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INSTITUTION BUILDING FOR ADAPTIVE RIVER BASIN MANAGEMENT

Case study : Brantas and the Rhine River Basin Management

Abstract

Recently the shift of paradigm in water management has been developed in many countries in the world. The shift refers to the approach changing from command control approach towards more adaptive approach encouraging responsiveness, flexibility and innovations development in the management process. The shift on the water management approach is encouraged by complexity of water system and many uncertainties emerging in management process. An adaptive management is promoted as an approach and methodological innovation providing better insight to deal with the need for more socially constructed in water resource management.

Because water management approach need to be changed towards more adaptive so this research want to know how adaptive management concept is brought in the management of river basin. The research is focused to attain better insight how institution is developed for bringing adaptive management concept in river basin management based on the experiences of Brantas and the Rhine RBMs. Based on understanding upon the institution building of both RBMs and the basic theory of the concept of adaptive management, we hope that we can get some lessons to improve the current institutions.

Keywords: Adaptive Management, River Basin Management, Institution Building, Brantas, and The Rhine

Agnes Andriani Kartika Sari/ S1702629
Double Degree ITB - RUG
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INSTITUTION BUILDING FOR ADAPTIVE RIVER BASIN MANAGEMENT:

Case study : Brantas and the Rhine River Basin Management

by
Agnes Andriani Kartika Sari
ITB : 25406031
RUG : S1702629

Double Master Degree Program

Development Planning and Infrastructure Management
School of Architecture, Planning, and Policy Development
Institut Teknologi Bandung

and

Environmental and Infrastructure Planning
Faculty of Spatial Sciences
University of Groningen

Approved by
Supervisors
Date: 2008

Supervisor I	Supervisor II
Dr. Johan Woltjer	**Ir. Tetty Armiati Argo, MES, PhD**
(RuG Supervisor)	(ITB Supervisor)

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Preface

This master thesis is completed as a partial fulfillment of the requirements for the Master Degree from Institut Teknologi Bandung and the Master Degree from University of Groningen. I am interested to focus the research on the comparative analysis between the concept of adaptive institution on river basin management and the current institution of Brantas and The Rhine RBM to attain better insight how the shift of approach on water management is applied on both RBMs. Moreover, the research is aimed to get some lessons from the current institution building.

By this chance, I would like to thank to God blessing me in finishing my thesis. I also give my greatest thankful for everybody giving supports to me in finishing my thesis. I would like to address my special thanks to my supervisor, Dr. Johan Woltjer (RuG) and Ir. Tetty A. Argo, MES, PhD (ITB) for guiding me on my thesis work. Respectively, I also would like to address my thanks to all my lecturers and faculty staff members in ITB and RuG. I also would like to express my appreciation for the Netherland Education Support Office (NESO) through StuNed program for giving me institutional and financial support. And finally great thanks are addressed to my lovely family in Indonesia especially for my parents, my husband and my little babies for supporting me during my study in Groningen.

Groningen, August 2008
Agnes A. Kartika Sari

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Chapter 1
Introduction

This chapter provides a description about what actually the research will do. It consists of background, research objectives, research questions, scope, methodology, research report structure and research framework. These descriptions are very necessary to guide the research towards end result.

1.1 Background

Water is a common good which has important role for the survival of human civilization and socio economic development. The issues of sustainable water resources management become a major concern over past decade. It is related to water scarcity and water abundance issues, deterioration of water ecosystem issues, declining water quality issues, etc. However, the pressing problems in this field needs to be tackled from a holistic and integrated perspective considering environmental, social and economic interests and their interdependencies (Dublin principles)[1].

Integrated River basin management (IRBM) constitutes one of the approaches for water resources management based on the management of unit area of the water. It is an activity which has multiple goals to maintain and improve the state of water resources in river basin area. The basic concept of IRBM emphasizes on harmonizing the interaction of all components of river basin including human component and biophysical component in order to achieve sustainable management of water resources in river basin area.

In practice, the development of river basin management face many challenges related to the complexities and uncertainties. Growing pressures on water resources because of the effect of economic development, increasing interdependencies between users, uncertain impacts of climate changes, and an associated increase in demands for water services are some of the factors underlying an increasing complexity in water resources management. Moreover, river basin management also often deals with arising uncertainties because of some reasons such as variability in environmental, socio economic and demographic states and incomplete knowledge and understanding about the complex system of river basin which makes the difficulties to predict the response of river basin system against management actions.

Because of the degree of complexities and uncertainties in river basin management, there are some criticisms addressed to the weaknesses of conventional management approach in responding environmental challenges (Klosterman 1996; Taylor 1998; Kenny and Meadow 1999; Herring 1999; Conacher and Conacher 2000 cited by choy, 2003). It is argued that conventional management characterizes a closed process rather than an open one. It is more focused on static, end-state, blue print master planning approaches and fragmented "command and control". However, it is considered that the conventional management approach was less appropriate with the characteristic of river basin management which has considerably effects and consequences to the interests of many parties.

[1] See the Dublin Statements and principles issued by the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992

To face the challenges, adaptive management is advocated as a new approach for water resource management (Pahl-Wostl *et al*., 2004). An adaptive management is promoted as an approach and methodological innovation providing better insight to deal with the need for more socially constructed in water resource management.

Actually, adaptive management is not a new concept. It is initially promoted in 1970s as an approach to environmental and natural resources management especially for managing the harvest of fisheries and forests. This method focus on the use of system models to underpin decision making. Nevertheless, recently, adaptive management method has been applied for various subjects of management which are agriculture, restoration of a degraded wetland, water resource management and the recovery of damaged river basin as well as for various socio political contexts: Australia, Canada, Europe, Southeast Asia, South Africa and United States.

In the past, the approach used in river basin management tends to be mono disciplinary focused on the physical and technical disciplinary area, top-down decision making (centralized governance type), fragmented command-control, and less involvement of other sectors. The decision makers are dominated by water authorities and technical experts. The idea behind the need for movement towards adaptive management is that water management issues are complex, characterized by uncertainty, low predictability and controllability, and involve many different stakeholders. Because they cannot be addressed through prediction and control, management needs to be adaptable to new information and changing circumstances. It need a method providing flexible and responsive management approaches (Gregory R et all, 2005).

The adoption of adaptive management for managing river basin has already recognized in some river basins around the world. Some literatures wrote about the application of this approach in some river basin management such as in Columbia River basin (Lee 1993), the Colorado River (Collier et al. 1996), the Chesapeake Bay (Hennessey 1994), the Mississippi River basin (National Research Council 2004), and the Kissimmee River in Florida (Light and Blann 2000).

Recently, in the European countries there is a change of perspective in river basin management. Wolsink (2005) said that there is a change of water planning and management approaches from "command-control" approach towards flexibility, adaptive management and making high priority for treating the natural requirements of water systems. In addition, in Indonesia, there is also a change of management approach from de-concentrated management to more decentralized management system in which water resources are managed at the lowest appropriate level. In this change, the approach is more openness and gives opportunity to participation and stakeholders' involvement. The objective of the shift is to encourage more adaptive management in order to reach sustainable development in river basin management. Besides that, there is also a change of perspective on river basin management from the primary emphasis on the water utilization for agricultural sector to more emphasis on the conservation and preservation of the resources with optimization of the utilization of water. This is a step towards sustainable development and management of water resources. The intention is to adapt an ecosystem-based approach within river basins in order to achieve sustainable water resources management (Gunatilaka et al). In shaping ecosystem processes and dynamics in river basin, the ecosystem-based approach recognizes the roles of the human being reflecting complex adaptive system such as a various set of institutions and interactions between actors that shape future social structure and dynamics (Folke et al, 2005).

Although adaptive management concept gives promises to better approach coping with complexities and uncertainties in managing river basin environment, but the implementation of this approach still has many barriers. Lee (1993) considered that the obstacles include the high costs of information gathering and monitoring, resistance from managers who fear increased transparency, political risk due to the uncertainty of future benefits, difficulty in acquiring stable funding, and fear of failure. Moreover, Raadgever et al, 2006 argued that the development of adaptive river basin management needs to refresh institution building in order to bring the characteristic of adaptive management which emphasizes on flexibility, more responsiveness, bottom up approach, etc. Successful adaptive water management project is entirely determined by the institutional performance (saleth and Dinar 2004 cited by Raadgever et al, 2006).

Based on the understanding above, I want to explore deeper what kind of institution is required to bring the concept of adaptive management in river basin management and the extent to which the concept has been implemented in practice. To attain better understanding, the research will be conducted by making comparative analysis between two cases of river basin management (Brantas and Rhine RBM) which have different characteristics. There are considerations why the research chooses Brantas and Rhine RBMs as the case studies. Those considerations are described as follows:

a. Brantas river basin is chosen as the case study because its institutional arrangement is regarded as a precedent for developing river basin management for other river basin in Indonesia even though in some cases the institution has not been able to overcome properly water issues in Brantas river yet. Meanwhile the Rhine river is chosen as another case study because the institutional arrangement in the Rhine RBM is regarded having success in overcoming the water issue, clean up the river from heavy water pollution, and change the status of the Rhine as Europe's sewer into a model for a successful remediation.
b. Although physiographically different, the two river basins share some similar issues including water quality and water quantity issues, as well as ecosystem degradation due to the impact of the activities in upstream catchments area. The conflicts between upstream and downstream area become the similar issue in both RBMs.
c. Both case studies are prominent in international water resources management researches so that the accessibility to gather the data and information is relatively easier.

1.2. Research Objectives

There are three main objectives of the research. The first objective is to explore the extent to which institution building developed in current river basin management (Brantas and Rhine RBM) bring the requirements of adaptive management concept into practice. The second objective is to compare the development of river basin institution in two river basin management: Brantas and Rhine RBM and to analyze how different institutional arrangement of both cases influences the level of adaptiveness of institution river basin management. The last objective is to attain better insight how institution is developed for bringing adaptive management concept in river basin management based on the experiences of both RBMs and to formulate recommendation for improvement the performance of river basin institution towards more adaptive management.

1.3. Research Questions:

To achieve the objective of the research, the research will be guided by three main research questions. The questions are

a. *How is institution building developed in current river basin management: Brantas River Basin Management and in Rhine River Basin Management?*
b. *To what extent does institution building developed in current river basin management bring the requirements of the adaptive management concept? What are the strengths and the weaknesses of both RBM institutions?*
c. *What can be learned from the experiences of both RBMs and what can be recommended to improve the performance of RBMs' institution building towards more adaptive management?*

1.4. Scope of Research

The scope of the research is limited to:

a. describe current institution building of Brantas and Rhine River Basin Management focused on the structure, the legal institution, and the process of both river basin management;
b. compare the institutions of both river basin managements to attain better insight the extent to which the current institutions bring the requirements which are needed to develop adaptive river basin management;
c. give recommendations to improve performance of institution in river basin management.

1.5. Research Methodology

The research will be conducted by using these methods as follows:

a. ***Literature Review***

Literature review is used to construct theoretical framework about the concept of river basin management, the concept of adaptive management, the needs for adopting adaptive management in river basin management, and the requirements for developing adaptive institution in river basin management. This review will be obtained through collecting literatures from some significant sources, which are journal articles, research report, relevant publication and selected books.

b. ***Collecting Data and Information***

In addition, the research also will collect data and information about the structure, and the process of both Brantas and Rhine RBMs. The structure of RBM will be obtained from the information about the type of basin governance, organizational setting which responsible to carry out river basin management and the distribution role of government and stakeholders in the management of both river basins as well as financial aspect and information management in both RBMs. Meanwhile, the information about the process will be obtained from the picturing on how basin actors relate to each other in the preparation and in the implementation of management process. It describes coordination, cooperation and public participation within the process of planning, decision making, implementing, monitoring and evaluation in both river basin managements. Moreover, it also will collect the data/information about legal institution including the law, regulation, and policies related to river basin management in both river basin cases. The information will be obtained through collecting data/information from some significant sources, which are journal articles, research report, newspapers, and websites.

c. ***Exploration and Comparative Analysis***

After constructing theoretical framework and describing the existing structures, processes, and legal institution of both RBMs, I would like to explore whether current institution building developed in both river basin managements has brought the concept of adaptive management. To analyze this, I use some criteria and indicators argued by some authors as it will be described in theoretical framework. Each criterion will be

compared with the current institution of both RBMs (Brantas and Rhine RBMs) to obtain better understanding about adaptive management concept which is carried out in both RBM cases. Based on the understanding, I will argue about the strengths and weaknesses of current institution in bringing adaptive management concept. Moreover, it will also analyze the influences of aspects such as different cultural background and political system in both RBMs against the development of adaptive institution of both RBMs.

d. ***Conclusion and Recommendations***

Finally, this research will produce some conclusions and recommendation made based on the understanding of those cases above.

1.6. Report Structure

To guide the research, the structure of the research will be divided into six chapters. The structure of the research can described as below:

Chapter 1 : ***Introduction***
This chapter consists of background, research objectives, research questions, scope, research methodology, report structure and research framework.

Chapter 2 : ***Theoretical Framework***
This chapter will provide basic theory which will be a guideline for analysis. Theoretical framework will provide the principle concepts of river basin management, adaptive management, the need for adoption of adaptive management in river basin management and the requirements of institution building to bring adaptive management in RBM.

Chapter 3 : ***Institution Building in Brantas River Basin Management***
This chapter will provide overview of Brantas RBM and describe about the institution building of Brantas RBM. The description of institution building is focused on picturing the structure (basin governance type and river basin organization, and distribution role of government and other stakeholders), legal institution (policies, law, regulation), and the process of planning and decision making (cooperation, coordination, participation and communication between basin actors), as well as information management in Brantas RBM.

Chapter 4 : ***Institution Building in Rhine River Basin Management***
This chapter will provide overview of Rhine RBM and describe about the institution building of Rhine RBM. The description of institution building is focused on picturing the structure (basin governance type and river basin organization, and distribution role of government and other stakeholders), legal institution (policies, law, regulation), and the process of planning and decision making (cooperation, coordination, participation and communication between basin actors) as well as information management in Rhine RBM.

Chapter 5 : ***Comparative Analysis***
This chapter will be the comparative analysis of the institution building developed in both RBMs based on the criteria and indicator which has been advocated by adaptive management concept. In addition, it also will be analyzed the strengths and weaknesses of those institutions. More over it also will analyze the influence of aspects such as different

cultural background and political system on the development of adaptive institution of both RBMs.

Chapter 6 : ***Conclusion and Recommendations***
Finally, this research will produce some conclusions and recommendation made based on the understanding.

1.7. Research Frameworks

The framework of the research can be described as follows:

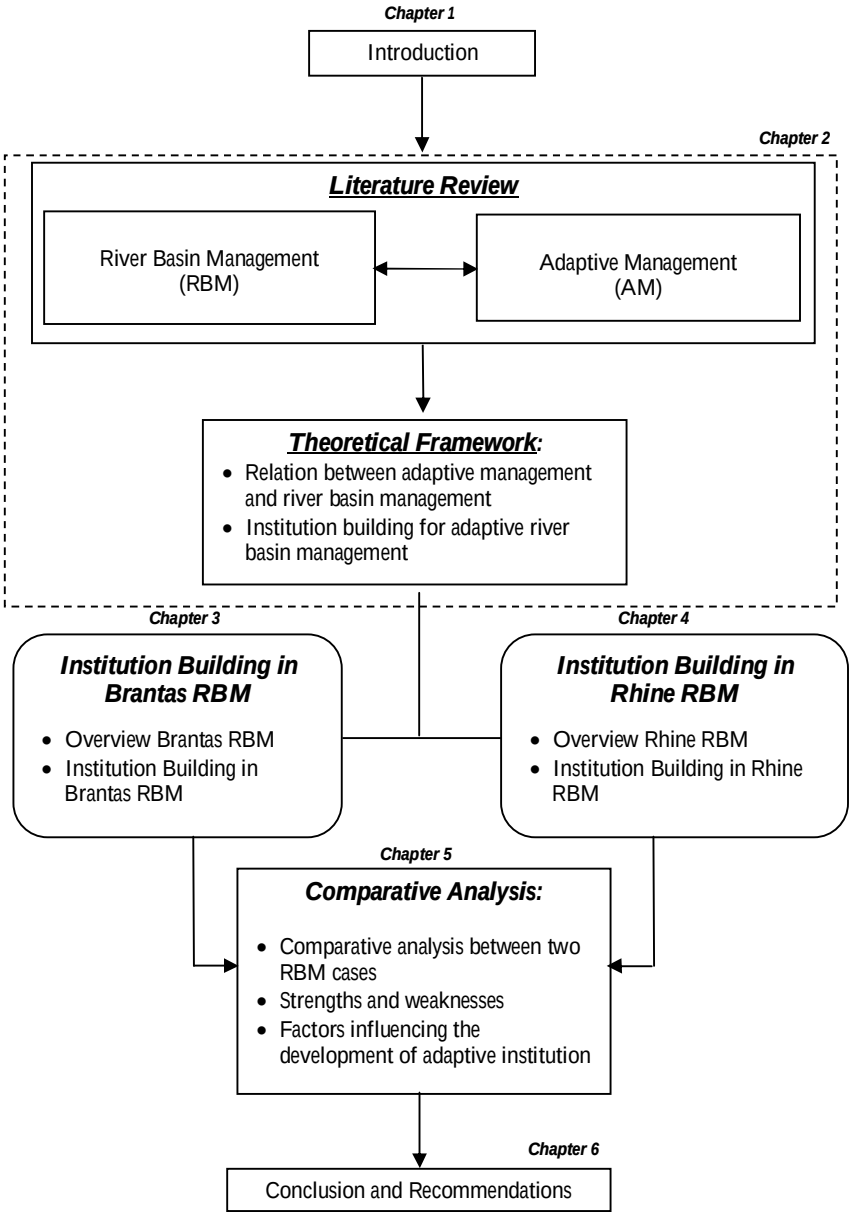


Figure 1.1 : Research Framework

Chapter 2
Theoretical Framework

This chapter will provide basic theory which reviews the principle concepts of river basin management, adaptive management, the adoption of adaptive management in river basin management and institution building required to bring adaptive management in managing river basin. The synthesis of those understandings will be useful as fundamental consideration for analyzing the research.

2.1. THE CONCEPT OF RIVER BASIN MANAGEMENT

Since long time, river basin has had an important role for supporting human life and other forms of life. There is strong relation between river and humans as since earliest civilization, everyone commonly lives in river basin and absolutely depends on the river water for doing their all activities. Generally, human migrations and emerging new towns are alongside the river. It is because river basins constitute the natural entities which provide freshwater needed for sustaining communities' life and their development. Water resources in many river basins are fully placed to various human uses such as for supplying drinking water, irrigation, hydroelectric power, industrial activities, recreation, transportation, etc.

Anyhow, because of dense human activities in river basins, it often affects the distribution, quantity, and quality of water resources in river basins. A key issue in river basin management is how to harmonize various uses and functions of river basins with natural capacity of the river systems.

In practice, the management of water resources faces many challenges. Growing pressures on water resources because of the effect of socio-economic development, increasing interdependencies between users, uncertain impacts of climate changes, and an associated increase in demands for reliable water services are some of the factors underlying the increasing complexity in water resources management.

Awareness to the complexity in water resource management has encouraged the establishment of the concept of river basin management. RBM is conducted to prevent and cope with the water problems related to the quality and quantity of water, conflict between different water users, conflict between upstream and downstream uses, etc. RBM constitutes the management of water systems as a part of the broader natural environment and in relation to socio economic environment.

River basin management is established as one of the approaches of water resource management based on consideration that river basin constitutes a unit area of water resource management. River basin is an area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta (Directive 2000/60/EC on Water Framework). As catchments in which all the water falls within its sides, a river basin sends all the water falling on the surrounding land into a central river and out to the sea. A river basin can be divided into some watersheds or all land surrounding small rivers, streams and lakes which are interconnected. Based on this understanding, it can be said that river basin is always related to the geographical area determined by the system of waters.

According to WWF (2007), "Integrated river basin management (IRBM) is defined as the process of coordinating conservation, management and development of water, land and related resources across sectors within a given river basin, in order to maximize the economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems." It constitutes a framework where all factors relevant to quality and availability of water resources within the river basin (hydrological, geochemical, ecological, and socio-economic factors) are taken into consideration to achieve river basin management objectives (Nakamura T, 2006). In addition, Jasper (2003) also said that integrated river basin management focus on the integration of natural limitations with all social, economic and environmental interests. In the other words, the approach used in river basin management should create a better understanding and clearer link between human and ecosystem requirements and interaction between them (Wallace et al, 2003 cited by Medema and Jeffrey, 2005)

Based on the definition of IRBM above, we know that the scope of river basin management (RBM) is very broad. It involves some basic elements such as attention to the different forms of water resources (surface and groundwater) and aspects (quantity, quality) of water; attention to the relations between land and water resources; the integration of natural limitations, social and economic demands (sustainability); institutional arrangements; public participation; and legal, political and administrative processes including financing, monitoring and control, and capacity building (Mostert *etal*., 1999; Medema and Jeffrey, 2005). As Nakamura T (2006) said that river basin management (RBM) has been characterized by inter-sectoral (involving various interests such as industry, agriculture, urban development, fisheries management and conservation, etc), interdisciplinary (physical, environmental, socio, economic, and political field) and multiple management objectives. RBM not only covers the management of all human activities that use and affect the water systems, but also covers land use planning, agricultural policy and erosion control, environmental management and other policy areas (Mostert et all, 1999; Shah T. et al, 2005). Moreover, RBM also emphasizes the relation between water and land resources within broad geographical dimensions. It can involve management not only in local dimension but also in broader geographical dimension even often in international dimension.

