Ecosystem Valuations of Three Ecosystems in Bhubaneswar, Odisha

AC	**Air Conditioner**
BMC	**Bhubaneswar Municipal Corporation**
CE	**Common Era**
EPIC	**Proliferating Ecosystem-based Adaptation in Indian Cities**
FGD	**Focus Group Discussion**
INR	**Indian Rupee**
NIUA	**National Institute of Urban Affairs**

Table of **Contents**

List of Tables

List of Figures

SECTION I:

INTRODUCTION

1.1 Background

Urban ecosystems serve as critical buffers in the balance between development and environmental sustainability—particularly in rapidly expanding cities like Bhubaneswar. As the capital of Odisha and one of India's earliest planned cities post-independence, Bhubaneswar has experienced rapid urbanisation, which has increasingly strained its natural and cultural landscapes.

In this context, understanding the structure, usage, and significance of local ecosystems—both green and blue—is vital for sustainable urban planning and community-led conservation. This report presents an in-depth analysis of three interconnected urban commons in Bhubaneswar: **Bindusagar Lake**, **Jaidev Vatika**, and a **designated Wetland area**. While these sites differ in form and function—from a sacred waterbody to a historical urban park and an ecologically sensitive wetland—they each play a vital role in sustaining biodiversity, cultural identity, and local livelihoods.

Bindusagar Lake, located near the iconic Lingaraj Temple, is a centuries-old sacred waterbody revered for its spiritual significance, especially during rituals like Ashokastami. Beyond its religious importance, the lake also performs essential ecological services such as groundwater recharge and microclimate regulation. However, pollution, encroachment, and infrastructural neglect threaten its ecological and cultural integrity, underscoring the need for informed and participatory conservation efforts.

Jaidev Vatika, a 39-acre urban green space named after the poet Jayadev, is situated close to the Khandagiri and Udayagiri caves. It functions as both a recreational retreat and a biodiversity haven. Survey responses indicate that over 90% of visitors perceive the area as cooler than its surroundings, reaffirming its role in enhancing thermal comfort and improving air quality in the city.

The Wetland, although less prominent than the other two sites, emerged from the study as a critical ecological zone. Wetlands naturally filter water, mitigate floods, and serve as habitats for diverse flora and fauna. In a city like Bhubaneswar—where extreme weather events and unplanned urban development are making floods more frequent—the protection of water-retentive landscapes like wetlands is increasingly urgent. Field visits and community feedback emphasize the wetland's role in regulating water cycles, supporting informal livelihoods, and maintaining ecological balance.

1.2 Why This Study Matters

By integrating the voices of residents, vendors, fishermen, visitors, and informal workers, the analysis captures the deep interconnections between communities and the natural spaces they depend on. The aim is to inform development strategies that are not only environmentally sound but also socially inclusive. Safeguarding these ecosystems is essential—not only for ecological resilience but also for preserving cultural heritage and enabling economic sustenance for vulnerable urban populations.

1.3 About the Study

The research study was part of the **'Proliferating Ecosystem-based Adaptation in Indian Cities (EPIC)'** initiative, being implemented by the **National Institute of Urban Affairs (NIUA)**. The EPIC project promotes ecosystem-based approaches to climate adaptation in Indian cities, with a key objective of demonstrating the **economic valuation** of urban ecosystems.

In Bhubaneswar, the study focused on three diverse ecological assets: Bindusagar Lake (a waterbody), Jaidev Vatika (an urban green space), and a Wetland. To document their ecological, social, and economic value, surveys were conducted with a wide range of stakeholders. These engagements were aimed at developing a holistic understanding of how different user groups perceive, use, and benefit from each ecosystem.

Objective

The primary objective of this study is to assess the **ecological**, **socio-cultural**, and **economic significance** of Bindusagar Lake, Jaidev Vatika, and the Wetland by capturing stakeholder perceptions, usage patterns, and emerging conservation needs. This evidence base will support efforts to mainstream nature-based solutions in Bhubaneswar's urban planning and climate resilience strategies.

Methodology

A comprehensive mixed-methods approach was adopted for this study, integrating both **quantitative** and **qualitative** techniques to assess the ecological, socio-cultural, and economic value of three distinct ecosystems in Bhubaneswar—Bindusagar Lake, Jaidev Vatika, and the Wetland. This approach enabled triangulation of data from diverse stakeholders, enriching the analysis with multiple perspectives and insights.

The survey targeted a wide cross-section of user groups including residents, visitors, water users, fishermen, hawkers, shop owners, and informal workers such as cattle grazers. The final distribution of respondents across the three study sites is summarised below. A total of **769 stakeholders** were surveyed:

Table 1: Stakeholders and Sample Size

STAKEHOLDER	BINDUSAGAR	JAIDEV VATIKA	WETLAND
Residents	100	61	120
Visitors	129	39	x
Water Users	3	x	x
Any Users	24	x	21
Fishermen	15	x	x
Hawkers	111	54	x
Shop Owners	91	x	x
Cattle Grazers	X	x	1
TOTAL	**473**	**154**	**142**

Key above stakeholder groups were identified in collaboration with the **National Institute of Urban Affairs (NIUA)**, with **CMSR** supporting the validation of stakeholder relevance for each ecosystem. Stakeholders were selected based on their interaction with, dependence on, or influence over the respective ecosystems.

Tools Development and Data Collection

Initial drafts of the quantitative survey tools were developed by the NIUA team. These tools were reviewed and refined based on feedback from CMSR researchers to ensure contextual relevance and clarity. Once finalized, the tools were translated into bilingual formats (English and Odia) to ensure linguistic accessibility and facilitate smoother interactions with local respondents.

CMSR recruited **eight local enumerators and one field supervisor**, who were extensively trained and supported by the CMSR core team and the NIUA project team. A two-day training programme was conducted to prepare the team for fieldwork:

Day 1 (Classroom Training):	Day 2 (Field-Based Mock Interviews):
Covered survey objectives, ethical considerations, data collection protocols, and a detailed walkthrough of the questionnaire.	Enumerators conducted supervised practice interviews, enabling them to build confidence and receive feedback before official data collection.

The CMSR team maintained regular contact with field teams to provide guidance, troubleshoot issues, and ensure adherence to protocols throughout the survey period.

Quantitative data was collected using structured, digitally administered surveys. Enumerators obtained informed consent from all respondents prior to interviews. Daily field schedules and

assignments were coordinated between enumerators and their supervisor to ensure efficiency and coverage.

To complement survey findings, Focus Group Discussions (FGDs) were conducted at two sites, Bindusagar Lake and Jaidev Vatika. These discussions included a mix of stakeholders, such as community members, informal workers, and visitors. At Jaidev Vatika, particular emphasis was placed on engaging with site workers to understand their unique perspectives and experiences.

Each FGD was audio-recorded with the consent of participants and supplemented by detailed note-taking by the facilitators. These discussions provided rich, contextual insights into the cultural, functional, and emotional significance of the ecosystems.

Quality Control Measures

To ensure the reliability and validity of the data collected, several quality control measures were implemented:

1. ***Deployment of local resources:*** We have worked on similar projects and hired enumerators who are familiar with the geography.
2. ***Training of Data Collectors:*** All data collectors underwent rigorous in-person training on data collection protocols, ethical considerations, and the use of tools.
3. ***Supervision and Monitoring:***
    a. Field data collection was closely supervised by field supervisors and other members from the team. The timestamp and geotagging were inbuilt in the software to ensure the quality.
    b. The first observation took place during the training of the field enumerators/investigators and was used for screening in the selection of the enumerators/investigators.

Data Analysis

The analysis across all three ecosystems—Bindusagar Lake, Jaidev Vatika, and the Wetland—was guided by a set of core questions provided by the National Institute of Urban Affairs (NIUA). These questions focused on understanding the ecological functions, stakeholder interactions, cultural relevance, and economic dependencies associated with each site. Using these guiding questions as the analytical framework, qualitative and quantitative data from stakeholder surveys—including residents, hawkers, visitors, and other users—were systematically reviewed. The approach ensured consistency in thematic focus across the three ecosystems while allowing for context-specific insights to emerge from each location. This structured yet adaptive method enabled a comparative understanding of how different urban commons function within the broader ecological and social fabric of Bhubaneswar.

SECTION II:

KEY RESULTS AND INSIGHTS OF 'BINDUSAGAR' SURVEYS

2.1 About 'Bindusagar' Waterbody

Bindusagar Lake is situated in the heart of Bhubaneswar, the capital city of Odisha, India. Located approximately 200 meters north of the famous Lingaraj Temple, this ancient lake covers an area of about 1,320 feet by 780 feet (402 meters by 238 meters)[1]. The lake is rectangular in shape and is surrounded by various temples and religious structures. In addition to its religious significance, the lake is a popular attraction for both tourists and locals.

The Lake is believed to have been constructed in the 7th or 8th century CE during the reign of the Keshari dynasty[2]. The lake is believed to contain water from all the holy rivers of India, making it a highly revered water body[3]. It is particularly significant during the Ashokastami festival, when thousands of devotees gather to take a holy dip in its waters[4]. The lake is also used for the immersion of idols during festivals like Durga Puja and Ganesh Chaturthi, and immersion of ashes of those who have passed away.

In addition to its religious significance, Bindusagar serves as an important ecological resource for Bhubaneswar. It acts as a natural reservoir, helping to recharge groundwater and maintain the local water table. The lake also provides a habitat for various aquatic species and birds[5].

In recent years, there have been concerns about the pollution and degradation of Bindusagar Lake. The Odisha government and local authorities have initiated various conservation and restoration projects to preserve this historic water body. These efforts include desilting, preventing sewage inflow, and improving the overall water quality[6].

2.2 Analysis of 'Residents' Surveys

Demographics

To assess the ecological and economic relevance of Bindusagar Lake from the perspective of local communities, structured interviews were conducted with **100 residents** living in its vicinity. Of these, **43% were female** and **57% male**. The age distribution reveals that:

[1] Patnaik, N. (1997). Sacred Geography of Puri: Structure and Organisation and Cultural Role of a Pilgrim Centre. Kalpaz Publications.
[2] Mohapatra, R. P. (1986). Archaeology in Orissa. B.R. Publishing Corporation.
[3] Dash, S. P. (2007). Coastal Histories: Society and Ecology in Pre-modern India. Primus Books.
[4] Mishra, P. K. (2005). The Orissa Gazette. Government of Orissa.
[5] Mohanty, P. K. (2012). Encyclopaedia of Schedule Tribes in India. Gyan Publishing House
[6] Government of Odisha. (2018). Odisha Economic Survey 2017-18. Planning and Convergence Department.

57%	22%	21%
of respondents were between 30 and 50 years old,	were aged above 50, and	were in the 18–30 age group.

The residential context provides insight into the socio-economic profile of the respondents:

Nearly 70% of the respondents live in private builder floors, while 23% of them live in unauthorised colonies. Over 61% of those surveyed live in a single bedroom house, reflecting their socio-economic context, while 27% of them live in a two-bedroom house. Most of the residents stated having lived there for generations, and 76% of them own their homes.

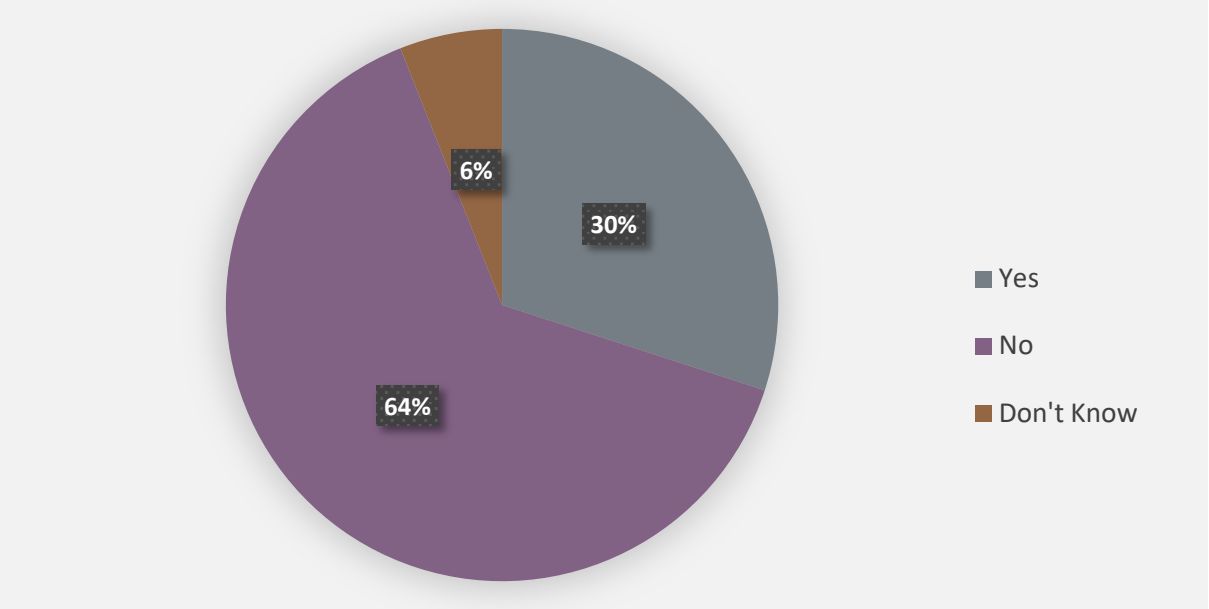
Water Supply: Sources and Treatment

A major objective of the survey was to document the access to and use of quality water. Through an analysis of the water usage, insights can be drawn on the impact that Bindusagar might have on the surrounding areas. Most of the residents (94%) reported receiving water through the municipal pipeline.

A significant 90% of the respondents explained that they receive water intermittently, with 53% of them explaining that they fill their water storage tanks once a day.

The residents largely reported not treating the water before use, with only 30% stating that they treat it at the household level.

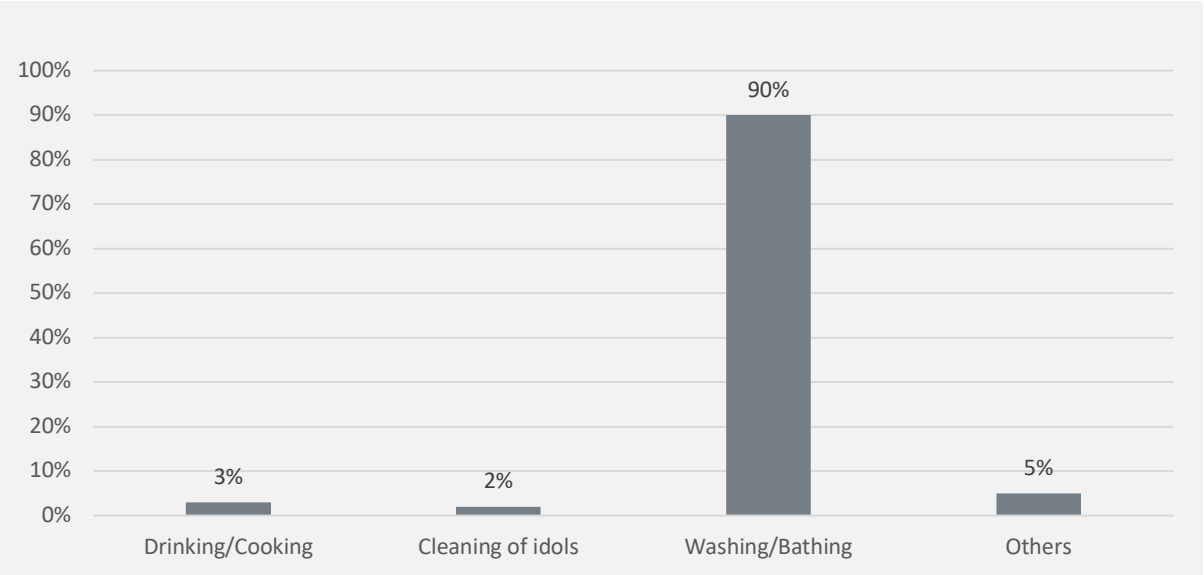
Fig 1: Distribution of Residents by water treatment at the household level (n=100)



Use of Water

Residents were asked about the use of water from the Bindusagar lake, wherein 60% stated using the water for some purpose or the other. Of them, a majority of the residents (90%) who reported using the water from the lake explained that they primarily use it for washing or bathing while a few used it for other purposes such as drinking, cooking (3%) or cleaning of idols (2%).

Fig 2: Distribution of Residents by Water Usage Patterns (n=60)



When asked whether they treated the lake water before use, nearly 92% of respondents said they did not, citing that the water is primarily used for washing and bathing. Only 7% reported treating the water before use.

Of those who reported using the water, 82% use the water from the water body directly.

Almost all the respondents (98%) stated that other residents use the water body for some purpose or the other. Responses regarding the number of residents using the water from the water body varied, though over 50% revealed that more than 50 residents visit the water body.

Perceived Impact of the Lake on Groundwater Access and Levels

To understand the potential impact of the water body on groundwater levels in the surrounding areas, residents were asked whether they use a handpump, dug well, or borewell. Only 13% of respondents reported using any of these sources, while the remaining 87% did not rely on groundwater for their water needs.

A majority of the residents who use handpump, dug well, or borewell revealed that they had to dig between 20 and 30 feet to access groundwater. Interestingly, there were variations in terms of how much they had to dig, based on whether their homes were near (within 1 km)

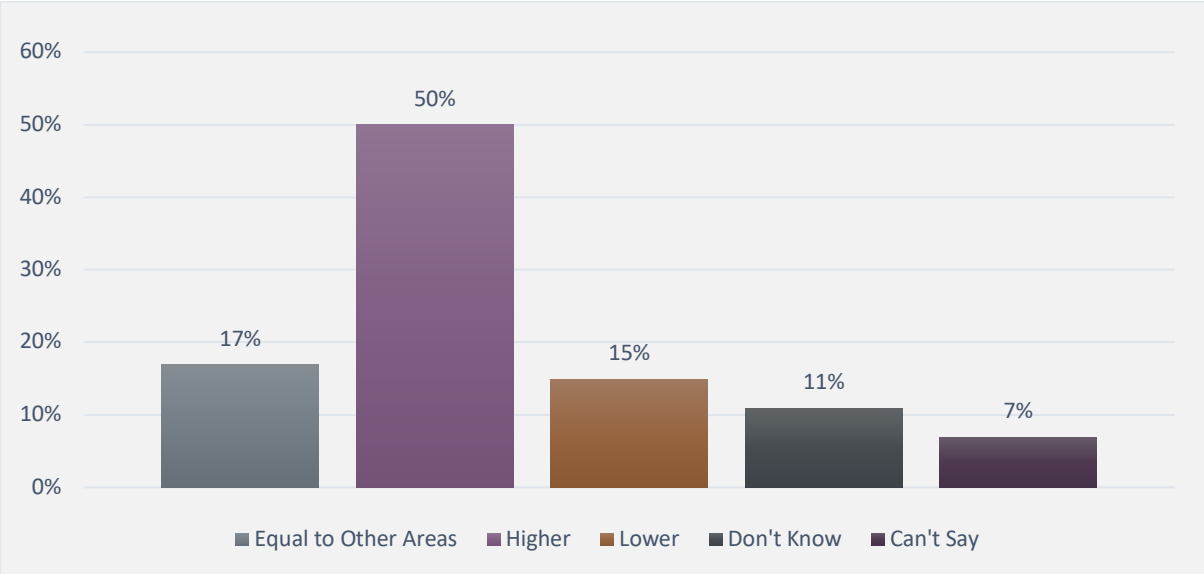
the lake or far (over 1 km) from it. For example, 75% of those living away from the waterbody stated having to dig over 25 feet, while 64% of those living nearby had to dig less than 25 feet.

Table 2: Distribution of Groundwater Depth by Proximity to the Lake in Feet (near n = 8, far n=4)

DEPTH	NEAR	FAR
10 feet to 15 feet	13%	0%
16 to 20 feet	13%	25%
21 to 25 feet	38%	0%
26 feet to 30 feet	13%	50%
40 feet	13%	25%
100 feet	13%	0%

Notably, 50% of respondents stated that they believe the water level around the water body is higher than elsewhere, acknowledging the significant impact that the lake has on the area. These perceptions varied based on the proximity of the residents' house to the lake; 37% of those living near the lake stated that the water levels are higher, while only 15% who live far away believe the same. Meanwhile, 47% of those living far away believe that the water levels are the same across areas, while a mere 22% of those who live nearby are of this opinion.

Fig 3: Variation in water levels from other areas (n=60)



Household Air Conditioner Usage Patterns

Only 25% of residents reported using air conditioners. Among these users, 84% have one air conditioner, while the remaining 16% own two. In terms of seasonal usage, 48% of AC users reported operating their units for 2–4 months each year, 32% for 8–9 months, and 20% for 5–7 months.

Regarding daily usage during peak summer, 36% of users reported running their ACs for 4–6 hours per day. Additionally, 20% each reported using them for 2–4 hours and 6–8 hours. About 12% used their ACs for 8–10 hours, while the remaining 12% used them for less than 2 hours daily.

Household Air Coolers Usage Patterns

A small number of residents (13%) reported using air coolers, and all of them stated using only one cooler per household. Interestingly, a higher proportion of cooler users lived far from the lake (46%) compared to those living nearby (23%); 31% did not share the distance of their homes from the lake. These patterns may reflect underlying economic differences among residents based on their proximity to the waterbody. Interestingly, 46% of the cooler users use it for 8 to 9 months, while 31% use it for 3 to 6 months. In a trend similar to that of the AC usage, 38% of cooler users use it for 4 to 6 hours a day in peak summer, while 23% each reported using it for 6 to 8 hours and 8 to 10 hours respectively.

A crucial finding from the survey was the perception of the residents with regard to ambient temperature; when asked if they thought that the area around the water body is cooler than other areas, a noteworthy **90% stated that they did find the area to be cooler.**

Biodiversity in and around the Water Body

Respondents shared a diverse range of flora and fauna they have observed in and around the Bindusagar lake. In terms of plant life, they mentioned the presence of green leafy vegetables along with various trees such as Neem, Almond, Pipal, and Jamun. The area also supports a variety of animal life, including birds, tortoises, pigeons, snakes, fishes, ducks, cows, dogs, and cats.

Additionally, some respondents specifically noted sightings of mongooses, rats, monkeys, and squirrels. Snakes, dogs, cats, and several species of birds were frequently mentioned across responses, indicating a rich and active biodiversity in the vicinity of the lake.

Overall Perception of the Water Body

Bindusagar attracts a large crowd for various reasons, as revealed by the survey responses. Many people are drawn to the area due to its historical significance and the presence of the Lingaraj temple nearby. Religious activities such as *Pind Daan* and *Mundan* are key motivations for visits, along with bathing—both for religious purposes and general use. Additionally, the site serves as a venue for functions and festivals and is also used for outdoor activities. Some respondents mentioned that they visit the area without any specific reason, especially given their proximity to the water body.

Suggestions for Improving Lake Cleanliness and Public Facilities

Respondents suggested that the water in the lake should be cleaned twice a month to maintain hygiene and enhance the overall environment. They emphasized the need to ban anti-social activities in the area and recommended the presence of police enforcement to ensure safety and order.

Additionally, respondents highlighted the need for greater awareness about cleanliness among visitors. They also proposed the construction of toilets and dressing rooms to improve public convenience. Suggestions for environmental improvement included new plantations to create a greener, cleaner space, and the repair of the existing motor pump to support maintenance efforts.

Summing up

The Bindusagar waterbody plays a multifaceted role in the lives of nearby residents, affecting their environment, daily routines, and quality of life. A significant 60% of surveyed residents directly use the water from the lake, primarily for washing and bathing purposes, indicating its practical utility in their daily lives. Half of the respondents believe that groundwater levels are higher around the waterbody than elsewhere, demonstrating its ecological value for the local water table. Most notably, 90% of residents perceive that the area around Bindusagar is cooler than other areas of the city, creating a natural microclimate that enhances their living environment and potentially reduces their reliance on artificial cooling. This is reflected in the modest usage of air conditioners (only 25% of households) and coolers (even fewer).

The analysis also reveals significant differences between residents living near versus far from Bindusagar Lake. Residents who reside near the lake are 2.5 times more likely to perceive higher groundwater levels compared to those who reside far (37% vs 15%), suggesting a strong correlation between proximity to the waterbody and awareness of its hydrological benefits. Cooling strategies also differ markedly by distance: near residents demonstrate higher air conditioning usage (42% vs 29%) but significantly lower cooler usage (9% vs 43%), while residents who reside far from the lake show the opposite pattern with lower AC adoption but 5 times higher cooler usage. This distance-based variation indicates that proximity to Bindusagar correlates not only with different perceptions of groundwater benefits but also with distinct cooling preferences, potentially reflecting either the waterbody's microclimate effects reducing cooling needs for nearby residents or socioeconomic differences between the two groups that influence both housing location and cooling technology choices.

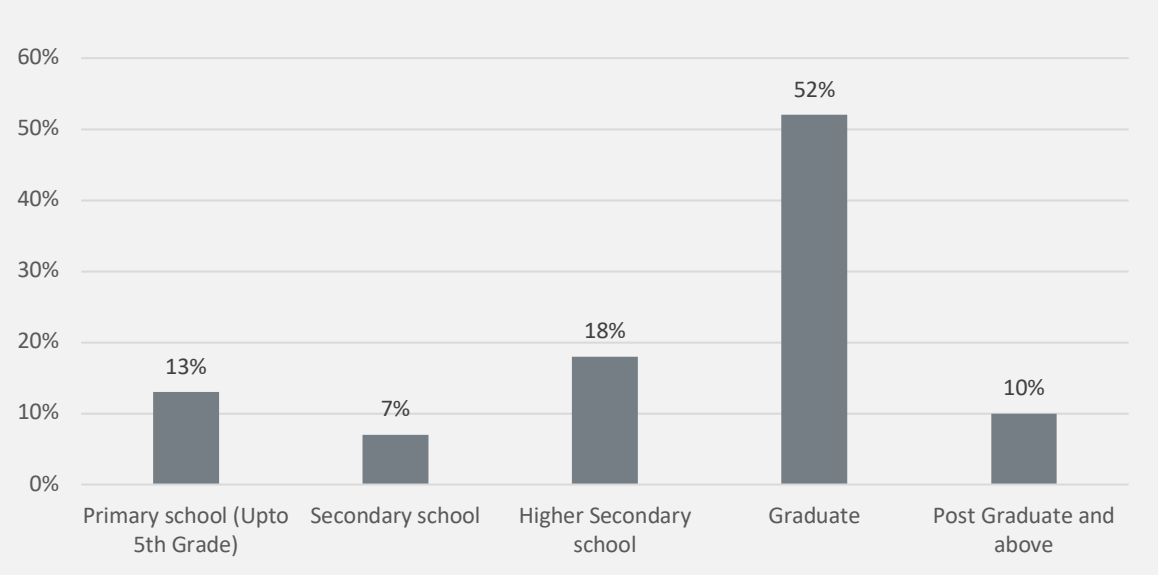
The water body also supports rich biodiversity that residents have observed, including various flora, birds, and animals that contribute to the environmental quality of the area. Residents value the waterbody not only for its practical uses, but also for its religious significance, cultural heritage, and as a venue for community gatherings, making it an integral part of the local social fabric.

2.3 Analysis of 'Visitors' Surveys

Demographics

One of the main stakeholders around the Bindusagar lake were visitors. Since this plays an important socio-cultural role, it was essential to capture the perception of visitors at the site. To this end, 129 visitors were surveyed, of whom 70 (54%) were male and 59 (46%) were female. The largest group of respondents belonged to the 30 to 50 years age group, followed closely by those between the ages of 18 and 30. Around 11% respondents were over 50 years. A majority of the visitors who were surveyed are **graduates** (52%), while others stated having completed their higher secondary (18%). Only 9% reported having studied till primary school, indicating a largely literate respondent group.

