

# The Sustainability of Ready to Drink Water: Local Government Preparedness in Malang, Indonesia

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**Abstract** Access to clean water and ready-to-drink water is one of the important issues raised in the Sustainable Development Goals (SDGs) which focuses on access to ready-to-drink water for universal communities with guaranteed safety and cleanliness of potable water sources by 2030. However, there are still several obstacles to settle drinking water, as the weak institutional control and limited local government participation and involvement led to the ineffective way to produce ready-to-drink water, referring to Minister of Health Regulation No. 2 of 2023 about water quality to be well-prepared. This study examines these issues in the context of Malang, Indonesia, where the local government's preparedness in managing ready-to-drink water is crucial. This study presents data using the Soft System Methodology which includes observations that have been made with the Drinking Water User Association, Department of Public Planning and Spatial Planning, Water Company and the user of HIPPAM and PDAM. This research produces an integrated model of ready-to-drink water management that involves regional officials, distribution actors and the community. The model addresses the challenges by promoting collaboration and enhancing the efficiency of water management practices. The findings contribute to the understanding of sustainable water management and provide a framework for improving access to clean water, aligning with the SDGs' objectives. The study also highlights the importance of regulatory compliance, in this case, Minister of Health Regulation No. 2 of 2023, in ensuring water quality. The research implications extend to policy-making, suggesting that a more coordinated

approach and stronger governance are needed to overcome the barriers to achieving sustainable water access. Practical implications include the adoption of the integrated model by local governments and water management entities to enhance service delivery and ensure public health.

**Keywords** Sustainability, Integrated Model, Ready-to-Drink Water, Local Government

## 1. Introduction

Access to clean water and ready-to-drink water is one of the important issues raised in the Sustainable Development Goals (SDGs) which focuses on access to universal ready-to-drink water for communities with guaranteed safety and cleanliness of potable water sources by 2030. However, in reality, with access to clean water suitable for drinking, there are still several obstacles, including weak institutional control and limited participation and involvement of local governments [1]. At least efforts to manage and guarantee the provision of clean water have been regulated in Law Number 17 of 2019 concerning water resources. Based on this, it can be seen that the role of the state is present in determining the boundaries and scope that guarantee the availability of water for the community.

In most communities, the role of Drinking Water User Association (HIPPAM) is seen as a more economical solution for water supplies apart from considering areas

where it is difficult to get access to the Drinking Water Organization by Local Government (PDAM) network. It was recorded that in 2020, community-based drinking water provision in 15 regencies/cities in Indonesia performed below standards, while 659 Drinking Water User Population Associations (Hippam) were no longer functioning. Consider that HIPPAM is also the provider of clean water that is most widely used by the people of Malang City. However, one of the issues in providing community-based drinking water is related to aspects of sustainability in the future. To anticipate an increase in non-functioning hip pumps, an integrated ready-to-drink water system sustainability mechanism is needed to realize the sixth target of the SDGs.

Furthermore, the debate on the sustainability and integration of water governance systems emphasizes the dilemma between the policy and planning frameworks being developed. Some new approaches that are being developed include polycentric governance that refers to a system where multiple governing authorities at different scales interact to manage a common resource, allowing for more flexible and context-specific solutions [2-5]; community-based resource management [6-7]; collaborative governance [8], network governance [9-11], as well as adaptive governance that emphasizes the ability of institutions and communities to adapt to changing conditions and uncertainties, ensuring long-term sustainability of water resources [12-14]. Some of these approaches have different focuses but overall support the long-term agenda of sustainability and resilience of social-ecological systems. Several previous studies [1], [15-18] show that the success of system sustainability is determined by institutional factors (social networks, local leadership, environmental conditions and internal institutions).

By considering the readiness of HIPPAM regarding drinking water quality, this study attempts to carry out social engineering by elaborating on community-based drinking water governance, in this case, HIPPAM based on a sustainable quality and environmental management system framework is adopted from Ostrom [3] and Agrawal [19] with hopes of creating a long-term planned implementation of a ready-to-drink water system. This study seeks to assess the level of readiness of local governments in Malang, Indonesia, in terms of their ability to effectively manage the distribution and provision of ready-to-drink water. More precisely, it aims to: (1) Enumerate the primary difficulties and barriers encountered in facilitating the availability of uncontaminated and secure potable water; (2) Create a comprehensive model for managing ready-to-drink water that includes regional authorities, distribution stakeholders, and the local community; (3) Evaluate the efficacy of the suggested model in enhancing the availability of uncontaminated water in the area. The study aims to contribute to the broader discussion on sustainable water management and the attainment of the Sustainable Development Goals (SDGs) by addressing these objectives.

