White Paper Series

Paper #2

OPINIONS & CONCERNS REGARDING SOUTH CAROLINA'S CLEAN WATER: WHO'S RESPONSIBILITY IS IT?

Institute for Clean Water and Healthy Ecosystems
Socio-Economic Working Group
University of South Carolina

Dr. Lori Pennington-Gray
Mr. Xavier Basurto
Dr. Tammi Richardson

INTRODUCTION

Water resources are essential to the socio-economic fabric and environmental sustainability of South Carolina, where the quality and management of these resources critically influence the region's development trajectory and livability. The interplay between water quality and community welfare underscores a complex challenge requiring multifaceted solutions. Gilmore and Troutman (2020) emphasize the centrality of water resource management in shaping regional futures, while Pétré et al. (2021) document the persistent chemical pollutants affecting the area's water bodies.

When individuals consider avoiding certain areas due to water quality concerns, several key issues often emerge as significant factors. Contamination with pollutants, such as industrial chemicals, agricultural runoff containing pesticides and fertilizers, and heavy metals like lead or mercury, poses serious health risks and is a primary concern. Microbial contamination from bacteria, viruses, and parasites in untreated or inadequately treated water sources can lead to a range of diseases, from gastrointestinal disturbances to severe infections. The occurrence of harmful algal blooms, fueled by nutrient pollution, generates toxins harmful to human health, aquatic life, and the environment, further discouraging use of affected areas.

Sedimentation and turbidity, resulting from high levels of sediment due to erosion, not only degrade the aesthetic appeal of water but also harm aquatic life by reducing sunlight penetration. The risk of chemical spills and industrial discharges, which can release hazardous substances into water bodies, creates acute and chronic health hazards, rendering nearby areas unsafe for activities such as drinking, swimming, or fishing. The growing concern over plastic pollution, including the accumulation of microplastics, poses threats to aquatic ecosystems and potentially to human health through bioaccumulation in the food chain.

The issue of insufficient wastewater treatment, where sewage and industrial waste are not adequately processed, leads to widespread contamination with pollutants, presenting significant risks to both human health and the environment. Overuse and depletion of water sources due to excessive withdrawal for agricultural, industrial, or domestic purposes can lead to water scarcity, impacting both quality and ecosystem health. Additionally, the presence of pharmaceuticals and personal care products in water bodies, even in trace amounts, can affect aquatic life and raise potential health concerns for humans. These multifaceted concerns underscore the complexity of water quality issues, and the reasons individuals might choose to avoid certain areas, highlighting the need for effective water management and regulatory oversight to ensure safety and protect public health.

Water quality is of paramount importance for several compelling reasons. First and foremost, it directly affects health and safety. Clean water is essential for drinking, cooking, and hygiene; consuming or using contaminated water can lead to a wide array of health issues, from acute illnesses such as gastrointestinal infections to long-term conditions like cancer or neurological disorders due to exposure to toxic chemicals or heavy metals.

Beyond personal health, water quality has significant ecological implications. Aquatic ecosystems depend on clean water to thrive. Pollution can devastate populations of fish, invertebrates, and plant life, disrupting food chains and leading to loss of biodiversity. Healthy water bodies also provide critical services like purification of water through natural processes, which in turn supports human, plant, and animal life.

Water quality is also inextricably linked to economic activities. Industries such as fishing, tourism, and agriculture rely on clean water for their operations. Poor water quality can harm these industries, leading to economic losses and affecting livelihoods. For instance, contaminated water can lead to fish kills that impact commercial fishing, or pollution can deter tourism in areas known for their natural water features.

Moreover, water quality is a matter of social justice and equity. Often, the burden of poor water quality falls disproportionately on marginalized communities that may lack the resources to access clean water or address pollution. Ensuring high water quality standards is essential for promoting fairness and protecting the most vulnerable members of society.

Finally, water is a shared resource, and its quality affects everyone in a community. Protecting water quality means not only looking after our own health and well-being but also that of our neighbors and the environment. It's about stewardship and responsibility, recognizing that our actions today influence the availability and quality of water for future generations.

Given these wide-ranging impacts, it's clear that unclean water poses a significant threat to South Carolina's public health, environment, and economy. Addressing water pollution requires coordinated efforts from government agencies, businesses, communities, and individuals to implement and enforce regulations, invest in water treatment and conservation practices, and raise public awareness about the importance of water quality. Ensuring clean water is not just about preserving natural resources; it's about protecting human health, sustaining ecosystems, and maintaining the economic well-being of the state.

