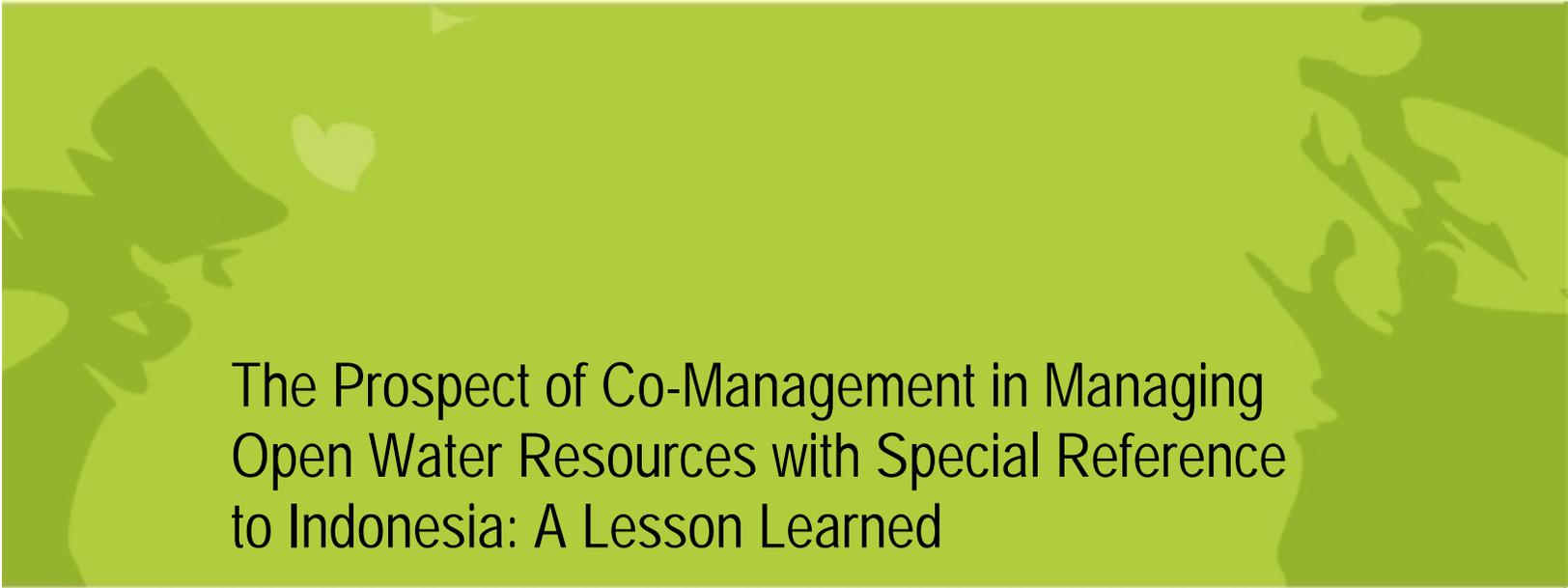


Conference Paper 20



The Prospect of Co-Management in Managing Open Water Resources with Special Reference to Indonesia: A Lesson Learned

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ABSTRACT

Indonesia is a maritime country, composed of about 17,500 islands. It has a great number of open water resources such as rivers, lakes, dams, ponds, swamps, etc. which are spread over the country. Many tribes and races are associated with these resources each with their own habits, tradition, and cultures. Indonesia is formed of thousands of islands and given such a large territory, it would be costly to set up a system for formal enforcement and surveillance for open-access resources like fisheries and access to water. Fortunately, each community has an indigenous or traditional system to manage the resources. For example: Ikan Larangan (in West Sumatra), Sasi (in Maluku), Subak (in Bali), Sedekah Laut (in Java) and so on (Susilowati, 1996; 1999). Rather than waiting for a complete formal resource management system (which would need to be set up by the government) it will be more reasonable and timely to revive the traditional system of resource management belonging to the respective communities. In short, community involvement in resource management is urgently encouraged, particularly in a developing country with limited budget like Indonesia.

