

MEASURING WATER CONFLICT POTENTIAL : A BASIC PRINCIPLES

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ABSTRACT

Decentralisation has been implemented in Indonesia for several years based on Regulation No. 22/1999 about decentralisation. In fact, decentralisation system is better than centralisation. However, there are some constraint in the implementation of decentralisation in Indonesia, therefore, the result of the decentralisation implementation is not as expected. The constraint of the implementetion of decentralisation in Indonesia are, for examples, limited skilled and qualified human resources, lack of coordination, lack of information about the decentralisation regulation, and limited natural resources for each different region. There is a report that some conflicts have been arising between some regions due to water dispute, for examples, water dispute between PDAM Surakarta and Boyolali Regency Government. Besides that, there might have been some water disputes in Indonesia, but not been widely informed yet. According to some researches and reports, there are some important indicators that can be used in measuring water conflict potential, such as Index of Human Insecurity (IHI), Water Stress Index (WSI), and Social Water Stress Index (SWSI). In addition, there are some important data required to measure these indicators, such as population number, volume of runoff, number and density of dams, minority community group, GDP, inter regions relationship condition, and number of agreement about fresh water management.

Key words : *decentralisation, water resources management, water conflict potential, water conflict indicator.*

INTRODUCTION

Decentralisation has been implemented in Indonesia for several years, however some problems has been faced related to its implementation due to some matters such as lack of coordination, lack of qualified human resources, inadequate regulations, and the fact that each region have different natural resources. In addition, decentralisation also gives impact on water sector which lead to conflict between regions. In addition, in Indonesia, there are many rivers which flow between different regions and many transboundary river basins, such as Bengawan Solo river basin which is located from the south-west of Central Java Province to the north-east of East Java Province, and passes through 9 regencies/municipalities in Central Java Province and 11 regencies/municipalities in East Java Province (Jasatirta, 2003). Due to some matters such as lack of coordination among stakeholders in managing water resources, conflict over water between regions is likely to happen.

Therefore, measuring water conflict potential is important as information required to anticipate and reduce water dispute in the future.

RECENT WATER DISPUTES IN INDONESIA

According to some news paper report and other sources, there have been some water conflicts happen

in Indonesia. The table below shows some examples of water conflicts in Central Java Province.

The water disputes shown on the table above are only such problems that happen in Central Java Province. Indonesia is a big country, and there must be other water disputes happened in other regions due to, for instance, the increasing of population growth and water uses competition. However, it might not be widely informed yet. Hence, emphasis should be done to anticipate and reduce the conflict over water.

MEASURING WATER CONFLICT POTENTIAL

According to Votrin (2003), there are some water conflict indicators that can be used to measure the potential of water conflict, for instance :

1. Index of Human Insecurity (IHI). This indicator is developed to facilitate identification of vulnerable regions. Index of Human Insecurity is defined as “*an aggregate measure of human welfare that integrates social, economic, and political exposures to and capacity to cope with a range of potentially harmful perturbations*”. Votrin (2003) reported that the IHI identifies four “key system components”, namely : the environment, the economy, society, and institutions.

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Table 1. Some examples of water conflicts in Central Java Province

Parties in conflicts/disputes	The source of conflicts/disputes	The damages/disadvantages
PDAM and farmers in some region (<i>not clearly reported in</i> Subandriyo, 2005)	The allocation between water for irrigation and water for domestic use. (Subandriyo, 2005)	The farmers destroyed the pipeline network owned by PDAM. (Subandriyo, 2005)
The community and industries in Karanganyar Regency. (<i>personal experience,</i> 2000)	Over-exploitation of groundwater source by industry (drilling artesian well).	The groundwater level is decreasing dramatically and the shallow well in the industry surrounding area are dry.
Farmers in Wonogiri Regency and farmers in Sukoharjo Regency and Klaten Regency. (<i>personal communication,</i> 2004)	<ul style="list-style-type: none"> The allocation of water for irrigation from Wonogiri Dam. (<i>personal communication,</i> 2004) The people living in the upstream region would like to get fee from the downstream region who get benefit from the Wonogiri Dam. (<i>personal communication,</i> 2004) 	The farmers in Wonogiri Regency (upstream region) made some holes along the irrigation channel thus the water flowing to downstream area (Sukoharjo Regency and Klaten Regency) has decreased. (<i>personal communication,</i> 2004)
PDAM Surakarta and Boyolali Regency (<i>Kompas,</i> 2002)	<ul style="list-style-type: none"> The allocation between water for irrigation and water for domestic use. The allocation of income. (<i>Kompas,</i> 2002) 	<ul style="list-style-type: none"> Warning from the people living in Boyolali Regency that said they will stop distributing the water to PDAM Surakarta. The people in Boyolali Regency destroyed the pipeline network owned by PDAM Surakarta. (<i>Kompas,</i> 2002)
Farmers in Wonosobo Regency and farmers in Banjarnegara Regency. (<i>personal communication,</i> 2004)	The allocation of water for irrigation from Mrica Dam. (<i>personal communication,</i> 2004)	<ul style="list-style-type: none"> The farmers in upstream region made some holes along the irrigation channel thus the water flowing to downstream area has decreased. Sedimentation problem along the irrigation channel, due to agricultural system in the upstream region. (<i>personal communication,</i> 2004)

