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Water Resources Potential Assessment during Dry Season in Indonesia: A Systematic Literature Review

Mohamad Sapari Dwi Hadian[1], Sani Suhardiman[2], Yusi Firmansyah[3], Mochamad Nursiyam Barkah[4], Cecep Yandri Sunarie[5], Aldrin Ramadian[6]

Abstract

The dry season in Indonesia has been studied in the context of its impact on rainfall extremes, with research indicating that the dry season rainfall extremes are strongly affected by IOD and ENSO (El Niño-Southern Oscillation). The impact of dry season in 2023 based on the data from the Meteorological, Climatological, and Geophysical Agency (BMKG) mentioned that this dry season started from march to September 2023. Java Island, whose land area is only 138,379 km² or 7 (seven) percent of Indonesia's area, has a very important position because it is crowded by 65 percent of Indonesia's population or an average of 864 people / km² and contributes to GNP of 60 percent. This article aims to review the water resources in Java Island in Indonesia during the dry season in 2017 to 2023. That causes the lack of water resources has become the main problem in some area in Java Island in Indonesia. This research result assesses the water resources during the dry season, the technique, the method, and the findings. There are 287 articles found only from Scopus sources, 40 article reviewed, and only 5 articles have been matched to the topic by using Prisma P. process. Finally, the result shows that one aspect that remains unclear about Indonesia's dry season is how exactly climate change influences its duration and intensity. While it's known that Indonesia undergoes a dry season, the specific impacts of climate change on factors like rainfall patterns, temperature, and the occurrence of extreme weather events are not fully grasped. This lack of understanding presents challenges for planning agriculture, managing water resources, and conserving ecosystems in the region.

Keywords: *Resources Potential Assessment, Literature Reviewe, Water Resources.*

Introduction

Climate phenomena such as El Niño and the Indian Ocean Dipole (IOD) have impacted The dry season in Indonesia by leading to decreased rainfall and drier-than-usual conditions in some areas (Mujetahid et al., 2023). The dry season in Indonesia typically lasts from June to November, and in March 2023, the Meteorology, Climatology, and Geophysics Agency (BMKG) issued advice that the intensifying El Niño phenomenon and positive IOD may cause a drought during this period. (Adinugroho et al., 2022) . The concurrence of both phenomena is likely to exacerbate the impacts of El Niño, leading to decreased rainfall in some areas of Indonesia throughout the dry season (Yulianti et al., 2023). BMKG has provided historical data from a similar situation in 2019 when El Niño coincided with IOD, and it triggered more than 4000 hotspots and significant impacts to communities, including forest fires in several provinces in Indonesia. The dry season has also been associated with forest fires, impacting the productivity of the affected regions.

The dry season in Indonesia has been studied in the context of its impact on rainfall extremes, with research indicating that the dry season rainfall extremes are strongly affected by IOD and ENSO (El Niño-Southern Oscillation) (Yulianti et al., 2023) .Additionally, the response of tropical dry forests to El Niño Southern Oscillation has been assessed, indicating that the dry season was negatively affected by specific sea surface temperature anomalies (Sayama et al., 2021) . Furthermore, scholarly interest in forest fires in Indonesia during the dry season has been noted, with research highlighting the impact of fires during this period. Additionally, there has been a comparative study of bioclimatic definitions using two climatic data sets,

[1] Faculty of Geological Engineering, Universitas Padjadjaran, 45363, Indonesia, Email: sapari@unpad.ac.id, (Corresponding Author)
[2] English language Education, Universitas Negeri Yogyakarta, Sleman, 55281, Indonesia, Faculty of Engineering, Universitas Buana Perjuangan Karawang, 41361, Indonesia, Email: sani.suhardiman@ubpkarawang.ac.id
[3] Faculty of Geological Engineering, Universitas Padjadjaran, 45363, Indonesia, Email: yusi.firmansyah@unpad.ac.id
[4] Faculty of Geological Engineering, Universitas Padjadjaran, 45363, Indonesia, Email: m.nursiyam@unpad.ac.id
[5] Faculty of Geological Engineering, Universitas Padjadjaran, 45363, Indonesia, Email: cecep.yandri@unpad.ac.id
[6] Faculty of Geological Engineering, Universitas Padjadjaran, 45363, Indonesia, Email: aldrin.ramadian@unpad.ac.id

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which includes the assessment of annual precipitation and dry season in the context of the tropical dry forest (Deros et al., 2022) .

Drought can be interpreted as a temporary lack of water or moisture supply significantly below normal or expected volumes for a given period (Kuswanto et al., 2021) . Hydrological drought is indicated by the lack of water in the hydrological system both including rivers, reservoirs and lakes (Kim et al., 2023) . Lack of water supply will have an impact on various factors from health to economic factors, and this if not monitored will become a problem in the future and have a prolonged impact (Fitriyah et al., 2019). As we all know that drought is one of the natural disasters that are considered important that occur, especially in tropical and subtropical regions, this is certainly common in Indonesia every year as stated by (Asadi et al., 2022) (Fitriyah et al., 2019). The dry season can occur in a short time, in a certain period of time or over a long period of time depending on rainfall and other causative factors and it has a very significant impact (Deformes et al., 2023). Based on data from the National Disaster Management Agency (BNPB), large and vast provinces in Indonesia experience the impact of drought and some even severe conditions (Prasetyo et al., 2022) .

Knowing the characteristics of rivers, drought duration is a very important source for drought planning and mitigation in describing hydrological drought and GWP potential (Stiegler et al., 2019) . Estimates of the frequency (i.e., payback period) with which these characteristics repeat form the basis for assessing the severity of drought and water shortage (Arianti et al., 2022) . In addition, spatio temporal quantification of payback periods can be used to establish appropriate water demand and supply systems and help address challenges encountered in hydrometeorological regulation of rivers, lakes to reservoirs in the site area (Suharnoto et al., 2022) . Estimates of drought return periods can be early warning information, minimizing potential drought risks that may occur in the future (Muralikrishnan et al., 2022) .

in 4 major provinces, and the Special Region of Yogyakarta Province and the capital city of Jakarta which experienced severe drought in early July to October 2023 experienced extreme drought, up to 120 days without rain (Jameel et al., 2023) . Based on this fact, it is very important to study future drought patterns in some of the above provinces which will be useful to predict very appropriate strategies, mitigation and adaptation to minimize the risk of drought occurring (Yulianti et al., 2023) . This paper investigates GWP drought only in terms of the River's potential and focuses on projections of future climate in a more general sense.

