A Critical Assessment of Watershed Management in Indonesia

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ABSTRACT

To address many environmental problems in Indonesia, the Ministry of Forestry created a planning system and developed guidelines to manage the watersheds in the country. Today, the environmental problems are still continuing, calling for improvement of watershed management. This study reviewed international guidelines, selected case studies of other countries' experiences, and the watershed management guidelines in Indonesia, then compared and contrasted the result of these reviews and made recommendations in order to improve watershed management and planning in Indonesia. The international guidelines published by ASEAN, FAO, ESCAP, UNEP, and ADB offered several frameworks of watershed management from various perspectives. The comparisons between these frameworks/perspectives and the Indonesian guidelines gave an opportunity to make an assessment and opened up the possibility of improving the existing framework and practice in Indonesia. The international guidelines provided some input on the importance of monitoring and evaluation in the management process, emphasised the need for adequate data for planning, and advocated an iterative process in planning. The assessment of the Indonesian guidelines and practice of water treatment management and planning: (1) proved ineffective, as demonstrated by the inconsistency and discontinuity of development, (2) was based on poor quantity and quality of data, (3) provided inadequate legal background, and (4) was implemented by an inadequate infrastructure. These problems created gaps that can be filled with recommended best practices learned from other developing countries (the Philippines, Malaysia, Thailand, and India). These recommendations include: (1) Establishment of an adequate national information system of watersheds and their management, (2) Improvement of the planning system, to be consistent with the planning hierarchy and to be iterative, (3) Promotion of collaboration and partnerships by the government, (4) Strengthening of the legal system as the foundation of effective watershed management and planning, and (5) Encouragement and strengthening of public participation in watershed management and planning.

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INTRODUCTION

1.1 Background

1.1.1 Why watershed and watershed management

Over the past few decades, scientists and government agencies around the world have started to invest more resources in watersheds, since they realised that water is one of the most important indicators of the health of a nation's natural resources. There are good reasons for using watersheds as units of measurement of environment quality: (1) A watershed provides a logical boundary system and conceptual unit for ecosystem management, because the concept of a watershed recognises the important role of water in biological relationships; and (2) A watershed is easily recognized, and enables the managers to measure and monitor the basic physical and chemical of ecosystems components (NRC, 1999). Therefore, environmental issues related to sustainable management of natural resources are addressed within the context of watershed management. Hence this is the rationale for the development of a perspective of watershed management to balance long term ecological, economic and social stability with cumulative environmental change. Therefore, understanding natural resource ecology and interactions at the watershed level will provide a basis to develop comprehensive management guidelines.

1.1.2 Watershed degradation in Indonesia

Watershed managers in Indonesia are today, faced with complicated and interrelated problems, for example floods, water scarcity, sedimentation and erosion. Deforestation had been known as one of the main causes of watershed degradation. Forests are not only important to supply forests product, but also to maintain and regulate the hydrological cycle within a watershed and to prevent environmental disasters, such as flood and erosion ("Basic Forestry Law," 1967). Based on the experience of facing continued environmental problems over decades, the Government has made the forestry sector responsible for the management of watersheds in Indonesia. For instance, this concern is shown in Law No. 41,1999 on Forestry, in which it is mentioned that the ideal forest cover, appropriate for supporting the ecosystem balance, should be at least 30 percent of the total land area. The Indonesian Ministry of Forestry has a role to

ensure that watershed management in the country is carried out effectively. The ministry is the holder of functional authority over watershed management activities in the country. An effective watershed management requires a suitable strategy which provides a framework and guidelines for effective implementation and problem solving.

Watershed management activities have three general objectives: rehabilitation, protection and enhancement (Black, 1996). The role of forests is closely related to the first and the second objectives. The rehabilitation function of a forested watershed is directed to abandoned, abused, or even naturally altered lands that produce excess sediment, unwanted soluble materials in runoff, or excess or ill-timed runoff itself, while the protection function is for normal and especially sensitive areas to be protected from activities that might lead to the need for rehabilitative measures.

Forests, as components of watersheds, play important roles in watershed management in order to obtain those objectives. Degradation of forests has resulted in many catastrophes. As a result, the number of critical[1] watersheds in Indonesia has increased in the last two decades (Ditjen RLPS, 2003 in Annonim, 2003d), as illustrated in the following graph (Figure 1.1):

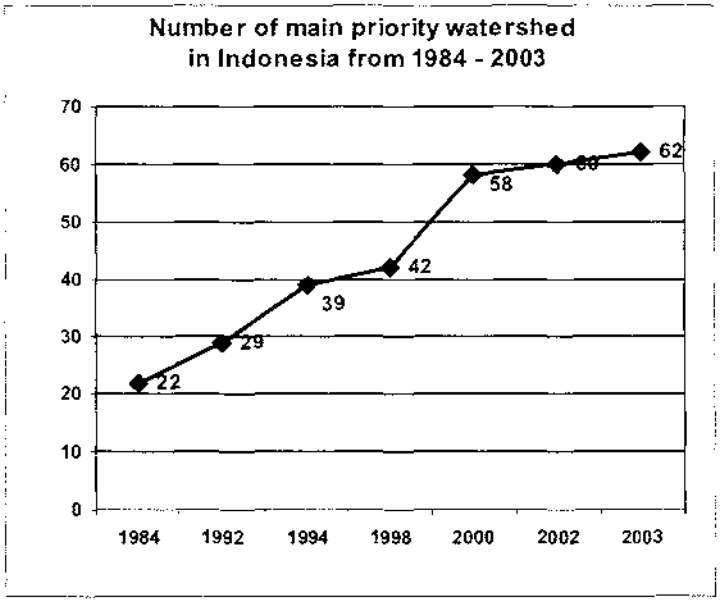

Figure 1.1. Critical watersheds in Indonesia over the period 1984 - 2003

[1] A watershed area is considered critical if it has large areas that are severely eroded or are being eroded at high rates, and it is sufficiently degraded to adversely impact the productivity of downstream activities (Mangundikoro, 1985 in Brooks et al., 1990, p. 33)

1.1.3 Watershed management in Indonesia

The concept of watershed management was recognised and included in Indonesian Government's policy as a basis for development in the country; also watersheds are accepted as units of natural resource management ("MPR Resolution No. IV," 1999). The government has also paid considerable attention to the forestry sector which is closely related to watershed management by setting Law No. 41/1999 on Forestry. Previously, the concept of a watershed as a unit of management had been formally established in the PP No. 33/1970 (Government Regulation on Forest Planning). In this legislation, the government set up a policy which emphasises the importance of watersheds as a basis for development and the urgency of effective watershed management to solve the widespread environmental problems in the country.

Recently, to address the increasing environmental problems, the Ministry of Forestry of Indonesia has created a planning system and has developed national guidelines to manage watersheds in the country, aimed at guiding an integrated watershed management based upon the principle of "*one river, one plan, one management*". However, there are still some questions remaining on whether the watershed management and planning have been successful or not. The continuing environmental disasters indicate that there is a need for improvement in watershed management in Indonesia. Therefore, this research is to assess the watershed management guidelines and the planning system which has been developed within the forestry sector by comparing it to international experiences.

1.2 Problem Statement

Practitioners have identified time limitations of the current planning system and the national guidelines, most notably their ineffectiveness when it comes to specific problems in the field. They are:

(1) Uncertainty about effectiveness and the relevance of the existing planning system (BPDAS Brantas, 2003). They also noted that planning is not adequate and powerful enough to be applied in the field. Further, they noted the national guidelines and the plans required have not been synchronised with local regulations in managing the forested watershed.

(2) Another report (BTPDAS Surakarta, 2002), stated that the criteria and indicators for the monitoring and evaluation of watershed management provided by the national guidelines are not well-developed. These problems are recognised as not giving adequate information to improve the planning and implementation of watershed management, and not able to be practically implemented in the field.

There is a need to review the planning system and to develop the existing guidelines towards the improvement of the watershed management in Indonesia.

1.3 Research Questions

(1) How effective is the existing Indonesian watershed planning system?
(2) How do we improve the watershed management and planning practice in Indonesia?
(3) What are examples of effective guidelines for watershed management from an international perspective?
(4) What can we learn from other countries' experiences on watershed management practices?

1.4 Research Aim and Objectives

***Aim*:**

The aim of the research is to improve the watershed management guidelines for project managers in the forestry sector in Indonesia.

***Objectives*:**

To attain this aim, the objectives of this research are as follows:

(1) To review international guidelines and selected countries' experiences in order to gain an understanding of best practice in watershed management and to derive some best management practices developed in selected countries.
(2) To review watershed management guidelines in Indonesia's forestry sector.
(3) To compare and contrast the result of objective 1 and 2 and make recommendations to improve watershed management in Indonesia.

1.5 Research Methodology

This research is a desk-top study that uses a qualitative research perspective. The approach used in this research is non-experimental research, where no hypothesis is proposed. Accordingly, this research employs a descriptive method that proposes to describe the characteristics of effective forested watershed management according to perspectives from around the world.

Then, review on Indonesian material to supply the information of existing practice in the country. Further, an assessment of this existing practice will be conducted based on the understanding resulting from the first review. This assessment will be carried out through establishment of matrices to compare and contrast among the results of review.

1.5.1 Data Collection and Sampling Technique

Qualitative data to be analysed in this research include documents from organisations (international organisations, watershed management agencies, and research agencies), research or project reports, official publications and reports, paper, journal articles, theses, letters, print-out of emails, and written responses of correspondence.

In this research, the international guidelines developed by the following organisations will be reviewed: FAO (*Food and Agriculture Organization*), ASEAN (*Association of South-East Asian Nations*), ADB (*Asian Development Bank*), UNEP (*United Nations Environment Programme*) and UN-ESCAP (*United Nations-Economic and Social Commission for Asia and the Pacific*).

In addition, case studies about watershed management in selected other countries will be assessed. As the sample south-east Asia countries selected include the Philippines, Malaysia, Thailand and India.

The rationale for selecting these countries is because they have similarity with Indonesia regarding the following points:

- Four of them are developing countries and members of ASEAN;
- They are countries to whom the concept of watershed management is relatively new;

- They have similar complexity of problem in development, which involve environment, physical and socio-economic aspects;
- They have problems related to high population, limited non-renewable resources and limited land resources;
- They are facing similar problems associated with watershed management: flood, drought and erosion;
- They consider forestry as important sector for development and they have problem with deforestation;
- They have similar climate and geographic condition.

The third group is Indonesian watershed management planning documents, which includes national guidelines of watershed management, as well as any related documents, such as examples of watershed management plans and related legislation. Watershed management plans, as required in the national guidelines follow the hierarchy of:

- Long-term (15 years) plan, as macro level planning.
- Medium-term (5 years) plan, as medium level planning.
- Short-term (annual) plan, as micro level planning.

Using a purposive sampling technique, the examples of these planning documents will be chosen with an underlying purpose according to the aim of the research. Therefore they will be selected from the prioritized watersheds in Indonesia based on their critical level. This means they meet particular characteristics (Patton, 1990) that have been emphasised to address the objectives of this study.

Of the five main islands in Indonesia, Java has the greatest percentage (18.30 percent) of total critical watersheds in the country (see Figure 1.2); which is representing the most important issues related to forest degradation. Therefore, for this research, 4 samples of sets of watershed management plans will be selected as representative of 17 critical watersheds within 5 provinces in Java.

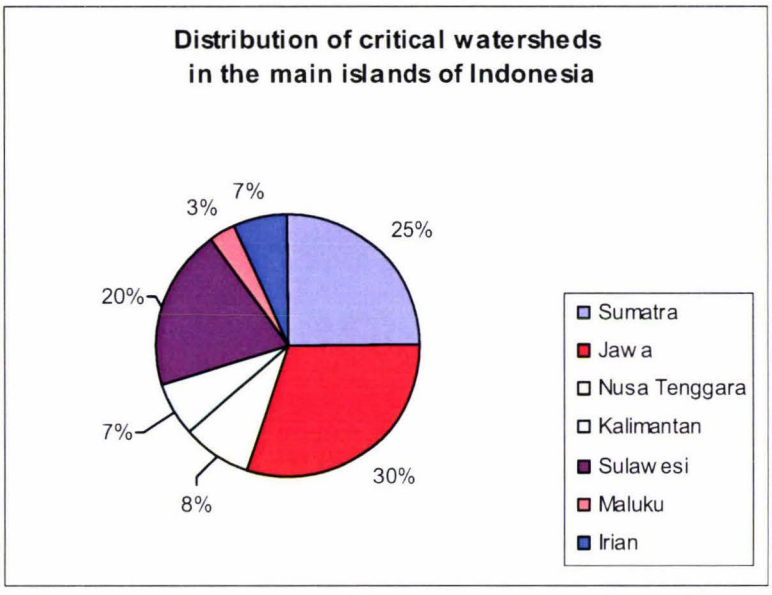

Figure 1.2. Distribution of critical watersheds in the seven main islands of Indonesia

In Indonesia, establishment of planning documents have not been carried out evenly throughout the country. From the total watershed area of 113,470,000 hectares around the country, there are 48,151,000 hectares (42 percent) for which the documents of watershed planning have been established.

1.5.2 Data Analysis

Following the completed review of three groups of data, a direct analysis will be conducted through building matrices to compare and contrast the result of reviews. The comparison analysis will be stratified and divided into three main parts: (1) comparison between international guidelines and Indonesian guidelines of watershed management; (2) Comparison between the guidelines as theoretical frameworks (the international and the Indonesian) and the existing practice of watershed management and planning in Indonesia; and (3) Comparison between the problems found in the watershed management and planning in Indonesia and the best practice from other countries' experiences. The comparisons will be finalized with recommendations towards the improvement of watershed management and planning in Indonesia.

The framework adopted for the research is illustrated in the following flowchart (Figure 1.3):

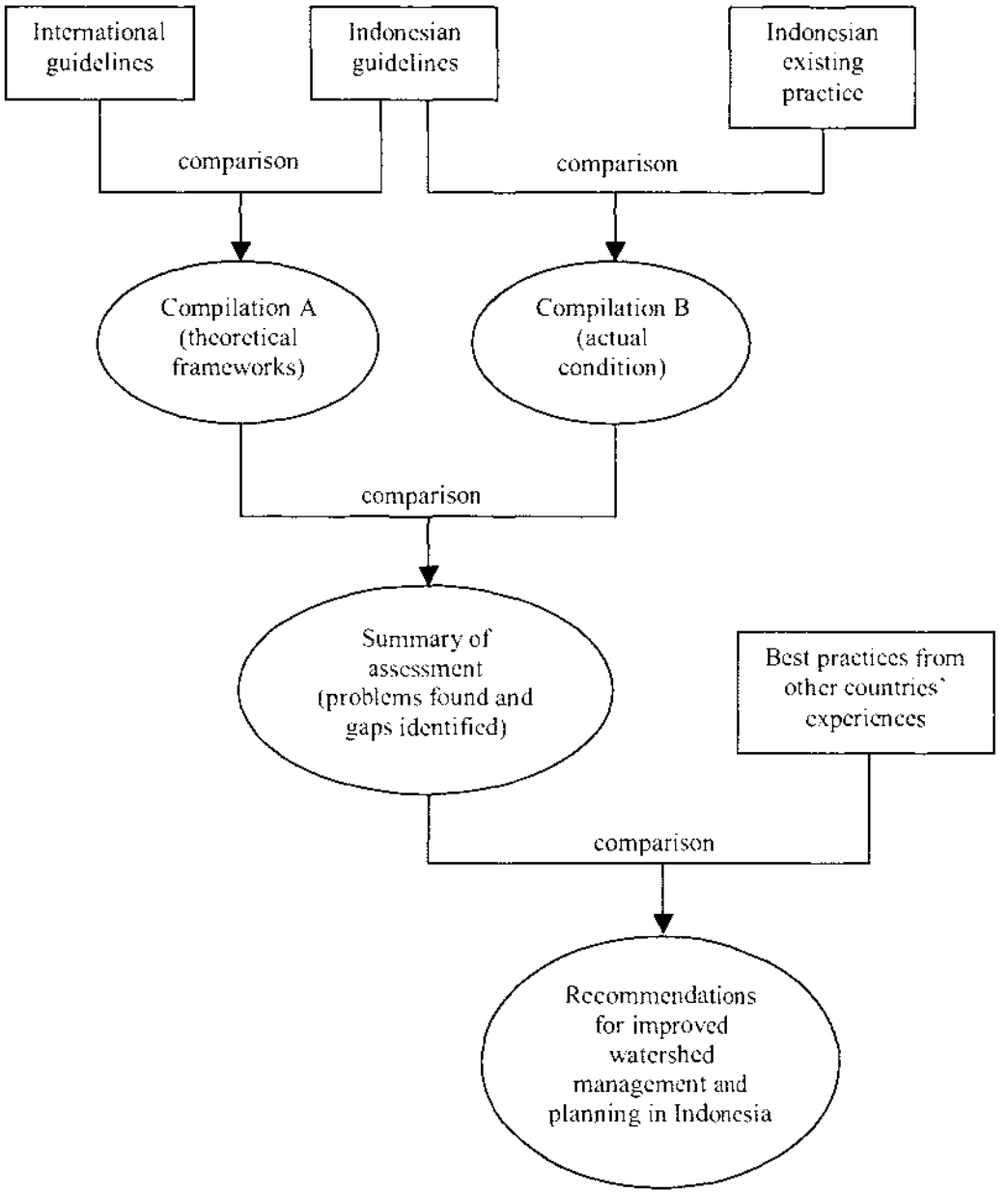

Figure 1.3. Flowchart of the step taken to make a comparative analysis

1.6 Implications and Limitations of the Research

Implications:

There are a number of points which show the importance of this research to be carried out. Most of them are based on the strategic value of the planning system in the watershed management, as has been demonstrated by some previous studies (explained further in the next chapter). The likely implications of this research basically can be locally or directly and generally.

Locally and in short-term, this research is expected: (1) to provide information to planners and decision-makers to improve the watershed planning system; (2) to assist the project managers to implement the plans effectively; (3) to increase the awareness of stakeholders in watershed management; (4) to promote the collaboration among stakeholders to obtain the objectives of watershed management in the country; and (5) to assist the government agencies under the Ministry of Forestry to optimize their role in watershed management and to improve their performance in managing the watersheds.

Meanwhile, generally or in long-term, the outcomes of this research can be reflected by these implications: (1) to assist in finding the most suitable framework for watershed management in Indonesia; and (2) to promote further bilateral or multilateral coordination in watershed management with other countries and world organisations, for example in the form of research co-operations, watershed development projects, or extension education.

Limitations:
Limitations that are and might be encountered in this research are mostly associated with the nature of this research as a desk-top study. Since it is dependent on documents as research material, it is possible that it might not cover information that can only be obtained by field observation. Information gathered might be limited due to the lack of up-dated sources for review and a limited number of research projects in the similar area, particularly in developing countries. Moreover, due to long-distance and low technology, there is also a limitation regarding the availability and accessibility of information in Indonesia.

1.7 Thesis Structure

In accordance with the objectives of this research, chapters of this thesis are organised as follows:

Chapter1 introduces the general background to the research, what is to be attempted, the methodology used in the study, and how the thesis is organised.

Chapter 2 will be opened by a brief description regarding the history of the topic of this study, followed by some basic theories underlying the topic of watershed management.

These will be useful as a bridge towards discussion of international perspectives (Chapter 3) and as a basis to support the analysis in discussion (Chapter 7). Chapter 2 will also review prior relevant research that discusses the related methodologies used and critical arguments on the topic of watershed management and planning.

Chapter 3 is a review of international perspectives: namely, a critical review on the varied concepts of watershed management and planning according to guidelines published by five selected world organisations.

Chapter 4 describes the practical experiences from selected developing countries in addressing the issue of watershed management and planning. The results of this section will be useful in the analysis and discussion (Chapter 7).

Chapter 5 is a critical review and assessment of the current state and practice of watershed management and planning in Indonesia. The assessment will focus on the effectiveness of the process of planning used within the existing planning system and hierarchy in Indonesia and data that is available in the planning system. This will be achieved by reviewing the documents of national guidelines and documents of watershed planning established by selected prioritized watersheds in Indonesia.

Chapter 6 is the discussion by comparing and contrasting the result of the review from Chapters 3, 4 and 5. This will be done through cross-check matrices that will provide important points to be analysed. Further, the gaps identified in the comparison will be discussed using the theories as previously described in Chapter 2.

Chapter 7 will be the conclusion that indicates the extent to which this research has achieved the objectives proposed in Chapter 1, including summarized recommendations towards the improvement of watershed management and planning in Indonesia. The conclusion will be followed by suggestion for further study.

The complete structure of the thesis and flowchart of the chapters are illustrated by Figure 1.4:

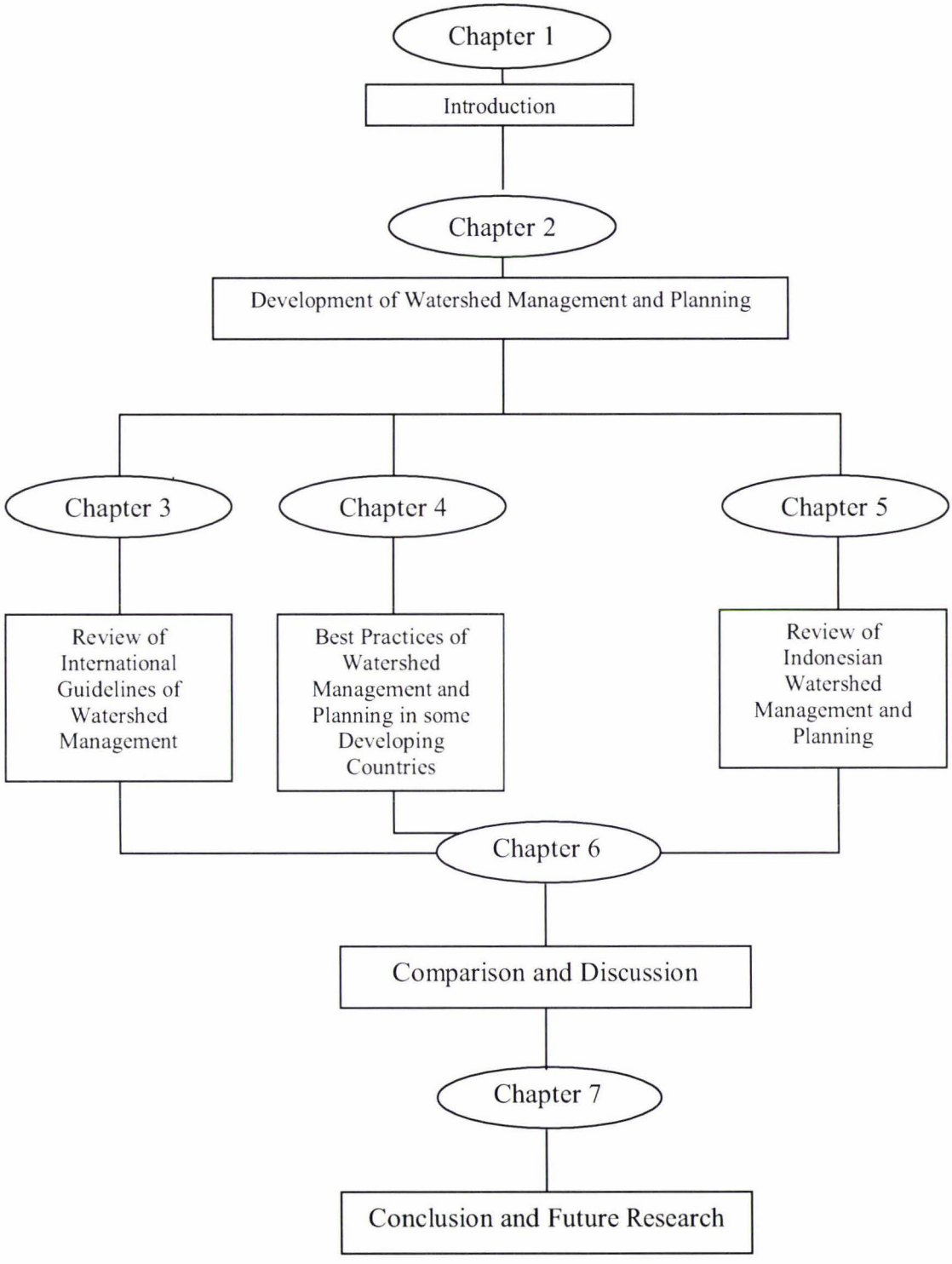

Figure 1.4. Thesis structure

Chapter 2

DEVELOPMENT OF WATERSHED MANAGEMENT AND PLANNING

2.1 Introduction

This chapter reviews the development of watershed management from the context of both developed countries and developing countries. This will be based on key literature, and develop some conceptual frameworks on watershed management. Next, the review will be broken down and focused more on the topic of watershed management planning. Before the review of several dimensions of watershed management planning, there will be a section that particularly discusses the understanding of planning in watershed management as a process. In this section, the attention being put into the planning aspect of watershed management will be also demonstrated through the description and review of a number of studies that have been conducted in this particular area. The review of these relevant previous studies includes those which have been done both in developing countries and in developed countries. Many of them have assisted in the process of building this research proposal, in ways such as providing familiarity with the topic of watershed management, in developing an appropriate approach for the research, and in indicating further questions to be answered and problems that still need to be solved.

2.2 Historical Review of Watershed Management

In 1998, the United Nations Commission on Sustainable Development strongly urged governments around the world to endorse watershed management as a means to manage freshwater (Commission on Sustainable Development, 1998, in UNEP-DTIE, 2002). But this is not the first time attention has been given to watershed management. The history of watershed management has been underway for a relatively long time. Brooks & Eckman (2000) said that watershed management initiatives have been implemented over the last half of the 20th century. They also noted that for many centuries, watersheds have been viewed as useful systems for planning and implementing natural resource and agricultural development. Some of the earliest civilisations have recognised the importance of watersheds, showing the philosophical history of the

concept of watershed management. An ancient Chinese proverb states that "Whoever rules the mountain also rules the river" (Brooks & Eckman, 2000). In their early settlement in Hawaii, the Polynesians organised their economic and political systems on the basis of watersheds (Morgan, 1986 in Brooks & Eckman, 2000), realizing that their livelihood was dependent on sound management of both land and water. A long time before the emergence of watersheds and watershed management terms, the relationship between humans and land, water and vegetation within watersheds and concern about these relationships, has existed in tropical developing countries. For instance, Plato in his manuscript, Criteas, about 400 B.C., described watershed degradation by forest destruction and overgrazing in the Mediterranean Basin more than 2000 years ago (Pereira, 1989). Another philosopher, Lucius Columbella, observed that the clearing of forests has caused rapid decline of soil fertility.

2.2.1 Historical review of watershed management status in developed countries

Chronologically, the earlier development of the watershed management concept is found in some developed countries rather than in developing countries (Sheng, 2001; Unasylva, 1991). Some other factors also caused the differentiation in the development of watershed management in both of the countries groups.

In an editorial of an FAO journal, Unasylva (1991), reported that the origins of modern watershed management can be traced to two parallel and independent efforts. The first was in Europe to re-establish the Alps, that started in the last quarter of the nineteenth century. The second was the conservation movement in North America in the 1930s, when the opinion of watershed as a sound basis for water resources planning and management began to appear and the term watershed management began to be used (NRC, 1999; Veale, 2003). These two movements explain why the development of watershed management came earlier in countries based on western (European and American) cultures. Unasylva (1991) and Sheng (2001) reported that the European effort led to the development of most of today's land restoration and torrent-control techniques, where the majority of work was for flood and debris control of mountain streams and their drainage basins. Meanwhile, the Americans led with the era of vegetation manipulation and soil and water conservation, where the emphasis was on managing the upstream areas or watersheds for water benefits such as water yields,

water quality and flood prevention. Over time the watershed approach became widely used in many places in the United States to protect and enhance natural resources (Reimold, 1998b).

There is one common factor shared by the two approaches which came from different origins and were different in many respects: the techniques employed were designed primarily for use in watersheds that were only slightly, if at all, affected by human action. They were, therefore, designed to have an impact on naturally occurring physical relationships. Although both of the approaches mentioned above will influence the development of the watershed management concept in developing countries, this factor will be the point that distinguishes the watershed management in developed countries from those in developing countries.

The development from land management to watershed management was not without its problems. Even in a developed country such as the United States, Reimold & Singer (1998) reported that land use planning had been resisted in the early period of watershed management development because there had been a perception that the planning was a cancellation of the rights of individual ownership of land. But later on, the focus of national efforts started to be given to the protection and enhancement of public resources, including air, water, or federally owned land. Previously there had also been no regulation to govern land management practices in uplands, which can affect the downstream water quality. Then there was the U.S. Clean Water Act appearing as a good example of regulation to attempt to integrate physical, biological and social aspects of the nation's waters. Later, as the individual consciousness on the importance of land and water management increased, the public awareness was strengthened. The concern of the public regarding water and land issues has stimulated the transformation of organisations and institutions in many places. Organisational and institutional change has become one of major changes in the development of watershed management.

The development of watershed management has affected the way that many developed countries organise their government agencies to integrate environmental, social, and economic perspectives. Canada is one of the developed countries that led the initial development of the watershed management concept and has a lot of experience in introducing watershed management as an integrated and ecosystem-based initiative. The

organising of water and environmental activities by provincial governments has been traditionally done in watersheds (Newson, 1992 in NRC, 1999). For example in the province of Ontario, the driving force of watershed management has developed since the first Ontario conservation authorities were created in the late 1940's (Conservation Ontario, 2003). Initially, in the first decade of watershed management development in Ontario, it focused on a single-issue program to manage floods. Later, in the 1980's and 1990's the concept of watershed management was growing and developed into a broader concept that addressed more complex issues related to resources and environmental protection, which also took the interrelationships among these issues into account.

In Australia, initially the creation of organisations with a watershed management function was only intended to serve as flood mitigation authorities. For this purpose, the Hunter Valley Conservation Trust was created in New South Wales in 1950, and a similar authority of Dandenong Valley was created in Victoria, in 1960s (Margerum, 1996 in NRC, 1999). Later, catchment water management boards were established in 1995 in the state of South Australia to serve as management connections between watersheds and river channels, and to cope with broader issues (State of South Australia, 1995 in NRC, 1999). Recently, in 1997, legislation in Australia has made a clear distinction between the role of the catchment management boards and the state or federal agencies. The catchment management boards have the responsibility for resource management, while state and federal agencies have the responsibility for standard setting and regulatory enforcement (Dyson, 1997, in NRC, 1999).

New Zealand has a longer record of the use of watersheds as administrative units. The history started when River Boards were established in 1868 in response to the problems of flooding and erosion. Until the 1980s there were 20 Regional Water Boards in New Zealand. In 1989 16 new regions, defined by watershed boundaries, were created through the reorganising and consolidation of local governments (Dixon and Wrathall, 1990, in NRC, 1999). The New Zealand example shows that organising according to watershed boundaries is a practicable method to ensure local control over water and water-related resources.

2.2.2 Historical review of watershed management status in developing countries

The influence of western civilisation in the development of watershed management in developing countries is strong. Many projects aimed at soil and water conservation can be traced back to the colonial period, particularly by British colonialism (Brooks & Eckman, 2000). In the 1960s – 1980s, the focus in developing countries was maintained to restore degradation related to land and water resources and to protect earlier water resource development investments that had been established during the colonisation period. Unfortunately, many projects were done without the spatial and temporal view of watershed management (Brooks & Eckman, 2000). The projects have been criticised as too ambitious in demonstrating the rapid progress toward development, but as often carefully recognising and identifying the causes of the problems.

Should the international comments be interested in watershed management in tropical developing countries? One of the reasons to answer "yes" is that the world food problem is concentrated in the tropical and sub-tropical developing countries, as reported by many international organisations (Wortman & Cummings, 1978, in Pereira, 1989). The second reason is that most of the world's population inhabit these developing countries, and it is estimated that the population will increase. These are the main reasons that have caused the greatest trigger of the concern about watershed resources. To address these issues, protection and management of soil and water resources are critical; and this can be obtained using the approach of watershed management.

Even though the basic concept has been known for decades, the management of watersheds in developing countries is quite different from those in developed countries, due to the differences in socio-economic background and physical settings (Sheng, 2001). Goodman and Edwards (1992), as cited in Heathcote (1998), identified the following issues: (1) natural resources, (2) population distribution and styles of living, (3) economy, and (4) political, institutional, and legal structures, need to be considered to improve chances of successful management. Heathcote (no date), stated that, compared to developed countries such as the United States and Canada, many Asian countries are different in terms of tools, their underlying values, attitudes, and priorities

in managing the watersheds. Even though these differences do not appear explicitly in the planning, they can influence the success of plan's implementation.

The differences in socio-economic background and physical settings between developed and developing countries lead to a difference in the focus needed in watershed management. In developed countries, watershed management is mostly focused on the biophysical aspects, such as hydrology and geology. Meanwhile, in developing countries the focus needs to be on social aspects. This is because in the developing countries economic stability can be both a precursor to and a result of watershed management practices, and social acceptability is closely related to ethical or cultural concerns. For example, social acceptability can affect the availability of trained personnel for management activities (Heathcote, no date). Therefore, Goodman & Edwards (1992) in Heathcote (no date) emphasize that in the context of less developed countries, the plan of programs and projects of watershed management should be economically efficient and socially desirable.

In many developing countries, like Indonesia, watershed management is a relatively new concept. There is still disagreement concerning the vision about the watershed management concept and the programmes of watershed management, as has been stated by BPDAS Brantas (2003). This problem, combined with a lack of understanding, might be one factor that causes the lack of success of watershed management in the country. This problem can be approached from the planning aspect of management. Unfortunately, in this particular aspect, there are not many research projects that have been done in Indonesia. A workshop in planning and watershed management was held in Indonesia, in 2003, which discussed the problem of watershed planning and management internally within the country. However, the discussion was not completed with a satisfactory solution, and there is still a call for further studies. Therefore, this research is expected to offer complementary input through both internal (reviewing the existing system) and external (reviewing international experiences) approaches.

2.3 Conceptual Framework of Watershed Management

The belief that watersheds are the basis for water resource management came into being around the 1930s (NRC, 1999), while the importance of watershed management as a

component of natural resource management has been recognised since the 1950s (Lal, 1997a). In other words, watershed as an appropriate unit for managing water resources has been the recognised for at least 70 years (Conservation Ontario, 2003).

2.3.1 The importance of watersheds as a management unit

The Environment Protection Agency (EPA) of the United States defines a watershed as 'a geographic area in which water, sediments, and dissolved materials drain into a common outlet" (Reimold & Singer, 1998). The common outlet can be a stream, lake, estuary or ocean. Reimold (1998) recognised the quality of water as one of the most important indicators of the health of natural resources.

Advantages derived from taking a watershed approach in managing the natural resources are varied. The United States Environmental Protection Agency (EPA) (Reimold, 1998) advocated using a watershed as the basis for operating and coordinating programs made good sense for environmental, financial, social, and administrative reasons. Besides that, the watershed approach should also be economical since it can improve communication and coordination, which reduce the duplication of effort and conflicting action. Therefore, the U.S. EPA found that the watershed approach assisted in developing local and regional economic capability in ways that are environmentally sound and consistent with watershed objectives. Furthermore, the watershed approach strengthens teamwork between the public and private sector at any level to achieve the most optimal natural resource management. It has been a challenge for most countries to develop an effective planning system within watershed management; that is the one which will: (1) allow an adequate supply of water that is sustainable over many years, (2) maintain water quality at levels that meet government standards and other societal water quality objectives, and (3) allow sustainable economic development over the short and long term (Heathcote, 1998).

There are some alternatives to the watershed as the unit for management and planning. They have been classified by Riggs (1961) as follows: (1) established governmental units at different levels, such as township, county, state; (2) special governmental units, such as drainage or conservancy districts or federal regions; and (3) non-governmental units, such as the community and trade areas. These social infrastructures are created by humans as the impact of their activities. However, they are purely social entities and can

not serve as the physical entity for planning. Therefore they are not to be favoured as the unit of management. Rather, they can help in setting the goals, establishing the broad economic and social context within which planning takes place, assisting in financing, and responsibility for decision (Tolley & Riggs, 1961). But none of them has such unique physical characteristics as the watershed does. It is a hydrologic unit that encompasses complex interrelationships among the elements that include all the consequential implications for land and water use.

2.3.2 Watershed management – general conceptual framework

There are many ways to define watershed management. Black (1996), a hydrologist, defined watershed management as the planned manipulation of one or more factors of a natural or artificial drainage system so as to effect a desired change in or maintain a desired condition of the water resource. A report by NRC (1999) described watershed management as a broad concept that incorporated the plans, policies, and activities used to control water and related resources and processes in a given watershed. Meanwhile, from ecological point of view, Reimold & Singer (1998) termed that watershed management is a strategy for effectively preserving and restoring aquatic ecosystems and protecting human health. Watershed management is not merely about managing natural resources, but also about managing the interrelationship among resource components involved in the watershed system, including managing human activities and all possible affects on the natural resources. This explains why effective watershed management can prevent environmental problems that occur as social impacts on a watershed resulting in water shortage, poor water quality, flooding, and erosion.

In developed countries, such as the United States, the U.S. EPA developed a model called the "watershed protection approach" (NRC, 1999, pp. 15), which stated that watershed management should be an integrated, holistic problem-solving strategy. It can be used to bring back and sustain the physical, chemical, and biological integrity of aquatic ecosystems, protect human health, and provide sustainable economic growth. Today, the concept of watershed management has been developed to address the emerging issues of the environment.

Watershed management can be described as a cycle that has basically been adapted from a standard management model has existed for years. This management cycle has four basic stages or functions, as illustrated in Figure 2.1:

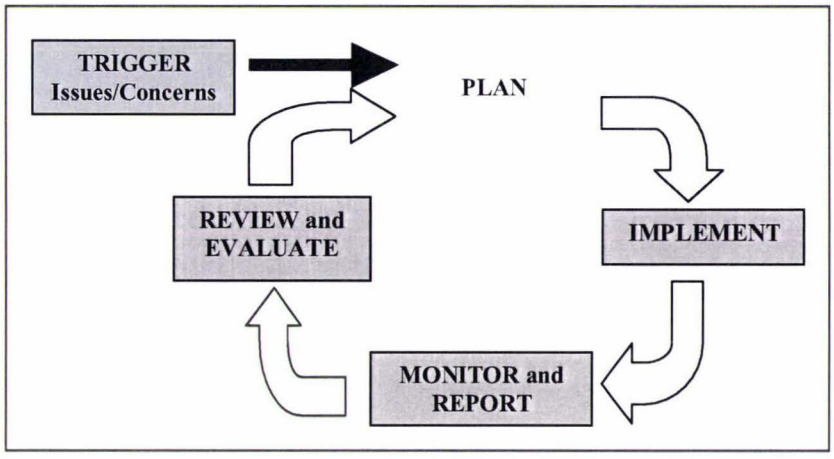

Figure 2.1. The Cycle of Basic Management Process (Veale, 2003 and the Conservation Authorities of Ontario, 2003).