The aim of integrated river basin management (IRBM) is to ensure the sustained multi-functional use of the basin. IRBM does not only focus on fulfillment of basic water needs of people but also sustaining sufficient water resources in a good quality and quantity in river basin. In other words, IRBM should find the right balance between protecting the water resource itself while meeting social and ecological needs (Odendaal, 2002). Thus, the overall goal of river basin management should ensure that human communities will develop harmonious relationship between water users and relationship with the ecosystem in river basin to be able continuously benefit water from river basin in equitable manner.

Svendsen M. et al (2005) state that there are some essential functions for river basin management which are planning, allocating and distributing water, monitoring and enforcing water quality, protecting against water disasters, protecting ecology, constructing and maintaining facilities. Planning in river basin management is addressed to formulation of plans (short - long term plans) for the management and development of water resources in keeping the balancing between water demands of different sector and water supply in the basin. Allocating and distributing water are addressed to the

mechanisms for formulating criteria in apportioning bulk water among different use sectors and ensuring that allocated water reaches its point of use. Monitoring and enforcing water quality are addressed to the activities in monitoring water pollution and ensuring that the water pollution remains below accepted standards. Protecting against water disaster is addressed to the activities concerned flood and drought prevention and warning. Protecting ecology is related to the activities for protection of the ecosystem which is a part of river basin systems. Constructing and maintaining facilities are related to the activities in designing, building/constructing, and maintaining the infrastructure in the basins.

In practice, some efforts are encouraged to reach the objectives and to fulfill the functions of IRBM such as maintenance of water retention, sustaining the functions of forests, protection of aquatic biodiversity, keeping the quality of river water, improving the quality of agricultural runoff etc (Nakamura T, 2006). In addition, Marchand and Toornstra (1986) formulate several guidelines to carry out the efforts in managing river basins. Those guidelines can be described below:

a. Preservation or improvement of the spontaneous functions fulfilled by the river. The efforts can be carried out by restoring erosion and sedimentation processes, preserving genetic diversity, preserving the self purifying capacity of the river.
b. Conservation of the natural values of river basin by preventing deterioration/destruction of natural resources, establishing reserves in the most vulnerable ecosystems, establishing environmental education programs, initiating programs to promote sound, durable exploitation of ecosystems.
c. Conservation of the river basin's extensive exploitation functions by guaranteeing the protection of production zones such as floodplains, estuaries and lakes, etc, implementing reforestation schemes for supply of firewood, in relation to sound of watershed management.
d. Development of sustainable intensive exploitation functions.
   Sustainable functions of river basin can be developed through drawing up a water allocation plan for the entire river basin to achieve a better match between water demand and supply, developing small scale projects of irrigation, fishponds, forestry etc, improving product processing, and sales and marketing by making better use of the river as a transport route.
e. Improvement of the overall health situation in the river basin.
   Some efforts should be carried out to improve health situation in the river basin such as by combating water borne diseases, improving the food situation both quantitatively and qualitatively, establishing a drinking water programs for rural areas with the objective of making clean, healthy water available for the whole population and ensuring that detailed plans for the above objectives are thoroughly checked against the other criteria within the framework of an environmental impact assessment.
f. Guiding principles for regional planning.
   Some principles which guide regional planning are such as protection environment, assessing carrying capacity of extensive agricultural and water use system, preservation of rare species and ecosystems etc.

(Marchand and Toornstra (1986) in Newson, M (1997) Pg : 152-153)

According to Turton et al, 2000, the successfulness of river basin management only can be achieved when some prerequisite are fulfilled in the operational river basin management. Turton et al (2000) explained about the prerequisites based on the best

practices of river basin management in both developed and developing countries. Those criteria are described below:

a. River basin management needs both robust and flexible institutional framework. It needs clear regulation and an integrated policy framework;
b. River basin management is carried out through planning and management which is driven for information and knowledge. Strategic assessment of water and related resources should actively pursue the generation of strategically information and knowledge;
c. River basin management should encourage integration built into institutions, resource management, and policy. It should recognize the holistic nature of ecosystems, and all policies, decisions and projects;
d. River basin management should develop community participation built into all processes. Community participation leads to government efficiency, ownership of policies and actions by the community, and to readily accepted principles of cost sharing.

Moreover, WWF (2007) explained that there are seven key elements which have to be fulfilled to actualize a successful IRBM initiative. The seven key elements are described as follows:

a. It needs a long-term management vision agreed to by all the major stakeholders.
b. It needs an integration of policies, decisions and costs across sectoral interests such as industry, agriculture, urban development, navigation, fisheries management and conservation, including through poverty reduction strategies.
c. It needs a strategic decision-making at the river basin scale, which guides actions at sub-basin or local levels.
d. It needs an active participation by all relevant stakeholders in well-informed and transparent planning and decision-making.
e. It needs an adequate investment by governments, the private sector, and civil society organizations in capacity for river basin planning and participation processes.
f. It needs a solid basic knowledge of the river basin and the natural and socio-economic forces that influence it.

(WWF, 2007)

2.2. The Concept of Adaptive Management

The concept of adaptive management has been developed by some ecologists such as Holling (1978), Walters (1986), Gunderson et al (1995) and other ones since more than past 25 years ago. It was initially advocated by Holling (1978) based on his consideration that in complex systems the outcomes of such management are difficult to be predicted. And because of this, it is needed a particular approach to explicitly addressed those uncertainties and design and evaluate creative alternatives to cope with the problem (Holling, 1978, Walters, 1986; Ohlson, 1999).

Adaptive management has been advocated as an approach for managing natural resources in the face of uncertainty and variability (Holling, 1978; Walters, 1986; Walters and Holling, 1990; Ohlson, 1999). In this term, uncertainty refers to the situation in which we have lack information that describes a problem (Klir and Wierman, 1999 as cited by Medema and Jeffrey, 2005). The premise is that the system response to management is often unpredictable so the information about the ecosystem is often deficient. (Holling 1978, Walters 1986, Holling & Walters 1990, Berkes et al. 2003).

Recently, the adaptive management concept has been pursued in diverse fields. It has been used not only in the natural resource arena such as for agriculture, fisheries, and forestry but also has been used for business and education arena (Stankey et all, 2005). It also incorporates various academic perspectives including learning theory, public policy, and experimental science.

Adaptive management is promoted as a method providing flexible and responsive management approaches (Gregory R et all, 2005). Flexible means that adaptive management allows the potential of a system for structural change, meanwhile responsive management refers to the potential of a system to adapt to changes in external boundary conditions (Medema and Jeffrey, 2005). Adaptive management drives a flexible approach in which policies are designed as hypothesis and management is implemented as experiments to test those hypotheses (Gunderson et al, 1995).

Adaptive management is an incremental approach based on experiential learning and decisions making strengthened by active monitoring of and feedback from the effects and outcomes of decisions (Prato, 2005, Jiggins & Rolling 2002). Experiential learning refers to the process for improving management policy and practice by learning from the outcomes of preceding operational policies and its implementation (British Columbia Forest Service, 2000 cited by Smith *et al* , 2007).

Adaptive management as argued by Bosch (2003) is represented as a cyclic process which initiated by planning activities and followed by implementation, monitoring and reviewing process. Generally, the process of adaptive management can be described as figure below:

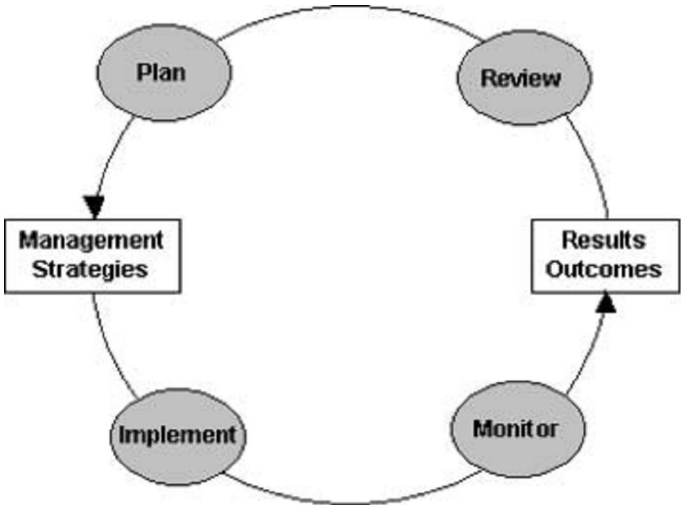


Figure 2.1. Generalized adaptive management cycle (Bosch et al., 2003)

In the cyclic process represented by figure above, plans are made to achieve particular objectives which are developed based on the current knowledge. Moreover, plans will be implemented, continuously monitored and reviewed. The results of monitoring and reviewing outcomes will contribute new knowledge which can be used to refine management plans for future implementation (Bosch et all, 2003). This learning cycle of AM (Figure 1 above) includes the following sequence of steps: establishing a stakeholder adaptive management team; defining the problems; establishing goals and objectives;

developing hypotheses about the effects of different management actions that address the uncertainties; designing management experiments/interventions to test hypotheses while meeting management goals; designing a monitoring plan to measure the impacts of management interventions; implementing management interventions; monitoring; evaluating the impacts in terms of management goals and hypotheses; and reassessing and adjusting the problem statement, goals, conceptual model, interventions, and monitoring plan(Walters, 1997). Those sequences form a cyclic in which there is an iterative management process (Bosch et al, 2003).

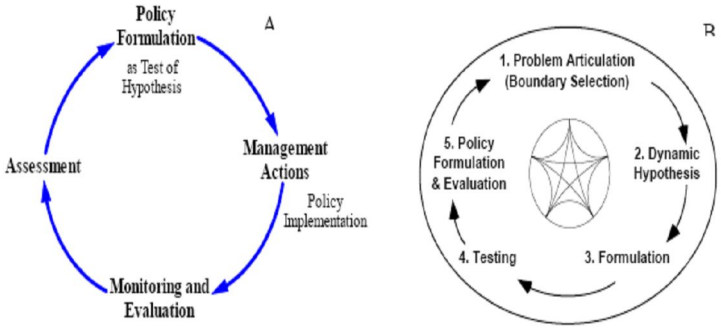


Figure 2.2: A) Adaptive management process as a structured learning cycle
B) Iterative process of model development (steps1 – 4) linked to policy formulation
Source : Pahl-Wostl, C. and J. Sendzimir, 2005

Some literatures report that there is a variety of ways to undertake adaptive management. Walters and Holling (1990) said that generally there are three types of adaptive management approach which are promoted by many ecologists. The first type is an evolutionary or trial and error learning model. The second type is passive adaptive management approach. And the last type is active adaptive management.

The first type of adaptive management approach (*trial and error learning model*) is commonly used in term of incremental adaptive management in which some learning from whatever management experience is undertaken. Scientist Charles Lindblom (1959,1977) argued that the management of complex system has to be approached by incremental model. Lindblom argued that system such as nations or cities could not possibly be managed directly by an appointed group of officials by means of comprehensively understand how the system work since the system is very complicated (cited in Gardner and stern, 2002). As a result, incremental approach should be used to manage and solve a complex problem by means of small trial and error step rather than trying to understand the problem comprehensively (Lindblom cited in stern and gardner, 2002). Moreover, Holling (1978) also advocated trial and error learning as an approach to face the complexity and uncertainty in the environmental management. The concept of trial and error learning points to the management based on experience. What information and knowledge which we have can be the departure point for trial. And errors will provide new information and understanding and become a basis from which new experiments are designed. Mitchell (2002) said that the failure made in the management process are accepted to attain understanding the previously unknown conditions and will improve our capability to deal with them. “With experience, new understanding is achieved and

progress is realized" (Mitchel, 2002). Moreover, Hilborn (1992) called this type of management approach as a reactive approach. In this type, the results of external decisions and choices are used to frame subsequent decisions to made improvement of the further results. There is no purposeful direction to it and one simply brings in whatever benefits derive from earlier experiences (Stankey et al, 2005).

The second type of adaptive management approach (*passive adaptive management*) is commonly addressed to create an improvement of management policies (Gregory R et al, 2005). Bormann et al. (1999) called the passive adaptive management as a sequential learning. In this term, the cyclic process includes developing hypothesis about the performance of the system, implementing a management action based on the available data, and closely monitoring to test the basic hypothesis. The historical data are used to develop hypotheses and to frame a single best approach for implementing management action (stankey et al, 2005). The hypothesis and assumptions are adapted with the objective to improve the overall management framework (Medema and Jeffrey, 2005). The outcomes of management actions are monitored continuously and new information resulted is used to update the historical data set, hypotheses and management actions (Gregory et al, 2006). The cyclic process is iteratively run to guarantee continuous improvement. Nevertheless, in reality, passive adaptive management often turns into basic trial and error learning in which explicit hypothesis is vague or even unavailable; the updating of historical data is done in an offhand way, and monitoring is often done incompletely (Gregory R et al, 2006). As a consequence, the passive adaptive management models sometimes can not give clear implications for management practices.

Differ from passive type which is more addressed to integrate experimentation into policy and management design and implementation; in the last type of adaptive management approach (*active adaptive management),* managers seek to define competing hypotheses about the impact of management activities and to design management experiments to test them (Gregory R et al, 2006) in order to improve new knowledge for management actions. In this type the physical environment are manipulated by testing a range of alternative management actions or treatments. The active adaptive management is more focused on developing alternative models and policies rather than focused on the search for the single best result (stankey et al, 2005). Thus, in this type, the design and of suites of policies are directly and simultaneously compared and evaluated (Bormann et al, 1999). The cyclic process management is addressed to the improvement of new knowledge giving contribution to the management of scientific knowledge base rather than creating an improvement of management policies. The management experiments are designed to provide data and feedback effectively and efficiently to improve new knowledge for management actions.

However, in practice, the concept of adaptive management faces some major barriers. According to Walters (1997), low success rate in implementing adaptive management is caused by following factors : the expense and risks of undertaking large scale experiments, a fear among research and management organizations that adaptive management may undermine their credibility; and fundamental conflicts among diverse stakeholders about ecological values. Moreover, Lee (1993) also consider that there are some other obstacles include the high costs of information gathering and monitoring, resistance from managers who fear increased transparency, political risk due to the uncertainty of future benefits, difficulty in acquiring stable funding, and fear of failure. Through analysis of adaptive management in the Florida Everglades, Gunderson (1999)

concluded that three major barriers are inflexibility in social systems, little flexibility in ecological systems, and technical challenges associated with experiment design.

2.3. Adaptive management And River Basin Management

2.3.1. The need for adopting adaptive management in river basin management

Two arguments are given to make clear why there is a need to adopt adaptive management in managing river basin. The first argument is that river basin constitutes a complex system including both biophysical and social elements which needs for interactive approach in its management. The second argument is that there are some factors which are difficult to be predicted in managing river basin so that it raises uncertainties. Those arguments will be described further as follows.

River basin is considered as a system in which all elements that play a role in the management arena are interrelated. It implies that decisions which are taken in river basin management including water issue and ecological river basin issue should be made through an interactive approach within the system. Interaction in river basin management can be developed within two main interacting systems (Ash, 2000). Firstly, it is the interaction between river basin managers and other stakeholder and community which should be composed through information exchange with the communities and stakeholder' involvement in decision making process. Secondly, it is the interaction between water managers and the water system including the whole of interrelated physical, chemical and biological components.

In addition, it is argued that the management of river basin often deals with many uncertainties (Medema and Jeffrey, 2005). Some factors can clarify why uncertainties come up in river basin management. Firstly, variability in environmental, demographic, socio, economic and other factors make river basin system responses to management actions uncertain. Secondly, sampling and measurement errors make it difficult to precisely measure how systems respond to management actions. Thirdly, "ecosystems (including river basin ecosystem) are not only more complex than we think but they are more complex that we can think" (Egler as quoted by Medema and Jeffrey, 2005). Incomplete understanding and the complexity of river basin systems prevent accurate prediction of systems responses to management actions (Conroy, 2000; Prato, 2003). It is supported by Medema and Jeffrey, 2005 that also argue that it is difficult to foresee future key drivers and issues and the responses of the river basin systems to the drivers and issues because of the complexity of river basin systems.

Because of both issues, there are some criticisms addressed to the weaknesses of conventional management approach in responding the challenges faced in river basin management (Pahl-wostl, C. 2007). The first clarification of this criticism is that conventional management approach in river basin management is more focus to technical approach in which management is dominated by authorities and technical experts (Wolsink, 2005). Rondinelli (1993) cited in Mitchel (2002) said that the conventional approach emphasize on the using of blueprint to maintain control and to minimize variation in management process. The approach will be suitable if it is used for the project emphasizing on physical infrastructure and construction facilities (Mitchell, 2002). On the other hand, in the term of river basin management, the project is not just focused on the physical and construction infrastructure but it also emphasize on social and environmental development project which has level of uncertainty and complexity and need more iterative approach. Thus, it is argued that blueprint approaches were less appropriate. The river basin management initiative should be considered as experiential

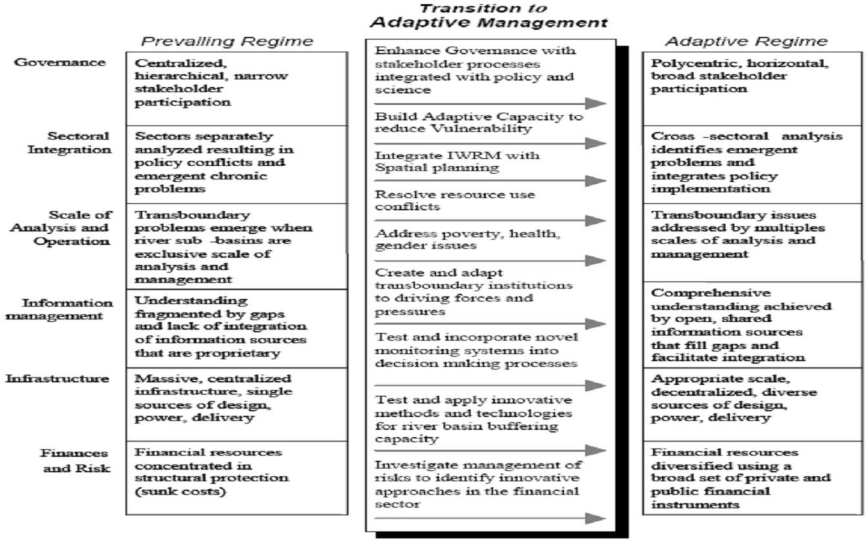
learning (Rondinelli, 1993 cited in Mitchell, 2002). The second clarification is that conventional approach tends to be lack interaction between components within the river basin systems since management basin governance is centralized. It is contradictive to the characteristic of river basin management which requires more interactive actions between components of the system. The third argument for the criticism of conventional approach is that the assumption brought by conventional management approach in which managers well understand about the response of the system to management actions is not fully correct. In practice, it is difficult to ensure that the system will respond management action appropriate with our prediction. So, it needs an approach which can manage the system under uncertain state.

Based on the understanding, thus, there is a need to apply other management model to fulfill the need for interactive approach and the need for coping with uncertainties in river basin management. Trist, 1980 (cited in Mitchell, 2002) argued that the adaptive management will be appropriate as an approach to manage complexity and uncertainty in the environment since it comprises of four characteristics which can cope with the problem about complexity and uncertainty. Those characteristic are continuous process, participatory, integrated approach, and active coordination. Continuous process allows frequent modifications which will be essential for learning; participatory allows all stakeholders to have a role in management process; integrated approach will incorporate various interests; and active coordination is done for recognizing the interdependence of issues and decisions.

2.3.2. Transition towards more adaptive management in river basin management

According to Pahl-Wostl et al (2005), the need for shifting to more adaptive management in river basin management is part of the "soft-path" advocated by Gleick (2003) to build greater flexibility in water management regimes to address the rising uncertainty from global change. The soft path points a change towards understanding management as learning rather than control, directing management process to social dimension by involving a wide range of basin stakeholders.

Pahl-wostl et al (2005) said that there are some structural requirements for a system to be adaptive which are different from the conventional regime. Those requirements are describe in this table below:



Source : Pahl-Wostl et al, 2005

2.4. Institution Building for adaptive river basin management

2.4.1. Institution in general

Institutions are understood as a shape of human interaction which consists of norms, values, and behaviors that persist overtime and bring actions (Uphof, 1986; Hearne R., 2007, March and Olsen, 1989). Institutions provide structure and regularity for everyday life and a guide for human interaction (Svendsen, M. et al, 2005). Therefore, it is recognized that institutions is not only considered as the rules of the game, or set of working rules but are reproduced and transformed through interaction and negotiation between heterogeneous actors having diverse goals (Mosse, 1997). Rydin Y (2003) said that institutions are spaces arenas for conducting interaction between social actors, in which communication, dialogue, debates and deliberations occur.

In addition, institution is also considered as instruments for transforming and interpreting information into knowledge (Saleth and Dinar, 2004). It is argued by Hodson (1998) that institutions is important instrument providing a cognitive framework to interpret the information based on data, fact, habits, and customs and transform them to become useful knowledge (Hodson, 1998 cited in Saleth and Dinar, 2004). The way for interpreting and transforming the information into useful knowledge enable the individual and collective group to develop coordination and social interaction.

Gunderson et al said that institutions are ''the sets of rules or conventions that govern the process of decision making, the people that make and execute these decisions, and the structures created to carry out the results'' (Gunderson et al., 1995a). In addition Ostrom (1990) argued that institution is considered as "a sets of working rules used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregations rules will be used, what procedures must be followed, what information must be or must not be provided, and what payoffs will be assigned to individuals dependent on their actions" (Ostrom 1990). Thus, commonly it is recognized that institutions includes the organizational structure, the policy and legal environment (policies, laws, regulations, rules, rights, conventions and customs both formal and informal) and the processes, procedures and the mechanisms of planning, decision making, coordination, and negotiation (Svendsen, M. et al, 2005).