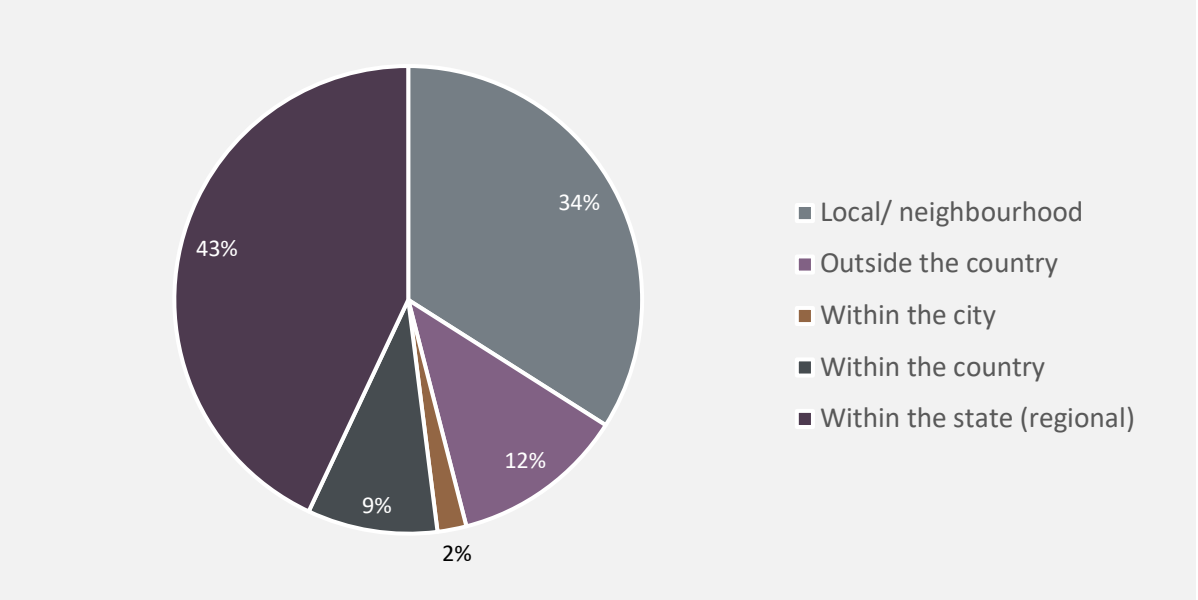
Fig 4: Literacy level of respondents (n=128)



Visit to Bindusagar: Reason and Context

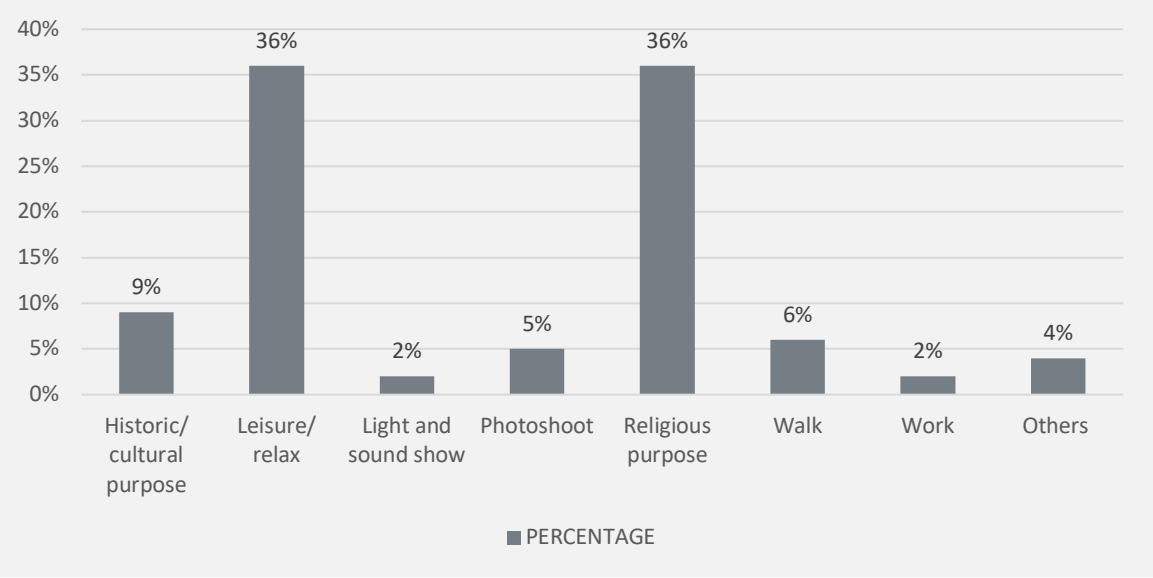
Around 43% reported traveling from within the state, while 34% revealed that they were local to the area. Interestingly, 12% of the visitors were from outside the country, reiterating the importance of the lake as a tourist location.

Fig 5: Respondents' place of origin (n=129)



When asked their primary purpose for visiting the site, 36% stated that they had come to the lake for leisure, while an equal percentage of respondents stated religious reasons for their visit. Around 9% mentioned historic/cultural reasons for their visits and 6% and 5% respectively visited the site for walking and photoshoots.

Fig 6: Primary purpose for visit (n=129)



The 129 respondents reported visiting with others, amounting to a total over 1070 visitors. Around 75% reported visiting Bindusagar from other places, including Puri, Kumbh Mela, the Lingaraj Temple, and Gopalpur Beach.

Expenditure at Bindusagar

In order to assess the economic impact of Bindusagar, it was essential to document the amount that visitors are spending at the ecosystem. This expenditure includes amount spent on commute to and from Bindusagar, as well as expenses at the site.

Respondents were asked how much they spent to commute to Bindusagar, and a majority of the visitors (60%) said that they had spent less than INR 500. This is supported by the fact that 34% of the visitors stated coming from the neighbourhood, reducing the amount spent on transportation. Those that reported having spent more than INR 3000 were likely visiting from outside the city, as some visitors revealed coming from Puri.

Table 3: Expenditure on transportation (n=114)

EXPENSES	PERCENTAGE
INR 0-500	60%
INR 501-1000	5%
INR 1001- 1500	9%
INR 1501-2000	5%
INR 2001-2500	2%
INR 2501-3000	5%
Above INR 3000	14%
TOTAL	**100%**

Respondents who were local or from nearby areas reported spending approximately INR 0–500 during their visit, whereas those who travelled from other cities or states spent more than Rs. 3,000. Those who came from far spent money on food as well as prayer related items. When asked about their expenses, the majority (92 respondents or 74%) mentioned spending on food. A few others reported expenses on puja related materials, parking, water bottles, etc.

Experience at the water body

Visitors shared that the site offers multiple advantages, making it a popular destination for a wide range of people. Its spiritual significance draws many for performing *Shradh* rituals and *Pindadan*, reinforcing its socio-cultural relevance. Located near the Lingaraj Temple, the site is often visited in conjunction with temple visits. Beyond its religious appeal, the area is appreciated for its clean air, peaceful environment, and scenic surroundings, making it ideal for morning walks, long strolls, and photoshoots. It is also popularly known as a lovers' point. A key attraction is the renowned light and sound show, which adds to the site's charm and creates a memorable experience for visitors.

Biodiversity in and around the water body

Visitors who had been to the lake before were asked how biodiversity has changed over the years, some respondents observed that the water body has become cleaner and that the evening light show has contributed to an overall improvement of the area. Plantation efforts, including the addition of medicinal plants like Tulsi, have made the surroundings greener. The ponds, in particular, were noted to be cleaner and better maintained. However, opinions were mixed—while some felt there had been no significant change over the past two years, others believed that the area has been degraded due to irresponsible behaviour by visitors.

Respondents reported observing a variety of species in and around the water body. These included various birds (avifauna), kites, kingfishers, magpies, white birds, crows, and water crows, as well as animals like squirrels, mongooses, cows, dogs, ducks, and fish. Among the plant life, they mentioned *Champa*, *Krishna Chura*, almond trees, lotus, hibiscus, banyan, and coral tree plantations. Some respondents also noted the presence of snails and green leafy vegetable plants. A few mentioned having seen a unique plant whose name they could not identify. However, the majority stated that they had not observed any particularly unique species in the area.

The visitors were also asked to reflect on how the loss of the biodiversity of the lake would impact them. It is noteworthy that 82% affirmed that the loss of biodiversity would affect them, while 7% said that they could not say; only 11% said that it would not impact them.

When asked to explain how it would impact them, they expounded that a decline in the beauty of the lake would directly affect the income of nearby shops, as it would likely lead to a decrease in visitor numbers. Additionally, the loss of natural habitat could contribute to a drop in air quality, further harming the local environment. With reduced tourism, local vendors would experience a decline in earnings, ultimately impacting their livelihoods. This was an interesting finding as visitors were not only speaking about their own experiences, but also empathising with local vendors.

Maintenance and Contribution to Bindusagar

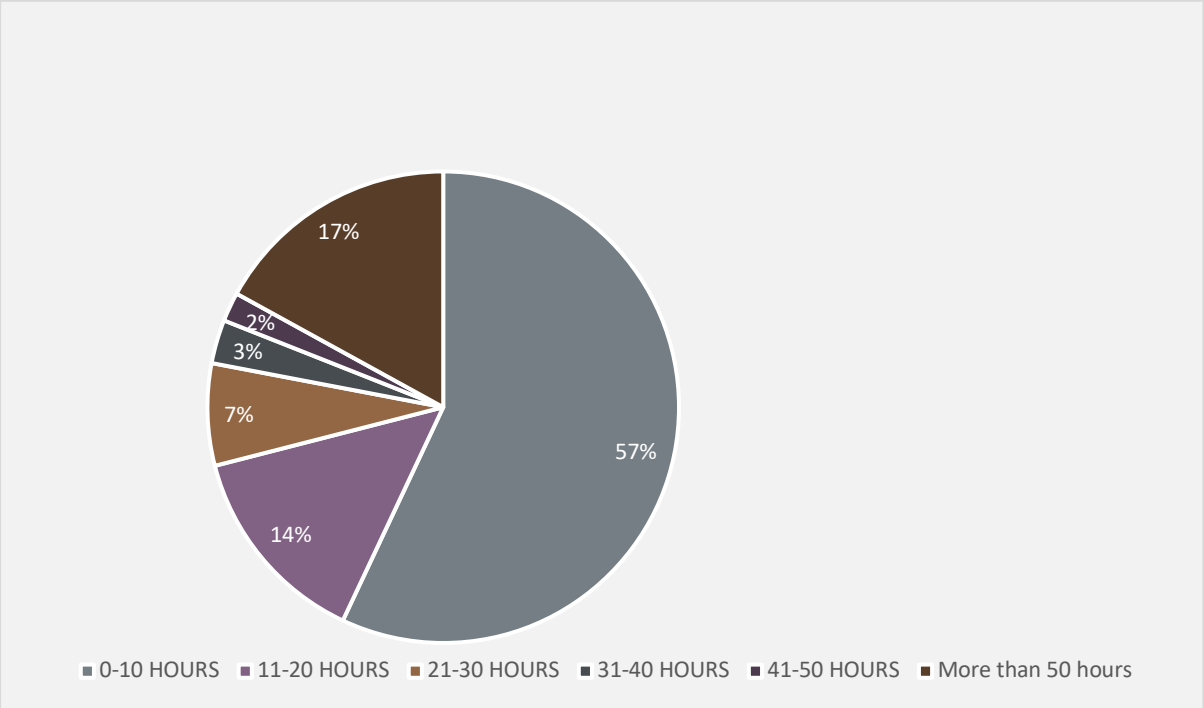
Visitors were asked whether they felt the Bindusagar Lake was well-maintained. Nearly half (49%) believed it was not, while 17% felt it was well-maintained. Interestingly, a notable 34% were uncertain and stated they could not say either way.

Two-thirds or 66% of the visitors who were surveyed revealed that they would be interested in providing their support to protect the water body. To preserve the environment and enhance the beauty of Bindusagar, respondents expressed a willingness to participate in cleanliness drives and raise awareness about the importance of nature through community engagement and local meetings. They also emphasised the need to educate others about the

vital role nature plays in our lives. Additionally, respondents showed interest in taking part in plantation activities and water cleaning drives to help restore the water body.

Around 68% of those willing to support in the maintenance of the water body said that they would contribute time for these efforts. Over half (57%) of the respondents said that they would contribute less than 10 hours a year, while 17% stated that they were willing to spend more than 50 hours a year.

Fig 7: Distribution of Visitors by Willingness to Contribute Time Towards Maintenance of Bindusagar (n=58)



Around 58% of visitors expressed a willingness to financially contribute towards the protection of the water body. The most common amount offered was INR100, with 29% of respondents selecting this option. Additionally, 11% each were willing to contribute INR10 and INR 50. In total, the contributions pledged by visitors amounted to INR 15,405.

Table 4: Visitor's willingness to contribute towards the maintenance of Bindusagar (n=54)

INR WILLING TO CONTRIBUTE	PERCENTAGE
10	11%
20	4%
35	2%
50	11%
100	29%

INR WILLING TO CONTRIBUTE	PERCENTAGE
120	2%
150	2%
200	15%
500	11%
1000	9%
1500	2%
2000	2%

Economic value of the ecosystem

The approximate economic value of the ecosystem was calculated based on the amount that visitors spent on commute to the lake, money spent at the site, and the money they are willing to contribute towards the maintenance of the ecosystem. This amounted to **INR 4,27,250.**

Summing up

Bindusagar waterbody serves as a significant cultural, religious, and recreational destination that draws a diverse range of visitors from the local area (34%), within the state (43%), and even internationally (12%). The dual nature of the site is evident from the equal proportion (36% each) of visitors who come for religious purposes and those who visit for leisure and relaxation. The waterbody generates notable economic activity, with visitors spending on transportation, food, religious items, and other services, contributing to an estimated economic value of INR 4,27,250.

Despite nearly half (49%) of visitors noting that the lake is not well-maintained, there is strong interest in its preservation—66% expressed willingness to contribute their time to protect the waterbody, and 58% were willing to make financial contributions totalling INR 15,405. This demonstrates the high value visitors place on Bindusagar's environmental, cultural, and spiritual significance. The waterbody's appeal spans multiple dimensions, from its connection to the nearby Lingaraj Temple to its peaceful environment and scenic surroundings, making it an important asset for tourism as well as local cultural heritage that visitors are invested in preserving for future generations.

2.4 Analysis of 'Any Users' Surveys

Demographics

The any users included respondents who did not necessarily fall under any of the other categories. A total of 24 people were surveyed under this category, of whom 13 (54%) were female and 11 (46%) were male. A majority (65%) of the respondents were between the ages

of 30 and 50, while 22% belonged to the 18 to 30 age bracket. Nearly 13% were over the age of 50.

Use of Water Body

A significant percentage of the respondents (63%) use the water from the lake for bathing or washing, followed by for religious activities (38%). It should be noted that many of the respondents use the water for multiple purposes and the responses shared below capture the overall usage of the water body.

Table 5: Purpose for water use (n=24)

Activity	Percentage
Bathing/washing	63%
Religious	38%
Recreational	25%
Fishing	8%
Other	29%

**Multiple responses*

Visit Frequency

The data reveals that the majority of respondents (54%) visit the water body more than 20 times annually, showing a high level of regular engagement with this resource. The second most common response was visiting once (17%), followed by 2-5 visits and 5-10 visits, each representing 8% of responses. A smaller portion of respondents (4%) reported visiting the water body 2-3 times per day, indicating daily interaction.

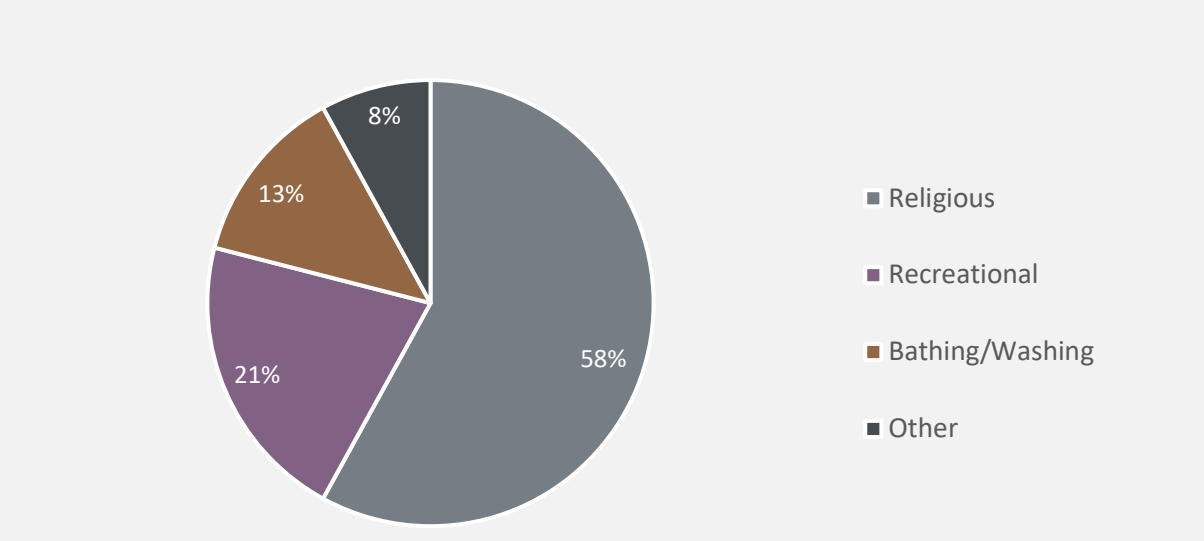
Given that a significant portion of the respondents have visited Bindusagar before, they were able to share the approximate number of visitors on a daily basis. Half of the respondents (50%) reported that the water body attracts more than 1000 visitors per day. The second largest group (42%) indicated that the water body receives between 500-1000 visitors. Much smaller proportions reported lower visitor numbers, with only 4% each reporting 100-500 visitors or less than 100 visitors. This suggests that the water body is a popular destination that primarily attracts large numbers of people.

Table 6: Estimated Number of Daily Visitors (n=24)

NUMBER OF VISITORS	PERCENTAGE
100 - 500	4%
500 - 1000	42%
Less than 100	4%
More than 1000	50%

When asked why other people visit the site, a majority (58%) believed that most visitors come to the water body for religious purposes. Recreational activities were identified by 21% as the primary reason for visits, while 13% mentioned bathing and washing. An additional 8% cited other purposes. This distinction highlights the diverse ways in which the space is perceived and utilized by different groups.

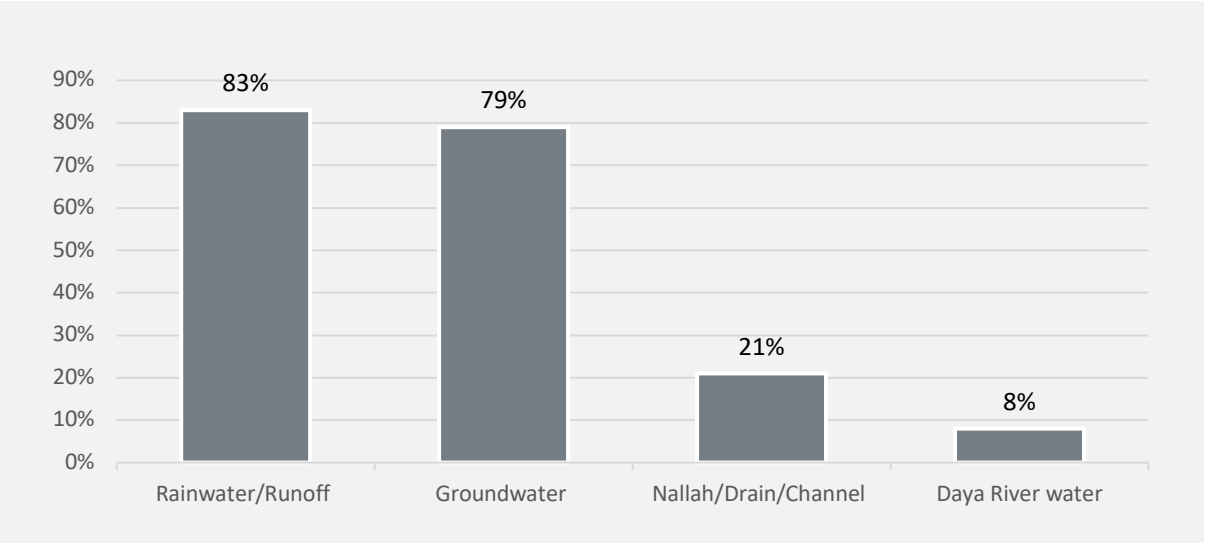
Fig 8: Perceived Purpose of Visitors to the Water Body (n=24)



Perceived Sources of Water

Majority of the users (83%) stated that the main water source of the lake was rainwater/runoff, closely followed by groundwater at 79%. Nallah/drain/channel was mentioned by 21% of respondents, while Daya River water was the least frequently mentioned source at 8%. It should be noted that rainwater/runoff as well as groundwater were both selected as the main sources of water in the lake by 2/3rd of the respondents.

Fig 9: Perceived Sources of Water (n=24)



A significant majority (92%) of users stated that the lake never dries up completely. Another 4% reported that it rarely does, while the remaining 4% (one respondent) said they did not know. Interestingly, the one respondent who believed the lake might dry up completely noted that this typically occurs in the month of April.

Institutional Responsibility

A majority of respondents (53%) identified the Bhubaneswar Municipal Corporation (BMC) as the agency responsible for the water body. Notably, 29% of respondents were unaware of which agency held responsibility. Additionally, 12% believed that private bodies were in charge, while only 6% mentioned the Temple Trust.

Cultural Relevance and Perception

A notable 83% of respondents (20 out of 24) indicated that people primarily visit Bindusagar for religious purposes, establishing it as the dominant reason for visitation. The proximity of the lake to the Lingaraj temple is also a critical aspect in understanding the relevance of the space, with 87% acknowledging that there are community spaces nearby. Additionally, 38% of respondents (9 out of 24) mentioned that people come for entertainment or recreational purposes, while others noted visits for relaxation and photography. These observations were corroborated by the enumerators' field notes.

Several respondents highlighted the uniqueness of the ecosystem, particularly noting its cleanliness and maintenance as distinguishing features. The religious significance of Bindusagar was frequently cited as what makes the location special. One notable insight came from a respondent who mentioned that real estate prices in the vicinity are higher due to the cooler microclimate compared to surrounding areas. Some respondents also observed a decline in water levels at the site over time.

Festival Footfall and Reach

A significant majority (79%) of respondents stated that there are periodic festivals or events at the site. Among those who reported festivals being conducted at Bindusagar, 79% stated that more than a 1000 people visit the site during the festivals. Fewer respondents (21%) believed the number to be between 500 and 1000.

Table 7: Estimated Visitors During Festivals (n=19)

NUMBER OF VISITORS	PERCENTAGE
500 to 1000	21%
More than 1000	79%
TOTAL	100%

Regarding festival visitors at Bindusagar, 90% of respondents (17 out of 19) reported that visitors come from local areas or from within the city. The same percentage (90%) indicated that visitors come from within the state. Nearly 95% mentioned that visitors also come from other parts of the country. A significant proportion (42%) noted that the festivals attract international visitors as well.

This data suggests that while the festivals primarily attract visitors from Odisha and other parts of India, they also have international appeal, highlighting Bindusagar's significance as a cultural and religious destination.

2.5 Analysis of 'Water Users' Surveys

A total of three water users were interviewed, comprising two males and one female. Two of the respondents were between the ages of 30 and 50, while the third was in the 18 to 30 age group. Two of the respondents (one male and one female) were part of the maintenance staff, and the remaining male respondent was a visitor to the site.

The maintenance staff reported that they receive water through the municipal connection, while the visitor revealed that he receives water from the community borewell.

When asked what they use the water for, all the three respondents (100%) said that they use it for washing and bathing, directly from the water body. Interestingly, one of them said that he treats the water before use. One water user, the visitor, said that he uses around 160 litres of water from the water body.

One of the maintenance staff mentioned that there is a water storage tank of around 50 litres which gets filled around 2 to 3 times a day.

When asked why the water body attracts such a large crowd, the water users explained that its proximity to the Lingaraj Temple plays a significant role—many people visit the lake while visiting the temple. Additionally, the site is frequented by individuals performing *Shraadh* (rituals for deceased ancestors), which also contributes to the high footfall.

Two of the three respondents, one visitor and one maintenance staff member emphasized the need for regular cleaning of the water body and measures to restrict the presence of anti-social elements. They also suggested installing dustbins and providing designated dress-changing rooms to improve hygiene and convenience for visitors.

Based on the amount of water used from the lake (160 litres) and the cost of water per litre (INR 6.12), the economic value of the lake amounted to **INR 979.2** per person.

2.6 Analysis of Fishermen's Surveys

Demographics

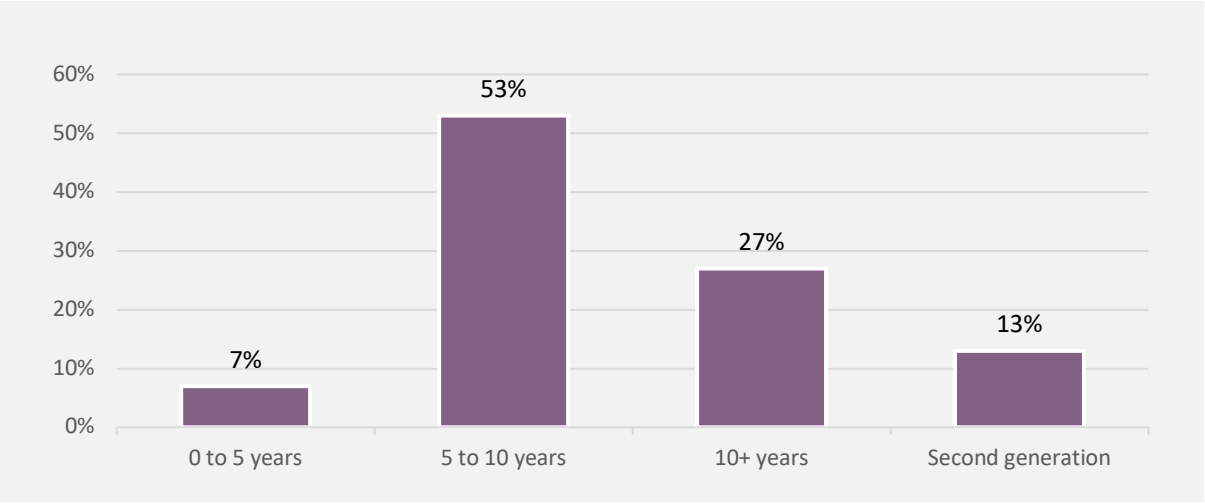
All respondents in this category were male. A majority (60%) belonged to the 30–50 age group, followed by 27% in the 18–30 age group. Those above 50 years of age formed the smallest group, accounting for 13% of the total respondents.

Fishing Frequency and Experience

Most fishermen (60%) visit the lake weekly, while a third (33%) fish daily. Fortnightly visits were rare.

Over half of the fishermen (53%) reported fishing at Bindusagar since the last 5 to 10 years. Around 27% have been fishing for more than a decade, while 13% said the practice has continued across generations in their families. Only 7% of respondents have been fishing at the lake for less than 5 years.

Fig 10: Years of Fishing at Bindusagar (n=15)



Duration and Seasonality of Fishing

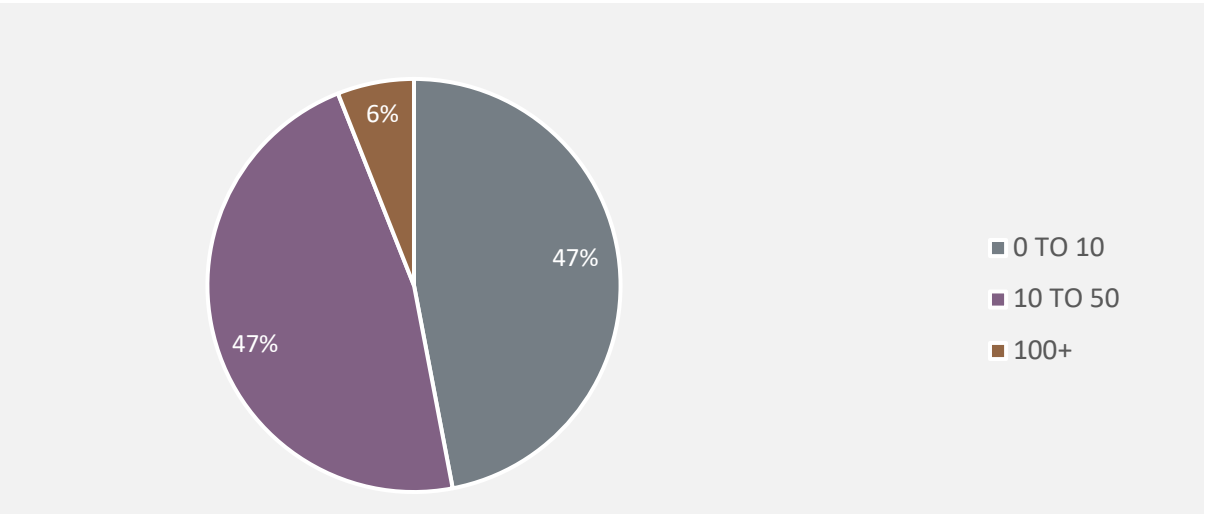
One-third of the fishermen reported fishing for approximately two hours, while 60% said they typically fish for three to five hours. Only one respondent mentioned fishing for just 30 minutes to an hour.