(source : cited from Pudyastuti, 2005)

Within each of these four indicator categories are four variables, each of which measure either a key structural relationship (e.g., linkages, defining characteristics) or a key functional relationship (e.g., processes, flows) of the system. Where data in a time series are missing, IHI developers utilize statistical techniques to

establish a complete time series for all indicators and all countries, where there is sufficient initial data. However, the index for each year is specific to that year, making it difficult to compare changes in a country's IHI from across years.

2. Water Stress Index (WSI). The formulae to calculate WSI is :

$$WSI = \frac{\text{volume of water resources available}}{\text{number of population}}$$

However, this measure does not account for a country's ability to adapt to water stress, such as with more efficient irrigation technology.

3. Social Water Stress Index (SWSI). The SWSI has developed to incorporate a measure of country's adaptability. The formulae to calculate SWSI is :

$$SWSI = \frac{WSI}{UNDP's\ Human\ Development\ Index / 2}$$

Besides the three indicators described above, there are several other potential indicators were also mentioned in the literature, including overall population growth rates within a country, population density within and outside a basin, relative power and riparian position of countries within a basin (Wolf, 1999, cited in Votrin, 2003), the degree of democratisation of countries sharing a river basin, per capita GDP, etc..

DATA REQUIRED IN MEASURING WATER CONFLICT POTENTIAL

According to Votrin (2003), there are some important data required to measure the potential of water conflict, such as :

- *Population.* Population growth is one of the key factors to assess water scarcity. The relation of water access to population distribution should therefore be assessed. In measuring water conflict potential, the evaluation of river basin population density is preferably to be done instead of the evaluation of region population density, because a river basin rarely follows political or administrative boundary.
- *Runoff.* Runoff is defined as the total amount of surface flow in a given area. Votrin (2003) noted that any assessment of a water resource related issue would be incomplete without some approximation of water availability within the study area.
- *Dams.* The number and density of dams in a study area is one of the key factors in assessing water scarcity (Votrin, 2003). Furthermore, Votrin (2003) noted that when statistically testing potential water conflict indicators, dams themselves did not appear to be a potential indicator for water conflict, yet in basins without water treaties lower dam density basins tended to exhibit slightly less conflict. With negative

overall relations between countries and absence of a transboundary institution, unilaterally setting a large dam or diversion project can provide a context for the conflict over water, while positive relations and presence of a transboundary institution can mitigate the situation.

- *Minority groups.* Minority groups such as people displaced from dam construction site might cause conflict.
- *GDP (Gross Domestic Product).* Low per capita GDP (< \$765/person according to the World Bank lowest income country definition) was identified to be one of the indicators of conflict over water (Yoffe, 2001, cited from Votrin, 2003).
- *Overall relations.* Generally speaking, regions that co-operate in general also co-operate over water, and regions with overall unfriendly relations are also unfriendly over water issues.
- *Freshwater treaties.* Votrin (2003) reported that generally, freshwater treaties mitigate conflict, and no or limited freshwater treaties for a basin increase the likeliness of conflict over water.

TESTING INDICATOR OF WATER CONFLICTS

Votrin (2003) reported that the methodology for establishing indicators of international freshwater conflict and co-operation was developed under Basins At Risk (BAR) project at Oregon State University, USA (Wolf, Yoffe and Giordano, 2003, cited from Votrin, 2003). BAR which has spanned for 4 years effectively developed and created legal and spatial framework to further evaluate international river basins at potential risk for future water conflict.

Furthermore, Votrin (2003) noted that indicators could be selected in accordance with the following criteria: relevance to the selected framework; general availability of the data; existence of a theoretical or empirical link with security issue; and an adequacy of spatial and temporal coverage allowing for effective representation and modelling. Emphasis was made on the regional and basin scale indicators rather than on indicators of potential water conflict at global scale. Internationalisation of a basin was at special focus. Assuming that there is a causal link between the internationalisation of a basin and incidents of conflict among the states that now share that basin, the presence of ethnic minorities with nationalistic aspirations becomes a potential indicator (Wolf, 1999, cited from Votrin, 2003).

