



Egis Insights | Thought Leadership

Designing Waste Systems that can Keep Pace with the Future —

Building infrastructure that meets today's operational needs while remaining flexible enough to absorb the technologies and regulations still to come.



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From the Margins of Planning to the Centre of Strategy —

Across the Gulf, waste management has moved from the margins of infrastructure planning to the centre of strategic decision-making. Rapid urbanisation, population growth, economic development, and changing consumption patterns are placing increasing pressure on existing waste management systems. At the same time, governments are setting more ambitious sustainability targets, public expectations continue to rise, and the range of available technologies is expanding rapidly.

This combination creates one of the key challenges facing the sector today: how to develop waste management systems that address today's operational needs while remaining flexible enough to integrate future technologies and evolving regulatory requirements.

The answer is not to choose between stability and innovation, but to design systems that can deliver both from the outset.

The GCC waste sector is entering a new phase of development. The region generates approximately 105–120 million tonnes of waste each year, while municipal solid waste generation averages between 1.6 and 2.0 kilograms per person per day—among the highest rates globally. Municipal waste streams are still dominated by organic waste, typically accounting for 40–50% of total generation, followed by plastics, paper, textiles, and a highly contaminated dry recyclable fraction. Despite significant investment in infrastructure, recycling rates generally remain between 5% and 15%.

Key Figures - GCC Waste Profile

105 – 120 Mt

Waste Generated
per Year

1.6 – 2.0 kg

Per Person
per Day

40 – 50 %

Organic Share of
Municipal Waste

5 – 15 %

Typical Recycling
Rate



The data highlights several structural characteristics of the GCC waste sector that directly influence infrastructure planning and technology selection.

These characteristics explain why some technologies consistently underperform, why others deliver better results, and why the sequence of infrastructure development is just as important as the technologies themselves. Across the GCC, several structural challenges continue to shape waste management performance:

Structural Challenges

- Waste generation continues to outpace treatment and recovery capacity in rapidly growing urban areas.
- Limited source segregation results in highly contaminated recyclable streams, reducing material quality and recovery rates.
- Organic waste remains the dominant fraction of municipal waste, while dedicated treatment capacity is still insufficient in many areas.
- Recycling markets continue to face inconsistent feedstock quality, limited end-market demand, and fluctuating commodity values.
- Landfilling continues to play a significant role in waste management across much of the region, highlighting the need to further strengthen resource recovery systems.

Together, these conditions reinforce a simple but important reality: advanced technologies alone cannot compensate for weak system foundations. Sustainable waste management begins with a well-designed system, supported by appropriate infrastructure, effective regulation, and reliable operational practices.



Building Stronger Waste Management Systems

The immediate priority is to strengthen the core infrastructure and governance needed to support future development.

Waste management systems must operate reliably before they can successfully integrate more advanced technologies. Strengthening collection, sorting and treatment infrastructure is a key step towards improving material recovery and reducing dependence on landfill. The most appropriate infrastructure will depend on local waste composition, collection systems and long-term strategic objectives. Without these foundations, achieving higher recovery rates and improved resource efficiency becomes significantly more difficult.

Sanitary landfills and legacy dumpsites also require structured rehabilitation programmes, including improved leachate management, landfill gas control, and long-term environmental monitoring. In parallel, hazardous and industrial waste streams require more consistent classification, permitting, and treatment pathways to reduce environmental and operational risks.

Waste-to-Energy is an important component of integrated waste management systems, particularly for managing residual waste that cannot be economically recycled. However, it should not be viewed as a standalone solution. Successful implementation depends on reliable waste data, predictable feedstock characteristics, and strong operational governance throughout the waste management chain. For this reason, the success of future waste infrastructure will depend as much on sound planning and procurement as on the technologies themselves. Procurement therefore becomes a strategic instrument for delivering long-term system performance.

