

Urban Design Initiatives in Drought-prone Areas dealing increasing Water Demand as Pandemic Covid-19 Impact

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ABSTRACT

The Covid-19 pandemic becomes a primary issue in urban development that requires several supporting facilities and infrastructures to handle. The adequate water supply to ensure the washing hand and bathing as part of health protocol implementation is crucial for drought-prone areas. Meanwhile, the government strategies on drought handling by assisting the water trucks are considered a temporary solution. Hence, this study examines urban design initiatives to deal with Covid-19 impact on the water sector, particularly in Semarang drought-prone areas. The research used a quantitative method by overlaying physical variables such as the soil type, slope, and water supply coverage to determine the drought level map. Afterward, the drought level compared with the population growth and community's economic capacity to describe the area's vulnerability. Besides, the existing drought handling strategies were analyzed to examine the impact. This study utilized secondary data such as the government institution websites as well as Google maps. The analysis results point out that most of drought-prone areas did not serve by government water service and relied on the community-based water supply system. In addition, 25% of the inhabitants are categorized as a low-income community, so that they prefer to take water from the river or spring than have to expend more to buy the water. Meanwhile, the existing initiatives on drought handling did not have significant impacts because of a lack of knowledge and unclear regulation. The Water Sensitive Urban Design (WSUD) concept has already been adopted, yet the implementation was still small-scale and unsustainable. Therefore, it is necessary to consider the physical, socio-economic, and political aspects in implementing the drought handling initiatives.

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1. Introduction

The Covid-19 pandemic affects all humans' lives, such as how people live, work, move, and interact in the future (Bereitschaft, 2020; Sivakumar 2020). The Covid-19 pandemic case is still

dynamic in our daily life, where the number of positive exposed cases had decreased in March 2021, yet it rose again in July 2021. Indonesia even became the highest daily death rate country in the world on August 15, 2021, amounting to 1,245 cases. Meanwhile, in terms of vaccination achievements, in August

2021, the first dose of vaccine reached 26.25%, whereas the second dose of vaccine reached 13.90%. The government target on vaccination is 70% of all population having vaccinated by the end of 2021 or until March 2022. Furthermore, the government also urges the communities to implement health protocols by consistently complying with the 5M: wearing masks, physical distancing, avoiding crowds, washing hands with soap, and reducing mobility. In addition, applying the Clean and Healthy Living Behavior (PHBS) in daily life to be a habit is still being encouraged.

The main aspect of realizing PHBS is the availability of adequate clean water. World Health Organization (WHO) mandated that the provision of clean water and sanitation, good waste management, and environmental hygiene management are efforts to prevent disease outbreaks, including overcoming the spread of the Covid-19 virus (WHO, 2020). Likewise, a safe hands campaign initiated by WHO since the end of 2019 where it is essential to wash hands using soap and clean water or, if that is not possible, use alcohol-based hand gel. Washing hands with running water for 20 seconds is the easiest and most practical way to prevent virus transmission for the community after outdoor activities, after coughing and sneezing (Bellizzi, Napodano, Fiamma, & Maher, 2020; Sivakumar, 2020).

The frequency of washing hands or bathing after activities outside the home has increased, and consequently, the water demand has also risen (Cotterill et al., 2020). Providing adequate clean water in implementing PHBS or safe hands is challenging, especially for drought-prone areas, including Semarang City. In 2018, there were 87.75% of people have access to drinking water. From this population, only 20.14% have access to piped water networks, while the rest obtain clean water through a community-based approach (Pamsimas) and an institution-based approach through regionally-owned enterprises (Medium-Term Plan Document - RPJMN Semarang City 2020-2024). Unserved areas for piped clean water networks from the Local Water Company (PDAM) also include drought-prone areas.

The threat of the Covid-19 virus and drought simultaneously can have complex impacts or called a compound disaster, a situation in which two different types of disasters coincide and cause vulnerability in energy, environment, agriculture, and economy (Mishra, Bruno, & Zilberman, 2021). Therefore, appropriate policies for handling the compound disasters impact are needed. In addition, good water management has also played a role in mitigating overexploitation of groundwater, consuming insufficient quality water, and competition for water control between communities, government, and sectors (Keulertz, Mulligan, & Allan, 2020). The government's and all stakeholders' commitment towards integrated water management is essential, primarily to fulfill water needs and sustainable wastewater management for all communities (Anim & Ofori-Asenso, 2020). There are two strategic steps; short-term strategy and long-term strategy (Warner, Zhang, & Rivas, 2020). The distribution of water trucks is one of the short-term strategies carried out by the Chinese Government to meet the community's demand for clean water, mainly to ensure handwashing and bathing activities (Anim & Ofori-Asenso, 2020). Likewise, some local governments in

Indonesia have always allocated funds for clean water provision, especially during the dry season. Meanwhile, the long-term strategy is realized by conserving watersheds, controlling development in the upstream area, and synchronizing water management from upstream to downstream (Anim & Ofori-Asenso, 2020).

