

**WATERSHED MANAGEMENT IN INDONESIA:
Behavior And Strategic Interaction Between
Upstream And Downstream
(Case Study: Ciliwung Watershed)**

MASTER THESIS

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ABSTRACT

Watershed cannot separate from human life. The condition of watershed in Indonesia is changing rapidly in line with the regional development. There are many externality problems such as flood, drought, high sediment and pollutant. The condition become worse when local autonomy was regulated. Every local government has given authority to manage their region and community. Development in local level has grown significantly since local autonomy. This has been made the situation become more complex and uncertainty. The dilemmas occurs when economic investment become the main goal of all local government. The conflict of interests between upstream and downstream shows that the management of watershed should be integrated.

Ciliwung watershed is one of the watershed which has complex situation. It relates to two province and at least 2 municipalities and 1 regencies. The most problem is flood in Jakarta which until now cannot be solved well. The technical approaches has been done. The institutional efforts also has been tried through the regulation, coordination and cooperation. The coordination, cooperation and commitment implementation have new challenge when they are implemented in local autonomy era where every local government has their own interests. It is shown in the relationship among three tiers of government. Actually there are coordinating line between them, but in the implementation, provincial level (as representative of central and also mediator for state and municipalities/regencies) is powerless. It is because there is no hierarchical system between province and municipality/regency government.

Nevertheless, there is the unobidient in the implementation which is landuse changes in upstream. The economic motive is the most influencing factor behind the landuse changes. Besides, for Jakarta river conservation such as flood protection is also the main focus. This means that they are conflicted each other. Policy will be useless as long as the policy does not understand the real interests and behavior of related players/actors.

Knowing the behavior of decision makers in interacting to each other is helpful to understand the failure of policies and coordination. In doing so, game theory is used. Game theory tries to discover the existing condition of decision makers interrelation in Ciliwung watershed. It explains how decision makers interact to each others' strategy. In the end, this research explains the failures of policies and coordination in watershed management and the role of incentive and disincentive that will change the behavior and the equilibrium of the game itself. Therefore, the recommendation to the policy and government are defined.

Key word : Watershed, Watershed management, Ciliwung river, Upstream, Downstream, Conservation, economi investment, game theory, incentives

GUIDELINE FOR USING THESIS

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FOREWORD

Watershed is important thing to consider in regional development. The watershed condition in Indonesia is in serious condition and it changes rapidly. The infrastructure and economic investment developments are done, in many cases unsustainable. Those phenomena shows that there is something wrong with the management. It could be organization, regulation, etc. Watershed management should be managed integratedly and should involve all related stakeholders within watershed. Then, the commitment to save the watershed from those stakeholders is being questioned. The disobedient from stakeholders shows that the policies were fail. This is related to the political will of stakeholders. Behavior and strategic interaction are important to understand the real interests and action of stakeholders. Further, it will be known what should be done for the improvement of watershed management.

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Agung Arief

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CHAPTER 1

INTRODUCTION

1.1. Background

Watersheds cannot be separated from human life because they have an important role in human life. Not only supporting freshwater supply, but also they are important for socio-economic point of view. Based on the decree of Ministry of Forestry No. 284/Kpts-II/1999, Indonesia's Watersheds are divided into three criteria based on the priority to be rehabilitated. This is determined from their critical degree of hydrological condition, socio-economic condition, investment condition and policy of development. There are 427 watersheds which are in priority 1; 232 watersheds which are in priority 2; and 178 watersheds which are in priority 3.

The data shows that most of Indonesian watershed are changing rapidly. According to Hendrayanto (2004) the present condition of watershed hydrology in Indonesia is characterized by frequent occurrence of extreme flood, drought, and high sediment/pollutant loads in the water bodies. The changes of land covers and its management of watersheds affect not only the long-term hydrologic regime but also the precipitation amount and pattern. Numbers of reservoirs (lakes) in Jakarta-Bogor-Depok areas are decreasing from about 218 in 1970 to less than 100 in 2003. Sedimentation rates in the big lakes are very highly reducing the storage capacity. Sentani Lake in Papua since 1999 is silting up of about 5 m/yr. It is also happen in Tondano Lake in Sulawesi, the deepest level which was 50 m in 1970, now is only 10 m. Big cities experience severe decreasing ground water level. In Bandung, intermediate ground water level (< 150 m) decreases 0.12-8.76/yr, while deep ground water level (>150m) decrease 1.44-12.48 m/yr. In Jakarta (the areas around Cengkareng, Grogol, Cempaka Putih, and Cakung), ground water level decrease of about 17 meters. There are several causal factors influencing such as illegal logging, the overexploitation of natural resources (forest) in upstream area, population growth, land use changes (from forest to development area and other unsustainable development).

Actually, there is a close relationship between forest, watershed and water. Forestry and water cannot be separated. Forests and water occur together and they interact. If people plant a tree it will use water; if people cut a tree its water use ceases. In Europe these relations were recognized as early as the 13th century. In the United States, they were embodied to conserve the forest. in the 19th century legislation (Anderson. 1976). Further, there are at least seven simple relationships between forest and water (Johnson, 2000) : 1) Forests slow the rate of runoff in a watershed, 2) Forests reduce soil erosion and sedimentation of waterways, 3) Forest soils filter contaminants and influence water chemistry, 4) Forests reduce the total annual water flow in a watershed, 5) Forests can increase or decrease groundwater recharge, 6) Forest loss shifts aquatic productivity, 7) Forests may influence precipitation at a large regional scale, but the effect of forest covers on rainfall in most areas are limited. Forest ecosystems provide people with four types of water-related benefits which are *Water quality, flow regulation, water supply, and aquatic productivity*. Water supply in a watershed for a certain purpose is determined by the amount of water input (precipitation) and the watershed function to transform precipitation into

utilized water that fulfill the requirement of that utilization purpose, quantity, quality and timing of availability. The watershed function in precipitation transformation is strongly influenced by the land use and management (Hendrayanto. 2004).

Since regional autonomy has been applied in Indonesia through Act number 22 year 1999 and Act number 25 year 1999, practically, the authority of regional management is in local government responsibility. Since it has been regulated, the development in every region has grown significantly. The development is aimed at the development of economic and financial region. As a result, the urbanization process increases rapidly. In addition, population growth means increasing demand of housing and food. Those things encourage government to provide more houses and more agriculture lands such as farm. In many cases, local government decides to change forests become housing, palm plantation, mining, industrial use etc. Along with this, illegal housing within watershed also becomes the main problem.

The impact of replacing forest cover with other land uses almost always results in increasing runoff and stream flow (FAO. 2005). In Indonesia case, it is exacerbated by the upstream topography that in general, is quite steep (around 25° - 40°), and its forests are set to be protected area. That means those forest, should be protected and suggested, not exploited because it will bring negative impacts to the environment such as increasing run-off, flood and erosion. Hence, the worse impact of the deforestation/land use change in upstream can be seen in the rain season where the water debit will increase significantly beyond the ability of the river. In this time the huge flood and erosion will occur, for there are not enough barriers to reduce the runoff. In the dry season, there will be the lack of fresh water, because there is not enough forest to store ground water.

In fact, central government through Ministry of Forestry has tried several measures to reduce the impacts of urbanizations like conservation programs such as reforestation. Indonesia has long experience in the rehabilitation and reforestation efforts. The critical land rehabilitation program has been initiated since 1976 through the INPRES (Presidential Instruction) of Reboisasion and reforestation program aid. A side from that, government also tries to engage society to prevent their forest and their environment through its collaboration programmes. The government also involves many stakeholders to discuss and sometimes make agreement of watershed management. In several areas it works. The forests are successfully protected from unsustainable treatment by local community. However, in many cases, it does not work, especially in poor regions or less natural resources. So far, the results of those programmes are not satisfactory yet, because these efforts are limited to technical aspects. Other reasons are because, in general, those conservation efforts, are not followed by sustainable development of other sectors. In this case, the conflict of interest between sectors has not been solved yet. The different interests is not only between local government and central government, but also among sectors/departements within central government (i.g Mining and Mineral department VS Forestry Department, etc), and between provincial governments or between province and local/district governments, etc.

Basically, there are three main perspectives used to manage watersheds in Indonesia,. They are conservation perspective, spatial perspective dan regional autonomy perspectives (Ahmadjayadi. 2001). They have different approaches in the

implementation. Conservation perspective emphasizes on forest prevention and conservation within river basin and along river. This becomes Ministry of Forestry or Forest Department authority. The actions are related to forest rehabilitation and reforestation. Spatial perspective emphasizes on maintenance of river or river basin such as dredging, water management, DAM, etc. This is the authority of Public Work Departement. The last, Regional autonomy perspective which views the management of river basin lies on the authonom governmental boundaries.

According to Raharja (2008), those differences in perspective and its implementation have caused many technical and organizational problems such as fragmentation of river basin management at all level. Thus, many cases showed overlapping authority and interests between institutions of central government and clash between central government and regional or local government. The management of river basin only can be managed based on hydrological approach. The management of river basin or watershed should be based on the natural river flow or its hydrological nature that in many case could be cross administrative boundaries.

The management of watershed should be integrated and considered by all aspects (hydrology, economic, social, culture, etc). According to this, government really recognizes that watershed should be managed integratedly. President of Indonesia Republic published the decree of President no 5 year 2008 that emphasizes the need to protect watershed and gave the Ministry of Forestry the authority to manage watershed. Afterwards, the Ministry of Forestry published Government Regulation No: P. 39/Menhut-II/2009, 12 Jun 2009 about the direction of integrated watershed management plan arrangement. This regulation also explains about the establishment of Forum DAS (watershed forum) as a coordination forum for all stakeholders. Many authorities or agencies was established at all levels to solve the environmental problems. But the fact is that flood and water scarcity and other problems still occur. There are still landuse changes in unsustainable way within watershed area.

In this research, Ciliwung Watershed will be used as a case study of which objective to generate broader knowledge on how Indonesia regional water management works and shows its challenges. Ciliwung river is one of the biggest rivers in West Java. This river has important role in supporting human and economic activities such as drinking water, industrial needs, electric turbin, etc. Administratively, Ciliwung River flows through Bogor, Depok and Jakarta.

The condition of this river nowadays is getting worse. Water pollution, lack of fresh water and flood are the main issues of this river. The "Annual" Flood in Jakarta ,especially in rainy season, is because of this river. Several research indicated the land use change as the main problem which affect the flood in Ciliwung river. Based on the research of Pujilestari (2005), during 1990-1996 settlement area increased from 6,25 km² (6,1 % of total area) to 19,26 km² (16,11 % of total area) and in 2004 become 26,61 km² (36,01 % of total area). On the other side, forest area has decreased from 20,57 % of total area (in 1990) to 5,67 % of total area in 2004.

There is a violation of land use in upstream ciliwung watershed from the initial spatial plan. Susilowati (2007) found that there is about 4,79 % of forest area that are not appropriate with the spatial plan, and this indicates that the amount has converted to be agricultural area and settlement area. The effect of the conversion of forest area in watershed area is the increasing of water debit which may cause flood in the

downstream area, Jakarta. Steep Topography, high intensity of rain, bottle neck in down stream are also factors that make the condition get worse.

Those conditions have attracted many actors (governments, academics, NGO and society) to discuss about it. Many ways have been tried such as technical approaches- building dam, canal, planting trees, etc- or involving many stakeholders in the project to solve this problem. However, the huge flood still occurs every year. This situation is complex. There is a hydrological relationship between Bogor, Depok and Jakarta. Every development or treatment in Bogor will bring impact to Jakarta. Therefore, the management of Ciliwung watershed should be integrated from planning to evaluation phase by involving many actors such as Bogor regency, Depok administrative municipality, Jakarta province, NGOs and community. Several programs have been implemented to solve this problems, such as PROKASIH (Clean River Programme), RLKT (Forest Rehabilitation and Conservation), and JWRM (Jabodetabek Water Resource Management), Nevertheless, the land conversion still happens in Bogor regency.

In this research, the main conflict of interest and strategies of authorities within Ciliwung watershed will be identified. How the relation between governments/decision makers; how the coordination and strategic interaction between decision makers will be analyzed. Through game theory analysis this research will find out the interrelation among decision makers within Ciliwung watershed. The result of this thesis will be a recommendation for Indonesia in arranging its watershed institutional framework, especially how coordination between upstream area and downstream area should be.

1.2. Research Objects / Questions

Based on the explanation above, the main objective of this research is to understand how to coordinate upstream land conversion in favor of downstream safety (flood reduction). This general objective can be divided into four questions follows:

1. How is the relationship among decision makers related to local autonomy system and watershed management in Indonesia ?
2. What are the conflicted interests/strategies between downstream and upstream ciliwung watershed?
3. How is the behaviour and strategic interaction of upstream and downstream authorities in ciliwung watershed ?
4. How can failure of watershed policies be explained?

1.3. Problem Statement

Water is an essential element in human life. The unsustainable management will bring the negative impacts. Water problems such as water scarcity, flood, water pollution, etc have become the main issues in cities all over the world. For water is related to many interests and actors, many research has proved that water resources should be managed integratedly. It is because water flows does not follow the administrative boundaries. On the other side “very often that water management strategies have failed because they neglected to incorporate the full range of values and perspectives present among water users or agencies with an interest in water management” (Heathcote. 1998. p10). The impact is that agencies are impacting water systems as a side effect.

The watershed is an area of land that captures water in any form, such as rain, snow, or dew, and drains it to a common water body, i.e. stream, river, or lake. According to Heathcote (1998) the watershed is the best unit for the management of water resources. The characteristics of that drainage network play a great part in determining how water moves through the basin and consequently impacts upon issues such as water quality and quantity (including flooding) in a given place. Therefore, the watershed should also be managed in order to gain optimum water quality and water quantity for supporting human life. The management of watershed has evolved from only technical-oriented to more integratedly approaches. Integrated Watershed Management means that managing the watershed integratedly, involving all relevant multistakeholders from related sectors, such as government, private sector, local community academics and NGO, and considering the specific local characteristics (economic, social and culture). Integrated Watershed Management depends on the strength of its institution and also coordination strategy. In this research, it concerns with those two things (institution and coordination strategy) among multistakeholders..

The watershed management in Indonesia has a long story, from the technical measures like DAM development to the conservation measures such as reforestation and forest rehabilitations since 1970's. Later on, the involvement of society has also been done to protect and prevent the watershed. Many discussions, meetings and agreements has been made by involving many stakeholders (central and local governments, experts, NGO, private sectors and society). Notwithstanding, the unsustainable development are still occurring in most regions/provinces/municipalities/districts. Economic-based development becomes the main reason for that the circumstances. The conditions become worse, since the local authonomy has been strengthened.

The conflict of interests between central and local government and/or between local governments has made the situation of watershed become worse. Many regulations have been made (central and local) that in reality, many of those are overlapping. There is a confusion in the field in term of authorities. The Law is defeated by Major regulations (Hirarchieally, the Law is higher than Local regulations). For example, the changes of landuse from the nature/conservation use into housing/industrial use. It shows that the interest of local government is more to the economic development than to protect the forest as one of water resources. Urbanization forces government to give more priority in the development of social and economy than development of

environment/forest. The demand of house, food and job are the main interests of local government.

Ciliwung river is one of the example of watershed management in Indonesia that is complex. Rapid urbanization in watershed area has brought too many changes to the land use. Many forests have been changed into agricultural areas or/and settlement areas. Economic development always becomes the reason behind those changes. This situation becomes worse since the local authonomy has been implemented. Its impact is the quality degradation of its environment such as the increasing water debit, sedimentation and erosion. Further, flood is the main issue of this watershed that can not be solved until now. The flood occurs in the downstream, Jakarta. This factor makes this case is more special than other watersheds, because this related to the capital city of Indonesia, Jakarta. The Ciliwung River has the biggest contribution for flooding in Jakarta and this is happening every year.

The program has been made (PROKASIH, RLKT and JWWM) and many discussions involving many stakeholders has been established to solve this flood problem. The coordination programs also has been made. The fact is, that until today, the condition of watershed is still “unhealthy”. So what’s wrong? Why does the coordination not work. Why the landuse changes in upstream and midstream seems to be “never ending story”. Through this research, the researcher would like to find out what are the strategies/policies/programs of upstream authority and downstream authorities?, and how the power relation between them ?. Thus, the behaviour and how they interact to each other will shows the gap in coordination system. The result of this research will help people to understand the situation or conflict between upstream and downstream and help government improves the policies and program that will accommodate and give the benefit for all authorities within watershed.

1.4. Research Methodology

1.4.1. Method

This research will combine several methods such as based case study and literature study method and employing game theory approach. Case study will elaborate the characteristics of ciliwung watershed management to be the variable of analysis. The variable of analysis includes biophysics, social, economic, and instutional characteristics. A deep understanding of the case study shall be generalized as lessons that can be learned in other similar cases. Literature study will elaborate and determine the theoretical framework used in assessing the coordination in watershed management. Literatures used in this research are related to Watershed Management, and game theory.

Watershed Management literatures will give the basic knowledge about the watershed itself; the definition, issues, and what integrated watershed management is. The main literature of this topic is Integrated Watershed Management : Principles and Practice by Heathcote. 1998. This book explains the watershed in easy way. It describes the basic definition of watershed and then shows the current issues about water and watershed management.

Game theory literatures is used to see the basic of game and the benefit to solve the problem of conflict between upstream and downstream watershed. Games And

Information: An Introduction To Game Theory. By Rasmussen (1995) is the main book used in this research. This book describes game theory clearly and in easy way. The basic understanding, how to develop the game and how to make a solution based on game are also discussed here. Besides that, other literatures are related to social choice theory. The main book used in this research is Democratic Planning and Social Choice Dilemmas by Sager in 2002. This theory is also used integratedly with game theory to show that how individuals/actors/groups make decision rationally. This theory will be used to support or give the strong argumentation of the players/authorities involved in this case. This research will also use related literatures which are explaining the organization and development process of coordination of watershed management in ciliwung watershed (Indonesia) regarded to the policies, tasks and authority of the regime.

Game theory will be used to explain the conflict of interests in coordination between upstream and downstream. This theory will use several assumptions which are built based on the institutional information of Ciliwung watershed. Those assumptions are simplification of the data gathered such as the strategies and the players. Game theory will show the behaviour of upstream and downstream authorities. Thus, it show also the strategic interaction between them. How each player respond others' strategy in order to maximize its benefit. Further, The result of the game will explain how the policies failure and what is the optimum strategy that can be used by the decision makers in implementation of watershed management.

1.4.2. Data

Due to the management of watershed related to many actors or institutions, this research will use data from many sources to see the relationship between those actors. Secondary data will be drawn from many sources such as regulations, books, journals, articles, publications, etc while official documents are gathered from national government through contact persons or official sites. According to research objectives, these types of data and its sources can be indicated as below:

Table 1.1 Data required and Sources

No	Data Required	Sources
1	<i>Relationship Among Decision Makers</i>	
	<ul style="list-style-type: none"> - <i>Distribution of tasks/responsibilities from central to local level</i> - <i>Fiscal balance between levels of governments</i> - <i>Relationship between regional development plan, spatial plan and watershed management plan</i> 	<ul style="list-style-type: none"> - <i>Laws</i> - <i>Other related regulations</i>
2	<i>The Characteristics of Ciliwung Watershed</i>	
	<ul style="list-style-type: none"> - population data - social economic data - Hydrological data - Landuse changes in Ciliwung watershed etc 	<ul style="list-style-type: none"> - Statistical bureau of West Java Province - Statistical bureau of DKI Jakarta - Related researches and reports - Competent bureau such as forestry, agriculture, mining and mineral, public work, Bogor government, Jakarta government
3	<i>The Management of Ciliwung Watershed</i>	
	<ul style="list-style-type: none"> - Organization - Related regulations - Programmes & Strategies that have been established - Regional development plan of Local level within watershed - Hierarcical relationship between governments - Forum Das - etc 	<ul style="list-style-type: none"> - Competent bureau : forestry, public work, Bogor government, Jakarta government, etc - Related researches and reports - Publications - etc
4	<i>Strategies of Decision Makers</i>	
	<ul style="list-style-type: none"> - Vision and Mission - Regional development plan - Prioritized Development Policies 	<ul style="list-style-type: none"> - Regional development plan - Strategic plan - Publications - etc

Those data will be used to show the characteristics of Ciliwung watershed (social, economic and hysical elements), landuse change phenomena, local autonomy situation and the existing management of watershed in Ciliwung watershed.

As mentioned before that, this research analyses the problem of coordination between upstream and downstream in watershed management in Indonesia, with case study Jakarta flood. To achieve this goal, it needs to know about the behaviour and how they interact to each other' strategies. This research uses Game Theory in analyzing the behaviour and their strategic interaction, Further, the result of the game will be presented the current situation and will be useful to explain clearly wht the coordination or policies is fail.

1.5. The Structure of Thesis

The Content of this thesis are organized into six chapters as describe respectively below.

Chapter 1. Introduction. This chapter explains the background of the problem and interesting aspects that become the reason for this research to be carried out. Introduction of the problem is related to the growing concern of this topic which is enriched by some facts and figures of the study area. There are also some reasons directing to some literatures which are important for planning discourse. This Chapter also contains key question which addresses some questions of this research based on problem background and is followed by research method..

Chapter 2. Theoretical Framework. This chapter will provide basic and principal theory of forest and water, watershed, integrated watershed management, theory of coordination and organization, game theory and social choice theory. All those theories will be used as a guideline for the analysis.

Chapter 3. The Characteristics and Landuse Changes in Ciliwung Watershed. This chapter will provide general and basic information of Ciliwung watershed. The information is about geographical context such as size and boudaries of Ciliwung watershed, hydrological condition, topographical characteristics and Land characteristics (land tenure, existing landuse, and landuse trend). Socio-economic characteristics will also be described such as population density and economic activity and dependence of land. This chapter also discusses about the laduse changes phenomena in Ciliwung watershed and the factors influencing.

Chapter 4. Local Autonomy, Watershed Management and Power Relation Between Authorities. This chapter mainly discusses the local authonomy and its relationship with watershed management in Indonesia. Firstly this chapter describes about the concept of local autonomy which is used in Indonesia; decentralization of authorities and reseponsibilities from central to local government; fiscal balance between levels of government, and tasks distribution between central and local government in forestry field and watershed management.

Then, the system of watershed management will be discusses including the roles of central and local government in watershed management, incentives and disincentives system, forum das, and the management of Ciliwung watershed. The last, the power relation between decision makers within watershed will be described. The power relation among authorities figures the interrelation among decision makers. It will be useful in solve the conflict of interest within watershed management.

Chapter 5. Behavior and Strategic Interaction Between Upstream and Downstream Within Game Theory Framework. This chapter will explore and discuss the conflict between upstream and downstream of Ciliwung watershed into the game. The matrix of payoffs will be used to show the current and possibilities situation between players. In this chapter the reflection of the game and the result will be explained clearly and analyzed in simple and

clear structure. The result which will be the interaction among players strategies is clearly defined. Based on that the solution of the conflict will be presented. In the end, there is a recommendation for governments/players who are involved about how they can solve the flood in downstream and urbanization in upstream in optimum way, so that every players will get the optimum benefit.

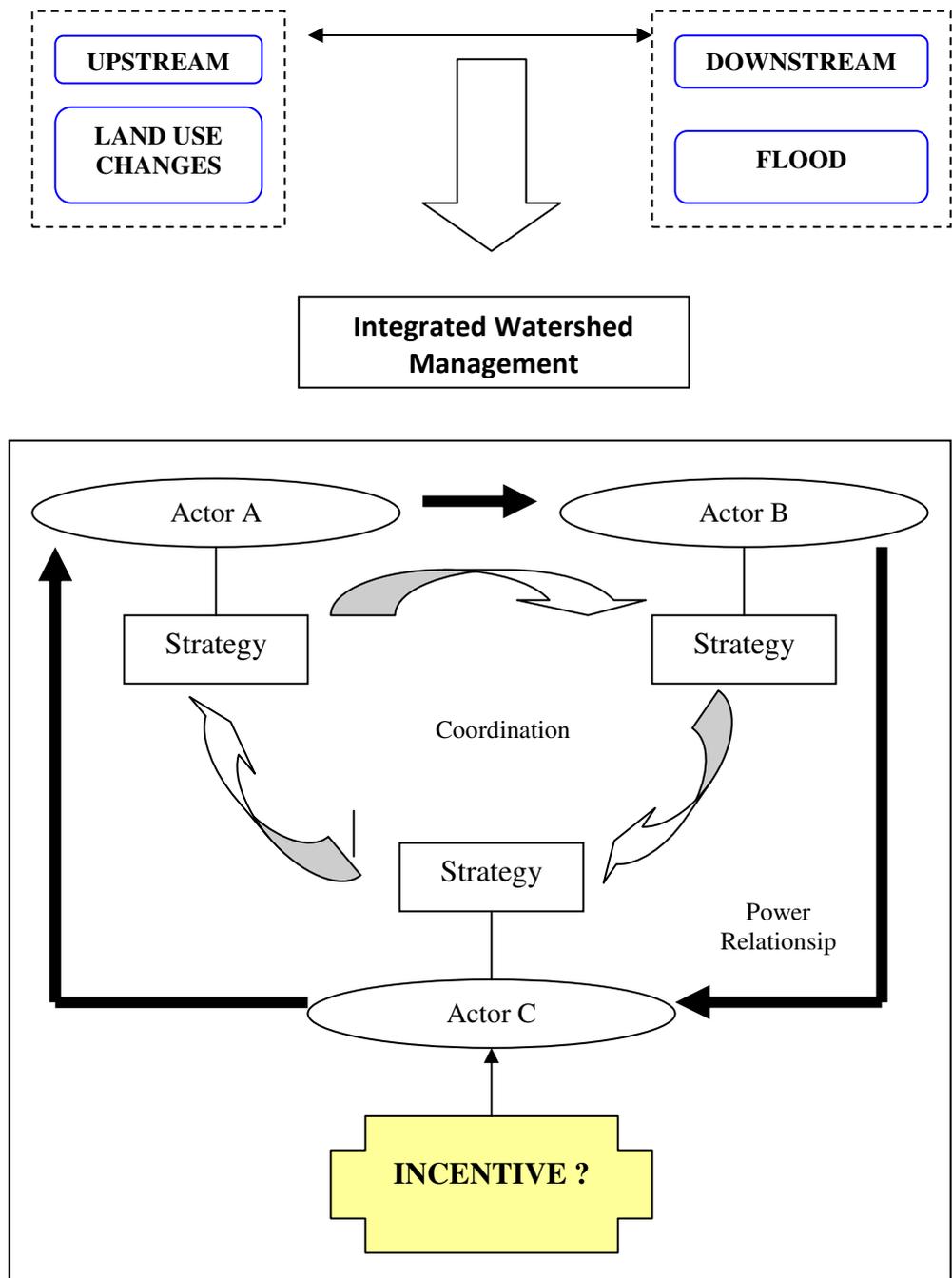
Chapter 6. Conclusion. This chapter contains the results and recommendations related to this research. This chapter gives a short conclusion of this research as well.