Knowing the characteristics of rivers, drought duration is a very important source for drought planning and mitigation in describing hydrological drought and GWP potential (Krisnanto et al., 2021) . Estimates of the frequency (i.e., payback period) with which these characteristics repeat form the basis for assessing the severity of drought and water shortage (D. B. E. Putra et al., 2021) . In addition, spatio temporal quantification of payback periods can be used to establish appropriate water demand and supply systems and help address challenges encountered in hydrometeorological regulation of rivers, lakes to reservoirs in the site area (Deformes et al., 2023) . Estimates of drought return periods can be early warning information, minimizing potential drought risks that may occur in the future.

Assessing water resources potential during the dry season in Indonesia is a crucial topic, given the country's reliance on groundwater as a source of freshwater, particularly during periods of low rainfall (Krisnanto et al., 2021) . A systematic literature review on this subject can provide valuable insights into the methods, findings, and challenges related to water resources assessment in the context of seasonal variations. A systematic literature review on this topic can provide a comprehensive overview of the current state of knowledge and offer insights that can be useful for policymakers, researchers, and professionals involved in water resources management in Indonesia, especially during dry seasons when water resources are under stress.

The aim of this article is to review the water resources in java island in Indonesia during the dry season in the 2017 to 2023. That causes the lack of water resources that become the main problem in mostly some area in java island in Indonesia. This research result is assessing the water resources during the dry season, the technique, the method and the finding. Realizing how important the role of water resources for life and

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the increasingly weak carrying capacity of water resources in Java Island caused by various factors including caused by environmental damage and triggered by the rapid rate of forest destruction, is an important reason how important this SLR research study is to the carrying capacity of water resources in Java island, especially during the current dry season.

Literature Review

Water Resources research is critical to sustainable development and biodiversity conservation (Arcega-Cabrera et al., 2023). The characterization of water resources and the assessment of water recharge in specific areas are part of these studies (Nishi et al., 2023). Water resources is widely used in the city of Semarang. From 1982 to 2002, water resources withdrawal increased significantly, from 14 million m3 in approximately 150 registered wells to 45 million m3 in 1.200 registered wells (Wurjanto et al., 2019). The socio-cultural component was found to be highly significant when examining the published studies (Stec, 2023). For many individuals, it may be the deciding factor when selecting an additional water source for their home. According to some studies, the main problem with this topic is low public awareness, which is typically brought about by a lack of educational programs and information (Jia et al., 2023).

The status of water quality was determined using two methods listed in the Decree State Minister of Environment Number 115 of 2003 concerning Guidelines for Status Determination (Sudiyani et al., 2022). Water Quality is measured using the STORET (the water ability in aquiver) method and the Pollution Index method developed by Nemerow and Sumitomo. Methods for determining water quality status using the STORET method calculated from water quality monitoring data. Monitoring data is the result of sampling river water quality at up to 540 points in 79 rivers using APBN (Local Government funds) (deconcentration). In Java Island, particularly in a specific area (Wiranegara et al., 2023) .

Java Island, whose land area is only 138,379 km² or 7 (seven) percent of Indonesia's area, has a very important position because it is crowded by 65 percent of Indonesia's population or an average of 864 people / km² and contributes to GNP of 60 percent (Nishi et al., 2023). This situation makes Java Island the center of development attention in Indonesia. On the other hand, the environmental carrying capacity of Java Island continues to decline, which is marked by the increasing frequency of natural disasters and environmental damage (Febrianto et al., 2023). Floods, landslides, droughts, earthquakes, and volcanic eruptions can reduce the carrying capacity of the environment and have an impact Large losses both in the form of casualties and material (Krisnanto et al., 2021). The main factors causing the disaster are in addition to climate change, blobal warming and due to other important factors, such as the number and distribution of population, utilization of natural resources (Triplett & Condon, 2023). government institutions and natural resource management policies that have cumulatively caused environmental damage to Java Island (Faidah et al., 2022).

Water Resources in Indonesia

Since the dry season has caused drought in some areas of Indonesia, the ministry of public works and housing has anticipated and mitigated the impact of the dry season through the directorate general of water resources (Belgaman et al., 2017). According to data from the Meteorological, Climatological, and Geophysical Agency (BMKG), the impact of the dry season in 2023 began in March and will last until September 2023 (Akil et al., 2023) . Water consumption comes first, followed by irrigation and farming. The Director of BMKG, Jarot widyatmoko, mentioned the actions and steps to anticipate this happening by conducting FGD (focus group discussions) and allocating funds for rehabilitation and maintenance of existing wells. Then, if there is no CAT (groundwater basin) and the water has also dried up, continue to coordinate with the local governments to drop water with water tanks.

The ministry stated that in the year 2023, Indonesia has constructed 37 new drilled wells spread across 19 provinces (Listyani et al., 2023). Furthermore, it rehabilitated 25 existing drilled wells in 11 provinces."The government also performs operation and maintenance activities for all existing wells in the OPOR (Optimization and Rehabilitation Maintenance Operations) program, which includes approximately 8,213 drilled wells with a capacity of 72.02 m3 / second.While the lowest index achievement for the last 8 years