Another long-term solution is developing water infrastructure to fulfill water demand through a good water distribution system design (Zvobgo & Do, 2020). Landscape design, which is part of urban design, is considered a strategy to create a healthy environment, including handling the impact of compound disaster (Alwaer, Speedie, & Cooper, 2021). A healthy environment has an impact on society, both in mental and physical health. Hence, it is necessary to understand environmental and health design better to provide more alternatives for creating a healthy environment. For instance, the Food Sensitive Planning and Urban Design (FSPUD) concept that included as an urban design strategy responding to urbanization, increasing population, increasing water demand, as well as problems due to climate change (Haysom, 2021). FSPUD is a water sector strategy that emphasizes the food security aspect, whereas another water strategy concerning drought and water management is Water Sensitive Urban Design (WSUD). This strategy is well known and has been implemented in Semarang City. WSUD considers water an intrinsic aspect of urban planning and development and focuses on how urban water cycles achieve adaptive water management. Eventually, WSUD will be able to overcome water-related problems, including drought. Indeed, the implementation of WSUD has not been entirely successful since its introduction in the 1970s in Australia. It was because of the government's lack of understanding about WSUD, including low community commitment and participation (Morison & Brown, 2011).

Several studies on the Covid-19 pandemic impacts on the water sector have been carried out, such as the study on how the water supply agencies readiness in dealing with the increasing water demand (Cotterill et al., 2020), several proactive strategies for the water providers (Sowby, 2020), as well as the relationship between covid-19, water issues, food and agriculture security (Keulertz et al., 2020). However, this research emphasized the urban design initiatives to deal with Covid-19 impact on the water sector, particularly in drought-prone areas.

2. Methodology

2.1 Description of Study Area

This study focuses on Semarang City, which includes a city with a high number of positive cases of Covid-19 in Central Java Province, as well as included in the red zone category. Moreover, as the capital city of Central Java Province, Semarang is a center of economic and community activities and inhabits by diverse communities that differed with respect to the socio-culture and economic characteristics. Hence, it requires a particular strategy in dealing with the spread of the Covid-19 virus.

In addition, Semarang city is also facing climate-change disasters where drought is one of the disasters. According to the Disaster

Management Agency (BPBD) Semarang City, 24 urban villages from 6 districts (14% of the entire Semarang City area) are categorized as drought-prone areas.

Table 1 Drought Prone Areas in Semarang

No	District	Sub-district / Village
1.	Mijen	<ul style="list-style-type: none"> • Karangmalang • Polaman Wonolopo • Ngadirgo • Bubakan
2.	Banyumanik	<ul style="list-style-type: none"> • Pudukpayung • Gedawang • Jabungan
3.	Candisari	<ul style="list-style-type: none"> • Candisari • Jomblang • Wonotingal
4.	Tugu	<ul style="list-style-type: none"> • Tugurejo • Jerakah • Mangkang Wetan • Karanganyar • Randugarut • Mangunharjo
5.	Gunungpati	<ul style="list-style-type: none"> • Sukorejo • Kandri • Nongkosawit • Kalisegoro • Gunungpati
6.	Tembalang	<ul style="list-style-type: none"> • Meteseh • Mangunharjo • Rowosari

Source: BPBD Semarang, 2011

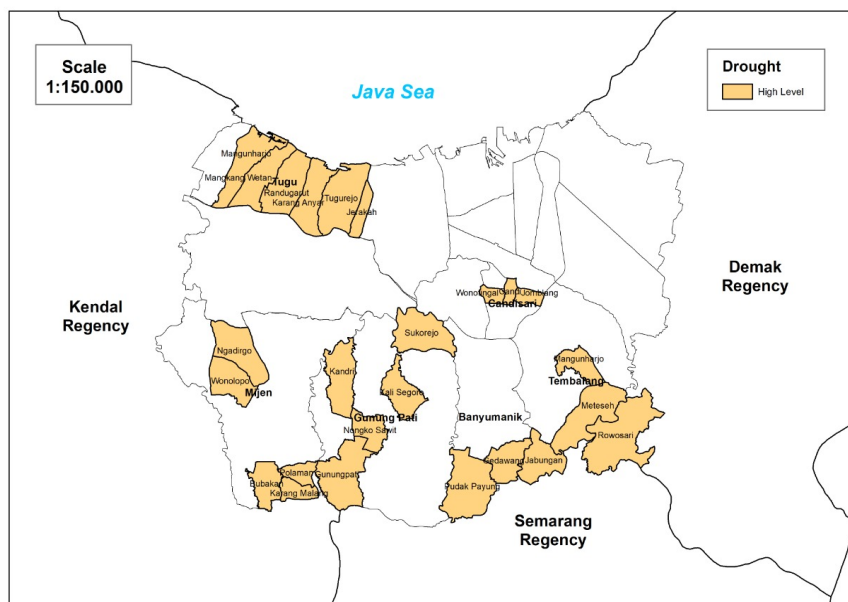


Figure 1 Distribution of drought-prone areas in Semarang

2.2 Data Collection and Analysis

This study used a quantitative method that revealed the Covid-19 pandemic impact on water provision in drought-prone areas and analyzed the appropriate design directions. The study consists of three steps, first, identifying physical characteristics of the research area; second, analyzing water demand level after the Covid-19 pandemic by overlaying the topography, soil type, drought-prone areas, and water supply coverage area. Next,

analyze the existing efforts in providing clean water compared to the number of Covid-19 cases, then give appropriate urban design recommendations.

