



Solid Waste Management- Mismanagement from Houseboats of Dal Lake: Assessing Strategies for Effective Waste Reduction and Resource Recovery

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Abstract— The current study set out to evaluate and examine the difficulties faced by houseboat owners in solid waste management as well as possible solutions to these difficulties. The study was conducted at four sites of Dal Lake: Lakut Dal, Bod Dal, Gagribal, and Nigeen Lake. A list of registered houseboats was acquired from the Lake Conservation Management Authority (LCMA) in 2023 indicates that there are 950 houseboats in Dal Lake. Data were gathered using a structured interview schedule. A sample of 100 houseboats, 25 from each site, was selected using stratified random selection; this represents about 10.5% of the total population. The study found that the restrictions faced by houseboat owners differed depending on how easily LCMA services could be accessed at each location. The absence of a nearby color-coded waste facility was cited by 92% of houseboat owners in Site 1 as their main concern. Site 2's outcomes were comparable, the absence of consistent (weekly) solid trash collection services being identified by 84% of houseboat owners as their main challenge, 88% of site 3 houseboat owners cited the absence of solid trash collection services provided by LCMA, and 56% of site 4 houseboat owners said they were happy with the existing collection services. Nonetheless, the largest obstacle faced by 40% of houseboat owners is the absence of regular garbage collection services. The houseboat owners in Dal Lake nevertheless face several challenges on a daily basis, which are discussed in more depth.



Keywords— Houseboats, Dal Lake, LCMA, Limitations, solid waste

I. INTRODUCTION

Dal Lake is 3.5 kilometers wide and 7.44 kilometers long, and it is located in the Srinagar district of Kashmir. The deepest point of the lake is at Nigeen Lake, which is 20 feet deep, whereas Gagribal's depth is 2.5 meters (8.2 ft). (Bhat et al., 2017). One of the key factors in the valley's booming tourism business is the quantity of floating homes on the lake. Houseboats, also referred to as "floating palaces" or "floating hotels," are closely linked to Dal Lake. These serve as visitor accommodations, symbolize the Kashmir Valley's cultural legacy, and accentuate Dal Lake's breathtaking natural surroundings. More contemporary houseboats of a higher class often have a dining area, kitchenette with server, lounge, and

two to five bedrooms, each with its own bathroom, complete with toilet. There is a little "balcony" on the front of every houseboat, and many of them are anchored next to a small wooden deck on the lake. Some houseboats (Deluxe and Class A) may also include a little garden with piled ground in between the boats. Houseboats may be seen at Nigeen Lake and along the Boulevard Road between Dalgate and Nehru Park. For control purposes, the tourist office assigns deluxe, A to D categories to the houseboats. Because they have more amenities than other houseboat classes and generate more garbage as a result, deluxe, A, and B grade boats are regarded as high quality. (Tanveer et al., 2017) In the busiest travel seasons, houseboats in the Nigeen basin and Dal Lake are completely occupied by visitors. Waste is generated during

occupation in both liquid and solid forms. which immediately into the lake, posing a major danger to its ecology and health. As a result, this freshwater lake has undergone significant changes in its physico-chemical and biological properties, turning it into a eutrophic water body. The proprietors of houseboats on Dal Lake in Srinagar City deal with the increasingly challenging problem of incorrect solid waste management. This is caused by a number of factors, including poor environmental awareness among the populace, growing urbanization and tourism, and inadequate services provided by the Lake Conservation Management Authority (LCMA).

Description of the sites:

- 1) Lakut Dal: According to Fazal and Amin (2012), the location of the site is 34°03'N & 74.48°E. There are around 250 houseboats in the vicinity of this spot.
- 2) Bod Dal: As stated by Fazal and Amin (2012), the location of the site is 34.13°N and 74.48°E. There are more than 250 houseboats in the vicinity of this area.
- 3) Gagribal 34° 5' 10" N, 74° 50' 40" E are the geographic coordinates of the location.(maps, 2023) and has over 270 houseboats in it.
- 4) Nigeen: 34.11°N 74.83°E are the geographic coordinates of the location. (Google Maps, 2023) There are about 250 houseboats in the vicinity of this spot.

II. METHODOLOGY

Study area: Dal Lake in Srinagar, Jammu & Kashmir, served as the site of the inquiry. The lake is home to about 38,000 people, and houseboats may accommodate up to 10,000 people (Majeed et al., 2021). Particularly during the summer months, the people living around the lake adds to the solid waste, which either directly or indirectly pollutes the lake by disposing of waste materials carelessly into the water. The fact that so many people reside in hamlets inside Dal Lake makes it special.