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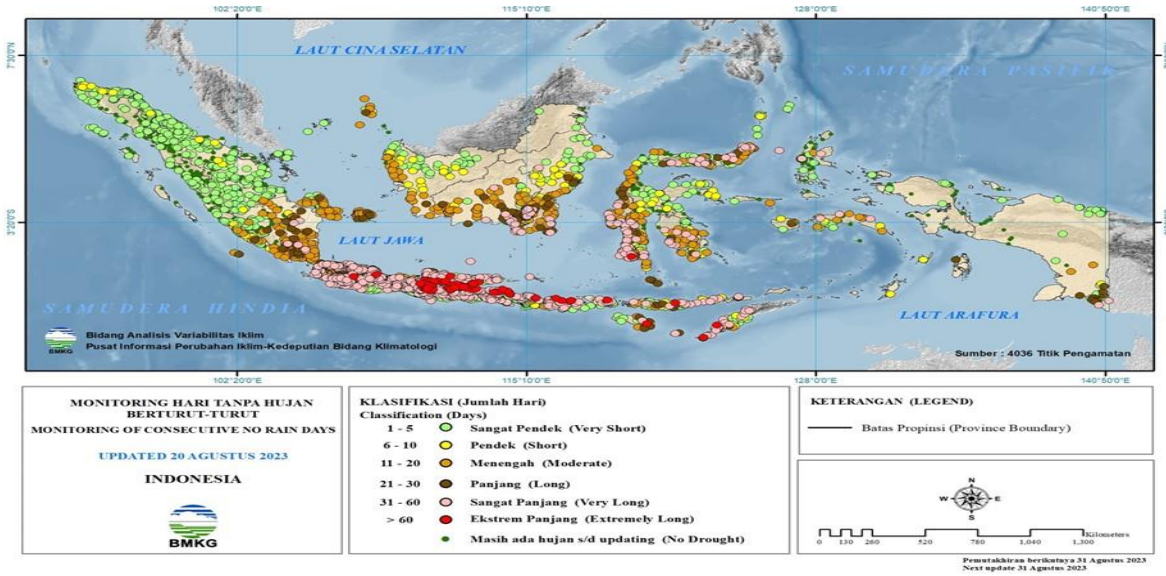
occurred in 2016 with an index of 50.2 points. This figure managed to increase by 5.5 percent in 2017 to 53 points. (Yulianti et al., 2023) explained that Over a period of 8 years, the water quality index fell 3 times, less than the increase. The increase in IKA occurred 4 times in a row since 2017, 2019, 2020, and 2022 with each having points above 52 points.

This demonstrates good performance for the Ministry of Environment and Forestry in continuing to improve Indonesia's existing water quality index (P. S. Putra et al., 2023). Aside from bore well construction, the Ministry of Public Works and Housing optimizes the function of water storage in dams, situ, reservoirs, and lakes. Currently, the condition of 13 major reservoirs is being monitored: Jatiluhur, Jatigede, Kedung Ombo, Batu Tegi, Wadas Lintang, Wonogiri, Karang Kates, Bili Bili, Wonorejo, Paselloreng, Bintang Bano, Kalola, and Tapin (Stiegler et al., 2019) .

The volume of water available from the 13 main reservoirs is 3.37 billion m3 as of August 6, 2023, from an effective reservoir of 5.93 billion m3 and an effective reservoir of 5.55 billion m3. The 13 dams can serve an area of 568,074 hectares out of a total of 572,485 hectares. It will also continue to build 13 more dams (ongoing) in 2023 (Badaruddin et al., 2023). In order to prepare for the drought of agricultural land, the report stated that structurally rehabilitated irrigation networks covering an area of 412,541 hectares, according to the Director. Then there's the operation and maintenance (OP) of irrigation areas totaling 3,015,345 hectares, as well as the operation and maintenance of 923 rivers. Water shortages in the dry season of 2023 will primarily affect rainfed rice fields and rice fields that rely on technical irrigation from weirs that are dependent on river water discharge (Muralikrishnan et al., 2022) .

Monitoring of Consecutive No Rain Days



Picture 1. Monitoring of No Rain Days in Indonesia

In Java, Indonesia, monitoring consecutive rainless days is essential to assess drought conditions and their impact on agriculture and water resources. The Indonesian Meteorology, Climatology and Geophysics Agency (BMKG) monitors meteorological droughts and droughts on a 10-day time scale, complemented by daily dry season monitoring derived from satellite-based rainfall products. This monitoring helps in understanding the duration and severity of dry periods, which is crucial to anticipate potential water scarcity and its impact on food security, especially in the largest rice-producing districts. In addition, in various regions of Indonesia, including East Java, extreme droughts have been observed with more than 60 consecutive days without rainfall, emphasizing the importance of monitoring such conditions for effective water resources management and agricultural planning.

