Managing River without Management?: the experience of Kaligarang (Banjir Kanal Barat) River, Semarang - INDONESIA

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ABSTRACT

Semarang is a capital city of Central Java Province covers about 373.7 Km^2. It lies in the Northern part of Central Java with about 1.5 million persons (2006) and the population density of about 3.7 thousand persons/Km^2. As the biggest city in Central Java, Semarang attracts migrants from the surrounding areas. Many industries from micro- to large-scales and also informal industries are located in Semarang city. Kaligarang river stream down from Ungaran mountain in Semarang regency and will end in Java sea in the Northern part of Semarang city. This river is utilised for muli-sectors activities such as agriculture, industry, and mines.

"Clean river" program which had has been launched by the central government of Indonesia in the last decade but apparently performed less effective. The program covered 25 rivers in Indonesia and spread over in 11 provinces and one of them is Kaligarang or Banjir Kanal river. Based on a previous experience, top-down approach is no longer effective to manage the common property resources, including river in Indonesia lately. Therefore, we need to find another options and one of the alternative is through involvement of the competence stakeholders, especially from grassroot, i.e. community along the river. Highly commitment among the stakeholders involved to maintain the river is a key-success to keep the functions of sustainable river. To date, Kaligarang river is polluted and full with delta due to high in sedimentation. It is timely to "romance" the competence stakeholders, particularly community along the river, in order to have higher in sense of belonging and responsibility to maintain the river eternally. One of the strategy to condition the such situation is perhaps by intruducing Co-Management approach (Kuperan et al., 2003).

The study aimed to explore the prospect of Co-Management approach in managing Kaligarang river in Semarang city. The total sample of 120 respondents have been interviewed. An institutional analysis (Pomeroy and William, 2004) has been applied into the study with necessary modification. The results indicated that in the long-run this approach is soundly. However, in the short-run, people are mostly more realistic and tend to be more economic-minded in making decision. Nevertheless, socialisation, campaign and promotion of the scheme with partnerships-management (like Co-Management or in local term called as *kemitraan*) is becoming an important agenda in managing river in the study area.

Keywords:Kaligarang (Banjir Kanal), river, Semarang, Indonesia, pollution, delta, Co-Management.

INTRODUCTION

Indonesia is basically an archipelago and agricultural country. Nearly three-fourth of people lived in rural area and involved with agricultural activities. People are mostly involved in agricultural and fisheries sectors.

Lately, the role and involvement of community in development activities becomes a significant in Indonesia, especially after the socio-political reforms was running. There is policy and paradigm shift in governing activities from top-down to decentralized systems. The authority devolvement from national government towards provincial and local government are progressing from time to time since decentralization law No.22 / year 1999 has been promulgated in 2001. There are shifting in functions, tasks, authority and responsibility from centralized government to the local government. Currently, most of the designed programs now are directed to the grassroots targets. Communities and the related stakeholders are expected to play their roles in development. Thereby, participation and sharing responsibility among the stakeholders are needed as the key-success to achieve the sustainable development. River management in a region is also delivered to the local government with necessary coordination with central government. Several evidence of success and failure in managing river in Indonesia are found with its variation. This is subject to the commitment deserved by the authority and stakeholders in resource conservation.

One of the severed problems faced by the city manager in Indonesia, including Semarang as of now is the illegal unregulated and unreported (IUU) resettlement and most of them are located in the bank of rivers or canal (Susilowati, 2004). Consequently, environmental quality of the rivers or canals are deteriorating. This situation is also taking place on the bank of Kaligarang river which ended to the Java sea via downtown of Semarang city. Kaligarang river springs from Ungaran mountain and flows along 30 km to Java sea near Tanjung Mas Semarang's port. Down stream of Kaligarang river then called by local people as Banjir Kanal Barat river which means as flood control river for west Semarang.

This paper attempts to investigate the involvement of community along the Kaligarang river in resource management. The prospect of co-management approach and the degree of stakeholders' involvement in managing the river have also been assessed in this study.

METHODS

Study Area: The study was carried out in three segments of Semarang river, namely: (1) upper-stream (from Ungaran, Banyumanik, Gunungpati and Gajah Mungkur sub-

districts); (2) middle-stream (from Gajah Mungkur, Semarang Barat and Ngaliyan sub-districts); and down-stream (from Semarang Barat, Semarang Selatan and Semarang Utara sub-districts). Selection of the study areas was arrived at after pre-survey and discussions with the competent people.

