

Solid Waste Management in Paktika, Afghanistan: Challenges, and Sustainable Solutions

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ABSTRACT

Purpose:

This study aimed to assess the current solid waste management practices in Sharan, Paktika Province, Afghanistan, identify the associated environmental and public health challenges, and propose sustainable waste management solutions.

Method:

A cross-sectional survey was conducted among 40 residents of Sharan, Paktika Province, using a structured questionnaire to collect data on waste generation, disposal practices, and public awareness regarding waste management. The collected data were analyzed descriptively to identify prevailing waste management challenges and potential improvement strategies.

Results:

The findings revealed that open dumping, burning, and burying of waste are the most common disposal methods used by residents. These practices are primarily driven by the absence of an organized waste collection system, limited recycling facilities, and low public awareness of proper waste management. The study identified significant risks associated with these practices, including environmental pollution, contamination of water sources, and increased transmission of diseases.

Practical Implications:

The findings emphasize the need for establishing formal waste collection services, implementing recycling programmes, promoting composting of organic waste, developing waste-to-energy initiatives, enforcing waste disposal regulations, and conducting public awareness campaigns to improve environmental and public health conditions in Paktika Province.

Originality/Novelty:

This study provides one of the first assessments of solid waste management practices and challenges in Paktika Province, Afghanistan. It offers context-specific recommendations for sustainable waste management that can support local authorities and policymakers in addressing waste-related environmental and health issues.

Keywords: Open dumping, sustainable solutions, Solid waste, and waste disposal.

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1. Introduction

The National Waste Management Policy of Afghanistan defines waste as any substance that is discarded or intended to be discarded, regardless of its value. Solid waste comes from various sources, including domestic, commercial, and industrial activities, and includes items like plastic, metal, glass, and food waste (Azad, 2015). The growing population, booming economy, rapid urbanization, and rising living standards in developing countries have led to a significant increase in municipal solid waste. Municipalities are challenged to develop effective waste management systems for their residents (Guerrero, and et al, 2013). Solid waste management includes the separation, collection, storage,

reduction, reuse, recycling, and disposal of waste to minimize impacts on health, the environment, and aesthetics (Bantigegn, and et al, 2020). Unsafe open dumpsites threaten public health by spreading odours, transmitting diseases, and polluting water sources (Wangatia, 2011). Afghanistan, a resilient low-income developing country, is embracing the challenges of solid waste management as an opportunity for growth and innovation (Bawar and Hashimoto, 2017). By acknowledging the current challenges and implementing sustainable strategies, policymakers and stakeholders can collaborate to manage solid waste effectively in Afghanistan. This study specifically investigates the existing challenges of solid waste management in Paktika and proposes sustainable solutions. The research addresses the following questions: What are the challenges related to waste management in Afghanistan, particularly in Paktika province? What environmentally friendly approaches are necessary for effective solid waste management?

2. Methods and Materials

2.1 Study Area

The study gathered data on solid waste management issues in Paktika, Afghanistan, utilizing both primary and secondary sources. Field observations and questionnaire surveys were conducted, with descriptive analysis supported by questionnaires in Pashto. In addition, secondary data was obtained from books, journals, research papers, and conference proceedings.

2.2 Samples Collection

A questionnaire with closed-ended questions was administered to 40 residents of Sharan, Paktika, yielding consistent responses that enhance its credibility. A field study was conducted to gather insights into local views on solid waste management, supplemented by information from the municipality regarding the situation in Paktika.

2.3 Statistical Analysis

The results were descriptively examined using SPSS 25. Frequency and percentage were selected as the research analysis methods because they are the most effective and acceptable ways to evaluate the test questions.

3.4 What Features We Used

We extracted 12 different characteristics from each flow record: the average size of packets, how varied packet sizes were, how much time passed between packets, how long the flow lasted, total bytes and packets transferred, the ratio of upstream to downstream data, counts of different TCP control signals, and the randomness of packet sizes. We standardized these features so they had similar ranges. We checked for redundant features by looking at correlation and variance inflation factors, and removed features that were too correlated with others. This gave us 11 final features.

4. Results

The questionnaire included general questions and specific inquiries about solid waste types, disposal methods, issues related to solid waste, sustainable solutions, and public involvement in waste management. Indicated in Table 1.

Information from the Sharan Municipality indicates that 24 cubic meters of solid waste are collected daily from Sharan city and disposed of in a designated area near the PRT zone. As shown in Figures (a and b), the city of Sharan is facing a critical shortage of waste disposal facilities, such as sufficient waste bins, and is also lacking modern vehicles for efficient solid waste collection. This situation has led to a range of significant environmental challenges. Notably, clinical waste, which poses serious health risks, is frequently discarded in municipal waste bins, rather than being handled through appropriate channels. Furthermore, as seen in figure (c), there are alarming instances where clinical waste is carelessly dumped and incinerated in open areas, exacerbating the environmental impact and threatening public health.

