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PLIABILITY FRAMEWORK ON RESIDENTS WITH NO POTABLE WATER

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ABSTRACT
Water scarcity is becoming more and more prevalent in areas with dry climates, especially in areas where access to potable water is limited. This study aimed to identify factors that make the communities pliable despite the lack of access to potable water as well as the development of a framework utilizing the Exploratory Factor Analysis (EFA) technique. The study was conducted in Davao and Caraga Regions, where 150 residents without potable water were identified as research respondents. A questionnaire validated by an examiner was utilized as the research instrument for the data collection. Rotated component matrix discarded 3 items out of 30. Out of the remaining 27 items, the study found six factors that contribute to the pliability framework of residents without access to potable water. These factors include collaborative solutions, innovating for sustainable solutions, coping capacity of the community, knowledge, capacity, and experience of the community, community engagement and willingness, and community capacity and adaptability.

Keywords:
Water scarcity, climate, potable water, pliable, exploratory factor analysis, collaborative solutions, innovating, sustainable, coping capacity, knowledge, experience, community engagement, willingness, adaptability

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INTRODUCTION

In places with dry temperatures, susceptible aquifers, and unpredictable rainfall, water stress is becoming increasingly burdensome. Human health and economic development are at risk when there is insufficient access to safe and affordable drinking water, especially in developing nations. While most developed nations have put in place mechanisms to ensure high standards of water quality and supply consistency, keeping these standards is becoming more complex and expensive, given the ambiguity around the effects of climate change and the refusal of water users to alter their usage habits (Hartley, Tortajada, & Biswas, 2019).

It is frequently taken for granted where water is abundant, but in areas where the supply is scarce, it is valued (Semasinghe, Jatrana, & King, 2023). Communities forecasted to experience severe water scarcity and where climate change is anticipated to limit supplies significantly must choose among the options to develop sustainable water supplies (Scruggs, Pratesi, & Fleck, 2020).

OBJECTIVE OF THE STUDY

The study aimed to identify the factors that make the communities pliable despite the lack of access to potable water. These factors will be analyzed further to create a framework for a better understanding the residents without access to potable water.

METHODOLOGY

This study was conducted in Davao and Caraga Regions, where 150 residents without potable water were identified as research respondents. Experts in this field examined and validated the survey questionnaire. The researchers personally conducted and administered the survey. The degree of partial correlations among variables was examined using the Kaiser-Meyer-Olkin measure of sampling adequacy. The factors were identified using the Exploratory Factor Analysis (EFA). The underlying factors of several observable variables are frequently found via exploratory factor analysis (Auerswald & Moshagen, 2019). A scree plot was used to illustrate and

identify the factors graphically. These factors are scrutinized using content analysis techniques to formulate the resilience framework. The identity of the correlation matrix was tested using Bartlett's test of sphericity.

RESULTS AND DISCUSSION

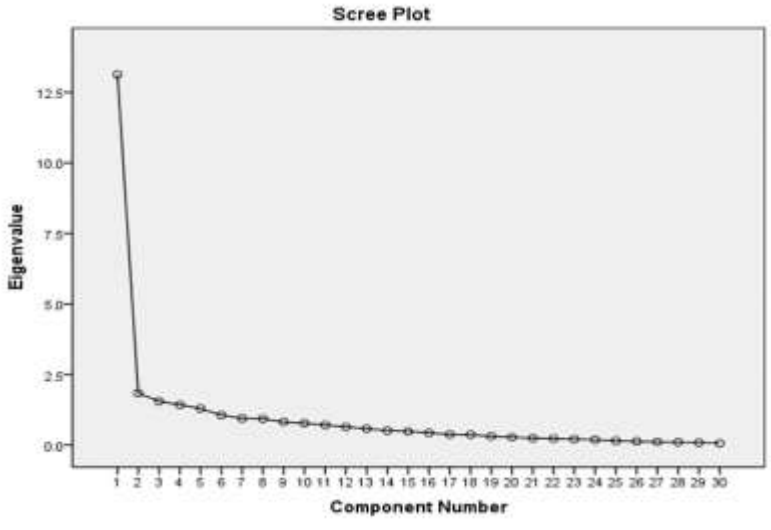
This section shows the analysis and interpretation of the gathered data.

