



Management Planning Water Resources in Balikpapan City, Indonesia: A Case Study

 Mellyda Dharma Mulyawati^{1*},  Agus Ferdinand¹,  Jauchar B¹,  Angga Kusuma Wijaya²,  Herdin Arie Saputra³

¹Master of Government Science, Faculty of Social and Political Science, Mulawarman University, Indonesia

²Faculty of Public Policy, Australian National University, Australia

³Department of Political Science and Area Studies, Ural Institute of Humanities, Ural Federal University named after the first President of Russia B. N. Yeltsin, Ekaterinburg, Russian Federation.

Received: 18 June 2024; Revised: 4 July 2024; Accepted: 5 July 2024

*Corresponding Author: mlldhrm@gmail.com

Abstract

This study aims to investigate the role of water resource management in Balikpapan City, Indonesia, focusing on how the city government implements sustainable development and water governance practices. Using a qualitative approach and literature review, this research examines Balikpapan's strategies for addressing water challenges amid climate change, population growth, and its role within the Indonesian Capital City (*Ibu Kota Nusantara*, IKN) area. Findings reveal that Balikpapan's regional development plan has adopted a sustainable approach, emphasizing prevention and mitigation efforts to secure long-term water resources. In addition to constructing new infrastructure, Balikpapan is exploring collaboration with neighboring administrative areas to ensure a reliable water supply in the future. Nonetheless, there is a need for stronger partnerships with the private sector, especially to support technological innovations that, while potentially costly, could enhance water management. Public participation is also essential to prevent social conflicts and to ensure that development progresses fairly and inclusively. By engaging diverse stakeholders—including the government, private sector, and community—in planning and implementation, Balikpapan and IKN Nusantara can work towards sustainable development goals that prioritize environmental responsibility and

How to quote: Mulyawati, M., D., Ferdinand, A., Jauchar B., Wijaya, A., K., & Saputra, H., A. (2024). Management Planning Water Resources in Balikpapan City, Indonesia: A Case Study. *Government & Resilience*, 2(2), 41-62. <https://doi.org/10.62503/gr.v2i2.17>

meet the needs of all communities. This collaborative approach can foster sustainable, equitable solutions that align with global goals, supporting a resilient and water-secure future for Balikpapan and its surrounding areas.

Keywords: Water Governance, Climate Change, Sustainable Development, Water Resource Management, Indonesia

Introduction

Climate change refers to long-term and significant changes in the world's climate caused by natural causes or human activities (Chen et al., 2013). The increase in temperature due to global climate change (Carr et al., 2024) makes the temperature in the current dry season 1.5 to 3°C higher than the temperature in the pre-industrial era (Liu et al., 2019). This affects the longer dry season which is felt by two-thirds of the world's population (Kuczynski, 1928). Prolonged drought will impact the reduction of groundwater and surface water, which can eventually affect social and economic aspects (Naumann et al., 2018).

Water is a source of life and human life (Bogin & Varea, 2020) that is used for purposes such as agriculture, clean water supply, power generation, transportation, and so on. The conservation of water resources (Booth & Charlesworth, 2014) has an important role in the management are the community and agencies related to the management of water resources (Arguëllo, 2018).

In Law (UU) Number 17 of 2019 concerning Water Resources, 2019) Article 6 states that "The state guarantees the people's right to water to meet the minimum daily basic needs for a healthy and clean life in sufficient quantities, good quality, safe, sustainable, and affordable". However, the fact is that in Balikpapan City there is still a shortage of raw water for drinking water (Tröger et al., 2021). The need for raw water for drinking water (García-Ávila et al., 2021) in Balikpapan City until 2039 is projected to be around 3.3 cubic meters per second, but currently only 1.3 cubic meters per second has been met (kaltim.antaranews.com, 2021). Iwan Wahyudi is a member of the Balikpapan City DPRD explained that for now, the residents of Balikpapan City are still having difficulties in getting clean water (Talukdar et al., 2023). As a result of the distribution disruption experienced by the Tirta Manuntung Balikpapan Company (PTMB) or PDAM (prokal.co, 2023).

Indonesia has adopted the formulation of the *Sustainable Development Goals* (SDGs) (Miyazawa, 2012) from the United Nations which has begun to be implemented in the National Medium-Term Development Plan (RPJMN) document for the period 2015 – 2019 and 2020 – 2024. The Balikpapan City RPJMD for 2021-2026 states that Balikpapan is experiencing limited availability of raw water with a raw water deficit of 1,570 lt/s out of the total need of 2,000 lt/s. Regarding the SDG targets related to climate change impacts (Moritz & Agudo, 2013), Goal 13 specifically emphasizes that governments around the world act tactably to address the impacts of climate change (Singh et al., 2023). One of the targets is to strengthen global resilience (Hicklin, 2024) and adaptation and integrate climate change anticipation actions into policies and planning strategies in each country (Presidential Regulation of the Republic of Indonesia. No. 111 of 2022, 2022).

Listed in (Law No. 23 of 2014 concerning Regional Government, 2014) concerning Regional Government in ensuring the fulfillment of community needs for water, Regional Governments are given the authority to manage water resources as one of the regional potentials. In this case, the Balikpapan City Regional Government handed over its implementation to an agency in the form of a Regionally Owned Enterprise (BUMD) engaged in drinking water services, namely the Regional Drinking Water Company abbreviated as PDAM.

Therefore, based on the above background, this study aims to evaluate the Regional Medium-Term Development Plan (RPJMD) of Balikpapan City for 2021-2026 which is used in supporting the achievement of the Sustainable Development Goals (SDGs), especially the Strategy regarding climate change is also explained in Goal 6 of the SDGs, which is related to ensuring the availability and management of clean water and sanitation (Zahid, 2018). In the global and specific targets of implementing agencies/agencies, how many actions are emphasized until 2030 to ensure a sustainable fresh water supply to anticipate water scarcity? By reviewing the concept of water governance (Groenfeldt & Schmidt, 2013; Kirkpatrick, 1992) which is hoped to be used by the government, the private sector, and the community in water management regarding government policy-making by paying attention to environmental sustainability, balancing resources with water needs for people who still pay attention to the ecosystem and maintain the sustainability of water resources as part of the ecology of the government (Kirkpatrick, 1992).

Water resources are important to life on Earth (Schnoor, 2015). Water is not only needed by humans but also by nature to maintain the stability of its ecosystem (Cadotte et al., 2012). Water resources are any form of water that can be utilized by humans and other living things to meet their needs (Hodder, 2014). The types of water sources generally used include seawater, rainwater, groundwater, and surface water (geograf.id, 2024).

Water Resources Management is an effort to plan, implement, monitor, and evaluate the implementation of water resource conservation, water resource utilization, and water damage control (Loucks & Van Beek, n.d.). This effort is a very important process in maintaining the balance of water use and the sustainability of the ecosystem (Purwanto & Susanto, 2017).

Currently, Integrated Water Resources Management (PSDAT) is very necessary considering the main water-related problems, including the increasingly limited availability of clean water, water pollution phenomena, and water use conflicts (Ashton, 2002). The implementation of PSDAT is needed to overcome these problems and ensure the sustainability of water data sources (Syme, 2008). Therefore, to ensure its implementation, PSADT must involve the development of policies, regulations, and information systems (Hevner, 2004). This involvement ensures the implementation of PSDAT, including integration between development and water management and the community's active role (Arsyad, 2017).