Based on the generic management framework as illustrated in Figure 2.1, watershed management is a cyclic process that has four main stages: planning; implementation; monitoring and reporting; and reviewing, evaluating and updating. One or more triggers usually initiate this sequence of events and stimulate the development of watershed management plans. Triggers can include some environmental concerns in the watershed, such as the degradation of water quality, the increasing sedimentation, erosion caused by illegal logging, or any other problems. Triggers can also include proposals which can have significant environmental effects such as large-scale urban development, gravel extraction or large water takings (Conservation Ontario, 2003).

Planning in that cycle is defined as a stage of developing a watershed, sub-watershed or other watershed-based environmental plans (Conservation Ontario, 2003). Next, the process of implementing the programs, policies or projects that arise from those plans are included in the stage of implementation. Reimold & Singer (1998) defined that implementation is the activation of management strategies based on the plan. Monitoring and reporting is needed to assess whether plan goals, objectives and targets are being met. This stage also aims to conduct periodical communication of the implementation results to decision-makers and the public. Finally, periodic review, evaluation and update are needed to review watershed management plans themselves to

see if changes are required and to provide alternatives of targets, plans or actions. This is to meet the requirements of effective watershed management, that it must be an iterative process (Conservation Ontario, 2003; Hashim, 1998; NRC, 1999). This review should take the importance of both the successes and mistakes of implementation into account.

According to Veale (2003d; 2003), there are some factors that determine the success for each step required in the stages of watershed management, as summarised in Table 2.1.

Table 2.1. Watershed management stages, steps and factors for success (Veale, 2003)

Watershed Management Stages	Watershed Planning Steps	Factor to Success
Trigger	The development of a watershed management plan is usually spurred by one or more triggers (e.g. resource issues such as water quality degradation or institutional/legal requirements such as the update of an official plan).	
Plan	Scoping Characterize the system Set goals, objectives and working targets Develop management alternatives Evaluate management alternatives Select preferred management alternatives Finalize targets Develop implementation and monitoring plans	Tailor planning process to particular watershed Develop clear terms of reference that define process, roles and responsibilities Build understanding and support of Steering Committee Collect baseline data up front Effectively characterize the system by integrating information for each discipline Use GIS to communicate data, information and recommendations Set Clear, understandable goals, objectives and targets Consider a range of alternatives Have expertise and decision support tools for evaluating alternatives
Implement	Develop an implementation committee Identify the implementation requirements and consider the options available Develop a work plan for implementation Allocate resources to the work plan Develop a schedule Carry out the plan	Identify clear, discrete actions and responsibilities Ensure clear accountability of deliverables Ensure "buy in" from key partners from the beginning Gain support of municipal politician and staff Include actions at different scales Set "do-able" short term milestones as well as longer-term targets

Table 2.1. (cont.)

Watershed Management Stages	Watershed Planning Steps	Factor to Success
Monitor and Report	Analyze the issues Develop specific objectives and questions Define impact models, indicators, protocols, sites Establish an information management system Establish rigorous quality assurance program Prepare and implement program Analyze data and prepare reports Practice adaptive management to promote a continuous process of adaptation to changing technologies, issues and societal attitudes.	Celebrate success Report on a regular basis Involve the public in developing monitoring plans, monitoring and reporting Link monitoring to watershed goals, objectives and targets
Review and Evaluate	Review should be done when the natural system has had enough time to respond to management actions It is an opportunity to review the effectiveness of implementation and to adjust the plan based on new technologies and approaches.	Update at 10 year intervals to reflect changes in environmental conditions, stressors, and public preferences.

The model of watershed management provided in this section is applied in Canada which represents a well-developed country, as well as some factors that are assumed as factors that determine the success of the management steps. The framework shows a top-down style of decision making, and is tailored to suit the situation based on western culture. The focus of planning is more on biophysical aspects with the use of high technology. There is no explanation on how social aspects such as public involvement are incorporated into the planning process and whether they can be factors of success in watershed management. Some of the recommendations from the success of watershed management in Canada might be useful for developing countries, but some might not be suitable.

The effectiveness of watershed management and the stages involved has been discussed in many studies. For example, Henry (2000) investigated a planning framework through which farmers can create an agro ecosystem for sustainable production. This study found that to achieve an effective link between conservation and sustainable development in watershed planning on the farmstead scale, community participation is required. The use of this is to identify environmental, social and economic needs in the

watershed. Next, a case study in the United States by Imperial (2001) approached the implementation stage of watershed management by assessing six watershed management programs in the country. The emphasis of this study was on the role of collaboration as a strategy that influences the effectiveness of the implementation process. The result of this study showed that in all six assessed watersheds, collaboration emerged as an important implementation strategy. The use of a collaboration strategy was found at both the operational level and the policy-making level. In another study concentrating on the monitoring and evaluation of watersheds, Zandbergen (1998) developed a methodology for urban watershed management assessment which can serve as a useful tool in the support of effective integrated watershed management. The case study of the Brunette River watershed, in the Greater Vancouver Region resulted in new data, improved interpretation and the synthesis of existing data. This has contributed to the knowledge base on the watershed and will be helpful in improving the monitoring and evaluation of the studied watershed.

2.4 Watershed Management Planning

Unasylva (1991) mentioned that, as with all development efforts, a key to successful implementation of watershed management is appropriate planning. Within the cycle of management (Figure 5) planning is the first function to be completed to address the trigger of concerns and to achieve the objectives of management. Recently, the European Union (EU) Member States who developed a common strategy on the implementation of water policy, stated that planning is a tool or working methodology for decision making with the objective of improving the use of resources available to achieve certain goals. The EU members also state that the primary purpose of planning is "to provide a Plan as an instrument for making decisions in order to influence the future" (Common Strategy on the Implementation of the Water Framework Directive or CSI-WFD-Project, 2003). According to them, planning is a systematic, integrative and iterative process that is comprised of a number of steps executed over a specified time schedule. Specifically, the EU members agree that water planning is a means to improve and support the sound management of water resources. They stress that water planning has to be regarded as a process and not as an objective of the Directive in itself (CSI-WFD-Project, 2003).

Nowadays the literature emphasizes discussion on the importance of watershed management planning as a process, and not merely as an end product of the planning itself. This is because there is a lot of evidence of the failure of watershed management as a result of the ignorance of planning as a process. In the period when watershed management planning was mostly conducted in a top down fashion, the product of planning was regarded as the final goal of planning. People called 'decision makers' (sometimes they were called experts) worked in a closed group. They came up with several documents called 'plans' which then usually sat on the book shelves of the agencies' office. The lack of understanding that planning is a process led to the ineffectiveness of the plan itself, which in turn reduced the effectiveness of implementation as well.

2.4.1 Watershed management planning as a process

In the history of watershed management, initially watershed planning was a very linear process (Hashim, 1998). Within this framework, a planning organisation identifies goals and objectives, states problems, and determines actions to solve problems with the end result being the production of a single final plan. The linear planning process can be illustrated by flow chart in Figure 2.2:

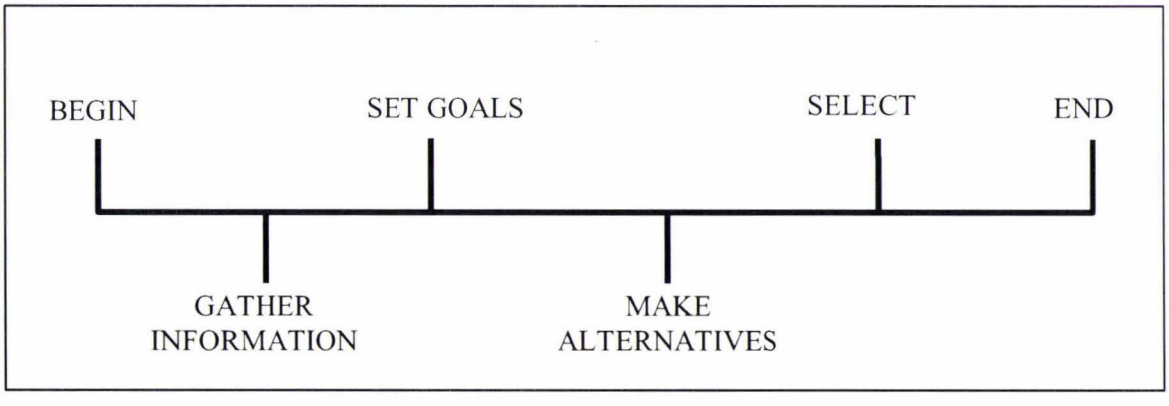

Figure 2.2. Flowchart of watershed planning as a linear process (Hashim, 1998)

Hashim (1998) has criticised that the linear planning model has some limitations. Since the model was not interactive, there is limited participation of affected people in the planning process. With the linear planning process there was also limited coordination with other planning efforts, as decision-making was usually dominated by some people regarded as experts. Also, the linear nature of the process resulted in limited solution

alternatives that could not resolve the problems. Agreeing with Hashim's criticism, Heaney (1993) in NRC (1999) said that one of the things that contribute to the difficulties in the implementation stage of the watershed management plan is that watershed planning is often perceived as a static process that leads to the formulation and adoption of a restrictive master plan. The restrictive nature of the plan results in a static process that can not be agreed to and accepted easily by people, especially when we have to deal with multiple groups of people with diverse interests.

The alternative to the old linear model of planning is a circular planning model (Hashim, 1998). This model was developed on an understanding that watershed planning is a functional process, where all interests are considered. In this model, the process of interaction of all interest is iteratively carried out and forms a circular pattern. The watershed planning as a functional process is illustrated in Figure 2.3.

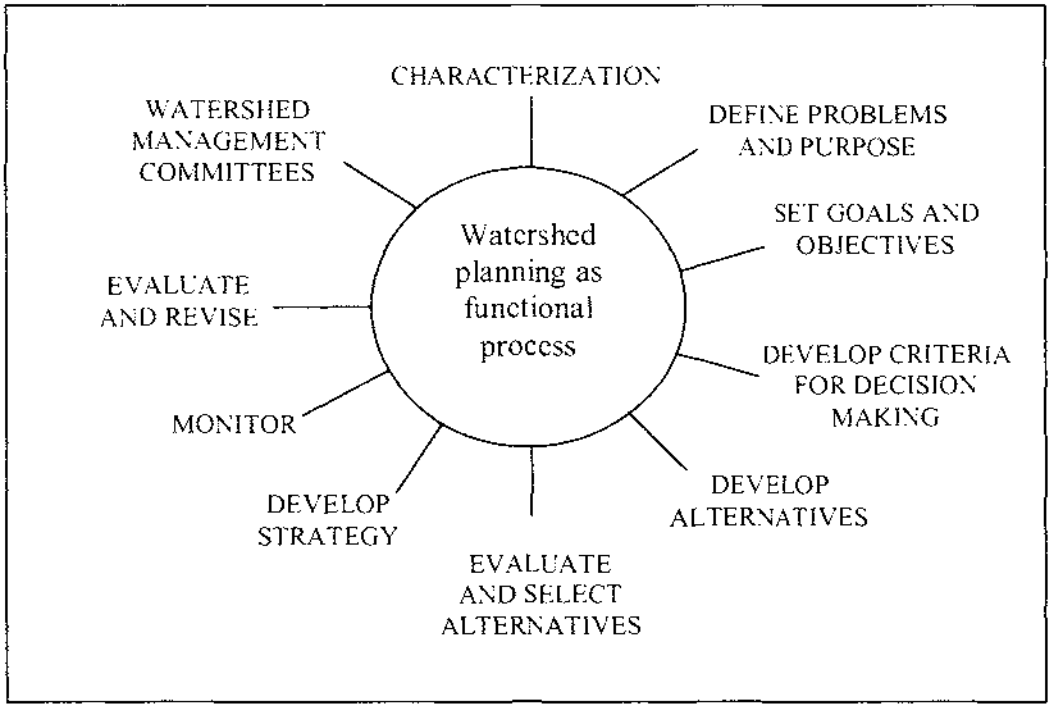

Figure 2.3. Watershed planning as functional process (Hashim, 1998)

Figure 2.3 shows a circular, iterative process in watershed planning, that is broken down from the one stage of planning in the Figure 2.1. Given the clear circular pattern, the circular functional model of the planning process is more dynamic than the linear one shown by Figure 2.3. Therefore, based on the experience of Washington State with the Nisqually River project, watershed planning using the functional model was fruitful and

more successful (Hashim, 1998). However, even though the circular model is more developed than the linear one, it is still a simple model. The model still does not explain how to analyse the relationship between human interactions with the environment in the planning process.

In agreement with the functional model in Hashim (1998), The European Union members state an improved approach for planning (CSI-WFD-Project, 2003) as shown in Figure 2.4.

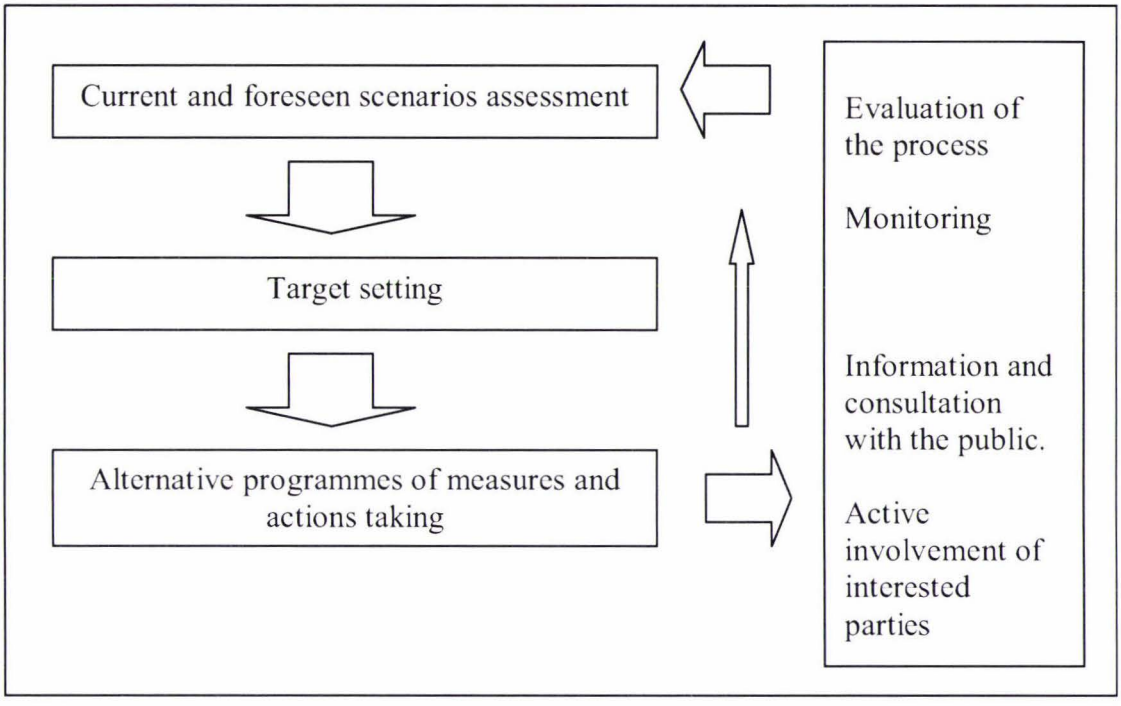

Figure 2.4. The approach of planning as a cyclical and iterative process (CSI-WFD-Project, 2003)

The cyclical and iterative planning process shown by Figure 2.4 has three main stages that are basically similar to those in the previous model. They are current and foreseen scenario assessment, target setting, and alternative programmes of measures and actions taken. There are also monitoring and evaluation steps included in both models, but in the CSI-WFD's model (Figure 2.4), the elements of public consultation and involvement of interested parties are also emphasized. This means the social aspect has been incorporated into and considered in the planning process. Since the process is iterative, the consideration of this social aspect will be developed in a continuous way in parallel, creating a link between the others. Furthermore, CSI-WFD-Project (2003) described that each of the main stages and the link between them consists of ten components, as mentioned in Table 2.2.

Table 2.2. Main components that can be identified within the three main stages of an iterative planning process by WFD (CSI-WFD-Project, 2003)

Main stages	Components according to WFD
Current and foreseen scenario assessment	Setting the scene Assessment of the current status and analysis of preliminary gaps
Target setting	Gap analysis Setting up of the environmental objectives
Alternative programmes of measures and actions taken	Setting up of the programme of measures Development of river basin management plans Implementation of the programme of measures and preparation of the interim report.
Linking stages	Establishment of monitoring programmes Evaluation of the first and second period Information and consultation of the public, active involvement of interested parties

As has been learned through the experience of Washington State with the Nisqually River (Hashim, 1998), one of important principals in understanding watershed management as a process is that, to be effective, watershed management planning should be an iterative process. Conservation Ontario (2003) noted that this reiteration is also called adaptive environmental management (AEM). AEM is an approach that is historically created to involve people in research and development initiatives to improve natural resource management. This was developed in the 90's as an improvement on the previous approaches: Participatory Rural Appraisal and Rapid Rural Appraisal which were popular in the 70's (Allen, 2001). AEM in reiterated watershed management planning is characterized by the following: (1) recognition of the uncertainty of the ability to understand watersheds and predict future changes in them; (2) acknowledgement of learning through experimentation; (3) reflection of the need for, and use of, continuous and deliberate learning and improvement; (4) support to expect "surprise" or natural variability in an ecosystem; (5) requirement of a system approach to planning, managing and monitoring the activities; and (6) the requirement of a partnership approach involving researchers, managers and other stakeholders (Conservation Ontario, 2003). As a consequence of these characteristics, in order to achieve an iterative planning process towards an effective watershed management, there is a need for an interrelationship and harmony among science, management and community.

Such a planning process based on the steps mentioned above has been proven to be successfully implemented in managing the watershed in the U.S. urban areas (Bingham, 1998), as illustrated in Figure 2.5.

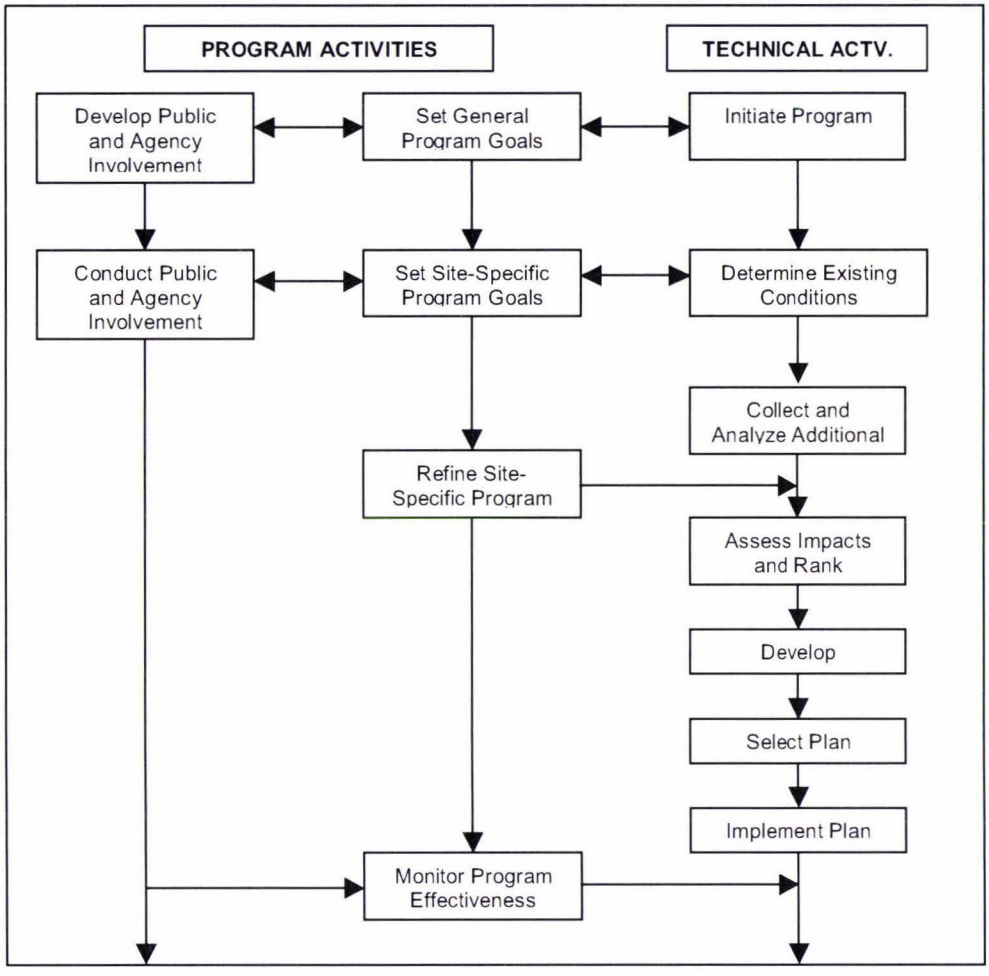

Figure 2.5. Example of watershed planning process carried out in rural watersheds in the United States (Bingham, 1998, p. 177)

The case in Figure 2.5 shows that an effective planning process in watershed management does not involve merely technical activities, but also program activities that include social activities such as to develop and to conduct public and agency involvement. These social activities should be done in a parallel way, along with refining program goals and effective program monitoring. By doing so, the planning is done reiteratively and the effectiveness of the process can be achieved.

Within a different setting, another study which is intended to approach the effectiveness of watershed management planning was done by Symko (2000) in Canada. She did a case study of Crabapple Creek, a watershed with the mountain resort community in

Canada. The study was to identify critical features of planning that are applicable to promote the effective integrated management of the watershed. The project involved a review of literature and procedures for developing the Crabapple Creek Watershed Management Plan. Symko reported that there are critical procedures for the development of a watershed management plan, including: collecting and assessing biophysical information; identifying and engaging watershed stakeholders; identifying critical watershed issues; and refining the management plan through stakeholder and external review. These critical procedures have been recommended to be applied to the development of integrated watershed planning in order to help protect the quality of water resources and habitat in the watershed.

Summarising the concepts of watershed planning, it can be concluded that most planning models are basically similar, sharing four key steps (NRC, 1999): (1) defining the problem; (2) developing goals and finding alternative ways to reach the goals; (3) selecting the best alternative; and (4) implementing the plan.

Therefore, NRC (1999) suggested that watershed planning should explicitly specify processes for identifying: (1) the watershed problem and objectives for its resolution; (2) the appropriate watershed scale; (3) relevant stakeholders; (4) tradeoffs among alternative solutions; (5) shared values guiding selections of alternatives; and (6) best actions to balance among tradeoffs.

All of the examples provided above are based on the global practice of watershed management and planning in most developed countries. We do not know whether they are suitable for tropical developing countries, especially for Indonesia. The further chapters of this study will review the current status of watershed management and planning in some developing countries, and compare them with watershed management and planning in Indonesia.

2.4.2 Dimensions of watershed management planning

Typically, a watershed consists of a physical landmass, vegetation and water resources (Ramadasan, Salam, Kumaran, & Perumal, 2000). These three components form the biophysical dimension in watershed management and planning systems. A watershed is

also a place to live for many people who introduce a dimension of social and institutional involvement in watershed management and planning. All of the features are related to each other as land, forest and water have a complex link with humans and their activities.

The effect of this link might be either positive or negative. Good management of land and water can provide the people with the production of goods and services. These include things like agricultural production, irrigation, drinking water, recreation or amenities. Conversely, mismanagement can result in destructive change in natural resources, such as forest resource degradation, sedimentation, land erosion, flooding, landslides and water pollution.

The dimensions of watershed planning mentioned above are related to the functions of watersheds, which Williams (1990 in Ramadasan et al., 2000) grouped into four broad categories, namely: physical /hydrological, chemical, biophysical and socio-economic (Table 2.3).

Table 2.3. The functions of watersheds (Williams, 1990; in Ramadasan et al., 2000)

Category	Functions
Physical/Hydrological	Flood mitigation Coastal protection Recharging groundwater storage Sediment trapping Atmospheric and climatic fluctuations
Chemical	Pollution trapping Removal of toxic residues Waste processing
Biological	Productivity Decomposition Nutrient transport Nutrient utilisation Habitat for biodiversity
Socio-economic	Consumptive/subsistence use value Non-consumptive use value (e.g. aesthetics; education and research; recreation)
Note: None of the above categories is exclusive and each can have a profound effect on the other.	

The following section reviews each of those dimensions with issues and matters to be considered.

2.4.2.1 Biophysical dimension

a. Vegetation

Lal (1997b) stated that vegetation cover is one of the watershed characteristics that governs the fluvial process within the watershed. The functions of vegetation are to block, to store and to regulate stream flow and infiltration (Ministry for the Environment, 2000). Pereira (1989) said that destruction of natural vegetation without replacement by productive agriculture or forestry will result in soil erosion and sediment transportation. Therefore, vegetation is a part of the biophysical dimension that is important to be considered in watershed management, including in the planning process. The importance of vegetation in watershed management and planning is supported by the results of some studies.

Neville (1996) explored the role of vegetation as a potentially cost effective contributor to watershed management in the upper Gwynns Falls watershed in Baltimore, Maryland. His results indicated that the conservation of existing forest cover and the replacement of trees on pervious sites, particularly in intensive use areas, can significantly reduce total runoff, high 10 percent flows and average peak flows; and can increase low flow. Abdul Rahim (1996), Kennedy (1998) and Zainuddin (1996) in Ramadasan et al. (2000) also stated that there is a close relationship between forests and water within the watershed and this reflected the importance of forests to total or integrated water resources management. Hamilton & Pearce (1988) stated that "forests in a watershed need to be maintained and kept undisturbed" to protect the watershed and provide the best vegetative protection against erosion and mass movement, and yield the least sediment. Undisturbed forests also delay peak flows, and usually reduce peak flows and storm flow volumes more that other cover or logged forest. Vegetation plays a vital role in the protection of the soil surface from the direct impact of rainfall and the maintenance of rapid infiltration (Pereira, 1989). This is the reason for the causal relationship between deforestation and the occurrence of flood that can be found in many places around the world. The reduction of the forest canopy through cutting or logging reduces the evapotranspiration losses from the water budget of forest watersheds, and this causes the increased water yield in streams from the harvested area (Hamilton & Pearce, 1988).

The wide range of benefits to forests in managing the watershed has been inspirational in some efforts to carry on reforestation. Hardjono (1980 in Hamilton & Pearce, 1988) reported that in Indonesia, reforestation with *Pinus merkusii*, *Tectona grandis*, *Swietenia macrophylla*, and *Eucalyptus alba* has resulted in the reduction of sediment yield in the planted sub watersheds. They also reported that the sediment yield from forested areas is three times lower than in an agricultural watershed.

The function of forest and other vegetation cover is clearer when related to the link between the upstream and downstream of a watershed. The link between erosion that occurs in the upstream and the sediment problem that affects the people downstream calls for the role of forest and vegetation cover in reducing those problems through better upland watershed management. Hamilton & Pearce (1988) reported that forests have an important beneficial role to play in reducing the downstream social and economic costs of unwanted sediment. An understanding of this issue is required as a consideration in the process of watershed management and planning. Adequate data on vegetation cover should be collected and well-analysed to assist in developing a watershed management plan.

b. Land and soil

There is a closed relationship between land resource and rivers or streams within a watershed. The health of lands can both influence and illustrate the quality or the health of the rivers and streams (Conservation Ontario, 2003). In understanding the watershed as the natural basis for resource management and development, we need to understand that the land has been shaped by water through a geological process.

Land and soil resources and human activity are very close related. The expanding human population and their extensive needs lead to the increase of cultivated land, and result in the scarcity of land and natural resources. For instance, in the tropical developing countries, it is estimated that the need of farm land for feeding is about 0.5 hectare per capita (Pimental et al., 1995 in Brooks & Eckman, 2000); while it is projected that by the year 2025, 45 countries in the tropics will have less than 0.1 hectare of arable land per capita. Brooks & Eckman (2000) reported that land degradation resulting from cultivation, grazing, and deforestation of marginally productive lands, has made the effects of land scarcity into complex problems.

Exploitation as the result of an expansive population and their activities also leads to the degradation of soil and decline in soil quality. Many cases of soil erosion and pollution are emerging as a result of the impact of human activities rather than by natural hazard. For instance in China, Zhang (1997) reported that soil degradation occurred in the form of soil erosion, decline in soil fertility, and soil acidification. Lal (1997a), suggested using watershed management techniques as attempts to reserve the destructive trends towards the improvement of soil quality. Effective planning can contribute to watershed management in solving the problem of soil erosion and other soil degradations.

c. Water

Heathcote (1998), stated that water is the lifeblood of a watershed ecosystem. The main features of a water resource are its quantity and quality. For many developing countries, both of the features have been emerging as problems for decades. There are two main disasters related to water quantity that can be considered as two sides of a coin: drought and flood. For instance, on Java Island, Indonesia, the distribution of rainfall is uneven, with 80 percent in rainy season and 20 percent in dry season. Within the degraded watershed, with a reduced capacity of the watershed to store the water in, there is intensive flooding in the rainy season and a reduced supply of water in the dry season.

For people living in arid and semiarid regions, water scarcity has been a problem, which has been aggravated by an increasing population. Lal (1997b) reported that the world trend of water scarcity problems is estimated to be increasing over time in accordance with the increasing population. It is reported by Lal that in 1995 there were 166 million people living in 18 countries who were affected by water scarcity. According to his projection, in 2050 it is estimated that the number of population affected by water scarcity will increase by more than ten times (1,700 million), and the problem of water scarcity is estimated to spread to 39 countries (see Table2.4).

Table 2.4. Status of world's fresh water availability (modified from Lal, 1997b)

Parameter	1995	2050
World population (billions)	5.7	9.8
Population affected by water scarcity (millions)	166	1,700
Countries affected by water scarcity (millions)	18	39

Many developing countries have been struggling to combat the problem of drought and flood. Indonesia, India, Bangladesh and some South Asian countries are examples of developing countries that have been faced with this dilemma.

Another environmental problem associated with water that usually accentuates the problem of drought or water scarcity is the water quality problem. The quality of water in a watershed can be influenced both by natural processes and human activities. The influential natural factors include geology, soils, topography, vegetation, wildlife populations and climate (NRC, 1999). Water quality issues can also be promoted by the population through human activities that intensively use the natural resources. NRC also agrees that human activities and land use in the watershed are the more important causes of most water quality problems. In developing countries, this reality can be seen clearly as there is a rapid development of industries. Lal (1997a), said that there is also a relationship between the water quality issue and soil degradation. The processes of soil degradation through varied adverse human activities can cause pollution, as has been experienced by some highly populated countries in the Asian region. Further, Lal (1997b) also noted that in many developing countries, agricultural activities can lead to the eutrophication of water, since high nutrient content in the water body causes growth of water weeds.

Watershed planning, which includes consideration of water characters, plays a vital role in watershed management. NRC (1999) suggested that there are some key hydrology components including precipitation, evaporation, the amount of water held in the soil, stream flow, ground water and water quality that need to be considered in watershed management planning. Heatchcote (1998) added transpiration and run off into the previous list of hydrology components. These are the hydrological features which together with climate components play a role in hydrological processes in the watershed ecosystem and need to be understood. The inventory on these water features provides a scientific basis in watershed management planning and in assessing the impact of management actions on the watershed.

d. Climate

According to an international organisation that works in the area of environment, the United Nations Environment Programme (UNEP), climate and land cover are major

factors that regulate the hydrological cycle in a watershed (UNEP-DTIE, 2002). Moreover, Heathcote (1998) also stated that climatic factors that include temperature, wind force and direction, and precipitation, create important influences on water resources through their role in hydrological and biological process in a watershed. For instance, temperature regulates the hydrological cycle in a watershed through its influence on evaporation and transpiration, and on the growth of vegetation in the watershed. The process of evaporation and transpiration, which are basically the transfer of water from its liquid state to its vapour form, are related to another process, namely precipitation. Precipitation is the reverse process of evaporation and transpiration (often combined as evapotranspiration), from which all the water in a watershed come in varied forms (rain, snow, or dew) (Heathcote, 1998). Another climatic element is wind, whose condition can affect many land and water phenomena in a watershed, especially evapotranspiration and wind erosion.

Understanding the influence of climatic factors in the hydrological process of a watershed, means it is not surprising that climate should be given plenty of attention. The availability and good management of climatic data are very important in watershed planning to support a successful watershed management program. The ignorance of the need for appropriate attention or the ill-management of climatic data has been a proven result in many environmental problems. The impact of a flood or drought that occurs naturally can be worse because of the lack of climatic data or mismanaged climatic data. In some tropical developing countries, the occurrences of natural phenomena, such as cyclone Bola in Guatemala and el Niño in the Philippines, drive the peoples attention to the importance of the regular management of climatic data. In developing countries, as has been reported by Pereira (1989), the lack of ability in managing or even collecting data due to lack of technology and skill is a common problem. Therefore, some practitioners suggest maximising capabilities (particularly in terms of skills and equipment) of research agencies in developing countries to maintain, to manage and to analyse the climatic data to contribute effectively to watershed management.

2.4.2.2 Social dimension

Generally, Meijer (1984) said that planning has implications for social relations and planning has to be considered as a social process in itself. Bishop (1970), in Heathcote,

(1998) argued that the development of watershed management strategy is fundamentally a process for creating social change. Therefore, it should be a set of activities that must logically be approved by the affected society. As a consequence, it is not surprising that the occurrence of social conflicts in watershed management is common. The United Nations also recognise that the social dimension in watershed management is fundamental and an important priority (Commission on Sustainable Development, 1998 in UNEP-DTIE, 2002). Unfortunately, the attention given by watershed management activities to socioeconomic factors is limited. Brooks & Eckman (2000), who did a review on the success of some watershed management field and training projects, involving 25 countries, found that only five out of thirty projects they reviewed tried to study socioeconomic factors, such as land use, farming systems or land tenure, for their planning process before running the implementation. They concluded that watershed planning has historically relied upon engineering and technical expertise, but has been deficient in socioeconomic aspects (as also observed by IDB, 1995, and Shah, 1994, in Ravnborg & Guerrero, 1999). This caused the less than optimal outcomes and the discontinuity of the projects' benefits.

Paudel (2002) reported that there are some management issues related to the social dimension in watershed management to be addressed in developing countries. These include: (1) achieving a shift from a centrally controlled top-down to bottom-up mode of planning; (2) involvement of poor inhabitants in watershed management activities; generation of appropriate technologies in watershed management and their transfer to local communities; (3) establishment of an interface between the top-down and bottom-up modes of watershed management; and (4) strengthening the institutional capability of local organisations involved in watershed management and planning.

The following sections review some social comments that relate to those issues.

a. Public need

Water resources are vital for socio-economic development. They play an important role in many aspects of the lives of humans, such as social infrastructure, health, agriculture, food, energy, industry and any general consumption of people's welfare (Mumma, 2001). Much of the literature says that watershed management and planning is greatly

stimulated by public need and population growth. For instance, Perez & Tschinkel (2003) stated that most of the watershed management projects around the world, particularly in developing countries, are still focused on assisting in combating poverty, increasing agricultural productivity and increasing the income of the local community. Public involvement in watershed management is commonly started by the need for a better living conditions or a more optimal use of resources. For a long time, planning in general, has been used to promote and support human growth by the use of rational procedures of thought and action (Meijer, 1984). Smith & Rast (1998) in Reimold (1998) also support the opinion that planning in water resource management is a must, since the global water supply is finite while the world's population is continuing to increase rapidly in many places around the world. This results in the decreasing amount of water available per capita. Regarding growth as a process, Faludi (1976 in Meijer, 1984) therefore stated that as an instrument to promote human growth, planning is not a product but a process. Planning is a process to assist humans to use water resources in an environmentally sustainable manner.

b. Social conflicts

Competition in the use of watershed resources often results in conflict. Given that the global water supply is finite with the world's rapid population growth, the conflict that results from water resource use can be geographically based within a watershed. This is because activities in the upper part of a watershed may have an unexpected impact on the lower or down stream part of it. Conflicts that are raised or stimulated by the value of water resources such as social and economic good within watersheds is not a new issue. Gleick (2000) has chronologically compiled a list of conflicts regarding water resources that have occurred around the world. On the list, it is stated that the oldest conflict involving water resources dated back to 1503, when Leonardo da Vinci and Machiavelli planned to divert the Arno River away from Pisa during a conflict between Pisa and Florence, two states in Italy (Honan, 1996 as compiled by Gleick, 2000). Today, conflicts about water resources and watersheds are still going on around the world. They involve either two or more countries or states, or on a smaller scale, two or more provinces or regions in one country. The situations where watershed boundaries do not coincide with administration boundaries often stimulate social conflicts.

In Indonesia, the problem caused by cross-boundary is also a big issue in watershed management. On Java Island, the most populated island in the country, the utilisation of the Bengawan Solo River has caused conflict as two different provinces are using the one resource: Central Java (upstream) and East Java (downstream). There has been conflict for years because the water resource in the watershed has been used mostly for the advantage of people upstream rather than down stream; this results in drought for farmers in some regions in East Java province (Annonim, 2003a). The problem is also reported to have resulted in the deterioration of drinking water quality in some areas downstream, due to the use of water resources in the upper area for industries. On the other hand, the stakeholders in the upper part of the watershed claimed that there has been no effort put in to running such effective management by the local government of the downstream region.

c. The need for public and stakeholder involvement

Based on the review of watershed planning by some watershed authorities in Canada, Conservation Ontario (2003) noted that besides external triggers and the four main stages, there are two other primary elements in watershed management, namely the partnership process and public involvement. The partnership process is defined as a process that involves various stakeholders, including conservation authorities and municipalities. The involvement of and consultation with the public takes place at every stage of watershed management, and is included in the process of planning. Bingham (1998) stated that the support and involvement of the public is crucial to plan implementation and its success.

The fact that watershed boundaries often cross regional, provincial and sometimes national boundaries, leading to social conflict within a watershed, is one of the reasons the importance of public and stakeholders involvement is emphasized. Secondly, watershed management is an integrated approach to management that considers all aspects of the environment. Consequently, there is a requirement for different agencies and different stakeholders with varied interests to work together to bring the integration of the aspects into reality. Another reason is that today, the partnership approach, in which the public and stakeholders' involvement is core, has been relatively widely-accepted in many places as a planning and decision-making process. How this third

reason can support such effective watershed planning will be discussed further by reviewing the next three planning models.

Based on the relationship among stakeholders and the authority involved in the watershed planning process, the USDA Forest Service (1993), as adopted in NRC (1999) illustrates three planning models (Figure 2.6).

