THE VOICE *of* INDONESIAN FUTURE LEADERS

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Edited by
Reni Suwarso
Mohamad Fahmi

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INITIAL PLAN FOR SUSTAINABLE WATER MANAGEMENT IN INDONESIA THROUGH THE DEVELOPMENT OF *A WATER SUSTAINABILITY INDEX*

Iwan Juwana

Water resource management in Indonesia, particularly in Java Island, faces severe water problems. In its annual report released in 2008, the National Planning and Development Council of Indonesia predicted that cities in Java Island would suffer critical water deficits by 2025, if the current excessive use of water resources continues (Bappenas, 2008). The excessive use was mainly caused by the sporadic groundwater extraction for various purposes, including agriculture, industry and household (Keppres, 2001). In the West Java Province, the situation is even worse by the high level of pollution of rivers, in addition to excessive water use.

In the past, to address these problems, the local government of West Java Province implemented some programs to manage the use of water resources, such as the enactment of new groundwater regulations and the campaign for clean river. However, such programs were not successful due to lack of awareness and support from various water resource stakeholders (BPLHDJabar, 2008). The lack of people awareness occurred because there was no effective communication on current water sustainability conditions (Syarief, 2008). The lack of stakeholder support was due to different sectors implementing their own programs without appropriate consideration on the sustainability of water resources (Wangsaatmaja, 2004).

A sustainable and integrated water management to engage all stakeholders is therefore needed; such water management has demonstrated to be capable of integrating all issues of water resources management (Loucks & Gladwell, 1999; Jakeman, Letcher, Rojanasoonthon et al., 2005). The regional government of East Java in its East Java Regional Plan (RPJMD) in 2005 supported the importance of integrated water resources management through inter-sector coordination among

stakeholders. They believed that in the past the lack of inter-sector coordination was the main cause of the ineffective water resources management schemes, which in some cases have resulted in stakeholder conflicts (Jatim, 2008; Syarief, 2008).

One approach to achieve sustainable and integrated water management is through the application of the indicator-based approach (Jakeman et al., 2005). In the past, this approach has been used to develop water sustainability indices, namely Water Poverty Index (WPI) by Sullivan (2002), Canadian Water Sustainability Index (CWSI) by Policy Research Initiative (PRI, 2007) and Watershed Sustainability Index (WSI) by Chaves and Alipaz (2007). All these three indices have common objectives to provide information on current conditions of water resources, provide inputs to decision makers and prioritise water-related issues (Lawrence, Meigh & Sullivan, 2003; Chaves & Alipaz, 2007; PRI, 2007). However, each index also had specific objectives for their development.

The WPI, which attempts to seek out the relationship between poverty and water issues in different countries, has successfully met its objectives. At the end of its development process, the index has provided a framework, which combined environmental and socio-economic measures, related to poverty and water issues (Lawrence et al., 2003). At the end of its application, the WPI has also contributed to the national-level comparison of the status of water access and poverty across the world (Sullivan, 2002). It also allowed national and international institutions interested in water management, to regularly observe and improve the conditions of unsatisfactory water resources and all associated socio-economic issues (Lawrence et al., 2003).

The CWSI adopted the framework of WPI to develop a water sustainability index for Canada. One of the benefits of CWSI was to present relevant water-related information at the six surveyed communities of the case studies. Nevertheless, it was also claimed that CWSI can also be applied in other communities, districts and watersheds in Canada (PRI, 2007). The other benefit was to provide valuable input to water and wastewater infrastructure decisions, such as exploring water storage alternatives and operator training (PRI, 2007).

The WSI, which attempted to integrate hydrologic, environmental, life and policy issues, has shown advantages, both in the process of its development as well as in the implementation. In the process of its development, the WSI has provided decision makers, particularly in Southern Brazil, with a clear and concise framework of water sustainability. During implementation, it has helped various stakeholders to protect remaining forest areas, improve water resources policies and minimise sewage pollution (Chaves & Alipaz, 2007).

