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Research Article/ Waste Management

Sustainable Circular Waste Management in the Urban Areas of Nepal

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ABSTRACT

Pokhara Metropolitan City is experiencing a high degree of urbanization, making it a prime tourist destination in Nepal. As a consequence, more municipal solid wastes are being generated. Currently, the prevailing practices for managing these municipal wastes are mostly linear in nature, with minimal support from donors for recycling activities. Against this background, the relevance of governance structures and coordination in shaping the application of the principles of the circular economy within the context of managing wastes in Pokhara Metropolitan City was discussed in this study. A qualitative exploratory study design was applied for data collection. Interviews for collection of data were conducted with 12 influential informants. The study findings indicated that a lack of technical knowledge, poor application of policies, lack of clarity on institutional objectives, incoordination between donors and city administrators, and implications of decision-making for citizens regarding their activities for effective management of wastes, are factors that hampered the application of principles of the circular economy.

KEYWORDS: Urbanization, solid waste, circular economy, community engagement, waste management

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INTRODUCTION

One of the biggest changes that have taken place in the past thirty years in the world is urbanization. This change has led to changes in the way of living, the place where humans habituate, and the manner in which humans consume different products and services (Maharjan & Lohani, 2020). Due to the migration of humans from rural to urban areas and the establishment of urban areas, a number of humans residing in the urban area has also shown an increase. This increase is not only restricted to the number aspect but to the lives of humans residing in the place. Due to changes in their lives and the increase in their incomes, they start using more packages that can just be disposed

of. Due to all these factors, the production level of waste materials has shown increase (Wilson et al., 2006). Although the municipal waste produced during the previous decades was biodegradable materials, the waste materials produced in the form of municipal waste currently consist of plastics, multi-layer packaging materials, electronic gadgets, and other hazardous materials. These materials act as a burden to the municipalities (Adhikari, 2022). Although the municipal systems in the past could take care of the biodegradable components of municipal wastes, they currently lack the ability to handle modern wastes. There is an urgent need for new ways and approaches that would take into consideration these changes.

One such example where these challenges are seen is Pokhara Metropolitan City, Nepal. Being an important tourist destination and economic hub for Gandaki Province, Pokhara Metropolitan City is an even bigger waste-generating unit than other municipal areas due to its relatively bigger quantity of waste generation than other municipal areas (Bastola et al., 2017). With an increase in festivals, treks, or international events where there is an increase in tourist visits due to Pokhara Metropolitan City being an important tourist destination, there is an increase in the waste generation. In addition, hotels, restaurants, trekkers, or amusement centers generate waste of different types that need an appropriate consideration for its disposal. In addition, due to the intensified urbanization and developmental activities along with the construction work process methodologies, there has been an unexpectedly high increase in the construction demolition waste (Maharjan & Lohani, 2020). Thus, for Pokhara Metropolitan City, it is even more difficult than other cities due to the varied sources with relatively high waste generation during different times such as tours or developmental activities along with the high amounts of construction destruction waste.

However, despite all these difficulties, the system for managing this refuse in Pokhara Metropolitan City is still dependent on the collection, transportation, and subsequent dumping of refuse in landfills. In fact, the largest landfill in Ward 32 normally overflows the intended capacity, leading to the problems such as the emission of leachate into the environment. Therefore, this development has caused an anxiety among the community in opposition to the landfill system (Dahal & Adhikari, 2018). The available evidence indicates that the traditional methods are insufficient in dealing with this emerging issue of refuse.

Whereas the linear economy focuses on taking, making, and then disposing of material goods, the circular economy is primarily one that strives first to reduce the waste materials, with a minimal use of the virgin resources by recycling and recovering processes (Korhonen et al., 2018). Besides, the circular economy methods also aim at closing the material loops through the recovery of value from the disposed products in order to extend the product life-cycles and decrease the period of environmental pressure (Geissdoerfer et al., 2017). The job generation that is earth-friendly and their effectiveness in the use of resources are among the strengths connected to sustainable waste management. In cities where the volume is small in landfills created through waste, the application of the circular economy is useful in one's effort to reduce harmful impacts to the environment while ensuring the maximum material potential recovery (Chalise & Shrestha, 2021). This is especially in the scenario involving the Pokhara region that is developing extremely quickly.