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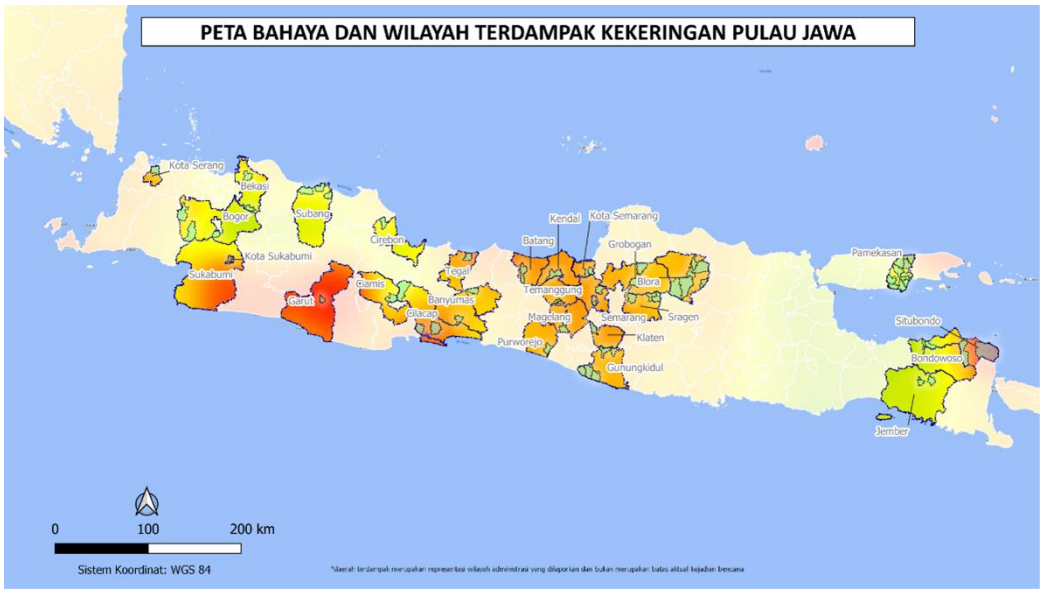
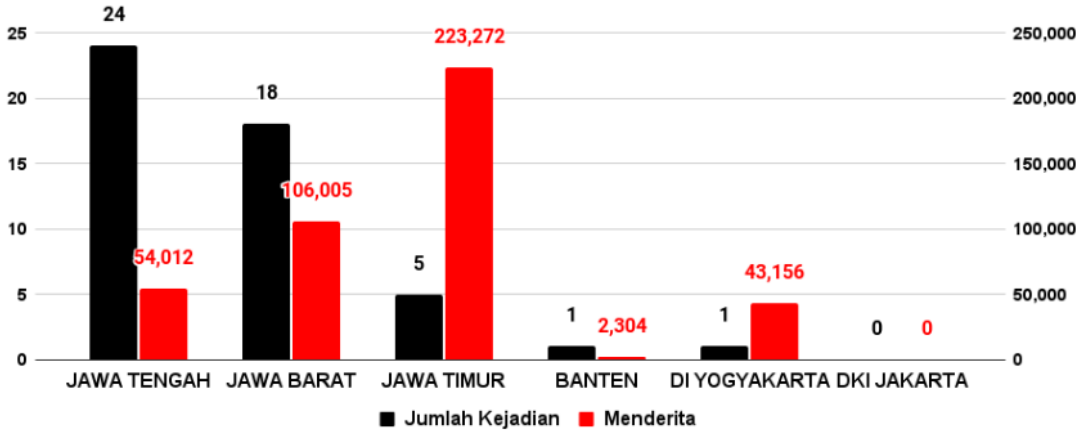
Map of Hazards and Areas Affected By Drought In Java Island



Picture 2. Map of Hazards And Areas Affected By Drought In Java Island

Based on the risk map and hazard map of drought-affected areas in Java Island taken from InaRisk, most areas in Java, especially in areas affected by drought, are included in the risk index category and medium to high hazard index. Coupled with El Nino that hit Java, it is likely that some areas in Java Island are experiencing drought. In August 2023, drought will hit several areas in Java, Serang City in Banten Province and in West Java Province, including Sukabumi Regency, Bogor Regency, Bekasi Regency, Subang Regency, Sukabumi City, Garut Regency, Ciamis Regency, and Cirebon Regency. In Central Java, drought also hit a number of regions, including Tegal, Banyumas, Cilacap, Purworejo, Magelang, Temanggung, Batang, Kendal, Semarang, Semarang, Grobogan, Blora, Sragen, Klaten. While in East Java, drought hit the Pamekasan area, Situbondo Regency, Bondowoso Regency, and Jember Regency. The D.I. Yogyakarta region is also experiencing drought in Gunung Kidul Regency

In addition to having a risk index and hazard index with moderate to high categories, El Niño plays a role in making the Java region have very low rainfall. Based on the Monitoring of Consecutive No Rain Days issued by the Meteorology, Climatology and Geophysics Agency (BMKG), some areas in Java Island have the number of days without rain with a long to extreme long category. El Niño is the cause of the long



Graphic 1. Illustrates Drought Disaster in Java Island, Banten Province, DIY And Jakarta

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Data collected until August 27, 2023, that there are five of the six provinces in Java affected by drought on Java Island. Central Java, with the highest incidence this year experienced 24 drought disasters with 54,012 people affected. The highest position is occupied by West Java, second as many as 18 drought events with a total of 106,005 victims affected. East Java with 5 drought events, resulting in the highest affected victims with 223,272 people. Banten only experienced 1 drought with 2,304 people affected. D.I. Yogyakarta also experienced one drought with 43,156 victims affected. Meanwhile, DKI Jakarta has not recorded drought this year.

Methodology

The Systematic Literature Review (SLR) method uses the process search of literature sources. Consists of research identification, selecting major research, accessing the quality of a literature, abstracting data and continuously monitoring, and synthesizing data by searching using internet search media. The selected article only from Scopus arranged from January 2017 to October 2023. The Research design used in this research uses a case study research design. Subject In this study, relevant data are needed to obtain the data based, data collection techniques, thus, the validity of the data is reliable and trustworthy. Data collection techniques are intended to obtain The data needed, to then be analyzed. There are several Hancing to do. The stages are the Search Process, Research Question, Inclusion and Exclusion Criteria, Quality assessment, Data Analysis, and Deviation from Protocol (Report Deviations)

The literature review was conducted and limited only in several areas in the java island Indonesia. The method of this study used Prisma P. Process PRISMA (Preferred Reporting Items for Systematic Reviews) and PICO[17] analysis, Population, Intervention, Comparison and O outcome, the analysis is drawn in the table below:

NO	Article / author	Year	Loc	Topic	Link / DOI	method	finding	Include/ Exclude	Reason
1.	Fitriyah	2019	Wonogiri Central Java	Drought mitigated	https://doi.org/10.3390/su11246897	Remote sensing DATA (CWSI) And TVDI	Frequency of Elnino Caused risk of drought in paddy rice field	excluded	Java Island. Out of topic
2.	Weichend lo	2021	Semarang	Ground water and water resources	https://doi.org/10.3390/w13101395	Simulations were carried out to obtain hydrogeology data, artificial and natural deep well disposal, and boundary effects in Semarang	This research shows that with proper measurement and management in Semarang City against Groun	**Included**	Java Island, the topic and the location represent the population of SLR topic and the area

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						City. From 1970 to 1990 Calibration Groundwater modeling undergoes two flow conditions from steady state Temporary conditions from 1990 to 2005 have been distributed in Semarang City for six observation wells	dwater control is able to restore the ground water level to rise again and the sustainability of ground water resources can be achieved again		
3	Panjie Wiranegara, Sunardi.	2023	Cirata, Bandung	Hydrology Effect, and Climate Change	. https://doi.org/10.3390/w15173132	Mann Whitney U-Test	the water quality characteristics in the Cirata Reservoir in the dry season were influenced by environmental conditions in the reservoir,	**Included**	Java Island, the topic and the location represent the population of SLR topic and the area