When asked about the best time for fishing, 5 out of 15 fishermen identified March as the most favourable month, followed by 3 respondents who preferred April.

Estimate of Total Fishermen at Bindusagar

When asked about the number of other fishermen at the lake, 47% of respondents estimated fewer than 10, while an equal proportion reported between 10 and 50 fishermen depending on the lake. Only one respondent mentioned that more than 100 fishermen visit the lake. Observations by the enumerators corroborated these estimates, noting that approximately 10 to 20 fishermen typically fish at Bindusagar.

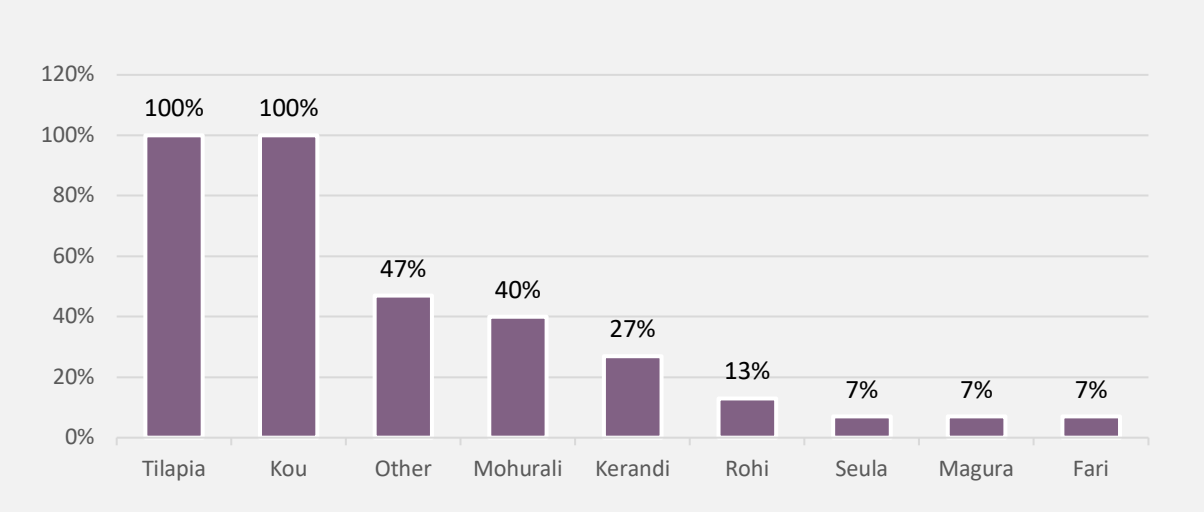
Fig 11: Number of Fishermen at the Lake (n=15)



Types of Fish Caught

All 15 fishermen (100%) reported catching both Tilapia and Kou, while, Mohurali is the third most common fish type, caught by 40% of fishermen. Meanwhile, Kerandi is caught by about a quarter of fishermen (27%). Less common fish types included Rohi, Seula, Magura, and Fari.

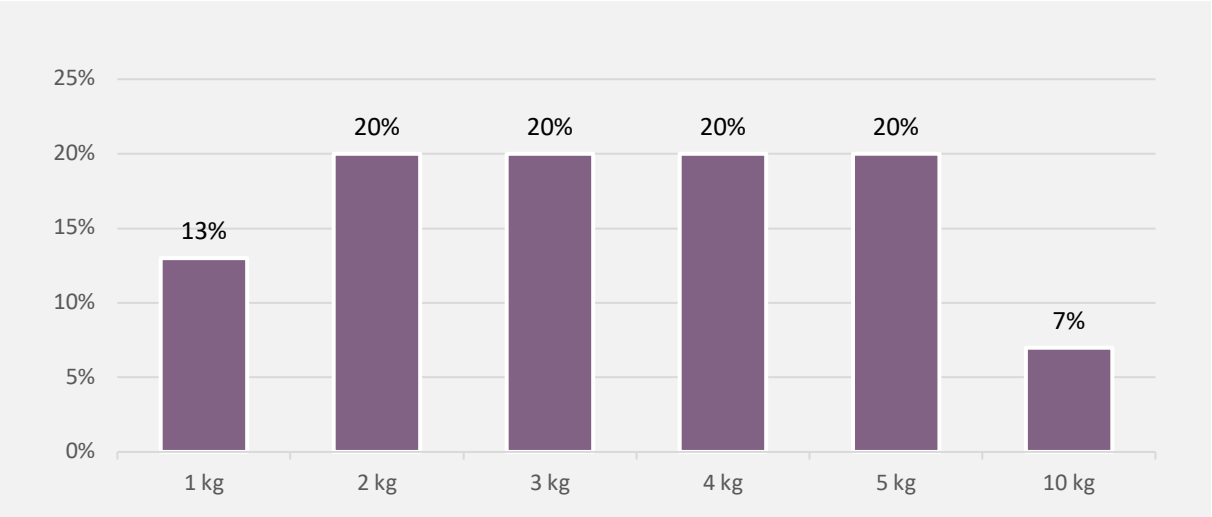
Fig 12: Fish Species Caught (n=15)



Daily Catch and Use — Tilapia/Kou

All the 15 surveyed fishermen reported catching Tilapia (Kou), with an average daily catch of 3.6 kg. The majority (80%) catch between 2 and 5 kg per day, with catch amounts evenly distributed across this range. A smaller portion (13%) catch around 1 kg daily, while 7% reported a higher catch of 10 kg.

Fig 13: Daily Catch Distribution (Tilapia/Kou) (n=15)



The table reveals the different ways in which fishermen utilize their catch of Tilapia/Kou, Notably, 27% of fishermen do not sell any of their catch, suggesting a reliance on fish for

personal consumption. In contrast, 13% of fishermen sell their entire catch. The remaining 60% fall along a spectrum, selling between 50% to 90% of their catch. On the consumption side, 27% of fishermen consume 100% of their catch, while 13% consume none, likely selling it all instead. These figures suggest that while a portion of the fishing community depends entirely on their catch for food, the majority engage in both self-consumption and market sale, reflecting a dual livelihood strategy.

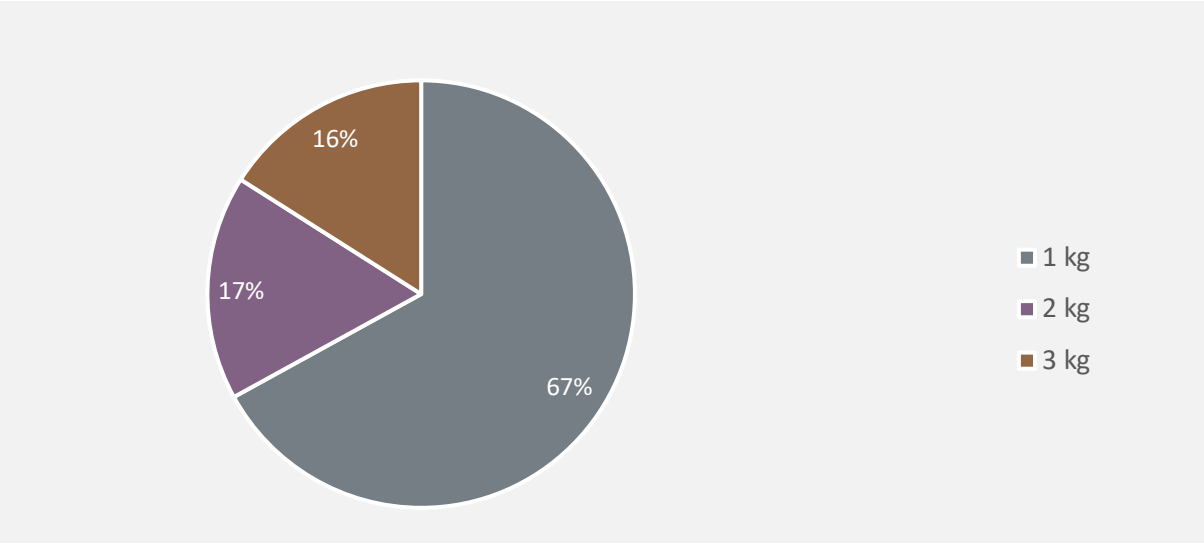
Table 8: Tilapia/Kou: Catch Utilization (n=15)

PERCENTAGE OF CATCH SOLD		PERCENTAGE OF CATCH CONSUMED	
% OF CATCH	**% OF FISHERMEN**	**% OF CATCH**	**% OF FISHERMEN**
0%	27%	0%	13%
50%	13%	10%	13%
70%	21%	20%	13%
80%	13%	30%	21%
90%	13%	50%	13%
100%	13%	100%	27%
Total	**100%**	**Total**	**100%**

Daily Catch and Use — Kerandi

The daily catch distribution data for Kerandi fish indicates that it is caught by 6 fishermen (40% of those surveyed), the majority of fishermen (67%) typically catch 1 kg of fish per day. A smaller proportion report catching 2 kg (17%) and 3 kg (16%), respectively. This suggests that daily catch volumes are generally low, with two-thirds of the respondents managing only 1 kg.

Fig 14: Daily Catch Distribution (Kerandi) (n=6)



The data on catch usage in Kerandi (n=5) reveals a clear split in the way fishermen utilize their fish. 40% of fishermen do not sell any of their catch, indicating a focus on self-consumption, which is mirrored by the 40% who consume 100% of their catch. On the other end, 40% of fishermen sell their entire catch and consume none, suggesting a purely commercial orientation. The remaining 20% follow a mixed strategy, selling and consuming half of their catch.

Table 9: Percentage of catch sold and consumed (Kerandi) (n=5)

PERCENTAGE OF CATCH SOLD		PERCENTAGE OF CATCH CONSUMED	
% OF CATCH	**% OF FISHERMEN**	**% OF CATCH**	**% OF FISHERMEN**
0%	40%	0%	40%
50%	20%	50%	20%
100%	40%	100%	40%

Daily Catch and Use — Mohurali

In the case of Mohurali, it is caught by 4 fishermen, representing 27% of those surveyed. The average daily catch among them is 1.25 kg, indicating relatively small yields. A closer look at the distribution shows that 75% of these fishermen catch only 1 kg per day, while the remaining 25% manage to catch 2 kg.

The data on Mohurali catch usage (n=4) reveals that half of them (50%) do not sell any of their catch**.** On the other end, 25% sell their entire catch, while another 25% sell 80%, indicating some level of market engagement. In terms of consumption, 50% of fishermen consume their entire catch, 25% consume 20%, and another 25% do not consume any, likely selling it all.

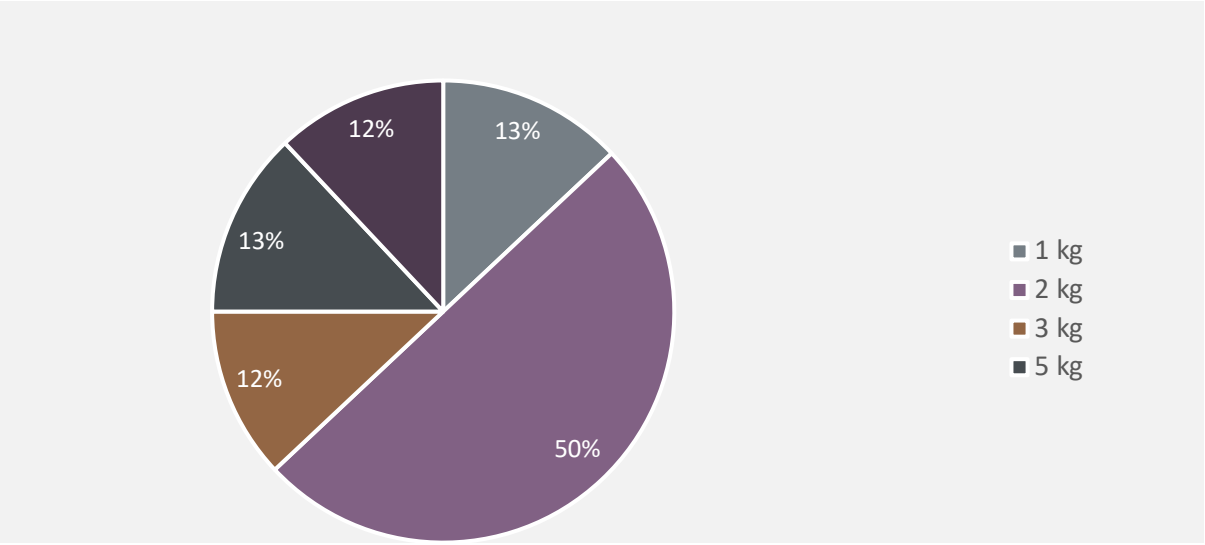
Table 10: Percentage of catch sold and consumed (Mohurali) (n=4)

PERCENTAGE OF CATCH SOLD		PERCENTAGE OF CATCH CONSUMED	
% OF CATCH	**% OF FISHERMEN**	**% OF CATCH**	**% OF FISHERMEN**
0%	50%	0%	25%
80%	25%	20%	25%
100%	25%	100%	50%
Total	**100%**	**Total**	**100%**

Daily Catch and Use — Other Fish Species

In addition to these species of fish, other fish types (primarily Rohi according to the survey data) are caught by 8 fishermen (53% of those surveyed), with an average daily catch of 4 kg. Half of the fishermen catch 2 kg per day, with one fisherman reporting a substantial 15 kg daily catch.

Fig 15: Daily Catch Distribution (Others) (n=8)



Half of the fishermen (50%) sell their entire catch of the other fish types, while the rest sell between 50% and 93%, indicating that all fishermen in this group engage in market sales to some extent. On the consumption side, 50% of fishermen do not consume any of their catch**,** while the remaining half consume varying amounts i.e. 7%, 40%, and 50%. Overall, the figures suggest that fish grouped under "Others" are primarily valued as a source of income, with minimal use for household consumption among most fishermen.

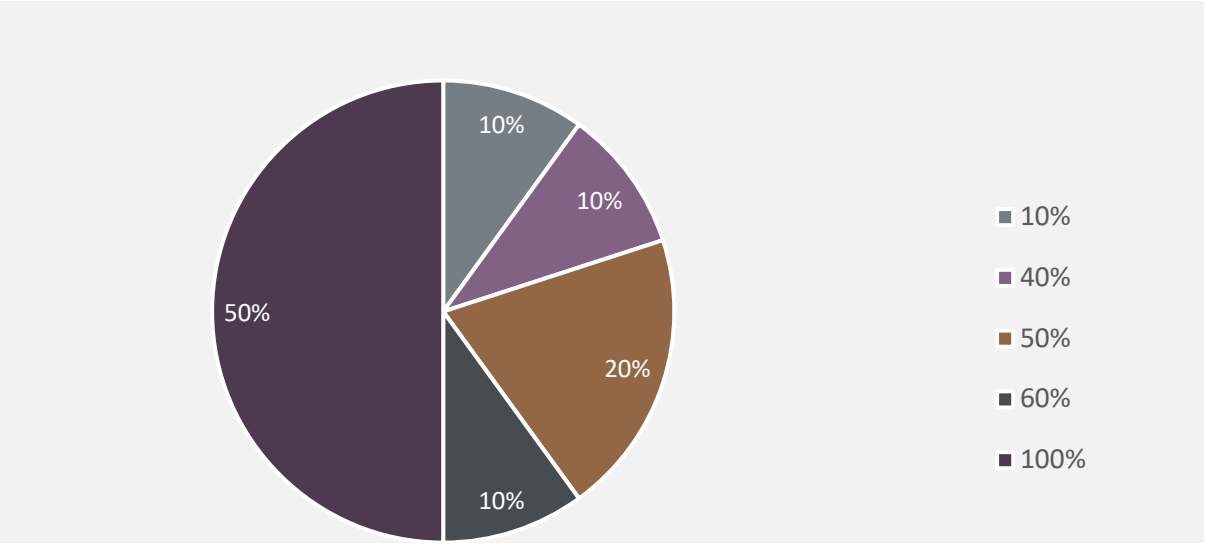
Table 11: Percentage of catch sold and consumed (Others) (n=8)

PERCENTAGE OF CATCH SOLD		PERCENTAGE OF CATCH CONSUMED	
% OF CATCH	**% OF FISHERMEN**	**% OF CATCH**	**% OF FISHERMEN**
50%	13%	0%	50%
60%	25%	7%	12%
93%	12%	40%	25%
100%	50%	50%	13%

Dependence on Bindusagar Lake

The data shows that exactly half of the surveyed fishermen (50%) get all of their fish catch (100%) from the Bindusagar waterbody, indicating complete dependence on this water source. Another 40% of fishermen get between 26-75% of their catch from Bindusagar, while only 10% (1 fisherman) gets a small portion (10%) of their catch from this waterbody.

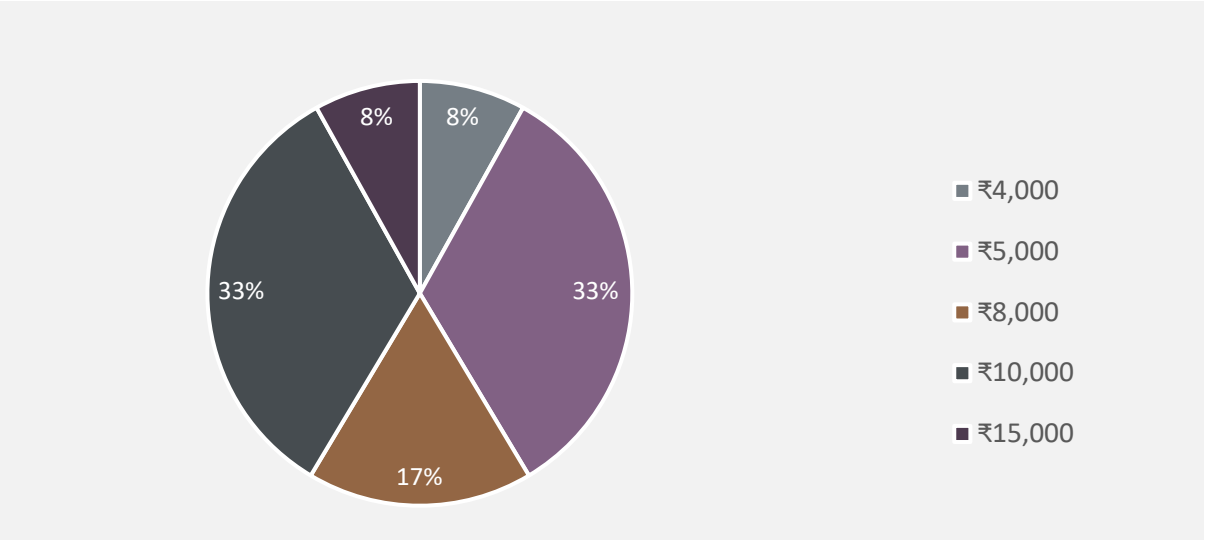
Fig 16: Proportion of Total Catch from Bindusagar (n=10)



Monthly Earnings from Fishing

The data shows that the fishermen at Bindusagar earn between INR. 4,000 and INR. 15,000 per month from selling fish. The earnings distribution peaks at INR. 5,000 (33% of fishermen) and INR. 10,000 (33% of fishermen). Half of the fishermen (50%) earn between INNR. 5,001 and INR. 10,000 per month, while 42% earn INR. 5,000 or less. Only one fisherman (8%) reported earnings in the higher range of INR.10,001-15,000, with none of the fishermen earning above INR.15,000 monthly.

Fig 17: Monthly Income from Fish Sales (n=12)



Economic Value of Fishing at Bindusagar

Based on the values shared by 12 of the 15 fishermen interviewed, the total annual income of the fishermen per year is **INR 11,40,000/-**.

In addition to their earnings, fishermen also saved on expenditure by consuming some of the fish. The total amount saved was reported as **INR 3,718/-**[7]**.**

The economic value of the lake has been calculated based on the total income, averaging to **INR 95,000** per fisherman. This calculation does not include the amount that is saved from consumption of fish caught.

Summing up

The Bindusagar waterbody serves as a vital resource for the local fishing community, providing both livelihood and sustenance. The fishermen depend heavily on this waterbody, with half of them deriving their entire catch from it. Tilapia/Kou is the dominant fish species, caught by all surveyed fishermen, while other species like Rohi, Mohurali, and Kerandi supplement both income and food sources. The high dependency on Bindusagar underscores the importance of maintaining the health and productivity of this waterbody for the sustainable livelihood of the local fishing community.

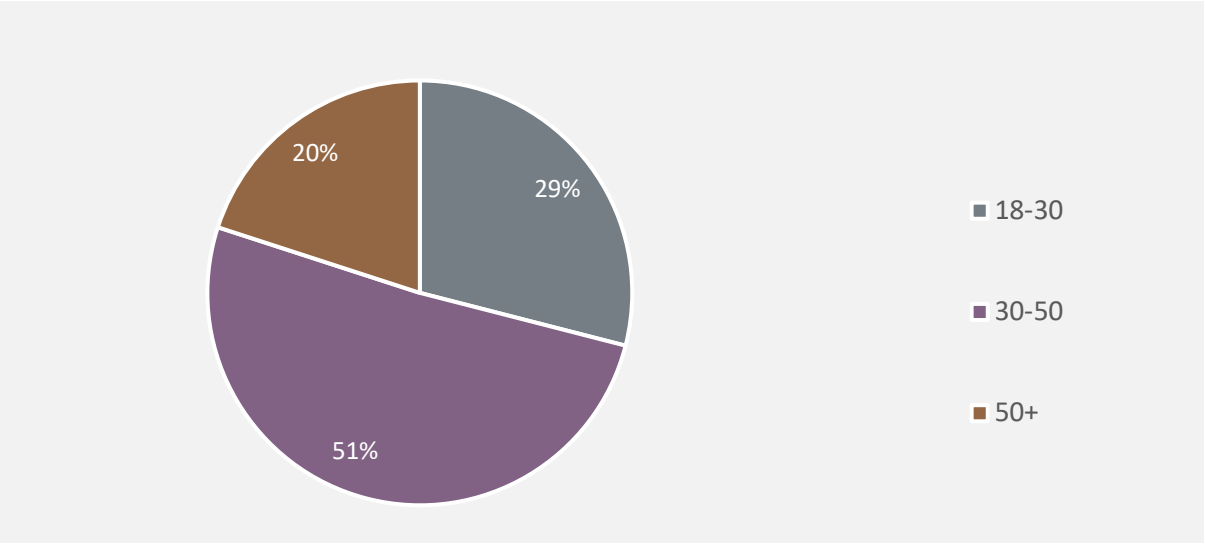
2.7 Analysis of 'Hawkers' Surveys

Demographics

A significant majority (94% or 104 of 111) of the hawkers interviewed were male, while 6% (7 of 111) were female. Over half of the hawkers and street vendors surveyed were between the ages of 30 and 50, while the next largest group of respondents were between the ages of 18 and 30 (29%).

[7] The calculation has been made based on the following: 13 fishermen who catch Tilapia, at the rate of 120 per kg; 4 fishermen who catch Kerandi, at the rate of 150 per kg; 4 fishermen who catch Mohurali at the rate of 120 per kg; 4 fishermen who catch other fish, primarily Rohu. The rate has been standardised in cases where the fishermen have not answered the cost. In cases where they have answered the question, the calculation has been made on the actual figure shared.

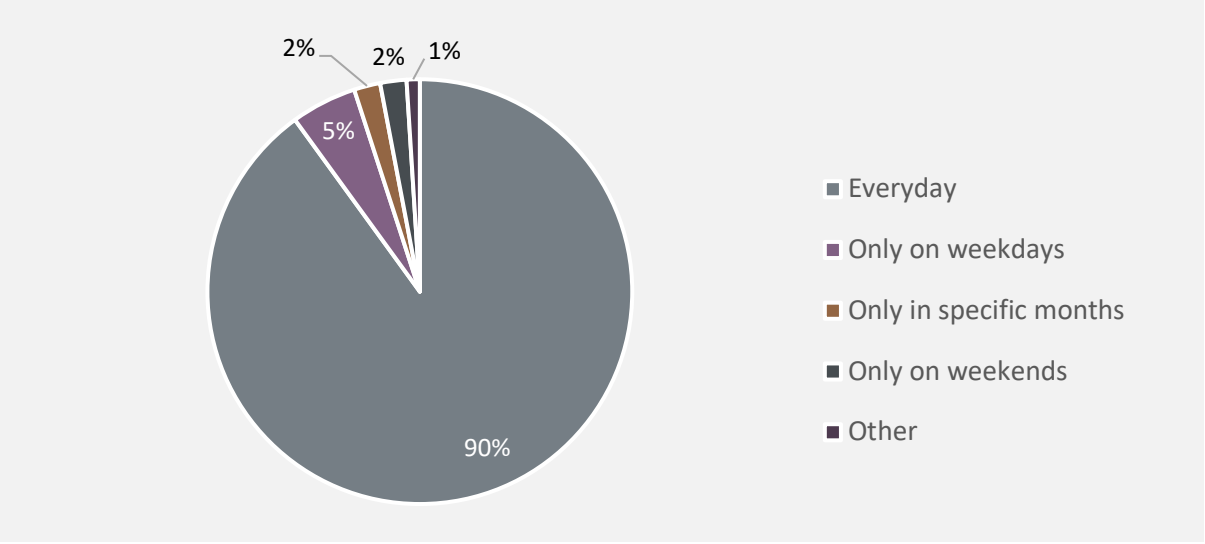
Fig 18: Age distribution of hawkers (n=110)



Frequency and Duration of Vending

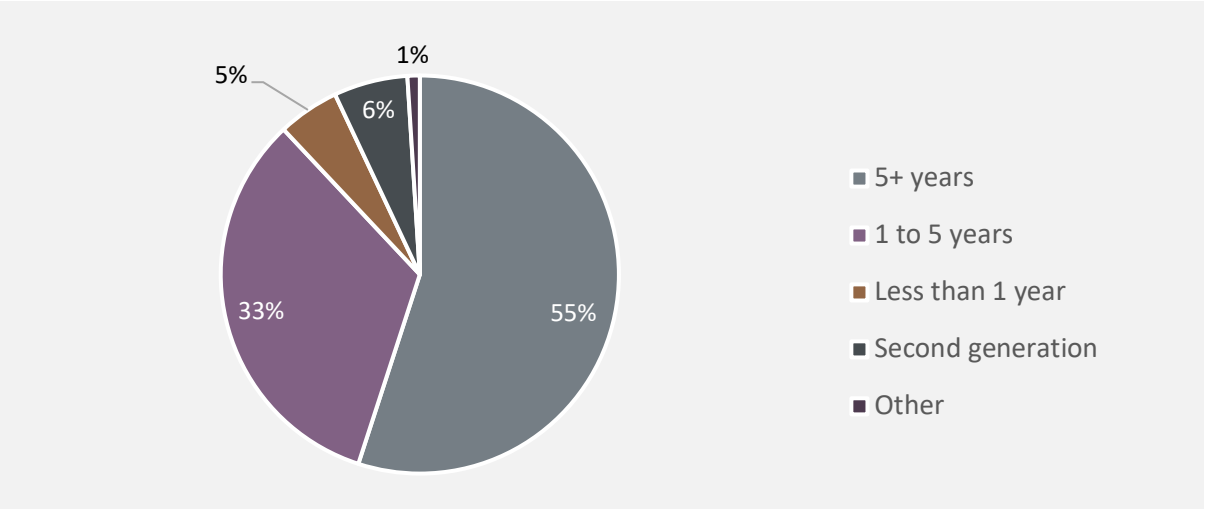
The vast majority of hawkers (90%) operate daily at this location, indicating its significant importance to their livelihood.

Fig 19: Frequency of Vending at Bindusagar (n=111)



In terms of experience, , majority of the hawkers (55%) have been operating at Bindusagar for more than 5 years, and 33% have been vending for 1 to 5 years**.** A notable portion (6%) represented second-generation businesses, while only 5% are relatively new**,** with less than a year of experience.