This study utilized several data from the website (online) of relevant government institutions such as the Central Bureau of Statistics of Semarang City (BPS); Development Planning Agency (Bappeda) Semarang City; Regional Disaster Management Agency (BPBD) Semarang City; Meteorology, Climatology, and Geophysics Council (BMKG) Semarang City; Environmental

Services (DLH) Semarang City. Moreover, field observation through an online platform such as google maps or google street-view to verify the physical characteristics of research locations.

3. Result and Discussion

3.1 Physical Characteristics of Studi Area

Topographically, the Semarang city consists of two different landscapes, whereas the coastal and lowland areas exist in the northern part of Semarang City with a slope of 0-2%; a hilly area locates in the south part with a slope of 2-40%. All drought-prone areas reside in the southern (upstream) area with a topographical slope above 15%. Topography is a soil formation factor that determines the water amount absorbed, the depth of groundwater, and the soil's ability to withstand erosion (Schilling, 2011). The slope degree affects the run-off volume to the downstream area so that it requires intervention to keep the water in the upstream areas to meet the water demand.

Drought is in conjunction with soil types; how the characteristics, absorption power, and soil permeability. Drought is a disaster that

runs slowly and begins with a decrease in rainfall, causing water shortages. Drought is when water availability is less than the water demand for both community life activities and agricultural activities, economic activities, and the environment. Drought represents a water deficit in the community and causes ecological resources damage, reduced agricultural productivity, even causing hunger (BNPB Indonesia, 2016; Wang, Qiao, Wang, Cao, & Zhang, 2020). Soil type affects the water availability capacity (AWC), as the soil can store water for plant roots. The soil type also determines the amount of natural water absorption and the run-off level.

Soil types in the upstream area are dominated by soil types with moderate to low natural water absorption capacity, while the soil types in the downstream area are relatively fertile and suitable to function as cultivation areas, including agriculture. Most drought-prone areas have so high ergonomics and absorb water, which is also less than optimal. Hence, the soil type factor influences the occurrence of hydrological drought in which surface water and water supply in the land are limited due to low rainfall in a relatively long period.

Table 2 Soil type and the characteristic

No	Soil type	District	Percentage	Characteristic
1.	Dark-brown Mediterian	Tugu, Ngaliyan, Gunungpati, Candisari, Tembalang, Banyumanik	36%	Moderate absorption and permeability, sensitive to erosion and has an AWC of 200 mm/m
2.	Latosol reddish dark brown	Mijen, Gunungpati	26%	The soil texture is clayey; the soil structure is a crumb with a loose consistency, has a rather fast to slightly slow infiltration, the soil power is quite good, quite resistant to soil erosion
3.	Alluvial hydrosate, grumosol dark gray, latosol dark brown, regosol dark gray	Tugu, Gunungpati, Mijen	22%	Clay or sandy soil texture so that it tends to be hard when it is dry or has a low moisture content; the potential for severe drought
4.	Alluvial gray and dark brown	Other district (lowland)	22%	Fertile and suitable for agriculture and secondary crops

Source : Subardja et al., 2016; Development Planning Agency Semarang City, 2011

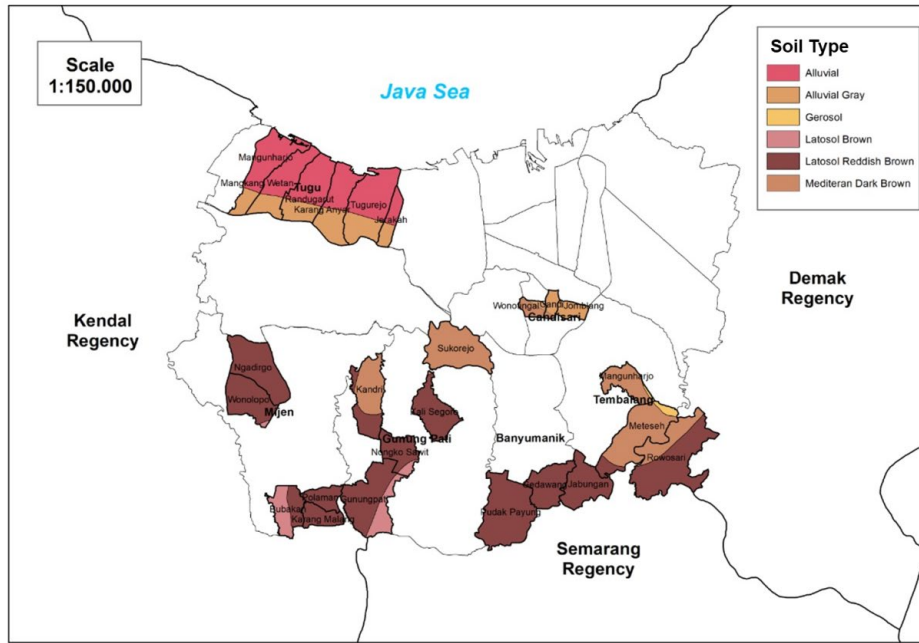


Figure 2 Soil type distribution map

In general, drought in Semarang City occurs in the dry season; based on the Meteorology Climatology and Geophysics Council (BMKG) prediction, it will start at the end of April and reach its peak in August. The dry season is the season in the tropics in which the rainfall is below 60 mm per month and the temperature increase. The distribution of the Covid-19 virus will decrease along with increasing temperatures (Chien & Chen, 2020). The optimum temperature for spreading the virus is 0-90 C, while during the dry season, the temperature reaches 28-300 C, so the chance for covid-19 spread will decrease. However, the current condition indicates that this virus mutates and forms new virus variants in some countries. Therefore, the community must remain vigilant by continuing to carry out health protocols because even though the temperature is high during the dry season, it does not mean that the virus undeveloped automatically. Hence, it needs to prioritize the provision of clean water and facilities to support the PHBS movement.

