Stakeholder Consultation on

URBAN AQUIFER MANAGEMENT & WATER GOVERNANCE IN KERALA

Analysis, Interpretation & Findings

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Organized by

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INTRODUCTION

Water governance in Kerala has emerged as a critical issue due to the state's unique geographical and climatic conditions. The region faces water scarcity, quality, and distribution challenges, making effective governance crucial for sustainable management. Kerala's diverse ecosystem and population require a governance framework that can address the needs of various stakeholders, including government officials, academics, NGO workers, professionals, and the general public. Understanding the perceptions of these different groups can provide valuable insights into the strengths and weaknesses of current water governance practices and help identify areas for improvement.

Objective:

This survey aims to gather diverse stakeholder perspectives on various aspects of water governance, including water quality, quantity, data management, stakeholder engagement, and inter-departmental coordination.

Methodology:

Sample and Data Collection

This survey gathered insights from 154 respondents from different regions of Kerala, encompassing the state's southern, central, and northern parts. After excluding 41 incomplete responses, 113 valid responses were used for the final analysis. The demographic variables considered in the survey included age, gender, occupation, and location, providing a comprehensive overview of the respondent profile.

The respondents spanned various age groups, from young adults to senior citizens, and included both male and female participants. They came from various occupational backgrounds, including government officials, academics, NGO workers, professionals, and others. This diversity was critical to understanding how perceptions of water governance might vary based on professional experiences and societal roles. Additionally, the survey captured significant geographic diversity by including respondents from Kerala's southern, central, and northern regions.

Instrumentation and Data Analysis

Data collection involved structured questionnaires designed to cover various aspects of water governance. We employed descriptive and inferential statistical tests to analyse the survey data. We summarised the responses in item-wise response tables to analyse the data, providing a clear and organised view of stakeholder perceptions on various aspects of water governance.

We used the chi-square test and the Kruskal-Wallis test to determine associations and significant differences among the different stakeholder groups.

The chi-square test assessed the associations between categorical variables, helping us understand the relationships between demographic factors and perceptions of water governance. The Kruskal-Wallis test, a non-parametric method, was used to compare the mean ranks of perceptions across different occupational groups, allowing us to identify any statistically significant differences in perceptions based on occupation.

Summary of the analysis

In this study, our primary focus was on investigating perceptions of key aspects of water governance in Kerala, specifically concerning water quality, water quantity, data management, stakeholder engagement, and inter-departmental coordination. We conducted tests and analyses to explore how these factors varied across different occupational groups.

Our study examining water quality across different occupations evaluated key aspects, including Water Quality Satisfaction, Overall Water Quality Rating, Effectiveness of Water Monitoring, Concerns about Health and Environmental Hazards, Surveillance Frequency, Observation of Foul odours, and Visible Signs of Contamination. Our analysis revealed significant differences in the overall water quality rating and effectiveness of water monitoring among occupational groups. Government officials consistently rated these aspects highest, reflecting more positive perceptions, whereas NGOs consistently rated them lower. Conversely, other aspects such as Water Quality Satisfaction, Concern about Health and Environmental Hazards, Surveillance Frequency, Observation of Foul odours, and Visible Signs of Contamination did not show statistically significant differences in mean scores across occupations.

In our analysis of stakeholder engagement concerning occupation, we investigated perceptions of stakeholders' engagement and cooperation in water management practices in Kerala. We found significant variations across occupational groups, with government officials reporting the highest mean scores and NGOs the lowest in engagement. This disparity underscores differing levels of satisfaction and involvement among stakeholders in engagement mechanisms related to water management. However, our analysis did not reveal significant differences in perceptions of cooperation among stakeholders across different occupational categories. This suggests a consistent perception of cooperation levels among government officials, academics, professionals, NGOs, and others involved in water governance.

While considering data management, we examined aspects such as monitoring reliability, accessibility of data, and data-sharing collaboration. However, our analysis did not reveal

significant differences among different occupational categories in these areas. Similarly, we found no significant differences across occupational groups in assessing water quantity through questions related to water shortage frequency.

Our analysis shows a statistically significant association between occupation and perceptions of government coordination in water management in Kerala. This indicates notable variations in how occupational groups perceive inter-departmental coordination within water management. Government officials rate coordination more positively than NGOs, professionals, and academics, who generally express lower satisfaction. Understanding these disparities is crucial for developing strategies that enhance inter-departmental collaboration, improving overall effectiveness and efficiency in water management practices across the state.

Finally, in our comprehensive analysis of water governance, we evaluated critical aspects such as Transparency in Water Governance, Enforcement of Water Policies, Sustainability Prioritization, sufficient Financial Resources, and Consideration of Future Generations. Across these dimensions, significant variations were evident among occupational categories, with Government Officials consistently assigning the highest ratings, indicating robust perceptions, while NGOs consistently reported lower scores. These findings underscore the integration of occupational perspectives into developing and implementing water governance strategies. Addressing disparities in perception, mainly through enhanced transparency measures, is essential for fostering trust and accountability in water management. Furthermore, promoting stakeholder collaboration is pivotal in ensuring uniform policy enforcement and bolstering resilience to climate change across all sectors.

In addition to these aspects, our analysis covered Science-Based Decisions, Accountability Mechanism Failures, Integration of Traditional Practices, Cooperation among Stakeholders, Adaptability of Governance Framework, Gender Equality and Inclusivity, Investment in Water Infrastructure, Protection of Ecologically Sensitive Areas, Balancing the Needs of Water Users, Transparency in Governance Decisions, and Effectiveness of Water Governance. Notably, we found significant differences in how Government Officials and NGOs rated Science-Based Decisions and Accountability Mechanism Failures, with officials giving higher scores and NGOs lower ones. These differences highlight varying views on the importance of scientific evidence and accountability in water management

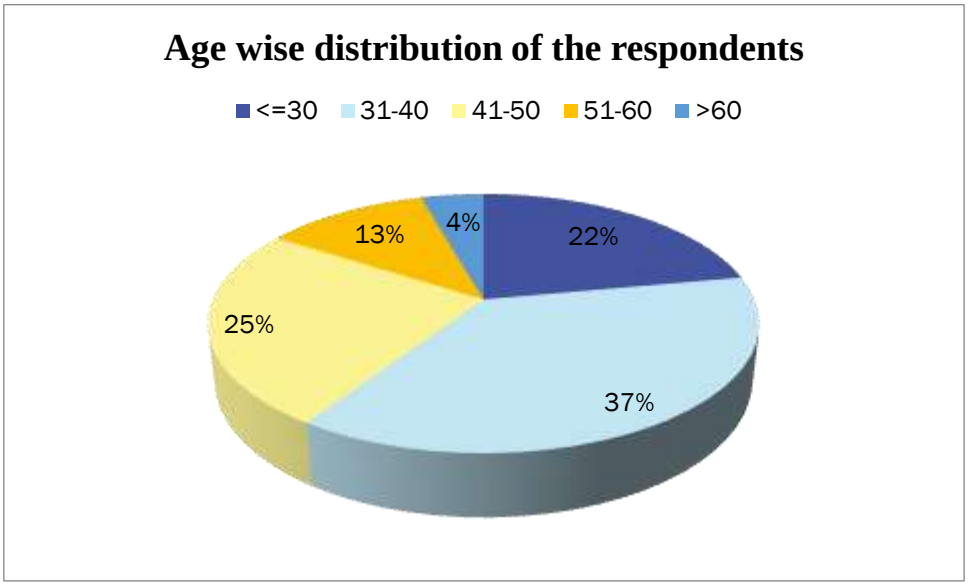
FREQUENCY DISTRIBUTION

Demographic Variables

1. **Age-wise distribution of the respondents**

Age	Frequency	Percentage
<=30	25	22.1
31-40	42	37.2
41-50	28	24.8
51-60	13	11.5
>60	5	4.4
Total	113	100.0

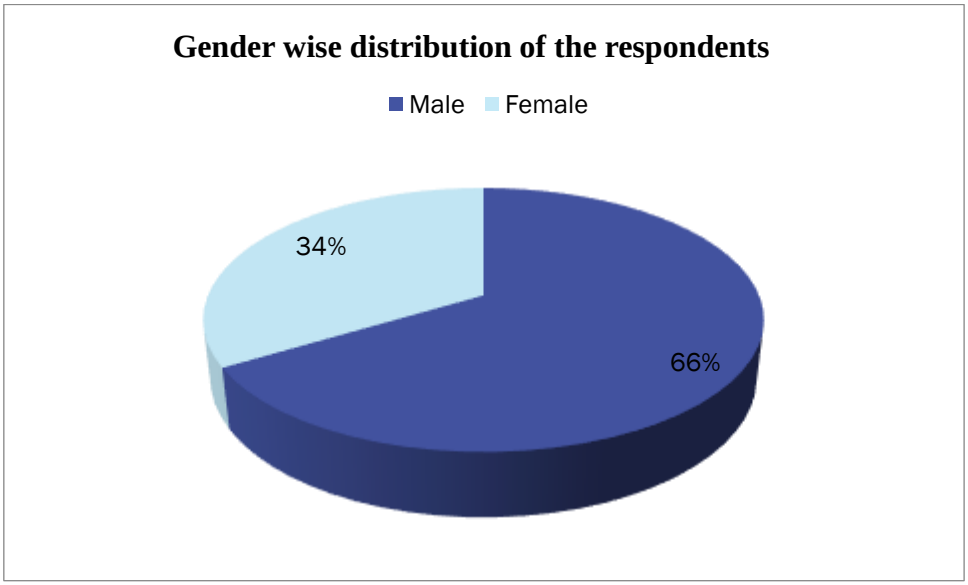
The data represents the distribution of respondents across different age groups, totalling 113 individuals. The majority falls within the age range of 31-40 years, comprising 42 respondents (37.2%), followed by those aged 41-50 years with 28 respondents (24.8%). Younger adults aged 30 years or below account for 25 respondents (22.1%), while individuals aged 51-60 years constitute 13 respondents (11.5%). The smallest group consists of respondents over 60 years old, comprising 5 individuals (4.4%). This distribution illustrates a predominantly middle-aged population in the survey sample, with notable representation from individuals aged 31-50 years.



2. Gender-wise distribution of the respondents

Gender	Frequency	Percentage
Male	75	66.4
Female	38	33.6
Total	113	100.0

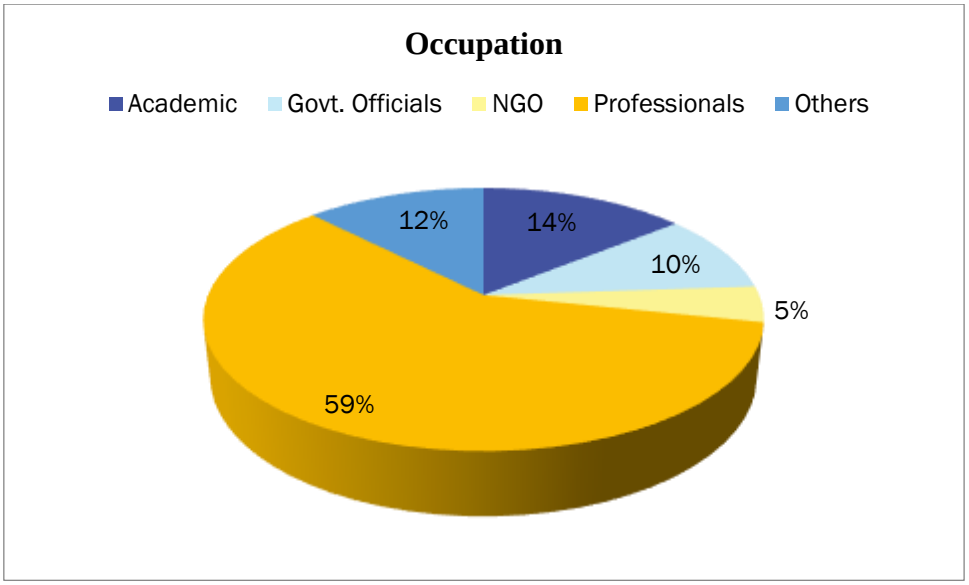
The data provides an overview of gender distribution among 113 respondents, with males comprising the majority at 75 individuals (66.4%) and females accounting for 38 individuals (33.6%). This distribution indicates a higher representation of males within the survey sample compared to females.



3. Occupation

Occupation	Frequency	Percentage
Academic	16	14.2
Govt. Officials	11	9.7
NGO	5	4.4
Professionals	67	59.3
Others	14	12.4
Total	113	100.0

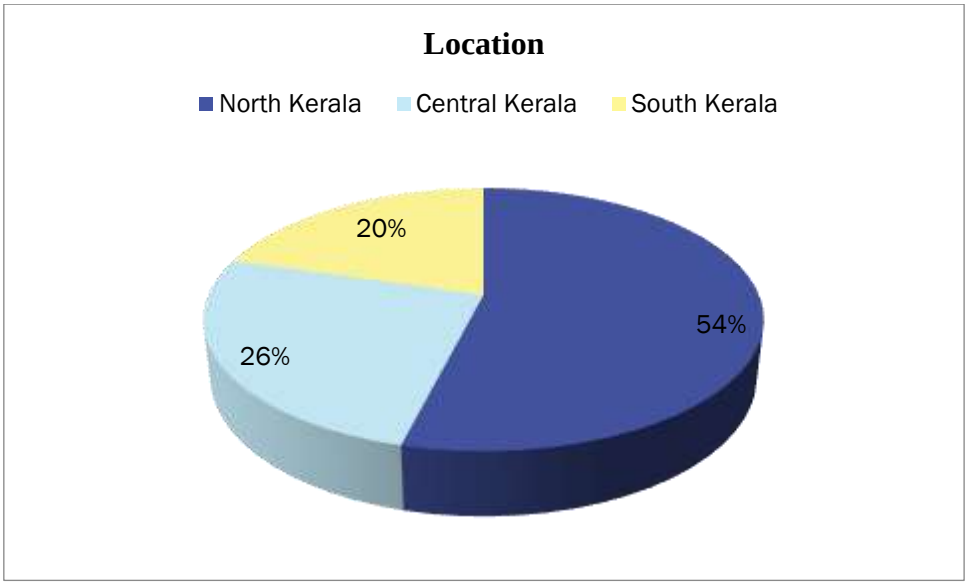
The data presents the distribution of occupations among 113 respondents, categorized into five groups. From the above table, the distribution of respondents across different occupations shows that a significant majority are professionals (59.3%), followed by academics (14.2%), and others (12.4%). Government officials and NGO representatives constitute smaller proportions, at 9.7% and 4.4%, respectively. This distribution indicates that the survey sample is predominantly composed of professionals, suggesting their perspectives heavily influence the overall water management and governance findings.



4. Location

Location	Frequency	Percentage
North Kerala	61	54.0
Central Kerala	29	25.7
South Kerala	23	20.4
Total	113	100.0

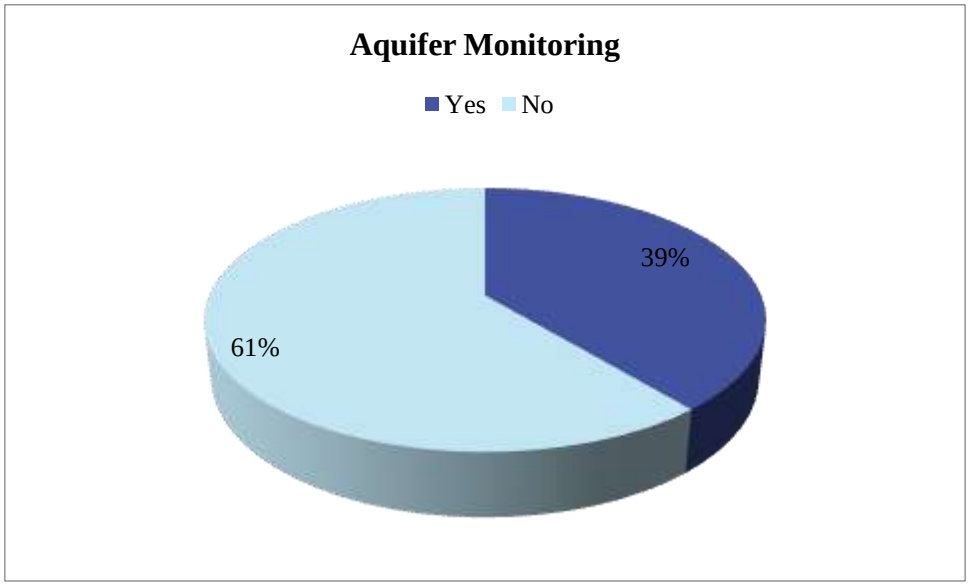
The data illustrates the geographic distribution of 113 respondents across different regions of Kerala. The majority of respondents, totalling 61 individuals (54.0%), are from North Kerala, indicating a significant representation from this region. Central Kerala follows with 29 respondents (25.7%), while South Kerala has 23 respondents (20.4%).



Frequency and Percentage distribution of respondents based on aquifer management and water governance in Kerala

Aquifer Monitoring Practices in Kerala

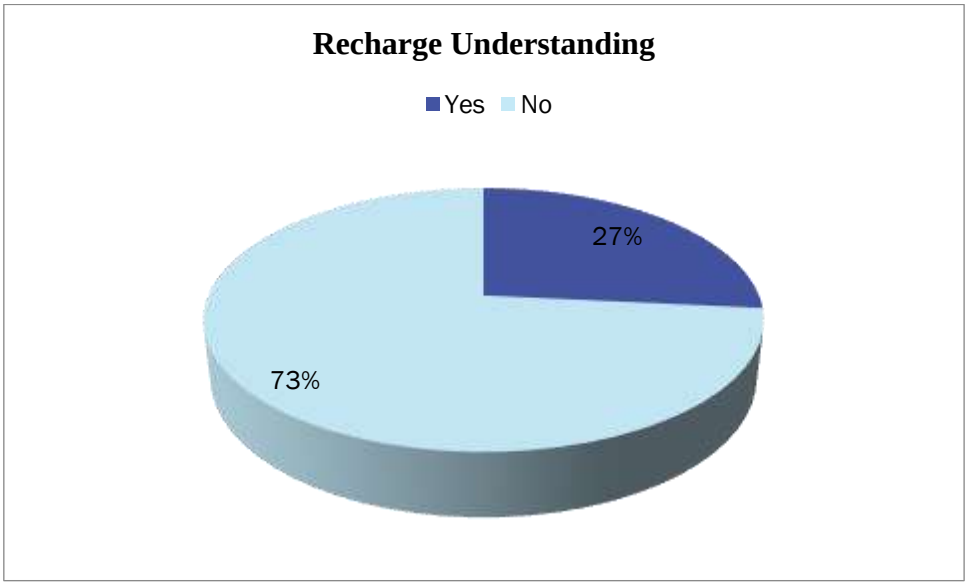
Aquifer Monitoring	Frequency	Percentage
Yes	44	38.9
No	69	61.1
Total	113	100.0



The data reveals that 61.1% of respondents in Kerala report that groundwater levels need to be regularly monitored, indicating a significant gap in systematic groundwater management across the region. Only 38.9% have regular monitoring, highlighting the need for enhanced policies, infrastructure, and stakeholder engagement to ensure sustainable groundwater use and management statewide.

Understanding of Aquifer Recharge Rates in Kerala

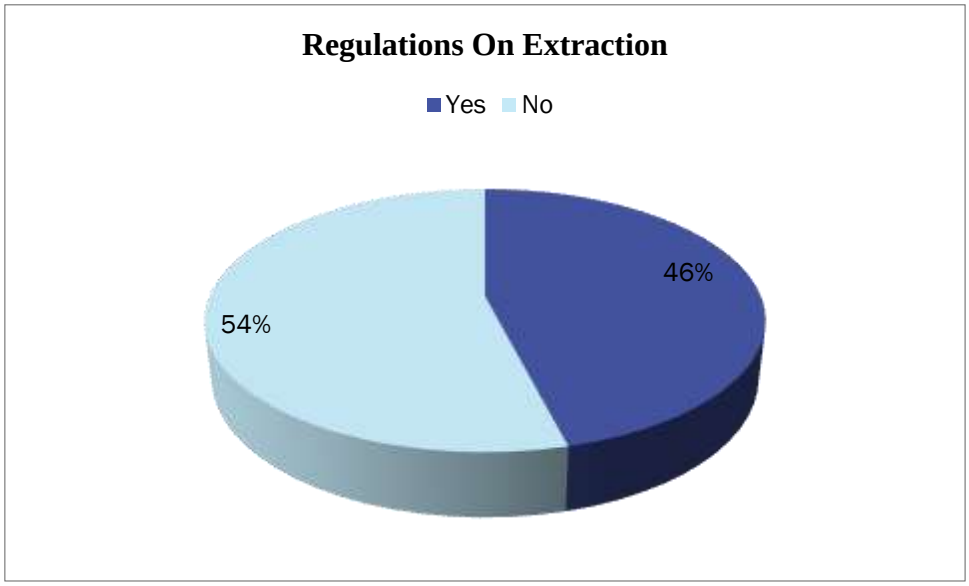
Recharge Understanding	Frequency	Percentage
Yes	30	26.5
No	83	73.5
Total	113	100.0



The data shows that 73.5% (83 respondents) in Kerala indicate no comprehensive understanding of their region's aquifer recharge rates, suggesting a significant knowledge gap in groundwater sustainability. Only 26.5% (30 respondents) report having such an understanding, highlighting an urgent need for improved research, monitoring, and data collection to manage groundwater resources effectively.

Regulations on Groundwater Extraction in Kerala

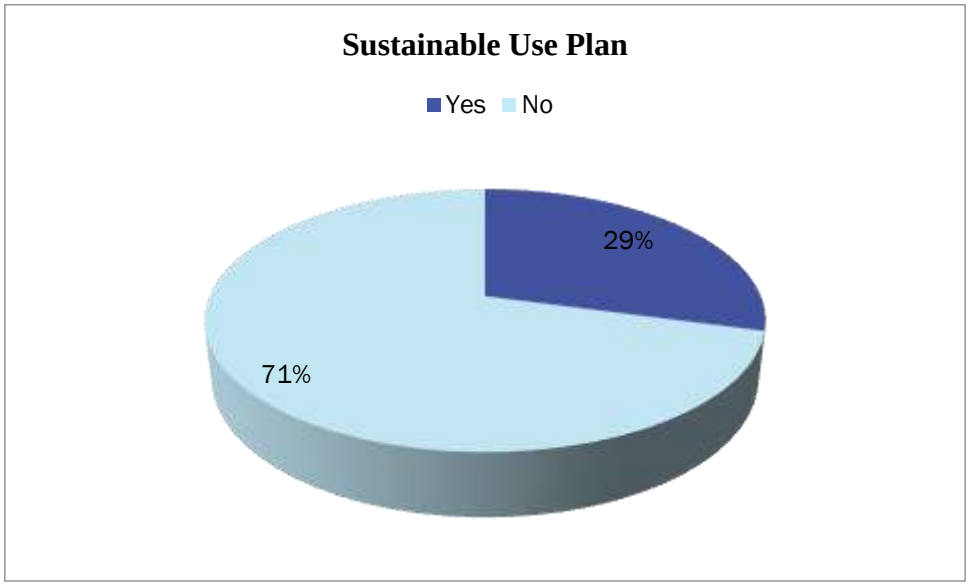
Regulations On Extraction	Frequency	Percentage
Yes	52	46.0
No	61	54.0
Total	113	100.0



The data indicates that 54.0% (61 respondents) of participants in Kerala report no regulations to limit groundwater extraction, suggesting a regulatory gap in managing groundwater use. Conversely, 46.0% (52 respondents) state that such regulations exist, highlighting the need for more comprehensive and enforceable policies to ensure sustainable groundwater management across the region.

Sustainable Groundwater Use Plans in Kerala

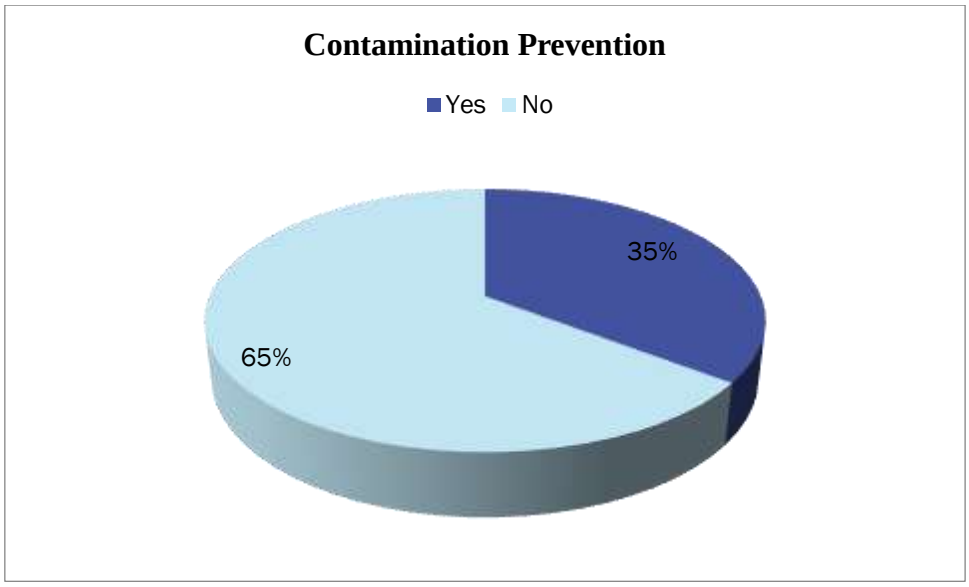
Sustainable Use Plan	Frequency	Percentage
Yes	33	29.2
No	80	70.8
Total	113	100.0



From the above table, it's evident that out of 113 respondents surveyed, 33 individuals (29.2%) reported having a Sustainable Use Plan, whereas the majority, comprising 80 respondents (70.8%), indicated not having such a plan. This highlights a notable disparity in adopting sustainable practices among those surveyed.

Contamination Prevention Measures for Aquifers in Kerala

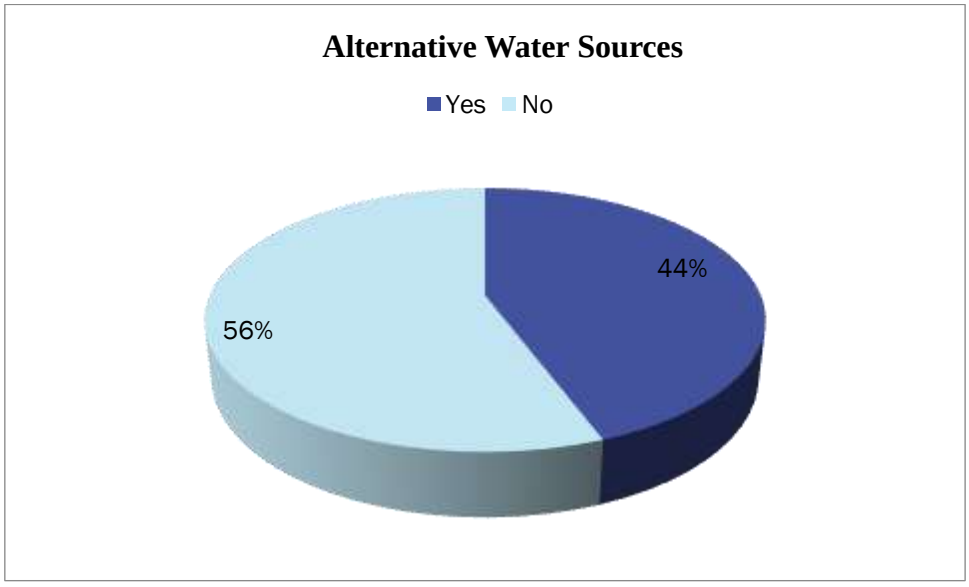
Contamination Prevention	Frequency	Percentage
Yes	40	35.4
No	73	64.6
Total	113	100.0



The data reveals that 64.6% (73 respondents) in Kerala report no measures to prevent aquifer contamination, indicating a critical vulnerability in protecting groundwater quality. Only 35.4% (40 respondents) confirm the existence of such measures, highlighting the urgent need for implementing contamination prevention strategies to safeguard water resources.

Consideration of Alternative Water Sources in Kerala

Alternative Water Sources	Frequency	Percentage
Yes	50	44.2
No	63	55.8
Total	113	100.0



The data indicates that 55.8% (63 respondents) in Kerala report that alternative water sources or water circularity are not considered to reduce reliance on aquifers, pointing to a missed opportunity for diversifying water supply. Meanwhile, 44.2% (50 respondents) acknowledge such considerations, emphasizing the need to enhance efforts in exploring and implementing alternative water solutions.

Conflict Management Systems for Aquifer Use in Kerala

Conflict Management	Frequency	Percentage
Yes	22	19.5
No	91	80.5
Total	113	100.0

The data shows that 80.5% (91 respondents) in Kerala report the absence of a system for managing conflicts over aquifer use, indicating a significant gap in conflict resolution mechanisms. Only 19.5% (22 respondents) confirm the existence of such a system, highlighting the urgent need to establish effective conflict management frameworks to address disputes over groundwater resources.

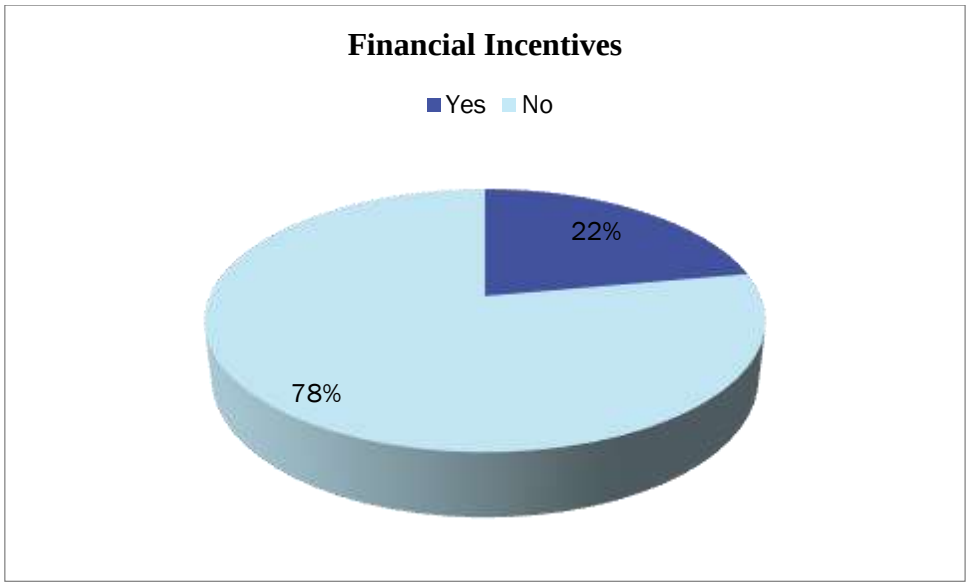
Stakeholder Collaboration in Aquifer Management in Kerala

Stakeholder Collaboration	Frequency	Percentage
Yes	26	23.0
No	87	77.0
Total	113	100.0

The data indicates that 77.0% (87 respondents) in Kerala report a lack of collaboration between stakeholders for aquifer management, revealing a substantial gap in cooperative efforts. Only 23.0% (26 respondents) confirm the existence of such collaboration, emphasizing the need to foster stronger stakeholder engagement and cooperation to improve groundwater management.

Financial Incentives for Sustainable Aquifer Management in Kerala

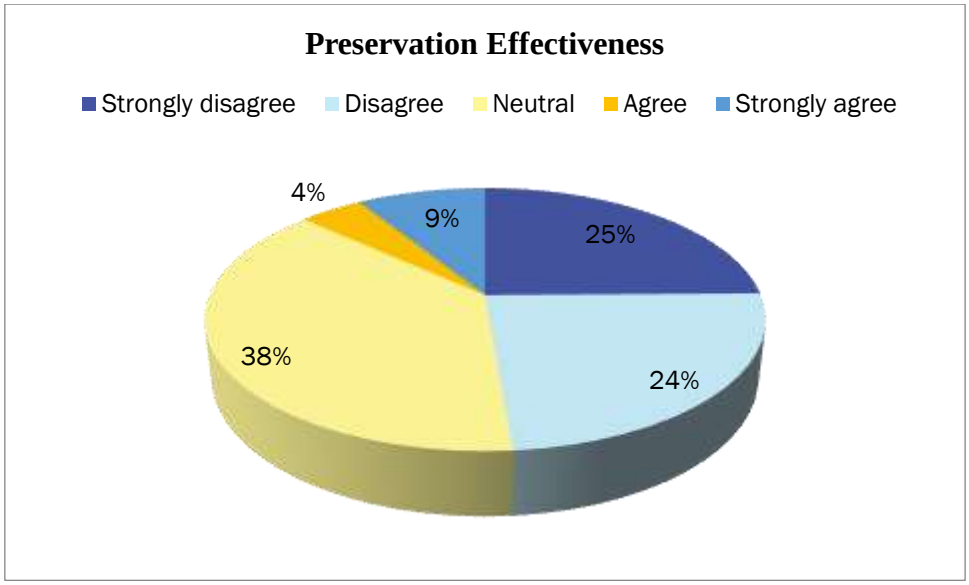
Financial Incentives	Frequency	Percentage
Yes	25	22.1
No	88	77.9
Total	113	100.0



The data shows that 77.9% (88 respondents) in Kerala report no financial incentives for sustainable aquifer management, indicating a significant shortfall in economic support for conservation efforts. Only 22.1% (25 respondents) confirm the existence of such incentives, highlighting the need to develop and implement financial mechanisms to encourage sustainable groundwater practices.

Effectiveness of Aquifer Preservation Practices in Kerala

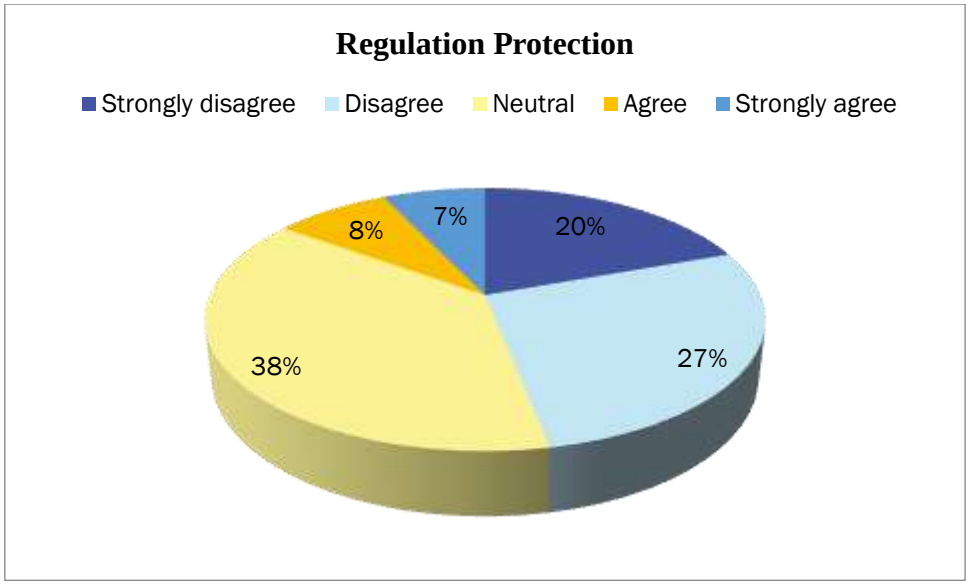
Preservation Effectiveness	Frequency	Percentage
Strongly disagree	28	24.8
Disagree	27	23.9
Neutral	43	38.1
Agree	5	4.4
Strongly agree	10	8.8
Total	113	100.0



The data reveals that 48.7% (55 respondents) in Kerala either strongly disagree (24.8%, 28 respondents) or disagree (23.9%, 27 respondents) that current aquifer management practices effectively preserve groundwater resources, indicating widespread dissatisfaction. Meanwhile, 38.1% (43 respondents) are neutral, suggesting uncertainty or mixed feelings. Only 13.2% (15 respondents) either agree (4.4%, 5 respondents) or strongly agree (8.8%, 10 respondents), highlighting a minority who believe in the effectiveness of current practices, thereby underscoring the need for significant improvements in groundwater preservation efforts.

