

NEW IDEAS FOR WATER MANAGEMENT AND CONSERVATION

Bambang Hartono

Mayor, Purwokerto City

Introduction

Water is one our most important natural resources, and there are many conflicting demands upon it. Skilful management of our water bodies is required if they are to be used for such diverse purposes as domestic and industrial supply, crop irrigation, transport, recreation, sport, commercial fisheries, power generation, land drainage, flood protection, and waste disposal.

Purwokerto is an administrative city. It is also a capital city of Banyumas Regency (Kabupaten Banyumas). Even though the local government has established “Perusahaan Daerah Air Minum”, a local company responsible for drinking and other domestic use waters, only 44.45% of 45.355 families live in Purwokerto take the services. The rest (55.55.1%) get the water supply directly from well, water resources and rivers (see Table 1). Therefore, it is clear that rivers and other natural water resources play important role for the water supply for the citizens. In addition, the PDAM depend their supply from those natural water resources.

Table 1. Water resources and number of people served
(data collected in 2000)

Water Resources	Number/ unit	Number of people served	Percentage
Springs	23	1.235	0.39
Well	20.694	86.203	27.40
Artesian well/hand water Pump	2.184	11.202	3.56
Public well	27	2.025	0.94
River, tributary, creek, rivulet		53.650	24.26
PDAM (Local government company for plumbing water services)	23.850	95.400	44.45

Like other cities in Indonesia, the rivers in Purwokerto are used for diverse purposes such as mentioned above. This present problems of water quality degradation, shortening of water supply particularly during dry season, pollution, and health. Efforts have been taken to prevent and to solve the problems such as by imposing law enforcement and campaigning Clean River Program (Prokasih). However, so far the achievement is not promising due to the lack of community's awareness and it is likely that the failure of the strategy is due to the approaches applied. Based on these, new approaches in increasing community's awareness and strategy applied should be introduced. This paper proposes some ideas that might be useful and applicable for water management and conservation. Some ideas are not original, as some have been applied in some other countries, however in Indonesia those ideas might be considered new and have not been applied yet.

Systematically, the paper will discuss the problems, the action have been taken, constraint, and the ideas proposed for the water management and conservation with reference to Purwokerto city.

Problems

Concerning with water management, Purwokerto city is facing several problems. In general, the problems can be classified as follows:

Water supply shortcoming.

Despite of the lack of recently supporting data, some phenomenons strongly indicate that there is a decrease of water supply compared to the 15 years ago. These can be seen by the facts that:

- Even though the agricultural areas tend to decrease, the farmer competes each other to get water for their land. Fifteen years ago the water for irrigation is managed by an “ulu ulu”. Now the farmer cannot rely the water distribution merely on “ulu-ulu” as the water is limited. They go to the land every night, particularly in the beginning days of planting, to ensure that their rice field is watered. There is a worry that the other farmers will turn the water run to other lands.
- In a workhouse busy hours (06:00 pm~11:00 pm) the running water supply for domestic need is getting less, even is not available. The water is getting scarce during dry season.
- It is estimated that at least 60% of wells established at Purwokerto city lost their waters during dry season.
- The significant discrepancy of river water debit between dry and raining seasons.

Those above may indicate that there is a water supply decrease for Purwokerto. Those phenomenon were not happened in the days of 15 years ago. The increase of the population (increased by 3.23% since 1995), the decrease of absorption areas due to the increase of urban and tourism development might be taken as the causal explanation of the shortcoming. In addition, the community habits and behaviors that are lack of awareness to conserve water deteriorate the case.

Pollution

Purwokerto is not an industrial city. Therefore, pollution is not a serious problem compared to those of industrial or bigger cities. The factories established at the surrounding are those of tapioca and volatile oil industries, and some home industries (tofu, tempe, noodle). The main problem that is faced by Purwokerto is that of organic pollution. The sources of pollution are the factories, sewage, ranches, hotels, domestic waste and agricultural waste. In a decade the hotels and real estates grow rapidly in Purwokerto. The data recorded showed that since 1995 the volume of domestic waste increases by 76.47%.

The environmental stress of the organic pollution is not considered critical yet. However, the actions should be taken, as the magnitude year by year tends to increase. In addition, Purwokerto is not provided with a system of early wastewater treatment. The waste directly is disposed to the waters such as rivers, irrigation channels.

Flood

Flood is not a threat for Purwokerto city itself as the city is located at the altitude of 60~90 asl. However, the flood that oftenly occurred at the areas situated at downstream of the city is an indication of watershed mismanagement. In the downstream areas, the flood happens almost every year and has caused a great agricultural loss.