The responsibility for ensuring water cleanliness in South Carolina is shared among various federal, state, and local agencies. At the federal level, the Environmental Protection Agency (EPA) sets and enforces standards for water quality and pollutants under the Clean Water Act and the Safe Drinking Water Act. Within the state, the South Carolina Department of Health and Environmental Control (SCDHEC) plays a pivotal role, overseeing water quality monitoring, issuing permits for discharges into waterways, and enforcing regulations to protect public health and the environment. Local municipalities also bear responsibility, managing water treatment facilities to provide safe drinking water to their communities and handling wastewater treatment to prevent pollution. Moreover, non-governmental organizations and community groups often contribute to efforts to protect and improve water quality through advocacy, education, and conservation projects. This shared responsibility underscores the importance of collaboration among different levels of government, the private sector, and the public to safeguard South Carolina's water resources for current and future generations.

LITERATURE REVIEW

Threat appraisal model

The Threat Appraisal Model, embedded within the Protection Motivation Theory framework, serves as a pivotal mechanism for understanding individual responses to perceived threats, particularly within health psychology. This model delineates the process through which individuals evaluate threats based on several key variables: perceived severity, perceived vulnerability, perceived response efficacy, perceived self-efficacy, and response costs. Perceived severity relates to an individual's assessment of the seriousness of a threat. Perceived vulnerability examines the likelihood of the individual being impacted by the threat, considering personal risk factors or exposure levels. The efficacy of a response is judged by perceived response efficacy, where individuals evaluate the effectiveness of certain actions in mitigating the threat, and perceived self-efficacy, which assesses one's confidence in executing these actions successfully. Lastly, response costs, though not a core component of the threat appraisal, play a crucial role in the overall evaluation process by accounting for potential barriers or costs associated with undertaking protective behaviors (Rogers, 1975; Maddux and Rogers, 1983). This comprehensive assessment of threats influences an individual's motivation towards adopting protective behaviors. The model posits that a high perception of severity and vulnerability, combined with strong beliefs in the efficacy of responses and one's ability to carry them out, encourages proactive protective measures. Conversely, high perceived costs or low efficacy beliefs may deter individuals from engaging in such behaviors. The applicability of the Threat Appraisal Model extends beyond health-related issues, finding relevance in environmental conservation efforts and safety measures, illustrating the broad utility of understanding the psychological underpinnings of threat response (Rogers, 1983; Bandura, 1977).

Responsibility Continuum for Risk Management

The responsibility continuum in risk management presents a comprehensive framework for understanding the distribution of responsibilities between individuals at risk and authoritative entities in mitigating hazards, such as natural disasters or public health emergencies. This concept outlines a spectrum from complete individual self-reliance to full dependence on central authority, offering insight into various risk management strategies (Figure 1).

Figure 1. Responsibility, Risks and Action

At one end of the continuum, the self-reliance approach emphasizes the responsibility of individuals or communities to manage their risks independently. This perspective assumes those facing risks have the necessary knowledge and resources to protect themselves effectively. An example of this approach is in outdoor activities like rock climbing, where climbers are responsible for their safety, relying on personal skills and equipment without regulatory intervention (Cvetkovich & Earle, 1991).

On the opposite end, the central authority model assigns all responsibility for risk management to government bodies or regulatory agencies. This model is predicated on the belief that centralized entities, with their comprehensive resources and expertise, are better equipped to address risks. Commercial

aviation safety, heavily regulated to ensure passenger and crew safety, exemplifies a domain where central authority predominates, and individual passengers have little role in managing their risk (Majone, 1996).

The area between these extremes represents a gradient of shared responsibility, where effective risk management results from cooperation and joint effort among all parties involved. This middle ground suggests that a combination of individual initiative and authoritative oversight can be most effective, resonating with Olson's theory of collective action that advocates for collaborative endeavors to achieve common goals (Olson, 1965). The way responsibility is framed within this continuum influences the development and implementation of risk management strategies, reflecting societal preferences for either autonomy or control. Such framing can also lead to disagreements when different societal groups adopt conflicting approaches, each backed by their rationale and assumptions about risk management (Weick, 1995). Recognizing and navigating the responsibility continuum is essential for crafting balanced risk management policies. These policies must integrate individual freedoms with the protective oversight of central authorities, facilitating dialogue and compromise. Understanding the continuum enables stakeholders to address risk management challenges effectively, respecting the diverse capabilities and viewpoints of all parties involved.

PURPOSE

This study aims to understand better the opinions and beliefs held by residents of South Carolina concerning water-related issues, responsibility attribution, perception of threats, future urgency for the state, and general water quality assessment for aesthetics and nuisances. This information can help identify the public's agenda on water issues. By comprehending public perception, stakeholders can design effective communication and education campaigns to address concerns related to water quality, potential threats, and present and future concerns. Researchers evaluated the significance of water quality and quantity to South Carolina residents. The following research objectives guided this study:

THREAT APPRAISAL

PERCEIVED SEVERITY

1. If you avoid some areas due to your concerns about water quality, what issues concern you the most? (q18)

PERCEPTION OF THREAT

2. What do you think are the biggest threats to South Carolina's fresh water supply? (q11)
3. Issues of concerned in South Carolina (q5)