Government Regulation for Aquifer Protection in Kerala

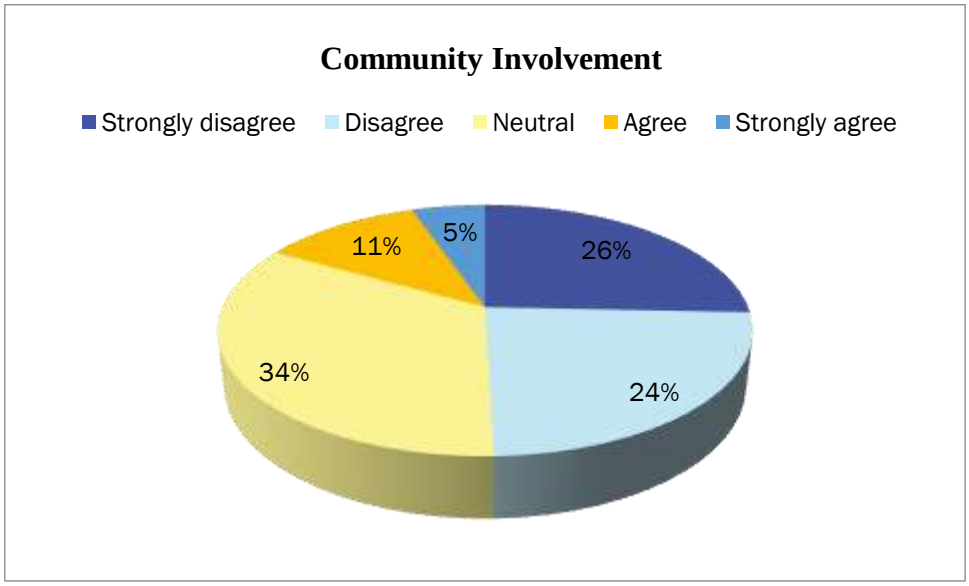
Regulation Protection	Frequency	Percentage
Strongly disagree	22	19.5
Disagree	31	27.4
Neutral	43	38.1
Agree	9	8.0
Strongly agree	8	7.1
Total	113	100.0



The data indicates that 46.9% (53 respondents) in Kerala either strongly disagree (19.5%, 22 respondents) or disagree (27.4%, 31 respondents) that there is sufficient government regulation to protect aquifers from overexploitation, reflecting considerable concern about regulatory adequacy. Additionally, 38.1% (43 respondents) are neutral, indicating a significant portion of respondents are unsure or have mixed views. Only 15.1% (17 respondents) either agree (8.0%, 9 respondents) or strongly agree (7.1%, 8 respondents), suggesting a minority believe current regulations are adequate, thus emphasizing the need for stronger regulatory measures to protect groundwater resources.

Community Involvement in Aquifer Management in Kerala

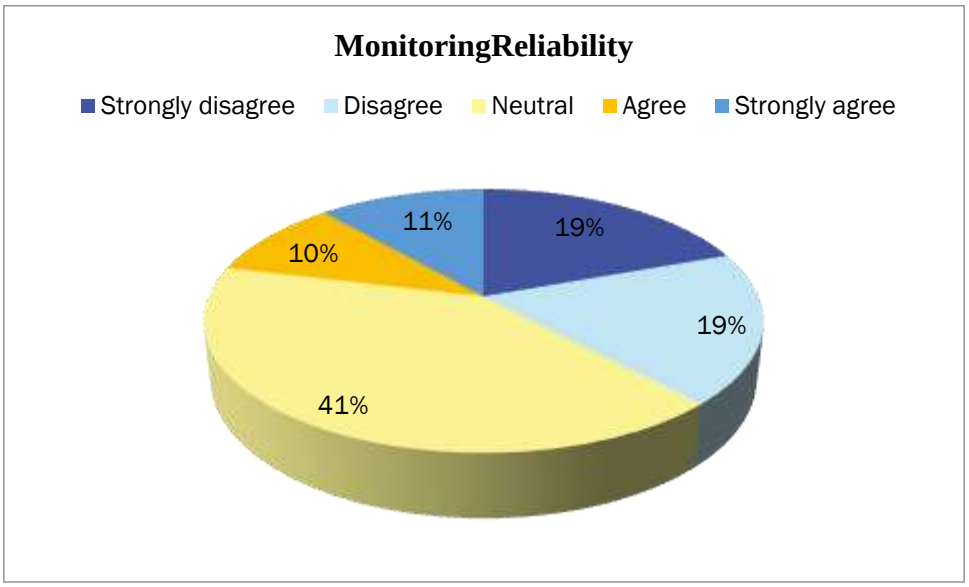
Community Involvement	Frequency	Percentage
Strongly disagree	29	25.7
Disagree	27	23.9
Neutral	38	33.6
Agree	13	11.5
Strongly agree	6	5.3
Total	113	100.0



The data shows that 49.6% (56 respondents) in Kerala either strongly disagree (25.7%, 29 respondents) or disagree (23.9%, 27 respondents) that community involvement is adequately considered in aquifer management decisions, indicating significant dissatisfaction with current engagement practices. Additionally, 33.6% (38 respondents) are neutral, reflecting uncertainty or mixed views. Only 16.8% (19 respondents) either agree (11.5%, 13 respondents) or strongly agree (5.3%, 6 respondents), highlighting a minority who feel that community involvement is sufficiently considered, thereby underscoring the need to enhance community engagement in water management processes.

Reliability of Aquifer Monitoring in Kerala

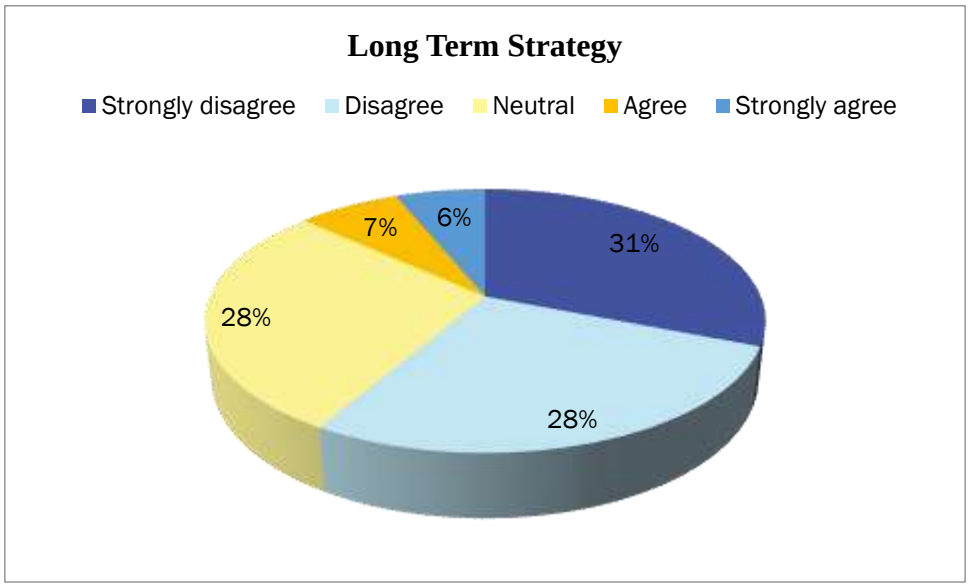
Monitoring Reliability	Frequency	Percentage
Strongly disagree	22	19.5
Disagree	21	18.6
Neutral	46	40.7
Agree	11	9.7
Strongly agree	13	11.5
Total	113	100.0



The data indicates that 38.1% (43 respondents) in Kerala either strongly disagree (19.5%, 22 respondents) or disagree (18.6%, 21 respondents) that the monitoring and data collection methods for aquifers are comprehensive and reliable, showing considerable concern about the current monitoring systems. Additionally, 40.7% (46 respondents) are neutral, suggesting a significant portion of respondents are uncertain or have mixed views. Only 21.2% (24 respondents) either agree (9.7%, 11 respondents) or strongly agree (11.5%, 13 respondents), highlighting a minority who believe in the reliability of the current monitoring practices, thus emphasizing the need for improvements in data collection and monitoring systems.

Long-Term Strategy for Aquifer Management in Kerala

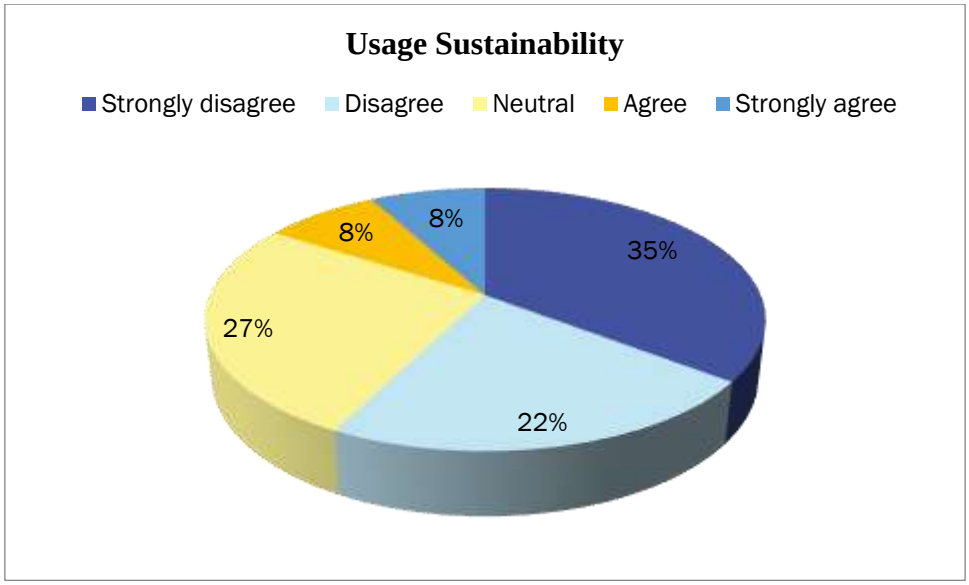
Long Term Strategy	Frequency	Percentage
Strongly disagree	35	31.0
Disagree	31	27.4
Neutral	32	28.3
Agree	8	7.1
Strongly agree	7	6.2
Total	113	100.0



The data shows that 58.4% (66 respondents) in Kerala either strongly disagree (31.0%, 35 respondents) or disagree (27.4%, 31 respondents) that there is a clear long-term strategy for aquifer management, indicating a significant lack of confidence in strategic planning. Additionally, 28.3% (32 respondents) are neutral, suggesting uncertainty or mixed opinions about the presence of a long-term strategy. Only 13.3% (15 respondents) either agree (7.1%, 8 respondents) or strongly agree (6.2%, 7 respondents), highlighting a minority who believe in the existence of a clear long-term strategy, thereby emphasizing the need for robust strategic planning in aquifer management.

Sustainability of Water Usage from Aquifers in Kerala

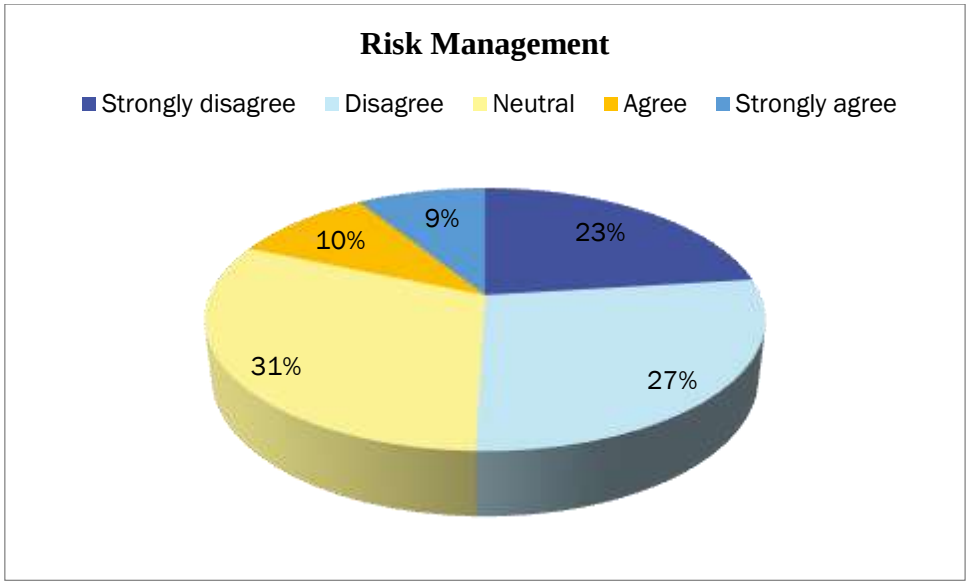
Usage Sustainability	Frequency	Percentage
Strongly disagree	40	35.4
Disagree	25	22.1
Neutral	30	26.5
Agree	9	8.0
Strongly agree	9	8.0
Total	113	100.0



The data indicates that 57.5% (65 respondents) in Kerala either strongly disagree (35.4%, 40 respondents) or disagree (22.1%, 25 respondents) that current water usage from the aquifer is sustainable for future generations, reflecting substantial concern about sustainability practices. Additionally, 26.5% (30 respondents) are neutral, indicating a significant portion of respondents are uncertain or have mixed views. Only 16.0% (18 respondents) either agree (8.0%, 9 respondents) or strongly agree (8.0%, 9 respondents), highlighting a minority who believe that current usage is sustainable, thus underscoring the urgent need for improved sustainable water use practices.

Risk Management for Aquifer Resources in Kerala

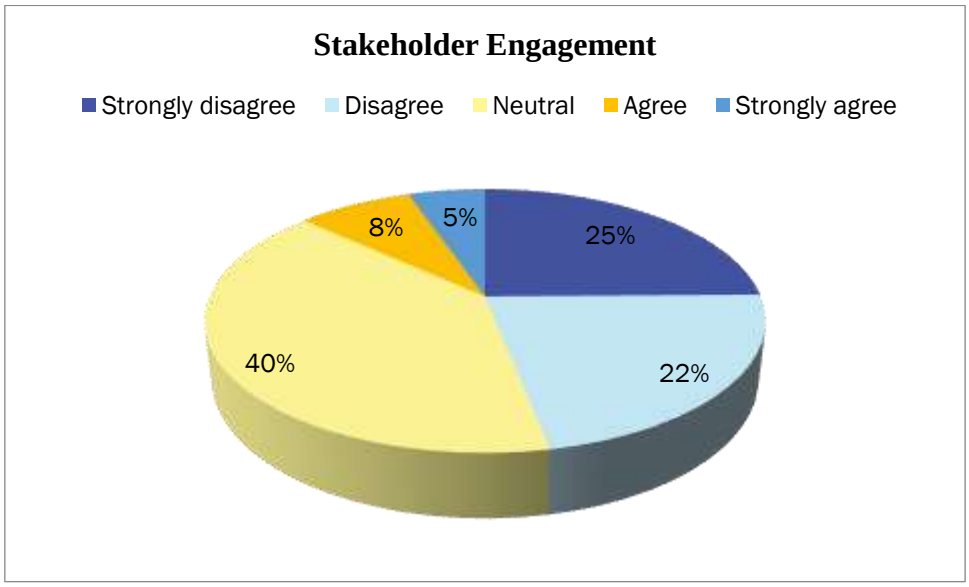
Risk Management	Frequency	Percentage
Strongly disagree	26	23.0
Disagree	31	27.4
Neutral	35	31.0
Agree	11	9.7
Strongly agree	10	8.8
Total	113	100.0



The data reveals that 50.4% (57 respondents) in Kerala either strongly disagree (23.0%, 26 respondents) or disagree (27.4%, 31 respondents) that aquifer management plans effectively address potential risks such as pollution and saltwater intrusion, indicating substantial concern about risk management. Additionally, 31.0% (35 respondents) are neutral, suggesting a significant portion of respondents are uncertain or have mixed views. Only 18.5% (21 respondents) either agree (9.7%, 11 respondents) or strongly agree (8.8%, 10 respondents), highlighting a minority who believe that current risk management practices are effective, thus emphasizing the need for enhanced risk management strategies in aquifer management.

Stakeholder Engagement in Aquifer Decision-Making in Kerala

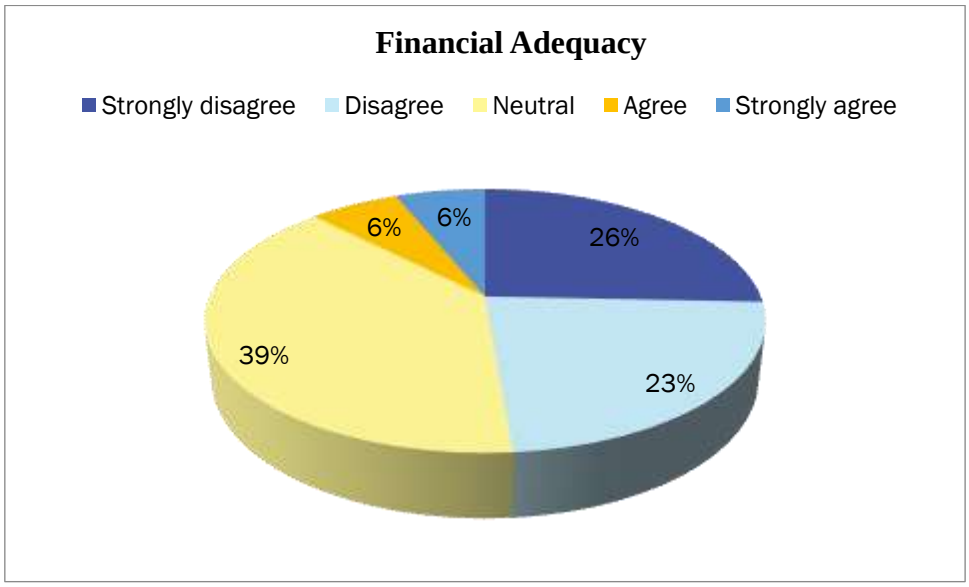
Stakeholder Engagement	Frequency	Percentage
Strongly disagree	28	24.8
Disagree	25	22.1
Neutral	45	39.8
Agree	9	8.0
Strongly agree	6	5.3
Total	113	100.0



The data indicates that 46.9% (53 respondents) in Kerala either strongly disagree (24.8%, 28 respondents) or disagree (22.1%, 25 respondents) that stakeholders are sufficiently engaged in the decision-making processes regarding aquifer management, showing significant concern about stakeholder involvement. Additionally, 39.8% (45 respondents) are neutral, suggesting many respondents are uncertain or have mixed views. Only 13.3% (15 respondents) either agree (8.0%, 9 respondents) or strongly agree (5.3%, 6 respondents), highlighting a minority who believe that stakeholder engagement is adequate, thereby underscoring the need to improve stakeholder participation in aquifer management decisions.

Financial Adequacy for Aquifer Management in Kerala

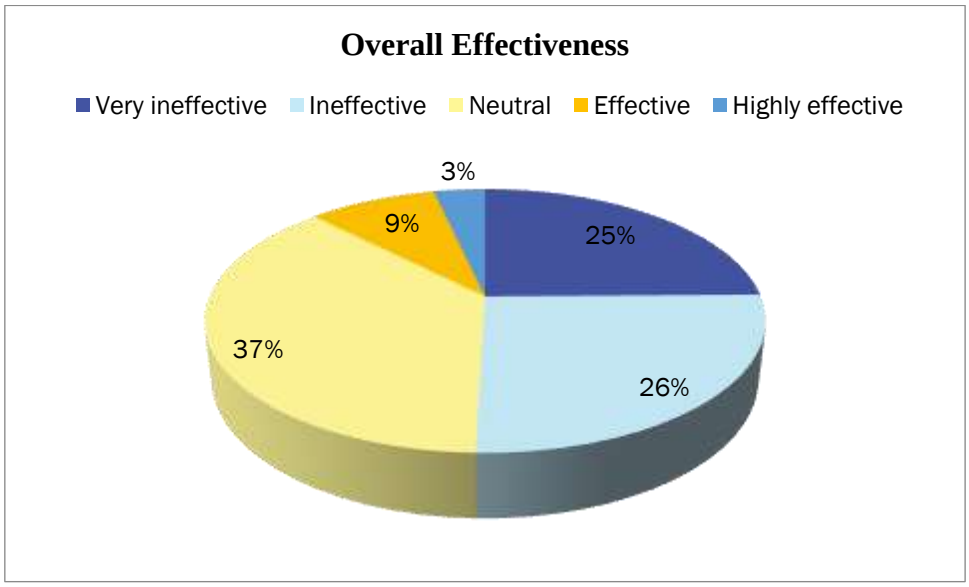
Financial Adequacy	Frequency	Percentage
Strongly disagree	29	25.7
Disagree	26	23.0
Neutral	44	38.9
Agree	7	6.2
Strongly agree	7	6.2
Total	113	100.0



The data shows that 48.7% (55 respondents) in Kerala either strongly disagree (25.7%, 29 respondents) or disagree (23.0%, 26 respondents) that financial resources allocated for aquifer management are adequate, indicating considerable concern about funding levels. Additionally, 38.9% (44 respondents) are neutral, suggesting many respondents are uncertain or have mixed views. Only 12.4% (14 respondents) either agree (6.2%, 7 respondents) or strongly agree (6.2%, 7 respondents), highlighting a minority who believe that financial resources are sufficient, thereby emphasizing the need for increased financial investment in aquifer management.

Overall Effectiveness of Aquifer Management in Kerala

Overall Effectiveness	Frequency	Percentage
Very ineffective	28	24.8
Ineffective	29	25.7
Neutral	42	37.2
Effective	10	8.8
Highly effective	4	3.5
Total	113	100.0

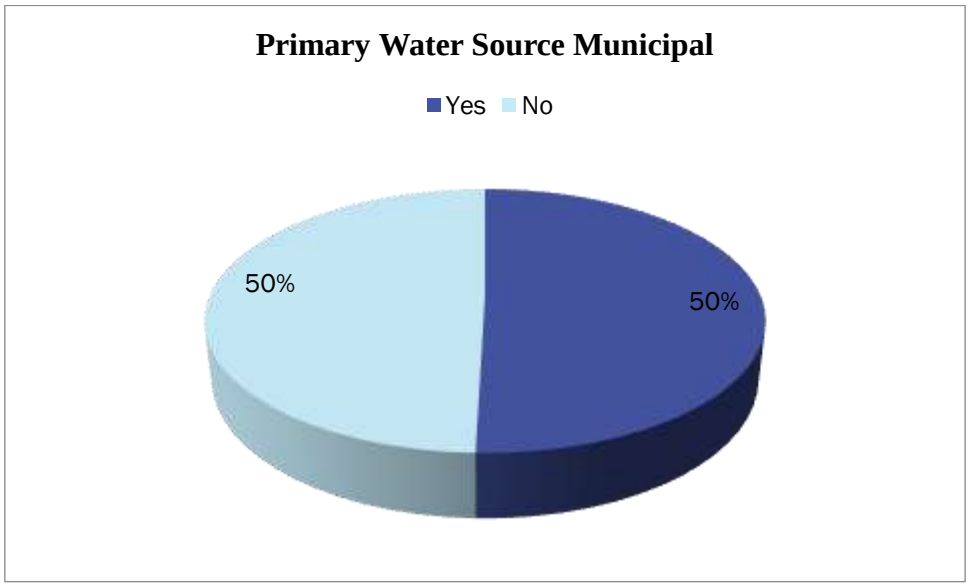


The data reveals that 50.5% (57 respondents) in Kerala consider aquifer management efforts to be either very ineffective (24.8%, 28 respondents) or ineffective (25.7%, 29 respondents), indicating significant dissatisfaction with current practices. Additionally, 37.2% (42 respondents) are neutral, suggesting many respondents are uncertain or have mixed views. Only 12.3% (14 respondents) believe the efforts are either effective (8.8%, 10 respondents) or highly effective (3.5%, 4 respondents), highlighting a minority who view the aquifer management efforts positively, thereby underscoring the urgent need for improvements in overall effectiveness.

Primary Water Sources for Domestic Consumption in Kerala

- **Primary Water Source Municipal**

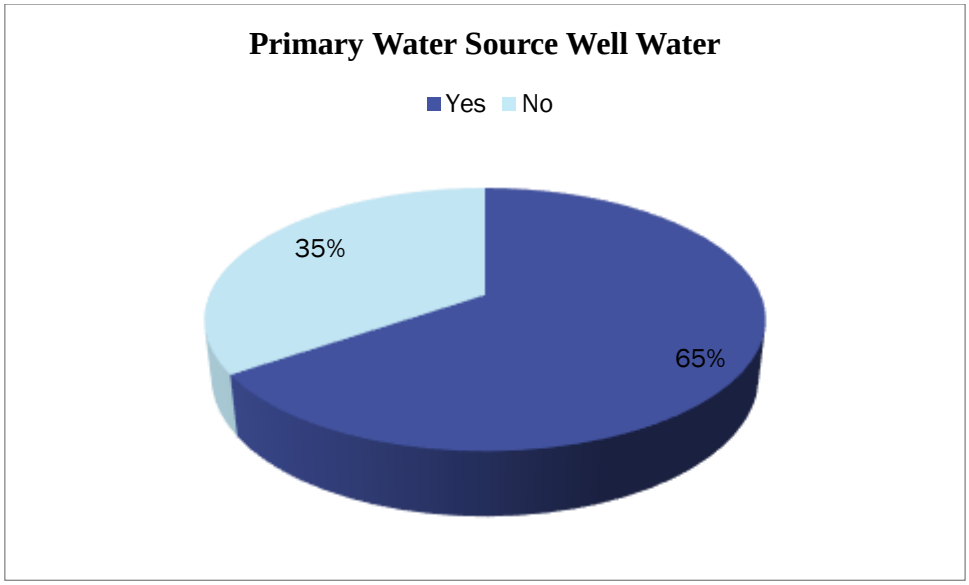
Primary Water Source Municipal	Frequency	Percentage
Yes	57	50.4
No	56	49.6
Total	113	100.0



The data indicates that 50.4% (57 respondents) in Kerala rely on municipal water sources for their primary domestic water consumption, while 49.6% (56 respondents) do not.

- **Primary Water Source Well Water**

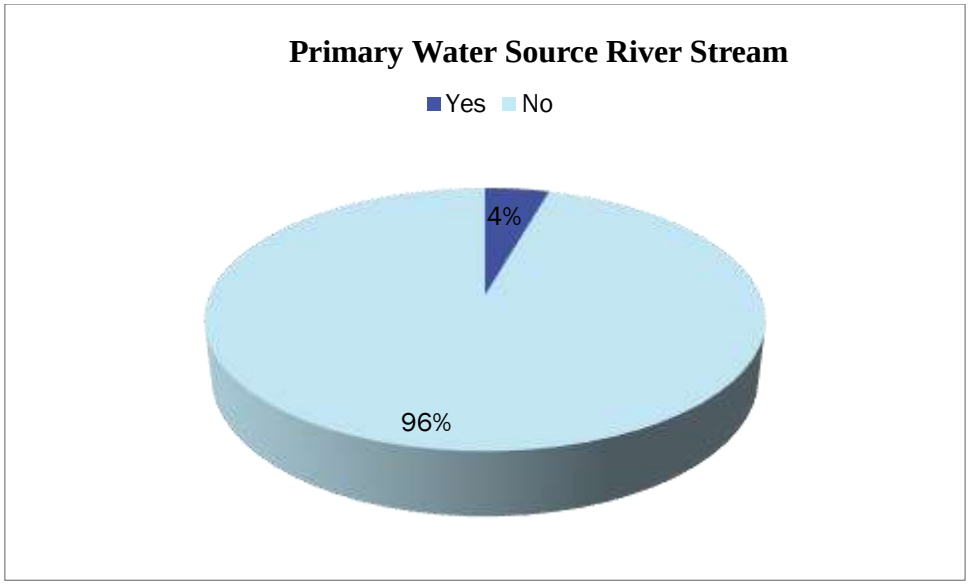
Primary Water Source Well Water	Frequency	Percentage
Yes	74	65.5
No	39	34.5
Total	113	100.0



The data indicates that 65.5% (74 respondents) in Kerala rely on well water for their primary domestic water consumption, while 34.5% (39 respondents) do not.

- **Primary Water Source River Stream**

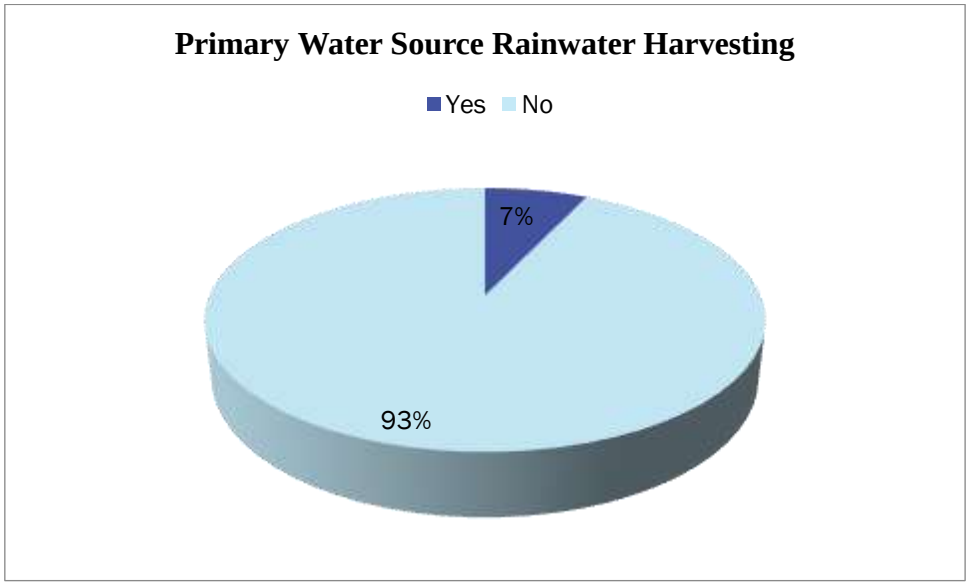
Primary Water Source River Stream	Frequency	Percentage
Yes	5	4.4
No	108	95.6
Total	113	100.0



The data shows that only 4.4% (5 respondents) in Kerala rely on river or stream water for their primary domestic water consumption, while a significant majority of 95.6% (108 respondents) do not.

- **Primary Water Source Rainwater Harvesting**

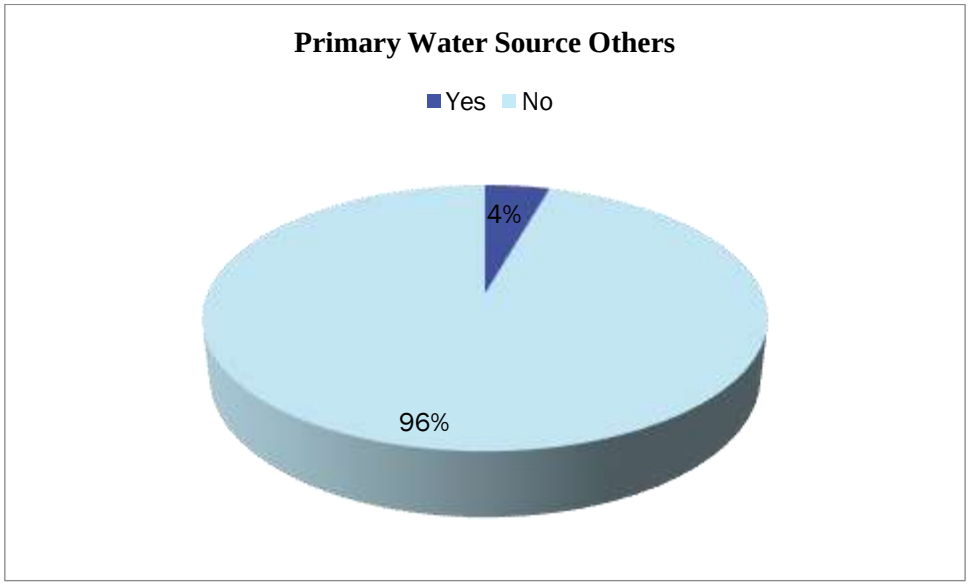
Primary Water Source Rainwater Harvesting	Frequency	Percentage
Yes	8	7.1
No	105	92.9
Total	113	100.0



The data indicates that 7.1% (8 respondents) in Kerala rely on rainwater harvesting for their primary domestic water consumption, while 92.9% (105 respondents) do not.

- **Primary Water Source Others**

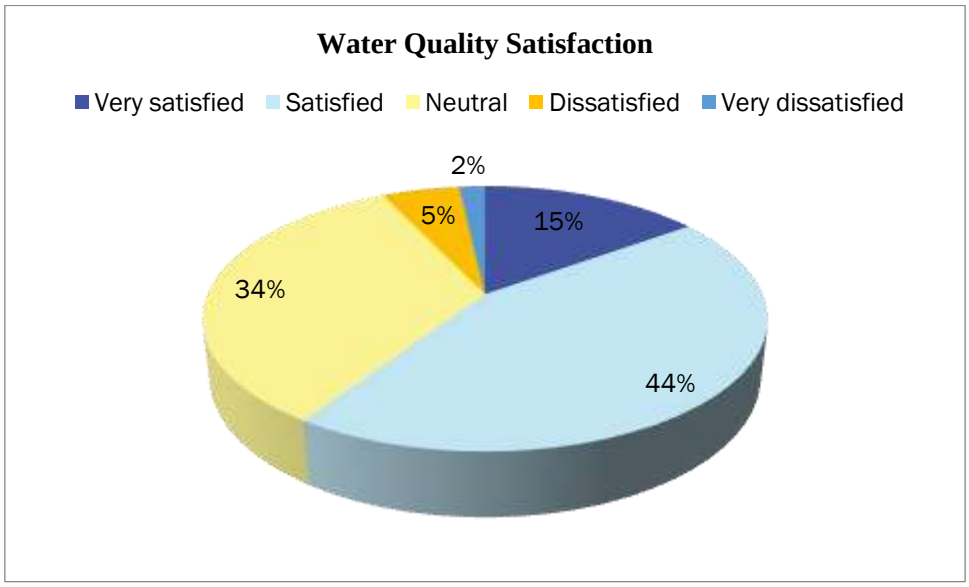
Primary Water Source Others	Frequency	Percentage
Yes	5	4.4
No	108	95.6
Total	113	100.0



The data shows that 4.4% (5 respondents) in Kerala rely on other sources besides municipal, well water, river/stream, or rainwater harvesting for their primary domestic water consumption, while 95.6% (108 respondents) do not.

