Status and challenges of water governance in facing the water crisis disaster in Blora Regency, Indonesia

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Abstract. The water crisis is a problem faced by many cities in the world. The water crisis is a disaster. The condition of the water crisis is further aggravated by climate change. One important factor to overcome the water crisis is water governance. The purpose of this study is to assess the status of water governance to overcome the water crisis. This study used Blora Regency as a case study. Blora Regency is one of the districts in Indonesia which experiences a water crisis every year. The water crisis always occurs in the dry season. In addition to seasonal problems, another problem that causes the water crisis is the uneven distribution of water sources, topographic conditions, access to infrastructure, and seasonal variation. This study uses a governance capacity indicator approach. Criteria to assess government capacity consist of planning, implementation, and monitoring and evaluation. The data was collected from interview with stakeholders and secondary sources. Most of the sub indicators have not been fulfilled. Policies, strategies, programs, and activities have not been derived from the causes of the water crisis, are less innovative, less based on the river basin approach, and have not involved the participation of many parties, and have not been supported by adequate funding. Finally Indicator monitoring and evaluation is not yet an outcome based indicator.

1. Introduction
Water is a basic human need. [23] Stipulates that water is a human right. In the Sustainable Development Goals the fulfillment of the need for water for all communities is one of the goals that must be achieved by 2030 [23]. Regardless of the importance of water in human life, water crisis is a condition that is faced by many countries. [13] Estimates that 240 million people will experience a lack of access to improved water sources. [27] States that water crisis are one of the global risks.

Water crisis are related to water scarcity and water shortage. [24] Stated that defines water scarcity can be caused by physical water shortages or access problem caused by limited infrastructure or institutional failure. It is estimated that in 2025 two-thirds of the world's population will face water shortages [29]. Water scarcity will result in a water crisis if no intervention is carried out [31].

Water crisis is caused by many things. Rapid population growth is inseparable from the increasing need for water [22]. The water crisis condition is further aggravated by climate change. Climate change has caused uncertainty in water supplies (Verner, 2012; [22], [1]. Climate change has implications for the occurrence of droughts in the dry season and flooding in the rainy season. Water pollution is also a problem faced by many countries. Water pollution causes the amount of water that can be used is reduced [4]. Access to water is also a cause of water crisis [29]. Infrastructure limitations cause limited access to water.

Water crisis are sometimes not technological problems. If the water supply is sufficient in aggregate compared to demand, then the intervention through water governance is the right solution. [22] Stated
that water governance as a set of political, social, economic, and administrative systems that are placed in the development and management of water resources and water services at various levels of society. Water governance consists of all actions, regulations, subjects, objects, and objectives aimed at ensuring access to water that is sustainable for the entire community and for all purposes [5].

Blora Regency is an administrative region in Indonesia that is experiencing a water crisis. Water source in Blora Regency is actually greater than demand. However, not all water sources can be used to meet this need. The cause of this problem is the uneven distribution of water sources, limited accessibility to water sources due to topography and infrastructure, and considerable fluctuations in water sources during the rainy and dry seasons. By paying attention to the problems faced by Blora Regency, water governance is an intervention that can be applied to overcome the water crisis in Blora Regency.

Identification of problems and challenges of the water crisis is the key to success in improving water governance (Romano and Akhmouch, 2019). The root problem of the water crisis in Blora Regency is at macro and trans-district level. Solutions to the water crisis in Blora District require intervention from formal institutions. Although current developments in water governance show that it is run by formal and informal institutions in the form of polyscentric institutions, formal institutions or government in developing countries still play a strong role. It is because decentralization has not developed well [8] and community participation in decision-making is still weak [7][6]. Governments have many responsibilities for governance functions, such as formulating policy, developing legal frameworks, planning, coordination, funding and financing, capacity development, data acquisition and monitoring, and regulation [25]. In the context of water governance, this formal institution plays a role in regulating water distribution given the uneven distribution of water sources and accessibility to water sources, as well as fluctuations in water flow. By paying attention to the root causes of the water crisis in Blora district as mentioned, this study aims to assess the water governance in formal institutions in Blora Regency. Although in terms of its components water governance does not only include clean water, but also includes sewage, drainage, wastewater, and water security [15], but the focus of this study is on water supply for domestic needs while taking into account its relationship with other water sectors.