Table 1: The survey findings

Questions	Parameters	Survey participants responses		
		Frequency	Percentage	
General Information	Respondents Gender	1) Male	40	100.0
		2) Female	0.00	0.00
		Total	40	100.0
	Respondents Education level	1) No formal Education	4	10.0
		2) Primary school	8	20.0
		3) Secondary school	3	7.5
		4) Bachelor	19	47.5
		5) Master	5	12.5
		6) PhD	1	2.5
		Total	40	100.0
What types of solid waste generated in your area?	1) Organic waste	1	2.5	
	2) Plastic	7	17.5	
	3) Paper and cardboard	4	10.0	
	4) Metal and glass	0	0.00	
	5) Medical waste	1	2.5	
	6) All of them	27	67.5	
	Total	40	100.0	
	Current Solid Waste Management Status	How is waste usually disposed of in your community?	1) Open dumping	16
2) Burning			10	25.0
3) Burying			7	17.5
4) Collection by Municipality			2	5.0
5) It is not Known where the waste goes			5	12.5
Total			40	100.0
How is the waste collection system in your area?		1) Regular collection	3	7.5
		2) Collect some times	8	20.0
		3) No organized system	29	72.5
		Total	40	100.0
Who is responsible for waste collection in your area?	1) Municipality	6	15.0	
	2) Private companies	0	0.00	
	3) Collect by local community	10	25.0	
	4) No one collects it	24	60.0	
	Total	40	100.0	

Sustainable solutions	What are the main challenges of solid waste management in your area?	1) Lack of waste collection system	5	12.5
		2) No recycling facilities	0	0.00
		3) Lack of public awareness	8	20.0
		4) Limited Funding and resources	3	7.5
		5) Illegal dumping	24	60.0
		6) All of them	40	100.0
	Would you be willing to separate waste at home if recycling program were available?	Total	40	100.0
		1) Yes	36	90.0
		2) No	4	10.0
		3) Maybe	0	0.00
	What methods of sustainable waste management do think work best in Paktika?	Total	40	100.0
		1) Recycling Programs	4	10.0
		2) Composting organic waste	3	7.5
		3) Waste to energy initiatives	1	2.5
		4) Strict regulations on waste disposal	7	17.5
		5) Public awareness campaigns	18	45.0
	Do you think the local government should invest more in waste management infrastructure ?	6) All of them	40	100.0
		Total	40	100.0
1) Yes		39	97.5	
2) No		1	2.5	
Would you be willing to pay a small fee for improved waste collection services?	3) Not sure	0	00.0	
	Total	40	100.0	
	1) Yes	32	80	
	2) No	1	2.5	
What role should community members play in waste management?	3) Maybe	7	17.5	
	Total	40	100	
	1) Participate in waste segregation	4	10.0	
	2) Report illegal dumping	1	2.5	
	3) Join local cleanup efforts	8	20.0	
	4) All	27	67.5	
	Total	40	100.0	



Figure 1: a) Municipal concrete waste bin, b) Municipal solid waste collection tractor, c) Dumping and burning of clinical waste, D) A child collect metal bottles from clinical and municipal waste.

5. Discussion

Table 1 illustrates that 40% of residents in Sharan city engage in open dumping, 25% practice burning, and 17.5% opt to bury their solid waste. The key challenges regarding solid waste management in Paktika include the lack of a waste collection system, insufficient recycling facilities, inadequate public awareness, limited funding and resources, and instances of illegal dumping. These improper waste management practices result in significant environmental and health issues. However, if a recycling program were implemented, 90% of the Paktika population expressed a willingness to separate their solid waste, and 80% indicated they would be agreeable to paying a small fee for improved waste collection services. As shown in Table 1, 100% of Sharan city residents are ready to participate in waste segregation, report illegal dumping, and join local cleanup initiatives. According to Zhu et al. (2008), municipal solid waste in many cities often contains human and animal excrement, as well as hazardous chemical pollutants and sharp objects. Studies have indicated that a significant percentage of workers who handle refuse, as well as individuals who live near disposal sites, are infected with gastrointestinal parasites, worms, and related organisms. Effective solid waste management relies heavily on public awareness and participation. The findings of this study suggest that recycling programs, composting organic waste, waste-to-energy initiatives, strict regulations on waste disposal, and public awareness campaigns are essential sustainable solutions for solid waste management in Paktika, Afghanistan. As stated by Chen et al (2010), regulations and policies serve as vital tools for effective solid waste management. Municipalities should collaborate with commercial centers, institutions, informal waste collectors, and small enterprises for effective solid waste management (Manyazewal and Walegn, 2019). Methods include recycling, incineration, waste-to-energy conversion, composting, and landfilling, with landfilling being the preferred disposal method (Nanda and Berruti, 2021). Integrated collaboration among government bodies, local authorities, and private institutions is crucial (Budhiarta et al., 2012).

6. Conclusion

The condition of solid waste management in Paktika province, Afghanistan, is dire, leading to a range of significant environmental and public health challenges. To effectively tackle these issues, several sustainable solutions must be implemented. These include the establishment of robust recycling programs, the promotion of composting organic waste, and the development of waste-to-energy initiatives. Additionally, enforcing strict regulations on waste disposal and launching comprehensive public awareness campaigns are essential for fostering responsible waste management practices. Moreover, achieving success in these initiatives requires the active collaboration and participation of a diverse array of stakeholders. This includes coordination among government bodies, local authorities, public and private institutions, and academic communities. By working together, these groups can create a more integrated approach to solid waste management, ultimately leading to a healthier environment and improved quality of life for the residents of Paktika.

Conflict of Interest

The authors declare no conflict of interest.

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