Research Design:

Research methodology: To gain a thorough grasp of the difficulties in managing solid waste in Dal Lake, this study used a mixed-methods research methodology that included qualitative and quantitative methodologies.

Data Collection:

Primary Data:

- a) Surveys: A pre-testing survey was carried out to gain an understanding of the difficulties experienced by Dal Lake houseboat operators. The interview was designed with the goals and the data gathered from the pre-test survey in mind. It was also translated into Urdu for improved

understanding. Structured questionnaires were distributed to houseboat owners in order to gather data on their experiences, opinions, and present problems with solid waste management in Dal Lake.

- b) Interviews: To acquire a greater understanding of the difficulties encountered, in-depth interviews with important informants and community leaders were undertaken.

Secondary Data:

- a) Literature Review: To comprehend the larger context and pinpoint best practices, existing literature, research papers, reports, and policy documents pertaining to solid waste management in comparable ecological environments were studied.
- b) Official documents: Information on trash creation, collection, transportation, and disposal procedures was obtained by accessing pertinent official documents from waste management organizations like LCMA.

Sampling:

- a) sample Strategy: A mix of random and selective sample methods was used. Owners of houseboats residing in Dal Lake houseboats were among the selection criteria for responders.
- b) Sample Size: After obtaining a list of registered houseboats from the LCMA, it was found that 950 of them were located in Dal Lake, which includes Lakutt Dal, Bod Dal, Gagribal, and Nigeen Lake. Stratified random selection was used to pick a sample of 100 houseboats for the study, 25 from each site.

Data Analysis:

- a) Quantitative Analysis: In order to obtain significant insights and spot trends and patterns, survey data were analyzed using the appropriate statistical techniques, such as descriptive statistics and inferential tests.
- b) Qualitative Analysis: To find reoccurring themes and significant difficulties in solid waste management, a thematic analysis was used to interview transcripts. Coding, classification, and interpretation of qualitative data were performed in this research to provide a comprehensive understanding of the relevant issues.

III. RESULT AND DISCUSSION

This essay goes into great detail on the creation of solid trash, how it is managed, and the difficulties faced by Dal Lake houseboat owners. The LCMA hired G-active Services, one of the firms, to handle the solid waste collection in Dal. The agency was chosen via an appropriate tendering procedure.

Site 1 (Lokut Dal).

The vast majority of house boat owners at the location (92%) said that neither the LCMA nor they had made any efforts to get color-coded trash cans for collection of waste. It was found that the respondents had bought little, non-color-coded bins to collect rubbish from the houseboats but were unaware of the need of colored-coded bins. They didn't separate their garbage since they didn't understand how important it was. Majeed et al. (2012) reported comparable results, emphasizing the need for distinct trash receptacles for on-site segregation, such that the amount of solid waste that ends up in the disposal unit is minimal. According to 76% of respondents, the Lake Conservation Management Authority (LCMA) and houseboat owners do not collaborate. The houseboat owners felt that the LCMA officials should establish a close relationship with them in order to enable them to function at the ground level and help the houseboat owners overcome the problems or difficulties encountered. They ought to help them recognize the requirements and difficulties experienced by houseboat owners. According to 72% of the respondents, the large number of tourists that stay on houseboats during the March–April tourism season generates a significant quantity of garbage. Similar conclusions were reached by Shah & Wani (2013), who found that the amount of solid waste generated is directly correlated with the number of rooms occupied by residents and visitors. However, they expressed concern about the small size and inadequate capacity of the carts used for solid waste collection, as well as the poor quality of the cart service. They also mentioned that the collectors' harsh behaviour and poor sanitation were issues with waste pickup. When asked to clean up gently, the trash collectors would verbally dispute and mistreat the people who had left waste in wooden boxes that occasionally had unpleasant smells. The garbage collectors also failed to properly remove the rubbish that had been placed outside their houseboats. 32% of respondents said they would be interested in learning more about solid waste management. They expressed a wish to get knowledgeable about solid waste management strategies in order to turn trash into money. Twenty percent of houseboat owners said that their lack of experience in this area prevented them from advising visitors and residents of Dal Lake on how to properly dispose of their trash. On the other hand, houseboat owners who receive training and education may contribute to solid waste management by giving tips on how to handle rubbish better. Sixteen percent of respondents said that the trash collected was dumped close by, which both houseboat owners and visitors found inconvenient due to the offensive stench.

