

MANAGEMENT CHALLENGES IN IMPLEMENTING CIRCULAR ECONOMY PRINCIPLES IN WASTE-MANAGEMENT PROJECTS IN UZBEKISTAN

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Abstract: The transition from a linear waste-management model to a circular economy has become an important part of Uzbekistan's environmental and economic development agenda. While recent reforms have expanded waste-collection infrastructure, recycling initiatives, public-private partnerships and waste-to-energy projects, the practical implementation of circular economy principles remains challenging. This paper examines the major management challenges that affect the implementation of circular economy principles in waste-management projects in Uzbekistan. Attention is given to institutional coordination, infrastructure and technology, financial sustainability, waste separation, human capacity, public participation, and project monitoring. The paper uses a conceptual and analytical approach based on recent policy documents, project reports and academic literature. The analysis suggests that successful circular waste-management projects require more than investment in physical infrastructure. They also depend on effective coordination between government institutions, municipalities, private companies and local communities. Strengthening project-management capacity, improving source separation, creating stable markets for recycled materials, introducing measurable circularity indicators, and increasing public participation are therefore essential for Uzbekistan's transition toward a more resource-efficient waste-management system.

Keywords: *Circular economy, waste management, project management, recycling, sustainability, Uzbekistan, resource efficiency*

Introduction.

Waste management is increasingly becoming an economic and managerial issue rather than simply an environmental one. Traditional waste systems generally follow a linear model: resources are extracted, products are manufactured and consumed, and the remaining materials are disposed of. A circular economy, in contrast, seeks to retain the value of materials for as long as possible through reduction, reuse, repair, recycling and resource recovery.

For Uzbekistan, this transition is particularly relevant because economic growth, urbanization and population growth are increasing the pressure on existing waste-management systems. The country has already introduced several reforms aimed at improving collection, disposal and recycling. The national strategy for municipal

solid waste management for 2019–2028, for example, identified the development of modern recycling systems and the reduction of waste sent to landfills as important policy objectives. More recent reforms have moved further toward a circular-economy approach. In March 2025, Presidential Decree No. UP-56 identified the reduction of existing landfills and the wider introduction of circular-economy practices as major directions for the waste sector. At the same time, large-scale investment projects involving waste processing and energy recovery are being developed.

However, introducing circular economy principles into a waste-management project is considerably more complicated than constructing a recycling plant or purchasing waste-collection equipment. It requires changes in the way projects are planned, financed, implemented and evaluated. Therefore, the central question of this paper is: What are the main management challenges that may limit the implementation of circular economy principles in waste-management projects in Uzbekistan?

1. Circular Economy and Waste-Management Projects

Circular economy principles change the traditional understanding of waste. In a linear system, waste is generally considered the final stage of consumption. In a circular system, waste can become a source of secondary raw materials, energy or other economic value.

This distinction is important from a project-management perspective. A conventional waste-management project may focus primarily on collection, transportation and final disposal. A circular project must consider the entire material flow. This includes how waste is generated, separated, collected, transported, processed and returned to economic activity.

International research indicates that circular-economy implementation is affected by several interconnected barriers. These include technological, institutional, economic and cultural factors. Research on developing regions also shows that infrastructure limitations, financial constraints, public behavior and weak policy implementation can reduce the effectiveness of waste-management systems.

Consequently, project managers should not treat circularity as an additional environmental component of an existing project. It needs to be incorporated into project objectives, procurement decisions, financial planning, stakeholder management and performance evaluation from the beginning.

2. Current Context of Waste Management in Uzbekistan

Uzbekistan has made considerable progress in modernizing its waste-management system. The government has increased attention to separate collection, recycling, private-sector participation and technological modernization. According to

government information, the country has been developing recycling activities for materials such as polyethylene, paper, glass, textiles, metals, used oils and tires.

The scale of the challenge, however, remains significant. Government information published in 2024 reported that Uzbekistan generates millions of tons of household waste annually while the proportion recycled remained relatively low. This demonstrates the difference between establishing waste infrastructure and creating a functioning circular system.

The Sustainable Solid-Waste Management Project supported by the Asian Development Bank provides an important example. Its objectives include improving collection systems, strengthening institutional capacity, improving the regulatory framework, increasing public awareness and developing environmental monitoring capacity. These components demonstrate that waste management is not simply an infrastructure problem; it is also a governance and project-management problem. Recent reforms have also strengthened the institutional framework. Uzbekistan established a dedicated Agency for Waste Management and Circular Economy Development, with responsibilities related to waste-management policy and the development of circular-economy practices.

3. Major Management Challenges

Institutional Coordination: One of the main challenges is coordination among the different organizations involved in waste-management projects. Such projects may involve ministries, regional administrations, municipal service providers, private companies, investors, recycling enterprises and local communities.

Circular economy projects make this coordination even more important because waste moves across organizational and economic boundaries. For example, effective recycling requires coordination between households that separate waste, collection companies that transport it, sorting facilities that process it, and manufacturers that purchase secondary materials. If responsibilities are unclear, projects can experience delays, duplicated functions or gaps in accountability. Research on circular-economy governance similarly emphasizes that policy coherence, institutional capacity and collaboration between stakeholders are necessary conditions for successful implementation.

For Uzbekistan, this means that project governance should clearly define who is responsible for collection, sorting, processing, monitoring and the final use of recovered materials.