1.6. Research Framework

This research will discuss mainly about behaviour and strategic interaction between upstream and downstream in watershed management in Indonesia. Case study is Ciliwung watershed. In this analysis, this research will use watershed and institutional arrangement of Integrated watershed management theory in term of understanding and seeking how organizational structure influences characteristics and commitments of watershed management considering all level of institutions. It also tries to understand what each strategies are related to watershed and how each actors give the contribution. This research also tries to figure out the agreement they achieved and how coordination between actors reaches the agreed goal. It is necessary to comprehend the watershed organization and its coordination to understand the problem of commitment in integrated watershed management implementation. These phenomena can be seen or analyzed and explained by using the Game Theory and/or the social choice theory. The *Social choice theory* is the branch of decision theory which is concerning. Agents agree to be bound by the outcome of a social choice procedure, such as a vote. This theory is used to measure individual interests, values, or welfares as an aggregate towards *collective decision*. "Game Theory" is an approach to possible strategies which will be used. This theory is mathematically arranged to be received in a logical and rational way. Game Theory is used to find the best strategy in an activity, where every player in it are equally achieve the highest utility. Its application is mostly done in various disciplines such as biology, military, politics, diplomacy, social science, etc.. The game theory is an application with cost-benefit principle. Every actor within act is based on the cost and benefit. The equilibrium will be achieved until every actor has understood each other.

Those theories can help this research to describe or explain how decision makers' behaviour and how their response to other strategy. Finally, based on the analysis, this research will try to give the better insights of the optimum strategy that can be used to as a solution to solve the problem of coordination in watershed management in Indonesia.

Research Framework



CHAPTER 2

THEORETICAL FRAMEWORK

2.1. Current Issues In Water Management

According to Heathcote (1998), there are several main issues related to water management that are:

- a. Water Availability, Requirement and Use
 - i. protection of aquatic and wetland habitat,
 - ii. management of extreme events
 - iii. excessive extractions from surface and ground waters
 - iv. global climate change
 - v. safe drinking water supply
 - vi. waterborne commerce
- b. Water Quality
 - i. Coastal and ocean water quality
 - ii. Lake and reservoir protection and restoration
 - iii. Water quality protection, including effective enforcement of legislation
 - iv. Management of point- and nonpoint- source pollution
 - v. Impacts on land/water/ air relationships
 - vi. Health risks
- c. Water Management and Institutions
 - i. Coordination and consistency
 - ii. Capturing a regional perspective
 - iii. The respective roles of federal and state/provincial agencies
 - iv. The respective roles of projects and programs
 - v. The economic development philosophy that should guide planning
 - vi. Financing and cost sharing
 - vii. Information and education
 - viii. Appropriate levels of regulation and deregulation
 - ix. Water rights and permits
 - x. Infrastructure
 - xi. Population growth
 - xii. Water resources planning, which is including :
 - consideration of watershed as an integrated system

- Planning as a foundation for, not a reaction to, decision making
- Establishment of dynamic planning processes incorporating periodic review and redirection
- Sustainability of projects beyond construction and early operation
- A more interactive interface between planners and the public
- Identification of sources of conflict as an integral part of planning
- Fairness, equity, and reciprocity between affected parties.

Meijerink (1999) said that as natural resources, international river issues should be treated as a coherent unity. These relationships should be concerned to relationship between water quality, ground water and surface water, water and sediment quality, water and waterbed quality, and the ecology, land use and water, and also upstream and downstream part of a basin. If the river issues are not managed and treated well, conflict and problems related to those issues will be raised. There are some objects that can be defined as the trigger of the conflicts. Objects of the conflict in the river issues can be :

a. Navigation

Could be closing access for the upstream water traffic to the sea by downstream countries. This will make difficult for transportation access of upstream countries. Also, there are problems of the toll paid by the ships across the river in one area for the governments of the region

b. Fisheries

The infrastructure built in the downstream, such as dam could blockade the fishery chain from sea to the up stream. many species of fish cannot flow from upstream to downstr vice versa. It will create an ecological imbalance in the upstream.

c. Pollution

Industrial area in upstream could pollute the river. The people ehi live in the down area can be suffered from degradation of the water quality because of water polution

d. Salt

The availability of fresh water in the river can hamper salt water intrusion in the river estuary area. The lack of fresh water in the soil makes salt water infiltrate ti the land easily and will harm the ecosystem in the estuary and the water consumption in that area.

e. ecology and flooding

Integrated coordination in maintaining ecology should be improved to raise the quality of environment. Maintaining ecology can be improved only by certain area. These will effect on decreasing the probability if flooding.

The problems cannot be solved by multilateral cooperation, strong communication among related institutions, and considering the role of third party in reaching the agreement and conflicts prevention

2.2. Forest & Water

Johnson (2000) explained that the biophysical relationships between forests and water are highly varied from one location to another depending on climate, soils, and vegetation types. However, there is no substitute for site-specific information. The following are a few simplified basic relationships:

Forests slow the rate of runoff in a watershed. Forest vegetation takes up water and delays the duration to soil saturation (after water pools or runs off the land into the nearest watercourse). Forest soil usually also has a higher water storage capacity than non-forest soils (Falkenmark et al. 1999). Further, the more complex structure of the forest ground surface and underlying soil allows more efficient soil infiltration compared to a deforested watershed. By slowing the rate of runoff, forests can help minimizing the flooding in smaller watersheds (although they may not influence large-scale flooding). By slowing the runoff rate forests may also increase minimum stream flows during the dry season.

Forests reduce soil erosion and sedimentation of waterways. Interception of rain and snowfall by forest canopies means less water falls on the ground compared to a deforested watershed. Understory forest vegetation and leaf litter protect the soil from the impact of rain that does fall through the canopies. Extensive root systems help holding soil more firmly in place and resisting landslides compared to clear-cut or heavily disturbed watersheds. Sedimentation levels in waterways of forested watersheds are generally lower than in nearby agricultural or urbanized watersheds, but the degree depends on soil types, topography, and climate (Falkenmark, et al. 1999).

Forest soils filter contaminants and influence water chemistry. Forest soil is more waterlogged than other soil (except wetlands) and contain more nutrients, allowing them to filter out contaminants (Falkenmark et al, 1999). Clearing and cultivating forest soils tend to accelerate decomposition greatly and to release large amounts of nutrients that leach into groundwater, surface water runoff, and streams. For example, streams in agricultural areas in temperate regions typically have nitrate levels 10 times higher than streams in nearby forested watersheds (which is partly the result of fertilizer applications).

Forests reduce the total annual water flow in a watershed. Contrary to popular opinion forests generally reduce the total annual stream-flow (Calder, 1998). This is because trees consume water for transpiration, which is then evaporated back into the atmosphere. In general, trees consume more water than other types of vegetation, including grasses and annual crops. The degree to which forests reduce stream-flow, however, depends on various factors. For example, shallow-rooted trees tend to use less water than deep-rooted trees. Young regenerating forests tend to use much more water than mature and old growth forests (Bruijnzeel In press).

Forests can increase or decrease groundwater recharge. Forest cover can lower groundwater recharge because more precipitation is intercepted by vegetation and returned to the atmosphere through evapotranspiration. In some areas, however, removal of forest cover can result in a crusting soil surface that reduces or prevents water infiltration and groundwater recharge (Falkenmark et al, 1999).

Forest loss shifts aquatic productivity. Forest cover plays an important and complex role in sustaining aquatic productivity (Thomas et al. 1993). Trees shade waterways and moderate water temperatures. Woody debris provides fish with habitat, while leaves and decaying wood provide nutrients to a wide array of aquatic organisms.

Forests may influence precipitation at a large regional scale, but the effect of forest cover on rainfall in most areas is limited. The distribution of forests is a consequence of climate and soil conditions — not the reverse. Some evidences suggest that large-scale deforestation has reduced rainfall in China and some climate models indicate extensive forest losses in Amazonia and Central Africa which could lead to a drier climate (Institute of Hydrology 1994; Xue 1994). Still, afforestation is not an effective strategy to increase rainfall (Kaimowitz. 2000)

Forest ecosystems provide people with four types of water-related benefits. These include (Johnson. 2000) :

Water Quality. Forests can provide people and companies with high quality water supplies that have low nutrient and chemical contaminant levels. There are a wide variety of potential beneficiaries, such as rural and urban domestic water users; industrial water users, including distilleries, water and soft drinkbottlers; film processors, and microchip manufacturers. The best opportunities for the use of market-based instruments to protect water quality are in watersheds which are serving relatively large populations.

Flow Regulation. Forest cover can regulate surface and groundwater flow in various ways that benefit people. For example, flooding and landslides have been widely linked to deforestation, road building, and other forms of development. In Australia, the loss of forest cover is leading to salinisation of water supplies and farmland. With fewer trees transpiring water, the water table rises and brings mineral salts to the surface. Again, there are many potential beneficiaries including farmers, agricultural markets, property owners in flood plains, taxpayers, insurance companies, and a range of government agencies. The best opportunities for market-based instruments to maintain or restore this service are in watersheds where chronic or catastrophic damages have caused major economic losses.

Water Supply. Although forests generally reduce total annual water flow, in some cases they can increase minimum flows during the dry season (base flows). The main beneficiaries of this type of ecosystem service are irrigators, municipal water utilities, electric utilities, and large industrial water users that require adequate water supplies during the dry season. The best opportunities to use market-based instruments in order to maintain this service are in regions with annual dry seasons or frequent droughts where base-flow demands meet or exceed supplies. It should be noted, however, that some research indicates that forests are likely to decrease water supplies during both wet and dry seasons.

Aquatic Productivity. The condition and quality of fisheries is often linked to the condition of adjacent or upstream watersheds. For example, valuable sport and commercial fisheries, such as Chinook salmon in British Columbia, can be very sensitive to water quality. Beneficiaries of this service include sport and commercial fishermen, fishery management agencies, and the tourism industry. The best opportunities are probably in watersheds with high value fisheries.

Water supply in a region (watershed) for a certain purpose is determined by the amount of water input (precipitation). The watershed function is to transform precipitation into utilized water that fulfill the requirement of that utilization purpose, quantity, quality and timing of availability. Protecting forest –which reduces the erosion and sediment, improves water purity. In some cases, capturing and storing water is a cost effective way to provide clean drinking water (Ernst et.al. 2004)

Replacing forest cover with other land uses almost always results in increasing runoff and stream flow. Runoff and stream-flow patterns will gradually return to original levels if an area is left to revert back to forest. Converting forest to grasslands, however, will normally result a permanent increase in total water runoff (FAO & CIFOR. 2005). The watershed function in precipitation transformation is strongly influenced by the land use and management. Many researches show forest degradation and inappropriate soil conservation practices are influencing the water supply decreasing directly. The changes of land covers and its management of watersheds affect not only the long-term hydrologic regime but also the precipitation amount and pattern (Hendrayanto. 2004).

2.3. Watershed

There are several definitions about what the watershed is. Debarry (2004) described that a watershed is an area of land that captures water in any form, such as rain, snow, or dew; and drains it to a common water body, i.e., stream, river, or lake. In general terms, a watershed is a geographic area where all the water, sediments, and dissolved materials drain to a common outlet—a stream, river system, reservoir, underground aquifer, or other body of water. It can also be thought as an area that "catches" water and routes it to a common basin, channel, or network of channels. Internationally, the term catchment rather than watershed is used to convey this idea (Haury. 2000). Over the past twenty years, a strong global consensus has begun to develop around the notion that the watershed is the best unit for the management of water resources (Heathcote, 1998). This is supported by CEC (2001) that stated that there are several reasons why watershed is an appropriate approach in water resource management by structuring policy, planning and management (CEC, 2001), such as :

- a. Due to its unique properties, water integrates and catalyzes other biophysical processes in the air, land and water environment
- b. Watersheds define distinct biophysical units
- c. Watersheds are an easy-understood ecosystem unit
- d. The health of rivers and streams are illustrative of the health of the lands through which they flow.
- e. Water systems demonstrate the cumulative effects of environmental stresses
- f. Quality of life is directly linked to water quality in the watersheds
- g. Most management actions can be integrated using watersheds, at some scale, as a common planning unit, and
- h. There is a strong and growing public support for implementing at the local watershed level

A watershed is a basic hydrological unit. Each "watershed" has its own network of river and stream channels that drain water from and through a particular basin. The characteristics of that drainage network play a great part in determining how water moves through the basin. Consequently, they impact upon issues such as water quality and quantity (including flooding) in a given place (<http://www.wr.udel.edu>). There are some reasons why watershed should be taken care of :

- a. Communities across the nation find that their water resources are degrading in response to growth and development. They also discover that they can only protect these local water resources by thinking on a watershed-level. While the settings and resource issues that drive local watershed protection are diverse, communities often find that many of the same tools and techniques appear to work in every watershed. Watersheds are important to any community because they embody the sense of place in the landscape, and their waters are important in people's daily life. Communities quickly find many reasons to protect local watersheds because of economic benefits, recreation, flood prevention, scenery or the overall quality of life. Different groups of people often have their own unique rationale for protecting watersheds. Some may place a high value on the aquatic biological community living in these waters, while others will be more concerned about reducing stream channel erosion to the real estate in their back yard.
- b. Increasingly, State and Tribal water resource professionals are turning to watershed management as a means for achieving greater results from their programs. Why? Because managing water resource programs on a watershed basis makes good sense : environmentally, financially, and socially. For watersheds are defined by natural hydrology, they represent the most logical basis for managing water resources. The resource becomes the focal point, and managers are able to gain a more complete understanding of overall conditions in an area and the stressors which affect those conditions. Traditionally, water quality improvements have focused on specific sources of pollution, such as sewage discharges, or specific water resources, such as a river segment or wetland. While this approach may be successful in addressing specific problems, it often fails to address the more subtle and chronic problems that contribute to a watershed's decline. For example, pollution from a sewage treatment plant might be reduced significantly after a new technology is installed, yet the local river may still suffer if other factors in the watershed, such as habitat destruction or polluted runoff, go unaddressed. Watershed management can offer a stronger foundation for uncovering many stressors that affect a watershed. As a result, management is better equipped to determine what actions are needed to protect or restore the resource.
- c. The source of drinking water for people. By protecting the watersheds people can protect their water supplies and the integrity of the lands. Residents can protect the watershed by planting trees, cutting back on lawn fertilizer and pesticide use, and recycling household wastes like motor oil instead of dumping into storm drains.

2.4. Integrated Watershed Management

Why watershed should be managed?. Debarry (2004) argues that each watershed has a unique personality that needs to be explored in order to develop a truly personalized management plan. A watershed is like an interdisciplinary puzzle; that is, the watershed assessment collects the biological, physiographic, hydrologic, hydraulic, political and social as pieces of the puzzle and the management plan puts all these pieces of the puzzle together. However, the puzzle can fall apart. Unless it is laminated and preserved in a frame for long-term enjoyment. Apart from, Sharma (2005) also argued that the watershed is the appropriate hydrological unit for technical efforts to manage water and soil resources for production and conservation and need to be managed well. Watershed management is complicated by the fact that watersheds rarely correspond to human-defined boundaries.

Watershed management is used as an approach in water management regarding some problems in legal institutions of water resource management in the USA : a) inter region water management problems, b) implications of decentralization (federalism and separation of power), and c) inconsistency of water law among political units (Goldfarb and William. 1994). As a concept , watershed management has experienced at least two transitions among natural resources managers. Initially it was oriented toward the control of water supply and use. Afterwards, it has shifted to include a concern for water quality and the combined effects of land use in the drainage basin, particularly since non-point pollution has overtaken point-source pollution as cause of impairment (Nelson. 1998).

The movement of watershed management approach in water resource management is based on the new processes for comprehensive and integrated decision in which every party related to water fairly include in the decision making (Blomquist and Slagher, 2005). Heathcote (1998) argued that the integrated watershed management is relatively new in adopting “ecosystem” approach as trans-media environmental management due to the unsuccessful approach in the water management approach in the past, which focused primarily on single medium (water). Ecosystem approaches have fundamentally become part of the understanding of integrated watershed management. Further, in some contexts, ecosystem management and integrated watershed management are interchangeable ideas, in that both represent a holistic approach to the visible landscape and its physical and social features. (Nelson. 1998. p.566) . Watershed management is necessary for the sustainable protection of natural resources and environmental health. Watershed management, which recognizes the hydrologic (water) cycle as the pathway that integrates physical, chemical and biological processes, is an important approach to achieving the goal of a sustainable environment. Additionally, it is the tool to implement an ecosystem-based management strategy. (WPMPIC. 2007)

Watershed management is a process of managing human activities in an area defined by watershed boundaries. The aim is to protect and rehabilitate land, water, and associated aquatic and terrestrial resources. The goal is to contribute the environment, social and economic well-being of the area on a sustainable basis. Watershed management is a tool to assist the decision makers of land and water use. There are four phases in managing watershed: 1) issues identification and data

gathering; 2) analysis and planning; 3) implementation; and, 4) monitoring. It should be emphasized that monitoring does not conclude the process, but rather initiates the beginning of understanding of the subwatershed, for which the plans should be updated over time. (WPIPMC. 1997). Bandaragoda (2000) described the relationship between institution and organizations from two perceptions : 1) it focuses on how organizations come into existence, and how they evolve which is fundamentally influenced by the institutional framework, 2) it focuses on the established organizations, such as water board, river basin organization, etc.

2.5. Institution

As mentioned above, integrated watershed management relates to many organizations, interests, different strategies, etc. Institutions are the expressions of the terms of collective human experience. Institutions reflect the ways people interact with one another and the ways they interact with their environment. Further, they are the means that people use to solve social problems. The term institution has been defined in various ways. However, the broadest definitions include both formal institutions, such as administrative structures, and also informal institutions, such as customs and practices. According to Bandaragoda (2000, p.4) institution is an important thing to understand. He also defined the institutions as “ constituent rules of society” or “rules of the game” in which consists of :

- a. policies and objectives
- b. laws and regulations
- c. operational plans and procedures
- d. incentive mechanisms
- e. accountability mechanism
- f. norms, traditions, practice and customs.

Jasper (2003) defined an institutional arrangement as a set of rules that are used to determine who is eligible to make a decision in some arenas, and what actions are allowed or constrained. Rule in this context means what procedure must be followed, what information must or must not be provided and what pay-off will be assigned to affected individuals.

Livingston (1995) asserted that good water institution can facilitate achievement on both economic and social goals. Efficient water use requires the secure and flexible system of water rights. Thus, institutional design is specified into each area based on the physical characteristic of its water resources. There are three principal types of institutions interact in watershed development arena and enable agents to take decisions. They are dealing with : (i) policy, (ii) legal, and (iii) administrative institutions (Sharma. 2005). According to The appropriate institutional setting, watershed management should ensure the good condition in achieving economic, social and ecological goals and the integration of these aspects.

Jasper (2003) emphasized the importance of institutional arrangement in integrated RBM in order to achieve :

- a. the functioning platform for stakeholders which are involved in decision making

- b. water resource management on hydrological boundaries
- c. an organizational set-up in river basin and sub-basin authorities with their respective by-laws to incorporate decision making at the lowest appropriate level
- d. a planning system oriented at the production of integrated river basin plan, and
- e. the introduction of a system of water pricing and cost recovery.

Institutional framework for water management consists of rules, practices and organizations which are providing structure to human actions related to water management. Organizations are subset of institutions. For practical purposes, the institutional framework is classified into three categories : Policies, Laws and Administration related to water resources management in a watershed context. Considering that there are many actors or groups and users in water resources, water management needs an appropriate institution to be generated in order to make an effective planning and implementation of equitable, efficient and sustainable use of natural resources in watershed context. There are several requirements for that; valid information of physical , social, environmental, economic and institutional parameters of watershed (Bandaragoda. 2000).

2.6. Coordination

Some of the characteristics of basin organizations are the rights of a higher authority; task: policy and coordination; operational tasks : financing, and infrastructure development; stakeholders participation and supervision, and awareness raising (Alaerts. 2003). Integrated coordination among regions in managing river basin should be implemented to prevent conflict on river issues among neighborhood region, and also to overcome the problem arising from the conflict occurred. Teodosiu (2003) said that integrated river basin management represents the guarantee and the most appropriate tool to ensure the multifunctional use of water systems, paying respect to their ecological functions for the present and for the future generations. Furthermore, he said that the integrated water management concept considers all the relations between the natural environment (water circuit, ecological function of water) and the human activities (socio-economic environment) that contribute to water quality deterioration, with their related elements such as : water demand, utilities, pollution, possibilities of recycling and reuse”. Therefore there are three aspects in sustainable development that must be in balance : economic aspect, social and ecological aspect.

WWF concluded that there are five aspects in implementing integrated river basin management in the base of water framework directive. *First* principal is integration at the operational level. Achieving integration at the operational level in the international /regional river basins means to build cooperations between regions. Integration also means coherence between the major policy and financial instruments. *The Second* is Scale. The different scale of river within and between countries must be considered to the approach in handling river. That is why WWF EFP notes the importance of combination of top-down and bottom-up coordination approaches. *The third* is participation. Public and stakeholders should be involved in the activities. Hence, this can lead to consensus among all parties. Having participation of all stakeholders reduce the problems. *The Fourth* is timing. It is

important to build the participation up and coordination among stakeholders from all countries since the beginning. By developing it since it starts, participation and coordination among stakeholders become optimum.

However, the most important principal in the development process of the integrated coordination on river management regime and being the core of the principles above is capacity building. UNDP (www.UNDP.org) defined capacity building as the actions needed to create or enhance the capability of a country or an institution (or an individual) to carry out its allotted functions and achieve its objectives. From the definition, it is mentioned by UN that capacity building is the process, the means or the way of the improvement the abilities of individual, institutions, and organizations to achieve goals, not the goals themselves. The main achievement of the capacity building is reaching consensus and developing long term coordination.

Considering that there are many actors and/or groups and users in water resources, an appropriate institution is needed to make an effective planning and implementation of equitable, efficient and sustainable use of natural resources in watershed context. There are several requirements for that such as: valid information of physical, social, environmental, economic and institutional parameters of watershed. There are many actors with many interests involved. This situation makes watershed become a complex system, so the high degree of coordination is needed. (Bandaragoda, 2000).

In supporting the success of the coordination, several requirement of public participation should be noted before ensuring legitimacy and credibility for science decisions (Water International. 1999). The requirements are : 1) public should have a say in decisions about actions that affect their lives, 2) public participation includes the promise that the public's contribution will influence the decision, and 3) an effective public participation conditions should be fulfilled such as : facilitating the involvement of affected party, providing meaningful information, creating a forum of all community, scientists, and decision makers. Bandaragoda also argued that the appropriate institutional setting for watershed management should ensure the good condition in achieving economic, social and ecological goals and the integration of these aspects.

Meijerink (1995) stated that types of Cooperation can be classified according to the :

- a. types of actors cooperating. We can distinguish:
 - i. cooperation between governmental actors, for example to overcome the problem, separate bodies are responsible for surface water and groundwater, water quality and quantity.
 - ii. cooperation between governmental actors and the target groups of policy (private actors/NGOs). This cooperation can increase the public acceptance of public policy.
 - iii. cooperation between private actors or NGOs. They mostly cooperate to one another to enlarge their impact on policy making
- b. form of cooperation. Cooperation can be formal, such as cooperation based on a (hot-)legally binding agreement, or informal.

- c. goal of cooperation. Goals of cooperation can be general, such as the general development and conservation of a river basin, or they can refer to specific developments, uses, or protection issues
- d. territorial extent of cooperation. The territorial extent can coincide with jurisdictions or with hydrologically defined areas, such as a lake, estuary, (part of) a river basin etc.
- e. function(s) of the natural system. Cooperation can refer to the Nature functions, safety, or user functions, such as agriculture, navigation, industrial waste discharge etc.

Based on Meijerink (1995) two types of success criteria can be defined into : a). Content criteria, b). Process criteria. Content criteria refers to the goal of the actors. Cooperation is successful if it contributes to the achievement of certain goals. Since the goals of actors are often diverging or even conflicting, alternative criteria have been developed. These criteria are related to the process of cooperation.

Factors which are influencing the Development of Cooperation, LeMarquant (1977) distinguishes four interrelated and partly overlapping groups of factors that are influencing the development of international cooperation in river basins into :

- a. Hydrologic-economic patterns of incentives and disincentives. The hydrologic sequence of countries within a basin and their social-economic demands create different patterns of incentives for cooperation.
 - i. Foreign policy considerations. Five international relations factors which are influencing country's willingness to cooperate are:
 - ii. the image of a basin country
 - iii. international law
 - iv. the linkage of a river basin issue with other bilateral issues
 - v. reciprocity: there is a general desire for mutual commitment and obligation
 - vi. fear to lose sovereignty
- c. Domestic policy-making and consensus formation. The interests in cooperation are often different for politicians, the national bureaucracy and the regional and local governments. Some kinds of consensus between the administrative levels on the policy towards cooperation on international rivers should be reached, for many interdependencies between these levels exist.
- d. Factors facilitating communication between basin countries. Communication between basin countries is a prerequisite for cooperation. Factors facilitating communication are:
 - i. the same social-economical and cultural values
 - ii. the same administrative culture
 - iii. the use of a common language

iv. the existence of an extensive network of transboundary contacts.

In addition to these factors, a fifth factor is added:

e. The existence of common threats or the occurrence of calamities. The existence of common threats can be an important reason for cooperation to emerge.

2.7. Social Choice Theory and Game Theory

2.7.1. Social Choice

Social choice theory is concerned with providing a rationale for collective decisions when individuals have diverse opinions. Voting is an obvious way in which societies aggregate individual preferences into collective preferences (Chichilnisky, 1983). Social choice is a branch of rational choice theory concerned with ways, especially but not exclusively, via voting, of aggregating individual interests or preferences into social outcomes. It generates a set of robust, subtle results that identifies systematic difficulties with aggregative institutional arrangements by Knight and Johnson (1994) in Sager (2002).

Social choice theory is an analysis of collective decision making (Gaertner, 2009). The theory of social choice starts from the articulated opinions or values of the members of a given community or the citizens of a given society and attempts to derive a collective verdict or statement. Such a situation can be called direct democracy, where publications are determined directly by the members of society. Assumptions of measurability then specify which types of transformations that may be applied to an individual's utility function without altering the individually usable information. In other words, differences in formational set-ups will be linked to different solution concepts.