Site 2 (Bod Dal)

Table 2 enumerates the challenges that the houseboat owners at Site 2 confront. 84% of those surveyed said that the LCMA's rubbish collection service was inconsistent. Ganie & Hashia also discovered similar results, pointing out that enormous piles of solid trash are present both inside and outside houseboats and are frequently overlooked by the department. Due to the fact that garbage collection was only done once every 20 days, there was a substantial amount of trash accumulation in the houseboats, which resulted in a foul smell. They disclosed that the offensive stench emanating from the trash was a source of annoyance for both houseboat occupants and visitors. 80% of those surveyed stated that although LCMA had provided boats for garbage collection, another challenge with solid waste management was that the boats were non-operational. They could not carry all of the waste from the houseboats to the disposal site because they were very small damaged, and unreliable. Sixty-eight percent of the houseboat owners deduced that they were obliged to bring their own garbage to the disposal site due to the LCMA's inconsistent services. They are so overworked since they are required to finish duties that LCMA workers would typically perform. At site 2, the houseboat owners also showed that they were prepared to impose stringent regulations on the locals and visitors. There is a noticeable annual inflow of tourists in and around Dal Lake. Even though LCMA has supplied dustbins, people still buy delicacies from shops close to the lake and discard their rubbish in the water and surrounding areas. on a manner similar to this, people who go boating on the lake and live there purchase meals from merchants. After devouring the treats, the majority of them discard the rubbish or leftovers into the lake. Both locals and tourists patronize Mina Bazar, a lakeside market place. Additionally, the throwaway plates that are used to feed guests wind up in the lake. The houseboat owners believed that the LCMA need to establish stringent guidelines and policies for disposing of garbage. They said the LCMA need to employ security personnel who would keep an eye out for litterers and take swift action against them. At site 2, color-coded dustbins were favored by 72% of respondents for efficient trash disposal and rubbish segregation. Furthermore, as reported by 28% of respondents at this location, there was little cooperation between LCMA representatives and houseboat owners, leading to a notable discrepancy between the real and ideal circumstances. Four percent of the participants said that the growing number of houseboats in Dal Lake was negatively impacting the lake's health and suggested reducing the houseboat population. In addition to preventing congestion, this would help maintain the lake's elegance. Twenty percent of

those surveyed said that they were required to tip the garbage collectors, who only visited the site once a month to pick up the rubbish. On the other hand, many stated that they would prefer Consistent services and a fixed price rather than gratuities and sporadic assistance.

Site 3 (Gagribal)

Table 3 lists the difficulties houseboat owners at Site 3 (Gagribal) are attempting to overcome. The majority of responders at this location reported similar problems to those at site 2. Nonetheless, 16% of respondents at this location desired that the garbage collectors wear uniforms so that houseboat owners could quickly identify them and get in touch with them to remove the rubbish off their boats. They thought that doing this would also aid in teaching trash collectors discipline. In order to keep the area around the lake clean, 44% of respondents said there wasn't enough labor to gather rubbish, and they consequently indicated the wish to hire more personnel.

Site 4 (Nigeen)

The houseboat owners at site 4 had comparatively less obstacles than those faced by their counterparts at sites 1, 2, and 3. The investigator found that the participants expressed more satisfaction with the services provided by LCMA. Nonetheless, the houseboat owners brought to light some concerns, such as the fact that the LCMA employees were only picking up garbage twice a week when they would have expected it to happen at least four times. They also thought that strong regulations, such fines for litterers, should be put into place.

Unlike other sites, houseboat owners here have colored-coded trash cans. Merely 24% of participants reported that their garbage cans lacked color coding. It was also positive that 36% of the respondents said they had no problems with managing solid trash.

Table 1: Difficulties encountered by houseboat owners at site 1 (Lakut Dal)

n1=25

s.no	CHALLENGES	f	%	MS	RANK
1	Absence of Color-coded bins	23	92	9.2	I
2	Insufficient collaboration between LCMA and houseboat owners	19	76	6.84	II
3	Insufficient vehicles for door-to-door pickup	18	72	5.76	III
4	Insufficiently competent and trained labor force for collecting solid trash	13	52	3.64	IV
5	irregular services for the collection of solid garbage	11	44	2.64	V
6	Absence of knowledge on solid waste management	8	32	1.6	VI
7	Manpower shortage	7	28	1.12	VII
8	Carts' inadequate capacity	6	24	0.72	VIII
9	Inadequate instructions for residents and visitors on how to properly dispose of solid trash	5	20	0.4	IX
10	Absence of good manners in trash collectors	4	16	0.16	X

