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# PREFACE

The proceeding consists of the peer-reviewed papers from the 4<sup>th</sup> International Conference on Environmental Ecology of Food Security (ICEFS) 2024 which was organised by Musamus University at Merauke regency, South Papua province, Indonesia. The conference was held on 7 - 8 August 2024 at SwissBell Hotel at Merauke regency, South Papua Province, Indonesia.

The conference, with the theme "Sustainable Environmental-Based Food Security in Integrated Agriculture: Technology and Innovations" is very imperative because Environmental Ecology of Food Security is still a global issue. Climate change issue is displaying a new crisis in agricultural sector. Changes in the frequency of each season are becoming increasingly erratic pose threats to farmers, especially small- scale farmers in tropical areas, and furthermore threatens the survival of several plant and animal species, leading to extinction and reduced biodiversity. The major goal and feature of the conference was to promote knowledge, science and technology as well as to address issues in food security, by bringing together researchers, scientists, practitioners and scholars in the respected fields. Invited speakers from Australia, Austria, Vietnam, and Indonesia. Their presence indicates the concern and role of the researchers, scientists and practitioners which are significant in Environmental Ecology of Food Security.

The conference is held annually and hosted by a consortium of public universities in eastern Indonesia and association of agricultural expertise, i.e. Hasanuddin University, Udayana University, Mataram University, Halu Oleo University, Tadulako University, Nusa Cendana University, Gorontalo Public University, West Sulawesi University, Musamus University, Agricultural Development Polytechnic Gowa branch, Indonesian Agricultural Economics Association, Agribusiness Association of Indonesia, Nutrition & Food Experts Society of Indonesia, and Indonesian Agronomy Association.

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# Public perceptions regarding the implementation of the groundwater-free zone policy in Jakarta **Province**

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Abstract. Jakarta Province has been facing land subsidence problems for the last few decades. Excessive groundwater extraction is a primary cause of this problem. The latest policy set by the Jakarta Provincial Government is stipulated through Governor Regulation No. 93 of 2021 concerning Groundwater-Free Zones by establishing 12 road areas and 9 zone areas, which aims to reduce land subsidence caused by excessive groundwater extraction. Research regarding the implementation of the groundwater-free zone policy in Jakarta Province is still limited. Public perception regarding a policy is also an important aspect of research as feedback from the community to policymakers. This research aims to assess the implementation of the Groundwater-Free Zone policy in Jakarta Province based on public perception. Data were collected through questionnaires distributed to 100 residents, consisting of 50 respondents from Tanah Abang and Gambir Sub-districts as representatives of groundwater-free zone areas and 50 respondents from Tanjung Priok and Pademangan Sub-districts as representatives of groundwater-free road areas. An evaluation approach was used in this research, using a scoring analysis method. Based on the effectiveness and responsiveness variables, considered successful by the community. However, community involvement in the policy's initiation, implementation, and monitoring stages was perceived as unsuccessful. This study highlights the importance of increasing community involvement in future policy initiatives. The public considered that the Groundwater-Free Zone policy has been less successful. The Jakarta Provincial Government can further optimize the implementation of the Groundwater-Free Zone policy and achieve its long-term objectives of sustainable water management and land subsidence mitigation.

# **1. Introduction**

Jakarta Province has faced the problem of land subsidence for the last few decades. In general, the rate of land subsidence detected is around 1-15 cm per year, varying spatially (1). Several factors trigger the rate of land subsidence, namely excessive use of groundwater, urban development, in this case, decline due to building loads, decline due to natural consolidation of soil layers, and decline due to tectonic activity (2). One of the main factors causing land subsidence is excessive groundwater extraction. Several studies have shown the relationship between groundwater usage and land subsidence (2–4).



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The provision and security of raw water and groundwater are implemented at the central government level by enforcing groundwater extraction regulations (5). Based on the Long-Term Regional Development Plan of Jakarta Province 2005-2025, there is a target to develop a clean water network that reaches the entire city with advanced and modern technology to guarantee the availability of quality drinking water (6). The Jakarta Regional Spatial Plan 2030 also targets the development of a clean water distribution network in the western, eastern, and northern areas of Jakarta (7). The latest policy set by the Jakarta Provincial Government is stipulated through Governor Regulation No. 93 of 2021 concerning groundwater-free zones by establishing twelve road areas and nine areas (8). A groundwater-free zone is a zone without extraction or utilization of groundwater by consideration of the capabilities of aquifer conditions or groundwater conservation zoning maps, and support for piped clean water networks (8).

The groundwater usage control is one of the quick wins for the Jakarta City Resilience strategy (9). Groundwater extraction can accelerate land subsidence. In Jakarta Province, 40% of people still use groundwater for daily needs (10). The groundwater-free zone policy in Jakarta Province was established on October 22nd, 2021 and promulgated on October 26th, 2021. The policy is effective starting August 1st, 2023. Therefore, research regarding the groundwater-free zone policy in Jakarta Province is relatively new and still very limited (8,11). In addition, public perception as feedback regarding the implementation of a policy is important. Programs or policies can also be evaluated at the planning, implementation, and post-program or policy stages. (12,13). Research on the provision of clean water, water resources management, and community participation in groundwater management policies is also an important area of research but is still rarely researched (14,15). Thus, this research aims to assess the implementation of the Groundwater-Free Zone policy in Jakarta Province based on public perception.

# 2. Methods

# 2.1 Research Area

The research locations are in Tanah Abang and Gambir Sub-districts (Groundwater Free Zones in the Tanah Abang Area) and Tanjung Priok and Pademangan Sub-districts (Groundwater Free Road Areas: Danau Sunter Utara and R.E Martadinata). The selection of these two locations was based on the previous research which showed that land subsidence in the southern part of Jakarta was relatively low. In contrast, the rate of land subsidence in the northern and western parts of Jakarta was relatively higher (1,4). Previous research also shows that the north and west areas of Jakarta were chosen as priority areas for piped water development based on an analysis of three parameters consisting of water demand-supply gap, land subsidence, and groundwater quality (16). Thus, Tanah Abang, Gambir, Tanjung Priok and Pademangan Sub-districts are considered to represent the public perception regarding the Groundwater Free Zone policy in Jakarta Province. This research is also limited to the point of view of the people who are in the zone designated as an area or on the side of a groundwater-free road area.

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Figure 1. Location map of the research area.

# 2.2 Data Collection

The data used in this research consists of primary data obtained through a questionnaire. The specific population included in the groundwater-free road area or groundwater-free zone area is not precisely known, as the zone boundaries do not align with administrative boundaries. Data were obtained from 100 respondents who are owners of buildings/lots in groundwater-free zone areas (50 respondents in Tanah Abang and Gambir Districts) and from respondents who own buildings/lots along the sides of groundwater-free road areas (50 respondents in Tanjung Priok Sub-district and Pademangan Sub-district). The appropriate sample size for statistical testing ranges from 100-200, with a minimum of 5-10 times the number of indicators (17). In this research, there are 9 indicators for scoring analysis, so a minimum sample size of 90 respondents is considered sufficient. The map of respondent distribution can be seen in Figure 2.



Figure 2. Respondent distribution.