## 2. Literature Review

Implementation of the concept of sustainable development advocates the need for local-level solutions originating from community initiatives [20-21]. This initiation then gave birth to a combination of the autonomous rights of local governments and the transfer of responsibility to local communities for shared natural resources [22]. Most resources such as groundwater, irrigation, forests, and land can be classified as common property resources (CPR). CPR refer to resources that are shared by a group of people and are subject to overuse and depletion. Local-level resource management has developed widely in recent years with various biological and conservation approaches.

In recent years, there are various biological and conservative approaches [6-7]. This research underlines the important role of HIPPAM as a local community in managing water availability. In this management there are two emphases related to solutions to avoid over-exploitation of water resources in HIPPAM at the local level, then supervision from the community as HIPPAM users. Apart from that, clear rules and boundaries for resource management are important to regulate resource management [23].

These boundaries have not been clearly outlined in the management of ready-to-drink water in Arjowinangun Village, Malang City. Not all managers of common property are successful in managing their resources sustainably. Therefore, tragedies of commons or resource degradation often occur. This phenomenon explains the failure in managing common property resources, in this case, water resources. Ostrom [23] confirms that community-based resource management, where the community plays a central role in managing and protecting local water resources. However, in its implementation, management of collectively owned resources often cannot be completed with just one management mechanism [18], especially concerning ready-to-drink water, so in this research, the researcher elaborates on a sustainable quality and environmental management system.

The research adopts an integrated approach of managing ready-to-drink water, which is based on the ideas established by Ostrom [3] and Agrawal [19]. This model focuses on community-based resource management and the implementation of sustainable quality and environmental management systems. When assessing the suitability of this model for the present study and the actual circumstances in Malang, factors such as community engagement, sustainability, adaptation, and collaboration were taken into account. The strategy is in accordance with the local culture in Malang, where community organisations such as HIPPAM have a key role in providing water. It also addresses the city's objectives for environmental sustainability and adherence to national regulations. The model emphasises the importance of a collaborative approach for efficient water management in Malang,

necessitating collaboration among different institutions. In general, the accepted model is assessed as having a high level of quality and being compatible with both the current study paper and the real situation in Malang. This makes it an appropriate framework for enhancing the management of ready-to-drink water in the area.

This quality and environmental management system involves multidisciplinary knowledge from various social, economic and environmental aspects [24]. This quality and environmental management system is needed to prevent degradation or worse environmental damage. Therefore, for this research we adopted the basic framework of Ostrom [3]; Agrawal [19] related to quality and environmentally sustainable management systems for ready-to-drink water. The study by Nkhata et al. [15] discusses water resources management in Malawi. This research shows that community participation in CPR management is very important to maintain the sustainability of water resources. However, research also shows that community participation must be balanced with strict supervision and management by the government or water management agency, to ensure the availability and quality of sufficient and safe water for the community.

Furthermore, Mekonnen and Hoekstra [16] discussed water management in Ethiopia. This research shows that CPR management in ready-to-drink water management must pay attention to the social and cultural aspects of local communities. In this case, research shows that community participation in decision-making and management of water resources can increase community awareness and concern for the importance of maintaining the sustainability of water resources. Apart from that, there is also research conducted by Sarker et al. [17] which discusses water management in Bangladesh. This research shows that CPR management in ready-to-drink water management must pay attention to economic and financial factors, such as water management costs and the ability of local communities to pay these costs.

To summarise, the literature review emphasises the need of community engagement and localised approaches in effectively managing water resources in a sustainable manner. Nevertheless, there is a lack of comprehension regarding the efficient implementation of integrated and adaptive strategies in various settings, specifically in urban regions such as Malang City. The objective of this study is to fill this void by creating a comprehensive model for managing ready-to-drink water. This model will involve collaboration between regional officials, distribution actors, and the community. The subsequent section will delineate the approach utilised to accomplish this goal.

### 3. Materials and Methods

Methodologically, this research uses a qualitative approach with a systems thinking method, namely soft systems methodology (SSM). The use of systems thinking

in social research is developed through hard paradigm and soft paradigm-based paradigms. Furthermore, the difference between the hard paradigm and the soft paradigm lies in the way of looking at the real world and how the systems approach is used. The hard systems paradigm sees the world as a system that interacts with each other so that it can be engineered to achieve certain goals. Meanwhile, SSM as a (soft paradigm) has the basic idea that the real-world situation that we are exploring is all individual activity systems, in which we can choose one or several relevant human activity systems [25].