KNOWLEDGE/EXPERIENCE

4. When is the last time you went to recreate near or in a body of water in South Carolina? (q16)

COPING MECHANISMS

5. The following are ideas for how South Carolina could protect and manage fresh water better. Please indicate whether you agree or disagree with each of the following ideas (Q14)

RESPONSIBILITY ATTRIBUTION

6. Who do you think is responsible or accountable for the management of clean, fresh water in South Carolina? (q13)

METHODS

The study focused exclusively on adults over the age of 18 living in South Carolina, a decision driven by the state's emphasis on water resource management during the study period. The research data was gathered

through an online questionnaire, which was modeled after the RBC Canadian Water Attitudes Study conducted in 2012, 2016, and 2017, incorporating elements from a broader investigation. To meet the study's aims, five key areas were explored in the survey: water quality concerns, the allocation of responsibility for clean water management, identification of threats to freshwater supplies, the perceived immediacy of water-related issues in the future, and evaluations of water quality in terms of aesthetic and nuisance factors.

A panel of three experts in various fields—water quality and conservation, crisis management in tourism, health and human performance with a focus on recreation and tourism, public opinion polling, and survey methodology—guided the development of the survey to ensure its reliability and validity. Participants rated their water quality concerns using a four-point Likert scale, with options ranging from no concern to great concern. To assess who should be responsible for managing clean water, a binary choice was presented, ranging from not responsible to responsible, across various stakeholders including federal, state, and municipal governments, corporations, consumers, NGOs, international commissions, or none.

The survey asked participants to choose the top three threats to freshwater from a list of eleven potential issues, such as mass water exports, illegal toxin dumping, and infrastructure inadequacies, among others. Future urgency of water issues was gauged on a six-point scale, from no urgency to much more urgent, covering fourteen different water concerns like protecting drinking water sources and managing the costs of water treatment. Additionally, the general quality of water was evaluated across twenty aesthetic and nuisance aspects using a five-point Likeness scale from very bad to very good.

The participant pool consisted of 854 South Carolinians, representing a diverse cross-section of the state's counties, ensuring comprehensive demographic coverage. The data analysis, conducted using SPSS® version 29.0.1.0, provided descriptive insights into participants' attitudes towards water concerns, responsibilities, threat perceptions, urgency of future water issues, and quality assessments.

Data collection was facilitated by Pollfish, a research firm specializing in public opinion polling through a non-probability Random Device Engagement (RDE) approach. This method employs machine learning to identify and filter out fraudulent or insincere responses, ensuring the integrity of the data. Participants were incentivized with unique non-monetary rewards to discourage permanent panel membership, and a detailed demographic analysis was performed to understand the respondent profile, which included a balanced gender distribution among participants.

The demographics of the respondents, totaling 854 individuals, showcase a diverse group. Gender-wise, females constitute 55.9% (477 respondents) while males account for 44.1% (377 respondents). Age distribution reveals that the largest group is those aged 35-44 years, representing 26.3% of the sample (225 individuals), followed by those over 54 years at 23.7% (202 individuals), and the 25-34 age bracket at 21.4% (183 individuals). The younger age groups of 18-24 and 45-54 years hold smaller portions, 14.4% (123 individuals) and 14.2% (121 individuals) respectively. In terms of education, high school graduates are the most numerous at 33.6% (287 respondents), followed by university graduates at 23.2% (198 respondents), vocational technical college graduates at 20.4% (174 respondents), and postgraduates at 19.6% (167 respondents), with middle school education being the least common at 3.3% (28 respondents).

.

Table 1: ***Demographics of Respondents***

Gender			
	Frequency	Percent	Cumulative Percent
Female	477	55.9	55.9
Male	377	44.1	100.0
Total	854	100.0	
Age			
	Frequency	Percent	Cumulative Percent
> 54	202	23.7	23.7
18 - 24	123	14.4	38.1
25 - 34	183	21.4	59.5
35 - 44	225	26.3	85.8
45 - 54	121	14.2	100.0
Total	854	100.0	
Education			
	Frequency	Percent	Cumulative Percent
High School	287	33.6	33.6
Middle School	28	3.3	36.9
Postgraduate	167	19.6	56.4
University	198	23.2	79.6
Vocational Technical College	174	20.4	100.0
Total	854	100.0	

Regarding employment status, employed individuals form the largest category at 46.5% (397 respondents), with self-employed (11.4%, 97 respondents), retired (10.5%, 90 respondents), and students (6.9%, 59 respondents) following. Other statuses, including homemakers, those unable to work, unemployed but looking, and unemployed not looking, fill out the rest of the demographics. Racially, Whites dominate the sample at 70.5% (602 individuals), with Blacks or African Americans making up 17.9% (153 individuals). Hispanics, Latinos, Asians, Arabs, Multiracial, and others make up smaller percentages, contributing to the overall diversity of the respondent pool. This demographic breakdown highlights the variety within the sample in terms of gender, age, education, employment status, and racial background

