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Changing patterns of household access to clean water in Indonesia: A study for the 2018–2022 period

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Abstract

Access to clean water is an important indicator of community welfare. Despite improvements in recent years, many households in Indonesia still face challenges in accessing clean water. This study aims to analyze the change in the percentage of households without access to clean water in Indonesia during the period 2018–2022. This study used longitudinal data from an annual survey that measured the proportion of households without access to clean water. The analysis was carried out descriptively to identify trends and variations between regions. Results show that there is a gradual decline in the percentage of households without access to clean water nationally, although there are fluctuations in some regions. Some provinces showed significant improvement, while others experienced stagnation or even improvement. These findings highlight the importance of area-based interventions to improve access to clean water, with priority given to areas that show slow improvement or regression. The results of this study can be the basis for more targeted policies in ensuring the equitable availability of clean water throughout Indonesia.

Keywords

Access to clean water, Households, Regional trends, Indonesia, Social policy

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Introduction

Access to clean water is a crucial element in people's lives and a key indicator of well-being. Although Indonesia has recorded increased access to clean water in recent decades, challenges such as uneven distribution and inadequate water quality are still faced by many regions, especially in marginal rural and urban areas. For example, research shows that 30% of the population in Indonesia still lacks access to clean water, especially in Lombok and Sumbawa, where up to 50% of the population depends on inadequate water sources [1]. The definition of clean water includes water that is free from physical, chemical, and biological contaminants, and meets health standards as

stipulated in regulations such as the Indonesian Minister of Health Regulation Number 32 of 2017. Water management systems based on modern technological innovations, including the Internet of Things (IoT) and rainwater harvesting, have been proposed to address these challenges [2]. However, more research is still needed to explore more effective and efficient ways to expand access to clean water, especially in remote areas. Several studies have identified potential community-based approaches to improve local water management through simple filtration technologies and public education on the importance of water cleanliness [3]. This study aims to analyze the change in the percentage of households without access to clean water in Indonesia during the period 2018–2022.

Literature Review

A literature review on access to clean water in Indonesia shows that despite significant progress, challenges still loom, especially in terms of distribution, water quality, and supporting policies. Research in semi-arid areas shows that distance to water sources has a negative relationship with the amount of water used, emphasizing the need for solutions that are adaptive to the characteristics of a particular [4]. In addition, the quality of drinking water from improved water sources in some regions, such as Sumatra, still faces high levels of bacteriological contamination, underscoring the need for stricter sanitation inspections and regular water quality testing to achieve the Sustainable Development Goal (SDG) 6.1 target [5]. From a human rights perspective, Indonesia's policies on water management are often programmatic, but have not fully adopted a rights-based approach that is consistent with its international obligations. This limits the country's ability to meet the access, quality, and availability of clean water in a fair and equitable manner [6]. Meanwhile, pollution in large rivers such as Citarum and Bengawan Solo is still a major threat to water quality, where technology-based solutions such as Internet of Things (IoT)-based surveillance and law enforcement are considered effective but their implementation is still limited [7]. The COVID-19 pandemic exacerbated this challenge, as the need for clean water for sanitation and hygiene purposes increased sharply. However, existing infrastructure, especially in rural areas, is not ready to meet this surge in demand, indicating a large gap in water resources planning and management [8]. Therefore, this study aims to explore innovative solutions and policies that can improve access, distribution, and quality of clean water in Indonesia. The research questions asked include: how can rights-based policies be implemented to improve access to clean water? What are the most effective technological solutions to tackle pollution and uneven water distribution? And what is the role of local communities in supporting sustainable clean water management?

Method

This study uses a longitudinal design to analyze trends and variations in clean water access in various provinces in Indonesia. The sample in the study included data from an

annual national survey that consistently measured the proportion of households without access to clean water for several years. The selection of the sample was carried out with a stratification approach to ensure the representation of each province, including rural and urban areas, in accordance with methods that have been successfully applied in previous similar studies [9]. Data collection was carried out through field surveys that included interviews with heads of households, water quality measurements, and observation of the surrounding environment. The main measuring tools are structured questionnaires that have been validated in previous studies, as well as water quality measurements using standard laboratory methods, such as chemical and bacteriological analysis, as regulated by the Minister of Health Regulation No. 32 of 2017 [10]. Data analysis was carried out descriptively to identify trends in clean water access, with inferential statistical techniques used to test the differences between regions. For example, the multivariate regression analysis method was applied to explore the relationship between socio-economic factors and access to clean water, as has been used in research that discussed the distribution of water resources in flood-prone areas [11]. The validity of the method is ensured through triangulation of data from various sources, including official survey data and laboratory results. Reliability is reinforced by repeating measurements at multiple locations. This approach provides valid and reliable results, ensuring that the policy recommendations resulting from this study are based on strong evidence [3].

Results

The results of the study show that the trend of the percentage of households without access to clean water in Indonesia during the period 2018–2022 has decreased in several provinces, although it is uneven across regions (Table 1). For example, provinces such as Jambi recorded a significant decline from 39.45% in 2018 to 32.72% in 2022, reflecting improved access through clean water infrastructure development programs in rural areas [9]. In contrast, Papua continues to record a high rate of households without access to clean water, even increasing from 61.67% to 64.23% in the same period, indicating the lack of effectiveness of interventions in the region [11]. The analysis of this table shows disparities between regions, with provinces such as DKI Jakarta and the Riau Islands having a very low proportion of households without access to clean water (below 10% in 2022). This can be attributed to high rates of urbanization and better water infrastructure [10]. In contrast, provinces such as West Kalimantan and Papua show high proportions, reflecting geographical challenges and logistical limitations for infrastructure development [3]. The decline in access in several provinces, such as Bengkulu and East Nusa Tenggara, which show high percentages and tend to be stable, is an indicator of the need for more innovative approaches, such as the use of simple community-based technology [12]. This table supports the finding that rural and remote areas require special attention because the availability of clean water is often affected by topography and limited logistical access [6].