Infrastructure and Technological Limitations: Circular economy projects require infrastructure that supports material recovery. Collection containers alone are

insufficient if waste is subsequently mixed during transportation or delivered to facilities without adequate sorting capacity.

This creates a practical management problem: investments must be made across the entire value chain rather than in isolated facilities. A modern recycling plant cannot operate efficiently if it receives contaminated or poorly separated waste.

Recent ADB research on Uzbekistan also highlights the importance of combining improved landfill design with systematic waste minimization and resource recovery to move toward a circular economy. Therefore, project planning should consider the compatibility of collection systems, sorting facilities, recycling technologies, transportation networks and final markets for recovered materials.

Financial Sustainability: The initial investment required for circular waste-management infrastructure can be substantial. Recycling facilities, sorting equipment, specialized vehicles, digital monitoring systems and waste-to-energy technologies require significant capital.

However, the financial challenge does not end when construction is completed. Projects must also cover operating and maintenance costs. A facility may be technically successful but financially unsustainable if there is insufficient demand for recycled materials or if user fees do not cover service costs.

The experience of Uzbekistan's waste-management reforms shows why cost recovery and sustainable operation are important. The ADB-supported Sustainable Solid-Waste Management Project explicitly incorporates asset operation, performance-based approaches and cost recovery into its project design. For future projects, financial planning should therefore consider not only construction costs but also long-term operating expenses, revenue from recovered materials, service tariffs, government support and potential private investment.

Waste Separation and Public Behavior: A circular economy cannot function effectively without changes in consumer behavior. Source separation is particularly important because mixed waste reduces the quality and economic value of recyclable materials.

This makes public participation a management issue. Awareness campaigns alone may not be sufficient if citizens do not have convenient collection points, clear instructions or incentives to separate waste.

The government has already moved toward separate collection systems and has emphasized public awareness as part of sector reform. Nevertheless, the effectiveness of these measures depends on how consistently they are implemented at the local level. Project managers should therefore include communication and behavioral components in project design rather than treating them as secondary activities.

Human Capacity and Professional Skills: Circular economy projects require a broader range of professional skills than traditional waste disposal. Managers and specialists need knowledge of environmental regulation, recycling technologies, procurement, financial planning, stakeholder engagement, data management and environmental monitoring.

The ADB's waste-management project in Uzbekistan has included institutional capacity building and environmental education among its core components. This illustrates the importance of human resources in determining whether infrastructure investments produce sustainable results. Training should consequently be considered a continuing part of project implementation rather than a one-time activity.

Monitoring and Measuring Circularity: Another challenge is determining whether a project is genuinely becoming more circular. Traditional waste-management indicators often focus on the amount of waste collected or transported. These indicators are useful, but they do not fully measure resource recovery.

A circular project should also monitor indicators such as:

- percentage of waste separated at source;
- percentage of collected waste sent for recycling;
- quantity of recovered secondary materials;
- reduction in landfill disposal;
- energy recovered from waste;
- operational cost per ton;
- revenue generated from recovered materials; and
- public participation in separate collection.

The introduction of digital monitoring can strengthen this process. Uzbekistan has already been developing electronic systems for monitoring waste-management services and improving transparency in the sector.

4. Recommendations for More Effective Project Management:

Based on the challenges discussed above, several practical measures can support the implementation of circular economy principles in Uzbekistan.

First, circularity should be incorporated at the project-design stage. Recycling, reuse and resource recovery should be treated as core project objectives rather than optional additions.

Second, projects should be planned as integrated systems. Investment in collection, sorting, recycling and final disposal should be coordinated. Developing one part of the system without the others can create operational bottlenecks.

Third, public-private partnerships should be strengthened, particularly where private companies can provide technological expertise and investment. At the same

time, contractual arrangements should include measurable environmental and service-performance requirements.

Fourth, stable markets for recycled materials need to be developed. Recycling becomes economically attractive when recovered materials have predictable demand. Public procurement policies and incentives for businesses using secondary raw materials could contribute to this process.

Fifth, local communities should be treated as project stakeholders rather than passive beneficiaries. Their participation can improve source separation, identify service problems and increase public trust.

Finally, project performance should be evaluated using both financial and circularity indicators. A project that is financially successful but continues to send most of its waste to landfills cannot be considered fully circular.

Conclusion.

Uzbekistan is moving toward a more modern and environmentally sustainable waste-management system, and recent reforms demonstrate a clear policy interest in circular economy principles. Nevertheless, the transition is not simply a technological task. It requires changes in project governance, financing, infrastructure planning, human-resource development and public behavior.

The main management challenge is therefore to connect these different elements into one functioning system. Recycling facilities, modern collection vehicles and waste-to-energy plants can contribute to circularity, but their effectiveness depends on how well they are integrated into the broader waste-management chain. For Uzbekistan, the next stage of development should focus not only on building new infrastructure but also on improving the management of existing and future projects. Clear institutional responsibilities, long-term financial planning, reliable data, professional capacity, public participation and measurable circularity indicators can help ensure that investments produce lasting environmental and economic benefits.

A successful circular economy in Uzbekistan will ultimately depend on treating waste not simply as something that needs to be removed, but as a resource whose economic and environmental value can be retained. This shift in perspective should become one of the central principles guiding the planning and management of future waste-management projects.

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