Satisfaction with Water Quality for Domestic Use in Kerala

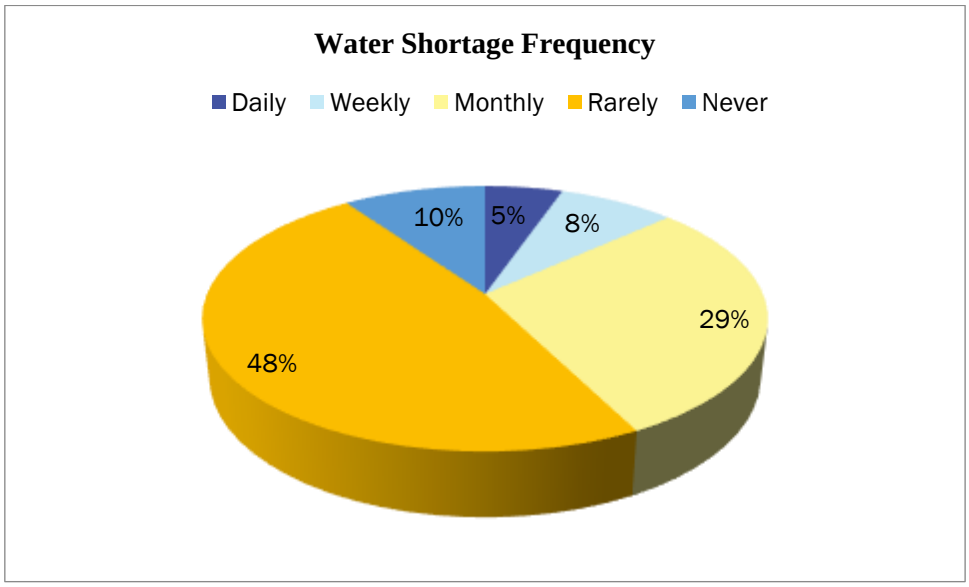
Water Quality Satisfaction	Frequency	Percentage
Very satisfied	17	15.0
Satisfied	50	44.2
Neutral	38	33.6
Dissatisfied	6	5.3
Very dissatisfied	2	1.8
Total	113	100.0



The data on water quality satisfaction in Kerala shows that 59.2% (67 respondents) are either satisfied (44.2%, 50 respondents) or very satisfied (15.0%, 17 respondents) with the quality of water provided for domestic use. About 33.6% (38 respondents) are neutral, indicating mixed feelings, while only a small minority, 7.1% (8 respondents), express dissatisfaction, with 5.3% (6 respondents) being dissatisfied and 1.8% (2 respondents) being very dissatisfied with water quality.

Frequency of Water Shortages in Kerala

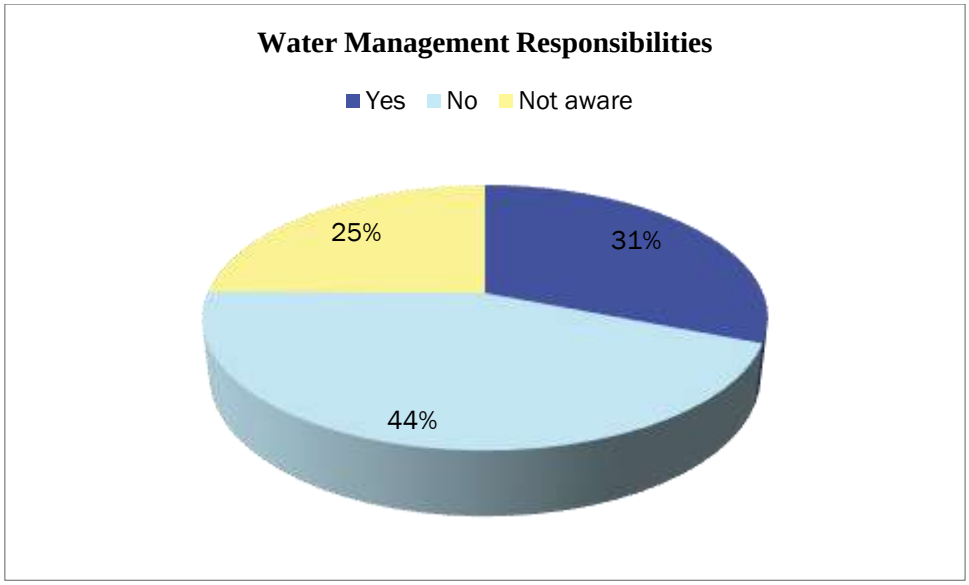
Water Shortage Frequency	Frequency	Percentage
Daily	6	5.3
Weekly	9	8.0
Monthly	33	29.2
Rarely	54	47.8
Never	11	9.7
Total	113	100.0



The data indicates varying frequencies of water shortage among respondents in Kerala: 47.8% (54 respondents) experience water shortages rarely, while 29.2% (33 respondents) face them monthly. Additionally, 9.7% (11 respondents) report never experiencing water shortages, whereas 8.0% (9 respondents) encounter them weekly and 5.3% (6 respondents) face daily shortages.

Responsibility for Water Management in Kerala

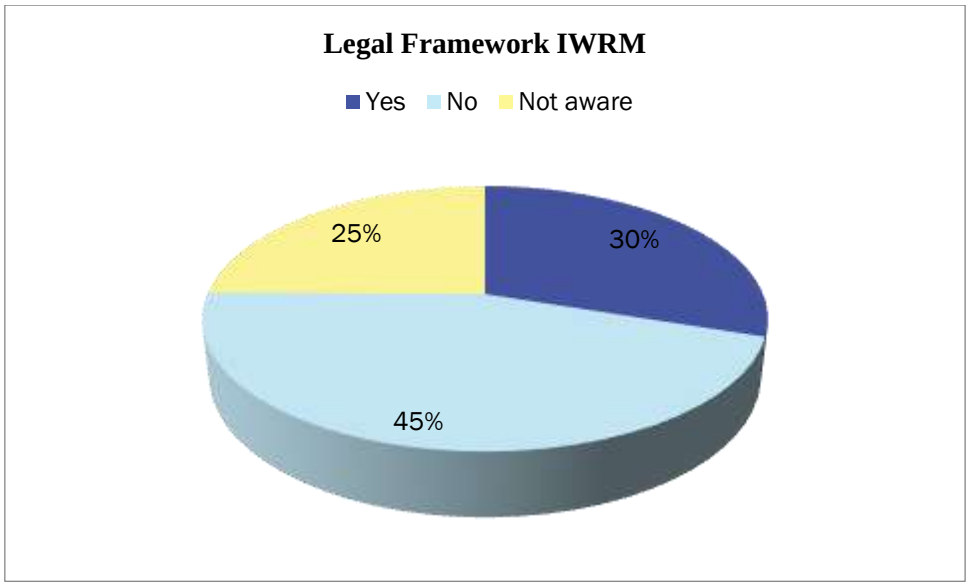
Water Management Responsibilities	Frequency	Percentage
Yes	35	31.0
No	50	44.2
Not aware	28	24.8
Total	113	100.0



The data shows that regarding water management responsibilities in Kerala, 44.2% (50 respondents) are not aware of clear definitions among relevant institutions. 31.0% (35 respondents) confirm that water management responsibilities are clearly defined, indicating some level of organizational clarity.

Legal Framework for Integrated Water Resources Management in Kerala

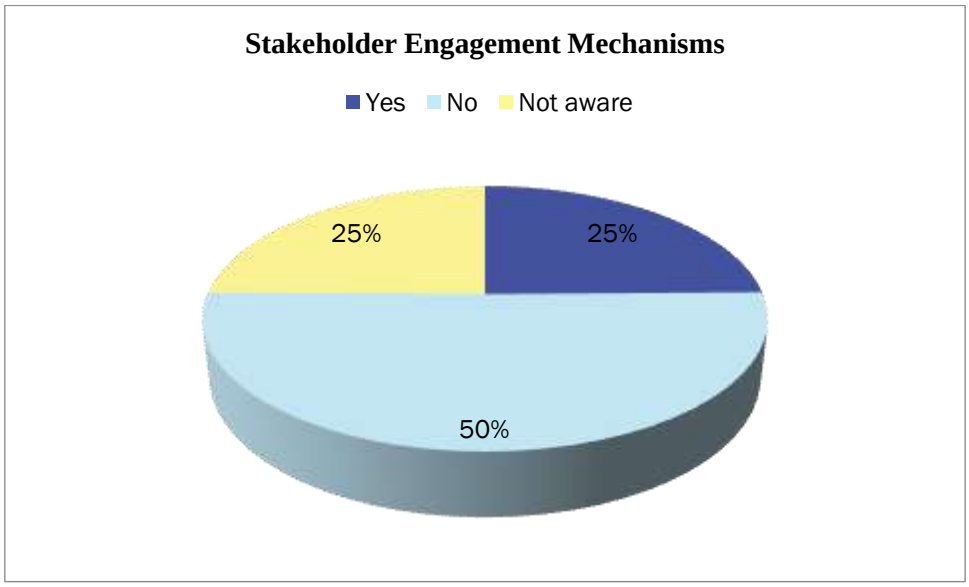
Legal Framework IWRM	Frequency	Percentage
Yes	34	30.1
No	51	45.1
Not aware	28	24.8
Total	113	100.0



The data reveals that concerning the legal framework supporting Integrated Water Resources Management (IWRM) in Kerala, 45.1% (51 respondents) are not aware of its existence, while 30.1% (34 respondents) confirm its presence. Additionally, 24.8% (28 respondents) are uncertain or not informed about the legal framework.

Mechanisms for Stakeholder Engagement in Water Governance in Kerala

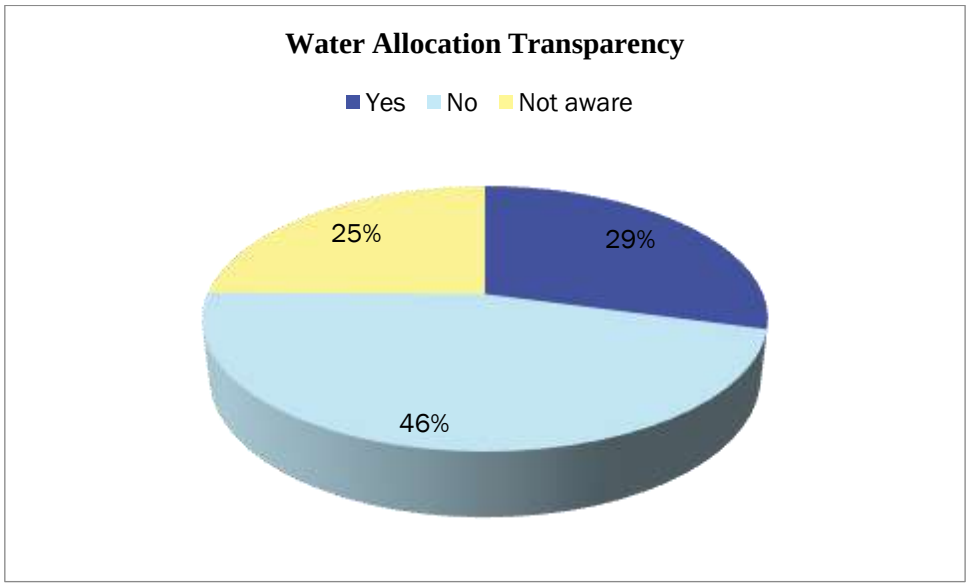
Stakeholder Engagement Mechanisms	Frequency	Percentage
Yes	28	24.8
No	57	50.4
Not aware	28	24.8
Total	113	100.0



The data shows that regarding stakeholder engagement mechanisms in water governance decisions in Kerala, 50.4% (57 respondents) are not aware of such mechanisms. Only 24.8% (28 respondents) are aware that stakeholder engagement mechanisms exist, highlighting a significant gap in understanding and participation.

Transparency in Water Allocation and Distribution in Kerala

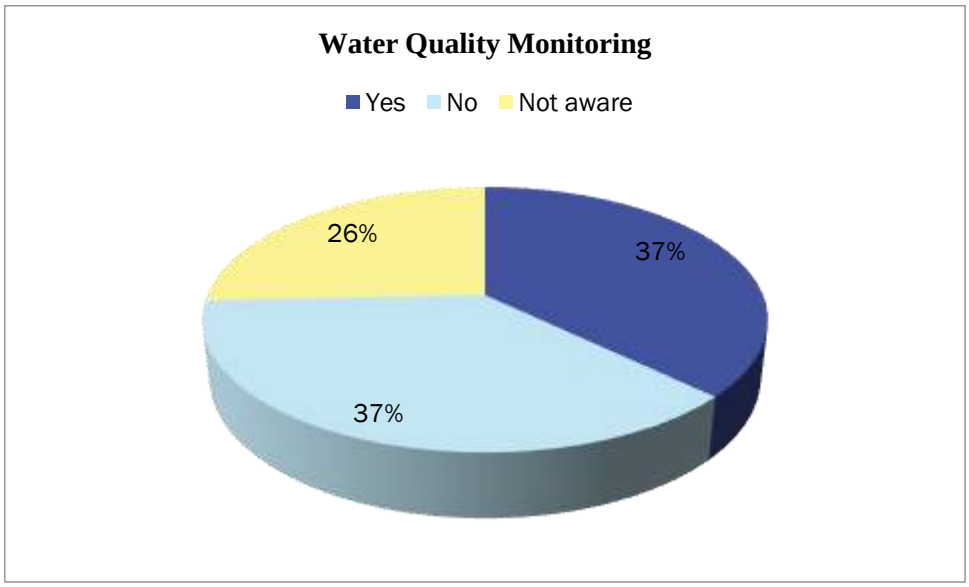
Water Allocation Transparency	Frequency	Percentage
Yes	33	29.2
No	52	46.0
Not aware	28	24.8
Total	113	100.0



The data on water allocation transparency in Kerala indicates that 46.0% (52 respondents) are not aware of transparent mechanisms for water allocation and distribution. 29.2% (33 respondents) acknowledge the existence of such mechanisms, while 24.8% (28 respondents) are uncertain or not informed about them.

Monitoring of Water Quality in Kerala

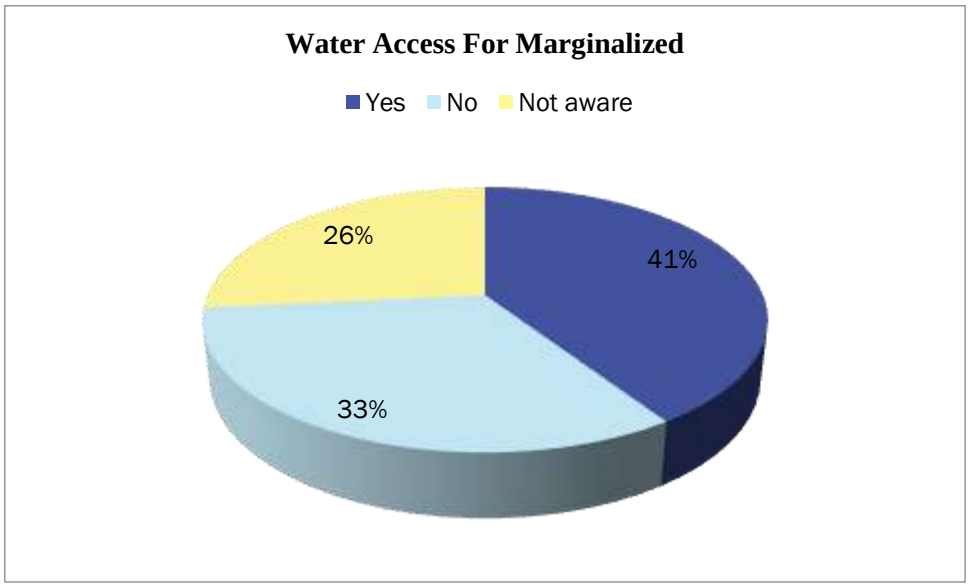
Water Quality Monitoring	Frequency	Percentage
Yes	42	37.2
No	42	37.2
Not aware	29	25.7
Total	113	100.0



The data reveals that 37.2% (42 respondents) are aware that such monitoring exists, while an equal 37.2% (42 respondents) are not aware. Additionally, 25.7% (29 respondents) indicate uncertainty or lack of information regarding water quality monitoring efforts.

Access to Water for Marginalized Communities in Kerala

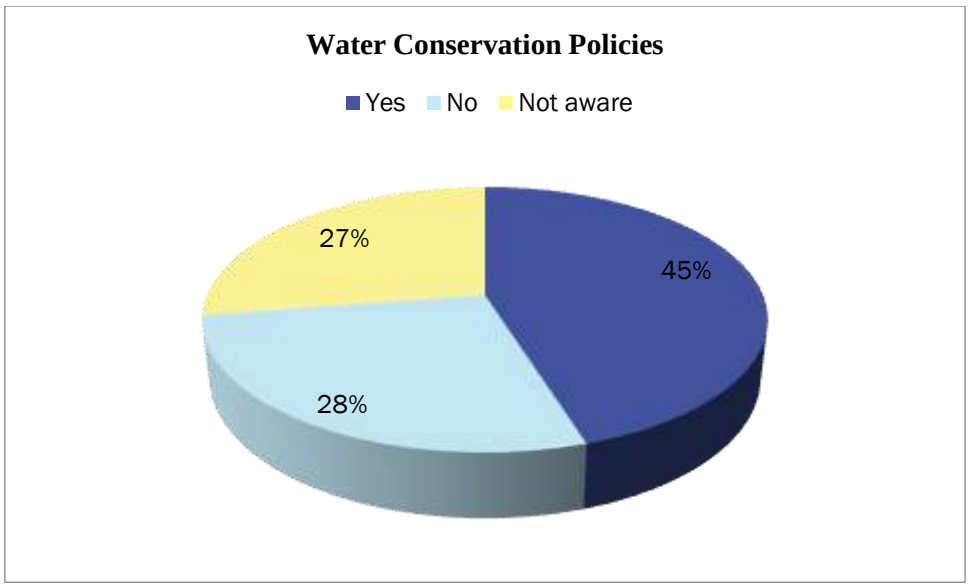
Water Access for Marginalized	Frequency	Percentage
Yes	46	40.7
No	37	32.7
Not aware	30	26.5
Total	113	100.0



The data shows that 40.7% (46 respondents) in Kerala are aware of mechanisms ensuring water access for marginalized communities, while 32.7% (37 respondents) are not. Additionally, 26.5% (30 respondents) are uncertain or unaware of such mechanisms.

Policies for Water Conservation in Kerala

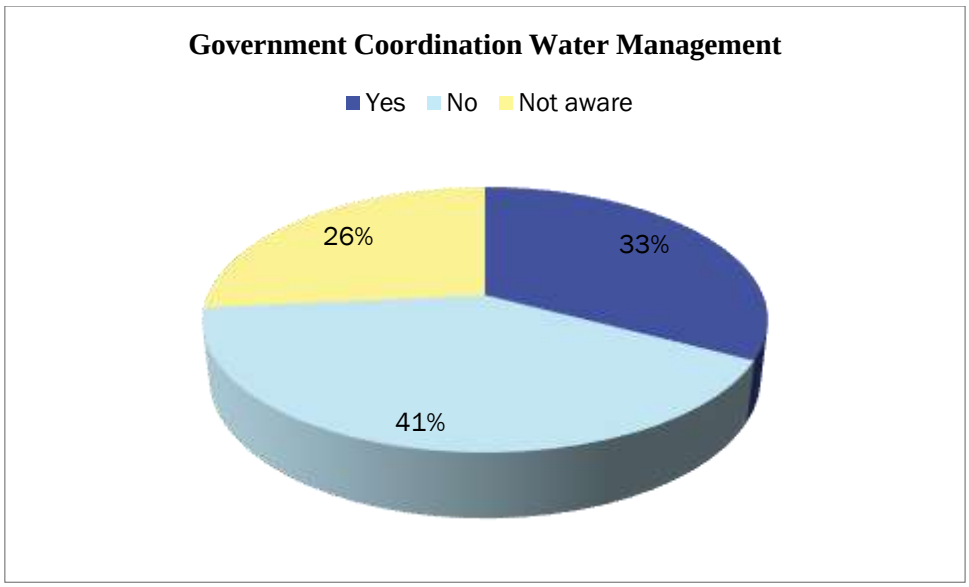
Water Conservation Policies	Frequency	Percentage
Yes	51	45.1
No	31	27.4
Not aware	31	27.4
Total	113	100.0



The data reveals that 45.1% (51 respondents) in Kerala are aware of existing water conservation policies, while 27.4% (31 respondents) are not aware and an additional 27.4% (31 respondents) are uncertain about their existence.

Government Coordination in Water Management in Kerala

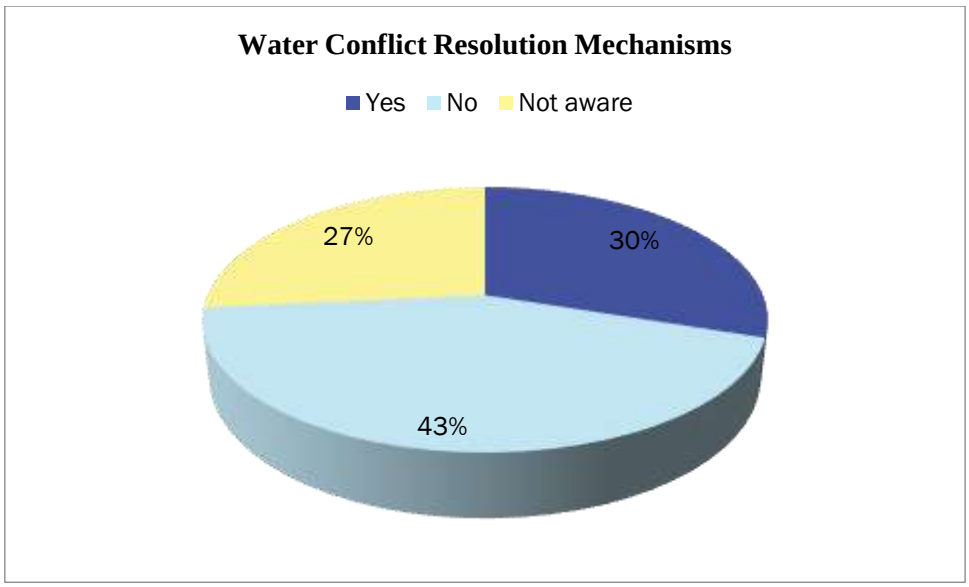
Government Coordination Water Management	Frequency	Percentage
Yes	37	32.7
No	46	40.7
Not aware	30	26.5
Total	113	100.0



The data shows that in Kerala, 32.7% (37 respondents) are aware of government coordination in water management efforts, while 40.7% (46 respondents) are not. Additionally, 26.5% (30 respondents) are uncertain or unaware of such coordination.

Mechanisms for Water Conflict Resolution in Kerala

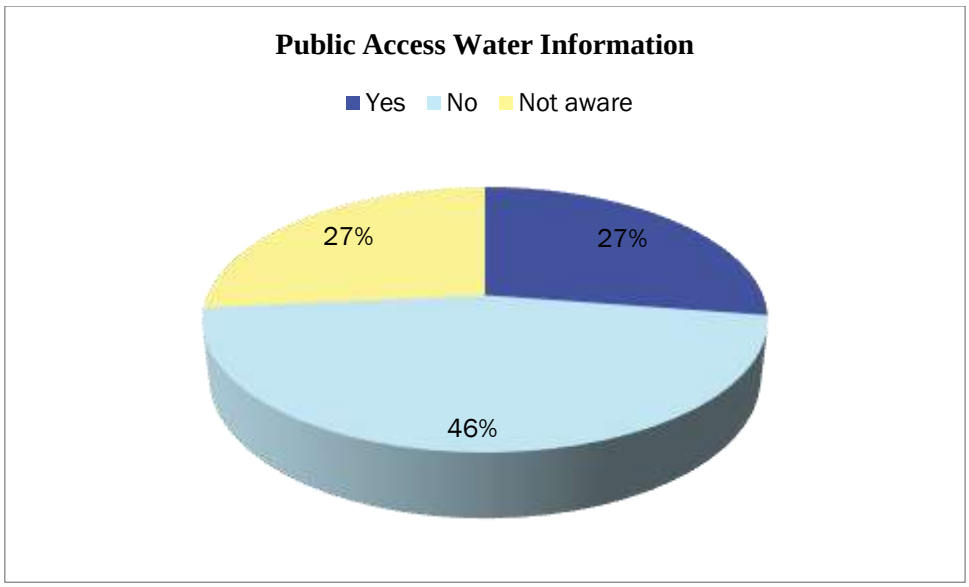
Water Conflict Resolution Mechanisms	Frequency	Percentage
Yes	34	30.1
No	49	43.4
Not aware	30	26.5
Total	113	100.0



The data indicates that regarding water conflict resolution mechanisms in Kerala, 43.4% (49 respondents) are not aware of their existence, while 30.1% (34 respondents) are aware. Additionally, 26.5% (30 respondents) are uncertain or not informed about such mechanisms.

Public Access to Water Information in Kerala

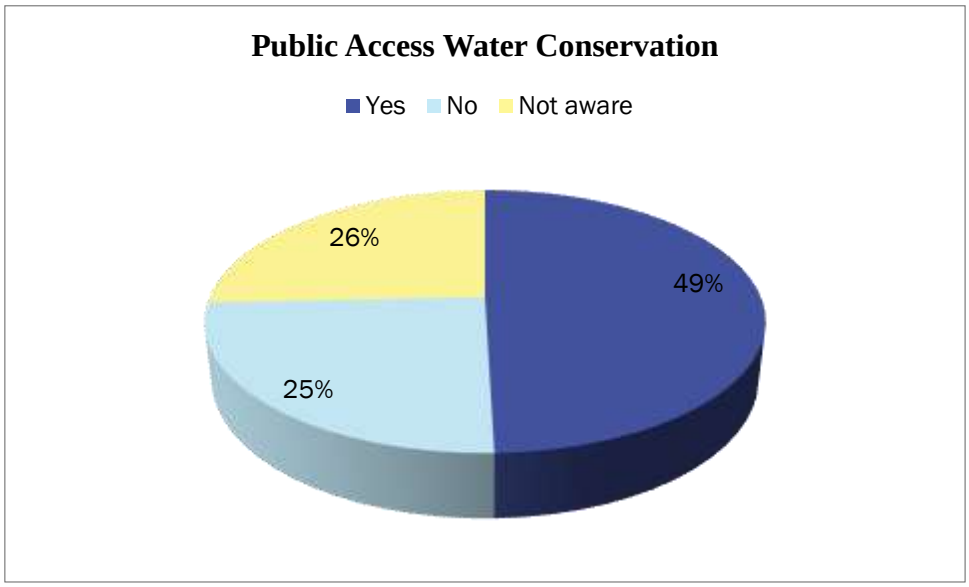
Public Access Water Information	Frequency	Percentage
Yes	31	27.4
No	52	46.0
Not aware	30	26.5
Total	113	100.0



The data reveals that 27.4% (31 respondents) in Kerala have access to public water information, while 46.0% (52 respondents) do not. Additionally, 26.5% (30 respondents) are uncertain or unaware of the availability of such information.

Public Awareness of Water Conservation in Kerala

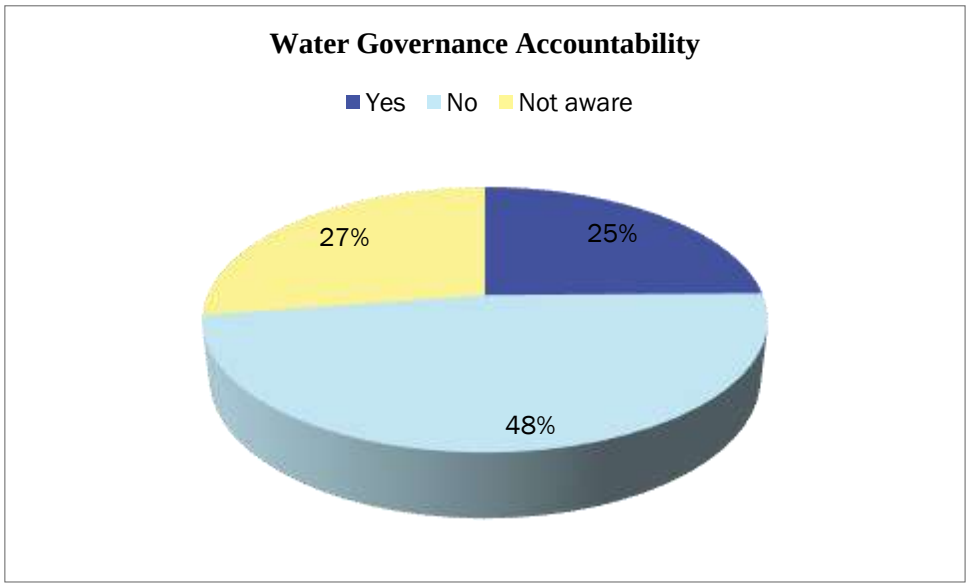
Public Awareness Water Conservation	Frequency	Percentage
Yes	56	49.6
No	28	24.8
Not aware	29	25.7
Total	113	100.0



The data indicates that 49.6% (56 respondents) in Kerala are aware of public awareness initiatives regarding water conservation. However, 24.8% (28 respondents) are not aware of such initiatives, and 25.7% (29 respondents) are uncertain or lack information about them.

Accountability in Water Governance in Kerala

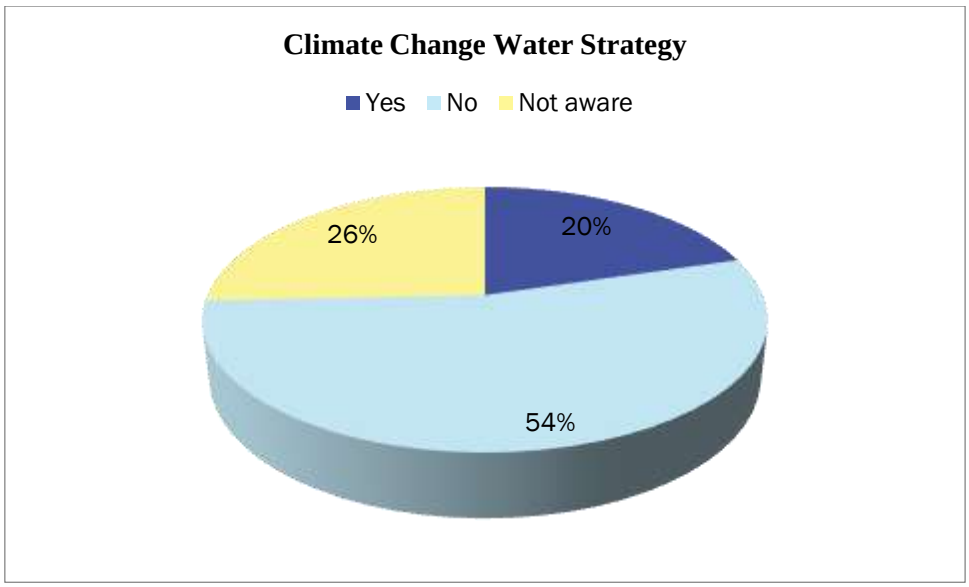
Water Governance Accountability	Frequency	Percentage
Yes	28	24.8
No	54	47.8
Not aware	31	27.4
Total	113	100.0



The data shows that regarding water governance accountability in Kerala, 47.8% (54 respondents) are not aware of its existence, while 24.8% (28 respondents) are aware. Additionally, 27.4% (31 respondents) are uncertain or lack information about accountability measures.

Strategy for Climate Change and Water Resources in Kerala

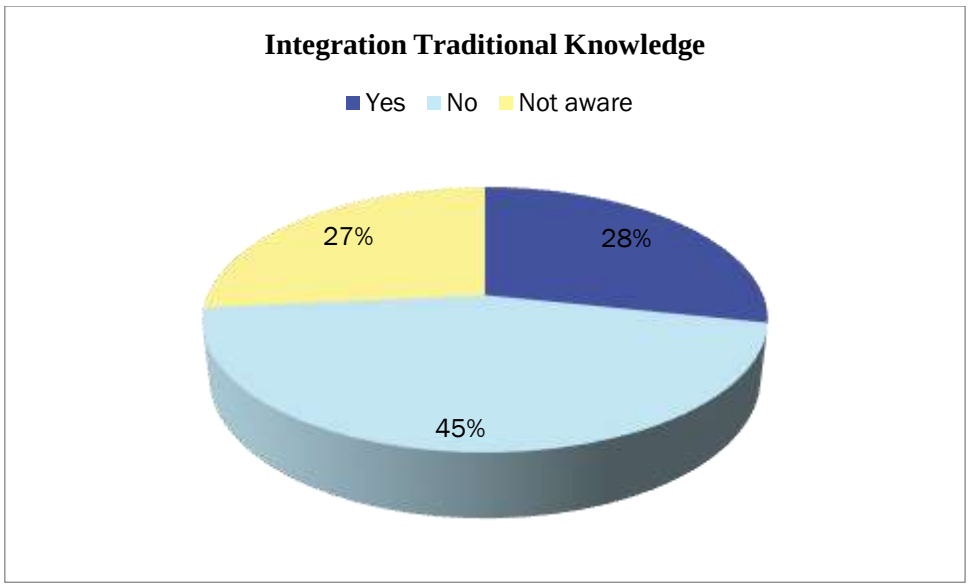
Climate Change Water Strategy	Frequency	Percentage
Yes	23	20.4
No	61	54.0
Not aware	29	25.7
Total	113	100.0



The data indicates that 54.0% (61 respondents) in Kerala are unaware of a climate change water strategy. Only 20.4% (23 respondents) are aware that such a strategy exists, while 25.7% (29 respondents) are uncertain or lack information about it.

Integration of Traditional Knowledge in Water Governance in Kerala

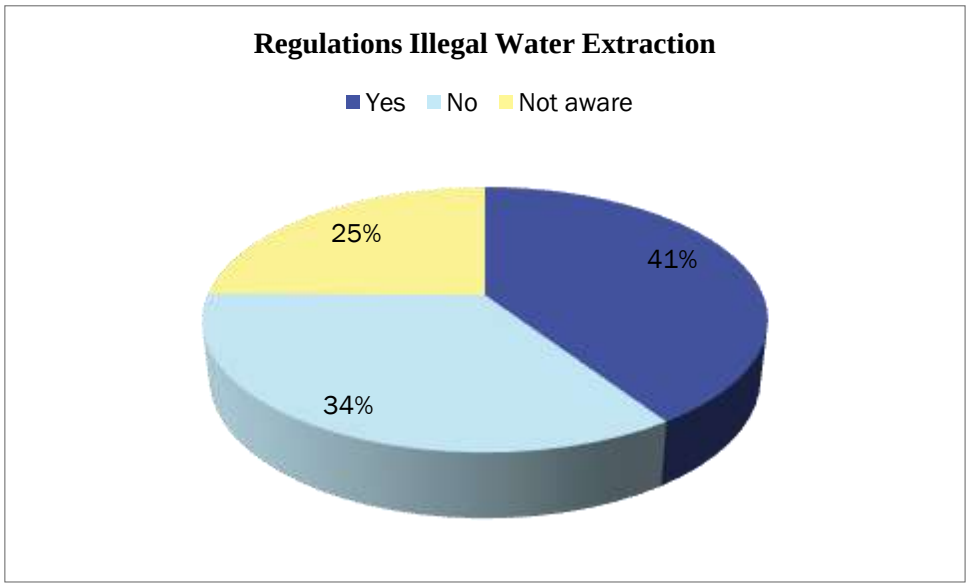
Integration Traditional Knowledge	Frequency	Percentage
Yes	32	28.3
No	51	45.1
Not aware	30	26.5
Total	113	100.0



The data shows that regarding the integration of traditional knowledge into water governance in Kerala, 45.1% (51 respondents) are not aware of such integration efforts. Meanwhile, 28.3% (32 respondents) are aware that traditional knowledge is integrated, and 26.5% (30 respondents) are uncertain or lack information on the matter.