This paper is attempt to compile an experience of applying a co-management approach to manage the open water resource by Susilowati (1999, 2002, 2004, 2006, 2007). An institutional analysis based on Pomeroy and William (1994) and Pinkerton (1989) with necessary modifications was applied to the respective studies.

The results indicated that there is a fairly good prospect to empower the competent stakeholders (community, government, private, independent parties) to be involved in managing the open-access resources. However, all parties need to be encouraged in order to achieve a high degree participation and commitment, and somehow to create their sense of belonging to advocate resource management. The chances of this being achieved are helped by the high degree of commitment to conservation of the resource shown by formal and informal leaders in Indonesia.

Key-words: community, resource, management, co-management, open access, Indonesia, Java.

INTRODUCTION

Indonesia is basically an archipelago and an agricultural country. Nearly three quarters of its people live in rural areas and are involved with agricultural activities. People are mostly involved in agricultural and fisheries sectors.

Lately, the role and involvement of communities in development activities has become significant in Indonesia, especially after socio-political reforms. There is

a policy and paradigm shift in governing activities from top-down to decentralized systems. The devolvement of authority from national government towards provincial and local government has been gradually progressing since the decentralization law (law No.22 / year 1999) was promulgated in 2001. There has been a shift in the functions, tasks, authority and responsibility from centralized government to local government. Currently, most of the designed programs are now targeted at the grassroots level. Communities and related stakeholders are expected to play their roles in development requiring participation and sharing of responsibilities as the key to success to achieve sustainable development. River management in a region is also delivered to the local government with necessary coordination with central government. There are several examples of successes and failures in managing rivers in Indonesia subject to the commitment of the authorities and stakeholders in resource conservation.

One of the severe problems currently faced by city authorities in Indonesia, including Semarang and its surroundings is illegal unregulated and unreported (IUU) resettlements with most of them located on the banks of rivers or canals (Susilowati, 2004; 2006). Consequently, the environmental quality of the rivers and canals (open water resource) are deteriorating. This situation is also taking place on almost all of the urban rivers like Kaligarang, Semarang, and Babon rivers.

This paper attempts to compile several studies that have been conducted by Susilowati et al. (2002); Susilowati (2004; 2006; 2007) to provide a picture of community involvement in resource management (river). At the same time, the prospect of co-management approach and the degree of stakeholders' involvement in managing the river(s) have also been discussed in this paper.

METHODS

(1) Study Area: there are four rivers were observed in this paper, namely: Babon; Semarang, Banjir Kanal Barat (or known as Kaligarang river) and Tuntang. All rivers are located in Semarang (Municipality and Regency).

(2) Data and Sampling: A cross-sectional survey was designed to collect the data through face-to-face personal interviews by the trained enumerators. The respondents of each study area were varied. It depended on the characteristics of the community and the presence of competent key-persons in the field. The distribution of respondents is shown in table 1.

Table 1. Distribution of respondents surveyed

No	Rivers	Respondents (persons)
1.	Babon	- Community (n=120) - Key-persons (n=30)
2.	Semarang	- Community (n=45) - Key-persons (n=30)

3.	Kaligarang	- Community (n=90) - Key-persons (n=30)
4.	Tuntang	- Community (n=90) - Key-persons (n=20)

Samples were selected by geographical clustered sampling. Primary data was considered as the main material for analysis in the each study. Training was given to all enumerators before they undertook the survey. Additional secondary data were also collected from the a number of institutions (Impact Assessment Board, River and Irrigation Office, Central Bureau of Statistics, and the Provincial, Municipal/ regency Government Offices) and some other various related publications.

(3) Method of Analysis: This paper aims to provide a comparison of the prospect of using a co-management approach in managing the open water resources in four rivers in Central Java-Indonesia. A research framework as outlined by Pomeroy dan Williams (1994) was applied to identify the prospect of co-management level; and the key conditions given by Ostrom (1990, 1992) and Pinkerton (1989) were used in this study with necessary modifications as applied in Susilowati (1999;2001a; 2001b) and Susilowati et al (2002) and Susilowati (2004; 2006; 2007). Multivariate analysis (Hair Jr. et al.,1998) has been employed and was complemented by descriptive statistics (see Mason et al., 1999; SPSS, 1996).