Data and Sampling: Cross-sectional survey was designed to collect the data through face-to-face personal interviews by the trained enumerators. The total respondents of 120 samples (community, n=90; and key-persons=30) were selected by the method of quoted geographical clustered sampling. Primary data is considered as the main materials for analysis in the study. In order to provide alertness of the enumerators, training was given to all enumerators before they undertook the survey. To facilitate an ample information for analysis, the secondary data were also collected from the concerned institutions (Impact Assessment Board, Irrigation Office, Central Bureau of Statistics, and the Provincial and Municipal Government Offices) and some other various related publications.

Method of Analysis: This paper is aim to explore the prospect of Co-Management approach in managing Kaligarang river, 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 are given by Ostrom (1990, 1992) and Pinkerton (1989) were used in this study with necessary modification as applied in Susilowati (1999;2001a; 2001b) and Susilowati et al (2003) and Susilowati (2004). The multivariate analysis (Hair Jr. et al.,1998) have been employed and also was complemented by descriptive statistics (see Mason et al., 1999; SPSS, 1996).

RESULTS AND DISCUSSION

Resource Description

Kaligarang river is a natural river. Its spring located in Ungaran mountain in the southern part of Semarang city. Since Dutch colony, the down-stream of this river was enlarged and it functionated as a canal for flood control. This is way then down-stream of Kaligarang river then called by Banjir (local: flood) Kanal (from canal). People then called as Banjir Kanal Barat which is continuation of Kaligarang river. In addition, there are two canals for flood control of Semarang City, namely: west and east canal of Semarang.

The upper-stream of Kaligarang river is mostly formed of agricultural based (forest and paddy field) and human settlement. This segment is considered as the water captured of Semarang City. While, gravel and sand mining, industries, human settlement are placed in the middle-stream of Kaligarang. Moreover, the water of Kaligarang is tapped as a raw water by Semarang Municipality's water supply company to surve Semarang people in the downtown and northern parts of Semarang.

Kaligarang river is mainly used by community and industry to dispose the liquid waste, particulary in the down-stream since no other river ended till Java sea in the northern part of Semarang. Agricultural and fisheries activities are benefitted from this river for irrigation. All drainage infrastructures in the west-northern part of Semarang with densely populated are captured by Kaligarang river.

Due to a heavy burden, nowadays Kaligarang river is often overflow whenever a heavy raining come. Adversely, Kaligarang river is degradating from time to time due to deforestation in the upper-stream and mining activities in middle-stream. High turbidity and sedimentation can not be avoided in the down-stream and particularly in estuaries. In fact, maintaining the river itself seems not properly given by the local government. Therefore, the river becoming narrower and shallow then many delta found along the river in down-stream and its estuaries. It was noted that the heavy flood in 26 January 1990 with flood debit ± 1.540 m^3/second. It caused losses in material for about 8,5 billion rupiah and hundred's victims of people.

Physical Attribute

Along Kaligarang river, the BOD, COD and DO have been exceeded the quality standard. The water quality is degradating whenever toward the down stream as performed by the physical condition of water in Table 1.

Tabel 1
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

There were five points of location to take the water sampled, namely: KG1 (jembatan Pramuka) in upper-stream; KG2 (Desa Tinjomoyo) and KG3 (Tugu Suharto) in middle-stream; and KG4 (Bendungan Simongan) and KG5 (Di bawah rel KA jl. Madukoro) in the down-stream.

The results indicated that the water quality of Kaligarang river is no longer safe for drinking water standard (class I). Even for class II criteria, the DO is exceeded the safety standard in all location of upper-, middle- and down-stream. The detail results of water analysis for Banjir Kanal Barat river is shown in Table 2.

