

Midocean University

Management College

Project Management



Project Title:

Developing a Comprehensive Waste Management Strategy for Riyadh:
Analyzing Barriers and Opportunities for Achieving a Zero-Waste City

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Study Problem:

The city of Riyadh, the capital and largest city of the Kingdom of Saudi Arabia, faces a significant challenge in managing the growing volume of household waste generated within its boundaries. With a rapidly expanding population and a thriving economy, Riyadh's residents produce an average of 1.5 kilograms of waste per person per day, resulting in a staggering total of over 12,000 tons of municipal solid waste every day (Al-Zahrani et al., 2021).

The current waste management system in Riyadh is primarily focused on landfill disposal, with limited efforts made towards recycling, composting, or other sustainable waste management practices. This linear approach to waste management not only places a significant burden on the environment but also represents a missed opportunity to transform waste into valuable resources.

The transition towards a zero-waste or circular economy model has become a global priority, as it promises to reduce the environmental impact of waste, conserve natural resources, and create new economic opportunities. Several cities around the world have already embarked on ambitious programs to reduce household waste, increase recycling and reuse rates, and work towards the ultimate goal of achieving a waste-free urban environment (Zaman & Lehmann, 2013). However, the unique cultural, economic, and infrastructural context of Riyadh poses distinct challenges that must be carefully examined and addressed.

The primary study problem this research project aims to address is the lack of a comprehensive waste management strategy in Riyadh that effectively integrates sustainable practices and addresses the specific barriers to achieving a zero-waste city. Despite the growing recognition of the need for a more sustainable approach to waste management, the city currently lacks a well-defined, data-driven strategy that can guide policymakers, waste management authorities, and the broader community towards this goal.

The study problem can be further broken down into the following key components:

1. Understanding the current state of household waste management in Riyadh: This includes an in-depth analysis of the existing waste management system, including waste generation patterns, collection and transportation methods, disposal practices, and the role of various stakeholders.
2. Identifying the barriers to implementing sustainable waste management practices: These barriers may include, but are not limited to, cultural attitudes towards waste, economic factors, infrastructural limitations, institutional and regulatory challenges, and the availability of technological solutions.
3. Exploring the opportunities and enablers for achieving a zero-waste city: This involves examining best practices from other cities that have successfully implemented circular waste management models, as well as identifying potential technological innovations, policy interventions, and public engagement strategies that could be tailored to the Riyadh context.
4. Developing a comprehensive waste management strategy for Riyadh: Based on the findings from the previous components, this research project aims to propose a holistic strategy that outlines specific, actionable steps to transform Riyadh's waste management system and transition the city towards a zero-waste future.

By addressing these key components, this research project will provide valuable insights and recommendations to guide Riyadh's journey towards a more sustainable and resource-efficient urban environment, ultimately contributing to the broader global efforts in tackling the challenge of municipal solid waste management.

Importance of the Study:

Firstly, the study addresses an urgent and growing challenge faced by Riyadh, as the city grapples with the ever-increasing volume of household waste generated by its rapidly expanding population and economic activities. The current linear approach to waste management, which is heavily reliant on landfill disposal, is neither environmentally sustainable nor economically efficient. As landfills reach capacity and the environmental consequences of improper waste management become more severe, the need for a paradigm shift in Riyadh's waste management system is paramount.

By developing a comprehensive strategy that integrates sustainable practices and addresses the unique barriers faced by the city, this research project has the potential to transform Riyadh into a model for waste management in the region and beyond. The successful implementation of such a strategy could serve as a blueprint for other cities in the Gulf Cooperation Council (GCC) region, which share similar cultural, economic, and infrastructural contexts, as they strive to address their own waste management challenges.

Moreover, the transition towards a zero-waste or circular economy model aligns with the broader global sustainability agenda. The United Nations' Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production), emphasize the importance of sustainable waste management as a key component of building resilient and environmentally-conscious urban centers. By addressing this crucial aspect of urban sustainability, the proposed research contributes directly to the achievement of these global development goals.

From an economic perspective, the shift towards a more sustainable waste management system holds significant potential for creating new job opportunities and fostering innovative business models. The circular economy approach encourages the recovery, reuse, and recycling of waste materials, which can lead to the emergence of new industries and the expansion of existing ones. This, in turn, can contribute to economic diversification, job creation, and the development of a more sustainable and resilient local economy in Riyadh.

