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Water Resource Management and Sustainability in Daura Metropolis, Katsina State: An Analysis of Water Availability, Usage Patterns, and Human Activity Impacts on Water Scarcity and Quality

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ABSTRACT
This study examines the complex relationships between water availability, usage patterns, and human activity impacts on water scarcity and quality in Daura Metropolis, Katsina State. Using a quantitative research design, the research investigates the perceptions and experiences of residents regarding water scarcity and quality, and analyzes the effects of agricultural, industrial, and domestic activities on water resources. The findings reveal moderate water scarcity, significant impacts of population growth and climate change, and substantial pollution from industrial and agricultural activities. The study recommends policy interventions focusing on water conservation, sustainable agriculture, pollution control, and effective water management. The research contributes to the understanding of water resource management and sustainability in arid regions, highlighting the need for integrated approaches to address water scarcity and quality issues.
Keywords: water resource management, sustainability, water scarcity, water quality

1. INTRODUCTION

Water is essential to sustainable development and is known as the "elixir of life." It was once thought to be an endless natural resource, or at the very least, completely renewable. But during the last 20 years, this priceless natural resource has been under extreme strain, mostly as a result of growing urbanization, industrialization, and population growth. In order to meet supply-chain requirements, these factors taken together have led to an increase in demand for irrigation, industrial, and residential uses. Given the limited amount of water resources that will be available in the near future and the hazards that accompany them, scientists studying hydrology and related fields like geography, landscape planning, sustainability science, etc., must act now. The significance of water to economic growth, healthy living and the prevention of the spread of infectious diseases, manufacturing and industrialization cannot be overstated. Water is a sign of life; insufficient or nonexistent supplies raise the risk of infectious diseases, bad industrialization, unsanitary individual and communal conditions, subpar food production, conflicts, violations of human rights, and poverty. Unsafe water and inadequate sanitation have been linked to over a million deaths each year, with 90% of these deaths in poorer nations involving children under five (WHO, 2015). Water resource management is a crucial aspect of sustainable development, particularly in regions where water scarcity and quality issues pose significant challenges.

Daura Metropolis, located in Katsina State, Nigeria, is an area that is grappling with water resource management and sustainability concerns. As the population in the metropolis continues to grow and human activities intensify, the demand for water has escalated, putting pressure on the available water sources and potentially impacting water scarcity and quality. Daura Metropolis is characterized by a

semi-arid climate, with limited rainfall and limited water resources. The region relies heavily on groundwater sources, such as boreholes and wells, for domestic, agricultural, and industrial water needs. However, the sustainability of these groundwater sources is uncertain due to factors such as over-extraction, contamination, and ineffective management practices. Understanding the dynamics of water availability, usage patterns, and the impacts of human activities on water resources in Daura Metropolis is essential for formulating effective water resource management strategies and ensuring long-term sustainability. By analyzing factors such as water scarcity, water quality, and the influence of human activities, this study aims to provide valuable insights into the current state of water resource management in the region.

The study will involve collecting primary data through surveys, interviews, and field observations. Data will be gathered on water availability, including rainfall patterns, groundwater levels, and surface water sources. Additionally, water usage patterns will be examined, encompassing domestic, agricultural, and industrial sectors, to determine the main drivers of water demand and consumption. The impacts of human activities on water scarcity and quality will be assessed, taking into account factors such as pollution, land-use practices, and population growth. The findings of this research will contribute to the knowledge base on water resource management in Daura Metropolis and provide valuable insights for policymakers, water authorities, and local communities. The study aims to inform the development of sustainable water management strategies and promote efficient and equitable water allocation practices to ensure the long-term availability and quality of water resources in the region. Ultimately, this research seeks to contribute to the overall goal of achieving water security and sustainable development in Daura Metropolis, Katsina State, Nigeria.

Research Questions

i. What is the current status of water availability in Daura Metropolis, Katsina State?
ii. What are the main patterns and trends in water usage across domestic, agricultural, and industrial sectors in the region?
iii. What are the primary factors contributing to water scarcity in Daura Metropolis?
iv. What are the key factors influencing water quality in the region?
v. What are the existing water resource management strategies and practices in the region?
vi. What are the challenges and limitations faced in the sustainable management of water resources in Daura Metropolis?
vii. What are recommendations for improved water resource management strategies in Daura metropolis?