2. Methods
This research is a case study. Case study research is part of qualitative research [19]. Case study research is not intended to generalize to the population [30], but rather is intended to understand the phenomena found in explored cases. Therefore, in the selection of case studies it is necessary to consider the specificity in the selected case [18]. Blora Regency is used as a case study because every year Blora Regency experiences a water crisis and this condition worsens from year to year (BLG, 2014). On the other side, Blora Regency has potential water sources. This situation can be overcome by water governance of formal institution. Blora Local Government (BLG) have the authority to regulate the use and distribution of water on a regency scale. It is interesting to examine the extent to which water governance in Blora Regency has been implemented to overcome the water crisis.

An assessment of water governance in Blora Regency is based on criteria, indicators, and water sub indicators (see Table 1). Water governance criteria, indicators, and sub indicators are derived from a number of literature related to governance and water management, water crisis, and water resources, with an emphasis on the role and authority of formal institutions [31]. Water governance assessment is carried out at the level of BLG.

| Criteria | Indicators | Sub Indicators |
|----------|------------|---------------|
| Planning | Policy, Strategy, and Regulation | Problem based policy, strategy, and regulation |
|          |            | Innovative policy, strategy, and regulation |

Table 1. Criteria, Indicators, and Sub Indicators of Water Governance for Formal Institution.
2.1. Case Study: Blora Regency

Blora Regency is located in Central Java Province. The area of Blora Regency is 1820 km² consisting of 16 districts and 295 villages. The population in Blora Regency in 2017 was 858,865 people and 245,080 households (BSO, 2018). Blora Subdistrict is the district with the largest population (11% of total population), while Cepu is the sub-district with the highest density. The average population density in Cepu District in 2013-2017 was 1,497 people/km², while population density in Blora regency was 542 people/km² (BSO, 2018). The largest land use in Blora Regency is forest with an area of 90,144,562 or 49.59% of the total area. The next widest land use is rice fields with an area of 2016,45,948.19 hectares or 25.3% of the total area. Administrative area of Blora Regency shown in Figure 1.

Clean water needs in Blora Regency are served by piping and non-piping systems. The piping system is organized by the public water supply company or PDAM of Blora Regency. The PDAM uses various water sources, namely springs, rivers, deep wells, and reservoirs. The water source discharge during the rainy season is 202.5 l/sec and in the dry season only 89.5 l/sec. The installed production capacity of infrastructure is 225 liters / second, while the utilization is 184.47 liters / second (BLG, 2014). The PDAM serves eight sub-districts. The number of customers was 15,338 households (PDAM, 2016). Service coverage was 6.26%. Non-Revenue Water was of 53.71% (PDAM, 2016). The population not served by the PDAM uses a non-piping system in the form of individual and communal systems. Water sources used in non-piping systems are springs and wells. Of the total 295 villages in Blora Regency, there are 97 villages that have not been served by piped or non-piped clean water systems.

Aggregate water supply demand analysis in Blora Regency shows that available water sources can meet the needs in Blora Regency, but if supply demand analysis is carried out based on village, then in 2021 there are only 43 villages in 6 sub-districts that have sufficient water sources. This supply demand analysis uses data on potential water source consisting of ground water and surface water, and the standard for clean water needs of 60 l/person/day. This condition is caused by limited accessibility to groundwater, such as topography and other physical accesses (BLG, 2014). In addition, the condition of surface water sources in Blora Regency is strongly influenced by the season (BLG, 2010). This condition is exacerbated by climate change (BLG, 2014).
2.2. Assessment of Water Governance in Blora Regency

2.2.1. Planning
Planning consists of problem based policy, strategy, and regulation; innovative policy, strategy, and regulation; and river basin oriented policy strategy and regulation.

2.2.1.1. Problem Based Policy, Strategy, and Regulation.
As explained earlier, quantity of water sources in Blora Regency can meet the needs of the population. The root of the problem of water crisis in Blora Regency is not about the limited sources, but rely on the following components: 1) uneven distribution of water sources, 2) accessibility to ground water, such as topography, permits and physical access, 3) fluctuations in surface water discharge caused by season. All of these conditions are expected to worsen in the future due to climate change.

