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Integrated Water Resources Conservation Management for a Sustainable Food Security

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Abstract

Many of Indonesia's watersheds are reaching a critical stage. As a result of higher rates of erosion and sedimentation, the number of critical watersheds in Indonesia has increased from 22 in 1984 to 58 in 2000 and in 2014 this number has reached 108. This result in food security is being threatened because there is insufficient water available for agriculture purposes due to catchment degradation, especially in the upper parts of the watersheds. At the same time, Indonesia's new government focused its national development programs on food security for the next five years. For these reasons Indonesia's National Development Planning Agency believes that it is timely to develop a national policy on Integrated Water Conservation Management (IWCM). To provide the rationale and suggested content for such a national policy, this paper has been prepared based onfocused group discussions with relevant interests at the national and regional levels. To obtain specific input from regional stakeholders, workshops were held in Medan, Yogyakarta, Banjarmasin, Nusa Tenggara Barat and Makassar as well as line agencies based in the state capital of Jakarta from October 2014 to March 2015. At the landscape level, the formulation of national policy on IWCM was based on integrated watershed management analysis as water resources within a specific watershed are integrated into other resources within an ecosystem. This action research recommends the following: a) integrating the IWCM into the regular regional development activities, b) encouraging local agreements on water resource conservation including local *adat* communities, c) formulating attractive economic incentives in implementing IWCM programs, d) using corporate social responsibility and payment for environment services funding to boost water resource conservation program at village level, and e) involving actively women in the IWCM programs. Considering that socio-cultural aspects are also playing an important role in the IWCM, a national-level of institutional arrangement on IWCM will also be proposed.

Keywords: IWCM; food security; green and blue water; watershed; institutional arrangement; Indonesia.

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1. Introduction

Many of Indonesia's watersheds are reaching a critical stage. As a result of higher rates of erosion and sedimentation, the number of critical watersheds in Indonesia has increased from 22 in 1984 to 58 in 2000 and in 2014 this number has reached 108. This result in food security is being threatened because there is insufficient water available for agriculture purposes due to catchment degradation, especially in the upper parts of the watersheds. At the same time, Indonesia's new government focused its national development programs on food security for the next five years. For these reasons Indonesia's National Development Planning Agency believes that it is timely to develop a national policy on Integrated Water Conservation Management (IWCM).

IWCM and Integrated Water Resources Management (IWRM) are very much related. The IWRM refers to the Global Water Partnership definition: "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" [7]. Therefore, IWRM is an ecosystem-based resources management tool that includes: 1) a watershed management unit approach, 2) a focus on the inter-relationships of upstream and downstream areas, surface water and groundwater as well as water quantity and quality, 3) an inter-relationship between water, other natural resources and the environment, 4) an inter-relationship between socio-economic and the environmental considerations, and 5) stakeholder engagement in planning, implementation, monitoring and evaluation in order to meet pre-set goals and targets. Based on the definition above, IWRM emphasizes the importance of the balance between supply and demand of water. In terms of demand for water resources, the balance is between the needs of water for human lives (i.e. generally, in the form of blue water) and the needs of water for ecosystems (i.e. green water) [6]. As for the supply of water resources, the balance is achieved through water resources development efforts, especially through improved reserves. Conservation and protection of water resources through vegetative and structural measures can be implemented for water resource improvement. This integrated effort for improving reserves of water sources is known as IWCM. In other words, IWCM, to be effective, requires that all efforts to protect water resources be carried out in an integrated manner [3, 7]. Integration needs to involve various scientific disciplines, across sectors and different management areas (specifically at the watershed level) as well as various national and local government line agencies.

2. Materials and Method

The world around us is changing rapidly. Precious natural resources continue to be under constant pressure from current and prospective users. This, in turn, results in more competition for these natural resources. Water, no doubt, has emerged as a precious commodity and as such, requires immediate attention from all segments of society because without adequate supplies of this resource, communities and economies will fail. With a growing population, increasing need for food, endless energy demands and constantly increasing desires for new developments, conservation and protection of Indonesia's fresh water resources are facing enormous challenges. Massive innovation, extraordinary measures and mainstreaming the conservation of water resources need to be made a higher priority in order to have adequate and secure sources of water resources for current and future generations. So, the time has definitely come when all segments of society, especially governments, must put in place more effective policies to manage the conservation of our water resources.