Furthermore, the successful implementation of a comprehensive waste management strategy in Riyadh would have positive implications for the city's environmental and public health outcomes. Reducing the reliance on landfills and promoting sustainable waste management practices can help mitigate the negative impacts on air quality, soil, and groundwater, as well as improve the overall quality of life for Riyadh's residents. This is particularly important in the context of Riyadh, where environmental sustainability and public health have become increasingly prominent concerns among policymakers and the community.

In conclusion, the proposed research on developing a comprehensive waste management strategy for Riyadh holds significant importance for the city, the broader GCC region, and the global sustainability agenda. By addressing the pressing challenge of municipal solid waste management, this study has the potential to contribute to the transformation

of Riyadh into a more sustainable, resilient, and livable urban center, serving as a model for other cities aspiring to achieve a zero-waste future.

Object of the Study:

The study will focus on the following key objectives:

1. Conduct a comprehensive assessment of the current state of household waste management in Riyadh.

This objective involves a thorough examination of the existing waste management system, including:

- Waste generation patterns and composition.
- Waste collection and transportation methods.
- Disposal practices, such as landfilling and open dumping.
- The roles and responsibilities of various stakeholders, including the municipal government, waste management authorities, private sector entities, and the general public.

2. Identify the barriers to implementing sustainable waste management practices in Riyadh.

The study will explore the various barriers that hinder the adoption of more sustainable waste management approaches in the city, such as:

- Cultural attitudes and behaviors towards waste.
- Economic factors, including the cost of implementing new waste management technologies and infrastructure.
- Infrastructural limitations, such as the availability and condition of waste collection and processing facilities.
- Institutional and regulatory challenges, including the lack of comprehensive policies and enforcement mechanisms.
- Technological constraints, including the availability and accessibility of waste management solutions.

3. Explore the opportunities and enablers for achieving a zero-waste city in Riyadh.

Building on the assessment of the current system and the identified barriers, the research will examine the potential opportunities and enablers that could facilitate the transition towards a zero-waste city, such as:

- Best practices and successful case studies from other cities that have implemented circular waste management models.
- Innovative technological solutions, including advanced waste sorting, recycling, and conversion technologies.
- Policy interventions and regulatory frameworks that could incentivize sustainable waste management practices.
- Public engagement strategies and educational campaigns to raise awareness and foster behavioral changes among Riyadh's residents.

4. Develop a comprehensive waste management strategy for Riyadh.

The culmination of the research study will be the formulation of a comprehensive waste management strategy for Riyadh that outlines specific, actionable steps to transform the city's waste management system and move towards a zero-waste future.

The strategy will incorporate the findings from the previous objectives and provide a roadmap for implementation, including:

- Short-term, medium-term, and long-term goals and targets.
- Detailed implementation plans for key initiatives and interventions.
- Recommendations for institutional, regulatory, and financial mechanisms to support the strategy's execution.
- Monitoring and evaluation frameworks to track progress and ensure the strategy's effectiveness.

Previous Studies:

1. Waste Management Practices in Saudi Arabia:

- Several studies have examined the current state of waste management in various cities across Saudi Arabia, including Riyadh, Jeddah, and Dammam. These studies have investigated waste generation patterns, collection and disposal methods, and the existing challenges faced by municipalities.

- For example, a 2018 study by Al-Zahrani et al. analyzed the solid waste management practices in Riyadh and identified the need for improved waste segregation, recycling, and public awareness campaigns.

2. Barriers to Sustainable Waste Management in Developing Countries:

- Numerous studies have explored the common barriers to implementing sustainable waste management practices in developing countries, including economic, institutional, infrastructural, and sociocultural factors.

- A 2016 review by Guerrero et al. synthesized the barriers to sustainable waste management in low- and middle-income countries, such as limited financial resources, lack of public awareness, and weak policy enforcement.

3. Successful Case Studies of Zero-Waste Cities:

- There are several examples of cities around the world that have made significant progress towards achieving zero-waste or circular waste management models, such as San Francisco, Kamikatsu (Japan), and Parla (Spain).

Theoretical Frameworks:

1. Circular Economy:

- The circular economy framework, which emphasizes the reduction, reuse, and recycling of resources, can provide a theoretical foundation for the development of a comprehensive waste management strategy for Riyadh.

- This approach encourages the transition from a linear "take-make-waste" model to a more sustainable, closed-loop system that minimizes waste and maximizes resource recovery.

2. Socio-Technical Systems Theory:

- This theoretical perspective recognizes the importance of the interaction between social and technical elements in the success of waste management systems.