Fig 20: Duration of vending at Bindusagar (n=111)



Daily Work Timings

The daily arrival time data for vendors at Bindusagar (n=111) shows that most vendors begin their day in the early morning hours, with a significant concentration between 5:00 AM and 8:00 AM. Specifically, 18% arrive at 7:00 AM, 17% at 6:00 AM, and 13% at 8:00 AM, making these the most common start times. An additional 11% report arriving in the morning without specifying an exact time. Smaller percentages arrive at 5:00 AM (7%), 9:00 AM (7%), and 5:30 AM (3%). A minority of vendors begin their activities later in the day, with 4% arriving at 5:00 PM, and smaller percentages at 10:00 AM, 11:00 AM, and 4:00 PM.

Table 12: Daily Arrival Time (n=111)

RESPONSE	PERCENTAGE
7:00 AM	18%
6:00 AM	17%
8:00 AM	13%
Morning (unspecified)	11%
10:00 AM	11%
5:00 AM	7%
9:00 AM	7%
5:00 PM	4%
5:30 AM	3%
11:00 AM	3%
4:00 PM	3%
Other times	5%

The most common departure time from the lake is 2:00 PM (18%), followed closely by 10:00 PM (17%). A notable portion also leaves at 1:00 PM (11%), 8:00 PM (11%), and 9:00 PM (11%),

indicating that many vendors work extended hours. Smaller percentages depart at 3:00 PM (5%), 11:00 PM (4%). A few leave at 4:00 PM and 5:00 PM (3% each).

Table 13: Daily Departure Time (n=111)

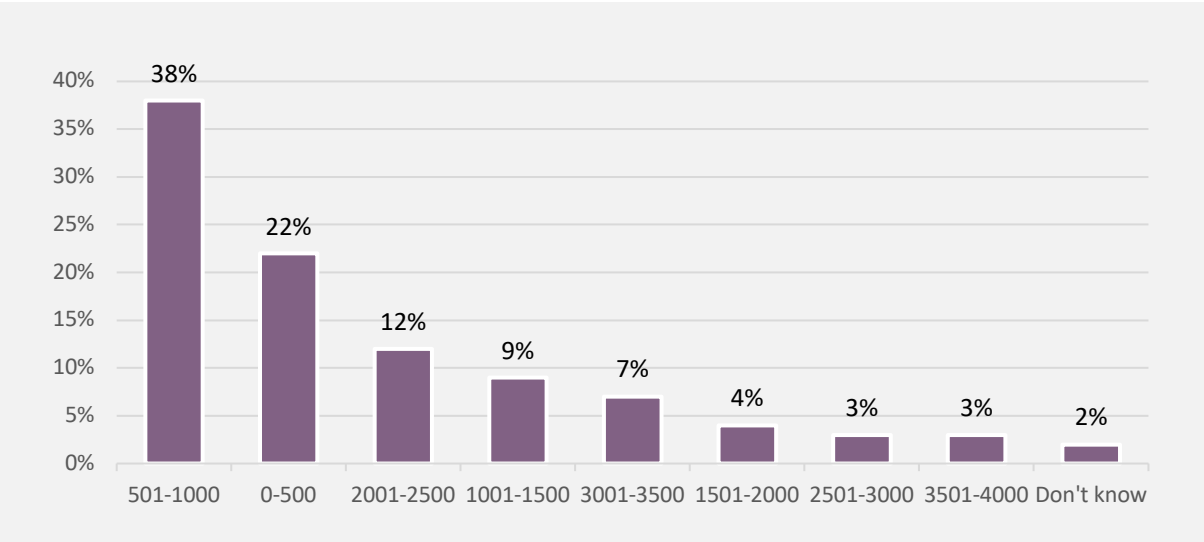
RESPONSE	PERCENTAGE
2:00 PM	18%
10:00 PM	17%
1:00 PM	11%
8:00 PM	11%
9:00 PM	11%
3:00 PM	5%
11:00 PM	4%
Afternoon (unspecified)	4%
4:00 PM	3%
5:00 PM	3%
Other times	13%

Economic Indicators

Daily Visitor Estimates

A majority of hawkers (60%) estimate that between 0 to 1,000 people visit the waterbody daily. Specifically, 38% estimate daily footfall between 501–1,000 visitors, while 22% believe it is between 0–500. However, a notable segment of vendors report significantly higher estimates: 12% believe there are 2,001–2,500 daily visitors, and 9% estimate 1,001–1,500, with smaller groups citing figures as high as 3,500–4,000.

Fig 21: Daily Visitor Estimates (n=111)



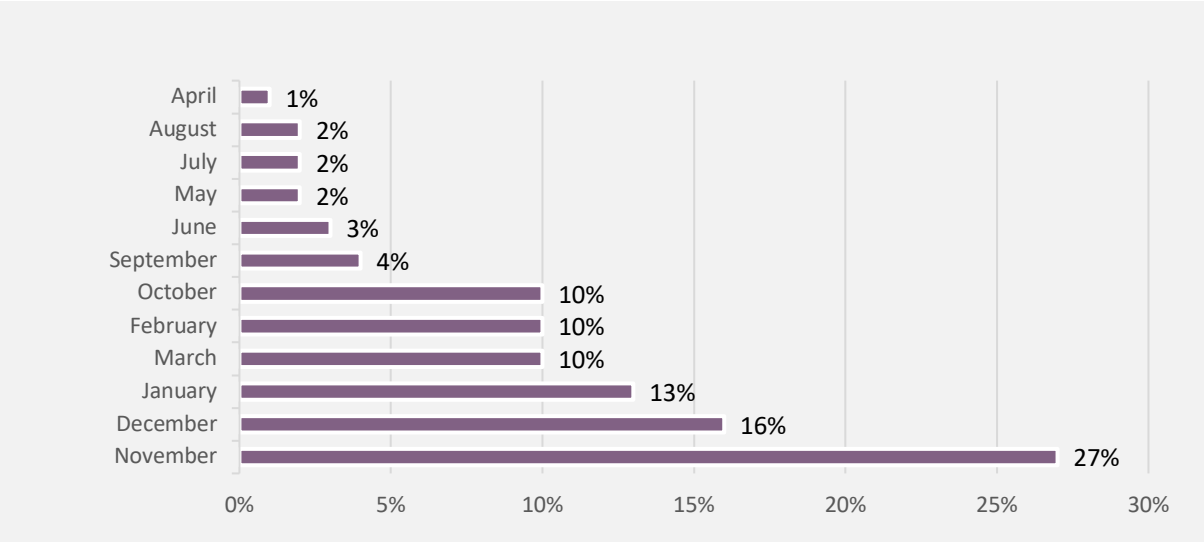
Products and Services

The hawkers interviewed were asked about the products that they sell at the lake. It was learned that they offer a diverse range of products and services that cater to both tourists and those who visit for religious/cultural purposes. In addition to the sale of food items, beverages, tiffin services and snacks, religious items such as puja materials and supplies for rituals are sold around the lake. Given its significance as a religious site, Brahmins also provide services for religious ceremonies, especially *Pind Daan*. The lake also attracts locals who are keen on doing photoshoots such as pre-wedding shoots, maternity shoots, etc. and these services are provided at the site. This mix of offerings reflects the dual nature of the area as both a religious site and a public gathering space.

Peak Business Months

The diverse vendors were asked which months are best for business, and most explained that the winter months (October to February) are when they have the maximum number of customers, with November being the busiest month.

Fig 22: Monthly distribution of customers (n=109)



Customer Base

An overwhelming majority (98%) of hawkers believe the waterbody directly benefits their business, highlighting its crucial role in sustaining their livelihoods. However, customer numbers vary significantly among vendors, with 59% serving 50 or fewer customers daily, while 41% serve more than 50 customers daily.

Table 14: Daily Customer Count (n=109)

RESPONSE	PERCENTAGE
0-50	59%
51-100	18%
101-200	11%
201-500	9%
501 and above	3%

Employment and Wages

Most hawkers (85%) operate independently without employees, while 15% (17) provide employment opportunities for others. Of the 17 with employees, 82% employ 0–5 workers and remaining have 6-10 employees.

The income data for employees (17) indicates that most earn relatively modest wages. A large majority (82% of employees) report earning between INR 1,000 and INR 10,000 per month**,** with 41% falling in the INR 1,000–5,000 range and another 41% in the INR 6,000–10,000 range. Only a small fraction earn above this range: 6% each report monthly incomes of INR 11,000–15,000, INR 16,000–20,000, and INR 26,000–30,000.

Table 15: Monthly income of employees (n=17)

RESPONSE (₹)	PERCENTAGE
1000-5000	41%
6000-10000	41%
11000-15000	6%
16000-20000	6%
26000-30000	6%
Total	**100%**

Vendor Profits

The average monthly profit data for vendors at Bindusagar (n=109) shows that the majority earn moderate to substantial profits from their vending activities. 34% of vendors earn between ₹5,001–10,000**,** while 30% report profits of ₹10,001–15,000**,** indicating that nearly two-thirds (64%) fall within this mid-income bracket. A smaller but notable segment earns higher profits: 16% make ₹15,001–20,000**,** and 12% earn above ₹20,000 monthly. Only 8% of vendors report profits in the lowest bracket (₹500–5,000)**.**

Table 16: Average monthly profit of vendors (n=109)

RESPONSE (₹)	PERCENTAGE
5001-10000	34%
10001-15000	30%
15001-20000	16%
Above 20000	12%
500-5000	8%
Total	**100%**

Overall economic value

Based on the data collected, the significant economic contribution of the Bindusagar waterbody towards the income of hawkers can be estimated. The total annual revenue from hawkers was calculated by multiplying the average monthly profit by the total number of hawkers and then by 12 months. This amounts to approximately **INR 22,171,849**.

The yearly income of employees working with the hawkers, calculated by multiplying the average monthly salary by the total number of employees and then by 12 months, reaches approximately **INR 9,278,437.**
The total economic value generated by hawkers and their employees, therefore, is estimated as **INR 31,450,286** annually.

Perception and Suggestions

Respondents provided several suggestions and insights about the waterbody, focusing on environmental improvements, visitor facilities, and security. With regard to environmental suggestions, the hawkers mention planting of trees like *Tulsi, Bela,* and other flowers around the water body for beautification and environmental enhancement. Given the high footfall at the sight, there was a strong recommendation for better tourist amenities including toilets, parking spaces, sitting areas, and a designated vending zone. Additionally, the vendors mentioned the need for security guards, police monitoring, and a proper system to prevent disturbances in the area.

These suggestions highlight the hawkers' concern for improving the environment, enhancing visitor experience, maintaining security, and recognition of the significant economic impact of their activities.

According to the survey responses, the Bindusagar waterbody attracts crowds for several key reasons, including its religious and cultural significance, natural beauty, peaceful environment, and leisure activities. Many people visit specifically for religious rituals like *Pinda Daan*, and leisure activities like photo shoots, outings, and recreational activities. This

combination of religious significance, natural beauty, and recreational opportunities creates a multi-purpose destination that appeals to diverse groups of visitors.

Summing up

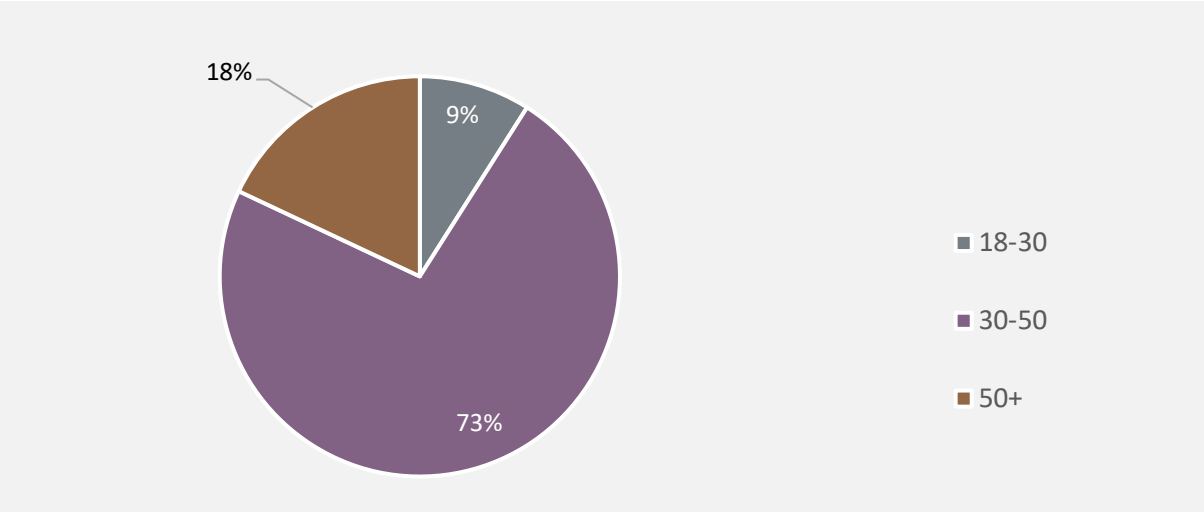
The Bindusagar waterbody serves as a vital economic hub, supporting a well-established community of hawkers who predominantly operate daily, with peak activity during winter months. Most vendors have maintained operations for over five years, demonstrating the sustainable nature of this economic ecosystem. The direct economic impact is substantial, with the majority of vendors earning between INR 5,000 and INR 15,000 monthly, and the waterbody itself is recognised almost unanimously as beneficial to their businesses. Given that 98% of hawkers attribute their business success to the waterbody, this natural feature serves as a significant economic catalyst with ripple effects throughout the surrounding community.

2.8 Analysis of 'Shop Owners' Surveys

Demographics

As in the case of hawkers, the shop owners interviewed were primarily male (89%), with just 11% or 10 out of 91 owners being female. Almost 3/4th, or 73%, of the shop owners were between the ages of 30 and 50. Around 18% of them were over 50, while the remaining were below 30.

Fig 23: Age distribution of shop owners (n=89)

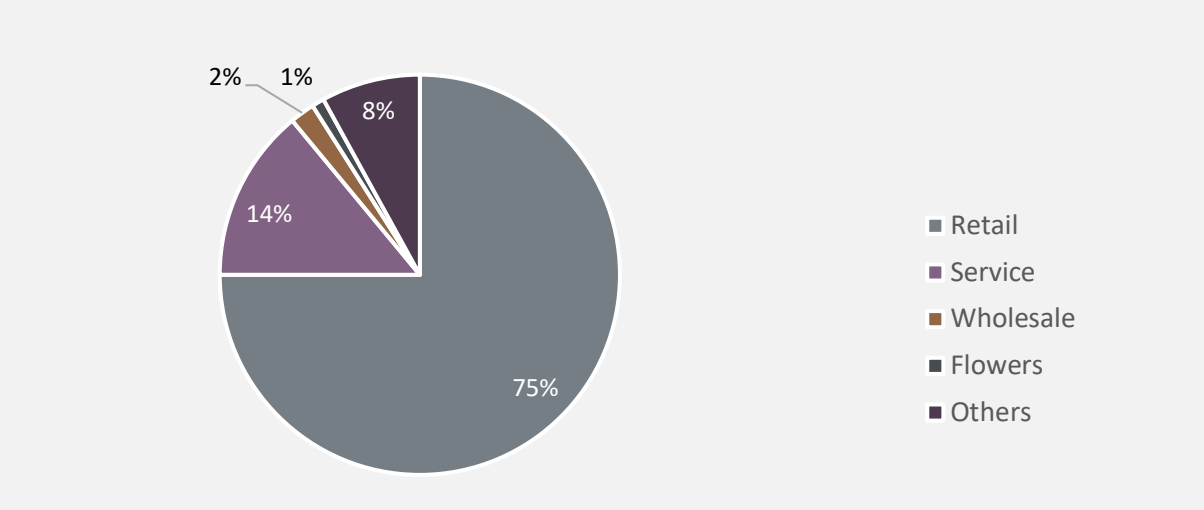


Nature of Shops and Products Offered

Most of the show owners (75%), stated that theirs is a retail shop. Meanwhile, 14% reported providing services, while others (8%) said that they sell wholesale products or flowers. These

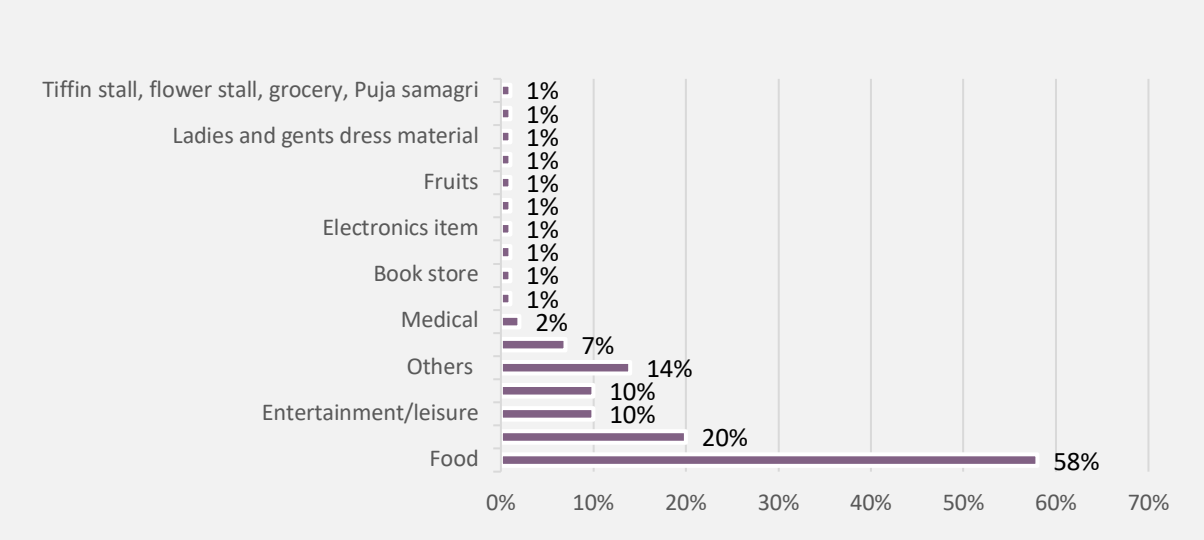
figures are interesting to note as there is a clear distinction between the products and services provided by hawkers and shop owners.

Fig 24: Type of shop (n=91)



The shop owners were asked about the products they sell. Majority (58%) reported selling food items followed by domestic utilities (20%), religious items (10%), entertainment/leisure items (10%) and souvenirs (7%).

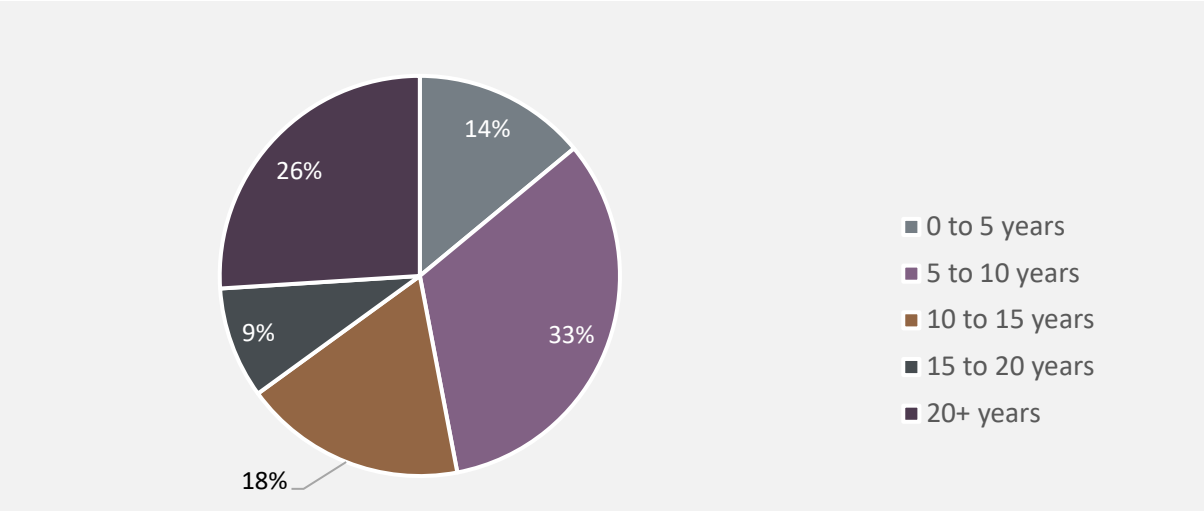
Fig 25: Products/services sold (n=91)



Business Tenure and Operations

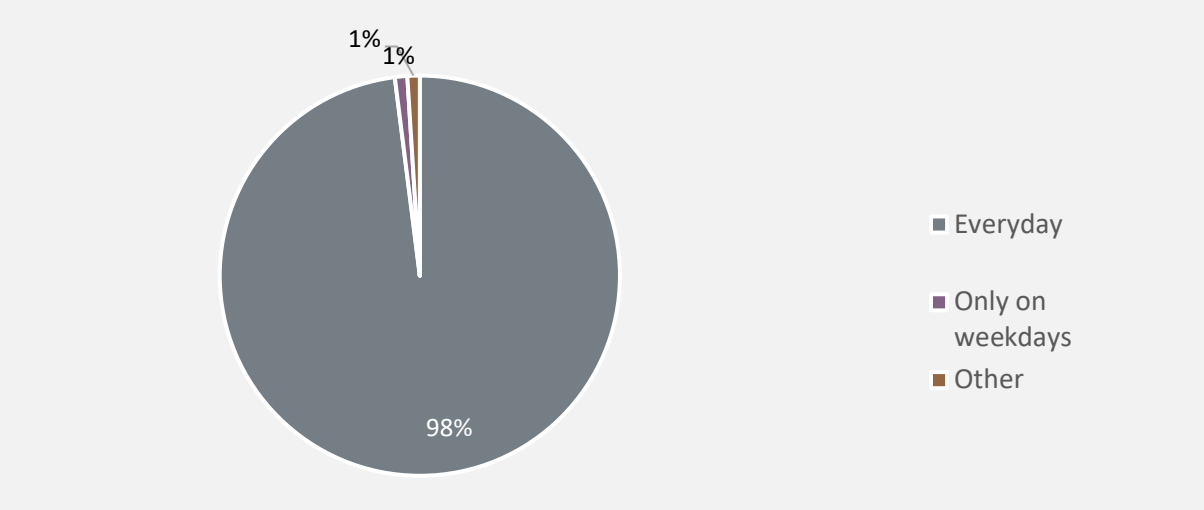
The data on the duration of business at Bindusagar (91) reveals a well-established vending community, with many vendors operating at the site for extended periods. 33% have been in business for 5 to 10 years, while 26% have continued for over 20 years, indicating long-term occupational stability and deep-rooted economic ties to the lake. Additionally, 18% have been vending for 10 to 15 years, and 9% for 15 to 20 years, emphasizing the presence of experienced vendors. In contrast, only 14% are relatively new entrants, with 0 to 5 years of experience.

Fig 26: Duration of business at the lake (n=91)



An overwhelming majority of shop owners (98%) operate their businesses daily, demonstrating the consistent economic activity around Bindusagar. Only 1% reported opening exclusively on weekdays, while another 1% mentioned other operating schedules.

Fig 27: Frequency of shop operations (n=91)



Dependence on the Waterbody

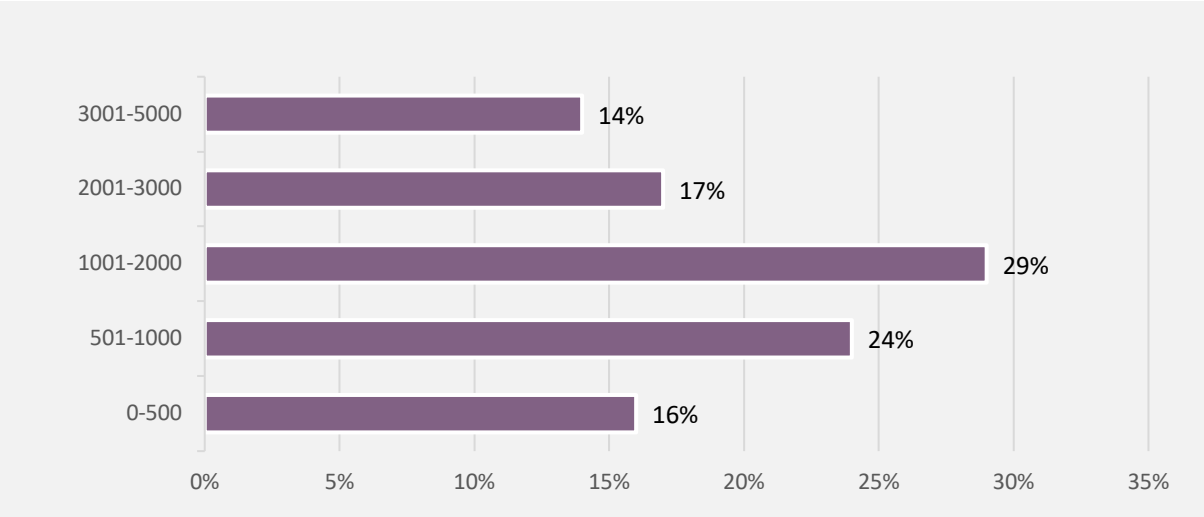
An overwhelming 92% of shop owners believe that Bindusagar benefits their business, while only 6% disagreed and 2% were unsure. This strong recognition of the waterbody's economic value underscores its importance to the local commercial ecosystem. Similarly, 96% of shop owners stated that their business would be affected if their shop were relocated elsewhere, with only 2% disagreeing and 2% uncertain. This demonstrates the critical importance of proximity to the waterbody for their commercial success.

Economic Indicators

Visitor Footfall and Customer Engagement

Shop owners' estimates of daily visitors to the waterbody varied considerably, with the largest group (29%) reporting between 1,001-2,000 visitors daily. Others estimated 501-1,000 visitors (24%) and 0-500 visitors (16%) while 31% believed the site attracts more than 2,000 visitors per day.

Fig 28: Estimated Daily Visitors (n=90)

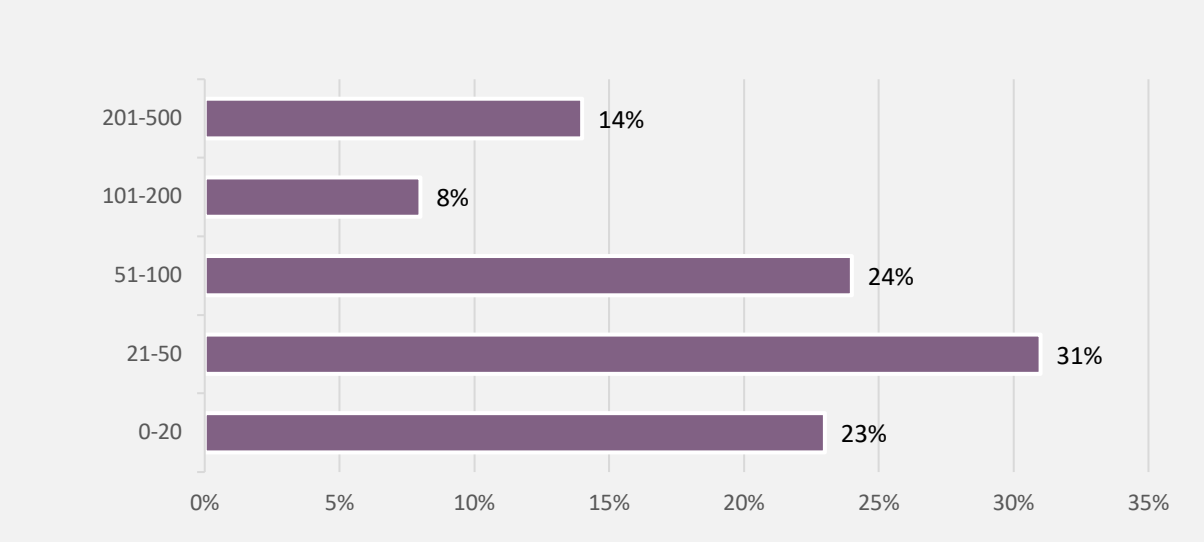


A significant 96% of shop owners confirmed that visitors to the waterbody come to purchase their products or services, establishing a clear economic link between the ecosystem and local commerce. Only 4% stated that waterbody visitors do not patronise their businesses.