Table 2
Water Quality Indicators of Kaligarang River

No	Parameter	Unit	Results		Water Quality Standard with Max Concentrate (PP No.82/01)			
			KG.4	KG.5	Class	Class	Class	Class
			11.01	11..35	I	II	III	IV
	I. PHYSIC							
1	Temperature	^{o}C	27.9	31.4	Deviasi 3	Deviasi 3	Deviasi 3	Deviasi 5
2	Dissolved Residu	mg/l	314	2542	1000	1000	1000	1000
3	Conductivity	mg/l	36	29	50	50	400	400
	II. CHEMICAL							
1	PH	mg/l	7.35	8.16	6-9	6-9	6-9	5-9
2	BOD	mg/l	7.568	7.11	2	3	6	12
3	COD	mg/l	40.82	49.47	10	25	50	100
4	DO	mg/l	2.42	8.26	6	4	3	0
5	Total Fosfat	mg/l	0.887	1.512	0.2	0.2	1	5
6	NO3 sebagai N	mg/l	-	-	10	10	20	20
7	Amonia (NH3N)	mg/l	4.15	7.675	0.5	-	-	-
8	Arseni (As)	mg/l	-	-	0.05	1	1	1
9	Kobalt (Co)	mg/l	-	-	0.2	0.2	0.2	0.2
10	Barium (Ba)	mg/l	-	-	1	-	-	-
11	Boron (B)	mg/l	-	-	1	1	1	1
12	Selenium (Se)	mg/l	-	-	0.01	0.05	0.05	0.05
13	Kadmium (Cd)	mg/l	<0.005	<0.005	0.01	0.01	0.01	0.01
14	Khrom (Cr)	mg/l	<0.005	<0.005	0.05	0.05	0.05	1
15	Tembaga (Cu)	mg/l	<0.005	<0.005	0.02	0.02	0.02	0.2
16	Besi (Fe)	mg/l	0.144	0.087	0.3	-	-	-
17	Timbal (Pb)	mg/l	<0.030	<0.030	0.03	0.03	0.03	1
18	Mangan (Mn)	mg/l	<0.010	0.097	0.1	-	-	-
19	Air Raksa (Hg)	mg/l	-	-	0.001	0.002	0.002	0.005
20	Seng (Zn)	mg/l	0.035	0.035	0.05	0.05	0.05	2
21	Khlorida (d)	mg/l	-	-	600	-	-	-
22	Sianida (CN)	mg/l	<0.002	<0.002	0.02	0.02	0.02	-
23	Fluorida (F)	mg/l	-	-	0.5	1.5	1.5	-
24	Nitrit sbg N (NO2)	mg/l	-	-	0.06	0.06	0.06	-
25	Sulfat	mg/l	-	-	400	-	-	-
26	Khlorin Bebas	mg/l	-	-	0.03	0.03	0.03	-
27	Belerang sbg H2S	mg/l	0.064	0.012	0.002	0.002	0.002	-
	III.ORGANIC CHEMICAL							
1	Oil & fat	mg/l	-	-	1000	1000	1000	-
2	Detergen sbg MBAS	mg/l	-	-	200	200	200	-

Notes:
KG4: Bendungan Simongan
KG5: Di bawah rel KA jl. Madukoro

I : Standard for drinking water
II : Standard for recreation, veterinary, freshwater fish culture, and gardening.
III: Standard for veterinary and freshwater fish culture, and gardening.
IV: Standard for gardening.

Source: The Environmental Impact Management Board (Bapedalda) of Semarang Municipality (October 2003).

Community attribute

Semarang, is a capital city of Central Java province, located in the north coast area and occupied by 1.5 million persons. The spring of Kaligarang river is in Ungaran town in south and stream down to the north a cross the western part of Semarang city. About 115,451 persons (in Semarang regency) and 694,110 persons (in Semarang city) are lived nearby the watershed of Kaligarang river. Thus, in sum of 779,561 persons are benefited by the Kaligarang watershed directly or indirectly as shown in Table 3.

Tabel 3
Population Nearby Kaligarang River
Year 2003 (person)

No	Sub-districts	Population			Population Mobility	
		male	female	Total	in	out
I. In Semarang Regency						
1	Ungaran	56,892	58,559	115,451	502	624
Sub total		56,892	58,559	115,451	502	624
II. In Semarang Municipality						
1	Gunungpati	29,394	28,648	59,042	893	264
2	Banyumanik	56,132	55,463	111,545	3,342	2,259
3	Gajah Mungkur	29,746	29,555	59,301	1,684	1,301
4	Semarang Brt	75,223	75,313	150,536	3,824	3,573
5	Ngaliyan	47,797	47,551	95,348	3,474	1,439
6	Semarang Slt	42,590	42,272	84,862	2,088	1,949
7	Semarang Utr	59,551	63,875	123,426	2,352	2,577
Sub total		340,433	343,677	694,110	17,657	13,362
Total		**397,325**	**402,236**	**779,561**	**18,159**	**13,986**

Source: Watershed of Kaligarang Planning, Human Resetlement and Planning, Central Java Province, Fiscal Year 2005 (CV Duta).

Most of people who live in the adjunction of Kaligarang river are engaged in industrial labor (13.12%). The distribution of population by its occupation is shown in Table 4.

Table 4
Population Occupation Nearby Kaligarang River, 2005

No	Occupation	Total (persons)	%
1	Farmer	14,777	1.85%
2	Labor	11,321	1.42%
3	Fisher	1,939	0.24%
4	Private	7,740	0.97%
5	Industrial labor	104,910	13.12%
6	Construction labor	43,983	5.50%
7	Trader	40,310	5.04%
8	Driver	16,737	2.09%
9	Civil servant / army	59,526	7.44%
10	Pensioned	24,300	3.04%
11	Others	474,018	59.28%
	Total	799,561	100.00%

In addition, the socio-economic-demographic description of the respondents (community, n=90; and key-persons, n=30) are summarised in the following tables.