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# 2.3 Data Analysis

This research used an evaluation approach by employing scoring analysis. Table 1 shows the research variables and indicators.

| Variables  | Indicators   | Statements on the questionnaire   | Justification |
|--|--|---|---------------|
| Effectiveness<br>(how far a<br>program or<br>policy can<br>achieve the<br>expected results<br>and benefits)  | <ul><li>a. There has been a shift in the use of water sources from groundwater to piped water networks.</li><li>b. There is a guarantee of clean water supply by the Jakarta Provincial Government following the policy</li></ul>  | <ul> <li>a. The groundwater-free zone policy caused me to shift from using groundwater to piped networks or other alternative water sources</li> <li>b. Fulfillment of clean water needs for daily needs has been guaranteed by the Jakarta Provincial Government (through the pipe network)</li> </ul>   | (8,12,13)     |
| Responsiveness<br>(related to the<br>appropriateness<br>of the program<br>in responding to<br>the needs,<br>preferences or<br>values of the<br>target group) | <ul> <li>a. Community obtains long-<br/>term benefits from policy</li> <li>b. Provision of a clean water<br/>pipe network that meets<br/>water quality parameters</li> <li>c. Provision of a clean water<br/>pipe network that meets<br/>water quantity standards</li> <li>d. Provision of a clean water<br/>pipe network that meets<br/>water continuity<br/>standards</li> </ul> | <ul> <li>a. I have received long-term benefits from the groundwater-free zone policy, including the provision of a clean water pipe network.</li> <li>b. The water quality from the pipe network is in good condition (in terms of smell, taste, turbidity, and color).</li> <li>c. The quantity of water from the pipe network is sufficient for my daily needs.</li> <li>d. The continuity of clean water from the pipe network meets the 24-hour flow requirements.</li> </ul> | (8,13,18)     |
| Community<br>Involvement<br>(community<br>involvement at<br>all stages of<br>policy)   | <ul> <li>a. Community involvement<br/>during the initial policy<br/>stage</li> <li>b. Community involvement<br/>in the policy<br/>implementation phase</li> <li>c. Public knowledge<br/>regarding forms of<br/>monitoring and<br/>sanctions of the policy</li> </ul>   | <ul> <li>a. I have been involved in the initiation and socialization stage of the groundwater-free zone policy.</li> <li>b. I have been involved in the implementation stage of the groundwater-free zone policy.</li> <li>c. I am aware of the forms of monitoring and sanctions imposed for continued use of groundwater after the groundwater-free zone policy.</li> </ul>   | (12,13,15)    |

 Table 1. Research variables and indicators.

Data in the form of a Likert scale were collected from the answers of the respondents, with the scale ranging from "1 = Strongly Disagree" to "5 = Strongly Agree". Respondents' answers to each indicator within the same criteria are added up by:

 $\sum \text{Effectiveness} = \overline{1A} + \overline{2A}$   $\sum \text{Responsiveness} = \overline{1A} + \overline{2A} + \overline{3A} + \overline{4A}$   $\sum \text{Community Involvement} = \overline{1A} + \overline{2A} + \overline{3A}$ Overall success assessment = Effectiveness + Responsiveness + Community Involvement

The scoring table used in this research was presented below, and the average score was used to assess the public perception regarding the implementation of the groundwater-free zone policy. Furthermore, the interval range was derived by calculating the class interval (Equation 1).

$$Interval = \frac{Range \ (highest \ score - lowest \ score)}{Number \ of \ classes} \tag{1}$$

Table 2 shows the five categories of success for the groundwater-free zone policy.

| Categories        | Effectiveness | Responsiveness | Community<br>Involvement | Overall       |  |
|-------------------|---------------|----------------|--------------------------|---------------|--|
| Very Unsuccessful | 2.00 - 3.60   | 4.00 - 7.20    | 3.00 - 5.40              | 9.00 - 16.20  |  |
| Unsuccessful      | 3.61 - 5.20   | 7.21 - 10.40   | 5.41 - 7.80              | 16.21 - 23.40 |  |
| Less Successful   | 5.21 - 6.80   | 10.41 - 13.60  | 7.81 - 10.20             | 23.41 - 30.60 |  |
| Successful        | 6.81 - 8.40   | 13.61 - 16.80  | 10.21 - 12.60            | 30.61 - 37.80 |  |
| Very Successful   | 8.41 - 10.00  | 16.81 – 20.00  | 12.61 - 15.00            | 37.81 - 45.00 |  |

 Table 2. Range and categories.

# 3. Results and Discussion

# 3.1 Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on effectiveness variable

The effectiveness variable consists of two indicators. The results show that in the first indicator which emphasizes that the groundwater-free zone policy causes people to shift from using groundwater to piped networks or other alternative water sources, the majority of people (59%) agreed and strongly agreed with an average score of 3.66 which means the public agrees with this statement. The second indicator regarding the guarantee of the provision of clean water for daily needs through pipe networks by the government was also responded to agree and strongly agree (74%) by the public with an average score of 3.92, which means the public agrees with this statement.

However, there are findings that before the groundwater-free zone policy was implemented effectively starting on August 1st, 2023, the majority of the community (64%) had used piped

networks as the main source of clean water for their daily needs, while there were 19% of people who used groundwater, 5% of community use groundwater and piped networks and 12% of community use other sources in the form of bottled water for daily needs. Communities that shifted from groundwater sources to piped networks were also not significant (Figure 3).



Figure 3. Clean water sources before and after policy.

The difference in findings could be due to limited public knowledge regarding environmental problems and the implementation of the groundwater-free zone policy in Jakarta Province. However, the results of the scoring analysis based on public perception which was calculated based on the cumulative average score was 7.58, which means that the effectiveness variable was considered successful by the public (Table 3).

| Table 3. Public perception regarding the implementation of the groundwater-free zone policy in |
|--|
| Jakarta based on effectiveness criteria.   |

| Ne  | Statements on the question size   |    | Fr | requency |    | Casua | A     |                   |
|-----|---|----|----|----------|----|-------|-------|-------------------|
| NO. | statements on the questionnaire   | 1  | 2  | 3        | 4  | 5     | Score | Average           |
| 1   | The groundwater-free zone policy caused<br>me to shift from using groundwater to<br>piped networks or other alternative water<br>sources      | 14 | 5  | 22       | 19 | 40    | 366   | 3.66              |
| 2   | Fulfillment of clean water needs for daily<br>needs has been guaranteed by the Jakarta<br>Provincial Government (through the pipe<br>network) | 12 | 6  | 8        | 26 | 48    | 392   | 3.92              |
|     | Total   |    |    |          |    |       |       | 7.58 (Successful) |

# *3.2.* Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on responsiveness variable

There are four indicators to measure responsiveness. First, indicators regarding the long-term benefits of the groundwater-free zone policy, including the provision of a clean water network, were responded to agree and strongly agree by the community (69%) with an average score of 3.79, which means the community agrees with this statement. The second indicator regarding the

community's assessment of the good condition of clean water in terms of four parameters was also responded to agree and strongly agree by the community (74%) with an average score of 3.98, which means the community agrees with the statement. This is in line with the findings that some people stated that there were no water quality problems from these four parameters as shown in Figure 4. However, complaints from some people regarding these four parameters such as problems with earthy odor, iron taste, and slightly yellow turbidity (Figure 4), the local government-owned water utility of the Jakarta Province still needs to pay attention.