Statement of the problem

Water scarcity, deteriorating water quality, and inadequate water resource management practices pose significant challenges to the sustainability and well-being of communities in Daura Metropolis, Katsina State. As a rapidly growing region with increasing demands for water due to population growth, urbanization, and agricultural activities, it is essential to assess the current status of water availability, usage patterns, and management strategies in order to address these pressing issues effectively. The problem at hand is the lack of comprehensive understanding of the water resources situation in Daura Metropolis, including the factors contributing to water scarcity, the quality of available water sources, and the impact of human activities on water availability. Despite the significance of water for various sectors such as agriculture, industry, and domestic consumption, there is a lack of up-to-date data and analyses that can guide evidence-based decision-making for sustainable water resource management in the region.

Furthermore, the existing water resource management practices in Daura Metropolis may not be aligned with the increasing water demands, changing climatic conditions, and evolving land-use patterns. Inadequate infrastructure, inefficient water distribution networks, and limited institutional capacity further exacerbate the challenges faced in ensuring equitable access to clean and sufficient water resources. Therefore, there is a need to assess water Resource Management and Sustainability in Daura Metropolis, Katsina State. The study will Analyze Water Availability, Usage Patterns, and Human Activity Impacts on Water Scarcity and Quality.

Objectives of the study

i. To assess the current status of water availability in Daura Metropolis, Katsina State.
ii. To examine the main patterns and trends in water usage across domestic, agricultural, and industrial sectors in the region.

iii. To identify the primary factors contributing to water scarcity in Daura Metropolis.
iv. To evaluate the key factors influencing water quality in the region.
v. To analyze existing water resource management strategies and practices in the region.
vi. To identify the challenges and limitations faced in the sustainable management of water resources in Daura Metropolis.
vii. To provide recommendations for improved water resource management strategies in Daura metropolis.

Literature Review

Water resources management refers to the comprehensive and integrated planning, development, and utilization of water sources to ensure their sustainable and equitable allocation for various uses while considering the preservation and protection of the environment. It involves the assessment of water availability, demand, and quality, as well as the implementation of strategies to optimize water use efficiency, mitigate water-related risks, and promote long-term sustainability (Shiklomanov, 2000). Sustainability in water resources management refers to the ability to meet current water needs without compromising the ability of future generations to meet their own needs. It encompasses the conservation and preservation of water resources, the maintenance of ecological balance, the promotion of social equity, and the enhancement of economic development in a balanced and integrated manner (UNESCO, 2015).

Several studies were conducted to assess the availability and management of water resources. Abubakar et al. (2018) investigated the current state of water resources management and sustainability in Daura Metropolis. They found that water resources are under increasing pressure from population growth, agricultural expansion, and industrial development. They also found that there is a lack of awareness about the importance of water conservation and water management in the city. Aminu et al. (2019) assessed the water quality in Daura Metropolis. They found that water quality in the city is generally poor. They also found that water quality is declining due to pollution from agricultural runoff, industrial effluent, and sewage. Dangana et al. (2019) investigated the impact of human activities on water quality in Daura Metropolis. They found that human activities are having a significant impact on water quality in the city. They also found that the main sources of pollution are agricultural runoff, industrial effluent, and sewage.

Lawal et al. (2019) found that water scarcity and management challenges are increasing in Daura Metropolis. They also found that there is a need for improved water management and water conservation in the city. Musa et al. (2018) found that water resources management in Daura Metropolis is facing challenges, but there are also opportunities for improvement. They highlighted the importance of water conservation and water management in ensuring the sustainability of water resources in the city. Ogundele and Lawal (2019) found that water resource management and sustainability are challenges in Nigeria, but there are also opportunities for improvement. They highlighted the importance of water conservation, water management, and water augmentation in ensuring the sustainability of water resources in the country.

Mohammed et al. (2020) found that water quality in Jibia Irrigation Scheme is poor and has implications for human health. They highlighted the need for improved water management and water quality monitoring in the scheme. Umoru et al. (2021) found that water quality in the Goronyo River Basin is generally poor. They highlighted the need for improved water management and water quality monitoring in the basin. By building upon these previous studies, the present research aims to contribute to the understanding of water resource management and sustainability in Daura Metropolis, Katsina State. It seeks to address the gaps in knowledge by focusing on specific factors such as water availability, usage patterns, impacts of human activities, existing management strategies, and challenges faced in the region. The findings of this study will contribute to the development of informed and context-specific recommendations for sustainable water resource management in Daura Metropolis and similar regions facing water scarcity and quality concerns.