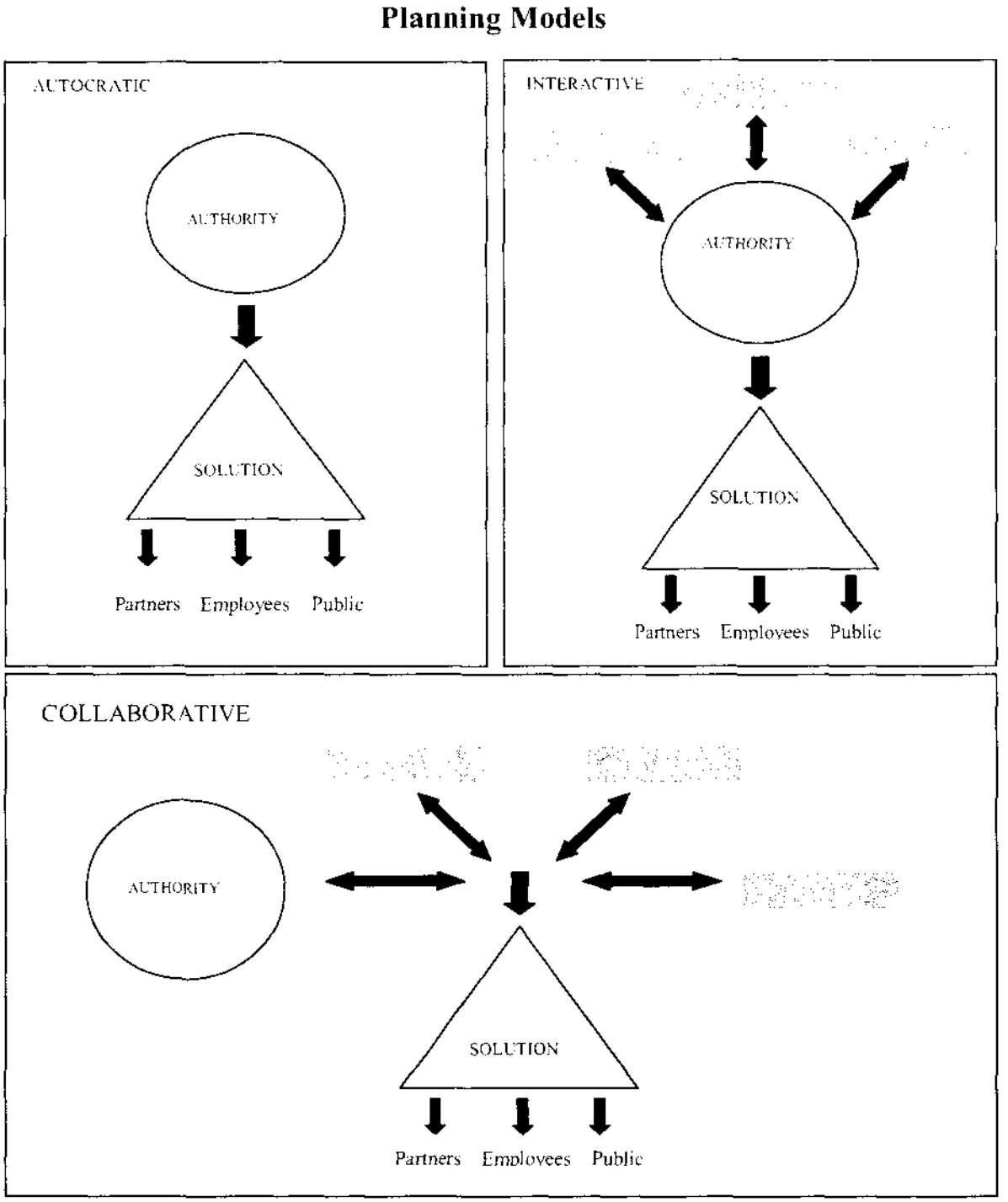

Figure 2.6. Illustrative planning models (USDA Forest Service, 1993, adopted by NRC, 1999)

Out of the three planning models, the collaborative planning model is the one that is favoured by many experts (NRC, 1999 and Veale, 2003). The reason for this is because this model can best accommodate the need for public involvement in the process of decision making through giving stakeholders a voice (NRC, 1999). Collaborative planning involves diverse community interests within the watershed. Further, Veale (2003d) who did a review of watershed management and planning in Canada found that the collaborative approach is seen as critical to the success of watershed planning and the implementation of management action. She recognised this approach as the concept of a marriage between "bottom-up" and "top-down" planning.

The problem is, although consideration of the needs of local people and their active participation is gradually being recognized as desirable and essential in watershed management, their involvement in the process of conceptualizing these efforts is still immature (Unasylva, 1991). Similarly, although participatory methods have been promoted in watershed management and its importance in planning has been emphasized by many people, D'Ostiani (1999 in Brooks & Eckman, 2000) notes that the methods are not ends in themselves, and are insufficient if used alone. In watershed management projects, Michaelsen (1991) said that local populations and their representatives are still only rarely involved in the design and planning stages. Local involvement and local input in the planning process needs to be stressed to ensure the full consideration of the most basic socioeconomic and cultural dimensions. In order to address this problem, Michaelsen (1991) stresses the use of a participatory approach in watershed planning as well as in monitoring and evaluation.

A study by White (1994) indicates that voluntary collective action can be an effective means to address the cross boundary dilemmas that have been mentioned above as social conflicts that commonly emerges in watershed management and planning. In regards to promoting this action, White (1994) recommends that governments need to : (1) provide an enabling policy environment; (2) disseminate knowledge and concern over public dilemmas and the alternative means to address them; and then (3) facilitate the coordination of action to resolve those dilemmas.

2.4.2.3 Institutional dimension

Planning in general management has implications for social relations and planning has to be considered as a social process in itself. The consequence of this is that planning then becomes an institutionalised activity in social relations (Meijer, 1984). This is the reason for the existence and importance of the institutional dimension in watershed planning. Ravnborg & Westermann (2000), and van Noordwijk et al. (2000) in Perez & Tschinkel (2003) suggest that in developing countries, one of the greatest challenges is to establish institutional mechanisms that coordinate and connect most stakeholders in partnership for collective action in the upper and down-stream zones, within a sub-watershed and even between watersheds.

The term: "institutions" usually refers to a legal system or set of rules governing watershed management, organisational arrangements involved in the planning and implementation of watershed laws, policies, strategies and programs, and also the relationship or coordination among those who are involved in watershed planning and management. These three aspects of an institution will be reviewed in the following section.

a. Legal system: Insuring regulatory and legal back-up

Naturally, humans are social creatures who tend to live socially in groups. Therefore, they naturally tend to utilize and manage resources together as groups. This characteristic sometimes leads to conflict, and to solve the conflicts in a social way they need tools within the society. That is why rules or legislations are created in the framework of conflict resolution. The function of rules, regulations or legislation in the legal system is to state the boundaries of acceptable behaviour within the society, and to determine sanctions that will be forced on those who break the rules existing in their society (Heathcote, 1998). In other words, the legal system in a society is a reflection of society's consensus to judge and correct immoral behaviour. In watershed management, the back-up from the legal system is important to support the success of the management practices. Given the complexity of watershed system and the high possibility of conflicts arising, the effectiveness of regulatory and legal back-up in watershed management is important. Some studies have been conducted by some researchers to assess the effectiveness of these measures.

In the western world, Veale (2003d) analyzed the effectiveness of watershed planning and management and associated legal tools in Canada, which was developed through an extensive literature review of relevant material. In order to find the lessons learned and to recommend best practices, this research also reviewed international experiences from around the world. Veale discovered from the analysis that most of the watershed planning and management initiatives in Canada have been newly created through legislation or are just in the process of being formally established. The only old initiative that has been formally activated through legislation is the one in Ontario province, which was set up under the Conservation Authority Act in 1946. The study found that weak environmental legislation can undermine the implementation of watershed management, including inadequate standards and guidelines. According to the result of this study, the benefit of enabling legislation in watershed management is to provide the framework for administrative procedures, partnership building and the legitimacy of certain actions. The international example of effective legal back-up in watershed management resulting from this analysis are: The United States Safe Water Drinking Act and the Clean Water Act that bring a shift in the planning focus from an old dependence on water supply intensification to the more efficient management of resources; The South African's National Water Acts that recognise watersheds as the natural unit for watershed management; and The Resource Management Act in New Zealand which sets up 12 regional councils based on the major watershed boundaries to carry out environmental planning. It was discovered that the lessons learned and the best practices identified through the review can be actively shared with other governing bodies across Canada.

Perez & Tschinkel (2003) said that regarding legal back-up in watershed management, the more serious problem is often the enforcement of the policies and rules as part of legal system itself. The most possible cause of this problem, according to these researchers is that the policies and rules are poorly designed. This leads to difficulties in enforcement and opens the way to corruption. To solve this problem they suggest assisting government agencies and legislatures with the drafting of the rules. Further, Arriens et al (1996) also suggested that well-trained and motivated individuals are essential to enforce laws and regulations to ensure their effectiveness.

b. Organisation

Organisation in watershed management and planning is an essential part in creating a practical step toward collaboration for the development of a watershed (LeMoigne, Barghouti, Feder, Garbus, & Xie, 1996). To reach the most optimal role of an organisation in achieving successful watershed management, both in planning and implementation, the best organisational structures should be determined. However, to achieve the best organisational structure that best fits into watershed boundaries is not an easy task; as stated by NRC (1999), that organisational structure can be either a barrier or an avenue to success. Although the number of local watershed-based management organisations of water resources today is increasing, there is very little information on the effectiveness of these organisations. The results of a study by Draeger (2001) that conducted an empirical evaluation of 79 watershed organisations shows that the level of effectiveness was found to be positively related to staffing, concern for water quality, public outreach efforts, existence of the citizens' advisory board, and operating a water quality monitoring program. Further, the study also found that the form of organisation was considered to be an influential factor in watershed organisation effectiveness. Highly effective watershed organisations were found to emerge from diverse organisational forms, including the local unit of governments, non profit organisations and voluntarily formed interjurisdictional agreements that were studied. In addition, the effectiveness of organisations in water resource management is also influenced by the character of the organisations. Holmes (2000), in studying water pollution management found that the organisations with more bureaucratic characteristics are less effective in providing a service. This is because in the less economically developing countries they tend to be more prevalent and then their existence become less efficient.

One of the problems related to organisation in managing watersheds is fragmentation. Sometimes the roles among the organisations involved are not well-defined and the areas of responsibility are not well-clarified. This may lead to contradictions and/or roles' overlapping among organisations. Therefore, the implementation of a watershed management programme often becomes inefficient. An example of this problem is the experience of Srilanka, as reported by ADB (Phan, 1996), which has a poor water management organisational structure. There are more than 40 agencies that have some

degree of role, responsibility or interest in water management, distributed at the national, provincial and local level; but many of these organisations have overlapping responsibilities that sometimes lead to conflict. In order to ensure the success of watershed management, the normal areas of organisational responsibilities should be recognised in the planning (Brooks, Gregersen, Lundgren, & Quinn, 1990). Organising in watershed management has to deal with different levels of management and different areas of jurisdiction and functions. It is suggested in NRC (1999) that the management of resources of small watersheds ideally should be handled by local organisations, while larger scale organisations should deal with aggregations or nested hierarchies of smaller units. Regarding functions, local level organisation can best handle such functions as planning and zoning, while other functions such as setting regulatory standards are more appropriately handled at the national level. To promote a good cooperation among them, an arrangement and inter organisational agreement needs to be established. The review on coordination among organisations or institutions in watershed management and planning is displayed in the following section.

c. Institutional coordination

Brooks & Eckman (2000) said that to be well-implemented, watershed management planning needs effective institutional support; which can be at various levels, from local or regional, to national. The first thing, as the two researchers suggested, is that institutional structures should be developed that recognise watershed boundaries, to make sure that the natural resources are managed in a similar way. NRC (1999) suggests a similar idea, that the organisational scale should fit the scale of the natural system, with respect to a scale in dealing with hydrologic issues. In order to manage those resources (especially related to soil and water resources) in a watershed framework, interdisciplinary approaches are needed. Brooks & Eckman (2000) noted that many governmental organisations lack the ability and authority to cope with complex watershed-level issues. Since the institutional arrangements are not organised and coordinated based on the watershed framework, then usually there are problems both of duplication of efforts and/or emptiness in responsibilities of managing the resources in the watersheds.

Based on the review of several international watershed management initiatives, Veale (2003d) concluded that coordination or a coordinating body at the watershed or sub-

watershed level is one of the key components that determine the success of watershed management. Veale stated that the advantage of coordination is that it can be a tool to build trust and will, continuity, knowledge of context and local conditions; to reduce the problem of power-sharing and duplication; to match the scale of the problem; and to provide opportunity to share or pool limited resources. The experience of Murray-Darling Basin Initiatives in Australia is a good example to show how coordination can help an agency to manage the input from stakeholders and to develop stakeholder initiative effectively.

2.4.2.4 Land-use in watershed management

One of the reasons that lead to the recognition of the importance of a watershed as a management unit is that in a watershed the quality of life is directly linked to water quality. Another reason is that the health of the watersheds is both influenced by and is a reflection of the health of the lands. The use of land in a watershed plays an important role within these causal relationships. For these reasons, there is a need for wise and effective land use planning to achieve effective planning in watershed management. In order to gain the effective land use planning on watersheds, Pereira (1989), p. 31, suggested that the planning must be based on quantitative information of the varied physical resources, such as climate, topography, geology, soils, vegetation, and water resources. In the context of a complex watershed that also includes people or community who inhabit the watersheds, there should be adequate information on social and economic aspects. In other words, all of the mentioned dimensions, both physical and social, have built the watershed system. The association between the social and economic activities of humans with the physical features in the system has encouraged changes in the natural watershed system, as stated by Heathcote (1998). She also said that a critical step in assessing and developing a plan to improve the system, is to understand current and anticipated land use within the watershed. Further, Reimold (1998) also mentioned that land use control is one of key components of effective management in protecting sensitive watersheds.

The term, land use, can be defined as the ways in which humans formerly, presently, or may in the future change the landscape for the purpose of resource extraction and processing (Heathcote, 1998). From this definition, it is clear that the time factor is an important issue in understanding land use, since land use in the past may have an impact

on land use in the present, and in the future. Land use within a watershed can be divided into categories, based on the type of human activities/purposes; such as agricultural, forestry, residential, commercial and industrial.

As mentioned before, there is a link between the dimensions or features of a watershed. Therefore, change of land use may alter the land in various ways. Regarding to the hydrological process in a watershed, land use can affect surface drainage systems and natural hydrology, since there is a change in the permeability of the land surface (Heathcote, 1998). Additionally, Allan & Flecker (1993) identified that land use change which causes hydrological changes to streams and rivers, is one of the most common and potent threats to the well-being of ecosystems. The hydrological change caused by land use change might result in the adverse change of water quality. For example, the water quality in a watershed with 50 percent agricultural land use and an intact forest riparian zone, may be expected to be better in terms of lower turbidity and nutrient content than in a similar watershed without any riparian zone. Land use change can also have a negative impact on soils. For instance, the practice of intensive agriculture can change the structure of soil and result in soil degradation. In the Red and Yellow Soil Region of Southern China, land uses of agriculture and horticulture have affected the soil erosion, soil fertility and soil acidification (Zhang, 1997). In Thailand, as reported in Pereira (1989), extractive tin mining has caused watershed damage through the operation of open-cast or strip mining that leads to erosion. The change of land use through clear felling of a pine forest in Colorado at the beginning of the century increased the water yield by 17 percent. Considering the impact of unwise land use, data collection and monitoring on land use change are essential in the planning of a watershed, to ensure the effectiveness of watershed management in controlling erosion and other soil degradation.

Land use and its change are also related to social economic factors. According to Lal (1997b), soil degradation caused by land misuse and soil mismanagement, is a physical problem that is driven by socioeconomic factors. Pereira (1989) stated that in some tropical developing countries, the main problem in land misuse is more related to a lack of administrative organisation and political guidance rather than to lack of high technology supports. Pereira also stated that to correct the misuse of resources in a watershed, including land, organisations or agencies have an important role. To

effectively contribute to these correction; national, international, bilateral, and/or non-governmental agencies should be coordinated. Based on the experience of Pereira, the problem of coordination in land use planning is one of the largest concerns in many developing countries.

2.5 Summary

It can be concluded from the review of the literature that after the relatively long history of the watershed management concept, it is agreed that the watershed the most appropriate and most desirable entity or unit for land and water (natural resources) management and planning by nearly all countries, both those which are developed or developing. Watershed management is basically a cyclic process that involves four main stages, which starts with planning as the earliest stage. Planning itself naturally is a process that is built by sequential steps that interrelate and should be bound together as one functional process.

One of the important matters regarding planning as a functional process is that it should be considered as an iterative and adaptive process. Within this concept, planning involves the harmony of several elements that encapsulate into 3 dimensions, namely biophysical, social and institutional. The entire dimensions are interrelated. The recognition of watershed as a management and planning unit bring to the consequence of building the structure of organisations in managing the natural resources based on the watersheds boundaries. In conducting planning to be effective, the aspect of watershed as the unit of planning should be well-applied; therefore planning should follow the hierarchy of watershed, namely: the plan for a smaller scale watershed should be fitted or nested into the broader plan for a larger scale watershed.

Finally, the review on what people have done in their studies shows the need for learning from each others' lessons and experiences in managing watersheds. This has been an effective approach towards the improvement of watershed management. It is hoped that at certain levels this approach will assist the government of Indonesia in improving watershed planning and management in the country.

Chapter 3

REVIEW OF INTERNATIONAL GUIDELINES OF WATERSHED MANAGEMENT AND PLANNING

3.1 Introduction

The second chapter of this study discussed the general theories and the importance of watershed management. This importance has lead to wide endorsement of the use of watersheds as a management unit in many jurisdictions around the world. As a form of acknowledgment, a range of world organisations have given attention to the topic of watershed management, within frameworks that are broadly aimed to assist their member nations to manage the natural resources towards the improvement of the quality of human life. The priority of these international organisations in improving water resource management has been shown in a range of support. Some of them also provide financial assistance; for instance, the World Bank lends about $2 billion per year (about 10 to 15 percent of its total lending), for water projects in the member countries (LeMoigne et al., 1996; LeMoigne, Subramanian, Xie, & Giltner, 1994). Some world organisations have published guidelines and/or manuals on the topic of watershed management. Many of the organisations have been processing a number of works in developing or less-developed countries, with an idea of incorporating the experiences of others, confronting challenges, and formulating solutions (LeMoigne et al., 1996).

This chapter is to review perspectives on watershed management published by five selected world organisations that have been working in the area of watershed management in developing countries for years, namely: Food and Agriculture Organization (FAO), Asian Development Bank (ADB), United Nations-Economic and Social Commission for Asia and the Pacific (UN-ESCAP), Association of South East Asian Nations (ASEAN), and United Nations Environment Programmes (UNEP). Each of them has developed guidelines that aimed to assist the development of watershed management. The purpose of doing this review is to explore examples of effective watershed management guidelines and to gain an understanding of best practice in watershed management.

3.2 The Perspectives of the Association of South-East Asian Countries (ASEAN)

ASEAN was established in 1967 by five original member countries. Today, there are ten developing countries within South-East Asia participating in this organisation. The aim of this association is: (a) to accelerate the economic growth, social progress and cultural development, and (2) to promote regional peace and stability among countries in the region (ASEAN, 2004).

3.2.1 Overview of the ASEAN guidelines

In 1990, ASEAN, together with USAID, the Forestry for Sustainable Development Program (FFSD), and Department of Forest Resources, University of Minnesota, has written a manual or overview document that aimed to provide a guide for the planning, monitoring, and evaluation of watershed management projects. ASEAN recognised that the environmental problems associated with widespread deforestation, watershed degradation and accompanying erosion problems in the tropics are a major driving force (Brooks et al., 1990). This manual addresses conditions in the ASEAN countries, and targets professionals who are involved in planning and implementation of watershed management projects.

The contents of the ASEAN guidelines flow from the strategic discussion in the beginning to more operational and practical on the rest of the document. The strategic considerations include the basic concepts of planning, monitoring and evaluation, and the discussion of planning in the context of sustainable management. The authors underlined that practicality is emphasized in the document, and not academic complexity (Brooks et al., 1990). Therefore, most of the parts of the guidelines consist of practical and operational suggestions, complemented with cases from some developing countries as examples of watershed management. Although the guidelines discuss the practical matters of a watershed management project, technical details, such as the instruction on how to design an erosion control structure, are not offered in the guidelines.

3.2.2 Types of planning according to the ASEAN guidelines

According to ASEAN guidelines, planning in natural resource management can be either strategic or operational planning. Strategic plans guide the development of

appropriate policies relating to natural resource sectors, set the overall direction and goals of development at the broad level (such as national level), and provide a general framework for action at the organisational level. Meanwhile, operational plans consist of two types: management plans (regional level) and project plans, both of which transform the broad objectives set by strategic planning into specific goals and actions to be implemented on the ground by an organisation. The particular attention of these ASEAN guidelines is upon project levels in watershed management and planning based on the understanding of important linkages between watershed management projects and human welfare, as illustrated by Figure 3.1:

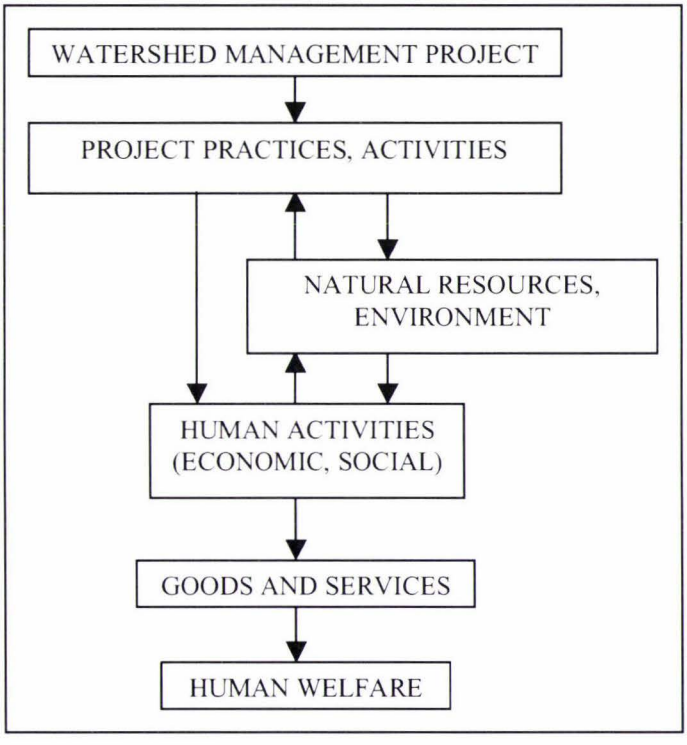

Figure 3.1. Important linkages between watershed management projects and human welfare (Brooks et al., 1990)

Simply, Figure 3.1 shows the linkage between human activities with natural resources and environment. These linkages are not only one-way relationships. In an effective watershed management project, there are not only the natural resources to be utilised through the project practices for the benefit of humans in producing goods and services, but also the management practices designed to manage the natural resource and to protect the environment. The balance within the linkage will successfully support the purpose of watershed management at the project level to achieve or to enhance human welfare.

Even though overall attention in the guidelines has been focused on watershed planning at the project level, ASEAN suggest that both management and project planning need to be considered together to see how the project will fit into an organisation, or how its implementation, costs, and benefits must be shared by different organisations and communities.

3.2.3 Planning process and key principles according to the ASEAN guidelines

Planning process in watershed management considered in these guidelines involves a list of steps as follows (Brooks et al., 1990): (1) Analyze problems and opportunities: set and define objectives, goals, and targets; (2) Identify and design the alternatives to meet objectives; (3) Narrow down the alternatives: the appraisal process; (4) Design the implementation plan; (5) Develop the monitoring and evaluation system; (6) Prepare and present the project plan and appraisal; (7) Monitor and evaluate on-going projects; and (8) Revise project plans to meet changing conditions.

This manual considered that planning is more an art than a science. Therefore, a planning team should be flexible and initially use the planning process described above as a guide and not a template (Brooks et al., 1990). However, based on the experience of ASEAN in some member countries, there are some general principles that have emerged over the years.

The first principle is that goals and objectives should be set appropriately, and there should be appropriate targets determined to meet objectives. Operational goals should be stated explicitly and clearly so that progress and achievement of goals can be easily measured. Further, the ASEAN guidelines also suggest that planning must consider the project feasibility in terms of technical and operational in the field. The goals and targets determined should be realistic and consider both constraints and opportunities. Projects may fail because of inappropriate targets.

The second principle is that planning is an iterative process in identifying and assessing alternatives. Decisions and choices are made throughout the planning process and the process of planning does not stop once the plan has been developed. It is inappropriate to consider at what stage planning stops and implementation starts. In addition, planners rarely have all of the information needed for planning at the beginning. Therefore, the

ASEAN guidelines suggest that in practice, planning involves a process of successive approximations, and should not be a simple step-by-step process. Besides that, usually there are more than one option to consider in a watershed project design, as well as several possible technologies that could be employed. One of the most critical jobs in planning process is to identify feasible alternatives that promise to achieve project goals effectively and efficiently.

The third principle suggested by the ASEAN guidelines is based on the economic principle for project planning, known as benefit-cost analysis. For a successful watershed management project, the guidelines highlight the importance of always applying the "with and without" principle. The use of developing and comparing alternative scenarios of what is likely to happen with the project and without the project determines the impact of the project, shown by the difference between both situations. To determine the impact is important, because the impact is a measurement of the success of the project.

3.2.4 Concluding remarks of the ASEAN guidelines

The ASEAN guidelines discuss watershed management planning more specifically at project level. The approaches that are used are mostly practical that are aimed to guide the practices at the operational level. However, an introduction of strategic approach in watershed management has been given to bring the target users to the comprehension of the management in a complete sense. Interestingly, most of the practices suggested in the guidelines are based on the experience in the member countries, covers both their strengths and weaknesses. This provides such a good opportunity to learn from one another among the ASEAN member developing countries. In addition, there is a number of examples that are practicable and easy to follow. This will be helpful for the targeted users of the guidelines, namely watershed project managers and decision makers in developing countries, to improve their work in watershed management.

3.3 The Perspectives of the Food and Agriculture Organisation (FAO)

FAO is an international organisation under the United Nations that serve both developed and developing countries. Established in 1945, FAO leads international efforts to overcome food shortage through activities in four main areas: (1) putting information within reach, (2) sharing policy expertise, (3) providing a meeting place for

nations, and (4) bringing knowledge to the field (FAO, 2004b). FAO also give attention on the management of watersheds around the world.

3.3.1 The background of the guidelines setting

FAO guidelines emphasised surveys and planning in managing watersheds. Surveys in FAO guidelines can be termed as a preparatory work to collect and identify useful data and information that can illustrate the existing condition of the managed watershed. FAO considers that surveys and planning are a continuous process, and are practically inseparable (Sheng, 1990). Data collected from surveys are essential in the process of planning for a watershed. FAO observed that, especially in developing countries, surveys for watershed management is considered as important for management purposes rather than for academic study. These guidelines are intended to provide basic knowledge and practical approaches to watershed managers and planners, who are involved in watershed survey and planning in developing countries. The guide is aimed primarily at middle-level technicians in order to enable them to carry out the actual planning work. Therefore, these guidelines by FAO provide more technical considerations that need to be taken into account in the watershed planning and do not include social issues.

3.3.2 Planning in watershed management according to the FAO

According to Sheng (1990) as stated in the guidelines by FAO, planning is defined as to "devise detailed methods for doing, arranging and making something". Therefore, different approaches should be adopted for different outcomes. FAO guidelines listed some useful approaches employed in planning.

1. Bottom-up approach

FAO recognise the importance of involving local communities (for example farmers and community in the border of the forests) in the planning process, particularly in developing countries that are heavily populated; otherwise watershed projects will fail. According to the guidelines, bottom-up approach is basically to maximise the participation of local community in the process of decision making. The understanding and the acceptance of people at the grass-root or local level will be very helpful for a watershed plan to be practicable. The bottom-up approach in watershed planning call for the real involvement of local community organisations in the planning process or

organising of watershed committee at the local level or community level that combine the representative of community with the representative of the government. By doing this, the real need of the local community can be well-approached and can be matched with the policy of the government.

2. Iterative approach

FAO also consider that planning is an iterative approach. The process of studies, assessments, alternative considerations and revisions might need to be repeated several times before a plan is set to reach the best result. Therefore, proposing the schedule of survey and planning activities, the FAO guidelines include the establishment of preliminary or interim report or plan, prior to the development of final plan (see Figure 13).

3. Flexible approach

The guidelines also suggest flexibility. Watershed management is basically a dynamic process that has to deal with many unpredictable things that can possibly happen during the long term, caused either by nature or humans. There will be a lot of challenges to make any change, so the planning process should be flexible to cope with the dynamic of the situation in the watershed. Additionally, watershed management is always faced with the complexity of physical, social, economical, cultural, legal and institutional problems of the watershed. Any plan should have flexibility to deal with: (a) uncertainty and unpredictability; (b) complexity. In dealing with these, flexibility in watershed planning is intended to provide spaces and possibility for future adjustment, modification, or revision. The consequence of being flexible is to conduct monitoring and evaluation to ensure the refinement of the resultant plan.

The approaches for watershed planning suggested by the FAO guidelines are based on the assumption of achieving an effective plan at project level. Similar approaches have also been recommended by the ASEAN guidelines. This shows the similarity in attention given by the two organisations.

3.3.3 Hierarchy of planning in watershed management according to the FAO

FAO suggests that watershed surveys and planning should be undertaken at four levels with a problem-oriented approach (Figure 3.2).

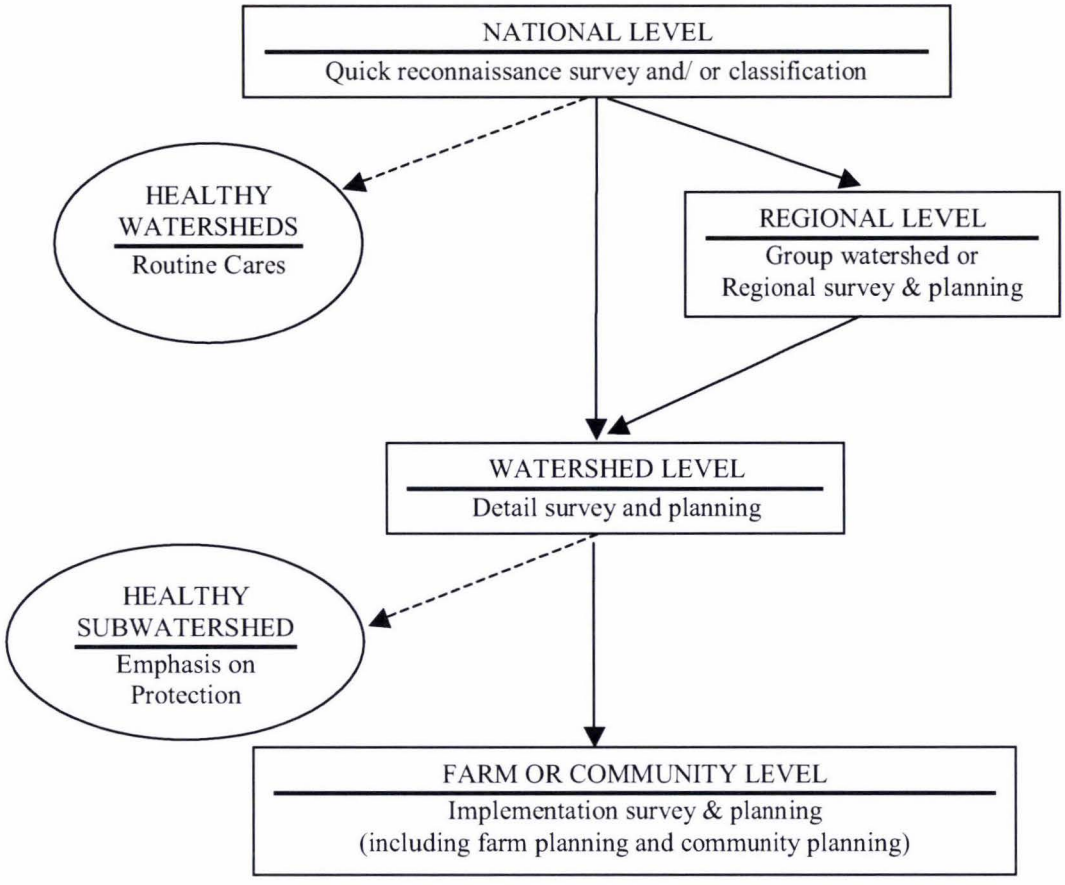

Figure 3.2. Various levels of survey and planning with emphasis on problem-oriented approaches (Sheng, 1990)

Figure 3.2 illustrates the hierarchy which need to be considered when carrying out survey and planning in watershed management. The different levels have different emphasis and scale of activities so for each level, data provided and the detail of survey might be diverse. Each level of survey and planning should be oriented towards identifying main objectives and problems, and plans and recommendations should be focused on solving or alleviating these problems. This priority to address main issues or problems is to achieve the most effective and efficient results in the whole planning hierarchy, considering the limited resources and time.

At the national level, a quick reconnaissance type of survey is sufficient for identifying major watershed problems and areas. For this type of investigation, FAO suggests aerial photographs or remote sensing techniques as important sources to assist in identifying broad land-use categories and main causes of disturbance. The information provided by these sources should be combined with existing data to provide sufficient information for an overall classification of the nation's watersheds. This classification provides

important input in national policy determination and in priorities setting. As illustrated in Figure 3.2, once the priorities of watersheds in the nation have been set, the next focus will be on watersheds that have more issues or problems. For the watersheds that can be categorised as healthy or have minor problems, then routine cares will be carried out.

The second level of survey and planning hierarchy in Figure 3.2 is regional or district level that covers scale of a cluster of watersheds or in conjunction with regional development plans. The detail of the plan at this level is not as broad as that of the national plan or strategy, but not too detailed as the plans for individual watersheds. The result of planning works in this level is to be used as inputs in the formulation of long-term development plans for the region or district.

The third level is where the most detailed survey and planning is conducted, at the watershed or sub-watershed level. One reason for this is because watersheds are a functional unit that links upstream and downstream areas in an integral system. Another reason is that watersheds are a suitable unit for planning and economic analysis. Again, based on the priorities and problem-oriented approach, the focus will be given to the most prioritised watersheds and sub-watersheds towards the achievement of a healthier condition of them. For the watersheds or sub-watersheds that are already in healthy condition, protecting them is the emphasis of management activities.

The last level at the bottom of the planning hierarchy of the FAO guidelines is farm or community level. Other guidelines end with the third level of planning hierarchy, but FAO guidelines consider that a fourth level, of individual farm planning, group farm planning and planning for community development are also necessary (Sheng, 1990). When this planning can be done is dependent upon definitive needs; either during the planning period or at the beginning of the implementation stage. Aiming to improve farm management and community development within the watershed area, this planning emphasis is on conservation of watershed resources as well as on development. The nature of planning at these levels is very local and practical; therefore the involvement of local bodies, local groups, and local communities is essential in the planning process.

3.3.4 The steps of planning process in the FAO guidelines

Planning, according to FAO, is preparatory work that initiates the cycle of management. For watershed and sub-watershed level, where these guidelines by FAO are aiming at, there are several steps of planning process suggested (Sheng, 1990), consisting of two groups of preparatory work. The first group of steps involves: identification of watershed problems, objectives and priorities, which consists of these following steps/activities: (1.1) collecting existing data, (1.2) quick identification of watershed problems, (1.3) considering management possibilities, and, (1.4) determining main objectives and priorities. The second group involves: organising and planning mechanism, which consists of the following activities: (2.1) joint planning and decentralized implementation, (2.2) Setting guidelines and criteria, (2.3) Progress monitoring.

Overall, there is a schedule of surveys and planning activities suggested by the FAO, where a time frame can be added to each major activity for control purposes. The schedule is as illustrated by Figure 3.3:

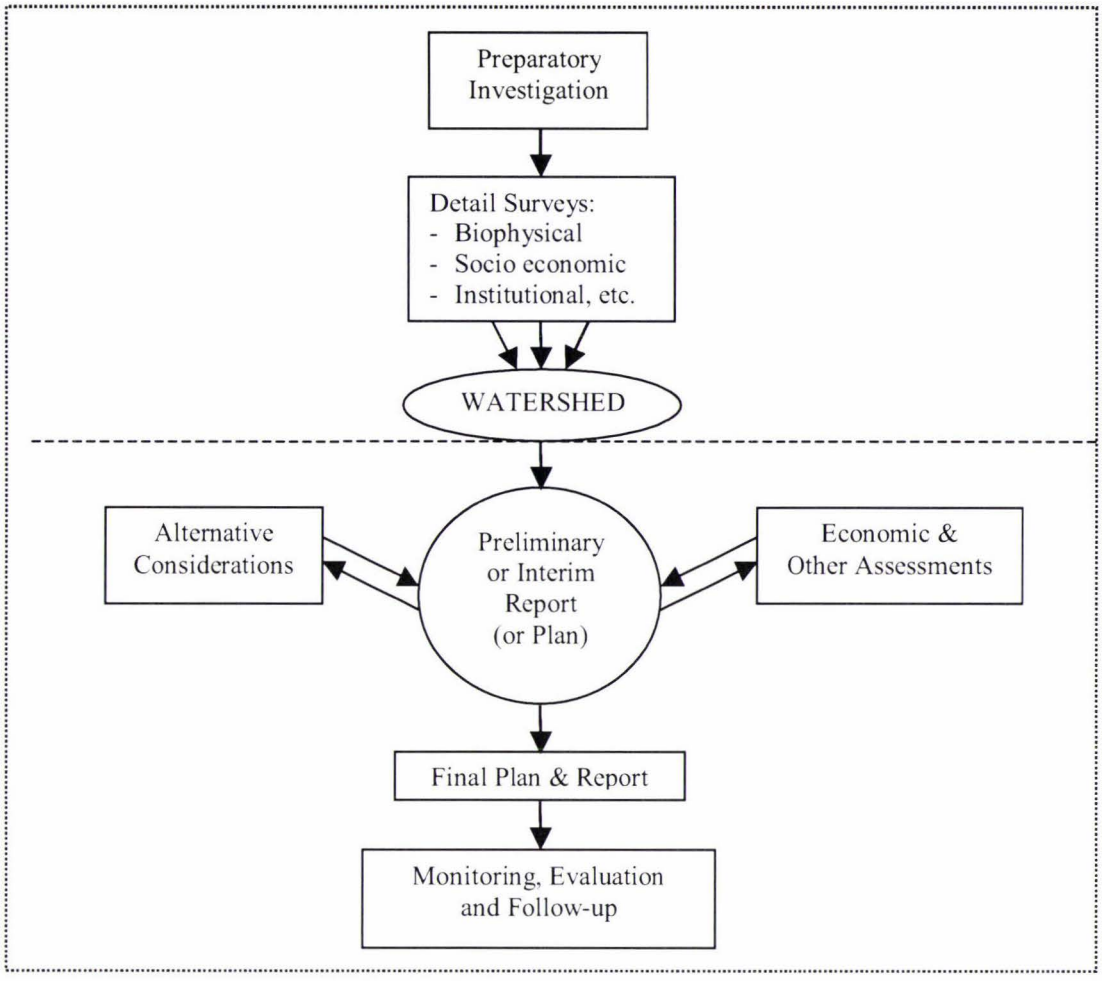

Figure 3.3. A Schedule of Survey and Planning Activities (Sheng, 1990)

The scheme in Figure 3.3 illustrates a schedule of overall activities of planning in watershed management in a global way. The main idea to be emphasized in the scheme is the clear allocation of time and resources among each stage. This scheduling is important to avoid conflicts in carrying out the work and achieving satisfactory job. The dash line shows the boundary between surveys as a stage that aims to gather comprehensive data and information about the managed watershed, and the further stages in the whole planning process. The line is not strict, meaning that even though there is a clear allocation of various work and a boundary between surveys and further stages, it is always possible that after the final plan has been produced and been monitored and evaluated, the process goes across the dash line back to the initial stage of survey.