One of the planning documents that became a reference in the development of drinking water in Blora District was the Water Supply Plan 2014-2028 (WSP 2014-2028). The WSP 2014-2018 is guideline for Blora Local Government (BLG) in developing water supply system. This document is a

Figure 1. Administrative Map of Blora Regency
Source: Development Planning Agency of Blora Regency, 2014
reference for the implementation of drinking water related programs. In the WSP, it is targeted that by 2028 all communities will be served by piping systems, both in urban and rural areas. This target corresponds to the national target, namely in 2019 all communities have access to drinking water. The existence of a pipeline network shows an effort to distribute water sources which is not evenly distributed. Strategy to overcome the drought, especially during the dry season, is also stated in the WSP. Efforts to overcome drought are carried out by identifying areas that are experiencing drought and making alternative treatments. Most sub-districts in Blora Regency are drought-prone districts. The strategy to overcome the drought is done by taking water from reservoir or river. However, the strategy does not help too much because the water source discharge is very volatile due to the season.

Efforts to increase the coverage of pipeline network services, besides being stated in the WSP, are also stated in Regional Midterm Development Plan 2016-2021 (RMDP 2016-2021), Government Regulation No. 26 year 2016 concerning Regional Policies and Strategies for Drinking Water Supply System (DWSS), and Action Plan for Water and Sanitation (AP-WS).

In the DWSS, it was stated several things related to efforts to overcome the water crisis, namely conservation in the catchment area, the use of appropriate technology, the development of regional systems on a broader scale than BLG, and river basin-based approaches. The DWSS document is a document at the policy level, it was not clearly stated how these policies have been implemented.

2.2.1.2. Innovative Policy, Strategy, and Regulation.
Innovative efforts to overcome the water crisis in Blora Regency can be found in the WSP document. In the document, it was stated about rainwater harvesting as an effort to increase raw water sources. Rainwater harvesting as part of eco drainage is applied in all sub-districts, except Blora District. In addition to rainwater harvesting, reservoirs are planned to be built in almost all sub-districts, except Tunjungan, Kunduran and Cepu.

2.2.1.3. River Basin Oriented Policy, Strategy, and Regulation.
Water management in the river basin scale is stated in Government Regulation No. 26 Year 2016 concerning Regional Policies and Strategies for the Implementation of the DWSS. Frid and Dobson (2002) explain that integrated river basin management is an approach that all developments in a catchment are connected by a river system. River basin-based planning is a model for identifying rivers and related natural resources that can be used to meet needs, but still pay attention to the health of the river (Pegram et al, 2013). The application of river basin management in Blora District is limited to distribute water for various purposes. The river basin based approach is not applied broadly in Blora regency.

2.2.2 Implementation
Implementation consists of connectivity between program and activity; and policy, strategy, and regulation; time frame for program and activity; realistic funds; human resources; division of roles between stakeholders; stakeholder coordination; coordination between areas; and participation from informal institution.

2.2.2.1. Connectivity between Program and Activity; and Policy, Strategy, and Regulation.
Programs/activities related to water supply systems and water resources are contained in various documents, namely AP-WS, Strategic Plan, and Annual Working Plan (AWP). AP-WS is prepared to fulfill the mandate of the National Midterm Development Plan 2015-2019 to improve 100% access to drinking water and as a supporting document for the RMDP. The programs and activities contained in the AP-WS are also included in the AWP, Strategic Plan, and WSP. The YWP is structured in line with the goals, objectives, policies, and strategies in RMDP. The Strategic Plan of the institution in Blora Regency is prepared based on RMDP.

The documents mentioned above have a timeframe for implementation. AP-WS focus on programs and activities on infrastructure development to increase service coverage. Besides, there are also
activities related to the maintenance of water sources and development of new water sources, such as reservoir construction and water resources conservation. The activities in the AP-WS are in line with the WSP. Activities at WSP are aimed to expand the scope of services, through providing raw water and infrastructure development. As previously explained, one of the innovative activities in the WSS was rainwater harvesting and reservoir systems.

The strategic plan of related institution also focus on the increasing access of community to water supply services. Strategic plan of Regional Planning Board focuses on coordination function between institution. Strategic plan of Housing, Settlement and Transportation Agency focuses on the development of water supply system and sub-district water supply system. The Strategic Plan of the Public Works and Spatial Planning Office focuses on efforts to provide water, among others in the form of providing land for reservoir, as well as building and rehabilitating reservoirs. Interesting things that in AWP there were activities to control the impact of climate change. The programs and activities in the planning documents in Blora Regency mostly refer to existing policies and strategies. However, there are also policies and strategies that do not have derivatives in programs and activities. An example is river-based planning.