Table 1 (con't): Demographics of Respondents : Employment Status			
	Frequency	Percent	Cumulative Percent
Employed	397	46.5	46.5
Homemaker	69	8.1	54.6
Military	5	0.6	55.2
Other	28	3.3	58.4
Retired	90	10.5	69.0
Self Employed	97	11.4	80.3
Student	59	6.9	87.2
Unable To Work	43	5.0	92.3
Unemployed but Looking	60	7.0	99.3
Unemployed Not Looking	6	0.7	100.0
Total	854	100.0	
Race			
	Frequency	Percent	Cumulative Percent
Arab	4	0.5	0.5
Asian	6	0.7	1.2
Black	153	17.9	19.1
Hispanic	28	3.3	22.4
Latino	7	0.8	23.2
Multiracial	18	2.1	25.3
Other	14	1.6	26.9
Prefer Not To Say	22	2.6	29.5
White	602	70.5	100.0
Total	854	100.0	

RESULTS

1. ***RQ1. If you avoid some areas due to your concerns about water quality, what issues concern you the most? (q18)***

Tables 2, 3, and 4 provide insights into public concerns regarding water quality and its impact on personal decisions to avoid certain areas in South Carolina. These tables detail responses to three distinct concerns: the unpleasantness of water for swimming and other activities, the risk of getting sick, and the potential for long-term health effects due to poor water quality.

In Table 2, which addresses concerns about water being unpleasant for swimming and other activities, a total of 882 respondents shared their perceptions. A significant portion, 33.2% (293 respondents), expressed great concern, while 31.1% (274 respondents) indicated they were somewhat concerned. Those who were a little concerned made up 25.9% (228 respondents), and a smaller fraction, 9.9% (87 respondents), were not concerned at all. This distribution suggests that the aesthetic and recreational quality of water significantly influences people's engagement with water-based activities and their decisions to avoid certain areas.

Table 2. The water is unpleasant for swimming and other things

	N	%
It does not concern me	87	9.9%
This concerns me a little	228	25.9%
This concerns me greatly	293	33.2%
This concerns me somehow	274	31.1%

Table 3 shifts the focus to concerns about getting sick, which garnered a more pronounced reaction. Out of 882 responses, a majority of 51.6% (455 respondents) stated they were greatly concerned about the risk of illness from poor water quality, and 24.4% (215 respondents) were somewhat concerned. Those a little concerned accounted for 16.1% (142 respondents), while only 7.9% (70 respondents) were not concerned. The fear of immediate health issues from contaminated water appears to be a more pressing issue for the majority, highlighting the direct impact of water quality on public health perceptions.

Table 3. Getting sick

	N	%
It does not concern me	70	7.9%
This concerns me a little	142	16.1%
This concerns me greatly	455	51.6%
This concerns me somehow	215	24.4%

Table 4 examines concerns over long-term health effects due to poor water quality. Here, a significant majority, 53.2% (469 respondents), reported great concern, with 23.2% (205 respondents) somewhat concerned, and 13.8% (122 respondents) a little concerned. A small portion, 9.8% (86 respondents), were not concerned. This indicates a high level of anxiety about the enduring health implications of exposure to contaminated water, suggesting that the potential for chronic health conditions is a critical factor in individuals' concerns about water quality.

Table 4. Long-term health effects

	N	%
It does not concern me	86	9.8%
This concerns me a little	122	13.8%
This concerns me greatly	469	53.2%
This concerns me somehow	205	23.2%

Overall, the results reveal a clear pattern of concern among respondents about water quality in South Carolina, with a significant majority worried about both immediate and long-term health risks associated with contaminated water. The data underscores the importance of addressing water quality issues to alleviate public health concerns and to enhance the recreational appeal of water bodies in the region. These concerns also suggest a need for continued and enhanced efforts in monitoring, regulation, and communication about water quality to ensure public safety and confidence in using water resources for recreation and other activities.

2. ***What do you think are the biggest threats to South Carolina's fresh water supply? (q11)***

The data presents a revealing snapshot of public perceptions regarding the threats to fresh water supply in South Carolina. The leading concern, identified by 53.28% (471 respondents) of participants, is the illegal dumping of toxins. This indicates a widespread awareness and apprehension about the direct pollution of water bodies through illicit activities, highlighting the critical need for stringent enforcement of environmental regulations and public awareness campaigns to deter such practices.

Close behind, with 45.32% (395 respondents) expressing concern, is the run-off of pollutants from land to water. This points to an understanding of the broader ecological impacts of land use on water quality, such as agricultural run-off, urban stormwater, and other non-point sources of pollution. It underscores the necessity for integrated land and water management practices that can reduce run-off and its detrimental effects on water bodies. The wasteful use by industrial companies and individual consumers was cited by 33.26% (294 respondents) and 30.80% (275 respondents), respectively. These concerns suggest a growing consciousness about the importance of sustainable water use practices and the need for industries and individuals to adopt water conservation measures. It also reflects an understanding of the direct impact of consumption patterns on water resources and the importance of reducing waste at all levels.