KMO and Bartlett's Test. Table 1 presents the results of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO score of .860 indicates that the samples exhibit strong correlations, making them suitable for factor analysis. In addition, Bartlett's test of Sphericity yielded a value of 3303.33 and a significance level of less than .001, which indicates that the data is appropriate for the pliability framework analysis of residents without access to potable water. Furthermore, rejecting the null hypothesis based on Bartlett's test of Sphericity implies that there is indeed a pliability framework for residents living without a potable water system.

Table 1: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.860
Bartlett's Test of Sphericity	Approx. Chi-Square	3300.326
	df	435
	Sig.	.000

Scree Plot. Figure 1 illustrates the total variance and Eigenvalues plotted against all factors in a graphical manner. The Scree Plot indicates the decreasing trend of Eigenvalues and determines the suitability of each component based on its significance. This scree plot is a valuable tool in deciding the number of factors to be retained, where the inflection point is where the curve flattens. In this study, the curve becomes flatter at component number three since Eigenvalues of less than one start to appear. If the items of each dimension fall below the minimum threshold, the dimension will be eliminated. Consequently, the analysis only kept six factors.



Rotated Component Matrix.

Table 2 shows the attributes grouped as "Collaborative Solutions," which focuses on the community's ability to work together to address the water crisis. The data show that participants rated Item 26 with a score of .681, indicating that they believe their community can develop and implement sustainable solutions to the water crisis. Participants also rated Item 29 with a score of .673, suggesting that they perceive their community as having a shared vision for addressing the water crisis. Item 28 and Item 27 received lower scores, with scores of .570 and .548, respectively. These findings are consistent with previous research that emphasizes the importance of collaboration and community engagement in addressing water-related challenges (Rojas, Bennison, Gálvez,

Claro, & Castelblanco, 2020; Musaka, Olaka, & Yahya Said, 2020; Foote, Gregor, Hepi, Baker, Houston, & Midgley, 2021).

Table 2: Rotated component matrix with grouped attributes of Collaborative Solutions

Factor	Attributes	Loading
Collaborative Solutions	Item 26 - I believe our community has the capacity to develop and implement sustainable solutions to the water crisis.	.681
	Item 29 - I feel our community has a shared vision for how to address the water crisis.	.673
	Item 30 - I believe our community can emerge stronger and more resilient from the challenges posed by the water crisis.Question	.615
	Item 19 - I feel our community is committed to finding long-term solutions to the water crisis.	.604
	Item 28 - I believe our community can work with external partners to address the water crisis.	.570
	Item 27 - I feel our community has a strong leadership that can guide us through the water crisis.	.548
	Item 18 - I believe our community has the capacity to innovate and find new solutions to the water crisis.	.536

Table 3 relates to the "Innovating Sustainable Solutions," which focuses on the community's ability to find creative and practical solutions to the water crisis. The data show that participants rated Item 7 the highest, with a score of .795, indicating a strong belief in their community's ability to recover from the challenges posed by the water crisis. Participants also rated Item 6 highly, with a score of .767, suggesting that they perceive their community as being resilient and able to withstand the challenges of the water crisis. Item 8 and Item 5 received scores of .632 and .611, respectively. These results suggest that participants have confidence in their community's ability to come up with innovative solutions to the water crisis or develop long-term strategies to address the issue of potable water. These findings are consistent with previous research emphasizing the importance of innovation and sustainable practices in addressing water-related challenges (Pahl-Wostl, 2020; Jimenez-Cisneros., 2015; Weaver, O'Keeffe, Hamer, & Palmer, 2019).

Table 3: Rotated component matrix with grouped attributes of Innovating Sustainable Solutions

Factor	Attributes	Loading
Innovating Sustainable Solutions	Item 7 - I feel our community can bounce back from the challenges of the water crisis.	.795
	Item 6 - I feel our community is strong and able to withstand the challenges of the water crisis.	.767
	Item 8 - I believe our community is innovative and can come up with creative solutions to the water crisis.	.632

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	Item 5 - I believe our community is capable of developing long-term strategies to address the issue of potable water.	.611

Table 4 presents the factor in creating coping mechanisms among communities without access to potable water. Attributes such as belief in the capacity of the community with a loading of .708 and sense of community identity in finding solutions with a loading of .595 are some of the attributes of this factor. This factor affirms the study of Sam et al. in 2020 that communities adapt local strategies to address the water problem. These coping mechanisms are implemented because water security affects health and economic growth (Abubakar, 2019; Gresham, Korzenevica, & Charles, 2019; Abedin, Collins, Habiba, & Shaw, 2019). Moreover, there is an urgency to adopt measures to address the issue of water security (Romano & Akhmouch, 2019; Gift, Raimi, Owobi, Oluwakemi, Anu, & Funmilayo, 2020).