Generally, institution is distinguished into two elements which are formal institution and informal institutions (Matczak, P et al, Saleth and Dinar, 2004). Formal institutions are pointed to institutions which are embedded in state operations. It includes constitution, law, regulation, government organization etc. Meanwhile, informal institutions rely on enforcement methods not supported by the state. It includes customs, traditions, rules of game, etc.

2.4.2. Institution in River Basin Management

According to Svendsen (2005), the organizational patterns for basin governance are distinguished into two types. The first type is centralized basin governance (monocentric type) and the second type is decentralized basin governance (polycentric type). The centralized type is characterized by decision making which is taken by a single unified public organization. Meanwhile, the decentralized basin governance is characterized by active coordination between existing river basin organization, layer governments and initiatives in decision making process for the entire river basin. In addition, Baer and Marando (2001) cited in Schulz (2007) emphasize two key characteristics of decentralized river basin governance. The first characteristic is related to the tendency of decision and action to locate at the lowest appropriate level to meet the needs of actors within the

system. The second characteristic is related to the capacity for continuous reorganization of management units to better accomplish their tasks.

In other perspective, Shah, T. et al (2005) distinguish three models of strategic organization in managing river basin. The first model is called the hydrological model in which a river basin organization/authority cutting across administrative boundaries, takes over all charge of water resource management. The second model is called administrative model in which water management is the responsibility of territorial organizations unrelated to hydrological boundaries. And the last model is coordinating mechanism superimposed to administrative organization to achieve basin management goals. However, the hydrological model can be associated to the centralized type of basin governance; meanwhile the administrative model can be associated to the much decentralized type of basin governance.

Svendsen (2005) argue that there are strengths and weaknesses of both two type of river basin organization. The strength of the centralized basin governance type is that the managers/decision makers can coincidentally manage and control the upstream and downstream basin. Nevertheless, there are weaknesses of centralized basin governance. The governance organization will just deal with water, and as a result water policies are separated from other relevant policy sectors such as agriculture, environment, economy, etc. Another weakness is related to the narrow range of stakeholder participation and less accountability.

On the other hand, decentralized basin governance is considered as the model which can cope with the weaknesses of centralized basin governance. The coordinative processes developed in decentralized basin governance encourage a more responsive governance process. There are several advantages to decentralized basin governance: (1) higher layers of governance protect the rights of the others in the system; (2) higher layers are able to see and address larger scale impacts and system-wide vulnerabilities; (3) system of overlapping management units allows successful management strategies to be shared with others in the system (E Ostrom 1999).

Furthermore, Alaerts (2003) consider that there are some characteristics which have to be brought by river basin organization. Firstly, river basin organization should allow the rights of higher authority to initiate a process of development towards such cooperation. Even though in fact river basin management is run in local cooperation, but the role of the higher authority is still required to stimulate such cooperation. Central government usually holds the tasks of setting national policy and guidelines, and multi- year national plans that must be conformed by basin plans. Secondly, river basin organization has various tasks including the tasks for formulating policy and conducting coordination and planning. In addition, it also has operational tasks for financing and infrastructure development. Thirdly, the critical characteristic of river basin organization is addressed to the need for bringing stakeholder participation and supervision. The review of all case studies strongly suggests that one of the most specific features of river basin organizations is their functioning as forums in which stakeholders interests can be represented and that can serve as mechanism to address and resolve conflicts, and achieve consensus both on the vision on the future of the basin and on its development, and on the allocation of the water resources (Alaerts, 2003).

In terms of stakeholder participation in river basin management, EU directive 2000/60/EC guide that all interested parties should be encouraged to be actively

involved especially in producing, reviewing and updating the river basin management plans. The interested parties includes the stakeholder and general public who have interest on the certain problems, plans, projects and programs related to river basin management.

To gain the successful arrangements of river basin organization, Alaerts (2003) advocates some points which need to be applied. The first point is the need for applying checks and balances in the design of the institutions and organizations to prevent monopolistic behavior. The second point is the need for applying sticks and carrots to encourage water users and other stakeholders to subscribe the collective action agreement. The last point is the need to develop the trust against the partners and confidence in a win-win situation among all stakeholders.

2.4.3. Institution for Adaptive River Basin Management

As it has been already mentioned above, that recently there is a need to shift the approaches of river basin management toward more adaptive management. As a consequence, the governing institutions of river basin management have to conform to the performance of adaptive management which emphasize on adaptive and learning driven.

There are some elements which differentiate governing institution in conventional management and adaptive management. Cortner and Moote (1999) explain the differentiation of both ones as follows:

	Traditional management	**Adaptive Management**
Management and organization	a. Centralized, rigid; little focus on incentives or innovation b. Hierarchical, top-down bureaucracy	a. Decentralized, interrelated teams, adaptive, flexible; focus on incentives, innovation, shared learning b. Adaptive, bottom-up, cooperative, open
Decision making	a. Rigid, command-and-control, authoritarian, expert-driven b. Science provides "the answers	a. Deliberated, inclusive b. Science provides information; if alone, it cannot provide answers c. Adapted to context of problems, interrelated to other problems, considers externalities
Participation	Low participation	Discursive, deliberative
Leadership	Authoritarian, command, leaders designated	Situational; leaders arise from the community

Table 2.1: Differentiation between traditional management and Adaptive management
Source : Cortner and Moote (1999).

In addition, Raadgever et al (2006) considered that to build adaptive management, the certain requirements have to be fulfilled by river basin regime. They used some criteria and indicator as requirements needed by the river basin management regime to bring adaptive management concept into practice. Those criteria include actor networks, legal

frameworks, information management and financial management. Those criteria and indicator can be described in table as follows:

Table 2.2. Framework for adaptive management institutions (Raadgever et al, 2006)

No.	Criteria	Indicator
1.	***Formal and informal actor networks***	
	- *Cross sectoral cooperation*	- Sectoral governments actively involve other governments sectors - cooperation structures include government bodies from different sectors - conflict are dealt with constructively, resulting in inclusive agreements to which the parties are committed
	- *Cooperation between administration level*	- lower governments are involved in decision making by higher level governments - cooperation structures include government bodies from different hierarchical levels, many contacts generally - conflict are dealt with constructively, resulting in inclusive agreements to which the parties are committed
	- *Cooperation across administrative boundaries*	- Downstream governments are involved in decision making by upstream governments - International/trans-boundary cooperation exists - conflict are dealt with constructively, resulting in inclusive agreements to which the parties are committed
	- *Broad stakeholder participation*	- Legal provisions concerning access to information, participation in decision making and access to court - Cooperation structures include non governmental stakeholders - Non governmental stakeholders contribute to agenda setting, analyzing problems, developing solutions and taking decision (co-production) - Non governmental stakeholders undertake part of river basin management themselves - Government takes stakeholders input seriously
	- *Coordination*	- Cross sectoral coordination, coordination between administration level and coordination across administrative boundaries
	- *Communication*	- Interactive communication - Formal and informal communication
2.	***Legal Framework***	
	- *Appropriate legal framework*	- a complete and clear legal framework for water management - policies are reviewed periodically
	- *Adaptable legal framework*	- laws and regulation can be easily changed - water use right can easily be changed
3.	***Information management***	
	- *participative information production*	- Different government bodies and non government stakeholders are involved in setting the terms of reference and supervising the project management
	- *Broad Communication*	- Governments actively distribute information and data to public (on the internet, by producing leaflet, etc)

	- *Interdisciplinary* - *Utilization of information* - *Explicit consideration of uncertainty*	- Governments exchange information and data with other governments - Different disciplines e.g. technical and engineering sciences, ecology and the social sciences are involved in defining and executing the research - New information is issued in public debates - New information influences policies - Uncertainties are not glossed over but communicated
4.	**Financial Aspects** **-** Appropriate financing system	- sufficient (public and private) resources are available - cost are recovered from the users by public and private financial instruments - Decision making and financing in one hand - Authorities can take a loan and depreciate their assets to facilitate efficient use of resources

In adaptive management, governance regime should be polycentric and stakeholder participation plays a major role (Pahl-Wostl et al, 2005). Stakeholders include all individuals, groups and organizations that area directly concern to solve the problem/issue (s) related to river basins (Gray, 1989 cited in HarmoniCop, 2003). According to Green (2003) cited in HarmoniCop (2003), stakeholders which should be involved in river basin management consist of those whose actions to promote or inhibit the achievement of river basin management; those who have knowledge or experience about river basin management; those who will be affected by the outcome of river basin management; and those who have an interest in river basins. In adaptive river basin management approach, it is advocated that all stakeholders should learn continuously and actively (Pahl-Wost, 2004).

It is argued that adaptive management should be considered as a social learning giving an opportunity to learn from the actions and to reorient iteratively toward sustainability. Social learning is developed through building collaborative and adaptive capacity in individual, organizational, relational and governance capacity (Foster-Fishman *et al*,. 2001). Hierarchical governance involving stakeholder participation in management processes is expected to increase adaptive capacity of society so that it can innovatively respond to uncertainty and change in river basins (Pahl-wostl et al, 2005).

Moreover, legal framework also can support the effectiveness of adaptive management if regulations are complete, clear enough, and contain sufficient detail guidance but they are not too restrictive or has to be adaptable (Raadgever et al, 2006). According to Raadgever et al (2006), a complete and clear water regulation should provide some rules for water management which are :

a. Rules about basic principle of integrated water management
b. rules for public participation and access to information
c. rules for giving incentives for periodical review and change of regulation and for changes in the actor network, information management and financial system.

Additonally, Paehlke and Torgerson (1990) consider that there are some principles which have to be brought to build effective institution adaptive management. Those principles are described as follows:

1. Non-compartmentalized: organizations should resist the "bureaucratic tendency toward compartmentalization" and develop the capacity to hold diverse disciplines.
2. Open: institutional decision making should be open and transparent and allow citizen access to debate and discuss within bureaucratic walls through legal processes as well as access to information
3. Decentralized: management focuses on local institutions.
4. Anti-technocratic: organizational processes must be conducted in a manner that educates both citizens and experts.
5. Flexible: institution should develop adaptive capacity and an ability to operate under uncertainty and ambiguity.

(Paehlke and Torgerson (1990) cited in stankey et al, 2005)

According to Scholz and Stiftel (2005), successful river basin management depends on how governance builds adaptive institutions. There are five major challenges which have to be resolved to build adaptive governance which are

1. Representation (Who should be involved?)
2. Decision Process (How can authorities and involved stakeholders reach policy agreements that serve them well?)
3. Scientific Learning (How can policy makers develop and use knowledge effectively)
4. Public Learning (how can resource users and the relevant public develop common understandings as a foundation for consensual policies and policy process
5. Problem responsiveness (How well do decisions achieve natural resource management, goals, including sustainability, equity and efficiency?)

2.5. Summary

Finally, in this paragraph I have some points which can be the synthesis of this chapter :

1. River basin management as a part of water resources management should be tackled from a holistic and integrated perspective considering environmental, social and economic interests and their interdependencies (Dublin principles).
2. To bring about holistic and integrated management, the conventional approach is considered not appropriate enough with the characteristic of complexity and uncertainty in river basin management. Adaptive management is advocated to cope with this problem.
3. The key characteristics of adaptive management are cooperative, discursive and deliberative, open, flexible, innovative, responsive and establishing learning process.
4. To bring the concept of adaptive management, it needs institution building which is more socially constructed.

2.6. Analytical Framework of the Research

Based on such understanding of theories above, I sketch a broad analytical framework of the research. To assess the extent to which both institutions of RBM bring the concept of adaptive management I synthesize some criteria and indicators which promoted by Cortner and Moote (1999), Raadgever et al (2006) and Pahl-Wostl (2005). Those criteria and indicators are described in table below:

No.	Criteria	Indicator
1.	Type of basin governance	Polycentric Governance : active coordination between existing river basin organization, government layers and stakeholder initiatives in decision making process for the entire river basin
2.	Sectoral Integration	Cooperation and coordination among sectors are well developed e.g. integration between spatial planning and water management
3.	Public Participation	Planning and decision making processes as well as implementation, monitoring and evaluation in RBM should be done in deliberative processes by involving actively all stakeholders and public communities
4.	Information Management	Information should be developed by various sectors related to water, involving all interdisciplinary subjects and various actors (government, NGOs, communities) through the development of proper coordination and cooperation. The information collected should be able to influence water policy (be utilized in decision making). In addition, this information also has to be disseminated properly to all stakeholders and public societies to guarantee the transparency of the information.
5.	Legal Institution	Comprehensive legal framework supporting the development of the indicators of adaptive institution (openness, transparency, deliberative cooperative, and innovative); nevertheless the legal framework not too restrictive or has to be adaptable. There should be an incentive to review

Table 2.3 : The Criteria and Indicator of Adaptive Institution which will be used for assessing the current institution of Brantas and Rhine RBM

In the chapter 3 and 4, some key points/elements picturing the current institution building of each river basin management: Brantas and Rhine RBMs will be discussed and elaborated. Those key points/elements are related to the structure, the legal institution and the management process including coordination, cooperation, and participation in both RBMs. Those factors will be compared for Brantas and Rhine RBMs based on the criteria and indicators above and it will be analyzed the extent to which the strengths and weaknesses of both RBMs' institutions in bringing adaptive management concept on river basin management. The results of the comparative analysis will be substances to give recommendations for better performance of RBM institution. For gaining clear understanding about the research framework, it can be shown below:

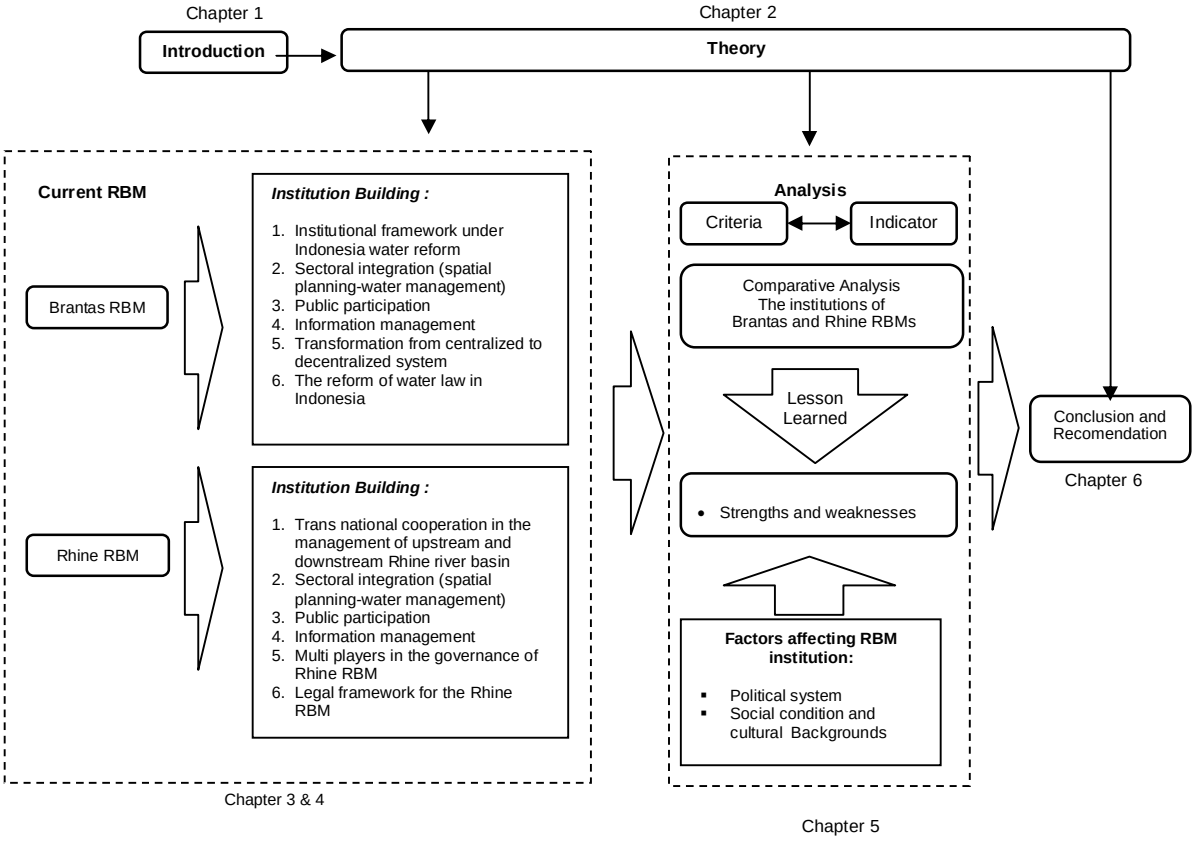


Figure 2.3. : Analytical Framework of the Research

Chapter 3
Institution Building in Brantas River Basin Management

3.1. Overview Brantas River Basin

Brantas river is the largest river system in East Java Province, Indonesia. It lies along 320 km. The basin areas lie approximately 11.800 km2 or about 24.6% of East Java's land area (Bhat etal, 2005) and it is divided into six sub basins which are Lesti sub basin (625 Km2), Konto sub basin (687 Km2), Widas sub basin (1.539 Km2), Brantas sub basin (6.719 Km2), Ngrowo sub basin (1.600 Km2) and Surabaya sub basin (631 Km2)(Gunatilaka, 1999). Based on the administrative boundaries, the basin area covers nine regencies which are Sidoarjo, Mojokerto, Malang, Blitar, Kediri, Nganjuk, Tulung Agung, Trenggalek and five municipalities which are Surabaya (capital of East Java), Mojokerto, Malang, Kediri and Blitar (Ramu, 2004).

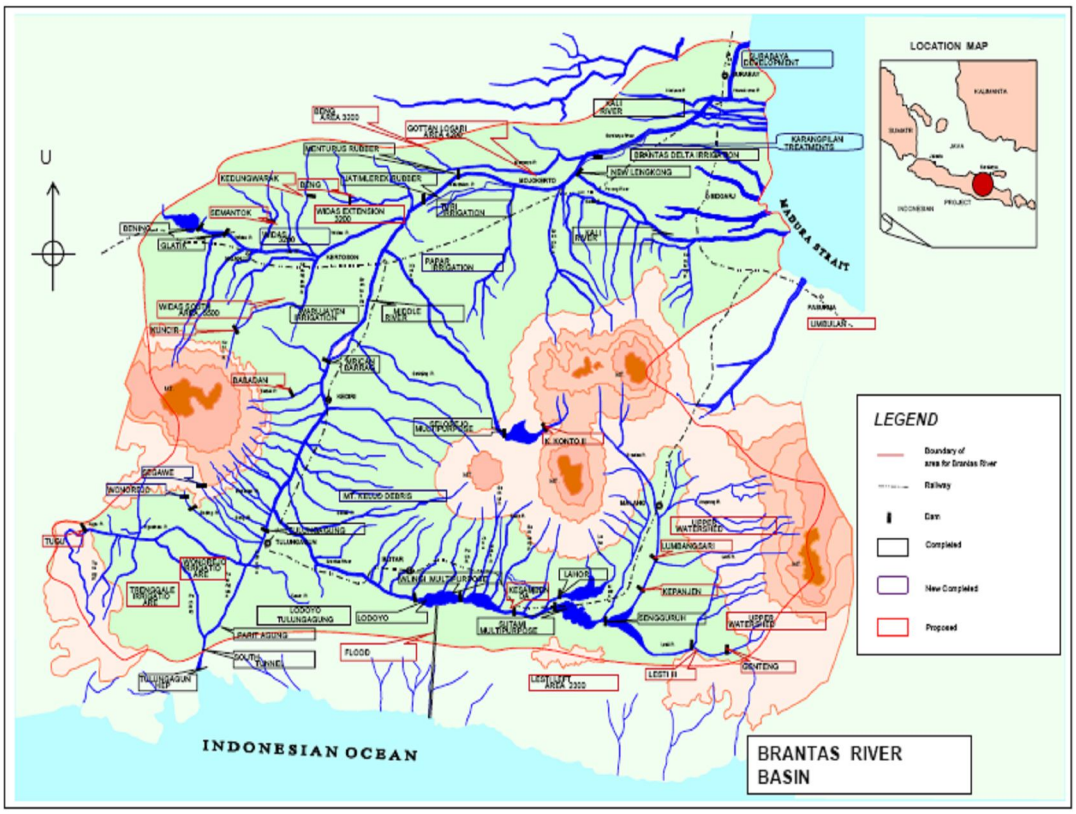


Figure 3.1 : The Map of Brantas River Basin (Source: Ramu, 2004)

As the largest river in East Java provinces, Brantas river has significant role to support the development of East Java province. Generally, many activities in rural and urban area utilize Brantas river water. The water is mostly utilized for irrigation by around 42.6 % of the 907.000 ha of agricultural land in East Java, as well as for domestic and industrial water supply, hydroelectric power, brackish water fishponds, etc.

During last three decades, development has been rapidly growing in basin area. Industrialization, agricultural development, urbanization and population growth are very intense. However, the intense development in basin area has contributed to several critical water resources problem such as water pollution, flooding and seasonal water scarcity. The rapid industrial growth in basin area has contributed to the degradation of water quality in the Brantas river because of unmanaged effluent of water waste. Annual severe flooding occurs due to the increasing in flood peaks because of changing land use and heavy deforestation, inadequate capacities of the river channel in the middle and lower reaches, high levels of sedimentation impacting to the river morphology and causing river mouth problems, lack of land use zoning and enforcement of land use controls, inadequate urban drainage, urban land subsidence due to over exploitation of ground water, poor maintenance of flood infrastructure and lack of funding and institutional weaknesses in flood management (Ramu, 2004).