SSM has been utilised in several contexts and countries to tackle intricate and unorganised issues. For instance, in the United Kingdom, the utilisation of SSM was employed to enhance the administration of chronic illnesses in primary healthcare settings [35]. This was achieved by comprehending the viewpoints of many stakeholders and establishing an integrated care framework. In Australia, SSM was utilised to build an enduring water management strategy by involving various stakeholders in a collaborative and inclusive approach.

SSM provides a versatile and collaborative approach to problem-solving, in contrast to other methodologies. Contrary to hard systems techniques that prioritise optimising predetermined goals, Soft Systems Methodology (SSM) places importance on comprehending diverse perspectives and investigating practical enhancements. It is especially appropriate for situations characterised by an ambiguous problem definition or conflicting interests among various stakeholders. Therefore, researchers used soft system methodology as a data analysis tool. The SSM method was chosen because it is rooted in the complexity paradigm, holding the view that all systems can be explored, models are intellectual constructions, the process of finding out in a social context is continuous, and the involvement of the human element in research is very high. It also answers what and how questions are in accordance with problems that are very complex and unstructured.

## 4. Results and Discussion

### 4.1. Drinking Water User Association (HIPPAM)

There are several aspects to developing a quality management system framework that can be discussed. First, the quality policies and objectives proposed within the system framework need to be discussed, including how these policies support the achievement of the desired quality in ready-to-drink water management in Malang. Next, it is important to discuss water quality control measures, infrastructure maintenance supervision, as well as the quality audit process carried out [26]. Risk management and performance monitoring systems are also the focus of discussion, where explanations of risk identification methods, integrated performance monitoring,

and performance reporting are important. Finally, a discussion of continuous improvement and certification or accreditation, if relevant, will complement the discussion of how this quality management system framework contributes to improving the effectiveness and reliability of ready-to-drink water management in Malang.

The integration of a sustainable environment in ready-to-drink water management in Malang City is discussed in several ways. First, an environmental impact evaluation must be carried out to identify the environmental problems being faced, such as water pollution and habitat degradation [27]. Furthermore, environmental management planning must consider policies and actions that can reduce negative impacts and increase the efficiency of resources and waste management. In terms of technology, it is important to explain the implementation of environmentally friendly technologies that can help reduce energy use and increase process efficiency [28]. Education and community participation are also important points, involving the community in educational programs and social campaigns to increase awareness of the importance of environmental protection [29]. Environmental monitoring and supervision must be carried out systematically, by measuring environmental parameters, collecting data, and using this information to identify problems and take corrective action. In addition, partnerships and collaboration with environmental organizations, research institutions and local communities should also be discussed, as this can strengthen sustainable environmental integration through knowledge exchange and technical support [30]. Finally, it is important to explain the social and economic benefits that can be gained through environmental protection, such as improved public health and economic empowerment. By describing action plans, policies and concrete actions in sustainable environmental integration, it is hoped that ready-to-drink water management in Malang City can provide wider benefits for the environment, society and the economy as a whole.

The implementation and evaluation of the ready-to-drink water management model based on a sustainable and environmental management system framework in Malang City require discussing various crucial aspects. One of the key considerations is the necessity to develop a comprehensive implementation strategy, involving the allocation of resources, scheduling, and identification of tasks among relevant stakeholders [31]. Concrete steps taken in implementing the model, such as policies, operational procedures water quality control measures, infrastructure maintenance, risk management, and the application of technology and innovation, also need to be emphasized [32]. Integrating technological improvements is crucial for enhancing the effectiveness of management strategies. By implementing a real-time water quality monitoring system, the timely detection and correction of contaminants can be ensured, thereby guaranteeing the safety of the water supply. Using Geographic Information

System (GIS) technology to map water distribution networks enhances the effectiveness of water distribution and identifies regions in need of infrastructure enhancements. Automated maintenance scheduling safeguards against system failures and guarantees the durability of water treatment facilities and distribution networks. A digital community engagement platform enhances contact between water management authorities and the public, facilitating the exchange of feedback and the dissemination of information regarding water conservation activities. Implementing regular training programmes for people improves operating efficiency and ensures adherence to quality standards. Incorporating these technological elements greatly enhances the efficiency of the integrated ready-to-drink water management approach, hence aiding in the attainment of sustainable water management objectives.