METHODOLOGY

Research Design

This study utilized a quantitative research design, which encompasses collecting and analyzing numerical data, specifically employing surveys and data analysis. Structured questionnaires were

administered to a sample of participants to gather data on the opinions and experiences related water resource management and sustainability in Daura metropolis. The data collected was then subjected to statistical analysis to identify patterns and trends,

Population: The population of interest for this study comprises approximately 401,900 residents, representing the entire demographic spectrum of individuals living in Daura Metropolis, Katsina State. This population includes diverse groups such as urban dwellers, rural communities, and marginalized populations, all of whom are relevant to the research topic and are therefore included in the study's scope.

Sample and Sampling Techniques: A sample of 384 participants was selected for this study, representing a representative fraction of the total population of 401,900 residents in Daura Metropolis, Katsina State, using the Krejcie and Morgan formula to determine the sample size, a probabilistic sampling technique that ensures representativeness and allows for random selection of participants, reducing bias and increasing the validity and reliability of the study's results.

Sources and Instrument of Data Collection: This study utilized primary data collection techniques, specifically structured questionnaires, as the instrument for gathering data. The questionnaires, which formed the primary source of data, were designed to collect information on key aspects such as demographic data (gender, age, qualification, occupation, duration of residence), water usage patterns, sources of water, and water-related challenges, thereby providing firsthand data for the study.

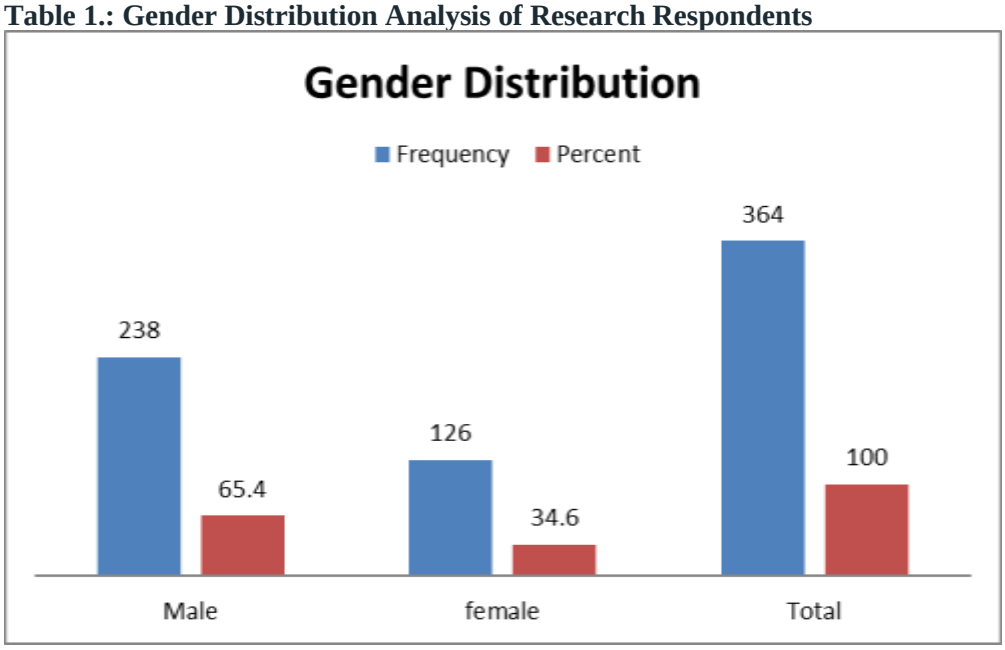
Method and Tools of Data Analysis: Quantitative Data Analysis: The collected survey data will be entered into a statistical software package (e.g., SPSS and Excell) for analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations will be computed to summarize the data. Inferential statistical tests (e.g., chi-square test, t-test, regression analysis) may be employed to examine relationships and associations between variables.

Ethical Considerations:

This study adhered to ethical principles, including informed consent, confidentiality, and anonymity. Participants have been provided with information about the study and asked to provide their informed consent before participating. The participants' confidentiality and anonymity be have been protected throughout the study.