Tabel 5
Characteristics of Community Respondents

No	Description	Upper (n=30)		Middle (n=30)		Down (n=30)	
		Freq	%	Freq	%	Freq	%
1	Age (th)						
	20-29	8	26,7	7	23,3	7	23,3
	30-39	4	13,3	2	6,7	4	13,3
	49-49	8	26,7	4	13,3	5	16,7
	50-59	1	3,3	5	16,7	8	26,7
	>60	9	30	12	40	6	20
2	**Education Level**						
	Unschooled	6	20	9	30	10	33,3
	Elementary	9	30	11	36,7	13	43,3
	Junior high school	7	23,3	7	23,3	4	13,3
	Senior high school	5	16,7	3	10	1	3,3
	Diplome/ Univ	3	10			2	6,7
3	Occupation						
	- Small trader	5	16,7	1	3,3	3	10
	- Labor	7	23,3	12	46,6	7	23,3
	- Gravel labor	12	40	14	40	17	56,7
	- Canoe boat driver	3	10	2	6,7	1	3,3
	- Small industry	2	6,7	1	3,3	1	3,3
	- Others	1	3,3			1	3,3
4	Length of stay (years)						
	-<=20	7	23,3	6	20	2	6,7
	-21-40	4	13,3	8	26,7	8	26,7
	-41-60	12	40	7	23,3	14	46,7
	-60>=	7	23,3	9	30	6	20
5	Social Activities						
	- Women Association (*PKK*)	10	33,3	2	6,7	6	20
	- Sub-village (*RT/RW*)	5	16,7	4	13,3	2	6,7
	- Security	3	10	3	10	2	6,7
	- Youth association (*Arisan/Karang Taruna)*	6	20	4	13,3	6	20
	- Nothing	6	20	17	56,7	14	46,7

Tabel 6
Characteristics of *Key Person* Respondents

No	Description	Upper (n=10)		Middle (n=10)		Down (n=10)	
		Freq	%	Freq	%	Freq	%
1	**Age** (th)						
	20-29	2	20	1	10	3	30
	30-39	1	10	5	50	1	10
	40-49	4	40	1	10	3	30
	50-59	1	10	1	10	1	10
	>60	2	20	2	20	2	20
2	Education **Level**						
	Unschooled						
	Elementary	2	20	4	40	5	50
	Junior high school	2	20	2	20	2	20
	Senior high school	5	50	3	30	1	10
	Diplome/ Univ	1	10	1	10	2	20
3	**Occupation**						
	- Small trader	1	10	2	20	2	20
	- Labor	3	30	2	20	2	20
	- Gravel labor	3	30	3	30	1	10
	- Canoe boat driver	1	10	2	20	1	10
	- Small industry	1	10	1	10	3	30
	- Others	1	10			1	10
4	Length of stay (years)						
	-<=20	2	20	1	10	1	10
	-21-40	3	30	3	30	3	30
	-41-60	2	20	4	40	2	20
	-60>=	3	30	2	20	4	40
5	- Women Association (*PKK*)						
	- Sub-village (*RT/RW*)	3	30	2	20	1	10
	- Security	2	20	3	30	6	60
	- Youth association (*Arisan/Karang Taruna*)	1	10	1	10	2	20
	- Nothing	1	10	2	20		

Rule-in-used

River is considered as the strategic resource since it carries multi-functions especially for the inhabitants along the watershed. Densely housing, business activities and industries are placed along the Kaligarang river. Due to all of these activities, this river has high potential in pollution and environmental damages. In order to achieve the goals of clean river program (prokasih), thus clean-production program should be imposed to the household, business, and industries activities along the river and this has been guided by the rules, formally and informally. The formal rules related to the river management are summarized in Table 7.

In comply for the relevant rules then awareness among the stakeholders to conserve the river is highly stipulated. It is often found that people are not friendly toward the environment while doing their daily and industrial activities. In general, people in the region perceived that river has dual functions as a place to get resource and to through out garbage and sewage. Knowledge of people along Kaligarang river toward technology and management skill is limited, whereas rule in-use is hardly consistently to be implemented in the region. Meanwhile the capacity of the government in surveillance and enforcement activities are very far from complete. The similar findings also found in Babon river which is located at the eastern part of Semarang city (Susilowati et al., 2003) and Semarang river in the Central of Semarang city (2004). Moreover, many people in Indonesia have an image that river is a place for the last destination to dispose the unused things. Therefore, when the dog or other pets is dead it will be through in the river as reported by Lucas and Arief (2000). It is indeed need to re-format the community's wrong-perception on the importance of a river. The formal rule-in-used are placed but the enforcement and compliance is very weak and weak. Thereafter, informal rules need to be revived and strengthen to provide a proper guidance for the people.

