

# Analysis of the Issues on Bengawan Solo River Basin Management Policies

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*Abstract:* -The Bengawan Solo river basin in Central Java Province, Indonesia, has a great history from era to era. But there are still issues with its current management system. Because of that, this paper aims to analyze issues in the management policies of the Bengawan Solo river basin. This is empirical legal research with qualitative analysis. The data were collected through interviews with informants who manage the Bengawan Solo river basin, from the Bengawan Solo River Management Office (RMO), the Environmental Service of Sukoharjo, Surakarta, and Karanganyar Regencies, as well as people who live around the Bengawan Solo river. Research showed that issues that concern the Bengawan Solo river basin are: (1) river basin pollution due to textile waste that is illegally disposed of in the river, and (2) there is a lack of regional regulations that are specially made to manage river basins. Based on the issues faced by the Bengawan Solo river basin, there needs to be a change in the policies on river basin management. There should be a special regulation on the Bengawan Solo river basin area. Apart from that, the Bengawan Solo river basin management should be changed into more effective management patterns.

*Key-Words:* - River basin, Management, policy, Bengawan Solo river, Environment, Indonesia.

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## 1 Introduction

Indonesia is a country with mega biodiversity, [1], beautiful nature, [2] and panorama, [3]. Unfortunately, it is threatened by issues such as environmental destruction, [4], such as deforestation, [5], in some of its large islands, [6], air pollution, [7], and river pollution, [8]. Indonesia is a developing country that is prone to river pollution, [9]. Most river pollution is caused by industrial waste, [10], and plastic, [11]. Due to these activities, Indonesian rivers have the status unfriendly and unhealthy, for instance, the Citarum river in West Java, [12], the Brantas River in East Java, [13], and the Bengawan Solo River in Central Java. These phenomena contradict the Indonesian constitution, where the state has an obligation to manage the environment, [14].

The issues of river damage in developing countries such as Indonesia are caused by the weak enforcement of environmental law and the ineffective legal protection of those rivers. Some indicators of the damage to watersheds include the decreasing river water quality as well as the change in river water color and odor. These things are caused by changes in land and excessive industrial activities, [15]. The Indonesian Ministry of Forestry declared 108 critical river basins in Decree No.

328/Menhut-II/2009 and one of which was the Bengawan Solo river basin. According to AZS from the non-governmental organization (NGO) that carried out an expedition through the Bengawan Solo river basin in 2021, it was found that the condition of this river was already bad. It has brought serious impacts on the nearby society as well as those who depend on the Bengawan Solo river for a living. This condition was caused by some companies who violated the regulations by directly disposing of the industrial production waste in the river without going through the Waste Water Management Installation (WWMI).

The Bengawan Solo river basin has a great history and is the longest river on Java island. Its length reaches 600 kilometers, [16]. It passes through ten regencies in two provinces. With such a predicate, the Bengawan Solo river is always inflicted by problems in every regency it passes that affect this river's quality, such as pollution due to fabric waste, alcohol waste, and trash. Such issues may also cause a flood, [17].

Indonesia is a legal state, [18], that upholds the equality of rights, [19]. The regulations on watershed management and protection are (1) Law No. 32 of 2009 on Environmental Protection and Management, (2) Law No. 17 on Water Resources,

and (3) the Governmental Decree No. 37 of 2012 on Watersheds. The constitutional regulations on watersheds in Indonesia are good enough to protect the environment, including rivers. But seeing the rampant problems of the Bengawan Solo river watershed, something must be wrong. Environmental conflicts will lead to limited natural resources, [20]. This also applies to the conflicts in the Bengawan Solo river watershed. Thus, this research aims to analyze the issues faced by the Bengawan Solo river watershed in the aspects of pollution and management. The researchers will then provide a solution to these issues for better management of the Bengawan Solo river watershed in the future.