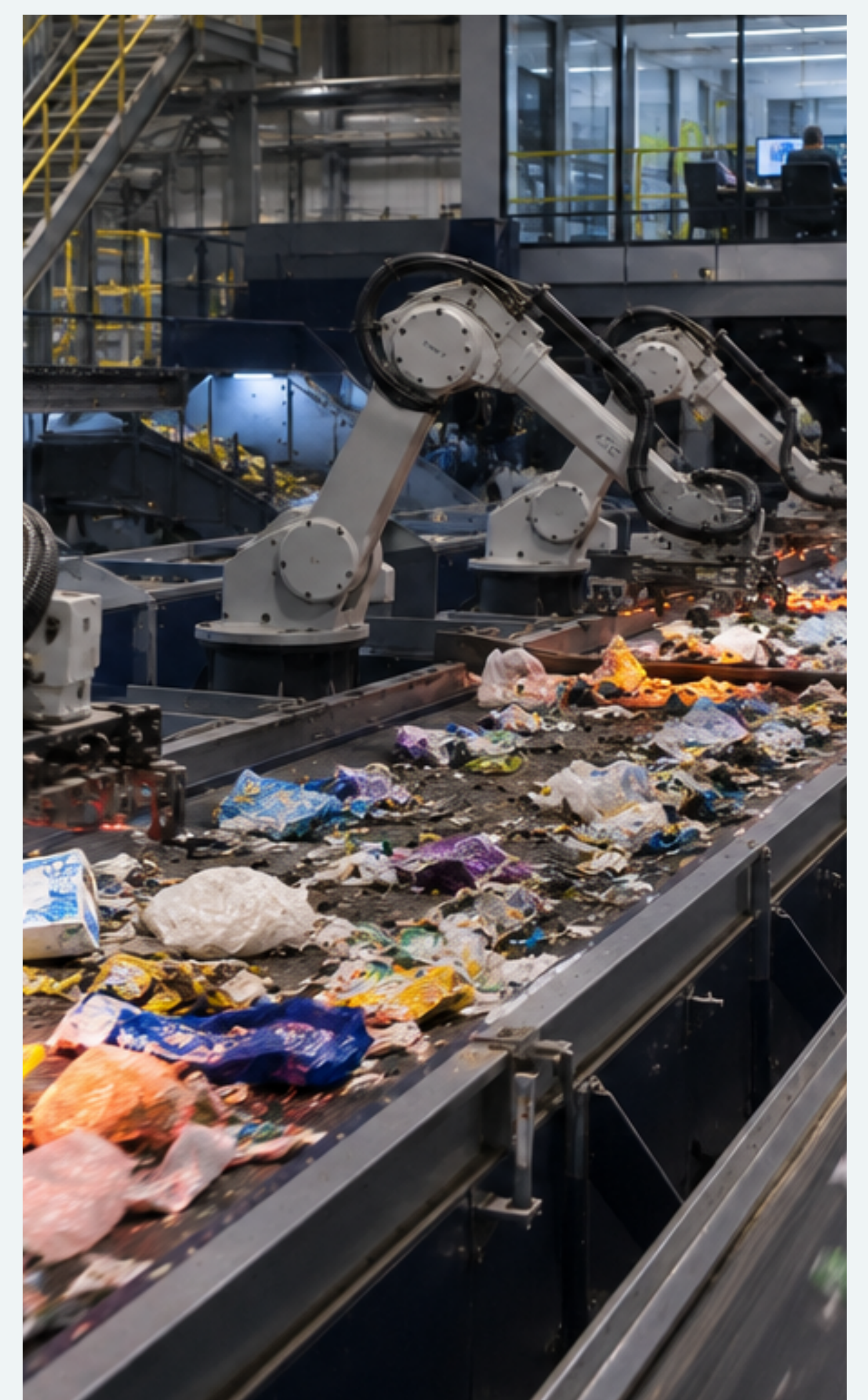
The greatest project risks rarely arise from technology itself, but from poor system integration, weak governance and unrealistic implementation planning.

Technology selection should be based on reliable waste characterisation data, operational requirements, lifecycle performance, and local market conditions. Proven technologies often provide the best starting point, provided they are implemented with sufficient flexibility to accommodate future improvements. Both public-private partnerships and traditional procurement models can deliver successful outcomes when responsibilities are clearly defined, risks are appropriately allocated, and contractual incentives support long-term operational performance.

Looking Beyond Today's Infrastructure

Future waste management systems should be designed with sufficient flexibility to accommodate technological advances while maintaining reliable operational performance.

Digitalisation is already transforming the sector through national waste tracking platforms, electronic permitting, real-time performance monitoring and data-driven decision making. Advanced sorting technologies, including robotics, near-infrared (NIR) sensors and AI-enabled object recognition, are improving material recovery and operational efficiency where appropriate waste streams and facility scale justify their application. At the same time, stronger regional recycling markets will depend on consistent feedstock quality, recognised material standards and greater industrial demand for recovered materials.



Looking further ahead, emerging Waste-to-Molecule technologies have the potential to become an important component of future circular economy systems. By converting selected residual waste streams into valuable chemical feedstocks through advanced thermal and catalytic processes, these technologies could strengthen the connection between waste management and the petrochemical industry. However, their successful deployment will depend on effective source segregation, reliable feedstock quality and commercially viable end markets. They should therefore be seen as complementary solutions that enhance resource recovery, rather than replacements for existing waste management infrastructure.

Future-ready waste management systems should be modular, scalable and adaptable. Collection, sorting, treatment, recovery and final disposal need to operate as an integrated system rather than as individual facilities. Equally important are effective governance, clear regulatory frameworks, reliable data and transparent performance monitoring to support continuous improvement.

Designing waste infrastructure today is no longer only about selecting technologies. It is about creating systems that can evolve technically, financially and institutionally as future requirements evolve. Equally important is ensuring that regulatory frameworks evolve alongside infrastructure, enabling performance-based oversight, better data-driven decision-making and continuous improvement across the sector.

The Bottom Line

The GCC is well positioned to accelerate this transition. Strong investment capacity established industrial ecosystems and long-term policy commitments provide a solid foundation for accelerating the transition from disposal-focused waste management towards integrated resource management and a more circular economy.



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