Table 4: Rotated component matrix with grouped attributes of the Coping capacity of the community

Factor	Attributes	Loading
Coping capacity of the community	Item 11 - I believe our community has the capacity to build and maintain sustainable water systems.	.708
	Item 10 - I feel our community is resilient in the face of the water crisis.	.685
	Item 3 - I feel our community is capable of finding solutions to the water crisis.	.595
	Item 23 - I feel our community has a strong sense of identity that can help us address the water crisis.	.566
	Item 1 - I feel my community is able to cope with the current lack of access to potable water.	.545

Table 5 presents Knowledge, Capacity, and Experience as a factor. It has attributes like past experiences of the community with a loading of .696 and the community's openness for new ideas with a loading of .602. This factor aligns with the study of Achore & Bisung (2023), where findings suggest that households without clean water were more likely to utilize behavioral, physical, or a combination of behavioral and physical coping mechanisms. Urban dwellers in underdeveloped countries cannot access the public water supply and must get their water from unauthorized or illegal sources (Nganyanyuka, Martinez, Wesselink, Lungo, & Georgiadou, 2014; Achore, Bisung, & Kuusaana, 2020). Socioeconomic factors often influence the strategies devised by communities. Overcoming strategies of households depends on socioeconomic status (Adeniji-Oloukoi, 2013).

Table 5: Rotated component matrix with grouped attributes of Knowledge, Capacity, and Experience of the Community

Factor	Attributes	Loading
Knowledge, Capacity, and Experience of the Community	Item 24 - I believe our community has a history of overcoming challenges and can use that experience to address the water crisis.	.696
	Item 20 - I believe our community has a resilient spirit that enables us to face the challenges of the water crisis.	.608
	Item 25 - I feel our community is open to learning and incorporating new ideas to address the water crisis.	.602

	Item 9 - I feel our community has the knowledge and expertise to tackle the water crisis.	.508

Table 6 presents Community Engagement and Willingness as a factor. The loading of 0.773 for Item 13 indicates the community's strong emphasis on mutual support, as noted by Spade (2020), highlighting the power of mutual aid in promoting community resilience and addressing systemic issues, particularly during the water crisis. Item 12 suggests that the community's collaborative culture played a vital role in their ability to work together and address the water crisis (loading of 0.706). This finding is consistent with the study by Oh, Agrawal, and Rao (2013), which analyzed tweets during social crises to understand how social media can facilitate community intelligence. Item 14 emphasizes the community's motivation to find solutions to the water crisis (loading of 0.627). The importance of motivation in community-based initiatives is emphasized by Smith and Sobel (2014), who argue that meaningful learning and problem-solving are driven by personal investment and a sense of purpose within a local context. Item 15 reflects the community's political will to address the issue of water scarcity (loading of 0.539), as highlighted by Kugelman's (2013) study on Pakistan's energy crisis, shedding light on the crucial role of political will in addressing such crises. Based on these loadings, it can be inferred that these four characteristics are significant predictors of a community's engagement and preparedness in dealing with water-related issues. This finding is consistent with Jha and Bhalla's (2018) study, which found that willingness and ability for beneficiary community engagement mediated the success of water management programs. Their study highlights the importance of community participation and cooperation in addressing water scarcity issues, which supports our findings that community engagement and willingness are critical factors in addressing water-related challenges.

Table 6: Rotated component matrix with grouped attributes of Community Engagement and Willingness

Factor	Attributes	Loading
Community Engagement and Willingness	Item 13 - I believe our community has a strong sense of solidarity and can support each other through the water crisis.	.773
	Item 12 - I believe our community has a culture of collaboration and can work together to address the water crisis.	.706
	Item 14 - I feel our community is motivated to find solutions to the water crisis.	.627
	Item 15 - I feel our community has the political will to address the water crisis.	.539

Table 7 highlights the critical role of community capacity and adaptability as key factors in the pliability framework for residents who lack access to potable water. The analysis of three survey items identified a single component that was positively associated with community capacity and adaptability. Specifically, Item 17 (loading value of 0.730) suggests that communities can utilize available resources to address water scarcity, consistent with the competency-based approach proposed by Shafieva, Kovalenkova, and Tekucheva (2020) for developing a regional anti-crisis strategy based on transport and logistics infrastructure.