The data on daily customer count among vendors at Bindusagar (n=91) shows that most vendors serve a moderate number of customers each day. The largest segment, 31%, serves between 21 to 50 customers daily, followed by 24% who cater to 51 to 100 customers. Another 23% serve up to 20 customers per day, indicating limited footfall for a significant portion of vendors. At the higher end, 14% report serving between 201 to 500 customers, and 8% serve between 101 to 200. This suggests that while the majority operate within a modest

customer base, a small segment handles significantly higher volumes, possibly due to better location, product type, or longer hours.

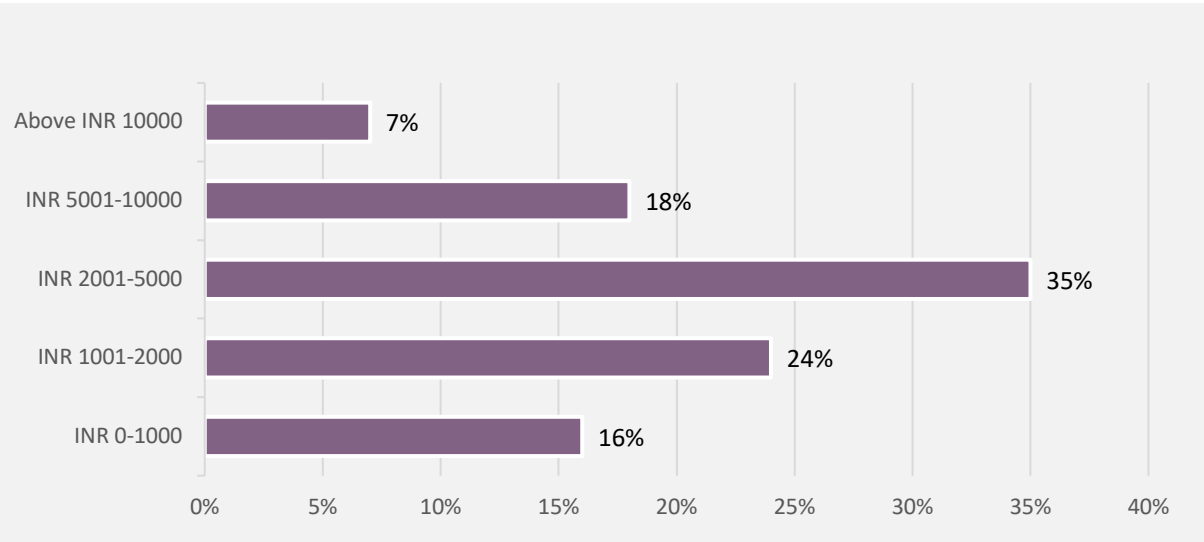
Fig 29: Average Daily Customers (n=91)



Sales and Revenue Patterns

Daily sales figures reflect the economic vitality of businesses around Bindusagar. The largest group of shop owners (35%) reported daily sales between INR 2,001-5,000, while 24% earn INR 1,001-2,000 daily. A notable 18% achieve daily sales of INR 5,001-10,000, and 7% report sales exceeding INR 10,000 per day.

Fig 30: Average daily sales (n=91)

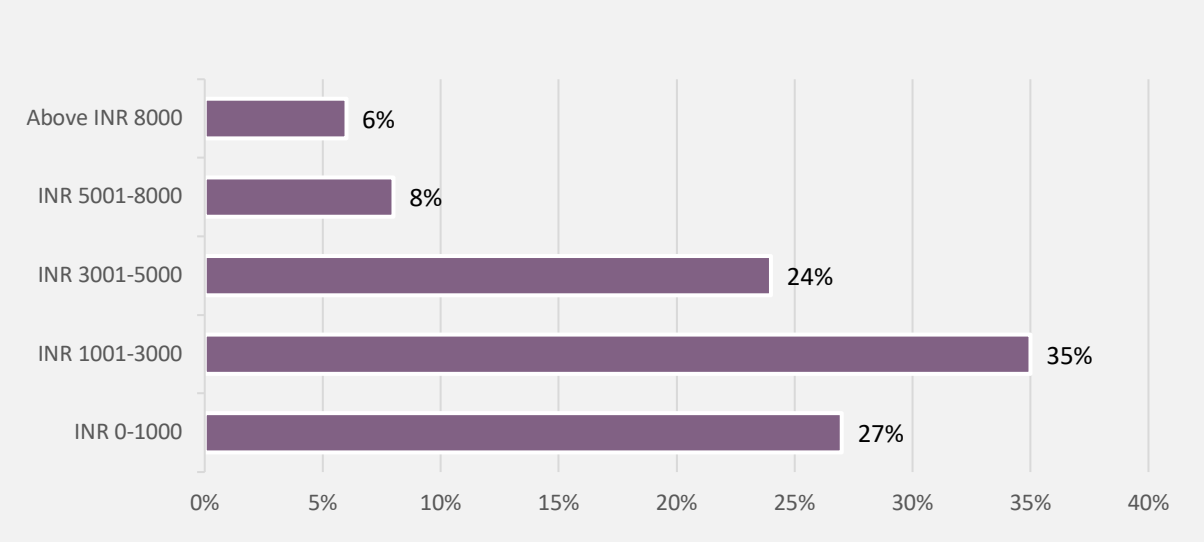


Rent and Financial Overheads

Most shop owners (87%) pay rent for their commercial space, while 13% operate without rental expenses. Among those paying rent, the distribution shows 35% paying INR 1,001-

3,000 monthly, followed by 27% paying under INR 1,000. Nearly a quarter (24%) pay INR 3,001-5,000, with the remaining 14% paying more than INR 5,000 monthly.

Fig 31: Monthly rent paid (n=75)

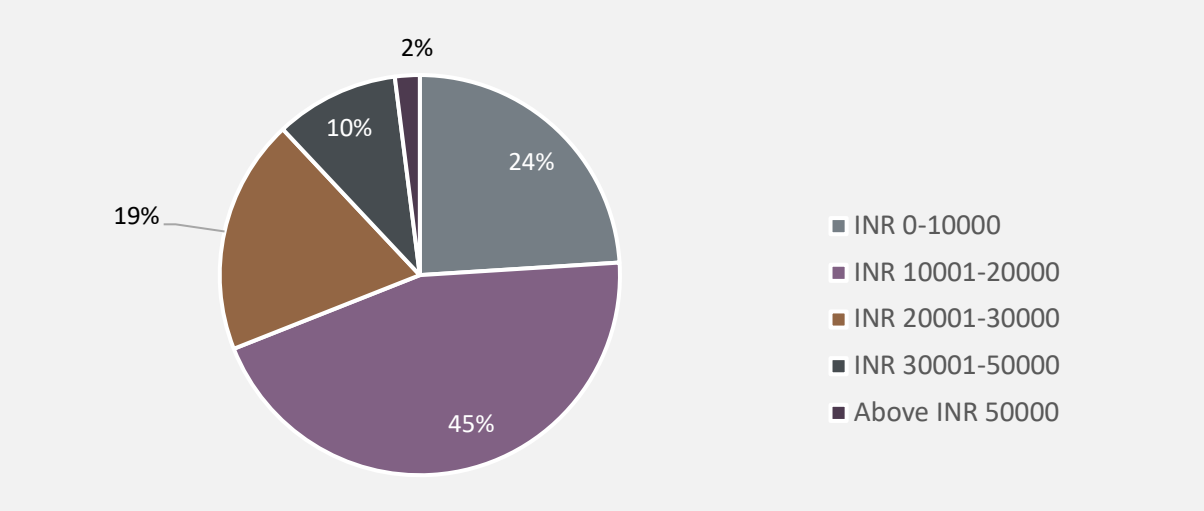


Only 8% of shop owners reported making other forms of payments (such as lease or purchase instalments) for their shops, while the vast majority (92%) do not have such additional financial obligations.

Profitability and Employment

Monthly profit distribution shows that the largest group (45%) earns between INR 10,001-20,000, while 24% earn up to INR 10,000. A significant portion (19%) achieves profits of INR 20,001-30,000, and 12% earn above INR 30,000 monthly.

Fig 32: Average monthly profit (n=91)



About 35% of shop owners employ staff, while 65% operate without employees. Among those with employees, the distribution is fairly even: 34% employ two people, 31% have one employee, 22% employ three people, and 13% have five or more employees.

Employee compensation varies, with the largest group (38%) earning INR 8,001-10,000 monthly. Nearly a third (32%) earn up to INR 5,000, while 21% receive INR 5,001-8,000. Only 9% of employees earn above INR 10,000 monthly.

Overall economic value

Based on the survey data, the economic contribution of shops around Bindusagar is substantial. With an average monthly profit of approximately INR 20,775 per shop owner, the total annual economic value generated by the 91 surveyed shop owners amounts to approximately **INR 2,26,86,300**.

Additionally, the 32 shop owners who employ staff contribute to local employment, providing jobs that generate an estimated monthly payroll of INR 2,75,000, adding approximately **INR 33,00,000** annually to the local economy through employment.

Summing up

The shop owner ecosystem around Bindusagar demonstrates remarkable economic vitality and dependence on the waterbody. With 98% operating daily and 96% acknowledging that waterbody visitors patronise their businesses, there is a clear symbiotic relationship between the natural resource and commercial activity. The businesses generate substantial economic value, with annual revenues exceeding INR 2.6 crore from the surveyed shops alone, while providing employment and serving the diverse needs of both religious pilgrims and recreational visitors. The overwhelming recognition (92%) that the waterbody benefits their business, combined with 96% stating they would be affected by relocation, highlights Bindusagar's crucial role as an economic catalyst that sustains a thriving commercial ecosystem serving thousands of daily visitors.

SECTION III:

KEY RESULTS AND INSIGHTS OF 'JAIDEV VATIKA' SURVEYS

3.1 About Jaidev Vatika

Jayadev Vatika, also known as Jayadev Batika, is a serene eco-park located in Bhubaneswar, Odisha. Named after the 12th-century saint-poet Jayadev, renowned for his Sanskrit masterpiece *Gita Govinda*, the park spans approximately 39 acres and is managed by the Odisha Forest Development Corporation. It boasts over 300 species of native and exotic plants, including medicinal herbs, shrubs, and bamboos, offering visitors a tranquil retreat into nature. The park features 22 pindis (platforms), expansive lawns, and around 110 designated picnic spots, making it an ideal location for family outings and nature enthusiasts.

Beyond its natural allure, Jayadev Vatika holds cultural and historical significance. The park's design draws inspiration from the vivid descriptions of groves in Jayadev's *Gita Govinda*, aiming to recreate the poet's envisioned landscapes. This connection to Jayadev's literary work not only honors his legacy but also immerses visitors in the rich cultural tapestry of Odisha. Additionally, the park's proximity to the Khandagiri and Udayagiri caves adds to its appeal, offering a blend of natural beauty and historical exploration.

To understand the diverse use, ecological value, and socio-economic impact of Jaidev Vatika, surveys were conducted with multiple stakeholder groups. These included residents, hawkers, and other key users who interact with this green space. The tables below summarise the number of people interviewed under each stakeholder group.

Table 17: Respondent category

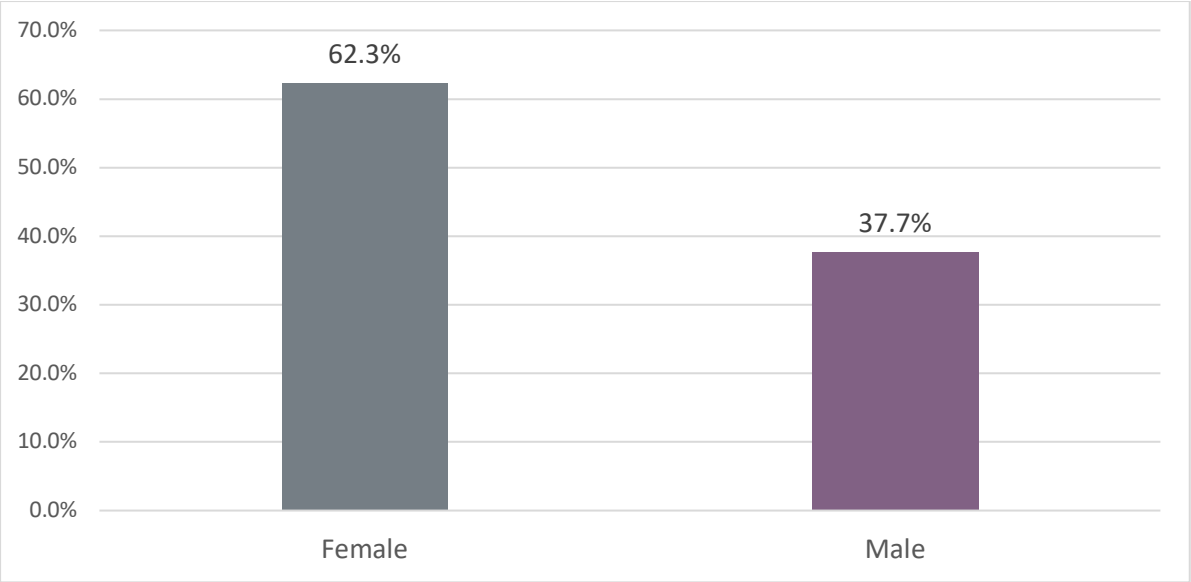
Category	Residents	Hawkers	Visitors	TOTAL
No. surveyed	61	54	39	154

3.2 Analysis of 'Local Residents' Surveys

Demographics

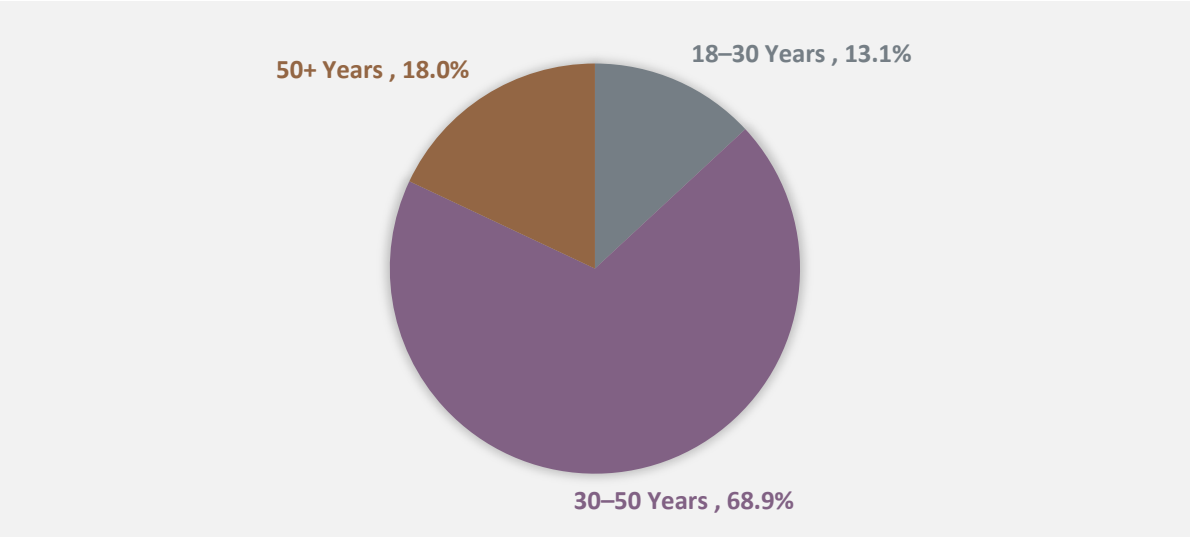
A majority of respondents were **female (62%)**, indicating either a targeted inclusion of women or higher participation from them in this context. Males represent a significant but smaller share (38%).

Fig 33: Distribution of Residents by Gender (N=61)



In terms of age distribution, the data is skewed toward the 30–50 years age group, which makes up 69% of respondents. This is followed by those aged 50 and above (18%), while younger individuals (18–30 years) represent the smallest segment at 13%. These figures suggest that Jaidev Vatika is primarily frequented by middle-aged residents.

Fig 34: Distribution of Residents by Age-group (N=61)



Establishment Type and Residential Profile

The survey findings reveal that the vast majority of establishments (87%) in the surveyed area were **residential**, confirming that the locality is primarily used for housing or living purposes. A smaller portion (13%) of establishments were **commercial**, while only **one establishment (2%)** was classified as **mixed-use**, combining both residential and commercial functions.

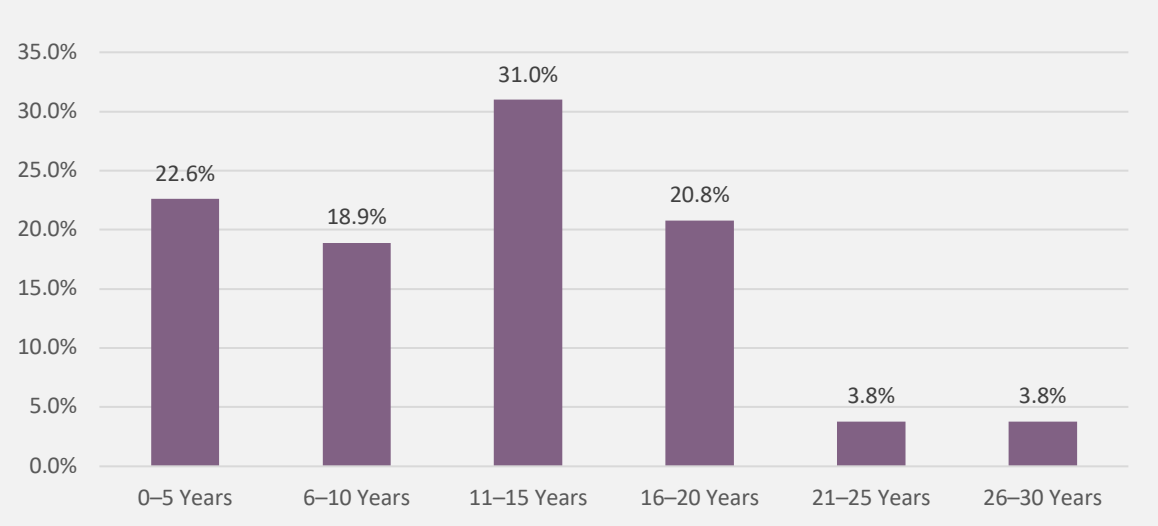
Among the **residential establishments**, the average household size was **4 persons**, with household sizes ranging from a **minimum of 1 to a maximum of 7 members**.

In terms of **residential typology**:

- A significant majority (**83%**) of these establishments were **unauthorised/informal** settlements.
- **15%** were categorized as **private builder floors**.
- Only **2%** are **government quarters**.

Among the **residential establishments** (53 respondents), the largest proportion (31%) reported residing in the area for 11–15 years. This is followed by 0–5 years (23%), 16–20 years (21%) and 6–10 years (19%). Notably, only a small fraction of respondents 4% each have been living in the area for 21–25 years and 26–30 years.

Fig 35: Duration of Stay in Residential Establishments (N=53)



Household Air Conditioner Usage Patterns

Based on the survey data, the use of air conditioning in homes appears to be minimal among sample respondents. Out of 61 individuals surveyed, only 3 (5%) reported using air conditioners, while the vast majority (95%) do not.

Among those who do use ACs, one respondent owns a single unit, while the remaining two did not reveal the exact number. In terms of seasonal usage, one respondent reported using the AC for 3 months, and two reported 4 months of use. During peak summer, ACs are used sparingly, with two individuals indicating usage of less than 2 hours per day and one using it for 4–6 hours daily. This indicates limited reliance on air conditioning for cooling needs, possibly due to affordability.

Household Air Coolers Usage Patterns

In contrast, air coolers are somewhat more common, with 10 out of 61 respondents (approximately 16%) reporting their use. Most of these users (9) have a single cooler, and only one has two units. Air cooler usage typically spans 3 to 5 months in a year, with most users (7) indicating a 3–4 months usage period.

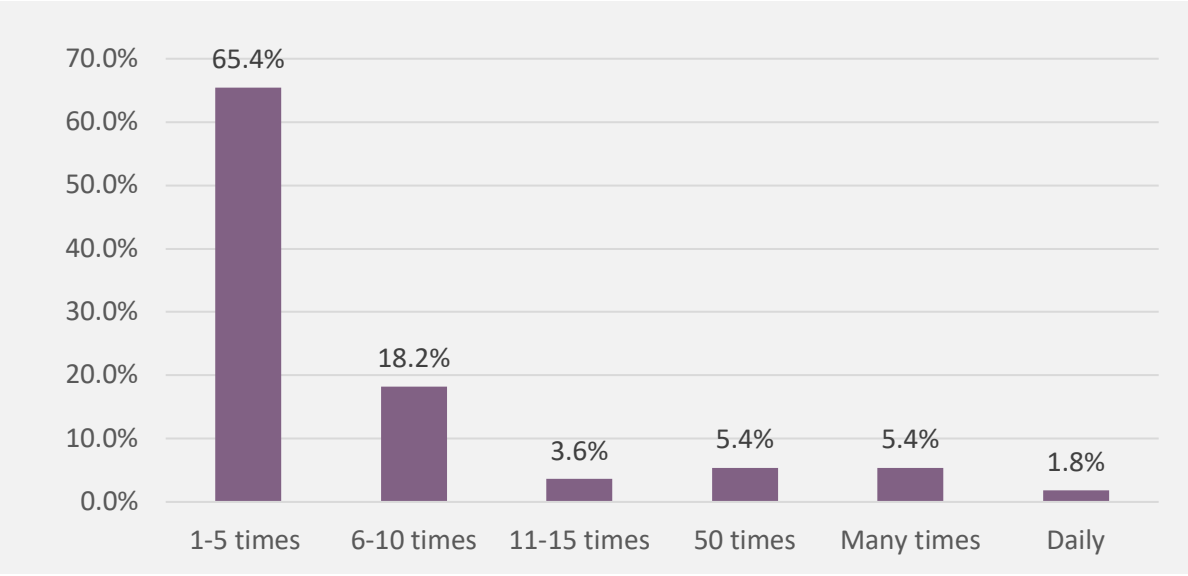
In terms of daily operation during peak summer, air coolers are used for longer durations compared to ACs. Six respondents reported using them for 6–8 hours daily, three for 8–10 hours, and only one for 4–6 hours. This suggests that air coolers are a more prevalent and accessible means of cooling in the surveyed population, likely due to lower operating costs.

Visitor Perceptions and Frequency of Visits

The analysis of the survey responses reveals that a significant majority of respondents (92%) perceived the area around the urban green space as cooler compared to other parts of the neighborhood. This suggests a strong recognition of the microclimatic benefits provided by green spaces, particularly in terms of thermal comfort.

Among those who affirmed the above (56 cases), 65% residents (36 nos.) reported having visited the urban green space between 1 to 5 times, while others had varying frequencies of visits—ranging from 6 to 10 visits, to very frequent or regular usage such as "daily" or "many times."

Fig 36: Frequency of visiting urban green (N=55)



When asked about how often they visit the urban green, a majority of respondents (59%) reported coming on a *yearly* basis. This was followed by *quarterly* visits (29%), suggesting that the space serves primarily as a destination for occasional, planned outings rather than routine visits. Only a small fraction reported visiting *monthly* (4%), *weekly* (7%), or *daily* (2%),

underscoring its role as a special-use recreational site rather than a frequently accessed everyday space.

Table 18: Frequency of Visits to the Urban Green (N=56)

Frequency	Percentage
Daily	1.8%
Weekly	7.1%
Monthly	3.6%
Quarterly	28.6%
Yearly	58.9%

Purpose of Visit

The overwhelming majority of respondents (71%) cited *leisure or relaxation* as the primary purpose of their visit, confirming the space's key role in supporting mental and emotional well-being. Another 22% mentioned *picnics*, emphasizing the green's function as a venue for family and social gatherings. Only a small percentage of users identified *historic/cultural interest* (2%), *walking or cycling* (3%), or *residency* (2%) as their reasons for coming, reinforcing the predominance of recreational over functional or heritage-related use.

Table 19: Purpose of Visit to the Urban Green (N=59)

Purpose	Percentage
Leisure/Relaxation	71.2%
Picnic	22.0%
Walk/Cycle	3.4%
Historic/Cultural	1.7%
Resident	1.7%

Perceived Benefits

Respondents highlighted several positive attributes of the space, including clean air, tranquillity, and opportunities for rest and recreation. The presence of features such as a water show and flower garden was mentioned as enhancing the site's appeal—particularly for families. Taken together, these responses underscore the space's contribution not only to environmental health but also to the community's quality of life by offering a peaceful and rejuvenating escape within an urban setting.

Perceptions of Jaidev Vatika as a Community Attraction

The responses to the survey questions provide insightful reflections on the role and significance of an urban green space in the lives of local visitors. A majority of respondents (38 out of 61 i.e 62%) identified the area as a popular destination primarily because it serves as an ideal picnic spot. They emphasized its peaceful atmosphere, open space, and its appeal for photography and television shoots, which contribute to large footfall and a vibrant social setting.

Perceived Changes in Biodiversity and Landscape Development Over Time

Over time, the biodiversity and infrastructure of the park have undergone notable changes. More than half the respondents acknowledged that the place has significantly improved from being a dense jungle to a more developed and accessible urban green space. Enhancements such as water shows, flower gardens, picnic facilities, and animal statues have made it more attractive and family-friendly. However, some respondents expressed concern over the shift from a freely accessible space to one that now requires an entry fee, reflecting the commercialization of a once-public resource.

Resident Observations of Local Biodiversity

When asked about observed biodiversity, nearly half of the respondents (20 out of 45) did not note specific species, while others mentioned birds, plants, and aquatic life in the fountain. A few respondents claimed to have seen unique species, mostly birds, though they were generally unable to identify them by name. Isolated mentions included swans and some insects, indicating a low level of awareness or biodiversity visibility among the public.

Community Concern Over Potential Loss of Biodiversity Habitat

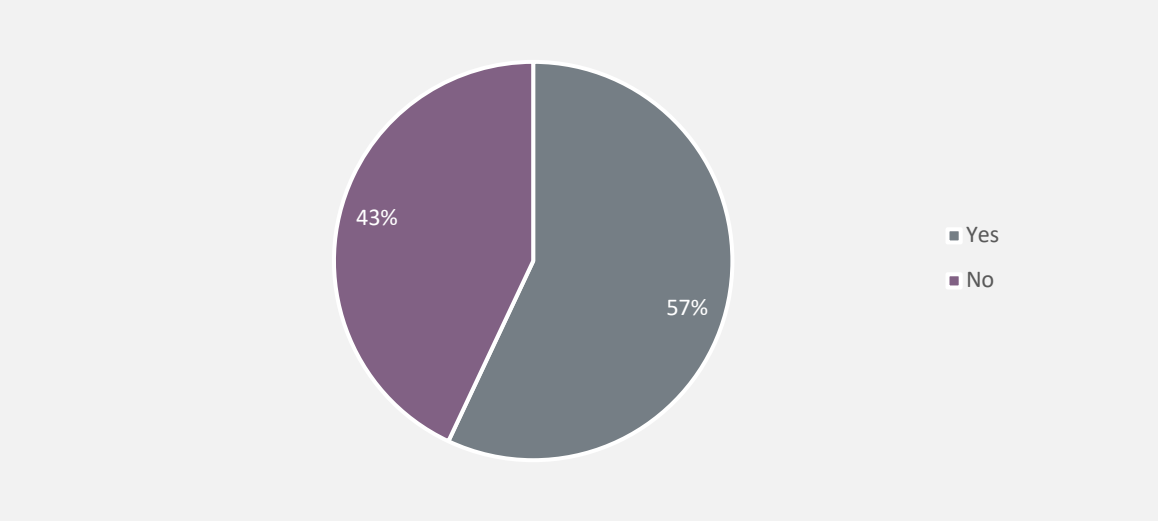
The perceived importance of biodiversity in this space is overwhelmingly positive. Sixty out of sixty-one respondents (98%) stated that losing the biodiversity habitat would affect them. Their concerns primarily centered on environmental impacts. They primarily cited the loss of clean air and increase in ambient temperature as the main impact of the loss of the green space. Other respondents also pointed out the loss of a place for leisure, the loss of income as it is dependent on the ecosystem, and an impact on the visitors

Community Willingness and Potential for Involvement in Urban Green Conservation

The analysis reveals a moderate yet encouraging level of community interest in supporting the conservation of Jaidev Vatika. Out of 61 respondents, 57% expressed their willingness to contribute to protecting the urban green space, indicating a generally positive orientation toward environmental stewardship. However, 43% were not willing to participate, suggesting

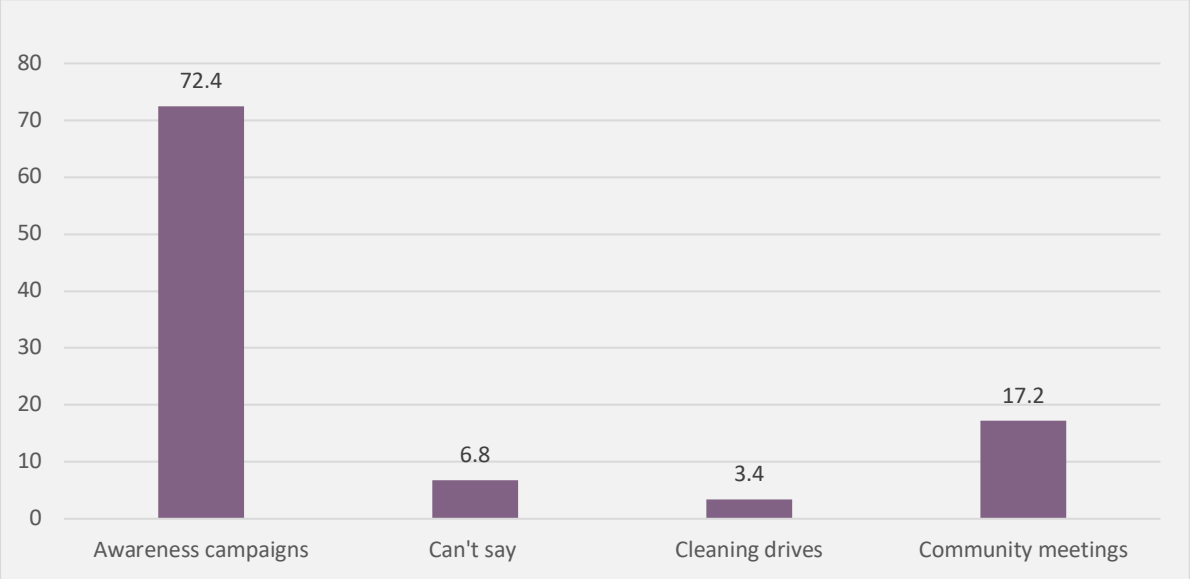
potential barriers such as limited awareness, time constraints, or a perceived lack of personal relevance.