At the end of the scheme there is a stage called monitoring, evaluation and follow-up. Monitoring and evaluation are not the end stage of planning process, but should be

actively followed up to revise the plan towards the achievement of a better result. The revision, as well as considerations and alternatives might be repeated for several times. It is an iterative process and this is accepted as one of the useful approaches to watershed planning in the FAO guidelines.

3.3.5 Concluding remarks of the FAO guidelines

Similar to the ASEAN guidelines, the FAO guidelines are intended to provide direction in watershed planning and management at the project or operational level. The targeted users of these guidelines have been mentioned as watershed managers and planners in developing countries who are involved in watershed survey and planning, particularly those who work at middle-level. Therefore, most of the guides and suggestions offered in the guidelines are technical. The difference between the FAO and the ASEAN guidelines is that FAO gives more attention to the activities of surveying as technical preliminary work that is considered as an important initial step for watershed planning. This greater attention includes the comprehensive guide for data collection and a range of methods suggested for the use in the field. Additionally, FAO also specifically focuses on the use of participatory approach in its guidelines, as an approach that is considered vital for the practice of watershed management in developing countries.

3.4 The Perspectives of the United Nations Environment Program (UNEP)

UNEP is an international organisation which works in the environmental area. Its mission is to provide leadership and encourage partnership to care for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations (UNEP, 2004).

3.4.1 Rationale for the introduction of new approach

With its particular division called DTIE (Division of Technology, Industry, and Economics), UNEP has set and published *Guidelines for the Integrated Management of the Watershed* in 2002. Compared to the other guidelines from other international organisations reviewed in this study, the guidelines by UNEP is the most recent. These guidelines broadly discuss the interrelationship among the issue of sustainability, development, and integration of water resources management. These guidelines are intended to provide new insights into the application of the recent developments in ecology to the sustainable use of water resources at the catchment scale (UNEP-DTIE,

2002). The new approaches are *ecohydrology* and *phytotechnology* that are applied in an integrated watershed management. UNEP would like to suggest that the use of both science and technology to be integrated with the basic principles of watershed management.

The background underlying the setting of these guidelines is that UNEP is aware of the problems from which the freshwater resources such as rivers, lakes, reservoir and wetlands are suffering. These problems consist of pollution, shore erosion, habitat loss due to construction and other unsustainable human activities and unsustainable practices (UNEP-DTIE, 2002). UNEP is aware of the relationship between resources building the watershed system that consist of both biophysical and socio-economic dimensions. The interaction between human and natural resources within these dimensions can lead to varied environmental problems. UNEP realize this interaction, any impact that might result, as well as any possibility and opportunity to develop the resources. The UNEP view is that the trend of the environmental problems is continuing over time, therefore, to terminate it, there is a need to build up appropriate planning and management approaches within the framework of Integrated Water Resource Management (IWRM). As defined by the Global Water Partnership (GWP), Integrated Water Resource Management is defined as:

> "A process that considers the co-ordination of development and management of water, land, and related sources to enhance economic and social welfare without jeopardizing the sustainability of the ecosystem" (UNEP-DTIE, 2002, p. 18)

Thus, as well as being aware of the possibility of any adverse impact, UNEP aims to employ as effectively as possible the positive and constructive side of the interrelationships. UNEP-DTIE introduced the use of ecohydrology and phytotechnology since there is acknowledgement that there is an urgent need for a new approach for integrated watershed management. UNEP offered ecohydrology as a framework within which to integrate hydrology and ecology across a range of temporal and spatial scales (UNEP-DTIE, 2002).

3.4.2 Relevance of the UNEP's new approach with the general concept of watershed management

In developing the concept of sustainable development, which has been the result of the initiatives and efforts of the UN organisations and OECD recently, UNEP agrees with

the assumption that the watershed is a fundamental unit for resource management. Moreover, UNEP also acknowledges the importance of forests' role in the control of biogeochemical processes, as stated by Baird & Wilby (1999), in UNEP-DTIE (2002), which, together with water dynamics at the watershed scale, has been fundamental to the development of low cost, high technologies in integrated water management. Therefore, UNEP stated that the link between ecohydrology and phytotechnology, and the restoration and management of forest cover in the watersheds, has been an essential tool for sustainable water resources management.

In simple terms, Baird & Wilby (1999), in UNEP-DTIE (2002), defined ecohydrology as a parallel integration of ecology and hydrology; or integration among vegetations, water and the landscape; or relationship among climate, vegetation and soil that drives water dynamics (Rodriguez-Iturbe, 2000 in UNEP-DTIE, 2002). The first point regards watersheds as a dynamic unit of planning and management that can provide a template for the quantification of ecological process. The second point is that the approach intends to increase and to maximise the capacity and the function of ecosystems to handle the impact resulting from human activities. Within the ecohydrological approach there is a conceptual tool or method that is provided to assist in managing watersheds. The use of ecohydrology includes understanding the whole processes involved that have a two-dimensional character, namely temporal and spatial; and this agrees with the character of watershed management and planning in general (NRC, 1999).

The ecohydrology framework will be helpful in providing a background for the development of a holistic approach in integrated watershed management. Furthermore, it also provides "low-cost, high technology" approaches to watershed management; therefore, UNEP considered these approaches to be especially important for developing countries and any countries in economic transition.

There are some advantages of applying ecohydrology in watershed management. Firstly, UNEP said that one of the advantages of the application is to promote environmental awareness among the public, enhance water resource values, and stimulate their protection. Secondly, since the approach comes from scientific understanding, it can provide scientific support for the use of watershed as the planning unit of choice for water resources management. The ecohydrology approach can also be

a challenge for policy and institutional approaches to watershed management, because it facilitates the solution of downstream-upstream conflicts through enhancing so-called "hydro-solidarity" (UNEP-DTIE, 2002). An understanding of ecohydrology can encourage the public to be aware of environmental issues related to water resource and to respect one another in valuing and using the resource. Therefore, understanding ecohydrology will also helps to strengthen the incorporation of social and environmental values into strategic water resource planning at the watershed level.

Meanwhile, the concept of phytotechnology is based on an understanding of the role of plants in energy flows, nutrient and water circulation in the landscape, and pollutant degradation and accumulation (UNEP-DTIE, 2002). Understanding this new concept will improve the watershed management in Indonesia and other developing countries which suffer from environmental problems associated with forest degradation. The integration of both ecohydrology and phytotechnologies provides the scientific basis for an effective interdisciplinary approach, as well as cost-efficient methods toward the sustainable management of biosphere resources.

Based on the case studies that demonstrated the application of phytotechnologies and the utilisation of ecohydrological principles to mitigate and to manage water resource-related environmental problems in several places of the world, UNEP noted that the key success has been a combination of local knowledge, community involvement, and the use of financial incentives, united with the utility and efficacy of watershed-based approach in the management (UNEP-DTIE, 2002).

3.4.3 Limitation of the UNEP guidelines

Unfortunately, there is only a limited example of the use of phytotechnology and ecohydrology from tropical watersheds. None of them is the case drawn from the experience in tropical developing countries in the Asian region. Even though there has been scientific discussion on the advantages of this high-technology, there is no extensive description and discussion on how the technologies have been applied and can be feasible to be developed in Asian developing countries. Unlike the other guidelines reviewed in this chapter, the guidelines by UNEP do not explain the process of watershed planning and management in a particular discussion, rather, they state the incorporation of hydrology and biophysics aspects of watersheds in an integrated water

resource management in detail. Differing from the others, these guidelines are intended to generate discussion in the more technical area rather than in management area.

3.4.4 Concluding remarks of the UNEP guidelines

Different from any other international guidelines for watershed management reviewed in this study, the UNEP one is based on the comprehension of the latest high technology.

Basically, the idea of introducing ecohydrology and phytotechnology is to maximise the ecosystem services. UNEP guidelines propose to apply the well-developed science to support the practice of watershed management. The approach offered by the UNEP guidelines is intended to address the strategic and institutional aspect of watershed management. There is no suggestion of step-by-step planning process in watershed management as discussed in the other guidelines, nor is there practical guide to carrying out watershed surveys for planning. Nonetheless, these guidelines tried to link the use of ecohydrolgy and phytotechnology, with social and economic dimensions in order to support the achievement of sustainable development.

3.5 The Perspectives of the Economic and Social Commission for Asia and the Pacific (ESCAP)

ESCAP is the regional arm of the United Nations Secretariat for the Asian and Pacific region (UN-ESCAP, 2005). Comprising 51 member and 9 associated member countries, ESCA is the only inter-governmental forum covering the entire Asia-Pacific region. Its main aim is to promote economic activity and social progress in the developing countries of the Asia and Pacific region. One of its divisions is the Environment and Natural Resources Development division, which actively undertakes research and participated in the promotion of adopting best practices in natural resource management (UN, 2001).

3.5.1 Background of the approach taken by the ESCAP

Publication of the guidelines by ESCAP was based on the concern about the increasing water-related disasters in the world, especially in countries within the Asia and Pacific region. ESCAP recognise that with the rapid population growth, the need for integration of water-related disaster reduction measures into national water resources development

and management programmes – or widely known as integrated watershed management - has become more urgent (ESCAP, 1997).

Integrated watershed management, can be defined as the coordinated, planned and sustainable management of the natural resources within a river basin (ESCAP, 1997). This integration is very important today since there are more people adopting the watershed as the unit for natural resource management. ESCAP see the integrated watershed management as an approach that involves the adoption of a rational management system for land, water, and vegetation which can improve the adverse impacts of natural disasters and help to attain the sustainable use of the natural resources within a watershed.

The contribution of ESCAP guidelines is emphasized in the promotion of improvement in land-use planning and practices for better watershed management. However, it does not mean that physical and socio-economic planning can be undertaken independently. As defined by Sheng (1990), land-use planning is the process of evaluating land and use patterns, together with other physical, social, and economic considerations for selecting or suggesting the best alternative uses. ESCAP suggested that appropriate approaches for the integration of planning and resource management systems should be developed, namely land use management.

3.5.2 Focus of the ESCAP guidelines on land-use management

The importance of the land-use planning and practices in promoting the better watershed management in the Asia and Pacific countries is based on rationale that land use constitutes a fundamental mechanism for development; therefore land-use planning can be a guiding tool to direct development efforts towards prosperity and sustainability (ESCAP, 1997). Hashim (1998) said that most environment problems originate as local land use issues. Moreover, ESCAP considered that the need for land-use planning for many countries is urgent, because the effects of inappropriate practices of land utilization and its over-exploitation are already irreversible or rapidly closing in on that status. For example, the status of uncontrolled land-use change as a cause of watershed degradation in Indonesia, Thailand, and the Philippines is considered as highly important (Brooks et al., 1990). The situation is predicted to get worse, reflected by the data of land-use change patterns from the last decade as follows (Table 3.1):

Table 3.1. Changes in land use patterns in the south-east Asia region from the last decade (FAO, 2004)

Country	Total Area (x1000 Ha)	Arable land (x1000 Ha)		Permanen crops (x1000 Ha)		Permanen pastures (x1000 Ha)		Forest & woodlands (x1000 Ha)	
		Increase (decrease) 1992-2002	%	Increase (decrease) 1992-2002	%	Increase (decrease) 1992-2002	%	Increase (decrease) 1966-1983	%
Indonesia	190,457	2,400	13.26	1,749	15.27	(623)	(5.28)	(1,560)	(1.26)
Malaysia	32,975	(50)	(2.70)	240	4.33	5	1.79	(1,915)	(8.83)
Philippines	30,000	200	3.64	600	13.64	220	17.29	(4,850)	(28.70)
Thailand	51,312	(1371)	(7.95)	164	4.92	0	0.00	(7,600)	(32.90)
India	328,726	(655)	0.40	1,500	21.74	(608)	(5.21)	N/A	N/A

Source: FAOSTAT, in FAO (2004)

Data in Table 3.1 show that in some developing countries in the south-east Asia region, land use patterns have changed significantly over time. It can be inferred from the data that the increase of agricultural development has come at the expense of forests and woodlands. Over all ASEAN lands, the net decrease in land under forest during the two decades was 8.5 percent, a total of nearly 16 million hectares. Within those periods, the greatest loss of forest cover was in Thailand (32.90 percent), and the smallest percentage was in Indonesia (1.26 percent); but this does not mean that today the situation is stable. During 1985 - 1997, Soekotjo as reported in Pikiran Rakyat (2003a), said that the loss of forest cover in Indonesia has reached 22.46 million hectares (11.79 percent). There is a trend that the rate of forest degradation in Indonesia is increasing. It was reported that the rate of forest degradation in Indonesia, was estimated to be about 1 million hectares per year in 1980 (Sunarto, 2004). This number drastically increased in the next decade to be 1.7 million hectares, and during 1996 to 2002 the number was estimated about 2 million hectares per year. One factor that contributes to this trend is the change of land use pattern, where there is a change of forest into permanent and intensive agriculture land, settlement and shifting cultivated land. Therefore, the attention of ESCAP on land use in watershed planning and management is not surprising.

Underlying the selection of land-use as a starting point for watershed planning and management by ESCAP is the understanding that sound land use planning methods and practices can be developed in different levels, national and regional (from an end-use point of view) – and for various sectors such as agriculture, forestry, mining and water resources (from a sectoral point of view). There are strong linkages in planning between the two points of view, and, interestingly, land-use planning can address these linkages

so that a basis for better planning in the fields of watershed management can be formed (ESCAP, 1997).

According to ESCAP (1997), the adoption of good land-use planning and management practices by government will result in overcoming or the avoidance of either existing or potential problems automatically. This is because of the cause and effect relationship between the land-use planning, the natural environment, the community and the national economy. Besides that, this international organisation also recognises that to share experiences among the countries in the region is essential. Therefore, in this document, ESCAP also drew and compiled some experiences in land-use planning and practices from the development processes in the region.

3.5.3 Hierarchy and the process of planning according to the ESCAP guidelines

Similar to ASEAN and FAO, ESCAP agrees that in land-use planning there is also a need to recognise three levels or scales in the formulation of different but related sets of goals: (a) the national or international scale, (b) the watershed or regional scale, and (c) the local or micro-watershed scale. Parallel to other organisations' perspectives and theory, ESCAP stated that land use planning is a process, and interaction between planning activities at all three levels is critical to ensure the effective attainment of development objectives and improved knowledge of the inter-related ecosystems. Supporting the importance of conducting an effective management within watershed and sub- or micro-watershed level, ESCAP suggest that such an integrated management should be based on a plan which sets the direction and provides a framework for the planning and development of individual catchments. These plans should ensure the existence of a structural approach to the management and utilisation of natural resources, such as land, water and forests, in order to make sure that these resources are managed in a sustainable manner. The plans should be clear in determining objectives that can be powerful to address the issues and should consider the activities that might be potential in causing the land degradation. To be effectively implemented, along with the clear objectives, the plans should include strategies to overcome the specified problem and monitoring actions to be done as an integral part of the management package (ESCAP, 1997, p. 47). Typically, land use planning process is as illustrated in Figure 3.4.

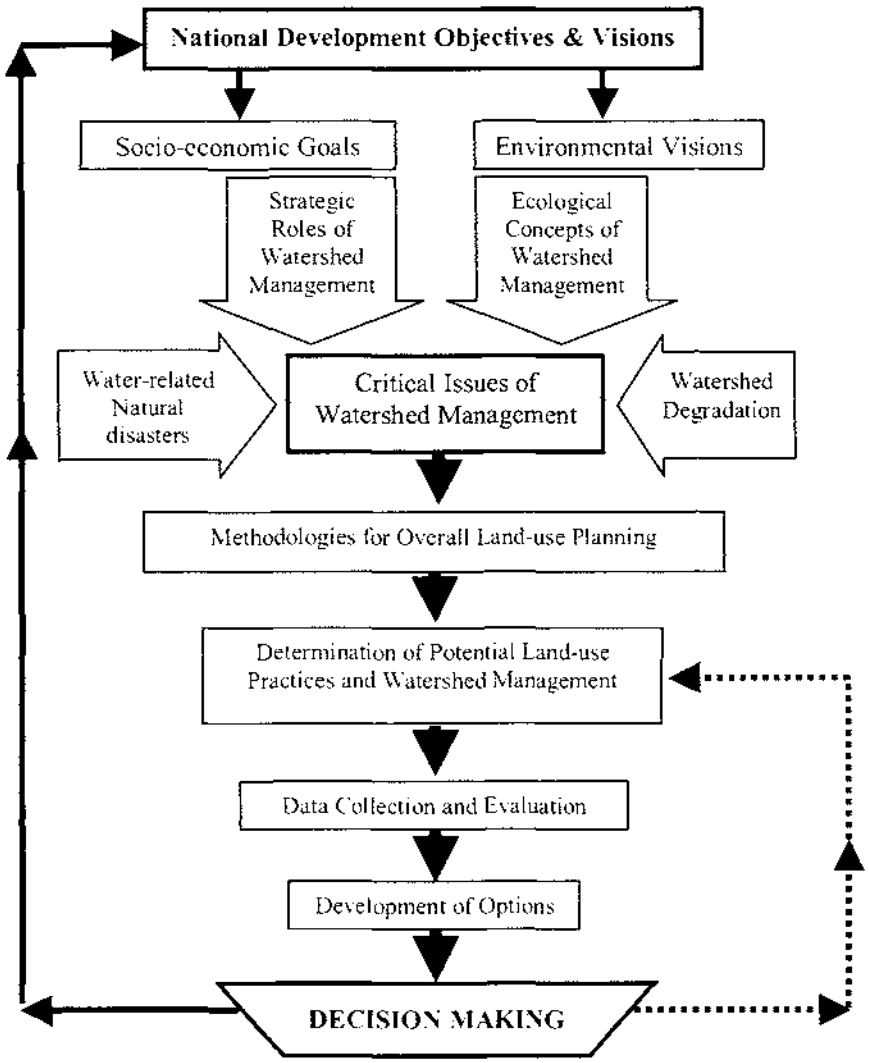

Figure 3.4. Typical Land-Use Planning Process (ESCAP, 1997)

The flowchart in Figure 3.4 shows the way land use is employed to assist in achieving development objectives and visions at the national level through land use planning. Within the framework of watershed management, potential land-use practices and watershed management are determined in order to provide alternatives for decision making. The flowchart includes data collection and evaluations on land use as a step in the planning process prior to the development of management options. This is to support the iterative nature of the planning process, as shown by the dotted arrowed line in the flowchart that goes back to the step of the determination of potential land-use practices and watershed management.

There are some hindrances faced by the member countries and reported by ESCAP, that need to be treated (ESCAP, 1997): (a) negative trend in natural resource degradation

and exhaustion; (b) a low level of strategic and policy commitment to natural resource management, with adequate financial, legislative or operational support; (c) uncoordinated and conflicting approaches from various government agencies; (d) lack of uniformity or consistency in policies, legislation and strategies amongst different tiers of government; (e) inappropriate and inconsistent administrative structures and boundaries; (f) low levels of policing and enforcement of controls, conditions and regulations; (g) low levels of community involvement in resource management activities.

In response to these hindrances, ESCAP (1997), p. 51) suggests improving the administrative system so that it is capable of meeting the challenge of protecting the environment, integrating economic and land use planning and management, and encouraging sustainable resource management. Many recommendations have been given to accomplish this improvement, such as: promote comprehensive and coordinated legal system, strengthen the legislation with foundation of sustainable resource management, environment protection, and ecosystem process maintenance. ESCAP also suggest optimising the use of watershed as unit in managing the land and resource, and establish standard on planning process with this base. In terms of organisation in watershed planning and management, ESCAP encourage the clear definition of the responsibility of every government agency. Finally, the recommendation to improve the administrative system in watershed planning is to consolidate the existing legislation into an efficient, manageable, and comprehensive legislation.

3.5.4 Concluding remarks of the ESCAP guidelines

Planning discussed in the ESCAP guidelines is principally a general planning. The focus of discussion has been on using land use management as a tool in integrated watershed management to reduce the impact of natural disasters related to water resource. There is no further explanation on the steps required in an effective planning process to achieve a successful land use management. The discussion is not focused to address a certain level of planning; rather, it is intended to address the three levels in general planning hierarchy: national, regional and local. The discussion of problems in an effort to conduct an effective watershed planning towards the disaster reduction in

the guidelines has been focused in strategic and institutional matters; followed by some recommendations on providing strategic approach.

3.6 The Perspectives of the Asian Development Bank (ADB)

ADB is a multilateral institution which established in 1966 and recently consists of 63 members. This institution is committed to reducing poverty in Asia and the Pacific region. The function of ADB is to help the developing member countries (DMCs) for their economic and social development, through financial and technical assistance. ADB also assists the DMCs in coordinating development policies and plans (ADB, 2005).

3.6.1 Concerns of the ADB

ADB has been concerned with the water resources issue in Asia and Pacific region for decades. There were a number of surveys and water management projects conducted in some member countries (especially in DMCs) with support and assistance ADB. An action that has been taken by ADB to address the issue associated with the degradation of water resources in the DMCs is the setting of ADB's water policy. This policy seeks to promote the concept of water as a socially vital economic good that needs increasingly careful management to sustain equitable economic growth and to reduce poverty (ADB, 2001).

ADB recognised the need for an integrated water resource management in a comprehensive and holistic manner (ADB, 2001); as ADB viewed the relationship between forest depletion, lost biodiversity, watershed areas deterioration with their impact that includes the decrease of both quantity and quality of water resources. Water, as referred by ADB in this policy paper, is surface freshwater bodies, such as rivers, lakes, and wetlands, and underground water sources. The target countries of ADB's policy are those in the Asian and Pacific Region, particularly those where the relationship between water and the environment is complex, and where watersheds and ecosystems have been severely degraded (ADB, 2001). According to ADB's survey (2001), Indonesia, India, Malaysia, Philippines and Vietnam are typical of countries whose water consumption needs are increasing as they rapidly move through the industrial chain. Floods and droughts are a common natural hazard in Asia and have strong links with water and its management. Watershed degradation (encompassing mainly deforestation and soil erosion) and unplanned urbanisation (where urban

settlements disturb natural drainage systems) are the two principal factors for flooding in the region (ADB, 2001).

3.6.2 Contribution intended by the ADB through the guidelines

What ADB intended by this policy paper is to provide policy for the sustainable use of water, such policy needing to be developed with special concern in consultation with all stakeholders. The core of this policy is the conservation and protection of water resources in the region through a participatory approach. Through this policy, ADB intends to (ADB, 2001) : (1) promote a national focus on water sector reform; (2) foster the integrated management of water resources; (3) improve and expand the delivery of water services; (4) foster the conservation of water and increase system efficiencies; (5) promote regional cooperation and increase the mutually beneficial use of shared water resources within and between countries; (6) facilitate the exchange of water sector information and experience; and (7) improve governance.

There are some problems in managing water a resource in DMCs observed by ADB, such as: (1) fragmented and overlapping responsibilities in management, (2) the rare involvement of communities in planning and management; (3) general lack of institutional capacity to deliver services and manage water resources efficiently. Addressing these problems, ADB agrees with and underlines some previous international initiatives that have been reflected in the policies and approaches for the water resource adopted by other international agencies. For instance, the World Bank's (1993) policy paper on water resources management, in ADB (2001), describes a "comprehensive analytical framework" that is based on the watershed as the fundamental management unit. The similar initiatives had also been stated by the European Union, which recently drafted a framework for water management as the operational tool in the implementation of a new European water policy; and by the Organisation of Economic Cooperation and Development, that adopted a model of the integrated water resource management in its analysis of the performances and challenges of the water management in its member countries (OECD, 1998). In other words, ADB supports the use of watershed as management unit, based on the reason that "it underscores the fragmented nature of current water resources management and advocates a holistic, integrated, and comprehensive approach for improved efficiencies" (ADB, 2001, p. 11).

According to ADB, Integrated Water Resource Management (IWRM) is a process to improve the planning, conservation, development, and management of water, forest, land, and aquatic resources in a river basin context, to maximise economic benefits and social welfare in an equitable manner without compromising the sustainability of vital environmental systems (ADB, 2001, p. 19). Referring to this definition, ADB suggests that in order to ensure the IWRM, watershed organisations need to be established with monitoring and regulation from higher levels. From this point, it seems that ADB suggestions are started from top level, reflecting the top-down approach in decision making. One of the ADB's roles to support this establishment is to facilitate stakeholder consultation and participations and to help improve planning information gathering, monitoring and advisory services to local and national authorities. The other roles of ADB are to introduce the IWRM and undertake comprehensive water resource assessment in watershed as a basis for future water investments projects. ADB will also support the decentralization of planning, development, and management of water and related sources to levels that respond best to watershed boundaries, ground water aquifers or hydrological regions.

ADB also recognised the role of forestry in the watershed management and contribute through its policy in forestry. This contribution starts from the understanding that watershed and wetland protection is an integral part of water resource management in a river basin context. Therefore, to maintain critical watersheds is part of ADB's policy on forestry (ADB, 1995). The role of ADB in the protection and rehabilitation of degraded forestlands is to encourage the involvement of local communities and NGOs.

There are four elements in planning that are considered important in ADB's member countries (Millington, 1996): (1) a stable institutional framework, (2) thorough knowledge of the problems, (3) better integration across natural resources, (4) strong community participation in identifying problems and creating solution. However, to fulfil these elements is not an easy task. ADB noted some factors that determine the success or failure of planning and management of water resources in a basin context in its DMC, namely: political will (the self-centered political atmosphere that is not conducive to progressive development), education (very low literacy rate), participation, planning traditions (this is the greatest force against development activity in these countries), types of planning, data and monitoring, and realism (ADB, 1996).

3.6.3 Concluding remarks of the ADB guidelines

ADB guidelines focus on institutional matters, and propose some strategies that are addressed to water management in the developing countries. The scope of policy intended by ADB in the policy paper or guidelines is the national one. The guidelines are purposed for improving the policy for water resource sector, in the developing member countries. Through the policy paper, ADB gives attention to the importance of relationship between forestry and watershed management. For planning process in water resource management, the ADB stresses the integration among natural resources and the importance of community involvement in supporting the successful planning.

3.7 Summary of the Reviewed International Guidelines

Based on the review of guidelines as has been mentioned in the previous paragraphs, there are varied points of view stated by those different international organisations. There is a range of perspectives by the world organisations discussed in their guidelines as summarised in Table 3.2.

Table 3.2. Summary of the review of international guidelines

attribute	International guidelines by:				
	ASEAN	FAO	UNEP	ESCAP	ADB
Intended/ focused level	Project/ operational level	Project/ operational level	National/ strategic level	General/three levels: national, regional, and local.	Strategic (national) level
Specific subject of interest	Watershed resources, forests	Watershed resources, forests, land-use	Watershed /fresh water resource ecosystem	Land use management and disaster reduction	Water resources in general
Basic approach	Technical and managerial approach	Technical and managerial approach	Scientific and technological approach	Technical and institutional approach	Political, financial and institutional approach
Targeted user	Watershed project managers and decision makers in developing countries	Watershed managers and planners in developing countries, particularly middle-level technicians.	Governments and water users	Decision makers at national level, planners, and practising engineers in the Asia-Pacific region.	Decision makers in water resource sector at the national level, in developing member countries.
Water referred in the guidelines	Surface water and ground water.	Freshwater, both surface water and ground water.	Freshwater (surface water: rivers, lakes, reservoirs, wetlands; and groundwater).	Surface water and ground water.	Surface fresh water bodies (rivers, lakes, and wetlands) and underground water resources.

Not all of the reviewed guidelines provide steps required in watershed planning explicitly; those which do are the ASEAN and the FAO guidelines. Some of the others, such as those from ADB and ESCAP, do not explain watershed planning process step-by-step, rather, they provide the users with strategic suggestions in achieving an effective planning process. ADB provides suggestions for policy framework establishment focused on the sector of water resource, while ESCAP stresses the land use management and disaster mitigation. Addressing the third research question of this study, there is only the FAO guidelines that give clear and complete suggestions on the list of data needed to collect in carrying out the planning process. Nevertheless, the UNEP, ESCAP and ASEAN have contributed in providing suggestions on type of data needed for a successful watershed planning.

However, in spite of the variation among the guidelines, there are some agreements that can be derived from their perspectives. The first agreement is that all of them acknowledge watershed as the most suitable unit in managing natural resource, mitigating and approaching the solution for environmental problems and disaster reduction, and in promoting the sustainable development. The second point is that all of them have a high level of awareness and concern about the watershed management in developing countries, and each of them offered varied recommendations for the problem-solving towards the improvement of watershed management in developing countries. Some of them provided framework for watershed management and planning that despite their diversity in explicitness still have similar basic understanding. The next point of agreement is that there is a similarity of perception about the two dimensions in watershed management (regardless of the standpoint they use), namely temporal and spatial.

Within the spatial dimension, all of the guidelines identified three levels of planning within a hierarchy, associated with three areas of different geographic extent: national; regional or river basin or watershed; and local areas or micro-watershed. Planning for these different areas is conducted to different degrees of detail and for different purposes, but the formulations of set of goals among them are inter-related. The difference among the reviewed guidelines is on the focus of discussion and on the angle of view from where they see the planning.

Temporal dimension is related to the spatial one. Based on the result of the review, all of the guidelines agree that watershed management has to deal with three different time frames: long-term, medium term, and short term. Some of the guidelines have focused on a particular time frame, for instance the ASEAN and FAO focus on short term time frame at project level, while the UNEP and ADB focus on strategy at the national level with long-term approach. Other guidelines by the ESCAP do not focus on a particular time frame or level; rather, they provide general discussion on general time frames and levels of watershed planning.

Chapter 4

BEST PRACTICES OF WATERSHED MANAGEMENT AND PLANNING IN SOME DEVELOPING COUNTRIES

4.1 Introduction

The World Bank stated that there is a need to learn from the experiences of other countries in order to improve water resource management in developing countries (LeMoigne et al., 1994). Studies aimed at improving of watershed management, such as Wamsley et al (2001), in South Africa; Veale (2003d), in Canada; and Perez & Tschinkel (2003) in Guatemala, showed that learning from other places around the world is very useful and reviewing case studies on watershed management in other countries is a reliable way to encourage the improvement of watershed management. For instance, Veale (2003d) found that a review of water management approaches elsewhere in the world had been useful to validate the importance of watershed management for the protection of water supplies and the improvement of water quality. She also found that the lessons learned and best practices identified through the review can be actively shared with other governing bodies. Further, Wamsley *et al.* (2001), approached twenty-one organisations from around the world with regard to whether they had developed indicators of sustainable development for watershed management. The results of the study, which were the identification of indicators, were found to be useful for the development of indicators for watershed management. By reviewing other countries' experiences, they gained deeper understanding about the watershed management concept.

Addressing the last question of this research: "What can we learn from other countries' experiences on watershed management practices?", this chapter is intended to explain the status of watershed management in some developing countries and to review some cases in order to derive best practices in watershed management and to learn some lessons based on the experiences of the selected countries. Best management practice (BMP) is a specific action or set of actions (can be planning practice or operational practice, approach, strategy, program, policy, procedure, method, technique or other type of activity) that is proven successful or considered useful to improve the performance in the given situation and to solve the problems in the context of watershed

management. UNESCO (2004) categorised BMPs with at least four common characteristics: innovative; make a difference; have a sustainable effect; and have the potential to be replicated, adapted and transferred to serve as a model for generating initiatives elsewhere. It is hoped that learning from the experience of some other developing countries in managing their watershed will contribute to the improvement of watershed management and planning in Indonesia.

4.2 Overview of Watershed Management in Developing Countries

There are some similarities of developing countries that differentiate them from those in developed countries. One is associated with climate and other physical characteristics. Many developing countries are in tropical or sub-tropical region of the world, with some similar topographic and geographic conditions. Most of them rely on agriculture and forestry as the main sectors that support the economic of the nations and they usually are experiencing rapid industrial growth. This rapid development is often accompanied by environmental degradation. Another similarity is that they are highly populated countries. The increasing human population has exacerbated the situation, as shown by data displayed in Table 4.1.

Table 4.1. Population and land in south-east Asia region (FAO, 2004)

Country	Average annual population growth (%)		Total population (est.and proj.) (million)		Population density (persons/sq km)		Man/ Arable land (pers./sq km)		Agricultural population (pers./sq km)	Rural population (percentage)	
	2000-2005	2005-2015	2005	2015	2000	2005	1984	2000	2000	1983	2005
Indonesia	1.3	1.1	225.3	250.4	111	118	1,081	1,485	227	76	52
Malaysia	2.0	1.7	25.3	29.6	63	77	1,490	2,059	565	69	35
Philippines	1.9	1.6	82.8	96.3	243	276	680	936	254	61	37
Thailand	1.0	0.9	64.1	69.6	126	128	291	380	204	82	68
India	1.6	1.4	1,096.9	1,246.3	309	334	468	1,032	711	72	71
Total/ Average	1.6	1.3	1,494.4	1692.2	170	187	802	1,178	392	72	53

Source: FAOSTAT, in FAO (2004)

Table 4.1 shows that the population in agricultural land is very high, and agricultural land available per capita is very limited; whereas Pimental et al., 1995 in Brooks & Eckman (2000) said that in the tropical developing countries, the requirement of farm land for food is about 0.5 hectare per capita (200 persons/sq km). In fact, Table 4.1 shows that in 2000, the average population density in arable land was 1,215 persons/sq km (the available of arable land is only 0.08 hectare per capita). This imbalance is

estimated worsen in the next years, as predicted by the year 2025, that 45 countries in the tropics will have less than 0.1 hectare of arable land per capita.

Since the watershed as a unit of management is complex and includes physical and social dimensions, watershed degradation has been a common problem in developing countries. Table 4.2 shows how the environmental problems related to the degradation of watersheds have been prioritised in some developing countries in Asia, reported by the Asian Development Bank (ADB) in Lohani et al. (1997).

Table 4.2. Relative significance of resource and environmental issues in selected developing countries in Asia (adopted from Jalal (1993) in Lohani et. al. , p. 1-3)

Region/Country (ranking)	**Resource and environmental issue**		
	Deforestation	**Land and soil resource problems**	**Water resource problems**
South Asia			
India	high priority	high priority	high priority
Southeast Asia			
Indonesia	high priority	medium priority	high priority
Malaysia	high priority	low priority	low priority
Philippines	high priority	high priority	medium priority
Thailand	high priority	medium priority	high priority
Vietnam	high priority	medium priority	medium priority

Table 4.2 shows that deforestation has been considered a highly prioritized environmental issue in seven developing countries in South Asia and Southeast Asia. The major problems associated with watershed degradation in some ASEAN countries has been summarised in Brooks et al. (1990) as: (a) soil erosion causing loss of land productivity, (b) water pollution, contaminating surface and groundwater supplies, including drinking water, (c) sedimentation of streams, including downstream reservoirs, channels, and irrigation facilities, (d) flooding and flood damage, (e) altered stream flow patterns, amount and quality that affect aquatic resources (e.g. fisheries), and (f) loss of native forests and biological diversity. FAO has differentiated and ranked the importance of certain types of watershed degradation in some developing countries in the ASEAN region (Table 4.3).

Table 4.3. Causes of watershed degradation and their importance for ASEAN region (FAO 1986, as cited in Brooks et al., 1990, p. 58)

Type of watershed degradation	Country			
	Indonesia	**Malaysia**	**Philippines**	**Thailand**
Natural Causes:				
Geologically susceptible	M	L	M	L
High intensity rain	H	H	H	H
River gradient	H	M	M	M
Shallow soils	H	H	H	H
Man-Made Causes:				
Deforestation				
Legal land settlement	VH	VH	VH	VH
Illegal encroachment	H	H	VH	VH
Shifting cultivation	VH	VH	H	H
Fuel wood timber deficit	L	L	H	L
Forest fire	H	H	H	H
Poorly developed forest management	H	VH	M	M
Low investment in forest management	H	L	L	L
Institutional deficiencies	L	L	H	H
Inappropriate Cultivation Practices				
Uncontrolled land use changes	H	L	H	H
Inappropriate farming practices	VH	H	VH	VH
Road Construction in Fragile Lands	VH	H	VH	H
Inappropriate Collection, Transportation, and Utilization of Water	VH	L	H	VH
Unscientific Methods and Institutional	L	H	H	H
Socio-Economic and Institutional				
Land tenure problem	H	H	H	H
Low policy and legislative support	VH	L	L	L
Scarcity of skilled manpower	M	H	L	H
Need for unified planning and extension for integrated watershed management	M	H	H	H
Low level of community participation	H	H	L	H

Legend: VH = Very High; H = High; M = Medium; L = Low.

The most powerful cause of watershed degradation is human activity rather than natural causes (Table 4.3). The FAO reported that deforestation caused by legal land settlement, illegal encroachment, shifting cultivation, ill-management of forest, have been very serious problems in those countries (Sheng, 1990). Some very high important degradations are related to unwise practice in human activities, such as inappropriate farming practices; road construction in fragile lands; inappropriate collection,

transportation, and utilization of water. From the socio-economic and institutional aspect, poor policy and weak legal support has been reported as a strong compounding factor in watershed degradation in some developing countries.

Difference of geographical characteristics is one main factor that leads to a difference in watershed management between developed countries and developing countries. There are some additional differences that exist between the two groups of nations, such as tools, mechanisms, and the underlying values, attitudes and traditions that might influence the watershed management practices in those countries. Heatchcote (no date) noticed that in the developing countries of South and East Asia, the difficulties associated with those differences are obvious. Therefore, it is appropriate to conduct a review on what has been experienced by some developing countries in managing their watersheds. The discussion will range from the environmental issues they faced, the status of watershed management in each of the countries, the problems and limitations they have in watershed management, the actions and practices to address the problems and the challenges that they might have regarding improvement in the future.

4.3 Experience of the Philippines

4.3.1. Overview of the country and the environmental problems

The Philippines is a tropical archipelago that consists of 7,100 islands and atolls with an aggregate area of approximately 3,000,000 km^2 (NWRB, 1980 in Jacob, 1996). One of the important natural resources of this country are the forests. There are 419 watersheds, within which over 5 million hectares of land is unproductive, degraded, and unstable land a result of inappropriate land use. Thus the Philippines has a number of environmental problems (Alvares Jr, 1985 in Brooks et. al, 1990).

Figure 4.1. Map of the Philippines (source: CIA, (2004)

The problems that have arisen in the Philippines are typical of Asian countries, such as soil erosion, sedimentation of downstream waterways, declining water quality and flooding. These increasing problems have been associated with deforestation in the country. FAO reported that during 1966 to 1983, total forest and woodland area has decreased from nearly 17 million hectares to just about 12 million hectares (or 29 percent) (Jasmin, 1986, in Brooks et al., 1990). In 1999, the forestry statistics reported that only 5.33 million hectares or about 18 percent of the total land area of the Philippines remain under original forest cover Javier (no date). Veracion (1985) in Brooks et al. (1990) stated that forest destruction and land degradation were exacerbated by the increasing population that requires forest clearing for agriculture, grazing, fuel wood gathering, logging, mining, and human settlement; and accelerated by forest fires that occurred as the result of those human activities. Javier (no date) summarised the key causes of this degradation within watersheds as follows: (a) unsuitable forms of land use and inappropriate land management practices, (b) increasing population growth and inward migration, (c) poverty and economic disadvantage arising from limited alternative livelihood opportunities, (d) inadequate institutional support services to

upland communities, (e) policies that restrict land-use options, and (f) insecure land-user rights for de facto users of forest lands.