3.2. Institution Building in Brantas RBM

3.2.1. Institutional framework under Indonesia water Reform

Water resources sector in Indonesia faced complex problem due to the adverse impacts of population growth, urbanization and industrialization. The problems increased along with the poorness of regulatory structures, institutional and financial framework. Therefore, it required reformations on water policies addressed to build more effective and efficient institutional framework for water resources management.

In 1999, government of Indonesia assisted by World Bank through water sector adjustment project (WATSAP) organized policy reform on water sector in Indonesia. The agenda of water reform in Indonesia is aimed to strengthen regulatory institution and to improve institutional framework for water resources management generally as well as to improve organizational and financial framework for river basin management. The reform is aimed to enhance the effectiveness and efficiency in water resources management in Indonesia by building transparency and accountability. Moreover, the policy reform on water resource management is expressed to move from narrow sectoral policies to more holistic and integrated policies (Anshori, I). The result of the reformation on organizational and financial framework of Brantas river basin management is shown in further paragraphs.

a. The establishment of water management committee as coordinating body for formulating water resources policy and action plan

Complex issues in river basin management were not new topic in the management of water resources in Indonesia. It has already acknowledged that the poorness of coordination among sectoral agencies in handling competing interests in water resources management has emerged the increasing problem over water resources. The establishment of water management coordinating body named "water management committee" (WMC) in national, provincial, local and basin level is one of the efforts to cope with coordination problem. The establishment of WMC is aimed to some improvements e.g. on monitoring WRM, reviewing broader issues concerning on WRM, improving efficiency in water use, promoting effective use of financial resources through priority allocation among sectors, and providing platform for key stakeholder participation in WRM (WATSAL, 1999).

Water management committee (WMC) is established based on the regulation of Ministry of public work and supported further by provincial/local government regulation. In the early year's development, it was merely composed of related sectoral government. The

absence of stakeholder involvement such as NGOs and public representations in WMC has prevented input from the non governmental sector and communities to decision making so that sometimes the interests of those stakeholders were not covered in the policies, plans and programs of RBM (Ramu, 2004). Nonetheless, the high pressure of supranational organization such as World Bank have pushed government of Indonesia to enact the new regulation on water management committee through government regulation no 12 of 2008. In this regulation, there is a requirement to involve NGOs, experts and public representatives in WMC's membership. They have to be involved directly in WMC's activities and have the rights to give ideas, opinion and suggestion in the formulation of policies, plans and programs of RBM.

The main role and responsibility of WMC is to formalize water policies for River Basin Management as well as to monitor and evaluate the implementation of management system organized by river basin operators. However, based on the analysis of WATSAP (water sector adjustment project), there are some positive impacts brought by the establishment of these coordinating bodies. Firstly, it improves political will to focus on important social and physical problems on river basin. Secondly, water management committee may integrate policy and planning of all modes of water (both surface and ground water) under one legal umbrella. Thirdly, it will review all regulations related to water sector in which in the last period the regulations were confusing and overlapping. Lastly, it improves coordination and the involvement of non governmental organizations (NGOs), experts and citizen representatives in the water policy making.

b. The establishment of autonomous basin management corporation

River basin is increasingly acknowledged as the appropriate unit for the analysis and management of water resources. Since 1990, Government of Indonesia use integrated river basin management approach to manage water resources. It established Perum Jasa Tirta I (PJT I) as a river basin organization which has main responsibility to develop the management system of the entire Brantas river basin using the concept of integrated river basin management. The establishment of PJT I as river basin organization has changed strategic organization model in the management of Brantas river basin from administrative models[2] to hydrological model[3].

PJT I was established as an autonomous state-owned company in form of public corporation. It is a profit oriented company which has authority to raise revenues through water user charges, pollution fee, sand mining, and tourism retribution. The objectives of the establishment of PJT I are (1) to build financial corporation in arrangement of bulk water supply and pollution discharge fees, and (2) to improve integrated management of water allocation and discharged, integrated management of surface water and ground water, integrated management of flood and drought control, and integrated management of upstream and downstream basin area.

Previously, financial support became one of the problems of water resources degradation in Brantas basin since there was limited budget of national government for the operation and maintenance of infrastructures in basin area (NARBO, 2004). However, to ensure optimum benefit of some water resources infrastructures at their planned lifetime, the amount of funds are required to keep the functions of those infrastructures. Based on

[2] In the hydrological model, a river basin organization/authority will cut across administrative boundaries and takes over all charge of water resource management

[3] In the administrative model, water management is the responsibility of territorial organizations unrelated to hydrological boundaries

that situation, government of Indonesia decides to establish state-corporation (PJT I) for the management of the entire Brantas river basin. One of the objectives of this establishment is to improve public and private participation in water resources management in order to reduce the national and regional development fund (NARBO, 2004). In this concept of public private partnership, there are three basic components of organization including regulators, providers, and users. Regulators refer to government (national/provincial/local government) which formulates regulations, policies and guidance on water resources management. Providers refer to organization which supply services concerned to water resources management. In this term, PJT I is regarded as provider in which it provides services for water users by developing infrastructure and managing water resources in the entire river basin. To carry out its responsibility, PJT-I collects funds from users (parties which have to pay for service provided by PJT-I). Those funds derives from water service fee/tax paid by beneficiaries, pollution fee/tax paid by polluters, and government subsidies paid for the development of social/public services such as for flood control, water quality control, and water resources conservation. Furthermore, those revenues will be reapplied for the development of river basin such as for water quantity and quality management, flood control management, environmental river management, watershed management, water resources infrastructure management, and research and development. Thus, PJT-I has important responsibility to carry out the integrated management of Brantas river basin entirely.

However, Brantas RBM is considered having success under the management of PJT I and it serves as precedent for developing river basin management for other river basin management in Indonesia (Gunatilaka, 2004). It is because PJT I develop the integrity of operational management, planning and institutional framework in carrying out the management of the entire Brantas river basin so that it is likely easier to deal with related water issues. Further, it will be mentioned the positive impacts of the establishment of PJT-I on the improvement of Brantas river basin management. Firstly, the establishment of PJT I enables better mechanism for conservation, water pollution control, and land use control in upper catchments. Secondly, full autonomy of PJT I on RBM ensure that revenues from water charges and pollution fees will be returned to water sector management. Thirdly, by establishing PJT-I as public company, financial problem of government on water sector management can be solved and it will raise better allocation of budgets. Fourthly, decentralized authority toward PJT I can push the increasing of responsiveness to local needs/interests. Finally, the autonomy of PJT I in the management of river basin can promote better coordination in strategic planning and management of river basin.

c. The integration of water management at regional and river basin level

When the strategic management of water resources has changed from administrative models to hydrological model, it needs an administrative organization to integrate water management at regional and river basin level. Therefore, provincial government set up basin water management unit (Balai PSDA) to implement water resources management using the river basin management approach. The Balai PSDA is built under the responsibility of provincial public water resources service (PWRS) to manage water resources based on river basin unit area. Thus, it has authority to manage and integrate river basin lying across district/regency/municipal. The responsibilities of Balai PSDA are to manage water allocation for several users, to control flooding and drought, to monitor and control water pollution, and to maintain inter-district irrigation system.

2. Sectoral Integration

Since planning functions are separated between department and government levels, the management of water resources faces the problem of lack of sectoral integration. For instance, Department of Mines has competence to issue license for groundwater extraction, but the management of ground water is not under the responsibility of this department. Moreover, license for developing activities such as building housing or industry is usually issued by the National land Agency but it does not coordinate with water management authorities to consider the aspects of water requirements. However, those are examples of the poorness of sectoral integration in water resources management in Indonesia. Moreover, lack of sectoral integration is also pointed to coordination and integration between spatial planning and water management. However, it becomes critical issue in Brantas river basin management.

Land management in relation to water is critical issues becoming public concern in Brantas basin area. It is because many issues related to water quality and quantity e.g. floods and landslides, contamination of drinking water, siltation of dams and water ways etc are related to the management of land use in upstream catchments area. The increasing of land use change for settlement and industrial zones and the intensive legal and illegal logging in upstream catchments have emerged negative impacts such as flooding, land slide, soil erosion, deepening ground water level, water pollution, et cetera in downstream area.

It is acknowledged that the most important aspect of inter-sectoral water resource planning is interrelation between spatial planning and water resource management. Most of negative impacts suffered by downstream area are the result of inadequate attention to spatial plans. There are some evidences for the lack of enforcement on spatial planning in Brantas basin. For instance, there are the increasing amounts of the construction of housing estate in upland area designated for ground water recharge, the development of industrial area in river floodplains in order to increase accessibility to use Brantas water and to discharge waste water back to the river, the conversion of agriculture land or forest area to settlement or industrial estate, et cetera. It is stated that in 2004, forest area in east java province just remained about less than 14% of the basin area (Walhi, 2008). In addition, almost 51 % of forest area in upper catchments has been degraded and a part of this area has been changed to other utilization. However, the implications of those spatial policies have negative impact on water. Although, the deliberation on spatial planning and water management has already existed but the follow up actions rarely seems to be taken.

However, the issues related to spatial planning and water degradation in Brantas basin area has become polemic for long time. Many respects are pointed to those issues. Regional autonomy, however, is considered as one of the factors for the increasing of infringement of existing spatial plans. In decentralization era, the initiative to improve social welfare of the region tends to be enforced merely in short term vision, not considering environmental preservation and sustainable development yet. Therefore, it is found that land conversion from conservation area to productive area usually is run under the excuse for the improvement of regional income. Based on the national statistic data, in 2001, the rate of land conversion from conservation forest to other land utilization is 19.000 ha/year in Java. Meanwhile, the conversion from agriculture land to non agriculture land is 50.100 ha/year. However, deforestation and agriculture land conversion in basin area have significant impact to the degradation of environmental quality of the river. Additionally, the other factors that lead to the infringement of spatial

planning are the poorness of planning process because of poor public involvement, poor monitoring and controlling system on the land development, lack of law enforcement, and weak coordination and cooperation system cross-administrative boundaries (upstream regions and downstream regions). Sectoral and regional egoistic may also lead to the lack of coordination and cooperation among local government. Because of great autonomy belonged to local government, it tend to exploit the resources of the region to encourage the development of the region without considering its impact to other regions.

However, to cope with those issues above, there is a reformation against spatial planning regulation in Indonesia. In the new regulation (the law no 26 of 2007) on spatial planning, there are some points supporting integration between spatial planning and water sector. Those key points are:

1. Regional spatial planning has to designate forest area at least 30 % of river basin area (article 17 point 5) to maintain the hydrological system in basin area
2. Urban spatial planning has to designate green space area at least 30 persen of urban area (article 29 point 2) to maintain the hydrological system in urban area.
3. The establishment of spatial planning has to consider connectivity inter-regions, inter-functional area, and inter-activities (article 17 point 6). This principle should have implication to conflict resolution related to land management and water management in upstream and downstream area.
4. The formulation of regional spatial planning has to consider the study of regionally spatial implication, environmental carrying capacity, and spatial planning of cross-border regions (article 22 and 25).

Additionally, there is a main difference between old spatial planning and this new spatial planning. In the old spatial planning, it is only concerned to planning activities; while in the new one, it has recognized the balancing between planning, implementation and controlling activities. The new spatial planning gives the room for sectoral government and communities to control the implementation of spatial planning and also give room for law enforcement against the violations on spatial planning.

3. Public Participation in Brantas RBM

Public participation is one of the principles which have to be advocated to build adaptive governance in water resources management. As it has already mentioned in the theoretical framework that adaptive management is concerned to learning process. Meanwhile public participation is one of the efforts to encourage social learning in the management of water resources. However, in the concept of adaptive management, public participation and collaboration is not only required within planning process but it is also required within every step of management process.

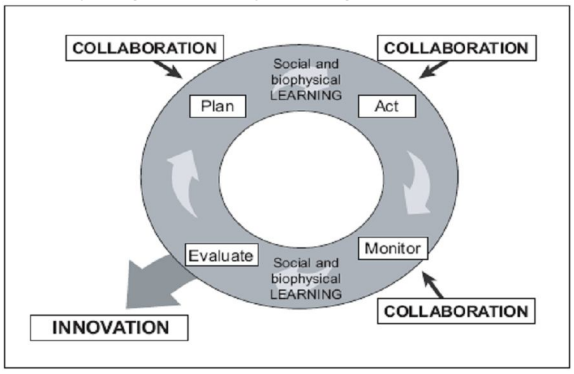


Figure 3.2 : the process of adaptive management (Graham and Kruger, 2002)

Public participation in water resources management in Indonesia has been given attention since there is an institutional and structural reform of water resources management at national, provincial, local and basin levels. The attention to public participation on WRM has been strengthened by regulating it in new water law no. 7 of 2004. Under this regulation, communities including experts, non governmental institutions, water user associations, customary community representatives, etc are given the role in the preparation of WRM policies, planning process, construction, operation, and maintenance, monitoring and supervision of the WRM. In planning process, there is a mechanism for public participation which is described detail in article 62 of the water law. Competence authority invited stakeholders including water user association and non governmental organization for consultation in the preparation of water resources management and planning process. Furthermore, the competence authority has to publicly announce the draft of water resources management plans to the communities. The communities have right to give their objection against the draft of water resources management plans within certain period determined and the competent authority will review the draft of the plan based on the objections before it is stipulated. Based on the mechanism, it is expected that policies, plans, and programs on water resources management represents local needs. However, the objectives of public involvement in water resources management are (1) to protect the interests of community, (2) to empower community, (3) to ensure transparency in water resources management, and (4) social learning which is directed to creating new values, structures and problem formulations.

Based on the water law no 7 of 2004, the level of public participation within planning process is improved from informing level to consultation level. In this level, the competence authority invite stakeholders and public representatives to collaborate in formulating policies, plans and programs concerned to water resources management. By promoting participation processes, communication among stakeholders, sectoral government and competence authority can be enhanced in order to achieve deeper understanding of one another.

According to Gunatilaka et al, during the last decade, public participation in Brantas river basin management has been improving. The establishment of regional water management committee involving stakeholders, experts and public representatives in developing policies, plans, and programs of Brantas river basin management shows the commitment of government to improve its responsiveness especially toward water user interests and local interests in general. Nevertheless, the road to meaningful public participation in water resources management in Brantas river basin is still far from perfect. Many challenges are faced in the implementation. First of all, public participation sometimes just becomes window-dressing ritual to fulfill the requirement which is regulated in water law. Public consultation sometimes is used just to give evidence that in producing policies, plans and programs power-holders or competence authority has gone through the required motions of involving public societies. For instance, in reality, the inputs of farmers are often neglected during the implementation of the irrigation management in basin area (Duhari, 2007). Moreover, the other challenge is the inclusion of locally hired facilitator for public consultation which may influence public consultation process since sometimes the facilitator has no comprehensive understanding of the real issues concerned. For really successful public consultation, however, it will be better if it involves facilitator from grass root organizations which are trusted by the communities. Additionally, Javanese culture

forming paternalistic and hierarchical attitudes of government also become another challenge of public consultation process. It has often hampered communication between stakeholders and government. Besides that, clientelism political culture of government in Java, allowing informal political bargaining in the process of formulating plan and policy, leads to the creation of strategic collaboration between powerful parties to bring particular interests which give advantages for their own parties (Hudalah, 2006). Because of this, sometimes the main goal for advocating the common local interests is not achieved properly.

4. Information management

It is acknowledged that water resource data base and management information system in the management of Brantas river basin is still weak for the sound planning. There are some problems related to the management of data base and information system in Brantas RBM. First of all, there are poor connections on producing and disseminating data. Connections in this term refer to horizontal connections (among government agencies), vertical connections (central, provincial, local and basin agencies), infrastructure connections (interoperability issues), connections between governments and citizens and connections among stakeholders (government, private sector, academic institutions, NGOs and civil societies). The second problem is related to poor quality of the data and information. Many existing data and information are inaccurate and often out of date. Sometimes, some government institutions produce the same data, but ironically, the values of the data vary one another. Moreover, data production tends to be project-oriented (WATSAL, 1999). When project funding finished, there is no incentive to manage and continuously update the data, then as a consequence the data will be out of date. However, the problems of data and information generally are caused by the limitation of budget for information management, limitation of technology used, and limitation of human resources. The poor database in brantas river basin management hampered the analysis, planning process and decision making.

However, to meet long term goals of river basin planning, it needs comprehensive data base management supported with interactive management information system. In the case of Brantas RBM, although it is still far from perfect, the efforts to improve interactive management information are being carried out. The efforts are enforced by the new water law 7 of 2004. One of the efforts is the improvement of information dissemination from related sectoral government and river basin organization to stakeholders and communities. Recently, PJT I and regional government which have competencies in the management of Brantas river basin use website/internet online to inform plans, programs and activities which are organized under their organization. This media has opened opportunity to public societies to criticize and give suggestion against the institution's achievement. Beside that, PJT I also routinely publish the bulletins and leaflets which contain of information around the management and development of Brantas river basin and water resources management generally. This bulletin and leaflet can be accessed by public societies. However, the efforts become the first step for improving relationship between government, stakeholders and communities generally.

Moreover, another effort to improve management information system of Brantas RBM is organized through the project supported by water sector adjustment loan on the establishment of inter-agency water management information system. This project is aimed to create an environment in which various sectors of government can share information on water resource management and related issues by linking with a computer system. Cooperation on management of information system in Brantas RBM is aimed to

improve the quality of data and information on water resources management as well as to minimize the operational cost for information management.

However, information managed in the Brantas RBM is still focused on the measurement of water quality and quantity. Data base required for planning and operational management of Brantas river basin has been provided through the installation of real time monitoring network of water quantity and water quality monitoring (Gunatilaka et al). It is completed by telemetry system for the transfer of real time data to central station. The installation of online monitoring station is aimed to assess continuously water quality and quantity in the entire river as well as to develop comprehensive data base. Additionally, water resources management information system is also established through Hydrological Information System (HIS) in which it is used to store the real time data generated by the online system as well as the supplementary data from the river basin. Hydrological Information System (HIS) is a modern system of data base management which incorporates interactive database management and information system. It provides tools and functions for capturing, storing, monitoring and analyzing of aquatic environmental data (Gunatilaka, 1999).

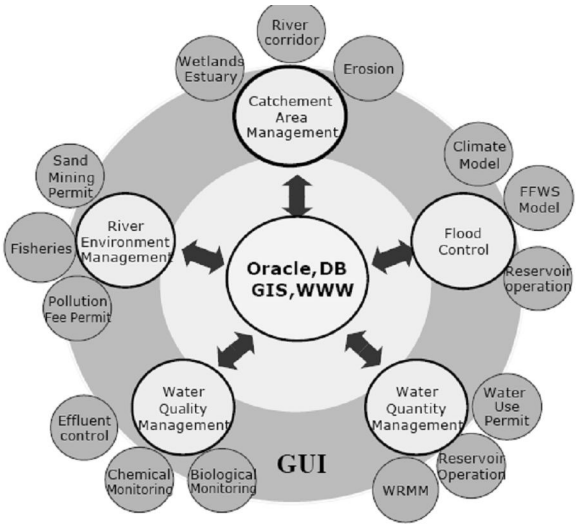


Figure 3.3: The scheme of Integration Information management system in Brantas RBM (IT- Concept)
Central database (Oracle) with interfaces for GIS (Geographical Information System) , www (World Wide Web, Home page), DSS (Decision Support System), and GUI (Common Graphic User Interface). Source : Gunatilaka, 1999

The aggregate management information systems of basin level and local government agencies will be transferred to provincial and national government level as basic information for decision making.

Based on the scheme of integration information management system above, it is known that data and information presented to policy makers on Brantas RBM is still focused only on the physical data and information. The other information such as financial data, land use issues, socio economic data, political data, etc are still poorly integrated in the Brantas Management Information System.

5. Transformation from centralized to decentralized system

In Indonesia, state has strong control over water resources. It is stated in the 1945 Constitution that:

> "The land, water, and any wealth therein are governed by the state and utilized as far as possible for the welfare of the people" (Par. 3, art. 33).

Based on this constitution, the state has a right and strong authority to manage, develop and take control over waters in order to keep the water utilization in equitable manner. The ministry of public works had competences and responsibilities in doing plan, monitoring, exploitation and utilization, operation and maintenance, and conservation over waters.

In the period before 1998, all of tasks related to water resources management were done by means of two systems which are de-concentrated and decentralized system. In de-concentrated system, Ministry of public works delegated its authority to part of its department at lower level but all decisions including the size and the scope of the projects still had to get approval from central government. In decentralized system, the authority is transferred to regional government including provincial and local government to do a part of specified functions of central government. Regional government has authority to formulate plan, policies and program itself. The activity conducted under decentralized system was operation and maintenance of infrastructure in basin area.

In line with the shift of political system in Indonesia towards decentralization system in 1998, more and more functions and responsibilities of central government in taking control over water has been transferred to river basin organization and regional government (provincial and local government). Under the law 32/2004 on regional government and the law 33/2004 on the fiscal balance between center and region, the regional government has the authority to formulate their own plans, programs, fiscal policies as well as the authority to exploit natural resources including water resources in their own region (Anshori, I.). Thus, under this reform, the role of central government has changed from provider to enabler. Its role is limited just to be regulator (provide regulation and guidance), to provide network for information exchange and to monitor WRM whereas sectoral mandate and its implementation will be devolved to provincial and local government as well as to river basin organization and water user association. Nevertheless, for cross border activities such as management of river basin in inter-provincial, central government still retain its responsibilities (Anshori,I). However, by the shift of the system, social coordination in river basin governance is expected to be polycentric system, in which the actions of existing organizations, layers of government, and stakeholder initiatives are coordinated to cover an entire river basin or sub basin (Mole et al, 2007).