The SDGs are a global action plan agreed upon by world leaders to end world problems, such as poverty, inequality, and the environment. The goal is to ensure that everyone lives better by 2030 (UNICEF, 2020). The Sustainable Development Goals (SDGs) (Waage et al., 2015) have 17 (seventeen) goals that aim to achieve sustainability and prosperity for people and the planet (Benavot, 2017). One of the water-related goals is Goal 6, which is the availability of Clean Water and Proper Sanitation with the target of achieving universal access to clean water and proper sanitation by 2030 (Thennakoon, et al., 2017).

The importance of this target means that everyone should have access to clean and safe water for drinking or washing, as well as access to sanitation and personal hygiene (Reddy & Snehathal, 2011). By achieving these goals, we can improve public health, reduce the risk of water-related diseases (Teymouri & Dehghanzadeh, 2022), and ensure sustainable water resource management (Batterman et al., 2009). Clean water and proper sanitation are the basic rights of every individual (Hardberger, 2005). Therefore, a concerted effort from around the world is needed to achieve this goal and ensure that everyone can enjoy access to safe water and adequate sanitation (UNICEF, 2020).

The regional Medium-Term Development Plan (RPJMD) is a regional development planning document that is valid for five years. This document contains an elaboration of the vision, mission,

and program of the regional head, concerning the Regional RPJP and paying attention to the National RPJM. In Balikpapan City Government (2021) states that the RPJMD is an elaboration of the vision, mission, and programs of the Mayor and Deputy Mayor which contains goals, objectives, strategies, policy directions, and regional development programs implemented by the Regional Apparatus accompanied by indicative funding. This document details development priorities and policy directions to advance the city of Balikpapan. The RPJMD is a reference in the implementation of development programs and activities during this period.

There are nine Development priorities in the Balikpapan City Regional Medium-Term Development Plan (RPJMD) for 2021-2026:

1. Government Bureaucracy
2. Health and Education
3. Poverty Alleviation
4. Availability of Drinking Water
5. Flood Management
6. Comfortable Environment
7. Social
8. Balikpapan as a MICE and Tourism City
9. Revitalization of Regional Public Company [*Perusahaan Umum Daerah, Perusda*] (jdih.balikpapan.go.id, 2021).

In the Balikpapan City Regional Medium-Term Development Plan (RPJMD) for 2021-2026, water issues are one of the main focuses. Efforts to address water needs involve infrastructure development, water resource management, and agreements with surrounding districts. In addition, flood management, environmental and social comfort are also the focus of the RPJMD.

The Balikpapan City Regional Medium-Term Development Plan (RPJMD) for 2021-2026 sets several development priorities in the environmental and social fields:

1. Availability of Drinking Water: Focus on meeting the drinking water needs of the population.
2. Flood Management: Efforts to overcome flood risks.
3. Comfortable Environment: Improve the quality of the environment.
4. Social: Paying attention to aspects of welfare and diversity of society

The Sustainable Development Goals (SDGs) are a global guide to achieving sustainable development. In the 2021-2026 Balikpapan City RPJMD, the SDGs are part of development priorities, including the availability of drinking water, flood management, and environmental comfort.

The Millennium Development Goals (MDGs) program (Sachs, 2012), which is the initial part of the Sustainable Development Goals (SDGs) program, took place in the period 2011-2014. The SDGs are a global call to end poverty, protect the planet, and ensure peace and prosperity for all by 2030. Sustainable development meets today's needs without sacrificing the capabilities of future generations. The importance of the SDGs in the new capital city project emphasizes the need for all aspects of development to refer to these goals. (Kalalinggi et al., 2023)

One of the programs related to sanitation infrastructure and involving community participation is Community-Based Urban Sanitation (SPBM). This program involves various parties at the central, provincial, and regional levels (Kusumah & Mustofa, 2020)

This concept refers to a way of water management that is considered good and sustainable. In line with the Sustainable Development Goals (SDGs) program Number 6, namely Access to Clean Water and Sanitation. Indonesia faces its own challenges because it has two climates, namely the rainy season and the dry season. Therefore, good water resource management is essential to

overcome water shortages during the dry season so that there are no adverse drought and flood disasters when entering the rainy season.

Water management systems, in their concept, incorporate how public policy is not only the responsibility of the government (Woodhouse & Muller, 2017) but also requires the participation and involvement of civil society as well as the private sector (Camkin & Neto, 2016). In addition, public policies related to water management must consider the balance between water resources and community needs, while still paying attention to the preservation of ecosystems and water resources (UN, 2014)

The UN explains that *Water Governance* in its concept (Manzungu, 2006), incorporates how public policy is not only the responsibility (Idris et al., 2023) of the government but also requires the participation and involvement of civil society and the private sector. In addition, public policies related to water management must consider the balance between water resources and community needs, while still paying attention to the preservation of ecosystems and water resources (UN, 2014)

Technical Capability of Water Management (Daigger, 2009), including knowledge, technical ability, information, use of cutting-edge technology, and understanding of the principles of sustainable water management (Boberg, 2005). This is important considering that in water governance (Gupta & Pahl-Wostl, 2013), the context of the policy content must be in favor of environmental sustainability and sustainable development that is fair, coherent and integrative (Kusumah & Mustofa, 2020). This study aims to investigate the role of water resource management in Balikpapan City, Indonesia, focusing on how the city government implements sustainable development and water governance practices.

Research Methods

In this study, a qualitative approach (Creswell, 2018) was employed, specifically through a comprehensive literature study (Idris et al., 2023). This approach involved a thorough examination of various existing documents, reports, and scholarly articles related to the topics under investigation (Aprilianadi & Noor, 2024). Initially, we provided detailed definitions and explanations of key concepts, including water resources, Sustainable Development Goals (SDGs), climate change, and water governance. This foundational understanding was essential for contextualizing the subsequent analysis.

Following the conceptual groundwork, we explored how the Balikpapan City Government incorporates sustainable water resource management into its development planning (Lewis, 2004). This involved analyzing policy documents, strategic plans, and implementation reports to assess the government's commitment to sustainability (Menzies, 2016). We examined specific initiatives and strategies employed by the government to ensure the availability and quality of water resources for current and future generations (Lee, 1982).

Furthermore, the study investigated the practical aspects of water governance in Balikpapan, focusing on the measures taken by the city administration to mitigate the risks of a potential water crisis exacerbated by climate change. This included evaluating the effectiveness of current water management practices, infrastructure development, and community engagement efforts aimed at fostering resilience against climate-induced water challenges (Gober & Kirkwood, 2010). By scrutinizing these elements, the study aimed to provide a comprehensive understanding of the city's preparedness and adaptive strategies in the face of climate change impacts on water resources (Kraisoraphong & Rajaratnam, 2010).

Research Site

Administratively, the overall area of Balikpapan City is 51,101.24 Ha. Geographically, Balikpapan City is located at 116.5° East Longitude and 117.0° East Longitude and between 1.0° South Latitude and 1.5° South Latitude, and borders Kutai Kartanegara Regency, North Penajam Paser Regency, and the Makassar Strait. The following is an administrative map of Balikpapan City (See Figure 1):



Figure 1. Balikpapan City Administration Map. Source: Balikpapan City Development and Regional Asset Planning Agency (2011), 2024

The city of Balikpapan consists of 6 sub-districts and 34 sub-districts. As much as 85% of Balikpapan City is a hilly area while the other 15% is a plain area located along the east and south coasts of Balikpapan City (Balikpapan Regional Government, 2021). The hilly contour of the land in Balikpapan City makes it difficult for PDAM to produce and distribute clean water supply to all residents so many residents rely on groundwater or drilled wells for daily activities (Gozali et al., 2021).