In the developing world, many challenges arise in implementing the circular concept of waste management.

Lack of stringent policy enforcement, confusion regarding the many institutions' roles responsible for policy implementation, absence of technical knowledge, and lack of coordination – each or all of these can lead to a failure in the implementation of circular systems (Bakaki & Bernauer, 2018). In most municipalities in the country, different departments exist, each dealing with the aspects of waste management; this alone may create a confusion about what is being managed.

Recycling, composting, and waste segregation have been initiated in the Pokhara region by a few initiatives by the local governmental and NGO initiatives. An introduction of these is a good start and these initiatives have new approaches towards waste management. Nevertheless, institutionalizing of them hovers elsewhere. The lack of coordination among the funding agencies and the concerned local bodies is one of the issues. The projects are normally planned and are implemented independently and unlike the local waste management systems (Marshall & Farahbakhsh, 2013). This leads to the overlaps and raises more workload along with losing on the learning experiences. The pockets of different priorities and lack of clarity on their roles and play along with the bureaucratic delays have impacted further on the intensity of momentum and sustenance. The process of monitoring and evaluation is not organized either. This affects the ability of the concerned local bodies to track progress and develop a corrective course if needed on changes and adjustments in waste management (Maharjan & Lohani, 2020). This implies a need for improved coordination and the development of a comprehensive planning system to enhance a circular waste management system.

The other important area demanding consideration is the low engagement of the actors in the informal waste sector. The informal actors play a critical role in the waste collection and recycling, yet they operate without a recognition and support (Wilson et al., 2006) . The level of community engagement in these initiatives related to waste management, in most cases, begins and ends with creating awareness and nothing more (Guerrero et al., 2013). This has culminated in many circular initiatives folding up soon after completing the projects commissioned by the donor agencies.

From this perspective, if the matters of governance, coordination, and institutional issues are ignored, Pokhara Metropolitan City will continue relying on landfills, thereby contributing to the increased levels of waste-related environmental pollution, social conflicts, and the health of the community. Therefore, this paper examines the different aspects of governance that strongly influence the concept of circular waste management in Pokhara Metropolitan City. This paper also identifies the different recommendations by examining the bottleneck process, the absence of alignment between the donors and the municipal authorities, and the facilitators that contribute towards the aspect of community engagement, thereby contributing to the different pieces of empirical evidence associated with the less researched area of sustainability in the urban areas in Nepal.

RESEARCH METHODS

Research Design

The study employs a qualitative exploratory research design that enables an understanding of the aspects of governance and coordination, influencing the implementation of circular waste management in Pokhara Metropolitan City. This is because the qualitative research is effective in investigating the aspects of governance that are difficult to quantify, as pointed out by Yin (2018). This is because it involves exploring the

contextual particulars to have better understanding of how the local governments and agencies perceive the challenges in governance and act accordingly in the course of implementation.

Study Area

Pokhara Metropolitan City, located within Gandaki Province, Nepal, served as the venue where this study was carried out. The city is well known for its extensive urbanization as well as its popularity as a prime tourist spot within the country. All these factors have resulted in a large amount of municipal waste being produced, especially during the peak tourist seasons. To add to this, the study area also houses a number of non-governmental organization-funded projects focused on enhancing its waste management activities, such as recycling, composting, and communally separating waste ((UNDP, 2024). Thus, the study area presents a unique case fit for testing the application of waste management practices in a circular economy environment.

Data Collection Methods

The study was conducted in Pokhara Metropolitan City of Gandaki Province, Nepal, which is widely known for its rapid urban expansion and its role as a major tourist destination. Due to this dual character, the city generates a high volume of municipal waste, particularly during the peak tourist seasons. The city also hosts several donor-funded waste management initiatives, such as recycling, composting, and community-based waste segregation programs (UNDP, 2024). These combined characteristics make this city a suitable and meaningful case for examining the waste management practices through the lens of the circular economy.