Fig 37: Distribution of Residents by their willingness to support in protecting urban green (N=61)



Among the 35 individuals who were willing to support conservation efforts, the most preferred form of engagement was participating in awareness campaigns (72%), followed by community meetings (17%). Only a small proportion (3%) were willing to participate in cleaning drives, while 7% were unsure.

Fig 38: Preferred modes of contribution (N=35)



Regarding time commitment, there was considerable variation. About 29% were willing to dedicate 1–5 hours annually, while smaller segments were ready to offer between 6 to 20 hours (31% in total). A few outliers were exceptionally committed—3% were ready to engage daily for 2–3 hours, and another 3% were open to dedicating 12 days per year. Meanwhile,

14% were uncertain about their availability. This diverse range of responses points to the need for flexible, tiered volunteer opportunities that accommodate varying levels of time commitment.

Willingness to make financial contributions was low. Only 7% of respondents were open to paying a nominal amount (₹100–₹200 annually) to support the green space and its biodiversity. This suggests limited financial commitment from the community, possibly due to low disposable income or skepticism about the tangible impact of such contributions.

Financial contribution towards conservation was notably low. Only 4 out of 61 respondents (just 7%) were willing to pay for protecting the urban green and its biodiversity, with pledged amounts ranging from ₹100 to ₹200 annually. This indicates a weak financial readiness among community members, possibly due to limited disposable income or lack of perceived value in monetary contributions for conservation.

When asked for suggestions, several respondents recommended incorporating gym equipment and children's exercise facilities, indicating a desire to blend conservation with recreational use. Others suggested enhancing the green cover, improving roads, and adding streetlights around Jaidev Vatika, reflecting both safety and ecological concerns. These suggestions underscore a holistic view of urban greens as multifunctional public spaces that should cater to ecological, recreational, and infrastructural needs.

Summing Up

The survey of local residents around Jaidev Vatika paints a multifaceted picture of how the community interacts with, perceives, and values this urban green space. Demographically, the respondents skewed female and middle-aged, with most residing in informal settlements for over a decade. The area is predominantly residential, with household cooling primarily dependent on air coolers rather than air conditioners—reflecting affordability constraints. Though usage of the park is largely infrequent (mostly yearly or quarterly), a significant majority perceive it as cooler and more comfortable than the rest of the neighborhood, highlighting the microclimatic benefits of urban greens.

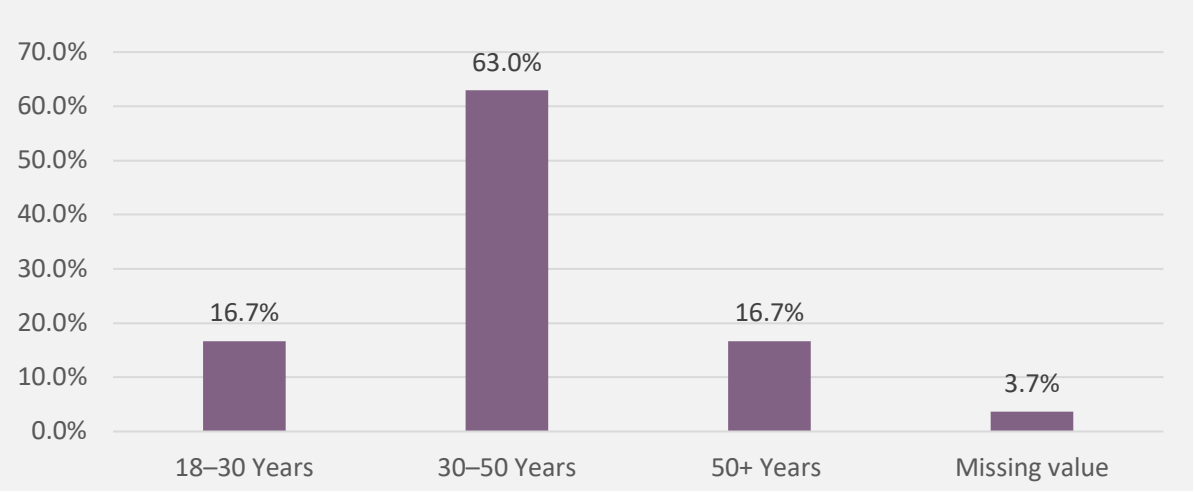
Community perceptions affirm Jaidev Vatika’s value as a recreational and environmental asset, offering clean air, peace, and family-friendly amenities. While concerns about commercialization and biodiversity loss are present, most respondents recognize its evolving landscape and ecological importance. Willingness to engage in conservation—particularly through awareness campaigns—suggests a latent potential for community-led stewardship, even though financial contributions remain low. Collectively, the findings highlight the critical need to preserve and enhance such urban greens—not just as environmental buffers, but as inclusive public spaces that support well-being, biodiversity, and community connection.

3.3 Analysis of 'Hawkers' Surveys

Demographics

The sample was predominantly male (93%), with only 7% female respondents. The 30–50 age group formed the majority (63%), suggesting that most respondents were in their economically active and socially responsible phase of life. Both the 18–30 and 50+ categories were equally represented at 17% each, indicating relatively lower involvement or accessibility for these age brackets.

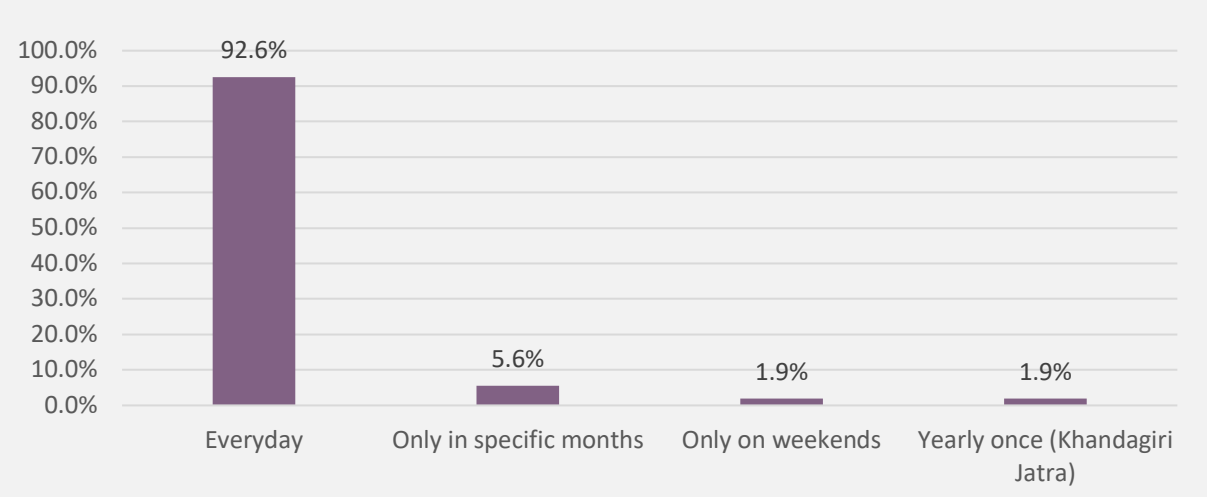
Fig 39: Distribution of Hawkers by Age-group (N=54)



Visit Frequency

The data reveals that a significant majority of hawkers (93%) visit the green space daily, highlighting its importance as part of their daily routine or livelihood activities. In contrast, only a small fraction of users visit seasonally—during specific months (6%), on weekends (2%), or annually during events such as the Khandagiri Jatra (2%).

Fig 40: Frequency of Visit (N=54)



In terms of duration of engagement, long-term users (more than 5 years) made up the largest segment at 43%, reflecting sustained utility and attachment to the space. Another 33% had been frequenting the area for 1 to 5 years, possibly representing newer residents or recent adopters of the space's offerings. Encouragingly, 13% were new users (less than 1 year), which may have indicated growing awareness or the increasing attractiveness of the green space. The presence of second-generation users (7%) and individuals who had been visiting for 10–25 years (6%) underscored the intergenerational value and deep-rooted connection some families had with the site.

Diversity and Dominance in Street Vendor Offerings at Jaidev Vatika

The vendor landscape at Jaidev Vatika is predominantly characterized by the sale of food and beverages, with *dahibada* emerging as the most frequently sold item (15%), underscoring its cultural popularity and consistent local demand. Overall, more than 60% of vendors offer edible products such as snacks, *gupchup*, tea, chicken dishes, ice cream, and sweet corn, reflecting a vibrant street food culture that appeals to a wide range of visitors. In addition to these staples, there is a modest presence of traditional local drinks like *kembu pani* and coconut water, each accounting for between 4% and 6% of vendor offerings. A smaller segment of vendors caters to niche demands with products and services such as camera usage, electric items, roti makers, clay portraits, and ladies' cosmetics—each representing under 2% of the total.

Table 20: Table: Distribution of Hawkers by Type Products they Sell (N=54)

Product/Service	Percentage
Dahibada	14.5%
Snacks	9.1%
Chicken	7.3%
Vegetable (all spellings)	7.3%
Ice Cream (incl. variations)	5.5%
Gupchup/Ghupchup	3.6%
Sweet Corn/Sweetcorn	5.5%
Fruits	3.6%
Tea (incl. combinations)	5.5%
Restaurant	3.6%
Snack Shop	3.6%
Tiffin Stalls (all types)	3.6%
Coconut/Coconut water	5.5%
Kembu pani	3.6%
Corn flour	1.8%
Electric items	1.8%

Product/Service	Percentage
Camera	1.8%
Sweet ludu ka dana	1.8%
Roti maker & wood items	1.8%
Lunch, food	1.8%
Biryani	1.8%
Fast food	1.8%
Clay items & portrait	1.8%
Ladies cosmetic	1.8%

Market Competition and Seasonality

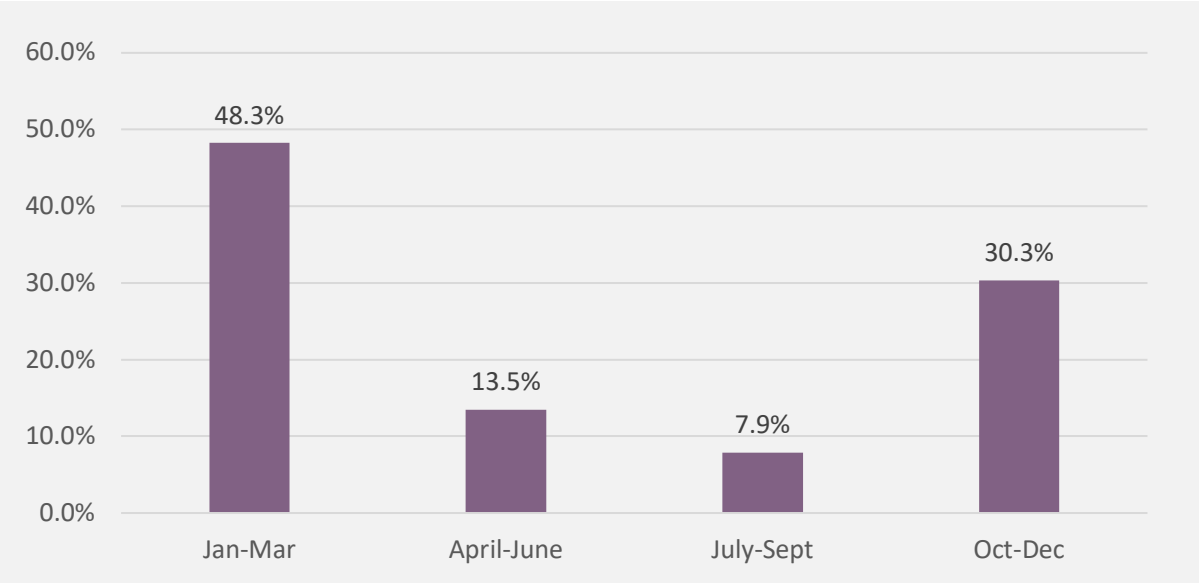
The business ecosystem around the urban green area appears to offer relatively low levels of direct competition for most vendors. A significant majority (78%) reported that only 0–5 other individuals sell the same products or services nearby, indicating potential for stable market share and reduced pressure from similar vendors. Only a small portion of respondents (4%) cited competition from 6–10 vendors, while 18% indicated a moderate level of competition from 11–15 sellers.

Table 21: Table: Number of Other Vendors Selling the Same Products/Services (N=51)

Number of Other Vendors	Percentage
0-5	78.4%
6-10	3.9%
11-15	17.6%

Seasonal variation plays a notable role in customer footfall. The January–March period sees the highest activity, with 48% of respondents identifying it as their peak season. This is followed by October–December (30%), possibly due to festivals and favorable weather. In contrast, July–September is the slowest quarter, reported by just 8% of respondents, likely due to the monsoon season. The April–June period accounts for 14% of peak traffic, possibly coinciding with school holidays or summer tourism.

Fig 41: Table: Peak Customer Months (N=89)



Footfall and Business Dependency

Daily footfall at the urban green appears to vary considerably, with the most common estimate falling in the 1,501–2,000 range, cited by 33% of respondents. While smaller in proportion, other estimates suggest significant surges in visitor numbers: 14% reported 2,501–3,000 visitors, and 12% reported 4,501–5,000 visitors. Lower footfall estimates were also recorded, including 0–500 visitors (10%) and 501–1,000 (23%). These figures indicate not only high and fluctuating visitor traffic but also the potential of the site as a vibrant public space.

This perception is reinforced by the economic value attributed to the space. A substantial 83% of vendors (44 out of 53) reported that the urban green positively impacts their business. This underscores the site's role not just as a recreational space but as a livelihood enabler for the local vendor ecosystem.

Table 22: Estimated Daily Footfall at the Urban Green (N = 51)

Footfall Range	Percentage (%)
0–500	9.8%
501–1,000	23.5%
1,001–1,500	2.0%
1,501–2,000	33.3%
2,001–2,500	0.0%
2,501–3,000	13.7%
3,001–3,500	0.0%
3,501–4,000	5.9%

Footfall Range	Percentage (%)
4,001–4,500	0.0%
4,501–5,000	11.8%

Customer Volume and Spending

When asked about daily customer volumes, most vendors (34 out of 51) serve between 0–100 customers, while 12 reported serving between 101–200. Only a few exceed these figures, indicating a predominance of small-scale operations. In terms of spending behavior, the majority of customers (39 out of 54) spend between Rs. 0–50 per visit, with a further 11 spending between Rs. 51–100. Very few customers spend more than Rs. 150, indicating that the area primarily caters to low-spending, high-volume footfall.

Overall, the data reflects a micro-enterprise economy with limited competition, seasonal variability, high dependence on foot traffic, and low per-customer transaction values—characteristics typical of informal or small-scale urban markets.

Employment Structure

A total of 9 individuals (5 part-time and 4 full-time) were employed across the surveyed hawker establishments. Among the part-time workers, the majority (4 out of 5) were employed in establishments with 1–4 part-time staff, while one establishment employed 5–10 part-time workers. Full-time employment was relatively low, with three establishments having 1–4 full-time staff. This suggested that most hawkers relied more heavily on part-time assistance than on full-time staff, possibly due to seasonal business variations or cost-saving considerations.

Average Monthly Profit and Estimated Annual Income

The self-reported average monthly profits among hawkers reveal considerable variation. A majority of respondents (63.5%) reported earning between Rs 5,100 and Rs 15,000 per month, with 29% earning Rs 5,100–10,000 and 35% earning Rs 11,000–15,000. A smaller segment (11%) earns less than Rs 5,000, while a notable minority (8%) reported monthly profits between Rs 31,000 and Rs 40,000. The remaining respondents are distributed across other income brackets, with very few in the Rs 16,000–30,000 range.

Table 23: Table: Average Monthly Profit of Hawkers (N = 52)

Profit Range (Rs)	Number of Hawkers	Percentage (%)
0–5,000	6	11.5%
5,100–10,000	15	28.8%
11,000–15,000	18	34.6%

Profit Range (Rs)	Number of Hawkers	Percentage (%)
16,000–20,000	5	9.6%
21,000–25,000	2	3.8%
26,000–30,000	2	3.8%
31,000–40,000	4	7.7%
Total	**52**	**100%**

The average monthly profit across surveyed hawkers is Rs 15,375. Extrapolating this figure, the estimated **collective annual profit** generated by 51 hawkers is approximately **Rs 94.1 lakh**. Additionally, assuming that 16 employees working with these hawkers each earn ₹60,000 annually, the **total estimated annual employee income** stands at around **Rs 1.15 crore**. These figures underscore the significant contribution of the informal hawker economy to local livelihoods, despite income disparities among individuals.

Crowd Attraction

Respondents attribute the area's high footfall to its multifunctional appeal. The location is a hub for **film and web series shoots**, making it attractive to onlookers and fans. Additionally, its status as a **tourist spot and picnic destination** adds to the daily crowd. Natural greenery also plays a role, with some people visiting solely to enjoy the environment. This diversity of attraction supports a vibrant informal economy and sustains the hawkers' businesses.

Summing Up

The hawker economy around Jaidev Vatika illustrates a vibrant and resilient micro-enterprise ecosystem deeply integrated with the urban green's social and economic fabric. Predominantly male and middle-aged, these vendors show long-term engagement with the site, with many relying on it daily for their livelihoods. Their offerings are diverse, dominated by popular street food items that cater to the area's dynamic visitor base. Despite the low per-customer spending and small-scale operations, the overall economic activity is significant. This economy thrives on high footfall, seasonal peaks, low market competition, and the multifunctional appeal of the space—from recreation to filming and tourism. It is marked by limited formal employment, flexible work arrangements, and strong spatial dependency. Overall, the findings highlight both the socio-economic importance of Jaidev Vatika for local hawkers and the critical need to recognize and support such informal economic zones in urban planning and policy frameworks.

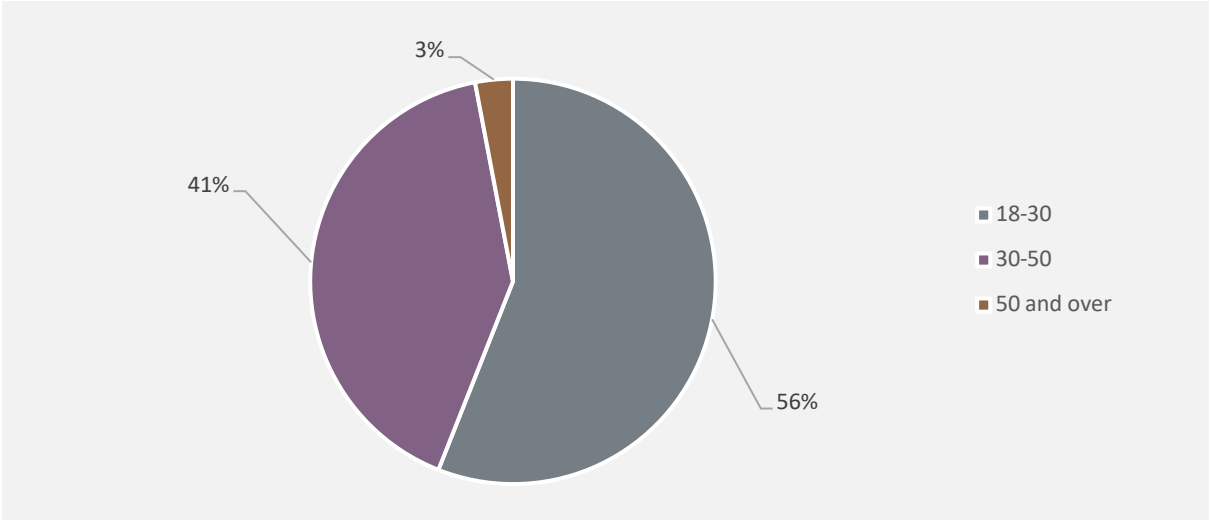
3.4 Analysis of 'Visitors' Surveys

Demographics

The bar chart illustrates a gender distribution among respondents, with 64% identifying as male and 36% as female.

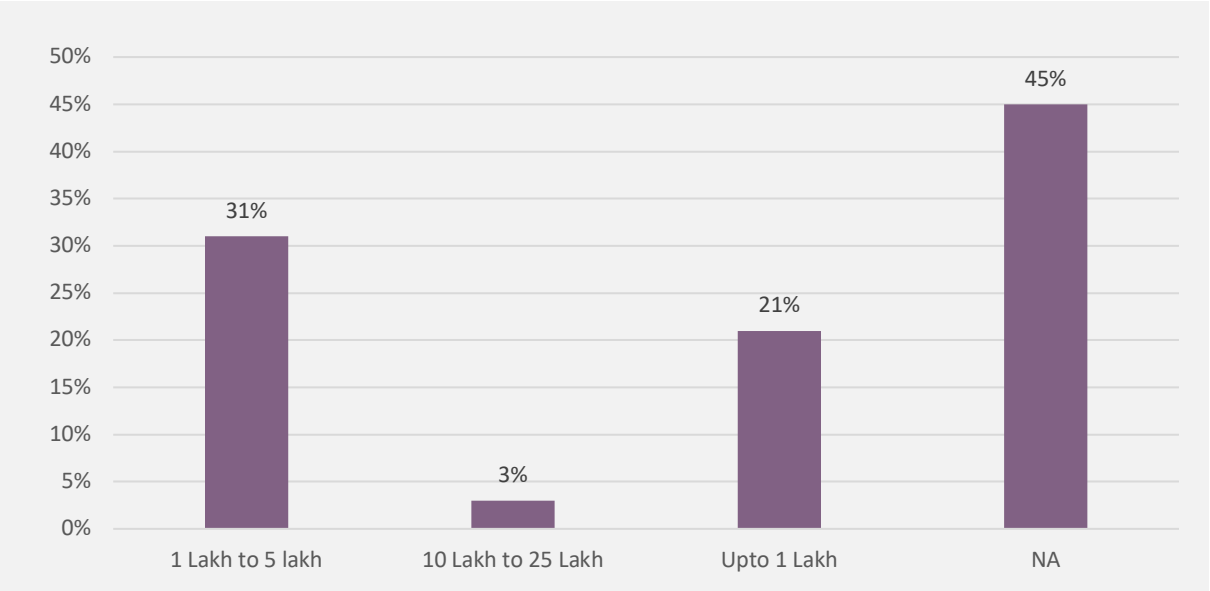
The majority of respondents (56%) fall within the 18–30 age group, indicating that the data is primarily shaped by younger adults. Another significant portion (41%) represents individuals aged 31–50, providing a strong secondary perspective from mid-aged participants. However, only 3% of respondents are aged 50 and over, pointing to a minimal participation from older adults.

Fig 42: Table: Age distribution of the respondents (N =39)



A significant portion of respondents (46%) chose not to disclose their annual income. Among those who did, the largest share (31%) reported earning between ₹1 lakh and ₹5 lakh annually, indicating this as the most common income bracket. Additionally, 21% reported an income of up to ₹1 lakh, highlighting the presence of a sizable low-income group. Only 3% of respondents reported incomes in the ₹10 lakh to ₹25 lakh range, suggesting limited representation from higher-income segments. Overall, the data indicates that the respondent base primarily comprises individuals from low- to middle-income backgrounds.

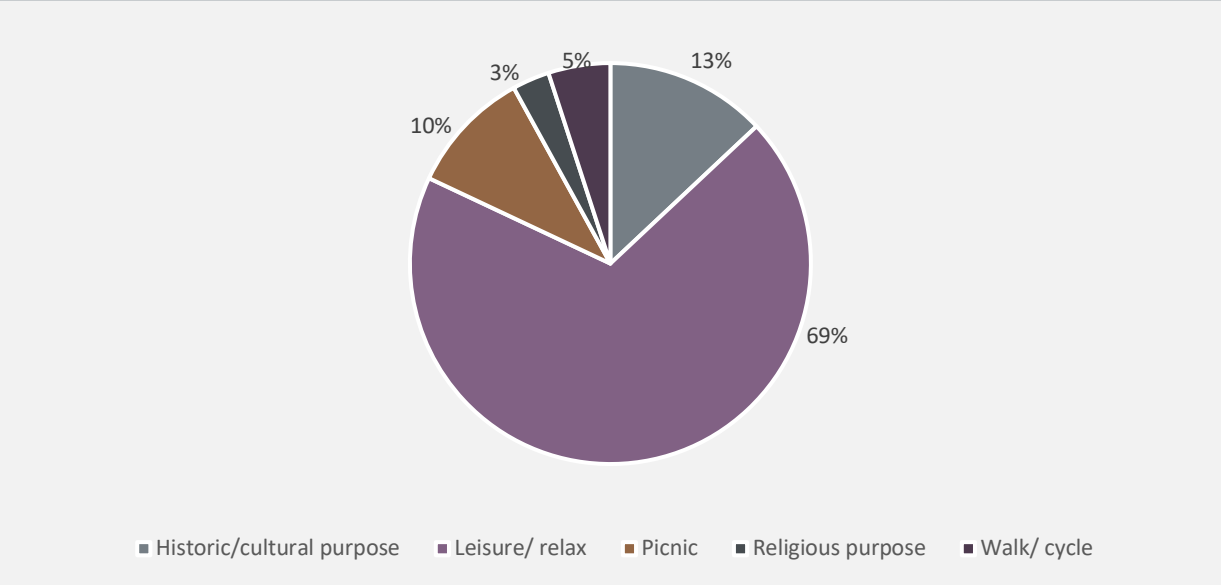
Fig 43: Table: Distribution of visitors by their annual income (N =39)



Primary Reasons for Visiting the Urban Green Space

The data illustrates the reasons people visit urban green spaces, with a dominant 69% citing leisure or relaxation as their primary motive. Historic or cultural purposes account for 13%. Picnics draw 10% of users, pointing to the value of group-oriented recreational facilities. Religious purposes (5%) and walking/cycling (3%) are less common reasons.