Drought can differ regarding the characteristics and the impacts (BNPB Indonesia, 2016; Wang et al., 2020).

1. The meteorological drought, assessed based on rainfall compared to the average condition over a long period.
2. The agronomic drought, a condition where soil moisture is lower than the level required for the growth and development of agricultural commodities so that it has implications for the yields obtained
3. The hydrological drought, when the availability of surface water and ground water decreases due to low rainfall, affects the amount of surface water flow and hampers aquifer recharge.
4. The socio-economic drought is the estuary of all previous droughts because this disaster has caused a social and economic crisis.

Drought in Semarang includes a risk, not a disaster that arises due to climate change or is not a metrological drought. It can be analyzed based on the moderate rainfall level in Semarang, so the occurrence of drought due to low rainfall only occurs in January.

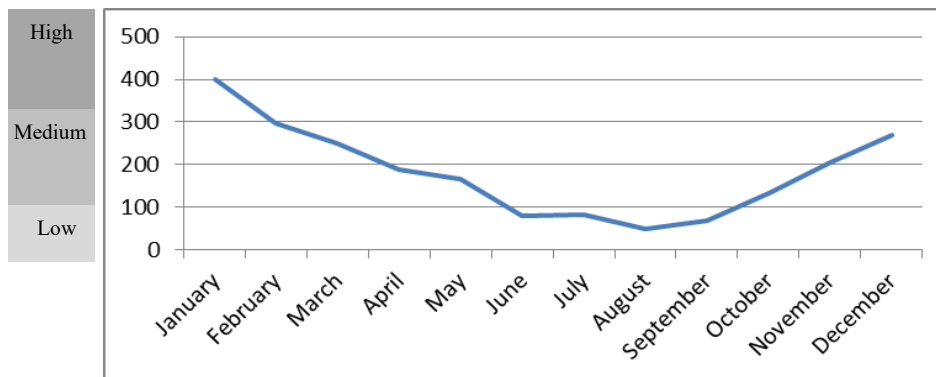


Figure 3 Rainfall level in Semarang

One of the drought triggers in Semarang is the soil type factor that hard to carry the natural adsorption so that the aquifer recharge process detain. Hence, the hydrological drought occurs. Consequently, the community, as well as industrial activities in several locations in Semarang, use deep wells, which incidentally take aquifer water. The exploitation of aquifers caused land subsidence, mainly in downstream (coastal) areas. The government handles the groundwater by establishing the Semarang City Government Regulation No. 2 of 2013, where the deep wells are prohibited, particularly in critical zones such as Banyumanik, Tembalang, and Tugu sub-districts. Therefore, the West Semarang Drinking Water Supply System (SPAM) project considers a government's solution to overcoming water supply for communities and industries in West Semarang as well as a small part of Mijen district.

On the other hand, limitations to access clean water in drought-prone areas are not only caused by the low discharge of surface and groundwater, but also because of poor water quality. For instance, drought in Mangunharjo sub-district, Tugu district experienced a clean water crisis during the dry and rainy seasons because of the sea-water intrusion. Therefore, this village receives clean water assistance from the government regularly. The water issue is a common point for the Semarang government and communities. Typically, the community faces drought during the dry season, while the rainy season deals with a flood. The stormwater intervention emphasized conveying water downstream as soon as possible to mitigate floods in urban areas. Meanwhile, the water storage as well as water treatment system on stormwater was still on a local scale or not comprehensive. Hence, it can be concluded that the drought in Semarang is not only caused by natural physical factors, but also because of unintegrated water management. The urban development in upstream areas caused significant land conversions, such as in Tembalang and Banyumanik districts.