Table 7

Related Rules and Regulations for Kaligarang River Management

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

No	Rules / Regulations	Description
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 No.32/ 1990	Conservation area management
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

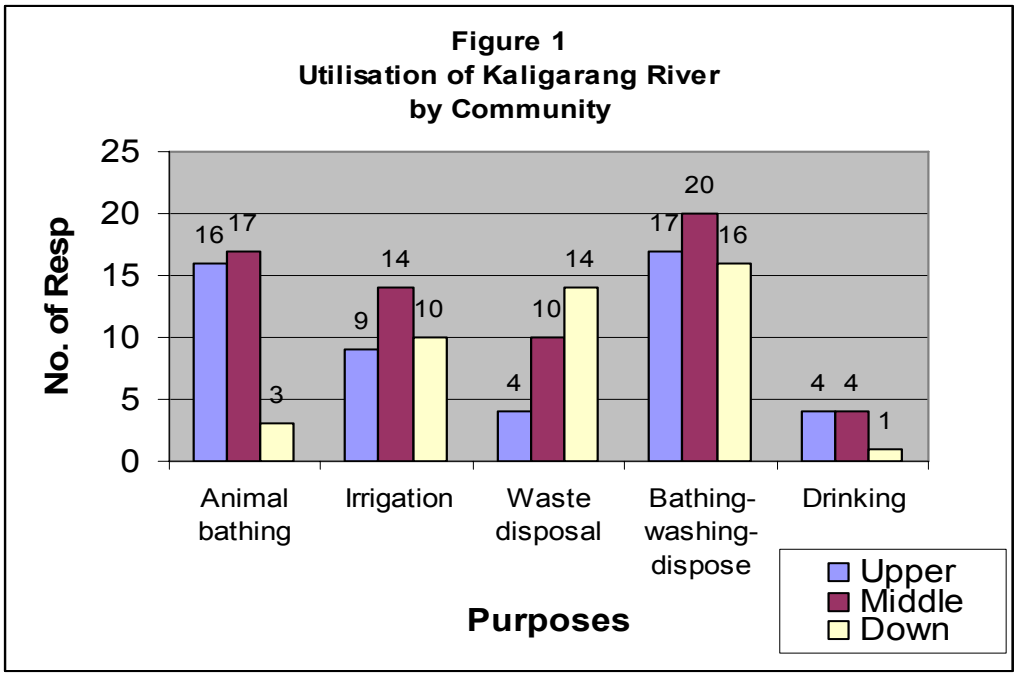
No	Rules / Regulations	Description
21	Governor of Central Java Instruction No. 660.1/ 11/ 1988	The procedure on alleviation of pollution and environmental destruction
22	Provincial Regulation of Central Java No. 20 Year 2003	Water quality and water pollution management of cross boundary regions in Central Java
23	Provincial Regulation of Central Java No 10 Year 2004	Sewage water standard

Note: UU = law; PP = national regulation

Source: Various publications, 2004.

Resources Utilisation

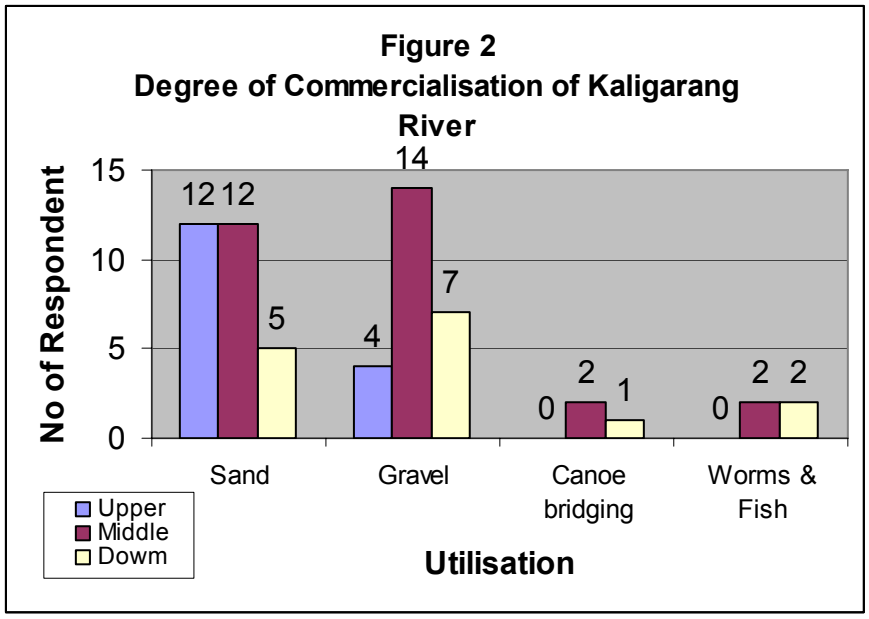
River in Indonesia is usually used for several purposes. Different community may have different motive in utilising a river. As perceived by community respondents indicated that people along the Kaligarang river are utilised for human bathing, washing and disposing; irrigation, animal bathing; to get rid of waste; and drinking water. However the pattern of river utilisasion in upper-, middle- and down-stream of Kaligarang are vary as shown in Figure 1. Most of respondents agreed that rivers are used for bathing, washing and disposing (local: MCK) in all segment (upper-, middle- and down-stream of Kaligarang river. In the down-stream shown that community are likely used the river as media for disposing waste but they are avoid to use for drinking due to its water quality is worsen.