Regulations on Illegal Water Extraction in Kerala

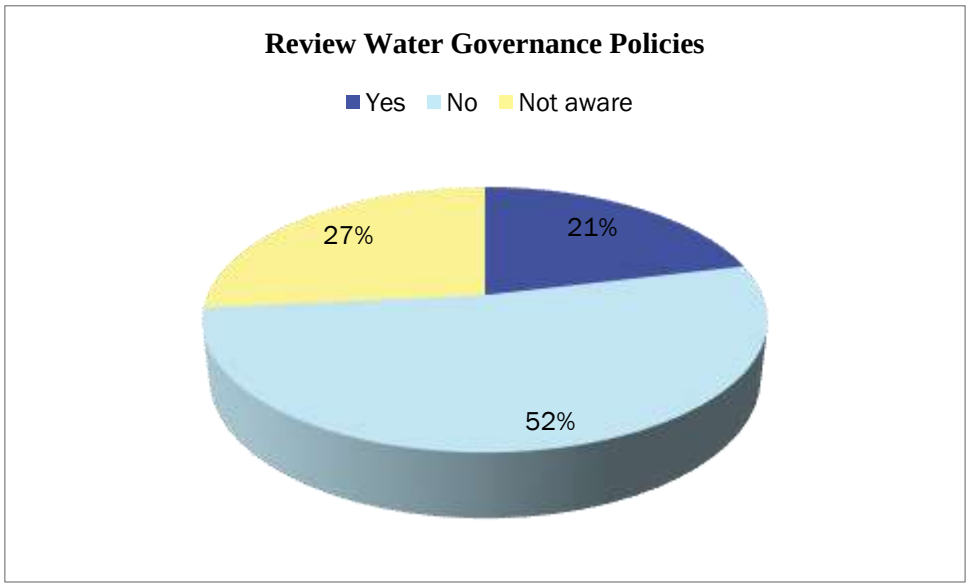
Regulations Illegal Water Extraction	Frequency	Percentage
Yes	46	40.7
No	39	34.5
Not aware	28	24.8
Total	113	100.0



According to the data, 40.7% (46 respondents) in Kerala are aware of regulations governing illegal water extraction. Conversely, 34.5% (39 respondents) are unaware of such regulations, and 24.8% (28 respondents) are uncertain or lack information about them.

Review of Water Governance Policies in Kerala

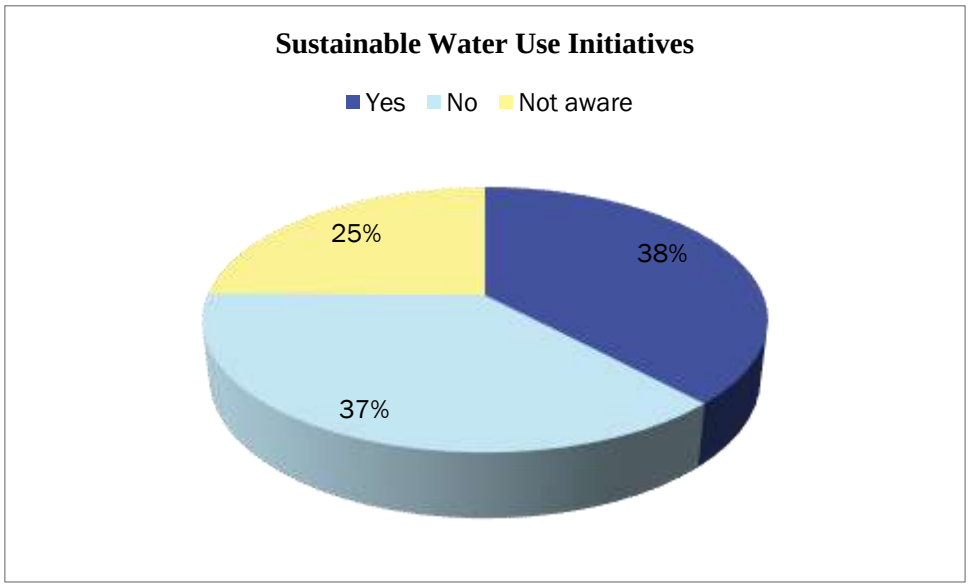
Review Water Governance Policies	Frequency	Percentage
Yes	24	21.2
No	59	52.2
Not aware	30	26.5
Total	113	100.0



The data shows that 52.2% (59 respondents) in Kerala are unaware of mechanisms for reviewing water governance policies. Conversely, 21.2% (24 respondents) are aware that such mechanisms exist, while 26.5% (30 respondents) are uncertain or lack information about them.

Initiatives for Sustainable Water Use in Kerala

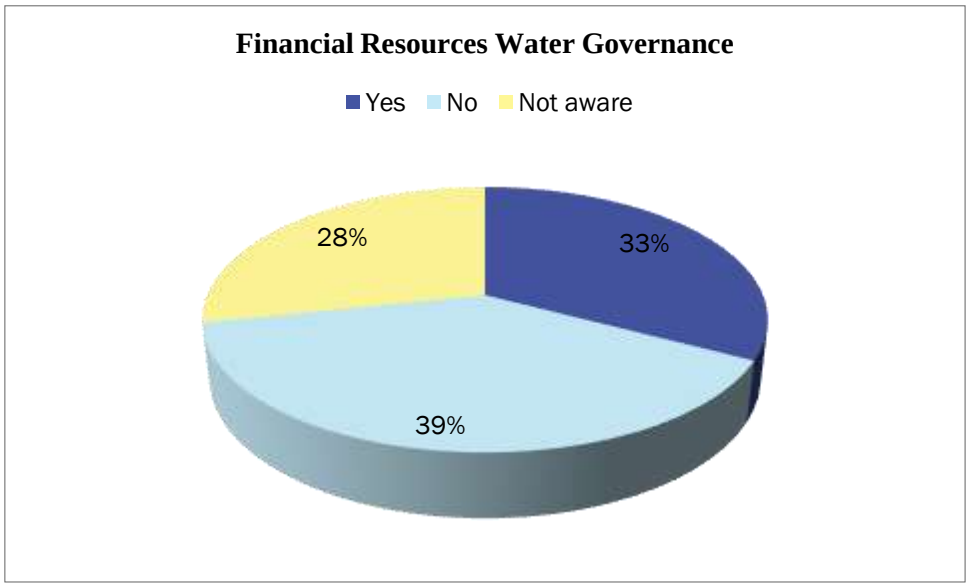
Sustainable Water Use Initiatives	Frequency	Percentage
Yes	43	38.1
No	42	37.2
Not aware	28	24.8
Total	113	100.0



According to the data, 38.1% (43 respondents) in Kerala are aware of sustainable water use initiatives. Conversely, 37.2% (42 respondents) are not aware of such initiatives, and 24.8% (28 respondents) are uncertain or lack information about them.

Financial Resources for Water Governance in Kerala

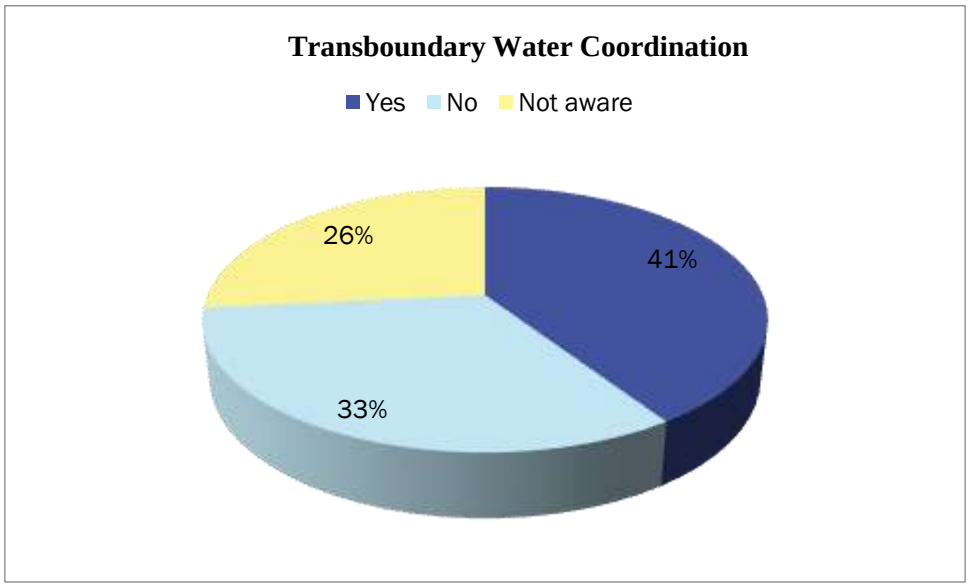
Financial Resources Water Governance	Frequency	Percentage
Yes	37	32.7
No	44	38.9
Not aware	32	28.3
Total	113	100.0



The data on financial resources allocated for water governance in Kerala shows that 32.7% of respondents (37 individuals) indicated the presence of allocated funds specifically for water governance. In contrast, 38.9% (44 individuals) reported no specific financial resources allocated. Additionally, 28.3% of respondents (32 individuals) were unaware of such financial allocations.

Coordination on Transboundary Water Issues in Kerala

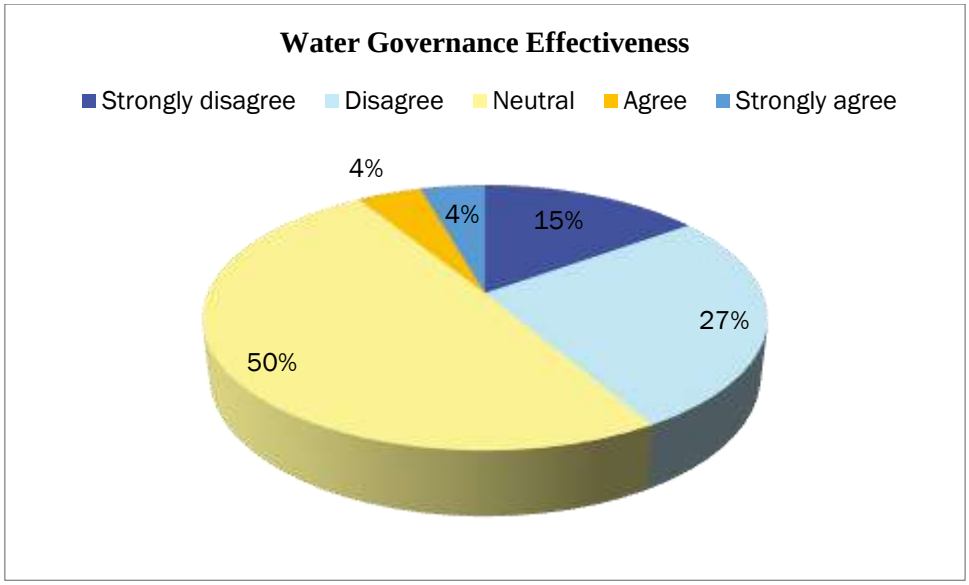
Transboundary Water Coordination	Frequency	Percentage
Yes	46	40.7
No	37	32.7
Not aware	30	26.5
Total	113	100.0



The data on Transboundary Water Coordination in Kerala reveals that 40.7% of respondents (46 individuals) are aware of existing coordination efforts with neighbouring states regarding water issues. Conversely, 32.7% (37 individuals) indicated no such coordination efforts, while 26.5% (30 individuals) were unaware of any coordination activities.

Effectiveness of Water Governance in Kerala

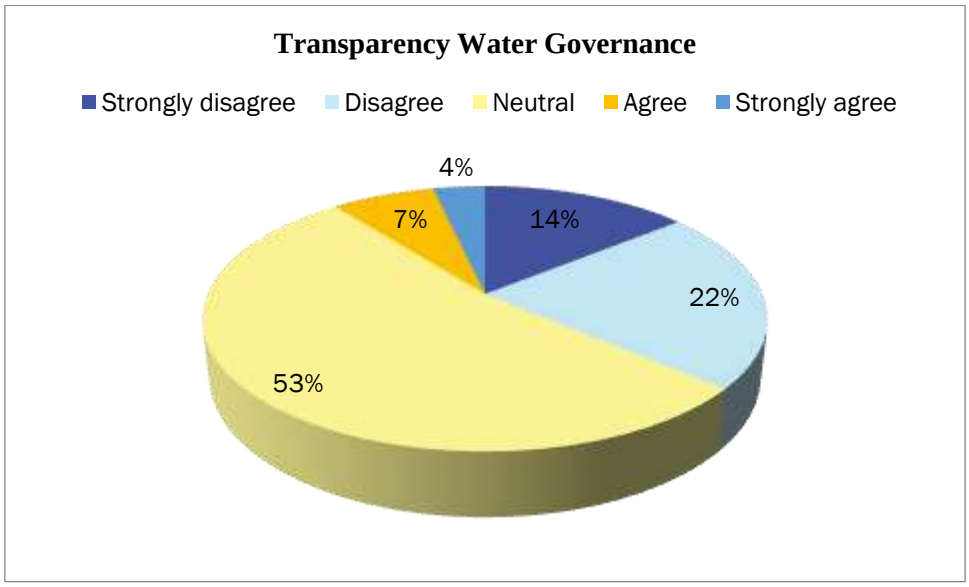
Water Governance Effectiveness	Frequency	Percentage
Strongly disagree	17	15.0
Disagree	30	26.5
Neutral	56	49.6
Agree	5	4.4
Strongly agree	5	4.4
Total	113	100.0



The data reveals that a significant portion, comprising 41.5% (47 individuals), either strongly disagree or disagree with the effectiveness of the current water governance framework. Additionally, nearly half of the respondents (49.6%, or 56 individuals) hold a neutral stance, suggesting uncertainty or ambivalence towards governance outcomes. Only a small minority, 8.8% (10 individuals), agreed with water governance efforts' effectiveness.

Transparency in Water Governance Decisions in Kerala

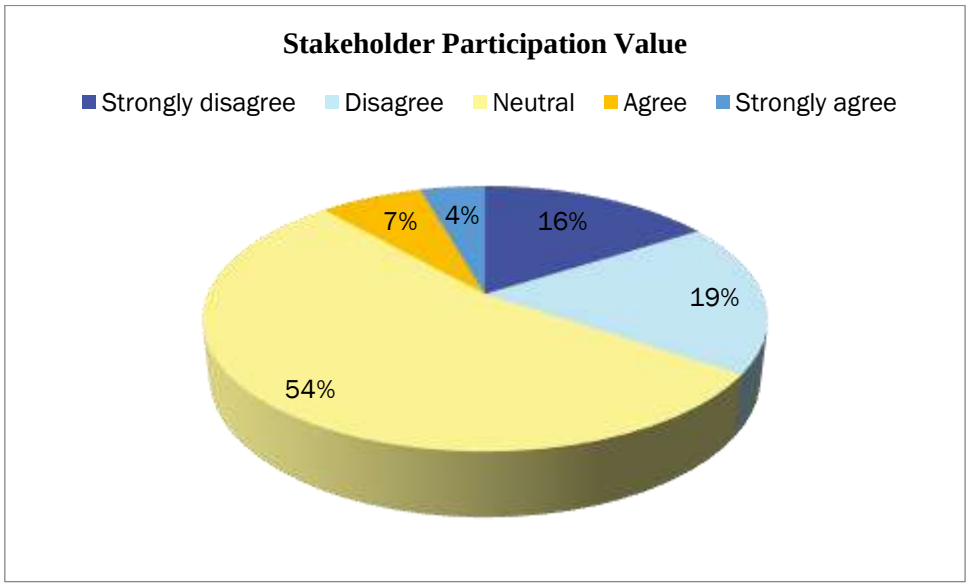
Transparency Water Governance	Frequency	Percentage
Strongly disagree	16	14.2
Disagree	25	22.1
Neutral	60	53.1
Agree	8	7.1
Strongly agree	4	3.5
Total	113	100.0



The data reveals that a significant portion of respondents (14.2%) strongly disagree, and 22.1% disagree that water governance decisions are transparent. A majority (53.1%) remain neutral, indicating uncertainty or a lack of strong opinion on the transparency of governance. Only a small percentage agree (7.1%) or strongly agree (3.5%) that governance decisions are adequately transparent.

Value of Stakeholder Participation in Water Governance in Kerala

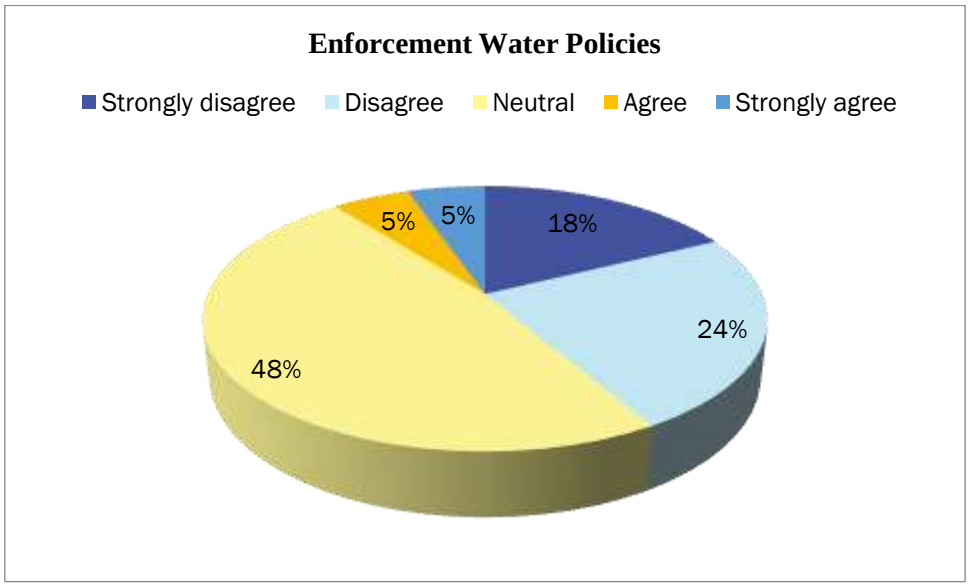
Stakeholder Participation Value	Frequency	Percentage
Strongly disagree	18	15.9
Disagree	21	18.6
Neutral	61	54.0
Agree	8	7.1
Strongly agree	5	4.4
Total	113	100.0



The data reveals that a significant majority of respondents either hold a neutral stance (54.0%) or express disagreement (15.9% strongly disagree and 18.6% disagree) regarding the effectiveness of stakeholder participation. Only a small percentage agree (7.1%) or strongly agree (4.4%) that stakeholder participation is adequately valued.

Enforcement of Water Policies in Kerala

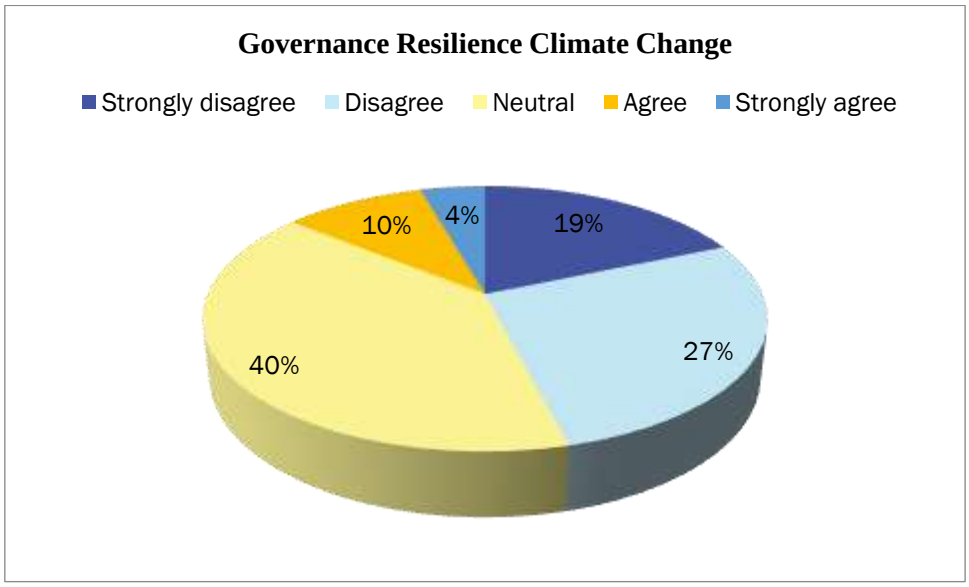
Enforcement Water Policies	Frequency	Percentage
Strongly disagree	20	17.7
Disagree	27	23.9
Neutral	54	47.8
Agree	6	5.3
Strongly agree	6	5.3
Total	113	100.0



The data reveals that a significant portion (17.7%) strongly disagree and 23.9% disagree that water policies are effectively enforced. A majority (47.8%) remain neutral, possibly reflecting uncertainty or a lack of strong opinion on enforcement effectiveness. A small percentage agree (5.3%) or strongly agree (5.3%) that water policies are adequately enforced.

Resilience of Water Governance to Climate Change in Kerala

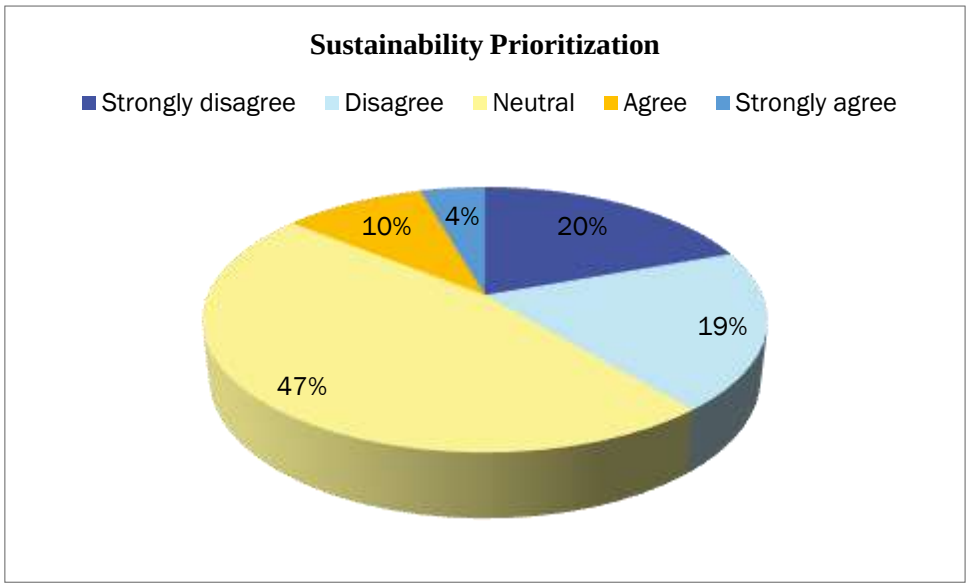
Governance Resilience Climate Change	Frequency	Percentage
Strongly disagree	21	18.6
Disagree	31	27.4
Neutral	45	39.8
Agree	11	9.7
Strongly agree	5	4.4
Total	113	100.0



The data reveals that a significant proportion (18.6%) strongly disagree and 27.4% disagree that the current water governance framework is resilient to climate change impacts. A substantial number (39.8%) are neutral, indicating uncertainty or a lack of strong opinion on the resilience of governance practices. A smaller percentage agree (9.7%) or strongly agree (4.4%) that the governance framework effectively addresses climate change challenges.

Prioritization of Water Sustainability in Kerala

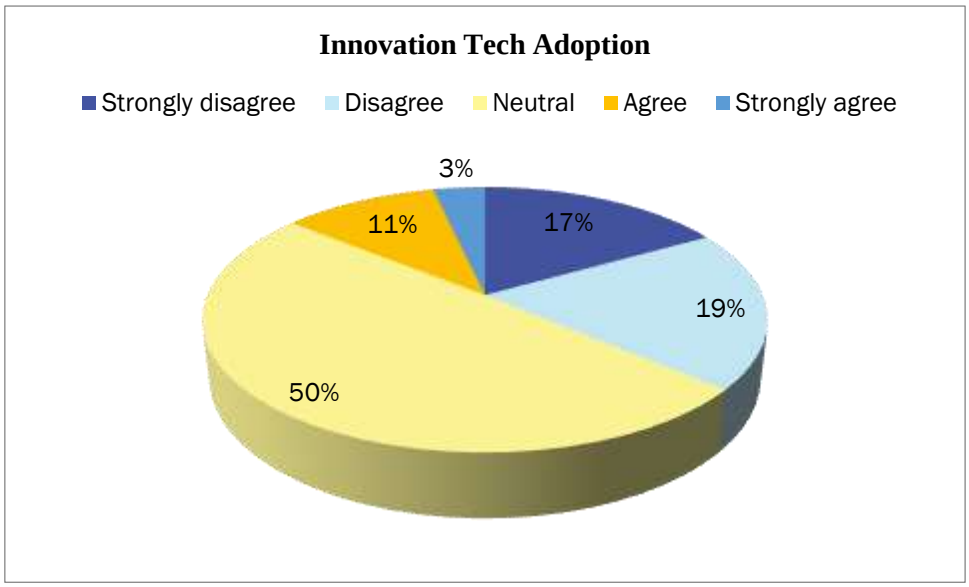
Sustainability Prioritization	Frequency	Percentage
Strongly disagree	22	19.5
Disagree	22	19.5
Neutral	53	46.9
Agree	11	9.7
Strongly agree	5	4.4
Total	113	100.0



The data reveals that a significant portion, comprising 19.5% who strongly disagree and another 19.5% who disagree, indicates dissatisfaction with the current prioritization of sustainability. A majority (46.9%) adopt a neutral stance, suggesting uncertainty or a lack of strong opinion. Meanwhile, a smaller percentage agree (9.7%) or strongly agree (4.4%) that sustainability is appropriately prioritized.

Innovation and Technology Adoption in Water Governance in Kerala

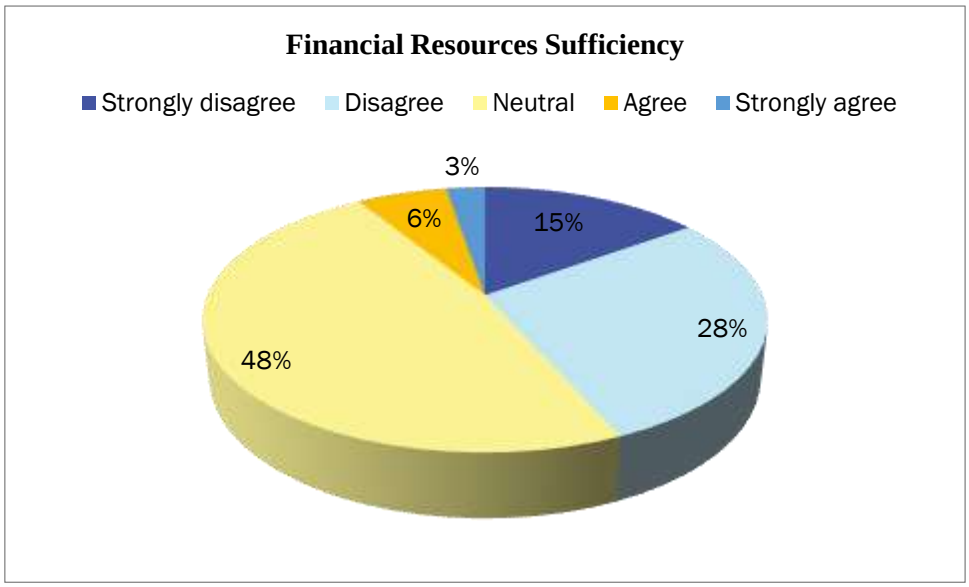
Innovation Tech Adoption	Frequency	Percentage
Strongly disagree	19	16.8
Disagree	22	19.5
Neutral	56	49.6
Agree	12	10.6
Strongly agree	4	3.5
Total	113	100.0



The data reveals that a significant portion (16.8%) strongly disagree and 19.5% disagree that there is sufficient innovation and technology adoption in water management practices. A majority (49.6%) remain neutral, suggesting uncertainty or a lack of strong opinion on the extent of technological advancements. A smaller percentage agree (10.6%) or strongly agree (3.5%) that innovation and tech adoption are adequately integrated into water management.

Sufficiency of Financial Resources for Water Security in Kerala

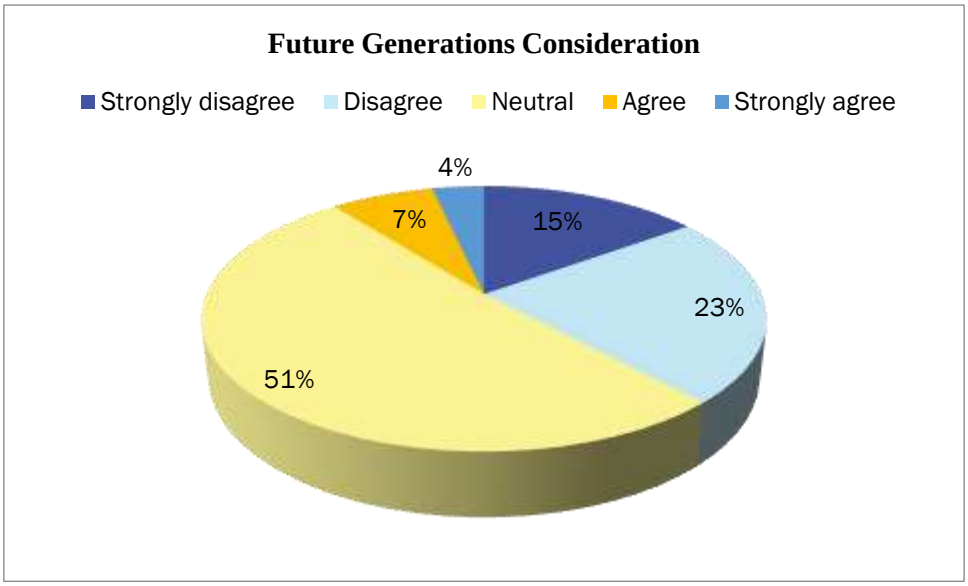
Financial Resources Sufficiency	Frequency	Percentage
Strongly disagree	17	15.0
Disagree	32	28.3
Neutral	54	47.8
Agree	7	6.2
Strongly agree	3	2.7
Total	113	100.0



The data reveals that a significant proportion (15.0%) strongly disagree and 28.3% disagree that current financial resources are sufficient for effective water management. A large majority (47.8%) express neutrality, indicating uncertainty or a lack of strong opinion on the adequacy of financial resources. A smaller percentage agree (6.2%) or strongly agree (2.7%) that the financial resources allocated are adequate.

Consideration of Future Generations in Water Governance in Kerala

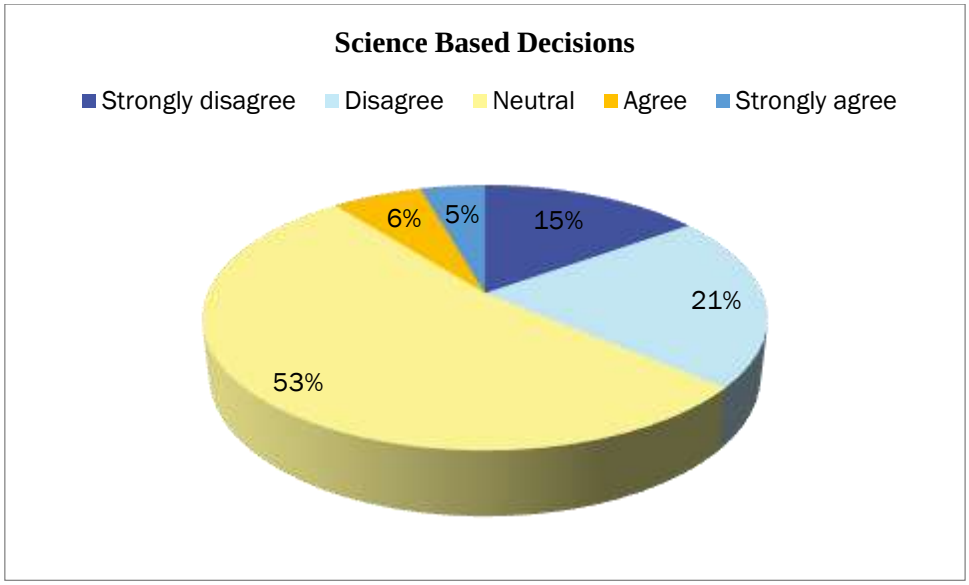
Future Generations Consideration	Frequency	Percentage
Strongly disagree	17	15.0
Disagree	26	23.0
Neutral	58	51.3
Agree	8	7.1
Strongly agree	4	3.5
Total	113	100.0



The data on future generations' consideration of water management decisions reveals that 15.0% (17 respondents) strongly disagree, and 23.0% (26 respondents) disagree that sufficient consideration is given to future generations. A majority, 51.3% (58 respondents), remain neutral, indicating uncertainty or a lack of strong opinion on the matter. Only a small percentage agree (7.1%, 8 respondents) or strongly agree (3.5%, 4 respondents) that adequate consideration is given to future generations in water management decisions. This suggests a need for improved long-term planning in water governance to ensure future sustainability.

Scientific Basis for Water Governance Decisions in Kerala

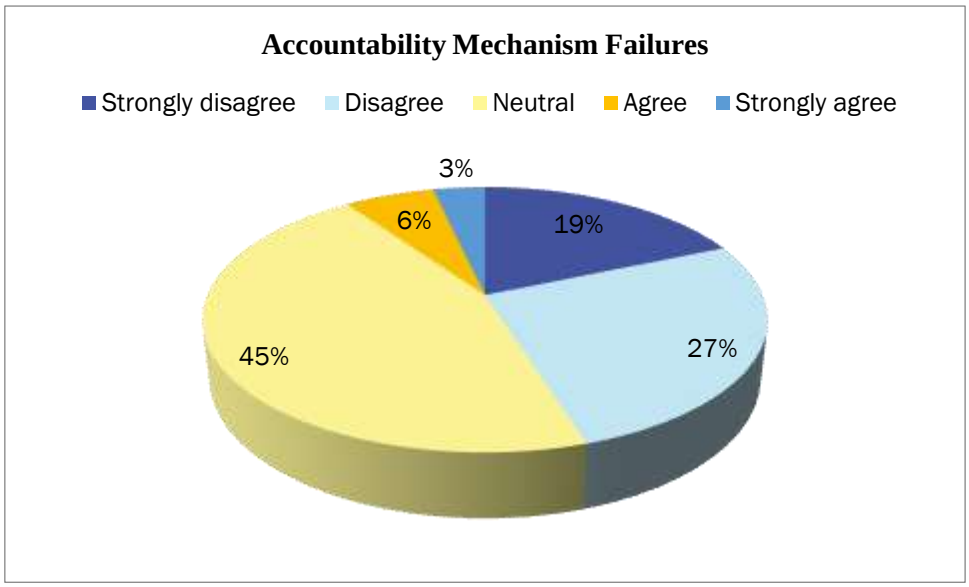
Science-Based Decisions	Frequency	Percentage
Strongly disagree	17	15.0
Disagree	24	21.2
Neutral	60	53.1
Agree	7	6.2
Strongly agree	5	4.4
Total	113	100.0



The Science-Based Decisions in Water Management data shows that 15.0% (17 respondents) strongly disagree, and 21.2% (24 respondents) disagree that decisions are based on scientific evidence. A significant portion, 53.1% (60 respondents), is neutral, indicating uncertainty or ambivalence towards using scientific evidence in decision-making. Only a small percentage agree (6.2%, 7 respondents) or strongly agree (4.4%, 5 respondents) that decisions are science-based.

Accountability Mechanisms for Water Governance Failures in Kerala

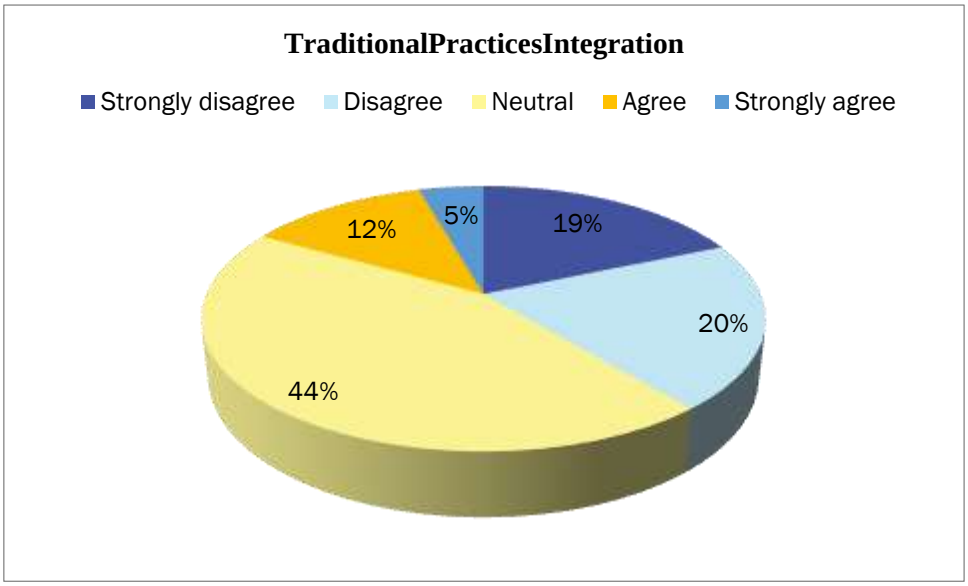
Accountability Mechanism Failures	Frequency	Percentage
Strongly disagree	21	18.6
Disagree	30	26.5
Neutral	51	45.1
Agree	7	6.2
Strongly agree	4	3.5
Total	113	100.0



The data on Accountability Mechanism Failures indicates that 18.6% (21 respondents) strongly disagree and 26.5% (30 respondents) disagree that there are failures in accountability mechanisms for water management. A large proportion, 45.1% (51 respondents), are neutral, suggesting uncertainty or a lack of strong opinion on this issue. Only a small fraction agree (6.2%, 7 respondents) or strongly agree (3.5%, 4 respondents) that accountability mechanisms are failing, reflecting limited recognition or concern about accountability failures.