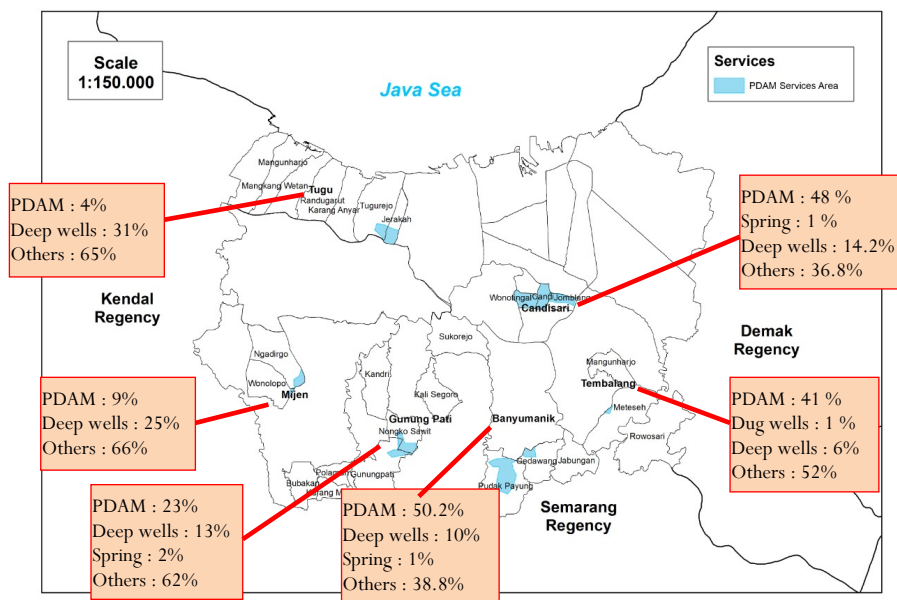
These areas are the most fast-growing district in Semarang that also have the highest population growth level. However, the upstream areas function as catchment areas that play a role in water reservoirs and water storage to minimize the run-off downstream. Indeed, the water adsorption in upstream areas did not optimize; the run-off directly goes through downstream. Realizing the importance of water storage facilities, the government developed Jatibarang dams and several ponds. This water storage is expected to be a water source during the dry season. Nevertheless, the reservoir and ponds' capacity are still limited, and improper water management influences the water quality.

3.2 Analysis of Water Supply and Water Demand

Water Supply

The water supply system for the community in Semarang utilizes the piping system managed by the Drinking Water Company (PDAM) Moedal Tirta's; and the non-piping system organized by the community through the National Program for Community-Based Drinking Water and Sanitation (PAMSIMAS). In addition, there are other sources of clean water, such as boreholes, artesian wells (deep wells), springs, and other sources.

The coverage of piped water services by Drinking Water Company (PDAM) Semarang City until 2021 reaches 60% of the total area of Semarang City. This piping network has not served the drought-prone areas, so water demands are fulfilled through the community-based water supply system. However, the capacity of the community-based water supply system was limited, that the maintenance and development cost still relied on government subsidies or other parties (CSR schemes from the private sector or assistance from national and international institutions).



Water Demands

United Nations Educational, Scientific and Cultural Organization (UNESCO) stipulates that the need for clean water is 60 liters/person/day, whereas Indonesia has a certain standard referring to the Directorate General of Human Settlements, Ministry of Public Works. The calculation of clean water demand in Indonesia are differed according to regional characteristics:

- Rural areas, the water demand is 60 liters/per capita/day.
- Small towns, the water demand is 90 liters/per capita/day.
- Medium City with a water demand is 110 liters/per capita/day.
- Big City with a requirement of 130 liters/per capita/day.
- Metropolitan City with a water demand is 150 liters/per capita/day.

The water demand above is in normal conditions or before the Covid-19 pandemic. Meanwhile, after the Covid-19 pandemic, the consumption of clean water increased due to activities following the health protocol by 20 liters/person/day (Bellizzi et al., 2020).

The city classification above refers to the Spatial Planning Law (Government of Republic of Indonesia, 2007), categorized based on the population number. Hence, Semarang includes a metropolitan city with a population of more than 1 million (Semarang in Numbers, 2020). Moreover, Semarang has functional linkages that integrate with the regional infrastructure system. The following is the clean water demand after the COVID-19 pandemic in Semarang's drought-prone areas.

Table 3 Water Demand after Pandemic Covid-19 compare to community economic capacity

No	District	Sub-district	Population numbers	Population percentage	Water demand (L)	Poor community
1.	Mijen	• Karangmalang	2.803	4,19	476.510	27% (18.824 from 69.749)
		• Polaman Wonolopo	2.113		359.210	
		• Ngadirgo	6.268		1.065.560	
		• Bubakan	2.068		351.560	
2.	Banyumanik	• Pudukpayung	25.092	9,09	4.265.640	23% (36.3661 from 15.5994)
		• Gedawang	10.021		1.703.570	
		• Jabungan	4.209		715.530	
3.	Candisari	• Candisari	10.621	4,24	1.805.570	28% (21.276 from 75.946)
		• Jomblang	17.322		2.944.740	
		• Wonotingal	7.130		1.212.100	
4.	Tugu	• Tugurejo	6.941	1,84	1.179.970	27% (8.563 from 32.041)
		• Jerakah	2.860		486.200	
		• Mangkang Wetan	6.437		1.094.290	
		• Karanganyar	3.940		669.800	
		• Randugarut	2.312		393.040	
		• Mangunharjo	6.307		1.072.190	
5.	Gunungpati	• Sukorejo	15.628	6,55	2.656.760	22% (24.435 from 109.445)
		• Kandri	4.740		805.800	
		• Nongkosawit	5.561		945.370	
		• Kalisegoro	3.862		656.540	
		• Gunungpati	7.780		1.322.600	
6.	Tembalang	• Metesch	21,870	11,55	371.790	24% (45.747 from 194.231)
		• Mangunharjo	11,811		2.007.870	
		• Rowosari	14,599		2.481.830	

Source: processed from Central Bureau of Statistics of Semarang City

The community's economic capacity is identified through the number of poor people to indicate how they cope with drought financially. During the dry season, communities in drought-prone areas have to buy water (20 liters) for Rp. 4,000 every two days, mainly for food and drink purposes. Meanwhile, for bathing and washing, they take water from the river then manually precipitated. The residents of Rowosari village,

Tembalang district, have to go through 3-4 km ride motorized vehicles to take water from the river using jerry water cans. They prefer to consume river water even though it has poor quality than they have to pay extra cost to buy water from water seller. Indeed, the Tembalang district has the highest number of poor people from all drought-prone areas in Semarang.