Figure 4. Community assessment of water quality based on four parameters.

Furthermore, the third indicator concerning the community's assessment of whether the quantity of water from the pipe network is sufficient for daily needs received a response of "agree" or "strongly agree" from 75% of the community, with an average score of 3.92. This aligns with respondents' reports of average clean water consumption before the policy implementation, which was 77.62 liters per person per day, and after August 1, 2023, which was 77.17 liters per person per day. This consumption level exceeds the standard basic drinking water requirement of 60 liters per person per day (19). Regarding indicator four, the majority of people (71%) assess that the continuity of clean water in their area meets the 24-hour flow requirement, while 29% reported that the water flow becomes weak or stops at certain times. Consequently, the community considers the groundwater-free zone policy in Jakarta Province to be successful based on the responsiveness variable, with a total average score of 15.5 (Table 4).

| Na  | Statements on the sucction size   |    | Fre | eque | ncy |    | Score 2 |                   |
|-----|---|----|-----|------|-----|----|---------|-------------------|
| NO. | Statements on the questionname  | 1  | 2   | 3    | 4   | 5  |         | Average           |
| 1   | I have received long-term benefits from<br>the groundwater-free zone policy,<br>including the provision of a clean water<br>pipe network. | 12 | 5   | 14   | 30  | 39 | 379     | 3.79              |
| 2   | The water quality from the pipe network<br>is in good condition (in terms of smell,<br>taste, turbidity, and color).                      | 13 | 3   | 10   | 21  | 53 | 398     | 3.98              |
| 3   | The quantity of water from the pipe network is sufficient for my daily needs.   | 15 | 2   | 8    | 26  | 49 | 392     | 3.92              |
| 4   | The continuity of clean water from the pipe network meets the 24-hour flow requirements.  | 15 | 3   | 11   | 28  | 43 | 381     | 3.81              |
|     | Total   |    |     |      |     |    |         | 15.5 (Successful) |

**Table 4.** Public perception regarding the implementation of the groundwater-free zone policy inJakarta based on responsiveness criteria.

# 3.3 Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on community involvement variable

There are three indicators in the community involvement variable. First, the community did not agree (average score 2.04) that community had been involved in the policy initiation or socialization stage. Second, the community also did not agree (average score 3.02) that community had been involved in the policy implementation stage. In the third indicator, the community was not aware of the information regarding the sanctions for continued groundwater use. This lack of awareness is attributed to limited public knowledge. While the majority of the community knows that their area is served by a pipe network, most people are not informed about the groundwater-free zone policy in their area or its purpose as a measure to control groundwater use. Further details can be seen in Figure 5.



**Figure 5.** Public knowledge regarding environmental issues and groundwater-free zone policy in Jakarta Province.

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The majority of communities perceived had never received information regarding the groundwater-free zone policy from the government. The research in line with previous research which states that participation is impossible without the dissemination of information, knowledge, and public awareness about groundwater resources (15). In water planning and management, there is a paradigm shift from initially focusing on a "top-down" approach to a "bottom-up" approach (20). The groundwater free zone policy in Jakarta Province can be considered a form of the traditional top-down approach, where the authorities are considered to know best and only need to tell the public (20). In other hand, the bottom-up approach requires that the public knows what it wants its elected representatives and state officials to achieve **20**. The groundwater-free zone policy in Jakarta Province currently tends to be top-down, considering that the majority of communities in groundwater-free zones are still unaware of the implementation of this policy. Thus, the community involvement variable was assessed as unsuccessful by the community (score 6.90) as can be seen in Table 5.

| Ne   | Statements on the questionnaire   |    | Frequency |    |    |    |       |                     |
|------|---|----|-----------|----|----|----|-------|---------------------|
| INO. |   |    | 2         | 3  | 4  | 5  | Score | Average             |
| 1    | I have been involved in the initiation and<br>socialization stage of the groundwater-<br>free zone policy.                                    | 39 | 31        | 23 | 1  | 6  | 204   | 2.04                |
| 2    | I have been involved in the implementation stage of the groundwater-free zone policy.   | 17 | 14        | 36 | 16 | 17 | 302   | 3.02                |
| 3    | I am aware of the forms of monitoring<br>and sanctions imposed for continued use<br>of groundwater after the groundwater-<br>free zone policy | 45 | 34        | 17 | 0  | 4  | 184   | 1.84                |
|      | Total   |    |           |    |    |    |       | 6.90 (Unsuccessful) |

**Table 5.** Public perception regarding the implementation of the groundwater-free zone policy in Jakartabased on community involvement criteria.

The public generally considered that the Groundwater-Free Zone policy has been less successful, with a total score of 29.98.

# 4. Conclusion

The assessment of the success of the groundwater-free zone policy in Jakarta Province consists of three variables, namely effectiveness, responsiveness, and community involvement. Based on the effectiveness variable, the Groundwater-Free Zone policy in Jakarta Province has been perceived as successful in shifting water sources and ensuring a clean water supply (score 7.58). The responsiveness variable, which includes four indicators, such as the long-term benefits of the policy and the provision of a clean water pipe network that meets quality, quantity, and continuity requirements, is also regarded as successful by the community (score 15.50). However, regarding the community involvement variable, which encompasses three indicators—community involvement in the initiation, implementation, and post-policy stages—the community perceived as unsuccessful (score 6.90). There is a clear gap in community involvement throughout the policy's lifecycle. It is crucial to prioritize community involvement in future policy initiatives. The public considered that the Groundwater-Free Zone policy has been less successful, with a total

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score of 29.98. This research focuses on the public perception in assessing the implementation of the groundwater-free zone policy. Further research could consider the perspectives of the Jakarta Provincial Government, regional drinking water companies, and other relevant stakeholders to optimize policy implementation towards achieving long-term goals in sustainable water management and mitigating land subsidence.