Results and Discussions

The influence of climate on drought in Balikpapan City, Indonesia

The annual rainfall in Balikpapan City from 1991 to 2020 ranges from 2200 mm - 2400 mm. Seasonal rainfall in Balikpapan City 1991-2020 is in the range of 750 mm – 450 mm. The peak of the rainy season in Balikpapan City is in the MAM season (March, April, and May), and the peak of the dry season is in the SON season (September, October, and November).

In the dry and rainy seasons, there are often fluctuations in the existing water reserves, causing a limitation of water resources that are used as a source of raw water. Raw water sources that have

been scattered have not been measured with relatively small discharges (Holt, 2000). Quality, quantity and continuity are still limited. Limitations are also owned by the management of IPA ((Holt, 2000), limited network coverage, old treatment units and distribution networks, and a fairly high water network leakage rate (Puji Isyanto & Dedi Mulyadi, 2020).

Table 1. Number of Rainy Days by Month in Balikpapan City in 2021-2023

MONTH	Number of Rainy Days by Month in Balikpapan City		
	2021	2022	2023
January	23	15	22
February	11	17	23
March	19	16	25
April	18	14	20
May	16	11	24
June	16	16	21
July	17	14	19
August	22	21	7
September	15	15	13
October	20	23	15
November	22	16	22
December	20	19	23
Sum	219	197	234

Source: Central Statistics Agency of Balikpapan City, 2024

The water crisis in Balikpapan City that occurred in October 2023 was caused by a long drought and resulted in a limited supply of clean water, so the Balikpapan City PDAM had to implement a water distribution rotation policy for some people in Balikpapan and the drying of the Teritip Reservoir and Manggar Reservoir (kalim.idntimes.com, 2023). This is because reservoirs or dams are one of the sources of clean water that are highly dependent on hydrological cycles involving rainfall. The Manggar Reservoir itself is a source of water for approximately 69% of Balikpapan residents. Low rainfall in the dry season will affect the decrease in the water level of the dam in the Manggar Reservoir (Hendriyani et al., 2021). The impact of the reduction in clean water sources due to the drought ultimately makes it difficult for residents to get water supply. This is because PDAM has reduced production capacity by 64.35 percent (Kalimantan.bisnis.com, 2023).

The Balikpapan City Regional Medium-Term Development Plan (RPJMD) for 2021 - 2026 states that the impact of climate change that is currently occurring has been felt by all communities in the world, including a decrease in rainfall and extreme drought (Spinoni et al., 2014). To reduce the impact on climate change, efforts are needed through mitigation and adaptation by strengthening disaster prevention and control (Balikpapan City Government, 2021). The availability of water as irrigation and a source of clean water may be reduced due to climate change (Riviwanto & Dwiyaniti, 2019).

Population of Balikpapan City

The availability of clean water is also closely related to the population conditions in an area. Population dynamics have very important implications for ecosystems, including those related to water availability. The high growth rate and population density can certainly affect the availability of clean water. Rapid population growth has resulted in not all components of society being able to enjoy clean water (Alihar, 2018).

The population density of Balikpapan City reaches 1,445 people per km² in 2023. Central Balikpapan District is the most populous area with a population density of 14,619 people per km². This is far from West Balikpapan District which has the lowest population density in Balikpapan City which is only 441 people per km² (Badan Pusat Statistik Kota Balikpapan, 2024).

Reporting from *Kompas*, the city of Balikpapan began to experience a clean water crisis for the first time in October 1991. Until now, the increase in population in the city of Balikpapan which has not been followed by the increase in clean water capacity has caused the community's limitations in meeting the needs of clean water for daily needs such as drinking, cooking and others (Kompas.id, 2020). The core area of the Nusantara Capital City (IKN) which is located in North Penajam Paser (PPU) makes Balikpapan City the nearest regional partner. This has the potential to affect an increasingly large water crisis caused by the incessant development that will occur followed by population growth and the need for clean water (kaltim.akurat.co, 2023; Kompas.id, 2020).

In Balikpapan City itself, based on Net Consolidated Data (DKB) issued by the Director General of Dukcapil Permendagri after the determination of the IKN location, specifically in 2021 the population growth in Balikpapan City was around 17,743, then in 2022 around 18,926, and in 2023 as many as 19,334 people. In the period from January to March 2024 residents

Balikpapan has increased again by 4,600 people. This means that cumulatively the population in Balikpapan City, which is the buffer for the IKN, will increase by 60 thousand residents from 2021 to 2024 (kaltim.antaranews.com).

An Instagram account (@enjoybpn) mentions that the percentage of population growth in Balikpapan ranges from 2.21 to 3.46 percent per year. Until 2030, the population of Balikpapan is projected to be 866,720 people. However, in 2040, the population of Balikpapan is projected to increase rapidly to 1,217,877 people. The size of the population is directly proportional to the water supply needs of Balikpapan residents. This account also said that the people of Balikpapan are expected to need a raw water supply of 3,856 liters per second or as much as 249 percent of the current availability of raw water. This is a projection of the water needs of the people of Balikpapan in 2040 (kaltim.idntimes.com, 2023).

Table 2. Population of Balikpapan City in 2023

NO	SUB DISTRICT	TOTAL POPULATION			TOTAL AREA (KM ²)
		MALE	FEMALE	TOTAL	
1	EAST BALIKPAPAN	53.106	49.853	103.959	119,16
2	WEST BALIKPAPAN	50.584	47.237	97.821	192,88

3	NORTH BALIKPAPAN	96.167	92.438	188.605	138,24
4	CENTRAL BALIKPAPAN	53.867	51.882	105.749	10,38
5	SOUTH BALIKPAPAN	80.416	77.904	158.320	11,10
6	BALIKPAPAN CITY	377.458	361.047	85.078	511,01

Source: Central Statistics Agency of Balikpapan City, 2024

In Balikpapan City, the availability of water to meet the needs of the community, it is obtained through surface water and groundwater. Groundwater is water that is found in the soil or rock layer below the surface of the soil, for example well water. Meanwhile, surface water is all water found on the ground surface, for example river water, reservoir water, lake water, and pond water. Currently, surface water is the main source of water in Balikpapan City. The surface water used is water that comes from reservoir reservoirs. The reservoir in Balikpapan City is a rainfed reservoir, therefore the availability of reservoir water is very determined by the rainfall that falls at a certain time (Suseno & Widyastuti, 2017).

Table 3. Report on the Number of Surface Water Withdrawals (AP) for All Water Treatment Installations in Balikpapan City in March 2022.

Water Management Installation (WMI)	Capacity (Litre)
Kampung Damai WMI	45,01
Gunung Sari WMI	140,11
Prapatan WMI	70,13
ZAMP WMI	10,08
Kampung Baru WMI	18,82
Total groundwater extraction WMI	284,15

Source: Regional Public Utility Company in Balikpapan, Indonesia, 2022

Table 4. Report on the Number of Surface Water Withdrawals (AP) for All Water Treatment Installations in Balikpapan City in March 2022

Water Management Installation (WMI)	Capacity (Litre)
Teritip WMI	166,93
Kampung Damai WMI	492,2
Batu Ampar WMI	70,13
Total deep water extraction WMI	284,15

Source: Regional Public Utility Company in Balikpapan, Indonesia, 2022

The Balikpapan City RPJMD for 2021-2026 targets to increase the supply of raw water by 1,720lt/second from the total raw water demand of 2,353lt/second. However, from these targets and needs, in 2023 Balikpapan City will only be able to provide a raw water supply of 1,550lt/second (Pemerintah Kota Balikpapan, 2021).