Social choice theory is actually a theory of group decision making. Its concern is not so much an empirical question of how groups actually do make decisions, rather than the normative and logical questions of how they should, and could, aggregate information about the views, interests, or preferences of individuals into group decisions. The normative aspect is the specification of minimal conditions that an acceptable aggregation mechanism must satisfy. The logical aspect is the identification of the class of logically possible aggregation mechanisms. These mechanisms are satisfying a given set of conditions. But the purely logical side of social choice theory will not favour one such set of conditions over another.

Social choice theory is concerned with combining individual preferences. A statement of indifference between two alternatives implies that the individual has considered the alternatives. Further, the individual has concluded that the relative advantages and disadvantages of the alternatives are exactly balanced. It is assumed by Arrow (1951) that the individual orders states by whatever standards he feels relevant. Social choice concerns to the possibility of making choice or a judgement. In some way, those possibilities are based on the views or preferences of a number of individuals, given that the views or preferences of different people may conflict with each other (Craven, 1992).

Many illustrations of "elections" are used to describe the concern of social theory. In an election, for instance, a president involves the combination of individual views of

who should be elected into some sort of collective or social statements of who is elected. In an election, the individuals' views are expressed on the ballot paper or the voting machine, either as a vote given by each voter to candidate, or as a list of order of preferences. The electoral system defines the rules for combining these stated preferences to determine the winning candidate(s), and maybe also an order of first, second and so on (Craven. 1992).

There is little in common between an electoral system and economy. The outcome of economy (the level and distribution of national income, the inflation rate, the production levels of various goods, hours worked, unemployment and so on) are the results of the combination of people preferences (Craven. 1992). In some cases, several agents have to decide on some issues of collective interest whereas their opinion (preferences) about the issue might differ. Despite their conflicting interests, they must agree on one particular "final" decision. A social choice is any proposed solution of this problem, where society is formed to be a group of agents who are concerned by the issues, no matter how small the group is (Moulin. 1983). This approach depends on the agents' willingness and their ability to bargain.

In the social choice approach, the decision power is indivisible into the hands of some legal or moral emanation from the collection (a central planner, a judge, or a referee), here the power flows persuasively and changingly among agents and coalitions of the agents.

Johnson (1983) explained that individual interaction can result in unexpected, possibly nonsensical, where social outcomes is the key element in social choice theory. This social theory plays role as the investigator to blend the individual preference into the social ranking of alternatives.

Game-theoretic analysis of political institutions can show the substantial differences in the equilibrium outcomes under different political institutions. If social choice theory has not given one perfect voting system, then it has left an important task of in characterizing the properties and performance of many voting systems that people have.

2.7.2. Game Theory

According to Stanford Encyclopedia of Philosophy (2006), Game theory is the essential mathematical study of competition and cooperation. It illustrates how strategic interactions among players result in over all outcomes with respect to the preferences of those players. Such outcomes might have not been intended by any players. Hargreaves and Varoufakis (2003) defined a game as any interactions between agents that is governed by a set of rules specifying the possible moves for each participant and a set of outcomes for each possible combination of moves. A theory of games promises to be applied in almost any social interactions where individuals have some understanding on how the outcome for one is affected not only by his or her own actions but also by the actions of others. These decision makers are assumed to contribute the optimizing of the objective function without giving priority to their own objectives. However, in game theory each decision maker plays the game to optimize his own objective, knowing that other players' decisions affect his objective value and that this decision affects others' payoffs and decisions.

Game theory provides more realistic simulation of stakeholders' interest-based behavior.

Game Theory came from economics. Nevertheless, it has been developed and used for social and political analysis today. Nowadays, this theory also has been used in attempting water conflict resolution studies in a game-theoretic framework. Game theory applications in water resources literature cover a range of water resource problems, locations, solution methods, analysis types, and classifications. It may be possible to place some studies in more than one table (under more than one category). However, the main aspect of the study was considered for categorization. So far, game theory has been applied for (1) water or cost/benefit allocation among users; (2) ground water management; (3) water allocation among trans-boundary users; (4) water quality management and (5) other types of water resources management problems (Madani. 2009).

Game theory can help providing some planning, policies, and designs in sights that would be unavailable from other traditional systems engineering methods (Madani. 2009). Another advantage of game theory over traditional quantitative simulation and optimization methods is, it is stable to simulate different aspects of the conflict, incorporate various characteristics of the problem. It also predicts the possible resolutions in absence of quantitative pay off information. Hargreaves and Varoufakis (2003) described that there are three particular games that have been extensively discussed in game theory. They are Chicken or Hawk – Dove game, Coordination game and Prisoner's dilemma game. These games have fascinated social scientists. The reason is simple, they appear to capture some of the elemental features of all social interactions. They can be found both within existing familiar 'structures' and plausibly in 'states of nature'. Thus the analysis of these games promises to test the claims of individualists. In other words, how much can be said about the outcome of these games will tell us much about how much of the social world can be explained in instrumentally rational, individualist terms.

The essential elements of a game are players, actions, payoffs, and information. These are collectively known as the rules of the game. The modeller's objective is to describe a situation in terms of the rules of a game to explain what will happen in that situation. Players are the individuals who make decisions. Each player's goal is to maximize his utility by choice of actions. Every player will always try to maximize their payoffs. The players will devise plans known as strategies that pick actions depending on the information that has arrived a teach moment. Based on the amount of the players there are two type of games which are two-person games and N-person games.

On the other side, in game theory there are two kind of game based on cooperation among players which are cooperative game and non-cooperative game. A cooperative game is a game in which the players can make binding commitments, as opposed to a non cooperative game, in which they cannot. Cooperative game theory is axiomatic, frequently appealing to pareto-optimality, fairness, and equity. Non cooperative game theory is economic in flavor, with solution concepts based on players maximizing their own utility functions subject to stated constraints. Non-cooperative game theory methods can help resolving the conflict based on the qualitative knowledge about the players' payoffs (i.e. how the players order (rank)

different outcomes (ordinal payoffs)). This enables to handle the socio-economic aspects of conflicts and planning, design, and policy problem when quantitative information is not readily available. From a different angle: cooperative game theory is a reduced-form theory, which focuses on properties of the outcome rather than on the strategies that achieve the outcome. It is a method which is appropriate if modeling the process is too complicated. In a non-cooperative game, none of these players will cooperate with each other. Thus, no coalitions will be formed and these players will act unilaterally (Becker & Easter.1997). Although in a cooperative game all of the players act cooperatively, a problem still remains in terms of how to allocate potential benefits which are associated with the cooperation among various stakeholders (Loehman. 1995). In addition, if one or several stakeholders lose benefits in a cooperative game, the results of the cooperation will be unstable unless compensation occurs as side payments among these stakeholders.(Yang, et al. 2008)

Cooperative game theory is payoff-centered game theory where people just get payoffs.. Non-cooperative game theory could be termed into action-centered or strategy-centered. A typical cooperation game consists of three elements: (1) a set of N players, (2) a set of feasible actions associated with each possible coalition, and (3) a set of characteristic functions associated with players. The solution is a series of payoffs to each player (N_i). In order to generate solutions for a game, two pre-conditions should meet: (a) the rationality of each game player, indicating that overall benefits of the cooperation game which are allocated to each participating player should not be less than or equal to what the player would obtain through his unilateral actions; (b) successful cooperation which should be based on group rationality, implying that aggregate benefits allocated to any subgroup of players are at least the same as what that partial coalition could achieve on its own actions.

In games, the concepts of outcome and payoff are defined. The outcome of the game is a set of interesting elements that the modeller picks from the values of actions, payoffs, and other variables after the game is played out. Payoff is the value or expected utility of the outcome for players involved in games. The outcome is the result of a complete set of strategic selection in a game. In general, different players will value their outcome differently. From here, the conflict is brought into a game. Every player has a different point of view or interests or goals about one thing that is make they have a different value.

Based on the benefits and loss, game is divided into two types which are a zero-sum game and non-zero sum game. A zero-sum game is a game in which the sum of the payoffs of all the players is zero according to whatever strategies they choose. A game which is not zero-sum is non zero-sum game or variable-sum. In a zero-sum game, what one player gains will cause another player lost. If a game is zero-sum, the utilities of the players can be represented so as to sum to zero under any outcome.

The combination of strategies chosen by each player is known as the equilibrium. Equilibrium is a set of the best strategies. In other words, in equilibrium, each player is playing the strategy that is a "best response" to strategies of the other players (Gardner, 1995). No one has an incentive to change his strategy which is given the strategy choices of the others. Given an equilibrium,the modeller can see the actions come out of the conjunction of all the players' plans, and this tells him the outcome of the game (Rasmusen. 1994). An equilibrium is a strategy profile

consisting of a best strategy for each of the n players in the game. The equilibrium strategies are the strategies players which pick when trying to maximize their individual payoffs, as distinct from many possible strategy profiles obtainable by arbitrarily choosing one strategy per player. Equilibrium is used differently in game theory than in other areas such as economics. In a general equilibrium model, for example, an equilibrium is a set of prices resulting from optimal behavior by the individuals in the economy. In game theory, that set of prices will be the equilibrium outcome, but the equilibrium itself will be the strategy profile—the individuals' rules for buying and selling—that generated the outcome. To find the equilibrium, to specifying the players, strategies, and payoffs is not enough, because the modeler must also decide what “best strategy” means. An equilibrium concept or solution concept is a rule that defines an equilibrium based on the possible strategy profiles and the payoff functions.

There are several type of games in game theory method, but three common 2x2 games are the prisoner's dilemma, Chicken, and stag-Hunt (Madani. 2010). The prisoner's dilemma is a non cooperative game, but it could be modelled as cooperative by allowing the two players not only to communicate but also to make binding commitments. This model is the most common model used in water conflicts research.

Based on Von Neumann and Morgensten in Samsura (2009), in general, there are three description frameworks/formats for games. They are a) The game in strategy form. This framework focuses on the existence of Nash equilibriums and on refinements of this concept. Nash equilibrium is the situation in which no player has an incentive to deviate from his selected strategy. In this game, every players has a set of strategies and they select a strategy from that set according to the payoff of that selected strategy. b) The game in coalition or characteristic function form. This framework focuses on the importance of coalition and payoffs. The basic concept of this framework is every players can gain more payoffs by forming or joining coalition. In this game, the value is assigned to each coalition, which is called as value of coalition. In this game a core payoff vector is described. A core payoff vectore is a payoff distribution among the players that can be improved upon by no coalition. c) extensive form. The concept of this framework is game tree, moves and payoff. In this game, all players will decide sequentially. They will move or respond after another player makes a move and so on. The whole game can be structured by means of a game tree, which can be seen as graphical representation of the strategic interactions of the players. Trees are defined in terms of node and branches that represent the decisions which are made by a player. Alternatives and actions among players is a choice which has to be made. In general, it can be said that :

- strategic form games is used when strategy and strategy selection are become the focus
- coalition form games is used when the emphasis is on coalition formation and conflict
- extensive games is used when the research interest is on detail information, on the position of players and the sequences of decisions (dynamics).

Prisoner's dilemma game is the most famous game that has been the subject of more than 2000 papers within the social sciences (Luce. 1957 in Riechert. 1983). This kind of game describes two persons who are arrested because they are suspected of being guilty for doing a crime. The police do not have sufficient conviction evidence for that. Those two suspects are separated each other. They will be given an incentive to cooperate with the police. Each prisoner has the option for confessing or remaining silent. While there is a firm evidence for the first charge, the second the evidence is insubstantial and a confession is essential to the prosecution's case. The district attorney offers the following deal in order to obtain the confession needed. If one of the prisoners confesses that both have committed the major crime, he will be freed immediately (i.e. he will serve no time in prison), whereas his partner in the crime will have to serve a ten-year prison term. However, if both prisoners confess, their minor crime will be forgiven but not the major one. As a result, each of them will serve a nine-year term. Clearly, if neither individual confesses, both will only have to pay the penalty for having committed the minor crime i.e. a one-year prison term (Riechert. 1983; Madani. 2010).

2.8 Concluding Remarks

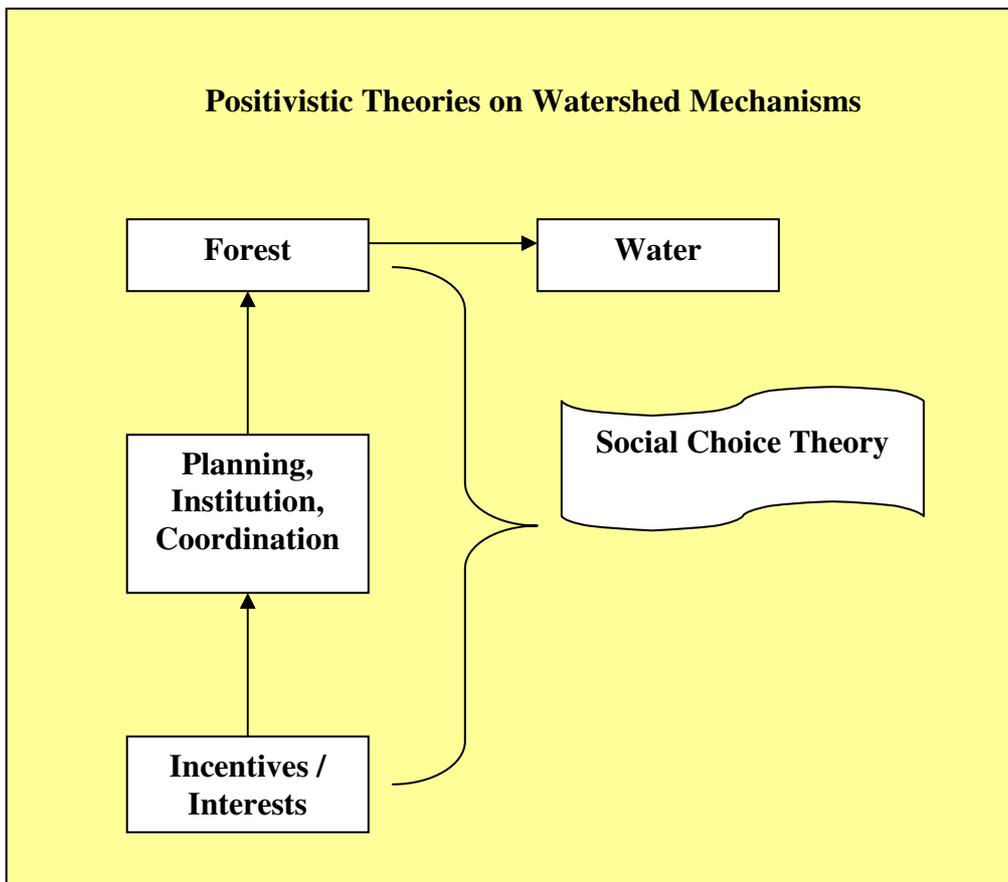
Based on the literature review in this chapter, it can be seen that water management is a never ending issues. Flood, air pollution, fresh water, etc are the hottest issues in water management. Those problems are related to externalities which means every actions in upstream will bring impact to downstream. In this case, flood is the main problem that happen because of the landuse changes (forest to developed area). It is clearly explained that forest and water have a close relationship. The deforestation in upstream, especially the region with steep topography, will cause flood in downstream area.

It is clear that water may flows through more than two administrative boundaries. It has made the management of watershed become more complex and fuzzy, because it involves many actors. It means that there will be many different interests and point of views. It can be said that conflict of interest between upstream and downstream should be well defined. In many cases, it has been proved that the management of water, or in this case watershed, has to be coordinated and integrated by considering all interests in sustainable way.

Because the management of watershed is related to many actors and interests/strategies, the institution aspect is the important thing. Institution literatures give the clear definition and boundaries about what institution is (such as policy, legal, and administrative institutions). Here, institution reflect to the ways people interact with one another and the way they interact with their environment. In other word, it can be a expressions of the terms of collecting human experience.

Because this research is talking about the coordination, therefore, the importance of coordination in watershed management itself should be well defined. Many literatures have explained the successful of coordination and cooperation. These experiences will be used as additional information and it can be also used as a recommendation for the implementation of coordination in managing watershed.

As explained above, this research needs a tool that can measure or figure out the behavior of decision makers and explain how they interact each other. Here, social choice theory and game theory play their roles. Social choice theory and game theory are concerned with problem of collective decision-making in which several agents/actors have to decide on some issues of collective interest whereas their preferences about the issue and/or their endowments might differ. Social choice theory answers the feasibility problem whether or not a particular (ethic) social choice mapping can be materialized. According to some pattern of behavior (equilibrium concept), game theory tells how a feasible social choice mapping can be implemented by decentralizing the decision power via a particular game. Through model of game theory and reflection of social theory, the problem will be structured. The model of game tries to simplify the conflict between upstream and downstream in the case of Jakarta Flood. The result will show the preferences and strategies of each player. Based on this result, the solution to the problem will be offered to improve the implementation of watershed management in Indonesia.



CHAPTER 3

LOCAL AUTONOMY AND WATERSHED MANAGEMENT IN INDONESIA

3. 1 Local Autonomy

3.1.1 Local autonomy concept in Indonesia

Since 2000, Indonesia has implemented the local autonomy of its governance system. Autonomy in Indonesian context is not real autonomy, but it is suitable with “decentralization” concept, which is “a transfer of management from the central to local governments.” There are some definitions of decentralization used in the Indonesian context. It is basically related to shifts of management, authorities, and institutions taking roles. In other word decentralization can be said as a matter of “management transfer” (Yuwono.2001 in Habib. 2008) and “delegation of authority” (Usman.2001 in Habib. 2008). Decentralization can also be defined as “definition of authorities” respectively from central to lower level of government, between organs of the state, and from central government to lower tiers of government (Koswara. 2001).

In decentralization concept, local government is part of and cannot be separated from Central government (State). Although every local government has right to manage their own region without intervention from central government, but local government has to do everything in line with central governments’ goals. This is because Indonesia is the unitary state. The power is in central government but its authorities are regulated by Constitution and Laws. Local government is under sovereignty of unitary state of Indonesia and has to honor the consequences.

In Habib research (2008), it is explained that in Indonesia, the government system is implemented in two ways, which are centralized and decentralized. Local government has the authority to manage and develop their region, but in other side, local government has to be a subordinate and dependent to central government. Local government cannot be separated from central government. This is the consequence when Indonesia embraces Unitary State form which its governance is Republic and democratic. The distribution or decentralization from local government to central government is only about governance authority. Legislative and judiciary authority are still centrals’ domain and it means that local government does not have full authority.

There are two main regulations used in implementation of decentralization in Indonesia which are Law No. 22/1999 and No. 25/1999. Those two Laws explain and define clearly about the shifts of decentralization authorities and responsibilities from central government to regional governments and fiscal balance between levels of government as well. It is emphasized that local governments as administrative autonomy manage their region including the resources. Decentralization of power and responsibilities from central to local governments does not mean that every local governments administratively separated from central government policies. In decentralization, local government can make their own policies but should refer to national policies/regulations.

3.1.2 The Decentralization of Authorities and Responsibilities from Central Government to Local Government

Before the reformation era, President is the powerful man in making policy. Central government had full authority to manage and control all region. Local government was just an executor and did not have rights to manage and allocate their own resources. Now local government has full authority to manage their own resources (finance and natural resources and regulated by Law), but it is still in coordinating relationship.

Since the reformation era, 1999, there are some changes in roles and responsibilities between the three tiers of government, namely central government, provincial government, and municipal governments. The provincial government has dual status, as autonomous region as well as the representative of central government in the region. Provincial government responsible for managing the particular aspects which are characterized by inter-municipal administration, or particular authorities which are not or not yet held by the districts and municipalities within its administrative boundaries (Usman, 2001). Governor responsible to its community within its provincial region through provincial legislative and directly to president as well. This is because governor is representative of president in province area even he/she is elected directly by his/her population. Provincial government, in implementation, acts more as a mediator and coordinator.

The districts and municipalities take roles and responsibilities as defined in the Law No. 2/1999 within its administration boundaries. Mayor is responsible directly to its community/population through legislative (DPRD) and President. In its implementation, mayors have to obey to the highest regulation (Act/Law). It means that, hierarchically, local government still has power relation with central government. Governor and Mayors have to give report the progress of their development/programmes/fund, etc to President. It is also showed there is a hierarchical system on regulation (Act-Provincial regulation-Local regulation). It shows that president is at the highest position in Indonesian governance system, Province is the representative of central government and regency/municipality is at the lowest level of the system. Provincial government has a role as regional chief and also as a representative of central government in local level. It has responsibility to coordinate regencies/municipalities within its region in order to keep local autonomy still in the right way and integration of a unite Indonesia.

The relationship between central government and local government is mentioned in Laws No. 32/2004. There are two relationship between central government and local government which are administrative relationship and cantonal relationship. Administrative relationship is the relation that is happen as a consequence where local government is part of state administrative system, which can not separated. Cantonal relationship is relation that is happen as a consequence of Indonesia as a unitary state that means every local region dependently is part of Unitary Indonesia.

The challenge now is local autonomy has given local government authority to manage their own region and it is regulated by Governmental Regulation No. 38/2007. There is a distribution of authority between central government and local government. Central government has full authority in term of international politics, national defense and security, religious, national monetary and fiscal, and justice.

And local government has authority of regional development planning, spatial planning, security, infrastructure and utilities, health, education, environment, land, administration, and other public services.

In managing its region, local government has authority to decide what its region and community needed as long as in line with Laws and National goals. Tasks that are obligatory to do by local government are:

- Development control and plan
- Spatial Planning, Utilization and Control
- Law and order
- Housing provision
- Culture and tourism
- Health services
- Infrastructure and utilities provision
- Education services and potential human resource allocation
- Matters pertaining to manpower
- Environment monitoring and control
- Land use administration and services
- Public administration
- Investment administration and planning
- Community empowerment
- Archives
- Statistic data provision
- Library provision

Besides that, there are several optional tasks for local government to do. Those are not obligatory. Local government can handle directly. If they choose not to take it, central government will take it as its responsibility. Those optional tasks for local government are:

- Fishery
- Forestry
- Agriculture
- Energy and mineral resources
- Tourism
- Industry
- Trading
- Transmigration

The main duty of government is serves its inhabitants/population with providing their needs such as providing basic infrastructure (road, electricity, fresh water, etc); improving its population's welfare by supporting with schooled providing; increasing employment opportunities; improving local economy. Housings and jobs are two basic important things for all inhabitants. The more the number of population, the more houses needs to be built and the more occupations are needed. Local government needs more fund for doing those tasks. Taxes, fees and charges are sources of local governments can get for their revenues. So that, they need to bring much investment to be built in their region, in order to increase their income.

3.1.3 Fiscal Balance between Levels of Government

As mentioned above that, Indonesia is a unitary state and local autonomy is regulated in order to honor the democracy principles. The local governments tries to give their community to savor their local resources and decide what their needs. Sufficient finances should support the local autonomy/decentralization process. Laws No. 25/1999 has been made and regulated in order to balancing the fiscal between levels of governments. This fiscal balance is based on the distribution of authority, tasks and responsibility among government levels.

In these Laws, it was mentioned that the sources of local revenue in decentralization implementation come from:

1. Local income. Local government has rights to collect it from (Laws No 18/2007)
:
 - Local taxes. For local taxes, there are several types of local taxes based on the authority to collect
 - o Collected by provincial government
 - Vehicle Tax → 90% of total income from this tax will be shared for local government.
 - Tax from ownership vehicle mutation
 - Fuel tax
 - o Collected by municipality/regency government
 - Hotel and restaurant tax
 - Entertainment tax
 - Advertisement tax
 - Streetlight tax
 - Mining and processing of C-type minerals tax
 - Utilization of groundwater and surface water tax
 - Local retribution. There are three types of local retribution that local government can collect. They are public services retribution, business services retribution and licensing/permit retribution.
 - Profit from Local owned company

- Profit from local resources
 - Other legal incomes
2. **Balanced Funds.** This is funds that come from revenue and expenditure Budget of State which is given to local government to fund the development in local level. It consists of :
- State income of land and building tax. This fund is shared into 10% for central government (this amount will be shared equally to all regions in Indonesia) and 90% for local government
 - Fee of land and building rights. This fund is shared into 20% for central government (this amount will be shared equally to all regions in Indonesia) and 80% for local government.
 - Income of natural resources (Forestry, Mining and Fishery). This fund is shared into 20% for central government and 80% for local government.
 - Income of petroleum. This fund, excluding tax, will be shared into 85% for central government and 15% for local government.
 - Income of natural gas. This fund, excluding tax, will be shared into 70% for central government and 30% for local government.
 - General allocation fund. It is 25 % of total state income mentioned in National Revenue and Expenditure Budget and will be shared 10% for province, municipalities, and regencies. About the portion of each region, it depends on the economic potency of region and the needs of local authority.
 - Special allocation fund. This fund is allocated for special needs such as unpredicted needs and national priorities and commitment. This fund includes fund from reforestation. Reforestation fund is shared 40% for region that produces that fund and 60% for central government. Officially, there are several type of special allocation fund :
 - For education
 - For Health
 - For Infrastructure and Bridge
 - For irrigation infrastructure
 - For water and sanitation
 - For Agriculture
 - For Fishery and Coastal
 - For Environment
 - For Forestry
 - For trading
 - Etc

All those funds are regulated by regulation of ministry of finance.

3. Loan. Local authority can loan some fund from abroad by itself or through central government. The requirements and rules about loan are regulated by the regulations.
4. Other legal incomes.

3.2 Watershed Management in Indonesia

3.2.1 Tasks Distribution between Central and Local Government in Forestry Field and Watershed Management

In Act no.22/1999, it is mentioned that local government has a rights to manage their natural resources and responsables to its maintenance and sustainability. Local government has authority to decide and give the permit to private or community who want utilize natural resources. It is regulated by related law. In addition, local government should coordinate with central government in giving the permit to company or private. Indonesian people has right for all benefit that are produced from those natural resources. Further, there will be a sharing in the benefit. For instance, 40% of production-forest utilization fees will be for central government and from that 40 % benefit will be distributed equally to other regions in Indonesia.

As mentioned above, that forestry is one of optional tasks that can be managed by central or local government. Local government may decide to take care of their forest or not. If choose not to manage it, central government will take this task. In fact, Forestry is managed centralized and still using coordination hierarchically between central and local government. This decision was taken because forest is shown as an object that brings effect universally. Further, forestry governance has been distributed from central to local authority. It is regulated by Presidential regulation. According to Act No. 41/1999 concerning Forestry and Act No. 32 of 2004 concerning Local Government, forest governance at sub-national levels consists of:

1. Decentralization/transfer of authority and responsibility to Provinces and District/Municipalities;
2. Deconcentration that is managed by technical implementing units of the Ministry of Forestry;
3. Assistantship, i.e. implementation of Central Government's tasks by Sub-National Governments.