Even though there have been some successful experiences with the implementation of the existing sustainability indices, these indices may not be fully applicable in other regions or in other countries, since some of these indices have been developed for use in specific regions or countries. For instance, PRI (2007) believes that Canadian water resources have different challenges compared to those of developing countries in South Africa and Asia. In consequence, the CWSI was developed to meet the specific needs for assessing and improving the sustainability of Canadian water resources (PRI, 2007). The threshold values for CWSI were mostly based on the specific regulations and policy for Canadian communities, which might not be relevant to be used in other countries.

Therefore, a water sustainability index, which is specifically developed with the involvement of local and national water experts and based on Indonesian natural and socio-economic characteristics, is needed to help improve the water resources management in Indonesia, particularly in West Java Province. The index will be able not only to assess the sustainability status of water resources in West Java, but also to prioritise water issues for use in integrated water resources management.

REVIEW OF EXISTING WATER SUSTAINABILITY INDICES

In the process of their development, all the existing indices were highly influenced by social, economic and cultural background of their country of origins, as well as the specific purposes of the index development (PRI, 2007). The three existing indices applied local, regional, national or even international policies, regulations or standards for their threshold values. The decision whether to use local, regional or national standard is based on the specific purpose of developing an index. For example, as the CWSI aims at providing water sustainability information at the community level, local and national standards applicable in the communities were used for their threshold values (PRI, 2007). On the other hand, the WPI focused more on comparing water resources of different countries, which was reflected in the use of more international-based standards like Gross Domestic Product (GDP) (Lawrence et al., 2003).

For the normalisation process, the WPI and CWSI used re-scaling normalisation method, while for WSI, the categorical scale normalisation method was used; the selection of which normalisation method should be used is determined by the original units of the chosen indicators and the purpose of developing the index (Nardo, Saisana, Saltelli et al., 2005). With regards to index aggregation, all three indices adopted the arithmetic aggregation method (Lawrence et al., 2003; PRI, 2007); this method of aggregation is vulnerable to two common problems, 'eclipsing' and 'ambiguity' (Ott, 1978; Swamee & Tyagi, 2000; Liou, Lo & Wang, 2004). The

eclipsing occurs in the aggregation when at least one component/indicator is considered unacceptable or having a very low value, while the aggregated index shows an acceptable value; on the contrary, the ambiguity occurs when the aggregated index is considered unacceptable while all individual sub indices are acceptable (Ott, 1978; Swamee & Tyagi, 2000; Liou et al., 2004; Swamee, Aditya Tyagi & Asce, 2007).

The importance of undertaking in-depth evaluation of existing indices is also shown by the following examples of components and indicators of the WPI and CWSI. Two of the WPI components are Capacity and Use are presented here. When assessing the Capacity component, the WPI uses a country's Gross Domestic Product (GDP). The use of GDP might be accurate for countries with low inequity levels among their populations. However, in many developing countries, especially in Indonesia, the disparity of the rich and the poor is exceptional (Kartasasmita, 1997; Elmi, 2004; Pemda-Jabar, 2004; KepGub-Jabar, 2006; Peneliti-UNISBA, 2006). As the GDP shows only the average capacity of population expenditure, it fails to recognize the inequity. If the Capacity component of the WPI is directly applied in Indonesia, the result will be misleading as it measures the average people capacity, neglecting the variations among communities. The use of household water expenses can be an alternative to measure the capacity in Indonesia.

The Use is the next component of the WPI, comprised of three indicators, the domestic, industrial and agricultural uses (Lawrence et al., 2003). For the domestic, the standard of water use of 50 l/cap/day needs to be adjusted to past water use studies and regulations in Indonesia. According to the Indonesian Department of Public Works, the average standard for domestic water use in Indonesia equals to 120 l/cap/day. The relatively low standard used by WPI is caused by the main purpose of the WPI, which is to make comparison of water conditions among countries all over the world. As a result, minimum standard of domestic water use was chosen (Sullivan, 2002; Lawrence et al., 2003).