In contrast, Item 2 had a loading value of 0.606, indicating that a community can adapt to a lack of access to potable water (Gandure, Walker, & Botha, 2013). Furthermore, Item 4 (loading value of 0.708) indicates that the community has the necessary resources to tackle the issue of potable water. These characteristics demonstrate that a community's ability to respond and recover from a water crisis depends on various factors, such as resource availability, utilization, and adaptability.

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The study by Chakma, Hossain, Islam, & Hasnat (2020) strengthens the argument for prioritizing community capacity and adaptability when designing strategies to mitigate water-related challenges.

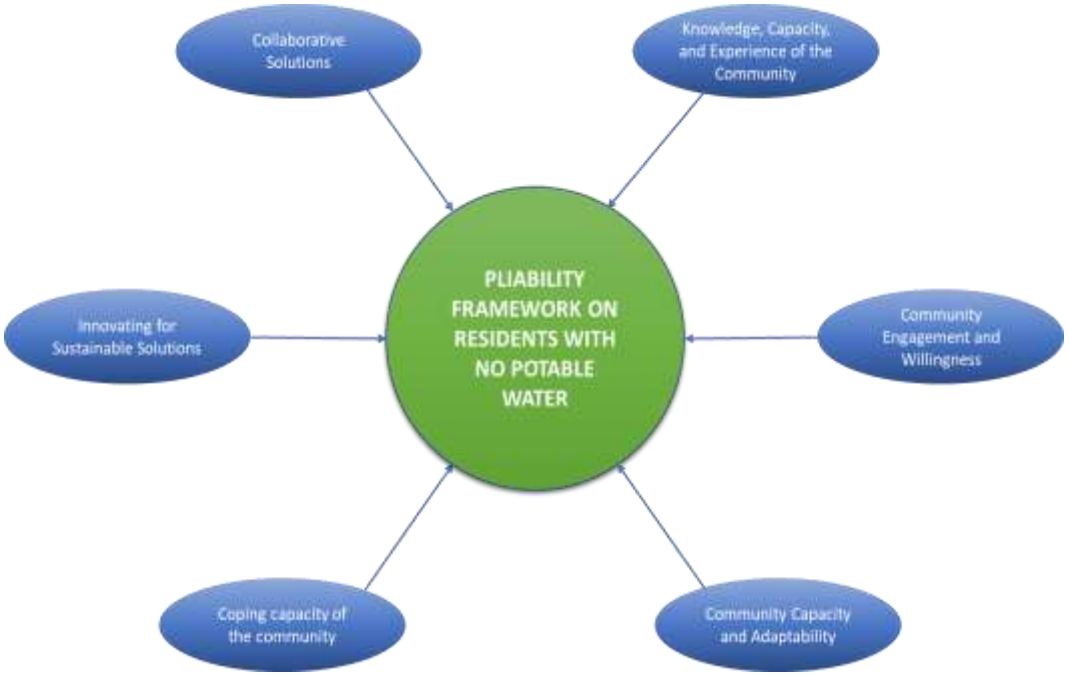
Table 7: Rotated component matrix with grouped attributes of Community Capacity and Adaptability

Factor	Attributes	Loading
Community Capacity and Adaptability	Item 17 - I feel our community can take advantage of available resources to address the water crisis.	.730
	Item 4 - I believe our community has the resources to address the issue of potable water.	.708
	Item 2 - I believe our community can adapt to the lack of access to potable water.	.606

STUDY FRAMEWORK

Presented in Figure 2 is the framework developed based on the findings. The researchers found out that the factors of the Pliability Framework on Residents with no Potable water are (1) Collaborative solutions, (2) Innovating for sustainable solutions, (3) Coping capacity of the community, (4) Knowledge, capacity, and experience of the community, (5) Community engagement and willingness, and (6) Community capacity and adaptability.

Figure 2. Pliability Framework on Residents with No Potable Water



CONCLUSION

Based on the findings, the researchers concluded that six factors make the resident with no potable water system pliable, namely Collaborative Solutions, Innovating Sustainable Solutions, Coping Capacity of the Community, Knowledge, Capacity, and Experience of the Community, Community Engagement and Willingness, and Community Capacity and Adaptability.

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