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

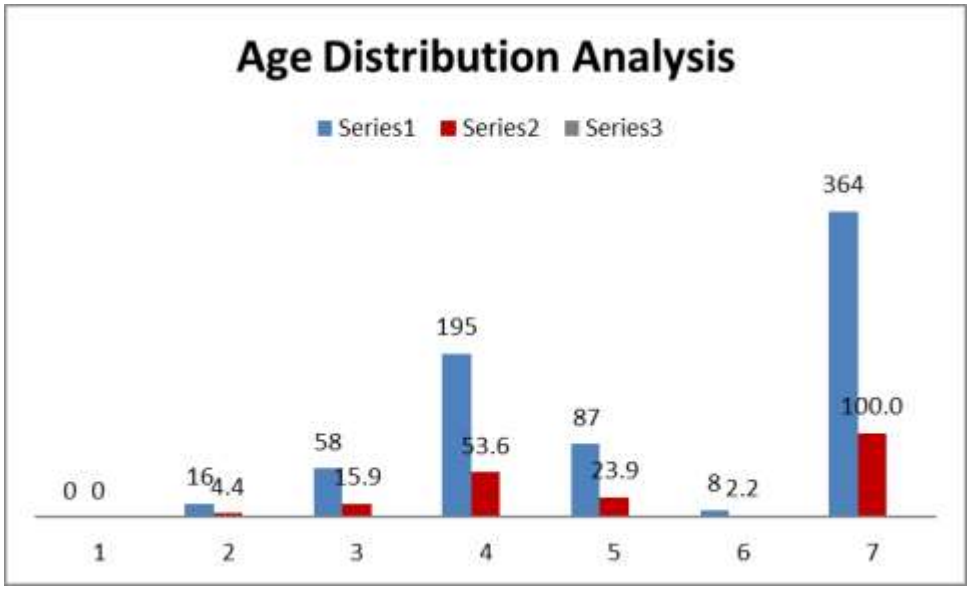
Table 1.: Gender Distribution Analysis of Research Respondents



Source: SPSS 21 Output 2024

The data from the research on "Water Resource Management and Sustainability in Daura Metropolis, Katsina State: An Analysis of Water Availability, Usage, and Human Activity Impacts on Water Scarcity and Quality" shows a gender distribution of 238 male respondents (65.4%) and 126 female respondents (34.6%), totalling 364 respondents.

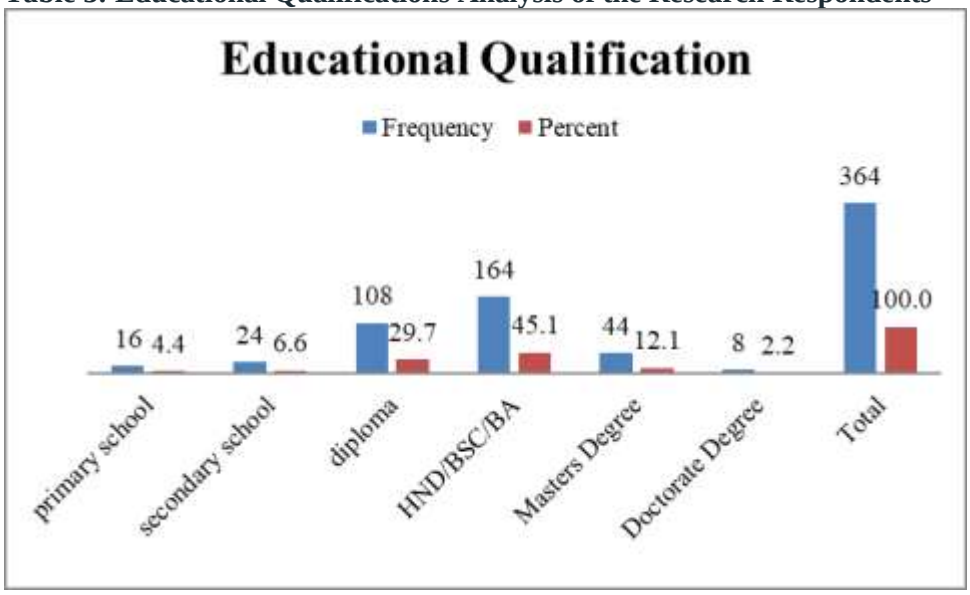
Table 2: Age Distribution Analysis of Research Respondents



Source: SPSS 21 Output 2024

The data shows that the majority of respondents (195, 53.6%) fall within the 36-45 age range, followed by 46-55 (87, 23.9%), 26-35 (58, 15.9%), 18-25 (16, 4.4%), and 56 and above (8, 2.2%), indicating a predominantly middle-aged respondent group, with a focus on those in their prime working years, likely reflecting the demographic characteristics of the metropolis.

