Environmental management in Citarum Watershed inter-institutional cooperation approach

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Abstract. Some environmental issues in Indonesia are remaining problems that cannot be resolved. One among the environmental concern is a growing interest in the Watershed (DAS) area management. Various attempts had been made to manage the areas but has not resulted in optimal outcomes so far. The aim of this study is to determine the implementation of environmental management in Indonesia, especially in Citarum Watershed area. Through this research, it is expected in the future inadequate supervisory system that had been developed within the community can be converted into better management, such as integrated management of watersheds with the culture of everyday life. This research uses a mixed method approach consist of quantitative and qualitative analysis. The data is obtained from the modification approach of previous research on Kutai National Park combined with an interview with experts from government and academics. Furthermore, the data is analyzed using AHP (Analytical Hierarchy Process) and ANP (Analytical Network Process) Superdecision software Ver. 2.6. The study resulted that the strategy of environmental management should be changed into civil-military based management. To be able to map out a strategized effort the military involvement is required at the stage of planning, implementation, coordination, and supervision.

1. Introduction
Indonesia is experiencing various crucial problems in the environmental field, one of which is a water problem. Citarum watershed is the part of the Watershed Areas (DAS) covered in DAS 1 area. Citarum River is the most important river in Indonesia, especially in West Java and DKI Jakarta Province. Citarum River area had problems in its previous management era, e.g. the clash of authority and interests among institutions. The watershed management approach is carried out by at least three different agencies namely Ministry of Forestry, Public Works and Local Government. The government had previously set a target that by 2018 the Citarum River water would be safe to drink, but this target failed to achieve. This is because, until the first quarter of 2018, the pollution of the Citarum River has not been successfully overcome. It is even referred to as the most polluted river in the world.

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This study expected to find the alternatives strategy in solving the Citarum River problem. Furthermore, this study aims to determine the improvement in environmental management in Citarum Watershed to achieve the ultimate goal, revitalization of Citarum River. The previous program called The Citarum Bestari run by West Java Provincial Government since 2013 has not been well implemented. Some indicators that are not achieved from the implementation of the program is the number of villages intervened for waste processing only touched 40% of the target, weak law enforcement against the waste disposal industry and the quality status of the Citarum, which is classified as a seriously polluted river. To replace the Citarum Bestari program, the government through Kodam III / Siliwangi initiated the Citarum Harum program. In this program, the revitalization effort is coordinated by Commander of Regional Military Command III / Siliwangi[1]. Civilian and military cooperation will ultimately help improve national security [2]. The takeover of this coordination function is an effort to increase the effectiveness to achieve the stated program objectives.

The military is one of the important stakeholders in policy making process. A military is a group of people or units whose function is to safeguard the state security against foreign threats and legalized by the law, while civilians are a group of persons or units who are not functioning as military but as policymakers, perpetrators, inspectors and policymakers in politics [3]. The military is also considered to be a permanently structured organization within a state, while civilians are non-military organizations under the auspices of the government. Based on Peter Feaver's "Principal-Agent" theory, civil and military relations have the essence of being a strategic interaction between civilian leaders and military agents [4]. Civilian leaders and military agents need to move in harmony in their respective duties. The military must follow the public's wishes voiced by civilians as the leaders of the country who are subject to the public will for civil society can monitor and control the military [5].

Civil and military relations can result in a positive collaboration in the implementation of political policy as the civil elites feel reassured that military involvement can reduce their burden of doubt in the pursuit of political policy [6]. Civil and military relations are not only limited to supervision and control but also effective implementation and policy-making involving the functioning of the security forces, as the security of enforcement becomes effective and is able to optimize the cost of implementing the policy [7]. Good civil and military relations are required in the implementation of environmental management in a country, since environmental management may be one of the political policies that need to involve harmonious cooperation between civilian leaders and military agents for the creation of optimal environmental management.