The Bengawan Solo River watershed has a long history and is one of the oldest river basins in Indonesia. Even during the Dutch colonial era in 1931, 11 fossil skulls of primordial men were found on the river banks of this river, [21]. These primordial men fossils were then named after their origin, namely *Homo (Javanthropus) Soloensis*. The Bengawan Solo river watershed was also crucial to the introduction of Islam in Indonesia, as it was used as a transportation facility. It was also a trade route between Indonesian kingdoms, [22]. The upstream of the ancient Bengawan Solo river watershed originated from the Wonogiri regency that flowed in the direction of the Pacitan Regency and Yogyakarta Special Region. Unfortunately, due to the split of the great Asia and Australia plates, the flow of the ancient Bengawan Solo river stopped, [21]. This led to a change in the Bengawan Solo river's direction. Before, it flowed to the south towards Pacitan Regency and Yogyakarta Special Region. Then, it shifted to the north to Sukoharjo Regency, Surakarta City, and even to Lamongan Regency in East Java Province.

The Bengawan Solo river watershed passes through two large provinces in Indonesia, namely Central Java and East Java. The authority and management of this river are in the hands of the Ministry of Public Works and Public Housing, and it is bestowed to the hands of the Bengawan Solo River Management Office (RMO). During an interview, ABR from the Bengawan Solo RMO stated that the Bengawan solo RMO currently manages the Bengawan Solo river watershed. The management is carried out by undergoing supervision, checking the river water quality, and giving permit recommendations to activities that will lead to changes in the Bengawan Solo River watershed area.

## 2 Methodology

This is empirical legal research that compares issued policies to manage an object as a result of the issuing of those policies, [23]. In this research, the researchers used primary and secondary data. The primary data in this research were obtained from parties who carried out interviews with the people who were responsible for managing the Bengawan Solo river basin, namely the RMO Bengawan Solo, and supporting managers, namely the Environmental Service of Sukoharjo, Surakarta, and Karanganyar Regencies. Primary data were also obtained from focus group discussions with non-governmental organizations and people who were impacted by issues of the Bengawan Solo river. Then, the secondary data were obtained through data identification of Indonesian laws, supported by books and articles. In this research, the data were analyzed using the qualitative technique of analysis.

## 3 Result and Discussion

### 3.1 The Policies on Watershed Management in Indonesia

Indonesia must also become a country with environmental awareness, [24]. The characteristic of a legal state is that it actively issues regulations to run a policy. Watersheds are one of the subjects of Indonesian policies. Its management is regulated by the law. As aforementioned, Indonesia has 108 river watersheds with critical status.

The watershed management in Indonesia must be according to the issued laws. This is to preserve their sustainability. The legal protection of watershed management in Indonesia is the Governmental Decree No. 37 of 2012 on Watersheds. Article 2 of that Decree states that watershed management in Indonesia is implemented through several stages, namely: (1) planning, (2) management, (3) monitoring and evaluation, and (4) guiding and supervision. The qualifications for the recovery status of damaged river watersheds are also determined and regulated in Governmental Decree No. 37 of 2012 Article 18.

Another legal basis of the river watersheds is Law No. 17 of 2019 on Water Resources. This law is general legal protection as it regulates policies concerning water resources. Article 15 of this law explains the authorities of the regional government, namely the authority to create water resource management policies and facilitate dispute resolution in the Regency in the case of water resource management. Apart from regulating the

regional government’s authorities in managing water resources, Law No. 17 of 2019 also regulates the authority to manage water resources at the village level.

Law No. 32 of 2009 on Environmental Protection and Management also has a role in managing river watersheds. Article 30, clause 3 states that anyone who disposed of waste to environmental media must have environmental permits. This law is a very useful legal basis to protect river watersheds as it focuses on all environmental aspects in Indonesia, [25].