Notably, 24.36% (212 respondents) pointed out the lack of knowledge about South Carolina's fresh water as a significant issue. This indicates a need for better educational programs and resources to inform the public about local water issues, conservation strategies, and the importance of maintaining clean waterways. Inadequate infrastructure and mismanagement of water by municipal, state, and federal government were also notable concerns, highlighted by 23.42% (207 respondents) and 22.48% (197 respondents), respectively. These points emphasize the need for investment in water infrastructure and effective water management policies to ensure the sustainable supply and quality of water. The legal release of toxins and mass exports of water were cited by 22.48% (198 respondents) and 18.74% (166 respondents), respectively, indicating worries about regulatory practices that may allow pollution within legal frameworks and concerns about the sustainability of water exports. Wasteful use by agriculture and harmful algal blooms in lakes, mentioned by 15.81% (142 respondents) and 10.07% (89 respondents), reflect specific agricultural practices and environmental conditions contributing to water quality issues. These concerns underscore the importance of promoting efficient water use in agriculture and addressing the ecological factors leading to algal blooms.

Table 5. What do you think are the biggest threats to South Carolina's fresh water supply

	Respondents (%)	N (N=881)
Illegal dumping of toxins	53.28%	471
Run-off of pollutants from land to water	45.32%	395
Wasteful use by industrial companies	33.26%	294
Wasteful use by individual consumers	30.80%	275
Lack of knowledge about South Carolina's fresh water	24.36%	212
Inadequate infrastructure	23.42%	207
Mismanagement of water by municipal, state and federal government	22.48%	197
The legal release of toxins	22.48%	198
Mass exports of water	18.74%	166
Wasteful use by agriculture	15.81%	142
Harmful algal blooms in lakes	10.07%	89

3. ***Below is a list of issues facing South Carolina that you might be concerned with. Please rate each on a five point scale- 1 is "not at all concerned" and 5 is "very concerned." (q5)***

The synthesis of public concerns as reflected in the data highlights a multifaceted landscape of anxieties that resonate deeply with findings from broader research. At the forefront, issues of crime and public safety command the highest level of concern, with a mean score of 3.63, underscoring a universal sentiment found in various studies that emphasize the critical impact of safety on community well-being and cohesion. This is closely followed by anxieties over the cost of food and the broader economy, both scoring above 3.5, mirroring national trends where economic stability and affordability of basic necessities remain paramount in the minds of citizens, as evidenced by research linking economic fluctuations to public health and social stability.

Healthcare and housing costs, also scoring 3.54, highlight an acute awareness of the essential nature of accessible medical care and affordable living spaces, a concern that echoes findings from literature on the social determinants of health, suggesting that these factors are integral to overall well-being. Similarly, water pollution, with a mean concern level of 3.54, reflects a growing global consciousness about the importance of environmental health, particularly clean water, which is consistently highlighted as a critical issue for sustaining life and ecosystems.

The concern for government operations, energy prices, and education, each with scores slightly above 3.5, aligns with broader discussions on the need for transparent governance, sustainable energy solutions, and quality education systems. These areas are pivotal to achieving societal progress and resilience, as suggested by numerous studies that link governance quality to environmental sustainability and educational outcomes to economic growth.

Water quality, scoring 3.48, although slightly lower, still signifies a considerable amount of concern, reinforcing the critical importance of clean water access as a fundamental human right and a cornerstone of public health, as extensively documented in environmental health research. Furthermore, the environment and poverty equity, with mean scores of 3.40 and 3.37 respectively, resonate with a global call to action as seen in sustainability and social justice research, emphasizing the interconnectedness of environmental stewardship and equitable social policies in tackling the root causes of poverty and environmental degradation.

The data also reveals concern for unemployment, flooding, and the practices of corporations, areas that underscore the complex interplay between economic security, climate change adaptation, and corporate responsibility in shaping societal outcomes. Public transportation, while receiving the lowest concern level at 3.05, still reflects an essential aspect of urban planning and sustainability, highlighting the need for efficient and accessible transport systems as part of a holistic approach to urban development.

The aggregated concerns present a clear mandate for a multi-pronged policy approach that addresses public safety, economic stability, healthcare accessibility, environmental protection, and social equity. These findings are supported by a wealth of academic and policy research that collectively underscores the urgency of addressing these issues through integrated solutions that are responsive to the nuanced needs and priorities of communities.