Disease

Data collected from 6 Puskesmas (Center of Community Health) in Purwokerto showed that during April 1999~December 1999 there were 26,555 people suffer the disease that is spread by water. The figure is an under estimation since there are victims who did not go to the hospitals or to the other health services. It can be seen that the rural area people who use water directly from rivers, mostly having white blotches caused by skin fungus.

They only take the health services of Puskesmas when the skin is seriously infected or painful.

Actions Have Been Taken

Prokasih (Clean River Program)

Streams in Indonesia, including those run in Purwokerto, are used by rural people for various purposes such as for bathing, washing, toilet and waste disposal. These habits have been lasting for ages. It is taken as normal activities. In the condition of a large scale and big volume, such as happened in a big city, this will lead to the environmental problem.

To solve the problem, in 1989 the government through Bapedal introduced a program called Prokasih. In the beginning, 50 rivers in 50 provinces are the main targets of the program. The program physically succeeded reduces the waste but biologically, medically and chemically is still questionable. It might be predicted that even visually the rivers are seen clean, some physicochemical parameters (ex. BOD, DO, pH) and biological and medical parameters (ex. species richness, diversity indices, *Escherichia coli*) would not show significant difference as the program concentrate on the visually seen garbage only.

Rivers that run in Purwokerto are not the targets of the program. However, in 1996 there was an effort to campaign the Prokasih. The program did not run well as the response of the community was weak. The community did not participated well. People did not change their habit. They still use the rivers for bathing, washing, toilet, and waste disposal in the high rate. The recent political atmosphere made this program got low support.

Family Toilet Program (Jamban Keluarga)

To solve the problem of pollution and to change the habit, the government launched a program called "Jamban Keluarga". The inhabitants were

provided with the toilet freely. Yet in fact, this program did not run well. There were many toilets neglected uselessly. Many inhabitants still use facility of public bathing, washing, and toilet on the river. This habit seems difficult to be changed.

Establishment of Public Well

In the number of 27 units of public well have been built (see Table 1). Nevertheless on the next stages, the society does not have awareness to maintain or renovate those buildings. They merely depend on the government in maintenance and repair.

Establishment of Springs Protector Building

Constructing a building around the springs, which also has functions for bathing and washing, has protected at least 23 springs. The existence of the springs at least has provided the water's need for population of 1,235. Likewise public well, not the entire user maintained the existing spring protector building. They depend on the government's fund in maintenance and renovation.

Garbage Disposal. End Point / Tempat Pembuangan Akhir (TPA)

At least 4 Garbage Disposal End Points (TPA) have been established to restore garbage from Purwokerto city. The garbage accumulation was performed gradually starting from the houses, then accumulated by the officer and finally restored in TPA. This system might need to be improved as:

- the community has not separated organic and inorganic garbage yet (can, paper, plastic, etc.)
- burning resulting in air pollution performed the last garbage process and the garbage could not be recycled.

Lack of environmental and conservation knowledge of people might present difficulties in campaigning the ideas of the importance of recycle things.

Even though the handling of the garbage has been well managed, nevertheless the system available has many constraints:

- limited number of infrastructure
- few settlements can be reached by garbage vehicles
- community habit throwing the garbage on the river and other places
- poor economic condition make them unable to pay for garbage retribution

Ecosystem Conservation Program through Reforestation and Absorption Areas Development

The water cycle mainly depends on the existence of ecosystem component thoroughly either terrestrial or aquatic cycle. Regarding to that matter, it is required the integrated ecosystem management in water management. It has been well known that the ability of self-purification process, decomposition of organic waste, re-mediation of polluted environment, progress of water cycle are processes that depends on abiotic and biotic states of environment.

The problem of environment degradation in Purwokerto city happening frequently is mainly caused by the conversion of land use from forest to urban settlement, agriculture, and the development of tourism infrastructure (hotel, motel, cottage, park). Of those activities resulted in the lack of absorption area and water retention.

The reforestation effort, which has been performed until now on still exists. However, reforestation effort that is performed in certain time/occasion and tends to be ceremonial is activity not based on people awareness to protect ecosystem. Those activities are still "top down" activity. The weakness of this approach is that society don't have sense of belonging of the project, consequently the reforestation don't succeed.

Several destructive activities of river ecosystem that frequently done by society are catching fish by using poison and calcium/ lime. This activity not only destroy the component of biotic ecosystem but also pollute environment. Although, these two activities have been prohibited by government, but so far not a single sanction/ punishment was given for the violation of the law. Even, it is very surprising that people living near the river generally do not react to the doer although it will endanger the river, which becomes their water resource.