RESULTS AND DISCUSSION

Resource Description

(1) Babon River: This river is considered as one of the strategic resources in Indonesia since it serves multiple functions especially for the inhabitants along the watershed. Many industries are placed along the Babon river stream. Because of that, the Babon river can be highly polluted. In order to achieve the goals of the clean river program (prokasih), thus clean-up program should be imposed on the business activities along the river. In order to comply with this requirement awareness among the stakeholders to conserve the river is highly recommended.

The Babon river crosses over the three regions, the Semarang District in its upstream reaches and the Semarang Municipality and Demak District further downstream. The multiple use nature of the river (e.g. water source, canal disposal, mining, etc) means that there have been many transboundary environmental problems.

The research was carried out along the Babon river in the stretch under the jurisdiction of Semarang Municipality only. Further, the study areas were divided into three river segments, i.e. up stream (Rowosari village), middle stream

(Penggaron Kidul village) and down stream (Banjardowo village). In the early rainy season of 1999 the water of Babon river was sampled from several intake points. The results indicated that the BOD, COD and DO are increasing and exceed the minimum standard. The BOD ranged between 18.98 – 80.28 mg/l, while the DO was about 2.20 – 3.80 mg/l. Water temperature was between 30-33°C. Table 2 shows the chemical indicators of Babon river water.

Table 2. Chemical Condition of Babon River

Coverage	Physical Condition			Quality Standard		
	BOD (mg/l)	COD (mg/l)	DO (mg/l)	BOD	COD	DO
Upstream	18.98	28.98	2.2	6	10	≥ 6
Middle stream	43.20	94.20	2.2	-	-	≥ 3
Down stream	80.28	161.76	3.8	-	-	≥ 3

Note: water sample was taken in August 1999 (morning)

(2) Semarang River: 'Kali'¹ Semarang is the only river that flows in the heart of Semarang city. It was famous when Semarang was a Dutch colony. At that time it was used as a transport route for Chinese and Arabic traders leading to the establishment of China-town and Arabic settlements being located near the river. The river bank was also utilized by Dutch people as a place for recreation, but since then the river-side has been used for building business and office complexes now known as 'kota-lama' or the old town of Semarang. The course of the Semarang river starts from the southern part of Semarang from Kaligarang dam, then down to east until near Kariadi General Hospital and Flower market (defined as upper-stream) and passes behind Lawang Sewu building, Mayor Semarang Office, and Jalan Inspeksi in Thamrin (defined as middle-stream). To the north it goes to China town, Johar Market, Mberok Bridge and down to Java Sea (defined as lower-stream).

Until 1970's, Semarang river was still used by the community for washing, bathing and rearing fish. Even until the early 1980's many home-based producers of 'tempe-tahu' (a famous Javanese dish made from soyabeans) used this river to wash their raw materials. However, all these activities have now stopped because the river is no longer suitable for these purposes. Today, Kali Semarang is utilized by the community for sewage, disposal of garbage and drainage. The river body is becoming shallow and narrower, and the river bank is being used for illegal settlements and other purposes.

The up-stream section is partly covered by concrete and used for streets. Semarang is built on fragile alluvial soils however during city development land was reclaimed and there has been infiltration of sea water due to water supply demands. These conditions have accelerated the process of depression of the

¹ local term for river

northern part of Semarang's land below sea level resulting in flooding of this area during high-tides. Meanwhile, the drainage infrastructure, including the Semarang river, has not able to cope with water flow during the rainy season. Semarang is now known as the 'flooded city' and there is even a famous satirical song with the lyric "Semarang kaline banjir".

The results of water quality analysis indicate that the Semarang river is no longer safe for drinking water standard (class I). For the standard of class II, the DO was above the required standard in the middle- and down-stream sections (T3 and T4), while the water sampled taken in T3 showed that Nitrate (NO₃-N) were excessive. The Sulfide (H₂S), Nitrite ((NO₂-N), BOD and COD were excessive for water quality class II at all the points sampled.

(3) Kaligarang River: This is a natural river with its source being a spring located in the Ungaran mountain in the southern part of Semarang city. When it became a Dutch colony, the down-stream section of this river was enlarged and it functioned as a canal for flood control. This part is called Banjir Kanal Barat.