Environmental management is all forms of activities that manage the environmental components and provide both direct and indirect impacts [8]. Environmental management can also refer to a form of activity that can contribute a positive or beneficial impact. Environmental management is also understood as an activity of developing, implementing and monitoring the process of achieving environmental goals [9]. Environmental management is required if environmental issues are clearly visible and comprehensive, so action needs to be taken to maintain environmental sustainability [10]. The intended actions need to follow the existing rules and the conditions that must be met. This occurs because environmental management can only be pursued if requirements in law and environmental law are met [11]. Environmental laws have many points of view, such as the point of view of natural and engineering knowledge, business and social, as well as methods and tools [12]. Therefore, environmental management is always followed by regulations issued by the government which is regarded as an effective way of maintaining the environment perseverance and the principle of sustainability [13]. To pursue the objective, the role of government as civilian elements and policy makers in this case environmental policy and the role of military apparatus as an element that can support the success of environmental management implementation are made necessary.

2. Material and Method
The method used in this research is a mixed-method, consist of qualitative analysis and followed by quantitative analysis using AHP (Analytical Hierarchy Process) and ANP (Analytical Network
Process) with SuperdecisionVer 2.6 software. In order to identify the criteria affecting the conservation management policy, the study uses the library studies and interview with the experts. After completing the process, the criteria determinations are set to 3 categories namely effective, acceptable and sustainable. The criteria are compared for evaluating the most important consideration in proposing a policy related to the issue. While the alternatives analyzed are modified model data on the conservation management of KNP Civil-Military Based Management Scenario from Prakoeso et.al [14], which offers an alternative to the status quo management, namely the revitalization program using the same approach with the previous program, which is coordinated by West Java Provincial Government. The second alternative is civil-military management, namely the implementation of revitalization activities involving military-civilian relations from the beginning of the program. The third alternative is to use collaborative management, i.e. the involvement of other stakeholders as a partner of West Java Provincial Government.

Three levels/hierarchies process according to the AHP method developed by Saaty is described in Figure 1. Within the picture, we can see the aim, criteria, and alternatives.

![Hierarchy of policy alternatives determination in coordination of Citarum revitalization program](image)

**Figure 1.** Hierarchy of policy alternatives determination in coordination of Citarum revitalization program

### 3. Result and discussion

From the calculation done by Super-decision software ver.2.6 to the assessment of the criteria for determining the policy and the criteria order is drawn. The calculation result is shown in Table 1. The main criteria for determining the coordination of the revitalization program are the effectiveness (75.14%), followed by the acceptability (17.82%), and sustainability (7.04%). The assessment reveals that effectiveness is the most significant factor affecting the policy proposed. The idea was supported by the concept of "effectiveness triangle" which described as the policy worked as intended and achieved the purpose of its design.

| Criteria   | Acceptable | Effective | Sustainable |
|------------|------------|-----------|-------------|
| Acceptable | 1          | 0.33      | 3           |
| Effective  | 3          | 1         | 9           |
| Sustainable| 0.11       | 0.33      | 1           |

| Criteria   | Percentage |
|------------|------------|
| Acceptable | 17.82%     |
| Effective  | 75.14%     |
| Sustainable| 7.04%      |

*Inconsistency ratio: 2.79%*

Furthermore, analysis of alternative options for each criterion is done. For the effective criteria, the results of the analysis are described in Table 2.
Table 2. Assessment of Effective Criteria for Alternatives Result

| Effectiveness | Civil-Military Management | Status Quo | Collaborative Management |
|---------------|---------------------------|------------|--------------------------|
| Civil-Military Management | 1                         | 5          | 3                        |
| Status Quo    | 0.20                      | 1          | 0.3                      |
| Collaborative Management | 0.33                     | 3          | 1                        |

| Alternative options | Percentage |
|---------------------|------------|
| Civil-Military Management | 63.69%    |
| Status Quo           | 10.47%    |
| Collaborative Management | 25.83%    |

Incosistency ratio: 3.70%

Based on the calculation, the military-civilian approach is the main alternative with 63.70%. The inconsistency ratio of 3.70% indicates that the results of the analysis are eligible (<10%). Furthermore, based on the acceptability criteria, the calculation results are shown in Table 3.