Degree of Commercialisation

River in the study area is considered as the endevoured resource and people perceived loosely as the common property and open access. Although there are rules and regulations (formal and formally) in place but due to weak in enforcement and surveillance and particularly worsen by economic pressure, thereby river is likely can be exploited for many purposes by community in the adjunction. It is hardly for community to be complier in conserving and maintaing the river whenever they see other parties are extracting and benefitting somethings from the river. Moreover, given less attention from the authority to conserve and to maintain the resource (including Kaligarang river) thus it becomes complete that resource is likely managed without a proper management. Due to missed-interpretation in decentralisation concept, then many of natural resources in Semarang city are potentially able be utilised by community, government and other stakeholders for commercial purposes.

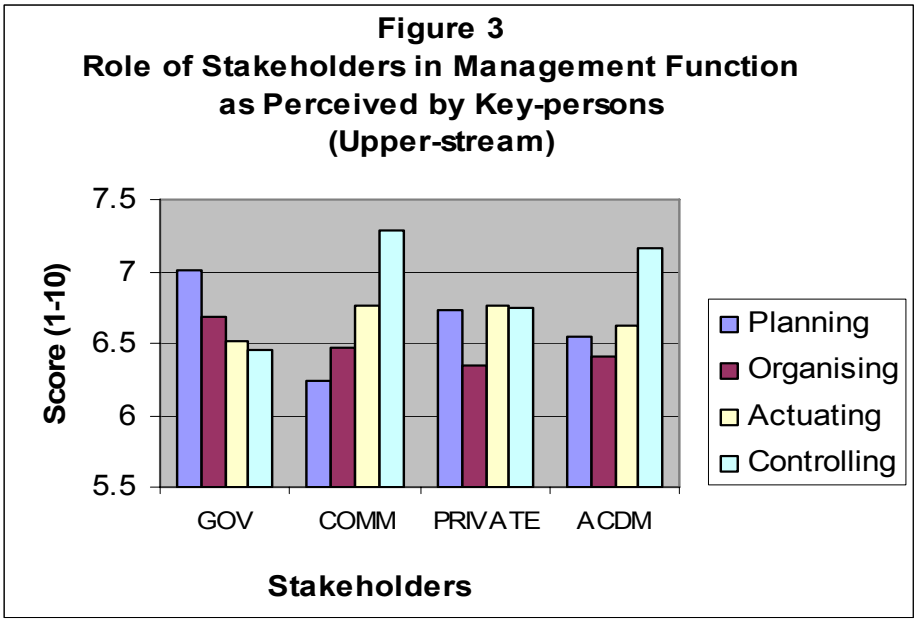
Sand, gravel, stone and water of Kaligarang river are extracted by several parties. While the bank of the river is utilised for agriculture and fisheries activities. Many canoe boats are operated for bridging people movement from one bank side to another side. People collecting worms and fish for commercial purpose as shown in Figure 2. It should be realised that so many benefits granted by the river from time to time. But given such improper management for kaligarang river, we should worry that all "benefit and grant" supplied will be extinct?