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4	Rubiantoro	2021	Pakis, East Java (Semeru Mountaint)	Water Quality, and GWP	DOI: 10.24425/jwld.2022.140382	Geoelectric measuremen	GWP Flows through the volcanic rocklayers	**Included**	Java Island, the topic and the location represent the population of SLR topic and the area
5	Siswo	2019	Kebumen, central Java	Water Sources Area, Environment Problems	doi:10.3390/f10100825	CCA canocial responden analysisto find out water resources	Plants of water source area	excluded	Java Island, but not in the specific method and topic of SLR
6	Anna fadliyah rusdi	2021	City of indonesia . Indramayu	Groundwater to iron manganeses contamination	https://doi.org/10.1007/s42452-021-04385-y	decomposition of organic matter from reductive environments can arise due to high dissolved organic carbon (DOC) coupled with high concentrations of trace metals	Trace-metal levels are substantially higher in the northern tip of Indramayu, indicating the impact of human activities on Fe and Mn dissolution. Additionally, the groundwater conditions in the souther	excluded	In java island but not discussed the specific topic

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							n portion are compar atively more natural, meanin g that human activity has less of an impact on the presenc e of Fe and Mn in this area.		
7.	Surya damar sasong ko, 2022		Yogy akart a, indon esia	Groun d water conta minate d by nitrate	doi:10.15243/ jdmlm.2022.0 94.3643.	The source of nitrate in the study area was identified using the Cl/NO3 and Cl/Br ratios in the research procedure . The groundwa ter table gradient, permeabil ity, depth to the groundwa ter table, sorption capacity above the groundwa ter table, and horizonta l distance from the contamin ation source	the study shows that with a maxim um concent ration of 167 mg L-1, nitrate levels in the study area typicall y surpass the WHO's maxim um drinkin g water standar d. Conta minatio n is the cause of the ground water's	**Included**	Java island (Special region of yogyaka rta) Java Island, the topic and the location represe nt the populat ion of SLR topic and the area

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						were used to assess the possibility for groundwater contamination.	excessive nitrate concentration.		
8	Halda, 2017	2019	Indonesia,	TOPOGRAPHIC CONTROL ON GROUNDWATER FLOW IN CENTRAL OF HARD WATER AREA,	DOI: https://doi.org/10.21660/2019.60.8104	This study is interested in the groundwater potential in West Progo Hills, particularly in the central part of it. Groundwater mapping was carried out in Girimulyo - Kaligesing and the surrounding area in order to obtain geologic data, water table measurements, and geomorphological data.	According to the findings of the study, the ground water table usually follows the local topography. The ground water table is shallow if it is between 0.9 and 8 meters below the surface. Wells dug by hand, as well as springs, are only found locally. Some springs are frequently found at slope breaks,	excluded	Not in the specific topic and specific area

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							indicating that they are governed by topography. According to data from dug wells, ground water conforms to topographic conditions.		
9	Muhammad rangga	2021	Cikapundung, west java indonesia	Raw water sources	DOI: 10.32526/ennrj/19/2021	During the dry and wet seasons, raw water samples were gathered from intake outlets and subjected to Fluorescence Excitation Emission Matrix Spectroscopy in conjunction with Parallel Factor Analysis (PARAFAC). Fluorescence-Index (FI) was	Three chemicals were found by PARAFAC: molecules that resembled humic substances (C2), tryptophan (C3), and water contaminants (C1). The wet season was when C2 was most prevalent, with a C3/C2	excluded	Dry and rainy season, but not in the specific topic and question of SLR

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						used to identify the origins of FDOM, and Biological -Index (BIX) was used to determine the autochthonous process contribution in the water body.	ratio of 0.33. C3 significantly rose during the dry season, reaching a C3/C2 of 1.60. The evidence of a strong association (R=0.86) between C1 and C3 suggested that the tryptophan-like and contaminant-like chemicals originated from the same anthropogenic sources. The detected chemicals' strong association with A254 could suggest		

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							that they are aromatic compounds.		
10.	Khagendra P. Bharambe	2023	india	Impacts of climate change on drought and its consequences	https://doi.org/10.1016/j.cliser.2023.100415	The worst-case drought scenario—that is, the year most affected by a severe-to-extreme drought with high drought severity—was identified by applying the standardized precipitation evapotranspiration index (SPEI) to analyze drought statistics. This information was then used to determine the precise drought risk.	The findings show that the severity of the drought differs amongst sub-basins. The central belt was expected to experience more drought episodes, especially over the sub-basins of Wardha, Wainganga, Pranitha, and a portion of Indravati and Lower Godavari. The GRB's six districts, which comprised 11% of the	exluded	Location not in indonesia, not in the specific topic and location

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							highly vulnerable area, saw a sharp decrease in rice production, which accounted for 41.02% of the production loss during the worst-case drought event.		
11.	L.R. Daryono	2019	Wonosobo basin. Central java indonesia	Geological spatial and groundwater resources	DOI:10.15243/jdmlm.2019.062.1595	Vertical electrical sounding (VES), a geological-geophysics method, was used at 12 distinct sites around the Kertek District, which is surrounded by an igneous volcanic rock sedimentary formation.	Shallow, medium, and deep groundwater aquifers are present, according to the results of the geophysical measurements (possibilities), and they have a tendency to follow the direction of the	excluded	The topic and the methodology not specific to the SLR topic

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							slope to the south. Given that the geoelectrical measurements were obtained at the start of the rainy season, this could be the result of the unsaturated soil conditions.		
12	Andi agus nur	2022	Jakarta, indonesia	Groundwater level	https://doi.org/10.1155/2022/2487656	the application of AI methods to GWL modeling	Determine, quantify, and keep supply and demand in balance for ground water resources. Groundwater availability can be ascertained by measuring and evaluating an aquifer's	**included**	Ground water, the topic is specific, and the location