The secondary data were collected to support the interview findings and strengthen the overall analysis. These sources included the municipal policies, donor reports, national waste management guidelines, and relevant academic studies. Using both primary and secondary data helped build a clearer understanding of the governance and institutional context, shaping the circular waste management in Pokhara Metropolitan City. This combination also improved the reliability of the study by allowing information to be verified across the multiple sources.

Data Analysis Methods

The interview data were transcribed and analyzed using the thematic content analysis. Coding was conducted in a cyclical manner, allowing the key themes related to governance, coordination, role clarity, and monitoring to emerge directly from the data (Braun & Clarke, 2006). This method enabled a deeper interpretation of institutional practices and revealed the underlying structures, influencing the circular waste management outcomes. The thematic analysis was found to be particularly useful for examining the qualitative governance issues and capturing the lived experiences within the institutional settings.

This approach helped identify the factors that either support or hinder the circular waste practices, including a communication between the municipal and donor actors, clarity of institutional roles, and effectiveness of the monitoring systems. By integrating the insights from the interviews with the secondary sources, the analysis provides a balanced understanding of both challenges and opportunities for the circular waste management in a rapidly urbanizing city such as Pokhara Metropolitan City.

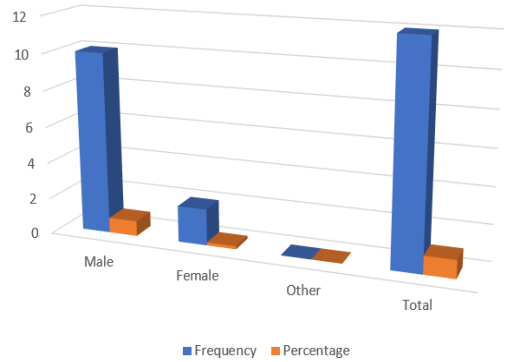
RESULTS AND DISCUSSION

Results

The study is based on the viewpoints provided by twelve important key informants residing in Pokhara Metropolitan City, who included the

Figure 1

Gender Distribution of Respondents



municipal representatives, representatives of wards, and representatives of organizations financed by the foreign donors. All of these individuals were involved in the planning and implementation of waste management activities, thus providing the sufficient grounds for discussing the practical issues on the basis of field data. On this premise, this part of the paper aims to summarize their views in order to discuss the existing governance patterns, institutional capacities, coordination of responsible parties, and stakeholders' involvement in the process of waste management.

As can be seen in Figure 1, there is an overwhelming number of men among the respondents, 10 of whom (83.3%) consider themselves men, whereas two of them (16.7%) are women. The absence of any other sex in the respondent sample is the reflective of trends in the municipal governance in Nepal, where most of the technical positions are occupied by men.

The issue of inequality, however, becomes relevant to the project when taking into consideration that women are very active in the area of waste management but may lack the necessary representation on the policy level.