Integration of Traditional Practices in Water Governance in Kerala

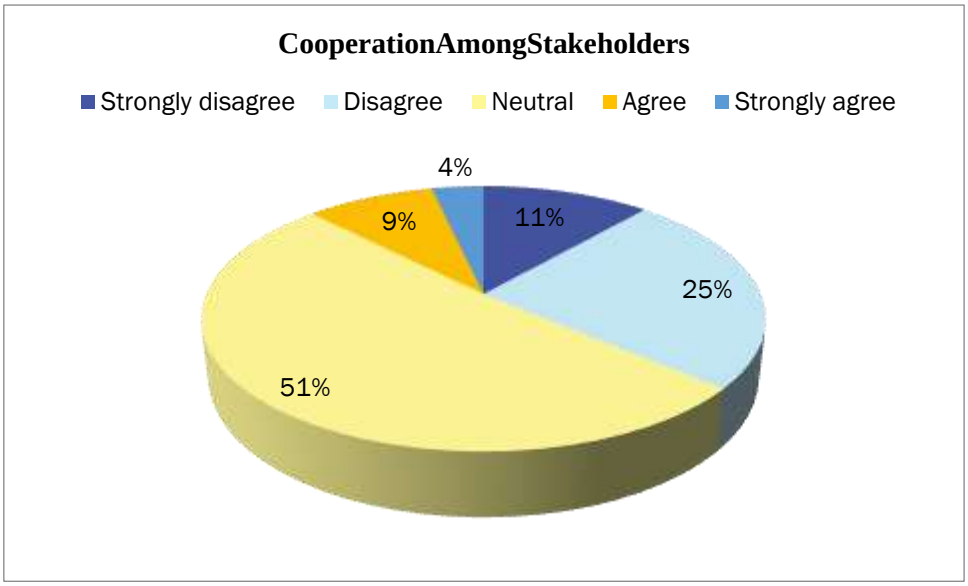
Traditional Practices Integration	Frequency	Percentage
Strongly disagree	21	18.6
Disagree	23	20.4
Neutral	50	44.2
Agree	14	12.4
Strongly agree	5	4.4
Total	113	100.0



The data on Traditional Practices Integration shows that 18.6% (21 respondents) strongly disagree and 20.4% (23 respondents) disagree with the integration of traditional practices in water management. A significant portion, 44.2% (50 respondents), remain neutral, indicating a lack of strong opinion on this issue. Meanwhile, 12.4% (14 respondents) agree and 4.4% (5 respondents) strongly agree.

Cooperation Among Stakeholders in Water Governance in Kerala

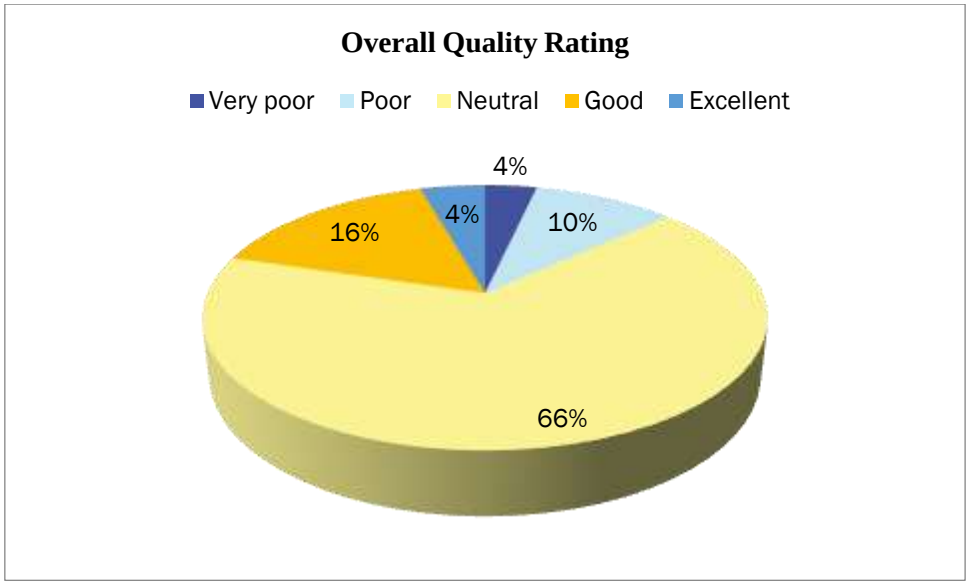
Cooperation Among Stakeholders	Frequency	Percentage
Strongly disagree	13	11.5
Disagree	28	24.8
Neutral	58	51.3
Agree	10	8.8
Strongly agree	4	3.5
Total	113	100.0



The data on Cooperation among Stakeholders reveals that 11.5% (13 respondents) strongly disagree, and 24.8% (28 respondents) disagree that there is adequate cooperation among stakeholders. A majority of 51.3% (58 respondents) are neutral, indicating a lack of strong opinion on stakeholder cooperation. On the positive side, 8.8% (10 respondents) agree, and 3.5% (4 respondents) strongly agree.

Rating of Overall Water Quality in Kerala

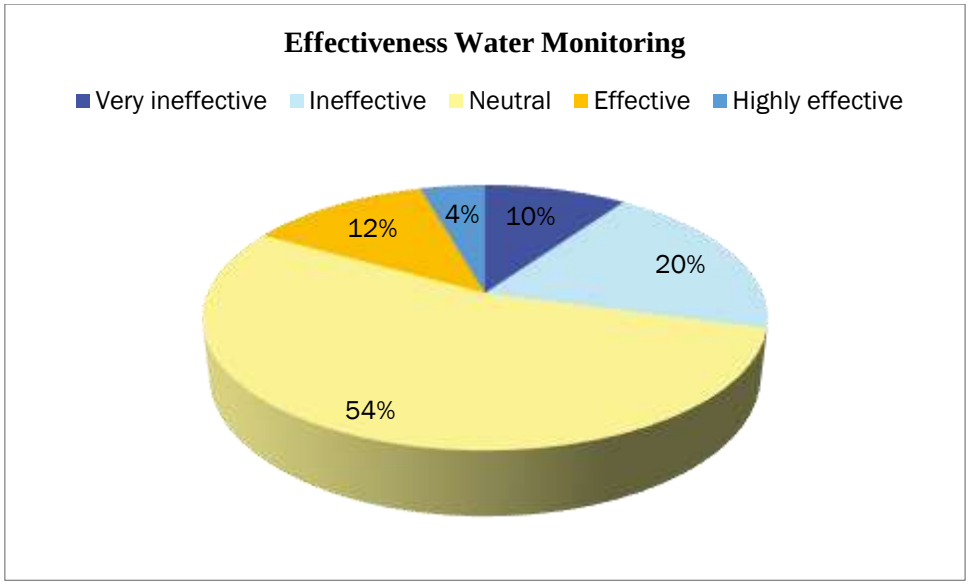
Overall Quality Rating	Frequency	Percentage
Very poor	4	3.5
Poor	11	9.7
Neutral	75	66.4
Good	18	15.9
Excellent	5	4.4
Total	113	100.0



The data on Overall Quality Rating indicates that 3.5% (4 respondents) rate the quality as very poor, and 9.7% (11 respondents) rate it as poor. A majority of 66.4% (75 respondents) remain neutral, neither leaning towards positive nor negative perceptions. On the positive end, 15.9% (18 respondents) rate the quality as good, and 4.4% (5 respondents) rate it as excellent.

Effectiveness of Water Quality Monitoring in Kerala

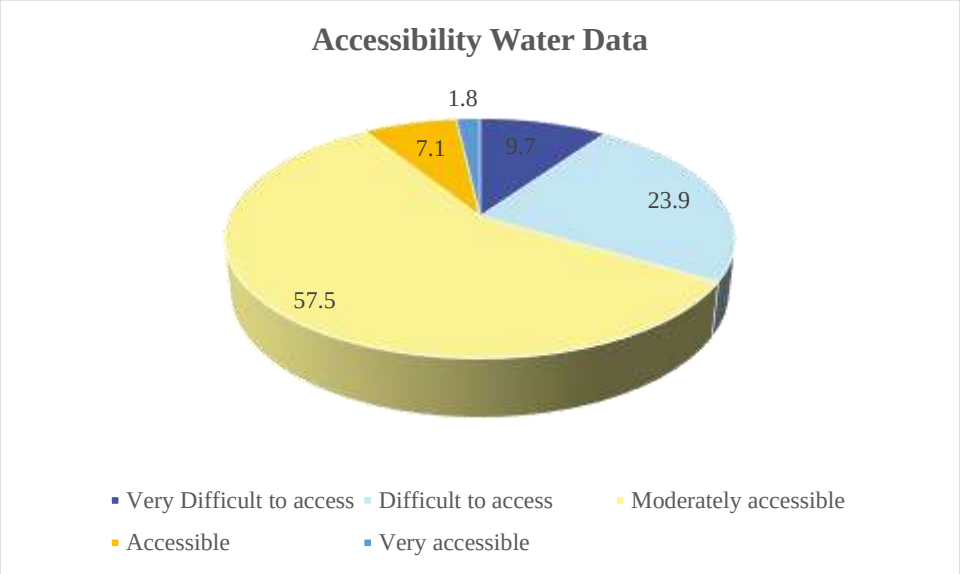
Effectiveness Water Monitoring	Frequency	Percentage
Very ineffective	11	9.7
Ineffective	22	19.5
Neutral	61	54.0
Effective	14	12.4
Highly effective	5	4.4
Total	113	100.0



The data on the Effectiveness of Water Monitoring reveals that 9.7% (11 respondents) consider it very ineffective, and 19.5% (22 respondents) consider it ineffective. A majority of 54.0% (61 respondents) remain neutral, indicating neither satisfaction nor dissatisfaction. On the positive side, 12.4% (14 respondents) find the water monitoring effective, and 4.4% (5 respondents) find it highly effective, suggesting that a minority of respondents view the monitoring efforts positively.

Accessibility of Water Quality Data in Kerala

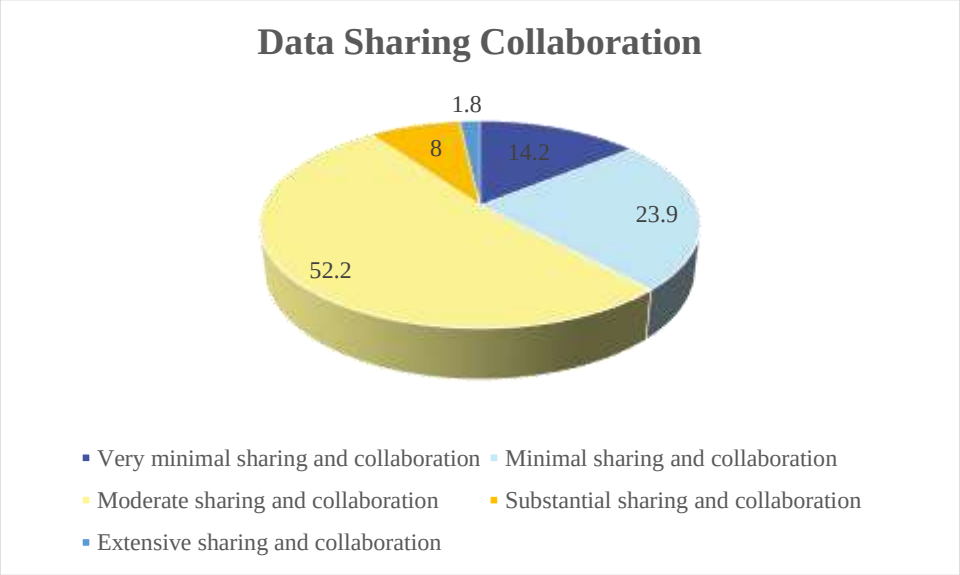
Accessibility Water Data	Frequency	Percentage
Very Difficult to access	11	9.7
Difficult to access	27	23.9
Moderately accessible	65	57.5
Accessible	8	7.1
Very accessible	2	1.8
Total	113	100.0



The data on the accessibility of water quality data and reports generated by government agencies in Kerala indicate notable challenges for many respondents. Out of 113 respondents, 9.7% find the data very difficult to access, and 23.9% find it difficult. The majority, 57.5%, find the data moderately accessible, suggesting that while the information is obtainable, it is not readily accessible. Only a small proportion of respondents find the data easily accessible (7.1%) or very accessible (1.8%), making up just 8.9% of the total. This distribution underscores the need for improvements in the accessibility of water quality data and reports to better meet respondent needs and reduce access difficulties.

Collaboration in Water Data Sharing in Kerala

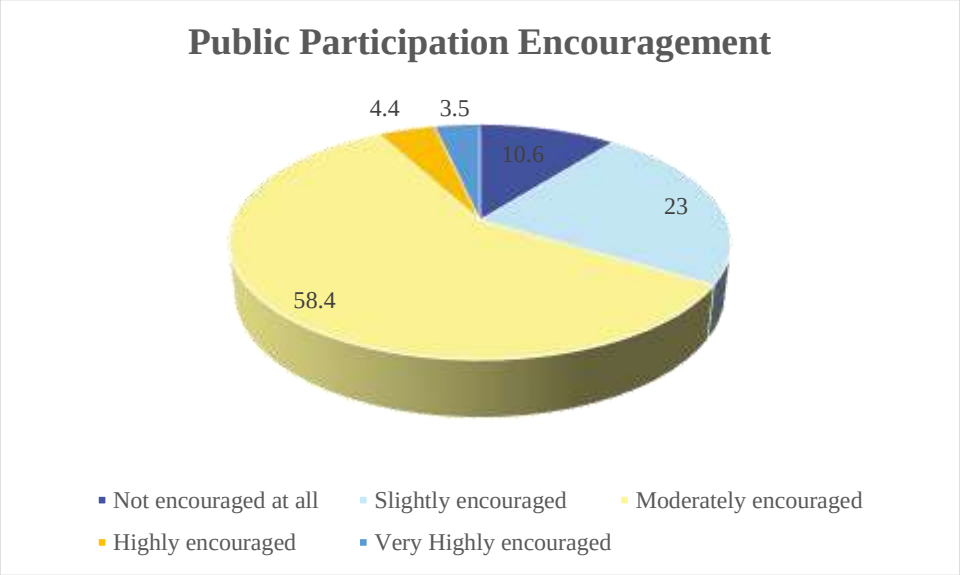
Data Sharing Collaboration	Frequency	Percentage
Very minimal sharing and collaboration	16	14.2
Minimal sharing and collaboration	27	23.9
Moderate sharing and collaboration	59	52.2
Substantial sharing and collaboration	9	8.0
Extensive sharing and collaboration	2	1.8
Total	113	100.0



The data on the extent of data sharing and collaboration among government agencies, research institutions, and community organizations in Kerala regarding water quality indicates that there is moderate cooperation, according to the majority of respondents. Specifically, 52.2% of the 113 respondents believe that there is moderate sharing and collaboration. However, 23.9% indicate minimal sharing and 14.2% indicate very minimal sharing. Only a small fraction of respondents believe there is substantial (8.0%) or extensive (1.8%) collaboration. These findings indicate the need for increased efforts to promote more extensive sharing of data and collaboration among these groups to enhance monitoring and managing water quality.

Encouragement of Public Participation in Water Governance in Kerala

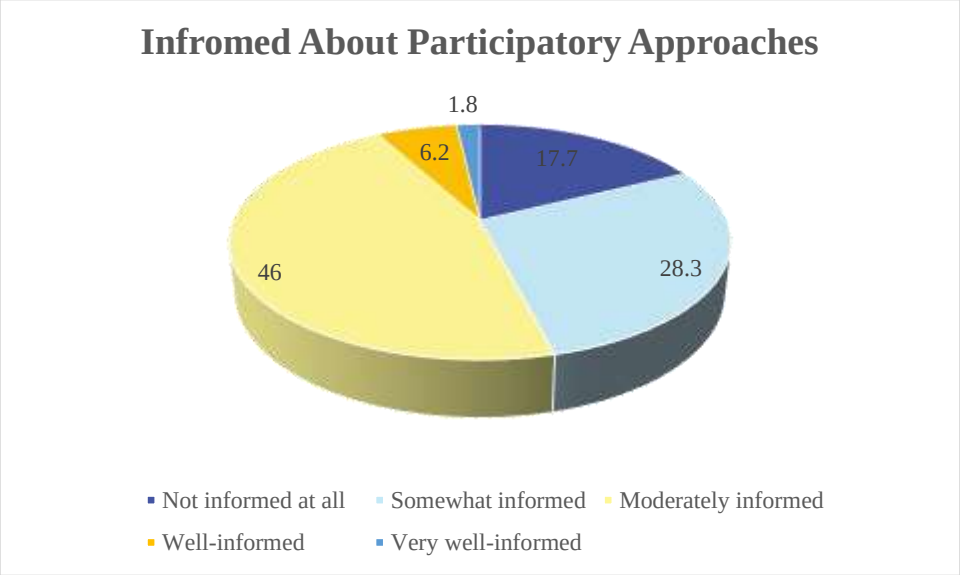
Public Participation Encouragement	Frequency	Percentage
Not encouraged at all	12	10.6
Slightly encouraged	26	23.0
Moderately encouraged	66	58.4
Highly encouraged	5	4.4
Very Highly encouraged	4	3.5
Total	113	100.0



According to the survey results, a significant proportion of respondents perceive varying degrees of encouragement for public participation. A notable 10.6% feel that public participation is not encouraged at all, while 23.0% consider it slightly encouraged. The majority of respondents, comprising 58.4%, believe public participation is moderately encouraged, indicating a baseline level of support. A smaller percentage of 4.4% and 3.5% view public participation as highly encouraged and very highly encouraged, respectively. These results indicate the need to enhance encouragement for public participation in water governance decisions in Kerala.

Informed about Participatory Approaches in Water Quality Surveillance in Kerala

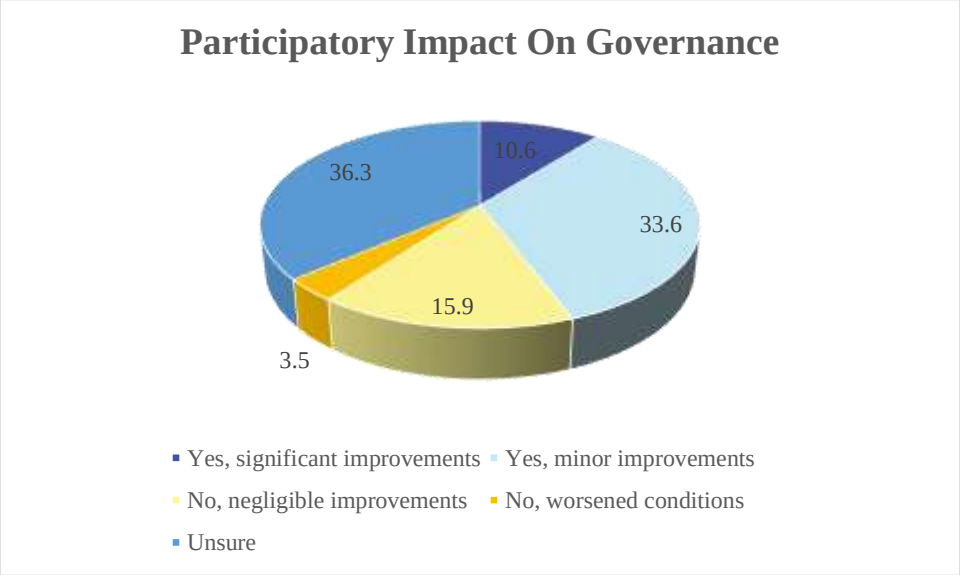
Informed About Participatory Approaches	Frequency	Percentage
Not informed at all	20	17.7
Somewhat informed	32	28.3
Moderately informed	52	46.0
Well-informed	7	6.2
Very well-informed	2	1.8
Total	113	100.0



The survey of 113 respondents provides insights into their understanding of participatory approaches in local water quality surveillance. A significant portion, 17.7%, feels completely uninformed, indicating a notable lack of awareness about these approaches. Another 28.3% perceive themselves as somewhat informed, suggesting they have a basic understanding but acknowledge the need for further learning. A majority, 46.0%, feel moderately informed, indicating a reasonable understanding of participatory methods. A smaller Percentage, 6.2%, considers themselves well-informed, indicating a higher level of knowledge. Only 1.8% feel very well-informed, highlighting a rare deep understanding of participatory approaches in water quality surveillance. These findings highlight the importance of improving how information about participatory methods in water quality surveillance is shared.

Impact of Participatory Approaches on Water Governance in Kerala

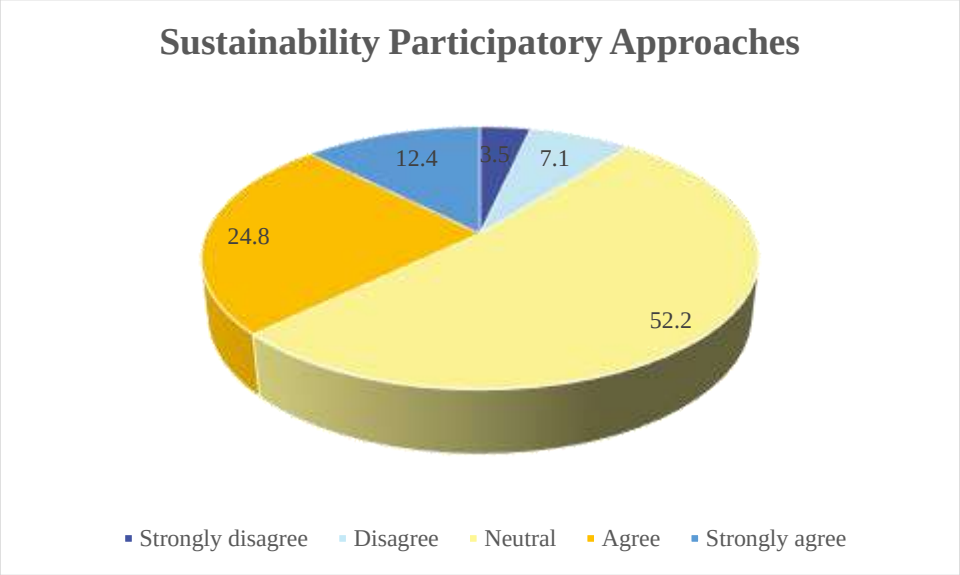
Participatory Impact on Governance	Frequency	Percentage
Yes, significant improvements	12	10.6
Yes, minor improvements	38	33.6
No, negligible improvements	18	15.9
No, worsened conditions	4	3.5
Unsure	41	36.3
Total	113	100.0



The data from 113 respondents provides insights into their perceptions regarding whether participatory water quality surveillance has positively impacted water management and governance practices in Kerala. According to the responses, 10.6% believe there have been significant improvements due to participatory approaches, suggesting a notable positive impact. Additionally, 33.6% see minor improvements, indicating some positive influence. However, 15.9% think there have been negligible improvements, and 3.5% feel conditions have worsened, signalling some concerns or challenges. A significant proportion, 36.3%, is unsure about the impact of participatory approaches. These findings indicate a varied perception among respondents regarding the effectiveness of participatory water quality surveillance in improving governance practices in Kerala.

Sustainability of Participatory Approaches in Water Surveillance in Kerala

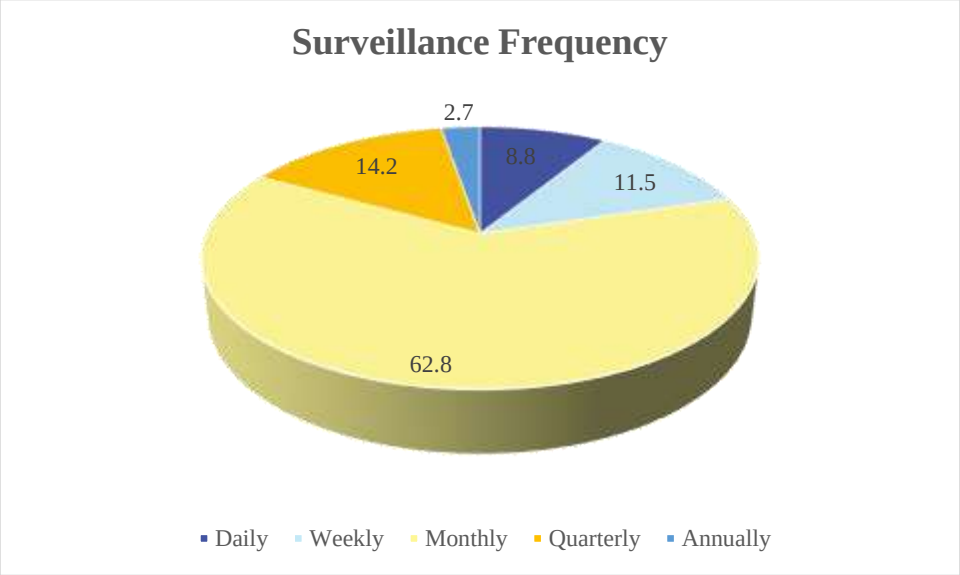
Sustainability Participatory Approaches	Frequency	Percentage
Strongly disagree	4	3.5
Disagree	8	7.1
Neutral	59	52.2
Agree	28	24.8
Strongly agree	14	12.4
Total	113	100.0



The data gathered from 113 respondents offers insights into their beliefs regarding the sustainability and long-term viability of participatory approaches in water quality surveillance in Kerala. According to the responses, 12.4% strongly agree and 24.8% agree that participatory approaches are sustainable. This indicates that a significant portion of respondents view these methods positively, indicating they are viable for ongoing monitoring of water resources. Conversely, 3.5% strongly disagree and 7.1% disagree, expressing concerns about the sustainability of participatory approaches. Additionally, 52.2% are neutral, suggesting a lack of strong opinion or uncertainty on the matter.

Frequency of Surveillance for Water Quality Impact Assessment in Kerala

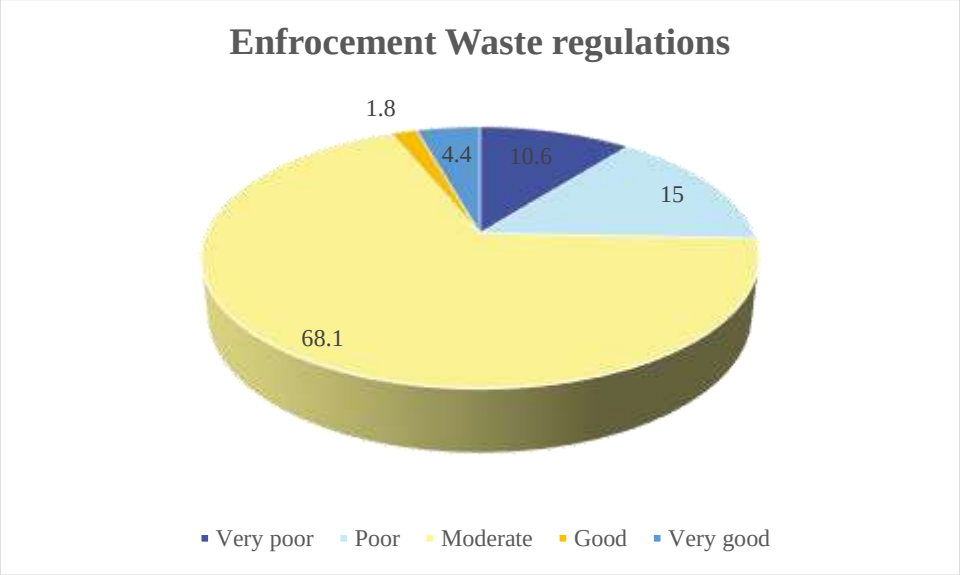
Surveillance Frequency	Frequency	Percentage
Daily	10	8.8
Weekly	13	11.5
Monthly	71	62.8
Quarterly	16	14.2
Annually	3	2.7
Total	113	100.0



The responses from 113 respondents provide insights into their opinions on the frequency of surveillance and monitoring needed to assess the impact of solid and liquid waste disposal on water quality. According to the data, a significant 62.8% of respondents believe that surveillance should be conducted monthly. This shows a widespread agreement among most respondents that consistent monthly monitoring is crucial for evaluating the effects of waste disposal on water quality. Additionally, 14.2% suggest that surveillance should occur quarterly, suggesting a smaller but still notable group that believes less frequent monitoring might be adequate. Fewer respondents support increased monitoring frequency: 8.8% for daily surveillance and 11.5% for weekly surveillance. Only 2.7% argue for annual monitoring, indicating a minority opinion on whether less frequent monitoring intervals are sufficient. These findings highlight a preference among respondents for frequent monitoring, particularly every month, to ensure timely detection of any adverse impacts of waste disposal on water quality.

Enforcement of Waste Regulations for Water Quality in Kerala

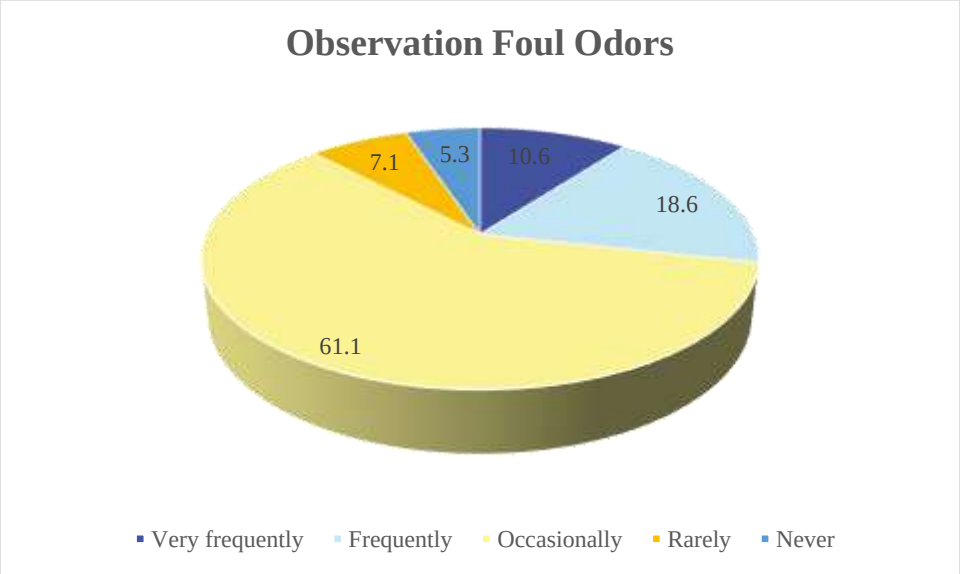
Enforcement Waste regulations	Frequency	Percentage
Very poor	12	10.6
Poor	17	15.0
Moderate	77	68.1
Good	2	1.8
Very good	5	4.4
Total	113	100.0



The responses from 113 respondents provide insight into their perceptions of government authorities' enforcement of regulations concerning the treatment and disposal of solid and liquid waste to protect water quality in Kerala. According to the data, a majority of 68.1% rate the enforcement as moderate. Additionally, 15.0% perceive the enforcement as poor, and smaller Percentages perceive enforcement as very poor (10.6%), good (1.8%), and very good (4.4%). Overall, these findings highlight mixed opinions about the effectiveness of government enforcement efforts, suggesting a need for enhanced regulatory measures to better protect water quality through more consistent enforcement of waste management regulations in Kerala.

Observation of Foul Odors from Stormwater Drains in Kerala

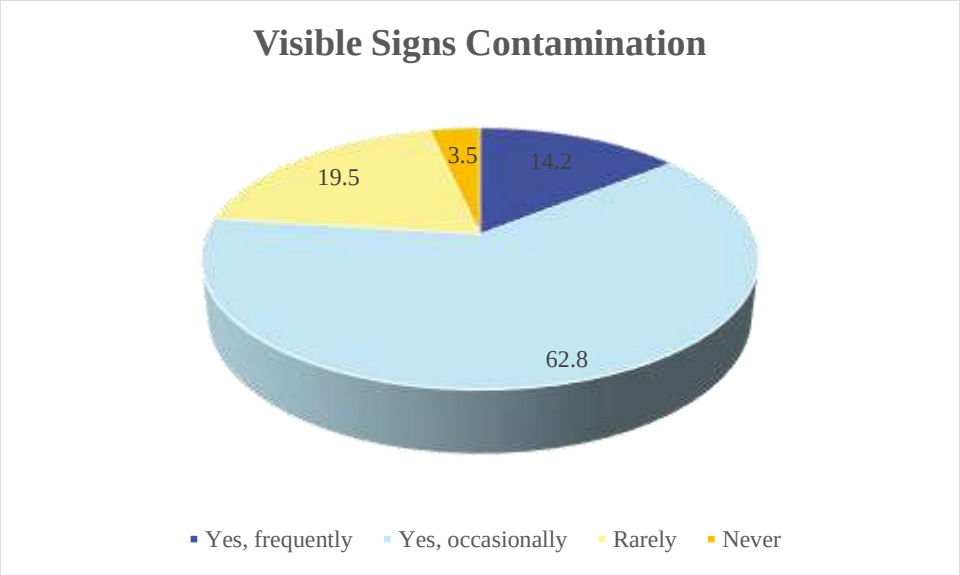
Observation Foul Odors	Frequency	Percentage
Very frequently	12	10.6
Frequently	21	18.6
Occasionally	69	61.1
Rarely	8	7.1
Never	6	5.3
Total	113	100.0



The data collected from 113 respondents provides insights into how frequently foul odours are observed emanating from stormwater drains in their locality. According to the responses, a majority of 61.1% observe these odours occasionally. This indicates that for many respondents, foul odours are not a constant issue but are noticed from time to time. Additionally, 18.6% report observing foul odours frequently, suggesting a recurring problem for a notable portion of respondents. Smaller Percentages note observing foul odours very frequently (10.6%), rarely (7.1%), and never (5.3%). These findings highlight varying levels of concern among respondents regarding foul odours from stormwater drains, suggesting a need for effective measures to minimize and manage these odours to improve local environmental quality.