# References

- 1. JICA Project Team. The Project for Promoting Countermeasures Against Land Subsidence in Jakarta. 2019.
- Abidin HZ, Andreas H, Gumilar I, Gamal M, Fukuda Y, Deguchi T. Land subsidence and urban development in Jakarta (Indonesia). 7th FIG regional conference, spatial data serving people: land governance and the environment, Hanoi, Vietnam. 2009. p. 1–16.
- 3. Hendarto H, Standing JR. Influence of groundwater extraction on land subsidence in Jakarta. Proceedings of the XVII European Conference on Soil Mechanics and Geotechnical Engineering, ECSMGE. 2019. p. 1–8.
- 4. Rahman S, Sumotarto U, Pramudito H. Influence the condition land subsidence and groundwater impact of Jakarta coastal area. IOP Conf Ser Earth Environ Sci. 2018;106(1).
- 5. Republic of Indonesia. Presidential Regulation No 18 of 2020 concerning National Medium Term Development Plan 2020-2024 [in bahasa]. 2020.
- 6. Jakarta Provincial Goverment. Regional Regulation of the Jakarta Province No 6 of 2012 concerning Regional Long-Term Development Plan 2005-2025 [in bahasa]. 2012.
- 7. Jakarta Povincial Government. Regulation of the Jakarta Province No 1 of 2012 concerning Spatial Plan of Jakarta Province 2030 [in bahasa]. 2012.
- 8. Jakarta Provincial Goverment. Governor Regulation of the Jakarta Province No 93 of 2021 concerning Groundwater-Free Zone [in bahasa]. 2021.
- 9. Pemprov DKI Jakarta dan Sekretariat Jakarta Berketahanan. Strategi Ketahanan Kota Jakarta. Pemprov DKI Jakarta dan Sekretariat Jakarta Berketahanan [in bahasa]. 2019.
- 10. Drinking-Water Company PAM Jaya. PAM Jaya Long Term Planning 2019-2023 [in bahasa]. 2018.
- 11. Azzarah TA. Pemprov DKI Mulai Terapkan Zonasi Bebas Air Tanah [website]. news.detik.com, Available from https://news.detik.com/berita/d-6904773/pemprov-dki-mulai-terapkan-zonasi-bebas-air-tanah [cited on June 26, 2024]. 2023.
- 12. Republic of Indonesia. Government Regulation No 39 of 2006 concerning Procedures for Control and Evaluation of Development Plan Implementation [in bahasa]. 2006.
- 13. Dunn WN. Public policy analysis: an introduction. 5th ed. routledge; 2012.
- 14. Noga J, Wolbring G. Perceptions of water ownership, water management, and the responsibility of providing clean water. Water (Switzerland). 2013;5(4):1865–89.
- 15. Cuadrado-Quesada G, Gupta J. Participation in groundwater governance outlining a path to inclusive development. Water Policy. 2019;21(5):1050–64.
- 16. Taftazani R, Kazama S, Takizawa S. Spatial Analysis of Groundwater Abstraction and Land Subsidence for Planning the Piped Water Supply in Jakarta, Indonesia. Water (Switzerland). 2022;14(20).
- 17. Hair J. Multivariate data analysis. Exploratory factor analysis. United Kingdom: Cengage Learning; 2009.
- 18. Republic of Indonesia. Regulation of the Minister of Public Works and Housing No 27/PRT/M/2016 of 2016 concerning Implementation of Drinking Water Supply Systems [in bahasa]. 2016.
- 19. Republic of Indonesia. Regulation of the Minister of Home Affairs No 23 of 2006 concerning Technical Guidelines and Procedures for Setting Drinking Water Tariffs at Regional Drinking Water Companies [in bahasa]. 2016.
- 20. Villholth KG, Conti KI. Groundwater governance: rationale, definition, current state and heuristic framework. Advances in Groundwater Governance. 2018. p. 3–31.

# PAPER REVIEW

| Title       | Public Perceptions Regarding the Implementation of the Groundwater-Free Zone Policy in Jakarta Province |
|-------------|---|
| Topic       | Climate Change Mitigation and policy  |
| Vol. & Page | ICEEFS  |
| Year        | 2024  |
| Author      | W Yahya*, A Sitawati, H W Wiranegara, E Fatimah and F G Sheviana  |
| Date        | 17/11/2024  |
| Reviewer    | Inriyani, M.T.  |

|              | This research aims to assess the implementation of the Groundwater-Free        |
|--------------|--|
|              | Zone policy in Jakarta Province based on public perception. The policy,        |
|              | implemented in 2023, aims to reduce land subsidence caused by excessive        |
|              | groundwater extraction.  |
| Abstract     | The research utilized a questionnaire survey of 100 residents from specific    |
|              | districts in Jakarta. The results indicate that the policy has successfully    |
|              | shifted groundwater usage to piped networks and ensured a clean water          |
|              | supply. However, public involvement in the policy's initiation,                |
|              | implementation, and monitoring stages was perceived as unsuccessful.           |
|              | Overall, the public perception of the policy's success is mixed, with positive |
|              | views on its effectiveness and responsiveness but negative views on            |
|              | community involvement.   |
|              | Jakarta Province has been grappling with the issue of land subsidence for      |
|              | several decades. Excessive groundwater extraction is a primary cause of this   |
|              | problem. The Jakarta Provincial Government implemented a Groundwater-          |
|              | Free Zone policy in 2021 to address this. This policy aims to limit            |
|              | groundwater extraction and promote the use of piped water. However, the        |
|              | implementation of this policy, particularly public perception and              |
|              | involvement, needs to be studied more. This research aims to fill this gap by  |
| Introduction | examining public perceptions of the policy's implementation. By                |
|              | understanding public perspectives, the study seeks to contribute to the        |
|              | ongoing efforts to mitigate land subsidence and improve water management       |
|              | in Jakarta.  |
|              |  |
|              |  |

|            | This research draws upon a comprehensive selection of references to explore the |
|------------|---|
|            | Jakarta Province's Groundwater-Free Zone policy.                                |
|            | Key Sources:  |
| litoroturo | 1. Land Subsidence and Groundwater Extraction: References such as [1,           |
| review     | 2, 3, 4] provide valuable background information on land subsidence             |
| leview     | in Jakarta, highlighting the connection between groundwater usage               |
|            | and this environmental challenge.   |
|            | 2. Government Regulations and Policies: References like [5, 6, 7, 8, 9]         |
|            | offer insights into the national and regional development plans, spatial        |
|            | planning strategies, and the specific Governor Regulation outlining             |
|            | the Groundwater-Free Zone policy.   |
|            | 3. Jakarta Water Management: References including [10, 11, 16] provide          |
|            | details on Jakarta's water management initiatives, including long-term          |
|            | planning for water supply and the spatial analysis of water needs for           |
|            | piped network development.  |
|            | 4. Public Policy Analysis and Community Participation: References [12,          |
|            | 13, 14, 15] explore the broader context of policy evaluation, public            |
|            | perception, and community involvement in water management                       |
|            | decisions.  |
|            | 5. Water Management Systems and Governance: References [17, 18, 19,             |
|            | 20] delve into technical aspects like drinking water supply systems             |
|            | and relevant regulations, contributing to a well-rounded                        |
|            | understanding of water management practices.                                    |
|            | Overall, the references thoroughly explore the policy's context,                |
|            | implementation, and potential impact.   |
|            |   |