The river watershed management in Indonesia principally follows integrated watershed management, as stated by a Bengawan Solo RMO manager, ABR. She said that the integrated management principle is still applied in managing river watersheds. This method is carried out by managing the river watersheds from the upstream to the downstream through monitoring, evaluation, guiding, and supervising. This principle was first introduced in 1992 in the Dublin Principle, [26], and it was called the Integrated Water Resource Management (IWRM) or the Integrated River Basin Management (IRBM). In other countries such as Turkey, [27], China, [28], Morocco, [29] and Canada, [30]. The integrated river basin management has been applied well with various evaluations and supervisions. Unfortunately, integrated river basin management in Indonesia is faced with some challenges. For instance, there is a lack of real support from various regions as it was inhibited by the applicable regulations.

### 3.2 The Condition and Issues of the Bengawan Solo River Watershed

Table 1. The Bengawan Solo River Watershed Pollution Index

| No | River Location           | Pollution Index |
|----|--------------------------|-----------------|
| 1  | Jurang Gempal (Wonogiri) | 4.99            |
| 2  | Nguter (Sukoharjo)       | 9.12            |
| 3  | Peren (Sukoharjo)        | 13.82           |
| 4  | Bacem (Sukoharjo)        | 16.28           |
| 5  | Jurug (Surakarta)        | 11.04           |
| 6  | Kemiri (Sragen)          | 19.22           |

Source: Bengawan Solo RMO,[31]

The above table shows the pollution index at each regency in Central Java that is flowed by the Bengawan Solo river. Every regency has its own problems. In Wonogiri Regency, the river is

relatively unpolluted. Then, in Sukoharjo City (Nguter, Peren), the pollution index starts to increase. This is caused by the activities of textile industries that violate the regulations in the Decree of the Minister of Environment No. 3 of 2010 on the Standard Quality of Waste Water in Industrial Areas.

The Decree of the Minister of Environment No. 3 of 2010 on the Standard Quality of Waste Water in Industrial Areas obliges all industries that produce liquid waste to have WWMI. But in Sukoharjo Regency, most of the textile Micro, Small, to Medium Enterprises (MSMEs) that produce beach fabric and batik in “X” village, Mojolaban District, do not have WWMI. The wastewater disposal from the beach fabric MSMEs directly flows to the river that flows to Bengawan Solo river. Then, in Nguter District, pollution happens due to an illegal pipe that acts as the source of pollution.



Fig. 1: An illegal pipe in Nguter Village, Sukoharjo Regency

This pipe originates from PT “X”, one of the largest factories that produce raw textile materials. This pollution disturbs the health of the surrounding communities. People have reported suffering from shortness of breath and itchiness when in contact with polluted river water.

TMO as a coordinator of the resistance action against that textile factory, stated that the malfunctioning WWMI of the factory resulted in an unpleasant odor. It led some Gupit Village inhabitants to suffer from shortness of breath and were hospitalized. Some people whose source of living was fishing at the Bengawan Solo watershed explained that since the pollution from that factory, it is harder and harder to find fish.

The illegal status of that pipe was agreed upon by SGT from the Sukoharjo Environmental Service. He said that the pipe is a source of pollution in the Bengawan Solo watershed. It has threatened the health of society. This conflict started in 2018 up to now and has caused hazards to society.

Some other issues happened in Surakarta City. Some home industries that produce batik in “X” Village and “X” Village have issues with WWMI. Most home industries dispose of the water waste from washing batik fabric to a small river that leads to the Bengawan Solo river basin.

ED from the Environmental Service of Surakarta City also stated that apart from originating from nature, the issues of the pollution in Bengawan Solo were also caused by human activities, namely the home industries that create batik fabric. Further, ED stated that of the 50 home industries in “X” Village and “X” Village, only six have WWMI drainage.

SRO from “X” Village stated that the river that is polluted by batik fabric waste in his village does flow to the Bengawan Solo river basin. This condition has long happened. Some people actually feel bothered by the stench that comes from the small river that becomes the place of waste disposal. But they do not have other places to dispose of the waste. Some of the people also work in those batik home industries. The stench causes people to suffer from health issues such as headaches.