Visible Signs of Sewerage Contamination in Kerala

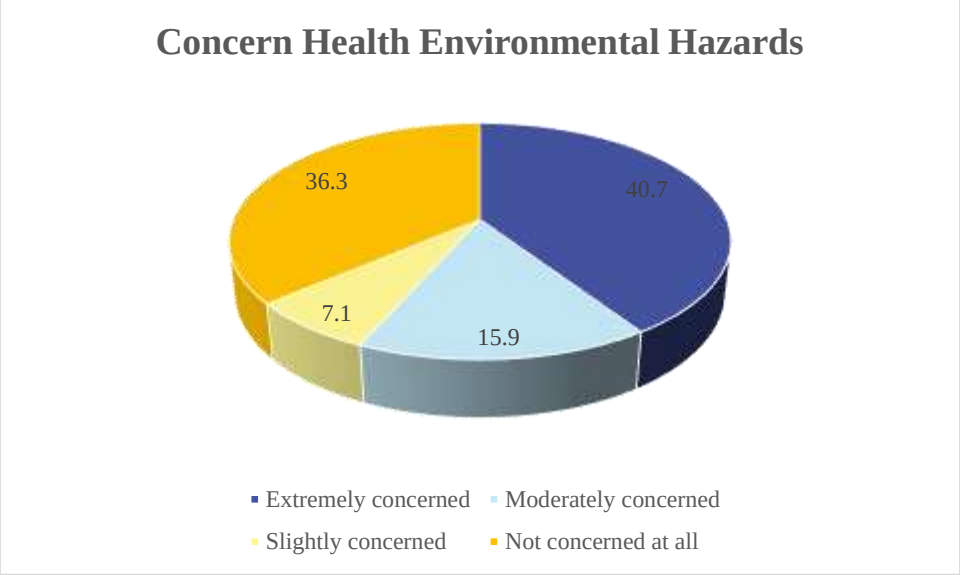
Visible Signs Contamination	Frequency	Percentage
Yes, frequently	16	14.2
Yes, occasionally	71	62.8
Rarely	22	19.5
Never	4	3.5
Total	113	100.0



According to responses from 113 respondents, their observations regarding visible signs of contamination in stormwater drains reveal varied frequencies. A majority of 62.8% report occasionally noticing such signs, indicating occasional occurrences of contamination. Additionally, 14.2% report frequently observing visible signs of contamination, suggesting a more persistent issue for a significant portion of respondents. Conversely, 19.5% state they rarely observe these signs, while a small 3.5% indicate they never do. These findings underscore concerns among respondents about contamination of sewerage in stormwater drains, highlighting the need for proactive measures to address and minimize these visible signs of environmental pollution.

Concerns about Health and Environmental Hazards from Sewerage in Kerala

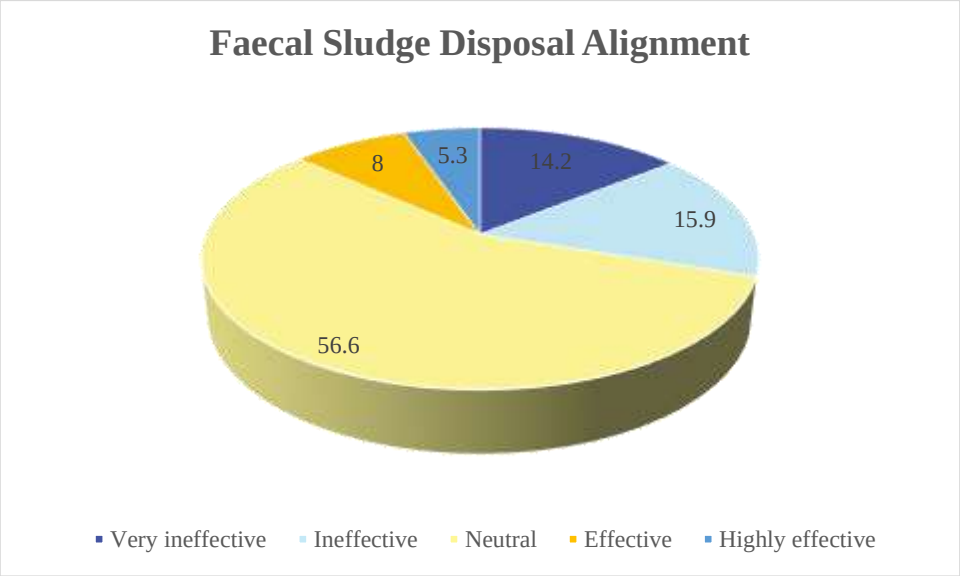
Concerns Health Environmental Hazards	Frequency	Percentage
Extremely concerned	46	40.7
Moderately concerned	18	15.9
Slightly concerned	8	7.1
Not concerned at all	41	36.3
Total	113	100.0



According to responses from 113 respondents, there are varying levels of concern regarding potential health hazards and environmental degradation caused by the mixing of sewerage with stormwater drains. A substantial 40.7% express extreme concern, indicating a significant worry about the consequences of this contamination on both health and the environment. Additionally, 15.9% are moderately concerned, suggesting a notable level of concern. On the other hand, 7.1% are slightly concerned, while 36.3% indicate they are not concerned at all. These responses underscore a range of attitudes among respondents, with a significant proportion highly concerned about the potential impacts of sewerage mixing with stormwater drains, highlighting the importance of addressing and minimizing these risks to safeguard both public health and environmental quality.

Alignment of Faecal Sludge Disposal with Guidelines in Kerala

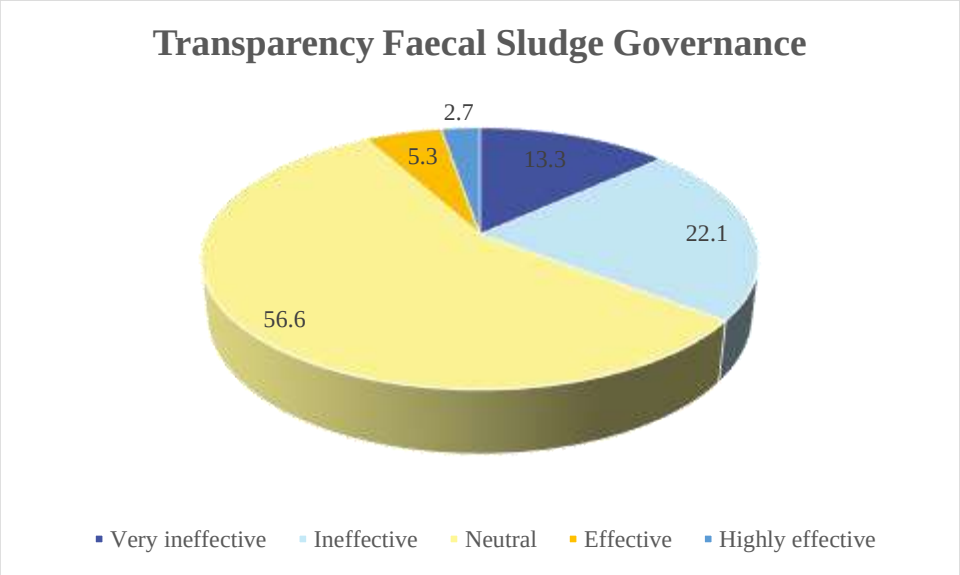
Faecal Sludge Disposal Alignment	Frequency	Percentage
Very ineffective	16	14.2
Ineffective	18	15.9
Neutral	64	56.6
Effective	9	8.0
Highly effective	6	5.3
Total	113	100.0



According to responses from 113 respondents, opinions vary regarding how well the faecal sludge disposal process aligns with the specific guidelines outlined in national standards for sanitation and wastewater management. A majority of 56.6% hold a neutral view, suggesting a lack of strong opinion. Additionally, 14.2% find the alignment very ineffective, while 15.9% consider it ineffective, indicating significant concerns about non-compliance or inadequacies in meeting national standards. Conversely, smaller percentages view the alignment as effective (8.0%) or highly effective (5.3%), indicating some respondents believe guidelines are adequately followed. These findings highlight varied perceptions among respondents regarding the alignment of faecal sludge disposal practices with national sanitation and wastewater management standards, bringing attention to areas needing improvement to ensure compliance and effectiveness in sanitation practices.

Transparency in Faecal Sludge Governance in Kerala

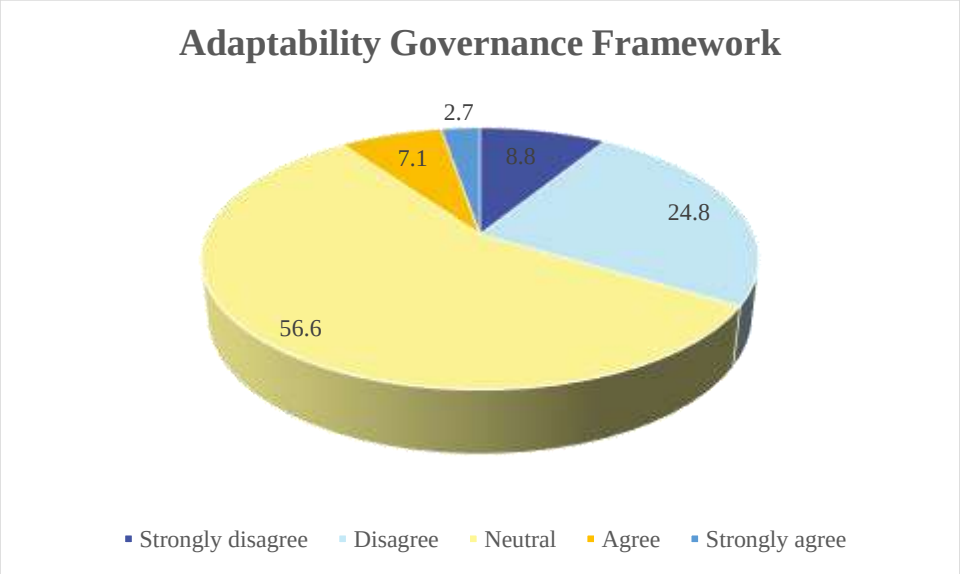
Transparency Faecal Sludge Governance	Frequency	Percentage
Very ineffective	15	13.3
Ineffective	25	22.1
Neutral	64	56.6
Effective	6	5.3
Highly effective	3	2.7
Total	113	100.0



According to responses from 113 respondents, opinions vary on the transparency of the governance structure overseeing faecal sludge management, which includes monitoring, enforcement, and stakeholder engagement. A significant majority of 56.6% hold a neutral view, indicating they neither consider transparency effective nor ineffective. However, 35.4% perceive transparency as either very ineffective (13.3%) or ineffective (22.1%), suggesting concerns about clarity in governance practices. Conversely, a smaller 7.9% find transparency effective (5.3%) or highly effective (2.7%), indicating some respondents believe the governance structure is sufficiently transparent. These responses highlight a mixed perception among respondents regarding the transparency of governance in faecal sludge management, emphasizing the need to improve accountability in monitoring, enforcement, and stakeholder engagement processes.

Adaptability of Water Governance Framework in Kerala

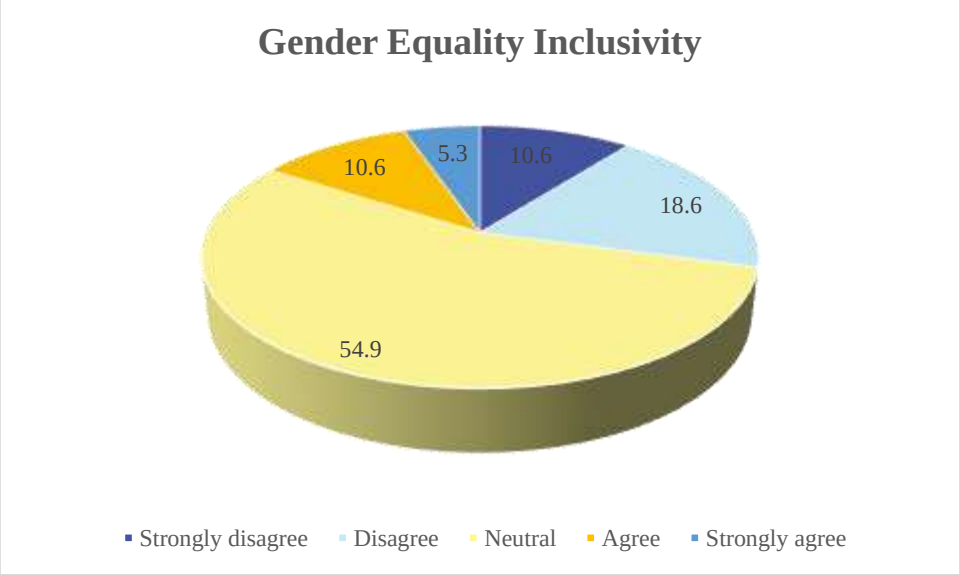
Adaptability Governance Framework	Frequency	Percentage
Strongly disagree	10	8.8
Disagree	28	24.8
Neutral	64	56.6
Agree	8	7.1
Strongly agree	3	2.7
Total	113	100.0



Out of 113 respondents, opinions on the statement "The current water governance framework in Kerala is adaptable to changing socio-economic and environmental conditions" are diverse. A minority of 10 respondents (8.8%) strongly disagree with the statement, indicating a belief that the framework is not adaptable. Additionally, 28 respondents (24.8%) disagree, suggesting that they also perceive significant limitations in adaptability. The majority, 64 respondents (56.6%), remain neutral, indicating uncertainty regarding the framework's adaptability. On the other hand, 8 respondents (7.1%) agree, seeing the framework as adaptable to changing conditions. Finally, a small group of 3 respondents (2.7%) strongly agree, indicating strong confidence in the framework's adaptability.

Gender Equality and Social Inclusivity in Water Governance in Kerala

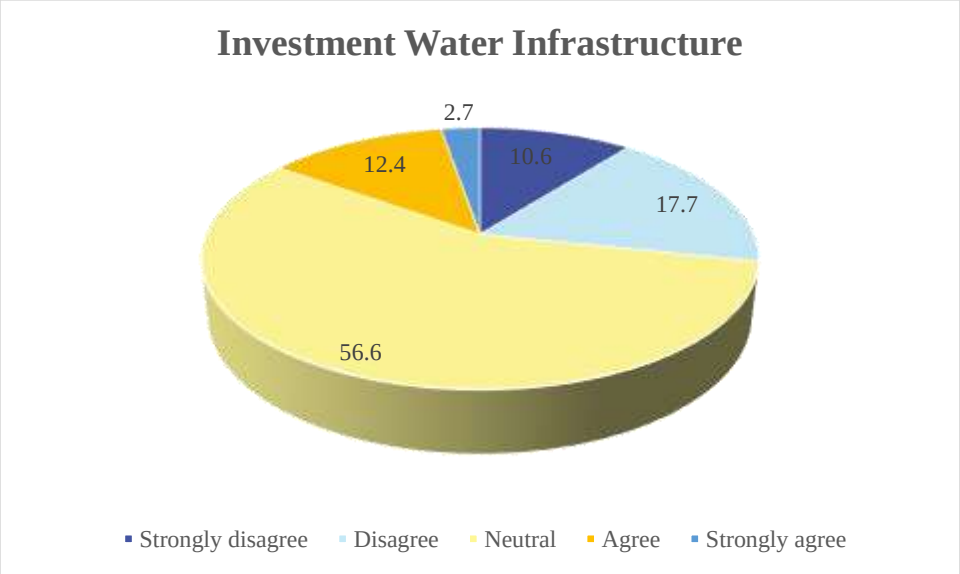
Gender Equality Inclusivity	Frequency	Percentage
Strongly disagree	12	10.6
Disagree	21	18.6
Neutral	62	54.9
Agree	12	10.6
Strongly agree	6	5.3
Total	113	100.0



Out of 113 respondents, 12 people (10.6%) strongly disagree with the statement that the water governance framework in Kerala promotes gender equality and social inclusivity in water management. A further 21 people (18.6%) disagree with the statement. The majority, 62 people (54.9%), are neutral. Meanwhile, 12 respondents (10.6%) agree, and 6 respondents (5.3%) strongly agree with the statement.

Investment in Water Infrastructure in Kerala

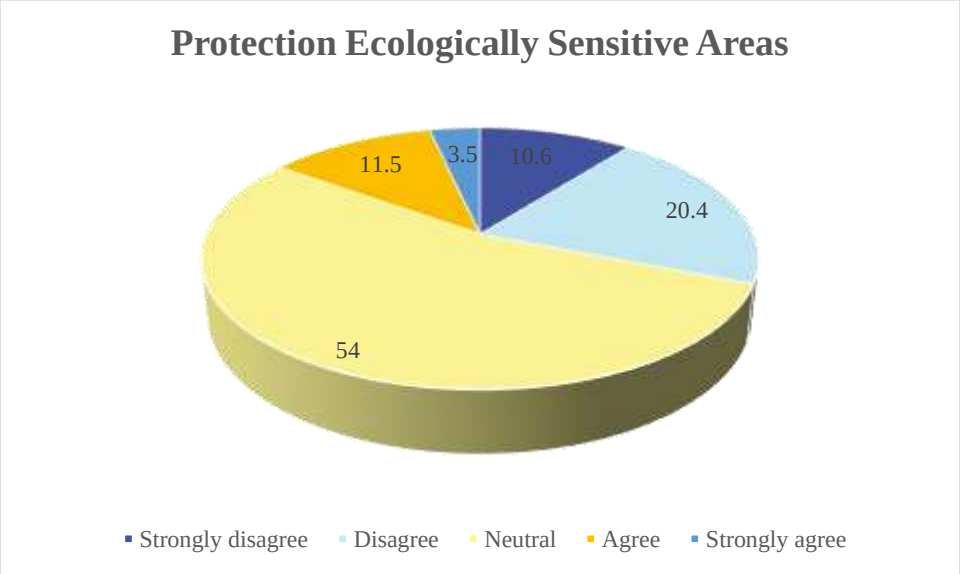
Investment Water Infrastructure	Frequency	Percentage
Strongly disagree	12	10.6
Disagree	20	17.7
Neutral	64	56.6
Agree	14	12.4
Strongly agree	3	2.7
Total	113	100.0



The responses from 113 participants regarding the adequacy of investment in infrastructure for water storage, distribution, and treatment in Kerala reflect mixed opinions. A notable portion, consisting of 12 respondents (10.6%) who strongly disagree and 20 respondents (17.7%) who disagree, indicate dissatisfaction with the current level of investment, suggesting it is insufficient to meet needs effectively. The majority, 64 respondents (56.6%), remain neutral, indicating uncertainty or a lack of strong opinion on whether the investment meets requirements adequately. Conversely, 14 respondents (12.4%) agree and 3 respondents (2.7%) strongly agree that the investment is adequate, indicating some confidence in the current infrastructure funding.

Protection of Ecologically Sensitive Areas in Water Governance in Kerala

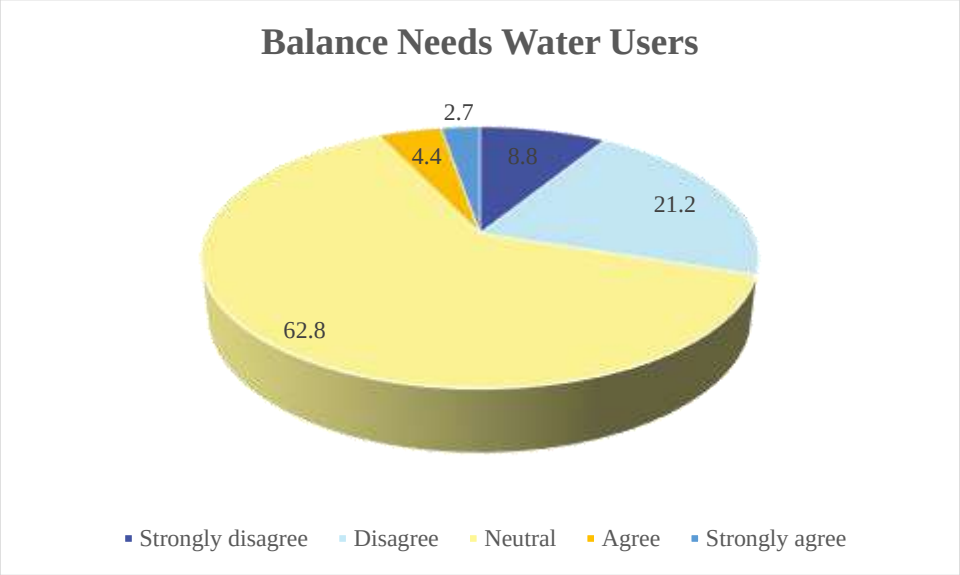
Protection Ecologically Sensitive Areas	Frequency	Percentage
Strongly disagree	12	10.6
Disagree	23	20.4
Neutral	61	54.0
Agree	13	11.5
Strongly agree	4	3.5
Total	113	100.0



The responses from 113 participants regarding whether water governance policies in Kerala prioritize the protection of ecologically sensitive areas and water bodies demonstrate varied perspectives. A portion, including 12 respondents (10.6%) who strongly disagree and 23 respondents (20.4%) who disagree, expresses dissatisfaction with the current prioritization, suggesting perceived inadequacies in safeguarding these areas. The majority, 61 respondents (54.0%), remain neutral, indicating a lack of strong opinion or uncertainty regarding the prioritization of protection measures. Conversely, 13 respondents (11.5%) agree and 4 respondents (3.5%) strongly agree that the policies prioritize protection adequately, suggesting some confidence in the existing governance framework.

Balancing the Needs of Water Users in Kerala

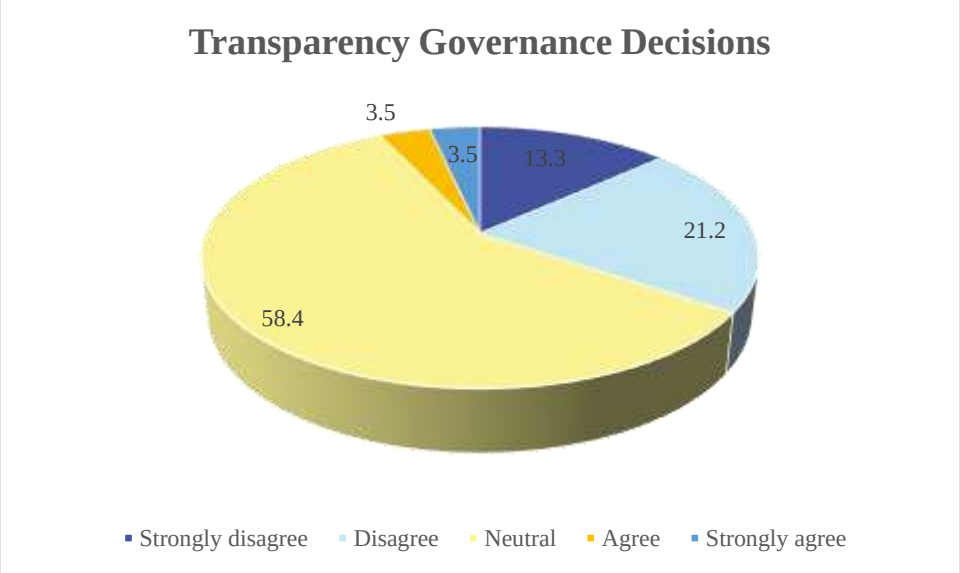
Balance Needs Water Users	Frequency	Percentage
Strongly disagree	10	8.8
Disagree	24	21.2
Neutral	71	62.8
Agree	5	4.4
Strongly agree	3	2.7
Total	113	100.0



A minority, consisting of 10 respondents (8.8%) who strongly disagree and 24 respondents (21.2%) who disagree, express dissatisfaction with the framework's ability to achieve this balance. The majority, comprising 71 respondents (62.8%), remain neutral, suggesting uncertainty or a lack of strong opinion on whether the framework adequately addresses the varying needs of water users. Conversely, 5 respondents (4.4%) agree and 3 respondents (2.7%) strongly agree that the framework effectively balances these needs, indicating some level of confidence in its ability to manage competing interests among water users.

Transparency in Water Governance Decisions in Kerala

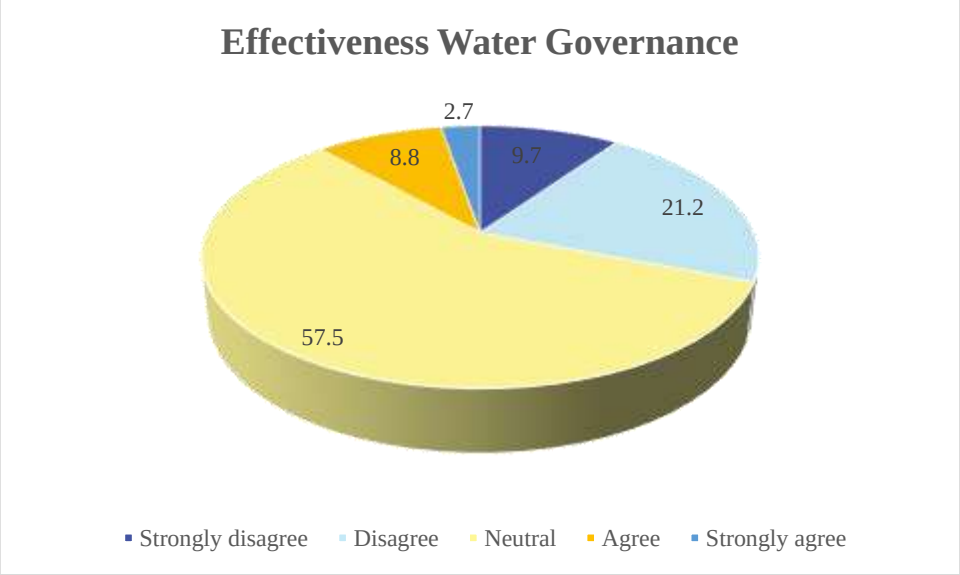
Transparency Governance Decisions	Frequency	Percentage
Strongly disagree	15	13.3
Disagree	24	21.2
Neutral	66	58.4
Agree	4	3.5
Strongly agree	4	3.5
Total	113	100.0



The survey responses from 113 participants regarding the transparency of water governance decisions in Kerala reveal diverse perceptions. A minority, consisting of 15 respondents (13.3%) who strongly disagree and 24 respondents (21.2%) who disagree, express dissatisfaction with how transparently these decisions are communicated to the public. The majority, comprising 66 respondents (58.4%), remain neutral, indicating uncertainty or a lack of strong opinion on the transparency of communication. Conversely, 4 respondents (3.5%) agree and an equal number of 4 respondents (3.5%) strongly agree that water governance decisions are transparently communicated, suggesting some level of confidence in the openness of communication channels.

Effectiveness of Water Governance in Kerala

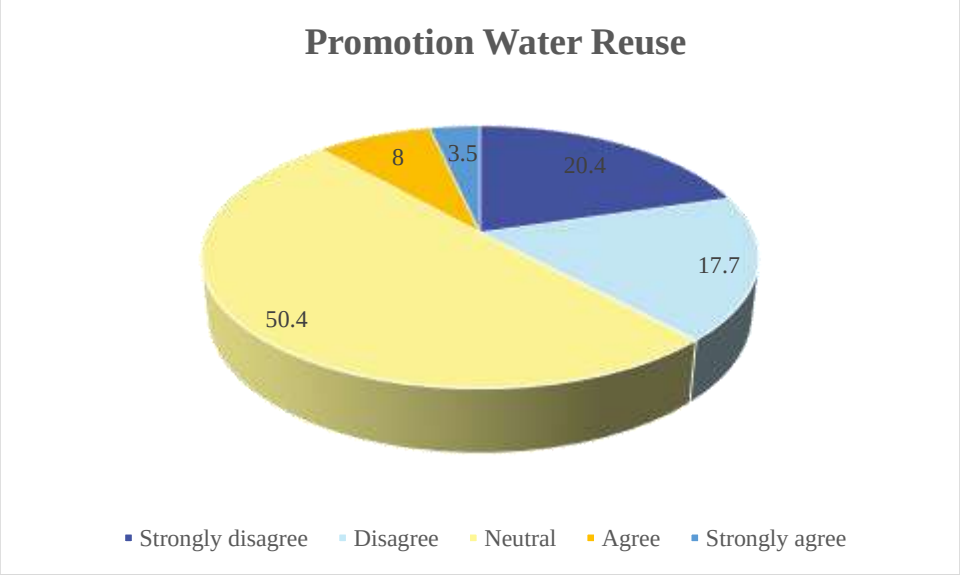
Effectiveness Water Governance	Frequency	Percentage
Strongly disagree	11	9.7
Disagree	24	21.2
Neutral	65	57.5
Agree	10	8.8
Strongly agree	3	2.7
Total	113	100.0



The survey results among 113 respondents regarding the effectiveness of water governance in Kerala in ensuring water security reflect varied perspectives. Some participants, comprising 11 respondents (9.7%) who strongly disagree and 24 respondents (21.2%) who disagree, express significant concerns about the effectiveness of current governance practices in safeguarding water security. The majority, comprising 65 respondents (57.5%), remain neutral, suggesting uncertainty or a lack of strong opinion on whether the governance measures adequately ensure water security. Conversely, 10 respondents (8.8%) agree and 3 respondents (2.7%) strongly agree that water governance in Kerala is effective in ensuring water security, indicating some confidence in the governance framework's ability to address these challenges.

Promotion of Water Reuse in Kerala

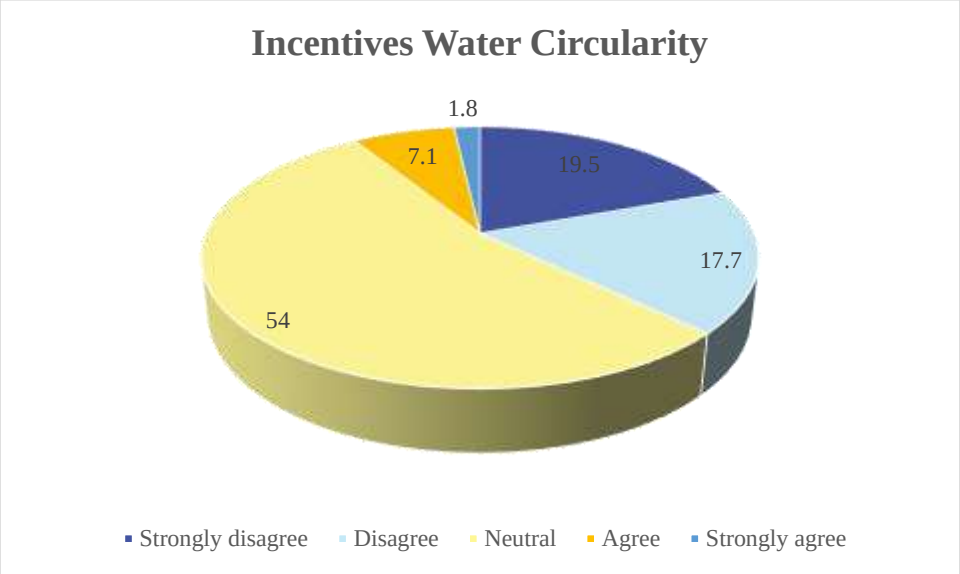
Promotion Water Reuse	Frequency	Percentage
Strongly disagree	23	20.4
Disagree	20	17.7
Neutral	57	50.4
Agree	9	8.0
Strongly agree	4	3.5
Total	113	100.0



The survey responses from 113 participants regarding the promotion and implementation of water reuse and recycling practices across sectors in Kerala reveal mixed perceptions. A significant segment, including 23 respondents (20.4%) who strongly disagree and 20 respondents (17.7%) who disagree, indicates dissatisfaction with current efforts. Meanwhile, a majority of 57 respondents (50.4%) remain neutral, suggesting uncertainty or a lack of strong opinion on the effectiveness of these practices. Conversely, 9 respondents (8.0%) agree and 4 respondents (3.5%) strongly agree that water reuse and recycling practices are effectively promoted and implemented, indicating some confidence in the initiatives undertaken.

Incentives for Water Circularity in Kerala

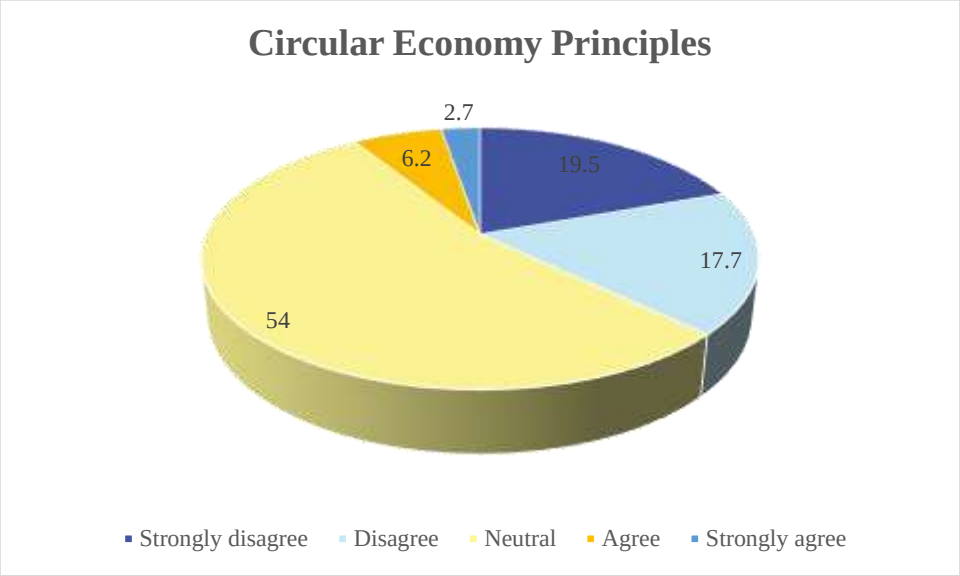
Incentives Water Circularity	Frequency	Percentage
Strongly disagree	22	19.5
Disagree	20	17.7
Neutral	61	54.0
Agree	8	7.1
Strongly agree	2	1.8
Total	113	100.0



The survey responses from 113 participants regarding the presence of sufficient incentives and policies to encourage industries and municipalities in Kerala to adopt water circularity practices show varied viewpoints. A significant portion, comprising 22 respondents (19.5%) who strongly disagree and 20 respondents (17.7%) who disagree, indicates dissatisfaction with the current incentives and policies. The majority, consisting of 61 respondents (54.0%), remain neutral, suggesting uncertainty or a lack of strong opinion on whether these incentives and policies are adequate. On the other hand, 8 respondents (7.1%) agree and 2 respondents (1.8%) strongly agree that there are sufficient incentives and policies in place, indicating some level of confidence in the effectiveness of existing measures.

Adoption of Circular Economy Principles in Water Management in Kerala

Circular Economy Principles	Frequency	Percentage
Strongly disagree	22	19.5
Disagree	20	17.7
Neutral	61	54.0
Agree	7	6.2
Strongly agree	3	2.7
Total	113	100.0



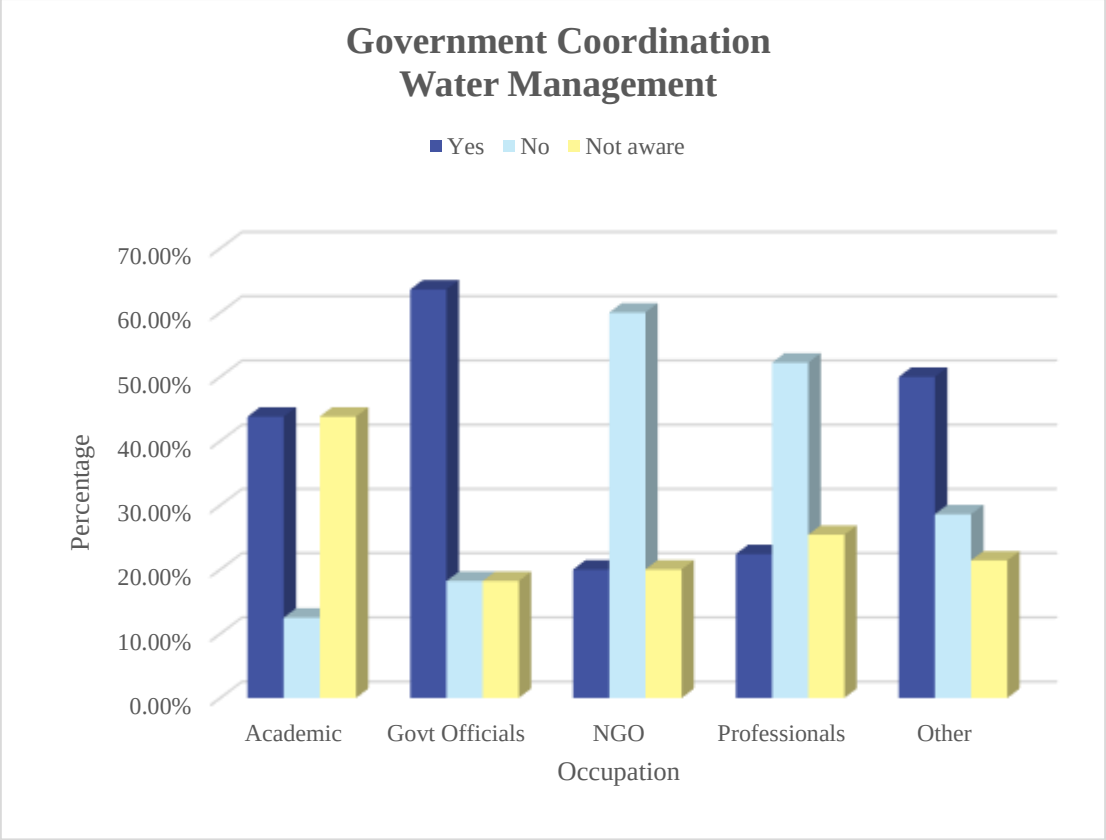
The survey responses from 113 participants regarding whether the current water management framework in Kerala encourages the efficient use and conservation of water resources through circular economy principles reveal varied perspectives. A significant number of respondents, comprising 22 respondents (19.5%) who strongly disagree and 20 respondents (17.7%) who disagree, indicate dissatisfaction with the framework's promotion of circular economy principles. The majority, consisting of 61 respondents (54.0%), remain neutral, suggesting uncertainty or a lack of strong opinion on whether circular economy principles are effectively integrated into water management practices. Conversely, 7 respondents (6.2%) agree and 3 respondents (2.7%) strongly agree that the framework encourages efficient water use and conservation through circular economy principles, indicating some confidence in its effectiveness.