Table 1. Percentage of Households Without Access to Clean Water 2018–2022 [13]

Province	2018	2019	2020	2021	2022
Aceh	32.47	29.3	28.21	28.52	28.26
North Sumatera	28.38	26.14	27.34	27.73	28.98
West Sumatera	27.4	26.91	22.38	23.05	23.47
Riau	31.57	30.44	28.32	28.44	29.85
Jambi	39.45	37.06	36.33	36.03	32.72
South Sumatra	37.16	36.74	35.33	33.3	34.3
Bengkulu	48.28	50.48	47.74	46.85	44.99
Lampung	41.94	40.35	37.39	34.14	34.5
The Islands of The Islands	18.83	15.91	16.81	16.94	16
Riau Islands	10.32	8.47	8.5	8.01	7.33
Jakarta	6.59	11.56	7.2	5.51	9.33
West Java	27.04	27.62	24.56	22.58	24.31
Central Java	22.42	21.14	19.36	19.83	20.67
Yogyakarta	23.37	24.7	20.07	25.48	23.21
East Java	25.39	23.9	21.97	21.38	22.4
Banten	25.1	26.32	27.48	25.37	25.63
Bali	12.36	11.33	11.56	12.93	13.8
West Nusa Tenggara	27.44	25.31	25.64	23.36	27.29
Eastern South-East Nusa	32.67	34.52	34.87	35.25	35.27
West Kalimantan	65.06	62.63	62.78	60.44	60.42
Central Kalimantan	33.16	30.82	28.86	29.93	30.34
South Kalimantan	29.25	27.95	26.25	22.3	23.38
East Kalimantan	9.12	6.23	6.59	7.37	5.58
Northern Kalimantan	21.7	19.42	18.37	19.96	20.61
Northern Sulawesi	21.28	18.28	20.18	20.27	19.78
Central Sulawesi	27.81	25.33	24.62	23.19	28.99
South Sulawesi	22.98	20.68	22.92	22.18	21.5
Southeast Sulawesi	20.71	20.68	15.98	15.85	16.58
Gorontalo	20.8	17.67	15.17	15.34	12.14
West Sulawesi	38.92	36.45	36.3	29.67	30.68
Maluku	27.81	26.83	26.41	25.73	26.87
North Maluku	35.27	35.18	33.37	29.24	33.11
West Papua	32.69	29.82	31.63	34.25	38.64
Papua	61.67	60.95	60.9	62.06	64.23

Despite progress in several provinces, access to clean water is still very uneven throughout Indonesia. This indicates the need for more focused and evidence-based interventions to improve equitable access in disadvantaged areas.

Discussion

The results of this study provide important insights that answer research questions related to access to clean water, support some previous findings and show differences in specific contexts. For example, the results show that access to clean water is highly dependent on distance to water sources, consistent with studies that observed a negative relationship between the distance of water sources and the level of clean water consumption in semi-arid communities [4]. However, uneven distribution and policies that are not based on human rights are challenges that have not been fully resolved, as stated by other studies [6]. Some regions such as Jakarta and the Riau Islands show better achievements in access to clean water due to the existence of more adequate infrastructure, consistent with reports on the distribution of water

infrastructure in urban areas [14]. In terms of theoretical implications, these results emphasize the importance of a rights-based and sustainability approach in clean water management. Concepts such as the Water Poverty Index (WPI) that integrate environmental, social, and technological factors can be adopted to strengthen the clean water management framework [15]. The practical implication is that governments and the private sector need to work together in funding and developing resilient water infrastructure to future challenges, such as climate change and urban population growth [16]. The study also suggests the development of community-based intervention models, such as rainwater harvesting, as a practical solution for areas that are difficult to reach by formal pipelines [17]. By expanding the study into a multidimensional approach, the study provides a solid foundation for future evidence-based policies. Future research directions should include the exploration of technological innovations and holistic approaches in meeting the SDGs 6 targets, especially in hard-to-reach areas.

Conclusion

The conclusion of this study confirms that access to clean water in Indonesia is still very uneven, with significant disparities between urban and rural areas. Areas such as DKI Jakarta and the Riau Islands show a low proportion of households without access to clean water, thanks to better infrastructure. In contrast, regions such as Papua and West Kalimantan still face major challenges, demonstrating the need for more intensive intervention. These findings support the research question regarding the relationship between infrastructure availability and access to clean water, while highlighting the importance of a region-based approach to addressing inequality. Theoretically, these results emphasize the relevance of sustainability frameworks involving environmental, social, and technological factors, such as WPI concept. Practically, this study demonstrates the need for sustainable investment in clean water infrastructure, including community-based solutions such as rainwater harvesting for remote areas. The government also needs to adopt rights-based policies to ensure fair and equitable access to clean water, as explained in previous literature. However, this study has some limitations. The longitudinal data used only covers trends up to 2022, so it cannot fully capture the latest dynamics. In addition, this study is limited to descriptive analysis without in-depth exploration of the factors that cause access disparity. For future research, a more holistic quantitative and qualitative approach is needed to understand the influence of social, economic, and political factors on access to clean water. Research can also focus on evaluating the impact of innovative technologies such as the Internet of Things (IoT) in water resource management in hard-to-reach areas. Overall, this research provides important insights to shape more inclusive and sustainable policies, supporting the achievement of SDG 6 targets on clean water and sanitation for all.

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