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							ground water table (GWL), which is a crucial and worthwhile exercise in the management of ground water resources. Data on GWL variability can also be utilized.		
13	Herikuswanto	2021	Papua	Droughwater analysis	| https://doi.org/10.1155/2021/6626102	Indonesian drought region examined through Regional Frequency Analysis (RFA)	With the fastest return period estimate of two years and four months, the drought return period analysis for conditions of 40% of normal rainfall finds that the region with the Fransiskus		

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							Xaveriu s, Gewaya ntana, and Mali stations has the highest risk of drought . Additio nally, the extreme drought analysis indicate s that in less than four years, two of the regions could see a recurre nce of an extreme drought with less than 20% of typical rainfall.		
14	Siswo	201 9	Kebu men, centr al java, Indo nesia	Water resour ces	doi:10.3390/f 10100825	evaluating the type of vegetatio n and the indicator species in the vicinity of the water resource area	T = - 5.104, p = 0.000 indicate s that there were signific ant differen ces in the species compos	excluded	Java Island, the topic and the location represe nt the populat ion of SLR topic and the area,

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							ition betwee n the water source areas in the Silengk ong (higher low flow) and Watujali (lower low flow) catchm ents. In compar ison to Silengk ong (import ant value = 41%, D' = 0.21), Pinus merkusi i was more prevale nt in Watujali (import ant value = 78%, D' = 0.62), and it also became an indicato r species (value = 52.1, p = 0.042) for Watujal.		but has already represe nted by other location

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15	Heru hendra yana	202 1	Yogy akart a, indon esia	Groun d water conta minati on	doi:10.15243/ jdmlm.2021.0 91.3115.	Total organice carbon was used to find out the the distributi on and concentra tion of diesel in unsaturat ed zone	There were Some areas of high TOC levels, associat ed with diesel odour layers	excluded	Java Island, the topic and the location represe nt the populat ion but not in the SLR topic
16	Sugeng krisnan to	202 1	Cisok an band ung	Chara cteristi c rainfall s induce slope	DOI: 10.5614/j.eng. technol.sci.20 21.53.5.4	field observati on, numerical analysis, and field and laborator y test data analysis	The result showed that slopes with instabili ty charact eristics could be broadly divided into two categori es: (i) slopes where rainfall causes a signific ant increase in ground water level; and (ii) slopes where rainfall causes an insignifi cant increase in ground	Excluded	Java island, but not mentio n the specific topic of SLR

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							water level. The first category's slope instability resulted from a loss of matric suction, which was followed by an increase in ground water level as a sign that the pore-water pressure, or uw, became positive.		
17	T listiany	2023	Yogyakarta, kulonprogo, Indonesia	Ground water and water resources	DOI: 10.24425/jwld.2023.143761	Using a geographic information system (GIS) and ratings and weighting values for six parameters—slope, rainfall, depth of the groundwater table, soil type, rock permeabil	The findings indicated that the northeastern and central regions of the study area had the potential for ground water recharg	excluded	Java Island, the topic and the location represent the population of SLR topic and the area, but has already represented by previous article.

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						ity, and land use—the research method is a spatial analysis.	e, and the north and south's discharge zones had potential infiltration values of		
18	Yuli suharnoto	2022	South Sumatra	Spatial peatland fire danger	https://doi.org/10.3390/su14137632	Merang-Kepahyang, South Sumatera, Indonesia's Peatland Hydrological Unit (PHU) in El-Niño (2015) and La-Nina (2016)	Hotspot frequency increased significantly. Between August and October of 2015, there were sixty-three hotspots where the area of high hazard classes exceeded 70%. Based on these findings, we suggested setting a threshold value that	excluded	Not in the specific topic and target area

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							indicates a 60% catchment area with high mKBDI classes is at risk of peatland fire.		
19	Yadi suryadi 2021	2021	Central kalimantan, Indonesia	Canal blocking in sub-peatland, hydrologycal unit	DOI: 10.5614/j.eng.technol.sci.2021.53.2.5	Freewat software was used to model various canal blockings, with simulation canal distances ranging from 200 m to 400 m and blocking heights ranging from 0.2 m to 0.6 m. replenish evaporative over a 20-year period.	According to this study, evapotranspiration and recharge, which are positively correlated with ground water rise and the rewetting period, are directly related to how effective canal blocking is.	excluded	Not in the topic and location
20	Wayan sutapa	2017	Central sulawesi indonesia	Effect of climate change on groundwater	https://doi.org/10.4491/eer.2015.127	the impact of changing temperatures on groundwater recharge.	the result shows is an annual ground water recharge trend that decreas	excluded	Not inte The specific topic and location

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							ed between 1995 and 2011. Between 3% and 25% of the monthly rainfall, the amount of ground water recharge varied linearly with the rainfall. This finding suggests that runoff and evaporation were influenced more by rain than by ground water recharge, and that rainfall has a major influence on both ground water recharge and Bangga River		

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							discharge. Reforestation initiatives should be stepped up in order to boost ground water recharge in the study area.		

From the data based and 5 articles that have been reviewed, the writer has come up with the summary by conducting the 2 research questions are as follow:

In What Circumstances the Water Resources Has Been Decreased?

Water resources depletion can occur under various circumstances, as indicated by the relevant resources based on the article found from scopus. In summary, groundwater depletion can occur due to overuse, anthropogenic changes, and the impacts of climate change. These factors contribute to decreased availability and quality of groundwater resources.