CHI-SQUARE TEST FOR ASSOCIATION

INTER-DEPARTMENTAL COORDINATION

			Government Coordination Water Management				Chi-square value	P value
			Yes	No	Not aware	Total		
Occupation	Academic	Frequency	7	2	7	16	17.491	0.025
		Percentage	43.8%	12.5%	43.8%	100.0%		
	Govt Officials	Frequency	7	2	2	11		
		Percentage	63.6%	18.2%	18.2%	100.0%		
	NGO	Frequency	1	3	1	5		
		Percentage	20.0%	60.0%	20.0%	100.0%		
	Professionals	Frequency	15	35	17	67		
		Percentage	22.4%	52.2%	25.4%	100.0%		
	Other	Frequency	7	4	3	14		
		Percentage	50.0%	28.6%	21.4%	100.0%		
Total		Frequency	37	46	30	113		
		Percentage	32.7%	40.7%	26.5%	100.0%		

The table provides insight into the perceptions of various occupational groups regarding the coordination among different levels of government for water management in Kerala. Academics are divided, with 43.8% believing in coordination and an equal percentage being unaware. Government officials predominantly believe there is coordination (63.6%), while NGO respondents largely think there is no coordination (60.0%). Among professionals, 52.2% believe there is no coordination, and a significant portion are unaware (25.4%). The 'Other' category shows that half of the respondents (50.0%) believe coordination exists. The chi-square value of 17.491 and a p-value of 0.025 indicate a statistically significant association between occupation and perception of government coordination in water management. **This analysis reveals that perceptions of coordination in water management in Kerala vary significantly across different occupational groups.**

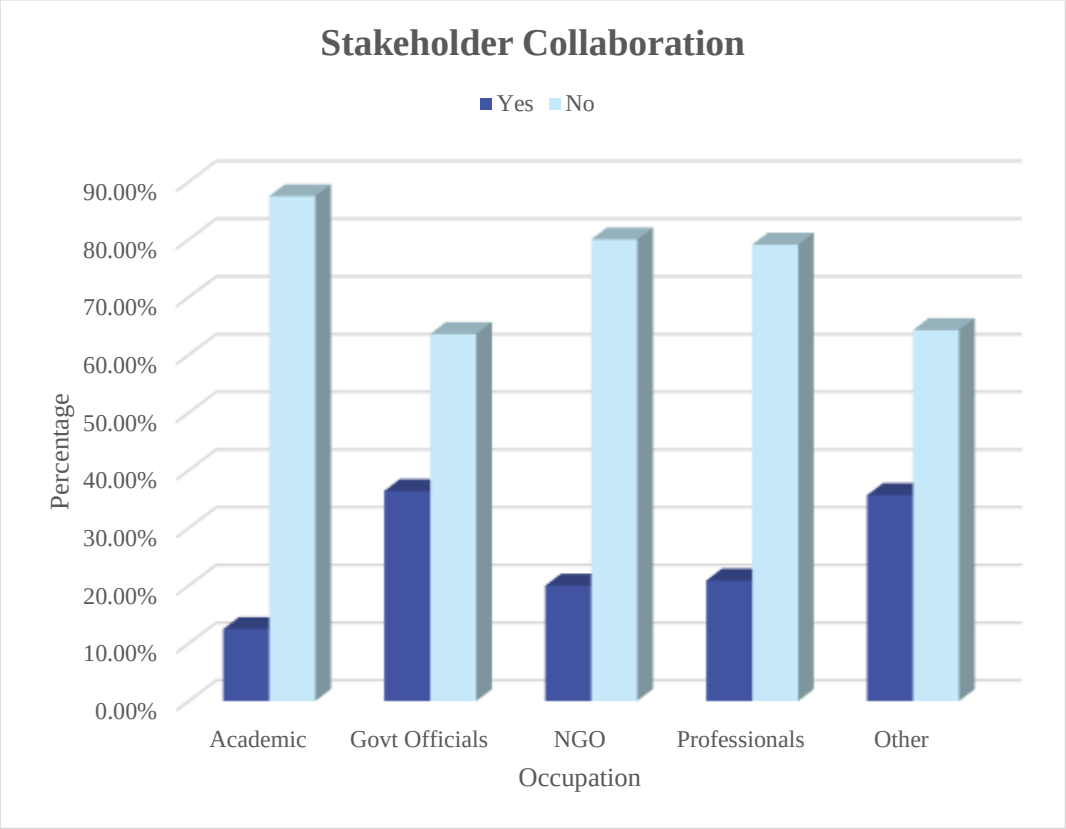


STAKEHOLDERS ENGAGEMENT

1. **Stakeholder Collaboration*Occupation**

			Stakeholder Collaboration		Total	Chi-square value	P value
			Yes	No			
Occupation	Academic	Frequency	2	14	16	3.575	0.467
		Percentage	12.5%	87.5%	100.0 %		
	Govt Officials	Frequency	4	7	11		
		Percentage	36.4%	63.6%	100.0 %		
	NGO	Frequency	1	4	5		
		Percentage	20.0%	80.0%	100.0 %		
	Professionals	Frequency	14	53	67		
		Percentage	20.9%	79.1%	100.0 %		
	Other	Frequency	5	9	14		
		Percentage	35.7%	64.3%	100.0 %		
Total		Frequency	26	87	113		
		Percentage	23.0%	77.0%	100.0 %		

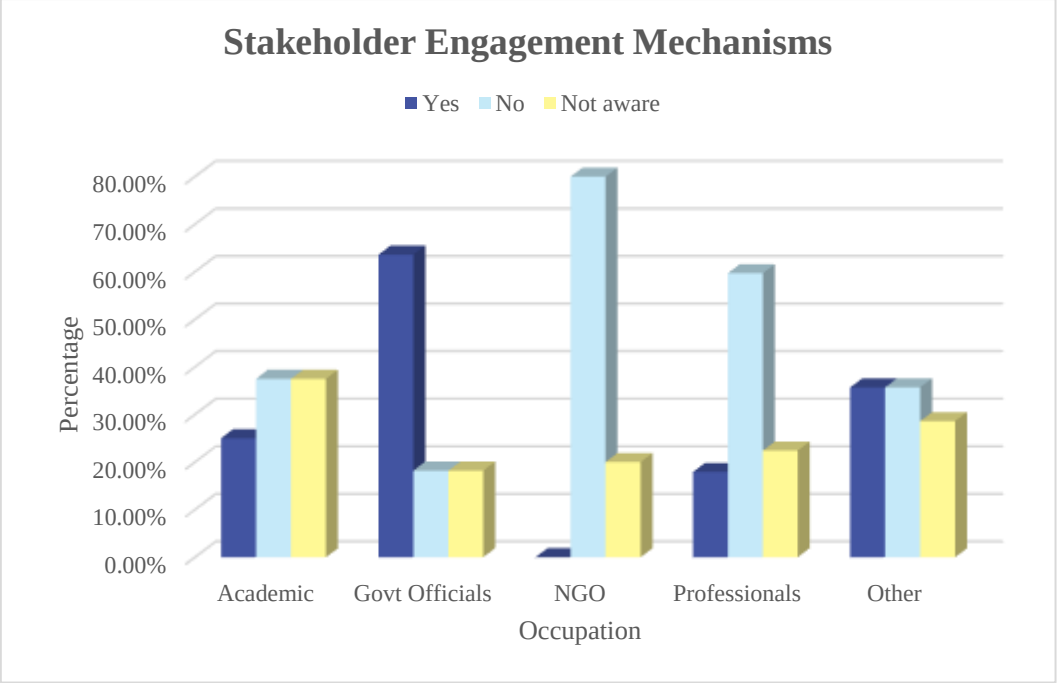
From the above table, a Chi-square test was performed to assess if there is a significant difference in collaboration across these groups, resulting in a chi-square value of 3.575 and a p-value of 0.467. With a p-value greater than 0.05, we conclude there is no statistically significant difference in collaboration for aquifer management among the stakeholder groups. **The data suggests a generally low level of collaboration across all occupational groups surveyed, indicating that while some stakeholders report collaboration, overall, it needs to be consistently practised across all groups involved in aquifer management in Kerala.**



2. Stakeholder Engagement Mechanisms*Occupation

			Stakeholder Engagement Mechanisms				Chi-square value	P value
			Yes	No	Not aware	Total		
Occupation	Academic	Frequency	4	6	6	16	16.821	0.032
		Percentage	25.0%	37.5%	37.5%	100.0%		
	Govt Officials	Frequency	7	2	2	11		
		Percentage	63.6%	18.2%	18.2%	100.0%		
	NGO	Frequency	0	4	1	5		
		Percentage	0.0%	80.0%	20.0%	100.0%		
	Professionals	Frequency	12	40	15	67		
		Percentage	17.9%	59.7%	22.4%	100.0%		
	Other	Frequency	5	5	4	14		
		Percentage	35.7%	35.7%	28.6%	100.0%		
Total		Frequency	28	57	28	113		
		Percentage	24.8%	50.4%	24.8%	100.0%		

From the above table, a Chi-square test was conducted to determine if there is a significant difference in awareness of stakeholder engagement mechanisms across these groups. The test yielded a chi-square value of 16.821 and a P-value of 0.032. With a p-value less than 0.05, we conclude that there is a statistically significant difference in awareness of stakeholder engagement mechanisms among the stakeholder groups. Specifically, the data indicates that awareness levels vary significantly across different occupational groups. Government Officials show the highest level of awareness (63.6%), followed by Academics (25.0%) and Others (35.7%). Professionals and NGOs exhibit lower awareness levels (17.9% and 0.0%). **This suggests that while some stakeholders are well-informed about engagement mechanisms, there is a need for increased awareness initiatives, especially among Professionals and NGOs, to enhance stakeholder engagement in water management practices in Kerala.**


Stakeholder Engagement Mechanisms
Yes
No
Not aware
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage
Academic
Govt Officials
NGO
Professionals
Other
Occupation

KRUSKAL-WALLIS TEST FOR SIGNIFICANT DIFFERENCES IN MEAN RATINGS OF WATER MANAGEMENT KEY TERMS ACROSS OCCUPATIONS

1. WATER QUALITY

WATER QUALITY	Occupation	N	Mean	Std. dev	F	P value
Water Quality Satisfaction	Academic	16	2.31	.873	2.933	0.569
	Govt Officials	11	2.09	.831		
	NGO	5	2.60	.548		
	Professionals	67	2.42	.907		
	Other	14	2.14	.770		
	Total	113	2.35	.864		
Overall Water Quality Rating	Academic	16	3.19	.655	12.892	0.012
	Govt Officials	11	3.55	.820		
	NGO	5	2.80	.447		
	Professionals	67	2.91	.733		
	Other	14	3.50	.760		
	Total	113	3.08	.758		
Effectiveness Water Monitoring	Academic	16	3.00	.816	13.710	0.008
	Govt Officials	11	3.18	1.250		
	NGO	5	1.60	.894		
	Professionals	67	2.73	.790		
	Other	14	3.21	1.051		
	Total	113	2.82	.928		
Concerns Health Environmental Hazards	Academic	16	2.94	1.237	6.004	0.199
	Govt Officials	11	2.64	1.286		
	NGO	5	2.40	1.517		
	Professionals	67	2.15	1.317		
	Other	14	2.71	1.437		
	Total	113	2.39	1.339		
Surveillance Frequency	Academic	16	2.63	.719	3.446	0.486
	Govt Officials	11	2.82	1.328		
	NGO	5	2.40	1.342		
	Professionals	67	3.00	.739		

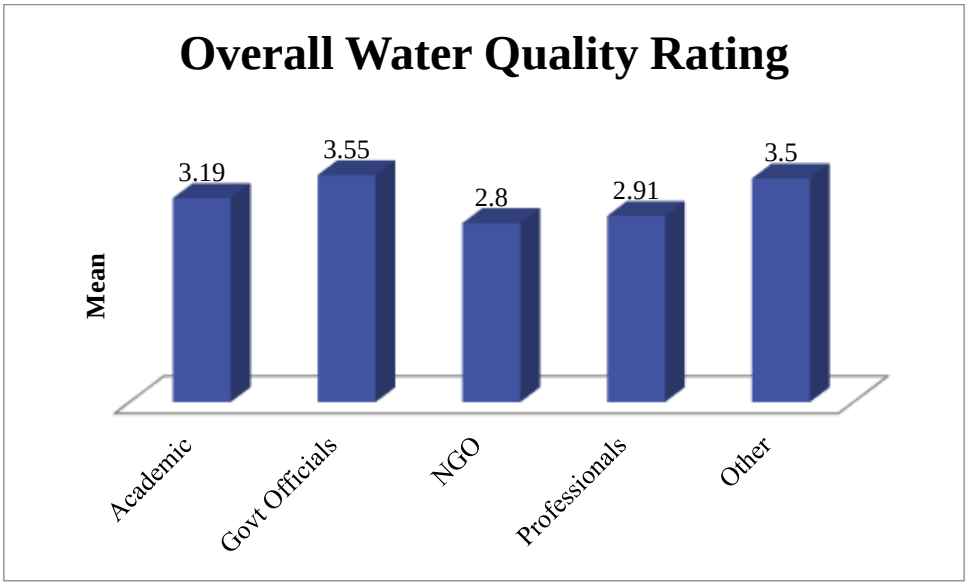
	Other	14	3.00	.784		
	Total	113	2.90	.845		
Observation Foul Odours	Academic	16	2.81	.544	3.741	0.442
	Govt Officials	11	3.09	.944		
	NGO	5	2.60	.548		
	Professionals	67	2.73	.880		
	Other	14	3.21	1.122		
	Total	113	2.83	.875		
Visible Signs Contamination	Academic	16	2.06	.443	5.496	0.240
	Govt Officials	11	2.45	.688		
	NGO	5	2.00	.707		
	Professionals	67	2.03	.674		
	Other	14	2.43	.852		
	Total	113	2.12	.683		

From the above table, we can conclude the following.

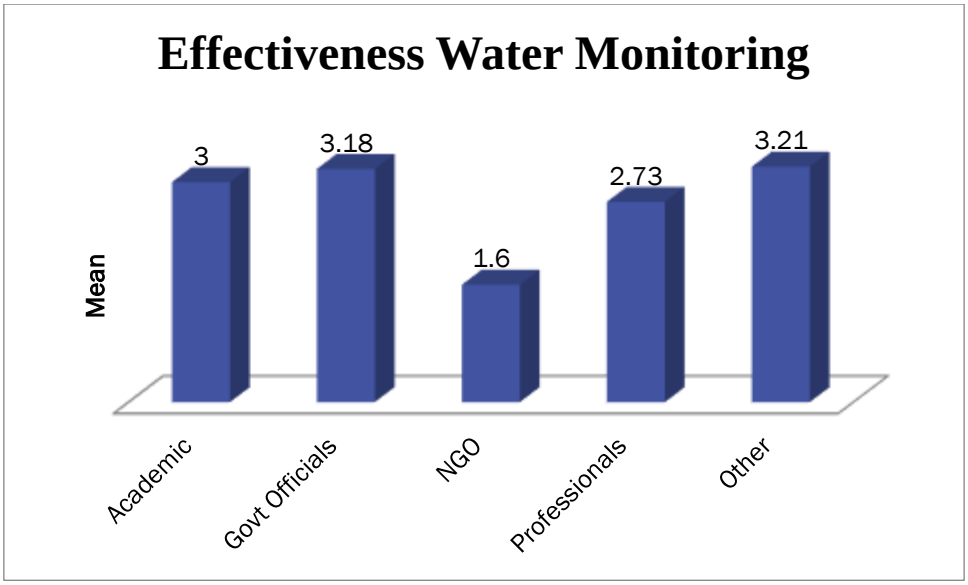
The Kruskal-Wallis test shows that the water quality satisfaction among the respondents having different occupations has a P-value (0.569) much higher than the significance level (0.05**).** This indicates that the mean satisfaction scores for water quality do not significantly differ based on occupation. This suggests that perceived satisfaction with water quality is consistent across different occupational groups, including academics, government officials, NGO workers, professionals, and others. **The lack of significant differences suggests that interventions or improvements in water quality would likely be perceived similarly across these occupational groups.** This uniformity can be advantageous for policymakers, as targeted water quality initiatives may be something other than occupation-specific.

The Kruskal-Wallis test shows that the overall water quality rating among respondents from different occupations has a P-value (0.012) lower than the significance level (0.05). This indicates significant differences in the mean scores for the overall water quality rating based on occupation. Academics have a mean score of 3.19, government officials 3.55, NGO workers 2.80, professionals 2.91, and others 3.50. The significant differences suggest that perceptions

of overall water quality vary across these occupational groups. **Policymakers should consider these variations when designing and implementing water quality initiatives, as different strategies may be needed to address the specific concerns of each occupational group.**



The Kruskal-Wallis test shows that the effectiveness of water monitoring among respondents from different occupations has a P-value (0.008), which is lower than the significance level (0.05). This indicates significant differences in the mean scores for the perceived effectiveness of water monitoring based on occupation. Academics have a mean score of 3.00, government officials 3.18, NGO workers 1.60, professionals 2.73, and others 3.21. The significant differences suggest that perceptions of the effectiveness of water monitoring vary across these occupational groups. **Policymakers should consider these variations to develop more tailored and effective water monitoring systems that address each group's needs and concerns.**



The Kruskal-Wallis test shows that concern about health and environmental hazards among respondents from different occupations has a P-value (0.199), which is higher than the significance level (0.05). This indicates that the mean concern scores do not significantly differ based on occupation. Academics have a mean score of 2.94, government officials 2.64, NGO workers 2.40, professionals 2.15, and others 2.71. The lack of significant differences suggests that concerns about health and environmental hazards are consistent across different occupational groups. **This uniformity implies that health and environmental policies can be uniformly applied without needing to be occupation-specific.**

The Kruskal-Wallis test indicates that the surveillance frequency among respondents from different occupations has a P-value (0.486), higher than the significance level (0.05). This suggests that the mean surveillance frequency scores do not significantly differ based on occupation. Academics have a mean score of 2.63, government officials 2.82, NGO workers 2.40, professionals 3.00, and others 3.00. **The lack of significant differences implies that perceptions of surveillance frequency are consistent across different occupational groups, suggesting that all groups would similarly perceive any changes in surveillance frequency.**

The Kruskal-Wallis test shows that the visible signs of contamination among respondents from different occupations have a P-value of 0.240, higher than the significance level of 0.05. This

indicates that the mean scores for visible signs of contamination do not significantly differ based on occupation. Academics have a mean score of 2.06, government officials 2.45, NGO workers 2.00, professionals 2.03, and others 2.43. **The lack of significant differences suggests that perceptions of visible signs of contamination are consistent across different occupational groups, indicating that contamination concerns are uniformly perceived, which can streamline contamination mitigation efforts across various sectors.**

2. WATER SHORTAGE / WATER QUANTITY

	Occupation	N	Mean	Std. Deviation	F value	P value
Water Shortage Frequency	**Academic**	16	3.88	.885	1.330	0.263
	Govt Officials	11	3.73	.467		
	NGO	5	3.60	.548		
	Professionals	67	3.33	1.021		
	Other	14	3.57	1.089		
	Total	113	3.49	.965		

The Kruskal-Wallis test indicates that there is no statistically significant difference in the perceptions of water shortage frequency among different groups in the locality (P value >0.05). The mean scores provided indicate varying perceptions of water shortage frequency among different groups in the locality. Academics report the highest mean score at 3.88, suggesting they perceive water shortages or disruptions to occur relatively frequently. Government Officials and Others follow closely with mean scores of 3.73 and 3.57, respectively, indicating a significant perception of water scarcity. NGOs and Professionals perceive slightly lower frequencies at 3.60 and 3.33, respectively. These variations in perception highlight differing degrees of sensitivity and awareness among stakeholders regarding water scarcity issues. **Such perceptions are crucial for policymakers and water management authorities to consider when developing strategies to mitigate shortages, improve infrastructure resilience, and enhance water conservation efforts.**

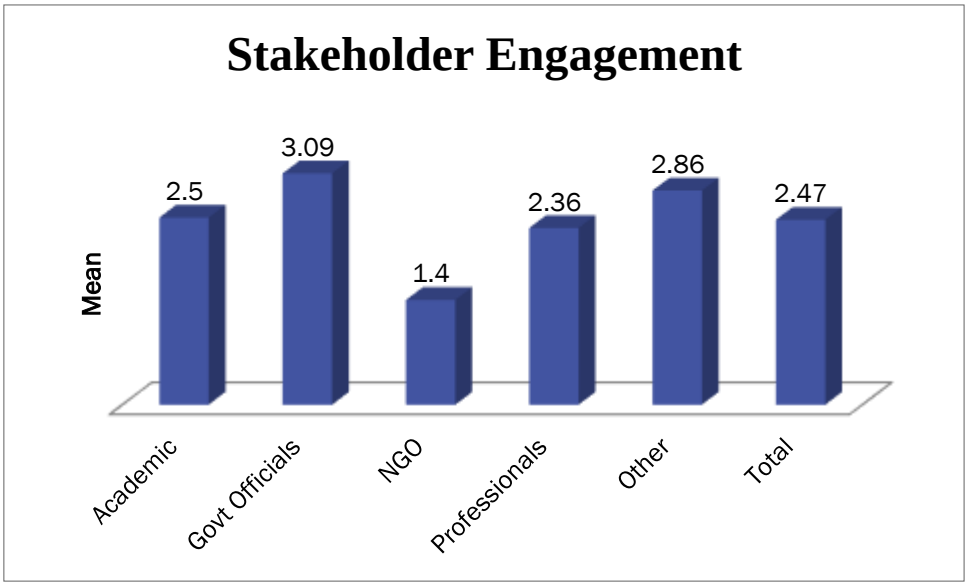
3. STAKEHOLDERS ENGAGEMENT

STAKEHOLDERS ENGAGEMENT	Occupation	N	Mean	Std. dev	F	P value
Stakeholder Engagement	Academic	16	2.50	1.366	11.212	0.024
	Govt Officials	11	3.09	1.221		
	NGO	5	1.40	.894		
	Professionals	67	2.36	.995		
	Other	14	2.86	1.027		
	Total	113	2.47	1.111		
Cooperation Among Stakeholders	Academic	16	2.88	.806	7.888	0.096
	Govt Officials	11	3.09	1.300		
	NGO	5	2.40	.894		
	Professionals	67	2.51	.877		
	Other	14	3.07	.730		
	Total	113	2.68	.919		
Transparency Faecal Sludge Governance	Academic	16	2.94	.854	4.606	0.330
	Govt Officials	11	2.91	1.221		
	NGO	5	2.40	.894		
	Professionals	67	2.51	.842		
	Other	14	2.64	.745		
	Total	113	2.62	.880		

From the above table, we can conclude the following.

The Kruskal-Wallis test shows that stakeholder engagement among respondents from different occupations has a P-value of 0.024, lower than the significance level of 0.05. This indicates that the mean scores for stakeholder engagement significantly differ based on occupation. Academics have a mean score of 2.50, government officials 3.09, NGO workers 1.40,

professionals 2.36, and others 2.86. **The significant differences suggest that perceptions of stakeholder engagement vary across different occupational groups, indicating a need for occupation-specific strategies to improve engagement efforts effectively.**



The Kruskal-Wallis test shows that cooperation among stakeholders among respondents from different occupations has a P-value of 0.096, higher than the significance level of 0.05. This indicates that the mean scores for stakeholder cooperation do not significantly differ based on occupation. Academics have a mean score of 2.88, government officials 3.09, NGO workers 2.40, professionals 2.51, and others 3.07. **The lack of significant differences suggests that perceptions of cooperation among stakeholders are relatively consistent across different occupational groups, indicating a generally uniform view of the state of stakeholder cooperation, which can help formulate broad-based cooperative strategies.**

The Kruskal-Wallis test shows that transparency in faecal sludge governance among respondents from different occupations has a P-value of 0.330, higher than the significance level of 0.05. This indicates that the mean scores for transparency in faecal sludge governance do not significantly differ based on occupation. Academics have a mean score of 2.94, government officials 2.91, NGO workers 2.40, professionals 2.51, and others 2.64. **The lack**

of significant differences suggests that perceptions of transparency in faecal sludge governance are consistent across different occupational groups, implying that any transparency-related improvements or policies will likely be received similarly across these groups.

4. DATA MANAGEMENT

DATA MANAGEMENT	Occupation	N	Mean	Std. dev	F	P value
Monitoring Reliability	Academic	16	2.88	1.360	1.047	0.903
	Govt Officials	11	2.91	1.446		
	NGO	5	2.40	1.673		
	Professionals	67	2.75	1.106		
	Other	14	2.64	1.336		
	Total	113	2.75	1.214		
Accessibility Water Data	Academic	16	2.75	.683	0.684	0.953
	Govt Officials	11	2.82	1.250		
	NGO	5	2.60	.548		
	Professionals	67	2.64	.811		
	Other	14	2.64	.745		
	Total	113	2.67	.818		
Data Sharing Collaboration	Academic	16	2.81	.750	4.520	0.340
	Govt Officials	11	2.91	1.300		
	NGO	5	2.20	.837		
	Professionals	67	2.49	.877		
	Other	14	2.71	.726		
	Total	113	2.59	.893		

From the above table, we can conclude the following.

The Kruskal-Wallis test indicates that perceptions of monitoring reliability related to data management among respondents from different occupations have a P-value of 0.903, which is higher than the significance level of 0.05. This suggests that the mean scores for monitoring reliability do not significantly differ based on occupation. Academics have a mean score of 2.88, government officials 2.91, NGO workers 2.40, professionals 2.75, and others 2.64. **The**

uniformity in perceptions across occupational groups implies that any improvements or interventions aimed at enhancing monitoring reliability in data management will likely be received similarly, facilitating uniform policy implementation and stakeholder engagement.

The Kruskal-Wallis test results for the accessibility of water data indicate a P-value of 0.953, which is well above the significance level of 0.05. This suggests that there are no significant differences in the mean scores for the accessibility of water data based on occupation. Academics have a mean score of 2.75, government officials 2.82, NGO workers 2.60, professionals 2.64, and others 2.64. **The lack of significant variation implies that perceptions of water data accessibility are consistent across various occupational groups, indicating that efforts to improve data accessibility can be broadly applied without the need for occupation-specific strategies.**

The Kruskal-Wallis test results for data-sharing collaboration show a P-value of 0.340, indicating no significant differences in the mean scores across different occupations. Academics have a mean score of 2.81, government officials 2.91, NGO workers 2.20, professionals 2.49, and others 2.71. **This lack of significant difference suggests that perceptions of data sharing and collaboration are relatively uniform across occupational groups, implying that initiatives to enhance data-sharing practices can be implemented broadly without needing occupation-specific adjustments.**

5. WATER GOVERNANCE

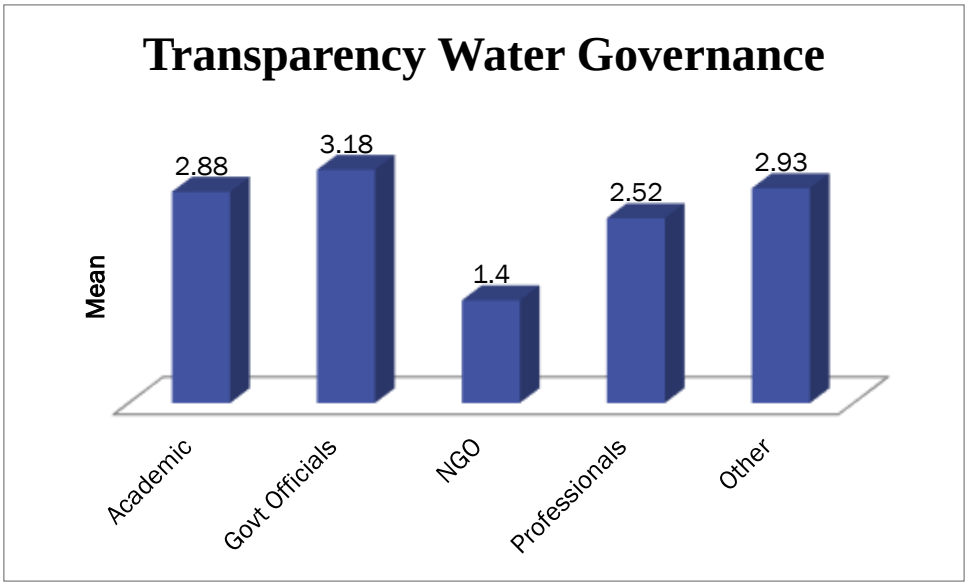
WATER GOVERNANCE	Occupation	N	Mean	Std. dev	F	P value
Water Governance Effectiveness	Academic	16	2.75	1.065	5.381	0.250
	Govt Officials	11	3.00	1.342		
	NGO	5	1.80	1.095		
	Professionals	67	2.51	.823		
	Other	14	2.57	.938		
	Total	113	2.57	.953		
Transparency Water Governance	Academic	16	2.88	.806	14.242	0.007
	Govt Officials	11	3.18	1.250		
	NGO	5	1.40	.894		
	Professionals	67	2.52	.859		
	Other	14	2.93	.730		
	Total	113	2.64	.936		
Enforcement Water Policies	Academic	16	2.75	.931	12.36	0.015
	Govt Officials	11	3.36	1.362		
	NGO	5	1.60	.894		
	Professionals	67	2.46	.910		
	Other	14	2.57	1.016		
	Total	113	2.57	1.017		
Governance Resilience Climate Change	Academic	16	2.69	.873	7.771	0.100
	Govt Officials	11	3.27	1.272		
	NGO	5	2.60	1.673		
	Professionals	67	2.36	.933		
	Other	14	2.64	1.151		
	Total	113	2.54	1.044		
Sustainability Prioritization	Academic	16	2.69	.946	9.938	0.041
	Govt Officials	11	3.18	1.250		
	NGO	5	1.80	1.095		
	Professionals	67	2.46	1.005		
	Other	14	3.00	.961		
	Total	113	2.60	1.048		
Innovation Tech Adoption	Academic	16	2.75	1.065	8.883	0.064
	Govt Officials	11	3.09	1.300		
	NGO	5	1.80	1.095		
	Professionals	67	2.52	.911		
	Other	14	3.07	.829		
	Total	113	2.65	.999		
Financial Resources Sufficiency	Academic	16	2.69	.873	9.579	0.048
	Govt Officials	11	3.09	1.300		
	NGO	5	1.60	.894		
	Professionals	67	2.43	.802		
	Other	14	2.71	.914		

	Total	113	2.53	.917		
Future Generations Consideration	Academic	16	2.75	.931	14.878	0.005
	Govt Officials	11	3.09	1.300		
	NGO	5	1.60	.894		
	Professionals	67	2.46	.841		
	Other	14	3.14	.770		
	Total	113	2.61	.949		

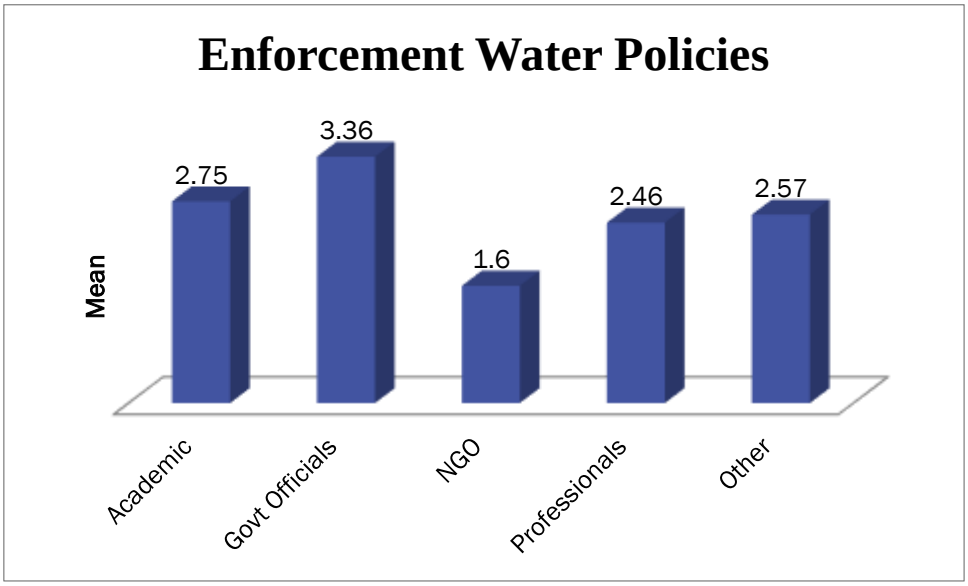
From the above table, we can conclude the following.