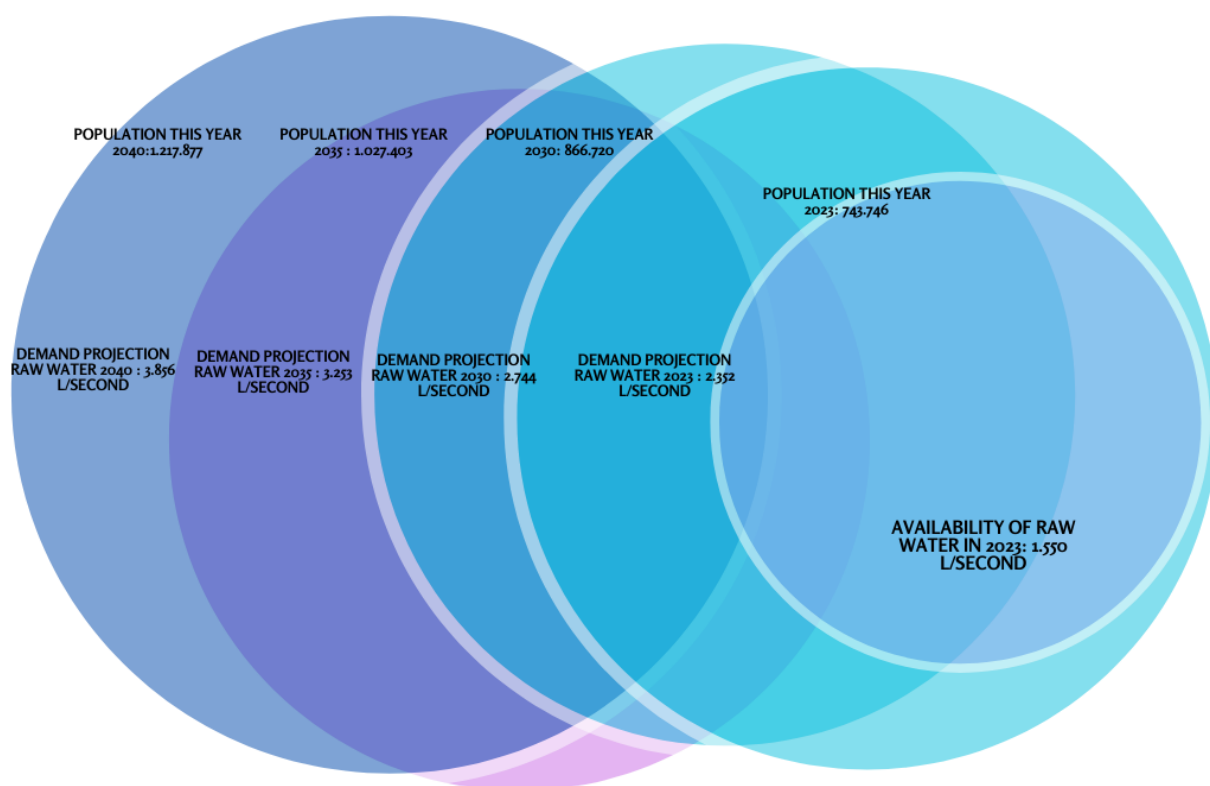


Figure 2. Projected Population of Balikpapan City and Balikpapan City's Raw Water Needs in 2023-2024. Source: Instagram @enjoybpn, 2024

Based on Figure 2, the population projection is made based on the unusually rapid population growth rate of Balikpapan in recent years, showing a possible population growth of 2.21% - 3.46%. In 2030, Balikpapan may have 866,720 residents, but in 2040, the number will increase rapidly and

significantly and could reach 1,217,877 residents. If this does happen, Balikpapan will likely need raw water up to 3,856 L/Second, which is 249% of the current availability of raw water (Balikpapan City Government, 2021).

Balikpapan City Planning Related to Clean Water and Drought Management

In obtaining raw water sources, the city of Balikpapan is highly dependent on rainwater (bsw.balikpapan.go.id, 2023). In Balikpapan City, the availability of water to meet the needs of the community, it is obtained through surface water and groundwater. The water source of Balikpapan City that uses surface water comes from reservoirs, namely the barnacle reservoir and the Manggar Reservoir.

The Balikpapan City Government is currently also building a drilled well in West Balikpapan and preparing the construction of the *Sepaku Semoi* SPAM (Drinking Water Supply System) as an alternative approach to meet the raw water needs in the region. The *Sepaku Semoi* Dam was built to serve the fulfillment of raw water in the Nusantara Capital City (IKN) area and its surroundings. This dam will have a capacity of 2,000 liters per second for the IKN, and 500 liters per second for distribution to Balikpapan (Kompas.com, 2023). This dam has an inundation area of 322 hectares and a capacity of 16 million cubic meters of water, which will serve the raw water needs in the IKN area and partly for the city of Balikpapan (Kompas.com, 2023).

What continues to happen is that in 2024 the *Sepaku Semoi* IKN Dam will not run smoothly, there is a phenomenon of social conflicts that arise related to the issue of relocation of residents and environmental impacts (Kompas, 2024). The emergence of social conflicts related to the construction of the *Sepaku Semoi* Dam arises mainly due to the issue of relocating residents and environmental impacts.

One of the affected communities is the Balik Tribe, who refused to relocate for fear of losing their cultural identity and customary land. (Mongobay, 2023) On the other hand, they are still experiencing a clean water resource crisis and the slow Perumda AMDT PPU clean water service (Prokal.co, 2023). They (Balik Tribe) who live in the *Sepaku Semoi* IKN Development area submitted several demands to protect their rights (Mongobay, 2023).

In line with these problems, triggering the emergence of potential conflicts is influenced by strong ethnic polarization where the risk of conflict is higher in a more polarized society. To turn this potential or risk into reality, various other things need to be considered, such as the level of education, history of previous conflicts, ethnic stereotypes, inter-ethnic relations, economic and political conditions, etc (Gunawan, 2024).

If reviewed from the budget issued by the Government of 836 billion which the development process started from 2020 until now, the role of the government and the private sector in overcoming this problem is very important. (Kompas, 2024) The government, through the Ministry of Public Works and Public Housing (PUPR), is responsible for the construction and supervision of the project. President Joko Widodo directly inaugurated and monitored the development of this dam, showing a high commitment from the government to complete the project on time (presidenri.go, 2023)

The Balikpapan City Government has taken various steps to overcome the water crisis in the region. Broadly speaking, these steps are taken to ensure the availability of clean water, which so far has mostly only been provided by the Manggar Reservoir and the Teritip Reservoir. The first effort is through cooperation between Balikpapan City, North Penajam Paser Regency and Kutai Kartanegara Regency. This collaboration plans to overcome the water needs in the region by taking raw water from the Mahakam River.

The second effort is the construction of the Aji Raden Reservoir. This reservoir aims to provide raw water that will be processed into clean water by PDAM (Regional Drinking Water Company). Currently, the Balikpapan City Government has only freed 71 hectares of land from the total need for reservoir land which reaches 150 hectares. The process of acquiring the remaining land of about 79 hectares will take place in 2025. The Aji Raden Reservoir is part of a long-term effort to meet the needs of raw water in Balikpapan.

The next effort is synergy with the *Sepaku-Semoi* Drinking Water Supply System (SPAM): The Balikpapan City Government hopes that the water supply from the *Sepaku-Semoi* SPAM can help overcome the water crisis in Balikpapan. This SPAM is planned to be integrated with four districts/buffer cities of the State Capital.