Based on the facts above, it can be concluded that the failure of water management and water conservation is caused by several factors;

Lack of environmental conservation awareness

People don't understand the concept of environmental issue and conservation, especially for those who have low education.

Improper Approach ("Top bottom")

Society never gets involved in decision-making and the existing project so that they do not have sense of belonging and responsibility to the program.

Poverty

For some poor people, it is very hard for them to build family toilet because they still have to concentrate on fulfilling their basic needs (food).

Community's view on river as trashcan

Unlike the developed countries, rivers in Indonesia are considered as public bathing, washing and toilet, and waste disposal place. River, as an ecosystem supporting the life of biota as well as water resource that need keeping its cleanliness and functions, is never understood.

Low education level.

The low education of most people has caused some difficulties in giving them insight of sustainable development use, river and ground water and other water resource conservation concepts. With the condition of law-educated people, even in this reformation era, it is very difficult to implement law enforcement.

New Ideas For Water Management And Conservation

Conservation and water management cannot be implemented separately. Various aspects have to be considered so that every effort that is done can work successfully. Those aspects include environmental aspects either aquatic or terrestrial environment, social, economics, politics, demography, topography, and culture.

Based on above, it can be identified that the failure of Government programs may be caused by factors as follows;

- lack of environment awareness
- applied approach (top down)
- people behavior and habit on cleanliness and conservation problem
- political will from someone who is competent in management and water conservation
- People's economical condition
- People image's image of water resource

Based on those, to resolve the above problems needs new strategy on water management and conservation. The new strategy should consider various aspects and use new paradigm. Social, cultural, educational, and economical aspects are those that need to be considered. Then the approaches should be;

- integrated approach for water resource that ecosystem as inseparable integral unit.
- bottom up approach
- socio-cultural and religious approach
- Considering those approaches, several ideas that can be advanced to water management and conservation are:

Environmental Awareness Improvement Program

Based on the existing problem, it can be concluded that the main problem of water management in Purwokerto is the insufficient or inadequate people's environmental awareness. Therefore, awareness improvement is the first priority. Up to the present, environmental issues have been known by public through both electronic and printed media. However, people's awareness on those issues is still very low so that they do not implement the issue that they have already known. Environmental-based perspective has not become the part of daily perspective. Therefore, the socialisation and dissemination of environmental-based perspective have to be conducted.

So far, dissemination or socialisation of environmental problem has been performed or done only through printed and electronic media. The way and "language" used to environmental campaign are not easy for people to understand or get the message. It is suggested that the campaign activity use media that are familiar with their life (culture and behaviour) as well as use simple and communicative language.

The strategies that can be implemented for example:

Involving Religious Leaders (Kyai, Pastor, Pendeta)

For Indonesian people, especially, for those living far from town/ city, the role of religious leader is very dominant. They have very strong loyalty to the religious leader, even, stronger loyalty than to government officials. It is evidence that the strategy has been successfully implemented to campaign the Family Planning Program.

The first step to perform is to give the religious leader knowledge of environmental issues and problems and to give them opportunity to find religious basic (from Holly Books) to support the related issue.

Traditional Theatre Media

Puppet shadow and Ketoprak (a Javanese traditional theatre) are the most favourite art performance for people especially who live in Central Java. The message of environmental problem can be inserted in this a such traditional theatre. Some the traditional plays itself has already several stories containing environmental messages. For example:

- Kisah Harjuna Pasang Grogol
- Kisah Panji Pasang Grogol
- Babad Alas Wanamarta

Even, in Mahabarata episode in chapter Bhagawad Gita contains dialog that is closely related to environmental problem, this dialog is as follows:

“Harjuna, you will fight not for your own interest. The land that you have is not your inheritance but entrusted land for your grandchildren.”

Community Involvement in Conservation Program

Increasing community involvement in environmental management has been considered as a first priority of National development strategy. It is clearly stated in GBHN and REPELITA (Five Year Development Plan). It also points out the importance of community involvement in National development. However, it was evidence that before 1998 the community is rarely involved in the program of environmental management.

Establishment water watch networking

To protect water resource from pollution, community especially who live near waters/rivers should be involved in monitoring the level of pollution periodically. The community can be divided into some groups. The group can be informal organisation, Youth Gathering, Senior High School students. The first step to do is to give those groups the knowledge of how to observe waters (monitoring). Biotic Indices Method or a method that developed by Waterland or Ausrivias might be applicable for monitoring tropical waters. Some studies conducted by Setijanto (1998) and Lestari et al., (1999) have proved that those methods with some modifications can be applied for tropical waters.