MS=Mean score

Table 2: Difficulties encountered by houseboat owners at site2 (Lakut Dal)

n2=25

s.no	CHALLENGES	f	%	MS	RANK
1	irregular services for the collection of solid garbage	21	84	8.4	I
2	Absence of newly constructed or renovated LCMA boats with large carrying capacities for collecting solid garbage	20	80	7.2	II
3	Manpower shortage	17	68	4.76	IV
4	Inadequate instructions for residents and visitors on how to properly dispose of solid trash	8	32	1.92	V
5	Absence of Color-coded bins	18	72	5.76	III
6	Insufficient collaboration between LCMA and houseboat owners	7	28	1.4	VI

7	houseboat odors	4	16	0.48	VIII
8	Absence of restrictions on the number of visitors on Dal Lake houseboats	1	4	0.04	X
9	Absence of a monthly charging structure	5	20	0.8	VII
10	Inability to restrict the number of tourists on houseboats	3	12	0.24	IX

Table 3: Difficulties encountered by houseboat owners at site 3 (Gagribal)

n3=25

s.no	CHALLENGES	f	%	MS	RANK
1	irregular services for the collection of solid garbage	18	72	6.48	II
2	Insufficient collaboration between LCMA and houseboat owners	23	92	9.2	I
3	Absence of surveys from LCMA	5	20	0.8	VII
4	houseboat odors	3	12	0.24	VIII
5	Absence of Color-coded bins	16	64	4.48	IV
6	Absence of uniform for trash pickers	4	16	0.48	IX
7	Inadequate instructions for residents and visitors on how to properly dispose of solid trash	8	32	1.6	VI
8	Absence of newly constructed or renovated LCMA boats with large carrying capacities for collecting solid garbage	17	68	5.44	III
9	Absence of a monthly charging structure	2	8	0.08	X
10	Manpower shortage	11	44	2.64	V

Table 4: Difficulties encountered by houseboat owners at site 4 (Nigeen)