|                             | The research primarily employs a quantitative research method using a survey  |
|-----------------------------|---|
|                             | questionnaire. This method allows for collecting data from a large number of  |
|                             | respondents and analyzing quantitative data.  |
|                             | Here is a breakdown of the methodology:   |
| Methods                     | 1. Research Area Selection: The researchers selected two contrasting  |
|                             | areas:  |
|                             | • Groundwater-Free Zones: Tanah Abang and Gambir Sub-   |
|                             | districts   |
|                             | Groundwater-Free Road Areas: Tanjung Priok and Pademangan   |
|                             | Sub-districts   |
|                             | 2. The selection was based on previous research indicating higher rates of  |
|                             | land subsidence in the northern and western parts of Jakarta.   |
|                             | 3. Data Collection:   |
|                             | • Questionnaire Survey: The researchers distributed   |
|                             | questionnaires to 100 residents in the selected areas.  |
|                             | • Sample Selection: The sample was divided into two groups: 50  |
|                             | respondents from groundwater-free zone areas and 50 from  |
|                             | groundwater-free road areas.  |
|                             | 4. Data Analysis:   |
|                             | • Scoring Analysis: The researchers used a scoring analysis   |
|                             | method to evaluate the groundwater-free zone policy's   |
|                             | effectiveness, responsiveness, and community involvement.   |
|                             | • Quantitative Analysis: The collected data was analyzed using  |
|                             | statistical methods to identify trends and patterns in public   |
|                             | perception.   |
|                             | Using this methodology, the researchers gathered information on public  |
|                             | perceptions regarding the implementation of the groundwater-free zone policy  |
|                             | and assessed its effectiveness, responsiveness, and community   |
|                             |   |
|                             | 1. Analyzing the Table: Public Perception of Groundwater-Free Zone Policy   |
|                             | a. Shift from Groundwater to Piped Networks: This indicator measures  |
| Result                      | whether the policy has successfully encouraged people to switch from  |
| and                         | using groundwater to piped water.   |
| Discussion                  | b. Fulfillment of Clean Water Needs: This indicator assesses whether the  |
|                             | policy has ensured a reliable supply of clean water through piped   |
|                             | networks.   |
|                             | 2. Overall, the results suggest that the public perceives the Groundwater-  |
|                             | Free Zone policy as a success in providing long-term benefits, including  |
|                             | improved water quality, quantity, and continuity. This positive perception  |
|                             | indicates that the policy has effectively addressed the issue of  |
|                             | groundwater depletion and improved the quality of life for residents in   |
|                             | Jakarta.  |
|                             | 5. Overall, the results suggest that community involvement in the   |
| Result<br>and<br>Discussion | <ul> <li>disponents from groundwater free road areas.</li> <li>4. Data Analysis: <ul> <li>Scoring Analysis: The researchers used a scoring analysis method to evaluate the groundwater-free zone policy's effectiveness, responsiveness, and community involvement.</li> <li>Quantitative Analysis: The collected data was analyzed using statistical methods to identify trends and patterns in public perception.</li> </ul> </li> <li>Using this methodology, the researchers gathered information on public perceptions regarding the implementation of the groundwater-free zone policy and assessed its effectiveness, responsiveness, and community</li> </ul> <li>1. Analyzing the Table: Public Perception of Groundwater-Free Zone Policy a. Shift from Groundwater to Piped Networks: This indicator measures whether the policy has successfully encouraged people to switch from using groundwater to piped water.</li> <li>b. Fulfillment of Clean Water Needs: This indicator assesses whether the policy has ensured a reliable supply of clean water through piped networks.</li> <li>2. Overall, the results suggest that the public perceives the Groundwater-Free Zone policy as a success in providing long-term benefits, including improved water quality, quantity, and continuity. This positive perception indicates that the policy has effectively addressed the issue of groundwater depletion and improved the quality of life for residents in Jakarta.</li> <li>3. Overall, the results suggest that community involvement in the Groundwater-Free Zone policy has been unsuccessful. This lack of</li> |

|            | involvement may hinder the effectiveness of the policy and limit its long-<br>term impact.   |
|------------|--|
| Conclution | The Groundwater-Free Zone policy in Jakarta Province has been perceived as successful in shifting water sources and ensuring a clean water supply. However, the policy's implementation, particularly regarding community involvement, has failed.<br>The public recognizes the policy's ability to encourage the transition from groundwater to piped water networks and its role in providing a reliable, clean water supply. Nonetheless, there is a clear gap in community engagement throughout the policy's lifecycle.<br>To enhance the policy's effectiveness and sustainability, it is crucial to prioritize communities to participate in decision-making. Strengthening monitoring and enforcement mechanisms can ensure compliance and address potential challenges.<br>By addressing these issues, the Jakarta Provincial Government can further optimize the implementation of the Groundwater-Free Zone policy and achieve its long-term objectives of sustainable water management and land subsidence mitigation. |
| Strenght   | <ol> <li>Straightforward Research Question: The research question is well-<br/>defined and focuses on a specific aspect of the groundwater-free zone<br/>policy.</li> <li>Relevant Methodology: Using a questionnaire to collect data from<br/>residents is a suitable approach to understanding public perception.</li> <li>Specific Research Site: The research focuses on specific sub-districts in<br/>Jakarta, providing a localized perspective.</li> <li>Clear Variables: The variables of effectiveness, responsiveness, and<br/>community involvement are well-defined and relevant to the research<br/>question.</li> <li>Quantitative Analysis: Using a scoring analysis method provides a<br/>quantitative approach to assess public perception.</li> </ol>  |
| Weakness   | <ol> <li>Limited Sample Size: A sample size of 100 respondents may not be<br/>sufficient to represent Jakarta's diverse population.</li> <li>Lack of Qualitative Data: While quantitative data is valuable, qualitative<br/>data, such as interviews or focus group discussions, could provide<br/>deeper insights into public perceptions and experiences.</li> <li>Focus on Public Perception: While public perception is important, it<br/>would be beneficial also to consider the perspectives of policymakers,<br/>water utilities, and other relevant stakeholders.</li> <li>Limited Discussion of Policy Implementation: The abstract could</li> </ol>   |

| provide more details on the challenges and successes in implementing  |
|---|
| the groundwater-free zone policy.   |
| Overall, the research seems to be well-designed and addresses an important<br>issue. However, by addressing the weaknesses and incorporating additional<br>perspectives, the research can provide a more comprehensive<br>understanding of implementing the groundwater-free zone policy in<br>Jakarta. |



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# Public perceptions regarding the implementation of the groundwater-free zone policy in Jakarta Province

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Abstract. Jakarta Province has been facing land subsidence problems for the last few decades. Excessive groundwater extraction is a primary cause of the problem. The latest policy set by the Jakarta Provincial Government is stipulated through Governor Regulation No. 93 of 2021 concerning Groundwater-Free Zones by establishing 12 road areas and 9 zone areas, which aims to reduce land subsidence caused by excessive groundwater extraction. However, the policy is effective starting August 1st, 2023. Research regarding the implementation of the groundwaterfree zone policy in Jakarta Province is still limited. Public perception regarding a policy is also an important aspect of research as feedback from the community to policymakers. This research aims to assess the implementation of the Groundwater-Free Zone policy in Jakarta Province based on public perception. Data were collected through questionnaires distributed to 100 residents, consisting of 50 respondents from Tanah Abang and Gambir Sub-districts as representatives of groundwater-free zone areas and 50 respondents from Tanjung Priok and Pademangan Sub-districts as representatives of groundwater-free road areas. An evaluation approach was used in this research, using a scoring analysis method. Based on the effectiveness and responsiveness variables, considered successful by the community. However, community involvement in the policy's initiation, implementation, and monitoring stages was perceived as unsuccessful. This study highlights the importance of increasing community involvement in future policy initiatives. The public generally considered that the Groundwater-Free Zone policy has been less successful. The Jakarta Provincial Government can further optimize the implementation of the Groundwater-Free Zone policy and achieve its long-term objectives of sustainable water management and land subsidence mitigation.