4.3.2 Development of watershed management and the problems

In the past, the Philippines lacked public awareness regarding watershed management opportunities for economic and water resource development projects (Javier, no date). There was a lack of understanding and appreciation on the vital role of watersheds in providing economic benefits - such as in supplying water. There was no recognition on the role of watersheds as natural 'water storage complex' and continual sanctuaries for wildlife. Moreover, the watersheds were hardly seen as (potential) agents that promote healthy ecological balance for life's variable amenities. Recently, the importance of watersheds is more appreciated and the need for managing them is growing. However, the Government of the Philippines has realized that the improvement of existing conditions takes time and requires resources, both financial and technical.

Various problems have been encountered by the Philippines in the watershed planning and management. One of the constraints is the legal system. The Philippines had a comprehensive and well-prepared suite of legislation relating to watershed protection and preservation, but improper management and inadequate technical knowledge have caused the failure of the existing laws to be effectively implemented (ESCAP, 1997). In forestry, Gabutan (1988) in Brooks et al. (1990) stated that there were laws and regulations provided to mandate acceptable forestry practices; but then undisciplined enforcement has allowed some inappropriate forestry practices which caused land degradation.

Another constraint in conducting an effective planning and management for the watershed in the Philippines is poor bureaucracy. Until the end of 90s, this institutional limitation is the larger and more significant constraint than technical ones (Garrity et al, 2000). Goze et al. (1987), in Brooks et al. (1990), reported that watershed management in the Philippines is obstructed by the fragmentation of watershed management activities and responsibilities among various government agencies and private enterprises. Javier (no date) said that the existing institutional arrangements, in some cases, could also result in duplications of functions. There is a lack of a practicable way or tool to coordinate the various agencies involved in watershed management, and to

mediate the diverse interests among them. In addition, FAO (1986) in Brooks et al. (1990) stated that the Philippines lack a comprehensive and coordinated watershed management strategy and program.

Besides the lack of a clear overall strategy, limited financial resources, and fragmented implementation responsibility, Javier (no date) also noted that earlier assessment on watershed management in the Philippines indicated the lack of public awareness and participation and the lack of properly trained personnel; whereas the socio-economic pressure in managing the watersheds is increasing. As result, PCARRD (1991), in Javier (no date), stated that many watersheds in the Philippines are now considered to be in a critical state due to overexploitation and mismanagement.

4.3.3 Best practices and lesson learned from the Philippines

FAO in Javier (no date) suggested that the country needs to promote coordination of agencies and to set out guidelines for comprehensive watershed management, including planning and monitoring. There is a need for changes in the previous policy environment to operate multiple-use management of watershed areas (Javier, no date). The first action step is the establishment of a national watershed information system to carry out the systematic collection, review and dissemination of information for improved watershed management. In order to ensure the conservation of watershed areas, criteria and indicators for sustainable watershed management must be developed. The government must actively promote and support research initiatives that provide accurate data and information for planning and policy making. The availability of the data and information is vital to support an effective and efficient management of watershed resources. Meanwhile, in the field level, the knowledge of local people on watershed and watershed management needs to be enhanced to ensure the adoption of suitable forms of land use and appropriate land management practices.

To promote coordination of related agencies as suggested by the FAO, many Local Government Units (LGUs), line agencies, and Non-Government Organisations (NGOs) now are involved in the development and implementation of a comprehensive training programme. This comprehensive training programme also involves the public. There has been a good use of education as a policy instrument to enhance the awareness and consciousness of the public to participate in watershed management programmes.

Through the participation of the community and LGU in the identification, formulation, implementation, monitoring and evaluation of watershed management plans is promoted. Multi-sectoral, multi-disciplinary and inter-agency partnership approaches are adopted in carrying out watershed management. Within these partnerships, institutional support services and mechanisms for improved watershed management at both the national and local levels are broadened and strengthened.

4.4 Experience of Malaysia

4.4.1 Overview of the country and the environmental problems

Figure 4.2. Map of Malaysia (source: CIA, 2004)

For Malaysia, the role of highland forests, and their interaction with the lowland or downstream area of the watersheds in the country is very important. Forests not only provide great income for the country through the forest product, but forest catchments are also vital for water supplies. Unfortunately, forest resource depletion that occurred mostly in lowlands of Malaysia Peninsular has stimulated the deforestation of hilly areas, since the timber production had shifted to the upper areas. This has created a worsening situation in some watersheds that had already been considered critical (Khairi Bin Mohd et al., 1987 in Brooks et al., 1990). The forest clearing for agriculture and mechanical logging and road construction has served as the primary cause of soil erosion in such areas. In addition, the construction of roads and highways, and the urbanisation of uplands have also contributed to the deforestation and the degradation of upper watersheds.

4.4.2 The development of watershed management and the problems

In the 1980's, there was no explicit integrated watershed planning practices in Malaysia (See, 1987 in Brooks et al., 1990). FAO (1986) in Brooks et al. (1990) also reported that at that time Malaysia has no national policy that specifically addressed the issue of watershed management. See (1987), in Brooks et al. (1990) noticed that land use planning has been guided by the Land Capacity Classification (LCC) - a system of soil suitability classification based on the capacity of a given soil to sustain agricultural, forest, or mining production. Even though this system guides development of forest, agricultural, and mining resources on national basis, See noted that the resulting planning only paid little attention to natural watershed boundaries, and did not place sufficient weight on the impact of these activities on water resources.

A decade later, there were some improvements. ESCAP (1997) reported that at the national level, Malaysia has adopted an Integrated Planning and Resource Management approach which recognizes the global need for sustainable development and recognizes the need to coordinate environmental and physical planning. However, even though a national approach for resource management has been adopted, it does not mean that watershed management has been done appropriately. Although the integrated watershed management concept has been accepted among planners and decision makers, its application on the ground is still unsuccessful (Ramadasan et al., 2000). Implementation of watershed management plans is mostly based on the application of engineering technology, while ecological and conservation aspects are not considered.

There is also bureaucratic fragmentation amongst the agencies involved in watershed management. In Malaysia, watershed management is located under different government departments and agencies. The government agencies concerned with watershed management include the Forestry Department, the Agriculture Department, the Drainage and Irrigation Department, the Malaysian Meteorological Service, the Department of Environment, the National Electricity Board, and the Mines Department (Khairi Bin Mohd *et. al*, 1987 in Brooks et al., 1990). Each of them is responsible for a different component of watershed management, but there is little or no interaction or coordination amongst them (Ramadasan et al., 2000).

4.4.3 Best practices and lessons learned from Malaysia

The adoption of an Integrated Planning and Resource Management approach at a national level has been a good start in order to combine environmental and physical planning. However, the application on the ground is still a big challenge. One major agenda being addressed in Malaysia regarding the improvement of watershed management and planning is people empowerment and decentralization of power to local government. Malaysia has realized that to achieve success in management, commitment from the public and local government is essential. Such a plan in watershed management should be widely accepted and fully supported by the public. Development of a consultative programme can ensure this and can reduce the dependency on government's role through a 'top-down' approach. Therefore, the approach taken by Malaysia is the exercise of a consultative process at all levels. This practice proved useful in order to gain opinion and inputs from the public in decision making (Yahya, 1997, in ESCAP, 1997).

Malaysia has also used education as an effective tool to promote community involvement in watershed management. Both formal and informal education has been used as an instrument to socialise watershed management program plans and eased their application in the field (Ramadasan et al., 2000 and ADB, 2001). An educative programme to protect and conserve watersheds has been developed by the government, involving school children and local communities. This successful experience has been an inspiration to develop the similar program of "the stream watch and river care" in Murray-Darling basin of Australia (ADB, 2001).

Further, to achieve a successful application of integrated watershed management at the local level, staff of varied agencies related to watershed management in Malaysia are equipped and given as much information as possible the fundamental ecological processes of the watersheds. To support this, several on-going research efforts are also underway to provide a strong scientific basis for development and application of watershed management in the field (for example in rehabilitation projects). The other role of the research is to determine the appropriate criteria and indicators for watershed management.

4.5 Experience of Thailand

4.5.1 Overview of the country and the environmental problems

Figure 4.3. Map of Thailand (Source: CIA, 2004)

Combined with population pressure, deforestation is a big problem in Thailand. The main cause of deforestation in much of the country is the clearing of land for agricultural production, besides commercial logging (Government of Thailand, 2001).The constant decline of forested area in Thailand in the past decades, as summarised from data in Brooks et al.(1990) and Chanphaka (1985) in Brooks et al. (1990), can be seen in the following graph (Figure 4.4).

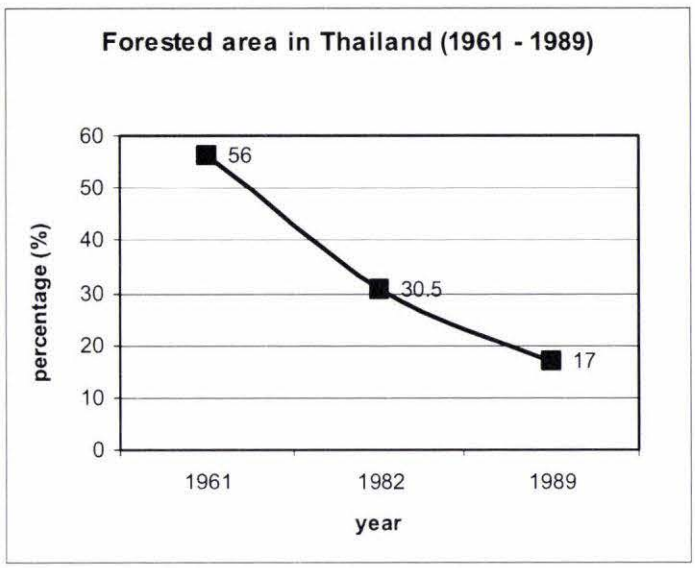

Figure 4.4. Forested area, as percentage of total, over the period 1961 to 1989 (Brooks et al., 1990, and Chanphaka, 1985 in Brooks et al., 1990)

The concern for an appropriate watershed planning and management in Thailand has been driven by the understanding of a link between deforestation and the occurrence of a number of environmental disasters in recent years, for example mud slides in southern Thailand in late 1988 that killed several hundred people. The prediction of a fuel wood shortage within the next 20 years has also concerned by the Government, as reported by FAO (1986), in Brooks et al. (1990). Therefore, in order to protect the country's upland areas, the government of Thailand, in the Fifth National Development Plan, set the goal of maintaining 40 percent forest cover in the country.

4.5.2 Status and problems in watershed management and planning in Thailand

In 1985, there was no comprehensive policy for watershed management in Thailand. Rather, the government approved regulations establishing a system of classification for watershed areas based on average slope percentage (FAO, 1986, in Brooks et al., 1990). FAO suggested that the greatest need of Thailand is for comprehensive legislation that includes specific conservation and management provisions. There is also a need for a multidisciplinary administrative unit that can effectively administer watershed management activities, and coordinate the activities of the various agencies involves. The following case of the Nam Pong Project, Thailand reported by Srivardhana (1983), in Brooks et al. (1990), is an example of the issues mentioned above.

The Nam Pong water resource development project was established in 1966. The main purposes of the project were hydropower production, the supply of irrigation water, and reduction in downstream flooding. Responsibility for the project involved several government agencies under several different ministries. For example, the Royal Irrigation Department (RID) was responsible for construction, while the Electricity Generating Authority of Thailand (EGAT) was responsible for reservoir management and maintenance. There were also some agencies responsible for land resources, such as the Office of Land Reform, the National Land Allocation Committee, the Department of land, and many others. For agriculture there were the Department of Agricultural Extension and the Agricultural Cooperative Office, both under the Ministry of Agriculture and Cooperatives. Meanwhile, forest management and the administration of forest lands was the responsibility of the Royal Forest Department (RFD).

The approach attempted in the planning and implementation of management for the Nam Pong project was 'bottom-up', where most directions for any individual office derive from higher up within their own department. Coordination among agencies became more complicated due the 'crossed-provincial borders problem' within the watershed.

It is clear that there was a lack of adequate interagency coordination. At that time, there were several committees at the national level and at the ministerial level (the World Bank in Le Moigne et. al., 1994). There were two committees at the national level attached to the office of the prime minister that were responsible for formulating guidelines and for coordinating the activities of all agencies concerned. The committees at the ministerial level were responsible in setting policy guidelines and in controlling the overall management of projects. But this was not adequate enough. The planning was still likely to be 'top-down' rather than 'bottom-up' since the coordination at the bottom level was unclear. Additionally, even though coordinating committees had been established, there was no assessment of their performance.

There are some consequences of these inadequacies. For instance, Srivardhana (1983) in Brooks et al. (1990) stated that inadequate cooperation among government agencies has caused difficulty in the adjustment of people from the production of lowland to upland crops. There was no system to stimulate efficient cooperation among agencies.

Moreover, to address the problem of pollution in the watershed, there was no clear responsibility and authority for such a program. Regarding the deforestation caused by the increasing population in the watershed above the reservoir area, there was no well-coordinated interagency effort.

4.5.3 Best practices and lessons learned from Thailand

There are some lessons to learn: (1) a clear responsibility for different aspects of a watershed management project to the various agencies involved is essential; (2) cooperation among agencies is necessary for the planning and implementation of the project to be successful; and (3) an institutional mechanism that encourages coordination is required to promote effective cooperation among agencies.

Another case from Thailand that provides positive lessons regarding these issues is the success of integrated watershed water-quality management in the Thachin River Basin (Simachaya, 2003).

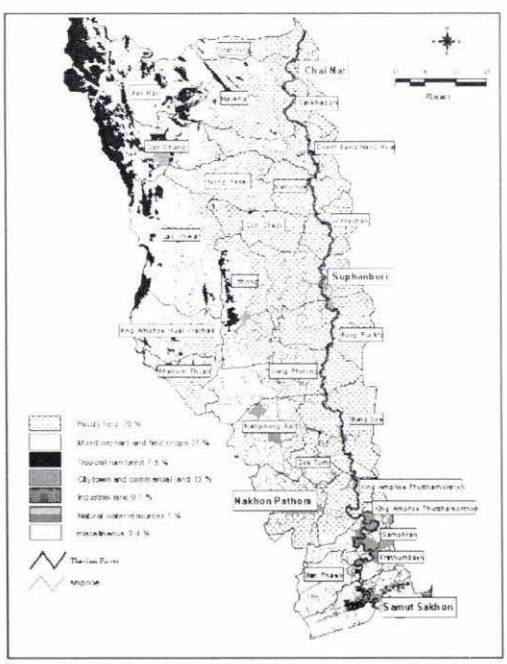

Figure 4.5. Map of land use in Thachin Basin (Simachaya, 2003)

In 2000, the effect of non-point source water pollution in this second most important watershed in Thailand had resulted in massive fish kills and drinking water quality degradation. Heavy rains at the time had reduced the quality of the river water. There was a lack of coordination between relevant agencies in addressing the problem, which

had also lead to confusion among the public regarding the real causes of the problem. Watershed management and planning was not well-coordinated and did not consider the upstream and downstream effects. In addition, there were also constraints and inadequacies in the existing laws and regulations.

There is no improvement until the establishment of the Thachin River Basin Coordinating Management Subcommittee to coordinate water quality management in the watershed. The subcommittee included representatives of relevant central government departments, NGOs, local academics, and civil society groups from each province in the watershed and worked closely with local water user groups and farmers. The committee also organised some workshops in order to accelerate the implementation of the action plan to solve the water quality problem.

This coordination was followed by a milestone: relevant central and local governments agreed to form a formal partnership agreement in 2002. Later, heads of four civil societies in the watershed also signed a cooperation commitment called "Public Partnership for the Thachin River Basin Restoration". This was the start of public participation in watershed management in Thailand.

The establishment of these agreements motivated the Thai people to develop networks, to support each other and to conduct cooperated actions in restoring, protecting, and conserving water quality in the Thachin River Basin. This story tells us that institutional coordination and public participation significantly influence the success of watershed management.

4.6 Experience of India

4.6.1. Overview of the country and its environmental problems

India is a country that relies on the agriculture sector. Having only 30 percent of cultivated land under the direct rainfall area, watershed management is important to support the agricultural production. The agricultural activities have impact on the natural resources on which they are based. Soil, water and vegetation have been severely degraded, especially in most of the arid and semi-arid regions (Kaushik, 2001).

Figure 4.6. Map of India (Source: CIA, 2004)

One of major forms of degradation is erosion, which along with the loss of vegetation cover has resulted in a lack of water and reduced soil quality. Amezaga (2003) added declining groundwater tables, reduction in quality and quantity of drinking water and loss of forest cover. Moreover, improper land use in the watershed has been indicated by the frequent occurrence of floods and droughts (MoA, 2002, in Amezaga, 2003; Hamilton, 1985), which have been a regular feature of India's climate. Consequently, the productivity of the land is decreasing over time. Kaushik (2001) reported that in India, over-population, harsh climate conditions, over-exploitation, improper use of soil, and deforestation have caused degradation of 57 percent of the total geographical area of 329 million hectares.

Water scarcity, combined with over population, is also a serious problem in India. The GoI Planning Comission in Amezaga (2003) reported that there is imbalance between the available water resource and population growth. The country has about 16 percent of the world's population, while its water resource is only 4 percent of the world's total. Due to the problem of water scarcity, around 70 percent of the agrarian districts of India are drought prone (ESCAP, 1997).

The problem in water resource management in India is the lack of political and local awareness, as well as ingrained and incorrect scientific understanding of water resource management and land use in some cases (Singh and Singh, 2002 and Gosain and Calder, 2003 as cited in Amezaga, 2003).

4.6.2. Status of watershed management and problems encountered

For the development of this country, conservation of water resource and addressing soil erosion are the focus of economic improvement as well as environmental development. The government of India selected integrated watershed management program as the major policy instrument to achieve these two-fold goals. Historically, the recognition of watershed management as an important strategy in India has been accepted for the past several decades, initiated by the establishment of four dry farming research stations at Rohtak, Sholapur, Hyderabad and Bellary in early 30's (Kaushik, 2001). Since the 1980's, the Integrated Watershed Development programmes had been formed.

Watershed management in India has been shared by three ministries: the Ministry of Agriculture (MoA), the Ministry of Rural Development (MoRD) and the Ministry of Environment and Forest (MoEF) (Baumann, 1998; Amezaga et al., 2003). The job description of each ministry is as follows: (1) The MoA deals with issues including erosion prone agricultural lands, optimizing production in rainfed areas and reclaiming degraded lands; (2) the MoRD deals with non-forest wastelands and poverty alleviation programmes with important components of soil and water conservation; while (3) the MoEF is dealing with forest and wasteland issues. The approach employed in watershed management and planning was still mostly 'top-down'.

Recently, the approach shifted to a 'bottom-up' one, initiated by the establishment of the national guidelines for watershed management in 1994. The guidelines were intended to set out a strategy to decentralise watershed management, and set up partnerships between government line departments, NGO's and newly formed local resource and user groups (Annonim, 2004). Nowadays, planning in India is focused on decentralised local planning (Amezaga et al., 2003). A participatory approach was selected as the most appropriate to assist in planning watershed management, since this approach can drive social mobilization and acts as a tool to develop long-term capacity and responsiveness of communities to plan effectively for the development of rain fed areas.

One of the key features promoted in the guidelines is the proposal of new modes of community participation through the organizing of the Watershed Association as a

representative of all members of the community who are directly or indirectly dependent on the watershed (Turton & Farrington, 1998). This association appoints a watershed committee or team that represents user groups, self-help groups, and the *gram panchayat* (elected village assembly). This team is then to formulate and develop a watershed development plan, in accordance with the planning process laid down by the guidelines. The plan is approved by the watershed association.

So far the guidelines are seen by some scholars such as Baumann (1998) and Farrington & Lobo (1999) as a good initiative to involve local people and to enable them to actively participate in developing and managing their watershed. The factors that support this achievement are the role of NGO's and the collaboration between the local community with the NGO's and foreign donor involvement. Moreover, the increasing acknowledgements of women's role, traditional cultures, and religious values in the society have encouraged the public participation. One example of successful use of participatory approach is the case of the Indo-German Watershed Development Programme in Maharashtra, covering 74 watersheds with area of 92,000 hectares and involving the co-ordinated activities of 50 NGO's (Farrington & Lobo, 1997). This successful participation was also contributed by involvement of women and lower castes (Harijans) in planning and implementation, sections of society that usually considered weak and vulnerable (Mishra, no date).

4.6.3. Best practices and lessons learned from India

The use of a participatory approach is an important influencing factor that determines the success of watershed management programmes in developing countries. Experience in India showed that the role of NGO's can be very helpful and need to be effectively empowered in the planning process and in the implementation of the watershed management program. The use of participatory approach in the case of Maharashtra Watershed Management has been successfully sustained by the growing response of women's role, traditional cultures, and religious values in the society. The acknowledgement and opportunities given to women has result in their active participation in local problem identification and the solving (Mishra, no date).

For the successful implementation of the watershed management programme in India based on the 1994 national guidelines, it was recommended that the guidelines need to be well-communicated to make them assessable to all types of people – from officials to farmers. Some attempts have been made to communicate the guidelines, such as translation of the guidelines from English to local languages and development of a supporting operational manual (a 'user manual' has recently been produced by an NGO that is waiting for the approval by the government).

4.7 Summary

The review of the experiences from selected developing countries has provided varied lessons to learn. The best practices and lessons to learn from the Philippines, Thailand, Malaysia, and India are summarised in Table 4.4.

Table 4.4. Summary of best practices and lessons learned from other countries experiences

Example of actions/practices from the referred country/case:	**Lessons learned :**	**Element category:**
PHILIPPINES		
Establishment of a national watershed information system to carry out the systematic collection, review and dissemination of information for improved watershed management	The availability of accurate data and information for planning and policy information is vital for an effective watershed management. Therefore, it is important to promote and support research initiatives towards effective and efficient management of watershed resources.	Institutional and technology, policy and legislation
Development of comprehensive criteria and indicators for sustainable watershed management in order to ensure the conservation of watershed areas.	Comprehensive criteria and indicators are important to conduct good monitoring and evaluation towards efficient watershed management.	Policy
Adoption of multi-sectoral, multi-disciplinary and inter-agency partnership to watershed management	Broaden the institutional base to improve the watershed management planning.	Institutional

Table 4.4. (cont.)

Involvement of Local Government Units (LGUs), line agencies, and Non-Government Organisations (NGOs) in the development and implementation of a comprehensive training programme.	Education is one appropriate policy tool to enhance the awareness and consciousness of the public to participate in watershed management. To be effectively implemented, coordination among local government, related agencies and NGOs needs to be promoted in a comprehensive training programme.	Policy and institutional
MALAYSIA		
Adoption of an integrated planning and resource management approach at national level which recognises the global need for sustainable development and recognizes the need to coordinate environmental and physical planning.	One of the key elements to promote a successful implementation of integrated watershed management on the ground is the incorporation of ecological considerations and conservation measures (environmental point of view) into the use of engineering technologies and solutions (physical point of view).	Policy
Development of a consultative programme that involves all levels of the community in the decision-making process.	For such planning to be effectively implemented, there is a need for wide acceptance and support from the public. Development of a consultative programme can ensure this and can reduce the dependency on the government's role through a 'top-down' approach. Education can also be an effective and efficient tool so promote community involvement towards successful watershed management.	Institutional and policy.
Promotion of community involvement in watershed management through the development of educative programmes involving school children and local communities.		
Provide the staff of related watershed management agencies with adequate skills, information and equipments which allow them to understand the complexity of watershed systems.	Well-equipped and well-trained staff with fundamental ecological information will be valuable to bridge the gap between engineering technology, ecology and conservation considerations. The balance between these aspects can be a factor determining the successful application of watershed management in the field.	Technical
Adequate support for on-going research efforts.	Research efforts can provide a strong scientific basis for the development and application of integrated watershed management. Research can also assist in determining criteria and indicators for watershed management.	Technology

Table 4.4. (cont.)

THAILAND *Case of the Nam Pong Watershed Project*		
	A clear responsibility for different aspects of a watershed management project to the various agencies involved is essential. Cooperation among agencies is necessary for the planning and implementation of the project to be successful. An institutional mechanism that encourages coordination is required to promote effective cooperation among agencies.	Institutional
	A comprehensive legislation system is a must in a watershed management framework.	Legislation
Case of the Thachin watershed water-quality management		
The establishment of a formal partnership agreement and a cooperation commitment among representatives of relevant central government departments, NGOs, local academics, and civil society groups from each province in a shared watershed to address the issue of water quality degradation in the Thachin River. Within this agreement, they meet periodically to follow up and report on the progress of the relevant activities.	A public partnership agreement is helpful to promote and to support public participation in achieving integrated watershed management as an effective means of water quality control. It is an example of real cooperation and coordination between the government and private sector, including the public. The agreement or commitment promotes the better understanding of the community among how to prevent pollution. It also assists in overcoming the difficulties in getting the various stakeholder organisations and local groups to cooperate and coordinate in the watershed management program.	Institutional
There are several coordinating committees at the national level, the ministerial level, and project level. Each of them has clear responsibility.	The establishment of committees as coordinating organisations should follow the hierarchy of planning in order to achieve optimal coordination for an effective watershed management.	Institutional

Table 4.4. (cont.)

INDIA		
Three central ministries, the Ministry of Agriculture, the Ministry of Rural Development, and the Ministry of Environment and Forest (MoEF) are coordinated in charge of the watershed management in the country. Each of these ministries along with their respective line departments, manage their part of the programme that focuses on different aspects and activities.	Good coordination among central agencies (ministries) from varied sectors and clear job descriptions and responsibilities determine the success of a watershed management program.	Institutional
The use of 'panchayat' or village as an implementation unit, but still the watershed is the unit of evaluation in assessing the impact of watershed management activities.	It is important to be consistent in the use of the watershed as a unit of resource management, from planning to monitoring and evaluation (impact assessment).	Institutional
An adequate and effective dissemination of watershed management guidelines to communicate the guidelines and their use in all levels.	There is a requirement for such a framework of watershed management that can be used by all the related stakeholders, with a format that is suitable for all levels in watershed hierarchy and consistent with local to national level structures.	Policy
Case of Maharshtra watershed development programme.		
The NGOs play roles in the implementation of watershed management programmes governed by the national guidelines. Their collaboration with local community and foreign donor organisations has provided support in achieving the goals.	The NGOs, especially the local ones, can be a valuable partner for the government to assist the community in participating in watershed management programmes. NGOs should be empowered and efficiently involved in the watershed management framework.	Institutional
The increasing recognition of women's role, traditional cultures, and religious values in the society.	Recognition of women's role, traditional cultures, and religious values promote the public participation and is useful to achieve a successful watershed management in efficient way.	Social/cultural

Chapter 5

REVIEW OF WATERSHED MANAGEMENT AND PLANNING IN INDONESIA

5.1 Introduction

Indonesia is one of the Asian developing countries which has suffered from various environmental calamities for decades. Its problems are both natural and man-made. Effective watershed management and planning will assist in providing solutions for these problems. This chapter will review the existing watershed management and planning in Indonesia. The review includes an overview of environmental problems, the history of watershed management in the country, current status of watershed management and planning from several aspects, and the problems encountered in the existing practice of watershed management. Four case studies will be reviewed as examples of existing watershed management practice.

5.2 Overview of the Country and Its Environmental Problems

Indonesia is an archipelago that consists of 17,508 islands and islets, as reported by Indonesian Naval Hydro Oceanographic Office (Indonesian Embassy, 2004). The islands are distributed around the equator so that the archipelago is known as an equator belt. Indonesia has a total land area of 1,919,443 square kilometres.

Figure 5.1. Map of Indonesian archipelago (Kominfo.LIN-Setneg, 2004)

From this total land area, approximately 64 percent was forest or woodland area in 1983 (Brooks et al., 1990). In 1984, about 20 percent was under *Imperata cylindrica* grass or otherwise infertile, and therefore unproductive (Mangundikoro, 1985 in Brooks et al. 1990). The geographic and climatic conditions in Indonesia are very diverse, ranging from highlands and lowlands, tropical, sub-tropical to semi arid and arid. Indonesia has a wide range of natural resources. Agriculture, mining, forestry, and horticulture are the main sectors that contribute most to the economy of the country. Many commodities from these sectors, together with other sectors such as tourism and industry, have played important roles in the economic development of Indonesia. Consequently, the rate of natural resource exploitation is increasing over time.

The population in the country is greatly increasing. Oxfam, a non-governmental development agency, reported that in 2001 the population of Indonesia was 211.1 million (Oxfam GB, 2004), which brings the country to the position of the fourth most populated country in the world. Beside the problem of increased population, the distribution of the population is another demographical problem. The population is concentrated in Java, which is the fifth biggest island in the country (see the map in Figure 5.1). This population density creates a huge strain on natural resources and the sustainability of development. There so many people that are 'hungry' for land. Production from arable land is unable to match the demands of a growing population.

One of the obvious concerns today is the over-exploitation of forests is threatening state of forestry in Indonesia. The FAO (1985), as cited by Karyana (2000) reported that forest degradation in Indonesia was the highest among countries in the Asia-Pacific region. Forest degradation in Indonesia is recognised as becoming a very serious problem. For instance, data from Planning Agency of the Ministry of Forestry reported that the annual rate of forest degradation in Indonesia is about 1.6 million hectares (Karyana, 2000). This rate has increased by three fold during the last six years. In Java, the situation is worse. According to the Ministry of Forestry, in 2002 the remaining forest area in the island was 20 percent of the land area (Annonim, 2002); but, recently, based on the satellite imagery by Planning Agency of Java-Madura the remaining forest area in Java is only 4 percent (1.7 million hectare). This percentage is very low compared to the standard that has been determined by the government in Law No. 41/1999 on Forestry. This law stated that the forest area should be at least 30 percent of

the total land area to be able to support the ecosystem. The causes of forest degradation are mainly of human activities, such as land clearing through the slash and burn method by several local peoples, illegal logging, over-exploitation and ill-managed logging practices by forest concession holding companies.

Some other environmental problems that have been attributed to the effects of increasing population pressure in Indonesia are erosion, sedimentation, landslides, flooding and drought (see Figure 5.2). The National Coordination Agency for Disaster Mitigation (Badan Koordinasi Nasional Penanggulangan Bencana) reported that, interestingly, the greatest disasters have been caused by human activities rather than occurring naturally. The agency has reported in Wahana Lingkungan Hidup (or WALHI, a non-government organisation in Indonesia that work in environmental area) press release that during the period from 1998 to 2003, there have been 647 environmental disasters in Indonesia, 85 percent of which are flooding and landslides (WALHI, 2003). These calamities have killed more than 1,600 people, and cost more than 2,000,000 million rupiahs. Specifically about flooding, between October 2001 and February 2002, there were 92 floods in the country that killed 146 people, and 389,919 people had been evacuated (Nugroho, 2003). Regarding the impact of drought, the cost to the agriculture sector in the last decade has been estimated at 700 million rupiahs per year. Erosion is another important problem that is usually related to forest degradation. The estimate of the cost of soil erosion and deforestation in Indonesia in 1984 was 4.0 percent of the Gross National Product (GNP), while the average of eight developing countries is 8.89 percent of the GNP (Barbier & Bishop, 1995).

Figure 5.2. Various environmental disasters in Indonesia (BP2TPDAS IBB, 2003).

The degraded areas can be classified as critical land. Mangundikoro (1985) cited in Brooks et al., (1990), mentioned two conditions of a watershed are considered critical. The first is if the watershed has large areas that are severely eroded or are being eroded at high rates. The second is if it is sufficiently degraded to adversely impact the productivity of downstream activities, for instance agriculture, infrastructure, or industry. Due to a limited capability to manage and handle the entire areas that have been categorized as critical, the government has set a policy to classify the watersheds in the country into three groups based on the priority of the watersheds to be managed. This determination of watershed priority by the government has changed over time, the trend shows that the number of critical watersheds is increasing. The latest government legislation regarding watershed prioritising is the Ministerial Decree No. 284/Kpts-II/99 (Ministry of Forestry, 1999). The classification of the priority of the watersheds is based on the following criteria or considerations: land (44.70 percent), hydrology (19.80 percent), social-economic (22.80 percent), investment (8 percent), and regional development policy (4.70 percent). According to the decree, the priority of total watersheds in Indonesia is as summarised in Table 5.1.

Table 5.1. List of watersheds and their priority for management (Indonesian Ministry of Forestry, (1999)

No.	Province	Number of watersheds (unit)		
		Priority I	Priority II	Priority III
1	D.I. Aceh	2	3	9
2	North Sumatera	4	19	3
3	Riau	4	3	23
4	West Sumatera	1	3	3
5	Jambi	1	-	5
6	Bengkulu	1	5	2
7	South Sumatera	1	1	6
8	Lampung	2	4	-
9	DKI Jakarta	1	-	-
10	West Java	4	29	18
11	Central Java	4	21	5
12	D.I. Yogyakarta	1	3	-
13	East Java	6	37	2
14	Bali	1	5	6
15	West Nusa Tenggara	1	4	4
16	East Nusa Tenggara	4	22	1
17	West Kalimantan	1	4	3
18	East Kalimantan	1	5	6
19	Central Kalimantan	1	2	5
20	South Kalimantan	1	1	10
21	South Sulawesi	4	12	5
22	South-East Sulawesi	2	7	7
23	North Sulawesi	3	7	9
24	Central Sulawesi	3	15	14
25	Maluku	2	9	16
26	Irian Jaya	4	1	14
Total watersheds		60	222	176

Figure 5.3. A critical watershed area in Central Java (BP2TPDAS IBB, 2003).

The main environment-related problems in the Indonesian watersheds for each priority class include respectively the issue of erosion, area of critical land, sedimentation, population pressure, vital infrastructure degradation, low income of local people, protection from forest degradation, the development status of the region, flood and drought prone, and ground water source protection (Ministry of Forestry, 1999). The distribution of the main problems in each priority class of watershed is shown by Figure 5.4, while the general illustration of the quantity of each problem in the total watersheds throughout the country can bee seen in Figure 5.5.

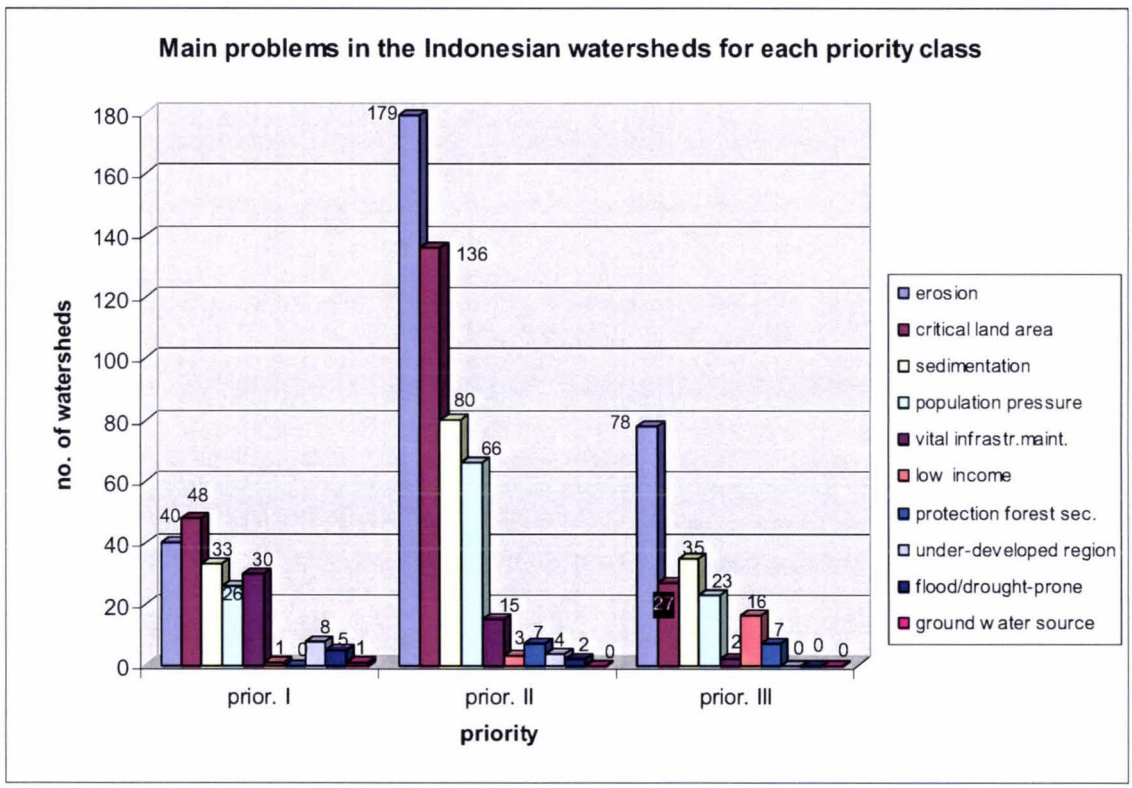

Figure 5.4. Main problems in the Indonesian watersheds for each priority class (Ministry of Forestry, 1999)

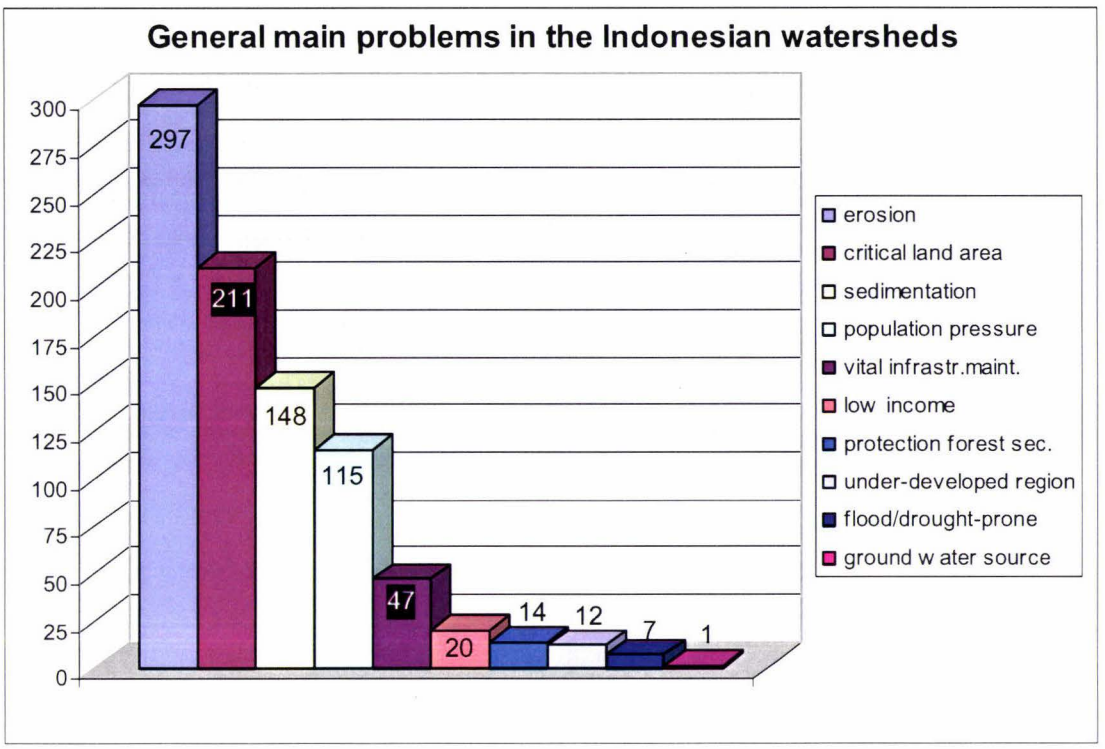

Figure 5.5. Main problems occurring in total watersheds in Indonesia (Ministry of Forestry, 1999)

As a consequence of the number of critical watersheds increasing overtime, and also the limited capability in managing the watersheds, it is important to increase the effectiveness of watershed management practices. One of important approaches is through the achievement of effective planning in watershed management. Therefore, this chapter will review existing planning in Indonesian watershed management.