Table 3. Assessment of Acceptable Criteria for Alternatives Result

| Acceptable | Civil-Military Management | Status Quo | Collaborative Management |
|------------|---------------------------|------------|--------------------------|
| Civil-Military Management | 1                         | 9          | 3                        |
| Status Quo    | 0.11                      | 1          | 0.20                     |
| Collaborative Management | 0.33                     | 5          | 1                        |

| Alternative options | Percentage |
|---------------------|------------|
| Civil-Military Management | 67.16%    |
| Status Quo           | 6.29%      |
| Collaborative Management | 26.54%    |

Incosistency ratio: 2.79%

Based on the above calculation, the military-civilian approach is the main alternative with 67.16%. The inconsistency ratio of 2.79% indicates that the results of the analysis are eligible (<10%). While on the criteria of program sustainability then the results of calculations on the alternatives offered are shown in Table 4.

Table 4. Assessment of Sustainable Criteria for Alternatives Result

| Sustainable | Civil-Military Management | Status Quo | Collaborative Management |
|-------------|---------------------------|------------|--------------------------|
| Civil-Military Management | 1                         | 5          | 0.33                     |
| Status Quo    | 0.20                      | 1          | 0.14                     |
| Collaborative Management | 3                         | 7          | 1                        |

| Alternative options | Percentage |
|---------------------|------------|
| Civil-Military Management | 27.89%    |
| Status Quo           | 7.19%      |
| Collaborative Management | 64.91%    |

Incosistency ratio: 6.23%
From above calculation, the collaborative management approach is the main alternative with 64.91%. The inconsistency ratio of 6.24% indicates that the results of the analysis are eligible (<10%). Overall, through the relationship analysis (ANP) between the criteria hierarchy and alternative, Table 5 shows the obtained result.

**Table 5. Final Alternatives Result**

| Alternatives                | Total   | Normal | Ideal   | Ranking |
|-----------------------------|---------|--------|---------|---------|
| Civil-Military Management   | 0.3090  | 0.6179 | 1.0000  | 1       |
| Collaborative Management    | 0.1435  | 0.2871 | 0.4646  | 2       |
| Status Quo                  | 0.0475  | 0.0950 | 0.1537  | 3       |

The table shows that an appropriate alternative to the implementation of the Citarum watershed environmental management program is to apply a civil-military approach. This role change signifies that the implementation of the river revitalization program is like a non-war military operation. One of the military forces in environmental conservation is the deployment of army personnel to clean the river from pollutants and waste. In the previous program implementation period, it can be analysed that the lack of coordination between the parties involved is one of the crucial factors. Given the wide coverage of the area and the involvement of many stakeholders, it is absolutely necessary to undergo the sustainable process which is able to accommodate the interests of the parties involved. To be able to map the strategic steps to restore the Citarum River, military engagement is needed at the stage of planning, implementation, coordination, and supervision. The pattern of relations in military organizations is more rigid than that of civil organizations. For watershed management especially through urban areas, community empowerment including children and women should also be involved so that the watershed conservation movement will become a massive social movement. Even now more participatory approaches are being undertaken to foster the solving of environmental problems.

In addition, the deployment of military power can encourage changes in the culture of the community because of the function of supervision which has been done is not effective yet. Conceptually, military thinking focuses on the realization of state security, so the military involvement can provide a guarantee of security stability within the region. [15] According to Egnell on civil-military relations, one of the things that need to be anticipated is the determination of coordination among stakeholders involved. Often differences in data and understanding become the constraining factor. Furthermore, cultural differences between civilian and military organizations can also be gaps in program implementation [16]. Meanwhile, according to Strachan, the role of the military should be integrated with the government (political leadership, in this case, the Regional Government) i.e. on the strategic analysis and planning process, thereby increasing the effectiveness in the operation [17].

4. Conclusion

The lack of coordination among sectors in environmental management in Indonesia is reflected in the case of the Citarum river management. Lack of coordination became crucial factors that determine the environment management. The extent of the coverage area of environmental management becomes a challenge because in the catchment area involves many elements of society. One solution that can be done is to involve the military as long as does not violate a duty. The military has a pattern of communication and military organizations more systematic in carrying out an activity, including in environmental management. Also, the military's role, in this case, closely with efforts to encourage behavioral change in the community for more disciplined and responsible for managing the environment.
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