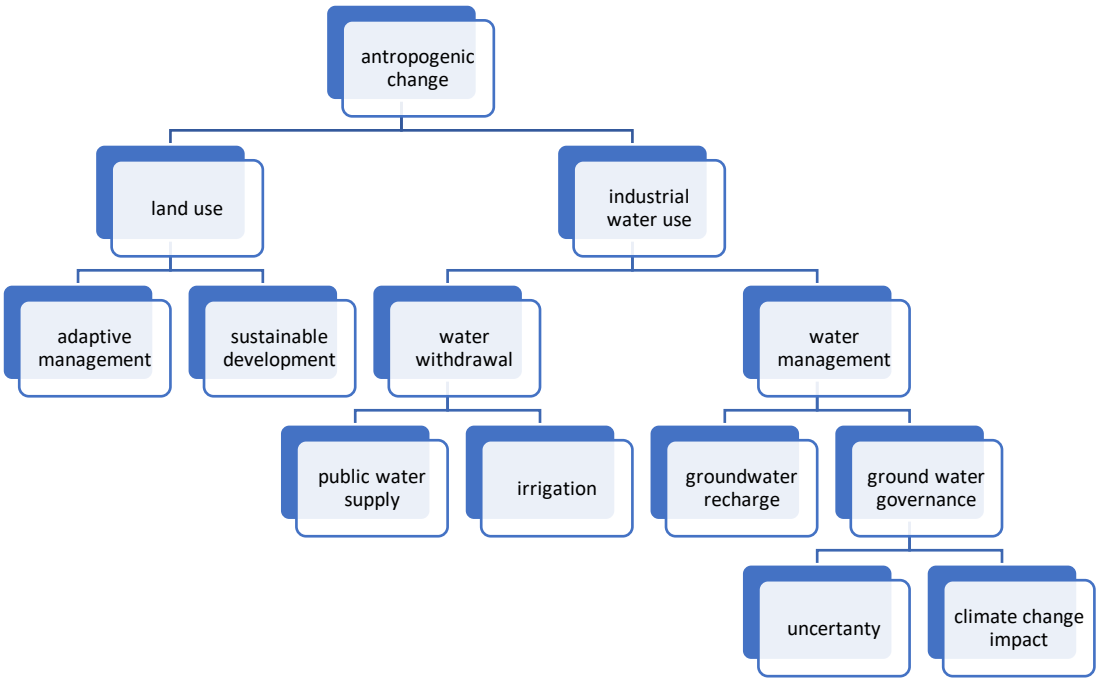

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Table 1. Antropogenic Change

In What Area Do the Dry Seasons Cause the Impact of Lack of Water Resources?

Water resources can be significantly impacted by dry seasons in a number of locations, including Jakarta, Indonesia, and the Special Region of Yogyakarta in Java Island.

Seasonality in water availability can change due to climate change, which can have an impact on the environment.

Extended periods of dry weather during hotter summers can make water resources more vulnerable; in certain cities, the deficit in water availability is as high as 30%.

The frequency and severity of droughts are expected to rise, impacting groundwater anomalies and hydrological extremes.

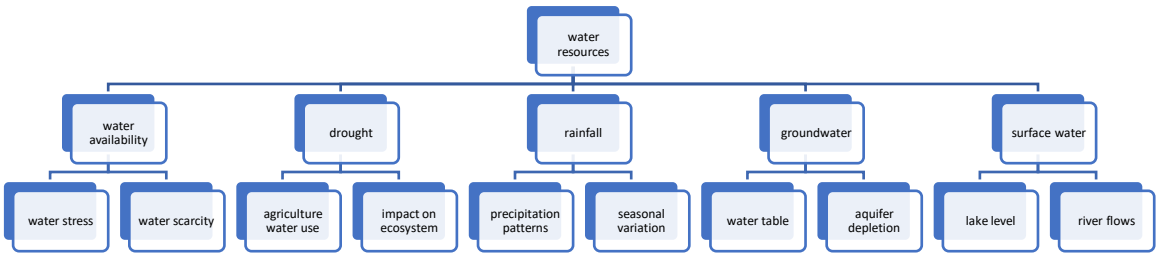

Table 2. Water Resources Based on The Impact Factor

Result & Discussion

To gain the credible and countable data base, only from reputable journal indexed by scopus by using the selected Key words:

Scopus	Key words	location	Year Range	Article found	Type
Database full article	Water resources	Indonesia	2017-2023	120	Open access
Database full article	Hydrogeology	Indonesia	2017-2023	42	Open Access
Database full article	Dry Season	Indonesia	2017-2023	125	Open Access

Table 3. Search String From Scopus

Based on the specific and the limitation of location, year range, type of publication , there are three phases , the first by using the specific keywords: Water Resources found 120 Articles, and the second by using the word: Hydrogeology found 42 selected articles and the third by using the keywords Dry Season. Found 125 Articles. Thus, the total article are 287 only from reputable sources using only search engine by Scopus.

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Identification of Studies Via Database of Scopus