A monitoring and evaluation system must be implemented to monitor the performance of drinking water management. Evaluation must be carried out using appropriate performance indicators and the results must be used to identify successes and challenges faced. Responses to evaluation findings and corrective actions taken should be discussed in detail. Additionally, it is important to evaluate the effectiveness and impact of the model, including the resulting social, economic and environmental impacts. Finally, survival and sustainability strategies need to be considered, including ongoing maintenance, development, and improvement efforts. In discussions on the implementation and evaluation of the model, accurate and relevant data and information must be presented to ensure continuous improvement and success in ready-to-drink water management based on a sustainable environmental and quality management system framework in Malang.

Implementation of a ready-to-drink water management model based on a sustainable quality and environmental management system framework in Malang City can have a significant social and economic impact [33]. Expected social impacts include improving public health through better access to safe, quality drinking water. The availability of adequate drinking water will reduce the risk of disease associated with unfit drinking water, especially in vulnerable groups such as children and the elderly. Apart from that, good management of ready-to-drink water will provide a sense of security and comfort for the community, improve the quality of life, and support social sustainability in the sub-district [34].

Positive economic impacts can also be seen through the implementation of this model. First, efficient use of resources will reduce operational and maintenance costs for water infrastructure, resulting in savings. Furthermore, the existence of quality ready-to-drink water management will create a conducive environment for investment and economic growth. Better access to safe drinking water will also help increase societal productivity, especially in sectors such as industry, agriculture and tourism that

depend on adequate water supplies. Thus, the implementation of this sustainable ready-to-drink water management model has the potential to provide positive economic impacts in the long term, stimulating local economic growth, creating jobs, and improving overall community welfare.

Overall, the social and economic impacts resulting from the implementation of a ready-to-drink water management model based on a sustainable quality and environmental management system framework in Malang City can provide significant benefits for the community. This not only improves the quality of life and health of the community but also contributes to sustainable economic development and creates better conditions for the growth and development of local communities, especially HIPPAM Mandiri Arjowinangun. HIPPAM, a water supply organisation that relies on community involvement, usually utilises less complex treatment methods as a result of low resources. The procedure may involve sedimentation for the removal of big particles, followed by filtration using sand or activated carbon filters to enhance clarity and flavour. To assure microbiological safety, disinfection is carried by using either chlorine or boiling. HIPPAM's objective is to adhere to the fundamental criteria established by the Ministry of Health for the quality of drinking water.

HIPPAMs in Malang have implemented several strategies to enforce quality policies and achieve objectives. An instance of this is HIPPAM Mandiri Arjowinangun, which has implemented an extensive quality management system encompassing routine water quality analysis, upkeep of water treatment infrastructure, and community outreach initiatives focused on water preservation and sanitation. An exemplary instance involves the partnership between HIPPAM Mandiri Arjowinangun and the local health department to carry out monthly evaluations of water quality. The assessments prioritise crucial factors such as turbidity, pH, and microbiological content to verify that the water complies with the health criteria established by the Indonesian Ministry of Health. In addition, HIPPAM Mandiri Arjowinangun has implemented a feedback system that enables community members to submit any concerns regarding water quality or service. The use of this proactive strategy has resulted in timely interventions and enhancements, hence improving the overall dependability of the water supply. These examples showcase HIPPAM's dedication in Malang to maintain high-quality policies and objectives, hence ensuring the delivery of safe and dependable drinking water to the population.

The implementation of a ready-to-drink water management model based on a sustainable quality and environmental management system framework in Malang City has several policies that can be recommended, including the following: First, it is recommended that there be a clear regulatory policy related to ready-to-drink water management. This policy may include establishing drinking water quality standards, monitoring procedures,

and technical requirements that must be met by drinking water service providers [26]. With this policy, a strong legal basis will be created to ensure that the drinking water provided to the community meets the specified standards and is safe for consumption. Furthermore, policies related to sustainable financing for drinking water management are recommended. This can include allocating adequate budgets for the development, maintenance and improvement of water infrastructure, as well as increasing human resource capacity related to the management and operation of potable water governance systems [34]. These policies could also encourage the use of alternative financing mechanisms, such as public-private partnerships or community-based financing schemes, to support long-term investments in water infrastructure.