Then is the seawater desalination plan. Desalination is the process of converting salt water into fresh water by removing salt content. Although it requires a large cost, this effort is considered a potential alternative to overcome the shortage of clean water supply in Balikpapan. Nevertheless, there are challenges that need to be overcome, and the support from investors who are willing to help meet the city's water needs is the key to the success of the desalination plan (kaltim.akurat.co, 2023).

Considering the high cost of desalination technology above. Therefore, the role of the private sector is also needed in this matter. This is in accordance with the concept of *water governance* which emphasizes that public policy is not only the responsibility of the government but also requires the helping hand and participation of *civil society* and the private sector (Kusumah & Mustofa, 2020). All of these efforts are part of the government's commitment to ensure that the needs of clean water are met for city residents, especially considering that Balikpapan is a buffer city for the National Capital that is visited by many residents from various regions (Wulandari, 2022).

Many countries are beginning to consider more holistic and ecosystem-based water management strategies, as well as paying attention to a more cautious approach to the development of large infrastructure such as dams. However, over time, it began to be seen that these projects failed to trigger environmental damage (Bartz et al., 2010)

The need for good water governance (Wilson et al., 2019) in response to the political complexity of water management how good water governance must be able to adapt to changing climate conditions, including through flexible and responsive policies

Through the Regional Medium-Term Development Plan (RPJMD), the Balikpapan City Government has projected the need for clean water until 2030 to 2040. The projection is important so that clean water infrastructure planning can be prepared by taking into account future needs. In a broader scope, the Balikpapan City RPJMD also emphasizes the phenomenon of extreme drought and underlines the need for efforts through mitigation and adaptation by strengthening disaster prevention and control.

In addition to the planning approach above, various efforts that have been and will be carried out by the Balikpapan City government such as partnership schemes with the surrounding administrative areas, the construction of reservoirs, dams and seawater desalination plans have also begun to be formulated. However, to overcome technical obstacles such as financial problems and others, a *water governance approach* that allows collaboration between the private sector and community groups can also be carried out (Miranda et al., 2011).

The participation of civil society, especially local communities at project sites, plays a crucial role in sustainable water governance. Not only do local communities have in-depth knowledge of their local environment and conditions, but they are also key stakeholders who will be directly

affected by water management policies and projects (Benson et al., 2015). When they are actively involved in the decision-making process, it not only ensures a fair representation of their interests, but also strengthens the social legitimacy of the policies and projects implemented. Conflicts that often arise between local communities, private companies, and governments, as occurred in the construction of the *Sepaku Semoi* dam, are often caused by a lack of adequate consultation and dissatisfaction with the sharing of benefits or losses. By facilitating inclusive participation and establishing open dialogue, potential conflicts can be better managed and more sustainable solutions can be achieved, ensuring that water management is not only effective but also supports sustainable social and environmental justice (Ma'mun, 2023).

The *Sepaku-Semoi* Dam to support the Water Treatment Plant (IPA) in Sepaku. The invitation that hints at the potential for social conflict due to unequal access to clean water in Sepaku District is the main focus of the discussion (prokal.co, 2023). This meeting involved various relevant parties, including the development implementation task force, relevant government agencies, and Perumda AMDT PPU, to find solutions that can minimize the negative impact on existing clean water services and ensure a fair and efficient distribution of water resources for all communities in the region (Ginting, 2023).

Research Implication

Previous research has served as a crucial reference for this initiative (Woodhouse & Muller, 2017). Studies on water management, sustainable resource utilization, and the impact of water treatment facilities on local communities have provided valuable insights that guided the planning and execution of the *Sepaku Semoi* Water Treatment Plant (WTP). These references have helped to identify the best practices and technologies to be implemented, ensuring the project's effectiveness and sustainability. By leveraging existing research, the government aims to address the water crisis more efficiently and create a model that can be replicated in other regions facing similar challenges. This evidence-based approach underscores the importance of informed decision-making in tackling environmental and resource-related issues.

The limitation of this research is its focus on good water governance in sustainable development at the *Sepaku Semoi* Dam of IKN. The researcher conducted an in-depth study using qualitative methods, supported by highly accurate data.

Conclusion

Sustainable development that adopts a comprehensive water management approach is crucial for the City of Balikpapan. By implementing such strategies, Balikpapan can ensure the sustainable management of its water resources, which is essential for guaranteeing the availability and quality of water for its residents and the surrounding environment (Mishra et al., 2021). This approach not only addresses the immediate needs of the population but also secures the long-term health of the ecosystem, promoting balanced and resilient urban growth (Maheshwari, 2016). In Indonesia, where water resources can be both abundant and scarce depending on the region, Balikpapan's model of comprehensive water management can serve as a valuable example for other cities aiming to achieve sustainability and environmental stewardship (Turnbull et al., 2021).

The provision of clean water for the community is a goal as well as a mandate that must be managed and carried out by the government. In the context of global climate change currents and future population increases, the provision of clean water sources can no longer rely on an adequate approach for the present. The increase in population means that we are getting closer to the potential

for water resource conflicts in the future. Especially when we take into account the potential for extreme droughts that can reduce or even eliminate raw water sources.

Therefore, a sustainable development and *water governance* approach is needed to face the challenges of the water crisis. The concept of water governance itself has been debated when viewed from its history (Woodhouse & Muller, 2017) in the 20th century the concept of water governance contributed to economic and social development, but also faced serious challenges in the 1970s and 1980s related to environmental impacts. During this period, the construction of dams and irrigation was widely considered as a solution to overcome the problem of water shortage and increase agricultural production and economic development. In the 1970s and 1980s, there was a greater awareness of these impacts, as well as a paradigm shift towards more sustainable development.

The suggestion that needs to be made for the Balikpapan City Government is to increase projections and strategies in the provision of clean water sources, which are in line with the development of the Special Economic Zone or IKN. The presence of the IKN can attract an increase in population, both permanent and non-permanent, in Balikpapan City beyond the current projection. Therefore, it is necessary to take the following steps:

- Population Projection Evaluation: It is necessary to update and adjust the population growth projection, taking into account the economic attractiveness of the IKN. This evaluation should cover a variety of population growth scenarios, including best and worst case scenarios.
- Water Infrastructure Planning: Integrating growth projections with adequate clean water infrastructure planning. This includes increasing water treatment capacity and water distribution networks to accommodate the growing needs of the community.
- Water Resources Conservation: Adopt efficient water conservation policies and technologies to ensure the sustainable use of clean water resources and can meet the needs of a growing population.
- Stakeholder Engagement: Involve all stakeholders, including local communities and the private sector, in the process of planning and implementing clean water supply strategies. This is important to ensure support and active participation in maintaining sufficient water availability for all.
- Monitoring and Evaluation: Establish an effective monitoring system to monitor water use and its impact on the environment, as well as to evaluate the effectiveness of policies and strategies implemented.

By implementing these measures, the Balikpapan City Government can better prepare itself to face the growth induced by the presence of the IKN, while ensuring that the community's needs for clean water are met in a sustainable and equitable manner.

Competing Interest Statement

The authors state that they have no competing financial interests or personal relationships that could affect the work reported in this paper.

Acknowledge

We would like to thank the Government & Review Editorial and Review Team. Resilience Journal that has supported our manuscript until it was published.