The Kruskal-Wallis test results for water governance effectiveness reveal a P-value of 0.250, indicating no significant differences in the mean scores across different occupations. Specifically, academics scored a mean of 2.75, government officials 3.00, NGO workers 1.80, professionals 2.51, and others 2.57. This lack of significance suggests that perceptions of water governance effectiveness are relatively consistent across occupational groups. **Policymakers and stakeholders can use this information to understand that assessments of water governance effectiveness do not vary significantly based on occupation, supporting the notion that strategies to enhance governance can be broadly implemented across various sectors without occupation-specific tailoring.**

The Kruskal-Wallis test conducted on transparency in water governance indicates a significant finding with a P-value of 0.007, which is below the typical significance level of 0.05. This suggests that perceptions of transparency in water governance differ significantly across various occupations. Specifically, academics rated transparency at 2.88, government officials at 3.18, NGO workers at 1.40, professionals at 2.52, and others at 2.93. The notable disparity highlights that government officials perceive water governance as more transparent compared to other groups, including NGOs, professionals, and academics. **This insight underscores the importance of targeted strategies to enhance transparency in water governance practices, mainly focusing on sectors where perceptions are lower, such as NGOs and professionals, to foster greater trust and accountability in water management decisions.**

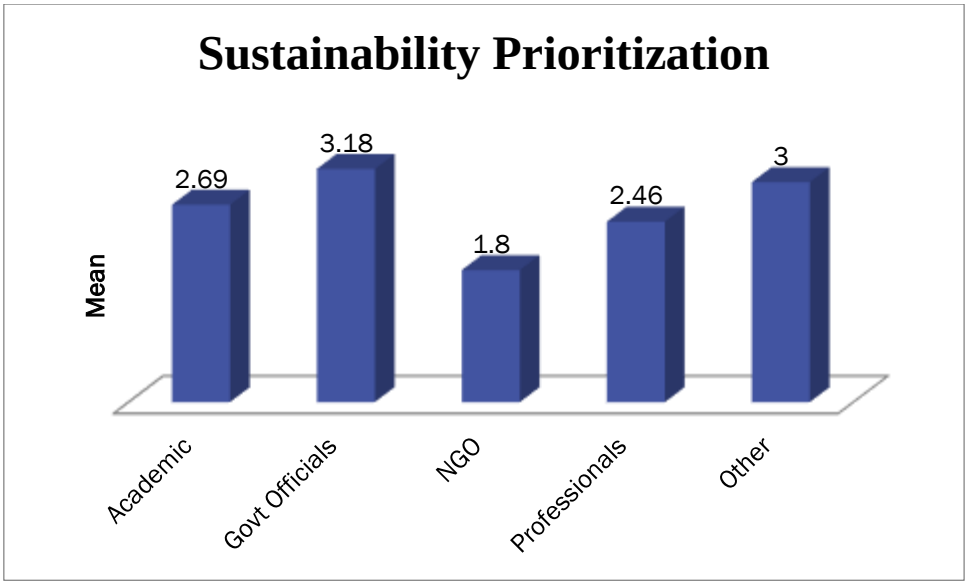


The Kruskal-Wallis test results for enforcement of water policies show a statistically significant difference among occupations, with a P-value of 0.015, indicating variability in perceptions of policy enforcement effectiveness. Government officials rated enforcement highest at 3.36, followed by professionals at 2.46, academics at 2.75, others at 2.57, and NGO workers lowest at 1.60. This disparity suggests that government officials perceive water policy enforcement more positively compared to other occupational groups. **The findings highlight a potential need for improved collaboration and communication among stakeholders to ensure consistent and effective enforcement of water policies across all sectors, aiming to address concerns and enhance compliance uniformly.**



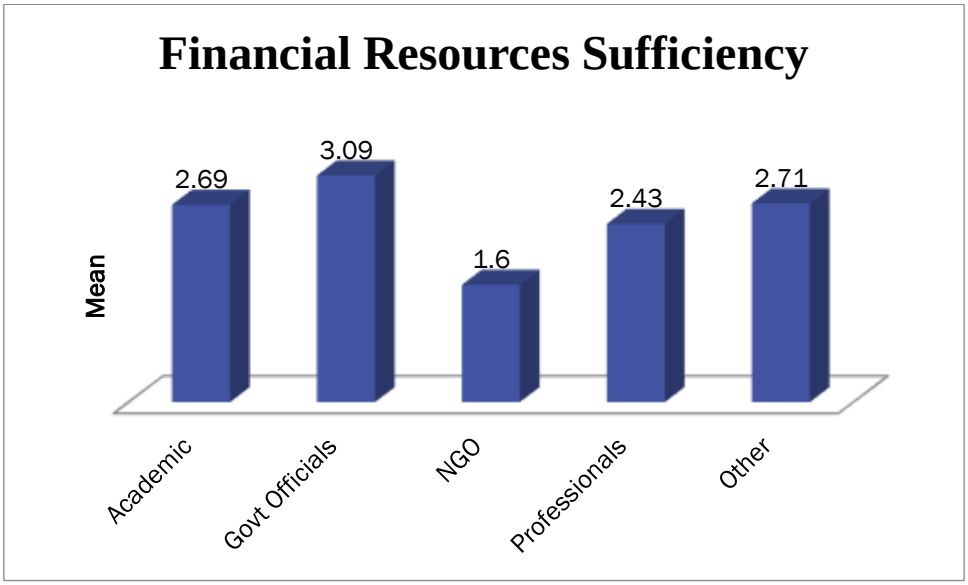
The Kruskal-Wallis test for governance resilience to climate change reveals no statistically significant difference among occupations, with a P-value of 0.100, above the conventional threshold of 0.05. This indicates that perceptions of governance resilience vary non-significantly across different occupational groups. Government officials rated resilience highest at 3.27, followed by academics at 2.69, others at 2.64, professionals at 2.36, and NGO workers lowest at 2.60. Despite the lack of statistical significance, **the varying perceptions suggest a need for enhanced collaboration and adaptive strategies among stakeholders to strengthen governance resilience to climate change uniformly across sectors.**

The Kruskal-Wallis test for sustainability prioritization indicates a statistically significant difference among occupations, with a P-value of 0.041, below the significance level of 0.05. This suggests that perceptions of prioritizing sustainability initiatives vary significantly across different occupational groups. Government officials ranked sustainability highest at 3.18, followed by others at 3.00, academics at 2.69, professionals at 2.46, and NGO workers lowest at 1.80. These differences highlight varying priorities and perceptions regarding sustainability initiatives among different sectors. **Policymakers and stakeholders should consider these insights to tailor strategies and policies that address sector-specific concerns while promoting a unified approach toward sustainability goals.**

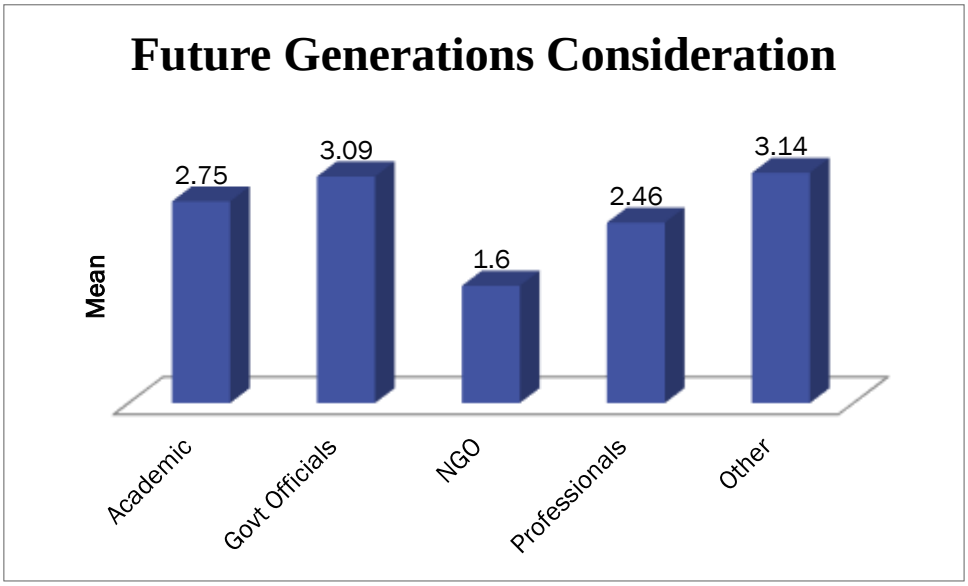


The Kruskal-Wallis test on innovation and technology adoption across different occupations yielded a P-value of 0.064, indicating no statistically significant difference among groups at the 0.05 significance level. While a trend suggests variation in adoption rates, the differences are not significant enough to reject the null hypothesis. Government officials reported the highest adoption at a mean of 3.09, followed by others at 3.07, academics at 2.75, professionals at 2.52, and NGO workers with the lowest adoption at 1.80. **This suggests that while there may be varied levels of adoption across sectors, overall perceptions regarding innovation and technology adoption are consistent across different occupational groups.**

The Kruskal-Wallis test on the sufficiency of financial resources for water governance across different occupations yielded a P-value of 0.048, marginally below the 0.05 significance level. This suggests that there may be some statistically significant differences in perceptions of financial sufficiency among occupational groups. Government officials reported the highest mean sufficiency score at 3.09, followed by others at 2.71, academics at 2.69, professionals at 2.43, and NGO workers with the lowest sufficiency score at 1.60. **These results indicate that while perceptions vary, a notable trend suggests that government officials perceive financial resources as more sufficient than other groups.**



The Kruskal-Wallis test on considering future generations in water governance across different occupations yielded a significant result with a P-value of 0.005, falling well below the 0.05 threshold. This suggests that there are significant differences in how various occupational groups perceive the consideration of future generations in water governance. Government officials reported the highest mean score at 3.09, followed by others at 3.14, academics at 2.75, professionals at 2.46, and NGO workers with the lowest score at 1.60. **These results indicate that government officials and those categorized under "other" occupations tend to prioritize future generations more highly than academics, professionals, and NGO workers.**



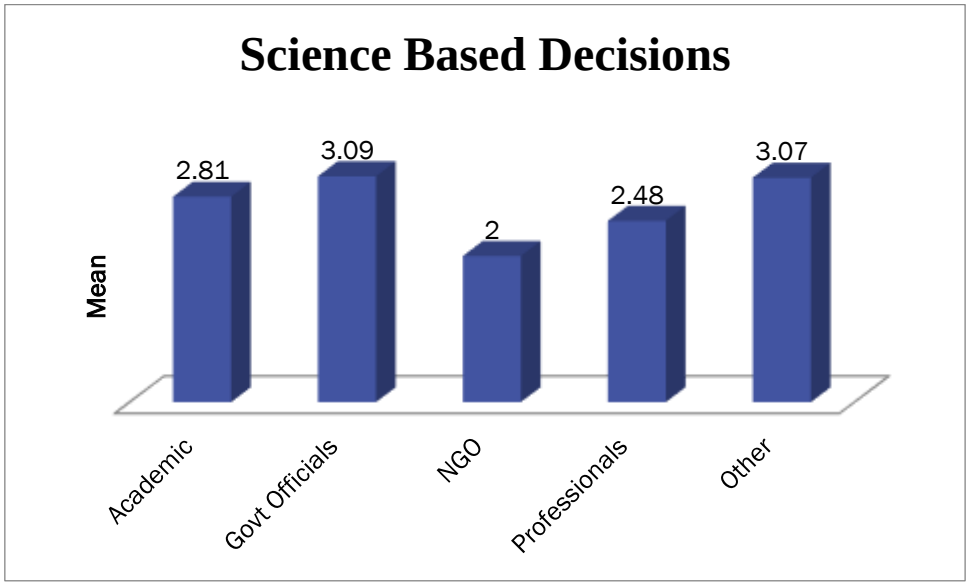
WATER GOVERNANCE	Occupation	N	Mean	Std. dev	F	P value
Science-Based Decisions	Academic	16	2.81	.981	9.568	0.048
	Govt Officials	11	3.09	1.300		
	NGO	5	2.00	1.000		
	Professionals	67	2.48	.823		
	Other	14	3.07	1.072		
	Total	113	2.64	.964		
Accountability Mechanism Failures	Academic	16	2.75	.931	16.157	0.003
	Govt Officials	11	3.27	1.272		
	NGO	5	1.40	.894		
	Professionals	67	2.34	.863		
	Other	14	2.71	.914		
	Total	113	2.50	.983		
Traditional Practices Integration	Academic	16	2.75	1.065	3.734	0.443
	Govt Officials	11	3.00	1.414		
	NGO	5	2.40	1.673		
	Professionals	67	2.52	.990		

	Other	14	2.86	.864		
	Total	113	2.64	1.061		
Cooperation Among Stakeholders	Academic	16	2.88	.806	7.888	0.096
	Govt Officials	11	3.09	1.300		
	NGO	5	2.40	.894		
	Professionals	67	2.51	.877		
	Other	14	3.07	.730		
	Total	113	2.68	.919		
Adaptability Governance Framework	Academic	16	2.81	.750	3.340	0.503
	Govt Officials	11	3.09	1.300		
	NGO	5	2.60	.894		
	Professionals	67	2.64	.773		
	Other	14	2.57	.756		
	Total	113	2.70	.833		
Gender Equality Inclusivity	Academic	16	2.81	.911	1.675	0.795
	Govt Officials	11	2.91	1.375		
	NGO	5	3.00	.707		
	Professionals	67	2.84	.863		
	Other	14	2.57	1.158		
	Total	113	2.81	.950		
Investment Water Infrastructure	Academic	16	3.00	.730	2.651	0.618
	Govt Officials	11	3.00	1.183		
	NGO	5	2.60	.548		
	Professionals	67	2.76	.906		
	Other	14	2.57	.852		
	Total	113	2.79	.891		
Protection Ecologically Sensitive Areas	Academic	16	3.00	.516	3.556	0.469
	Govt Officials	11	3.00	1.414		
	NGO	5	2.60	.548		
	Professionals	67	2.72	.867		
	Other	14	2.64	1.151		
	Total	113	2.77	.916		
Balance Needs Water Users	Academic	16	3.06	.680	4.498	0.343
	Govt Officials	11	2.82	1.328		
	NGO	5	2.60	.548		
	Professionals	67	2.63	.735		
	Other	14	2.64	.745		
	Total	113	2.71	.798		
Transparency Governance Decisions	Academic	16	2.69	.946	1.552	0.817
	Govt Officials	11	2.82	1.328		
	NGO	5	2.60	.548		
	Professionals	67	2.55	.822		
	Other	14	2.79	.893		
	Total	113	2.63	.888		
Effectiveness Water Governance	Academic	16	2.81	.834	2.749	0.601
	Govt Officials	11	3.09	1.300		

	NGO	5	2.60	.894		
	Professionals	67	2.67	.786		
	Other	14	2.71	.825		
	Total	113	2.73	.856		

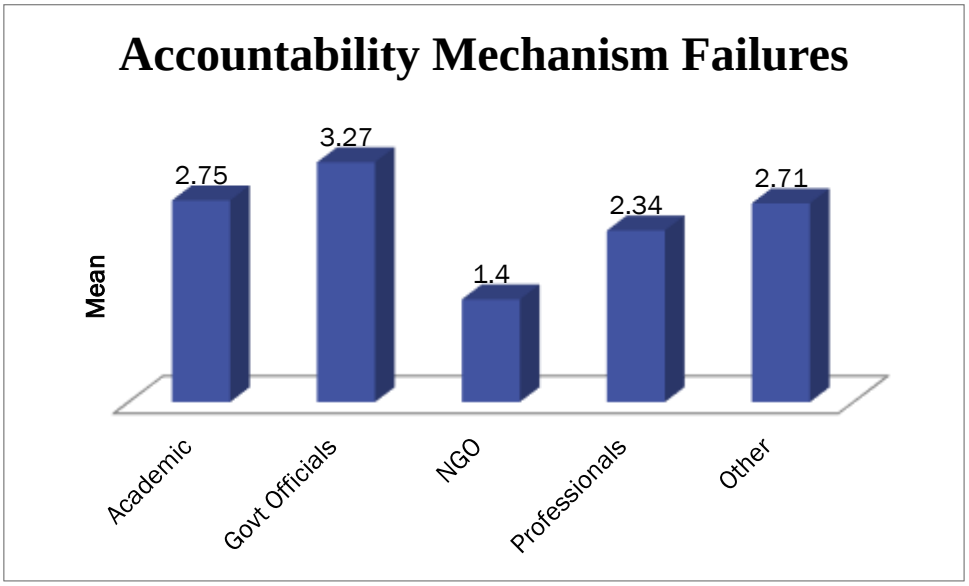
From the above table, we can conclude the following,

The Kruskal-Wallis test indicates significant differences among stakeholders regarding whether water governance decisions in Kerala are based on robust scientific evidence and data (P value < 0.05). Government Officials emerged as the group most likely to strongly agree with this statement, given their high average score of 3.09 on the scale related to science-based decisions. This suggests that Government Officials perceive water governance decisions in Kerala to be heavily influenced by robust scientific evidence and data. In contrast, other groups like Academics (average score 2.81), Professionals (average score 2.48), NGOs (average score 2.00), and Others (average score 3.07) show varying levels of agreement, with potentially less pronounced confidence in the scientific basis of these decisions compared to Government Officials. **This difference highlights the importance of addressing these perceptions to promote unity and effective water governance strategies in Kerala.**



The Kruskal-Wallis test indicates a statistically significant difference in the perceptions of accountability mechanism failures across these groups (P value < 0.05). Notably, Government

Officials have the highest average rating (3.27), suggesting that they are more likely to strongly agree that there is a clear accountability mechanism for failures in water governance. In contrast, NGOs have the lowest average rating (1.40), indicating that they are less likely to agree with this statement. The ratings from Academics (2.75), Professionals (2.34), and Others (2.71) are moderate, suggesting a more neutral perspective compared to the Government Officials. This significant variation implies that perceptions of accountability are not uniform and that Government Officials are the group most strongly agreeing that a precise accountability mechanism exists. **This highlights a potential difference in perceptions that could inform targeted governance and stakeholder engagement improvements.**



The Kruskal-Wallis test reveals different perceptions among various stakeholder groups regarding the integration of traditional water management practices into modern governance systems in Kerala. Since the p-value is more significant than the commonly accepted significance level of 0.05, we conclude that there is no statistically significant difference in the perceptions of integrating traditional water management practices among these stakeholder groups. **This suggests that variations in the average ratings are not significant enough to indicate an actual difference in opinion.**

The Kruskal-Wallis test explores perceptions of how the water governance framework in Kerala fosters cooperation and collaboration among various stakeholders. To assess whether these differences are statistically significant, yielding an F value of 7.888 and a p-value of 0.096. Since the p-value is more significant than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of cooperation and collaboration fostered by the water governance framework among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine whether these perceptions among the stakeholder groups have statistically significant differences. The test yielded an F value of 3.340 and a p-value of 0.503. Since the p-value is greater than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of the adaptability of the water governance framework among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine whether these perceptions among the stakeholder groups have statistically significant differences. The test yielded an F value of 1.675 and a p-value of 0.795. Since the p-value is more significant than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of whether the water governance framework promotes gender equality and social inclusivity among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine whether these perceptions among the stakeholder groups have statistically significant differences. The test yielded an F value of 2.651 and a p-value of 0.618. Given that the p-value is more significant than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of adequate investment in water infrastructure among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine whether these perceptions among the stakeholder groups have statistically significant differences. The test yielded an F value of 3.556 and a p-value of 0.469. Since the p-value is greater than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of whether water governance policies prioritize protecting ecologically sensitive areas and water bodies among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine whether these perceptions among the stakeholder groups have statistically significant differences. The test resulted in an F value of 4.498 and a p-value of 0.343. Since the p-value is greater than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of whether the water governance framework effectively balances the needs of different water users among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine if there are statistically significant differences in these perceptions among the stakeholder groups. The test yielded an F value of 1.552 and a p-value of 0.817. Given that the p-value is much greater than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of whether water governance decisions are transparently communicated to the public among the different stakeholder groups.**

The Kruskal-Wallis test was conducted to determine if there are statistically significant differences in these perceptions among the stakeholder groups. The test yielded an F value of 2.749 and a p-value of 0.601. Since the p-value is greater than the commonly accepted significance level of 0.05, **we conclude that there is no statistically significant difference in the perceptions of the effectiveness of water governance among the different stakeholder groups.**

REPORT ON STATISTICAL ANALYSIS OF URBAN AQUIFER AND WATER GOVERNANCE IN KERALA

Introduction:

Water governance in Kerala has emerged as a critical issue due to the state's unique geographical and climatic conditions. The region faces water scarcity, quality, and distribution challenges, making effective governance crucial for sustainable management. Kerala's diverse ecosystem and population require a governance framework that can address the needs of various stakeholders, including government officials, academics, NGO workers, professionals, and the general public. Understanding the perceptions of these different groups can provide valuable insights into the strengths and weaknesses of current water governance practices and help identify areas for improvement.

Objective:

This survey aims to gather diverse stakeholder perspectives on various aspects of water governance, including water quality, quantity, data management, stakeholder engagement, and inter-departmental coordination.

Methodology:

Sample and Data Collection

This survey gathered insights from 154 respondents from different regions of Kerala, encompassing the state's southern, central, and northern parts. After excluding 41 incomplete responses, 113 valid responses were used for the final analysis. The demographic variables considered in the survey included age, gender, occupation, and location, providing a comprehensive overview of the respondent profile.

The respondents spanned various age groups, from young adults to senior citizens, and included both male and female participants. They came from various occupational backgrounds, including government officials, academics, NGO workers, professionals, and others. This diversity was critical to understanding how perceptions of water governance might vary based on professional experiences and societal roles. Additionally, the survey captured significant geographic diversity by including respondents from Kerala's southern, central, and northern regions.

Instrumentation and Data Analysis

Data collection involved structured questionnaires designed to cover various aspects of water governance. We employed descriptive and inferential statistical tests to analyse the survey data. We summarised the responses in item-wise response tables to analyse the data, providing a

clear and organised view of stakeholder perceptions on various aspects of water governance. We used the chi-square test and the Kruskal-Wallis test to determine associations and significant differences among the different stakeholder groups.

The chi-square test assessed the associations between categorical variables, helping us understand the relationships between demographic factors and perceptions of water governance. The Kruskal-Wallis test, a non-parametric method, was used to compare the mean ranks of perceptions across different occupational groups, allowing us to identify any statistically significant differences in perceptions based on occupation.

Summary of the analysis

In this study, our primary focus was on investigating perceptions of key aspects of water governance in Kerala, specifically concerning water quality, water quantity, data management, stakeholder engagement, and inter-departmental coordination. We conducted tests and analyses to explore how these factors varied across different occupational groups.

Our study examining water quality across different occupations evaluated key aspects, including Water Quality Satisfaction, Overall Water Quality Rating, Effectiveness of Water Monitoring, Concerns about Health and Environmental Hazards, Surveillance Frequency, Observation of Foul odours, and Visible Signs of Contamination. Our analysis revealed significant differences in the overall water quality rating and effectiveness of water monitoring among occupational groups. Government officials consistently rated these aspects highest, reflecting more positive perceptions, whereas NGOs consistently rated them lower. Conversely, other aspects such as Water Quality Satisfaction, Concern about Health and Environmental Hazards, Surveillance Frequency, Observation of Foul odours, and Visible Signs of Contamination did not show statistically significant differences in mean scores across occupations.

In our analysis of stakeholder engagement concerning occupation, we investigated perceptions of stakeholders' engagement and cooperation in water management practices in Kerala. We found significant variations across occupational groups, with government officials reporting the highest mean scores and NGOs the lowest in engagement. This disparity underscores differing levels of satisfaction and involvement among stakeholders in engagement mechanisms related to water management. However, our analysis did not reveal significant differences in perceptions of cooperation among stakeholders across different occupational categories. This suggests a consistent perception of cooperation levels among government officials, academics, professionals, NGOs, and others involved in water governance.

While considering data management, we examined aspects such as monitoring reliability, accessibility of data, and data-sharing collaboration. However, our analysis did not reveal significant differences among different occupational categories in these areas. Similarly, we found no significant differences across occupational groups in assessing water quantity through questions related to water shortage frequency.

Our analysis shows a statistically significant association between occupation and perceptions of government coordination in water management in Kerala. This indicates notable variations in how occupational groups perceive inter-departmental coordination within water management. Government officials rate coordination more positively than NGOs, professionals, and academics, who generally express lower satisfaction. Understanding these disparities is crucial for developing strategies that enhance inter-departmental collaboration, improving overall effectiveness and efficiency in water management practices across the state.

Finally, in our comprehensive analysis of water governance, we evaluated critical aspects such as Transparency in Water Governance, Enforcement of Water Policies, Sustainability Prioritization, sufficient Financial Resources, and Consideration of Future Generations. Across these dimensions, significant variations were evident among occupational categories, with Government Officials consistently assigning the highest ratings, indicating robust perceptions, while NGOs consistently reported lower scores. These findings underscore the integration of occupational perspectives into developing and implementing water governance strategies. Addressing disparities in perception, mainly through enhanced transparency measures, is essential for fostering trust and accountability in water management. Furthermore, promoting stakeholder collaboration is pivotal in ensuring uniform policy enforcement and bolstering resilience to climate change across all sectors.

In addition to these aspects, our analysis covered Science-Based Decisions, Accountability Mechanism Failures, Integration of Traditional Practices, Cooperation among Stakeholders, Adaptability of Governance Framework, Gender Equality and Inclusivity, Investment in Water Infrastructure, Protection of Ecologically Sensitive Areas, Balancing the Needs of Water Users, Transparency in Governance Decisions, and Effectiveness of Water Governance. Notably, we found significant differences in how Government Officials and NGOs rated Science-Based Decisions and Accountability Mechanism Failures, with officials giving higher scores and NGOs lower ones. These differences highlight varying views on the importance of scientific evidence and accountability in water management.

Findings and Conclusions:

The main findings from the study are:

1. **Water Quality**: Significant differences in perceptions based on occupation, with government officials rating overall water quality and the effectiveness of water monitoring highest and NGO workers rating these aspects lowest; no significant differences in water quality satisfaction, concerns about health and environmental hazards, surveillance frequency, observation of foul odours, and visible signs of contamination across occupational groups.

2. **Water Quantity**: No significant differences in perceptions of water shortage frequency across different occupational groups.

3. Data Management: No significant differences in perceptions of monitoring reliability, accessibility of data, and data-sharing collaboration across occupational groups.

4. Stakeholder Engagement: Significant differences in perceptions of stakeholder engagement, with government officials rating it as highest and NGOs lowest; no significant differences in perceptions of cooperation among stakeholders across occupational groups.

5. Inter-Departmental Coordination: Significant differences in perceptions of government coordination in water management, indicating variations across different occupational groups.

6. Water Governance: Significant differences in perceptions of transparency, enforcement of policies, sustainability prioritisation, financial resources sufficiency, and consideration of future generations, with government officials rating these aspects highest and NGOs lowest.

In conclusion, this study highlights the diverse perceptions of water governance in Kerala across different occupational groups. While government officials consistently rate various aspects of water governance, such as water quality, monitoring effectiveness, stakeholder engagement, and policy enforcement, more positively, NGO workers tend to have lower perceptions in these areas. These findings indicate a need for targeted interventions to enhance transparency, collaboration, and communication in water governance, particularly among NGOs and other sectors with lower satisfaction levels.

Stakeholder Consultation on Aquifer Management and Water Governance in Kerala.

Questionnaire for Surevy

Personal Information:

Name (Optional):

Age:

Gender:

Occupation:

Location (District/Region):

Questionnaire:

1. **Are groundwater levels regularly monitored in the aquifers of your region in Kerala?**

Yes/No

2. **Is there a comprehensive understanding of the aquifer's recharge rate in your region in Kerala?**

Yes/No

3. **Are there regulations in place to limit groundwater extraction from aquifers of your region in Kerala?**

Yes/No

4. **Is there a plan in place for sustainable groundwater use in Kerala?**

Yes/No

5. **Are there any measures in place to prevent contamination of the aquifers in Kerala?**

Yes/No

6. **Are there any measures in place to prevent contamination of the aquifers in Kerala?**

Yes/No

7. **Are alternative water sources/ water circularity considered to reduce reliance on the aquifer?**

Yes/No

8. **Is there a system in place for managing conflicts over aquifer use in Kerala?**

Yes/No

9. **Is there collaboration between stakeholders for aquifer management in Kerala?**

Yes/No

10. **Are there financial incentives for sustainable aquifer management in Kerala?**

Yes/No

(Rating Scale Questions (1-5 scale, with 1 being "Strongly Disagree" and 5 being "Strongly Agree"):

11.The current aquifer management practices effectively preserve groundwater resources in Kerala.

1	2	3	4	5

12. There is sufficient government regulation to protect the aquifer from overexploitation in Kerala.

1	2	3	4	5

13. Community involvement is adequately considered in aquifer management decisions in Kerala.

1	2	3	4	5

14. The monitoring and data collection methods for the aquifer are comprehensive and reliable in Kerala.

1	2	3	4	5

15. There is a clear long-term strategy for aquifer management in place in Kerala.

1	2	3	4	5

16. The current water usage from the aquifer is sustainable for future generations in Kerala.

1	2	3	4	5

17. The aquifer management plans address potential risks such as pollution and saltwater intrusion effectively.

1	2	3	4	5

18. Stakeholders are sufficiently engaged in the decision-making processes regarding aquifer management in Kerala.

1	2	3	4	5

19. Financial resources allocated for aquifer management are adequate in the state of Kerala.

1	2	3	4	5

20. Overall, how would you rate the effectiveness of aquifer management efforts in your area?

1	2	3	4	5

Note: (1 being "Very Ineffective" and 5 being "Highly Effective")

Water Governance in Kerala:

21. Which primary source(s) do you rely on for domestic water consumption?

a. Municipal water supply

b. Well water

c. River/stream water

d. Rainwater harvesting

e. Other (please specify):

22. How satisfied are you with the quality of water provided for domestic use in your area?

a. Very satisfied

b. Satisfied

c. Neutral

d. Dissatisfied

e. Very dissatisfied

23. How frequently do you encounter water shortages or disruptions in your locality?

a. Daily

b. Weekly

c. Monthly

d. Rarely

e. Never

24. Are water management responsibilities clearly defined among relevant institutions in Kerala?

Yes/No

25. Is there a legal framework in place that supports integrated water resources management?

Yes/No

26. Does Kerala have mechanisms for stakeholder engagement in water governance decisions?

Yes/No

27. **Are there transparent mechanisms for water allocation and distribution in Kerala?**

Yes/No

28. **Is there an established system for monitoring water quality across various water sources in Kerala?**

Yes/No

29. **Are there measures in place to address water pollution and ensure water quality in Kerala?**

Yes/No

30. **Does Kerala have mechanisms to ensure water access for marginalized and vulnerable communities?**

Yes/No

31. **Are there policies or programs in place to promote water conservation and efficiency in Kerala?**

Yes/No

32. **Is there coordination among different levels of government for water management in Kerala?**

Yes/No

33. **Are there mechanisms for conflict resolution related to water issues in Kerala?**

Yes/No

34. **Is there public access to information regarding water management decisions and policies in Kerala?**

Yes/No

35. Are there initiatives to promote public awareness and education about water conservation in Kerala?

Yes/No

36**. Are there mechanisms to ensure accountability and transparency in water governance in Kerala?**

Yes/No

37. **Is there a strategy in place to address the impacts of climate change on water resources in Kerala?**

Yes/No

38. **Are there mechanisms to integrate traditional knowledge and practices into water governance in Kerala?**

Yes/No

39. **Are there regulations in place to control illegal water extraction or usage in Kerala?**

Yes/No

40. **Is there a mechanism for regular review and evaluation of water governance policies and programs in Kerala?**

Yes/No

41. **Are there initiatives to promote sustainable water use in industries and agriculture in Kerala?**

Yes/No

42. **Are there financial resources allocated specifically for water governance and management in Kerala?**

Yes/No

43**. Is there coordination between Kerala and neighbouring states on transboundary water issues?**

Yes/No

In the following Questions The Rating Scale Questions (1-5 scale, with 1 being "Strongly Disagree" and 5 being "Strongly Agree"):

44. **The current water governance framework in Kerala effectively addresses the needs of all stakeholders.**

1	2	3	4	5

45. **There is adequate transparency in water governance decisions and processes in Kerala.**

1	2	3	4	5

46. **Stakeholder participation is valued and effectively integrated into water governance in Kerala**.

1	2	3	4	5

47. Water policies and regulations in Kerala are effectively enforced.

1	2	3	4	5

48. The current water governance framework in Kerala is resilient to climate change impacts.

1	2	3	4	5

49. **Water management initiatives in Kerala prioritize long-term sustainability over short-term gains.**

1	2	3	4	5

50. **The water governance framework in Kerala encourages innovation and technology adoption for efficient water management.**

1	2	3	4	5

51. **Financial resources allocated for water governance in Kerala are sufficient to address water security challenges**.

1	2	3	4	5

52. **The water governance framework in Kerala takes into account the needs of future generations.**

1	2	3	4	5

53. **Water governance decisions in Kerala are based on robust scientific evidence and data.**

1	2	3	4	5

54. **There is a clear accountability mechanism for failures in water governance in Kerala.**

1	2	3	4	5

55. Traditional water management practices are effectively integrated into modern governance systems in Kerala.

1	2	3	4	5

56. **The water governance framework in Kerala fosters cooperation and collaboration among various stakeholders.**

1	2	3	4	5

57. On a scale of 1 to 5, how would you rate the overall quality of drinking water in Kerala? (1 being very poor, 5 being excellent)

1	2	3	4	5

58. How would you rate the effectiveness of water quality monitoring systems in Kerala in ensuring the safety of drinking water? (1 being very ineffective, 5 being highly effective)

1	2	3	4	5

59. How easily accessible do you find water quality data and reports generated by government agencies in Kerala?

- Very difficult to access
- Difficult to access
- Moderately accessible
- Accessible
- Very accessible

60. To what extent do you believe that government agencies, research institutions, and community organizations in Kerala share water quality data and collaborate on monitoring efforts?

- Very minimal sharing and collaboration
- Minimal sharing and collaboration
- Moderate sharing and collaboration
- Substantial sharing and collaboration
- Extensive sharing and collaboration

61. To what extent do you feel that public participation is encouraged in water governance decision-making processes in Kerala?

- Not encouraged at all
- Slightly encouraged
- Moderately encouraged
- Highly encouraged
- Very highly encouraged

62. How informed do you feel about participatory approaches in water quality surveillance in your locality?

- Not informed at all
- Somewhat informed
- Moderately informed
- Well-informed
- Very well-informed

63. Do you believe that participatory water quality surveillance has positively impacted to noticeable improvement of water management and governance practices in Kerala?

- Yes, significant improvements
- Yes, minor improvements
- No, negligible improvements
- No, worsened conditions
- Unsure

64. Do you believe that participatory approaches in water quality surveillance are sustainable and viable for the long-term monitoring of water resources in Kerala?

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

65. How frequently do you think surveillance and monitoring should be conducted to assess the impact of solid and liquid waste disposal on water quality?

- Daily
- Weekly
- Monthly

- Quarterly
- Annually

66. How would you rate the enforcement of regulations by government authorities regarding the treatment and disposal of solid and liquid waste to protect water quality in Kerala?

- Very poor
- Poor
- Moderate
- Good
- Very good

67. How often do you observe foul odours emanating from stormwater drains in your locality?

- Very frequently
- Occasionally
- Rarely
- Never

68. Have you noticed any visible signs of contamination of sewerage in stormwater drains?

- Yes, frequently
- Yes, occasionally
- Rarely
- Never

69. How concerned are you about the potential health hazards and environmental degradation caused by the mixing of sewerage with stormwater drains?

- Extremely concerned
- Moderately concerned
- Slightly concerned
- Not concerned at all

70. How well does the faecal sludge disposal process align with the specific guidelines outlined in national standards for sanitation and wastewater management?

(1 being very ineffective, 5 being highly effective)

1	2	3	4	5

71. How transparent is the governance structure overseeing faecal sludge management, including monitoring, enforcement, and stakeholder engagement?
(1 being very ineffective, 5 being highly effective)

1	2	3	4	5

The Rating Scale Questions (1-5 scale, with 1 being "Strongly Disagree" and 5 being "Strongly Agree"):

72. **The current water governance framework in Kerala is adaptable to changing socio-economic and environmental conditions.**

1	2	3	4	5

73. **The water governance framework in Kerala promotes gender equality and social inclusivity in water management.**

1	2	3	4	5

74. There is adequate investment in infrastructure for water storage, distribution, and treatment in Kerala.

1	2	3	4	5

75. **Water governance policies in Kerala prioritize the protection of ecologically sensitive areas and water bodies.**

1	2	3	4	5

76. **The water governance framework in Kerala effectively balances the needs of different water users.**

1	2	3	4	5

77. Water governance decisions in Kerala are transparently communicated to the public.

1	2	3	4	5

78. Overall, how would you rate the effectiveness of water governance in Kerala in ensuring water security?

1	2	3	4	5

79. **Water reuse and recycling practices are effectively promoted and implemented across sectors in Kerala.**

1	2	3	4	5

80. **There are sufficient incentives and policies in place to encourage industries and municipalities in Kerala to adopt water circularity practices.**

1	2	3	4	5

81. **The current water management framework in Kerala encourages the efficient use and conservation of water resources through circular economy principles.**

1	2	3	4	5

**********End of the Document**********