Many of Indonesia's watersheds are reaching a critical stage. As a result of higher rates of erosion and sedimentation, the number of critical watersheds in Indonesia has increased from 22 in 1984 to 68 in 2012.In 2014,the number of critical watersheds have reached 108 [2]. As such, the Government of Indonesia introduced a new regulation in 2012, Government Regulation No. 37/2012 requiring integrated watershed management plans for all watersheds in Indonesia. It is important to ensure that enough attention is made on water resources conservation in the implementation of those plans. New plans and those currently being developed must also insure that water resources conservation is a high priority. For these reasons, Indonesia's National Development Planning Agency (Bappenas) believes that it is timely to develop a national policy on Integrated Water Resources Conservation (IWCM). This paper has benefitted significantly from discussions with relevant interest groups at the national and regional levels. To obtain specific input from regional stakeholders, during period of October 2014 through March 2015, workshops were held in regional cities of Medan, Yogyakarta, Banjarmasin, Nusa Tenggara Barat and Makassar. While, national perspectives were obtained through national-level group discussion held in the capital city of Jakarta.

3. Result and Discussion

Regardless of the way the water resources conservation practices have been implemented, the following IWCM issues continue to be prominent in many countries including Indonesia [1, 5, 8]:

- Food security is being threatened because there is insufficient water available for agriculture purposes due to ground water supply for vegetation being dissipated and catchment areas being disrupted, especially in the upper parts of watersheds.
- High rates of erosion and sedimentation in major rivers are beginning to threaten water resources infrastructure and thus are causing significant cost implications.
- Activities involving the management of water resources in upstream and downstream areas are not being synchronized.
- Key watershed users such as farmers are reluctant to participate in water resource conservation efforts because they do not believe such efforts are aligned with their needs and thus do not see an immediate benefit for doing so. Therefore, it is essential to involve both upstream and downstream users for effective water resources conservation implementation.

Other issues being faced are ones related to institutional coordination and synchronization (central-regional), and integration among water resource conservation programs. Both challenges persist during their implementation despite the issuance of Government Regulation No. 42/2008 on Water Resource Management, No. 37/2012 on Watershed Management, and Presidential Regulation No. 33/2011 on National Policy on Water Resource Management. To assist in formulating a solution for these institutional issues. It is essential to harmonize the gap between water resource conservation policies and programs, which are sectoral in nature. As such, it is important to develop a national policy for integrated water resource conservation including itsintegrated institutional arrangement.

3.1. Green and Blue Water Concept for the National Policy on IWCM

Water security is commonly associated with, and can be analysed from the perspective of green water and blue water. The concept of green and blue water was initially articulated by Malin Falkenmark [6] at the FAO seminar on food security in 1993. This concept stresses the important of integrated approach of land and water in the effort of achieving world food security. The green water is commonly defined as water that is used by vegetation to produce agriculture, forest and plantation products (through evapotranspiration processes). While blue water is part of rainfall that is not used by vegetation in its productive process and it is found as ground water, rivers, lakes, and other water bodies. The blue water is commonly used for domestic, industry, and non-vegetative uses.

With the above understanding of green and blue water concept, changing landscape as a result of land use change, will affect the balance of green and blue water. This

disturbance of green and blue water may be a serious problem on water security, and hence, problem for realizing the defined target on food security. Currently, for most of Asian countries, the proportion of green and blue water is around 65% for green water and around 35% was categorized as blue water [6]. For the long run water security, it requires that the availability of blue water need to be slightly increased so that water for irrigation can be enhanced for agriculture use. However, the increase of blue water should be controlled in such a way that water-related problems such flood and landslide can be avoided or minimized. The proportional balance between green and blue water for food security is proposed to be around 60% and 40%. For this, the policy and strategy for IWCM implementation should be strengthen, particularly by enhancing coordination and integration across regions and sectors.