In the implementation of the deconcentration, the Ministry of Forestry has Technical Implementing Units (TIUs) that comprise TIUs for Watershed Management (31 unit); TIUs for Forest Area Stabilization (11 units); TIUs for Natural Resources Conservation (32 units), TIUs for National Parks (33 units), TIUs for Certification of Forest Products Graders (17 units), TIUs for Watershed Technology Research and Development (2 units), TIUs for Plantation Forest Research and Development (2 units), TIUs for Forestry Research and Development (8 units), TIUs for Sericulture (1 unit), TIUs for Seed Technology (1 unit), TIUs for Forestry Education and Training (7 units), and TIUs for Seed and Forest Plantation (6 units).

Central government, Ministry of Forestry, has made Decree of Minister of Forestry No. SK. 103/Menhut-II/2004. Through this regulation, the Ministry of Forestry has

established Centers for Regional Forestry Development for four regions: Region I covers Sumatra; Region II covers Jawa, Bali, and Nusa Tenggara; Region III covers Kalimantan; and Region IV covers Sulawesi, Maluku and Papua. This decision has been made in order to achieve synchronization and coordination of forestry development planning and implementation between national and sub-national governments.

The distribution of power in forestry field and watershed means that there is a hierarchical and coordination system. PP. 38/2007 concerns about distribution of tasks between central and local government. Overall, it arranges the central government's role. It is a policy/guidance maker. Central government produces general patterns, norms, standards operation, procedures, and criteria of tasks/programs. Provincial and Regency/municipality give technical consideration/opinion because they know much about their own region. Local authority also plays the main role as executor of rehabilitation program. The tasks, which are distributed from central government to province/municipality / regency consist s of :

1. Forest inventory
2. Strengthening of Forest boundaries
3. Determination of Forest Functions (Conservation, protected, producing forest,etc)
4. Spatial Forest Planning
5. Forest management plan (long term, mid-term, yearly)
6. Forest Information system
7. Forest utilization
8. Rehabilitation of land and forest including mangrove
9. Watershed management
10. Urban forest
11. Ecotourism
12. Forest protection
13. Research and training

In term of watershed management, central government responsables to determined the ranked-priority of watershed in Indonesia based on its condition (land cover, debit, erosion, etc). Central government also make a guidance, norms, procedures, standard operation, and criteria of watershed management, rehabilitation program, and plan. Central government responsables in making Integrated Watershed Management. Local authority responsables to make their own watershed management plan and land, and forest rehabilitation plan at local level. For instance, watershed in one municipality/regency is responsibility of municipality/regency government and it should involve local watershed coordination organization/forum. Watershed which consists of several municipalities/regencies is responsibility of Governor and it should involve watershed coordination organization/forum at provincial level. In addition, Tran provincial boundaries watershed plan is set by central government,

Ministry of Forestry, by involving national watershed coordination organization//forum. Provincial government gives technical consideration and opinion in this process. Regency/ municipality governments give technical considerations and opinions in making local watershed and Tran regency/municipality in one province.

There are three types of watershed management plan based on term, which are long-term watershed management plan, mid-term watershed management plan, and short-term watershed management plan. Long-term plan is strategic. Integrated watershed management is the example of this plan. Long-term plan is central governments' authority to make it. Mid-term plan tends to technical nature. The examples of this plan are field technical plan of land conservation and rehabilitation. The output of this plan consists of technical recommendations of land conservation and rehabilitation; yearly land conservation and rehabilitation programs; utility analysis (financial and economic utility); monitoring and evaluation plan. The short-term watershed management plan is made very detail and complete with design of all programs such as forest rehabilitation plan, which consists of information about location, type, volumes, time and cost. Province, regency/municipality has responsibility to make mid-term and short-term management plan for their watershed and based on their territory.

Minister of Forestry regulation no P.39/Menhut-II/2009 regulates about the Integrated watershed management plan. It is mentioned that integrated watershed management focuses on spatial planning, conservation, forest and land rehabilitation, water resources management, watershed quality improvement, community empowerment and institutional development. This is also mentioned that integrated watershed management has to be a guidance, consideration, and input for local governments (municipalities and regencies) in making their development planning (Long-term, Mid-term and Short-term development plan) and spatial planning as well. Integrated watershed management plan also should be a guidance and consideration for detail plan of sectors within watershed/sub-watershed area.

Integrated watershed management plan of local watershed is assessed by Bappeda (regional development planning agency) of certain municipality/regency and approved by major/regent. Integrated watershed management plan of trans-regencies/ municipalities is assessed by Provincial Bappeda approved by governor or mayors/regents involved through collective decision letter. In addition, integrated watershed management plan of trans-provinces is assessed by provincial Bappeda (regional development planning agency), and it is approved by governors related through a collective decision letter. Those collective decision letters will be appointed become regional regulation (provincial/regency/municipality) in order to make it stronger in its implementation. This also means that, every player (governments involved) officially has responsibility to obey this agreement and together prevent their watershed.

3.2.2 The Watershed Management Plan.

In Indonesia, since 2008 President has been Ministry of Forestry (Directorate General RLPS) to make watershed management framework. The main task of Directorate General RLPS is to formulate and implement policies and technical

standardization in the field of Land Rehabilitation and Social Forestry in accordance with the Regulation of the Minister of Forestry No.P.13/Menhut-II/2005, May 6, 2005 about The Organization and Working Procedure of Ministry of Forestry. The main focus of this organization is to optimize land rehabilitation and facilitate the development social forestry in supporting the improvement watershed function and society welfare. In implanting its authority, Ministry of Forestry has set several vision or goals in managing watershed. The visions of Watershed Management in Indonesia are:

- a. Providing productive and continual land suitable with its carrying capacity. For every the use of land has to be used/planned rationally based on its carrying capacity and land suitability, in order to keep its productivity and biodiversity health.
- b. Providing watersheds that have adequate land cover and have stable debit and drinkable without pollutant.
- c. Creating awareness, capability and participation from all stakeholders including community within watershed.
- d. Improving community's welfare. Natural resources utilization within watershed should be wise and smart and aimed at community welfare.

In process to reaching those goals, there are several activities that should be done. For instance, those activities are:

- a. Land use planning.
- b. Water resources conservation
- c. Management of land and vegetation
- d. Land and water conservation
- e. Community empowerment
- f. Institutional watershed building in community

Indonesia has no master plan of watershed management. Until now, central government watershed seems to be a central interest. Many policies are made by central government. Nevertheless, many policies with different interests are produced by different sectors such as public work, agriculture, mining, etc. Those regulations are not interrelated to each other. Many conflicts of interests are in implementation. According to Dephut (2009), There are many weakness of existing watershed management. Those weakness are:

- a. watershed is planned unintegratedly
- b. sectoral-oriented
- c. Less participation
- d. Watershed management does not have a strong Law
- e. It is not efficient and effective because it is sectoral plan (ministry of forestry)
- f. conservation and rehabilitation efforts dependt fully on central government (ministry of forestry)

- g. Environmental services does not appreciate
- h. It has not have participatory monitoring and evaluation system
- i. Law enforcement is weak and inconsistence
- j. Watershed management is considered as *cost center* that is not being the priority of local governments, privates and community.
- k. there is no incentive system
- l. disincentive system has not been implemented yet
- m. Incentives and disincentives which are based on performance of governmental institutions have not been implemented yet
- n. Cost sharing has not been implemented yet
- o. There is no regulation which concerns about financing of watershed management.

Central government really realizes that Indonesia needs integrated watershed management plan. In doing so, President of Indonesian Republic has commanded Ministry of Forestry to make the regulation about the integrated management plan. Indonesian Watershed Management Framework was made. Further, it is followed by the Ministry of Forestry regulation no.P.42/Menhut-II/2009 which concerns general condition, criteria and standard of integrated watershed management.

In the guidance of integrated watershed management plan making (P.39/Menhut-II/2009), the responsibilities of stakeholders are mentioned. Ministry of Forestry responsables for forest management including conservation area and watershed rehabilitation. Ministry of Public Work responsables for water resource management and spatial planning. Ministry of interior responsables for community empowerment at local level. Ministry of agriculture responsables for community development in term of agriculture land utilization and irrigation. Ministry of energy and mineral resources responsables for ground water management, mining areal reclamation. Ministry of fisheries and maritime responsables for coastal management; and Ministry of Environment responsables for environment quality control. The role of Province government is as coordinator/facilitator/regulator/supervisor of the implementation of watershed management at province scale. Province also gives technical consideration for watershed, which crosses regencies/municipalities. Other actors like legislatives, research institutions, NGOs, and university play role as supporting player which could be an advisor, analyst, academic consideration, critic, etc,

There is no integrated Laws that specifically arranges about watershed management. There are many regulations used in watershed management such as Act about water resources, spatial planning, local government, forestry, conservation of natural resources, environment, agriculture, etc. Forestry Minister regulation, it only explained about the need to manage watershed integratedly and establishment of forum DAS with the guidance of watershed management plan making process. There is no more explanation about the obligation for all actors involved to use the plan, even the punishment.

Nevertheless, in 2010, Ministry of Forestry started to make a Master Plan of Indonesian Integrated Watershed Management Plan. Further, all local government should make their watershed management plan which refers to this master plan.

3.2.3 The Position of Watershed Management Plan in Regional Development Plan

National development planning regulation no. 25/2004 and spatial plan regulation no. 26/2007 mention that every government (province/regency/municipality) should refer to National development plan and spatial plan in making and arranging their development plan and spatial plan, Provincial development plan and spatial plan should refer to National development plan and spatial plan. Regency development plan, and spatial plan should refer to Provincial development plan and spatial plan. The hierarchy and relationship between spatial planning and development planning is drawn in figure below.

The Law. No 25/2004 (about national development planning system) and Law. No. 26/2007 (about regional spatial planning) are aimed at harmonizes and coordinates all development and spatial planning of regions in Indonesia. It is done in order to get the integrated development and controllable. In those regulations, it is said that Indonesia should have one national development planning and national spatial planning. This plan should be a guidance and reference for all province and regency/municipality in making their development and spatial planning. Regional development planning is made by referring to regional spatial planning.

Spatial planning regulation is made in order to control the spatial utilization and unsustainable regional development. In this regulation, spatial utilization is controlled systematically using zona system regulation, permit, incentive and disincentive, and sanctions. Sanctions will be given for those who break the rule, community, or officials. The figure 4.1 shows not only the relationship between the development plans but also the relationship between authorities. The highest level of governance is in State/central government as mentioned before. The central government should consider the interests and needs of the province in making its plan, and so on. There is MUSRENBANG (Development Plan Discussion/Conference) in making the development plan. In this process, the plan will be synchronized each other. It means that, national level needs clarification and confirmation or getting information from lower level about the real situation in local level. In this forum, all authorities have opportunity to prevent their plan and negotiate with the higher level about the development plan and the spatial plan.

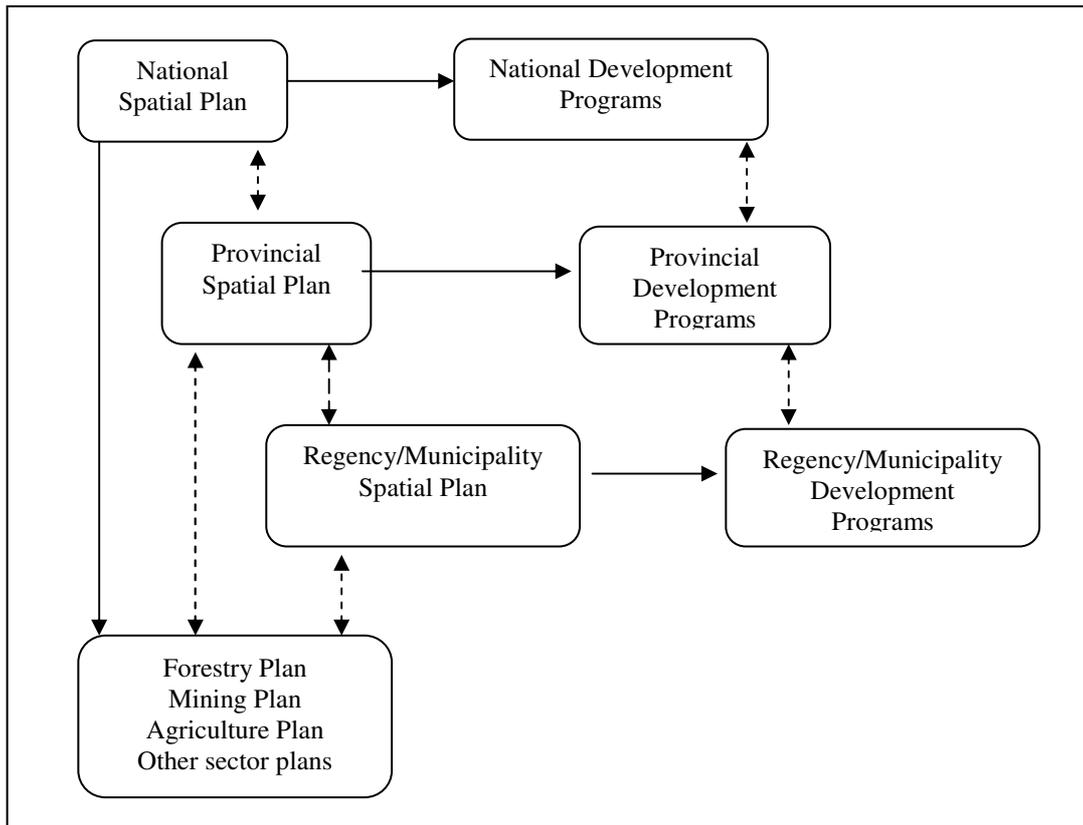


Figure. 3.1 Power Relation Between Three Tiers of Governments In Term of Spatial Planning and Development Plan in Indonesia

Source: Act No. 26/2007

As mentioned above that watershed management as part of regional development is an effort to manage causal relationship between natural resources mainly, vegetation, soil and water with human resources within watershed with all their activities in reaching economic utility and environmental services for development interests and also ecosystem sustainability within watershed. Watershed management efforts to manage and optimize land use rationally for various interests as well as other environmentally friendly practices. Further, it can be assessed with ultimate indicator (Dephut. 2009). This shows that there is a close relationship between watershed management and spatial planning. It is also mentioned in governmental regulation no.P.42/2009, that watershed management should be explained and mentioned clearly in regional development plan in all hierarchy (long-term, mid-term, and implementation plan) of all local government (province/municipality/regency). As shown in figure.

The spatial planning is made by referring from long-term development plan, which also has hierarchy in its system between national level and local level. In other word, the regional development planning, spatial planning and watershed management planning should be correlated and coordinated each others. Regulations have regulated the rule and the role of every player (government/actors) related within certain watershed. The lower level of governance has to consider and may not do something that unsuitable with the higher level of plan. The local government can do

changes in spatial plan by giving technical consideration or reason to the higher level and may not change it without coordination with higher level of governance.

As shown above that actually there is no hierarchical system in government system in Indonesia. The hierarchical system only exist in regulation system. This means that in local autonomy era mayor and regent are not under governor command. They are in same level. Mayor and regent have authorities to their regions, governor only act as a mediator and helps coordinate central government and local government in every level and program because governor is representative of central government in local level. There is the coordination between as shown in figure 4.1. Nevertheless, in fact, provincial government is powerless. The municipality and regency tend to ignore the existence of province. The province does not have power to give punishment to them because regulation said so. The municipality and regency government do not have accountability to province government. The provincial government in many case failed do their job as coordinator.

Watershed management should be a part of and regional development plan and spatial plan. Local government should consider regional development from watershed perspective. In fact, it is not shown in the regional development plan. The figure 4.2, it can be seen ideally, watershed management plan position in government system in Indonesia. In many case, watershed is not consider seriously in making the plan of municipality/regency' development.

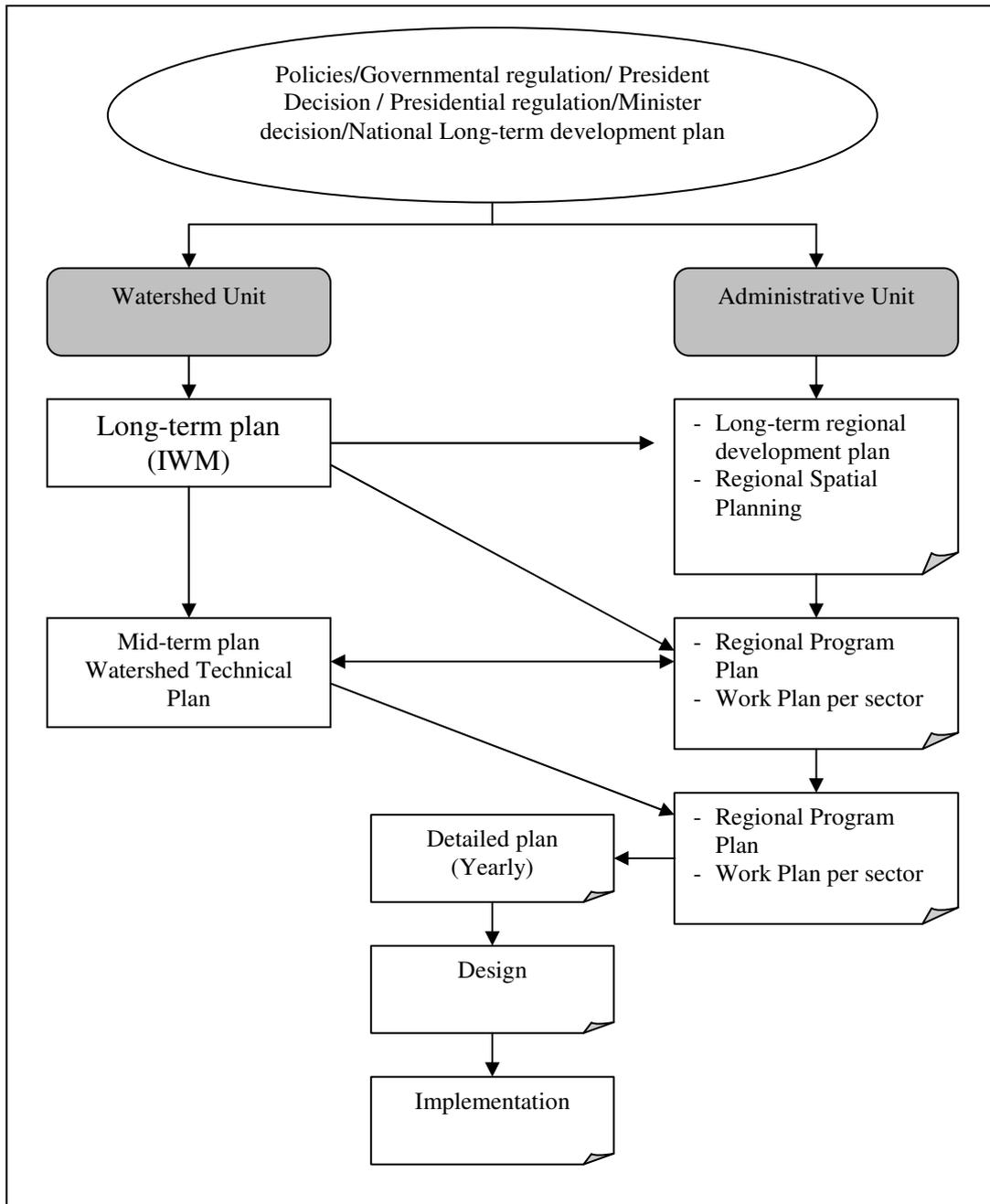


Figure 3.2 The position of Integrated Management Plan in Governance System

Source: Anonymous. 2009 (P.39/Menhut-II/2009)

3.2.4 Forum Das as A Watershed Coordination Forum

There are many sectors with different backgrounds, interests, goals and ways in managing watershed. In its implementation, those sectors tend to play as what they want to be than as what they should be. In many cases, conflict of interests, and conflict in authority is appeared. Many organizations and regulations in one object, for instance water. Central government realizes that there should be a forum that can be a media for all actors to participate and communicate each other's. An

independent organization is needed in supporting integrated watershed management. This organization is a media for all related/involved actors to coordinated and participated in watershed management. Therefore, Forum DAS (watershed forum), or something like that, should be established in every watershed region. Principally, this forum should represent all interests. This forum is directed to be an independent institution. Its function is helping government solve the problems within watershed and formulating its solution.

In guidance of watershed management, it is regulated that the right institution is coordinating organization of watershed management for facilitating the involvement of all actors involved. This organization could be forum or agency that is independent. This organization should be established at all levels : national, province, and local (regency/municipality). In national level, it is named National Watershed Board. This board can arrange policies, strategies, and watershed management programs at national level. This board is representative of Ministries, NGOs, Academics, research institutions, etc. This board is under Minister National Development Planning coordination. In regional level, it is named Regional Watershed Forum. This forum can arrange policies, strategies, and watershed management programs at regional/provincial level. This provincial forum is under governor responsibility and coordination. This forum consists of related actors/players within its province: universities, research agency, departments, NGOs, community, etc. The last is at Local level, it is called Local Watershed Forum. This forum can arrange policies, strategies, and watershed management programs at local (municipality/ regency) level. This forum consists of related actors/players within its boundaries: university, research agency, departments, NGOs, experts, community, etc. This provincial forum is under mayor/regent responsibility and coordination.

According to Guidance of Forum DAS Formation (Dephut. 2003), the tasks and authorities of Forum DAS are:

- a. Invites and organizes regular and incidental meetings in order to solve the conflicts among stakeholders
- b. Gives recommendation to governments about priority of watershed utilization which is based on the community welfare and environmental sustainability
- c. Gives recommendation about reforestation programs; soil and water conservation construction within watershed and all related investment for reducing the risk of flood, erosion, sedimentation and drought.
- d. Gives considerations or opinions about problem potencies that will cause conflicts and negative impact to environment to Ministries/Governors/Regents.
- e. Gives recommendations or considerations to Ministries/Governors/Regents in diciding the policies.
- f. Gives the reports about the progress of implementation of watershed management policies to Ministries/Governors/Regents.

Until 2006, 27 forum DAS has been established. Those forum DAS has been established by involving many stakeholders and local community. They has been also legalized by Decision Letter of Governor/Regent. Nevertheless, in fact that the existance of this forum seems not enough to influence the policies. Pujatmiko (2007)

found that the effectivity of this Forum in influencing the policies is weak. It is related to the independency of this forum. The main problem is about the funding system. All activities of this forum comes from central government budget. Pujatmiko saw this condition has made the forum cannot work independently. It could be affected the decision making process. Every actors in this forum, does not act independently. They are representative of their institution.

Watershed management is a continual process. It needs much time to discuss and mapping the problem. Inconsistency of the actors will affect to the process of constructing the plan. The transparent information from all sectors will affect the process.

3.2.5 The Incentives and Disincentives in Management of Watershed

Indonesia does not have Law that specially concerns about the management of watershed. The Laws that are used in watershed management are :

- a. Law No. 5/1960 about Basic Rules of Agriculture
- b. Law No. 9/1969 about State-business forms
- c. Law No. 11/1974 about irrigation
- d. Law No. 5/1990 about the conservation of natural resources and ecosystem
- e. Law No. 12/1992 about cultivation system
- f. Law No. 24/1992 about spatial planning
- g. Law No. 23/1997 about environmental management
- h. Law No. 22/1999 about local government
- i. Law No.25/1999 about Fiscal Balance between central and local government
- j. Law No. 41/1999 about forestry.

Those Laws mentioned about the punishment if there is violation of law. Those laws are not integrated. They are used separatedly. Besides that, ministry of forestry has made several regulations in order to spicify the technical and guidance of watershed management. In those regulations, the management of watershed explains clearly about the principles, authorities and tasks of central and local governments. For instance, the decision letter of ministry of forestry which concerns about the guidance of integrated watershed management implementation, has directed for all stakeholders to consider about the incentives and disincentives. It mentioned about the cost sharing. For those who gain the benefit from the watershed management should pay the cost sharing. Nevertheless, this regulation not discuss completely about this cost sharing.

In Indonesian governance system, only Law can definitely mention about the punishment and reward. The regulation hierarchically below the Law, such as decision letter of ministry only mention about the technical information and do not mention clearly about the incentive and punishment. In Authonomy era, sometimes, the regulations of ministry are ignored by local government. They feel that they are

in the same level of echelon. This is one of weakness of the watershed management in Indonesia.

The inexistence of Law which is arranged the management of watershed causes the management of watershed has no main legal umbrella/law in its implementation (www.Bappenas.go.id). All this time, planning bureau is dominated by water resources sector and it does not talk about watershed management. This condition has also affected to the fact that watershed has not been used as main basis in regional development plan and spatial planning process. It is because there is no rule that strictly mentioned about the compulsion to use watershed as a main framework in regional development and spatial plan.

Many programs and projects which are related to watershed management has been done by governmental institutions such as settlement providing and maintenance (by public work), forestry, plantation, agriculture, domestic affairs, transmigration, mining, and etc. Nevertheless, they act and do their jobs separately in its implementation. This condition affects the conflict of interest between them. This condition is happen because they use different regulation/Laws and every regulations are not integrated to each other. It is called “legal umbrella”.Indonesia does not have ‘legal umbrella” that is regulation which covers and integrates all interests.

3.2.6 Power Relation Among Decision Makers in Watershed Management

As mentioned above that since local autonomy has been regulated, the system of governance of Indonesia was changed. There is a distribution of authorities from central government to local government through decentralization, deconcentration, and assistantship. This autonomy spirit is implemented by sharing the task/governance between central and local government in many sectors. The tasks are divided into two which are main task and optional tasks. The system of governance in Indonesia is different from federal system which every state is independent. Local autonomy in Indonesia is still interdependent between central and local government (Figure 3.1). The highest power of state is in national level (president). Provincial government is a representative of central government. Municipality and regency government have the authority to manage their region and community. Nevertheless, for every decision and policies they make, it has also to consider the national plan. There is a coordination line among them. The distribution of power is aimed to accommodate local need and supporting the improvement of local development and local community.

In case of watershed management, it is arranged by central government that central government have responsibility to make a general guidance, norms, procedures, standard operation, and criteria of watershed management, rehabilitation program, and plan. Local government has the role as an executor or implementer of the program. Besides that, local government also has a role as a player who gives a technical opinion or consideration about watershed condition within their administrative boundaries. From this case, there is a direct relation between central and local government. Central government makes a policy, rules to which local government should refer. Local government has to make their own watershed management plan referring to integrated watershed management made by central government. Local watershed management plan should be as a consideration for

local government in making their regional development planning and regional spatial planning. The planning of regional development plan has to put the watershed management plan inside and regional spatial planning as well. The making of watershed management planning has to consider many aspects and involving many players related or within its region.