- It can help analyze the complex interdependencies between the technological, institutional, and behavioral aspects of waste management in Riyadh.

3. Stakeholder Theory:

- Stakeholder theory emphasizes the need to consider the diverse interests and roles of various stakeholders, including the municipal government, waste management authorities, private sector entities, and the general public, in the development and implementation of the waste management strategy.

Theoretical premises of the study:

1. Circular Economy Theory:

- The study is grounded in the principles of the circular economy, which seeks to transform the traditional linear "take-make-waste" model of resource use into a closed-loop system that maximizes resource recovery, reuse, and recycling.
- This theoretical framework recognizes the need to shift away from the current waste management practices in Riyadh, which are predominantly linear and focused on disposal, towards a more sustainable, circular approach.

2. Socio-Technical Systems Theory:

- The study adopts a socio-technical systems perspective, acknowledging that the success of waste management systems depends on the complex interactions between technological, social, and institutional factors.
- This theoretical premise suggests that addressing the barriers to sustainable waste management in Riyadh requires a holistic approach that considers not only the technical aspects but also the sociocultural, economic, and regulatory dimensions.

3. Stakeholder Theory:

- The study is premised on the importance of engaging and aligning the diverse stakeholders involved in the waste management system in Riyadh, including the municipal government, waste management authorities, private sector entities, and the local community.
- This theoretical framework emphasizes the need to understand the different interests, roles, and responsibilities of these stakeholders and develop a collaborative approach to designing and implementing the waste management strategy.

4. Behavioral Change Theory:

- The study recognizes the critical role of public awareness, attitudes, and behaviors in the success of sustainable waste management practices.
- Underlying this premise is the notion that fostering behavioral changes among Riyadh's residents, through targeted educational campaigns and community engagement, is essential for achieving a zero-waste future.

5. Technological Innovation Theory:

- The study is premised on the importance of leveraging technological innovations, such as advanced waste sorting, recycling, and conversion technologies, to overcome the current limitations and constraints in Riyadh's waste management system.

- This theoretical perspective suggests that the strategic adoption and adaptation of suitable technological solutions can play a crucial role in the transition towards a more sustainable and resource-efficient waste management model.

Methodology and research methods:

1. Mixed-Methods Approach:

- The study will employ a mixed-methods approach, combining both qualitative and quantitative research methods to gain a comprehensive understanding of the waste management system in Riyadh.

2. Literature Review:

- The research will begin with a thorough literature review to examine the existing body of knowledge on waste management practices, barriers, and successful case studies in Saudi Arabia and other developing countries.

- This will help establish a solid theoretical and empirical foundation for the study and identify knowledge gaps.

3. Stakeholder Interviews:

- In-depth interviews will be conducted with key stakeholders involved in the waste management system in Riyadh, including:

- Municipal authorities and waste management agencies

- Private waste management companies

- Community representatives and residents

- Experts and academics in the field of waste management

- These interviews will help understand the diverse perspectives, roles, and concerns of the stakeholders, as well as identify the existing barriers and opportunities.

4. Waste Composition Analysis:

- Field surveys and sampling will be carried out to analyze the composition and characteristics of the waste generated in Riyadh.

- This will provide insights into the waste generation patterns, the potential for recycling and recovery, and the specific waste streams that need to be targeted.

5. Site Visits and Observations:

- The research team will conduct site visits to observe the existing waste collection, transportation, and disposal practices in Riyadh.

- This will include visiting waste collection points, transfer stations, and landfill or dumping sites to assess the infrastructure, operations, and management practices.

6. Household Surveys:

- Surveys will be administered to a representative sample of Riyadh's households to gather data on waste generation, storage, and segregation practices, as well as residents' attitudes and behaviors towards waste management.

- This will help identify the socio-cultural factors that influence waste management practices and inform the design of public engagement strategies.

7. Benchmarking and Case Study Analysis:

- The study will analyze successful case studies of zero-waste or circular waste management initiatives in other cities, both within Saudi Arabia and internationally.

- This will involve a benchmarking process to identify best practices, innovative solutions, and the key factors that enabled their success, which can be adapted to the Riyadh context.

8. Scenario Analysis and Strategy Development:

- Based on the findings from the various research methods, the study will employ scenario analysis to explore different pathways and options for transforming Riyadh's waste management system.

- This will lead to the development of a comprehensive waste management strategy for Riyadh, outlining the short-term, medium-term, and long-term goals, as well as the detailed implementation plans and monitoring frameworks.