Another recommended policy is strengthening collaboration and partnerships between the government, related institutions and the community in the management of ready-to-drink water. This can be done through the formation of consultation forums or working groups involving all relevant stakeholders, including local governments, water management institutions, local communities and environmental organizations. This policy will enable knowledge exchange, coordination of actions, and synergy in achieving the goal of sustainable drinking water management. In addition, policies are recommended to increase public awareness about the importance of sustainable management of ready-to-drink water [34]. This can be done through educational programs and social campaigns that highlight the benefits of safe drinking water for health and quality of life, as well as the importance of efficient water use and good waste management. This policy will provide support to the community to play an active role in maintaining the sustainability of the ready-to-drink water management system and to become smart consumers in water use.

Overall, the recommended policies, namely clear regulatory policies, sustainable financing, collaboration and partnerships, as well as increasing public awareness, are expected to create a strong foundation for the implementation and sustainability of a ready-to-drink water governance model based on a quality management system framework and sustainable environment in Malang City. This policy will help ensure that safe and quality drinking water is available to all Malang City residents in a sustainable manner. In reality, Arjowinangun Village HIPPAM has achieved a significant level of success and has become a model for other HIPPAM. One indicator of this success is the ability to provide clean water and potential drinking water to 1500 household connections and 3,500 heads of families covering an area of 278 hectares. This shows that the management of ready-to-drink water in HIPPAM has been successful in providing better water access for the people of Arjowinangun Village. However, one of the main problems faced in developing HIPPAM is capital. As an independent HIPPAM, its management and exploitation are the responsibility of the

community itself. The capital required for water infrastructure development, maintenance and operations is a significant challenge. In this context, efforts are needed to find adequate sources of capital, either through community participation in financing, public-private partnership schemes, or raising funds from other interested parties. To overcome this capital problem, it is important to actively involve the community and provide an understanding of the importance of investing in sustainable drinking water management. Training and education regarding financial management and business management can provide the community with a better understanding of managing HIPPAM efficiently and independently. Apart from that, there needs to be support from local governments or related institutions in the form of policies and programs that encourage the development of HIPPAM Mandiri. This support can take the form of technical assistance, coaching, supervision, and possible subsidies or grants that can help communities overcome the capital constraints they face.

#### **4.2. Drinking Water Organization by Local Government (PDAM)**

PDAM plays a crucial role in ensuring the provision of safe and clean drinking water to the residents of Malang City. As a government-owned entity, PDAM is responsible for the treatment, distribution, and management of the municipal water supply. Indonesian Minister of Health Regulation No. 2 of 2023, which is a standard reference for drinking water that is suitable for distribution to the public, in this regulation is known that what is meant by drinking water is "drinking water is water that has been processed or untreated and meets health requirements and can be drunk directly". Based on this understanding, it is known that to distribute drinking water, preparation is required so that it meets existing standards and is said to be fit for drinking. The same thing is also explained in the regulation, namely "Every drinking water producer/supplier/organizer is obliged to ensure that the drinking water produced meets SBMKL and Health Requirements."

PDAM follows a multi-stage water treatment method to ensure that the water satisfies the necessary criteria. The process commences with the intake of untreated water, which is then subjected to coagulation and flocculation in order to eliminate any suspended particles. Sedimentation facilitates the settling of large particles, whereas filtering eliminates smaller particles. The process of disinfection, commonly using chlorine, guarantees the absence of detrimental bacteria in the water. PDAM complies with the Indonesian National Standard (SNI) for the quality of drinking water. This standard sets specific criteria for factors like turbidity, pH level, microbiological content, and chemical pollutants.

This regulation states that the existence of SBMKL commonly known as Environmental Health Quality Standards is a standardized value for environmental media that is related to or has a direct impact on public health, so

producers are required to have this to ensure the safety of the water produced. To fulfil this, SBMKL includes Physical, Biological, Chemical and Radioactive qualities. Apart from that, health requirements for water must have a processing, container and serving system for ready-to-drink water using the principles of hygiene and sanitation.

Based on this, it is known that PDAM as one of the drinking water companies managed by the region tries to meet these standards, by carrying out laboratory tests at certain periods, and cooperating with the Health Service to determine the quality of drinking water, which in general the Health Service will carry out unannounced inspections without a specific schedule to measure the quality of water that will be distributed to the community, without a specific schedule and unannounced inspections carried out by the Health Service requiring PDAM to maintain the condition of the water at all times. Water quality treatment is carried out by storing water using existing reservoirs and then separating them into several reservoirs. This is done if pollution occurs which can be prevented by separating the reservoirs so that other water in different reservoirs is not polluted.