Table 1

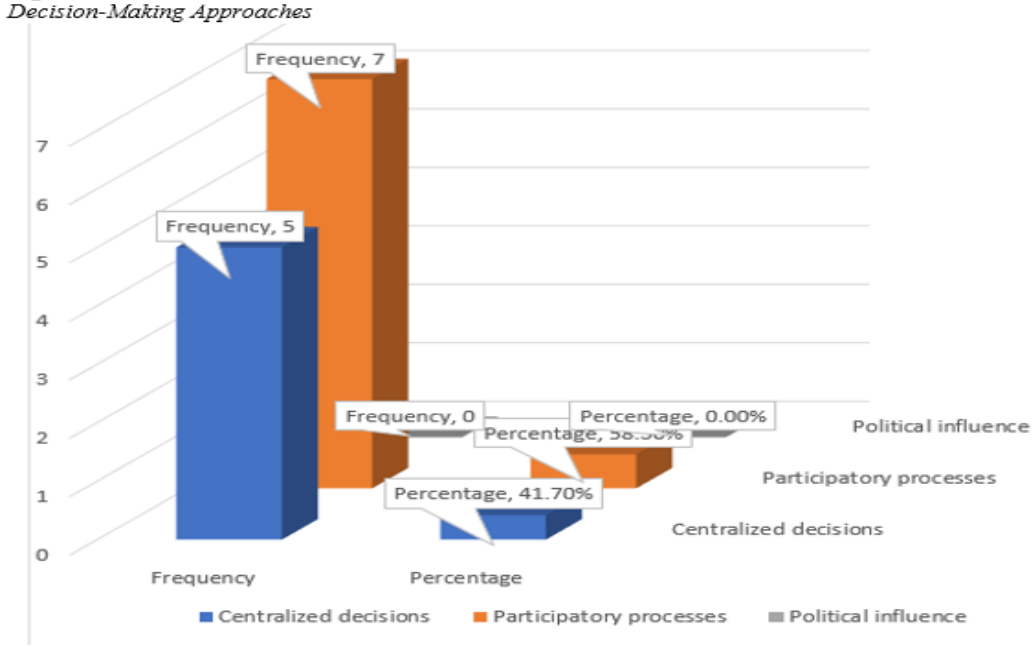
Perceived Roles and Responsibilities

Aspect	Frequency	Percentage
Mandate clarity	6	50.0%
Role definition	5	41.7%
Authority level	1	8.3%
Total	12	100%

As shown in Table 1, half of the respondents (50.0%) emphasized a mandate clarity as the most important aspect of their role in municipal solid waste management, followed by the role

Figure 2

Decision-Making Approaches



definition, while only 8.3% highlighted the authority level. This indicates that although the formal roles and responsibilities are generally well defined within the institutional framework, the actual decision-making power remains limited. The low emphasis on authority suggests that many actors operate within the clear mandates but lack sufficient autonomy to translate the responsibilities into an effective action.

As shown in Figure 2, most respondents (58.3%) reported a participatory decision-making, while a sizable share (41.7%) indicated that the decisions remain centralized, with no respondent identifying the political influence. This reflects a gradual move toward the inclusive governance involving the wards and technical actors, though the authority is still largely retained at the higher administrative levels. The greater decentralization in the circular waste management would allow more context-specific solutions and strengthen the community ownership.

Figure 3

Key Challenges Identified in Frequency

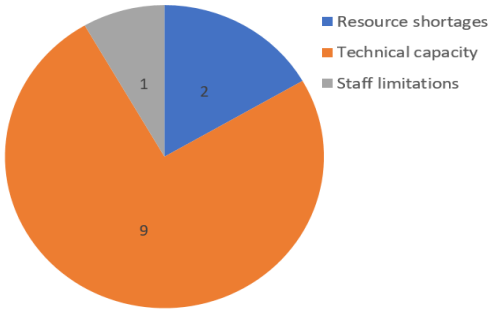


Figure 3 shows that lack of technical capacity is the main challenge, noted by 75% of respondents. The resource shortages (16.7%) and staff limitations (8.3%) were less critical. This suggests that the issue is not the resources but the insufficient skills, technology, and know-how for the circular waste management, including the gaps in the waste segregation methods, data handling, and training.

Figure 4

Donor Coordination Mechanisms

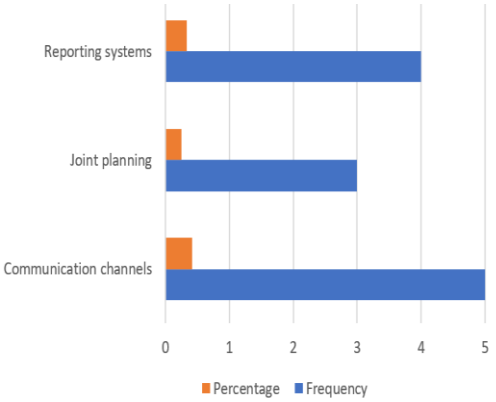


Figure 4 indicates that the coordination practices between the municipality and donors are stronger in communication (41.7%) and reporting (33.3%), but the joint planning occurs only 25% of the time. This suggests that the donor participation is mostly consultative, while the limited collaborative planning may hinder an effective integration of their efforts with the municipal objectives.