The highest level of watershed management plan is national integrated watershed management and followed by provincial integrated watershed management plan and regency/municipality integrated watershed management plan. Among those plans, there is a correlation meaning that the lower level has to refer to its higher level of government. There should be coordination among levels in order to keep the development in line with national goals.

3.3 Concluding Remarks

This chapter mainly discusses the local autonomy and watershed management in Indonesia. In order to explain the flood problem in Ciliwung watershed, it is necessary to know the condition of governance system between central and local government in Indonesia. Authorities of each decision makers are described in this chapter. The watershed management is related to the system of governance. It is because the watershed is part of regional development plan and it is also considered in spatial plan. Further, it can be seen the relationship among power in governance system. The power relation among authorities figure the interrelation among decision makers. It will be useful in solve the conflict of interest within watershed management.

This chapter gives more insight about the local autonomy condition and its relationship to watershed management in Indonesia. Firstly, this chapter explains clearly about the definition of local autonomy used in Indonesia. Local autonomy in Indonesia means decentralization and distribution of tasks and authorities from central government to local government. Indonesia is the unitary state. Every region are interrelated. The highest position of governance is in President. Because of this principle, local autonomy in Indonesia is not real full autonomy.

Since the reformation era, 1999, there are three tiers of government in Indonesia, namely: central government, provincial government and regency/municipality government. Now, Regent/mayor does not responsible to governor for every what he do. Governor is a representative of central government which responsible to coordinate all regencies and municipalities within its provincial boundaries. Regent and Mayor responsible directly to President. They are obligatory to give reports to President about their programs. Local autonomy also arranges the fiscal balance between levels of government. Local governments are spurred to maximize their local resources to maximize their income. Local governments have several sources in increasing their income. Those sources are : local income, balanced funds, and/or loan. Local income comes from local taxes, local retribution, profit from local government-owned company , profit from local resources and other legal incomes. The most of local income comes from local taxes the such as vehicle tax, fuel tax, hotel tax, restaurant tax, entertainment tax, advertisement tax, mining tax, and etc.

There are distribution of tasks and authorities from central to local government. There are two basic tasks which are obligatory tasks and optional tasks. Obligatory tasks are tasks that are obligatory for local government to do. In term of watershed management, central government has power to make a guidance, norms, procedures, standard operation, criteria of watershed, and rehabilitation programs and plan. According to Governmental Regulation No. 38/2007, local governments' tasks are gives technical consideration and opinions and execute the programs and plan which are made by central government. Local government responsables to make his watershed plan including rehabilitation of forest and land of its region. Local governments should refer to integrated watershed management plan which is made by central government.

Watershed management plan is related to regional development plan and also spatial plan. In regulation, it is directed that local governments should consider the watershed management plan into their development plan and spatial plan. As mentioned before that Indonesia is the unitary state, so every development plan should be coordinated. Therefore regional development plan, spatial plan and watershed management plan of local level (municipality and regency) should refer to national plan. There is coordination lines among all levels of government.

Local authonomy, conflict of interests and uncertain condition within watershed are factors that never been solved if Indonesia is still using existing management. In term of watershed management plan, Indonesia has no Master Plan of watershed management and integrated watershed management plan. Besides that, Indonesia has no Law which specially concerns about watershed management. Therefore, there are several weakness in its implementation such as weak law enforcement and inconsistency of decision makers in implementing the plan. Another problem is incentives and disincentives system is not explained clear enough. This is sencitive issue for all stakholders. Even regulation has suggest that every region which gain benefit from the watershed management of watershed should pay cost sharing. Nevertheless, it is not explained clearly and completely. Many agreements does not touch this issues.

Central government realizes this condition and starts to make integrated watershed management plan in 2010. Central government also considers and suggests to all watershed agency to make Forum DAS. This forum is independent. It does not only evaluate and monitor every development within watershed, but also evaluates the government policies related to watershed. This forum is expected helping government in making better watershed.

Indonesia does not have specific Law concerning about watershed management such as Laws about water, agriculture, forestry, local government, spatial planning, etc. Those Laws was established with different background of interests. In many cases, those regulations are conflict to each other. They are unintegrated to each other. Those Laws mentioned also about the punishments. The punishment will be given for each violation. Nevertheless, the incentives term is not mentioned or mentioned unclearly.

In the last sequence, the power relation between government is described. Even Indonesia has implemented the local autonomy, but the management of watershed is still handled by central government. There is a direct relation between central and

local government. Central government have responsibility to make a general guidance, norms, procedures, standard operation, and criteria of watershed management, rehabilitation program, and plan. Local watershed management plan should be as a consideration for local government in making their regional development planning and regional spatial planning. Local government has to make their own watershed management plan referring to integrated watershed management which was made by central government. The planning of regional development plan has to put the watershed management plan inside and regional spatial planning as well.

CHAPTER 4
CILIWUNG WATERSHED:
CHARACTERISTICS, LANDUSE CHANGES, AND MANAGEMENT

4. 1. The Characteristics of Ciliwung Watershed

4.1.1. The Physical Condition of Ciliwung Watershed

The Form and Condition of Watershed Area

Ciliwung watershed starts from upstream until a point in the Jakarta Bay. It covers areas of 347 km². The Length of the main river is 117 km. According to its toposequence, Ciliwung is divided into three parts which are upstream, middlestream and downstream. Every part has its own physical, land use, and social economic characteristics.

Administrative Boundaries

According to Departemen Kehutanan (2003) that based on administration region, Ciliwung watershed (from upstream to downstream) consists of Bogor regency, Bogor Municipality, Depok administrative municipality, and Jakarta Province. The regional delineations are :

a. Upstream Ciliwung.

Most of this area belongs to Bogor Regency (Megamendung sub-regency, Cisarua sub-regency dan Ciawi sub-regency) and small parts of Bogor Municipality (Kota Bogor Utara sub-regency and Kota Bogor Selatan sub-regency).

b. Middle Ciliwung.

It covers Bogor Regency (Sukaraja subregency, Cibinong sub-regency, Bojonggede sub-regency dan Cimanggis sub-regency), Bogor Municipality (Kota Bogor Timur sub-regency, Kota Bogor Tengah sub-regency, Kota Bogor Utara sub-regency, dan Tanah Sareal sub-regency) and Depok Municipality (Pancoran Mas sub-regency, Sukmajaya sub-regency dan Beji sub-regency).

c. Downstream Ciliwung.

Until Manggarai water gate, Ciliwung river is part of South Jakarta Municipality and Central Jakarta Municipality administrative boundaries. The downstream of Manggarai water gate, including Kanal Barat, is part of Central Jakarta Municipality, West Jakarta dan North Jakarta.

The Topographical characteristic and Rainfall

Upstream Watershed

Upstream part contains an area of 146 km², which is a mountainous area with elevation between 300m to 3000m asl. In this area, there are at least seven sub-

watersheds, namely: Tugu, Cisarua, Cibogo, Cisuka biru, Ciesek, Ciseuseupan, and Katulampa. Upper part is characterized by fast-flowing mountain river swift, high slope variations, with slopes of 2-15% (70.5 km²), 15-45% (52.9 km²), and the remaining is more than 45%. In the upper stream, it is mostly found springs that depend on the composition of rock lithography and graduation. Annual average of Rainfall over the period 1989-2001 is 3636 mm with average monthly rainfall is 303 mm.

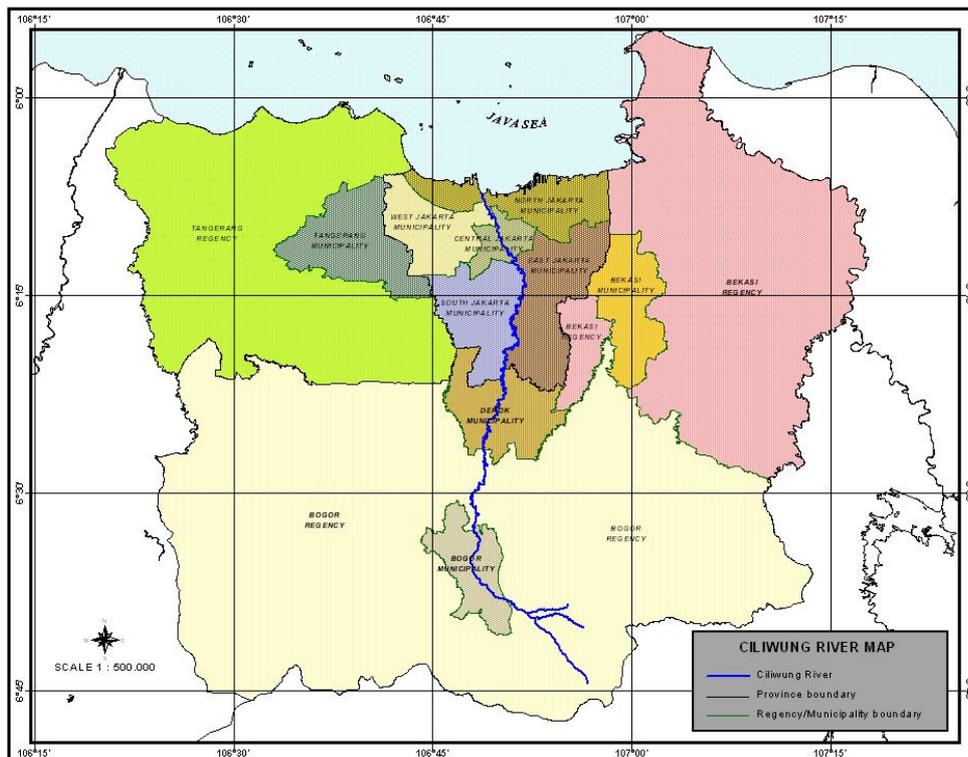


Figure 4.1 Ciliwung River Map

Source : processed result.

Midstream Watershed

The middle part covers an area of 94 km² which is bumpy and hilly with elevation variations ranging from 100 m to 300 m above sea level. In the Central part there are two tributaries, namely: Cikumpay and Ciluar. Both of which empties into the river Ciliwung. The middle part of Ciliwung is dominated with 2-15% slope. The average of annual rainfall over the period 1989-2001 is 3910 mm with the average of monthly rainfall is 326 mm. The limit from the dry season to rainy season in the central part is less clear (Antoro & Fahmiza, 2002). Rain in Depok is much lower compared with the rainfall of the three other rainfall stations in the central part Ciliwung. In general, rain in the central part is higher than in the lower part, except in the rainy season (January to March) rainfall in the downstream is higher.

Downstream Watershed

Downstream section up to the observation station New Kebon / Manggarai, at elevation PP +8m, covers an area of 82 km². The topography of this area is plain with elevation between 0 m to 100 m above sea level. Downstream area is dominated by 0-2% slope, with calm river flows. More downstream parts of Manggarai is characterized by the drainage network, which has been equipped with Western Canal as an antidote to the flood of the collector channels. In this condition, watershed boundaries become vague. Annual rainfall average over the period 1989-2001 is 2126 mm with average monthly rainfall is 177 mm.

In general, downstream areas are located in Jakarta and Tangerang in which the boundary between dry season and rainy season is evident. Rainy season starts in December and ends in March. In general, rain in downstream is the least compared with rain in the middle and upper watershed.

The Hydrological characteristic and Hydro-geology

Hydrology

From the analysis of heavy rainfall, it was found that there are the average 5 heavy rain events in January and only 0.2 events in July in the downstream areas. The mean of intensity of heavy rainfall varies between 8 mm/hr up to 20 mm/hour with duration of three to five hours. For the upstream Ciliwung, it was found that daily rainfall is more than 50 mm and 3-daily rainfall exceeding 100 mm. This can be classed as a heavy rain that could produce flooding in downstream areas. The nature of this heavy rainfall can be considered equal to the upper, middle, and downstream Ciliwung. The maximum daily rainfall values is 164 mm for 5-year return period; while for 10th-annual rate it is 189 mm; for 25th-annual rate, it is 220 mm, for 50-year it is amounted to 243 mm, and for 100-the annual rate, it is 266 mm (Pawitan, 2002).

Hydro-geology

a. Aquifer system configuration

Sedimentary rocks in DKI Jakarta area and its surroundings form the highly heterogeneous and complex aquifer system (Hutasoit, 2002). The complexity and heterogeneity aquifer systems in this area are marked by interfingering between aquifers and aquitards, variations in thickness, and the presence of faults / fractures.

According to Hutasoit (2002) in Departemen Kehutanan (2003):

- i. In general, the north-south cross section, the aquifer-aquitards system is thickening in the north. In the west-east cross section, the aquifer-aquitards system is thickening in the middle. Generally, the aquifer layer in the north-south cross section is as thick as in the north. For the east west cross section, this aquifer layer is thickening to the north and center. The depth of this aquifer layer is ranged from 0 - (-300) m asl.
- ii. Based on his research, it can be understood that Bopunjur (Bogor, Puncak, Cianjur) are the groundwater recharge area for DKI Jakarta region. Administratively, those recharge areas can be described as :

- Southern part : Parung, Depok, Ciangsana/Cileungsir, and Cibubur
- Northern part : Tongkol, Kayu Besar (Cengkareng), Muara Angke, Tongkol, and Kebonwaru
- Middle part : Kuningan, Pekayon, Dukuh Atas, and Pulomas
- Western part: Serpong and Rawa Bokor (Multi Bintang/Tangerang)
- Eastern part : Bekasi

b. Ground Water Condition

Based on the study of Mining Department of DKI Jakarta and DGTL in 1995 and 1996, Assegaf in 1998 noted that the condition of ground water in areas of Jakarta and surrounding are as follows (BPDAS Citarum-Ciliwung, 2003) :

i. The Aquifer at a depth of 0-40 m asl.

In the period before 1950 which was considered a natural condition, the ground water was at the position approximately five m asl. In 1992, the ground water level reached the position of -2.49 m above sea level. In 1993 it showed that the ground water level reached the position of -3.5 m asl, while the results of measurement in 1994 showed that the ground water level had reached the position of -3.9 m asl.

ii. The Aquifer at a depth of 40-140 m asl

In natural conditions, ground water is in position between 1-10 m asl. In 1992, the ground water level reached position at (-18.64) to (-35, 50)m above sea level. It continued in 1994 where the ground water table decreased (-20, 80) - (-43.70) m asl.

iii. The Aquifer at a depth of 140 – 250 m asl

In natural conditions, ground water is 2 m above sea level, while in 1992 the ground water was in (-20) - (-29.30)m dpl. In 1994, the ground water level decreased again and reached the level of -49.5 m asl.

Land Characteristic and Spatial of Ciliwung Watershed

a. Land Tenure in Ciliwung Watershed Area

According to Departemen Kehutanan (2003), land tenure in the upstream can be divided into state-owned land, property and lease rights. State-owned lands in the form of forest area are managed by the Central Government, Department of Forestry (Pangrango Gede National Park (National Park), and The Natural Resources Conservation and State-owned company-Perhutani (Protected Area and Production). Lands in the form of the river and lake there are managed by central government (Water Resources Management Center, Ministry of Settlement and Regional Infrastructure) and local government agencies. Commonly, owned-lands are used for plantation, rainfed lowland and technical, moor / fields, residential and recreation area. Meanwhile, the lease-rights lands are used as garden (PT Gunung

Mas and PT Ciliwung). Owned/private land is generally owned by people residing outside this area.

Land tenure in the central part of the upstream can be divided into state-owned land, property and lease rights. State-owned land in the form of forest area is managed by the government c.q Perum Perhutani (Protected Area and Production). Land in the form of the river and lake are managed by local government agencies and government c.q Water Resources Management Center, Ministry of Settlement and Regional Infrastructure. Land use in the lower reaches is dominated by residential land (build-up areas), road network, river bodies and other drainage channels, and a bit of green land in the park (Soetarto, 2002).

b. Land Use in Ciliwung Watershed Area

In general, land use in upper and middle Ciliwung watershed can be classified into four purposes. They are forest, agriculture, settlement (including industries businesses, etc) and others (including dam/lake). Both DAS upper and middle Ciliwung watershed is dominated by agricultural land (63,9% in upper and 72,2% in middle area). Notwithstanding,, upper area still have forest of which size is around 25% of total area. Most of the areas are protected forest and state-owned forests. Whereas middle area of watershed has no longer forest area. Around 30% of forest areas in upper area is production forest. Forest cover of these area is 25% of total upper area of Ciliwung watershed. Agriculture area in upper area of Ciliwung watershed is dominated by farms (25,4 %). Plantation area is around 16,2% dominated by tea and clove plantation. In the middle area of watershed, agriculture land use is dominated. Data of ownership of agricultural land in the Ciliwung showed a trend toward narrowing the land that is occupied by farmers. The most striking changes in land use in the upstream area and the center is on the proportion of land used for residential areas. Residential areas in the middle area of watershed have reached 29.6% of total area whereas in the upstream Ciliwung only about 7.4% (Departemen Kehutanan. 2003). Land use patterns in the region upstream and middle Ciliwung are presented in table 4.1

Table 4.1 Land Use Pattern in Upper and Middle Area of Ciliwung Watershed

Sub-das	Land Use	Width	
		Ha	%
Upper	Forest	4.274	28,8
	Agriculture	9.503	63,9
	- Plantation	2.407	16,2
	- Mixed Garden	1.775	11,9
	- Moor / field	1.543	10,4
	- Rice field	3.777	25,4
	Settlement	1.099	7,4
	Others	0	0
	Total	14.876	100
Middle	Forest	0	0
	Agriculture	9.923	72,12
	- Plantation	0	0
	- Mixed Garden	5.560	40,41

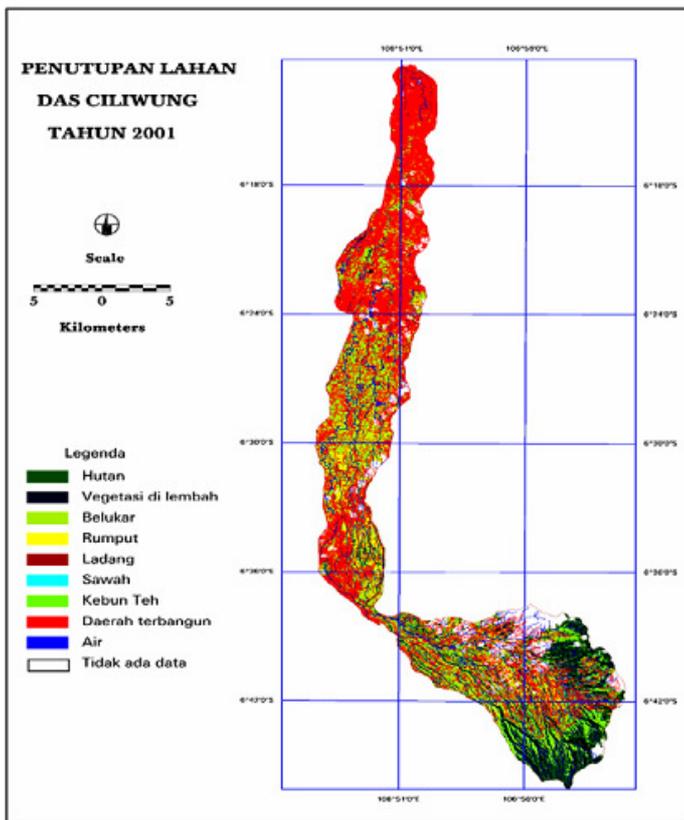
Sub-das	Land Use	Width	
		Ha	%
	- Moor / field	2.070	15,04
	- Rice field	2.244	16,31
	- Reed / bush	49	0,36
	Non- Agriculture	3.701	26,92
	- Settlement	2.796	20,32
	- Complex	214	1,56
	- Real estate	636	4,62
	- Industry	58	0,42
	Others	135	0,8
	Total	14.876	100

Source : Departemen Kehutanan (2003)

The Settlement patterns in the upstream area is different from the existing pattern of the central region. Ciliwung settlement patterns in the middle area form accumulations of occupancy that tend to be concentric in the municipalities of Bogor, Cibinong (as the capital of Bogor regency) and the City of Depok (as the new city which is closest to Jakarta). Settlements in the central of the region are much more organized. In addition to housing, settlements land use in the territory of the middle Ciliwung also changed into industrial zones, trade zones, and offices. In the middle of the watershed areas, there is accumulated industry which is located along roads, in parts of Bogor Botanical, and the edge of Ciliwung river.

This condition is different with upstream area. The settlements tend to spread although there is a tendency that the concentracy will move to the center along Ciawi-Cisarua highway. Settlement area in upstream Ciliwung is not only functioned as a residence but also as “week end house” which is used only in an weekends or holidays. Most of the owners lives in Jakarta.

From the pattern of land use explained above, it can be concluded that middle area of Ciliwung watershed is undergoing to the process of urbanization. Land use pattern in the Ciliwung upstream can still be categorized into agricultural areas with specific functions for tourism, and conservation purposes. This development can occur because of the influence of urbanization from Jakarta to Bogor, which is accelerated by the toll road Jagorawi (up to Gadok). Besides, the accumulation of the industry in the central part of Ciliwung watershed also has accelerated the urbanization process.



Source : Departemen Kehutanan (2003)

Figure 4.2 Land Cover of Ciliwung Watershed year 2001

4.1.2 Socio-Economic Condition within Ciliwung Watershed

Population Density

According to Departemen Kehutanan (2003), the most significant social characteristic in Ciliwung watershed is its very high population growth. Based on BPS (Statistic bureau) of DKI Jakarta (Table 4.2), the rate of population growth in JABOTABEK (Jakarta, Bogor, Tangerang and Bekasi) during year 1961 to 2000 increased rapidly. In 1961, total population of JABOTABEK reached 5,65 millions. Then, this number continued to increase up to 7,97 millions people in 1971. In 1990 the population number grew up to 16,83 millions and in 2000, it reached 23,31 millions people. The population distribution data of JABOTABEK can be seen In table 4.3.

Tabel 4.2 Population Growth in JABOTABEK 1961 – 2000 (x 1000)

Region	1961	1971	1980	1990	2000
DKI Jakarta	2.906,50	4.546,60	6.481,00	8.222,50	9.720,40
Bogor + Depok	1.257,80	1.597,20	2.493,90	3.736,20	5.423,30
Tangerang	817,20	1.025,70	1.529,10	2.765,00	4.594,20
Bekasi	669,70	803,00	1.143,60	2.104,40	3.570,60
Botabek (Bogor, tangerang and Bekasi)	2.744,70	3.425,90	5.166,60	8.605,60	13.588,10
Jabotabek (Jakarta + Botabek)	5.651,20	7.972,40	11.647,60	16.828,10	23.308,50

Source : Statistic bureau of DKI Jakarta (2001) in BPDAS (2003)

Tabel 4.3 Width, Total Population dan Population Density in Upper and Middle Ciliwung Watershed

No	Sub-Regency	Width (Ha)	Population	
			Total	Density
A	Bogor region			
1	Ciawi	2.518	78.792	31,29
2	Cisarua	6.372	90.914	14,26
3	Megamendung	4.006	77.558	19,36
4	Cibinong	4.249	207.763	48,89
5	Sukaraja	4.202	125.658	29,90
6	Kemang	2.341	107.989	46,13
7	Bojonggede	5.561	199.544	35,88
B	Depok Region			
1	Pancoran Mas	2.671	156.118	58,45
2	Beji	1.614	80.377	49,80
3	Sukmajaya	3.398	216.118	63,60
4	Cimanggis	5.077	221.330	43,59

Source : Spatial Planning of Bogor Regency (2002) in BPDAS (2003)

From the table above, it can be seen that, population in upper Ciliwung watershed is more rare (< 50 persons/ha) than population in middle watershed (> 50 persons/ha). This condition still continues to increase up to now. From those table, it can be seen that the growth of population within this watershed has increased rapidly from year to year.

The rapid urbanization process has occurred up in this area. This is influenced by several factors. Some places are industrial area such as Part of Bogor regencys (Cibinong and Bojong Gede), Bogor City and Depok City. Many people moved from rural to city in order to find better jobs with better salary. That is why in those area, the population growth is higher. In upper area of Bogor regency (catchment area), Megamendung and Cisarua, the population number is lower because this area is dominated by agricultural land such as paddy field and tea plantations.

Economic Activities and Dependence on Land

According to Presidential Decree No. 54 year 2008, Jabodetabekpunjur (Jakarta-Bogor-Tangerang-Bekasi-Puncak and Cianjur) are metropolitan area where DKI Jakarta is the main city. In Government Regulation No. 26/2008 about National Spatial Plan (RTRWN), this area is pointed as national strategic area whose spatial planning is prioritized and set by presidential regulation. This area has an important role in national development as a center of regional and nation economic development, and also as water and soil conservation area that guarantee social welfare and community economy.

Economically, Jabodetabekpunjur has given high “share” to national economy. In 2006, around 70% of national investments are in Java-Bali and most of them are in Jabodetabekpunjur area where 22% in DKI Jakarta, 11% in Banten, and 27% in West Java. DKI Jakarta gives the highest “share” to GRDP of all Jabodetabekpunjur as shown in figure below.

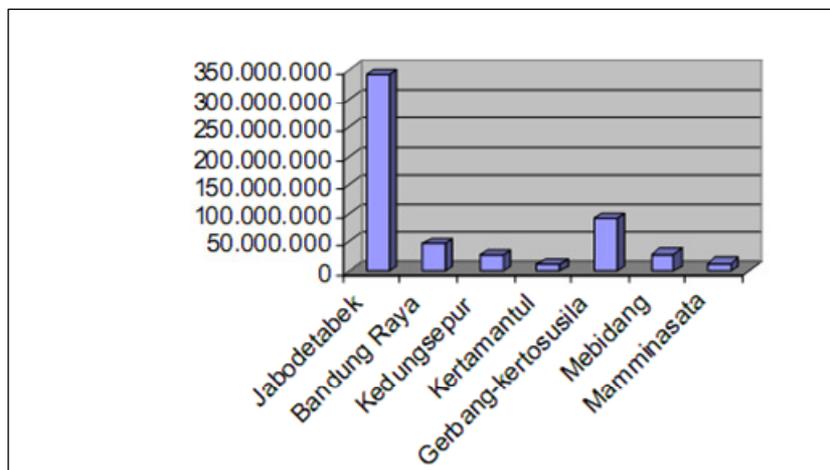


Figure 4.3 GRDP based on current price (million rupiahs) in Metropolitan Area 2006

Source : Djakapermana. 2009

Based on national Spatial Pattern and Structure of Jabodetabekpunjur (attachment of Presidential regulation no. 54/2008), it is clear that within Ciliwung watershed, upper areas such as Mega mendung, Cisarua, Ciawi, and Sukarja are dominated by protected and conservation area. This is because the physical condition of ts area that are steep slopes and catchment area. This also means that activities which are allowed in those area are activities that are supporting these purposes such as protect the forest, rehabilitation, wetland agriculture, and tourism. So there would be no industry found in that area and dense settlement as well. Middle and down area of watershed are purposed for economic activities and settlement. Bogor Municipality, Depok Municipality and DKI Jakarta are purposed for dense settlement, business and service, and industrial zone.