The main objective of the shift towards decentralization system is to ensure that the policies, plans and programs of government are more contextual and represent local interest. It means that the regional/local government should be more responsive to local needs. By bringing decision making closer and making it open and accountable to local populations, it is expected to increase sustainability, equity and efficiency in water resources management.

One of the implementations of decentralization system in water resources management in Brantas river refers to transfer responsibility for operation and management of secondary and tertiary irrigation canals to independent water user associations (WUAs).

The government supported by WATSAL empowers local communities (farmers) to manage their own physical infrastructure and institutional organization. The objective of this approach is to improve the involvement of communities in planning process, implementation, monitoring and evaluation related to water resource management. This approach will initiate more responses for public consultation.

6. The Reform of Water Law in Indonesia

Initially, water management in Indonesia is regulated by water law: number 11 of 1974 on water management. Based on the basic principle of the article 33 of the 1945 constitution state has a right to take control over waters. In the water law no 11 of 1974, it is asserted that state has authorities to manage and develop the utilization of water resources, and to establish, legitimize, and give provision of permits for utilizing and exploiting water resources based on water resources planning and management. The law number 11 of 1974 served as the main instrument for water management in Indonesia for 30 years before Water Resources law No. 7 of 2004 was enacted. For implementing this law, it was supported by Government Regulation No. 22 of 1982 on Water management and Government Regulation No. 23 0f 1982 on Irrigation and Drainage.

However, law 11 of 1974 was considered as incomplete regulation for water resources management in Indonesia. Some matters still have not been regulated yet including the distribution roles and responsibilities of government in water resources management, the responsibilities on water resources management and conservation, the rules of rights, obligation and roles of the community on water resources management, the rules of coordination schemes among government sectors and other stakeholders, information management system, etc. Under the water reform project assisted by World Bank, a draft Law on Water Resources was subsequently prepared in mid-2001. In 2004, the draft has been completed and was enacted as Water Resources Law no. 7 of 2004. In this law, some principles of water resources management which were absence in old law are regulated.

However, there are some basic changes between water law no 11 of 1974 and water law no 7 of 2004 which encourage the shift of paradigm on water resources management in Indonesia. Those basic changes are described in table below:

	Aspects	Water Law No. 11 of 1974	Water Law No. 7 of 2004
1.	Water Management principles	No arrangement	- water resources shall be managed on the principle of conservation, balance, public benefit, integrity and harmony, justice, independence, as well as transparency and accountability (article2) -Water resources are managed in comprehensive, integrated and environmentally manner
2.	Water function	Water serve as **social function** to be used for the welfare of people (article 2)	Water resources serve as **social, economic and environmental function** which should be implemented and realized in a harmonious manner (article 4)
3.	Water Right	Water is governed by the state	People have right to obtain and to use water for various need (there are two type of water use right : communal water use right and

			commercial water use right) (article 1 point 14-15)
4.	Unit Management	No arrangement	water management is carried out based on river basin area as a unit management with the principle of integration between surface water and ground water (article 11)
5.	Public Involvement	Communities/public societies were given role to participate in the operation and maintenance of water resources infrastructure (article 12)	communities/public societies are given role to participate in the preparation of WRM policies, process of planning, construction, operation, and maintenance, monitoring and supervision of the WRM(article 62, 82)
6.	Coordination and Cooperation	No arrangement	-Establishing coordination body : National, provincial, local and basin water management committee -Coordination bodies have to consist of members from related governmental sectors and non governmental elements -Interaction among national, provincial, local and basin committee should be in consultative and coordinative nature. (article 85-87)
7.	Information Management	No arrangement	-Information on water resources management encompasses hydrological data, water policies, water resources infrastructures, water resources technology, environmental and social economic aspect related to water resources management -Information on water resources management should be information network distributed and managed by various institution -those information networks should be able to be accessed by the various stakeholder in the field of water resources (article 65-69)
8.	Financial Aspect	Water resources management is financed by government and beneficiaries.	Water resources management is financed by government, private sector and beneficiaries (article 77)

Table 3.1 : Some differences of water law No. 11 of 1974 and water law 7 of 2004 (compiled by author)

The objectives of establishment new water law no 7 of 2004 are to put water in harmoniously social, environmental and economic dimensions, to attain integrity in water resources management, to give better attention to the basic human rights on water and to put more democratic mechanism and process of formulating policies and plans of WRM (Anshori, 2005). However, Water law No 7 of 2004 provide a comprehensive legislation framework for water management in Indonesia. For implementing the operational water resources management, many regulations are established by Ministry of public works in national level, provincial government regulation in provinces level (*PERDA Propinsi*), and

local government regulation in municipalities or regencies level (PERDA kota/kabupaten) based on the principles regulated by water law 7 of 2004.

3.3. Concluding Remarks

This chapter mainly discuss about the current institution building in the Brantas river basin management. The discussion is started with picturing how institutional framework is developed under water reform project in Indonesia. It is concluded that institutional framework developed under water reform bring the new paradigm in water management in Brantas river basin. First of all, the transformation has given room for stakeholders and public communities to involve in the river basin management processes: planning, implementation, monitoring and evaluation. Secondly, through the establishment of WMC, it attempts to involve various governmental sectors in decision making processes on water sector. Thirdly, through the establishment of state Corporation, it brings the new form for the financial cost recovery of water management. It establishes the form of public private partnership in the management of water resources in Brantas river. Fourthly, the reformation also brings transformation on perspective toward water functions. In the new paradigm, water is not only considered as social function but as an integration of social, economic and environmental functions. Therefore, institution built in Brantas RBM will be constructed to reach the function of the water.

In the next section, it discusses about the extent to which sectoral integration is developed in the management of Brantas river basin. In fact, sectoral integration becomes crucial issue in the management of Brantas river. Most of problems in the management of Brantas river are caused by lack of coordination and integration between spatial planning and water sector. The main cause of unharmonious relation between spatial planning and water sector is weak monitoring and controlling upon the implementation of spatial plan. Violations on land use planning have led to water problem in the Brantas river basin. However, the effort to improve spatial planning in relation with water sector is being strengthened by establishing new law on spatial planning. In this new regulation, some articles are concerned to the support of land use planning to the improvement of water sector. Nevertheless, the effectiveness of the implementation of the regulation still has to be examined.

In addition, under water sector reform, public participation in Brantas RBM has started to be improved. Based on the description above, there are some respects encouraging the improvement of public participation in Brantas river basin management such as:

- *Policy/Regulations:* under new water law, public participation becomes the important principle which has to be covered in the management of river basin. Mechanisms and procedures of public participation is detail regulated in this water law.
- *Institutions:* to formally accommodate stakeholders and communities in the management processes, it has already established water committee in which stakeholders and communities along with governmental sectors will consult each other to formulate policy, plans and program in water sector related to the management of Brantas river basin.
- *Decentralized governance:* The transformation from centralized to decentralized governance particularly in the management of Brantas river basin is aimed to bring the basin governance closer to water users particularly and communities generally. The objective is to ensure that the policies, plans and programs of government are more contextual and represent local interest. Decentralized governance is particularly

characterized by actively involving stakeholders and communities in the decision making and management processes.

Moreover, in term of information management, it is acknowledged that information management in water sector in Brantas RBM is still weak for the sound planning because of the limitation on the budget, technology and human resources. The weaknesses are mostly related to the data/information production and dissemination. Nonetheless, under water reform project, the efforts are being encouraged to the improvement of information management in Brantas RBM. It needs strong effort to continuously improve the quality of information management in Brantas RBM. Another problem of information management in Brantas RBM is poor integration between physical data/information and other information such as financial, political, land use issues etc.

In the last section, the reformation of legal framework on water resources management in Indonesia is discussed. From this section, it can be concluded that the new water law provides more comprehensive framework for the management of water resources generally and river basin particularly. The regulation gives wider insight on the management of water resources since it expresses more holistic and integrated policies. In the new water law, principles advocated to achieve sustainability on water resources management has already been regulated.

However, some transformations on water sector described above have implications to the degree of adaptiveness and responsiveness of the institutions of Brantas RBM. Some aspects likely encourage the adaptiveness and responsiveness of river basin institutions while other aspects still remain weak efforts towards adaptiveness and responsiveness. In chapter 5, the current institution building of Brantas RBM will be analyzed on the extent to which it bring the concept of adaptive management by comparing this with the criteria and indicator of adaptive institution. Moreover, it also will be compared with another case of RBM institution (Rhine RBM institution) to get better insight about the concept based on the experience of another institution. Further the strengths and weaknesses will be explored to gain action learning from the cases.

Chapter 4
Institution Building in Rhine River Basin Management

4.1. Overview of Rhine river basin

Rhine River is one of the largest river in Europe. It has a length of 1320 Km, of which 880 Km is navigable. The basin spread over an area of 195 000 Km2, which includes the area of the Meuse basin (33 000 m2) (Wolf, N et al, 1999 cited in Raadgever, 2005). It lies throughout nine countries, from its source, the high Rhine, in Switzerland (18 % of basin area), flows into North Sea via France (13 % of basin area), Germany (55% of basin area) and the Netherlands, the lower Rhine (6 % of basin area) and also covers parts of Italy, Austria, Liechtenstein Luxembourg and Belgium in small portion of basin area (Raadgever, 2005).

The high Rhine is located in Alpine area in Switzerland, spread over an area of 16 000 Km2, of which 400 Km2 are covered with glaciers. The highest basin area is at 4000 m above sea level. The average precipitation in Alpine area is 1400 mm per year in which the variation of annual precipitation is from 600 mm in valleys and 3000 mm in the mountains (Middelkoop, 2000 and Promes, 1987 cited in Overeem, 2005). The middle area of the Rhine is located in German middle mountains. The elevation varies from more than1000 m above sea level in the south and less than 500 m above sea level in the north (Promes, 1987 cited in Overeem, 2005). The low Rhine basin is mostly located in the Netherlands. The basin areas have maximum elevation 1000 m above sea level, even in the most parts of the catchments are less than 500 m above sea level (Promes, 1987 in Overeem, 2005). The average annual precipitation in this basin area is around 750 mm (Middelkoop, 2000 in Overeem, 2005)

The Rhine is one of the best known and the most important river in Europe. The first reason, it is because Rhine river is considered as representing some distinct river ecosystems. The high Rhine is known having two ecological importances which are for protection of reserves of international importance for fish and migratory birds. The upper Rhine located between Basel and Bingen is important reach for rehabilitation and protection of the alluvial areas along the Rhine which comprises alluvial forests, wooded fringes near water bodies, reed plains with many stagnant pools and water-filled swamps. The middle Rhine located between Bingen and Cologne is known as a unique ecosystem in which there are alluvial forests which only can survive on those islands. The lower Rhine which consists of the lower river reach between Cologne and the German-Dutch border and the branches of the delta in the Netherlands is known as flood prone areas because of the river slope. The second reason why the Rhine becomes so important in Europe is because the Rhine connect the second world's largest seaport of Rotterdam to the Ruhr and central Europe which leads to it becomes the most important international waterways in the world (Middelkoop, 2000 in Overeem, A., 2005).

Generally, Rhine river basin is utilized for transportation (navigated shipping route connecting Rotterdam seaport to Duisburg inland port), industrial and agricultural purposes, energy generation, disposal of municipal waste water, recreational activities and for production of drinking water for 20 million people (Leentvaar, J. and Frijters). Below it is shown the water utilization in the Rhine by each state.

	Switzerland	France	Germany	Netherlands
Drinking Water				X
Industrial Processes	X	X	X	X
Energy Production				X
Leisure	X	X	X	X
Wastewater	X	X	X	X
Navigation	X	X	X	X
Irrigation				X

Source: Bernauer 1997: 161.

Figure 4.1 : The Map of Rhine River Basin (source: UNEP GRID Europe 2005**)**

The major cities in those countries are located on the Rhine river basin and thus, the Rhine basin can be regarded as a kind of "mega city". However, the dense population in basin area has brought the environmental implication on the river basin. There are some specific issues related to water supply, flooding, water quality, transportation and institutional arrangement. However, water pollution was the major water issues in the Rhine river basin. This issue rapidly increased after World War II along with the expansion of industrialization along the Rhine (Mynt, 2007). The major cause of water pollution in the Rhine was untreated waste water discharged by industries.

It needs long time to cope with the water problems in the Rhine. Recently, it is known that institutional arrangement in the Rhine river basin management have success to protect the Rhine against heavy water pollution. Nowadays, 30 million inhabitants in the Rhine river basin can access water for daily needs in the high quality (Hubner and Karrenbrock, 2000). However, the successful outcome and the gradual improvement of water quality in the Rhine were stimulated by the adaptiveness of the institutions built in the Rhine. Furthermore, this chapter will explore about the current institution developed in the Rhine river.

4.2. Institution Building in the Rhine RBM

1. Trans national Cooperation in the management of upstream and downstream of Rhine river basin

Since 1800, when industrial revolution began, the expansion of industries increased rapidly in the European countries. One of the impacts of this rapidly industrial growth was the increasing use of the Rhine water and the discharge of water waste back to the Rhine. The increasing of waste water discharge in the Rhine led to severe water pollution in the Rhine. Although water pollution attained concerns from the citizens, but, in this period, it still was not a priority policy issue of the state leaders. The priority was concerned to ensure economic growth and maintain the progress of industrialization.

However, the Rhine pollution continuously increased dramatically after the World War II and made the Rhine as sewer of European. The Netherlands, being the lowest downstream country suffered from the huge impact due to the water problem in the Rhine. This impact was very influencing since the Netherlands used water in the Rhine for supplying drinking water and irrigation. It is realized that impossible to carry out the water pollution issue alone since the source of pollution come from abroad. Because of this, the Netherlands initiated diplomatic discussion with other riparian countries to seek for the problem resolution on this Rhine water issues. This diplomatic discussion have resulted the establishment of international committee on the protection of the Rhine (ICPR). ICPR was established in order to bring water pollution as international issues which have to be carried out together.

ICPR was established in 1950 with five member states including the Netherlands, Germany, France, Luxembourg and Switzerland. Initially, the ICPR is only the organization operated to share information. The first task of the ICPR was to collect scientific data for identifying the cause of water pollution in the Rhine and report the state of the environment of the Rhine. Additionally, the ICPR have tasks to formulate international policy solutions concerned to the ecological problems in the Rhine, to hold regular international consultations, and to monitor the implementation of any inter-governmental agreement. Institutional commitment of riparian states to cooperate in combating water pollution in the Rhine was based on convention on the protection of the Rhine signed in Bern in 1963. This convention provided a formal structure for consultation as well as determined the composition and the jurisdiction of the ICPR (Dieperink, 2000). Based on this convention, ICPR gain formal structure to provide negotiation platform and an adviser of the Rhine government.

ICPR was composed of governmental representatives from the Rhine countries and the representatives of European Community. The member states organized the plenary meeting of the ICPR once a year to set up the programs, finances and formal procedures. Meanwhile, there were formed coordination group which is responsible for the actual planning and coordination. Additionally, possible solutions to specific issues will be discussed in working groups which contains of the national governmental experts.

In early development, ICPR have resulted two important agreements which were the 1976 Rhine chemical treaty and the 1976 Rhine salt/chloride treaty. The 1976 Rhine chemical treaty contained of the agreement against water pollution of the Rhine derived from the hazardous chemical pollutants including chemical industries, domestic waste, and agricultural waste. This convention defined the emission standard list of black and grey substances and defined the technical means for reducing the substances. Meanwhile, the 1976 Rhine salt treaty contained of the agreement to control over the dumping of chlorides in the catchments area and to reduce gradually the potassium mines in the Rhine.

It was evaluated that those conventions haven't given success result for the reduction of water pollution in the Rhine yet (Dieperink, 1995). Some reasons are pointed to unsuccessful project on the chemical convention and chloride convention which are (1) the lack of involvement of local actors in international layer, (2) the tendency to view trans-boundary processes not in term of cooperation but in term of one state against the others (3) the development of hierarchical approach (command and control approach) in international level will be difficult to be implemented because of the various nature of hierarchical attitude in national level (Verweij, M, 1999).

In practice, the governance process of chemical convention involved the interests of multiple actors including individuals, private industries, business, non government organizations (NGOs), as well as government organizations derived from township, municipal, provincial, ministerial, national and international layers. Nonetheless, officially the chemical convention only recognized and allowed participation of representatives of nation states as the official decision making in the ICPR, while the individuals such as farmers, private industries such as chemical industries and drinking water industries, business, and non governmental organizations (NGOs) were not considered in the decision making process (Mynt, 2007). All decisions taken by ICPR were based on the agreement made by those member state's representatives/delegations. The centered-state approach was used to address transnational environmental governance. The absence of non governmental actors in official ICPR decision making was because of an assumption that governmental state negotiators have strong legal, political and social power to implement the international agreements/conventions in national level. In fact, multiple actors in the state interplay in layers of governance processes (Mynt, 2007). For instance, in national layer, agreements need to be ratified by minister, cabinet and parliament. When the negotiators/state delegations in ICPR have not well interacted with those actors, it will be difficult to get ratification of the agreements in national level. Moreover, problem may also occur after the ratification, when the agreements have to be implemented in the lower government and water user which have never been involved in the negotiation process at international level. Mynt (2007) argued that the failure of the chemical and chloride conventions is because there is no link between local layers and transnational layer.

> *"The strong link between local and national layer should not be assumed that the local layer is automatically linked to transnational layer. In fact, it has to be assumed that the strong link between local and national layers can hinder the achievement of objectives and goals of transnational regimes. Therefore, this strong link has to be loosened up by bringing the local layer into the international layer"(Mynt, 2007).*

Moreover, there was an indication that the national delegations strive to protect their national interests so that the interrelation among the delegations were not harmonious.

Because of distrust between delegations, there were tendency that one state fought against others to reach its own goals (Verweij, 1999). For instance, the Netherlands as the major victim country due to chemical and chloride pollution in the Rhine strive to address the problem of trans-boundary water pollution as international issue to be solved internationally. Meanwhile, Germany and France have less political will to address environmental problems rather than to keep industrial interests. Thus, actually, the discussion about water pollution issues in international level merely due to the pressure from group of key players raising issues of the Rhine pollution (Huisman, cited in Mynt, 2007).

Additionally, the unsuccessful project on the chemical convention and chloride convention was also because of the difficulties to implement international command and control in the arena of various national hierarchical attitudes. For instance, the chemical convention tried to provide goals and means coping with water pollution in the Rhine. While the national policies/programs of member states were different in many details with the international negotiations, the member states tend to defend their own policies/programs. As a result, it will be difficult to reach international deliberation aiming to create international command-control because each negotiator strived to get its own practices to be established at international level (Heritier, 1996 inVerweij, 1999).

However, the Sandoz accident in 1986 which have caused heavy water pollution in the Rhine, death of hundred thousands of fish, and stopped processing plant of drinking water have made shock for all riparian countries. This accident has encouraged a consultant called McKinsey-Amsterdam to outline a comprehensive international agreement on the restoration of the Rhine. Furthermore, in 1987, this concept proposed by Mckinsey was adopted by ICPR and called as the Rhine Action Plan (RAP). This project is aimed not only to eliminate a list of the chemical pollutant in the Rhine but also to rehabilitate the Rhine in order to protect extinct fauna species such as salmon and to guarantee the drinking water quality in the future.

However, this RAP has two characteristics. Firstly, this inter-governmental agreement is established informally and not legally binding. The means is not fixed under international law but only as recommendation so that it is flexible and can be adjusted to the experience and technology of each riparian state. Secondly, this intergovernmental agreement should be responsibility of the lowest government to implement. This project was success to overcome the water pollution problem in the Rhine and success to provide the good habitat for the salmons. According to Federal Ministry of Environment, Natural conservation and nuclear safety of Germany (2003), since 1987, the point discharges of hazardous pollutant have decreased 70 to 100 percent and around 1900 salmons of 63 various species have already returned to the Rhine. However, there are some reasons for the success of Rhine Action Program. First of all, it is because all member states of ICPR have high commitment and trust in the cooperation for protection the Rhine. Secondly, RAP is established by supporting of stakeholders including NGOs and experts. All programs were also informed to the public. Thus, the program turned into the basis of modern water management.

Based on the understanding above, it is found that there is a main difference approach carried out by ICPR before and after Sandoz accident. Before Sandoz accident, ICPR used the hierarchical approach to cope with water pollution. Mynt (2007) said that this regime was characterized by state-centric international regime and international law-treaty type. ICPR tried to provide both goals and the means for internationally environmental

protection on the Rhine. It attempted to build limitations in term of official international treaties which are internationally binding. Nonetheless, in fact, the progress of the project ran slowly and had high tensions. In conversely, after Sandoz accident, cooperation among member states in ICPR is built in individualistic principle in which it is emphasized on trust, informality, pragmatism and subsidiarity (Verweij, 1999). Mynt (2007) said that this regime is characterized by soft law-action oriented type. The ICPR only formulate the international goals and give opportunities to member states to use their own means, procedures, and plans to reach the goals. Additionally, this regime also facilitated non governmental actors to take role in multilayer governance processes (Mynt, 2007). However, the approach was proven success to overcome the water problem in the Rhine.