The upstream part of the Kaligarang River flows through agricultural land (forest and paddy field) and human settlements and is considered as the water source for Semarang City. The mid-stream section of the river is dominated by gravel and sand mining industries and human settlements. This is also where Semarang Municipality's water supply company sources water for communities in the downtown and northern parts of Semarang.

The Kaligarang River is mainly used by the community and industry to dispose of liquid waste, particularly in the down-stream section as it drains directly to the Java Sea. Agricultural irrigation and fisheries activities benefit from the river while all drainage infrastructures in the densely populated north-western part of Semarang are captured by the Kaligarang river.

The Kaligarang river often overflows during heavy rains and the water quality is adversely affected from time to time due to deforestation in upstream sections and mining activities in midstream sections. High turbidity and sedimentation cannot be avoided in the downstream sections and particularly in the estuary. The local government appears to pay little attention to maintaining the river. Therefore, the river is becoming narrower and shallow and there is heavy siltation along the river in its lower reaches. There was a particularly heavy flood on 26 January 1990 with peak water flows of around 1.5 m³/second. It caused material losses of around 8.5 billion rupiah and many hundreds of people drowned.

Along Kaligarang river, the BOD, COD and DO exceeded the quality standard. The water quality tended to deteriorate toward the downstream sections as shown in table 3.

Tabel 3

Table 3. Water Quality of Kaligarang River

No	Segment	Physical Condition			Quality standard		
		BOD mg/l	COD Mg/l	DO Mg/l	BOD	COD	DO
1	Upper	2,886	21,65	7,03	2	10	>=6
2	Middle	3,802	22,26	7,03			>=3
3	Down	7,566	40,82	7,49			>=3

Source: The Environmental Impact Management Board (Bapedalda) of Semarang Municipality, April 2004

(4) Tuntang River: This river originates in several springs from Telomoyo and Merbabu mountains. This water accumulates in Rawa Pening (a natural dam) and is used for electric power generation. The Tuntang river then flows from Semarang and Grobogan regencies on its way to the Java Sea passing through Demak regency.

During the monsoon the Tuntang water flow is significantly higher and sometimes overflows, particularly in downstream sections. The salinity of the Tuntang river is relatively high, therefore it is not suitable for agricultural irrigation. Despite this, communities along the river have no other options but to use its waters for their activities, particularly for farming, rearing the fish, etc.

The BOD, COD and of Tuntang river are about 4282 mg/l and 22.39 mg/l, while the CO is 6.38 mg/l meaning that it is still considered safe for water supply, bathing and cultivation (farming and aquaculture). The physical attributes of the Tuntang river are shown in Table 4.

Table 4. Water Quality of Tuntang River

Sampling time	Mg/l Station 1			Mg / l Station 2			Physical Condition		Quality Standard	
	BOD	COD	DO	BOD	COD	DO	BOD	COD	>6	>3
Jun 01	2.4	6.25	6.4	1.8	4.69	5.7	6	12	6	3
Jul 01	9	5.37	6.4	2.5	10.7	5.6	6	12	6	3
Aug 01	10	11.1	6.3	10	13.8	5.8	6	12	6	3
May 04	19.5	36	4.4	14	28	5	6	12	6	3
Jun 04	8	11	4.6	21	18	6.8	6	12	6	3
Jul04	17.5	12	4.7	17.5	3	6.4	6	12	6	3
Aug 04	13	14	5.1	13	16	8.7	6	12	6	3
Sept 04	18.5	22.5	5.6	14	16	7.2	6	12	6	3
Oct 04	17	20.5	5.5	13.5	16	5.2	6	12	6	3

Source: Impact Assessment Board of Semarang Regency, 2003.

Rules and regulations

A river is considered as a strategic resource since it performs multiple functions especially for the inhabitants along its watershed. Dense housing, business activities and industries are placed along urban rivers like Semarang and Kaligarang rivers. Due to all these activities there is high potential for pollution and environmental damage. In order to achieve the goals of clean river program (prokasih), clean-production programmes need to be imposed on households, businesses, and industrial activities along the river (in urban and rural) and this has been guided by rules, formally and informally. The formal rules related to the river management are summarized in table 5.