The biological methods of monitoring that commonly using benthic macroinvertebrate are not only cheap, easy but also do not require specific knowledge of biological knowledge so that ordinary people will be able to handle it. However, cooperation with an academic institution that has experts in water studies and adequate instrument for water monitoring program is suggested. The institution can be functioned as the centre of coordination. In Purwokerto city, there is Jenderal Soedirman University that facilitated with sophisticated equipments to do such a program. Furthermore, the experts who are experts on aquatic studies are also available. It is likely that cooperation in water monitoring program with such an institution should be established. The university will act as a coordinator of the program.

Each monitoring group then make a report of their monitoring periodically (for example; every 6 months) to the coordinator. The coordinator analyse the report and involve the groups to discuss the result of their monitoring, the problems and the solving. This model might be applicable also to be employed for terrestrial ecosystem monitoring (for example; forest & unirrigated field).

Program to build image that river is not as a place for waste disposal

River as a place of waste disposal has been an image for a long time. Public bathing, washing and toilet activities have been assumed as the common thing. Although river has been used as fishery and mining activities, but it is not considered as the natural resource that can be used for other business. Catching fish by using poison, electric current, explosion (dynamite) and stone or sand mining are strong indications of their image that river only as waste disposal place. It also indicates that they do not know the function of river in hydrology cycle

To change their image is very difficult. Law approach that has been done, (for example, the prohibition of poisoning, calcifying, electrofishing, disposing waste in the river, building a house on river bank) doesn't work. Thus, to make them realize the important role of river and to build other images of river is one way to solve this problem. Several ways to change the image are as follows:

Building image of river as picnic/recreation place

- Building park or playing ground at the side of river (riverbank).

The existence of park and playground near river will indirectly involve community in water watching river. They will be stimulated to have concern on the condition of their river. Besides that, people will feel ashamed when they want to defecate or throw trash/ rubbish not far from park or playing ground.

The materials to build the park are those of the materials that are easily found from surrounding nearby such as bamboo and sago palm. A competition or a stimulus fund might be necessary for stimulating them to build of park or play ground. These ideas are based on several facts that;

- community have strong solidarity and togetherness.
- people feel proud when they win a competition.

- community like gathering, having a chat.
- bamboo and sago palm can be easily found in their surrounding areas

• Games

In Banyumas, there are some local people games that are sometimes performed to commemorate certain holiday (ex. Independence Day). The games are known as “molimo” or 5 M (“murah, meriah, masal, menghibur, mendidik”¹⁾). The game is played in the river, such as panjat pinang (climbing palm tree for praises) and catching duck. Conducting such games on the rivers in turn will affect the people awareness on the cleanliness and water conservation.

• Customs and Traditions

Long time ago, there was a tradition, which is known as “Gogoh Iwak” (catching fish using hands). Gogoh Iwak was a tradition that was participated by people (old and young), men and women; they competed to catch fish by using their hands. The winner was he/ she who could catch the most fishes. If this tradition is perpetuated, it will be able to change people opinion/ view on river image. The tradition can not only make them aware of the importance of maintaining the cleanliness but also make them aware of the importance of river as food resource.

• Sport

The upper course/ head-waters of river that flow along Purwokerto has potential to be used as the place of water sport such as rafting and canoeing. Canoe sport has been done in the headwaters of Serayu River but due to rare

¹⁾ murah: cheap; meriah: merry; masal: massive; menghibur: entertaining; mendidik: educating.

frequency and the people only as the viewer make this sport as the temporary activity.

Ecosystem Preservation and Rehabilitation Program

Reforestation and development of absorption well are programs to solve environmental problem related to water problem. Rehabilitation that can be done for the implementation of this program is something related to approach. The approach that is used should be "bottom up". Community should be involved in decision making concerning kind of plants, field that will be reforested, and work plan. Concerning the reforestation, if it can produce profit/ benefit, they should also get the profit of this program.

Institutional approach should use informal institution. This informal institution is established to fulfil their needs and based on people's wish/desire such as religious (Islamic) study, "arisan" (regular social gathering whose members contribute to and take turns at winning an aggregate sum of money), and rice bard. In further development this informal will be look like formal institution. Besides that the distribution of work area should be based on topography or geography (grumbul, dukuh) instead of based on administrative border (RT, RW and Kelurahan). Thus, the leader of the activity should be someone who is most respected in the group instead of administrative leader. The group is given responsibility to supervise and to give the punishment/sanction of the destructive activities of ecosystem, such as illicit timber industry, catching fish by using poison, explosion and sand or stone mining.

Participatory Rural Appraisal Technique may also be applied in directing society to take part in both ecosystem rehabilitation and ecosystem preservation.

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