2.2.2.2. Time Frame for Program and Activity.
All programs and activities contained in the planning documents have time frames and responsible institutions. The planning document has a period of implementation, which can be divided into long term, medium term, and short term (annual). The long-term planning document, for example, is the WSP. WSP has an implementation period of 20 to 25 years, but in the case of Blora Regency, the recent WSP has 15-years implementation period. Strategic Plan, AP-WS, and RMDP are examples of medium term planning documents (5 years). Short term planning document include AWP.

2.2.2.3. Realistic Funds.
Clean water programs and activities in Blora Regency are funded by several sources. The largest proportion of funding comes from the Special Allocation Fund (SAF) from the central government. Funds from the central government are intended for the development of Community based Water and Sanitation (CbWS). In the context of developing CbWS, the local government also allocates supporting funds. Based on the WSP (2014) funding from the central government is planned at 90%, regional government 15%, and community participation 5%. This proportion shows that the role of the central government is still high and contribution from local government is limited. Based on WSP (2014), for the construction and optimization of drinking water infrastructure in the 2014-2028 period, it is needed around IDR 2,500 billion or around IDR 167 billion per year. In comparison, Regional Income in 2017 was IDR 1,904 billion, and Locally-Generating Revenue was IDR 190 billion. The need for water infrastructure development funds is 88% of the Locally-Generating Income or 8.7% of Regional Income. However, regional governments only have flexibility to make use of Locally-Generating Income. This fact shows that the resources of the BLG itself are still limited in the development and optimization of infrastructure.

2.2.2.4. Human Resources.
Minimum qualifications of human resources needed to support the implementation of drinking water supply systems and water resources according to Minister of Public Works Regulation No. 18 of 2007 concerning the Implementation of Development of Drinking Water Supply Systems consist of institutional/management experts, sanitation/environmental engineering/drinking water, socio-economic/financial, legal, and community empowerment. The needs of human resources with these qualifications almost have been fulfilled in the regional offices/agencies/business entities in Blora Regency, such as Housing, Settlement and Transportation Agency, Public Works and Spatial Planning Office, and Regional Development Planning Board, and Regional Water Company. However, there is one human resources qualification that is not yet available in Blora Regency, namely community empowerment experts.
2.2.2.5. **Division of Roles between Stakeholders.**

Based on Government Regulation of the Republic of Indonesia No. 122 of 2015 concerning Drinking Water Supply Systems, the implementation of Drinking Water Supply Systems is carried out by State-Owned Enterprises (SOE)/Region-Owned Enterprises (ROE) or Public Water Supply Company (PWSC), Technical Implementation Units (TIU)/Regional Technical Implementation Units (RTIU), community groups, and/or business entities.

In Blora District, water supply system is managed by PWSC, while BLG through its institution acts as a regulator. The organizational structure of the PWSC consists of supervisory bodies, directors, and staff. The supervisory body is formed to carry out the task of overseeing the implementation of all activities by the PWSC. The supervisory body consists of local government officials who meet the requirements and are responsible to the BLG.

The BLG, in carrying out its duties as a regulator of the implementation of water supply systems is supported by formal institution. The formal institutions carry out their authority and responsibilities related to the implementation of water supply system in accordance with their main tasks and functions. In Blora Regency, formal institutions that have the main tasks and functions related to the implementation of water supply system are as follows; Regional Planning Board, Housing, Settlement and Transportation Agency, and Public Works and Spatial Planning Office.

2.2.2.6. **Stakeholder Coordination.**

Coordination is carried out through a Focus Group Discussion (FGD) across institution. Coordination includes the arrangement of cooperative relations with the interrelated duties and authorities of several agencies in achieving a goal and avoiding confusion and duplication. As the regulator of the drinking water supply system in Blora Regency, BLG coordinates the achievement of drinking water target. Coordination is carried out between PWSC and related institutions in BLG. Some programs involve several institutions, such as the CbWSS. Institutions involved in the program include the Regional Development Planning Board, the Office of Industry and Manpower, the Health Office, the Housing and Settlements and Transportation Agency, and the Community and Village Empowerment Service. In the context of CbWSS, Regional Development Planning Board acts as the coordinating body.

In the context of water resources management there is also a coordination forum called the water resources council (WRC). The Public Works and Spatial Planning Office is part of the water resources council. WRC is central government body and involved in the water resources management coordination team (WRMCT). WRMCT work based on river basin approach. There are two watershed in Blora Regency, they are Pemali-Juana and Bengawan Solo. Coordination is carried out for the sake of maintaining and preserving surface water sources (rivers) and other interests that can affect the river.