2. Sectoral Integration (Integration between Spatial planning and Water Management) in the Rhine RBM

During the severe flood disaster in 1993 and 1995, many cities along the Rhine river were submerged. These disasters have engendered hundred thousand people to be evacuated and several billion euros to be lost. This tragedy encouraged the riparian countries to broaden the international cooperation for coping with the flood issues. For following up this intention, the environment ministries of Germany, Belgium, Luxemburg, the Netherlands and France established a declaration called the 1995 Arles declaration to cope with the flood problem in the Rhine basin. This declaration emphasized on the measures to integrate spatial planning/land use plan (e.g. agriculture, forestry, natural management, urbanization, and recreation) and water management (e.g. buffer zones, dykes and embankments, and flow management). There are some requirements which have to be fulfilled in developing such action plans which are:

- need for an internationally coordinated water management system
- need for taking spatial planning measures to permit greater water storage in the whole river basin, such as changes land use, afforestation, returning riverside areas to nature, the development of overflow zones and the de-canalization of streams
- need for preventing further urbanization in vulnerable areas along the Rhine including a ban on further construction

(Wessel, J., 1995)

Furthermore, this declaration was followed up by project group of ICPR toward formulating the "Action Plan on Floods Defence" aimed at the improvement of precautionary flood protection. However, to draft the action plan, it was established the working group on "spatial planning and preventive flood protection Rhine-Meuse". This working group is tackled by related ministries of Germany, Belgium, Luxemburg, the Netherlands and France and also supported by European Union. Thus, this project involved interdisciplinary and trans-boundary cooperation (Fritjters and Leentvaar). The targets and the means set up in the flood action plan point out that the improvement of flood control and management will only be reached through the effective integration of the fields of water management, spatial planning, natural protection, agriculture and forestry management (Fritjters and Leentvaar).

One of the international programs developed to integrate water management and spatial planning was the project carried out under the name of IRMA (Interreg Rhine/Meuse Activities) conducted during 1997-2001. This project is designed to reduce problems due to flooding in the Rhine basin by applying an integrated approach of spatial planning, water management and damage prevention. It developed a controlled system of rural

and urban planning, initiated legislative improvements as well as developed hydrological and hydraulic models for better assessment of possible measures (www.irma-programme.org). One of the concrete project of IRMA is the research on spatial planning instrument concerning on the reduction of high water level and prevention damage.

Another example for the integration of spatial planning and water management is the new Dutch policy in favor of "Room for the River" to anticipate higher extreme discharge of the Rhine because of climate change. In this policy, river cross section will be widened by moving the dykes further away from the river or by lowering the river forelands. However, this policy has replaced the old policy which was mostly concerned on the raising of the dykes in order to maintain the required level of flood protection. In addition, another measure to integrate spatial planning and water management in Netherlands is also taken through water impact assessment (Woltjer, 2007). The objective of water impact assessment is to guarantee that the negative impact on water system will be anticipated and prevented by considering water interest in land use planning (RIZA, 2003 in Woltjer, 2007).

3. Public Participation in the Rhine RBM

Public participation in international Rhine river basin management has been incorporated in recent international conventions and regulations as follows:

- The Aarhus Convention

The Aarhus convention in 1998 has issued some principles related to sustainable development in which there are rights of all citizens both in this generations and in the future generations to come to live in a health environment. This convention acknowledges that involvement of all stakeholders is prerequisite to achieve sustainable development. In this sense, public involvement is not only pointed to achieve environmental agreements but also to reach government accountability, transparency and responsiveness. The convention agree that public societies have rights to access environmental information, have rights to participate in environmental decision making and have rights to justice in environmental matters.

- European Water Framework Directive

Public participation is one of the water management principles emphasized by European Water Policies. It refers to preamble 14 and 46, article 14 and Annex VII A of the Water Framework Directive. These articles stress to the need and importance of information policy and public's active involvement in water resources management. It highlight that the success of the WFD is determined by the comprehensive involvement of the public.

There are two main reasons for an extension of public participation in European water policies. Firstly, it is acknowledged that involvement of various group interests is absolutely required to achieve the objectives of river basin management plans since river basin management constitutes a complex system affecting many sectors and stakeholders. Secondly, the extension of public participation in European Water Policies is concerned for enforceability. It is argued that "*the greater the transparency in the establishment of objectives and the reporting of standards, the greater the care member states will take to implement the legislation in good faith, and the greater the power of the citizens to influence the direction of environmental protection, whether through consultation or, if disagreement persists, through the complaints procedures and the courts*" (Frijters , D.I. and Leentvaar, J).

Based on the Aarhus convention and Water Framework Directive above, recently stakeholder participation in the Rhine river basin management has attained more

attention. According to the new Rhine Treaty, ICPR has to involve the relevant NGOs in exchanging information, take into account them in decision making, and inform them about all decision taken by ICPR (Barraque and Mostert, 2006). Since 1998, nine international NGOs have accreditation to involve formally as observer in the plenary assembly of the ICPR. The NGOs represented various special interests related to the Rhine river basin management including the field of nature conservation, landscape planning, water works and chemical industry. They can participate in the discussion in the plenary assembly, working groups and project groups of International Commissions for Protection the Rhine (ICPR) (Raadgever, 2005, Barraque and Mostert, 2006). Besides involving formally in the plenary assembly of ICPR, the NGOs also were involved informally through lobbying, disseminating information to the media, etc. Additionally, in the national preparation meetings, each member state is freely to organize discussion with NGOs and other stakeholders related to the Rhine issues (Enserink, Kamps and Mostert 2003; Kampa, Kranz and Hansen 2003; Garritsen, Vonk and de Vries 2000 cited in Barraque and Mostert, 2006).

Moreover, stakeholders are also involved beyond ICPR's projects. For instance, many non governmental organizations (NGOs) have been involved in the Rhinenet, an Interreg project which have task to improve the ecological state of the Rhine and to develop awareness of living in the Rhine (Solidarite Eau Europe 2005, in Raadgever, 2005). The Rhinenet project is developed with the goal to improve the involvement of stakeholders and the communities in the decision making process in order to enhance political legitimacy, success and effectiveness of Rhine RBM. The project concerned to explore the measure to develop information management, public consultation and participation of stakeholder in the major international Rhine river basin in order to achieve sustainable development of the Rhine.

In national level, the way and degree of public participation in water management process vary from one to another state. In France, stakeholders are involved through accommodating them in the membership of National water council ("Comité National de l'Eau"). The council is composed of all partners including water users, NGOs, water suppliers, Chairmen of water committees, experts, scientists, state representatives, elected officials, etc. In the Netherlands, public participation is institutionalized in representative members in water boards. Based on the Water Board act, there are five categories of stakeholders which have to be represented in water board. Those categories of stakeholders are households (including residents), landowners, tenants (optional), owners of buildings, and industry (Lazaroms, 2004). In addition, sometimes societies are involved much more than legally required. For example, in implementing Dutch policy 'Room for River", a computer tool "planning kit" is developed to enable all actors to select and test the effects on water levels of various combinations of measures (Van Schijndel, 2005). Additionally, in Germany, the degree of public participation is different in each *Länder* Water Act. In some *Länders* (Rheinland-Pfalz, Saarland and Sachsen-Anhalt), public participation in formulating water management framework plans was not foreseen within their Water Acts. In other *Länder* such as Lower-Saxony, Schleswig-Holstein, Hesse, Thuringia, Mecklenburg-Western Pomerania, there were provisions for public participation during the formulation the water management framework plans which involved organizations representing part of the public interest, public bodies and local authorities (Muro 2000 cited in HarmonyCop 2003).

4. Information Management

The complex problems and issues faced in the management of Rhine river basin requires better integrated information management. It is essential since decision makers need information on environmental and water-related issues in order to make rational decisions (Gooch et al, 2003 in Timmerman and Langaas, 2005). However, integrated information management should be built through close cooperation and communication between governmental and non governmental actors as well as integration of different sectors and disciplines of river basin system.

However, far before water management in European state shift from local water management toward river basin management, the information about the Rhine river basin is already provided by international commissions for the Rhine. For instance, the international Rhine commission (ICPR) has an obligation to inform the state of the Rhine and the ICPR's programs to public societies and all stakeholders. In doing the task, it establishes working groups composed of national officials and experts to collect the data and information about the state of the Rhine. However, those data and information are updated continuously. A lot of computerized models are used as instruments to simulate and predict the system behavior of the Rhine (Raadgever, 2005).To disseminate the information, ICPR provide website which presents information about the Rhine and the ICPR's work in multiple languages. Citizens and all other stakeholders can access the information fast and easily. Nevertheless, according to Ast (2000), the information covered by ICPR' site is still limited. Not all official documents published by this commission can be accessed in ICPR's site.

Moreover, in order to improve geo-data exchange among riparian state, it is already established E-Water project focused on developing web GIS portal for hydrological and geological data in relation to water management issues of riparian states. This portal, however, has become a place for dissemination of hydrological information internationally. The data set provided in this eWater system are Geo-referenced hydro-geological point measurement (from monitoring wells) including water measurement data (hydrological quality data/information) and spatial data. Moreover, in 2002, information management on water management generally and River Basin Management specifically also has been established by European Water Association (EWA) through the EWA homepage. EWA homepage is not only provide the information about the EU water regulation and standardization in water management, but also provide the discussion room for key technical and political issues related to water management (EWA, 2005). EWA considered that internationally information sharing about technical and political issues related to water management is very crucial to support institutional capacity in developing sustainability in water management and in the decision making process. However, the EWA is one of the important water association in European countries which not only supplies physical quality and quantity water data/information, water regulation and many standardization on European water management but it also provide the information on technical and political issues in relation to water management in those riparian states.

Additionally, with respect to the interaction with NGOs, there is no constraint on exchanging of information with NGOs. There is an open attitude for mutual exchanging information between governmental organization and non governmental organization. Nevertheless, it is argued that there is an uncertainty whether available information is used in decision making. Mr Rosenboom from Reinwater said that the utilization of

information for the Rhine management is like "black box" in which it can not be ensured whether available input of stakeholders will be used in decision making process (Raadgever, 2005).

Moreover, the development of information management for the Rhine river basin is also carried out by the Rhinenet project. This project concerns to the creation of a web page contains of the discussion platform, the information of the Rhienet project, the information about water issue in the Rhine, the WFD, etc destined for broad communities. Moreover, Rhinenet project also concerns to organize press conference to inform the project activities in the Rhine to the public societies, organize public events such as international Rhine bathing day, and publish editorials, newspaper, magazine article, etc related to the issues and water policies/plans/programs/projects in the Rhine (Rhinenet, http://www.regiowasser.de/projekte/rheinnetz.html).

In addition, one of the practices for developing integrated information management in the Rhine river basin management in national level will be presented in the further paragraphs. Mostert (2005) said that integrated information management for the Rhine river has been successfully carried out in the Dutch flood management. It is pointed to the management of information within the implementation of the Dutch "Room for the River" policy. The integrated information management is provided by the instrument of "Planning Kit". It is a computer tool that enables all stakeholders to involve in the planning process quickly and easily (Raadgever and Mostert, 2005). The objective of using planning kit in the implementation of Dutch "Room for the River" policy is to give opportunity for both governmental and non governmental stakeholders to define the combination of measures to get insight about the possibility to transport varying discharges to the sea without raising the dykes. However, the measures have been already identified and designed by governmental stakeholders before it, and then those are informed publicly to grab public opinions/ideas in combining the measures.

However, there are strength and weaknesses of using this tool. Those strengths and weaknesses can be pointed below:

Strengths	Weaknesses
- Interactive : incorporate knowledge of all stakeholders including policy makers, river managers, engineers, local authorities and communities - can be combined with other participatory tools - fast and easy to use it	- the scope is narrow and fixed so that it doesn't allow for discussion of causes and consequences - less comprehensive (doesn't support developing insight in the problem structure) - limited transparency since it doesn't allow for reflection

Additionally, Raadgever and Mostert (2005) evaluated that there are some outcomes gained by developing the "Planning Kit" tool. Those are:

- it may gather a lot of information both from local and regional stakeholders
- it can develop new measures and preferred alternative measures based on any definition of combination of measures
- Without much discussing of problems and goals, it has achieved agreement on the definition of measures
- There is a legitimacy for the decision making process since the process have involved all stakeholders

Nonetheless, in fact, the "planning kit" is only functioned as an additional tool to the decision making process. The focus of participatory decision making process was in the regional planning sessions in which it involves only local and regional governments. Thus, actually non governmental stakeholders hardly involved actively in the decision making process (Raadgever and Mostert, 2005).

Moreover, the information management conducted in the Rhine RBM is not only focused on providing data and information related to water quantity and quality but it also provides data and information from other sectors that will influence the policy making on water management. For instance, in the management of river basin, the Netherlands has developed a good tool of information management which is useful for integrated water management particularly in relation to spatial planning.

5. Multi players in the Rhine Governance

In trans-national level, management of the Rhine river basin is carried out by several international cooperation organizations. Nonetheless, there are three most important organizations which have significant roles in the management of Rhine river basin. Those organizations are Central Commission for the Navigation on the Rhine (CCNR), International Commission for the Hydrology of the Rhine Basin (CHR) and International Commission for the Protection of the Rhine (ICPR). Those organizations composed of delegations from riparian states. Generally, the delegations of each riparian state in the international commissions come from the officials of the ministries which are responsible on the management of the Rhine river basin.

In national level, the organizational framework of each riparian state differ one another. Germany and Switzerland are recognized as federal state, so that most of responsibilities in water management are devolved to federal state (*Länder* government and canton government). German administrative water management is characterized by strong functional division of responsibilities (Moss, 2004). The water administration in each level is organized by many divisions which have specific responsibilities and there is no strict hierarchy between levels (Raadgever, 2005). Meanwhile the Netherlands and France have different organizational framework. They are democratic states characterized by decentralized governance. In the Netherlands, the responsibility for water management are distributed to every governance layer (national, provincial, local and water board). Each government layer has specific responsibility. In France, water management responsibility is devolved to water agencies. The authority of water agency is based on the river basin unit management.

Moreover, the other players in the management of the Rhine river basin are non governmental organizations and communities. In national level, they are involved formally within organizational structure established by state. For instance, in France, water users, NGOs, water suppliers, Chairmen of water committees, experts, scientists, state representatives, and elected officials are recruited as the membership of National water council ("Comité National de l'Eau"). Meanwhile, in the Netherlands, households (including residents), landowners, tenants (optional), owners of buildings, and industry are recruited as the public representatives in water boards.

However, because there are multi players interplaying in governance processes, coordination and cooperation between governmental layers as well as between government and non governmental organization are very crucial and need special

attention since it will influence the successfulness of implementation of water management. Recently cooperation between governmental layers has been ameliorated. Link between local governmental layer and trans-national governmental layer have started to be developed. For instance, representatives of the *Länder* government of Germany incorporated in Germany Water Working Group (LAWA) and representatives of France water agencies (Agence de l'Eau) are counted in the ICPR organizational structure. They are accommodated to directly participate in the formulation and implementation of trans-national agreements. Moreover, the implementation of trans-national agreement is also devolved to the local governmental layer. However, this involvement of local governmental layer in trans-national layer has improved responsiveness of trans-national government layer towards local interests. On the other side, coordination and cooperation between government and non governmental organization are also improved since they consult each other in the planning and management processes. The involvement of NGOs, however, can bridge the interest of government and stakeholders.

6. Legal Framework for the Management of Rhine River Basin

During many decades the management of the transnational Rhine river basin was carried under the framework of International commissions such as ICPR. In the early development, ICPR tried to improve water quality of the Rhine by negotiating international agreements. There are two important agreements concerned to the measures against water pollution in the Rhine which are the international treaty on chemical pollution and the international treaty on chlorides. Those treaties are mainly focused on the cooperation between downstream state and upstream state on water quality management of the Rhine. However, those treaties tend to be hierarchical law and applying international command control approach. They provide goals and means on the measures against water pollution which were binding the member states. Nonetheless, it was evaluated that both chemical pollution and chloride treaties were regarded unsuccessful projects in the Rhine. They failed to bring the Rhine to be cleaned up from the water pollution. The reasons for the failure have already explained in the early section of this chapter.

Additionally, since 1987, after Sandoz accident, the ICPR has turned its approach toward non binding action program. The approach is emphasized on trust, informality, pragmatism and subsidiarity (Verweij, 1999). The legal instrument used to apply international cooperation is named of the Rhine Action Program (RAP). This program is aimed to eliminate pollutant substances in the Rhine, return salmon to the Rhine and guarantee the quality of drinking water in the future. However, under the non binding legal framework, the projects for rehabilitating the Rhine river is evaluated to be very successful.

In addition, the management of the Rhine river basin is also influenced by the Water Framework Directive as a legal framework of water resources management in the European Union. WFD constitutes an umbrella of European water policy aimed to bring the state of surface and ground water in the European countries in good status. WFD demands the management of water resources in European countries to be based on the system of river basin management. Member states have to formulate their river basin management plans. Based on some literatures, there are some characteristics of WFD which have implications for the management of Rhine river basin:

- WFD assume that water is not a commercial product like any other but rather a heritage which must be protected, defended and treated.

- In the management of water resources , policy style of WFD great emphasized on cost efficiency, inter agency negotiation process and public participation
- WFD highlighted the importance of public participation, voluntary agreements, cross sectoral agreements, openness of information, and flexibility to accommodate regional diversity
- Water policy should be directed to (1) incorporate an analysis of the characteristic of each water body : presence of diffuse and point source pollution (2) review the impact of human activity on the status of surface and ground water
- WFD focus on protecting and stimulating the good status of aquatic ecosystems, and ground water resources
- Implementation of the WFD implies a certain strong link with land use issues and spatial development since land and water have to be viewed as mutual coherence
- WFD strengthens the so called combined approach to pollution prevention, introduces economic analysis of water use and pay-polluter principle, provides general public with rights involvement and information over RBM planning and establishes a detailed system of monitoring and reporting to the commissions
- Coordination is obligatory not only when producing a national or international RBMP but also for more detailed programs and management plans for sub basin.

The regulations and decisions of the WFD are binding to all member state. Thus, its implication is that each member state should reform their institutional framework to adjust with WFD's requirements. Nonetheless, WFD remains the recommendations and options which are not binding for all member state. These recommendations are generally related to the means to reach the target stated in WFD (Raadgever, 2005). Thus, each member is free to determine the means for achieving the target which has been set by European Commission. Or in the other word, WFD allow each member state to be creative and innovative to reach the European Union vision.

However, the establishment of WFD has significant impact to the improvement of upstream and downstream relation in the Rhine basin (Moelenkamp, 2007). Some significant effects are argued by Moelenkamp (2007) as it is explained below:

1. WFD encourages the development of cooperation between downstream and upstream countries on equal level. Prior to the establishment of WFD, downstream country always became the motor of international cooperation, while under WFD the position of downstream country is as the same level as other basin countries. However, under the WFD, downstream-upstream states feel joint responsibility to implement the principles directed by WFD.
2. Under the WFD, EU commission has taken role as external controller for the management of the Rhine river basin. The external control, however, can enhance the solidarity among riparian states.
3. WFD encourage creating a common perception and interpretation on water management. Thus, it can be incentive for riparian states to overcome the problem on common views.
4. WFD has introduced new financial approach on the polluter-pays principle. In this principle, measures for abatement water pollution were financed by the polluters. Nonetheless, WFD doesn't prohibit using the financial compensation as it has been applied in the past. Financial compensation still can be applied as long as it is applied as a second step after the polluter pays has been applied.

4.3. Concluding Remarks

This chapter mainly discuss about the institution building in the Rhine river basin management concerned to the development of trans national cooperation with the problem and the successfulness, the development of sectoral integration in the Rhine river basin, the improvement of public participation in the Rhine RBM, the development of information management in the Rhine RBM, multi players in the governance of the Rhine basin and legal framework for the management of the Rhine river basin. However, the institution built in the Rhine river basin for many decades is acknowledged having success to cope with water issues emerging in the Rhine river. Next paragraph will summarize some main points related to the institution built in the Rhine river basin.

In the early section of this chapter, it is concluded that the evolution of institutional framework in trans-national cooperation from state-centric regime to individualistic regime has brought successful development of the Rhine river basin management. In governing the Rhine river, this new regime emphasizes on trust, informality, pragmatism and subsidiary. In addition, this new regime also develops better relationship with public communities and stakeholders related to the Rhine basin. In this regime, network and participation are developed to grab broader knowledge for decision making and to collect support for the implementation of the decision. This approach is proven to be suitable to build cooperation in trans-national river basin involving various attitudes and cultural backgrounds.

Another element getting main attention in the development of institution in the Rhine RBM is sectoral integration especially between spatial planning and water management. Since climate change becomes driving force to the increasing of flood and drought risks, there are efforts to adapt with the risks through paying attention to the integration between spatial planning and water policies. The severe flooding in 1993 and 1995 has become turning point in water management to move from technological solution to spatial solution. There is also transformation from mono disciplinary to interdisciplinary competences. Different measures have started to be taken to enhance the relation between water and land use.

Moreover, in term of public participation, it has been the important requirements for the management of water resources in the European countries since it is recognized in the principles brought by Aarhus treaty and European Water Framework Directive. In the Rhine RBM, public participation has been already accommodated in the International commission for protection the Rhine (ICPR) since 1998. Nonetheless, the participation is still limited to the nineteen NGOs which have accreditation as the observer in the ICPR. The degree of participation is in consultation level, so that they have no right to vote (Meijer, 2004). Public societies have not had opportunity to involve directly in the ICPR yet.

Additionally, information management is part of the institution which also attains special attention in the management of Rhine river basin. ICPR develop information management for the Rhine by involving many actors including national officials and experts incorporated in working groups as well as NGOs. Interactive principle in information management is carried out properly through dissemination of information to communities and exchanging information with NGOs. However, the key point of the proper information management in the Rhine is that information production and dissemination has already been well developed by involving various sectors, stakeholders, and communities. Information is not only concerned about the physical data of water

quality and quantity but also other information related to water issues e.g. land use data, technical and political information, etc. The information management is well developed because of the availability of budget, technology and human resources as well as commitment of all parties.