Keywords: Groundwater-Free Zone Policy, Public Perception, Evaluation Approach, Land Subsidence Mitigation

#### 1. Introduction

Jakarta Province has faced the problem of land subsidence for the last few decades. In general, the rate of land subsidence detected is around 1-15 cm per year, varying spatially [1]. Several factors trigger the 2 te of land subsidence, namely excessive use of groundwater, urban development, in this case, decline due to building loads, decline due to natural consolidation of soil layers, and decline due to tectonic activity [2]. One of the mate factors causing land subsidence is excessive groundwater extraction. Several studies have shown the relationship between groundwater usage and land subsidence [2-4].

The provision and security of raw water and groundwater are implemented 15 the central government level by enforcing groundwater extraction regulations [5]. Based on the Long-Term Regional Development Plan of Jakarta Province 2005-2025, there is a target to develop a clean water network

that reaches the entire city with advanced and modern technology to gu12 ntee the availability of quality drinking water [6]. The Jakarta Regional Spatial Plan 2030 also targets the development of a clean water distribution network in the western, eastern, and northern are 1 of Jakarta [7]. The latest policy set by the Jakarta Provincial Government is stipulated through Governor Regulation No. 13 of 2021 concerning groundwater-free zones by establishing twelve road areas and nine areas [8]. A groundwater-free zone is a zone without extraction or utilization of groundwater by consideration of the capabilities of aquifer conditions or groundwater conservation zoning maps, and support for piped clean water networks [8].

The groundwater usage control is one of the quick wins for the Jakarta City Resilience strategy [9]. Groundwater extraction can accelerate land subsidence. In Jakarta Province, 40% of people still use groundwater for daily needs [10]. The groundwater-free zone policy in Jakarta Province was established on October 22nd, 2021 and promulgated on October 26th, 2021. The policy is effective starting August 1st, 2023. Therefore, research regarding the groundwater-free zone policy in Jakarta Province is relatively new and still very limited [8,11]. In addition, public perception as feedback regarding the implementation of a policy is important. Programs or policies can also be evaluated at the planning, implementation, and post-program or policy stages [12-13]. Research on the provision of clean water, water resources management, and community participation in groundwater management policies is also an important area of research but is still rarely researched [14-15]. Thus, this research aims to assess the implementation of the Groundwater-Free Zone policy in Jakarta Province based on public perception.

#### 2. Methods

### 2.1. Research Area

The research locations are in Tanah Abang and Gambir Sub-districts (Groundwater Free Zones in the Tanah Abang Area) and Tanjung Priok and Pademangan Sub-districts (Groundwater Free Road Areas: Danau Sunter Utara and R.E Marta 10 ata). The selection of these two locations was based on the previous research while howed that land subsidence in the southern part of Jakarta was relatively low. In contrast, the rate of land subsidence in the northern and western parts of Jakarta was relativel in the first of parts of piped water development based on an analysis of three parameters consisting of water demand-supply gap, land subsidence, and groundwater quality [16]. Thus, Tanah Abang, Gambir, Tanjung Priok and Pademangan Sub-districts are considered to represent the public perception regarding the Groundwater Free Zone policy in Jakarta Province. This research is also limited to the point of view of the people who are in the zone designated as an area or on the side of a groundwater-free road area.



Figure 1. Location map of the research area.

#### 8 2.2. Data Collection

The data used in this research consists of primary data obtained through a questionnaire. The specific population included in the groundwater-free road area or groundwater-free zone area is not precisely known, as the zone boundaries do not align with administrative boundaries. Data were obtained from 100 respondents who are owners of buildings/lots in groundwater-free zone areas (50 respondents in Tanah Abang and Gambir Districts) and from respondents who own buildings/lots along the sides of groundwater-free road areas (50 respondents in Tanjung Priok Sub-district and Pademangan Subdistrict). The appropriate sample size for statistical testing ranges from 100-200, with a minimum of 5-10 times the number of indicators [17]. In this research, there are 9 indicators for scoring analysis, so a 14 nimum sample size of 90 respondents is considered sufficient. The map of respondent distribution can be seen in Figure 2.



Figure 2. Respondent distribution.

#### 2.3. Data Analysis

This research used an evaluation approach by employing scoring analysis. Table 1 shows the research variables and indicators.

Table 1. Research variables and indicators.

| Variables   |          | Indicators   |    | Statements on the questionnaire   | Justification |
|---|----------|--|----|---|---------------|
| Effectiveness<br>(how far a<br>program or<br>policy can                   | a.       | There has been a shift in the<br>use of water sources from<br>groundwater to piped water<br>networks.            | a. | The groundwater-free zone policy<br>caused me to shift from using<br>groundwater to piped networks or<br>other alternative water sources      | [8, 12, 13]   |
| achieve the<br>expected results<br>and benefits)                          | b.       | There is a guarantee of<br>clean water supply by the<br>Jakarta Provincial<br>Government following the<br>policy | b. | Fulfillment of clean water needs for<br>daily needs has been guaranteed by<br>the Jakarta Provincial Government<br>(through the pipe network) |               |
| Responsiveness<br>(related to the<br>appropriateness<br>of the program in | a.<br>b. | Community obtains long-<br>term benefits from policy<br>Provision of a clean water<br>pipe network that meets    | a. | I have received long-term benefits<br>from the groun 11 ater-free zone<br>policy, including the provision of a<br>clean water pipe network.   | [8, 13, 18]   |
| responding to the<br>needs,<br>preferences or<br>values of the            | c.       | water quality parameters<br>Provision of a clean water<br>pipe network that meets<br>water quantity standards    | b. | The water quality from the pipe<br>network is in good condition (in<br>terms of smell, taste, turbidity, and<br>color).                       |               |
| target group)   | d.       | Provision of a clean water<br>pipe network that meets<br>water continuity standards                              | c. | The quantity of water from the pipe<br>network is sufficient for my daily<br>needs.   |               |

| Variables  | Indicators   |                | Statements on the questionnaire Justification  |
|--|--|----------------|--|
|  |  | d.             | The continuity of clean water from<br>the pipe network meets the 24-hour<br>flow requirements.   |
| Community<br>Involvement<br>(community<br>involvement at<br>all stages of<br>policy) | <ul> <li>a. Community involvement<br/>during the initial policy<br/>stage</li> <li>b. Community involvement in<br/>the policy implementation<br/>phase</li> <li>c. Public knowledge regarding<br/>forms of monitoring and<br/>sanctions of the policy</li> </ul> | а.<br>b.<br>c. | I have been involved in the [12, 13, 12<br>initiation and socialization stage of<br>the groundwater-free zone policy.<br>I have been involved in the<br>implementation stage of the<br>groundwater-free zone policy.<br>I am aware of the forms of<br>monitoring and sanctions imposed<br>for continued use of groundwater<br>after the groundwater-free zone<br>policy. |

Data in the form of a Likert scale were collected from the answers of the respondents, with the scale ranging from "1 = Strongly Disagree" to "5 = Strongly Agree". Respondents' answers to each indicator within the same criteria are added up by:

 $\sum$  Effectiveness =  $\overline{1A} + \overline{2A}$ 

 $\sum$  Responsiveness =  $\overline{1A} + \overline{2A} + \overline{3A} + \overline{4A}$ 

 $\overline{\Sigma}$  Community Involvement =  $\overline{1A} + \overline{2A} + \overline{3A}$ 

Overall success assessment = Effectiveness + Responsiveness + Community Involvement

The scoring table used in this research was presented below, and the average score was used to assess the public perception regarding the implementation of the groundwater-free zone policy. Furthermore, the interval range was derived by calculating the class interval

 $Interval = \frac{Range (highest score-lowest score)}{Number of classes}$ (1)

Table 2 shows the five categories of success for the groundwater-free zone policy.