Study Tools:

1. Stakeholder Interviews:

- Semi-structured interviews will be conducted with key stakeholders, including:

- Municipal authorities and waste management agencies.

- Private waste management companies.

- Community representatives and residents.

- Experts and academics in the field of waste management.

- The interview guide will be designed to elicit information on the current waste management practices, challenges, barriers, and potential solutions from the diverse stakeholder perspectives.

2. Waste Composition Analysis:

- Field surveys and waste sampling will be carried out to determine the composition and characteristics of the waste generated in Riyadh.

- The data collection will involve the following tools:

- Waste sampling and sorting protocols to classify the waste into different categories (e.g., organic, recyclables, hazardous).

- Weighing and measurement instruments to quantify the volume and weight of the various waste streams.

- Documentation and recording templates to systematically capture the waste composition data.

3. Household Surveys:

- Structured questionnaires will be administered to a representative sample of Riyadh's households to gather data on:

- Household waste generation and disposal practices.

- Awareness and attitudes towards waste management.

- Barriers and incentives for adopting sustainable waste behaviors.

- The survey design will incorporate both closed-ended and open-ended questions to collect both quantitative and qualitative data.

4. Site Visits and Observations:

- The research team will conduct site visits and observations at various waste management facilities, including:

- Waste collection points and transfer stations.

- Landfill or dumping sites.

- Recycling and recovery facilities (if any)

- The observations will be documented through:

- Photographs and video recordings.

- Checklists and observation protocols to systematically record the infrastructure, operations, and management practices.

- Field notes and reflections on the existing waste management system.

5. Document Review and Analysis:

- The study will involve a comprehensive review and analysis of relevant documents, including:

- Municipal waste management policies, regulations, and reports.

- Waste management plans and strategies (if available).

- Existing waste-related data and statistics.

- Academic literature and case studies on waste management practices.

6. Benchmarking and Case Study Analysis:

- The research team will gather data on successful waste management initiatives and best practices from other cities, both within Saudi Arabia and internationally.
- This will involve the collection of information through:
 - Desk research and literature review.
 - Interviews or consultations with experts and practitioners from the benchmark cities.
 - Analysis of publicly available data and reports on the selected case studies.

Study Limitations:

1. Scope and Geographical Limitations:

- The study is focused solely on the city of Riyadh, which may limit the generalizability of the findings to other cities or regions within Saudi Arabia.
- The waste management challenges and solutions identified in Riyadh may not be directly applicable to other urban centers in the country, which may have different socio-economic, cultural, and infrastructural contexts.

2. Data Availability and Reliability:

- The study may face challenges in accessing comprehensive and reliable data on waste generation, composition, and management practices in Riyadh.
- Existing municipal records and waste-related statistics may be incomplete or outdated, which could affect the accuracy of the analysis.

3. Stakeholder Engagement and Accessibility:

- Gaining access to and securing the participation of key stakeholders, such as municipal authorities and private waste management companies, may be challenging.
- The research team may face difficulties in engaging with certain stakeholder groups, particularly marginalized communities or informal waste workers, which could limit the diversity of perspectives captured.

4. Cultural and Behavioral Factors:

- The study's findings may be influenced by the unique cultural and behavioral norms related to waste management practices in Riyadh.
- Changing entrenched attitudes and habits towards waste disposal and recycling may require long-term, sustained interventions that are beyond the scope of this study.

5. Limitations of Household Surveys:

- Household surveys, although valuable in capturing residents' perspectives, may be subject to self-reporting bias and may not fully reflect the actual waste management practices at the household level.
- Reaching a representative sample of Riyadh's diverse population, including low-income and marginalized communities, may pose challenges.

6. Practical and Logistical Constraints:

- The research team may encounter practical and logistical challenges in conducting field surveys, waste sampling, and site visits, such as access to waste management facilities, transportation, and coordination with various stakeholders.
- The COVID-19 pandemic may also introduce additional constraints and safety concerns that could affect the data collection process.

To mitigate these limitations, the research should consider the following strategies:

- Adopting a mixed-methods approach to triangulate data from various sources and enhance the validity of the findings
- Exploring opportunities for collaboration with local authorities and waste management companies to improve data accessibility
- Designing inclusive stakeholder engagement strategies to capture diverse perspectives, including marginalized groups
- Incorporating longitudinal or repeated data collection to monitor changes in waste management behaviors over time
- Acknowledging the context-specific nature of the findings and highlighting the need for further research in other Saudi Arabian cities or regions.

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