Trans-boundary Rhine river basin management is a complex process involving many actors in different level. Coordination and cooperation are essential to be developed between governmental layers as well as between government and non governmental organization to harmonize policy and implementation. In the last two decades, harmonious relation between governmental layers as well as between government and non governmental organizations in the Rhine river basin management has already been developed. In fact, this shift has encouraged the successfulness of the trans-national projects on the Rhine RBM.

Furthermore, the last point discussed in the institution building of the Rhine river basin is legal framework for water resources management in the Rhine. It is acknowledged that legal framework for the management of the Rhine river basin generally is influenced by EC Water Framework Directive. The principle and basic measures set-up in WFD are also elaborated in the conventions/legal agreements established by international commission for the Rhine such as ICPR. However, the main characteristic of both WFD and the conventions of international commission for the Rhine is that they are very strict regulation. Nonetheless, they are only binding to the regulations and decisions while the means to achieve the results are not binding. Because of that, it opens the opportunity for the member states to be creative and innovative to determine policies to implement the directive and the conventions/agreements. Based on the experience pictured above, under the framework, the Rhine basin management is evaluated very successful in rehabilitating the Rhine toward better environment.

However, the extent to which the current institutions developed in the Rhine RBM are adaptive can be examined by comparing them with the criteria and indicator of adaptive institution. In chapter 5, it will be analyzed and will be compared further with another case of RBM institution (Brantas RBM institution). The strengths and weaknesses will be explored to gain action learning from the cases.

Chapter 5
Comparative Analysis

Based on the understanding upon the picturing condition of current institution building of two RBM cases as described in chapter 3 and 4, this chapter will analyze on the extent to which those institutions have brought the concept of adaptive institution in the management of river basin. The criteria and indicators mentioned in the theoretical framework will be used to assess the current institutions of both RBMs. Further, it also will explore the strengths and weaknesses of both RBMs' institutions and analyze the factors which likely influence the development of adaptive institutions in both RBMs.

5.1. Comparative analysis for the institution building of both Brantas and the Rhine RBMs

As it has been already mentioned in the previous chapter that the extent to which the institution of both RBM bring the concept of adaptive management will be analyzed by comparing them with the criteria and indicator determined in chapter 2. Below, the analysis will be presented based on one by one of the criteria.

a. Type of basin governance

In the concept of adaptive management, polycentric governance is regarded as an appropriate type of basin governance. Polycentric institution refers to networks that connect individuals, organizations, and agencies at multiple layers. This institution type advocates greater collaboration, communication and coordination among multiple governance layers in the decision making process. Polycentric governance is characterized by decentralized governance system in which decisions are taken closer to the public and there is active interaction among existing organizations, layers of government, and stakeholder initiatives. Decentralization will be effective to bring the concept of adaptive management in RBM if the local entities are empowered with meaningful discretionary authority to manage water resources.

Moreover, institutional interaction across administrative levels is required in the adaptive institution concept because the intensive interaction can increase the diversity of response options. Developing collaboration at various governmental level, better social links and trust among governmental agencies and stakeholders may be able to mobilize learning process and social capital generation for adaptive management of complex RBM.

To get better insight how Brantas river and the Rhine river are governed, further, in this section it will discuss about the type of both basin governances.

Based on the understanding of chapter 3 and 4, it is said that the type of basin governance of Brantas and the Rhine tend to be polycentric characterized by decentralized governance. In the case of Brantas RBM, decentralization of water sector is applied by transferring the authority to regional government as well as to public corporation (PJT-I) and water users to manage water resources in the entire Brantas river basin. The shift towards decentralized governance is indicated by strengthening the role of lower government layers (local and provincial level of government) as well as basin organization and water users in the management of Brantas river basin. Decentralization in Brantas RBM characterized by giving managerial autonomy to basin organization

(Perum Jasa Tirta I) has given structure that make it more accountable to their stakeholders and customers.

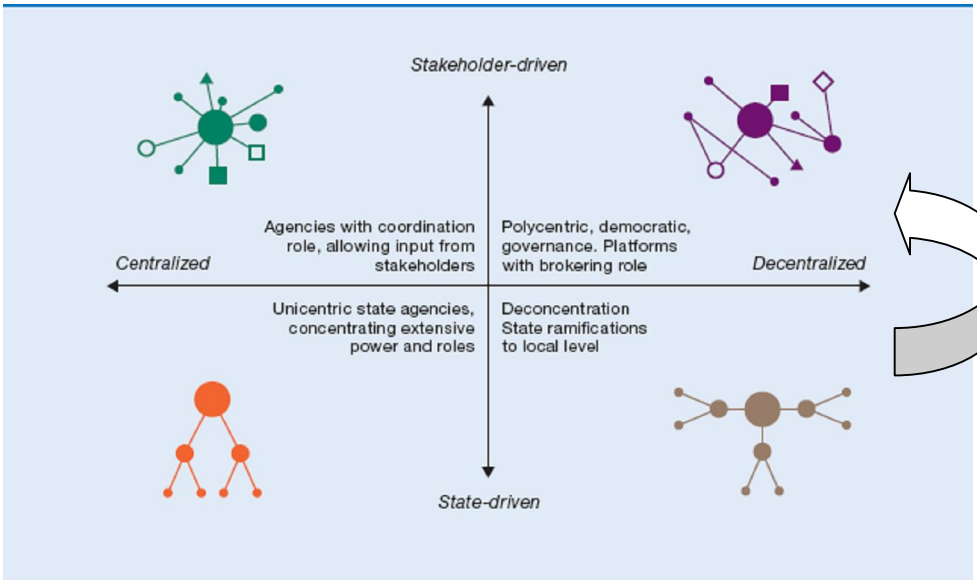


Figure 5.1 : Typology of river basin governance in Brantas RBM : Move from de-concentration to polycentric, (adapted from Mole et al, 2007)

By all means, because of tasks and responsibilities are distributed toward regional/local governmental layers as well as river basin organizations, it will require active coordination among those actors. Institutionally, the establishment of coordination body in Brantas RBM called regional and basin water management committee really supports the process of deliberation in the Brantas river basin management. Within the coordination body, the interaction between actors can be developed. However, decentralized governance in the management of Brantas river has encouraged more responsive governance process and the improvement of inter-sectoral linkages. Responsible policy making in water resources management can be ensured by coordination and collaboration among governmental agencies, water users, and other stakeholders. Thus, it is argued that the shift of governance system toward decentralized water management in Brantas river basin has encouraged developing of adaptive institution in Brantas RBM.

On the other hand, in the case of the Rhine RBM, the shift of governance regime in trans-national cooperation from state-centric regime to individualistic regime also has encouraged the management of international Rhine river basin towards more polycentric governance system. It is signed by the application of political approach more emphasizing on cooperation and political engagement at various levels rather than developing internationally binding obligation. This new governance system tends to encourage flexibility and compromising, so that it strengthens toward commitment and trust among riparian states to collaborate in managing the Rhine. Institutionally, under the new governance system, local actors such as Swiss cantons, the French *agences de l'eau*, and the German *Länder* are involved in the deliberative process in trans national layer. However, this arrangement was not occurred in the previous Rhine trans-boundary governance system. Previously, the actors who negotiate in transnational layer were mostly from the state central government.

In addition, in the concept of individualistic regime, the responsibility to implement any international agreements is devolved to the lowest possible government levels such as the Swiss cantons, the French *agences de l'eau*, and the German *Länder*. The collaboration among government at various administrative levels has given room to develop robust working relationship and it opens the opportunities to joint identification for gaining innovation in term of best technology for coping with water issues in the Rhine. Thus, the collaboration, trust enhancement, and achievement of common perspective built in the new governance regime will provide an arena for social capital enrichment, arena for innovation and enhancing flexibility.

Indeed, the successful implementation of decentralization on water sector is very influenced by the motivation of the transformation process towards decentralization. Blomquist et al (2005) argued that there are two ways in the process towards decentralized water sector which are top-down and bottom up. In the top down approach, decentralization initiative is pushed by central government with the objectives to solve the problems of central government itself. For instance, it is aimed to resolve a budgetary crisis, to eliminate the central government's accountability for past, and to eliminate current policy failures. Additionally, the top down decentralization initiative is also encouraged by pressure from external support agencies or supranational agencies such as World Bank with respect to prerequisite for continuing financial support. In conversely, in bottom up approach, the process of transformation towards decentralization is reached through process of mutual discussion and consensus between central government and local stakeholders. The objective of this transformation is to improve performance of water management and to fulfill the aspiration of local stakeholders to gain autonomy and flexibility in managing water resource. However, it is argued that the different ways of transformation towards decentralization above will perform different outcomes in the implementation. Decentralization which is developed based on the mutual pretension from both central government and local stakeholders is evaluated to be more successful rather than decentralization developed through top down approach (Blomquist et al, 2005).

In the case of Brantas RBM, decentralization process is mostly carried out through top down approach. It is pushed by the effort of central government to reduce the budget for water sector because of the financial crisis. The effort is applied with expectation that the role of public and private participation can be improved to help overcoming the financial problem of national government on water sector. Moreover, the decentralization process is also pushed by pressure from supranational agencies such as World Bank. Decentralization in water governance becomes one of elements in Indonesia water reform project which is financially assisted by World Bank. The impact of this state is that there are principles of decentralization in water management sector which have not been carried out properly. For instance, the development of public consultation, as one of the characteristics of decentralization in water management sector, sometimes is still used just to give evidence that in producing policies, plans and programs power-holders or competence authority has gone through the required motions of involving public societies. Therefore, the utilization of public and stakeholder ideas/information for decision making sometimes can not be ensured.

On the other hand, in the case of trans-boundary Rhine RBM, the transformation toward decentralized water policy is pushed by mutual pretension from Rhine government and local Rhine stakeholders. The idea to change approach from state-centric regime to

individualistic regime comes from local actor (Ms Kroes, a prominent member of the people's party for Freedom and Democracy (VVD), in Holland) which is endorsed by the ministerial Rhine conference. The aim of this transformation is to improve performance of Rhine river basin management especially against water pollution and to accept the aspiration of local stakeholders to gain flexibility in the management of Rhine river. The encouragement of local stakeholders to develop new regime in the Rhine RBM actually have supported the development of adaptive management in the Rhine river basin since there are efforts to enhance flexibility and adaptation in the management of the Rhine by giving more room for riparian countries to adapt their knowledge and innovations. However, under this governance system, management of the Rhine river basin has proved to be successful.

b. Sectoral Integration (Integration between spatial planning and water policy)

The integration between spatial planning and water management is one of the important elements in the development of adaptive river basin management. Because land and water are coherence, there is a spatial interdependency between land and water. Land use change in one place e.g. in upstream area will influence water quality and quantity in other place e.g. in down stream area. Therefore, to adapt with this issue, it is important to build integration between spatial and water policy in the management of river basin. In this section it will discuss the extent to which the integration of spatial and water policy is organized in both RBM.

Generally, in many respects, it is found that there is still lack of consideration given to water in the system of land use planning in Indonesia. In Brantas RBM case study, it is found that many policies which have spatial implications still neglected water interests. For instance, the heavy conversion of forest and agricultural land in upstream catchments of Brantas river into built up area has given an evidence that the spatial policy taken by government has ignore water interest. However, the lack of attention on integration between spatial and water policy in the case of Brantas river is triggered by unbalancing concern between social economic interest and environmental interest. As it is faced by most of developing countries, that many policies which have spatial implications still tends to take side on social economic interest rather than environmental interest. In the Brantas RBM case study, it is found that most of spatial policies are taken on behalf of the initiative to improve social welfare. As Gunawan (2006) argued that most of spatial planning in Indonesia is subject of political and economical interference. Spatial policies are often made to benefit certain parties such as businessman. The implication of the policies is that the violations on spatial development against the existing land use planning become common practices. Generally, the impact of this situation is on disregarding environmental aspects such as water interest. Heavy land conversion on upper catchments area has deteriorated the environment of Brantas river basin as a whole. In contrast, spatial policies in European countries (the Rhine riparian countries) are very strict in implementation. Land development is implemented closely from plans and regulations. The government has strong commitment and capacity building to implement spatial development according to the plans. As a result, there are little opportunities for emerging violations on land development. This condition has minimized the land use issue on the management of water resources in the Rhine.

Moreover, in term of integration between spatial policies and water management, it is found that in the last decades, riparian states of the Rhine have concerned to integrate spatial policies and water management. In planning arena, spatial planning becomes more and more important arena for policy integration. One of the key principles

advocated to balance all interests on land and water is proper communication between parties and disciplines involved in spatial planning process. In other word, the program on integrating spatial planning and water management is conducted through the involvement of multi-sector and interdisciplinary. Communication among sectors is done through the exchange of information belonged to those parties/sectors. The important thing is that spatial planners and project initiators has been stimulated to communicate with water experts earlier in every design process of the project. Commitment and political will to communicate and share information between spatial planners, project initiator and water managers is important to keep the water interest.

In the case of Brantas RBM, to integrate spatial planning and water management, it needs political will of government, all stakeholders, all related sectors, as well as support from communities. In fact, there is still poor political will of government to share information because of political interests among sectors. Poor transparency, however, has hampered information flow among government sectors and among government, stakeholders and communities. Lack of communication between spatial planners, project initiators and water experts also becomes the factor which is the constraint of the integration between spatial planning and water management in Brantas RBM.

c. Public participation

Public participation becomes the key element to build adaptive institution in river basin management. Public participation in this term includes the participation of all members of the communities such as water users as well as the participation of stakeholders such as water providers, NGOs, official representative of water users, and the other organization which have interests in water issues. According to Maimone (2006), a number of essential reasons are advocated to the necessity for public and stakeholder participation in the water resources management. Firstly, it is pointed to political support. However, public and stakeholder participation is encouraged to provide recommendations used as fundamental political support for decision maker. Secondly, public and stakeholder participation is also aimed to build better communication and information between stakeholders/societies and decision maker. It is important since communication and information constitute the instruments for collecting variety of knowledge and experiences. This second reason becomes the important rationale why public participation is necessary in building adaptive institution. In this term, public participation is built to gain social learning required for improving the responsiveness of institution. Lastly, public participation is also aimed to fulfill regulatory requirements. Most of water policies and regulations include a mandatory for public participation in the management of water resources.

Referring to the previous chapter, it is found that recently public participation in the management of Brantas river basin is gradually strengthened, although it is still in developing phase. The policy strengthening public participation in water management is already available. Since the enactment of new water law, public participation in water sector gets major attention both from government and from supranational agency. In every stage of water management, public and stakeholders are encouraged to be involved directly. It is argued that by promoting public participation in Brantas river basin management, it will open opportunities for enhancing communication, interaction and mutual clarification among stakeholders. By public participation, the degree of unfaith among stakeholders can be removed or at least suitably minimized.

Nevertheless, in case of Brantas RBM, it is found that public participation process sometimes still meet lack of effectiveness. The implementation is still clumsy and reluctant. For example, public participation in water planning process is still limited to certain stakeholders. Further, although in new water law there is an obligation for competence authority to publicly inform the draft of water resources management plans to the communities, but in practice it is still far from realization. Additionally, because of socio cultural condition which is not conducive such as the influence of paternalistic attitudes in Javanese culture, local people still face difficulties to reject or even voice their objection against certain management plans. Moreover, ineffective public participation in Brantas river basin management is also caused by lack of political will from government. For instance, based on water law, public communities and non governmental organizations have right to involve in monitoring the implementation of water management, but in practice the input and information given by those parties to government is often neglected. The response of government is often very slow as if waiting for emerging new problems. The increasing of credibility and professionalism of non governmental organizations is required in order to ensure and build faith of government to accept their idea and innovations.

Particularly, the government culture really influences the public participation process in the management of Brantas river. The characteristics of paternalistic brought in government culture especially in Java, in fact, can hampered the participation of public in decision making process.

However, the role of government is very important to initiate greater public involvement in water management sector. Government should be proactive to encourage public involvement by providing sufficient information to public societies and stakeholders and provide room for open dialogue to grab the input and recommendations from them. By gaining good information, people will respond more easily. Thus, the main attention which has been given to improve public participation in Brantas RBM is designing an effective stakeholder process. It is argued that successful stakeholder participation process should accomplish some respects related to granting guidelines for public participation, covering as broad population segment as possible for gaining wider input in multidisciplinary aspects, serving public participation process as a forum for understanding and reconciling various points of view, and ensuring for the acceptance of results and recommendations. All of those aspects mentioned should be increased in the development of public participation in the Brantas RBM.

In the Rhine case, since long time, stakeholder participation has become the crucial key element in the development of trans-boundary river basin management. NGOs actions have significant influence in the development of regime in the Rhine river basin. However, in this case NGOs have an important role to bridge the interests of government and stakeholder through lobbying and exchanging data and information. It is found that the good circumstance for public participation is available in the Rhine regime. For instance, in the international cooperation open dialogue between NGOs and governments becomes accustom and obligation in achieving every decision. The successful NGOs participation in the Rhine management is due to the openness political system of Rhine governments to the ideas of the NGOs. To get the acceptance from Rhine government, the NGOs attempts to built the faith through offering their professionalism. Moreover, successful public participation in the management of the Rhine is also promoted by supporting pre-conditions such as strong methodological basis on public participation, interlinked multilevel activities, long history of public

involvement and open dialogue in the Rhine riparian states as well as because of democratic regimes of riparian states.

Nonetheless, some weaknesses on the public participation process are also found in the Rhine regime. Public participation in the international cooperation is still focused only on the involvement of certain NGOs. The NGOs represent all kind of interests related to the management and development of the Rhine. To increase the role of public societies, citizens should be involved directly in policy formulation. Citizen participation in trans-boundary river basin management is important as it is an appropriate tool to maintain the flexibility of the system. Citizen participation is required to build better relationship between community and ecological system. Community may have close knowledge of ecological systems which may not available in scientific form. Moreover, as same as the process of public participation in the Brantas RBM which can not ensure the acceptance of results and recommendations given by stakeholders, the Rhine regime also can not guarantee for the utilization of information and idea given by stakeholders.

However, it is acknowledged that public participation is a critical stage in the development of adaptive institution in the management of water resources. The roles are to make information available in communities and to form social learning. Therefore, participation should cover a range from simple form of information exchanges to wider degree of involvement and decision sharing (Purnama, 2003). However, to build successful public participation it needs some respects such as suitable methodological design on public participation, openness political system, political will of all stakeholders, trust among stakeholders, et cetera. Based on two case studies above, it is shown that both the Rhine regime and Brantas regime has already encouraged public participation in every stage of decision making processes, although in some aspects there are still some weaknesses in its implementation. Both the Rhine and the Brantas regime have a chance to be able to reach better public participation because traditionally the spirit and culture on public participation has already existed since long time ago. Better quality of public participation can be reached if both government and non government institutions have strong commitment to achieve it. Government should continuously attempt to create openness political system for public idea, opinion and criticism. While non government institution should increase their professionalism so that they can gain the trust from government.

d. Information Management

Information management is the important element to develop adaptive institution in river basin management since it is required to identify emerging problems and trans-boundary issues, to analyze the opportunities and threats on the management of river basin, et cetera. The involvement of various agencies and actors developed in adaptive institution regime of course will need supporting instrument to incorporate, utilize, manage and disseminate the data and information resulted. Thus, there is demanding challenges for new and innovative approaches in information management. Many river basin organizations have already developed information management through building information technology such as computer networking, Geographic Information System (GIS), Computer based monitoring, decision support system, data base management, et cetera to help their tasks in achieving the river basin management objectives. Interaction with public is built through developing instrument such as internet. However, for supporting effective adaptive management discourse, it requires the information and knowledge interface. The interface may be provided by internet. Through internet connection, open decision making can be perfectly facilitated.

In the case of the Rhine RBM, information management is already developed properly. Good accessibility for data and information for public society and stakeholders has supported the empowerment of adaptive management in the Rhine. If traditionally the information and communication process is only restricted to decision makers and implementers, nowadays information and communication has been publicly opened. However, this information management brings the concept of adaptive management. The flow of information to the public is aimed to grab the feedback from public functioned to evaluate previous actions and guide future actions. By considering the negative feedback, we can learn from the mistakes.

However, information management of the Rhine RBM is developed under the standard of Euro Community and international trans-boundary cooperation. Information is available for public society with differing languages. In other word, data and information about the management and development of the Rhine has been managed communicatively to fulfill the needs on information of all riparian states. By using internet network for disseminating data and information, open communication with all stakeholders and communities is developed. Open dialogue and discussion are conducted easily, and it will provide room for exchanging knowledge and idea. However, generally, the communities of the Rhine riparian states have good access to internet. Almost all communities are already familiar to access the internet. It is differing from the condition of the Brantas' communities. Not all communities in Brantas river basin can access the internet. As a result, one of the problems of information management in Brantas RBM is the dissemination of the data and information. Generally, data and information are still disseminated limitedly. Not all communities and stakeholders can access the data and information. However, this condition can hamper the development of adaptive management in the Brantas RBM. To solve this problem, it needs another instrument which can improve the information flow from government to stakeholders and communities.

Moreover, in the case of Brantas RBM, it is found that information management also still faces other issue and challenge. The issue is related to data production and data management. It is found that the system of database is still poor. Many problems often emerging in information management of river basin such as incompatibility databases, a lack of research producing new information related to river basin management, lack interagency connectivity, and so on, have hampered the adaptation of policy development on water resources management. In addition, it is found that the information management of Brantas RBM is still focused only on the presentation of water quality and quantity data. It hasn't provided comprehensive database covering socio economic data, land use issue, financial data et cetera. Lack of communication and information sharing among sectors becomes the major issue in information management of Brantas river. The fundamental reasons for the poor management of information on the Brantas RBM are insufficient financial support, lack of technology and human resources.