References

- Alihar, F. (2018). Penduduk Dan Akses Air Bersih Di Kota Semarang (Population and Access to Clean Water in Semarang City). *Jurnal Kependudukan Indonesia* |, 13(Juni), 67–76.
- Aprilianadi, F., & Noor, M. (2024). Strategi Pengembangan Pariwisata Pesisir di Desa Pasir Mayang Kabupaten Paser. 2024(4), 417–427.
- Arguëllo, M. (2018). Generating critical knowledge and tools for sustainable management of water resources in the Andes. *Mountain Research and Development*, 38(4), 401–403. <https://doi.org/10.1659/MRD-JOURNAL-D-18-00095.1>
- Ashton, P. J. (2002). Avoiding conflicts over Africa's water resources. *AMBIO: A Journal of the Human Environment*, 31(3), 236–242. <https://doi.org/10.1579/0044-7447-31.3.236>
- Badan Pusat Statistik Kota Balikpapan. (2024). Kota Balikpapan Dalam Angka Balikpapan 2024. [online] available at <https://balikpapankota.bps.go.id/id/publication/2024/02/28/d677bf953231438416685773/kota-balikpapan-dalam-angka-2024.html> accessed on November 2024
- Bartz, R., Heink, U., & Kowarik, I. (2010). Propuesta de definición de daño ambiental ilustrada por los casos de cultivos modificados genéticamente y especies invasoras. *Conservation Biology*, 24(3), 675–681. <https://doi.org/10.1111/j.1523-1739.2009.01385.x>
- Basant Maheshwari, V. P. S. B. (2016). Balanced Urban Development: Options and Strategies for Liveable Cities. <http://www.springer.com/series/6689>
- Batterman, S., Eisenberg, J., Hardin, R., Kruk, M. E., Lemos, M. C., Michalak, A. M., Mukherjee, B., Renne, E., Stein, H., Watkins, C., & Wilson, M. L. (2009). Sustainable control of water-related infectious diseases: A review and proposal for interdisciplinary health-based systems research. In *Environmental Health Perspectives* (Vol. 117, Issue 7, pp. 1023–1032). <https://doi.org/10.1289/ehp.0800423>
- Benavot, A. (2017). Education for people, prosperity and planet: Can we meet the sustainability challenges? In *European Journal of Education* (Vol. 52, Issue 4, pp. 399–403). Blackwell Publishing Ltd. <https://doi.org/10.1111/ejed.12248>
- Benson, D., Gain, A. K., & Rouillard, J. J. (2015). Water governance in a comparative perspective: from IWRM to a 'nexus' approach?. *Water alternatives*, 8(1), 756–773. <http://www.water-alternatives.org/>
- Boberg, J. (2005). Liquid assets: how demographic changes and water management policies affect freshwater resources. RAND corporation.
- Bogin, B., & Varea, C. (2020). Evolution of Human Life History. In *Evolutionary Neuroscience* (pp. 753–767). Elsevier. <https://doi.org/10.1016/B978-0-12-820584-6.00031-3>

- Booth, C. A., & Charlesworth, S. M. (2014). Water Resources in the Built Environment: Management Issues and Solutions.
- Cadotte, M. W., Dinnage, R., & Tilman, D. (2012). Phylogenetic diversity promotes ecosystem stability. *Ecology*, 93(sp8), S223-S233. <https://doi.org/10.1890/11-0426.1>
- Camkin, J., & Neto, S. (2016). Roles, rights, and responsibilities in water governance: reframing the water governance debate. *World Affairs*, 179(3), 82-112. <https://doi.org/10.1177/0043820017690944>
- Carr, R., Kotz, M., Pichler, P.-P., Weisz, H., Belmin, C., & Wenz, L. (2024). Climate change to exacerbate the burden of water collection on women's welfare globally. *Nature Climate Change*. <https://doi.org/10.1038/s41558-024-02037-8>
- Chen, H., Zhu, Q., Peng, C., Wu, N., Wang, Y., Fang, X., Gao, Y., Zhu, D., Yang, G., Tian, J., Kang, X., Piao, S., Ouyang, H., Xiang, W., Luo, Z., Jiang, H., Song, X., Zhang, Y., Yu, G., ... Wu, J. (2013). The impacts of climate change and human activities on biogeochemical cycles on the Qinghai-Tibetan Plateau. *Global Change Biology*, 19(10), 2940–2955. <https://doi.org/10.1111/gcb.12277>
- Daigger, G. T. (2009). Evolving Urban Water and Residuals Management Paradigms: Water Reclamation and Reuse, Decentralization, and Resource Recovery. *Water Environment Research*, 81(8), 809–823. <https://doi.org/10.2175/106143009x425898>
- Donal Happy Ginting. (2023). Urgensi Pemberdayaan Masyarakat Lokal Perspektif Kemanan dan Ketertiban Makanan di Ibu Kota Negara.
- G. Fred Lee, R. A. J. B. W. N. (1982). Water Quality Standards and Water Quality. <https://doi.org/10.2307/25041632>
- García-Ávila, F., Avilés-Añazco, A., Sánchez-Cordero, E., Valdiviezo-González, L., & Ordoñez, M. D. T. (2021). The challenge of improving the efficiency of drinking water treatment systems in rural areas facing changes in the raw water quality. *South African Journal of Chemical Engineering*, 37, 141–149. <https://doi.org/10.1016/j.sajce.2021.05.010>
- Syme, G. (2008). Sustainability in urban water futures. *Troubled waters*, 99. [online] available at <https://library.oapen.org/bitstream/handle/20.500.12657/33597/459762.pdf?sequence=1#page=109> accessed on November 2024
- Gober, P., & Kirkwood, C. W. (2010). Vulnerability assessment of climate-induced water shortage in Phoenix. *Proceedings of the National Academy of Sciences of the United States of America*, 107(50), 21295–21299. <https://doi.org/10.1073/pnas.0911113107>
- Gozali, G., Kusuma, B. J., & Mulyanto, S. (2021). Penerapan Teknologi Pengolahan Dan Peningkatan Distribusi Air Bersih Di Lingkungan Masyarakat RT 36 Kelurahan Graha Indah. *Jurnal Karya Abdi Masyarakat*, 4(3), 660–666. <https://doi.org/10.22437/jkam.v4i3.11592>
- Groenfeldt, D., & Schmidt, J. J. (2013). Ethics and water governance. *Ecology and Society*, 18(1). <https://doi.org/10.5751/ES-04629-180114>