Along with rapid development in Jakarta, Depok, and Bogor, local economic activites had shifted. The shift from agriculture to the industrial sector, trade and services has occurred in almost all areas of Ciliwung watershed. Economic activities

on the agricultural sector only occurs in areas upstream of the Ciliwung and a small middle watershed area. The high land conversion and transfer of land ownership in this region shows a very strong tendency that the land-based economic activities can not be maintained anymore (BPDAS Citarum-Ciliwung, 2003). This condition has contributed to the reduction of vegetation cover which is important for the maintenance of the function of the upstream area as a catchment area.

Table 4.4 Total Population Based on Their Livelihood in Upper Area

No	Livelihood	Sub-Regency					Total
		Bogor	Ciawi	Cisarua	Megamendung	Sukaraja	
1	Farmer	350	1396	0	10227	488	15327
2	Trader	2634	875	3587	4563	107	11766
3	Government staff / army	1171	1141	2183	2161	77	6733
4	Hodge	371	2456	3851	3964	1465	12107
5	Small industry labor	3153	3974	719	2032	80	9958
6	Carpenter	630	333	1031	1470	47	3511
7	Transportation	69	159	1104	868	449	2649
8	Livestock	0	31	274	449	0	754
9	Others	24204	17932	62805	46052	5936	156959
Total		32582	28297	78420	71786	8310	219395

Source : Departemen Kehutanan (2003)

From the table above, it can be seen that the livelihood of community in upper area of Ciliwung watershed is varied. The most livelihood is farmer 15.321 people and hodge, 12.107 people and trader, 11.766 people. This shows that the dependence on natural resources such as land in those community in upper area of Ciliwung watershed is very high. Further, the majority livelihoods come from agricultural sector. This also shows that the main activities in upper Ciliwung is agriculture.

4. 2. Land Use Change in Ciliwung Watershed and Its Influencing Factors

4.2.1 Land Use Change in Ciliwung Watershed

According to Departemen Kehutanan (2003) Land uses in Ciliwung watershed are dominated by agriculture and plantation which are 61% of total upstream area and 73 % of total middle area. Total Forest area in uperstream is 5.310 ha. From the last two years of observation of Bogor Institute of Agriculture, it is shown that there is a decrease of forest area in the upper area of Ciliwung as much as 2 Ha, 35 ha of plantation area, 62 ha of paddy field area and 152 ha of dry land/land area. A similar phenomena also occurs in the middle stream of Ciliwung watershed. A striking improvement occurred in residential area, both in Upper and Middle Ciliwung. Each area increased from 255 ha to 506 ha for Ciliwung Upper and from 1147 ha to 1961 ha for the Middle Ciliwung. In other word it increased respectively by 98% and 71 %. It was obtained mainly from the reduction in area of paddy fields and dry, both at the upstream and middle region.

Table 4.5 Land Use in Upper and Middle Ciliwung Watershed year 1981 dan 1999.

Land Use	Upper Ciliwung Width (Ha)		Mid Ciliwung Width (Ha)	
	1981	1999	1981	1999
Forest	5312	5310	108	101
Mixed Garden/Cultivation	3266	3231	1837	1704
Settlement area	255	506	1147	1961
Technical paddy field	2270	2227	1499	1283
Rained paddy field	289	271	203	197
Moor / fields	3490	3338	2907	2456
Riverm, situ, etc	81	81	52	48
Total	14963	14964	7663	7706

Source : Singgih (2000) in Departemen Kehutanan (2003)

Landuse changes in upper Ciliwung watershed during 10-15 years occurred because of the need of settlements (residence, villa, hotel, motel).

Table 4.6 Landuse changes in Upper Ciliwung Watershed during 1981-1985, 1985-1990 and 1990-1998

No	Land Use	Changes 1981-1985		Changes 1985-1990		Changes 1990-1998	
		Ha	%	Ha	%	Ha	%
1	Dense forest grove	-316	-7.4	-354.6	+16.6	-971.4	-22.8
2	Forest grove	-154.7	-32	+867	+263.8	+712.5	+147.4
3	Forest undergrowth	-303.4	-62.5	+68.4	+37.7	-235.0	-48.5
4	Mixed garden	-104.2	-8.8	+50.6	+4.7	-53.6	-4.6
5	Tea plantation	+64.0	+2.2	-1338.8	+44.3	+1402.8	+47.4
6	Rubber plantation	+136.9	+230.1	-196.4	-100.0	-59.5	+100.0
7	Settlement	+943.2	+125.1	+269.2	+15.9	+1212.4	+160.8
8	Open Space	+534.0	+834.4	-458.2	-76.6	+75.62	+118.4
9	Moor	-770.6	-81.6	+443.4	+254.8	-327.2	-34.6
10	Paddy field	-28.3	-0.8	-1734.5	-47.6	-1762.8	-48
11	Lake/Situ	0	0	0	0	0	0

= “-“ means the decreasing of total areal

“+” means the increasing of total areal

Source : Departemen Kehutanan (2003)

Table 4.6 shows the landuse purposes ranked from the largest to the smallest area. These different size shows that the landuse changes has occurred rapidly and tend to be used for non-agriculture purposes.

Table 4.7. Landuse Change in Upper Ciliwung Watershed during 1981-1985 dan 1985-1990

No	Land Use	Land Use Changes 1981-1985	Land Use Changes 1985-1990
1	Dense forest grove (a)	↓ h, c, e	↓ e
2	Forest grove (b)	↑ h	↑ d, h
3	Forest undergrowth (c)	↑ d, e, f, g, h, j ↑ a	↑ f
4	Mixed garden (d)	↓ f, g, h, j ↑ a, b	↑ f, h ↓ b, d, i
5	Tea plantation (e)	↑ a, c, j	↑ a, d, h ↓ g
6	Rubber plantation (f)	↑ c, d	↓ c, d, e
7	Settlement (g)	↑ c, d, i, j	↑ d, e, f, I, j
8	Open Space (h)	↑ a, b, c, d, I	↓ b, d, e
9	Moor (i)	↓ h, g, j	↑ d, j ↓ g
10	Paddy field (j)	↓ g, h, i ↑ c, d	↓ g, i

Info : “↑” means total area decreased, converted into
“↓” means total area increased, derived from

Source : Departemen Kehutanan (2003)

Based on those tables, during 1981-1985 there were rapidly landuse changes. The number of residential area and open space increased. They increased in line with the decrease of forest, moor, and bush area. In the upper Ciliwung, residential acreage increased by 943 ha. These changes mainly occurred in areas with high levels of accessibility or area which has good transportation facilities. Before becoming a residential area, the area is a paddy field, mixed garden, moor, scrub and forest. Open space areas were also showing an increase of 534 ha in the previous upstream Ciliwung is a shrub forest, mixed gardens, dense forest thicket, scrub and dry forest.

Dense forest have a good structure. This grove forest has a less good structure of vegetation cover than the dense forest. Mixed gardens usually consist of a combination of annual and perennial plants / wood. Moor is generally cultivated for seasonal crops. The change from dense forest to grove forest or even a shrub garden or dry mix will greatly affect the hydrological system (hydrology) of Ciliwung.

During 1985-1990, rice paddy field area decreased up to 1734 ha. Those parts of lands have been converted into dry land and settlements. The dense forest area decreased up to 654 ha and were converted into tea gardens. Open space area decreased up to 458 ha and were converted into scrub forest, mixed orchard and tea garden as well. This is an indication of population pressure on land in the forest area. This is the indication which shows that reforestation efforts are not running optimally.

During period 1985-1990, the tea garden area were expanded very rapidly as large as 1338 ha. Those areas are area that were previously derived from a shrub forest,

mixed garden and open land. On the other hand, small portion of tea garden area also had been converted into residential area. Interesting change in the period 1985-1990 was the conversion of the entire acreage of “para” or *Hevea brasiliensis* (latex-producing trees) plantation area of 200 ha which was mixed garden, forests and settlements. *Para* tree cutting was followed by a change to other uses. The increase of number of settlement areas in the period 1985-1990 is as much as 269 ha. It is smaller than the period of 1981-1985.

From the description above, it can be said that the changing patterns of land use that occurred in the upstream Ciliwung have an increasing tendency over the years become the landuse. It has smaller infiltration characteristics and result in reducing conservation function of the upstream area of Ciliwung. The decrease of forest area into other areas mainly open land, residential and other uses causes hydrological functions disturbance

Spatial changes due to the changes in the use of land still continue until now. Based on data from The Balance of Natural Resources and Regional Spatial Bogor Regency, within the period 1995-1999, in Bogor Regency, there were changes in land use as can be seen in Table 4.8.

Table 4.8 Land Use Changes in Bogor Regency 1995 – 1999

No	Land Use	1995 (Ha)	1999 (Ha)	Changes		% Changes of Total Area
				(Ha)	%	
1	Paddy field	37.400,90	34.910,00	-2.490,90	-6,66	-1,05
2	Moor	17.313,97	15.832,95	-1.481,02	-8,55	-0,62
3	Mixed garden	59.668,70	54.607,01	-5.061,69	-8,48	-2,13
4	Big scale Plantation	32.243,42	22.439,54	-9.803,88	-31,41	-4,13
5	Forest	66.014,00	65.882,13	-131,87	-0,20	-0,06
6	Shrub and grass	8.642,18	6.456,21	-2185,97	-25,29	-0,92
7	Lake/Situ	500,27	437,35	-62,92	-12,58	-,03
	Total (1-7)	221.783,44	200.565,19	-21.218,25	-92,17	-8,95
8	Urban settlement	2.105,10	5.935,01	3.829,91	181,93	1,62
9	Rural settlement	6.208,71	22.436,83	16.228,12	261,38	6,84
10	Open-pit mining	1.265,70	1.874,30	608,60	48,08	0,26
11	Industry	1.638,68	1.654,99	16,31	1,00	0,01
12	Tourisme	136,04	160,43	24,39	17,93	0,01
13	Temporary land aperture	797,67	990,44	192,77	24,17	0,08
14	Others (rivers, road,etc)	3.187,25	3.805,81	618,56	19,41	0,26
	Total (8-14)	15.339,15	36.857,81	21.518,66	553,89	9,07
	Total	237.122,59	36.857,81	-42.736,91	461,72	0,13

Source : Planning Agency of Bogor Regency (1999) in BPDAS (2003)

Based on Departemen Kehutanan (2003), during the period 1995-1999. there has been an increasing use of land for settlement, either in urban or rural settlements. In urban land area, it increases to 3829 hectares (181.93%) and in rural residential area it is 16.228 hectares (261.38 %). The Increasing number also occurs in the use of land for open-pit mining (48.08%), temporary opening land (24.17%), tourism (17.93%), industry (1%) and the use of other purposes (19.41%). Totally, during the period 1995-1999, there were changes of land use as many as 21518.66 ha or 9.07% of total land area of Bogor Regency in 1995 which was 237,122.59 hectares.

4.2.2 Factors influencing land use changes in Ciliwung Watershed

Bogor, Puncak, Cianjur (Bopunjur) are areas that have rapid growth. It is because this area has a strategic position from Jakarta. Basically, this area is aimed at conservation area because those areas are catchment area of Jakarta. Principally, in this area, there is no dense residential settlement. Nevertheless, nowadays, this area has flooded by villas, hotels, luxury housings and appartements (Samadikun. 2007).

This condition (land use change) is influenced by several factors. Susilowati (2007) found in her thesis that there are several factors which cause landuse changes occur in upstream area of Ciliwung watershed. They are:

a. Economic motive

Local authonomy accomplishment can be implemented well if it is supported by sufficient fund. Shortly, local government needs much money to implement the local authonomy, because principally, local government has less dependency with central government, in term of finance in developing their region. This also means that local government has to creatively discover and use their own local resources to provide their own revenue for their own development. In this term, local income is the most important thing in local finance system.

The local income will be increased by local taxes, fees, and local charges. Local income, as mentioned in related regulation, has been arranged by central government. Furthermore, there is a distribution of finance governance from central government to local government in order to support local government does the local authonomy. Since local authonomy has been regulated, there is a different kind of taxes that are collected between province and regency/municipality. Province collects taxes that are come from vehicle taxes (land and water vehicle, vehicle ownership mutation taxes, fuel taxes, and ground water utilization taxes. On the other side, municipality/regency has a right to collect 7 type of taxes : , Hotel, restaurant, entertainment, advertisement, street light, mining type C (sand, coral) and parking taxes.

In Bogor regency case, Novalita (2007), found that taxes have a significant role to local income. In her research, she found that during 1998-2004 (before and after local auhtonomy is regulated) the graphic of local income of Bogor regency continually increased..

Table 4.9. The Realisation of Local Taxes Income Bogor Regency 1998-2004

No	Realisation of local taxes income (Rupiah)	Percentage of increasement
1998/99	28.655.625.413	
1999/00	36.464.173.774	27,25
2000	29.140.247.958	-20,09
2001	51.542.056.289	76,88
2002	62.589.334.585	21,43
2003	79.458.815.863	26,95
2004	91.308.030.000	14,91

Source : Novalita (2007)

Table 4.10 The contribution of taxes variable to local income of Bogor regency (1998-2004)

Type of Local Taxes	1998/99	1999/00	2000	2001	2002	2003	2004	Average Per year
Streetlight	15.93	16.77	18.76	23.51	25.45	27.83	25.25	21,93
Minerals Type-C	11.43	14.87	17.56	14.59	15.12	14.49	15.70	14,82
Hotel & Restaurant	9.00	9.78	7.60	6.32	7,33	7,57	8,74	8,05
Entertainment	1.37	1.31	0.99	1.27	1.33	1.50	2.09	1,41
Advertisement	1.17	1.10	0.96	1.09	1.47	1.77	2.70	1,47
Parking	Not regulated yet				0.056	0.11	0.30	0,16
Wallet Bird Nest	Not regulated yet					0.039	0.04	0,03

Source : Novalita (2007)

From tables above, it is clear that the local taxes income of Bogor regency continually increases. Additionally, local autonomy of local income has been regulated since 2002. In tables, it can be seen that streetlight tax gives the highest contribution to local income of Bogor regency, on average around 21,93% per year. Further, Mineral type-C (sand and gravel mining) is in second rank which gives 14,82% on average every year. Hotels and restaurants are the third biggest contribution to Bogor regency local income which is 14. 82% every year. In 2002, hotel and restaurant taxes are separated. Development of hotels, villas, resorts, and real estate is profitable for community and also for local government. For community, this means the opportunity to improve their welfare would be higher. They have many options for getting a job and get worthy income for their living cost. For local government, the more the investor invest their money in the more local income they get.

The number of hotel taxes continually increases. Pikiran Rakyat wrote that since 2006, the total income from hotel taxes was significantly improved. In 2007, hotel taxes increased up to Rp 10.750 millions from 8.700 millions, or increased 23,56%. In 2008, it increased up to around 12.365 millions or 15,03%; and in 2009 it is predicted to increase up to 18,55%, or around 14.659 millions rupiah.

Table 4.11 Total income of Hotel Taxes (2006-2009) of Bogor Regency

Year	Hotel Taxes Income (Rp x 1000)
2006	8.700.000
2007	10.750.000
2008	12.365.188
2009	14.659.304 * (predicted)

Source : Pikiran Rakyat.2009

This table shows that hotel sector is one of the most influencing sectors of local income in Bogor regency. As the chief of Local Income, Finance and Commodity Departement of Bogor regency said that in Pikiran Rakyat Newspaper (2009), Puncak area in Bogor regency has a potential and strategic role in providing local

income of Bogor regency. It has significant contribution to Bogor regency income through hotel local taxes.

Overall, local taxes of Bogor regency has significant influence to local income of Bogor regency. From the research of Novalita (2006), the percentage of local taxes contribution of Bogor regency on the average is more than 50% every year. It means that the financial capability of Bogor regency is in very good condition (Munir. 2002).

Table 4.12 The Contribution of Taxes to Local Revenue

No	Year	Contribution (%)
1	1998/99	44.72
2	1999/00	50.67
3	2000	51.86
4	2001	50.75
5	2002	50.75
6	2003	53.35
7	2004	54.90

Source : Novalita (2006)

In other research, Suharyanto (2007) found that the GRDP from tertiary sectors such as hotel, restaurant, trading, communication and services sectors continually grow every year. The GRDP of those sectors grew amount 7,39% in 2005 compared with 2004. Besides that the primary sectors such as agriculture and sand and gravel mining shows decreasing number.

Table 4.13. The growth of GRDP of Bogor Regency Based on Sectors (2002-2005)

Sectors	2002 (%)	2003 (%)	2004 (%)	2005 (%)
Primary sector (Agriculture, Sand and gravel Mining)	- 0,48	-2,94	-1,39	0,47
Secondary sectors (Processing industri, gas, electricity, drinking water, building construction)	4,87	5,35	5,99	5,87
Tertiary sector (hotel, restaurant, trading, business, communication and services)	5,26	6,06	6,63	7,39

Source : Statistic office of Bogor Regency. 2005

In other research, Risnarto (1993) found that there is a process of land use changes from agricultural, plantation and forest uses into settlement and other non-agricultural uses. One of the reason it happed is because the settlement area give additional value (land rent is higher than agricultural business). At that time, the revenue from agriculture work can only meet 47,46% of cost expenses. It makes many farmers sell their farms to the investors, and they find other job with good salary as the consequence.

Overall, it can be seen that the economic motive is very clearly explained. Local government in this case, Bogor regency really needs much money to do development in its region. Local authonomy regulates that every regency/municipality should creatively, yet efficiently use their local resources to build their regions and

communities. This statement emphasizes that local government is less dependent with central government in their financial arrangement.

b. The Lack of Law Enforcement and Commitment of Government

Susilowati (2007) saw that the law enforcement and commitment of central government and local government in saving and protecting the upper ciliwung area from the damage is very low. Many regulations have been produced in managing this area, such as Presidential No. 114/1999 about Spatial Planning of Bogor-Puncak-Cianjur, Act no. 41/1999 about Forestry, and Act. No. 5/1969 about Environment. Those regulations were made for protecting the area from the urbanization. Nevertheless, in practical, it does not work. It is because the weak commitment from government (central and local).

There are many conflicts of interests in this area. Local government needs to increase their revenue and serves its community by providing them the houses and job opportunities. Central government also seems not to have many efforts to control this situation because many occupants in central government and Jakarta government have their investment in upper Ciliwung area. Several generals, ministers, even the governor of Jakarta (previous period) have villas in protected area in Puncak area. That's why the control system of spatial in Bopunjur does not work optimally.

Corruption is another problem in this situation. The rules said that several area are forbidden from the development. However, the number of villas, housing and real esatates in that area still continually increases. This is because the rules can be changed by those who have authority to approve permits. This is like a tree's root. It can not be solved easily because it is related to many foremost people/officials.

From several literatures, economic motive is the most influencing factor for landuse change in upper area of Ciliwung. Community needs to improve their welfare by changing their livelihood, from farmer/agriculture become tourism sector. Becoming a clerk in hotel/villa or trader/souvenir seller in tourism area are more interesting and more revenue than being a farmer. Local government also needs to increase their income for their regional development such as infrastructure development and providing housing for their community. Bopunjur with its beautiful sightseeing is one of interesting tourism site. It makes many investors want to invest hotel/villa/appartement in this area. The more investors come, the more charges will be for local government (through taxes, fee, retribution, etc).

Actually, there are several regulation such as Act about regional development, spatial planning, forestry, water resources, etc. Those regulations warn the development of Puncak area should be sustainable, should be no high dense residential area, protected area should not be opened into housing/villa/hotel area. Nevertheless, there is always violation of the regulation in the implementation. The number of villas, hotel and appartement still continues. The illegal housing surrounding Ciliwung river are still there. The commitment from the government to save Ciliwung sustainability is still weak. Conflict of interests, and economy motives are still stronger than the law.

4.3. The Management of Ciliwung Watershed

4.3.1. Organization

There are many organizations which are related to management of Ciliwung watershed and Flood Jakarta. They are:

1. Organizations at central level
 - Ministry of National Development Planning Bureau
 - Ministry of Environment
 - Ministry of Public Work
 - Ministry of Forestry
2. Organizations at local level
 - Jakarta Provincial Government
 - West Java Provincial Government
 - Bogor Regency Government
 - Bogor Municipality Government
 - Depok Administrative Municipality Government

✚ Every local government has many departments related to watershed management. For example department of forestry, department of public work, and etc.

Many organizations mean many interests and approaches. Those organizations has their own authorities and plans. In many cases, they are conflict to each other. There is overlapping authority between them. In conclusion, too many organizations in one river.(Hardjono, 2004).

Based on PP (governmental regulation) no. 38/2007 about distribution of governmental authority, central government responsible to make guidance, criteria, indicators, procedures, and standard of integrated watershed management plan and set the priority order of watershed. Provincial governments responsible to implement it cross regency/municipality and regency/municipality government responsible to implement it at local level.

Based on Presidential Instruction no. 5/2008 about the focus of economic programs 2008-2009, watershed should be rehabilitated focusing on reducing flood, erosion, drought, and water pollution. In this regulation, president pointed Minister of Forestry who has full responsible in managing the watershed. But in the process of making watershed management plan, ministry of forestry have to engage many stakeholders (public and private sectors) such as ministry of agriculture, ministry of public work, ministry of mineral and mining, ministry of environment, Bakosurtanal, Local governments, universities, privates, and community.

Every watershed in Indonesia officially is managed by watershed agency. Ciliwung watershed is under supervision of Citarum & Ciliwung watershed agency. Based on regulation of Minister of Forestry, No: 665 / Kpts - II / 2002 about organization and working procedures of Watershed Management Agency, the main tasks of Citarum and Ciliwung Watershed Agency are:

- a. Consolidating data and information through the preparation of watershed management plans, development models, institutional and partnerships, monitoring and evaluation.
- b. Developing institution and partnerships in watershed management
- c. Develop the system of data and information preparation and presentation.
- d. Improving the quality of data and information services of watershed management
- e. Arranging the watershed management plan
- f. Preparing and presenting the information about watershed
- g. Development of watershed management model
- h. Development institution and partnerships of watershed management
- i. Monitoring and evaluation of watershed management

In its implementation, Ciliwung-Citarum watershed management agency involves local governments, private and local community in making the Ciliwung watershed management. This agency coordinates with other stakeholders in implementation the plan. It seems that reforestation become the main issues of the watershed management. Ciliwung-Citarum watershed together with provincial government evaluates and monitors the development within watershed.

4.3.2 Ciliwung Watershed Spatial Planning Policies

Ciliwung watershed can not be separated from metropolitan area, Jakarta, Bogor, Depok, Tangerang and Bekasi. As mentioned above that Ciliwung watershed is part of two provinces (West Java and DKI Jakarta), two regencies (Bogor regency and Cianjur regency), two municipality (Bogor municipality, Depok municipality). Bogor, Cianjur, Depok are part of West Java province. The most critical part of upstream Ciliwung are belong to Bogor regency region, which are Ciawi, Megamendung called Puncak area.

Jabodetabek and punjur (Jakarta, Bogor, Depok, Tangerang, Bekasi and Puncak, Cianjur) are set for metropolitan area and Jakarta is the center of metropolitan area. Metropolitan area (Jabodetabek-Punjur) area is set as area with special purpose or key region. Therefore, the spatial planning of this area is also set integrated and regulated directly by Presidential Regulation (PP no.54/2008). The functions of Jabodetabek and Punjur in national spatial planning are:

1. As a central of national and regional services for supporting the function of governance and national economy
2. As a single ecological river basin which covers mountain to coast

In case of Ciliwung and Jabodetabekpunjur area, government has given special attention to this area. It is because this area has an essential role in national development. Jabodetabek, as explained above, has a high contribution for National GRDP. In other side, flood is the most threat for the economic, social and political activities in this area. Based on historical records (www.prakarsa-rakyat.org), the flood in Jakarta has been existing since Dutch colonial period. It has been seen since

the year 1621. It was the first floods which strucked the city of Jakarta, which was called Batavia. The next huge flood casualties occurred in 1654, 1918, 1942, 1976, 1996, and, in 2002. This flood seems to be annual event. It is because flood almost happen every year. Because of that, this area has a very special treatment from central government.

Because of those things that are mentioned above, this area has been set as a national strategic area in national spatial plan. The spatial planning of this area has been set as one big system from upstream (Bogor) to downstream (Jakarta) and regulated directly by President of Indonesian Republic. This regulation (Presidential Regulation no 58/2008) has been a guidance for all regions (Jakarta, Bogor, Depok, Tangerang, Bekasi and Cianjur) in making their own spatial planning and regional development planning. This regulation arranges the guidance for regional spatial plan, spatial utilization, spatial control, and spatial supervision. The spatial pattern of this area contains of green open space, catchment area allocation, protected area with zone system, institutions, community involvement, and empowerment.

Jabodetabek has been a hot issue or focus of state since the first President of Indonesian Republic, Soekarno. The first regulation was Presidential Regulation No.12/1963 about Control of building development along road between Jakarta-Bogor-Cianjur outside DKI Jakarta Province boundaries, Bogor regency and Cianjur regency. Afterward, it was renewed by President Soeharto with its Presidential regulation no. 48/1983 which concerned about Special control of spatial planning and development of tourism area, Puncak, and regions along Jakarta-Bogor-Puncak-Cianjur road outside of DKI Jakarta province, Bogor municipality, Depok administrative municipality, Cianjur city and Cibinong city.

In 1999, President B.J. Habibie renewed this regulation with Presidential Regulation no. 114/1999 about Spatial planning of Bogor-Puncak-Cianjur. This regulation, obviously, regulated the spatial structure especially in upstream area of Ciliwung river. Upstream area of Ciliwung River is part of Bogor regency (Ciawi, Megamendung, Cisarua) and small part of Cianjur. In this regulation, Bopunjur area is more emphasized to be water and soil conservation and protected area. It is because most of this area is the catchment area (83, 88% of total area). Based on this regulation, upstream area of Ciliwung River is divided into 4 main purposes:

1. Protected area which are protected forest, national park, and conservation area
2. Buffer area which are tea plantation, mixed garden, production forest, etc
3. Agricultural area which are paddy field
4. Non-agricultural area which are urban settlement, industrial and cement raw material, industry without water pollution, tourism.