The other indicators, the industry and agriculture use, also require some changes. In the WPI, the proportion of industry and agriculture contribution on GDP is used to trace their water uses (Lawrence et al., 2003). To date, no statistical bureau in Indonesia has detailed data on such industry and agriculture contribution on the national GDP. Alternatively, water licenses given for these sectors can be used.

Another example of existing environmental index is the Canadian Water Sustainability Index. This index comprises 5 components; each consists of 3 indicators (PRI, 2007). Under the Supply component, the conditions of water resources (both the ground and the surface) are evaluated only by stating whether they are 'decreasing', 'increasing' or 'no change' (PRI, 2007). Considering the

wide range level of water source qualities in Indonesia, it is essential to analyse further the differences. A more detailed scale of '1 to 5' or '1 to 7' will provide a better grasp of water resources conditions in Indonesia. This is also important when taking into account that Indonesian water resources are considerably more varied, both in types and quantities.

Another indicator, the Demand, applies distributed water licenses as the basis for its measurement (PRI, 2007). In Indonesia, water licenses are only available and implemented in few sectors, like industry and agriculture (IATF-WSPR, 1999; Republika, 2006). Thus, for the Demand indicators, Indonesian water sustainability index needs to establish another way of measurement. Actual water use in current or previous year can be used to assess the Demand indicator for Indonesia.

The review of the indices shows that some criteria used in those indices are not relevant to Indonesian context. Social, economic and political backgrounds of the countries where the projects were conducted are different to Indonesian circumstances. Hence, the standards applied in those indices need to be carefully examined and, if necessary, are contextualized in accordance with situation in Indonesia. The WPI and CWSI also show that reliable data and information is critical to create powerful sustainability index.

INITIAL WATER SUSTAINABILITY PLAN FOR INDONESIA

Considering the deteriorating conditions in water resources quality in Indonesia and their poor management schemes, the use of water sustainability index in Indonesia is one challenging option. There are potential advantages by developing and implementing the index as part of the integrated water sustainability plan for Indonesia's water resources. However, there are also pitfalls to avoid in the process of gaining the advantages. Proposed steps for gaining the benefits of the water sustainability index implementation include the development and dissemination of water sustainability index, data and information collections, as well as issues and programs prioritisation, are as follow:

1. Development of a *Water Sustainability Index* (WSI) for Indonesia

The integrated water management plan proposed in this paper is started by the development of a WSI for Indonesia. In fact, the water sustainability index can be used as the overall road map for integrated water management in Indonesia, as it also support the national water plan policy (Keppres, 2001; Bappenas, 2008). Due to reason that water sustainability index is area-sensitive (Lawrence et al., 2003; Chaves & Alipaz, 2007; PRI, 2007), Indonesia (or even each province or city or water catchment area) needs to develop its

own water sustainability index. The development of the index can be initiated by the identification of water sustainability indicators or components (Maheepala, Evans, Sharma et al., 2004). With regards to sustainability, components which are identified have to cover all relevant and important water sustainability factors, including technical/engineering, socio-economic as well as environmental factors (Harding, 2002).

Once the components and their indicators are identified, criteria for assessing each of those components and indicators need to be developed (Pesce & Wunderlin, 2000; PRI, 2007). These criteria can be derived from various standards or other research outcomes relevant to the area of study. Each of the indicators will then be assessed using the defined criteria (Pesce & Wunderlin, 2000). Even though each indicator has its own criteria, at the end each indicator will be valued using the same scaling unit to be aggregated as final index (Pesce & Wunderlin, 2000; Liou et al., 2004). Some statistical procedures are available to aggregate the final index, as well as for prioritising respective programs (Swamee & Tyagi, 2000; Keyantash & Dracup, 2004; Liou et al., 2004).