Table 3: Educational Qualifications Analysis of the Research Respondents

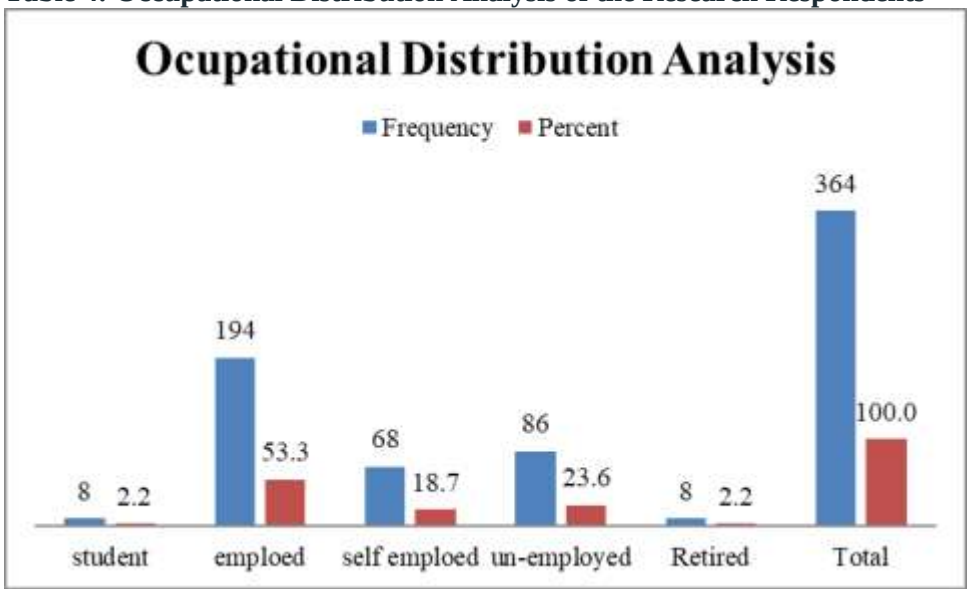


Source: SPSS 21 Output 2024

The data reveals the educational qualifications of respondents in the research on "Water Resource Management and Sustainability in Daura Metropolis, Katsina State", showing a majority holding higher education degrees, with 164 (45.1%) possessing HND/BSC/BA, 44 (12.1%) holding Master's Degrees, and 8 (2.2%) holding Doctorate Degrees, while 108 (29.7%) have diplomas, 24 (6.6%) have secondary school certificates, and 16 (4.4%) have primary school education, indicating a relatively

high level of educational attainment among the respondents, with nearly 60% holding tertiary education qualifications.

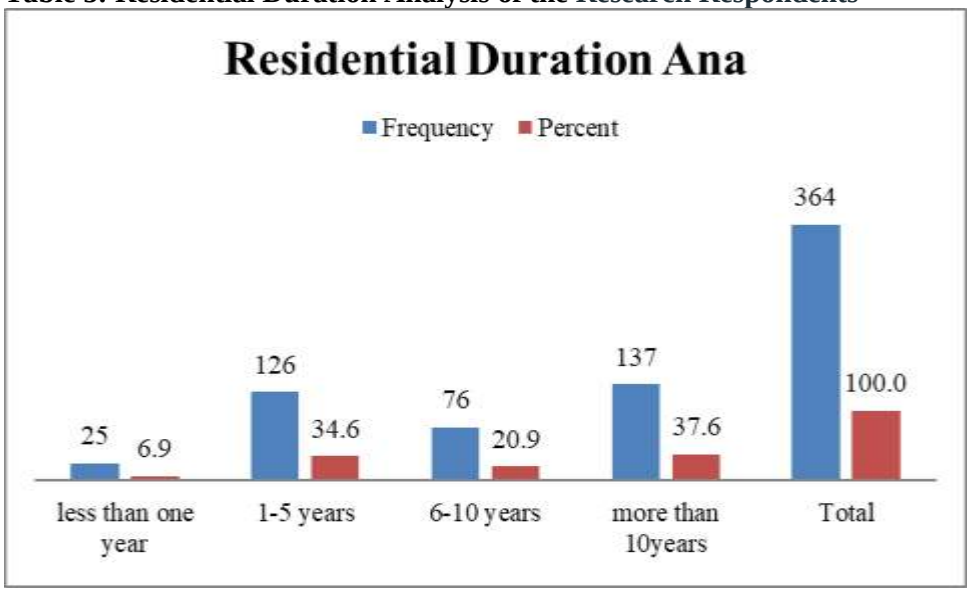
Table 4: Occupational Distribution Analysis of the Research Respondents



Source: SPSS 21 Output 2024

The data presents the frequency and percentage distribution of occupations among 364 respondents, revealing that employed individuals constitute the largest group (194, 53.3%), followed by unemployed (86, 23.6%), self-employed (68, 18.7%), and smaller groups of students (8, 2.2%) and retired individuals (8, 2.2%), providing a snapshot of the occupational landscape of the respondents.