In order to comply with the relevant rules it is important to increase awareness among the stakeholders to conserve the river. In general, people in the region perceived that the rivers have dual functions; as a place to get resources and to dispose of garbage and sewage. The level of knowledge of people along the rivers about technology and management skill is limited, and rules not consistently applied. Meanwhile the capacity of the government in surveillance and enforcement activities is very far from complete. Moreover, many people in Indonesia have an image that a river is a place to dispose the unused things, even dead pets, as reported by Lucas and Arief (2000). There is a need to re-orientate the community's attitudes on the importance of rivers. As well as proper enforcement of existing regulations, informal rules need to be revived and strengthened to provide proper guidance for the people.

Table 5. Related rules and regulations for river management in Indonesia with special reference to Central Java Province

No	Rules / Regulations	Description
1	UU No.11/ 1974	Drainage
2	UU No. 4/ 1982	Guideline for environmental management
3	UU No.27/ 1997	Guideline for environmental management (amendment)
4	UU No 7 / 2004	Guideline for water irrigation
5	PP No.22/ 1982	Water management
6	PP No.35/ 1991	River
7	PP No. 20/ 1990	Monitoring of water pollution
8	PP No. 51/ 1993	Environmental impact assessment
9	PP No. 19/ 1994	Dangerous and poisonous waste disposal management
10	PP No 27 Tahun 1999	Environmental Impact Assessment Analysis
11	PP No 82 Tahun 2001	Water quality and water pollution management
12	Presidential Decree	Conservation area management

No	Rules / Regulations	Description
	No.32/ 1990	
13	Minister of Public works Decree No. Kep.39/ PRT/ 1989	Division of river area
14	Minister of Public works Decree No. Kep.48/ PRT/ 1990	Water resources management
15	Minister of Public works Decree No. Kep.49/ PRT/ 1990	Guidelines for water resource utilisation
16	Minister of Public works Decree No. Kep.63/ PRT/ 1993	Border, watershed function, and territorial coverage of river and ex-river
17	Minister of Environment Decree No. Kep.02/ MENKLH/ 1988	Quality standard of liquid waste disposal of the running activities
18	Provincial Regulation of Central Java No. 1/ 1990	Guideline for Environmental management in Central Java
19	Provincial Regulation of Central Java No.660.1/ 26/ 1990	Water quality standard in Central Java Province
20	Provincial Regulation of Central Java No.660.1/ 27/ 1990	Classification of liquid waste disposal in Central Java Province
21	Governor of Central Java Instruction No. 660.1/ 11/ 1988	The procedure on alleviation of pollution and environmental destruction
22	Provincial Regulation of Central Java No. 20 Year 2003	Water quality and water pollution management of cross boundary regions in Central Java
23	Provincial Regulation of Central Java No 10 Year 2004	Sewage water standard

Note: UU = law; PP = national regulation

Source: Various publications, 2004.

Interactions

(1) Resource Utilisation: Rivers in Indonesia are usually used for several purposes and different communities may have different motives in utilising a river. As perceived by the respondents in the communities rivers are utilised for: human bathing, washing and sanitation; irrigation; animal bathing; to get rid of waste; and drinking water. However the pattern of river utilisation in the different river sections also vary (upper-, middle- and down-stream).

(2) Degree of Commercialisation: In general, rivers in all the study areas are considered as an open access resource and people perceive them loosely as the common property. Although there are formal and informal rules and regulations in place, weak enforcement and surveillance, worsened by economic pressure, means that the rivers are exploited for many purposes by surrounding communities. There is no incentive for communities to comply in conserving and maintaining the river when they see others misusing the resource. Misinterpretation of the concept of decentralisation means that many of the natural resources (particularly in urban area) are potentially able to be utilised by communities, government and other stakeholders for commercial purposes.

Sand, gravel, stone, clay and water from the river are extracted by several parties, while the bank of the river is utilised for agriculture and fisheries activities. Many canoes are operated as ferries for moving people from one shore to the other. People collect fish and other creatures (e.g. worms) for commercial purposes.