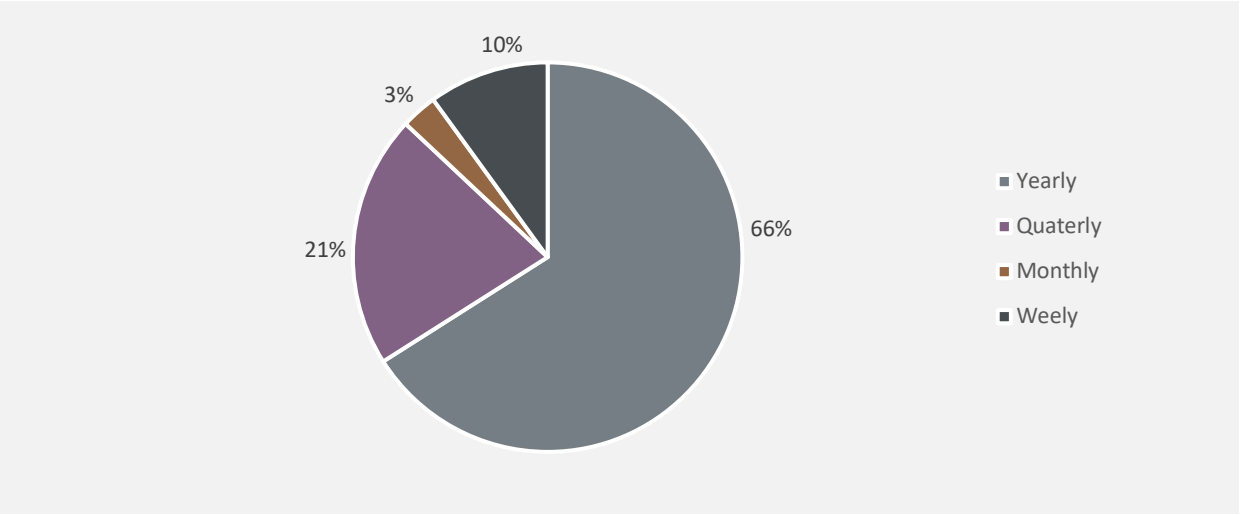
Fig 44: Table: Reasons for visiting the urban green space (N = 39)



Frequency of visiting Urban Green and reasons for attracting large crowd

The data shows that a large majority of respondents (82%) were visiting the biodiversity area for the first time, while only 18% had visited before. Those who had visited before, were asked about their frequency of visit. Majority of the respondents (66%) visit the urban green only once a year, followed by quarterly and weekly visits at 21% and 10%. While monthly visits are the least common at 3%. People visit this place for several reasons, such as; to enjoy the peaceful environment, to relax, to enjoy the greenery, for photoshoot, for picnic. Some people also visit to admire the beauty of the nature.

Fig 45: Table: Frequency of visiting the urban green space (N = 29)



Number of People Accompanying Visitors to the Urban Green Space

The data represents that most people visit urban green spaces in groups of 1–10 people (30%), followed closely by larger groups of 71–80 people (28%). Group visits in the range of 51–60 people account for 21%, while only 12% and 8% of visitors come in groups of 11–20 and 21–30 people, respectively. Overall, the pattern suggests a mix of individual or small-group visits and large organized group visits, with mid-sized groups being relatively less common.

Spending on Tickets and Additional Items

The amount spent on entry tickets to the urban green space varied between ₹40 and ₹400, reflecting the differing group sizes among visitors.

Respondents were further asked about additional spendings in the urban green space. The data shows that a majority of visitors (72%) reported spending money on things other than tickets within the area, while 28% did not spend anything apart from the ticket. Among those who did spend additionally, most mentioned purchasing food within the urban green space and vehicle entry charges. For food items such as chowmin, cold drink and water bottle

people have spent between Rs. 40-200, while for bike entry, Rs. 30 was paid and auto entry price ranged from Rs. 240-350.

The total amount spent by the visitors in urban green is **Rs. 8310.** The total amount was calculated by adding the total amount spent on tickets (Rs. 4550) and the amount spent on each item (Rs. 3760)

Usage of urban green for picnic

A significant percent of respondents (77%) reported never using urban green spaces for picnics. Only 23% of respondents have ever used urban green spaces for picnics. Additionally, many respondents, who had visited this place for picnic, observed 2–3 groups visiting this place for the same reason, while some saw as many as 20 groups. This reflects the popularity of the location and use of the place for group outings. Furthermore, the visitors had spent amount ranging from Rs.400 to Rs.1200.

This calculation is based on the approach provided by NIUA for estimating income generated through picnic bookings. The total income generated through picnic, was determined by adding the total no. of visitors (39) to the total no. of groups visited (98) multiplied by amount paid by the visitors to book the picnic spot (Rs. 2325). The total income amounts to Rs. **3,18,525.**

Ecological Variety Around the Urban Green Space

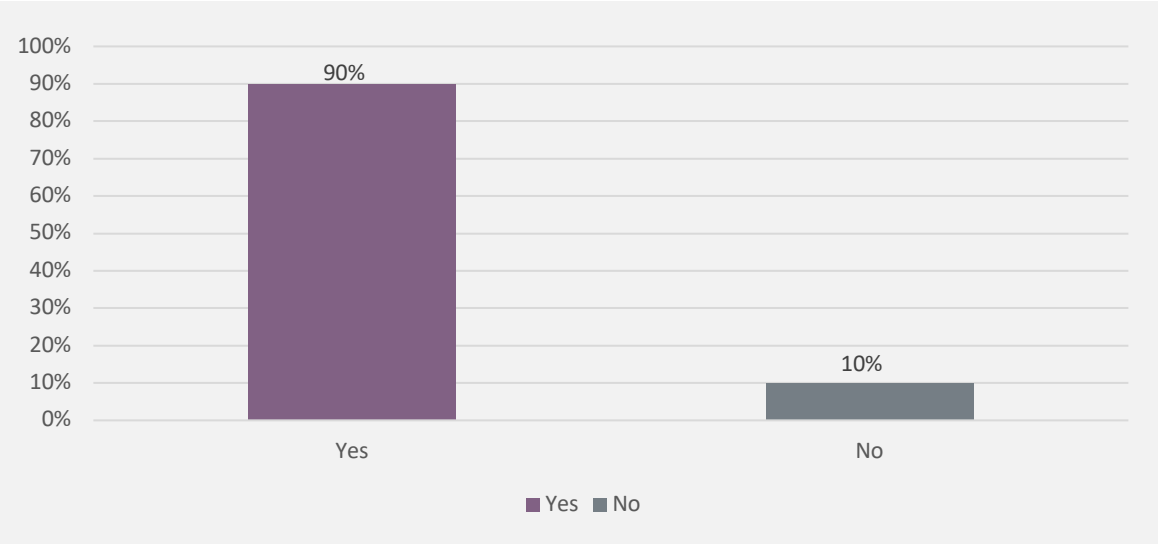
The biodiversity of the area includes a rich variety of species across different categories. It has numerous fish, supporting aquatic life. A wide range of birds can be observed. The presence of diverse flowering plants adds to the overall beauty of the place. Some respondents also mentioned seeing unique species, especially birds, but they were not aware of the type or name of the species.

Perceived Impact of Losing Urban Green Biodiversity

A significant majority of the respondents (90%) believe that the loss of bi-diversity in the urban green space would affect them, indicating a high level of awareness and concern about ecological importance of the area. However, 10% felt that such loss would not affect them. Overall, the findings suggest that most community members recognize the value of biodiversity and may be supportive of conservation efforts to protect and sustain the urban green environment.

Those who stated that biodiversity loss would affect them were further asked how it would impact them. Many respondents shared that they would need to find a new place to relax and spend quality time with their families. They emphasized the importance of having a green space with plenty of trees that provide a cool and pleasant environment, especially during the summer months.

Fig 46: Table: Perceived Impact of Biodiversity Habitat Loss in Urban Green Spaces (N = 39)

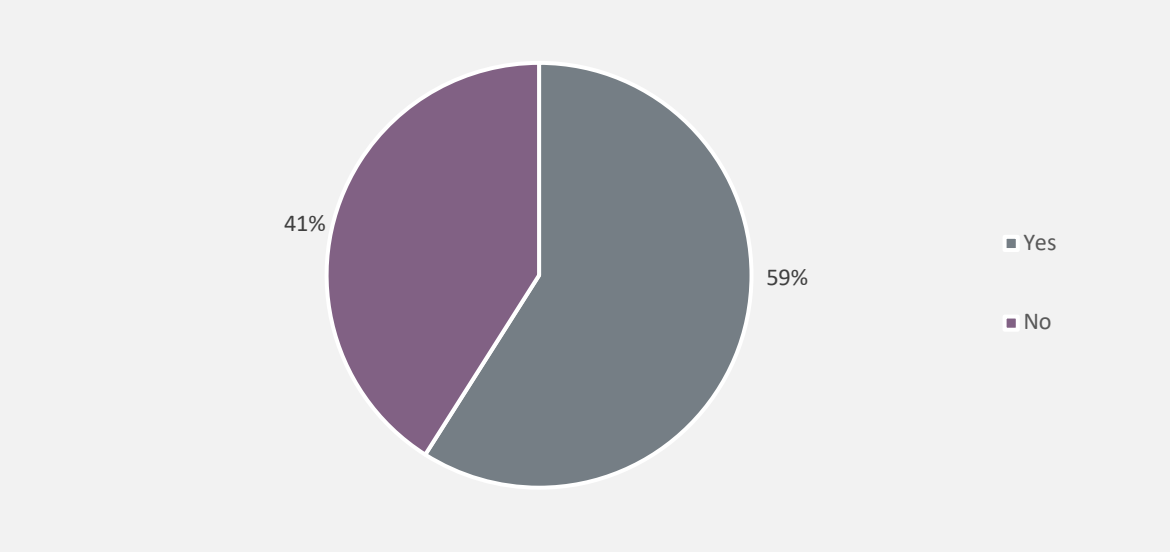


Willingness to dedicate time towards protecting this Urban Green

A majority of respondents (59%) expressed a willingness to protect urban green spaces, while 41% were not willing. This indicates that while there is a positive inclination among more than half the participants towards conserving green areas, a significant portion still lacks motivation or awareness about the importance of such efforts.

Those who expressed willingness to dedicate time to protect the space were further asked how much time they could commit. About 50% were undecided, while 20% stated they could spare 11–20 hours per month. Additionally, 15% each indicated they could dedicate 1–10 hours and 21–30 hours per month.

Fig 47: Willingness to dedicate time to Urban Green Spaces (N = 39)

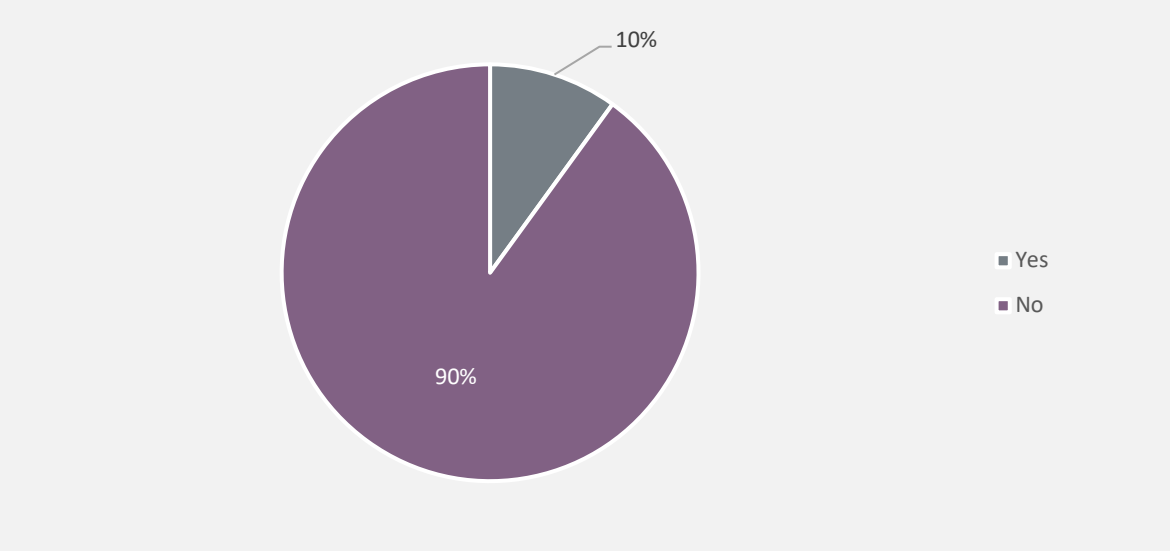


Willingness to dedicate pay towards protecting this Urban Green

When respondents were asked about their willingness to contribute financially towards the protection of this space, 90% indicated that they were not inclined to do so, while only 10% expressed a willingness to provide monetary support. To understand the extent of their support, respondents willing to contribute financially were asked about the amount they could offer. Most indicated that they were comfortable paying Rs. 100 annually.

The Value of biodiversity is determined by multiplying the total no. of respondents willing to pay (4) to maintain the UG with average amount of money they want to pay (Rs.100). As per the calculation, the value of biodiversity stands to be Rs. 400

Fig 48: Willingness to dedicate time to Urban Green Spaces (N = 39)



Summing Up

The visitor survey of the urban green space reveals important insights into demographics, visit behavior, spending habits, and attitudes toward conservation. Most visitors were young adults, predominantly male, with a significant portion falling in the low- to middle-income bracket. A notable number chose not to disclose their income. The primary reason for visiting was leisure and relaxation, with many visitors coming in small or large groups, reflecting both informal and organized usage. While the space sees high footfall, a large proportion of visitors were first-timers, with annual visits being more common among returnees. In terms of spending, a majority paid for food and vehicle entry, with total visitor spending estimated at a substantial amount. Picnic bookings, despite being reported by only a small group of visitors, generated a significant income.

Visitors appreciated the space's biodiversity, noting a variety of fish, birds, and flowering plants. Many expressed concerns about the personal impact of losing biodiversity and recognized the space's value as a serene, tree-shaded area. While a considerable number

were willing to invest time in protecting the space, only a small proportion were inclined to contribute financially, though this still resulted in a measurable amount of financial support. The findings highlight a generally positive attitude toward conservation, with potential for increasing community engagement and support for the long-term sustainability of the space.

Section IV:

KEY RESULTS AND INSIGHTS OF 'WETLAND (MARSHLAND)' SURVEYS

4.1 About the Wetland

The 'Marshland' is a natural wetland ecosystem located within the rapidly urbanizing landscape of Odisha's capital city, Bhuwaneshwar. Marshlands are among the most productive and ecologically significant ecosystems. It plays a vital role in maintaining environmental balance, supporting biodiversity, and sustaining livelihoods. In terms of biodiversity, marshlands are home to an extraordinary array of species. Birds, fish, amphibians, insects, and numerous invertebrates rely on these habitats for food, breeding grounds, and shelter.

Despite their immense ecological and economic value, marshlands are under increasing threat due to rapid urbanization, pollution, agricultural expansion, infrastructure development, and climate change. However, the marshland continues to be an important ecological asset for the local community, offering opportunities for conservation, nature-based solutions, and sustainable urban planning.

Surveys were undertaken to capture insights into how the Wetland ecosystem is used, its ecological role, and its socio-economic relevance. Respondents included a mix of stakeholder groups such as users, local residents, and cattle grazers who depend on or interact with the waterbody. A summary of the number of individuals surveyed across these categories is provided in the table below.

Table 24: Respondent category

Category	**Any User**	Residents	Cattle Grazer	TOTAL
No. surveyed	21	120	1	142

4.2 Analysis of 'Any User' Surveys

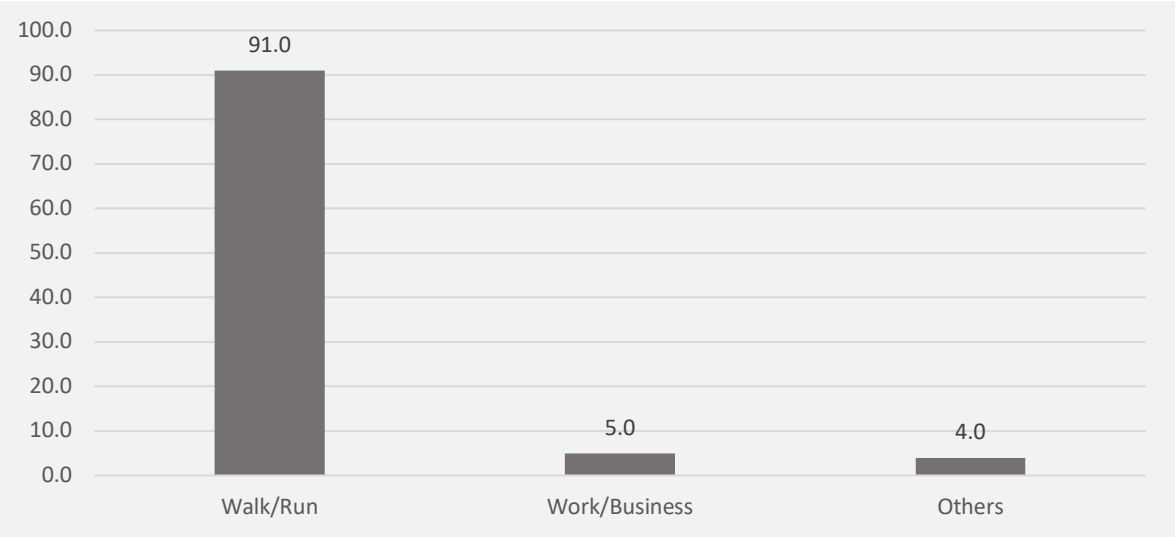
Demographics

The demographics data reveals that the majority of respondents are male, making up 81% of the total, while females account for 19%. The age distribution of the respondents shows that the majority, 57%, fall within the 30 to 50 years age group. The youngest group, aged 18 to 30, represents only 14% of the sample, suggesting relatively low participation from younger individuals. Meanwhile, those aged 50 and above constitute 29%.

Primary Activities of Respondents at the Wetland

The vast majority of respondents, 91%, are engaged in business or work-related activities at the wetland, indicating that this area serves primarily as a site for livelihood or commercial purposes. A small minority of respondents, 5% each, identified as labourers and temple priests, suggesting some diversity in the types of activities but with very limited representation outside of business/work. This distribution highlights the wetland's critical role in supporting economic activities for the local community.

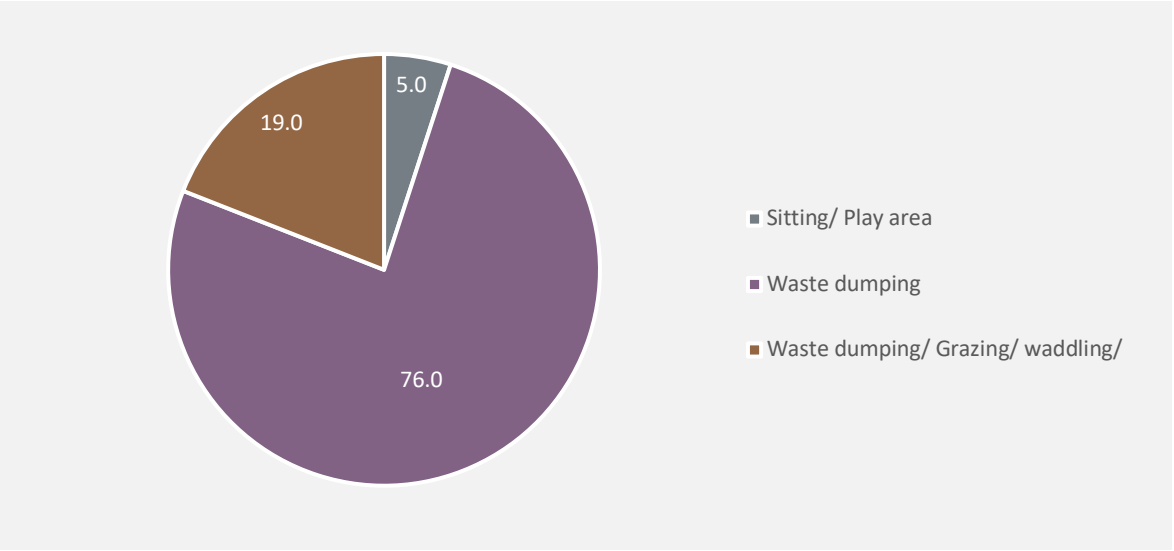
Fig 49: Table 3: Distribution of the respondents by reasons for visiting the wetland (N=21)



Use of Wetland Space

A majority (76%) of the respondents use the wetland for waste dumping, another 19% use it for multiple purpose waste dumping/grazing/waddling. While 5% use it for recreational activities like sitting or playing. The high percentage of respondents using the space for disposing waste indicates that the space has lost its biodiversity and being used as a waste disposal site.

Fig 50: Distribution of the respondents by reasons for visiting the wetland (N=21)



Community Perception regarding Water Inflow to the Wetland

The data indicates that the wetland primarily receives water from a very localized area, with 60% of respondents stating that water collects from within 100 meters around the site. Another 30% reported that water comes from a slightly broader range of 100 meters to 1 km, while 10% were unsure of the water inflow distance.

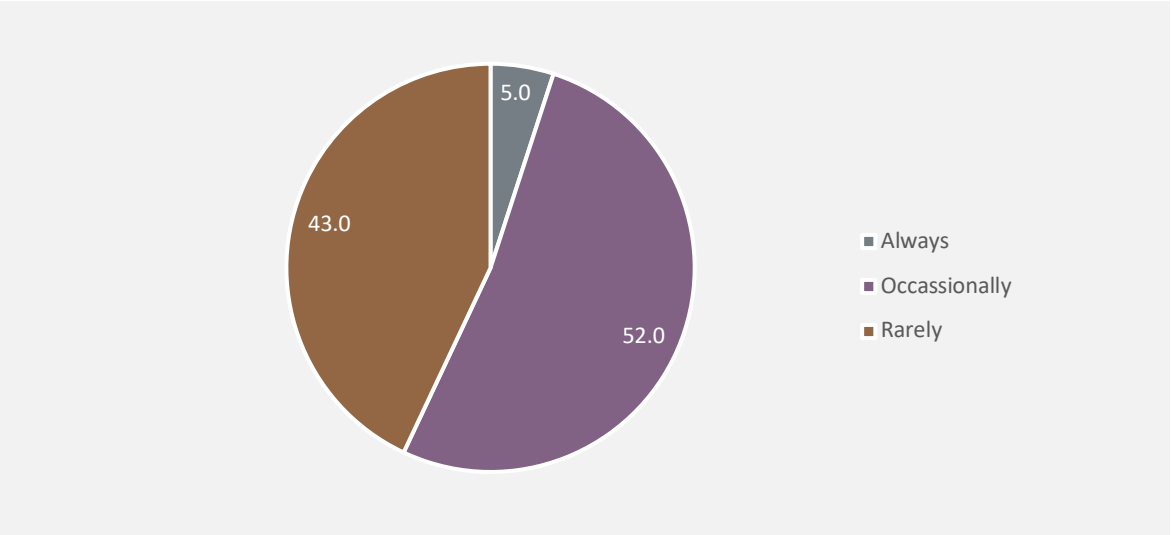
Table 25: Community perception regarding water inflow to the wetland (N=20)

Distance	%
100m - 1 km around	30.0
Up to 100m around	60.0
Don't know	10.0

Frequency of the Wetland Water Inflow

The data shows that over half of the respondents (52%) reported that the wetland gets water occasionally, while 43% said it receives water rarely. Only a small fraction (5%) observed that water flows into the wetland always. This indicates that the wetland does not have a consistent source of water.

Fig 51: Distribution of the respondents by frequency of the wetland water inflow (N=21)



Duration of Water Retention and Depth of the Wetland

The data indicates that the wetland retains water for a very short duration. A significant percent of the respondents (90%) reported that water remains in the wetland for up to one week, only 5% each noted that the water stays for more than a week or more than a month. When asked about the depth of the wetland, all the respondents stated it to be more than 4 inches.

Table 26: Distribution of the respondents by duration of water retention in the wetland (N=21)

Distance	%
More than a month	4
More than a week	5
Up to 1 week	91

Community Perception of Flooding Incidence and the Wetland's Role in Flood Mitigation

Out of the 21 respondents, 81% reported that the wetland does not get flooded, while 19% stated that it does. Those who stated, it gets flooded, were further asked its frequency. All respondents reported that the wetland rarely gets flooded.

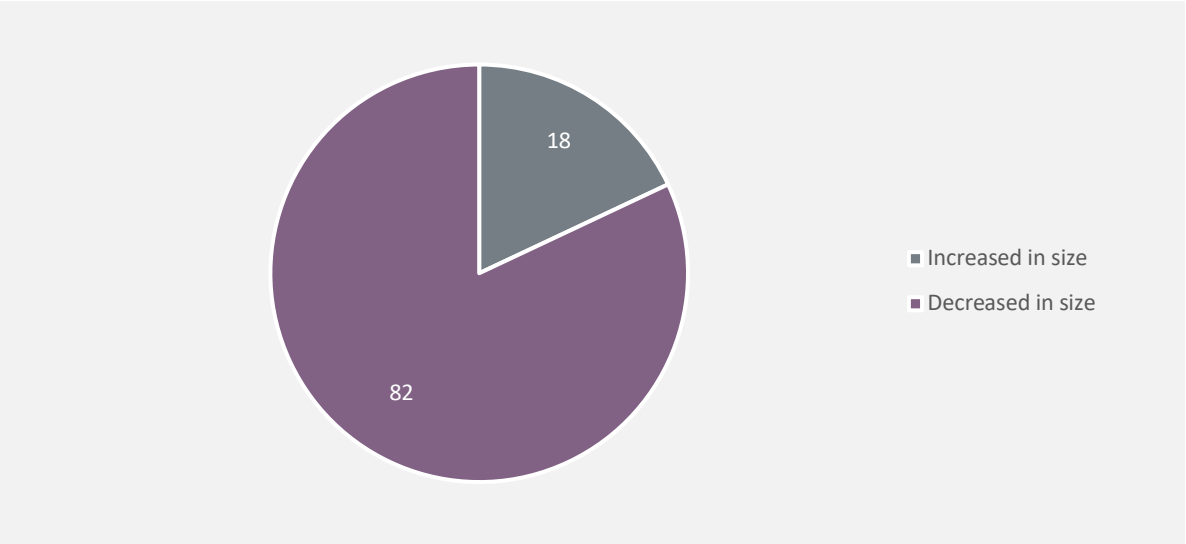
Table 27: Distribution of the respondents by incidence of wetland flooding (N=21)

Response	%
Yes	19
No	81

Changes Observed in the Wetland Over the Past 5 Years

The data reveals that a significant majority of respondents (81%) believe the wetland has reduced in size over the past five years. In contrast, only 19% felt that it has increased in size. This indicates that the observed reduction in the wetland's size is not a matter of physical contraction, but a broader signal of deteriorating ecological health, such as groundwater recharge, flood regulation, and biodiversity support, highlighting the need for targeted conservation and management interventions.

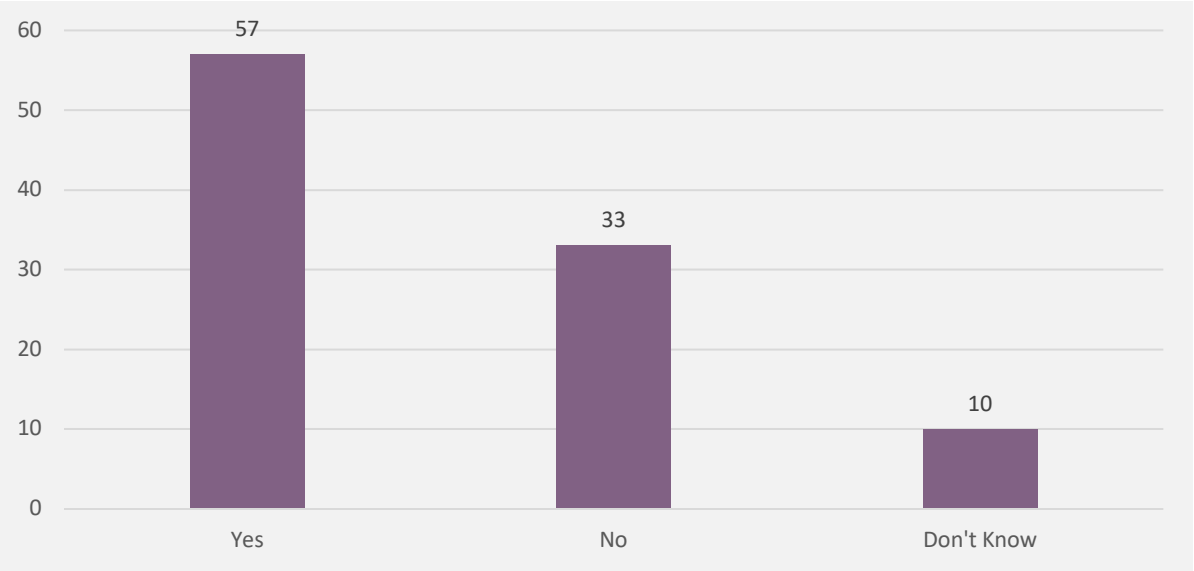
Fig 52: Distribution of the respondents by changes in wetland (N=21)



Community Perception of the Wetland's Role in Reducing Flooding

Based on the data, community perceptions regarding the wetland's role in flood mitigation are mixed. A majority of respondents (57%) believe that the wetland has not played a significant role in mitigating flooding in the surrounding areas. In contrast, about one-third (33%) acknowledged its potential contribution to flood reduction, while a small proportion (10%) expressed uncertainty or lack of knowledge on the matter.