Figure 5

Barriers to Implementation in Frequency

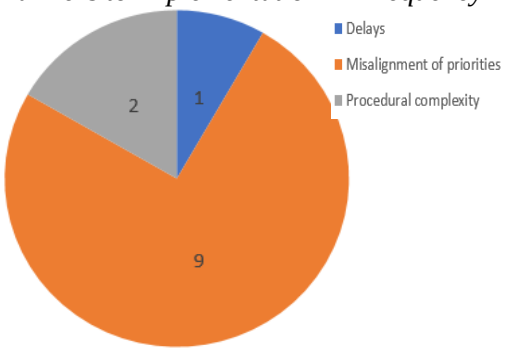


Figure 5 shows that the top barrier identified was the misalignment between the donor project objectives and local needs, reported by 75% of respondents. While any procedural delays were noted, they were less critical. This misalignment can challenge the success of projects, especially when the donor priorities do not fully match with the municipal strategies for the circular waste management.

Table 2

Effective Strategies Identified by Respondents

Strategy	Frequency	Percent
Capacity building	5	41.7%
Institutionalization	1	8.3%
Local ownership	6	50.0%
Total	12	100%

As shown in Table 2 above, the local ownership was the most highlighted method (50.0%) of ensuring the sustainability of the circular waste management systems by the donors. The capacity building also emerged as another highlighted method that is equally considered (41.7%), while a low percentage (8.3%) adopted the method of institutionalization. The level of importance of each method indicates that there have been the high levels of activity at the field levels as opposed to the structural levels. That is, the local ownership indicates that if the local government administration as well as the local citizens are able to own various programs, there is a high probability that the success will be realized within the borders of the donor-funded institutions. On the same note, the capacity building indicates that the local communities ought to possess the necessary capabilities or expertise needed to handle various complex systems pertaining to waste.

Figure 6

Stakeholder Involvement Mechanisms

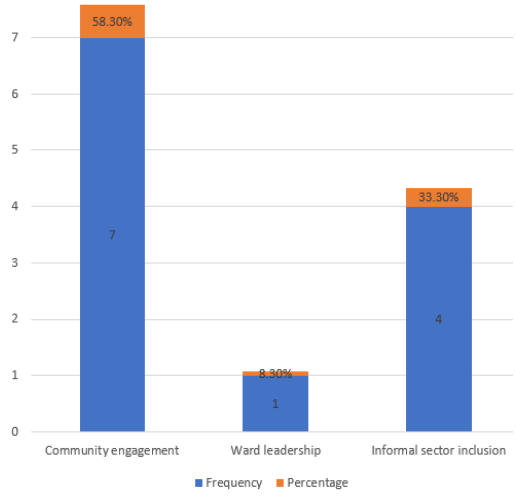


Figure 6 shows that a community involvement in the stakeholder participation into the waste management is leading, as stated by 58.3% of the respondents, followed by the involvement of informal sectors, at 33.3%, while the leadership at the ward levels received a minimum attention at 8.3%. This shows that the communities are highly involved in the operational activities such as the segregation, collection, and awareness creation. Such a low involvement of the waste collectors in the informal sector reflects the increased but still limited recognition of their role in recycling. Similarly, a weak engagement at ward levels suggests that better linkages between the elected representatives and day-to-day aspects of the waste management could help improve coordination and accountability.

Table 3

Barriers to Effective Collaboration.