5.3 History of the Watershed Management Concepts

Dutch colonialism:

As generally occurred in many developing countries, the concept of watershed management in Indonesia was inherited from colonialism. The initial concept of watershed management was introduced by the Dutch colonialists through the use of the watershed as the unit to divide and manage forest areas. This initial endorsement of watersheds as the unit of natural resource management was limited to forest production, and was not used widely for the management of natural resources. Then, the focus of efforts was developed to restore degraded land and water resources and to protect earlier water resource development investments established during the colonisation period (Brooks & Eckman, 2000).

The 1970's:

Watershed management activities were particularly focused on land rehabilitation and soil conservation. The 1970's was the era when the Ministry of Forestry started to be the governmental body that conducted the functional authority of watershed management in the country. By the end of 1969, a reforestation project had been prepared by the Ministry of Agriculture. Within a decade the Indonesian government had established co-operation with two world organisations (FAO and UNDP) in managing the natural resources based on watersheds. One of the early projects supported by the FAO was the Upper Solo Watershed management and the Upland Development Project (in 1972-1978) that was intended to formulate the watershed management system for the country (Nugroho, 2003). From 1973 to 1981 there were trials in co-ordination with the two organisations to figure out the most suitable method of land rehabilitation and soil conservation for watersheds in the country. During that decade, some other projects on watershed management had been conducted in selected watersheds around the country.

The 1980's - recently:

In conducting watershed management activities, Indonesia had been supported by multilateral or bilateral agencies from around the world (Brooks et al., 1990). However, until early in the 1980's, the watershed management had been a sector-centred effort that had some limitations. There had been no adequate attention to the nature of watersheds that do not acknowledge the political boundaries but only river/geographical boundaries. It was not well-understood that watershed management has to deal with multi-sectors and multi-disciplines, until a comprehensive effort was conducted in 1981 in Citanduy, a watershed in West Java. Another effort had been carried out in East Java, in a sub-watershed of Brantas watershed. However, most of the watershed management activities or projects had been focused on the development of the physical aspect of the watersheds, especially to handle erosion and flood problems. Nugroho (2003) criticised watershed management in the previous development of the country for being mostly focused on high-cost infrastructure or physical development; which lead to the failure of the management since there were no adequate maintenance after the project finished. In that way, the farmer or villager had not enough capability to apply and develop the conservation technologies. The participatory approach had not been acknowledged and implemented in the watershed planning. Even over the last decade, yet, the result of

watershed management project implementation in Indonesia has not been regarded as satisfactory.

Recently, a national program called Gerakan Nasional Rehabilitasi Hutan dan Lahan or GNRHL (National Movement for Forest and Land Rehabilitation) has been launched by the Ministry of Forestry, and incorporated into the watershed management program of the nation. The establishment of the GNRHL plan is harmonised with the short-term watershed management plan the lowest level, with the village as the target unit.

5.4 Current Status of Watershed Management and Planning

5.4.1 Background

Philosophically, the arrangement of watershed management and planning in Indonesia is based on the 1945 National Constitution (*Undang-Undang Dasar 1945*), particularly Article 33 (clause 3) which stipulates that "Land and water and all natural resources underneath are under the control of the government and [are to be] exploited as much as possible for the prosperity of the whole nation" (Suprapto, 2001). Further, the national statement in the People's Consultative Assembly (Majelis Permusyawaratan Rakyat or MPR) Resolution No. 11/MPR/1983 mentioned that "for development, natural resources should be utilised rationally and not destroy the environment, as well as take the needs of future generations into account". Therefore, the government agreed that the use of natural resources (including forest, land and water resources) for development to be sustainable, should be carried out using the system of watershed management (Dir. General of Reforestation and Land Rehabilitation, 1993).

Recently, on a global scale, there are some paradigm changes in water resource management that influence the development of watershed management and planning in Indonesia (Ministry of Forestry, 2001). The first one is the change of water as a resource from social good into economical good with social function. The consequence of this change is that planning regarding the use and utilisation of water resources should be done carefully, in order to avoid social conflicts. The desire of the public to participate in development is growing, leading to the movement of governance from government-centric towards public-private-community participation. The role of government should change from provider to enabler; and the approach to decision making should change from 'top-down' into 'bottom-up' (Ministry of Forestry, 2001).

Some practitioners are wondering whether the system of planning that exists in watershed management in Indonesia is still relevant, given the changing situation. Accommodating the changes, and realizing the influence of the changes upon planning in watershed management, it is necessary to review the current status of the existing practice of watershed management planning. Another reason to review the existing planning is that watershed management demands a long and continual process; therefore the planning should consider hierarchy in both spatial and temporal dimensions. Hendra (2003) stated that effective planning should be able to ensure land productivity in the short term, as well as ensure the sustainability of watershed resources as a basic asset for development in the future.

5.4.2 Legal framework of watershed management

The basic constitutional framework for watershed management in Indonesia is the 1945 National Constitution (*Undang-Undang Dasar 1945*), particularly Article 33 (clause 3). This is the constitutional background of watershed management set by the government of Indonesia. The concept of a watershed as a unit of management has been formally agreed by the forestry sector in the PP No. 33/1970 (Government Regulation on Forest Planning). Through this regulation, the government regards the primacy of using the watershed as a unit of management of forestry (as created by the Dutch colonialism), as well as the importance of forest management to address environmental issues. Since then, the Ministry of Forestry has been a functional authority in managing watersheds in the country. Then, the General Guidelines of the State Policy of Indonesia (*Garis-garis Besar Haluan Negara*) in the MPR Resolution No. IX/1998 strengthened the endorsement of the use of watersheds as units of natural resource management.

However, today the Ministry of Forestry is not the only government agency that deals with watershed management in the legal context. There are several legislation related or proposed to support watershed management in the country issued by other departments, underlying the development of watershed management guidelines in Indonesia. Key related legislations for watershed management in Indonesia are summarised in Table 5.2:

Table 5.2. Key related legislation of watershed management in Indonesia (Ministry of Forestry, 2001)

Related legislation no.	Administering Agency	Subject
MPR Resolution:		
MPR Resolution No. IX/1998	The People's Consultative Assembly	General Guidelines of the State Policy of Indonesia
MPR Resolution No. X/1998	The People's Consultative Assembly	Main points of development reformation to normalize the national civilization as the state's policy.
Law:		
Law No. 5/1960	The National Agrarian Agency	Agrarian basic regulation
Law No. 9/1969	Ministry of the Internal Affair	Forms of Governmental Enterprises
Law No. 11/1974	Ministry of Public Works	Irrigation
Law No. 5/1990	Ministry of Forestry	Conservation of biological natural resources and the ecosystem
Law No. 12/1992	Ministry of Agriculture	Cultivation system
Law No. 24/1992	Ministry of Public Works	Area regulation
Law No. 23/1997	Ministry for the Environment	Environment management
Law No. 22/1999	Ministry of the Internal Affair	Regional Governance
Law No. 25/1999	Ministry of the Internal Affair	Financial Balance between Central Government and Regional Government
Law No. 41/1999	Ministry of Forestry	Forestry
Government Regulation:		
Government Regulation No. 33/1970	Ministry of Forestry	Forest Planning
Government Regulation No. 22/1982	Ministry of Public Works	Water resource regulation
Government Regulation No. 23/1982	Ministry of Public Works	Irrigation
Government Regulation No. 20/1990	Ministry for the Environment	Water pollution control
Government Regulation No. 35/1991	Ministry of Public Works	River
Government Regulation No. 69/1996	Ministry of Public Works	Right, obligation, form and the regulation of public participation in regional/town planning.
Government Regulation No. 27/1999	Ministry for the Environment	Environmental Impact Analysis
Government Regulation No. 25/2000	Ministry of the Internal Affair	Governmental authority and provincial authority as autonomic region
Presidential Decree:		
Presidential Decree No. 32/1990	Ministry of Forestry	Management of protection area
Presidential Decree No. 84/2000	Ministry of the Internal Affair	Guidelines of regional organisation
Presidential Decree No. 165/2000	Ministry of the Internal Affair	Position, task, jurisdiction, and organisational structure of departments
Presidential Decree No. 234/M/2000 jo. Pres. Decree No. 289/M/2000	President	Establishment of Cabinet period 1999-2004

Table 5.2. (cont.)

Related legislation no.	Administering Agency	Subject
Ministerial Decree:		
Ministerial Decree No. 52/Kpts-II/2001	Ministry of Forestry	Guidelines of Watershed Management
Decree of the Directorate General of Reforestation and Land Rehabilitation No. 073/Kpts/V/1994	Ministry of Forestry	Guidelines for the development of Pola RLKT (land rehabilitation and soil conservation pattern)
Decree of the Directorate General of Reforestation and Land Rehabilitation No. 041/Kpts/V/1998	Ministry of Forestry	Guidelines for the development of RTL-TLKT (watershed's manual on field technical planning in land rehabilitation and soil conservation)

Source: Ministerial Decree No. 52/Kpts-II/2001, Appendix, Section II, Sub-section 2.1 (Ministry of Forestry, 2001).

Up to now, the guidelines set by the Ministry of Forestry (Ministerial Decree No. 52/Kpts-II/2001) are still the main (national) guidelines governing watershed management in Indonesia; and they still refer to all the agencies and stakeholders involved in the management. Following these national guidelines, several guidelines are to be referred to in developing plans with different levels according to the hierarchy of planning.

5.4.3 Hierarchy of watershed management planning

Watershed boundaries do not always coincide with administrative boundaries. However, from a political point of view, Indonesia has been governed using administrative borders for a very long time. To discuss the relationship between political administrative boundaries and geographical boundaries of watersheds is worthwhile, since regional autonomy or decentralization has been a radical change in the development of the country (since 2000) and is still an important issue today. In order to clarify the relationship between political administration and the use of the watershed as a unit of management, the watersheds in Indonesia are classified, according to the administrative territory and strategic function, into three groups (Ministry of Forestry, 2001): (a) local watersheds : a watershed that is located entirely in one municipal/district, or a watershed that can be potentially used by one particular municipal/ district; (b) regional watersheds : a watershed that geographically includes more than one municipal/district, or a watershed that can be potentially considered to be strategic for the regional development; and (c) national watersheds : a watershed that is

geographically located in more than one province; or potentially utilised by more than one province; or potentially considered to be strategic for national development. In relation to the hierarchy in planning, Paimin (2003) summarized this classification, which is outlined in Table 5.3:

Tabel 5.3. Relationship between administrative area and hierarchy in watershed management planning (modified from Paimin, 2003)

Watershed area	**Administrative area/territory**	**Hierarchy of planning**
Entire watersheds (nation-wide)	Nusantara/archipelago	Priority of watersheds DAS
Watershed	Province/National	Pola RLKT
Sub-watershed	Kabupaten (Region)	RTL RLKT
Sub-sub-watershed	Kecamatan (District)	Annual Plan
Micro watershed	Kelurahan/desa (Village)	Technical Plan

According to the national guidelines, the planning system in Indonesia follows a hierarchy of three types of plan: strategic, technical or tactical, and operational.

a. Strategic Plan

Pola Rehabilitasi Lahan dan Konservasi Tanah or Pola RLKT (Land Rehabilitation and Soil Conservation Pattern) is categorised as a strategic plan. This plan is the initial planning in the hierarchy of the planning system that is carried out at a macro level and intended to address general problems (Priyono & Mulyadhi, 2000). According to the Directorate General of Reforestation and Land Rehabilitation, Ministry of Forestry (1993), Pola RLKT is a general long-term plan (with a time frame of approximately 25 years) that is intended to provide technical direction for land use according to the area's function classification, the direction for land rehabilitation and soil conservation, and the level of criticality of each sub-watershed in a watershed/watershed group that needs priority. The directives in Pola RLKT are still general with respect to the outputs of general direction of land use, soil rehabilitation and conservation, priority order of sub-watersheds to manage within the watershed, and the direction in social-economic development. The development of Pola RLKT is also intended to coordinate the involved agencies in the watershed management activities. More detailed planning, which includes the analysis of social-economic factors, will be broken down in the next level of plan, namely, RTL-RLKT.

There are several steps required in order to create the Pola RLKT. To produce the plan, several agencies from varied sectors should be involved in the process, from the preparatory stages through to approval. The steps are defined by the Directorate of Reforestation and Land Rehabilitation (1993), as cited in Hendra (2003) as follows (Table 5.4):

Table 5.4. Steps required and agencies involved in the development of long-term plan (Pola RLKT)

No	Involved agencies	Steps required to develop Pola RLKT:					
		Preparatory	Data Collection /Inventory and Analysis	Report Development and Mapping	Discussion	Evaluation/assessment	Plan Approval
1.	BPDAS (watershed management agency)						
2.	Governor						
3.	Regional Planning Agency						
4.	Agriculture Service						
5.	Forestry Service						
6.	Horticulture Service						
7.	Agrarian Agency						
8.	Animal Husbandry Service						
9.	Irrigation Service						
10.	Forest Enterprise						
11.	Statistical Bureau						
12.	Environment Agency						

Source: Sistem Perencanaan Pengelolaan DAS (Hendra, 2003).

b. Technical/Tactical Plan

The next type of plan in the Indonesian watershed management planning system is the Manual on Field Technical Planning in Land Rehabilitation and Soil Conservation (RTL-RLKT). Based on the time frame, the difference between RTL-RLKT and the Pola RLKT is that RTL-RLKT is a medium term plan (5 years). Being more technical than strategic, this plan is intended to provide direction in determining the location, area and the criticality level of land according to the main problems that have been and are being faced in a sub-watershed or more than one sub-sub-watershed (Dir. General of Reforestation and Land Rehabilitation, 1998). By doing so, the plan is used as a guide to select the most suitable method, type and priority in managing the sub-watershed. The considerations provided in the RTL-RLKT include technical, socio-economic, and environmental considerations.

The RTL-RLKT can also be used in preparing watershed management plan that are synchronic with the development plan for the region. This can be achieved through the

use of basic data provided in the RTL-RLKT. The RTL-RLKT should refer to the existing development plan for the region and should refer to the Pola RLKT. The outputs of the RTL-RLKT include technical recommendations for land rehabilitation and soil conservation activities, the projection of activities each year for 5 years, benefit analysis (economic and financial), and a plan for monitoring and evaluation. Thus, the plan can also be used as a framework to monitor and evaluate the implementation and the impact of land rehabilitation and soil conservation activities carried out in a sub-watershed. The benefit analysis is done through the calculation of Net Present Value (NPV), Internal Rate of Return (IRR) and Benefit-Cost Ratio; which are useful to determine the overall feasibility of management activities.

According to Directorate General of Reforestation and Land Rehabilitation, the mechanism for developing RTL-RLKT involved similar governmental agencies, but at this level, their involvement is more active (Hendra, (2003). Rigorous data collection and discussion of the activities in the development plan are important to gather more details about the sub-watershed, since the RTL RLKT is intended to address more specific problems (Priyono & Mulyadhi, 2000).

The required steps in the development of RTL-RLKT and agencies involved are described in Table 5.5 (Hendra, 2003):

Table 5.5. Steps required and agencies involved in the development of medium-term plan (RTL-RLKT)

No	Involved agency	Steps required to develop RTL-RLKT:						
		Preparatory	Data collection	Data analysis	Report development and Mapping	Discussion	Evaluation/assessment	Plan Approval
1.	BPDAS (watershed management agency)	■	■	■	■	■		
2.	Governor					■		■
3.	Regional Planning Agency		■			■	■	
4.	Agriculture Service		■			■		
5.	Forestry Service		■	■		■		
6.	Horticulture Service		■			■		
7.	Agrarian Agency		■			■		
8.	Animal Husbandry Service		■			■		
9.	Irrigation Service		■			■		
10.	Forest Enterprise		■			■		
11.	Statistical Bureau		■			■		
12.	Environment Agency		■			■		

Source: Sistem Perencanaan Pengelolaan DAS (Hendra, 2003).

c. Operational Plan

This type of plan is the most detailed in that it is intended to guide the operation of management activities at the most local level. The plan is developed annually, consisting of a detailed plan to carry out certain watershed management activities in a local area and includes such information as location, type of activity, volume, time allocation and budget available for each activity. The plan is operational, locally site-specific and designed to achieve specific objectives; therefore development of this plan should be, as much as possible, carried out in a participative manner. An example of this operational plan is Rencana Teknis Tahunan Penghijauan or RTT Penghijauan (Annual Technical Plan for Reforestation project/activities) in a village that is also a micro watershed within a watershed. The steps in the development of this operational plan are as described in Table 5.6 (Hendra, 2003):

Table 5.6. Steps required and agencies involved in the development of short-term plan (RTT)

No	Involved agencies	Steps required to develop RTT:						
		Preparatory	Data Inventory/ Collection	Data Analysis	Report Development and Mapping	Discussion	Evaluation/Assessment	Plan approval
1.	BPDAS (watershed management agency)					■		
2.	Head of District							■
3.	Regional Planning Agency					■	■	
4.	Agriculture Service					■		
5.	Forestry Service	■	■	■	■	■		
6.	Horticulture Service					■		
7.	Animal Husbandry Service					■		
8.	Irrigation Service					■		
9.	Environment Agency					■		

Source: Sistem Perencanaan Pengelolaan DAS (Hendra, 2003).

Generally the RTT will be followed-up with the development of Rencana Kegiatan RLKT (RK-RLKT) or Detail Design for Land Rehabilitation and Soil Conservation. This plan is a temporal in nature and is used to guide the implementation of the annual plan for each specific activity; for instance the construction of erosion controls structure in a land unit. The design covers the work components, material, equipment, schedule and detailed budget that are required for the particular work.

5.4.4 Planning process of watershed management

According to the guidelines of watershed management (Ministerial Decree No. 52/Kpts-II/2001), planning process in watershed management should be an iterative and inter-related. The Ministry of Forestry, who set the guidelines, acknowledged that planning does not cease with the production of plan documents. After the implementation, there should be monitoring of goals and objectives; therefore, there will be feed back and revision of the developed plan.

The Indonesian guidelines determine that planning in watershed management involve the following steps: (1) Identification of the watershed characters, (2) identification of problems, (3) Formulation of goals and objectives, (4) Identification and evaluation of the management alternatives, (5) Development of the indicative plan and activities, and (6) Legitimizing and socialization of the plan.

The iterative planning process for watershed management governed by the national guidelines is illustrated in the flowchart in Figure 5.6.

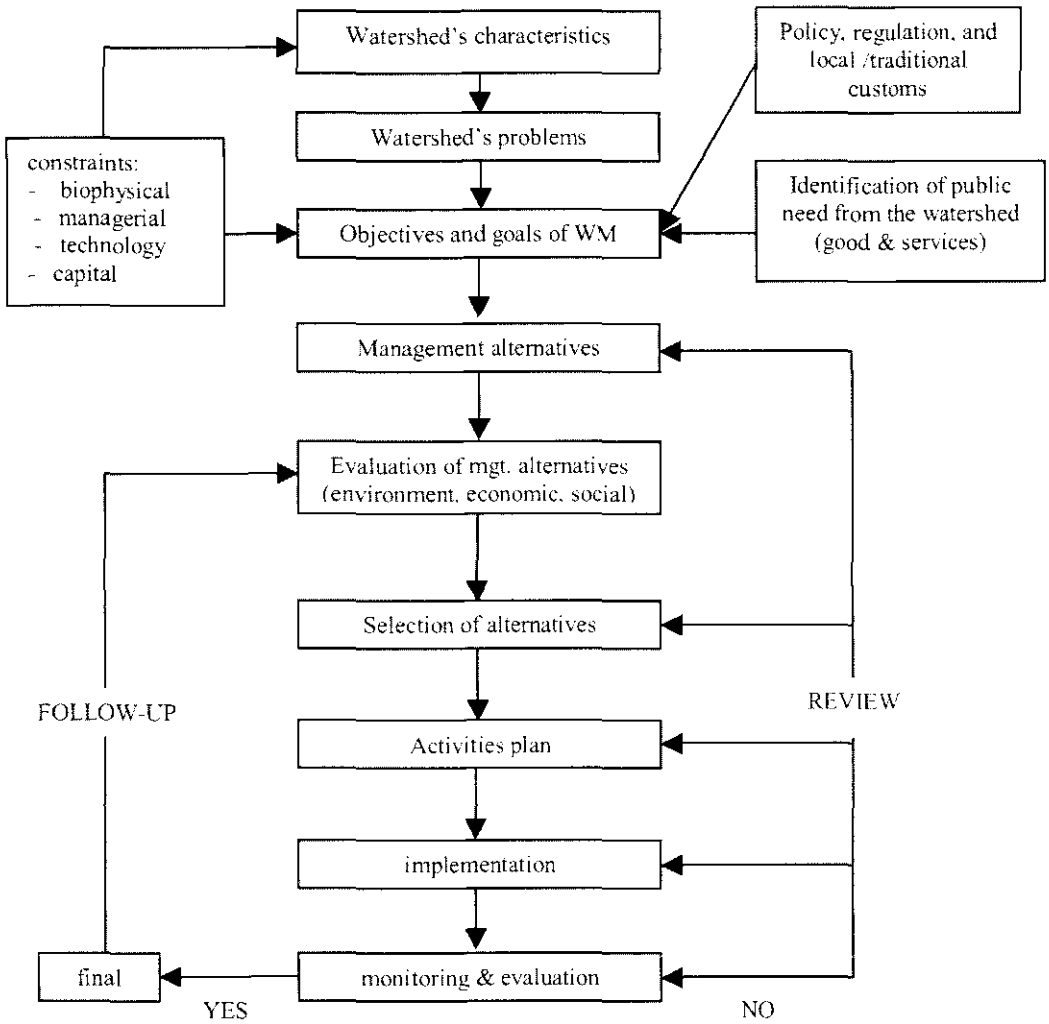

Figure 5.6. The iterative process of planning in watershed management (Ministry of Forestry, 2001)

According to the flowchart, the formulation of objectives and goals in watershed management should be based on three considerations, namely (1) legal system: policy, regulation, and traditional custom; (2) public need (the identified goods and services that are expected by the public from the managed watershed); and (3) Varied possible constraints: biophysical, managerial, technological, or capital constraints. Once the plan of selected activities is implemented, monitoring and evaluation should be carried out to see whether the activities meet the objectives and goals. If the result of implementation is not suitable, the planning process should be repeated by going back to the step of determining management alternatives, to find out the most suitable practices. This repeated review can also be done on the steps of alternatives selection, plan development, or the implementation.

The national guidelines set a range of criteria to be considered in watershed management planning. The first criterion for effective planning is the employment of the ecosystem approach, that planning should be comprehensive. Secondly, the planning should incorporate the development of both upper and lower areas of the watershed, and incorporate development of water resource and conversation of the watershed. Next, the planning should consider and be based on a clear description of responsibility of the involved agency, as well as the stakeholders' participation. The guidelines should also govern the use of high technology (for example the Geography Information System) as well as adaptive technology (such as indigenous knowledge).

Based on data compiled by the Division of Soil Conservation, Directorate of Land Rehabilitation and Social Forestry, the overall development of watershed management plans through out Indonesia has not been satisfactory. This can be seen through the graphs of plan development percentages in Figure 5.7 and 5.8.

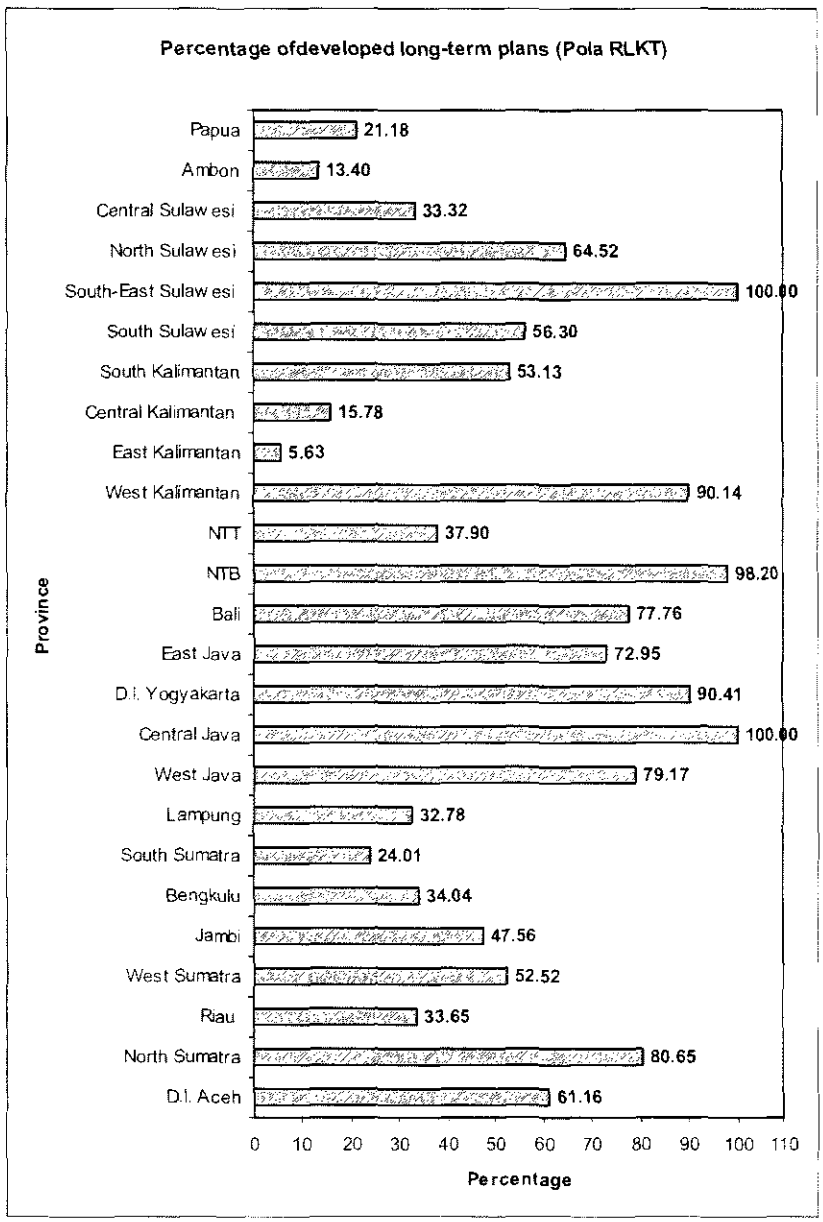

Figure 5.7. Percentage of developed long-term plan/Pola RLKT (Div. of Soil Conservation, 2000)

Figure 5.7 shows that the long-term plans do not exist for all watersheds in the provinces. Based on the most recent data gathered by the sub-Directorate of Watershed Management of the Ministry of Forestry (up to 2000), the only provinces in which all watersheds have long-term plans are Central Java and South-East Sulawesi. In some other provinces, the plans have been developed for most of the watersheds. But in other provinces the percentage of watersheds with plans is very low.

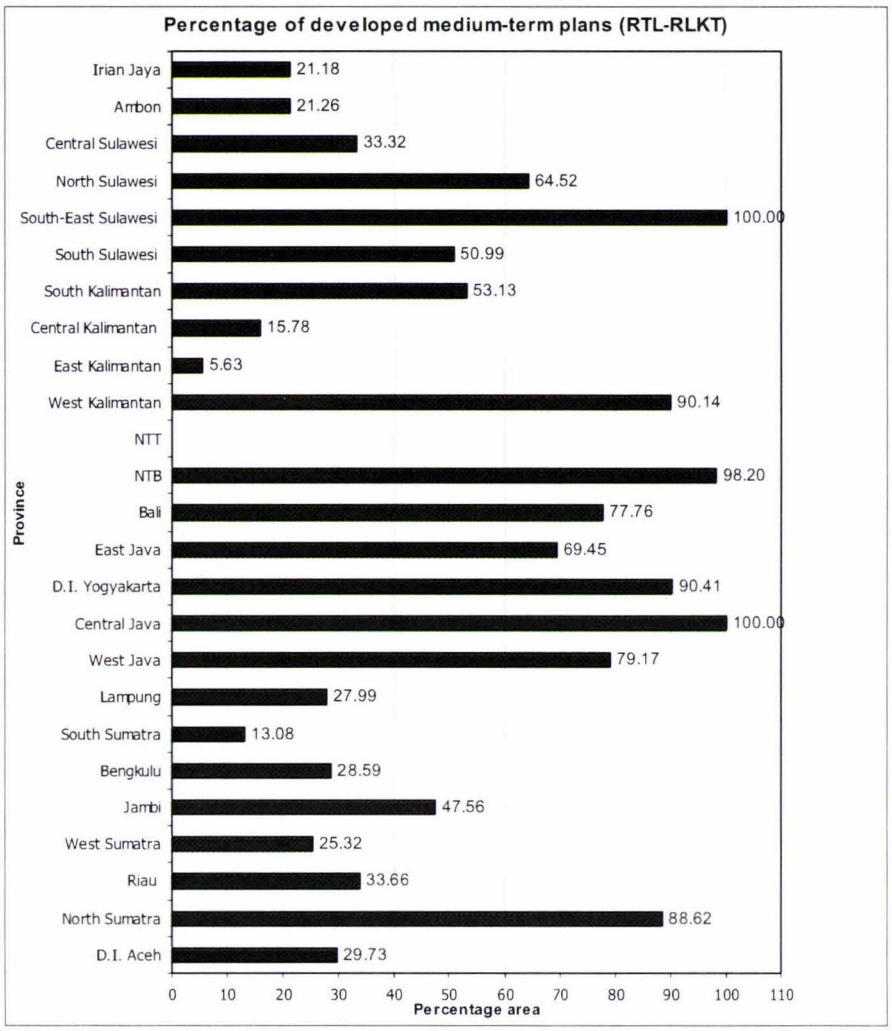

Figure 5.8. Percentage of developed medium-term plan/RTL-RLKT (Div. of Soil Conservation, 2000)

The similar trend also appears for the medium-term plans, as shown by Figure 5.8. In fact, in NTT (East Nusa Tenggara) province, RTL-RLKT has not been developed. This unsatisfactorily condition might be caused by several factors; but mostly by the lack of capacity of local watershed agency (lack of staff and skill), as well as lack of coordination with regional/local government in watershed management. The lack of capacity might due to the lack of data availability, associated with limitation in budgeting and skills.

5.4.5 Organisational and institutional framework in watershed management and planning

Ministry of Forestry is the governmental agency that holds the functional authority in watershed management in Indonesia. However, given that watershed management is not the exclusive domain of one particular sector and one particular discipline, management

is not the responsibility of one particular agency. The benefits of watershed management also should not to be intended for any particular group alone, neither government nor the public. Therefore, there are several stakeholders that are involved in watershed management and the planning process. The list of legislation that provides the legal framework for the watershed management planning in Indonesia (see Table 5.2) demonstrates that there are varied governmental agencies that administer watershed management and its planning in the country.

The guidelines of watershed management published by the Ministry of Forestry have included one section on the organising of watershed management. In this section, the guidelines concede that there is a lack of capacity in institutions in Indonesia and that to govern institutions in watershed management in the country is not easy, especially to coordinate the stakeholders. Therefore it is suggested that the first thing to do is to identify and list all the stakeholders involved in watershed management, including the public that might be affected by the watershed management activities. The next is to identify the tasks and responsibilities of each stakeholder; and then to formulate the watershed management body or institution that is the most suitable given the condition and geographical position of the watersheds.

The guidelines offer three alternatives institutions that can be chosen for watershed management in the country, namely (1) coordination body – an agency that has a function of coordinating the practice of watershed management in the country. The operational and maintenance of management practice is carried out by the related functional agencies; (2) Authority body – a body established by the government to govern, implement and empower the watersheds according to the policies that have been set by the Water Forum (watershed committee); (3) Governmental Enterprise– established by central government or regional government to manage the watersheds according to the policy set by the Water Forum (watershed committee).

Meanwhile, with a focus on planning in watershed management, the guidelines suggest the establishment of a Watershed Council or Watershed Forum as a board that formulate policy for watershed management. The board is to be established at three different levels or scopes in accordance with hierarchy of planning: national, regional, and local.

Unfortunately there is no explicit guideline on who is exactly responsible for watershed management planning. Paimin (2003) criticised the guidelines, because they do not give clear explanation or guide on the specific agency or institution that should be responsible and has jurisdiction for a certain level in the planning hierarchy. The clear definition of responsibility and jurisdiction among the agencies is essential if watershed management planning is to succeed, particularly in addressing the context of decentralisation.

5.4.6 Problems encountered in watershed management and planning

The complexity of interrelationships among the involved stakeholders in carrying out planning in watershed management causes some problems in planning. Karyana (2000) wrote that the global hindrances in the development of watershed management in Indonesia are the unsteady institutional framework and the weak and incomprehensive planning system. There have been a number of indications as to what has caused these problems. Firstly, Karyana noted that the incomprehensive planning system has situated people or society within the watershed as *object* rather as the *actor* of the development. Secondly, there has been an imbalance between physical and social development. Therefore the advantages or benefits from the development are not evenly distributed. Thirdly, the predominance of an old paradigm in the development has caused the limitation of opportunity and ability for the public to actively participate in the development. In short, humans are still regarded as an external part of the watershed ecosystem.

Meanwhile, Surya (1997) criticised the planning of watershed management in Indonesia, regarding the determination of goals in planning. He stated that there has been a lack of harmony in understanding the watersheds as units of management among stakeholders, including government agencies and regional government. This problem has been noted by one watershed management agency in East Java that is responsible for Brantas watersheds, Balai Pengelolaan Daerah Aliran Sungai (BPDAS) Brantas (BPDAS Brantas, 2003). The problem of unsynchronized regulations among the agencies has also been observed. Furthermore, BPDAS Brantas has also noted that the plans that have been developed have not been a powerful tool in watershed planning and management. As has been mentioned before in the history section, there have been only two departments or governmental agencies in Indonesia that have the watershed as part

of their jurisdiction. This has been a serious problem, since integration among agencies is important to accommodate the need of each sector and to establish an acceptable strategy. Surya pointed out that there is a need for planning tools that facilitate this integration and have a formal legal base that is powerful enough to commit all of stakeholders to the plan in order to implement policy in each sector.

Further problems were exposed in a technical work meeting on water quality enhancement programme held in Jakarta in 2000 (Ministry for the Environment, 2000). It was stated that the obstacles to watershed management in Indonesia are multiple. It acknowledged that there are differences in vision, mission, perception and objectives in the management among the stakeholders. The management is sector-centred, lead to the overlapping of jurisdiction and legislations among the sectors. In addition, there is no integrated information management system to support the management of the watersheds. On the other hand, similar to the point made by Karyana (2000), the meeting also concluded that there is a lack of public participation in planning and implementation.

Mangundikoro (1985), as cited in Brooks et al., (1990) has highlighted some technical problems in the planning process in Indonesia. Indonesia's watershed planning process is hampered by limited data, in terms of its availability and validity. Basic hydrology and land use patterns were lacking in the country. Another technical problem is the lack of well-trained staff to design soil conservation measures. Further, Mangundikoro also noted the lack of participation by local government agencies in the planning process. It seems that the 'top-down' approach is more dominant in planning rather than the 'bottom-up' one.

5.5 Summary of Review of the National Guidelines

Recently, watershed management in Indonesia has been functionally governed by the Ministry of Forestry, who set the watershed management guidelines at the national level, supported by several relevant pieces of legislation within a legal framework. The general characteristics of the national guidelines are summarised in Table 5.7.

Table 5.7. Summary of the Indonesian national guidelines' general characters

Attribute of character:	
Intended level	General/three levels: national, regional, and local.
Specific subject of interest	Water, forests, land and soil resources within the watersheds.
Basic approach	Political, institutional and managerial approach
Targeted user	Government, regional/local government, and public in using the watersheds.
Water referred in the guidelines	Freshwater, both surface water and ground water.

The national guidelines cover some aspects of watershed management. Explanation of some contents governed by the guidelines, especially regarding the planning are summarised in the Table 5.8.

Table 5.8. Summary of the Indonesian national guidelines for watershed management

No.	Contents	Explanation in the guidelines
1.	Objective of the guidelines	To provide direction and guidance in conducting watershed management to achieve the harmony of perception and action in watershed management.
2.	Legal framework	Consists of a set of legislation from the National Constitution to Ministerial Degree from varied relevant sectors.
3.	Hierarchy of planning system	Divided into 3 (three) levels of planning: - Long-term (25 years) planning at national level; (strategic plan) - medium-term (5 years) planning at regional level; (technical/tactical plan) - short-term (1 year) planning at local level (operational plan).
4.	Process of planning	Process involves the following steps: 1. The watershed characters identification (characterisation), 2. Problems identification, 3. Goal and objective formulation, 4. Identification and evaluation of the management alternatives, 5. Development of the indicative plan and activities, and; 6. Legitimizing and socialization of the plan.

Table 5.8. (cont.)

No.	Contents	Explanation in the guidelines
5.	Organisation / institutional arrangement	Recommended actions: a. Identification of relevant stakeholders; a. Identification of tasks and jurisdiction of related agencies and stakeholders. c. Formulation of the most suitable watershed management institution.
		Alternative forms of watershed management institution: coordinating body, authority body, or enterprise.
		For the formulation of watershed management policy, recommended forms of institution are: Watershed Board or Watershed Forum (in each level of planning hierarchy).

5.6 Watershed Management and Planning Case Studies

5.6.1 Ciliwung-Cisadane Watershed

a. Overview

Ciliwung-Cisadane watershed is one of the critical watersheds in West Java Province that has been of concern to both government and the public for years. This watershed has been the subject of continual flooding in its down-stream area called Jabotabek (Jakarta-Bogor-Tangerang-Bekasi). The Information Centre of the Ministry of Forestry (Annonim, 2002), reported that forest area in the watershed is only 12 percent of the total area, while the settlement area is 28 percent. This fact is not in accordance with the regulation in Law No. 41/1999 on forestry which mentions that ideally, forest area in watershed the should be at least 30 percent of the total area to be able to support the balance of the ecosystem in the watershed. The pressure from population growth led to the extensive settlement and increased erosion. The problem is compounded by the illegal logging, that has increased in the upper of the watershed.