(3) Pattern of interactions: Pomeroy et al. (1994) claimed that co-management involves various degrees of delegation of management responsibility and authority between the local level (resource users or community) and the state level (national, provincial, and district governments). The interaction among the stakeholders to perform the management functions (planning, organising, actuating, and controlling) in different segments of river (upper-, middle- and down-streams) are shown in the following figures.

In the upper-stream, the role of controlling the resource is by the community themselves and followed by the academician and/ or NGO, while the government shares in planning activities. Organising activities in river management are done by all related parties with the government as the facilitator. Further, actuating activities are usually done by the community and private parties.

Prospects for co-management

Among the emerging conditions for successful co-management are that the more of these key conditions that exist in a particular situation or system, the greater the chance for successful co-management (Pomeroy et al., 1994). The key conditions outlined by Ostrom (1990, 1992) and Pinkerton (1989) were used with necessary modifications as applied in Susilowati (1999; 2001a; 2001b) and Susilowati et al (2003) and Susilowati (2004; 2006; 2007) to evaluate the likelihood of success for co-management approaches in the rivers under study. Key conditions were evaluated on a likert scale (1 to 5) or conventional scale (1 to 10) based on observations in the field and discussions with several competent key-persons.

Total scores for the 11 key conditions required for successful co-management in each river are shown in annexed tables (see Appendix). Overall the results indicate that prospects for co-management ranged between marginal to pretty good.

In addition, the results indicated that the sharing in understanding and responsibility among the stakeholders, as perceived by the respective communities studied, are fairly good. There is an indication that community-based management may help them to pursue the goal of resource (river) management. There is a clear need to provide empowerment for all stakeholders who should be encouraged to develop synergistic partnerships.

CONCLUSIONS

The capacity and quality of the rivers studied are deteriorating due to a range of causes. Deforestation is most often claimed as the main factor in up-stream areas, while, mining and industrial activities were found to be the main activities accelerating the degradation of the mid-stream sections. Pollution from industries and domestic waste is becoming a significant problem for all the rivers. Illegal, unregulated and unreported (IUU) resettlements near the rivers are also a problem.

Based on an initial quick assessment using criteria provided (by www.healthywaterways.env.qld.gov.au), the Babon, Semarang and Kaligarang rivers are likely to be classified as 'poor health' rivers. The chemical indicators showed that the water quality of the rivers is no longer safe for drinking water standard (class I) and results from several monitoring stations showed that the water almost no longer fulfilled the quality for recreation and gardening (class II). Hence, the involvement of the community might not be sufficient for improving the quality and capacity of the rivers. There is a need for sharing understanding, responsibility, sympathy and empathy as well as a requirement for good will from all competent stakeholders in order to build support and a sense of belonging for managing the rivers.

It is unlikely that this recommendation will be implemented in the next few years however we do not have other options. So far, the government of Semarang Municipality and Regency are paying less attention to maintaining these resources. In fact, it is as if there has been no management in managing the rivers in the study areas (and perhaps, generally in Indonesia,) for the last five years. Thus, if we do not start doing something right now, it means we let the rivers go extinct.

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APPENDIX

Table 6. Key Conditions for Successful Co-management of Ikan Larangan, West Sumatra

No.	Key-Conditions	Phenomenon in the Field	Score **
1	Clearly defined boundaries	There are physical boundaries, so the fishers groups can have accurate knowledge of them; Boundaries using natural man-made marks	5
2	Membership is clearly defined	Individual fishers with rights to fish in the bounded fishing area and participate in area management	4
3	Group cohesion	High degree of homogeneity in terms of kinship, ethnicity, religion, local ideology, customs, and belief; There is common understanding of the problem and alternative strategies and outcomes	5
4	Existing organization	The fishers have some prior experience with traditional community-based systems and with organization	4
5	Benefit exceeds cost *	Individuals have an expectation that the benefits to be derived from participation and compliance with community- based management is exceed the cost of investments in such activities	5
6	Participation by those affected	Most individuals affected by the management arrangements are included in the group that makes and can change the arrangements	4
7	Management rule enforced	The management rules are simple, thus easily understood by the community	5
8	Legal rights to organize	The fisher group or organization has no legal rights to organize and make arrangements related to its need.	2

