanian Dinars were invested to improve the waste management services and infrastructure in 2015, followed by new financing package in 2021 (worth 14.7 million EUR).



Source: Constantine Hadjidimoulas





#### SOURCES



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