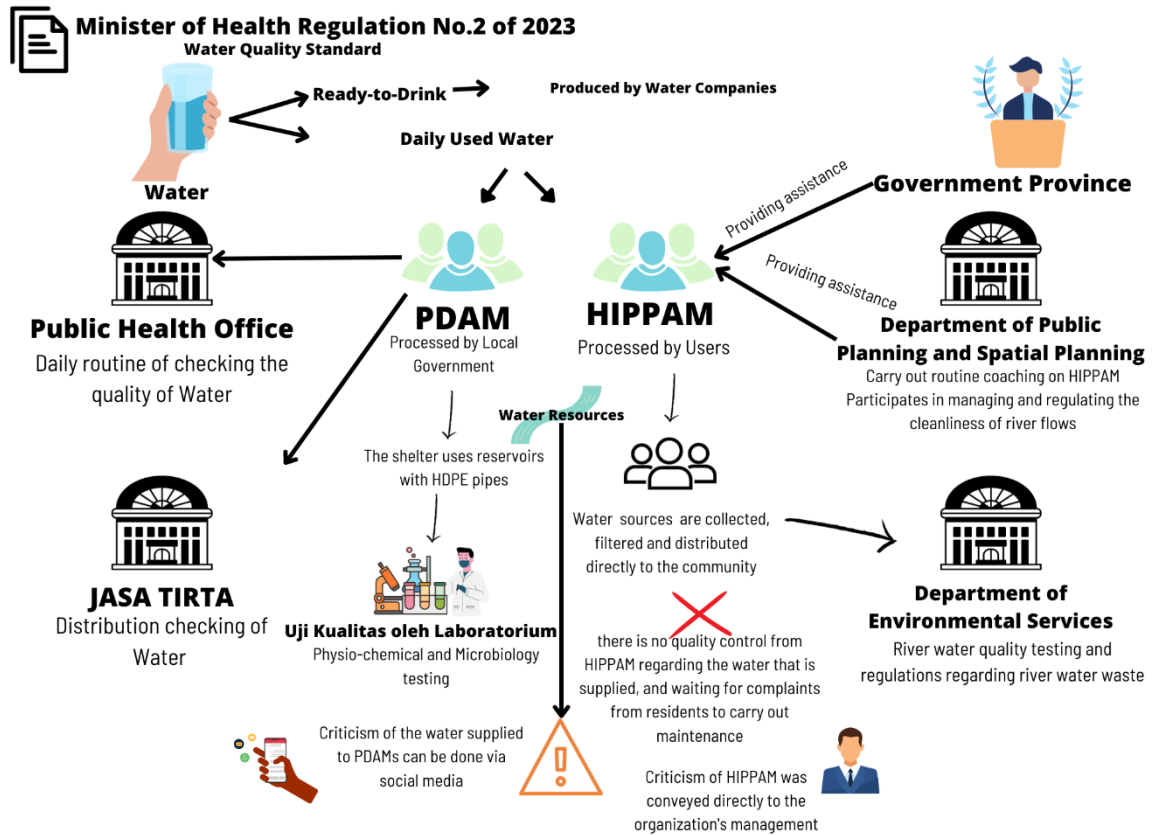
#### **4.3. Other External Organization**

Several external parties involved in providing water that is distributed to the community until the water is ready to drink, are:

- 1) Department of Public Planning and Spatial Planning or DPUPR is an institution that has an interest in supervising HIPPAM, where the institution guides the form of operational management and HR management. Apart from that, PUPR also provides funds with a ceiling of 1M to HIPPAMs who send proposals to Musrenbang and select the proposals. Meanwhile, every year the 1M ceiling funds can help around 5 to 6 existing HIPPAMs. DPUPR also provided ready-to-drink water prototypes which are planned to be applied to 2 pilot HIPPAMs. The selection of HIPPAMs is based on HIPPAM operational management. DPUPR plays a vital role in upholding the quality and dependability of the drinking water supply by implementing appropriate infrastructure and management methods.
- 2) Public Health Service or DINKES, is an institution that carries out inspections of the quality of distributed water. PDAMs generally the Health Service will carry out inspections of distributed water within an uncertain period. DINKES is the main authority tasked with overseeing and guaranteeing the public health elements of drinking water quality in Malang City. This involves doing routine inspections and conducting water quality tests to verify that both PDAM and HIPPAM adhere to the health regulations for potable water. DINKES evaluates multiple characteristics, including microbiological content,

chemical pollutants, and physical qualities of the water. If any violations or difficulties occur, DINKES collaborates with the water providers to enforce corrective actions and guarantee the restoration of water quality to safe levels. DINKES also fulfils a function in public health education by disseminating knowledge and information to increase awareness of the significance of maintaining clean water and advocating for safe water practices within the community.