Kartodiharjo, in Annonim (2003c) stated that there are not only technical issues underlying the problem of flooding in Jabotabek area, such as the change of land use in the upper part of the watershed. The other important issues are the management of the watersheds and the weak public policy governing the management. Kartodiharjo noticed these limitations due to weak lines of responsibility in managing the watersheds (there are at least two watersheds involved in the flooding problem in the area), including the management of the water resource that is a public resource.

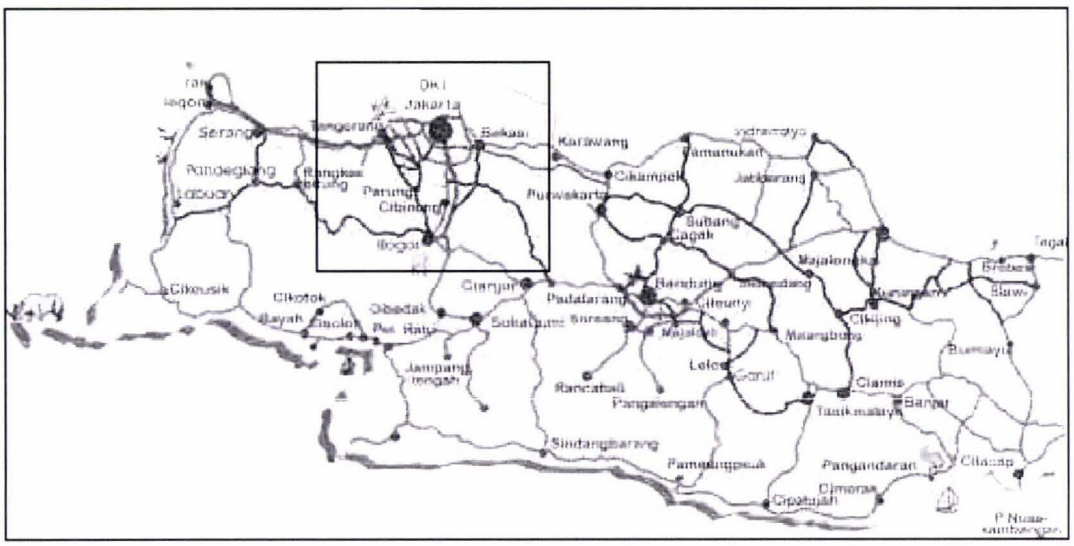

Figure 5.9. Map shows Cisadane sub-watershed location in West Java (Kominfo.LIN-Setneg, 2004)

b. Local environmental problems in Cisadane sub-watershed and problems in watershed management:

Beside the flooding that has brought public attention recently, the result of data analysis and problem identification in RTL RLKT has also found some other problems such as erosion and sedimentation (even though the rate of sedimentation is still tolerable), poor management of land use, and several watershed related social-economic problems.

Regarding the erosion problem, the result of data analysis found that the erosion in Cisadane can be classified according to the level of danger or hazard into five classes, as summarised in Table 5.9:

Table 5.9. Area of Cisadane sub-watershed based on erosion hazard classes

Erosion hazard classification		area (Ha)	%	level
I	< 15 tonnes/yr	95,245.10	61.04	very low
II	15 – 60 tonnes/yr	48,064.30	30.80	low
III	60 – 180 tonnes/yr	5,838.30	3.74	medium
IV	180-480 tonnes/yr	4,974.80	3.12	heavy
V	> 480 tonnes/yr	2,020.60	1.29	very heavy
Total		156,043.00	100.00	

Using the classification in Table 5.6, there are 12,732 ha or 8 percent of total watershed area that can be classified as medium to very heavy erosion hazard. Given the overall

erosion hazard as well as sedimentation in the watershed that can be regarded as moderate, the situation is generally not very bad. Even so, erosion and sedimentation are not the only problem. Interaction between physical factors (such as hydrology) and social-economic factor of the population in the watershed can result in a more serious problem. Recently flooding is an example of this interaction. Problem identification carried out in the planning process by the local watershed agency found that there are many traditional customs conducted in farming/agriculture practice that ignore the principals of soil conservation, leading to a decrease in land productivity. Even though the percentage of farmers in the watershed area is only 21 percent (185,511 farmers) of the total population, BPDAS Citarum-Ciliwung regards the impact of their farming activities on the land resource as the dominant factor. Their activities resulted in increased erosion, sedimentation and demand for land. Associated with the trend of increasing population, the concern of the watershed agency today should be more about social factors. The result of interviews showed that most of the public (especially farmers) are not well-educated, so they lack knowledge of good soil conservation techniques. The response of farmers to introduced soil conservation activities is low and the implementation of conservation system in the Cisadane sub-watershed is still unsatisfactorily.

c. Data availability:

Data that has been collected for this plan is varied. The first group of data is biophysical data gathered from many types of similar scale maps, including: watershed map, topographic map, soil type map, land use map, geology map, isoerodant map, administrative area map, and forest area map. Primary biophysical data has also been gathered from direct measurements/field survey. The biophysical data of Cisadane consists of location/position and area of the watershed, climate, soil, topography, land use, vegetation condition, hydrology, irrigation infrastructure, and data or map for land unit establishment.

The second group of collected data is socio-economic data, including primary and secondary data that are collected from many sources and methods such as interview with villagers and farmers, document review, and personal communication and consultation with related agencies. The socio-economic data includes demographic data, means of livelihoods, education, land ownership, agricultural pattern and the

production, labour condition, wage rate and price level, social economy institution, local organisation and the existing infrastructures.

All of the data was analysed to identify the level of land criticality, in order to select the most prioritised land to be managed in the watershed area. Additionally, to develop a plan for managing the watershed, selection and prioritisation were also built through economical and cultural feasibility. The output of this plan is recommendations on management alternatives to be implemented to address the problems in the watershed.

d. Planning hierarchy and the process:

When conducting planning of watershed management in Cisadane, the local watershed management agency need to follow the hierarchy of planning as governed by the Ministry's guidelines; by developing long-term, medium-term, and short-term plans. However, the planning has not been done satisfactorily. In order to manage the watershed, the local watershed management agency (BPDAS) has carried out planning and developed plans. According to the latest data of watershed management plans development recapitulated by the Soil Conservation sub Division, Ministry of Forestry, the long-term plan (Pola RLKT) for Cisadane has been developed and it should be valid until 2011, but unfortunately the document of the plan is not available any longer. The short-term plan for the micro-watershed (RTT) has been developed previously by the regional Forestry Service (and the watershed agency does not have a copy). Since 2003, the short-term planning for Cisadane has also been approached by developing a GN-RHL (National Movement for Forest and Land Rehabilitation) plan. This is an annual plan that specifies the form of rehabilitation activity, the pattern of planting, targeted location, the area in hectares, and the need for seedlings (type, species, and amount) in each target unit (village).

As mentioned before, RTL is a medium-term (5 years) plan; therefore in 2003 the RTL RLKT for Cisadane has been reviewed. Within this review, there are four main steps involved: (1) preparatory, (2) data collection, (3) Data analysis and identification of land's criticality level, (4) planning of land rehabilitation and soil conservation activities.

e. Recommended management practices:

As has been identified by the BPDAS in the planning process, the problem in watershed management in Cisadane is mostly related to a social factor that is the lack of education of farmers that results in the unsuccessful implementation of conservation systems. Erosion and sedimentation that have occurred were regarded as tolerable. However, the two environmental hazards are still problems that need to be addressed. Therefore, BPDAS in suggesting recommendation management practices used the approach of elimination of erosion hazard, population pressure and delivery ratio. These variables are to be minimised so as to be lower than the tolerance threshold.

Management practices that are recommended by the BPDAS include physical activities that are combined with social activities. Some of them involve vegetative methods, for example, the arrangement of agroforestry (5,000 hectares): alley cropping and contour-based planting (2,250 hectares); grass strip planting (1,050 hectares); establishment of production forest plantations including limited production forest and private forest (7,500 hectares); establishment of protection forest, social forestry, wildlife reserves and tourism forest (5,500 hectares); cover cropping (6,250 hectares); establishment of permanent vegetation including industrial and horticulture plantations (3,750 hectares); river and spring protection (75 hectares); agroforestry, mixed compound (mixed man-made plantation in the non-agriculture land area) and homestead garden (mixed compound in the homestead land area) (7,750 hectares).

Some other recommended practices are technical physical activities that are intended to establish structural design. These include establishment of (a) broad-base terrace and contour banks (1,500 hectares); (b) Individual terrace (2,500 hectares); (c) Mountain Terrace (6,000 hectares); (d) Vertical mulch (2,500 hectares); (e) Bench terrace (5,000 hectare); (f) drainage (5,000 hectares); and (g) Drop structure made from bamboo/stones (5,000 hectares).

The successful implementation of these technical recommendations will minimize the influence of all variables that might create adverse effects on the watershed conditions.

f. Organising the watershed management:

Since RTL-RLKT is an integrated planning system, there are varied stakeholders that are involved, that come from varied sectors and include representatives from the government, private sector and general public. In government owned land, implementation of land rehabilitation and soil conservation is to be carried out by the government agencies by involving the people that surround it; while in non-government owned land, the implementers are the land owners or land users.

Unfortunately, there is no clear explanation in the planning documents as to which agencies are involved in watershed management in Cisadane, neither the description of tasks nor responsibility of each agency. There is no information about organisational structure in planning or even in general management of the watershed/sub-watershed.

5.6.2 Bengawan Solo Watershed, Samin sub-watershed

a. Overview

The watershed's name was taken from the name of the longest river in Java, which has been associated to the life of people in the island for decades. Given the total length of 600 kilometres and drainage area of 16,000 kilometres square (Budidarma, 1997), Bengawan Solo watershed is an example of watersheds in Indonesia that involve two administrative territories, namely Central Java and East Java provinces. Unsurprisingly, social conflicts in the management of the watershed have occurred for a long time.

b. Local environmental problems and watershed management problems:

The most crucial environmental problem faced by the people who live around the Bengawan Solo watershed, especially in the upper stream (Wonogiri region) is flooding and drought. Moreover, the Ministerial Decree No. 284/Kpts-II/1999 (Ministry of Forestry, 1999) also noticed that the prioritized problems to handle are erosion and sedimentation, as well as the high population pressure. The media have intensively discussed and reported the implications of these disasters. Concerning flooding, Budidarma (1997) mentioned that great flooding had occurred in the watershed many times during the last half century, namely in 1958, 1966, 1968, 1975, 1978, 1984, 1986,

and 1993. An article of national newspaper also reported the seriousness of the sedimentation problem in Gajah Mungkur dam, a multi-purpose dam that drains the water from Bengawan Solo River (Annonim, 2003d). It was stated that the sedimentation rate in the dam was 8 millimetres per year, an increase from 2 millimetres per year in 1981 when the dam was established (Annonim, 2003b). The seriousness of problem has consequences - dredging of the sedimentation in the dam cost 60 million rupiahs. The cost of this dredging treatment was subsidised by the Japan International Cooperation Agency (JICA). These problems create the subsequent problem of both water quantity and water quality to many people that use water in the watershed. An additional complication is conflicts associated with a cross-boundary watershed (as has been mentioned before, the watershed is shared by two provinces). People in the down stream (East java province) claim that the watershed has been utilised more by people in Central Java province (that is mostly up stream), for instance to supply water requirements to industries in the province. Consequently, many farmers in East Java (for example in Padangan, Kasiman, Kalitidu district in Bojonegoro) region lack water for irrigation, particularly in dry seasons (Annonim, 2003a). It has also argued that the use of water by the industries in the upper stream has impacted on the water quality down stream; the colour of water that is used as drinking water in Lamongan and Gresik region in East Java has turned brown due to pollution. Research in 1993 by Environmental Study Centre of a local university found that there were unacceptable levels of the Chemical Oxygen Demand (COD) of 13.95 ppm and nitrogen content of 23.46 ppm.

Problems in Samin sub-watershed:

Locally in sub-watershed Samin, the problems that are related with management of the sub-watershed can be classified into five groups that are basically related each other: (1) incompatible land use with the land capacity/function; (2) the trend of increasing erosion and sedimentation rate; (3) the high erosion hazard level; (4) highly flood and water shortage prone; and (5) the exceeding population pressure on agricultural land.

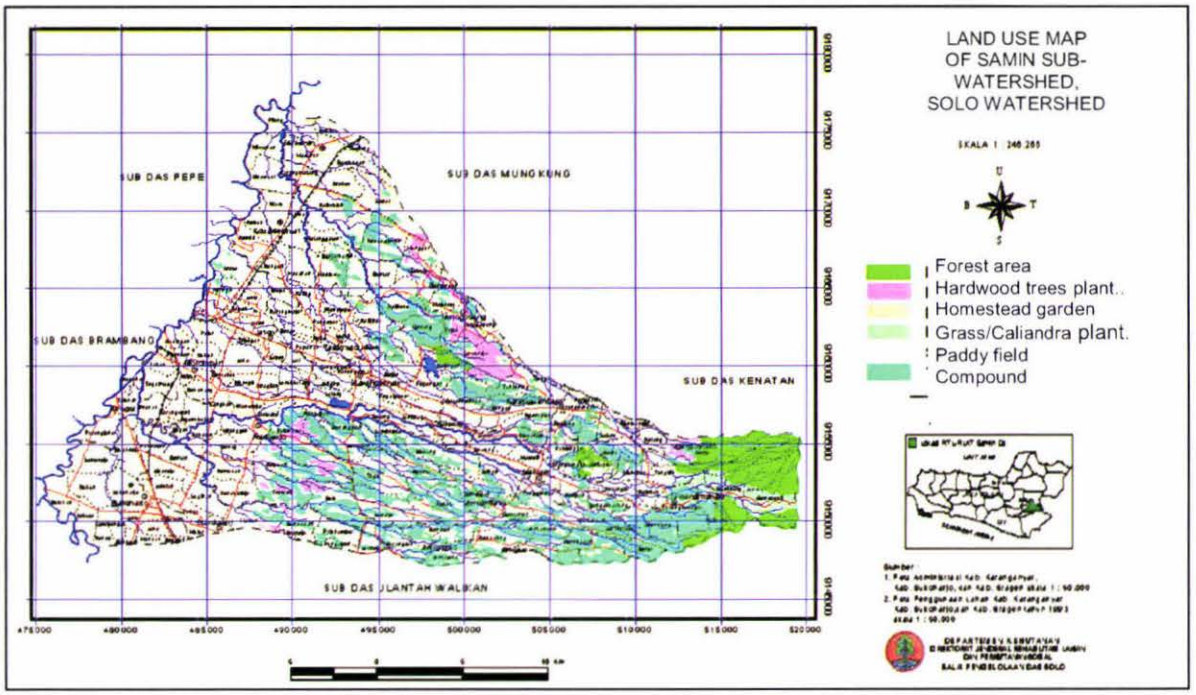

Figure 5.10. Map of land-use in Samin sub-watershed, Solo watershed (BPDAS Solo, 2003)

According to the result of survey, there were land use practices that are not compatible with the function has been determined by the government (Ministry of Forestry) and in excess of the capacity of land. This is caused by the pressure of economic need, as well as people lacking knowledge on soil conservation techniques. Indicators of the problem are natural resource degradation, excessive erosion and sedimentation, flood and water scarcity, and decreasing land productivity.

The high rate of erosion and sedimentation is the next problem. In the sub-watershed, the erosion rate had reached 41 tonnes/hectare/year (in 2002), which was greater than the allowable rate of 12-14 tonnes/hectare/year. Meanwhile, the sedimentation rate in the sub-watershed was 190,385 tonnes/year. The rates had significantly increased compared to 1994 (ten years before) which were 36 tonnes/hectares/year (erosion) and 185,762 tonnes/year (sedimentation). In conducting analysis of erosion and sedimentation data, the watershed agency also considered possibility of financial loss that might occur through off-site impact. The predicted off-site impact is the increasing flood intensity in the flood plain. Moreover, the increasing sedimentation in the reservoir and conservation structures, besides causing the decline of water quality, can also lead to the problem of maintenance that increases the operational cost of the

conservation structures. Another technical off-site impact is the increase of the stream's discharge fluctuation. For the down-stream area, this will create a greater possibility for water shortage to occur.

Based on analysis using Geographic Information System (GIS), the existing erosion hazard level in sub-watershed Samin is as summarised in Table 5.10:

Table 5.10. Area of Samin sub-watershed based on erosion hazard classes

Erosion hazard classification		area (Ha) in 2002	area (Ha) in 1994	Change of level (ha)
I (very low)	< 15 tonnes/yr	0.00	10,372.96	(-) 10,372.96
II (low)	15 – 60 tonnes/yr	36,197.91	25,001.68	(+) 11,196.23
III (medium)	60 – 180 tonnes/yr	18,236.34	15,422.00	(+) 2,814.34
IV (heavy)	180-480 tonnes/yr	5,175.54	7,089.50	(-) 1,913.96
V (very heavy)	> 480 tonnes/yr	3,892.85	5,616.50	(-) 1,723.65
Total		63,502.64	63,502.64	

Table 5.10 shows that there are 9,068 hectares areas that urgently need attention because of the serious level of erosion hazard (heavy and very heavy). Another concern is the increasing area at a serious level of erosion hazard, compared to 1994.

Flood and water shortage, basically the symptoms of the declining hydrology condition, often occur in sub-watershed Samin, particularly in several districts such as Masaran, Jaten, and Kebakkramat. According to the result of analysis conducted by the local watershed agency, factors that caused flooding are twofold: the local biophysical condition and the side-effects of land resource degradation in the upper of Bengawan Solo River. Naturally, the topography of the sub-watershed is steep; aggravated by the incompatible technique of land utilisation and soil erosion which leads to decreased water infiltration and increased run-off; thus the increasing flooding. Furthermore, the sedimentation has reduced the capacity of drainage channels, and mass wasting from the upper regions has closed up the stream dissection. Ironically, in dry season there will be problem in water quantity caused by the decreasing ground water reserve in the upper catchment. This problem often occurs in districts like Bendosari, Polokarto, and Jatiyoso. The flooding results in damage to agriculture plants, settlements, irrigation structures, road, rail-way, and many other infrastructure as well as the decline in water quality and environment's health in the sub-watershed.

Another problem related to watershed management in Samin sub-watershed is the magnitude of population pressure on land, especially on agricultural land. According to the result of analysis, the ratio of population to agricultural land in sub-watershed Samin is 5.88. This means the pressure from population on agriculture land is 5.88 times greater than the optimal one.

c. Planning hierarchy and the process:

The hierarchy of planning in Samin has followed the regulations governed by the national guidelines. There are long-term, medium-term, and short-term guidelines. Similar to the case of Cisadane, the current short-term planning was approached by developing a GN-RHL plan. The planning process employed in the development of watershed planning for Samin sub-watershed involved the following steps: (1) data collection; (2) data compilation; (3) problem identification; (4) data analysis; (5) map generation; and (6) management alternatives development.

d. Data availability:

In developing the RTL-RLKT for Samin sub-watershed, there were two categories of data that were collected: biophysical and socio-economic. Biophysical data were required to distinguish the condition and potential of the sub-watershed from the biotic and physical aspects; as well as to identify the symptoms of recent physical degradation in the use of land resource. The knowledge was useful for identifying the main problems in the sub-watershed and providing physical considerations in developing alternative solutions. Meanwhile, social-economic data were required to determine the background and motives of human actions in land use activities. Understanding these was useful in understanding social-economic problems that occurred in the sub-watershed, and therefore were helpful to develop alternatives management to handle the problems. Both management alternatives that were recommended, from biophysical and social-economic aspects, would therefore support one another.

Biophysical data:

The biophysical data for Samin sub-watershed plan included primary and secondary data. The primary data were collected from direct measurement and field survey, while the secondary ones were gathered from the related agencies, through the use of

statistical data, monographs, literature, documents, reports, and through the interpretation of aerial photos and thematic maps.

Biophysical data that were collected are data about the sub-watershed area; land distribution; status of land ownership; land capability classification; land productivity condition for each land use; the level of agriculture intensification; the existence of infrastructure for erosion and sedimentation control; reforestation effort; data on soil (type, allocation, and treatment for each type); climate and rainfall data. All of the data has provided information on the sub-watershed's physical characteristics and recent condition that were useful to develop the plan.

Social-economic data:
Social-economic data were obtained from the related agencies up to the district level, with the village as the smallest observation unit. Hence, the accuracy of available data should be reliable enough. The sources of the data were statistical data records, reports and varied publications from the agencies. The social-economic data include: demographic condition of the last decade (population density, the average population growth rate, education level, and the available labour); the major means of livelihood; and area and the condition of land's ownership in relation to the average income of farmers; and the condition of labour.

a. Recommended management practices:

The planning recommendations basically focused on land rehabilitation and soil conservation. The direction determined has been based on varied factors; including land uses, erosion hazard level, population pressure, slope classification and soil depth, according to the government regulation. The suggested direction for the problem solving in the watershed include some alternatives management practices that range from suggested land use, erosion and sedimentation control, flood and water shortage control, establishment of artesian wells, animal husbandry development, and establishment of SPAS (Stasiun Pengamat Arus Sungai or Stream Observation Station). According to the method or approach used, management practices that are recommended for the Samin sub watershed in order to address the problems in the

watershed can be divided into two groups, vegetative and non-vegetative or civil technical that respectively are displayed in Table 5.11 and 5.12:

Tabel 5.11. Vegetative (non-structural) method of soil conservation (BPDAS Solo, 2003)

Soil conservation techniques	For slope (%)	Minimum soil depth (cm)
Grass barrier planting	all slopes	> 15
Mixed plantation and intercropping	< 60	> 15
Contour cropping Strip cropping Alley cropping.	< 40	> 15
Minimized soil treatment. Without soil treatment.	< 60	> 15
Grass strip cropping.	< 60	> 15
Cover cropping.	< 60	> 15
Organic material management.	< 60	> 15
Live fences and hedge planting	< 60	> 15
Protection forest, social forest, wildlife reserve and tourism forest.	> 80	> 15
Production forest, including limited production forest and private forest.	< 60	> 15
Permanent vegetation.	< 60	> 15
Agroforestry, including mixed compound and home garden	> 80	> 15
Reforestation on bare land	all slopes	> 15
Natural succession	all slopes	> 15
Stream and spring protection	all slopes	> 15
Silvopasture	< 80	> 15
Grass planting for soil conservation	all slopes	> 15

Table 5.12. Civil engineering (structural) methods of soil conservation (BPDAS Solo, 2003)

Soil conservation technique	slope (%)	Minimum soil depth (cm)
Terrace guludan termasuk pematang kon-tour	15 – 60	> 30
Ridge terrace	5 – 30	> 30
Bench terraces	10 – 40	> 30
Individual terrace	15 – 60	> 30
Hill side ditches	10 – 60	> 15
Drainage		> 15
Vegetation rows	8 – 30	> 15
Rorak, vertical mulch		> 15
Drop structure (made from stones or bamboo)	> 8	> 15
Sediment controller including check dam and control dam		> 0
gully head structure including gully plug		> 10
Flood controller or streambank protector		> 0
Road side controller		> 0
Erosion and streamflow controller including drop structure	> 15	

b. Organising the watershed management:

There is no detailed information in the reviewed planning documents on the organisation of watershed management and planning for Samin.

5.6.3 Progo Watershed, Tangsi sub-watershed

a. Overview

Progo watershed is a watershed in Java that is shared by two administrative areas, namely Central Java and Special Territory of Yogyakarta (STY). Within these two provinces, the watershed includes 9 regions and 72 districts (BPDAS OPS, 1993). Based on the watershed area, Progo watershed is divided into 6 sub watersheds, namely Upper Progo, Tangsi, Blongkeng, Serang, Downstream Progo and Elo sub-watershed. In total, the watershed area comprises 268,400 hectares. Geographically, population density within the watershed is 1,488 people per hectare; while compared to the available agricultural land, the density is 49 people per hectare. The majority of the population are farmers that rely heavily on the land to live. Considering the condition and situation of the watershed, Ministerial Decree No. 284/Kpts-II/1999 (Ministry of Forestry, 1999) has classified Progo watershed as one of priority II watersheds in Indonesia.

Figure 5.11. Map of Progo watershed location in Central Java (Dirjen RRL, 1999)

b. Local environmental problems and watershed management problems:

Generally, environmental problems occuring in Progo watershed are mostly related to land use. In the watershed's area, there are uses of land that are not in accordance with the function determined by the government and capacity of land. This problem has been aggravated by the practice of seasonal cultivation in agriculture that ignores soil and water conservation principles, conducted by local farmers growing tobacco, potato and other horticultural crops on the slope of mount Sindoro and Sumbing. The excessive use of land in protection and buffer zones has caused of erosion and sedimentation in the watershed area. Natural factors that influence the erosion and sedimentation in the area include topography, steepness of the slope, drainage pattern of rivers and rainfall intensity.

Floods, as one of the common disasters in Java, also occur in the Progo watershed. The next problem in the watershed is the increasing critical land area; in terms of both hydrology and economy. In hydrology terms, the area is not able to supply the water resource in optimal way, either to support the agriculture activities or daily consumption. Economically, the watershed area is not capable to provide the community with a source of adequate income. The critical areas within the Progo watershed in 2000 total 34,294 hectares.

Another problem in the watershed that has been a concern is the effect of sand and stone mining activity along the Progo River. This activity has been a threat to the infrastructures such as bridges and roads as well as the stability of the riverbank.

Problems in Tangsi sub-watershed:

Tangsi is the most prioritised sub-watershed in Progo watershed. One of the main problems is erosion that is the highest among the five other sub-watersheds included in Progo watershed. This has been indicated by the Erosion Hazard Index (EHI) in Tangsi that has reached 8.36 (of 94 tonnes/hectare/year in 1998), while in other sub-watersheds the average index is only 5.2. The high level of erosion is caused by the inappropriate use of protection and buffer zones that constitute 46,600 hectares or 78 percent of the total sub-watershed area. The local people usually use the land for growing annual and seasonal crops. Meanwhile sedimentation in the watershed area has reached 0.92

mm/year. Erosion and sedimentation are caused by unwise agricultural practices and land clearing in the forest areas that has steep slope. On other hand, the pressure of population is great and many are dependant on land resource to live. Generally, the response of people to conservation is moderate; but especially for potato and tobacco growing area, the response of farmers to conservation is limited. From an institutional point of view, the existing farmers' group have not been well-organized and well-empowered to support the implementation of watershed a management programme.

c. Planning hierarchy and the process:

The planning has followed the hierarchy governed by the national guidelines, which include long-term, medium-term, and short-term planning. The recent planning documents for the three levels are still valid and still available.

Planning process carried out in watershed management in Progo involve several steps, namely (1) data collection, (2) data compilation, (3) problem identification, (4) data analysis, and (5) development of management alternatives.

d. Data availability:

Secondary data for the development of Progo watershed plan were collected from statistical data, reports, documents, and publications from related agencies; and also from the result of the interpretation of aerial photographs and relevant thematic maps. Biophysical data include: geographical data (area and location); climate (rainfall, humidity, air temperature); geology; soil (type of soil, erodibility, and land unit); topography (land form, slope, and elevation); vegetation/soil coverage condition (forest, agriculture, etc.); hydrology (debit, sediment, infiltration, and springs); irrigation building; and present land use.

Similarly, social-economic data also consist of primary and secondary data. The primary data were collected through survey and interviews; while the secondary were gained from statistic data, reports, documents and publications from the relevant agencies. Social-economic data include: demography (density, growth, number of population according to age, sex ratio, means of livelihood, level of income, area of land ownership); economy situation (economic activities: agriculture, trading, industry, tourism, and economic infrastructure: markets, cooperative economic enterprise, and

any other type of enterprise); communication (road, transportation, communication instruments); health (health service, paramedics); education (schools, teachers, extensions); public organisations; adoption level of farmer of land rehabilitation and soil conservation efforts as well as ideas and opinion of the public regarding natural resource conservation efforts.

e. Recommended management practices:

To address the problems mentioned, several management alternatives are recommended. For the erosion and sedimentation problems, the management alternatives are targeted at several land use types prone to erosion, namely dry land, home garden, mixed compound and forest. The target locations total 8,280 hectares. The recommended management alternative for handling erosion and sedimentation is a combination of vegetative and structural design/civil engineering methods. The vegetative methods include soil coverage improvement, agro forestry and alley cropping, social forestry, mixed compound and reforestation. While the civil engineering techniques include the improvement or renovation of the bench terraces, establishment of broad-base terraces, establishment of gully plugs, check dams, and streambank protection.

Development of the water resource was also recommended, which was intended to maintain the water supply (both surface and ground water), and to avoid flood in rain season. In order to achieve these purposes, steps are needed to improve the capacity of water infiltration into soil (to increase the absorption capacity of soil) and to protect the springs to sustain the water production. Another step is to build artesian wells and to plant perennial trees around the springs within a radius of 200 metres.

In order to increase the knowledge and skills of local people regarding land rehabilitation and soil conservation, some efforts are recommended in developing the human resource. By doing these, it is hoped that the local people will be willing to participate actively in erosion and sedimentation control and water resource development through the implementation of land rehabilitation and soil conservation in managing and using their land. The human resource development activities are targeted

at both government officers and the public; and carried out through extensions and publications of information booklets, leaflets, and brochures.

As a complementary activity, practices are recommended in order to develop the economic institution are to encourage the establishment of farmers groups that are steady and independent. Also encouraged is the establishment of home industries that do not rely or based on the agriculture sector; therefore the dependency on agricultural land can be reduced. Another complementary activity that is recommended is the development of agribusiness and agro industries; for example the cultivation of medicinal plants under forest stand or on open land, vegetables and fruit trees. It is hoped that these efforts can conserve the soil and water, as well as increase the income of local people.

f. Organising the watershed management:

There is no detailed information in the reviewed planning documents on the organisation of watershed management and planning for Progo/Tangsi.

5.6.4 Brantas Tengah Watershed, Konto sub-watershed

a. Overview

Brantas is one of the main rivers in Java, located in the eastern part of the island. There are three watersheds within the river (Upper Brantas, Middle Brantas and Down Brantas) that consist of 10 sub-watersheds with the total area of 1,188,559 hectares. Brantas Tengah or Middle Brantas is one watershed that covers 602,834 hectares and consists of 6 sub-watersheds: Ngrowo Ngasinan, Upper Lahar, Middle Lahar, Down Lahar, Widas and Konto. The last (Konto) will be discussed further as a selected case in the following sections. The rainfall intensity in the sub-watersheds is a range from very low to moderate. In 1996, the population of Brantas Tengah watershed was 3,018,420; with a population density of 501 people per km^2. According to criteria of population density in Act No. 56/1960, the population density in this watershed can be classified as very dense. From this population, the 23 percent rely on the agricultural sector which is dependant on the land resource. The dependency of people on the land resource is also stimulated by the lack of education of the local people; they do not have any other skills other than traditional farming. In order to provide training to increase the farmer's skill, there needs to be more instructors. The ratio of instructor and target farmers is only 0.1

percent; meaning only one instructor is available to train 3,217 farmers (total farmers is 366,693).

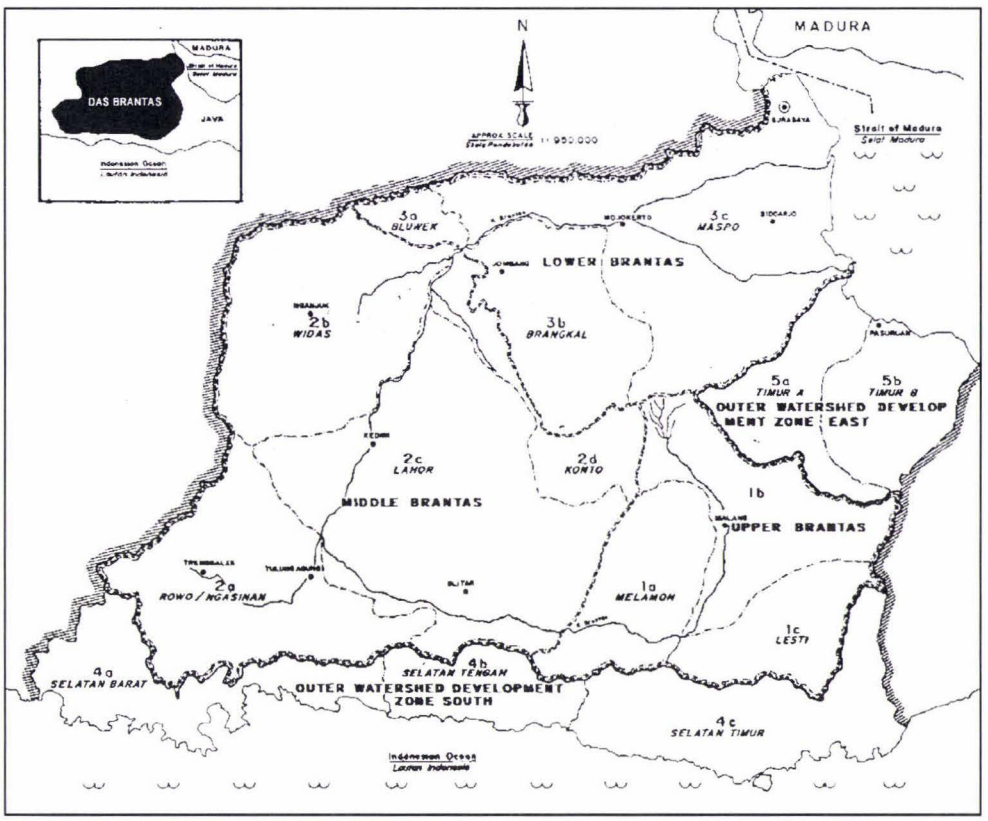

Figure 5.12. Map of Brantas watersheds location in East Java (BPDAS Brantas, 2003)

b. Local environmental problems and watershed management problems:

The increasing population that has lead to the increasing demand on natural resources is likely the typical root of environmental problems in most watersheds in Java, including in Brantas Tengah. As the consequence, there are land uses that are not suitable, and do not take the principle of conservation into account. The pressure of the population's need for land resource has lead to an orientation in land management that is focused on production enhancement and not how to preserve and conserve the land. If these are allowed to continue, there will be the further deterioration of land function, either as production or hydrological media.

General problem:

The ill-management of land use has lead to the decrease of soil fertility in the watershed area. Especially in land with the slope of more than 15 percent, there is a lack of perennial vegetation that is important to cover and to protect the soil from erosion.

Erosion and sedimentation in the watershed area can be considered serious, as has been seen by the change in the colour of the water during the rainy season to brown - an indicator of suspended sediment in the river. Another indication is the lower water table of the rivers during the dry season. Since the hydrology is not well-regulated, there is a great possibility of flood and water shortage in the watershed area.

Problems in Konto sub-watershed:

In terms of soil type with a sensitivity to erosion, Konto sub-watershed has the greatest sensitive area (20,689 hectares) compared with the other sub-watersheds. Combined with some other considerations such as population density and the invested irrigation infrastructure, Konto is selected as the most prioritised sub-watershed in Brantas Tengah. The most protection forest area (32.143 hectares or 43 percent of the total protection forest in the watershed) lies on the Konto sub-watershed. Within the forest area, actual erosion is the biggest problem. The erosion hazard index (EHI) in Konto is the highest (a mean of 7.08, while the average in the watershed is 4.79) compared to five other sub-watersheds in Brantas Tengah. This criticality has been influenced by some natural factors, such as the land form that is mostly hilly with steep slopes. Besides that, the high erosion is also caused by the misuse of land by local people that have limited knowledge about land conservation. There was also illegal logging of forest areas that had been selectively logged. The forest clearing leads to the decrease of forest capacity to protect the land from erosivity of the rainfall. There is intensive planting of seasonal crops on areas with steep slope, without consideration of suitable soil conservation techniques.

The erosion in the sub-watershed area has resulted in sedimentation that totally produced by land erosion, land slide and bank erosion. The Sediment Delivery Ratio (SDR, the ratio of sediment yield in the catchment's outlet to total erosion from the catchment, according to Roehl (1962), in Asdak (1995)) in the sub-watershed is 0.078, with the annual sedimentation of 1.70 millimetres. Water availability is another problem in Konto. According to the analysis of the watershed agency, the ability of the catchment area to store and regulate water is poor. Another influencing factor is the land cover that is relatively open and also the geographical condition of the watershed that is mostly hilly. There is also a problem with land use regulation; most of land in Konto is not used appropriately. For instance, there is a lot of seasonal cropping on buffer zones.

From the aspect of social and economic issues, dense population might put pressure onto the land resource. For Konto, the problem of population pressure has not become too serious yet as the ratio of population to agricultural land is still less than 1 (0.66 in 2002); but the situation might worsen unless the regulation of land use is improved. Actually, responses of local people (particularly farmers) on conservation activities is considered adequate, as indicated by the existing practice of conservation in agriculture such as terracing and vegetative methods of conservation. Support for the practice of land rehabilitation and soil conservation in watershed management has come through the participation of local people, even though the level of participation is still insufficient. This support will be useful for the development of the social and economy institution in the sub-watershed. Considering the physical vulnerability of the land, in the future these efforts need to be sustained and increased through assistance and guidance from conservation instructors.

Efforts to manage erosion and sedimentation in Konto have been carried out for long time; however the best results have not yet been achieved. The local watershed management agency noticed this failure is caused by the following factors (BPDAS Brantas, 2003): (1) inadequate financial support; (2) weak and ineffective planning systems for land rehabilitation and soil conservation; (3) the lack of integration in organising the implementation of the programme; (4) the lack of participation and ability of land users to adopt the conservation techniques; (5) the low income of farmers that stimulate them to exploit the land resource. These hindrances need to address to improve the watershed management in Konto.

c. Planning hierarchy and the process:

The planning has followed the hierarchy governed by the national guidelines, which include long-term, medium term, and short-term planning. The short-term planning was approached using the GN-RHL annual planning. The recent planning documents for the three levels/time frames are still valid and still available.

The planning process involved in watershed management in Konto includes (1) Data collection; (2) Problem identification; (3) Data analysis; and (4) Development of management alternatives.

d. Data availability:

Similar to the three previous cases, the type of data that are collected for watershed management planning in Brantas Tengah can be divided into two types: biophysical data and socio-economic data. The first biophysical data, regarding the location and area of the sub-watershed, were obtained through interpretation of images, aerial photographs and topographic maps with a scale of 1:50,000. The other biophysical data are climate (type of climate and rainfall intensity); soil (type of soil based on soil type map) and geology (based on screening study map); geomorphology (based on geomorphology map as a result of planimetric measurement); topography and land form (based on topography map); hydrology (stream net condition, surface water, stream discharge, spring condition, and irrigation structure); and land use in the sub-watershed.

The socio-economic data include demography (population and its development, population density, household size, labour condition); means of livelihood; land ownership and the use of land; education; economic infrastructure (markets, industry, co-operative enterprise, communication); and social-economic institution, local organisations and the existence of instructors.

There is no further information on how and from where the data were collected.

e. Recommended management practices:

In order to address identified problems in the sub-watershed, planning, through development of RTL-RLKT, has yielded some outputs and recommendations. Based on their aspect, the recommendations are divided into two activity groups: technical-physical activities and institution development activities. Each in this group is broken down into more specific activities, according to their purposes. The physical activities include the purpose of erosion and sedimentation control, water resource development, and rehabilitation of physical infrastructures. The institution development activities include the development of the human resource, development of the economy, development of animal husbandry and development of agribusiness.