Table 5: Residential Duration Analysis of the Research Respondents



Source: SPSS 21 Output 2024

The data reveals the residential duration of respondents in the research on "Water Resource Management and Sustainability in Daura Metropolis, Katsina State", showing that the majority (137, 37.6%) have lived in the area for more than 10 years, indicating a high level of long-term residency, while 126 (34.6%) have lived there for 1-5 years, 76 (20.9%) for 6-10 years, and 25 (6.9%) for less than one year, suggesting a relatively stable population with a significant proportion of long-term residents who have likely developed a strong connection to the area and its water resources.

Table 6: Water Resource Management Data

Variable/Questions					
Water Availability	**very available**	**Abundant**	**Moderate**	**Scarce**	**Very scarce**
1.How would you rate the overall water availability in Daura Metropolis?	42	60	214	48	0
2.How would you rate the reliability of water supply in your area?	95	144	100	25	0
Patterns and trends in water usage	**very available**	**Abundant**	**Moderate**	**Scarce**	**Very scarce**
1.How would you rate the water usage pattern in the domestic sector?	70	152	116	26	0
2.How would you rate the water usage pattern in the agricultural sector?	33	93	178	60	0
3.How would you rate the water usage pattern in the industrial sector?	35	134	135	42	18
Factors contributing to water scarcity	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1.To what extent do you believe population growth contributes to water scarcity?	154	118	34	38	0
2.How much do you think climate change affects water scarcity in the region?	121	125	94	16	8
Factors influencing water quality	**Very high**	**High**	**Moderate**	**Low**	**Very low**
1. How would you rate the impact of industrial discharge on water quality?	17	108	102	93	44
2. How would you rate the impact of agricultural runoff on water quality?	59	66	101	94	44
Human activities impact on water scarcity and quality	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
1.To what extent do you believe pollution contributes to water scarcity?	148	84	82	50	0
2.How much do you think land-use practices affect water quality in the region?	41	125	96	93	9
Water resource management strategies	**Very effective**	**Effective**	**Moderately effective**	**Ineffective**	**Very ineffective**

1.How effective do you think current water management strategies are in addressing water scarcity?	9	100	117	121	17
2.How would you rate public awareness and participation in water conservation efforts?	33	43	110	11	61
Challenges and limitations faced in the sustainable management of water resources	**Very significant**	**Significant**	**Moderately significant**	**Minor**	**Not significant**
1.How significant do you consider the lack of funding for water infrastructure projects as a challenge?	154	111	59	40	0
2.How much do you think political factors impact water resource management in the region?	67	143	103	51	0

Source: Questionnaire Administered 2024

Water Availability (WA1 and WA2)

The majority of respondents (214) rated water availability as "Moderate" (WA1), indicating a neutral perception of water availability in Daura Metropolis. However, a significant number (60) rated it as "Scarce", suggesting that some respondents face water shortages. No respondents rated water availability as "Very abundant", indicating a lack of confidence in the abundance of water resources.

The reliability of water supply was rated as "Reliable" by most respondents (144) (WA2), indicating trust in the consistency of water supply. However, some respondents (25) rated it as "Unreliable", highlighting concerns about the dependability of water supply. These findings suggest that while most respondents have access to reliable water supply, some face challenges with water availability and reliability.

Patterns and trends in water usage (PTW1, PTW2, and PTW3)

Most respondents (152) rated water usage in the domestic sector as "Moderate" (PTW1), indicating a balanced consumption pattern. However, some respondents (70) rated it as "High", suggesting excessive water usage in some households. In contrast, water usage in the agricultural sector was rated as "High" by most respondents (178) (PTW2), indicating significant water consumption for farming activities.

Water usage in the industrial sector was rated as "Moderate" by most respondents (134) (PTW3), indicating a balanced consumption pattern. However, some respondents (135) rated it as "High", suggesting excessive water usage in some industries. These findings highlight varying patterns of water usage across different sectors, with agricultural activities consuming the most water.

Factors contributing to water scarcity (FCW1 and FCW2)

The majority of respondents (154) strongly agree that population growth contributes to water scarcity (FCW1), highlighting the impact of increasing population on water resources. Most respondents (118) also agree that population growth contributes to water scarcity, emphasizing the significance of this factor. Only a few respondents (34) remain neutral, indicating a general consensus on the impact of population growth.