### Table 2. Range and categories.

|                   |               | Variables      |               |               |
|-------------------|---------------|----------------|---------------|---------------|
| Categories        | Effectiveness | Responsiveness | Community     | Overall       |
|                   |               |                | Involvement   |               |
| Very Unsuccessful | 2.00 - 3.60   | 4.00 - 7.20    | 3.00 - 5.40   | 9.00 - 16.20  |
| Unsuccessful      | 3.61 - 5.20   | 7.21 - 10.40   | 5,41 - 7.80   | 16.21 - 23.40 |
| Less Successful   | 5.21 - 6.80   | 10.41 - 13.60  | 7.81 - 10.20  | 23.41 - 30.60 |
| Successful        | 6.81 - 8.40   | 13.61 - 16.80  | 10.21 - 12.60 | 30.61 - 37.80 |
| Very Successful   | 8.41 - 10.00  | 16.81 - 20.00  | 12.61 - 15.00 | 37.81 - 45.00 |
|                   |               |                |               |               |

8 3. Results and Discussion

3.1. Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on effectiveness variable

The effectiveness variable consists of two indicators. The results show that in the first indicator which emphasizes that the groundwater-free zone policy causes people to shift from using groundwater to piped networks or other alternative water sources, the majority of people (59%) agreed and strongly agreed with an average score of 3.66 which means the public agrees with this statement. The second indicator regarding the guarantee of the provision of clean water for daily needs through pipe networks

#### 4

by the government was also responded to agree and strongly agree (74%) by the public with an average score of 3.92, which means the public agrees with this statement.

However, there are findings that before the groundwater-free zone policy was implemented effectively starting on August 1st, 2023, the majority of the community (64%) had used piped networks as the main source of clean water for their daily needs, while there were 19% of people who used groundwater, 5% of community use groundwater and piped networks and 12% of community use other sources in the form of bottled water for daily needs. Communities that shifted from groundwater sources to piped networks were also not significant (Figure 3).



Figure 3. Clean water sources before and after policy.

The difference in findings could be due to limited public knowledge regarding environmental problems and the implementation of the groundwater-free zone policy in Jakarta Province. However, the results of the scoring analysis based on public perception which was calculated based on the cumulative average score was 7.58, which means that the effectiveness variable was considered successful by the public (Table 3).

 
 Table 3. Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on effectiveness criteria.

| N   |   |    | Fr | eque | ncy |    | 0     |                   |  |
|-----|---|----|----|------|-----|----|-------|-------------------|--|
| NO. | Statements on the questionnaire   |    | 2  | 3    | 4   | 5  | Score | Average           |  |
| 1   | The groundwater-free zone policy caused<br>me to shift from using groundwater to piped<br>networks or other alternative water sources         | 14 | 5  | 22   | 19  | 40 | 366   | 3.66              |  |
| 2   | Fulfillment of clean water needs for daily<br>needs has been guaranteed by the Jakarta<br>Provincial Government (through the pipe<br>network) | 12 | 6  | 8    | 26  | 48 | 392   | 3.92              |  |
|     | Total   |    |    |      |     |    |       | 7.58 (Successful) |  |

3.2. Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on responsiveness variable

There are four indicators to measure responsiveness. First, indicators regarding the long-term benefits of the groundwater-free zone policy, including the provision of a clean water network, were responded to agree and strongly agree by the community (69%) with an average score of 3.79, which means the

community agrees with this statement. The second indicator regarding the community's assessment of the good condition of clean water in terms of four parameters was also responded to agree and strongly agree by the community (74%) with an average score of 3.98, which means the community agrees with the statement. This is in line with the findings that some people stated that there were no water quality problems from these four parameters as shown in Figure 4. However, complaints from some people regarding these four parameters such as problems with earthy odor, iron taste, and slightly yellow turbidity (Figure 4), the local government-owned water utility of the Jakarta Province still needs to pay attention.



Figure 4. Community assessment of water quality based on four parameters.

Furthermore, the third indicator concerning the community's assessment of whether the quantity of water from the pipe network is sufficient for daily needs received a response of "agree" or "strongly agree" from 75% of the community, with an average score of 3.92. This aligns with respondents' reports of average clean water consumption before the policy implementation, which was 77.62 liters per person per day, 131 after August 1, 2023, which was 77.17 liters per person per day. This consumption level exceeds the standard basic drinking water requirement of 60 liters per person per day [19]. Regarding indicator four, the majority of people (71%) assess that the continuity of clean water in their area meets the 24-hour flow requirement, while 29% reported that the water flow becomes weak or stops at certain times. Consequently, the community considers the groundwater-free zone policy in Jakarta Province to be successful based on the responsiveness variable, with a total average score of 15.5 (Table 4).

 
 Table 4. Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on responsiveness criteria.

| Na  | Statements on the questionnaire  | Frequency |   |    |    |    |             |         |
|-----|--|-----------|---|----|----|----|-------------|---------|
| NO. |  | 1         | 2 | 3  | 4  | 5  | Score Avera | Average |
| 1   | I have received long-term benefits from <b>from</b> groundwater-free zone policy, including the provision of a clean water pipe network. | 12        | 5 | 14 | 30 | 39 | 379         | 3.79    |
| 2   | The water quality from the pipe network is<br>in good condition (in terms of smell, taste,<br>turbidity, and color).                     | 13        | 3 | 10 | 21 | 53 | 398         | 3.98    |

| No.  |   |    | Fr | eque | ncy |    |       |                 |
|--|---|----|----|------|-----|----|-------|-----------------|
|  | Statements on the questionnaire   |    | 2  | 3    | 4   | 5  | Score | Average         |
| 3  | The quantity of water from the pipe network is sufficient for my daily needs. | 15 | 2  | 8    | 26  | 49 | 392   | 3.92            |
| 4 The continuity of clean water from the pipe<br>network meets the 24-hour flow<br>requirements. |   | 15 | 3  | 11   | 28  | 43 | 381   | 3.81            |
|  | Total   |    |    |      |     |    |       | 15.5 (Successfu |

3.3. Public perception regarding the implementation of the groundwater-free zone policy in Jakarta based on community involvement variable

There are three indicators in the community involvement variable. First, the community did not agree (average score 2.04) that community had been involved in the policy initiation or socialization stage. Second, the community also did not agree (average score 3.02) that community had been involved in the policy implementation stage. In the third indicator, the community was not aware of the information regarding the sanctions for continued groundwater use.

This lack of awareness is attributed to limited public knowledge. While the majority of the community knows that their area is served by a pipe network, most people are not informed about the groundwater-free zone policy in their area or its purpose as a measure to control groundwater use. Further details can be seen in Figure 5.