In addition, Votrin (2003) reported that as main statistical tool, linear regression was used to assess

the relative strength of various independent variables in explaining the variability of the event data. Also, other statistical methods such as two-sample t-test could be employed. Linear regression is preferably chosen because “it offered a concise summary of the mean of the response variable as a function of an explanatory variable” (Yoffe, 2001, cited from Votrin, 2003).

Furthermore, Votrin (2003) noted that most of the commonly cited water conflict indicators proved to be unsupported by the data. Neither government type, climate, IHI, water stress or number of dams, nor agricultural dependence on water resources and energy needs showed a significant relevance with water conflict. Based on the research done by Votrin (2003), river basins are at potential risk of freshwater conflict if, for instance:

- *population density exceeds 100 people per 1 km²*
- *per capita GDP is less than \$765*
- *overall unfriendly relations (<-1 at water event intensity scale)*
- *there are politically active minority groups that may lead to the internationalisation of a basin*
- *large dams or other water development projects are planned*
- *no or limited number of water treaties is available*

WATER CONFLICT POTENTIAL IN INDONESIA

Indonesia is a big countries formed of thousands islands with many transboundary river basins within them. The population of Indonesia is about 250 millions people that is increasing rapidly annually. Besides that, there are many big dams constructed in all around Indonesia, therefore there are significant number of displaced people due to the dams construction that might be source of conflict. Furthermore, the government do not pay attention to the displaced people in the upstream region which might lead to a conflict. In addition, according to World Bank report, Indonesia per capita GDP is low. Therefore, in the author opinion, Indonesia is at potential risk of freshwater conflict. Furthermore, research related to this problem should be done to anticipate and reduce conflicts over water.

Water Law in Indonesia

According to Siswoko (2006), Republic of Indonesia Water Law No. 7 / 2004 has regulated the water resources management in whole Indonesia

including the management of transboundary river basin and the resolution of conflict over water. However, this regulation has not been correctly and widely informed, and there are still some weaknesses in this regulation particularly in transboundary water resources management and conflict resolution. In addition, Siswoko (2006) also reported that the Indonesia Ministry of Public Work and Directorate General of Water Resources Management has arranged new regulation related to the management of transboundary water resources and resolution of conflict over water..

CONFLICT RESOLUTION IN TRANSBOUNDARY RIVER BASIN MANAGEMENT

According to Smout et al (2004, p. 286), the methods used to resolve the conflict will depend on the issues involved; if there is a dispute about facts, then this can be addressed by investigating the situation to ascertain the true picture. Differences in understanding may be resolved through education and communication, whilst differences in goals are more fundamental. The first step therefore is to identify the issues considered important by all the stakeholders. Furthermore, the enabling environment (legal and institutional) has an important role in conflict resolution.

Smout et al (2004, p. 288) noted that there are some techniques in conflict resolution processes, and all these techniques rely on a process that involves : (a) clarifying differences and points of disagreement, (b) making a commitment to stakeholder decision-making, (c) sharing knowledge, (d) recognising the interdependence of water users, (e) promoting the need for change building relationships, (f) changing the viewpoints of all parties, so they can see and accept the opposition’s situation, and (g) identifying what is most important.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

According to the explanation above, it can be concluded that :

1. In fact, there have been some conflict over water happened in Indonesia. However, emphasis has not been done seriously to anticipate the conflict over water in Indonesia.
2. There are some key indicators to measure water conflict, such as :
 - Index of Human Insecurity (IHI)
 - Water Stress Index (WSI)
 - Social Water Stress Index (SWSI)

3. Some data is required to measure the water conflict indicators, namely :
 - Population data
 - Runoff data
 - The number and density of dams
 - The existing of minority groups
 - Gross Domestic Product (GDP)
 - The existing overall condition among regions
 - Freshwater treaties
4. The Republic of Indonesia Water Law No. 7 / 2004 is one of the enabling environment that can be used as a guidance in resolution of conflict over water happened in Indonesia.

Recommendations

The author would like to give several recommendations related to the conflict over water in Indonesia, namely :

1. The Republic of Indonesia Water Law No. 7 / 2004 should be widely informed to the public. It is not only informed to academic group, but also informed to all stakeholders.
2. Further research about water conflict potential should be done as soon as possible because there have been some evidence related to conflict over water, therefore water conflict could be anticipated and reduced immediately.
3. Data base related to the measurement of water conflict indicators should be set up in the whole Indonesia regions.

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