- Gupta, J., & Pahl-Wostl, C. (2013). Editorial on global water governance. In *Ecology and Society* (Vol. 18, Issue 4). <https://doi.org/10.5751/ES-06115-180454>
- Hardberger, A. (2005). Life, Liberty, and the Pursuit of Water: Evaluating Water as a Human Right and the Duties and Obligations it Creates Recommended Citation Life, Liberty, and the Pursuit of Water: Evaluating Water as a Human Right and the Duties and Obligations it Creates. In *Northwestern Journal of International Human Rights* (Vol. 4, Issue 2). <http://scholarlycommons.law.northwestern.edu/njihr/vol4/iss2/3>
- Hevner, A. R. (2004). Design Science in Information Systems Research. pp. 75-105 (31 pages). <https://www.jstor.org/stable/25148625>
- Hicklin, J. (2024). Taking the Lead: Rechanneling SDRs to Create and Leverage a New Global Resilience Trust at the IMF. <https://about.jstor.org/terms>
- Hodder, I. (2014). The entanglements of humans and things: A long-term view. In *New Literary History* (Vol. 45, Issue 1, pp. 19–36). Johns Hopkins University Press. <https://doi.org/10.1353/nlh.2014.0005>
- Holt, M. S. (2000). Sources of chemical contaminants and routes into the freshwater environment. *Food and chemical toxicology*, 38, S21-S27. [https://doi.org/10.1016/S0278-6915\(99\)00136-2](https://doi.org/10.1016/S0278-6915(99)00136-2)
- Idris, A. S., Syaifuddin, T. I., Effendi, S. N., Alaydrus, A., Idris, A., & B, J. (2023). Corporate Social Responsibility and Sustainable Development Goals: How the Mining Industry Supports Quality Education in Paser Regency (pp. 30–44). https://doi.org/10.2991/978-2-38476-194-4_4
- Miyazawa, I. (2012). What are Sustainable Development Goals? (p. 2). Institute for Global Environmental Strategies. https://www.files.ethz.ch/isn/141991/rio_issue_brief_vol1_sdgs_mar2012.pdf
- Jason Thistlethwaite and Melissa Menzies. (2016). Assessing The Governance Practices Of Sustainability Reporting. [Policy Brief] available at <https://www.jstor.org/stable/pdf/resrep16159.pdf> accessed on November 2024
- John W. Creswell. (2018). Research Design Qualitative, Quantitative, and Mixed Methods Approaches Fifth Edition.
- Kalalinggi, R., Hisdar, M., Sarmiasih, M., & Wijaya, A. K. (2023). Forecasting The Development of IKN (New National Capital) in Sustainable Development, Indonesia. *Journal of Governance and Public Policy*, 10(1), PRESS. <https://doi.org/10.18196/jgpp.v10i1.16786>
- Ketut Gunawan, I. (2024). Ethnic Fractionalization, Ethnic Polarization, and Potential Conflict in Parent Districts of IKN. *Jurnal Ilmu Sosial Dan Humaniora*, 13(1), 38–51. <https://doi.org/10.23887/jish.v13i1.69381>
- Lewis, W. A. (2004). Development planning. Routledge.

- Kraisoraphong, K., & Rajaratnam, S. (2010). S. Rajaratnam School of International Studies Water Regime Resilience and Community Rights to Resource Access in the Face of Climate Change. In School of International Studies.
- Kuczynski, R. R. (1928). The World's Population. In Source: Foreign Affairs (Vol. 7, Issue 1). <https://www.jstor.org/stable/20028661>
- Kusumah, R. I., & Mustofa, M. U. (2020). Kajian Teoritis Water Governance Untuk Pengelolaan Air Di Indonesia. *Jurnal JISIPOL Ilmu Pemerintahan Universitas Bale Bandung*, 4(1), 29–51.
- Liu, B., Martre, P., Ewert, F., Porter, J. R., Challinor, A. J., Müller, C., Ruane, A. C., Waha, K., Thorburn, P. J., Aggarwal, P. K., Ahmed, M., Balkovič, J., Basso, B., Biernath, C., Bindi, M., Cammarano, D., De Sanctis, G., Dumont, B., Espadafor, M., ... Asseng, S. (2019). Global wheat production with 1.5 and 2.0°C above pre-industrial warming. *Global Change Biology*, 25(4), 1428–1444. <https://doi.org/10.1111/gcb.14542>
- Loucks, D. P., & Van Beek, E. (n.d.). Water Resource Systems Planning and Management An Introduction to Methods, Models, and Applications.
- Thennakoon, M. U., Gunawardena, U. A. D. P., & de Zoysa, U. (2017). Analysis of Water Management towards Achieving Sustainable Development Goal 6 (Clean Water and Sanitation for All); Case Study of WilpitaWewa (Hali-Ella), Kamburupitiya, Sri Lanka. In *Proceedings of International Forestry and Environment Symposium* (Vol. 22). <https://journals.sjp.ac.lk/index.php/fesympo/article/view/3441>
- Ma'mun, A. R. (2023). Problematika Komunikasi Politik Pendanaan Pembangunan Ibu Kota Negara Nusantara. *POLITICOS: Jurnal Politik Dan Pemerintahan*, 3(1), 1–16. <https://doi.org/10.22225/politicos.3.1.2023.1-16>
- Manzungu, E. (2006). Water for all: Improving water resource governance in Southern Africa. International Institute for Environment and Development. <http://www.jstor.com/stable/resrep01811>
- Miranda, L., Hordijk, M., & Torres Molina, R. K. (2011). LITERATURE REVIEW Water Governance Key Approaches: An Analytical Framework Literature Review.
- Mishra, B. K., Kumar, P., Saraswat, C., Chakraborty, S., & Gautam, A. (2021). Water security in a changing environment: Concept, challenges and solutions. *Water (Switzerland)*, 13(4). <https://doi.org/10.3390/w13040490>
- Moritz, C., & Agudo, R. (2013). The future of species under climate change: Resilience or decline? In *Science* (Vol. 341, Issue 6145, pp. 504–508). American Association for the Advancement of Science. <https://doi.org/10.1126/science.1237190>
- Naumann, G., Alfieri, L., Wyser, K., Mentaschi, L., Betts, R. A., Carrao, H., Spinoni, J., Vogt, J., & Feyen, L. (2018). Global Changes in Drought Conditions Under Different Levels of Warming. *Geophysical Research Letters*, 45(7), 3285–3296. <https://doi.org/10.1002/2017GL076521>

- Pemerintah Kota Balikpapan. (2021). Peraturan Daerah Kota Balikpapan No 6 Tahun 2021 tentang Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Kota Balikpapan Tahun 2021-2026 (Issue September, pp. 1–346).
- Puji Isyanto, & Dedi Mulyadi. (2020). Kajian Analisis Kebutuhan Air Bersih Bagi Warga Masyarakat dan Perusahaan (Studi Pada Kecamatan Ciampel, Kecamatan Klari dan Kecamatan Purwarasi). *Buana Ilmu*, 5(1), 1–14. <https://doi.org/10.36805/bi.v5i1.1210>
- Kirkpatrick, R. C. (1992). Ecology, government legitimacy, and a changing world order. *BioScience*, 42(11), 867-869. <https://www.jstor.org/stable/1312086>
- Reddy, B. S., & Snehalatha, M. (2011). Sanitation and personal hygiene: What does it mean to poor and vulnerable women? *Indian Journal of Gender Studies*, 18(3), 381–404. <https://doi.org/10.1177/097152151101800305>
- Riviwanto, M., & Dwiyaniti, D. (2019). Kerentanan Ketersediaan Air Bersih dan Penyakit Akibat Perubahan Iklim dan Strategi Adaptasi. *Dampak*, 16(2), 123. <https://doi.org/10.25077/dampak.16.2.123-130.2019>
- Robert A. Holt. (2016). Wastewater Discharges from Water Treatment Plants.
- Sachs, J. D. (2012). From millennium development goals to sustainable development goals. In *The Lancet* (Vol. 379, Issue 9832, pp. 2206–2211). Elsevier B.V. [https://doi.org/10.1016/S0140-6736\(12\)60685-0](https://doi.org/10.1016/S0140-6736(12)60685-0)
- Schnoor, J. L. (2015). Water unsustainability. *Daedalus*, 144(3), 48-58. https://doi.org/10.1162/DAED_a_00341
- Singh, B. K., Delgado-Baquerizo, M., Egidi, E., Guirado, E., Leach, J. E., Liu, H., & Trivedi, P. (2023). Climate change impacts on plant pathogens, food security and paths forward. In *Nature Reviews Microbiology* (Vol. 21, Issue 10, pp. 640–656). Nature Research. <https://doi.org/10.1038/s41579-023-00900-7>
- Spinoni, J., Naumann, G., Carrao, H., Barbosa, P., & Vogt, J. (2014). World drought frequency, duration, and severity for 1951-2010. *International Journal of Climatology*, 34(8), 2792–2804. <https://doi.org/10.1002/joc.3875>
- Suseno, N. V., & Widyastuti, M. (2017). Analisis Kualitas Air PDAM Tirta Manggar Kota Balikpapan. *Journal of Physics A: Mathematical and Theoretical*, 6(1), 1–8. <https://doi.org/10.1088/1751-8113/44/8/085201>
- Talukdar, I. H., Rifat, M. A., Sarkar, P., Saha, N., Tessma, M. K., & Miah, M. I. (2023). Perceived difficulties in maintaining menstrual hygiene practices among Indigenous adolescents during seasonal water scarcity periods in Bandarban hill district of Bangladesh: A cross-sectional study. *International Journal of Hygiene and Environmental Health*, 254. <https://doi.org/10.1016/j.ijheh.2023.114268>
- Teymouri, P., & Dehghanzadeh, R. (2022). Climate change and water-related diseases in developing countries of Western Asia: a systematic literature review. In *Climate and Development* (Vol.