The socio-economic characteristic of the Tembalang district community is the primary consideration for government to prioritize this district regarding drought management. In 2015, the government developed a deep well in Rowosari village, Tembalang district, yet it turns out that the village is included in the no-drilling zone so that what comes out of the well is not water but gas. Afterward, the government closed the wells permanently.

Based on the preceding facts, the Tembalang district has high vulnerability factors. Likewise, if reviewed from the number of Covid-19 cases, this district recorded the highest number of cases from all drought-prone areas. Therefore, the government considers and prioritizes the Tembalang district for the water provision programs.

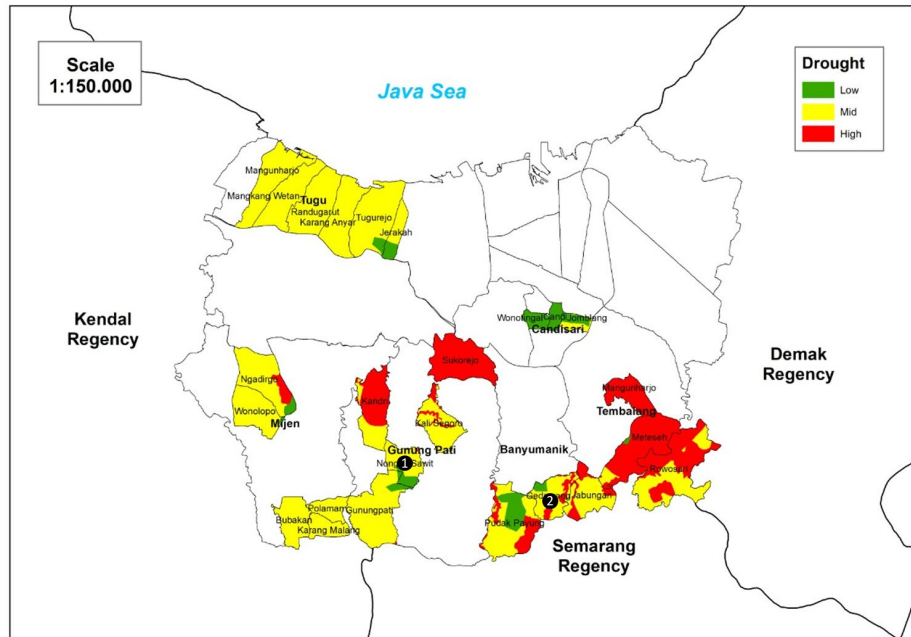


Figure 5 Drought level; the vulnerability level of each drought-prone district reviewed from the soil type, water supply network, and community’s economic capacity

Generally, Covid-19 transmission cases in Semarang are decreasing; even in the Candisari district, there is no recorded positive confirmed case. However, implementing health

protocols is a must during the current pandemic; it means that water availability still becomes an inevitability.

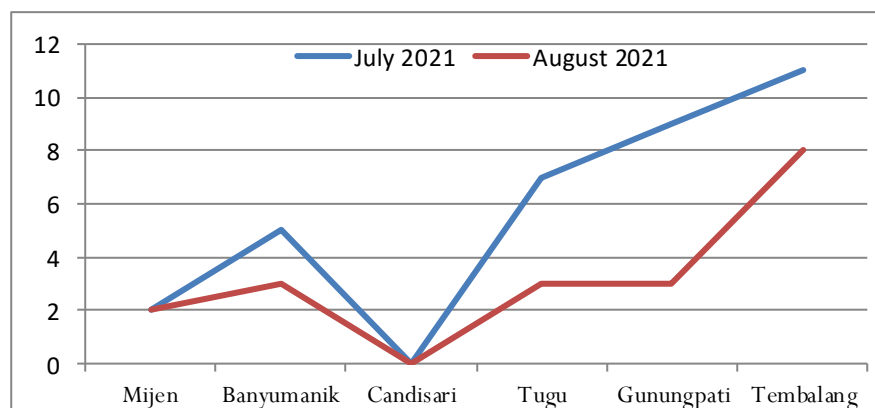


Figure 6 Covid-19 transmission case in Drought-prone areas

3.3 Analysis of the Urban Design initiatives related to Drought

Drought causes losses reaching USD 6-8 billion/year (Wang et al., 2020). Indeed, drought has a socio-economic impact on the

community, so that in handling urban drought needs to consider the physical aspects, socio-economic characteristics of the community, and political or governance aspects (Wang et al., 2020). Drought significantly affects the area with a higher population density and low socio-economic capabilities than the area with a wide green open space and high socio-economic

community's capabilities. In addition, drought management relates to the political aspect regarding the budget availability that emphasizes overcoming drought.