The Presidential Regulation no.114/1999 was only focus more on upstream area. The problem is on the implementation. Flood still can not be solved, because the regulation did not treat this problem as a whole area but only the upper area. In 2008, President Susilo Bambang Yudhoyono signed Presidential regulation no. 54/2008, which is about Spatial planning of Jakarta-Bogor-Depok-Tangerang-Bekasi-Puncak-Cianjur. This was made to cover the weakness of previous regulation. This regulation tries to manage and control the urbanization problems through the integrated spatial structure control of Jabodetabek and Punjur as a single watershed-based framework

which emphasizes on interrelation between upstream, midstream and downstream area.

Those regulations which are explained above show and prove that this area (Jakarta, Bogor, Depok, Tangerang, and Bekasi) has an important role in economy development of Indonesia. The economic growth in Metropolitan area should be managed and improved in order to increase the welfare of Indonesian people. This is emphasized that all development in metropolitan area should be done integratedly and comprehensively.

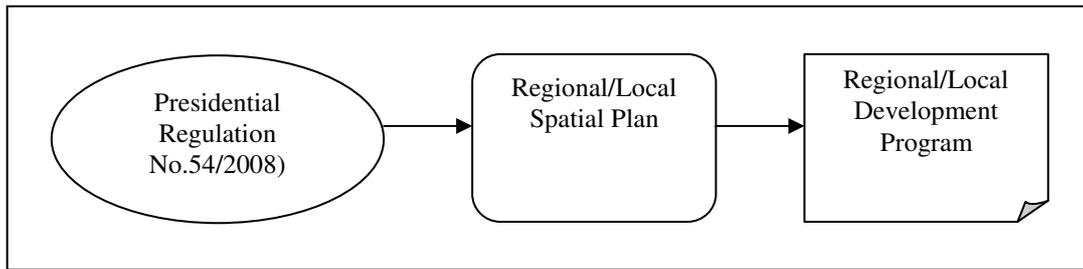
Central government has arranged the spatial structure and pattern map of this area as a guideline for all governments in doing their development/programs. In this map, it is very clear the land use purposes is directed by central government. (Can be seen in attachment 1). This regulation has divided the metropolitan area become several specific spatial patterns, which are management of regional green open space; catchment area; protected area; controlling; institution; community role; and founding. In this map, we can see that Jabodetabekpunjur is divided into three regions:

- 1) Upstream : Bopunjur area (Bogor-Puncak-Cianjur). This is aimed at catchment area, area with steep slope more than 40%, riverine, area surrounding dam/lake, area surrounding spring, national park, conservation area, low residential density settlement.
- 2) Midstream: Buffer area of Jabodetabek (Jakarta-Bogor-Depok-Tangerang-Bekasi). This is aimed at low/mid dense residential settlement, trading and services, light non-pollutant industry, agriculture, fishery, plantation, production forest.
- 3) Downstream: Jakarta. It is aimed at low/mid/dense residential settlement, trading and services, non-pollutant industry, agriculture, plantation, fishery, agro industry.

Those regulations show the efforts of central government to balancing the development aspects (economy, social, and environment) within jabodetabekpunjur area. Further, those regulations are also being a guideline for central and local government in doing development within that area (jabodetabek and punjur) in order to control the urbanization in this area, especially to control the catchment area from the urbanization in order to keep flood away from Jakarta. It also means that, those areas cannot change easily the land uses, especially protected area, in their area because the President has already set the guidance of spatial plan in Jabodetabekpunjur area. For those who break the rule will be punished

From the explanation above, it shows that principally, the spatial structure of Jabodetabek and Punjur has been arranged specifically. It also shows that central government has set upper part of Ciliwung as a conservation area. This area is prone to bring erosion and flood because of its characteristic, Jakarta as a capital city of Indonesia and also the hearth of national economic should be kept away from disaster like flood and supported with enough fresh water capacity.

Figure 4.3 Presidential regulation No.54/2008 and its relation with regional/local spatial and development plan.



From the figure above, it can be seen that the Presidential Regulation no. 54/2008 is a guidance for the spatial planning of Metropolitan area, Jabodetabek. The spatial plan of Metropolitan area should refer to the Presidential regulation. It is obligatory as mentioned in this regulation. Each regency/municipality should coordinate each other and governor as a mediator. Further, this coordinating spatial plan from all regions within will be a provincial spatial plan that agreed by all related local governments. Monitoring and evaluation of land use/spatial utilization is become authority of local government mayor, governor and together with minister. Nevertheless, this regulation does not mention clearly about the incentives, disincentives and punishment.

In case of Ciliwung watershed, the same hierarchy and relation between watershed management and regional development plan are shown. As mentioned above that for Jabodetabekpunjur there is a special regulation arranged its spatial planning. It means that every related administrative unit (Jakarta, Bogor, Depok, Tangerang, Bekasi, and Cianjur) should coordinate each other in determinate their regional development plan. Ciliwung watershed management made by central government should be a main consideration in arranging the development plan and spatial plan in those areas.

4.3.3 Conflict of Interests/Strategies Among Governments.

As mentioned above that Ciliwung River flows through two provincial boundaries and 4 municipality/regency boundaries. They are Bogor regency, Bogor municipality, Depok administrative municipality and Jakarta Province (special region with one management). Every government has their own vision and mission in their regional development. Since the local autonomy era, local governments has to maximized their resources with the aim of supporting their regional development. According to their mid-term regional development plan, those governments within Ciliwung watershed focus on improvement of infrastructures and economic condition of their region. That is why the development of infrastructures such as roads and housing are dominant in those area. The impact is that the use of land has been changed . As expalained above that initially, upper and midle part of Ciliwung watershed was dominated by agriculture area and ponds. Today, those area is dominated by dense resident area.

Since the local autonomy has been regulated in 2002, local government has been encouraged to be able to able manage their own financial resources. It is different from previous era in which the financial resources was managed by central government. Now, income of local governments mainly come from their local resources. So, local government should be able creatively to manage their resource

and improve their economic condition by their own. Overall, the development in municipality/region depend on the fund they have. As mentioned that local governments' economic depend with local income they have. In this era, most of local government's financial resources come from their own resources. The intervention from central government is very low in this term. So that the local government seems to be autonomus in surviving.

Related to landuse changes in upstream Ciliwung, it can be concluded (in 4.2.2) that economic motive is the main influencing factor. Here, economic investment become the most interesting strategy that is chosen by all governments. In upstream, hotels, villas, appartements and restaurants are promising business now. The taxes from those sectors significantly contribute to local income. It is more than 10 percent of local income and the numbers tend to continually increase every year. In midstream, the demands of houses is high. This is because the price of houses in Jakarta is very high so for rest of people it is not affordable. In midstream, the price of houses is affordable because the price of land is lower than in Jakarta. That is why many people choose to live in this area, even they work in Jakarta. This situation gives benefit for local government because the local taxes from property rights will increase their local income.

On the other side, environmental condition in Ciliwung watershed become worse. The flood occurs every years in Jakarta which is downstream of Ciliwung River. The huge flood occurred in 2002. Based on Rusdiana, etc (2003), the number of people who affected by floods was 3,709,324 inhabitants. Inundation area reaches 8707 hectares or around one sixth of the total area of Jakarta. Loss from permanent housing sector reached Rp 3.2 trillion. Jakarta also lost more than 587 billion rupiahs because of damages of non-residential buildings such as factories and industries. Direct damage also occurred in non-accruing costs of buildings, among others, on health, infrastructure, agriculture and other losses that range was between 1.8 to 32 milyar. Total losses caused by floods in 2002 was 9.8 trillion.

Based on that fact, Jakarta has strategy to protect its city from flood. The physical development has been done such as building the east flooded canal to reduce the volume of water in Ciliwung river when peak debit occurs. Besides, program cleaning river body of Ciliwung River from trash and slum area has also been doing until now. As we know that, flood in Jakarta is because not only high flood frequency from upstream but also the unsustainable development in river body in downstream. Then, conservation of Ciliwung River become concent of Jakarta now. It is because Jakarta will never improve its economic condition maximally if the flood still occurs.

4.3.4 Governmental Programs and Coordination in Ciliwung Watershed Management

Until now, there are at least 5 programs which are related to ciliwung watershed management. They are PROKASIH (Clean River Program), JW RM (Jakarta Water Resources Management Project), Pollution Reduction Program-Bogor Regency, Bogor, RLKT/GERHAN (Land and Forest Rehabilitation), and Spatial planning of Jabodetabekpunjur. PROKASIH, JW RM and Pollution Reduction Program are

program which is related to water quality problem. The rest are programs which related to flood problems.

The Ciliwung river situation is complex. As explained above that this river flows through two provincial boundaries. That is why the management of Ciliwung river is coordinated by central government. In doing so, institutional matters is important. Central government has regulated that Ciliwung watershed should be managed integrately and coordinatedly by involving all governments within watershed boundary. The coordination organization should be established.

In case of Ciliwung watershed, a coordination organization has been established in 1996 which is named Satgas/Pokja Bopunjur. This organization was aimed at helping government in controlling and managing the implementation of ciliwung watershed management. This organization purposes in coordinating all stakeholders within watershed boundaries. Nevertheless, since the decentralization has been regulated, the role of this organization become blur because of the shift of governance and authorities.

The adjustment of spatial planning regulation of Ciliwung watershed was made in line with the implementation of decentralization. In 1999, Development Cooperation Body (BKSP) was established through Presidential Decree No.114/2009. The main duty of this organization is coordinating the use of land within Bopunjur Area. The challenge of this organization is different from the previous one. The Challenge is the consequences of decentralization itself. The coordination and agreement process is difficult to do. It is because every government has different sights and they will stick up with their own perspective. Nevertheless, the contribution of this organization is still questioning in solving the environmental problems within Cilwiung watershed. Actually, the lastest result of discussion among governments is the task/responsibilities distribution. Nevertheless, until now, not all stakeholders are doing their job based on that agreement. This is indicate that the coordination is fail (Risidiana, etc. 2003).

Today, President of Indonesian Republic has given the responsibility to Ministry of Forestry to coordinate all stakeholders in doing and making integrated watershed management plan. This ministry is helped by provincial and local government in managing watershed. Minister of Forestry has published the regulation about the integrated watershed management. This regulation emphasized also the needs to establish the FORUM DAS (coordinating organization) in every watershed in Indonesia. The main focus of the integrated watershed management is rehabilitation in upstream and spatial integration in whole watershed boundary. The target of Ministry of Forestry is Master Plan of Integrated Watershed Management of Indonesia. This project is planned starting in 2010.

It can be seen that there are many organizations focusing in watershed management. They have different interests and points of views. The coordination needs a independent body that can be a media for all related stakeholders participate. This organization, perhaps, can be not only a neutral body that can accommodate all interests but also a body that can influence the policies in all levels. In fact, there are many coordinating organizations that was established.

In Ciliwung case, we can see that at least there are three governmental coordinating organizations. This sometimes impacts to the overlapping programs and authorities.

This is one of dilemmas in institutional Ciliwung watershed management. Once time, this organizations was established, but now this organization seems “disappear”. Until now there is no actual actions from this organization. In conclusion, Forum DAS of Ciliwung is fail to coordinate upstream and downstream.

4.5 Concluding Remarks

This chapter mainly discusses the case study’s characteristics. It is aimed to get more insight of the case study. The administrative boundaries of Ciliwung watershed are described. The Ciliwung River flows through two provincial boundaries which are West Java Province and Jakarta Province. Based on administrative region, Ciliwung watershed encompasses 4 administrative regions which are : Bogor regency, Bogor municipality, Depok administrative municipality and Jakarta. Total area of Ciliwung watershed is 347 Km². The length of main river is 117 Km. This watershed is divided into three part which are upstream, midstream and downstream. The annual rainfall rate varies in each part. The annual rainfall rate in upstream area is 303 mm/year; the annual rainfall rate in midstream area is 326 mm/year; and the annual rainfall rate in downstream is 177mm/year. According to the data, the characteristics of its topography in upstream is mountainous area with elevation between 300m to 3000m asl. This area is characterized also by fast-flowing mountain river swift, high slope variations, with slope varies from 2-45%. From this data, it can be explained that, Ciliwung River is flood-prone.

As mentioned above, that flood occurs every year in Jakarta. This is because of the landuse change in upstream area. The development in protected area has changed the natural function of its watershed which as catchment area. Based on the characteristics of Ciliwung watershed in upper area, it will send negative externalities to downstream area. Therefore, the flood, erosion and sedimentation are the products that will harm downstream area. As explained in chapter 2 that forest and water are interrelated. Catchment area should be managed well and may not be developed out of its limitation. The development in upper area of Ciliwung watershed is very significant. The changes of land from protected area become hotel and/or real estates has reduced the capability of nature to absorb the rain water. Further, flood is the biggest problem which is faced by downstream area.

According to several researches, there are two main motives behind the landuse changes in upstream area of Ciliwung (Puncak). They are economic motive and the lack of law enforcement and commitment of government. The development of hotels and other real estates has increased the local income of Bogor regency. This local income comes from hotels and restaurant taxes. Besides, entertainment, advertisement, street light also become the input of its income. The number of hotel and restaurant in upperstream always increases every year. It gives contribution in Bogors’ income in average 8.05%/year of total income. In 2008, total hotel taxes reaches 12 billions rupiahs. Besides economic motive, weak law enforcement also become the problem in management of Ciliwung watershed. Many conflicts of interests exist in this area. Dilemmas between save the environment and save the community’s economy.

This information is useful to see the real condition of Ciliwung watershed. This shows that the management of Ciliwung is complex. There should be a balance

between health environment and prosperous community. This becomes the main issues in watershed management in Indonesia.

In term of Ciliwung watershed, this region has close relationship with metropolitan area (JABODETABEK). Ciliwung River has essential role for metropolitan area. This river has the biggest contribution to flood in downstream (Jakarta). Puncak area (Bogor regency) is the catchment area for metropolitan area. This is part of strategic area which appointed by President to be managed integratedly and comprehensively. The management of Ciliwung watershed is handled by Ciliwung-Citarum Watershed Agency (Ministry of Forestry). In doing his job, this agency is coordinated with local governments and local community.

There is conflict of interest in Ciliwung watershed. Mainly, there are two main focuses interests in this case. They are economic investment and conservation. Bogor and Depok are not affected by the flood. It could be said that Bogor is the one who send the huge flood and Depok the side that has made the worse impact of flood in Jakarta. On the other side, Jakarta is the only one region that gain huge impact of flood. Considering the loss caused by flood, Jakarta wants Bogor protects their forest and keep the function of catchment area. Nevertheless, Bogor and Depok need more money to develop their region. So that, they need to exploit their resources. Housings, hotels, villas and restaurant are the beneficiary bussineses. It is because the demand of those sectors is high.

The coordinating forum/bodies has been established. Historically, they were changed in line with the changes of governance system in Indonesia. Too many organizations which concerns to Ciliwung watershed implicates to many programs and regulations. Those programs and regulations in many cases conlict to each others. The overlapping of authorities occur in management of this river. This situation is happen because the regulations are not integrated/interrelated each others.

CHAPTER 5.

BEHAVIOUR AND STRATEGIC INTERACTION OF DECISION MAKERS WITHIN CILIWUNG WATERSHED

5.1 Conservation Versus Economic Investment

According to information explained in Chapter 3 and 4, the main issue of landuse change in Ciliwung watershed is economic investment. Since the local autonomy/decentralization has been regulated, local government has power to manage their region. Local government also has to maximize their income in order to develop their region. On the other side, central government has appointed upstream Ciliwung watershed (Bogor) as a conservation area which is also the catchment area of Jakarta. This means that the development in this area are limited. The coordination and cooperation between upstream and downstream has been formulated. The cooperation in solving the flood problem has been offered such as protect the forest in upstream area from exploitation. Nevertheless, the landuse changes still occurs until now. Here, economic motive is very dominant. The local taxes from hotels and restaurants have given significant contribution for Bogor regency (around 10% of total income). Besides, the conservation strategy will not give them benefit, in short time.

The commitment from local governments within watershed management is weak. Not only in upstream, the slum area along Ciliwung river in downstream also has make the situation become worse. Trash fulfill the river. Therefore, in rainy season, flood occurs in every where in Jakarta. The commitment to save the watershed seems to be the central government's interests only. It is because all local governments focus on economic improvement of their region. This is dilemma.

5.2 Downstream Versus Upstream

As explain in previous chapters that, Ciliwung river flows through several administrative regions. They are Bogor regency, Bogor municipality, Depok administrative municipality and Jakarta province. Every government has its own vision and missions of development. Nevertheless, all of them have the similarity in which economic investment become the main goal. It is normal. Local governments needs much money to develop their region and society. Therefore they tries to maximize their local resources.

In this case, flood is the main issue. Flood has given the much loss to downstream. The damages of infrastructures such as road, bridge, and buildings; and casualties. The huge flood occurs in Jakarta as Downstream of Ciliwung river. The Flood in Jakarta is happen because of not only the landuse changes in upstream (Bogor) and midstream (Depok), but also the increasement of water debit of Ciliwung River. In upstream, landuse has been changed from agricultural or forest become hotels/villas. In mid-stream, landuse has been changed from farm become settlement area. The number of ponds are decreased. So that, the capacity of ciliwung river is not enough to accommodate all surface water. Further, huge flood is the result.

According to those information, we can summarize that Bogor is the area which “send” the flood. Depok which is the buffer zone of Jakarta has been changed into dense developed area. In addition, this area cannot stop or reduce the impact of flood. In other word, because of the landuse chages in upstream and mid-stream, the flood situation become worse. In this case, Jakarta is the most suffered region because it gains the flood and others do not. So that, it can be grouped into two groups which are upstream and downstream. Upstream is the group which “send” the negative externalities and is not affected by the flood. On the other side, downstream is the group which has gain the negative externalities caused of the upstream’ actions.

5. 3. Game Construction of Behavior and Strategic Interaction Between Upstream and Downstream

As mentioned in chapter 2, game theory tries to explain the uncertain situation in which many actors/players/decision makers has different interests. In planning, it is useful for explaining clearly the conflict in planned area. Game theory can be used to analyze the interaction among players of rational agents who behave strategically. In their strategies, each players try to maximize their utility in a circumstance in which their outcome depend either on their choice or and other players choice (Luce and Raiffa. 1967 in Basaran 2005). In solving externalities in environmental problems between agents/players, negotiation is needed and game-theoretic strategies can be used for negotiations (Nijkamp. 1980 in Basaran 2005).

Game theory is useful to explain decision maker’s behaviors in watershed. In this case, it can be seen that there are several conflicts between upstream and downstream in terms of environment sustainability and urbanization financial-oriented. Flood in downstream and urbanization process in upstream.

Game theory studies strategic interactions among decision makers (players-persons, firms, nations, etc), especially when the actions taken by a certain player affect others; such as is the case of pollution or, in general, of environmental externalities (Zara-Dinar and Patron. F. 2006).

According to Riechert (1983) in modeling the outlined conflict or other dilemmas as a game, there are three things that must be specified carefully (Riechert. 1983):

1. Who are the players and what are each player's interests? (How strongly would each prefer one outcome to another in the comparison between any two outcomes of the total conflict?)
2. What are the actions that can be chosen by player?
3. How do the actions of the players affect the outcome of the conflict?

In this chapter, who are the conflicting player and their strategies will be explored and discussed in order to get their payoffs. Based on that payoffs matrix, the equilibrium will be gained and will be a consideration as maximum strategy for those players to coordinating each other in favor to reduce and or to keep flood away and supporting the economic development of each player.

5.3.1 Framework for The Game

a. The Players

According to Rasmusen (1994) the main elements of the game theory are players (it could be two or more) and the strategies (it could be pure strategy or mixed strategy). It is also mentioned by Selten (1999) that players, their strategies and how they act are the influencing elements that will affect the game.

Decision Makers are those who have power to decide or make policy related to regional development. The more the players it could be the more conflicts between them. In other word, the rivalry between them increases as well because of different interests and strategies. Every player will maximize their payoff.

In this research, players are those who have power to decide or making the policy. They are not inhabitants or and private sectors because they are the side who are affected by the policy and personally their actions do not affect watershed. In game theory , they are called pseudo players (Rasmusen. 1994). Players are public organizations/institutions who act on behalf of the public benefits. Laws have regulated their roles.

As mentioned above in 5.3 that, there are several decision makers involved in Ciliwung watershed management. They Bogor regency, Bogor municipality, Depok administrative municipality, and Jakarta province are players. In this study, it is simplified into two groups of players, which are upstream authority and downstream authority. The simplification is based on the externalities which is gained by each player. Bogor and Depok are part of upstream player who bring the negative externalities to downstream or are not affected by flood. Jakarta is part of downstream player who gain the negative externalities (flood). That means it can be drawn that conflict here is between local administrations (Downstream VS Upstream).

Players here are upstream authority and downstream authority. Every player may have same or different strategies and they will act rationally when they choose their strategies. Player's strategies are defined by discovering through their policies, plans, programs and goals. It can be seen in their regional development planning or strategic planning.

b. Strategies of Players

Strategy is every ways or options of players that will be used to play their role. Strategy can be seen in regional development planning or strategic planning (Basaran. 2005). In this case, regional development plan is used to define the strategy of players, which contains of vision, mission, and strategic policy as mentioned in table.

As explained in 5.1 that mainly this is more about environment and economy. In this case, economic investment motive is the main interests of all players. It can be concluded that actually there are two conflicting strategies in solving the flood problems. They are conservation efforts and economic development efforts. For Upstream, economic development is the most emphasized mission and for Downstream as well. Forest conservation and protection is part of upstream strategy

that will be used in this game, and for Downstream, the physical flood protection (such as development of canal) is part of its strategy.

c. Hypotetical Situations

Based on the explanation above, it can be generalized that there are two main players which are:

- Upstream player, and
- Downstream player.

In addition, their strategies are :

- Economic Investment, and
- Conservation.

The Assumption Used in This Game :

- The players think rationally
- The information is complete
- This is non-cooperative game which means each player does not know exactly what other player' interaction
- The game is static which means the game is played only one time. There is no repetition.
- In this game, flood and economy are the main analyzed factors in building the matrix.

In order to put those strategies into game, the first thing to do is giving the value for all possible outcomes. Here, the outcome of the game is flood. There are several variables that influence the value of payoffs. Based on data, in general those variables are:

Variables for outcome of upstream

1. Investment increase/decrease
2. Local income increase/decrease
3. Rehabilitation/Conservation/recovery cost increase/decrease

Variables for outcome of downstream

1. Damages/financial loss increase/decrease
2. Rehabilitation/Conservation/recovery cost increase/decrease Investment increase
3. Local income increase/decrease

Players in deciding on what strategy he/she will use/choose, they will consider those variables. The values of payoffs of this game are not weighted. The valuation is done qualitatively. The number 0-3 are used to indicate the economic benefit that can be

gained from certain strategic interaction. The value “0”= “get nothing/worse from the outcome”; the value “1”= “economically, they loss because they loss one or more local income sources”; value “2”= “they gain benefit from the outcome, but still loss one sources of local income”; value “3”= “economically the outcome will give them optimal benefit”.

5.3.2 The Game

a. Payoffs Matrix

As explained above that the players of this game are two person/groups. This game is aimed to see the interaction between those two players based on their strategies. Based on that matrice, the existence of Nash equilibriums can be seen (Nash equilibrium is the situation in which no player has an incentive to deviate from his selected strategy). So that, the game will be played in strategy/normal form. In this game, every player has a set of strategies. They select a strategy from that set according to the payoff of that selected strategy.

For two-players game, the strategic form very suitably can be represented by two matrices of the same dimension (Basaran . 2005). Downstream’s pure strategies are identified with the rows of the matrices (the “row player”) and the pure strategies of upstream are identified with the columns of the matrices (The “column player”). The left number (black) in box is downstream’s payoffs and the right side (in blue) is upstream’s. The strategies of each player are “Conservation” and “Economic/Investment.”

Table 5.1 Payoff Matrix

		Upstream	
		Conservation	Economic Investment
Downstream	Conservation	2 , 1	1 , 3
	economic Investment	3 , 1	0 , 2

When both players do conservation the result is flood free. Flood free means everything for downstream. Conservation will force downstream authorities to spend a lot of money for conservation/rehabilitation of the river, but when there is no flood, there will be no infrastructure damages, human loss or other financial losses. This condition gives the positive circumstance for economic sector. Further, it will be the trigger for the increasement of investment in this place. This condition will increase the local income for downstream authorities. Nevertheless, the river conservation means also as the extra cost. That is why downstream wins “2”. In other side, Flood free does not bring any influences to Upstream. Conservation efforts mean upstream authority should spend the extra budget. The conservation in Puncak area means also that the urbanization in Puncak area will be restricted. The number of Hotel villas, apartments, and restaurants will decrease. The impact is the local income from hotel, restaurant and real estate taxes will decrease and it will bring negative impact to the local population’s welfare in term of the job opportunity decrease. Besides that, if Upstream chooses the strategy of conservation, the local income is only supported by

tourism and agriculture sectors. So that, the upstream win only “1” from this strategy. It loses the income from hotel, villa and real estates taxes.

When Downstream chooses strategy of “conservation” and Upstream chooses “Economic Investment”, the result is the number of flood will decrease. Nevertheless, the risk of flood will be higher. This condition brings more benefit for Upstream. If urbanization is the strategy of Upstream, it means that the local government will develop Puncak area (catchment area) into hotel/apartment or maybe industrial area to support and improve the economic of Upstream. The local income will increase, the local population’s income also will increase, and it will bring them to a better welfare. In this circumstance, player upstream win “3”. For Downstream, this strategy will not give much benefit for Downstream. This condition will bring negative impact; the risk of flood is still high. Much money will be spent for the flood protection and river conservation such as development of Canal, cleaning the river from the garbage. That means the cost for protecting city from flood will increase significantly but the impact of flood will be lower because the downstream chooses Conservation/flood protection. So that Downstream wins “1”.

Urbanization economically will bring much profit for players. In this case, if both player do “Economic Investment” and do not do conservation the outcome is flood in high frequency and high damages. In matrix, it can be seen that if those two players choose urbanization as their strategy, it makes downstream win “0” and Upstream wins “2.” Yes, this condition will bring nothing for downstream because the flood affect to the financial loss of the region. The infrastructures will broken by flood, people feel worry about their safety. The investors will think twice to invest their money within that region. They need more money for recovery the damages. More money is needed for fixing infrastructures which are the damage by flood. Further, the economy of downstream will decrease. Flood will not bring significant effect to upstream’s economic condition. This situation gives them the higher benefit. Urbanization will allow upstream area to utilize for supporting local income. Hotel and apartment in upstream (Puncak area) with its strategic and economic potency will give positive impact to Upstream economy significantly. This also means inhabitant will have more opportunity to getting better job with better salary and it will improve their family’s welfare. Nevertheless, the economic condition in downstream will also affect the economic condition in upstream. That’s why upstream win only “2” in this situation.