Most respondents (125) agree that climate change affects water scarcity (FCW2), indicating awareness of the impact of climate change on water resources. However, some respondents (121) strongly agree, emphasizing the significance of climate change in exacerbating water scarcity. A few respondents (16) remain neutral, suggesting some uncertainty about the impact of climate change.

Factors influencing water quality (FIW1 and FIW2)

The majority of respondents (108) rated the impact of industrial discharge on water quality as "High" (FIW1), indicating significant concern about pollution from industrial activities. Most respondents (102) also rated it as "Moderate", highlighting the need for improved pollution control measures. Only a few respondents (17) rated it as "Low", suggesting some optimism about the effectiveness of current measures.

Most respondents (66) rated the impact of agricultural runoff on water quality as "Moderate" (FIW2), indicating concern about pollution from farming activities. However, some respondents (59) rated it as "High", suggesting significant concern about the impact of agricultural runoff. A few respondents (101) rated it as "Low", highlighting some uncertainty about the impact of agricultural runoff.

Human activities impact on water scarcity and quality (HAIW1 and HAIW2)

The majority of respondents (148) strongly agree that pollution contributes to water scarcity (HAIW1), highlighting the significance of pollution in exacerbating water scarcity. Most respondents (84) also agree, emphasizing the need for improved pollution control measures. Only a few respondents (82) remain neutral, indicating a general consensus on the impact of pollution.

Most respondents (125) agree that land-use practices affect water quality (HAIW2), indicating awareness of the impact of land-use practices on water resources. However, some respondents (41) strongly agree, emphasizing the significance of land-use practices in determining water quality. A few respondents (96) remain neutral, suggesting some uncertainty about the impact of land-use practices.

Water resources management strategies (WRM1 and WRM2)

Most respondents (100) rated current water management strategies as "Moderately effective" (WRM1), indicating a neutral assessment of current strategies. However, some respondents (117) rated them as "Ineffective", highlighting concerns about the adequacy of current strategies. Only a few respondents (9) rated them as "Very effective", suggesting some optimism about the effectiveness of current strategies.

Most respondents (110) rated public awareness and participation in water conservation as "Moderate" (WRM2), indicating a balanced assessment of public engagement. However, some respondents (43) rated it as "Low", highlighting concerns about the level of public awareness and participation. A few respondents (33) rated it as "High", suggesting some optimism about public engagement.

Challenges and limitations faced in the sustainable management of water resources

The majority of respondents (154) consider the lack of funding for water infrastructure projects as "Very significant", indicating a widespread concern about the impact of inadequate funding on water resource management. Additionally, many respondents (111) rated it as "Significant", and some (59) as "Moderately significant", further emphasizing the importance of addressing funding challenges to ensure sustainable water resource management.

Most respondents (143) agree that political factors impact water resource management, highlighting the influence of political considerations on water management decisions. Furthermore, some respondents (67) strongly agree, underscoring the significance of political factors in shaping water resource management outcomes. However, a notable number (103) remain neutral, suggesting some uncertainty or variability in the perceived impact of political factors.

Summary of Findings:

i. Water availability is perceived as moderate, with some respondents experiencing scarcity. Water availability is rated as moderate, indicating a neutral perception of water availability in Daura Metropolis, but some respondents face water shortages, rating it as scarce.
ii. Agricultural activities consume the most water, followed by domestic and industrial usage. Agricultural water usage is rated as high, indicating significant water consumption for farming activities, while domestic and industrial water usage is rated as moderate, with some cases of high usage.
iii. Population growth and climate change are widely recognized as significant contributors to water scarcity. Population growth is strongly agreed to contribute to water scarcity, and climate change is agreed to affect water scarcity, with some strongly agreeing.

iv. Industrial discharge and agricultural runoff are considered major factors influencing water quality. Industrial discharge is rated as having a high impact on water quality, and agricultural runoff is rated as moderate, with some cases of high impact.
v. Pollution and land-use practices are seen as significant contributors to water scarcity and quality issues. Pollution is strongly agreed to contribute to water scarcity, and land-use practices are agreed to affect water quality.
vi. Current water management strategies are deemed moderately effective, with room for improvement. Current water management strategies are rated as moderately effective, but some rate them as ineffective, highlighting concerns about the adequacy of current strategies.
vii. Funding and political factors are identified as significant challenges to sustainable water resource management. The lack of funding for water infrastructure projects is considered very significant, and political factors are agreed to impact water resource management, with some strongly agreeing.