In contrast, information management becomes one of the aspects strengthened in the water management in the Rhine riparian states. Water framework Directive as a one of the legal instruments in the field of river basin management has strengthened the importance of information for water management. Proper data and information related to the management and development of the Rhine is generated through the involvement of multilevel and sectors of government, stakeholders and community. Better

communication among sectors and comprehensive database generation becomes the clue of information management in the Rhine river basin. Moreover, providing information of the Rhine basin is also supported by some water association such as EWA. This association not only provides the information about water quality and quantity of the Rhine but also provide the technical and political information related to the management of the Rhine. However, proper management of data and information in the Rhine RBM is because there is sufficient financial support, technology, and human resources.

It is acknowledged that one of the most important functions of the establishment of international commission for the Rhine is to develop better coordination and cooperation related to the management of the Rhine through the development of information needs and strategies for information collection, analysis and use (Savenije and van der Zaag 2000; Enderlein 2001 cited by Nilsson, 2006). However, the main goal of the development of information management by the Rhine governance is to provide good and complete information for stakeholders and public societies. This vision becomes basic spirit to take measures for proper information exchanging and disseminating. Because each riparian state has interest to create good condition of the Rhine, so they have responsibilities to provide good information for decision making. Proper data and information management can be achieved when all riparian states have the same vision to build the availability of data and information required for decision making. In respect to achieve the vision, measures taken are concerned to actively communicate information each other and share it to the public through regular meeting with the NGOs for exchanging and disseminating information. To develop complete information, ICPR involve non governmental organizations and experts from multidisciplinary field e.g. technical and engineering sciences, ecology and the social and political sciences incorporated in working groups.

e. Legal Institutions

Water law and water policy are the instruments which can support the development of adaptive management. Raadgever et al (2006) said that appropriate legal framework encouraging the development of adaptive management is if it stands for a complete and clear water regulation in which it should be comprised of the regulation strengthening the elements of adaptive management :

d. Rules about basic principle of integrated water management
e. rules for public participation and access to information
f. rules for giving incentives for periodical review and change of regulation and for changes in the actor network, information management and financial system.

Moreover, Raadgever et al (2006) also suggested that to develop adaptive institution, legal institution should be more flexible. Regulations should be able to be modified easily. To develop adaptiveness of legal institution, policy should be reviewed periodically.

In the case of Brantas RBM, the basic concept for developing adaptive management is already covered in the new water law. The principles of public participation, balanced distribution roles of every stakeholder, the requirements for coordination, cooperation, collaboration in the management process, and strengthening in financial aspect are already regulated comprehensively in the new water law. On the other case study, in the case of the Rhine RBM, Water Framework Directive and other international conventions also has provided comprehensive legal framework for water management in the river basin. The characteristic of WFD and other international conventions which are only binding to the goal and not binding to the means, however, has stimulated flexibility in

the management of river basin. This flexibility constitutes one of the ideas in developing adaptive management concept.

However, although the legal framework of both RBM have been well developed especially in term of their comprehensiveness, but in term of the provision for policy and regulation review are still less developed. Most of policy and regulation on water management of both river basin have not been reviewed periodically yet. This state, however, becomes one of the constraints on the development of adaptive management in both river basin.

5.2 The factors which likely influence the development of adaptive institution in both RBMs

The development of institutional arrangement in Brantas RBM is influenced by some factors. First of all, it is influenced by political factor. The development of new regime in the Brantas RBM is really influenced by interference of supranational agency. The World Bank holds the important role and power to build adaptive institution in Brantas river basin management. The roles are expanded through policy guidance extended when they grant financial support in form of loan for the management of water sector. Policy guidance pushed by the World Bank points to the reformation of institutional system and regulatory system stressing on decentralization of water policies as well as strengthening privatization on water sector in order to overcoming the financial problem on water sector. Additionally, the World Bank also encourages public involvement and democratization in water management through strengthening information management as well as public participation in planning, implementation, monitoring and evaluation on water resources management. However, all of those policies encourage the development of adaptive institution on water resources management.

In addition, democratic system of the country also becomes another factor supporting the development of adaptive institution in river basin management. Democratic country generally encourages public involvement in policy making process. However, strengthening on public involvement is one of the principles in developing adaptive institution since public involvement encourages social learning in the management process.

Moreover, cultural factor becomes factor which may support the development of adaptive institution but it may also become factor hampering. In the case of Brantas river basin, the Javanese culture in which deliberation becomes a custom in decision making has supported the development of adaptive institution. Nonetheless, the tendency toward paternalistic becomes the factor which can hamper the development of adaptive institution.

In the Rhine case study, because the Rhine river flows through some states so that the management of this river is influenced by various political system and cultural background of all riparian countries. However, the various political system and cultural background of riparian states may cause the difference degree on developing adaptive institution. For instance, the Netherlands which has been already familiar with collaborative planning, may have higher chance and faster process to develop adaptive institution. In contrast, Germany, which tends to be more command-control country, may have lower opportunity and slower process in developing adaptive institution.

Moreover, the Rhine management is also influenced by a number of supranational institution such as European Union as well as international river basin committees e.g. International Commission for Protection the Rhine (ICPR), Central Commission for the Navigation on the Rhine (CCNR), International Commission for the Hydrology of the Rhine Basin (CHR), et cetera. They play role in the development of policy instrument for the management of the Rhine. For instance, WFD established by EU has brought in the concept of adaptive management in water management of European countries. WFD combined the command control governance system with interactive and negotiative approach. It emphasized and encouraged the involvement of communities and water stakeholders in the decision making process. Strengthening on sectoral integration, public involvement and information management emphasized in WFD also become the basic principles for the development of adaptive institution in river basin management. In addition, at present, the production and implementation of agreements in international river basin committees also tend to adopt the principles of adaptive management.

5.3. Concluding remarks

Based on the understanding above, I will conclude that there are elements brought by both RBM institutions which strongly support the concept of adaptive management while other elements remain weak support. Below it is mentioned the elements which strongly and weakly support the adaptive management concept.

RBM	Criteria				
	Type of basin governance	Sectoral integration	Public participation	Information Management	Legal Framework
Brantas	√	0	√	0	√
The Rhine	√	√	√	√	√

√ : strongly support
0 : weakly support
X : do not support

The basin governance type of both Brantas and the Rhine RBM strongly support the development of adaptive management concept. The institutional arrangement developed in Brantas RBM support the process of decentralization on water sector. Nonetheless, although type of basin governance in Brantas RBM strongly supports the development of adaptive management, but it still needs the improvement of political will of government to encouraging and empowering the deliberative process in the management of Brantas river basin. On the other side, the new institutional arrangement built in the Rhine RBM after developing Rhine Action Plan (RAP) also supports the development of adaptive management in the Rhine. The trustful understanding among riparian states has encouraged better trans-boundary cooperation. Moreover, the new regime, however, have developed better relationship between basin government in every level and public communities/stakeholders. Better development of network and public participation will grab broader knowledge for decision making and to collect support for the implementation of the decision. There are useful lesson which can be obtained from the application of decentralized system in the Rhine basin. When the process of management such as problem definition, goal setting, strategy articulation and priority determination as well as monitoring are carried out together by all riparian states in international level, so there is the same vision on the management of the Rhine. The generated vision in the international level however can stimulate support across societies.

When the action/implementation of plan is decentralized to the national level so national government have responsibility to achieve internationally agreed vision. Nonetheless, nonbinding decision on the means to achieve the vision in international level may allow flexibility for national government to implement the agreed vision. Flexibility is one of the characteristics advocated in the concept of adaptive management.

Moreover, in term of sectoral integration, it is found that sectoral integration especially integration between spatial planning and water management in the Rhine river basin is more developed rather than in the Brantas river basin. Better coordination and communication between spatial planners and water experts carried out in the Rhine river basin management becomes the basic principle which has not been found in the Brantas river basin management yet.

In addition, both river basin organizations have already encouraged public participation as the important requirement on policymaking process. Public participation is strengthened by regulating it in the legal framework, so that it becomes legal requirement in the management of river basin. Nonetheless, the effectiveness of the implementation of public participation varies in both river basin since the designs of public involvement vary one another. The effective public involvement required to develop adaptive management will be achieved when it is considering social learning for developing wider knowledge and consideration on decision making process to answer the challenges of uncertainty in the management process. It means that utilization of generated knowledge should be ensured as considerations in decision making.

Moreover, in developing adaptive institution, the institution of Brantas RBM faces the weaknesses in information management. The weaknesses refer to the production, management and dissemination of the data and information. Financial, technological and human resources supports become the main problems on the development of information management in Brantas river basin. However, the poor management of information has hampered the development of adaptive institution since adaptive institution needs comprehensive understanding and monitoring of multi-sectoral information. Wide knowledge and information originated from multi-sector, multidisciplinary and diversity of social knowledge is really required to help decision maker in defining the emerging problems and determining the measures which should be done facing the uncertainty situation in the management process. In contrast, in the Rhine case study, the information management becomes the main concern of the river basin management. Proper management of information in the Rhine management, however, has supported the development of adaptive institution in the Rhine.

Finally, legal framework also will influence the development of adaptive institution in river basin management. Based on our understanding in chapter 3 and 4, it is argued that legal framework of both RBM really supported the development of adaptive institution. The criteria brought in the concept of adaptive management are strengthened by regulating them in the water regulation. However, by regulating the criteria of adaptive management in legal institution, it will support adaptive institution building on both RBM.

In addition, to get lesson learning from this research, below it will be concluded the strengths and weaknesses of both river basin institution in bringing in the concept of adaptive management.

No.	Criteria	Strengths	Weaknesses
	Brantas RBM		
1.	Type of governance	Decentralization on water management in Brantas river basin has started to improve relationship, communication, coordination and cooperation between governmental layers and sectors, so that broader knowledge can be provided in decision making process.	Decentralized system in Brantas RBM is developed through top down approach. This approach sometimes hampers the development of adaptive institution.
2.	Sectoral Integration	-	Lack of coordination, communication, and information sharing between spatial planners and water experts/managers.
3.	Public Participation	a. Public participation becomes legal requirement in river basin management since it is strengthened in the water law. b. The principle of public participation has been recognized in the management of the Brantas river basin for long time, so that it is already familiar, not new approach in the river basin management	a. The characteristic of paternalistic which is very strong in the management of Brantas river basin may hamper the effectiveness of public involvement in Brantas RBM b. There is still no specific design for public participation in Brantas RBM
4.	Information management	Information management is already included in the one of the important aspects which is regulated in the new water law (Water Act No. 7 of 2004), although it is still poor in the implementation	a. Lack of financial, technical and human resource supports. b. Poor management on data production (poor quality on databases) and data/information dissemination
5.	Legal Framework	New water law (Water act no. 7 of 2004) provide comprehensive legal framework for water management in Brantas river basin supporting the development of adaptive management concept	Policy and regulation review are still less developed. There is no requirement to periodically review on water policy.

Table 5.1. The Strengths and weaknesses of the institution of Brantas RBM

No.	Criteria	Strengths	Weaknesses
	The Rhine RBM		
1.	Type of basin governance	Polycentric system in the Rhine RBM is developed through bottom up approach, so that the governance system is more robust.	-
2.	Sectoral Integration	a. Better communication and coordination between spatial planners and water managers/experts b. Technical and political cooperation are well developed in the internationally Rhine cooperation	-
3.	Public Participation	a. Public participation becomes legal requirement b. Professionalism of NGOs has increased the trust and faith of government c. Accessibility of communities and stakeholders d. Openness political system of Western culture	a. There is still limitation of the involvement of communities in international river basin management.
4.	Information Management	a. Better financial, technical and human resource supports for information management. b. Information production and dissemination are well developed	a. Utilization of information generated is not ensured. The available information may be neglected in decision making process
5.	Legal Framework	a. There is comprehensive legal framework supporting the development of the criteria of adaptive institution b. Flexibility : binding only on the general goals, but not the means to reach the goals. The means can be adapted in the national regulations of each riparian state.	Policy and regulation review are still less developed. There is no requirement to periodically review on water policy.

Table 5.2. The Strengths and Weaknesses of the institution of the Rhine

Chapter 6
Conclusion and Recommendation

Recently, river basin management is recognized as the appropriate unit for water management. River basin is a complex system comprised of physical, biological, and social elements. Because of its complexity, uncertainties are often emerged in the management process. If previously, the water management is commonly deal with command control approach, at present this management is considered not appropriate anymore for the management of river basin.

Because of the degree of complexities and uncertainties in river basin management, there are some criticisms addressed to the weaknesses of conventional management approach in responding environmental challenges. The weaknesses refer to its characteristics which are more focused on static, end-state, blue print master planning approaches, single discipline involved, and less development of public participation. Recently, adaptive management is advocated to replace command control approach. The advantages of adaptive management are that it is increasing flexibility, openness, responsiveness and stimulating innovation in the river basin management through the enhancement of social learning.

The research is concerned to understand how the concept of adaptive management is used in the management of river basin. Two case studies: Brantas river basin management and the Rhine river basin management are taken to give better understanding about how institution is developed to bring in the concept of adaptive management in both RBM. By comparing the concept of adaptive management and the institution building in management practice, we will have better understanding and lesson learning from the strengths and the weaknesses of those institutions.

Based on the understanding of the institution building of Brantas river basin explained in chapter 3, I conclude that a transition to adaptive water management has already been recognized in Brantas river basin, with respect to the criteria of the type of basin governance, stakeholder participation, and legal framework. Decentralization of water management which was conducted in the management of Brantas river basin, however, has given the new management system in Brantas RBM. In this system, there is better coordination and cooperation among governmental layers, existing organization, stakeholders and communities. However, better coordination between those actors has increased the responsiveness of river basin management. Moreover, the increasing of the degree of public participation in the management of Brantas river basin also becomes the indicator in developing adaptive management. Strengthening of public participation in regulatory framework, however, has been legal basic for societies to actively participate in every stages of management process. The legal basic ensure societies to get rights to directly and indirectly participate in decision making process. However, the increasing of public participation in the management of brantas river basin has stimulated the extent of knowledge of decision maker. Knowledge is very important in adaptive management since it is needed to answer many uncertainties in the management of river basin. In addition, comprehensive legal framework developed for the management of Brantas river basin becomes one of the indicator for the successful development of adaptive management in Brantas river basin. However, the new water law established as one of the results of water reform in Indonesia has provided the basic principle required to build the adaptive institution in Brantas river basin.

Nonetheless, based on the five criteria which are determined in chapter 2, two of those criteria are still less developed in Brantas river basin management. Those criteria refer to the criteria of sectoral integration especially integration between spatial planning and water management, and the criteria of information management. In the management of Brantas river basin, it is found that there is still lack of coordination, cooperation and communication between spatial planners and water experts/managers. It is found that water policy often are not synchronized or in line with the spatial policies. As a result, land use becomes major issues emerging many water problems in the management of Brantas river basin. Moreover, information management is also still less developed in Brantas river basin management. Poor management of information is shown by the poorness of database production and information dissemination. However, the poorness of information management really influence the development of adaptive management in Brantas river basin since information is the key point which is required to adapt with complexity and uncertainties in river basin management

In the case of the Rhine river basin management, it is found that the five criteria required for developing adaptive institution already existed, although there are still some weaknesses in its developing. Nonetheless, based on my point of view, some key principles brought in the concept of adaptive management such as flexibility, responsiveness of government and river basin organization, openness and the stimulation of innovations have been advocated in the new regime of the Rhine river basin management. The key element which is well developed to support the other criteria on developing adaptive institution in the Rhine river basin is legal framework for the Rhine river basin management. WFD and other international conventions for the Rhine, however, have played the important role in the development of adaptive institution in the Rhine river basin management. The characteristic of those legal frameworks which are binding only on the goals and not on the means, however, provide flexibility on the management of the Rhine. It also encourages each riparian state to look for the innovations in facing the challenges in the management of the Rhine river basin. Flexibility and innovations, however, are the characteristics of adaptive management. Moreover, those legal frameworks also have strengthened other criteria of adaptive management which require to be built in the management of the Rhine. The criteria of public participation and information management are covered and regulated in those legal frameworks and have been implemented properly. Sectoral integration especially between spatial policy and water policy also has started to be developed in the Rhine river basin management. The need to integrate spatial policy and water policy, however, emerged since many studies argued that the spatial policy and water policy may not be separated because land and water are coherence. Based on the understanding about the institution building in the RBM, it is concluded that the institution building of the Rhine river basin management has already started to promote the adaptive institution on its management. Support from involved actors and other institutions become the important factor for successfulness of adaptive institution building in the Rhine RBM.

Based on the understanding of both case studies above, there are some lessons which can be learned. First of all, the development of adaptive institution in national river basin management is not easier than in trans-boundary river basin management. In fact, it is shown that the Rhine river basin institution has succeeded to shift from conventional approach towards adaptive management approach by bringing the criteria advocated in AM concept in its institution building. Although, there is a challenge due to the diversity of political system and cultural background of riparian states, the development of the

same vision and trust between riparian states, in fact, has relieved the process of transition towards management. The challenge faced by the institution of Brantas river basin in shifting towards adaptive management is the lack of trust among governmental sectors as well as between government and other stakeholders including water users and communities, so that there is still poor cooperation among actors and sectors. Lack of trust emerges because there is still poor transparency on the management of river basin.

In addition, the lesson which can be learned from the Rhine RBM is the changing role of water management in spatial planning. The policies on water management, generally, are integrated in spatial planning. In this respect, there is a need to change the work relation between spatial planners and water managers/professionals. This condition will emerge a challenge in the planning process. As we know that water management is closely related to stakeholder participation. Water manager is one of the important stakeholders. However, stakeholder participation in water management could be long planning process because of the complexity of water system. In addition, it also will emerge uncertainties about the outcome. As a result, planning process may suffer little public support when it needs to shorten planning process.

In term of the development of the criteria such as public participation, sectoral integration and information management, it will need supporting elements such as financial, technological and human resources support. In this case, those supporting elements are better developed in the Rhine institution rather than in Brantas institution. However, those supporting elements will significantly influence the development of the criteria mentioned above. The absent of those supporting elements will hamper the transition towards adaptive management. As Lee (1993) said that the obstacle of the development of adaptive management is the high cost of information gathering and monitoring due to the need to improve technology and human resource capacity. Another problem is difficulties in acquiring stable funding.

However, the need to shift towards adaptive management in river basin management is significantly required to face the complexity of the river basin system and the emerging of uncertainties in RBM. As a consequence, the improvement of institution building in river basin management is needed. Based on the understanding of both river basin institutions above, I propose some recommendation to improve the current institution building. Next paragraphs will present some recommendations.

Recommendations

Based on the understanding above, I proposed some recommendations as follows:

1. *Communication* : Successful implementation of adaptive management is really depended on the development of communication between actors. In Brantas river basin, the respect which is still poor developed is communication. Communication should be improved through developing better intersectoral coordination, the improvement of information dissemination, and the improvement of public role in planning process. In the current Brantas institution building, better communication among urban planners (Bappeda on provincial and municipal level), sectoral departments making policies which have implication to water such as Forestry department, Public work department, and water manager such as Perum Jasa Tirta I are absolutely have to be developed. To reach better communication in the management process, transparency and strong leadership is really required to guide the communication process. Good communication is achieved when each

department can give feedback upon the policies which have implications to water. Communicative planning, thus, absolutely has to be improved to gain better result on urban planning. The key point which has to be improved to develop better communication is information management. Transparency on the information management produced by related departments is absolutely required to help urban planners to collect all information especially related to water states and its issues. The information should be continuously updated and completed to understand the current issues. In conclusion, the weaknesses on information management in Brantas institution absolutely should be improved.

2. *Financial support*: Financial support became one of the problems of water resources management in Brantas river basin. The limited budget for the operational management such as for information management will hamper the development of adaptive management in Brantas river basin. However, to ensure successful implementation of adaptive management, the sufficient financial support is absolutely required. Financial autonomy derived from water charges especially for pollution taxes should be improved to suffice the need of cost for the management of water as a whole. In the current states in Brantas RBM, water taxes are still less developed. It is because the inventory of water users has not been developed properly. Many industries which pollute the Brantas have not been charged pollution taxes because there is limited data on the industries which flow their waste water to Brantas river. Many ground water users also do not have legal permit from government so they also have not been charged for the water use taxes. Thus, one point which has to be improved is an inventory of water users and monitoring on water uses.
3. *Integration water management and Spatial Planning*: the key point which has to be developed to integrate water management policies and spatial planning policies is the development of work relation between spatial planners and water managers. Better work relation can be developed when it is enforced by regulation and supported by political will of both sectoral government to coordinate and cooperate continuously.
4. *Public participation* : to ensure the effectiveness of public participation in river basin management, it requires determining of public participation design which is matched to the social characteristic of communities in the river basin. In the Brantas RBM case study, for instance, it may need specific design for public participation in rural communities which is differed from the design for communities in urban area because they may have specific culture and because of their limited capacity on education level. In the Rhine case study, the specific design for public participation in each riparian state will vary based on the characteristic of cultural background and political system of each state.
5. *Information management*: because river basin constitute as a complex system so understanding about the system only has to be built through communicating various existing mindframes. Thus information should be provided to give input to problem analysis. Proper information will has benefits if it is provided based on mindframes of the receiver. The data and information gathering, as a result, has to be developed by involving related actors and sectors and to be based on the mindframes of each related actor and sector. Moreover, the improvement on information management should be done on the basis of the kinds of information which have to be provided by the government institution. In the case of Brantas RBM, the information on water management is still focused on the information about water quality and quantity. Meanwhile, other information related to water issues such as information on social demography, cultural characteristic of basin communities, information on land development, information on industries distribution in basin area, etc are still less developed and integrated.

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