If Downstream chooses “Economic Investment” and upstream chooses “Conservation,” therefore Downstream win ‘3’ and upstream win ‘1’. This means that for Downstream this situation will bring more positive impacts for them whereas the number of flood will be reduced, economic condition will be positive, the cost expenditure of downstream will optimum to support the economic and social infrastructures and utilities. The income of its resident also will move positively and this environment will be healthier for community to live. In other side, this situation of fewer floods means nothing for Upstream. The conservation strategy means extra budget for player and restriction for urbanization in upstream. Upstream’s local income will decrease because the revenue from hotel and apartment taxes decrease and the cost of conservation will increase too.

b. Nash Equilibrium

In this matrix, we can see that every player tries to choose the maximum benefit for itself. In this game, we assume that every player does not know the strategy of other player. But, in the decision process, we believe those player will act positively or rationally. This conflict between upstream and downstream seems like the assurance game (stug-hunt) where there are two equilibriums in the game. They are downstream's conservation - upstream's conservation and downstream's conservation and upstream's economic investment.

The equilibrium is a set of the best strategies. In other words, in equilibrium, each player is playing the strategy that is a "best response" to the strategies of the other players (Gardner. 1995 in Basaran. 2005). To find the Nash equilibrium for any game, there are two stages. *First*, we identify each player's optimal strategy in response to what the other players might do. *Second*, Nash equilibrium is identified when all players are playing their optimal strategies simultaneously. From the payoffs matrix above, we can see the equilibriums between those players are in matrix "Downstream-conservation" - "Upstream-Economic Investment" and "Downstream-conservation"- "Upstream-conservation". The maximum strategy for Upstream and Downstream solving flood and landuse change problems is conservation and urbanization coalition in which downstream doing "conservation" and upstream doing "Economic Investment."

5. 4. Discussion

5.4.1 Type of Game

The game played in this case is Assurance Game (Stug-Hunt). It is because in this game there are two equilibriums and they are pure strategy. The optimum strategy is in equilibrium. Each player assumed cannot communicate each other so they just can choose the best option for him. Even they can communicate and has an agreement, but each player can changed his mind in order to maximize his payoff. From the payoffs matrix we can see that this game is non-zero sum in which sum of the payoffs of all the players is zero whatever strategies they choose. In a zero-sum game, what one player gains, another player must lose. It must be emphasized at this point that non-cooperative game theory does not attempt to describe or predict actual human behavior in the game situation; since it assumes that the decisions are made by perfectly rational players (Rierchert. 1983).

5.4.2. Different Interests, Different Strategy, Different Value

This game explains clearly the existing situation in Ciliwung watershed. Upstream authority does not prefer for this strategy because it will not support their main goal, which is economic improvement for local society's welfare. They prefer to choose to do physical investment to increase their local income. As mentioned in Chapter 3, that the landuse changes (legally or illegally) in upstream still occur until now and local government seems can not solve the problem, even in some literatures mentioned that local government actually gain the positive impact of this situation (their local taxes increase). The fact, the economic motive is very strong in this case

as mentioned in chapter 3. Hotels and restaurants have given the significant contribution for local government income. As we know that Puncak area (catchment area) is one of the most potential for economic of Bogor regency.

When upstream chooses to do conservation, it means that the economic development such as the development or provision of hotels, villas and restaurant in upstream area will be limited by restriction of environmental requirement. For this, upstream groups will loss their local income from the taxes of hotels, villas, apartment, and other real estates. On other side, upstream authority has to spend much money to do conservation effort such as reforestation, river conservation, etc. Different result if upstream authority doing physical development such as infrastructures and let real estates (hotels, villas and restaurants) development, they will gain economic benefit from this situation. The local income will increase in line with the increasement of local taxes from hotels and restaurants.

On the other side, downstream authorities have different situation. Flood has given the negative impact for their condition. The impacts of flood are many infrastructures such as road are damages, many people died could die, and the investment will be decrease because the safety for the business is to risk. Therefore, from these findings, we can see that downstream authorities have to do conservation and prevention efforts such as build the canal, maintaining their sewerage, preparing their inhabitants for evacuation, build the dam, cleaning the body river from being slum area, etc. Economically, downstream authorities will suffer because of flood. This explains why downstream have to do conservation whatever upstream do.

Downstream governments also realize that economic investment is important for its regions with the same reason, local community welfare. But, it will not be optimum when the flood still occurs. So downstream governments have high hope for upstream government would do conservation of its forest and Ciliwung River seriously. But in other side, they realize that upstream has dominant strategy in economic strategy and downstream do not have the dominant strategy over upstream authority. That is why, in game, whatever upstream do, no else downstream can do except do conservation and rehabilitation of Ciliwung river. This strategy is taken in order to reduce the number of flood and its risk. This is the best strategy responding upstream's economic investment strategy and this is the Nash equilibrium of this game, the condition in which both players cannot take other better strategies because this strategy is the optimum strategy they have.

We can see that there is an unbalance situation here. While one player must suffer, another player wins. Actually, there is the optimum strategy that players can choose to minimize the number of flood. The optimum strategy, which has the highest utility value, is in downstream do "conservation" and upstream do "economic investment". Besides, the optimum strategy is happening also when downstream do economic investment and upstream do conservation. As explained above that in some circumstances, the optimum condition will not be a considering condition for players because the players prefer to choose one condition in which he will gain the higher benefit for himself. Madani (2010) mentioned that in real world, results, which are gained by players, are not always optimal for the whole system as each player makes his own decision based on individual information about the game and his own criteria. A player tends to be unwilling to contribute to on overall optimization or

costs or benefits for the whole system. For instance, Downstream will choose the "Conservation" while Upstream chooses "Economic Investment" Flood is the most problem that bring many negative impacts for downstream authorities especially for their economic stability. In this game, it is clearly showed that the upstream will always choose "Physical Investment" to improve their income. It is showed by the highest payoff gained by upstream. Upstream authorities will not move from this point to "conservation" because it will worse him. In this condition, we call it dominant strategy of upstream. In other side, downstream authorities know that they are the one who accept the negative externalities and will always be like that if they do not do conservation. So whatever upstream will do, they have to do conservation. As long as downstream do conservation the number of flood will be reduced. In this situation, both of players have no any better choices to make and they feel fine with this condition.

5.4.3 The Failures of Policies and Coordination (Commitment Matters)

As mentioned before, that there is an unbalanced situation in interaction between upstream and downstream authorities. It is clearly shown in the result of the game. Upstream player could do conservation in his area and flood will be reduced, perhaps gone. Nevertheless, it is obviously seen that this effort does not give upstream authority much benefit economically. As discussed in chapter 4, that until now, there is no mechanism about clear incentives and disincentives between upstream and downstream authorities within Ciliwung watershed. There is no how much exactly downstream should pay for every benefit they got from the watershed management. Nevertheless, there is no exactly how much upstream should pay for every disaster made by the development in upstream area. Besides, Indonesia has no a specific Law arranging about watershed management. Indonesia still uses separated Laws in implementation of watershed management. It is obviously explained the weaknees of watershed management and the weakness of law enforcement in Indonesia.

Based on that findings, it is fair that the commitment to saving and protect the watershed is still weak. Every region still focuses more on economy. The sustainability of environment is still negotiable. The landuse changes in upstream and the slum area along Ciliwung river in downstream area are examples of the inconsistency of local government in implementing watershed management plan. From the game result, it can be seen that, upstream will always do economic investment as long as downstream they do not discuss and agree about the incentives mechanism.

In fact, communication between upstream and downstream is not optimal. There are many discussion between central government and local governments, but it seems not work. Discussion looks like a ceremonial event that is not followed by the real action. The implementation of watershed management in local level is stiiil weak. The violation of rule still occurs not only in upstream area and but also in downstream area. Not only forest in upstream area is damage, but also the river condition in downstream area is apprehensive. There are no tough commitment from all decision makers to keep and save the sustainability of Ciliwung watershed. Further, the commitment becomes the main issues in Ciliwung watershed management.

As discussed in Chapter 2 that cooperation and coordination will be good if they are implemented integrately. The integrated and comprehensive actions will reduce the conflicts of interests. Thus, coordination should be transparent and mutually beneficial for all stakeholders related. In cooperation and coordination of watershed management, participation factor is important. It can reduce the misunderstanding and it can also build common perception among the involved players. Coordination needs to consider all aspects/sectors (economy, social, and ecology) of all involved stakeholders. Those aspects should be assessed and evaluated together. This is aimed at build one perception of watershed management.

Based on theory of coordination, the cooperation of Ciliwung watershed is classified as coordination between governmental actors. This means that the role of government is dominant in decision making process. In previous watershed management, private sectors has not fully been involved. It is necessary to involve all sectors in watershed management. The involvement should be done from the beginning and at all activities (planning to evaluation).

In Ciliwung watershed case, the main issue is flood in Jakarta. Many actions is taken to reduce the flood in downstream such reforestation, land rehabilitation in Puncak area (upstream) and the appointment of Puncak as conservation and protected area which cannot be developed into dense-development. On the other sides, this goal is not clearly shown or less discussed in Bogor regency vision and mission. It means that those efforts do not become the main priorities in Bogor regency development plan. This phenomena also shows that the watershed management of Ciliwung are not fully integrated yet. The central governments's role is to dominant in the decision making process. On the other sides, the watershed management of Ciliwung has not accommodated all different interests of all involved stakeholders. Further, it seems natural if the commitments of involved stakeholders are questioned. It is because some actors/players are not satisfied from the policies made. The sustainability of environment or forest in upstream is very important, but other factor such as how to alleviate the weak economy/welfare of local community in that area has not been considered seriously. Compensation of conservation action in upstream should be more discussed.

Local autonomy and decentralization are the process of democratization of Indonesia. The purpose is the improvement of local community condition. It is believed that local level knows much better about their own condition than central level. From the game result above, it can be seen that regional development is option, but the Indonesian republic as a unitary state is not negotiable. Therefore, developments in certain administrative region, hopefully, will not bring the negative externalities for other regions.

This is a dilemma. Local government should serve their community while on the other side, they also should comply with state rules. Nevertheless, every benefit gained by certain regions, it should counter with compensation for other region which gains the loss. Weakness of will may also be a factor in interactive decisions. Commitment is one of two interpretations of unselfish behavior and can occur only when there is at least an expected-value sacrifice by the decision maker of her own interest. In Ciliwung watershed case, if forest in upstream is in good condition, it will bring the positive impact for the downstream. In order to reach that situation, the

incentives and disincentives mechanism should be formulated between upstream and downstream.

To do those things, central government has emphasized that watershed management should be implemented integrately. Thus, central government has published the regulation concerning about integrated watershed management plan. This regulation is made by Minister of Forestry. It mentioned that central and local governments have to work together to build the good management of watershed. Once more, it is a regulation made by minister level. The strength of this regulation sometimes is not enough to implement in local level. In many cases, local levels not really obey the rules like this and they only obey to the Laws. In practice, sometimes, players might choose not to cooperate, perhaps due to lack of trust. In trust dilemma, if players trust each other, there is no risk of failed cooperation and the players will cooperate. This is also happen in management of watershed in Indonesia.

New regulation also mentioned about the needs to establish forum DAS. Forum DAS is established to be a neutral mediator. It seems not able to control and solve this problem. Forum DAS consists of all related stakeholders within Ciliwung watershed. Of course, they are represented their institutions/organizations and they bring their interests to this forum. The establishment of Forum DAS is aimed to solve the Flood Jakarta integrately. There is a research, which explores and find out the affectivity of this forum in influencing the policies. This research done by Pujatmiko (2007) found that the affectivity of this forum is weak because this forum cannot influence the policies in local levels. The fund is still the problem of this forum. The fund is come from central government, and this make this forum is not yet independent. So in many circumstances, this forum is under central government interests. The power of this forum is weak. If we see in the game theory analysis, to make the situation become optimum, the incentive should be there. In addition, until now, there is no clear agreement between upstream and downstream about this incentive. Forum DAS could be the effective way to solve this externalities problem. This forum can do the assessment of the incentives and punishment that can be given to the players involved.

5.4.4 The Optimum Strategy of Watershed Cooperation under Game Theory Framework

According to presidential regulation no.54/2008, the expected condition is upstream do “conservation” in order to keep all downstream area free from flood. On the other side, downstream is focused to be development or economic center which can support the national economy. To make the equilibrium move to this condition, the intervention should be given. Intervention could be incentive or disincentive for those who involve in this game. This intervention, perhaps, will balance the development of economy and environment sustainability. This condition/problem is about externalities, and in economics the externalities mean cost (Bernauer. 2002).

In this game we see that, Upstream loses 1 payoff than downstream and it is the decrease of upstreams' local income. To make upstream move to “conservation” strategy could be by giving the incentive such money. Not only the money can make the upstream player wants to move, but also the strict regulation and punishment from central government can make it move. For instance, if the incentive is given to

the upstream players if they would do the “conservation” and punishment will be given to upstream if they not doing conservation, so that the payoffs will be changed.

Table 5.2 Payoffs Matrix With Incentives and Disincentives

		Upstream	
		Conservation	Economic Investment
Downstream	Conservation	2 , 3	1 , 1
	economic Investment	3 , 3	0 , 1

Here, in new payoff matrix, we can see that the equilibrium now moves to the quadrant downstream’s economic investment and upstream’s conservation. This equilibrium is also the optimum strategy that can be reaching by them. If the reward and punishment are implemented strictly, so the value of upstream’s payoff for doing conservation strategy will be increased 1 point because for every conservation effort done by upstream will be given the incentives. Here incentive also could be the rewards for environmental services given by upstream so the downstream gain the benefit. The other side, the payoff of upstream’s economic investment strategy will be decreased 1 point because there will be an punishment, such as giving penalty to upstream so that they should pay downstream for every economic benefit they get.

In reality, all players have met each other and discussed about this situation. But until now, this condition seems can not be solved. The landuse changes and the presence of illegal villas in upstream still exist. Central government through Ministry of Forestry has tried to do reforestation in this area and the upstream government has done several actions related to this problem such as displacing the illegal villas, but in fact there is still many illegal villas exist in there. The communication and clear negotiation should be done among the authorities within Ciliwung watershed. This negotiation should be a media for them to discuss and solve this externalities problem. Clear and open discussion is needed. It is not easy to do that, because we understand that every government will do everything to serve their community. The binding agreement has to be made such as environmental services’ cost for upstream if they do conservation or externalities cost for downstream for every flood come from Ciliwung River.

5.5 Concluding Remarks

Game theory is believed can help solving the externalities problem such as complexity in watershed management. This theory studies interactions among decision makers, especially when the actions taken by a certain player affect others. Ciliwung watershed management is related to the flood Jakarta. To solve the problem of flood Jakarta and Ciliwung management, it is necessary to know about the players/decision makers’ behaviour in watershed. The interaction of strategies between decision makers which is conducted in this researches is analyzed by using

game theory framework. In doing so, the strategies of each decision makers are defined.

Basically, there are three main elements of game theory. They are players, strategies, and the interaction between players. In this research, players are decision makers. They are those who have power or make policy related to regional development. They are also public organizations who act on behalf of the public benefits and their roles has been regulated by Law, in other word they are government. In fact, Ciliwung watershed involves many authorities. It is because Ciliwung river flows through 4 administrative regions. They are Bogor regency, Bogor municipality, Depok administrative municipality and Jakarta Province. In this research, the players are simplified into two groups. They are Upstream and downstream player. The simplification is based on the externalities that gain by each player. Bogor is part of upstream which send the negative externalities and does not affected by flood. The downstream authorities are Depok and Jakarta province who gain the negative impact (flood) of landuse changes in upstream.

The data of decision makers' strategies are taken from their regional development plan. From the data, it is can be generalized that there are two main strategies related to watershed. They are conservation strategy and economic investment. Those two strategies are put in the payoff matrix and it is analyzed. Game in this research uses form/strategy form. It is because this research want to see the behaviour of players and how they interact to each other.

The results of this game' payoffs are interesting. The upstream player has dominant strategy on economic investment. The nash equilibrium in this game is happen when upstream does conservation and downstream does economic investment. It means that this is the best strategy that every players take. In this condition, each player is playing the strategy that is a "best response" to the strategies of the other players. There is no other best strategy that can be benefit for those players. It can be seen that, upstream tends to do economic investment because it gives economic benefit for them. On the other side, reducing flood is the most important for downstream so that the conservation is the best way they can choose.

From the game constructed in this research, it can be concluded that, conflict between upstream and downstream is conflict between environment sustainability and economic interests. The upstream chooses to do economic investment in order to get much money to develop his region and improve his welfare of his community. On the other side, It is difficult for Downstream player to improve their economic if flood still occurs. There is an unbalance situation in this game where downstream will suffer more because of upstream's landuse changes.

From this game, it can be seen that, actually, upstream can do conservation but he does not. He prefers to choose the more beneficiary action for him. In this game, it is found that the best strategy is the optimum strategy. Yes, the optimum strategy is not always the best strategy for each players. According to Presidential decree about Jabodetabekpunjur spatial plan, It should be downstream does economic investment and upstream does conservation. Nevertheless, without incentives and disincentives mechanism, this equilibrium will not move to that situation. To make players move to the optimum strategy, incentives and disincentives should be given.

The result of this game also gives explanation why the commitment between the players in saving and protecting the Ciliwung watershed is weak.. The conflict of interest which is not followed by transparent communication, common perception and strict regulation will not solve the conflict. To make coordination works, all stakeholders' interests should be considered. The absence of clear and legal incentives and disincentives mechanism in watershed management will not make the players keep their commitment to the environment sustainability. This matters should be mentioned clearly in Laws. The absence of sharing cost between upstream and downstream has made the management of watershed not integrated well. This is why watershed seems to be central interests than local interests. Local governments seems not really interest in conservation effort because conservation means limited development and limited economic benefit.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Flood in Jakarta has occurred since many years ago, even since the Dutch colonial era. The flood occurs not only in Jakarta but also in Depok municipality. This condition has never been solved. The Ciliwung river has the highest contribution to the flood Jakarta. Ciliwung river flows through two provincial boundaries and several municipalities and regency : Bogor regency, Bogor Municipality, Depok administrative municipality and all municipalities of Jakarta. That is why central government declares that the management of Ciliwung watershed should be done integratedly and involved all stakeholders.

Nevertheless, in practice, the landuse changes in upstream still occur, and it seems not to be handled optimally by upstream government (Bogor regency). The landuse changes in upstream, especially in Puncak area has been the main cause of the flood. The economic motives become the essential issues behind the landuse changes. Hotels, villas, and restaurant taxes have given the significant contribution to the economic of Bogor regency. Besides, Depok area also has been changed significantly from agricultural area into settlement area.

The condition becomes worse when the local autonomy was regulated. Local autonomy has arranged the distribution/decentralization of authority from central government to local government. In this term, local government has a right to manage their owned resources, but their action should be under Indonesian Unitary principle. Since the local autonomy was regulated, local government tries to use all of their resources to improve their economic condition and further, for supporting their regional development. In this situation, sometimes environment become the one which is sacrificed.

Since the local autonomy has been regulated, there are several changes in Indonesian governance. The three tiers of government has been changed. Local authorities is not under the provincial comannder anymore. According to Laws, local governments have authority to decide and plan for their communitys' needs as long as they not diverge from Indonesian unitary state's goals. In planning the development in local level, every government should coordinate to each other. Local level should refer to provincial plan, provincial plan should refer to national plan. This is also happen when local autonomy plan their spatial administrative region. In watershed management, central government has authority to make a general guidance, norm, rules and standards in watershed management. Provincial, municipality and regency government responsible to give the technical consideration to central government. In addition, they also responsible to make watershed management plan in their regional administrative boundaries. This plan should refer to national guidance, norms, and standards. The watershed management plan should also being adopted and considered in making regional development plan and spatial plan.

Many programs has been done by all related governments such as PROKASIH, RLKT (reforestation), JW RM and integrated Bopunjur spatial planning. Nevertheless, the flood still occurs and the landuse changes in ciliwung watershed

seems to be unstoppable. The institutional approach also has been done. The discussion between government has been tried. The coordination between them has resulted to the establishment of forum or independent organization. This organization was aimed to solve the flood problem. Nevertheless, this forum has no real contribution to influence the policies in all levels. The ego-centric of sectors or local governments has confronted all alternatives. The different interests of all government cannot be solved. The coordination has failed to harmonize the economic development and Ciliwung watershed sustainability.

In case of Ciliwung watershed, conflict of interest is defined. At least, there are two main strategies that conflicting to each other. Economic investment and conservation. Economic investment is the main motive behind the land use changes in upstream and downstream. The local autonomy has pushed local government for maximally using their local resources in order to improve their local income. In upstream, the taxes from villas, hotel and restaurants is high. This situation is advantages for Bogor regency. The contribution of those sectors is up to more than 10% of total income of Bogor regency. This is different from midstream. In Depok, administrative municipality, the land use has been changed into settlement area. This can be explained that this area is close to Jakarta. The price of house and land is lower than Jakarta. So people who work in Jakarta prefer to choose Depok as their home. Besides, in this area there are many universities. The biggest university is University of Indonesia. This is also attract people to come and live here. On the other side, Jakarta is the capital city of Indonesia. Flood is nightmare for Jakarta. The flood has suffered Jakarta in many years. The loss from flood in 2002 was around 9.8 trillion rupiahs. Jakarta together with state has spend much money to reduce the number of flood and its damages. Here, conservation become the main focus of Jakarta.

Coordination is important to solve the problem of flood in Ciliwung watershed. In order to do so, it is also essential to know about the behavior and strategic interaction between decision makers within Ciliwung watershed. Knowing the behaviour and strategic interaction will help the all related decision makers understand the actual situation. Game theory is tool to analyze the situation of this problem, the interaction between upstream and downstream authorities are shown clearly. From the game conducted in this research, it clearly defines the strategies of all players (upstream and downstream). The strategies they use are "conservation" and "economic investment". From the payoff matrix, there is dominant strategy in this game and this is owned by upstream players. The dominant strategy of upstream is doing "economic investment". Upstream tends to choose this strategy because this strategy is always the highest payoff that give the highest benefit for upstream. This game also shows that downstream player does not have dominant strategy. It means downstream strategy does not have the influence to the upstream action. As consequence, whatever upstream takes, it is better for downstream to choose "conservation" strategy. If downstream still does "economic investment", they will just suffer themselves, because the most negative impact is flood and flood will only bring nothing except financial loss. This situation is called best strategy for both players. The best strategy is the best option that the players can choose to minimize the flood.

From the result, it can be seen that there is an unbalanced situation whereas the upstream will choose to do what is profitable for them and not for downstream. In order to make upstream want to do conservation, incentive and disincentive are the essential factors to be implemented. In this case, it is seen that upstream player is the most influencing player. Upstream, of course, can choose doing “conservation” and the flood will be reduced. Further, payoffs’ downstream will increase. Notwithstanding, this situation has no benefit for the upstream, in other side if they do “conservation”, they will lose billions of rupiah from hotel, restaurant, real estate and entertainment taxes because of the restriction of development in Puncak area. Whereas they have to produce much money to develop their region in order to serve local community who choose them in the election. In this circumstance, upstream should be given incentives so that they want to do conservation consistently; or central government can use its power to control fully this region and make strict punishment for every landuse changes in Puncak area. It is should be mentioned and arranged clearly by regulation. There are several regulations used in the management of watershed, but there is no specific Act/Law specifically which regulates about the management watershed. Act/Law has the powerful role in term of giving the reward and punishment, because it is the highest position in hierarcycal regulation system in Indonesia. Thus, this is one of the weakness of watershed management in Indonesia.

6.2 Recommendation

For Decision Makers

Based on the result of this research, there are several recommendations that should be considered for all decision makers (governments) within Ciliwung watershed in term of solving the problem of flood in Jakarta.

- Incentives and Disincentive.

Flood problem is the externality. The externalities in economics means the costs. In many cases, incentives and disincentives are related to money. In this case, the incentive and disincentive should be formulated by involving all governments within ciliwung watershed. Who should pay for What has to be defined clearly and discussed fairly. Central government should act strictly based on the environmental sustainability efforts. Strict implementation of rules should be done by central government for every violation of regulations. On the other side, central government should also think about the local community walfare. In this situation, central government should be a mediator who bridges the communication among local authorities. If the communication found “death lock” situation, central government takes this position and decides the incentives and punishments that are suitable with the real condition and information gathered from both side (upstream and downstream).

- Integrated Policies.

Integrated watershed management is not only about integrating all organizations within Ciliwung watershed and sit together and solve the problem together, but also all policies related to regional development which should also be integrated. All policies produced should be interrelated to each other. Since the local authonomy has been regulated, many regulations (national and local level) was

made. Even there is a hierarchical in regulation system in Indonesia, in many cases, there is overlapping regulations and authorities in its implementation. This shows that Indonesian regulation is not yet integrated to each others. The integrated policies is needed for successful of sustainable watershed management in Indonesia. All policies should be interrelated to each other and it should be based on the environmental sustainability.

- The empowerment of Forum DAS

Forum DAS is an independent organization that was established for helping government in solving the problems regarding watershed management. This forum could be the best way to involve many stakeholders within watershed boundaries, and give them equal positions to share their problems and interests. This forum is established with the decision letter from Governor. But, in many cases this forum does not have power to influence the governments policies. One research which was done by Pujatmiko (2007) found that, the effectivity of this forum is still weak in influencing the policies. In many cases, Forum DAS can not stop the landuses changes in upstream watershed. Further, Forum DAS's members do not keep their commitment to keep their forest in green. This is because the independency of this forum is still questioned. In doing their jobs, they are subsidized by central government. Hence, this forum is not really independent. Therefore, in the future, the first thing should be done is the funding mechanism should be formulated and released from central government binding.

Further Researches

- This research is far from good. The variable of outcome could be more complete and consider many things not only in economic but also social and political condition. The outcomes are also not weighted. It is because the incomplete data becomes the problem in doing so and the variable of this outcome only considers the economic benefit. Thus, for further research, weighed method in its utility function will give better result and findings.
- Based on the result and also mentioned in conclusion, it is found that there are many things that should be studied for completing the result of this research. For instance, the study about formulation of incentive and disincentive. This research has not been studied, especially in Ciliwung watershed. This kind of research will be useful for central and local governments in deciding what they have to do in solving the flood problems.
- Besides that, the study about the integrity of policies which is related to the watershed management is the interesting one. As mentioned before, that management of watershed needs to be planned, monitored, and evaluated integratedly. The first important thing is that the regulations should be interrelated. Furthermore, many regulations are published since the local autonomy was regulated.

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