River issues are common issues. Thus, all areas in which the river passes suffer the consequences. Surakarta City is a very crowded city that requires a supply of clean water for its inhabitants daily lives. Unfortunately, this water supply is often inhibited due to the pollution of the Bengawan Solo river watershed.

AGN as a manager of the Municipal Waterworks of Surakarta City, stated that the Bengawan Solo is one of the suppliers of clean water in Surakarta City. Unfortunately, the supply is often disturbed due to the polluted river water. This river flows from Sukoharjo and Wonogiri Regencies.

The consequences of the river pollution have also started to be felt by the people whose areas are passed through by the Bengawan Solo river in other regencies, such as Sragen and Karanganyar Regencies. Based on the observation, apart from suffering from the consequences, Karanganyar Regency is also a source of pollution and waste.

SYN from the Karanganyar Environmental Service said that Karanganyar Regency is impacted by pollution as well as a source of it. This is because some chemical, animal husbandry, and textile companies dispose of their waste directly to the river without functioning the WWMI well. This causes the river that flows through Karanganyar Regency to be polluted. It emits a stench, and it disturbs people’s health.

Sragen Regency is the last regency that is flowed by the Bengawan Solo river in Central Java Province. The pollution condition in this regency is highly

concerning. According to MHU, a citizen of Sragen Regency, the Bengawan Solo river that flows in this regency is often black in color. It causes people who take water for daily needs to suffer from itchininess in their legs. The stench that it produces is unpleasant and disturbing. The issues in the Bengawan Solo river basin are similar to the river issues in other areas in Indonesia, as rivers act as the last disposal of human activity. According to Trias, the issues on the river watershed require strict regulation implementation and a good pattern of awareness, [31].

### **3.3 Strengthening the Policies on Bengawan Solo River Watershed Management**

The policies on the Bengawan Solo river watershed management are so far in the hands of the Ministry of Public Works and Public Housing, and it is bestowed to the Bengawan Solo RMO and the Ministry of Environment and Forestry. The legal protections used to manage the Bengawan Solo river watershed are Law No. 17 on Water Resource and the Governmental Decree No. 37 of 2012 on Watershed. But seeing the facts in the field, the application of these regulations is still suboptimum in managing and protecting the river from pollution and ecological damage. According to AZS from NGO, the water along the Bengawan Solo river basin in 2022 contains microplastic. The results of Yusron and Jaza’s research in 2021 showed that the water in the Bengawan Solo river basin contained microplastic, [32]. The guarantee for a good environment is stipulated in the Indonesian constitution, [33] where the state is obliged to protect its citizens from environmental damage and provide a clean and healthy environment.

The Bengawan Solo river basin is currently in a bad condition. As stated by ABP from the RMO, “There are obstacles to the management of the Bengawan Solo river basin due to the limited members of the Bengawan Solo RMO that is not proportional with the length of the river that flows through two provinces in Java Island.” The management of the Bengawan Solo river basin also has obstacles in its law enforcement. According to Law No. 11 of 2020 on Job Creation, if there is river pollution, the authority to act upon polluters is in the hands of the Ministry rather than the regional-level governments. This causes new obstacles and issues. One of them is the ongoing operation of PT X in Sukoharjo Regency, although it has been given sanctions and warnings.

River management does involve various responsible institutions and interests in the case of planning, [34]. Regulations and interests that synergize both

vertically and horizontally are one of the ways to good river management. A conflict will be born from the lack of synergy, [35]. The policies that are arranged by written management will function to characterize the structure and usability. This highly helps in formally supporting the integration of regulations, the law, and authority [36]. Even so, the integration must be analyzed profoundly and carefully, [37]:

Indonesia is a state that has applied the decentralization system, where regions are given top-down democracy, [38]. It means that each region has the authority to manage its own area, [39]. The strengthening of the decentralization system also comes from the regulatory hierarchy in Indonesia that is stipulated in Article 7 of Law No. 11 on Constitutional Regulations: The Constitution, The decision of the People's Consultative Assembly, Laws, Governmental Decrees, Presidential Decrees, Decrees of Provincial Governments, Decrees of Regency Governments.