Barrier	Frequency	Percentage
Trust issues	7	58.3%
Role overlap	1	8.3%
Communication gaps	4	33.3%

In Table 3, the trust issues emerged as the primary concern in the inter-institutional collaboration at 58.3%, followed by the communication difficulties at 33.3%, whereas the overlapping of roles was of less concern at 8.3%. It appears that the relationship/behavioral issues are far more complex than the structural issues. Lack of trust between the local government institutions, donors, and stakeholders may create the impediments in cooperating, making decisions, and ensuring transparency, whereas the poor communication channels might add more complexity to coordination among the stakeholders' expectations.

Figure 7 indicates that the public–community partnerships accounted for the highest percentage (75.0%) in the citation of the best practice, while the remaining

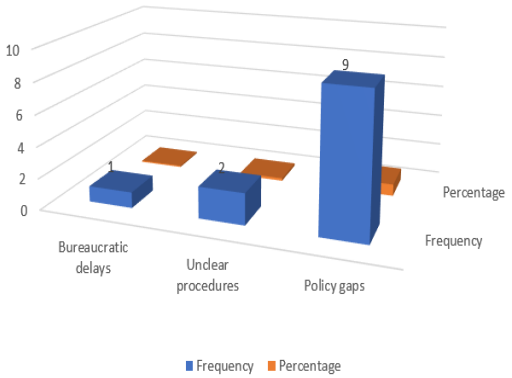
25.0% was attributed to the co-management models. Probably, the low priority given to the co-management is an indication that the institutions lack the necessary expertise and willingness to share the responsibility of co-manage practice.

Table 4
Monitoring and Evaluation Tools

Mechanism	Frequency	Percent
Indicators	0	0.0%
Reporting frequency	4	33.3%
Feedback mechanisms	8	66.7%

Table 4 shows that the feedback mechanism is the main mechanism used to monitor the waste management, as cited by 66.7% of the respondents, while the frequency of reporting contributed 33.3%. The result illustrates the dominance of subjective feedback over the objective progress indicators in waste management monitoring. Although the community views are captured by feedback, the absence of progress indicators in feedback suggests the integration of feedback and indicators as a means to improve decision-making.

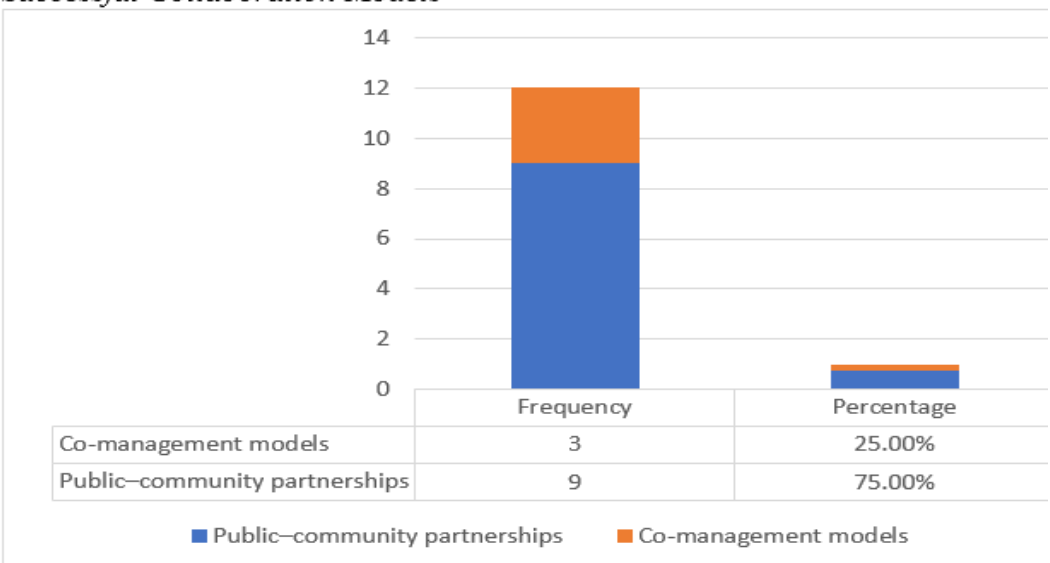
Figure 8
Institutional Bottlenecks



As shown in Figure 8, it can be noted that the predominant concern among the policymakers in relation to waste recycling is that of the institutional bottlenecks at 75.0%, while the procedural inefficiencies would be of concern to the policymakers to some extent. This would indicate that the current policies are not very effective in dealing with the intricacies of circular waste recycling.