As mentioned above, drought management consists of short-term and long-term schemes. Short-term scheme solutions concern providing clean water assistance and changing communities' habits in daily water use, such as prioritizing water for washing hands compared to watering flowers or other activities, turning off the faucet when taking soap. In addition, encourage the community to apply water reuse initiatives and introducing domestic water management.

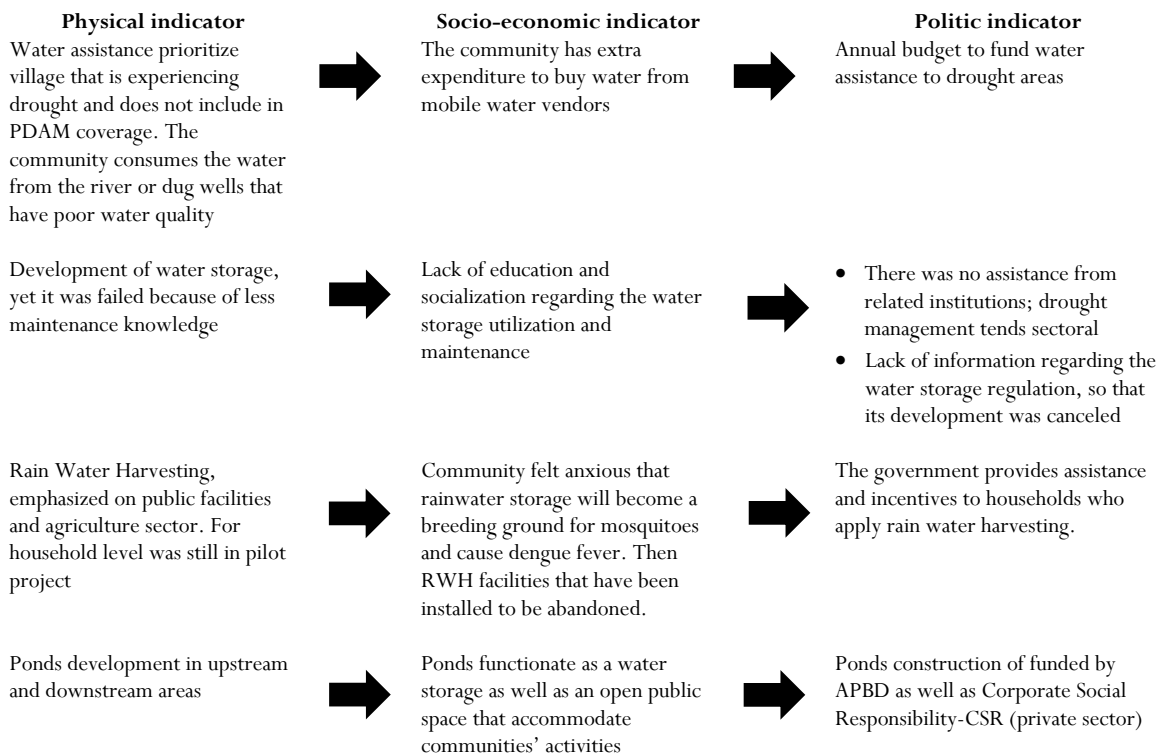
The long-term solution focuses on watershed conservation, land use management and promotes the utilization of alternative resources.

Currently, the government has several strategies to provide and manage clean water in drought-prone areas, such as developing infiltration wells, bio pores and supplying clean water through water trucks. These initiatives require communities' commitment and participation, especially related to changing community's habits in water utilization and their engagement in water reuse concept implementation.

However, encourage the community to adopt a new way of water utilization has some obstacles (Lee & Jepson, 2020), such as:

- Lack of a policy framework that underlies water reuse initiatives so that its implementation does not involve all relevant stakeholders
- Low community capacity to access water reuse services
- Social factors, public ignorance about water reuse process and its benefits
- Lack of supporting facilities, including unclear management and maintenance

Table 4 Identification of existing effort in handling the drought



The government considers the importance of long-term solutions regarding water management. This solution may consider to physical characteristics of Semarang, which differ between upstream and downstream areas. A comprehensive urban design initiative towards drought management has also been implemented abroad, such as clean water-dropping using water tanks as an immediate solution in Sri Lanka; normalization of drainage or agricultural irrigation networks to conserve the catchment areas (watershed conservation areas), and aquifer recharge through bioswales (de Waegemaeker, Van Acker, Kerselaers, & Rogge, 2016).

The government's commitment to managing climate change-related problems represents by Semarang's involvement in several international initiatives on sustainable development goals. Hence, Semarang becomes the first city in Indonesia to be part of the 100 Resilient Cities network. Consequently, the government has to apply several resilience strategies, including the strategy to overcome the urban drought. The Semarang Resilience Strategy Document explains these strategies that propose the proper drinking water supply design, such as

rainwater harvesting and the grey water recycling process (Semarang government, 2016).