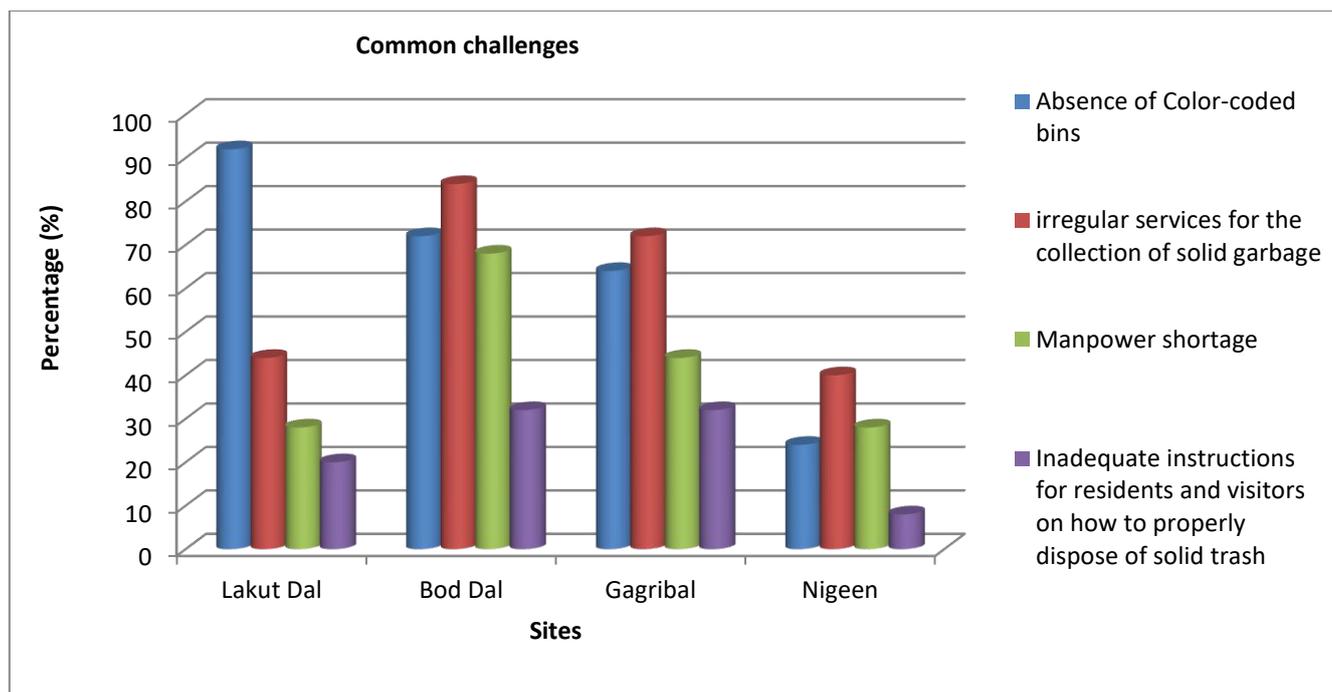
n4=25

s.no	CHALLENGES	f	%	MS	RANK
1	Absence of daily trash collection offerings	10	40	2.0	I
2	Absence of Color-coded bins	6	24	0.96	III
3	Inadequate road infrastructure	1	4	0.04	V
5	Inadequate instructions for residents and visitors on how to properly dispose of solid trash	2	8	0.24	IV
6	Manpower shortage	7	28	1.12	II

Table 5: common issues from Dal Lake's four locations

n5=100

s.no	CHALLENGES	%	MS	RANK
1	Absence of Color-coded bins	63	2.52	I
2	Inadequate instructions for residents and visitors on how to properly dispose of solid trash	25	0.25	IV
3	Manpower shortage	42	0.84	III
4	irregular services for the collection of solid garbage	60	1.8	II



IV. CONCLUSION

The investigation's findings support the notion that managing solid waste presented a number of difficulties for houseboat owners. They lack the proper infrastructure for disposing of solid waste, such as collection systems or facilities. Houseboat owners find it difficult to dispose of their garbage because of this lack of infrastructure. Houseboat occupancy fluctuates throughout the year, with peak season producing large amounts of garbage. As a result, the LCMA has to have effective plans in place to deal with the extra waste generated during peak season. It's possible that visitors and houseboat owners are unaware of the necessary waste management techniques that have a detrimental influence on the ecosystem. As Houseboats are not affable by LCMA trucks for the collection of garbage, hence the provision of special boats for this purpose is essential.

V. RECCOMENDATIONS

IMPARTING GENDER INCLUSIVE TRAININGS

It is required that the houseboat owners of Lakut Dal and Nigeen Lake get on-campus instruction about solid waste management in cooperation with the Faculty of Fisheries SKUAST-K's extension division (Social Sciences). Houseboat owners in Bod Dal and Gagribal did not show a willingness to participate in the trainings because of their busy schedules, but their female population can receive solid waste management training through on-campus or off-campus programs, which can help lessen the impact of solid waste on Dal Lake in the long run.

CONTRIBUTORY APPROACH

Since the LCMA has been tasked with overseeing and protecting the lake. In order to manage solid waste effectively, conservation policies must now be implemented in a collaborative rather than an authoritarian fashion, including all stakeholders and making incorrect disposal of solid waste punishable by appropriate laws or rules. Considering the outcome, the majority of houseboat owners acknowledged that they didn't get along with LCMA representatives, supporting the earlier claim. The success of the LCMA's efforts to manage solid waste in Dal Lake depends on its ability to guarantee that all parties involved, including houseboat owners participate in all stages of the initiatives created to guarantee secure disposal of garbage. A participatory strategy will provide two-way contact between the LCMA authorities and important stakeholders, as well as help the LCMA develop stronger programs and ideas for managing solid waste.

GENERATING MONEY FROM WASTE

Training in waste management and segregation must be offered. If the responders are taught how to convert the enormous amount of trash created by houseboats across all four research locations into organic manure, it may be utilized for plants as well as Dal Lake's floating garden. Promoting the use of organic manures rather than fertilizers may also be advantageous for the environment and help the LCMA develop better plans and initiatives for the management of solid waste.

ORDINARY SERVICES

Regular services must be provided by LCMA at least four times a week. This would help houseboat owners preserve Dal Lake's general health as well as the cleanliness of their community. It is recommended that the LCMA charge houseboat owners a monthly fee in exchange for their regular services in order to establish an effective garbage collection system. The LCMA should fix the damaged boats that were used to remove waste from houseboats. It would be necessary to bring new, spacious boats in order to make sure that all of the garbage from the houseboats gets collected. Promoting boats for rubbish collection is necessary since they are the best means of accessing a lake's interior..

SETTING UP A SUFFICIENT NUMBER OF WASTE COLLECTORS

Because Dal Lake is a well-liked tourist site and produces a significant amount of rubbish, LCMA needs to hire a large number of waste collectors. Garbage collectors must to be required to wear uniforms and complete solid waste management training in order to establish discipline.

TEAMWORK PROGRAMME WITH FACULTY OF FISHERIES, SKUAST-K

The Faculty of Fisheries SKUAST-K and the LCMA should work together on any training and research pertaining to Dal Lake preservation.

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