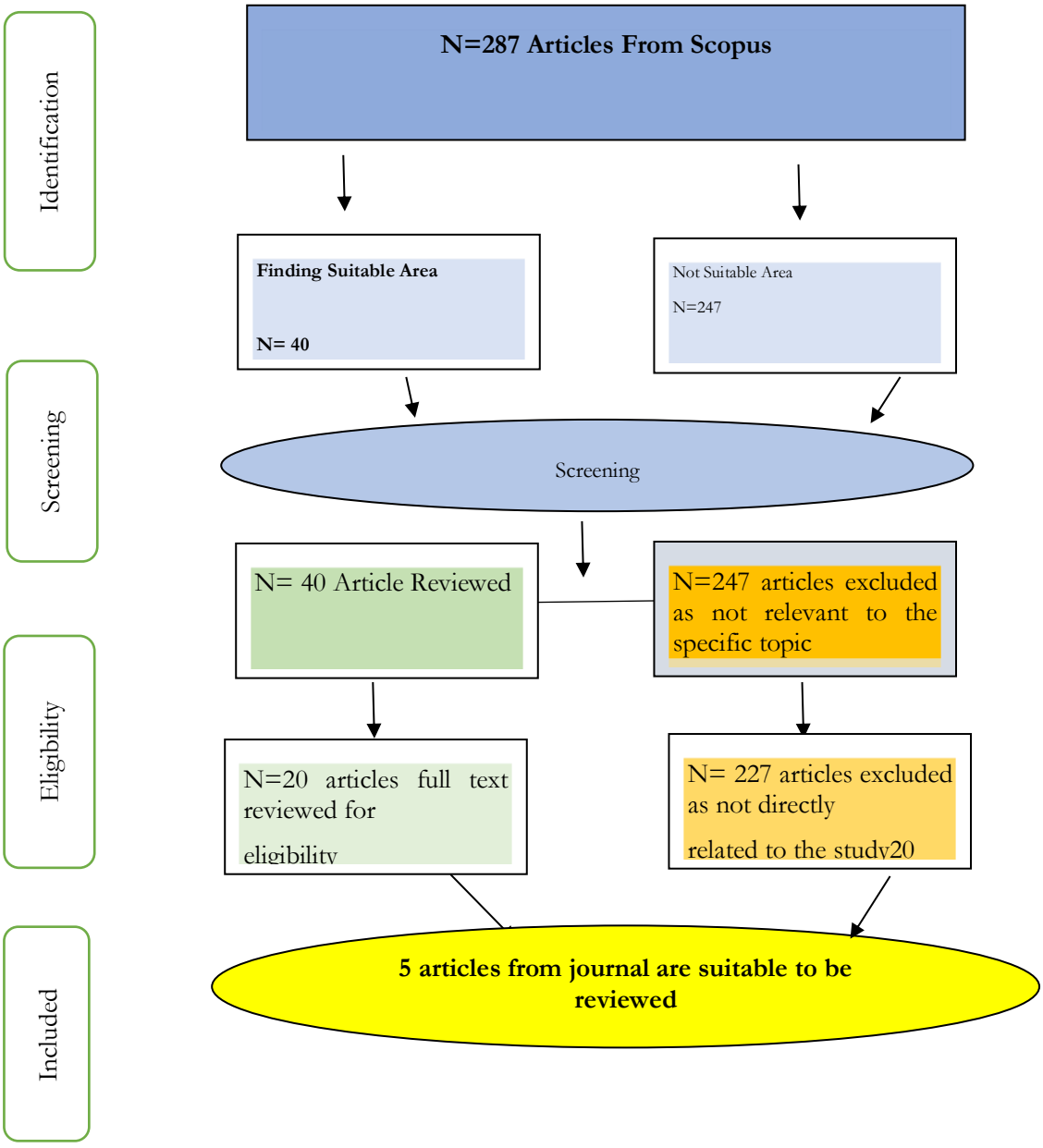

Figure 1. Prisma Flow Diagram for Systematic Review

Publication Trend

The Publication trends that have been reviewed above, including the author, publication year, DOI, Journal Publishing, the co-occurrence of the keywords, the methodology, finding and gap already mentioned in the table, The research about water resources has been trended lately during the L-Nino effect and the drought season, it is phenomenology that in the dry season especially in Indonesia who has only two seasons, Dry season and Rain Season, most of the research article that has been published in Scopus in the limited time 2017-2023. During the latest 2023 publications, some of the researcher found in the specific location in java island that the needs of management and assessment to overcome the impact based on their finding.

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Java Island has a monsoon type climate that makes it experience only two seasons, namely the dry season that occurs from April to September and the rainy season that lasts from October to March.

Drought, pollution, and poor resource management threaten Indonesia's most populous island with total water scarcity

The El Niño phenomenon has contributed to a prolonged dry season, resulting in crop failure and drought in certain areas of Java Island

BMKG has circulated an early warning of potential drought causing water scarcity, particularly in Java and Bali, and the southern part of Sumatra. Several areas have already been impacted by the drought causing water scarcity since June or the beginning of July. While the drought peak is not reaching the peak yet, due to the anomalies, some areas may experience drought up until October or November. The drought has impacted crop production in some specific areas in java island. Building more reservoirs is one possible answer to alleviate the impacts of drought, but the focus should also be on cleaning up and improving local sources of water Water scarcity is projected to intensify by 2045 due to climate change, land degradation, and unsustainable water usage.

Due to its monsoon-style environment, Java Island only experiences two distinct seasons: the dry season, which runs from April to September, and the rainy season, which runs from October to March 1.The most populated island in Indonesia faces total water scarcity due to drought, pollution, and inadequate resource management 2.In some parts of Java Island, the El Niño phenomenon has led to a protracted dry season, which has caused crop failure and drought.

An early warning of possible drought-related water scarcity, especially in Java, Bali, and the southern portion of Sumatra, has been distributed by BMKG.Water scarcity brought on by the drought has already affected several locations since June or the beginning of July. Some places may experience drought until October or November, even though the drought peak has not yet reached its peak due to anomalies. Crop production on Java Island has been affected in certain regions by the drought. Increasing the number of reservoirs is one way to mitigate the effects of the drought, but the main objective should be to enhance and purify nearby water supplies. By 2045, it is anticipated that land degradation, climate change, and unsustainable water use would worsen the state of water scarcity.

Conclusion

Several important conclusions are drawn from the systematic literature review on the assessment of Indonesia's water resources potential during the dry season. The reviewed studies shed light on Indonesia's water resource management potential and challenges, especially in light of population growth and climate change. The study highlights the importance of managing water resources holistically, taking seasonality, water quality, and availability into account. The effect of ENSO, human activity, and climate change on water levels in particular areas, in java island. The review comes to the conclusion that thorough and methodical research is desperately needed to pinpoint the main variables influencing Indonesia's water resources. Additionally, it highlights the significance of climate projection data for better future in the following insights:

Data acquisition, research and product development, interoperability, and capacity building have all significantly improved as a result of the GEOSS Water Strategy's execution, which places an emphasis on the application of Earth observations to water research and management decisions.

By managing intricate water systems, a systems approach can assist in addressing the issues brought about by growing complexity, environmental effects, and sustainability principles. Future water resource management can benefit from knowledge gained from global experience. Water systems are seen as structurally co-constituted of social, engineered, and natural elements under the theory of socio-hydrological systems. Through examining issues related to characteristic management, researchers can recognize effective innovations and comprehend the elements influencing system resilience. To sum up,

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the application of the GEOSS Water Strategy, the adoption of a systems approach, and the consideration of the interaction between social, engineered, and natural aspects in water systems are all components of sustainable management strategies for water systems that are informed by hydrogeology and environmental geology. Any of those approaches can be modified to address Java Island's water resources during dry season.

Declaration of Conflicting Interest

The authors declare that there is no conflict of interest in this work.

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