Based on the results of the focus group discussions in several regencies in Central Java Province, there is not yet any regional legal product that is specially integrated with the legal regulations that manage the Bengawan Solo river. Also, the Decree of the Regional Government No. 23 of 2014 on Regional Governments does not stipulate the authority to manage river basins, [40]. Plus, neither does it regulate anything about the Bengawan Solo water resources.

The solutions that can be applied in the policy of the good Bengawan Solo river basin management in the future are as follows:

*First*, strengthening the concept of the integrated river basin area that is already applied in Indonesia by developing people's mindset on the future of the river basin area. This is to change their mindset on the watershed, which they regard merely as a place of waste disposal. The concept of the integrated river basin can be integrated with the sustainable development concept, considering that Indonesia is ranked the 82<sup>nd</sup>, [41], in the rank of sustainable development goals released by the United Nations. The concept of the integrated river basin encourages the harmonization of the thought of the watershed functions from the upstream up to the downstream. The strengthening of this river watershed is very good as it contains intersectoral approaches and rearrangement, [42] as well as the ecosystem approach, [43].

*Second*, integrating policies or regulations. Every area that is passed through by the Bengawan Solo river must have regional legal products that are integrated with the regulations on the Bengawan

Solo river basin. The formation of these regional regulations can minimize the legal void in every region. The decentralization system in the Indonesian legal system obliges every region to manage its own areas. This can be utilized in managing the Bengawan Solo river basin. Apart from that, by integrating regulations, it will be easier to enforce the law and monitor the policies in general, [44].

*Third*, combining the integrated river basin area concept with the ecosystemic approach and environmental management. Changes in the river basin area from time to time are marked by the abundant chemicals from industries, agricultural pesticides, and urban waste that flow directly into the river basin area. The ecosystemic approach and environmental management work are based on an empirical framework. They explore the theoretical basis of trans-disciplinary sciences that aim to improve the relationship between humans and the environment, [45]. With the keyword of trans-disciplinary sciences, this approach is very good to be used as a supportive approach to the integrated river basin area concept that is not too specific in terms of the approach as it uses trans-disciplinary sciences. The cases that threaten the Bengawan Solo river basin area are mostly caused by the violation of environmental laws. But seeing the weak law enforcement and the weak legal awareness of polluters around the Bengawan Solo river basin area, the systemic approach and environmental management can become the basic foundations in learning how to manage the watershed before focusing on the concept of the integrated watershed. Indonesia has a universal plan for clean sanitation and clean water program from 2020-2024. The benefits of this program should be felt if it is seriously applied. Clean water can be obtained from the river basins that flow through several regencies, and the Bengawan Solo river basin area is one of them. The future of the Bengawan Solo river basin area is the future of Indonesia, as in the program of sustainable development that has been integrated into Law No. 32 of 2009 on Environmental Protection and Management. The good management of the Bengawan Solo river basin area can bring good impacts to the areas around this river.

## 4 Conclusion

The condition of the Bengawan Solo river basin currently highly depends on applicable management policies. Unfortunately, several issues inhibit the application of these policies, namely: (1) there is a lack of special regulations in the regions that are

integrated with the existing laws, (2) actors of small and large industries lack the awareness to preserve the sustainability of the Bengawan Solo river basin, (3) the integrated river basin management system is not yet applied as expected due to a lack of socialization. Thus, to resolve these issues, there needs to be a new policy on river basin management. This new policy must integrate with the regulations in each regency in which the Bengawan Solo river flows. Then, the new management policy must also strengthen the applicable concept of integrated river basin management.

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#### Conflict of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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