2.2.2.7. **Coordination between Areas.**

Coordination among regions was carried out in the Water Resources Management Coordination Team. Coordination between regions carried out in this team is coordination within the river basin. There are two river areas in Blora Regency, namely the Pemali-Juana River Region and the Bengawan Solo River Region. Coordination between regions within smaller administrative units is usually not done. Therefore, the inequality of water sources in Blora Regency must be resolved by BLG.

2.2.2.8. **Participation from Informal Institution.**

The participation of other informal institutions in overcoming the water crisis is in the form of a CbWS management group. CbWS is a community-based clean water supply system. CbWS is a central government program. The central government provides funds to build clean water supply systems for groups of people. Community groups must also contribute to the development of the system, both in the form of money, labor, or other resources. After the system is built, community groups are obliged to manage the system. The CbWS program in Blora Regency has been implemented since 2008. Until 2018 there are 127 villages that have received the CbWS program which is spread throughout Blora Regency.
The CbWS management group contributes for increasing public access to clean water. In general, there are no other innovations carried out by this group, except managing the supply of water, such as the use of rain water, the preservation of water resources and so on. Participation from other informal institutions, such as developer or other private sectors to overcome the water crisis in Blora Regency is still limited.

2.2.3. Monitoring and Evaluation
Monitoring and Evaluation consist of monitoring and evaluation process and procedures.

2.2.3.1. Monitoring and Evaluation Process.
The process of monitoring and evaluation is part of the implementation of programs and activities. Until now the process that has been carried out is an evaluation process at the end of the year, while monitoring has not been done routinely. The programs and activities in the Annual Working Plan is evaluated to measure their achievements.

2.2.3.2. Monitoring and Evaluation Procedure.
Evaluation procedures are carried out by comparing the indicators and targets of each program with their realization. To get the outcome based evaluation the target achievement of each program must reflect the outcome. Until now the targets of each program and activity are still in the form of input, process, and output targets. The results of the evaluation will be used as guideline for preparing the programs and activities for the following year.

3. Results and Discussion
In general, all components of the water governance criteria, namely planning, implementation, and monitoring and evaluation have been carried out in Blora Regency. However there are still many indicators and sub-indicators that have not been fulfilled. In terms of planning, the existing policies have not been based on the causes of the water crisis in Blora Regency. Existing policies and strategies are still usual ones. They still focus on the meeting the needs of the community for clean water, such as increasing access to pipeline and maintenance of water resources. Innovative policies to overcome the water crisis are still limited. Until now an innovative policy that already exists is the utilization of rainwater. However, this rainwater utilization policy has not been widely applied. The same as innovative policies, river basin-based policies are also still limited. Existing policies are still oriented to administrative areas, not watershed or river basin approach.

On the implementation side, not all programs and activities are derived from policy and strategy. Existing programs and activities already have a clear time frame and clearly defined institutions in charge. The division of tasks among stakeholders involved has been defined clearly. Regarding resources, the fund for clean water supply still relies on the central government. Local government contributions are still very limited. In relation to human resources, the qualifications needed are mostly fulfilled. In implementing programs and activities, coordination between related stakeholders has been carried out. Regional Development Planning Board is the coordinator in the implementation of programs and activities. Existing cross-regional coordination is limited to the existence of water resources management coordination team initiated by the central government. Community and other parties have not been too varied. The extensive participation that already exists is community participation in the form of Community based Water and Sanitation Management. Monitoring and evaluation processes and procedures already exist and have been implemented in Blora Regency, although the focus of implementation is still on evaluation processes and procedures. Monitoring and evaluation indicators are still input, process and output based, not yet outcome based.

4. Conclusions
There are still many indicators and sub-indicators of water governance that have not been fulfilled in Blora Regency. To overcome the water crisis by implementing water governance, it is necessary to
formulate the causes of the water crisis firstly. By knowing the causes of the water crisis, policies, strategies, programs and activities will be more in the right direction. Policies to overcome the water crisis need to be innovative and involve the participation of formal institutions to the greatest extent. This innovative and participatory policy can reduce the funding needs of the local government. Policies also need to be river basin oriented. Finally, all policies, programs and activities need to be assessed for their achievement using the outcome based indicator.

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