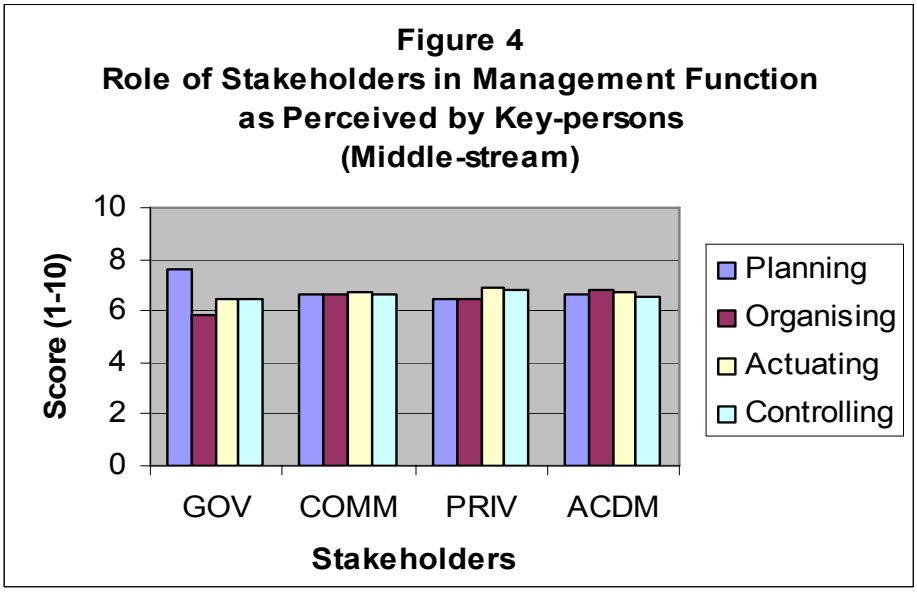
Pattern of interactions

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, role in controlling the resource is particularly done by the community itselves and followed by the academician and/ or NGO. While, the government mostly shared in planning activities. Organising activities in river management are proportionately done by all related parties with government as the facilitator. Further, actuating activities are preferably done by community and private parties as shown in Figure 3.

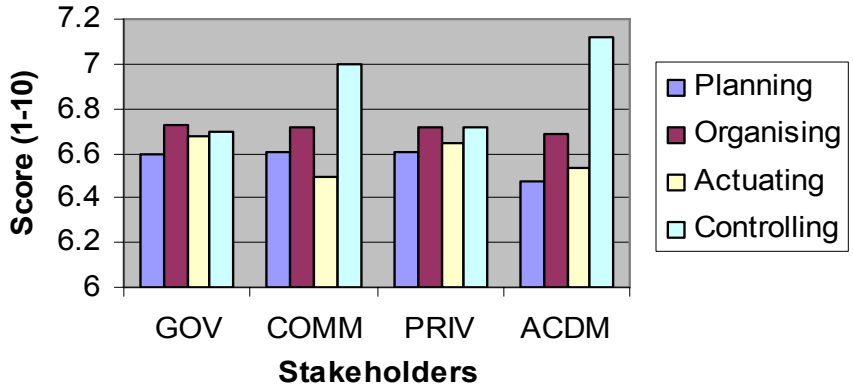


In middle-stream almost all functions of management are contributed proportionately by all parties. Of course with greater role of government in planning actitities as shown in Figure 4.



In the down-stream of Kaligarang river are found a complexed problem such as worsen in water quality and conflict of interests in utilisation of resource allocation among several parties, therefore academician and/ or NGO as well as the community itselves are play a significant role in underdoing management function of Kaligarang river. This phenomenon is shown by Figure 5.

Figure 5
Role of Stakeholders in Management Function as Perceived by Key-persons (Down-stream)



Prospect of 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). While the key conditions are given by Ostrom (1990, 1992) and Pinkerton (1989) is used to evaluate the success of co-management for *Kaligarang* river. Every key-conditions observed for evaluation was measured by conventional scale (1 to 10). Based on observation in the field and discussion with several competent key-persons, then judgement was made by researcher to evaluate the success of co-management application in *Kaligarang* river.

The eleven key-conditions provided by Ostrom (1990, 1992) and Pinkerton (1989) were used in this study with necessary modification as applied in Susilowati (1999; 2001a; 2001b) and Susilowati et al (2003) and Susilowati (2004) to figure out the prospect of co-management in Managing Kaligarang river.

The total score of 11 key-conditions for successful co-management of *Kaligarang* river is averaged about seven as shown in Table 8. This scored is classified as pretty good. The results indicated that a sharing in understanding and responsibility among the stakeholders as perceived by the community respondents are remain fairly.The proportion of sharing in responsibility and/or authority between the government and local-resources users or community to manage the river or resources is plotted into the hierarchy of co-management arrangements (after Berkes, 1991) with judgement given by the researcher. There is an indication that community-based management may shed some lights to underdo *Kaligarang* river.It is indeed need to provide empowerment for all stakeholders should be encouraged to attain for synergic-partnerships.