According to Minister of Health Regulation No. 2 of 2023, the involvement of multiple stakeholders is evident in the supply and distribution of ready-to-drink water, as depicted in Figure 1. The PDAM and HIPPAM are responsible for providing the community with safe and high-quality drinking water. In addition, various other organisations, such as DPUPR, Public Health Services, and Jasa Tirta, also took part in the process. Figure 1 provides a more comprehensive description of the process that is involved.



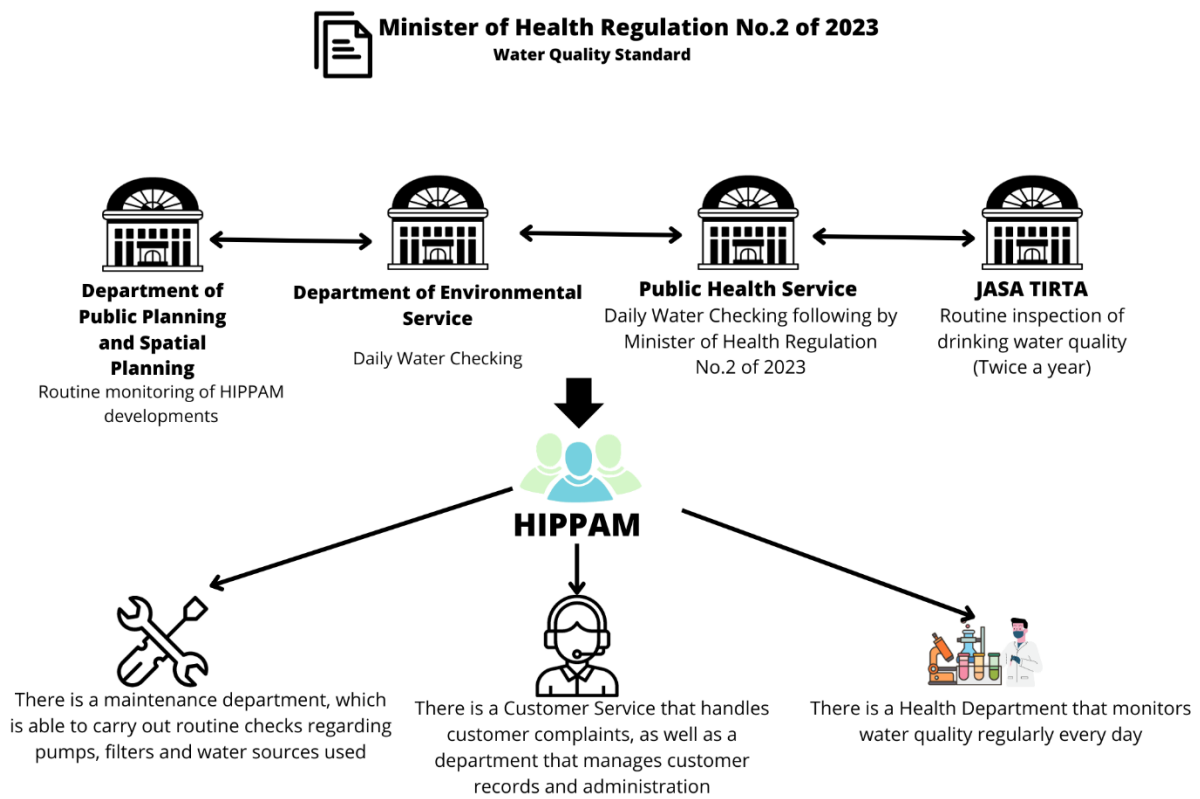
Source: Author (2024)