CONCLUSION

The study's objective was to investigate water availability, usage, and management in Daura Metropolis, and the findings revealed that water availability is perceived as moderate, with some respondents experiencing scarcity. Agricultural activities were found to consume the most water, followed by domestic and industrial usage. Population growth and climate change were widely recognized as significant contributors to water scarcity, while industrial discharge and agricultural runoff were considered major factors influencing water quality. Pollution and land-use practices were also seen as significant contributors to water scarcity and quality issues. Furthermore, current water management strategies were deemed moderately effective, with room for improvement, and funding and political factors were identified as significant challenges to sustainable water resource management. Overall, the study highlights the need for improved water management strategies, increased funding, and addressing the impacts of population growth and climate change to ensure sustainable water resource management in Daura Metropolis.

RECOMMENDATIONS

i. Implement water conservation measures to address moderate water scarcity. Encourage efficient water use practices in domestic, agricultural, and industrial sectors. This can be achieved through public awareness campaigns, education, and incentives for adopting water-saving technologies.
ii. Develop sustainable agricultural practices to reduce water consumption. Promote water-efficient irrigation systems and crop selection. This can help reduce the water footprint of agriculture, which is the largest water user in Daura Metropolis.
iii. Address population growth and climate change impacts on water scarcity. Develop and implement population growth management strategies, such as family planning and education. Implement climate change mitigation and adaptation measures, such as renewable energy and water harvesting.
iv. Improve industrial and agricultural practices to reduce water pollution. Implement pollution control measures in industrial processes, such as wastewater treatment and recycling. Promote best management practices in agriculture, such as buffer strips and organic farming.
v. Enhance pollution control and land-use practices to protect water quality. Strengthen pollution control regulations and enforcement, and promote sustainable land-use practices, such as reforestation and soil conservation.
vi. Improve water management strategies and effectiveness. Conduct regular assessments of water management strategies, and develop and implement more effective water management plans. This can involve stakeholder engagement, capacity building, and technology transfer.
vii. Increase funding and address political factors to support sustainable water resource management. Allocate sufficient funds for water infrastructure development and maintenance, and strengthen institutional frameworks and political will to support sustainable water resource management. This can involve policy reforms, institutional capacity building, and international cooperation.

Policy implications

i. Develop and implement water-saving technologies and practices in domestic, agricultural, and industrial sectors to reduce water consumption. Enact and enforce water conservation regulations and standards, and promote public awareness and education on water conservation through campaigns and outreach programs.
ii. Develop and implement sustainable agricultural practices, such as drip irrigation and crop rotation, to reduce water consumption and protect water quality. Provide incentives for farmers to adopt water-efficient practices, and encourage agricultural water use efficiency through education and training programs.
iii. Develop and implement population growth management strategies, such as family planning and education, to reduce the impact of population growth on water resources. Enact and enforce climate change mitigation and adaptation policies, and promote water-efficient technologies and practices in response to climate change.
iv. Enact and enforce pollution control regulations and standards to protect water quality. Promote best management practices in industrial and agricultural sectors, and increase funding for pollution control infrastructure and enforcement to prevent water pollution.
v. Develop and implement effective water management strategies and plans to address water scarcity and quality issues. Promote stakeholder engagement and participation in water management decision-making, and increase funding for water management infrastructure and capacity building.
vi. Increase funding for water infrastructure development and maintenance to address water scarcity and quality issues. Strengthen institutional frameworks and political will to support sustainable water resource management, and promote transparency and accountability in water governance.
vii. Promote public awareness and education on water scarcity and quality issues through campaigns and outreach programs. Increase education and training on water-efficient practices and technologies, and encourage community involvement in water resource management decision-making to promote sustainable water resource management.

Future research Direction

Future research should focus on exploring innovative solutions to address the challenges of water scarcity and quality in Daura Metropolis, such as investigating the effectiveness of water harvesting and conservation techniques, assessing the potential of alternative water sources like wastewater reuse and desalination, and examining the impact of climate change on water resources. Additionally, studies could investigate the socioeconomic factors influencing water usage and management practices, and evaluate the effectiveness of existing water policies and governance structures. Furthermore, research could explore the potential of integrating traditional knowledge and modern technologies to develop sustainable water management strategies that meet the needs of local communities, ultimately contributing to the development of a comprehensive and sustainable water management plan for Daura Metropolis.

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