In Table 5, the recommendations included the reforms in the policies at 41.7%, building on capacity at 33.3%, and coordination at 25.0%. These are similar to the previously identified the challenges that reflect the citizens' awareness of the necessity of facilitating the policies,

Figure 7
Successful Collaboration Models



capacity, and coordination of stakeholders for the effective governance in the Pokhara waste management process.

Table 5

Key Recommendations

Recommendation	Frequency	Percent
Policy reform	5	41.7%
Coordination mechanisms	3	25.0%
Capacity enhancement	4	33.3%

This paper consolidates the findings from twelve semi-structured interviews on governance, institutional arrangements, coordination, and stakeholder interactions in Pokhara's circular waste management. The results integrate the quantitative data from Tables 1–13 and Figures 1–13 with the qualitative insights. The discussion emphasizes that the stakeholder structures and interactions, rather than merely the inputs, significantly shape the outcomes of circular waste management.

Discussion

The findings show that governance is the most important factor affecting the efficiency of the circular waste management system in Pokhara Metropolitan City, outweighing the cost/resource issues. While there is a formal system in place, the decision-making is centralized, which reduces the autonomy in both the ward offices and the technical department, and slows down the implementation of decisions. There is a growing trend towards decentralization in the decision-making, which is still dominated by the centralized decision-making.

The technical capacity also emerged as a critical factor for success. Nearly three-fourths of the participants pointed towards a deficiency in skills and technical capabilities as a concern, more so even than the budget or manpower matters. These technical deficiencies in the issues such as trash segregation, composting, recycling, and data prevent an implementation of the circular economy practices as a success by the concerned municipal authorities.

The donor coordination is also a challenge. There is communication and reporting, but there is a lack of joint planning, which results in a lack of alignment between the city priorities and donor goals. This could lead to duplication, ineffectiveness, and unsustainability of the programs when the terms of funding expire.

The community involvement and public-community partnerships have been identified as the major facilitators. When the public is involved in the waste segregation, collection, recycling, and awareness programs, feedback becomes better, innovations in the process improve, and the whole process becomes more efficient. The informal sector participation, such as that of scavengers, is also important. However, a lack of trust among the municipality, fund providers, and the public is still a major constraint.

The monitoring and evaluation are very reliant on qualitative feedback from staff and community members, and do not utilize very much quantitative performance indicators. The addition of qualitative feedback and performance indicators could be very useful.

Finally, there are bottlenecks within the institutions and policy shortcomings that are serious limitations mentioned by three-fourths of the respondents. The policy formulation has failed to address the complexity related to the management of circular waste because as there is a need for the policy reform and support from all donors to develop a sustainable waste management system within Pokhara Metropolitan City in particular and other cities of Nepal at large.

CONCLUSION

Pokhara Metropolitan City has shown the significant developments in effective circular waste management, although

sustainability has been an issue for the long-term approaches. A delegation of more decisions can help enhance the capabilities of wards and technical departments for faster actions, innovations, and more localized approaches. Developing more capability and technology, including training and recycling needs an attention.

There is a need for better coordination between the various donor groups and the city government, especially in a matter of planning cycles and project timelines. Encouraging the community engagement through the existing civic groups is important, especially from the point of view of trust and behavior change. Finally, the promotion of new policies from the pilot stage and the incorporation of the principles of circular economy into the management of the city is essential for effective waste management in Pokhara Metropolitan City.

CONFLICT OF INTEREST

The author declares no conflict of interest. This research was conducted independently without financial, political, or personal relationships that could inappropriately influence the study's findings or interpretations.

AUTHOR CONTRIBUTIONS

I declare that this manuscript is my original work.

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