With this new green and blue water balance approach, the problems of overlapping policies and programs on IWCM implementation can be overcome. The green and blue water approach can also be used to structure who is doing what for national water resource management. The green water category, should be the responsible of Ministry of Forestry and its regional offices because they are responsible for developing national greening and reforestation programs. Ministry of Agriculture and its regional offices may contribute by developing national policy on how to do agricultural practices that in line with the principles of soil and water conservation. While the blue water management will be the responsible of Ministry of Public Work, particularly in establishing water reservoirs, river rehabilitation and water irrigation. Blue water management will also involve Ministry of Energy and Mineral Resources for managing ground water and making sure that artificial ground water recharge is in place.

3.2. Institutional Issues and Challenges

Water resources conservation, which in principle refers to an effort to retain as much as, and as long as, possible water in catchment area, covers a wide range of disciplines and involves various government sectors at national and local levels [9]. Thus, IWCM is a complex effort that requires integrated programs or activities and synergy between institutions in its implementation. However, water resources management appears to be carried out under a sectoral approach. For instance, the activities in water resources management in the upstream and downstream of a watershed have not been synchronized. Therefore, based on the brief description above, it is clear that the national policy on integrated water resources conservation should be formulated in a participatory manner by involving multi-stakeholders and should take the diverse biophysical as well as social, economic and cultural aspects of Indonesia into consideration. With the national policy being formulated in a participatory manner that involves decision makers and executing agencies at national and local level, it is expected

the implementation of water resources conservation programs and activities will gain more success in achieving the target of water security for national food security.

Nevertheless, various problems still in fact get in the way of achieving that goal despite several policies and planning documents on water resources conservation have been produced. The institutional issues identified during the research stage can be summarized as follows [4]:

- Overlapping regulations that are preceived to be causing challenges with respect to the implementation of water conservation policies.
- Conflicts involving many parties on the use of natural resources, both horizontally and vertically, which are complicating comprehensive and effective efforts to conserve water resources.While, an alternative mechanism for dispute resolution in the use and management of natural resources was not in place.
- Water resources conservation not being an integral part of regional development planning processes.
- Watershed users working separately and independently and not conscious of the critical importance of water resource conservation activities.
- A lack of awareness of the importance of watershed stewardship among the related parties, including those representing economic interests.
- Lack of institutional capacity of indigenous people and rural communities in the management of natural resources that support effective policy implementation of water resources conservation.
- Lack of regulations and limited incentives to manage water resources in upstream areas to provide water for downstream users.
- Limited participation of community members and informal leaders in the implementation of water resources conservation programs, including through religious and education programs.

4. Conclusion

An important conclusion is drawn that a national policy on the conservation of water resources in Indonesia either doesn't exist or remains firmly fragmented, and is increasingly caught between being unable to break from past practices, locked in by existing incentives and institutions, and effectively embracing a new reality. The above discussions serve as a catalyst to initiate action towards the development of a national policy on IWCM and its implementation on the ground. As such, it should provide a significant contribution to the achievement of water security in Indonesia through various improvements as follows:

1. Explore ways to achieve a balanced proportion of green water and blue water to reduce the risk of natural disasters and support the realization of water security for clean water, food and energy.

2. Develop a mechanism for the integration and coordination of national and provincial government programs activities related to the management of integrated water resources conservation.

3. Encourage the Ministry of Home Affairs and local governments to integrate water resources conservation programs into regional development planning processes (RPJMD) and to strengthen the on-going implementation of water resources conservation programs by providing a sustainable funding system. This funding allocation should be integrated in the RPJMD and local spatial planning system (RTRW).

4. Water resources conservation policies set up by different government agencies should be supported by adequate instruments for implementation on the ground, and in the same time, the support from local government agencies should be strengthened.

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