- 14, Issue 3, pp. 222–238). Taylor and Francis Ltd.
<https://doi.org/10.1080/17565529.2021.1911773>
- Tröger, R., Ren, H., Yin, D., Postigo, C., Nguyen, P. D., Baduel, C., Golovko, O., Been, F., Joerss, H., Boleda, M. R., Polesello, S., Roncoroni, M., Taniyasu, S., Menger, F., Ahrens, L., Lai, F. Y., & Wiberg, K. (2021). What's in the water? – Target and suspect screening of contaminants of emerging concern in raw water and drinking water from Europe and Asia. *Water Research*, 198. <https://doi.org/10.1016/j.watres.2021.117099>
- Turnbull, J. W., Clark, G. F., & Johnston, E. L. (2021). Conceptualising sustainability through environmental stewardship and virtuous cycles—a new empirically-grounded model. *Sustainability Science*, 16(5), 1475–1487. <https://doi.org/10.1007/s11625-021-00981-4>
- Waage, J., Yap, C., Bell, S., Levy, C., Mace, G., Pegram, T., Unterhalter, E., Dasandi, N., Hudson, D., Kock, R., Mayhew, S. H., Marx, C., Poole Book, N., & Editor, B. (2015). Ubiquity Press Chapter Title: Governing Sustainable Development Goals: interactions, infrastructures, and institutions Chapter Title: Thinking Beyond Sectors for Sustainable Development. Ubiquity Press.
- Woodhouse, P., & Muller, M. (2017). Water Governance—An Historical Perspective on Current Debates. In *World Development* (Vol. 92, pp. 225–241). Elsevier Ltd. <https://doi.org/10.1016/j.worlddev.2016.11.014>
- Wulandari, putri ayu. (2022). Kapasitas Pemerintah Kota Balikpapan Mengatasi Masalah Krisis Air Bersih. december, 44.
- Zahid, J. (2018). Impact of clean drinking water and sanitation on water-borne diseases in Pakistan. <https://www.jstor.org/stable/resrep17223>

Document

- Badan Pusat Statistik Kota Balikpapan. (2024). *Kota Balikpapan Dalam Angka Balikpapan Municipality in Figures 2024*.
- Pemerintah Daerah Balikpapan. (2021). *Profil Pembangunan Kota Balikpapan 2021*.
- Pemerintah Kota Balikpapan. (2021). *Peraturan Daerah Kota Balikpapan No 6 Tahun 2021 tentang Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Kota Balikpapan Tahun 2021-2026* (Issue September, pp. 1–346). <http://balikpapan.go.id/berita/detail/6053/pertama-di-kaltim-workshop-posyandu-terintegrasi>
- Peraturan Presiden RI. No. 111 Tahun 2022, Kementerian Sekretariat Negara RI 1 (2022).
- Undang-undang (UU) Nomor 17 Tahun 2019 tentang Sumber Daya Air, Jdih Bpk Ri Database Peraturan 50 (2019). <https://peraturan.bpk.go.id/Home/Details/122742/uu-no-17-tahun-2019>
- Undang-undang no 23 Tahun 2014 Tentang Pemerintah Daerah, 58 Undang-undang Republik Indonesia 460 (2014). <https://pih.kemlu.go.id/files/UU0232014.pdf>

Website :

- <https://balikpapankota.bps.go.id/indicator/151/148/1/jumlah-hari-hujan-menurut-bulan-di-kota-balikpapan.html> diakses pada: 6 Mei 2024
- <https://bsw.balikpapan.go.id/news/9395-debit-air-di-waduk-teritip-dan-manggar-menurun-wali-kota-lakukan-peninjauan> diakses pada: 6 Mei 2024
- https://geograf.id/jelaskan/pengertian-sumber-daya-air/#google_vignette diakses pada: 7 Mei 2024
- <https://jdih.balikpapan.go.id/v2/detail-berita/195> diakses pada: 14 Mei 2024
- <https://kaltim.akurat.co/news/1343316396/krisis-air-di-balikpapan-desalinasi-laut-solusi-atasi-kekurangan-pasokan> diakses pada: 6 Maret 2024
- <https://kaltim.antaranews.com/berita/109726/kota-balikpapan-masih-kekurangan-air-baku> diakses pada: 4 Maret 2024
- <https://kaltim.antaranews.com/berita/211092/dampak-ikn-penduduk-balikpapan-meningkat-14-persen-per-tahun> diakses pada: 6 Mei 2024
- <https://kaltim.idntimes.com/news/kaltim/muhammad-maulana-3/krisis-air-balikpapan-berharap-pasokan-air-dari-spams-mahakam> diakses pada: 6 Mei 2024
- <https://kaltim.idntimes.com/news/kaltim/sri-wibisono/proyeksi-kebutuhan-air-baku-di-balikpapan-dari-postingan-media-sosial> diakses pada: 5 Mei 2024
- <https://kaltim.tribunnews.com/2023/02/08/pemkot-balikpapan-pastikan-akan-tetap-bayar-ganti-rugi-lahan-embung-aji-raden> diakses pada: 6 Mei 2024
- <https://kaltim.tribunnews.com/2024/03/07/solusi-walikota-rahmad-masud-atasi-krisis-air-bersih-di-balikpapan-buat-jangka-panjang-dan-pendek> diakses pada: 6 Mei 2024
- <https://kaltimpost.jawapos.com/balikpapan/2384371466/untuk-penyedia-air-baku-2025-pembebasan-lahan-embung-aji-raden-tuntas?page=1> diakses pada: 6 Mei 2024
- https://koran.bisnis.com/read/20231003/436/1700267/dampak-kekeringan-balikpapan-terancam-krisis-air-baku?utm_source=desktop&utm_medium=search diakses pada: 6 Mei
- <https://lestari.kompas.com/read/2023/05/11/130000686/mengenal-tujuan-6-sdgs--air-bersih-dan-sanitasi-layak> diakses pada: 8 Mei 2024
- <https://web.balikpapan.go.id/detail/read/49> diakses pada: 9 Mei 2024
- <https://www.kompas.com/properti/read/2023/01/13/190321821/bendungan-sepaku-semoi-impounding-juni-2023-ini-progresnya> diakses pada: 6 Mei 2024

<https://www.kompas.id/baca/nusantara/2020/03/02/sejarah-panjang-balikpapan-mencari-air> diakses pada: 5 Maret 2024

<https://www.prokal.co/kalimantan-timur/1773809156/ketersediaan-air-bersih-masih-menjadi-keluhan-warga-balikpapan> diakses pada: 4 Maret 2024

<https://www.tirtamanuntung.co.id/infrastruktur/sumber-air-baku/88> diakses pada: 6 Mei 2024