2. Dissemination of the Established *Water Sustainability Index*

After the WSI for Indonesia is established, the index then needs to be disseminated to as many relevant stakeholders as possible. It does not mean that dissemination process only be done after the index is completed. During the development of the index, accommodating all stakeholders' interests is also essential. When the WSI is established, the dissemination of the WSI is of utmost important as the index is about to be implemented (Harding, 2002; Jakeman et al., 2005).

3. Data and Information Collection

Data and information of one area, covering all the identified components, are then collected. For available water resource data, information on annual amount of renewable freshwater per person is essential. In most areas in Indonesia, such information can be gathered by collecting data of average annual stream flow or maximum extractable groundwater (BPLHDJabar, 2008; DisPSDA, 2008; Pusair, 2008).

In general, concerns for collecting data and information in Indonesia are availability and validity (Wangsaatmaja, 2004). In many cases, it is difficult to find complete data on stream flow or extractable groundwater availability. Regarding validity, once particular data is collected, there should be multiple verification procedures to ensure that the collected data is valid and accurate (Wangsaatmaja, 2004; Ouyang, 2005).

4. Issues Prioritisation

Once the collection of data and information completed, values are then assigned to each indicator using appropriate methods, including statistical procedures if needed. To capture a more representative water resource condition, weighting process and sensitivity analysis might be applied. It is important that the decision of assigning different weights on different indicator is undertaken as an agreement among different stakeholders (Giuppponi, Jakeman, Karrssenberg et al., 2006). Survey through questionnaire and interview to representative stakeholders might be the best way to obtain objective results (Delbecq, Ven & Gustafon, 1975; Linstone & Turoff, 1975; Toward & Ostwald, 2002). The values assigned on each indicator are the basis for prioritising issues. At the end of the exercise, all sub components are in the order of their importance. This order is mainly the combination of existing quality performance and the weighting factors for each component.

5. Program Planning for Prioritised Issues

All four earlier stages are essential to develop water resources programs in Indonesia. In the last several years, water program executed were not based on comprehensive analysis (Bappenas, 2008; BPLHDJabar, 2008). The above four stages are expected to provide a more comprehensive analysis, which will leads to a better water-related programs. Here, the programs are based on carefully-designed sustainability issues prioritisation. The more important the issue, the more prioritised the programs. The identified programs might either address one particular indicator or combination of two or more.

INDONESIAN WATER MANAGEMENT IN 2028

In twenty years from now, on optimistic scenario the followings are expected to happen with the implementation of the West Java Water Sustainability Index:

1. People are aware of the importance of water resources sustainability

The main problem of water management in Indonesia, particularly in urban areas, is the lack of people awareness on the importance of water resource sustainability. Having the water sustainability index developed, people can be constantly communicated regarding the status of water sustainability in their respective areas. This way, they will be more aware of the importance to protect available water resources, and possibly contribute to the improvement of degraded water resources. The way of communicating the sustainability can be done through the internet, newspapers or environment-related community events.

2. Water-related improvement programs are supported by various stakeholders from different sectors

In the past, governments and other water-related institutions struggled to embrace other stakeholders for contributing to designated water-related improvement programs. The main reason was other stakeholders did not realize the importance of those programs for their interest. With the water sustainability index, all the stakeholders will be able to identify the importance of water-related programs, and eventually be motivated to take part in the programs. In consequence, with participation from more stakeholders, the water-related programs are expected to make more significant changes to the improvement of current water resources in Indonesia.

3. Water-related programs are comprehensively well-planned, well-executed and well-monitored

Another crucial issue related to water resource management in Indonesia was the water-related programs were not comprehensively designed, which has resulted in the improper execution and monitoring. Limited budget that most provinces had, were not spent accurately. In many cases, available budget were spent on issues that were not of utmost important, with regards to water sustainability. The water sustainability index will provide decision makers the tool to prioritise issues and programs related to water sustainability. At the end, the decision makers will be able to put the available budget on the most-prioritised programs, rather than less-prioritised ones.

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