Table 6. Issues Facing South Carolina

Statements	Mean	Std. Dev.
Crime/Pubic safety	3.63	0.67
Cost of food	3.61	0.72
The economy	3.54	0.76
Healthcare	3.54	0.75
Housing costs	3.54	0.74
How government	3.54	0.67
Water pollution	3.54	0.78
Energy prices	3.52	0.73
Education	3.51	0.72
Water quality	3.48	0.85
Environment	3.40	0.82
Poverty equity	3.37	0.87
Unemployment	3.30	0.90
Flooding	3.25	0.88
How corporations	3.21	0.94
Public Transportation	3.05	0.94

4. When is the last time you went to recreate near or in a body of water in South Carolina? (q16)

Table 7 reveals insights into the recreational habits of individuals in relation to bodies of water, highlighting how recently people have engaged with aquatic environments for leisure activities. The data indicates that a significant portion of the respondents, 45%, have participated in recreational activities in or near a body of water less than a year ago, suggesting a strong affinity or access to such environments for leisure or enjoyment within the last year. This is a considerable majority, reflecting an ongoing engagement with water-based recreational activities.

On the other hand, 34.7% of the respondent's report that it has been more than a year since they last engaged in recreational activities in or near a body of water. This group represents a substantial fraction of the population that, for various reasons, may have limited access, opportunity, or inclination to engage with water-based recreational settings, which could be due to geographical, economic, or personal barriers. The data also shows that 11.1% of the individuals surveyed have never participated in recreational activities in or near a body of water, pointing to a notable segment of the population that is entirely disconnected from such experiences. This disconnection could stem from a range of factors, including but not limited to, lack of interest, access issues, or perhaps even concerns related to water quality or safety.

Table 7. When was the last time you went to recreate in or near a body of water.

	N	%
Less than a year ago	397	45.0%
More than a year ago	306	34.7%
Never	98	11.1%
Missing	81	9.2%

5. ***The following are ideas for how South Carolina could protect and manage fresh water better. Please indicate whether you agree or disagree with each of the following ideas (Q14)***

Table 8 illustrates the varied opinions regarding the management and protection of fresh water, suggesting a complex public perspective on environmental policy and regulation. There is significant support for implementing stricter rules and standards for water use by industries and municipalities, with a combined 75.9% of respondents either strongly or somewhat agreeing with this approach. This indicates a strong public desire for more stringent regulatory oversight of water consumption by major users.

The notion that commercial enterprises should fully cover the costs associated with water delivery and treatment also receives considerable backing, with 75.1% of respondents showing support. This reflects a widespread belief in the principle that businesses should be financially responsible for their environmental impact. However, when it comes to the specific proposal of requiring licenses for commercial groundwater use, the responses show a notable division, with a high percentage of respondents (38.9%) expressing uncertainty, and 35.4% somewhat disagreeing. This indicates a lack of consensus or awareness regarding the need for such regulatory measures.

The idea of making water management decisions more science-informed has a plurality of respondents unsure of their stance, combined with a significant portion somewhat disagreeing, suggesting a gap in public understanding or trust in the role of scientific research in policy formulation. Similarly, there's uncertainty about the necessity for industries and municipalities to monitor and report all water use, with a considerable percentage of participants unsure of their position. Concerning the financial aspects of water services, there's a consensus leaning towards the inclusion of the full costs of water delivery, sewage, and treatment in consumer water bills, although a significant number remain undecided. This suggests an acknowledgment of the real expenses involved in water provision, tempered by reservations about the practicality and fairness of such pricing strategies.

The proposal to increase charges for household water use as a conservation measure reveals mixed feelings, with a notable portion of respondents supportive, yet a significant number unsure. This highlights the complexity of public attitudes towards economic incentives for environmental conservation, indicating both recognition of their potential effectiveness and concern over their broader implications. Overall, Table 8 captures the nuanced public sentiment on freshwater management and protection, revealing broad agreement on the need for stronger regulation and financial accountability for water use, alongside notable uncertainty and skepticism regarding some specific policy proposals. This complexity underscores the importance of engaging the public in informed discussions on environmental policy and ensuring that such policies are clearly communicated and effectively implemented.

Table 8. How to manage and protect fresh water	Do not Know		Somewhat agree		Somewhat disagree		Strongly agree		Strongly disagree	
	N	%	N	%	N	%	N	%	N	%
Water management decisions should be better informed by science	368	41.7	88	10.0	312	35.4	42	4.8	72	8.2
Commercial enterprises should have to obtain licenses for groundwater use	343	38.9	110	12.5	312	35.4	45	5.1	72	8.2
We should require industry and municipalities to monitor and report all water use	341	38.7	94	10.7	250	39.7	33	3.7	64	7.3
Water costs for consumers should include the full costs of water delivery, sewage, and treatment	308	34.9	134	15.2	253	28.7	97	11.0	90	10.2
We should charge more for household water use to encourage Conservation	247	28.0	163	18.5	175	19.5	239	27.1	58	6.6
We should develop stricter rules and standards to manage water use by industry and municipalities	73	8.3	342	38.8	86	9.8	327	37.1	54	6.1
Commercial enterprises should pay for the full costs of delivering and treating all the water they use	70	7.9	349	39.6	88	10.0	313	35.5	62	7.0

6. ***Who do you think is responsible or accountable for the management of clean, fresh water in South Carolina? (q13)***

Table 9 reveals a comprehensive overview of public opinion regarding the entities perceived as responsible for the management and protection of water resources. The data suggest a strong consensus among respondents on the importance of various stakeholders in ensuring water quality and sustainability, with state government leading as the most recognized responsible party (88.7%). This high percentage underscores the public's expectation for state-level leadership in environmental stewardship and policy implementation.