Figure 5. Public knowledge regarding environmental issues and groundwater-free zone policy in Jakarta Province.

The majority of communities perceived had never received information regarding the groundwater-free zone policy from the government. The research in line with previous research which states that participation is impossible without the dissemination of information, knowledge, and public awareness about groundwater resources [15]. In water planning and management, there is a paradigm shift from initially focusing on a "top-down" approach to a "bottom-up" approach [20]. The groundwater free zone

policy in Jakarta Province can be considered a form of the traditional top-down approach, where the authorities are considered to know best and only need to tell the public [20]. In other hand, the bottomup approach requires that the public knows what it wants its elected representatives and state officials to achieve [20]. The groundwater-free zone policy in Jakarta Province currently tends to be top-down, considering that the majority of communities in groundwater-free zones are still unaware of the implementation of this policy. Thus the community involvement variable was assessed as unsuccessful by the community (score 6.90) as can be seen in Table 5.

| Table 5. Public perception regarding the implementation of the groundwater-free zone policy in |
|--|
| Jakarta based on community involvement criteria.   |

| Na  |  |    | Fr | eque | ncy |    | 0       | •                   |  |
|-----|--|----|----|------|-----|----|---------|---------------------|--|
| NO. | Statements on the questionnaire  | 1  | 2  | 3    | 4   | 5  | - Score | Average             |  |
| 1   | I have been involved in the initiation and socialization stage of the groundwater-free zone policy.  | 39 | 31 | 23   | 1   | 6  | 204     | 2.04                |  |
| 2   | I have been involved in the implementation stage of the groundwater-free zone policy.  | 17 | 14 | 36   | 16  | 17 | 302     | 3.02                |  |
| 3   | I am aware of the forms of monitoring and<br>sanctions imposed for continued use of<br>groundwater after the groundwater-free<br>zone policy | 45 | 34 | 17   | 0   | 4  | 184     | 1.84                |  |
|     | Total  |    |    |      |     |    |         | 6.90 (Unsuccessful) |  |

The public generally considered that the Groundwater-Free Zone policy has been less successful, with a total score of 29.98.

### 4. Conclusion

The assessment of the success of the groundwater-free zone policy in Jakarta Province consists of three variables, namely effectiveness, responsiveness, and community involvement. Based on the effectiveness variable, the Groundwater-Free Zone policy in Jakarta Province has been perceived as successful in shifting water sources and ensuring a clean water supply (score 7.58). The responsiveness variable, which includes four indicators, such as the long-term benefits of the policy and the provision of a clean water pipe network that meets quality, quantity, and continuity requirements, is also regarded as successful by the community (score 15.50). However, regarding the community involvement variable, which encompasses three indicators-community involvement in the initiation, implementation, and post-policy stages—the community perceived as unsuccessful (score 6.90). There is a clear gap in community involvement throughout the policy's lifecycle. It is crucial to prioritize community involvement in future policy initiatives. The public generally considered that the Groundwater-Free Zone policy has been less successful, with a total score of 29.98. This research still focuses on the public perception in assessing the implementation of the groundwater-free zone policy. Further research could consider the perspectives of the Jakarta Provincial Government, regional drinking water companies, and other relevant stakeholders to optimize policy implementation towards achieving long-term goals in sustainable water management and mitigating land subsidence.

#### References

- JICA Project Team 2019 The Project for Promoting Countermeasures Against Land Subsidence in Jakarta
- [2] Abidin H Z, Andreas H, Gumilar I, Gamal M, Yoichi F and Deguchi T 2009 Land Subsidence and Urban Development in Jakarta (Indonesia) Spatial Data Serving People: Land Governance and the Environment - Building the Capacity, 7(October 2009), 5–16

7

- [3] Hendarto H and Standing J R 2019 Influence of groundwater extraction on land subsidence in Jakarta 17th European Conference on Soil Mechanics and Geotechnical Engineering ECSMGE 2019 - Proceedings 2019 September <u>https://doi.org/10.32075/17ECSMGE-2019-0511</u>
- [4] Rahman S, Sumotarto U and Pramudito H 2018 Influence the condition land subsidence and groundwater impact of Jakarta coastal area IOP Conference Series: Earth and Environmental Science,106(1) <u>https://doi.org/10.1088/1755-1315/106/1/012006</u>
- [5] Republic of Indonesia 2020 Presidential Regulation No 18 of 2020 concerning National Medium Term Development Plan 2020-2024
- [6] Jakarta Provincial Government 2012 Regional Regulation of the Jakarta Province No 6 of 2012 concerning Regional Long-Term Development Plan 2005-2025
- [7] Jakarta Provincial Government 2012 Regulation of the Jakarta Province No 1 of 2012 concerning Spatial Plan of Jakarta Province 2030
- [8] Jakarta Provincial Government 2021 Governor Regulation of the Jakarta Province No 93 of 2021 concerning Groundwater-Free Zone
- Jakarta Provincial Government 20219 Strategi Ketahanan Kota Jakarta Retrieved from https://lingkunganhidup.jakarta.go.id/jakartaberketahanan/?p=16623 (January 23<sup>rd</sup>, 2024)
- [10] Drinking-Water Company PAM Jaya 2018 PAM Jaya Long Term Planning 2019-2023
- [11] Azzahra T A 2023 Pemprov DKI Mulai Terapkan Zonasi Bebas Air Tanah Retrieved from <u>https://news.detik.com/berita/d-6904773/pemprov-dki-mulai-terapkan-zonasi-bebas-air-tanah</u> (January 22<sup>nd</sup>, 2024)
- [12] Republic of Indonesia 2006 Government Regulation No 39 of 2006 concerning Procedures for Control and Evaluation of Development Plan Implementation.
- [13] Dunn, W N 2012 Public policy analysis: an introduction 5<sup>th</sup> edition Pearson Education ISBN-13: 978-0-205-25257-2
- [14] Noga J and Wolbring G 2013 Perceptions of water ownership, water management, and the responsibility of providing clean water Water (Switzerland) 5 1865–89
- [15] Cuadrado-quesada G 2019 Participation in groundwater governance outlining a path to inclusive development 21 1050–64
- [16] Taftazani R, Kazama S and Takizawa S 2022 Spatial Analysis of Groundwater Abstraction and Land Subsidence for Planning the Piped Water Supply in Jakarta, Indonesia Water (Switzerland) 14
- [17] Hair J F, Black W C, Babin B J & Anderson R E 2018 Multivariate Data Analysis (8th ed) United Kingdom: Cengage Learning
- [18] Republic of Indonesia 2016 Regulation of the Minister of Public Works and Housing No 27/PRT/M/2016 of 2016 concerning Implementation of Drinking Water Supply Systems
- [19] Republic of Indonesia 2016 Regulation of the Minister of Home Affairs No 23 of 2006 concerning Technical Guidelines and Procedures for Setting Drinking Water Tariffs at Regional Drinking Water Companies
- [20] Villholth K G, Gunn E L, Conti K I, Garrido A & Gun J V D 2019 Groundwater governance: rationale, definition, current state and heuristic framework

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