Table 8
The Prospect of Co-Management Approach in Managing Kaligarang River
as Perceived by Key-persons (n=30)

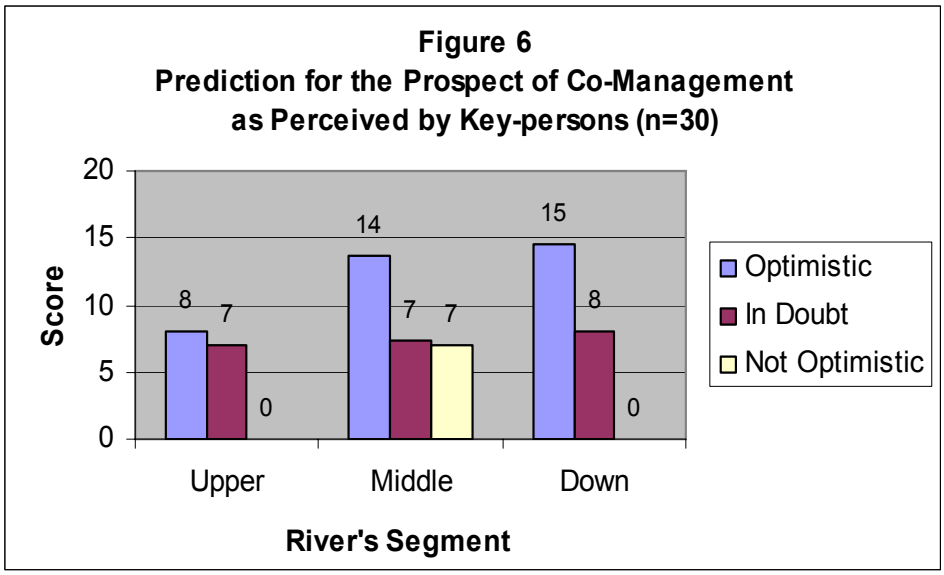
No	Key-Conditions	Items	Score (1-10)		
			Up	Middle	Down
1	Clearly defined Boundaries	2	7.3	8.2	7.7
2	Membership is clearly defined	2	7.5	8.2	7.7
3	Group cohesion	2	6.9	8.2	7.8
4	Organisation	3	7.6	7.8	7.9
5	Benefit exceed cost	3	8.5	8.2	8
6	Participation by those affected	6	7.8	7.8	7.8
7	Management 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	Cooperation and leadership at community	2	7.7	7.6	7.7

Table 8
The Prospect of Co-Management Approach in Managing Kaligarang River as Perceived by Key-persons (n=30)

	level				
11	Coordination between government and community	2	8.2	7.6	7.6
	Overall	**30**	**7.6**	**7.9**	**7.7**
	Classification		**Fairly**	**Fairly**	**Fairly**

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

In addition, based on interviewed with key-person (n=30) found that they will more optimistic about the success of co-management approach in underdo river management in the study area. However, many of key-persons also still in doubt regarding the prospect of co-management approach in managing Kaligarang river. Prediction of the success of co-management approach application in the study area is depicted in Figure 6.



CONCLUSIONS

Capacity and quality of Kaligarang are deteriorating with several causalities. Deforestration is claimed as the main factor in upper-stream. While, mining is found as an activities in accelerating the degradation in the middle-stream of Kaligarang river. Moreover, pollution from industries and domestic waste becoming a significant problem of Kaligarang waterway. Adversely, illegal unregulated and unreported (IUU) resettlement nearby the river are not be given a promptly warning and proper action to do surveillance.

Based on an initial quick assessment using criteria provided (by www.healthywaterways.env.qld.gov.au), Kaligarang river is likely classified under poor health river. The chemical indicators showed that the water quality of Kaligarang river is no longer safe for drinking water standard (class I) and even water from several monitoring station showed no longer fulfilled the quality for recreation and gardening (class II). Hence, involvement of the community might not sufficient for improving the quality and capacity of Kaligarang river. It is indeed need sharing in: understanding, responsibility, sympathy and empathy as well as deserve for a good-will from all competence stakeholders in order to grow the spirit and sense belonging in managing Kaligarang river. It is hardly to implement this recommendation in the coming couples of years. But we do not have other options. So far, the government of Semarang Municipality is paying less attention in maintaining the resource endevour such as Kaligarang river. In fact, it is as if there is no management in managing Kaligarang river for the last five years. Thus, if we not start doing somethings right now, means we let Kaligarang river will extinct. Similar condition is also happen with managing other rivers in Semarang city such as Kali Semarang , Banjir Kanal Timur and Kali Banger, etc.

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ACKNOWLEDGEMENT

The paper benefited from the useful comments of Dr. Waridin (Faculty of Economics, Diponegoro University). Thanks to my students:Shaumi Arandani and Himawan Arif for their efforts during the field survey. My high appreciation to the Australian government for providing a funding to present this paper in Brisbane Riverfestival, 4-7 Sepetember 2006 and my special thanks goes to Emily Smigrod and Dr. Selina Ward.

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