Following closely, corporations are seen as the second most accountable group (79.7%), reflecting a growing awareness of the environmental impact of corporate activities and a demand for corporate social responsibility in water management. The acknowledgment of municipal governments (75.9%) and consumers (74.5%) as significant contributors to water management issues highlights a recognition of the shared responsibility across different levels of society, from local governance to individual actions. The federal government is also identified as a key player (74.0%), indicating the public's expectation for national standards and regulations to safeguard water resources. This suggests a belief in the need for overarching policies that transcend local and state boundaries to address water issues effectively.

Non-governmental organizations (NGOs) are recognized by 61.3% of respondents, pointing to the valued role of civil society in advocacy, education, and direct action in water conservation efforts. International Joint Commissions are seen as responsible by 57.0% of participants, suggesting some awareness of the importance of cross-border cooperation and governance in managing shared water resources. Interestingly, a significant portion of respondents (43.0%) selected "None of the above," which might indicate skepticism or uncertainty about the effectiveness of existing institutions in managing water resources, or it may reflect a belief in the need for other entities or approaches not listed in the options provided. The distribution of responsibility across various entities underscores a broad recognition of the complex, multifaceted nature of water management, requiring concerted efforts from governmental bodies, the private sector, individuals, and international organizations. This collective responsibility approach is crucial for addressing the intricate challenges of water sustainability and quality, emphasizing the need for integrated water resource management (IWRM) strategies that bring together different stakeholders in decision-making processes.

The findings align with the principles of environmental governance, which advocate for a multi-stakeholder approach to managing natural resources. Research and case studies in the field of environmental science and policy have consistently shown that effective water management is achieved through collaboration among various levels of government, the private sector, civil society, and local communities (United Nations World Water Development Report, 2021; OECD Studies on Water, 2020). This holistic approach is essential for addressing the current and future challenges of water scarcity, pollution, and climate change impacts on water systems.

Table 9. Responsible Party

	Responsible	
	n	%
State government	792	88.7
Corporations	703	79.7
Municipal government	669	75.9
Consumers	657	74.5
Federal government	653	74.0
Non-governmental organizations	541	61.3
International Joint Commissions	503	57.0
None of the above	379	43.0

DISCUSSION

The comprehensive analysis of public opinion on water quality and management in South Carolina highlights a deeply ingrained concern among residents regarding the state of their water resources. This concern spans from the direct implications of water quality on health to broader environmental and economic impacts. Studies consistently show that water quality is a critical issue for communities worldwide, affecting not only public health but also biodiversity, ecosystem services, and local economies (Schwarzenbach et al., 2010). In South Carolina, residents have expressed significant anxiety over the potential health risks associated with water pollution, including the unpleasantness of water for recreational activities, the immediate risk of getting sick, and the long-term health effects of exposure to contaminated water (WHO, 2019).

The identification of major pollution sources, such as illegal dumping of toxins, runoff of pollutants, and industrial wastage, underscores the necessity for stringent regulatory measures and responsible corporate practices (Harrison, 2001). This aligns with global findings where effective water management has been linked to the implementation of comprehensive regulatory frameworks that ensure sustainable water use and pollution control (OECD, 2015).

The assignment of responsibility to a wide range of stakeholders, including government bodies, corporations, and individuals, reflects a broader understanding that water management is a shared responsibility. This is consistent with the principles of integrated water resources management (IWRM), which advocate for a coordinated approach to managing water and related resources to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (Global Water Partnership, 2000).

Moreover, the strong public support for stricter water use standards and the incorporation of scientific research into water management decisions mirrors the global consensus on the need for evidence-based policies and practices in environmental stewardship (United Nations World Water Assessment Programme, 2018). The call for full-cost pricing mechanisms for water services suggests a recognition of the true value of water resources and the importance of economic instruments in promoting conservation and sustainable use (Rogers, De Silva, & Bhatia, 2002).

These findings from South Carolina offer valuable insights into public perceptions and expectations regarding water quality and management, echoing broader global concerns and priorities. It highlights the urgent need for concerted efforts and innovative approaches to safeguard water resources, underscoring the critical role of governance, corporate responsibility, and community engagement in achieving sustainable water management outcomes. Future policies and strategies should be informed by these insights, integrating public concerns with best practices from around the world to ensure the long-term viability and quality of water resources in South Carolina and beyond.