No.	Key-Conditions	Phenomenon in the Field	Score **
		However, in practice the fisher group or village organization has made its arrangement; There is no legislation from the government defining and clarifying local responsibility and authority. However, informally the government provide some support for ikan larangan although still in low degree	
9	Cooperation and leadership at community level	There is an incentive and willingness on the part of fishers to actively participate with time, effort, and money in fisheries management; There is an individual or core group who takes leadership responsibility for the management process	5
10	Decentralization and delegation of authority	The government has established formal policy and/or laws for decentralization of administrative functions (Regulation No. 22/1999, amendment Regulation No. 5/1974). However, delegation of management responsibility and/or authority to local government and local group organization levels has not been given	2
11	Coordination between government and community	The blue-print of establishment of coordinating body of ikan larangan is being processed by the Fisheries Office. This body is aimed to monitor the local management arrangements, resolve conflicts and reinforce local rule enforcement.	2
	Total score		43
	Average score **		3.99

Notes: Likert scale: 1, 2, 3, 4, and 5

* Definition B/C is very subjective for each person. In the most of study area, people interpreted the B/C in terms of social context.

**The average score is close to 4. This can be interpreted that the prospect for successful co-management for ikan larangan is good.

***Definition: (1) Strongly disagree; (2) Disagree; (3) Doubtful; (4) Agree; and (5) Strongly agree. (1) Very bad; (2) Bad; (3) Neutral; (4) Good' and (5) Very good.

Table 7. Key-conditions for Successful Co-management of Babon River, Semarang

No.	Conditions	Phenomenon in the Field	Evaluation **		
			U	M	D
1	Clearly defined boundaries	There are physical boundaries, so the community groups can have accurate knowledge of them;	2	5	3
		Boundaries using natural man-made marks	2	4	3
2	Membership is clearly defined	Individual community has rights to utilize the resource in the bounded area	4	4	4
		Member of community are need to be involved in resource management	5	5	5
3	Group cohesion	High degree of homogeneity in terms of kinship, ethnicity, religion, local ideology, customs, and belief;	4	5	4
		There is common understanding of the problem and alternative strategies and outcomes	2	3	4
		Community has a good adaptation with situation changes	2	3	3
4	Existing organization	Community could understand with the existing organization	2	2	5
		The community have some prior experience with traditional Community-based systems and with organization	3	2	5
		Participative management has been applied by the community in their organisation	3	2	3
5	Benefit exceed cost *	Individuals have an expectation that the benefits to be derived from participation and compliance with community- based management is exceed the cost of investments in such activities	3	4	3
6	Participation by those affected	Most individuals affected by the management arrangements are included in the group that makes and can change the arrangements	3	4	4
7	Management rule enforced	The management rules are simple, thus easily understood by the community	3	4	3
		Enforcement in the community with participative management in placed is more effective than under the centralized ones	4	4	5
8	Legal rights to organize	The community group or organization has no legal rights to organize and make arrangements related to its need. However, in practice the community group or village organization has made its arrangement;	2	4	4
		There is no legislation from the government defining and clarifying local responsibility and authority. However, informally the government provide some support for Babon river management although still in low degree	4	4	3
9	Cooperation and leadership at community level	There is an incentive and willingness on the part of community to actively participate with time, effort, and money in Babon river management;	3	2	4
		There is an individual or core group who takes leadership responsibility for the management process	3	5	5
10	Decentralization and delegation of authority	The government has established formal policy and/or laws for decentralization of administrative functions (Regulation No. 22/1999, amendment Regulation No. 5/1974). However, delegation of management responsibility and/or authority to local government and local group organization levels has not be given	4	5	4
		Decentralisation and devolution of authority are expected in order to support the participative management in the Babon river in the future	4	5	4
11	Coordination between government and community	The blue-print of establishment of coordinating body of Babon river is being processed by the Government of Semarang (perhaps Bapedalda). This body is aimed to monitor the local management arrangements, resolve conflicts and reinforce local rule enforcement. Participative management provides an easy coordination and communication between the government and community	3	4	5
	Total score		70	83	87
	Average score **		3.33	3.90	4.13

Notes: Likert scale: 1, 2, 3, 4, and 5; U : Up stream; M : Middle stream; D: Down stream

* Definition B/C is very subjective for each person. In the most of study area, people interpreted the B/C in terms of social context.

