Focusing Hydrological Research on Environmental Hydrology in Detailed Scale

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Abstract. The problem of water resources is broadly related to its quantity, quality, and spatial & temporal distribution. Ongoing global changes are expected to lead to increasing severity of water resources in the future. Population growth, changes in land use and increasing variation of human activities cause more problems related to water resources. Climate change also yields a big challenge in the future. It is increasingly difficult to manage water resources in the future due to the above factors. Unfortunately, current hydrological research has not been able to solve problems in this field due to its nature at the macro level. To deal with water resource problems in the future, the future hydrological research must be developed to give more detailed analysis and scale in order to solve hydrological problems at the local level and directly benefit the community.

1. Introduction
Hydrology is the study of the existence of water on land on the surface of the Earth, describing the relationship or relationship between land and hydrological cycles, and studying the relationship between water and human life [1]. Hydrological science in practice can be used to solve various problems related to flooding, drought, watershed management, water availability and fulfillment of water needs [2,3].

About 97.5% of the water on Earth is salt water in the sea and oceans [4]. The remaining 2.5% is fresh water which is spread in glaciers, groundwater, permafrost, rivers, lakes, atmosphere and soil moisture. The highest amount of fresh water is in the form of glaciers which are difficult to use (68.7% of the total fresh water on Earth). Groundwater becomes the most fresh water that can be utilized, even though the number is actually only around 30.1% [6, 7]. All freshwater deposits in any form must get good attention from all of us. This is because fresh water is an essential requirement for humans and other living things.

2. Problems of water resources
The problem of water resources in the world can be broadly divided into three parts, namely: a) too much, b) too little and c) too dirty. The water problems are also could be related to four variables, including 1) problems due to the quantity of water (too much or too little), 2) water quality that is not in accordance with certain designation, 3) spatial distribution of uneven water resources (there are areas with a lot of water and areas that lack water), and 4) the temporal distribution of non-uniform water resources (large amounts in one rainy season and small amounts in the dry season).
World water issue mostly related to population growth, land-use changes, and increased human activities such as agriculture, industry, tourism, and population.

3. Water Resources: Future Challenge

In addition to the various problems mentioned earlier, climate change is one of the major challenges in the future of water resources management. From the study, we found that some regions were changing their hydrological condition. Some area tends to get wetter, and some others tend to get drier than their condition before [10, 11]. Precipitation conditions and changing rainfall patterns will significantly affect the condition of agriculture and disaster probability. Due to climate change, the weather will be difficult to predict. Therefore, it is difficult to plan for future water resource management. One of the most feared things in the future is that the number of disaster victims due to water resources will be increased.

Research with a detailed scale is critical to identify the characteristics of the effects of climate change and various other changes so that adverse impacts on society can be reduced. So far, most of the research is still on a less detailed or macro scale. Existing research has not touched much on the interests of local communities. Therefore, micro-scale research with a detailed scale needs to be done especially those related to direct community involvement in environmental management and conservation of water resources.

4. Previous studies

4.1. Some Note on Local Wisdom in Spring Water Management in the Rural Area (Volcanic Area of Merapi, Yogyakarta) [12]

This study aims to carry out an inventory and analyze of water resource management and strategies in order to meet the domestic needs and their relation to local wisdom on the southern slopes of Merapi Volcano, Yogyakarta, Indonesia. The focus of this study includes: (1) The significance of spring for domestic water in the rural area. (2) Spring water management should be applied to avoid conflict among users, and (3) Local Wisdom in rural areas has been applied for years (considered to be sacred places, the traditional ceremony is held, not allowed for cutting trees).

![Figure 1. Example of local wisdom practice related to spring management, the southern part of Merapi Volcano](image)

4.2. Water Resources Conservation Based on Local Wisdom of Rural Communities in the Volcano and Karst Physiographic Areas [13]

This research aims to assess the influence of different environmental conditions on community culture-based water management. The data measurement conducted in two different locations which
have different characteristic namely Karst Gunungsewu and Merapi Volcano. Based on the result, both study areas have different water resources and resulted in diverse water management (Figure 2).

4.3. Sediment Characteristics and Water Quality on Overland Flow in the Suburban Areas [14]

There are several interesting findings of this research (1) sediment yield in dense residential areas is dominated by dust and sand; (2) Roads contribute to higher sediments than home yards; (3) the water quality of overland flow sourced from home yards is worse than those sourced from roads. The response shows that water level increase in slower duration and affected by rainfall accumulation in the research area (Figure 3).

4.4. Integrated Water Resources Management Based on Appropriate Technology and Local Wisdom in Drought Vulnerable Area [15]

This research was conducted in Menoreh Mountains, Kulon, Yogyakarta. This study aims to map the hydrogeological, climatological and meteorological conditions in Kulonprogo Regency. In addition, this study also analyses the technologies developed by the community in managing water
resources at the study area. From the study, we found that the local technology can be applied for other regions that have similar environmental conditions.

4.5. Impacts of Agricultural Practices on the Sustainability of Volcanic Lakes in Dieng Plateau, Central Java [16]

This study aims to assess the impacts of agricultural practices on environmental degradation of lakes which could be given further impact on the sustainability of the lakes. The results of the study show that (1) the change of lake shape will reduce the capacity of the lake; (2) high rate of lake water pumping will lower the water level significantly; and (3) water quality and change due to fertilizer.

5. Conclusions

At least there are four things that we can convey to close this paper. First, there are no instant solutions to address environmental and water resources problems. It takes a long time to keep trying and keep correcting what has been done. Secondly, research with a detailed scale is needed. Therefore, research can have a direct impact on solving problems in the community. Third, long-term observation of weather and hydrological data is a must. Models may continue to be developed, but basic research that builds on science must continue to develop. Fourth, good changes will occur if we start to do good things. Therefore, we have to start from ourselves.

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