Indeed, the Environmental Agency, Department of Water Resources Management (PSDA), and the Department of Energy and Mineral Resources (ESDM) have implemented RWH in several villages, such as in Tandang village (Tembalang district) and Wonosari villages (Ngaliyan district). These villages resided in the upstream area that currently many new residential developed and converted the green open space. Hence, the RWH initiative aims to reduce the run-off and mitigate flooding downstream. In addition, the Department of Agriculture has also initiated the RWH concept to keep adequate water for irrigating the agricultural land, especially during the dry season.

Another initiative regarding water conservation strategies is developing bio pores and infiltration wells. The Environmental Agency carried out the Water Resources Conservation Activities program by encouraging the community to develop bio pores

Moreover, the appropriate urban design is necessary to optimize the spatial function as well as cope with the drought impacts (Lottering, du Plessis, & Donaldson, 2015). Discussing the

and infiltration wells in their neighborhood to maintain the water availability. Based on the Ministry of Environment Regulation No.12 of 2009 about Rainwater Utilization, infiltration wells and bio pores refer to holes that absorb rainwater into the soil or water-bearing rock layers. The bio pores design creates a vertical hole with a diameter of 10-25 cm and a depth of 100 cm or not exceeding the depth of the face groundwater. These two initiatives have been implemented spread over the Semarang area, which is not only managed by the government institutions, but also the private sector, non-government organizations, and others.

All of the existing initiatives towards water management and handling drought are very important, mainly due to the Covid-19 pandemic. However, these initiatives are conducted at a small-scale or neighborhood level that only covers a few households. The community needs assistance to better comprehend water management at the maintenance level, particularly stormwater management.

Covid-19 pandemic in drought-prone areas means conversing the urban development related to health, water provision, and water problems (such as water pollution from the increasing drug waste from sufferers and liquid waste management).

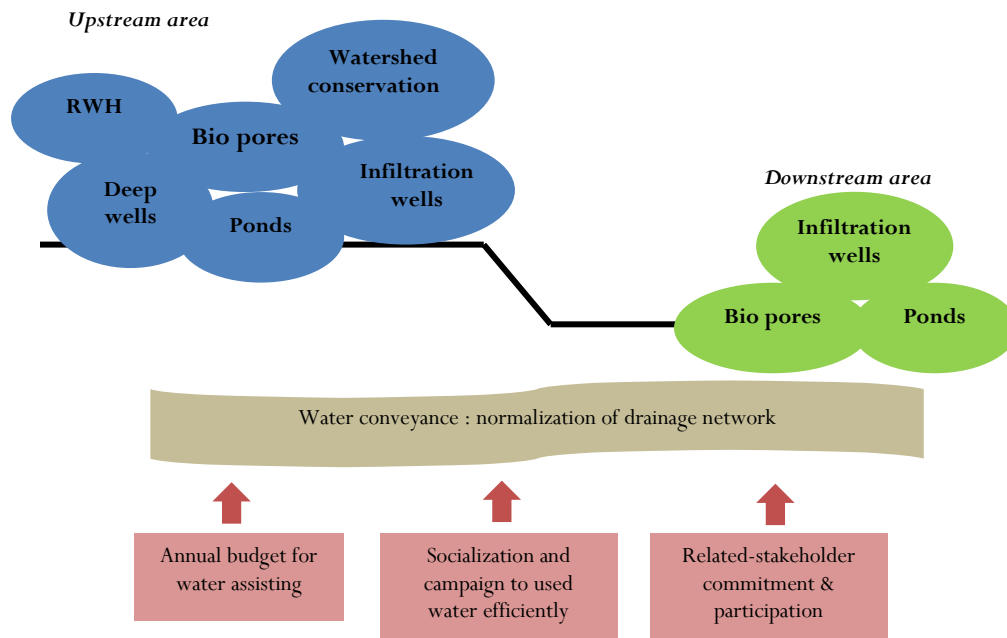


Figure 7 Urban Design Initiatives in dealing Drought; a long-term Solution

The increase in water demand during the pandemic Covid-19 in drought-prone areas can be met through short-term solutions as the government has done. However, long-term solutions are still being encouraged, such as increasing the understanding of the government and the community regarding water management, changing people's habits in using water, and conserving watersheds. The achievement of long-term water solutions will increase the region's resilience and the community to be more robust in facing the future's problems. Lastly, WSUD initiatives may consider in every urban development process.

4. Conclusion

The Covid-19 pandemic has had an impact on all people's lives. The increasing clean water demand as an implication of implementing PHBS and as a form of implementing health protocols is a severe problem for drought-prone areas. Moreover, a clean water piping network has not served this area, so it relies on a community-based clean water supply. On the other hand, the community's self-help ability is not yet fully optimal because poor people mainly inhabit the area.

The existing strategies on drought handling tended temporary, incidental, and unsustainable. Indeed, some urban design concepts such as Water Sensitive Urban Design have been adopted, particularly stormwater management, by encouraging the RWH system, developing water storage, and normalizing the water conveyance network. The implementation of WSUD at the local level with practical and implementation designs is very much needed by the community. In addition, the design strategy must be comprehensive that it does not only focus on drought-prone areas but transmits from upstream to downstream. Finally, the government and related stakeholders have to commit to implementing the short-term strategies as well as striving the long-term strategies towards sustainable urban development.

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