Figure 1. Rich Picture of Integrated Model of Ready-to-Drink Water

#### 4.4. Integrated Model of Ready to Drink Water

The figure below shows the HIPPAM management that must be implemented when providing ready-to-drink water, where in preparing ready-to-drink water, careful preparation is required. Based on Minister of Health Regulation no. 2 of 2023 concerning Drinking Water Quality Standards, it is known that the physicochemical and microbiological quality of water must meet standards and must not exceed the specified thresholds, therefore many preparations are needed such as sterilisation machines, water pumps, the use of water layers to prevent mildew, and rust to water flow pipes that must meet standards. Based on the results of interviews with related parties, in this case, PDAM as one of the regional companies has deemed that PDAM water has met the ready-to-drink standards, and in preparing for this PDAM has made a lot of preparations. Departing from this, to be able to prepare ready-to-drink water, HIPPAM must collaborate with several regional apparatus, bearing in

mind that not all regions in Indonesia can be accessed by PDAM and also have different water quality, by collaborating with existing regional apparatuses, then the management of ready-to-drink water can be carried out and distributed effectively and efficiently. The model above is based on Minister of Health Regulation No. 2 of 2023, where to meet these standards, HIPPAM collaborates with DPUPR. Collaboration between HIPPAM and DPUPR has been established, where DPUPR has the task of directly supervising and guiding HIPPAM in the regions, and DPUPR also provides assistance in developing facilities and infrastructure for HIPPAM in improving water quality and the quality of services to the community including water distribution. Apart from that, HIPPAM should collaborate with the Environmental Service, as it is known that some HIPPAM water sources come from rivers, and the Environmental Service directly supervises river water waste, so that pollution can also be prevented with the help of supervision from the Environmental Service.



Source: by Author (2024)

**Figure 2.** Integrated Model of Ready-to-Drink Water



Another role is that HIPPAM should collaborate with the Health Service, as it is known that the Health Service is an institution that directly supervises public health, where in this case the Health Service also checks the quality of PDAM water which is generally carried out periodically, to minimize, prevent and supervise the quality of drinking water should be checked regularly with the Health Service, something similar is also done by Jasa Tirta, where Jasa Tirta is one of the state-owned institutions that manages water resources.

Collaboration carried out by HIPPAM with other institutions should also be supported internally by HIPPAM, where HIPPAM should have a maintenance department. The maintenance department is accountable for the maintenance and repair of water treatment facilities, pumps, filters, and distribution networks. Performing routine maintenance guarantees optimal equipment performance and mitigates the risk of equipment failure that could potentially jeopardise water quality. This agency also oversees the physical state of the water infrastructure to swiftly identify and resolve any potential problems. Apart from that, there is a need for a service department, including customer service. The service section is responsible for managing customer interactions, which involves handling complaints and inquiries regarding water quality and service. This department has a vital function in upholding communication with the community and ensuring that their complaints are dealt with efficiently. Apart from that, human resources are needed who can carry out good administration regarding customer data. What is no less important is the existence of a health department, which will routinely monitor the quality of ready-to-drink water that will be distributed. The health department is responsible for overseeing the microbiological and chemical composition of the water to verify that it complies with health regulations. This involves conducting routine analysis of water samples to detect the presence of harmful substances and disease-causing microorganisms. The health department additionally executes health and hygiene education initiatives to enhance community understanding.

## 5. Conclusions

Based on the research carried out, knowing that it requires a lot of preparation from various aspects to provide ready-to-drink water, as is done by PDAM that refers to the standards of Minister of Health Regulation No. 2 of 2023, which concerns drinking water quality standards including physico-chemical and microbiological aspects. In water, there is a certain threshold limit that must not be exceeded. Apart from that, to achieve this readiness, collaboration between existing stakeholders is needed, and this is then outlined in the integrated model of drinking water management, where there is a role for regional officials such as the Health Service which has a special role in checking the quality of drinking water that is suitable for

the entire community, the PUPR Service which is tasked with directly monitoring the performance of HIPPAM, the Environment Service which has the authority to check river waste and Jasa Tirta as one of the state-owned institutions that carries out routine inspections. Meanwhile, the preparation for HIPPAM requires in-depth preparation within the organization, including administrative preparation, services and equipment.

In conclusion, the research offers significant knowledge regarding the preparedness and difficulties faced by local authorities in handling packaged drinking water in Malang, Indonesia. The results and suggestions can guide the development of policies and practical measures to enhance water management practices and guarantee the supply of clean and easily accessible drinking water to the community. Future research should focus on examining the scalability of the integrated model to other urban regions facing comparable difficulties, evaluating the long-term sustainability of the model, and studying the effects of climate change on water resource management. In addition, future research might prioritise the examination of the economic dimensions of water management by conducting cost-benefit evaluations of various water treatment and distribution approaches.

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