Fig 53: Distribution of the respondents by perceived role of wetland in flood reduction (N=21)



4.3 Analysis of 'Resident' Surveys

Demographics

The majority of respondents were male (54%), while 44% were female.

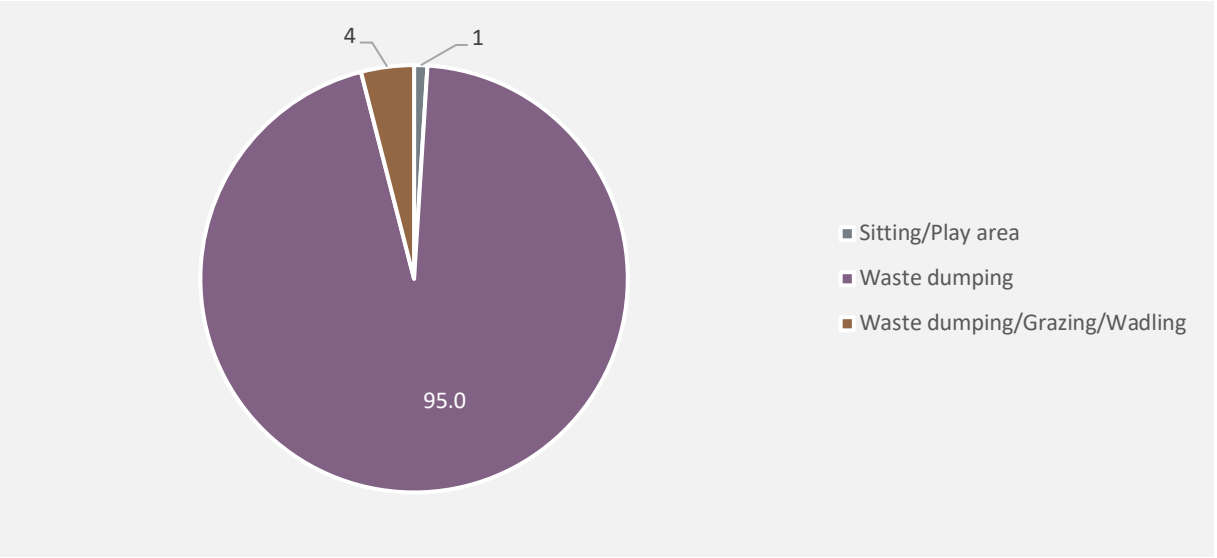
Most respondents (53%) were in the 30–50 age group, indicating that middle-aged individuals had the highest level of engagement or were most affected by the wetland and its surrounding issues. This was followed by 36% who were aged 50 and above, suggesting a significant presence of older adults in the area. Only 11% of respondents were between 18 and 30 years old, reflecting relatively lower participation or presence of younger individuals.

All respondents reported that the area was a residential neighbourhood.

Pre-dominant Use of the Wetland

The data clearly indicates that the predominant use of the wetland is for waste dumping, as reported by 95% of respondents. A small proportion of respondents (4%) reported a mixed use of the wetland for both waste dumping and activities like grazing or waddling, while an even smaller fraction (1%) mentioned its use for sitting or as a play area alongside waste dumping. These findings indicate that the wetland's potential is largely unused, and its current misuse may harm local health and biodiversity.

Fig 54: Distribution of respondents by use of the wetland (N=120)



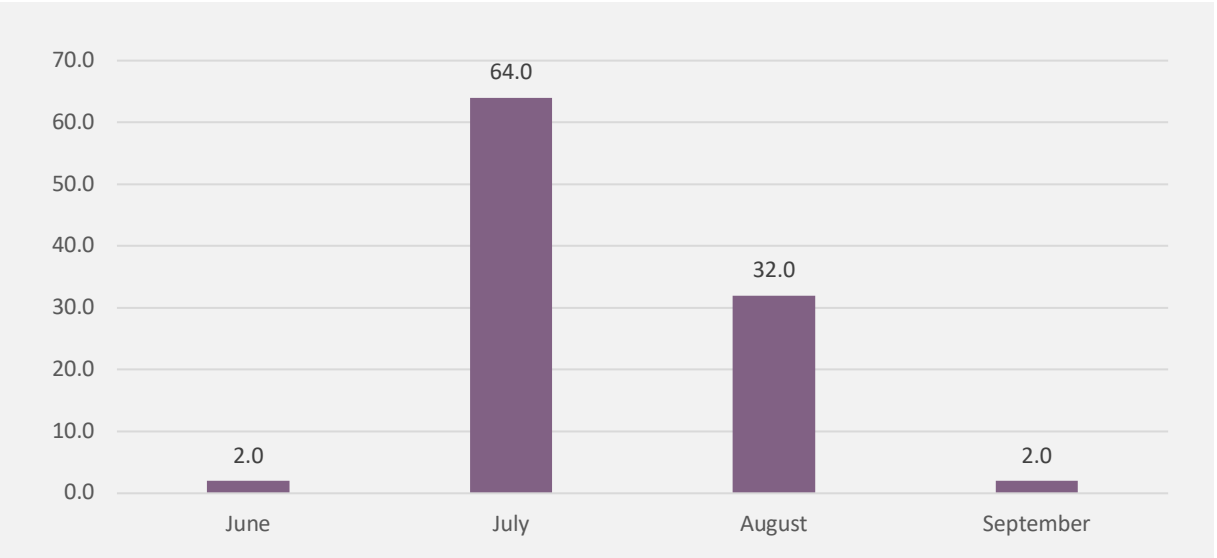
Frequency of wetland filled with water

Based on the data, a majority of respondents (54%) stated that the wetland rarely holds water, while 45% said it is filled occasionally. Only 1% reported that the wetland always contains water.

Monthly Pattern of Wetland Water Levels

With regards to month in which wetland filled with water, a significant majority of respondents (64%) identified July as the month when the wetland is usually filled, followed by 32% pointing to August. Very few mentioned June (2%) and September (2%).

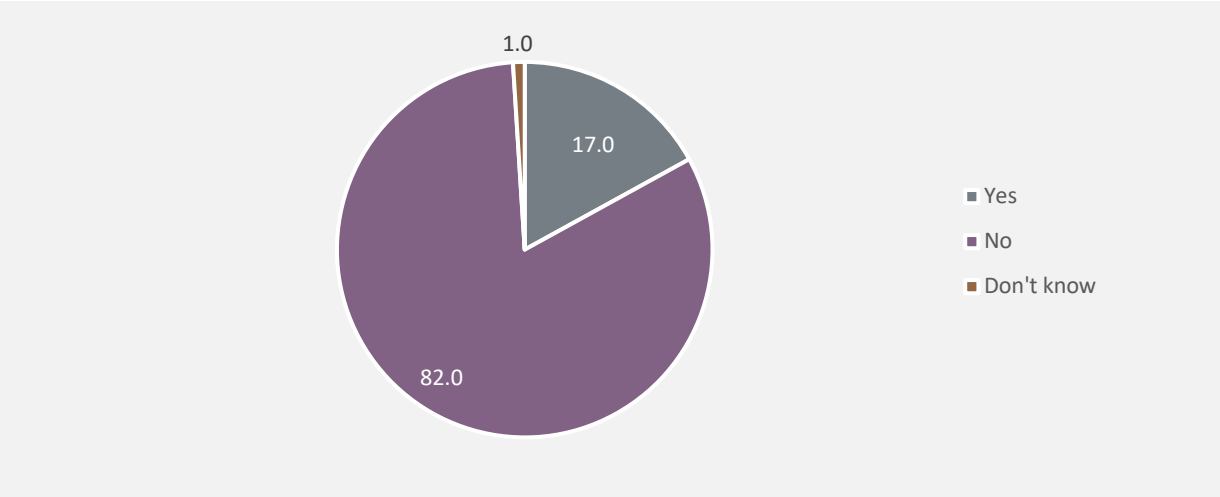
Fig 55: Table 5: Distribution of respondents by water-filled months in the wetland (N=120)



Residents' opinion Regarding Wetland Flooding and its' Impact

The data reveals that the majority of respondents (82%) reported that the area around the wetland does not experience flooding. A smaller proportion, 17%, stated that the area does get flooded, suggesting there may be occasional instances of flooding. Only 1% of respondents were unsure. These findings suggest that the perceived risk of flooding in the area is low.

Fig 56: Distribution of respondents by perception of residents regarding wetland flooding (N=120)



The respondents who stated that the area around the wetland gets flooded were further asked about the frequency of such events. Among them, 85% reported that the area rarely gets flooded, while 15% stated that it happens occasionally. Further, respondents who reported flooding were asked about its impact. They mentioned that flooding primarily affects communication, as the main road gets submerged, making travel difficult. Drain water overflows onto the roads, creating unsanitary conditions. Additionally, the presence of water snakes and mosquitoes during such times adds to the inconvenience and health risks faced by the community. However, none of the respondents reported having spent any amount to address the damage caused due to flooding, nor were they aware of any expenditure made by others for such repairs.

Reduction of Flooding in the Wetland: Community Perception

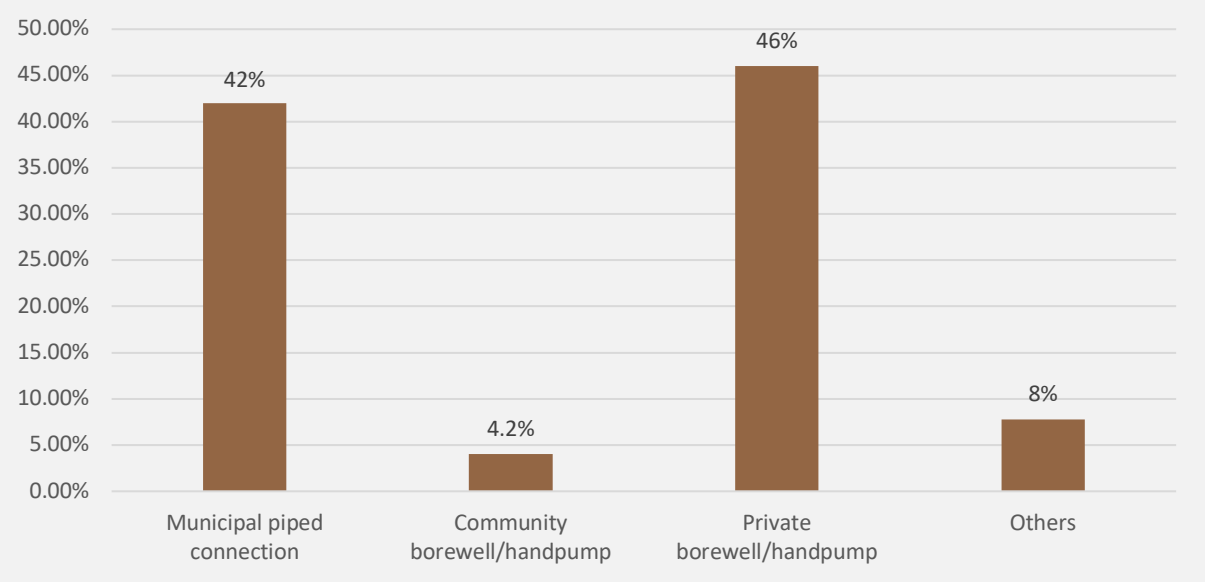
A significant majority of 65% believe that there has been reduction in flooding. However, 26% of respondents disagreed. Additionally, 9% of participants were uncertain.

Source of Water Supply

The data represents the distribution of different water sources used by the residents. The most commonly used source is private borewell/handpump, accounting for 46%, followed closely by municipal piped connection at 42%, indicating a strong reliance on both private and municipal systems for water access. A smaller portion of the population (8%) depends on

other sources such as, others house. Some of the respondents pay Rs. 500 to get water for their neighbour's house. Remaining 4% get water from community borewell/handpump.

Fig 57: Distribution of respondents by source of water supply for the residents (N=120)



Depth of the Water Level and Cost of Digging

The data shows that a significant majority of respondents (70%) reported the water level to be between 0–10 feet. An additional 12% reported water depths between 11–20 feet. A smaller portion of the population (7%) stated it to be in the 21–30 ft range, while very few (2% and 4%) noted depths in the 31–40 ft and 41–50 ft ranges, respectively. Notably, 1% reported an extremely deep-water level (111–120 ft), which could be an outlier or represent localized depletion.

Table 28: Distribution of respondents by depth of the water level (N=97)

Depth	%
0-10 ft	70
11-20 ft	13
21-30 ft	7
31-40 ft	2
41-50 ft	4
111-120 ft	1
Don't know/ Can't say	3

Respondents were further asked about the depth they had to dig to access water. Most respondents (85%) reported digging to deep levels to access water, typically between 100 and

180 feet while remaining 15% reported digging 30-50 ft. The respondents reported to pay the digging cost of between Rs. 40,000 to 130,000. While a few respondents also reported unawareness regarding the amount paid for digging.

Construction of Water Sources

Respondents were asked when they constructed the borewell/dugwell/handpump. A majority (51%) reported that their homes were built over 10 years ago followed by 32% had constructed their houses within the last 5 to 10 years. Additionally, 12% constructed it in the last 1 to 5 years, while only 2% did so in the past year. Other 4% were unsure, categorized as "Can't say".

Impact on Ground Water due to the Wetland

Based on the data, a majority of respondents (60%) believe that the groundwater in the area is not affected by the nearby wetland, while only 20% think it is affected, and another 20% are uncertain.

Respondents were further asked to compare the groundwater in this area and other areas. The majority of respondents (36%) believe that the groundwater level in their area is higher than in other areas, followed closely by 33% who think it is lower. About 23% believe the groundwater level is the same as in surrounding areas, while a small portion (8%) are uncertain.

Use of AC at home

Majority (53%) of the respondents use at home while other 47% doesn't. Among those who reported using an AC at home, 76% reported having one AC, 22% reported having two, and the remaining 2% have three AC units in their household. Additionally, they were asked about the number of months AC is being used. The data shows a wide variation in the number of months respondents use air conditioning in a year. More than $1/4^{th}$ (26%) reported using AC for 8 months, followed by 4 months, 1-2 months and 5 months at 23%, 18% and 15% respectively. A smaller group (13%) uses it for 9 months, while very few (3%) use it almost year-round for 10 months.

Respondents were further asked the number of hours they use AC during peak summer The data indicates that the majority of AC users (41%) operate their units for 6–8 hours daily during peak summer. This is followed by 28% who use ACs for 8–10 hours per day. Around 10% each use ACs for less than 2 hours and 2–4 hours, while 8% use them for 4–6 hours. Only 3% of users report running their ACs for more than 10 hours per day.

Use of Cooler

Only 15% of the respondents reported using a cooler, and each of them owns one cooler. Among these users, 39% use the cooler for only 1 month in a year, while another 39% use it for as long as 8 months. A smaller share uses it for 2 months and 6 months, accounting for 11% each.

The respondents were further asked, the number of hours cooler is used. The data shows a varied pattern in the number of hours coolers are used daily during peak summer. The most common duration is 2–4 hours per day, reported by 29% of cooler users. Respondents use coolers for less than 2 hours and 6–8 hours per day at 21% each. Smaller proportions use them for 4–6 hours and 8–10 hours, at 14% each. This variation in daily usage suggests most users seem to rely on coolers moderately throughout the day.

Perceived Temperature Variation and Species in the Wetland Area

The data indicates that a significant majority of respondents (77%) believe the area around the wetland is cooler compared to other parts of the neighborhood. Only 23% disagreed with this perception.

Table 29: Distribution of respondents by perceived temperature variation near the wetland area (N=120)

Response	%
Yes	77
No	23

When asked about the species observed in the wetland, respondents reported seeing a variety of biodiversity, including fish, birds, cranes, and snakes. While no unique specie was observed in the area.

4.4 Analysis of 'Cattle Grazer' Surveys

Only one cattle grazer was surveyed during the visit to the wetland. The respondent was a male in the 30–50 age group who reported visiting the wetland daily for over five years. He brought 10 livestock, including cows and buffaloes, for grazing. According to him, the wetland provided direct benefits to his business by supporting the grazing needs of his animals. On average, he spent approximately ₹20,000 per month on fodder for his livestock.

Section V:

INSIGHTS ACROSS THREE URBAN ECOSYSTEMS IN BHUBANESWAR

The comprehensive analysis of Bindusagar Lake, Jaidev Vatika, and the Wetland reveals five critical cross-cutting themes that define the relationship between urban ecosystems and community well-being in Bhubaneswar. These insights, drawn from extensive stakeholder consultations and focus group discussions, illuminate both the profound value and urgent challenges facing these vital urban commons.

5.1 Universal Microclimate Benefits

A remarkable finding across all three ecosystems is the universal recognition of their cooling effects, demonstrating the critical role these spaces play in urban heat mitigation. At Bindusagar, 90% of residents perceive the area as cooler than surrounding areas, while at Jaidev Vatika, 92% of residents reported the same cooling effect. Even the degraded Wetland maintains this function, with 77% of residents acknowledging its cooling properties.

This consistent pattern reveals that urban ecosystems provide essential climate regulation services regardless of their conservation status. The cooling effect translates into reduced dependence on energy-intensive cooling systems—only 25% of Bindusagar residents use air conditioners, and a mere 5% of Jaidev Vatika residents rely on AC units.

As one Bindusagar resident noted in the FGD, *"It's cold and cloudy. People come and sit here to enjoy the natural view"* and *"in afternoon we come to sit here"* instead of relying solely on artificial cooling.

The ecological value of the park was acknowledged by the staff as well, with one of them stating an improved understanding on the subject. *“After getting this job I got to know everything about trees, medicinal plants, and nature’s value. Now, we are planning to prohibit plastic inside the park.”*

The economic implications are significant: reduced energy costs for households and enhanced property values. One respondent specifically mentioned that *"real estate prices in the vicinity are higher due to the cooler microclimate compared to surrounding areas."*

5.2 Complex Livelihood Dependencies

The three ecosystems support intricate webs of economic activity that sustain thousands of livelihoods, revealing their function as critical economic infrastructure rather than merely

environmental amenities. Bindusagar demonstrates the most complex economic ecosystem, generating substantial annual revenues.

The FGD at Bindusagar revealed the multi-generational nature of these dependencies. A priest explained his family's connection: *"Yes, it is helpful as we are doing our work here from generations,"* earning approximately *"4000 rupees in 15 days"* during peak religious seasons. A shop owner operating for *"25 years"* generates daily profits of *"600-700 rupees,"* while acknowledging that *"Because it's Bindusagar. It is a rushed and touristic place."*

Even at Jaidev Vatika, 83% of hawkers confirmed that the urban green space positively impacts their business. However, the FGD with caretakers revealed concerning working conditions, with wages of only *"450-600 rupees per day"* and *"no safety measures. If you get injured then you will stay at home. It's like no work no pay."* One of the FGD participants also explained the stringent measures taken against them if they are late. *"We come from far away and if we get late, we get the day off or we don't get entry and then we don't get salary that day."* One of the demands that the staff made was to receive employee benefits. Nevertheless, an employee at Jaidev Vatika also explained, *"I do like the work as I also contribute in developing the park which enhances the happiness of people."*

The economic dependency creates a powerful constituency for ecosystem protection, as evidenced by hawkers' and shop owners' overwhelming recognition (92-98%) that these spaces benefit their businesses. Beyond the critical role that the ecosystems play for the employees at the sites, there are larger economic implications. For instance, the section incharge at Jaidev Vatika revealed that, *"In winters like in December and January, a revenue of 45 lakhs gets generated monthly. Then, in February it is 15 lakh and in , 14 lakh. In summers, it is 12-13 lakh. This year we have crossed 2 crores. This is Bhubaneswar's second place of generating such revenue."*

5.3 Development Pressures vs. Conservation

All three ecosystems face significant development pressures that threaten their ecological integrity, representing a fundamental tension between short-term development gains and long-term ecosystem benefits. This conflict is most apparent at Jaidev Vatika, where caretakers revealed concerning plans: *"Now, DM wants to make it a beautiful garden. The government is trying to create lawns by cutting trees. Development projects are getting planned to happen here on foreign names like Bangalore Park, Japanese park, Sri Lanka Park."* The environmental consequences are clearly understood by ground-level workers: *"Government wants to cut trees. It will lead to global warming."* Visitor resistance is also evident: *"No, they are complaining by saying why do you cut these trees."*

The Wetland presents the most extreme case of ecosystem degradation, with **95% of respondents reporting its use for waste dumping** and **81% observing size reduction over five**

years. This transformation from a functional wetland to a waste disposal site represents a complete loss of ecosystem services.

At Bindusagar, development has been more balanced, with infrastructure improvements noted by long-term residents: *"It has been developed a lot like lights are decorated, Boundary wall is there, and films, serials are getting shot here... It's developed a lot in last 4-5 years."* However, even here, concerns about environmental impacts persist, with declining aquatic biodiversity noted: *"Fishes are not here. Watery creatures are decreasing."*

5.4 Differentiated Usage Patterns

The three ecosystems serve distinctly different roles in residents' lives, reflecting their varying accessibility, condition, and management approaches. Bindusagar functions as a **daily-use ecosystem** with intense, multi-purpose utilization—60% of residents directly use the water, fishermen visit weekly or daily, and 90% of hawkers operate daily.

Jaidev Vatika serves primarily as a **special-occasion destination** with 59% of residents visiting yearly and 29% quarterly. This reflects its role as a curated recreational space rather than an integrated part of daily urban life. One of the employees at Jaidev Vatika explained, *"This is 125 acres of land. There is waterfall, streams, bridges, film shooting area, India gate, Kargil setups, Butterfly Garden, and Japanese garden. Because of these things in the park people are getting attracted towards the park, which increases our work load but it's quite interesting and fun."* The entry fee structure reinforces this pattern, as noted by residents who expressed concern about the shift *"from a freely accessible space to one that now requires an entry fee, reflecting the commercialization of a once-public resource."*

The Wetland has largely **lost its ecosystem function**, serving primarily as an unmanaged waste disposal site with minimal positive human interaction, though it retains some utility for occasional cattle grazing.

These usage patterns reflect both accessibility and ecosystem health—degraded ecosystems lose their ability to support diverse human activities, while well-maintained spaces can serve multiple functions simultaneously.

5.5 Community Stewardship Potential vs. Financial Capacity Constraints

Strong community attachment exists across all ecosystems, but financial capacity for conservation remains limited, revealing a critical implementation challenge for conservation strategies. At Bindusagar, **66% of visitors expressed willingness to contribute time** for protection, and **58% were willing to make financial contributions**, totaling INR 15,405 in pledged support.

However, the pattern of high time commitment but low financial contribution is consistent across sites. At Jaidev Vatika, **57% expressed willingness to support conservation** through participation, but **only 7% were willing to make financial contributions** of INR 100-200 annually.

The FGD insights reveal the economic constraints underlying this pattern. Workers at Jaidev Vatika earning *"450 rupees per day"* with no job security have limited capacity for financial contributions despite their direct dependence on ecosystem health. Similarly, fishermen at Bindusagar face income uncertainty, with some days yielding *"300-400 rupees"* and others *"nothing."*

This suggests that conservation strategies must rely primarily on non-financial community contributions while seeking alternative funding mechanisms for actual conservation activities.

5.6 Strategic Implications and Recommendations

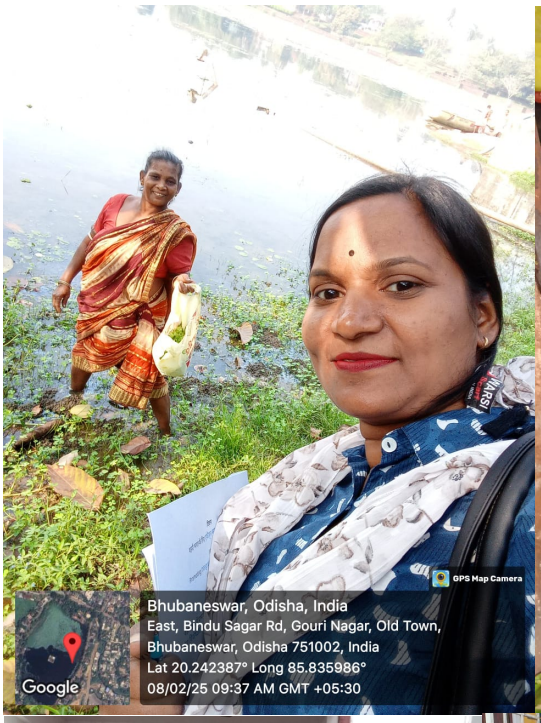
The cross-ecosystem analysis reveals that **Bhubaneswar's urban ecosystems function as integrated socio-ecological systems** where environmental health, economic vitality, and community well-being are inextricably linked. The universal cooling benefits, complex livelihood dependencies, and strong community attachment demonstrate their critical importance to urban resilience.

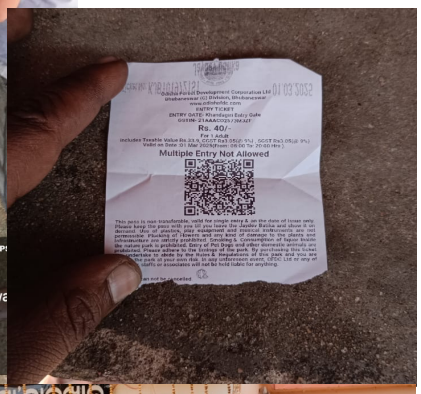
However, the intensifying development pressures, differentiated usage patterns, and financial capacity constraints highlight the need for **nuanced, ecosystem-specific conservation approaches** that:

1. **Recognize and protect the cooling function** as a critical urban service
2. **Integrate livelihood considerations** into all conservation planning
3. **Balance development with ecological integrity** through evidence-based planning
4. **Develop appropriate management models** for different usage patterns
5. **Mobilize community stewardship** through non-financial mechanisms while securing alternative funding sources

The success of conservation efforts will ultimately depend on acknowledging these ecosystems not as isolated environmental assets, but as fundamental infrastructure supporting the social, economic, and environmental resilience of Bhubaneswar's urban communities.

Glimpse of the surveys conducted at the three ecosystems





References

1. Odisha Tourism. "Bindu Sagar Lake, Bhubaneswar." https://odishatourism.gov.in
2. Odisha Forest Development Corporation. "Jayadev Vatika Eco Park." https://www.odishafdc.com
3. Ramsar Convention Secretariat. *The Importance of Wetlands*. https://www.ramsar.org
4. Patnaik, N. (1997). Sacred Geography of Puri: Structure and Organisation and Cultural Role of a Pilgrim Centre. Kalpaz Publications.
5. Mohapatra, R. P. (1986). Archaeology in Orissa. B.R. Publishing Corporation.
6. Dash, S. P. (2007). Coastal Histories: Society and Ecology in Pre-modern India. Primus Books.
7. Mishra, P. K. (2005). The Orissa Gazette. Government of Orissa.
8. Mohanty, P. K. (2012). Encyclopaedia of Schedule Tribes in India. Gyan Publishing House.
9. Government of Odisha. (2018). Odisha Economic Survey 2017-18. Planning and Convergence Department.

National Institute of Urban Affairs
1st Floor, Core 4B,
India Habitat Centre, Lodhi Road,
New Delhi - 110003, India
(+91-11) 24643284/ 24617517 (ext. 214)
urvers@niua.org