** The average score is close to 4. This can be interpreted that the prospect for successful Co-management for Babon river is good.

*** Definition: (1) Strongly disagree; (2) Disagree; (3) Doubtful; (4) Agree; and (5) Strongly agree. (1) Very bad; (2) Bad; (3) Neutral; (4) Good' and (5) Very good.
Source: Susilowati (1999) with necessary modification.

Table 8: The Prospect of Co-Management Approach in Managing Semarang River

No	Key-Conditions	Items	Score (1-10)		
			Up	Middle	Down
1	Clearly defined Boundaries	2	2.4	3.2	2.1
2	Membership is clearly defined	2	2.0	3.7	4.7
3	Group cohesion	2	5.1	5.3	4.6
4	Organisation	3	4.7	4.9	4.6
5	Benefit exceed cost	3	6.3	6.4	5.9
6	Participation by those affected	6	4.0	3.6	4.0
7	Management rule enforced	2	3.6	6.6	7.2
8	Legal rights to organize the management	3	2.3	6.9	6.8
9	Cooperation and leadership at community level	3	2.2	6.6	6.8
10	Decentralisation and delegation of authority	2	3.7	6.7	7.1
11	Coordination between government and community	2	6.1	6.5	6.7
	Overall	30	5.5	5.3	5.4
	Classification		Marginal	Marginal	Marginal

Source: Susilowati (1999; 2003) with necessary modification.

Table 9: The Prospect of Co-Management Approach in Managing Kaligarang River as Perceived by Key-persons

No	Key-Conditions	Items	Score (1-10)		
			Up	Middle	Down
1	Clearly defined Boundaries	2	7.3	8.2	7.7
2	Membership is clearly defined	2	7.5	8.2	7.7
3	Group cohesion	2	6.9	8.2	7.8
4	Organisation	3	7.6	7.8	7.9
5	Benefit exceed cost	3	8.5	8.2	8
6	Participation by those affected	6	7.8	7.8	7.8
7	Management rule enforced	2	7.2	7.5	7.7
8	Legal rights to organize	3	7	7.6	7.3
9	Cooperation and leadership at community level	3	7.8	8	7.8
10	Decentralisation and delegation of the authority	2	7.7	7.6	7.7
11	Coordination between government and community	2	8.2	7.6	7.6

Overall	30	7.6	7.9	7.7
Classification		Good	Good	Good

Source: Susilowati (1999; 2003, 2004) with necessary modification.

Table 10
The Prospect of Co-Management Approach in Managing Tuntang River as Perceived by Key-persons

No	Key-Conditions	Item	Evaluation (Scale: 1- 10)*					Keyperson (overall) N=20
			Central Gov't* N=2	Upper-stream N=5	Middle-stream N=5	Down-stream N=8		
1	Clearly defined Boundaries	2	5.7	7.1	6.6	3.8	5,80	
2	Membership is clearly defined	2	8.0	7.1	6.9	7.5	7,38	
3	Group cohesion	2	6.7	7.0	5.9	6.8	6,60	
4	Organisation	3	5.9	6.5	6.2	5.4	6,00	
5	Benefit exceed cost	3	6.5	7.2	6.4	4.0	6,03	
6	Participation by those affected	6	5.1	6.0	7.1	5.2	5,85	
7	Management rule enforced	2	7.2	7.8	6.8	5.3	6,78	
8	Legal rights to organize	3	7.4	5.9	5.7	6.1	6,28	
9	Cooperation and leadership at community level	3	7.1	7.1	6.2	5.0	6,35	
10	Decentralisation and delegation of the authority	2	7.7	6.9	7.5	6.1	7,05	
11	Coordination between government and community	2	8.0	7.0	6.4	7.9	7,33	
	Overall		6,84	6,88	6,52	5,74	6,49	
	Classification		Fairly	Fairly	Fairly	Marginal	Fairly	

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