RECOMMENDATIONS

To address the concerns highlighted by the residents of South Carolina regarding water quality and management, the following recommendations are proposed for the state government, relevant stakeholders, and policymakers:

1. Strengthen environmental regulations concerning water quality to include stringent limits on pollutants, regular monitoring, and enforcement actions against non-compliance. This should encompass both point sources, such as industrial discharges, and non-point sources, like agricultural runoff.
2. Encourage industries to adopt cleaner production techniques and water-saving technologies through incentives and support programs. Implementing full-cost pricing for industrial water use can also drive efficiency and conservation.
3. Allocate resources towards upgrading and expanding water treatment facilities to handle pollutants effectively and cope with the demands of a growing population. This includes investments in modernizing sewage systems to reduce leaks and prevent contamination.
4. Develop comprehensive education campaigns to raise public awareness about the importance of water conservation, the impacts of pollution, and ways individuals can contribute to water quality improvement. Engaging communities in water management decisions can foster a sense of responsibility and collective action.
5. Utilize scientific research and data analytics in water management policies and practices to ensure they are effective and adaptive to changing environmental conditions. This includes embracing innovative technologies for water quality monitoring and treatment.
6. Foster collaborations between state and local governments, industries, NGOs, and communities to facilitate integrated water resources management (IWRM). Such partnerships can leverage the strengths and resources of each stakeholder for more effective water management.
7. Implement conservation and restoration projects for lakes, rivers, and wetlands that serve as critical water sources and habitats. Protecting these areas from pollution and degradation is essential for maintaining biodiversity and ecosystem services.
8. Develop and implement adaptation strategies to address the challenges posed by climate change on water resources, including increased droughts, flooding, and sea-level rise. This includes improving water storage and distribution infrastructure to enhance resilience.
9. Enact laws that regulate the extraction of groundwater to prevent overexploitation and contamination. Licensing for groundwater use by commercial enterprises should be mandatory to ensure sustainable usage.

REFERENCES

Bandura, A. (2001). Social cognitive theory: An agentic perspective. Annual review of psychology, 52(1), 1-26.

Cvetkovich, G., & Earle, T. C. (1991). The construction of justice: A case study of public participation in land management. Journal of Social Issues, 47(4), 89-103.

Grossarth, S. K., & Hecht, A. D. (2007). Sustainability at the US Environmental Protection Agency: 1970–2020. Ecological Engineering, 30(1), 1-8.

Gilmore, J. N., & Troutman, B. (2020). Articulating infrastructure to water: Agri-culture and Google's South Carolina data center. International journal of cultural studies, 23(6), 916-931.

Global Water Partnership. (2000). Integrated Water Resources Management. TAC Background Papers No. 4, Stockholm.

Harrison, E. Z. (2001). The challenge of affording water. Environment: Science and Policy for Sustainable Development, 43(3), 8-18.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. Journal of experimental social psychology, 19(5), 469-479.

Majone, G. (1996). Regulating Europe. Routledge.

OECD. (2015). OECD Principles on Water Governance. Organisation for Economic Co-operation and Development, Paris.

Olson, M. (1965). The Logic of Collective Action: Public Goods and the Theory of Groups. Harvard University Press.

Pétré, M. A., Genereux, D. P., Koropeckyj-Cox, L., Knappe, D. R., Duboscq, S., Gilmore, T. E., & Hopkins, Z. R. (2021). Per-and polyfluoroalkyl substance (PFAS) transport from groundwater to streams near a PFAS manufacturing facility in North Carolina, USA. Environmental science & technology, 55(9), 5848-5856.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change1. The journal of psychology, 91(1), 93-114.

Rogers, R. W. (1985). Attitude change and information integration in fear appeals. Psychological reports, 56(1), 179-182.

Rogers, P., De Silva, R., & Bhatia, R. (2002). Water is an economic good: How to use prices to promote equity, efficiency, and sustainability. Water Policy, 4(1), 1-17.

Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., von Gunten, U., & Wehrli, B. (2010). Global water pollution and human health. Annual Review of Environment and Resources, 35, 109-136.

United Nations World Water Assessment Programme. (2018). The United Nations World Water Development Report 2018: Nature-Based Solutions for Water. UNESCO, Paris.

Ureta, J. U., Ureta, J. C., Bower, L. M., Peoples, B. K., & Motallebi, M. (2024). The value of improving freshwater ecosystem services: South Carolina residents' willingness to pay for improved water quality. Journal of Environmental Management, 353, 120260.

Weick, K. E. (1995). Sensemaking in Organizations. Sage Publications.

World Health Organization (WHO). (2019). Guidelines for Drinking-water Quality, 4th edition. World Health Organization, Geneva.