For the purpose of erosion and sedimentation control, the recommended management practices to establish are as follows: (1) vegetative method: intercropping, alley

cropping, cover cropping, protection forest, social forestry, mixed compound, and natural succession; and (2) structural method: bench terrace, check dam, and gully plug. To preserve and to enhance the water resource, the recommended practices are the improvement of cropping management, conservation of catchment areas and the establishment of artesian wells to preserve the water from rainfall as much as possible. Another recommended physical activity is the rehabilitation of roads as a vital infrastructure.

The institutional development activities include some recommended management practices. For the purpose of human resource development, it is considered important to enhance the knowledge and consciousness of local people to participate more in land rehabilitation and soil conservation programmes. This is to be achieved through informal education, the establishment of pilot sampling units, competitions, and information dissemination regarding conservation programs through varied media such as films, slides, booklets, leaflets, and brochures.

For the development of economic infrastructure, there is no practical alternative that is recommended. The only suggestion is to develop economy institution that is directed to achieve the optimal function of the existing institutions such as market, banking, and co-operative enterprise. The practice that is recommended in assisting the development of animal husbandry is the establishment of superior vegetation (such as some types of grass and legume species). The vegetation will be useful as fodder for livestock as well as land cover and soil protection. Finally, for the development of agribusiness, the recommended practice is post-harvest handling to give added value to agriculture products. Therefore, the establishment of home industries is encouraged.

f. Organising the watershed management:

Regarding the organisation of watershed management activities, the planners involved in the Konto sub-watershed agree that watershed management planning is an integral work that involves many stakeholders with different interests. In doing planning, the local watershed management agency noted that the work should be an integrated effort involving governmental agencies and the local community. However, similar to the plans from other cases, there is no explicit information on who or what organisations are or have been involved in the planning and implementation of watershed management in the area.

5.6.5 Summary of case studies

Table 5.13. Summary of case studies of four watersheds in Indonesia

Case/ Data available	Data source	Problem identified	Planning hierarchy consistency	Planning process	Public involvement	Organisational & Institutional coordination
CILIWUNG-CISADANE, Cisadane						
Biophysical data : location/position and area of the watershed climate soil topography land use vegetation condition hydrology irrigation infrastructure data or map for land unit establishment	-field survey -varied types of similar scale maps, including: watershed map, topographic map, soil type map, land use map, geology map, isoerodant map, administrative area map, and forest area map.	-continual flooding -erosion and sedimentation -over population - illegal logging -extended settlement as a major land use (especially down stream) -weak institution arrangement in land use management – unclear responsibility description -ill-empowered and weak public policy in watershed management -traditional customs in agriculture practice (upper stream) -lack of farmer's knowledge on conservation -low response of farmers on introduced soil conservation activities -conflict between upper and downstream.	Planning has followed the hierarchy regulated/governed in the national guidelines (long, medium, and short term); but however in the application, the long-term plan document is not available.	1. preparatory, 2. data collection, 3. Data analysis and identification of land's criticality level, 4. planning of land rehabilitation and soil conservation activities.	People participation is mainly as the object in watershed management programme.	Not clearly explained in detail.
Socio-economic data: - demographic data - means of livelihoods - education - land ownership - agricultural pattern and the production - labour condition - wage rate and price level - social economy institution - local organisation - the existing infrastructures.	-interview with villagers and farmers -documents review -personal communication -consultation with related agencies.					

Table 5.13. (cont.)

Case/ Data available	Data source	Problem identified	Planning hierarchy consistency	Planning process	Public involvement	Organisational & Institutional coordination
SOLO, Samin						
Biophysical data : -land distribution - status of land ownership - land capability classification - land productivity condition for each land use - the level of agriculture intensification - the existence of infrastructure for erosion and sedimentation control - reforestation and afforestation effort - data on soil (type, allocation, and treatment for each type) - and climate and rainfall data.		- flood and drought - increasing erosion and sedimentation rate - the high population pressure on agricultural land - unsuitable land uses with land capacity and function - water quantity problem in dry season - water quality deterioration/water pollution in the down stream caused by industries in the upper stream - social conflict between upper and downstream.	Planning has followed the hierarchy regulated/governed in the national guidelines (long, medium, and short-term). The recent planning documents are valid and available.	1. preparatory, 2. data collection, 3. Data analysis and identification of land's criticality level, 4. planning of land rehabilitation and soil conservation activities.	Not clearly explained.	Not clearly explained in detail.
Social-economic data: - demography condition of the last decade (population density, the average population growth rate, education level, and the available labour) - the major means of livelihood - area and the condition of land's ownership to approach the average income of farmers - the condition of labour.	Social-economic data were obtained from the related agencies until the district level, with the village as the smallest observation unit. The sources of the data were statistical data records, reports and varied publications from the agencies.					

Table 5.13. (cont.)

Case/ Data available	Data source	Problem identified	Planning hierarchy consistency	Planning process	Public involvement	Organisational & Institutional coordination
PROGO, Tangsi						
Biophysical data: - geographical data (area and location) - climate (rainfall, humidity, air temperature) - geology - soil (type of soil, erodibility, and land unit) - topography (land form, slope, and elevation) - vegetation/soil coverage condition (forest, agriculture, etc.) - hydrology (debit, sediment, infiltration, springs) - irrigation building present land use.	Primary data can be achieved through field survey. Secondary data for the development of Progo watershed plan are collected from statistical data, report, documents, and publications from related agencies; and also from the result of the interpretation of aerial photographs and the relevant thematic maps.	-Over-use of land resource (to grow tobacco and potato) on the protection zone and buffer zone that caused erosion and sedimentation - Trend of increasing critical land - Activities of sand and stone mining that create adverse impact on infrastructure (road) and stream stability - High population pressure - ill-organized farmer group to support the implementation of watershed management programme.	Planning has followed the hierarchy regulated/governed in the national guidelines (long, medium, and short-term). The recent planning documents are valid and available.	1. preparatory, 2. data collection, 3. Data analysis and identification of land's criticality level, 4. planning of land rehabilitation and soil conservation activities.	People participation is mainly as the object in watershed management programme. This is encapsulated in one of the recommended management alternatives, namely human resource development activity.	Not clearly explained in detail.
Social-economic data: - demography (density, growth, number of population according to age, sex ratio, means of livelihood, level of income, area of land ownership) - Economic activities: agriculture, trading, industry, tourism. - economic infrastructure: markets, cooperative economic enterprise, and any other type of enterprise	The primary data were collected through survey and interviews; while the secondary were gained from statistic data, reports, documents and publications from the relevant agencies.					

Table 5.13. (cont.)

Case/ Data available	Data source	Problem identified	Planning hierarchy consistency	Planning process	Public involvement	Organisational & Institutional coordination
- communication (road, transportation, communication instruments) -health (health service, paramedics) -education (schools, teachers, extensions) -public organisations -adoption level of farmer on land rehabilitation and soil conservation efforts as well as ideas and opinion of public in natural resource conservation effort.						

Table 5.13. (cont.)

Case/ Data available	Data source	Problem identified	Planning hierarchy consistency	Planning process	Public involvement	Organisational & Institutional coordination
BRANTAS TENGAH, Konto						
Biophysical data : - location and area of the sub-watershed - climate (type of climate and rainfall intensity) - soil and geology - geomorphology - topography - hydrology (stream net condition, surface water, stream debit, spring condition, and irrigation structure) - land use in the sub-watershed.	-interpretation of images, aerial photographs and topographic map with scale of 1:50,000. -soil type map -screening study map -geomorphology map as a result of planimetric measurement	- Erosion and sedimentation - Forest clearing and illegal logging -Trend of increasing population that might create pressure on land resource - Unsuitable use of land - Decrease of soil fertility - Lack of local people's knowledge and skills - Practice of traditional farming that creates barrier in the implementation of watershed management programme.	Planning has followed the hierarchy regulated/governed in the national guidelines (long, medium, and short-term). The recent planning documents are valid and available.	1. Data collection 2. Problem identification 3. Data analysis 4. Development of management alternatives to solve the problems.	People participation in the planning is limited; People participation in the implementation of watershed management programme is in the process of improvement. This has been conducted through human resource development activity as one of the recommended management alternatives included in the plan.	Not clearly explained in detail.
Socio-economic data: - demography (population and its development, population density, household size, labour condition); - means of livelihood; - land ownership and the use of land; - education; - economic infrastructure (markets, industry, co-operation enterprise, communication); - social-economic institution, local organisations and the existence of instructors.	There is no further information on how and from where the data were collected.					

5.7 Concluding Remarks

The existing national guidelines set by the Ministry of Forestry have been the advocacy guidance for watershed management in Indonesia. They have covered many aspects of watershed management, but are very generic. This has been shown by the unspecified and non-detailed guides on organisational and institutional coordination. The guidelines do not specify the institution or agency which has responsibility and jurisdiction for planning at each level of planning. In regard to the issue of decentralisation, this weakness might create a hindrance to achieving successful watershed management, leading to the problems stated in the introduction.

The implementation of the national guidelines and their related or derivative legislations has not been successful or even satisfactory. First of all, development plans have not been completed for all watersheds in the country. Next, the coordination among stakeholders in planning is still weak. The suggestion from the national guidelines to select one particular coordinating body, as well as the establishment of a Watershed Board or Watershed Forum to formulate the watershed management policy have not been implemented.

A comparison of the watershed management and planning case studies showed that no one of them is perfectly successful. Each of the cases has weaknesses and strengths, depending on what point of view was used to compare them. Firstly, from the continuity of plans development point of view, watershed management and planning in the cases of Samin, Konto, and Progo are more reliable than in Cisadane. In the Cisadane case, the long-term and short-term plan documents are not available. Secondly, regarding the data availability and adequacy, the Progo case is the most adequate, having the most complete and reliable data. Konto case has moderate data adequacy and availability, whereas the data that is available in the Samin and Cisadane's cases are insufficient, both in quantity or quality. The more adequate and available the data, the greater the possibility of better planning to address the environment in the watershed. Thirdly, in term of the offered/selected management alternatives, the case of Progo is the most successful. The recommended management alternatives in Progo are balanced between biophysical and socio-economical activities, even though there is no practical alternative recommended for the development of economic infrastructure. In the Cisadane case, a combination of physical and social effort has been recommended as

management practices. However, most of them take the form of physical activities (involving the use of the vegetative method and structural design). Therefore the achievement is less optimal and less effective. In the Samin case, the management alternatives focused on land rehabilitation and soil conservation that were dominated by physical activities through the use of the vegetative (non-structural) method and the civil engineering (structural) method. The result of these management alternatives is not effective and efficient. All of the case studied has followed the steps of the planning process governed by the guidelines. A similar weakness among the cases is on the unclearness of organisation in planning and the inadequate participation of stakeholders and the public in planning. The public, especially local people, are mostly involved as the object of recommended activities, rather than as active participants.

Chapter 6

COMPARISON AND DISCUSSION

6.1 Introduction

This chapter consists of several comparisons, each followed by a discussion. The first comparison is between the Indonesian guidelines and the international guidelines reviewed in chapters 3 and 5. This is to determine the extent to which the international guidelines are linked and can be used to improve the Indonesian guidelines and the practice of watershed management and planning in Indonesia. The second comparison is between the existing Indonesian guidelines in theory, and contrast with the practice of watershed management and planning in reality. On completion of these comparisons, the missing aspects of Indonesian watershed management and planning will be assessed and identified. Finally, a comparison is made between the problems found in Indonesia and the experience of selected developing countries. Relevant lessons learned from best practices in these countries will be identified.

6.2 Comparing the Indonesian Guidelines with the International Guidelines

The review of several international guidelines of watershed management has revealed theoretical frameworks that contain similarities and differences. Every version of guidelines has its own perspective, dependent on the background and the point of view used in issuing the guidelines. Particular guidelines may intend to watershed management at one or more certain level. The general purpose of all of the guidelines is basically the same, namely, to achieve an effective watershed management. This purpose can be achieved through several ways. Along with the offered approach(s), the guidelines suggest several kinds of data required for the effective watershed management and planning. The combination of intended or focused level, focus of data requirement and approach(s) used by the international guidelines is illustrated by 3-dimensional prisms in Figure 6.1. The prisms are modified from the World Bank's "development diamond" model, a 2-dimensional illustration to characterize development of a country from the economic, social, and environmental indicators (World Bank, 1994 in Rogers et al., 1997). Each prism has three separate axes; each represents different aspects mentioned above. Characters of the guidelines are plotted on

each axe with various scales (1/3 to 1 of the axe line), referring the result of review in Chapter 3. By drawing lines through the plotted points, a prism is resulted. This 3-dimensional shape shows the trend of the guidelines characteristics. Therefore, these models can be compared one and another.

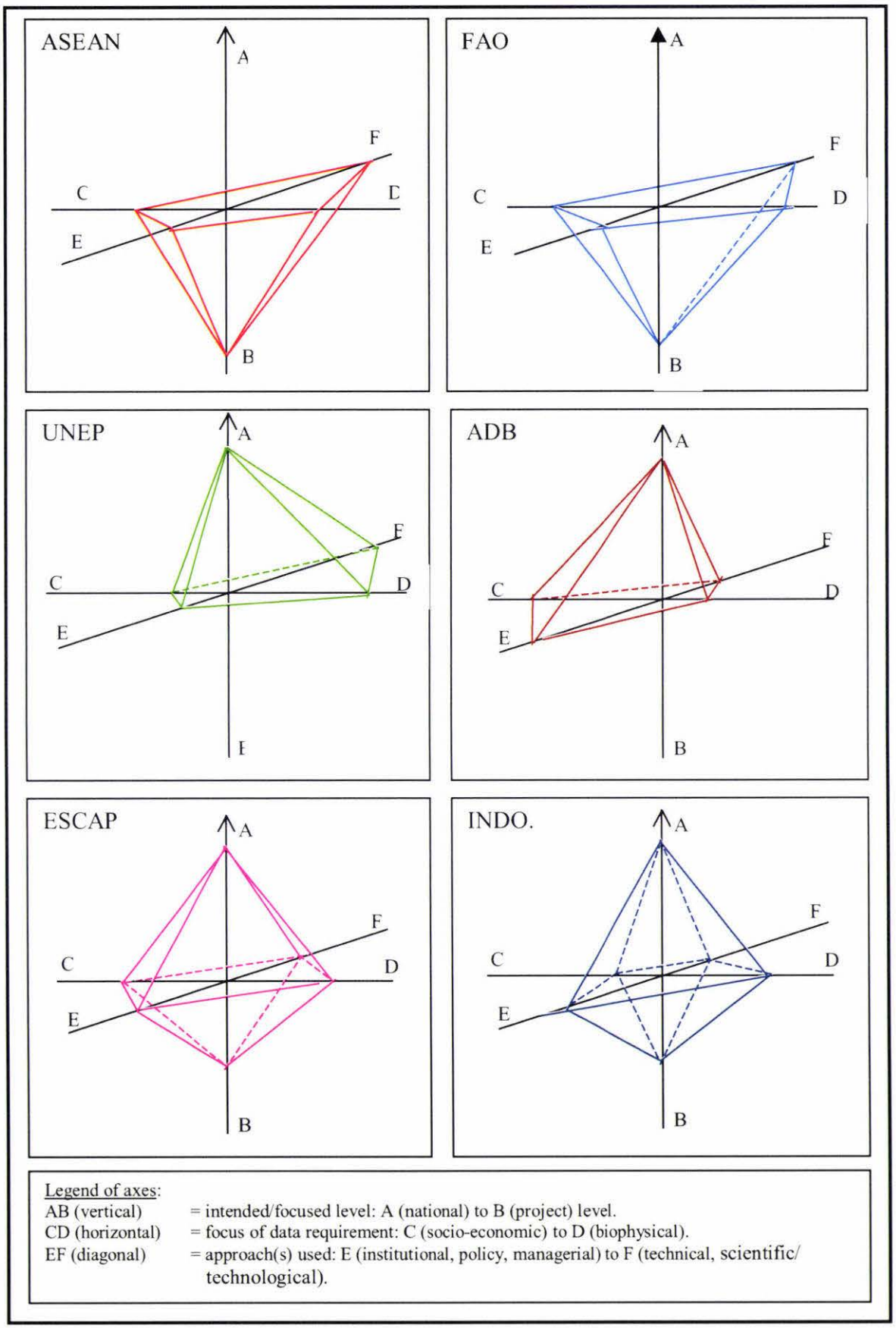

Figure 6.1. Three-Dimensional characterization of the international guidelines (modified from World Bank, 1994 in Rogers et al., 1997)

Figure 6.1 illustrates similarities and differences among the guidelines. The ASEAN and FAO guidelines are nearly similar. They are intended to serve at project level and tend to employ technical and managerial approaches. They suggest the use of both biophysical and socio-economic data. The UNEP and ADB guidelines are intended to serve at national level (at the same scale), but they are different in the approach used and the focus of data requirement. The UNEP guidelines use scientific and technological approach, while the ADB ones work through the policy and institutional aspect of water resource management. Therefore, the ADB's tend to focus on socio-economic data, whereas the UNEP's more focus on biophysical data. The ESCAP guidelines are the most balanced ones. They guide the watershed management at the national to local/project level, employ technical and managerial approaches, and suggest the use of both biophysical and socio-economic data. Due to this diversity, not all subjects can be used as the basis for comparing the guidelines. However, there are also some similarities that bind them and enable them to be flexibly applied to some places with similar situations. All of them address watershed or water resource management, mostly in developing countries.

Most of the matters governed by the Indonesian guidelines are similar to those which are suggested by the international guidelines. This indicates that generally and theoretically, the Indonesian guidelines already have adequate content to cover the requirements of effective watershed management and planning for a developing country. The contents of the Indonesian guidelines have already been completed, covering all of the main components of watershed management, namely planning, organisation, implementation, and monitoring and evaluation. The Indonesian guidelines have also included criteria and indicators for effective watershed management. The prism (see Figure 6.1) shows that the Indonesian guidelines are intended to serve at national to local level, even though the portion of focus for national is bigger than for the local level. They tend to use institutional and managerial approach; however, the focus of data is more on biophysical rather than socio-economic ones.

Compared to the five international guidelines reviewed in this study, the Indonesian guidelines agree with varied frameworks in various subjects. The first subject is regarding the hierarchy of planning. In determining the hierarchy of watershed

management planning, the Indonesian guidelines agree with all of the international guidelines which stated that the hierarchy should follow both partial and temporal scales. According to this rule, this hierarchy consists of long-term, medium-term, and short term planning at national, regional, and local levels. In practice, the planning in Indonesia has followed this rule, shown by the development of multi-levelled plan documents.

The next subject to be compared is the steps of the planning process. Among the five reviewed guidelines, the ASEAN and the FAO guidelines provide a list of steps required in the planning process in watershed management. The comparison of the steps in the planning process among the ASEAN, the FAO and the Indonesian national guidelines versions is displayed in Table 6.1:

Table 6.1. Direct comparison of watershed planning process according to various guidelines

Steps	ASEAN Guidelines		FAO Guidelines		Indonesian Guidelines	
1.	Analyse problems and opportunities: set and define objectives, goals and targets.		Collecting existing data		Identification of watershed characteristics	
2.	Identify and design the alternatives to meet objectives.		Quick identification of watershed problems		Identification of watershed problems	
3.	Narrow down the alternatives: the appraisal process.		Considering management possibilities		Formulation of goals and objectives	
4.	Design the implementation plan.		Determining main objectives and priorities		Identification of activities alternatives	
5.	Develop the monitoring & evaluation system.		Joint planning and decentralized implementation		Evaluation of activities alternatives	
6.	Prepare and present the project plan and appraisal.		Setting guidelines and criteria		Selection of activities	
7.	Monitoring & evaluation of on-going projects.		Progress monitoring		Development of activities plan	
8.	Revise project plans to meet changing conditions.				Plan Implementation	
9.					Monitoring and evaluation	
10.					Review of the plans	

The comparison in Table 6.1 summarises the steps in the planning process provided in the three different watershed management guidelines. Every dotted line in different colours indicates the consistency and parallelism among the steps. Thus we can see whether such a step of planning suggested by an organisation is also suggested by other guidelines. We can also identify what steps are missing in the Indonesian planning process. As shown by the indicating lines in Table 6.1, one step is missing in the Indonesian planning process: the development of monitoring and an evaluation system includes the setting of criteria for monitoring and evaluation. The identification of this missing step in planning is important to ensure the success of watershed management. Brooks et al. (1990) stated that watershed management the activity that does not follow through with monitoring and evaluation will not be able to determine whether activity meets its objective, or whether changes in the plans are necessary.

The comprehensiveness of the criteria and indicators included in the watershed management guidelines is related and can be approached through the completeness of the data and information that is available. The requirement of data is the next subject to compare among the guidelines. The data required for effective watershed management and planning compiled from the varied guidelines, including Indonesian guidelines, are shown in Table 6.2.

Table 6.2. Data required for watershed management requirements of selected agencies

No.	Data Group/Sub-Group		Data required	FAO[2]	ASEAN[3]	ESCAP[4]	UNEP[5]	ADB[6]	The Indonesian guidelines
1.	**GENERAL DATA/ INFORMATION**	1	General data: Watershed name, Location, boundaries, size, elevation, the presence of streams, tributaries.	Yes	Yes	Yes	Yes	Yes	Yes
		2	General information: Population, administrative districts, accessibility and roads.	Yes	Yes	Yes	Yes	Yes	Yes
2.	**BIOPHYSICAL DATA**								
	2.1 PHYSICAL DATA	3	Geology data	Yes	Yes	Yes	Yes	No	Yes
	Geomorphological data:	4	Drainage patterns, streams density and order, channel profiles.	Yes	Yes	Yes	Yes	No	Yes
		5	Topography data	No	Yes	Yes	No	No	Yes
	Data on soil hydrologic conditions:	6	Density of the forest and undergrowth	Yes	Yes	No	Yes	No	Yes
		7	Kind, density, and thickness of the ground cover	Yes	Yes	No	Yes	No	Yes
		8	Soil textures and infiltration rates	Yes	Yes	Yes	Yes	No	Yes
		9	Effective soil depth	No	Yes	Yes	No	No	Yes
		10	Site conditions incl. slope, elevation, erosion.	Yes	Yes	Yes	Yes	No	Yes
		11	Soil degradation level	No	No	Yes	No	No	Yes
		12	Land slope information	Yes	Yes	Yes	Yes	No	Yes
	2.2 CLIMATE, HYDROLOGY and WATER RESOURCE DATA	13	Precipitation (form, amount, distribution, intensity), wind (speed and direction), evaporation, temperature (maximum, minimum, mean, frost days), humidity, radiation.	Yes	Yes	Yes	Yes	No	Yes
		14	Rainfall intensities	Yes	Yes	Yes	Yes	No	Yes

[2] Food and Agriculture Organisation
[3] Association of South East Asian Nations
[4] Economic and Social Commission for Asia and the Pacific
[5] United nations Environment Programme
[6] Asian Development Bank

Table 6.2. (cont.)

No.	Data Group/Sub-Group		Data required	FAO	ASEAN	ESCAP	UNEP	ADB	The Indonesian guidelines
		15	Hydrological data: Stream flow, runoff and sedimentation (suspended load, bed load and total sediment deposits)	Yes	Yes	Yes	Yes	No	Yes
		16	Information on flood damage, drought and other hydrologic problems.	Yes	Yes	Yes	Yes	Yes	Yes
		17	Information on hydrological infrastructure.	No	Yes	No	Yes	Yes	Yes
		18	Water balance or water budget of the watershed	Yes	Yes	Yes	Yes	No	Yes
	Information on water use problems (regarding both quantity and quality, and legal and economic aspects of water use):	19	Information on water shortage	Yes	Yes	Yes	Yes	Yes	Yes
		20	Information on water quality problems (e.g. sediment)	Yes	Yes	Yes	Yes	Yes	Yes
		21	Information on various use rights	Yes	No	No	No	Yes	No
		22	Information on related laws or regulations	Yes	No	No	Yes	Yes	No
	2.3 LAND USE, LAND CAPABILITY AND BIOLOGICAL DATA	23	Present land use	Yes	Yes	Yes	Yes	No	Yes
		24	Land use history and future trends	Yes	No	Yes	Yes	No	Yes
		25	Land capability or suitability data	Yes	Yes	Yes	Yes	No	Yes
		26	Vegetation data	Yes	Yes	Yes	Yes	No	Yes
		27	Erosion data: Erosion rate, erosion type and causes of erosion	Yes	Yes	Yes	Yes	No	Yes

Table 6.2. (cont.)

No.	Data Group/Sub-Group		Data required	FAO	ASEAN	ESCAP	UNEP	ADB	The Indonesian guidelines
3.	**SOCIO-ECONOMIC AND INFRASTRUCTURAL DATA**								
	3.1 SOCIAL CONDITIONS	28	Population condition and its trend in the watershed	Yes	Yes	Yes	Yes	Yes	Yes
		29	Possible barriers toward innovative technology	Yes	No	No	Yes	Yes	Yes
		30	Social factors constraining the development and management of activities in the watershed	Yes	Yes	Yes	Yes	Yes	Yes
		31	Existing social structures, systems or hierarchy influencing the individual or community development in the watershed	Yes	Yes	Yes	Yes	Yes	Yes
		32	The main need of the community in the watershed	Yes	No	No	Yes	Yes	No
		33	The status of women in the community/society, their role and responsibilities	Yes	No	No	No	Yes	No
		34	Level of awareness and consciousness of the community of the causes and problems facing the watershed; and adoption level of community on the conservation activity.	Yes	Yes	Yes	Yes	Yes	Yes
		35	The perception of the community on the protection and development of the watershed.	No	Yes	No	No	Yes	Yes
	3.2 ECONOMIC STATUS	36	The present economic activities in the watershed	Yes	Yes	No	Yes	Yes	Yes
		37	The potential for economic improvement or development	Yes	Yes	No	Yes	Yes	Yes
		38	The constraints or problems of development from an economic point of view	Yes	Yes	Yes	Yes	Yes	
		39	Various costs of cropping and farming activities and their returns, the cost and benefit of watershed conservation work, and other related economic figures.	Yes	Yes	No	Yes	Yes	Yes

Table 6.2. (cont.)

No.	Data Group/Sub-Group		Data required	FAO	ASEAN	ESCAP	UNEP	ADB	The Indonesian guidelines
	3.3 INFRASTRUCTURE IN THE WATERSHED	40	Information on rural development	Yes	Yes	No	No	Yes	Yes
		41	Detailed investigations of roads, housing and domestic water and energy supplies.	Yes	Yes	No	No	Yes	Yes
4.	**INSTITUTIONAL AND CULTURAL INFORMATION**								
	4.1 INFORMATION ON INSTITUTIONS AND LEGISLATION	42	Information on watershed policy and legislation	Yes	Yes	Yes	Yes	Yes	No
		43	Information on related government organisations and coordination	Yes	Yes	Yes	Yes	Yes	Yes
		44	Information on present and past programmes in watershed management	Yes	Yes	Yes	Yes	Yes	No
		45	Information on education, training and extension needs	Yes	No	Yes	Yes	Yes	Yes
		46	Information on local community development	Yes	Yes	No	Yes	Yes	Yes
		47	Information on land users' organisations, community and special interest groups	Yes	Yes	Yes	Yes	Yes	Yes
		48	Information on marketing and others	Yes	Yes	No	Yes	Yes	Yes
	4.2 CULTURAL INFORMATION AND CONSIDERATIONS	49	Compatibility with cultural patterns	Yes	Yes	No	Yes	Yes	Yes
		50	Traditional practices	Yes	Yes	No	Yes	Yes	Yes
		51	Religious influences	Yes	Yes	No	No	Yes	No
		52	Cultural activities	Yes	Yes	No	No	Yes	No
		53	Urban and rural relationships	Yes	Yes	No	No	Yes	No
		54	Attitudes towards group action	Yes	Yes	No	No	Yes	No
	Total:	54		49					44

Table 6.2 shows that there are 44 items of required data included in the Indonesian guidelines, out of the total 54 items compiled from the various guidelines. This data related to the planning process, as the comprehensive and adequate data and information will promote effective planning in watershed management. The question is whether the criteria and indicators, reflected by the data available, have been comprehensive and able to be practically applied in the field. The result of assessment of the data comprehensiveness and availability in Indonesia will be further discussed in section 6.3.

The other question is whether the existing guidelines have provided a strong legal support system and have been well-coordinated with the related regulations, especially those required at the regional/local level. The results of the review on the existing legal system in watershed management in Indonesia show that the guidelines have considered several legislations from various departments in determining the guides of an integrated watershed management. Most of the legislation considered as the legal background for the guidelines, is taken from at the national level. Legislation at the regional and local level is rarely included or mentioned in the guidelines. The FAO guidelines mentioned, that to incorporate and coordinate local regulations is important, to ease the plan as it is applied in the field at local level (Sheng, 1990). Since watershed management involves various resources, the FAO also suggested the planners and managers needs to carry out a close review on any legislations related to watershed management. However, in Indonesia there is no information about extent that managers of watersheds at local level have known or been informed about the regulation or requirement in the guidelines, neither have the local community.

Socialisation or dissemination of the guidelines is one of the aspects that can be addressed to help users at all levels to be well-informed. White (1994) stated that this is the responsibility of the government. This effort needs to be followed by periodic evaluation to make sure if the guidelines are applicable in the field. Periodic evaluation is also intended to synchronise the guidelines with regional and local regulations, which reflect the development of regional and local situation. Therefore, the guidelines themselves need to be periodically reviewed so they can be adapted to the actual situation.

6.3 Comparison between the Guidelines and the Practice of Watershed Management in Indonesia

The agreement between guidelines and practice regarding the hierarchy in planning has been shown by the development of multi-levelled plan documents. These plans range from Pola RLKT, RTL-RLKT and RTT in the Indonesian watershed planning system. From the legal perspective, this hierarchy has the consequence that adequate legal support must be provided and well-synchronised at all levels. The ASEAN guidelines stated that planning and management alternatives offered in it should be compatible with the existing legal system (Brooks et al., 1990). Therefore it is important to ensure that there is a strong regulatory and legal back-up at every level of planning. A review of Canadian and international experiences showed that enabling legislation is one of the key long-term components that determines the success of watershed planning and management (Veale, 2003). Accordingly, the UNEP guidelines also highlighted the fact that an adequate legal system should be incorporated in watershed management planning at the highest institutional level, as well as at the community level (UNEP-DTIE, 2002). This is to promote environmental awareness, enhance water resource values, and therefore stimulate their protection. In the Indonesian situation most regulatory and legal back-up is available at national level, while there is not enough attention for those at the local level. This is the reason why BPDAS Brantas (2003) complained that the regulations in the top government (national level) are not synchronous with those at regional and local levels.

To achieve effective planning, there are some influential factors at each step of the planning process. Table 6.3 displays a comparison between international perspectives regarding key factors that determine the success of each step in the planning process, and the existing practice in watershed management planning in Indonesia. This comparison is undertaken based on the results of the review on four watershed cases in Indonesia, and is intended to assess the existing practice of planning in watershed management. The statements put in the (-) (minus) bracket column are the gaps identified in the existing practice of the planning process.

Table 6.3. Factors determining the effectiveness/success of each planning step according to various guidelines

Steps of planning		Criteria/ important factors of each step according to:		Indonesian existing practice[7]	
		ASEAN[8]	FAO[9]	(+)	(-)
1.	Collection of existing data and identification of watershed characteristics	• Include characterising the existing situation of the watershed. • Initially the situation should be investigated from both technical and socio-economic perspectives. • The problems should be defined in clear terms. • The problems should not be described only in biophysical terms, but also from the human point of view. • Consider both existing and potential problems. • The causes of the problems should be	• No duplication of effort • The appropriate use and organising of historical data. • Routine updated and central-filed data.	• The initial situations are characterised and investigated from both technical and socio-economic perspectives. • The problems have been described from both biophysical and human (social) point of view. • The causes of the problems have been assessed and identified. • The ranking of the objectives has been done by considering the seriousness (urgency) of watershed degradation, land capability, land suitability, and socio-economic factors. • Planning includes general work plan and budget estimation.	• Duplication of effort • The historical data are not well-organised. • Data up-date has not been done regularly and continually. • Potential problems are only slightly considered. • Opportunities in the watershed have not been analysed adequately. • Institutional factor has not been well-considered in objectives ranking. • Criteria to evaluate the achievement of objectives are not comprehensive.

[7] Existing practise of planning in Indonesia, (+) = the practice that has agreed with the ASEAN and FAO guidelines, (-) = the practise that does not suit with them.
[8] Association of South East Asian Nations
[9] Food and Agriculture Organization

2.	Identification/analysis of watershed problems	problems should be assessed and identified to the extent possible. • Opportunities should also be analysed (not only the degradation of watershed to be reclaimed). • The objectives should be ranked, with the consideration of: (1) seriousness of watershed degradation; (2) land capability; (3) land suitability; (4) socio-economic and institutional factors. • Include establishment of design criteria against which objectives are to be evaluated. • Prepare a work plan that lays out in general what needs to be accomplished.	• Include physical problems, resource use problems, end problems & socio-economic and culture problems. • Problem identification should be clear. • The problems, especially the end problems (final effects of watershed degradation) should be identified as quickly as possible.		
3.	Setting of goals and objectives		• Main objectives should be identified and defined as early as possible. • Should include establishment of priorities. • Should prepare survey budget estimation.		
4.	Identification and design of management alternatives	<u>(1) Institutional considerations in design:</u> • Reconciliation of watershed boundaries with political boundaries. • Clarification of areas of responsibilities among agencies involved. • Assurance of regulatory and legal back up.	N/A	• Biophysical and technical factors have been considered in project design.	• Reconciliation of watershed boundaries with political boundaries is still a problem. • Areas of responsibilities among agencies involved have not been well-clarified. • Regulatory and legal back-up have not been adequate

		• Involvement of local people in the planning process. • The use of a broad-based approach. • The use of an incremental approach to change. • The utilisation of the existing local traditions and organisations. • Minimisation of dependency on outside inputs and other support. • Blending of research and development of appropriate technology into programme. <u>(2) Project design:</u> • All possible watershed practices should be reviewed. • For watershed rehabilitation, production should be considered. • Soil and slope stabilization. • Water yield and water flow patterns. • Water quality.			for all levels. • Involvement of local people in the planning process is very little, as well as the use of the existing local traditions and organisations. • The practical use of research and development of appropriate technology into programme is still limited. • Review on all possible watershed practices is hampered by financial and skills availability problem.
5.	Narrowing down the alternatives, appraisal or evaluation of management alternatives/ possibilities	• Appraisal should be made for both the *with* and *without* situation. • The appraisal process should be iterative. • Appraisals should be	• If there are examples of successful and effective projects in WM, a quick study should be made to provide lessons learned that will aid in the	• Appraisal based on with and without situation has been made through Benefit-Cost Analysis. • Appraisal has involved multiple criteria, done through	• The appraisal process has not been done iteratively.

		made using multiple criteria (financial, economic, social and environmental). • The results of appraisals must be used with caution, since appraisals are invariably based upon imperfect representations of the real world. Criteria of acceptance should include the following considerations: • Compatibility of the alternative with the physical and biological objectives. • Acceptability of the alternative to local people and agencies required to manage and implement the project. The ability of the project to be carried out in the existing social and institutional environment. • The economical feasibility of the project. • Impacts of the project on the environment and social life. • Possibility of "non-market" effect of the alternative.	planning, design and future implementation of the proposed work. • The seriousness of the problems, the urgency of the task and the availability of the resources should be considered to determine the appropriate level and kind of management that is expected for the watershed. • The right combination of watershed mgt work categories (protection, improvement, rehabilitation or/and development) should be worked out according to the nature and extent of the problem identified.	IEA.	

6.	Selection of activities	N/A	N/A		
7.	Design and development of implementation plan	Tasks to be included in a project implementation plan: • Organizing the project staff. • Developing an understanding of project objectives and plans. • Scheduling work activities. • Liaison to develop improved working relationship. • Procuring project facilities. • Publicity to inform any individuals or organisations that need to know about the activities and accomplishments. • Reporting. • Organising of equipment and materials. • Supervising staff. • Developing budgets. • Evaluating project cost and benefits. • Implementation plans must be compatible with the organisation.	• Emphasize in "joint planning and decentralised implementation" arrangement rather than "staff borrowing" or "piecemeal" approach. • Participation of agencies and groups is needed. • Delegation of responsibility for coordination of watershed planning activities to a single body. • A proper coordination mechanism • The need of a well-organised steering body involving representatives of coordinating agencies and local communities. • Reliable and responsible field survey and planning teams. • The need of a liaison unit to delegate and back-up the termination of steering committee after the planning stage.	• The project staffing has been organised, including scheduling. • Participation of agencies and groups is available. • Reporting is done, particularly to the higher jurisdiction under the same department (Ministry of Forestry).	• Delegation of responsibility for coordination of watershed planning activities to a single body has been suggested, but so far has not been done in practice. • Lack of proper coordination mechanism. • Reliable and responsible field survey and planning teams. • A liaison unit to delegate and back-up the termination of the steering committee after the planning stage is not available. • Publicity and dissemination about the planning is limited.
8.	Development of monitoring and evaluation system includes setting of the criteria	• Monitoring and evaluation should be an iterative dynamic	• General guidelines should be set out at the beginning.	• General guidelines for monitoring and evaluation are available, included in the	• Monitoring and evaluation have not been done as an iterative dynamic process.

	for monitoring and evaluation.	iterative dynamic process. • Design of monitoring programs should include the following steps: 1. determining information needs 2. setting information-need priorities. 3. determining means of collecting information 4. information management.	beginning. • Related to policy matters. • Related to the main objectives and addressing major watershed problems as identified by the preparatory investigation. • Include/consider priorities, schedule and procedures.	available, included in the national guidelines for watershed management.	iterative dynamic process.
9.	Preparation and presentation of the plan and appraisal.	• The proposed plan should be presented with limited technical language to be clearly understood. • The presentation should be clear in describing the levels of uncertainty involved in various parts of the proposed project (shortcomings should be discussed openly). • Qualitative information should not be avoided. • Presentation should clearly specify the links between the watershed project or component and the productive activities being affected.	N/A	• Both qualitative and quantitative information have been included and presented in the plan. • The links between the watershed project and the affected productive activities have been specified.	• The presentation of the plan is relatively technical and mostly aimed at governmental officials and the language used is not very local-user friendly. • Shortcomings are not discussed openly in the plan.

10.	Plan implementation	N/A	N/A	N/A	N/A
11.	Monitoring and evaluation of on-going projects/ activities in progress.	• Subjects to be monitored include biophysical data, socio-economic data, and project activities and outputs. • Monitoring of project activities and outputs include: implementation, effectiveness and validation. • Evaluation should seek to make a systematic, objective analysis of the performance, effectiveness, efficiency, and impact of the project in relation to its stated objectives. • Evaluation should focus on at least three aspects: (1) performance; (2) outputs, effects and impacts; and (3) economic and financial efficiency. • The result of the evaluation should be well-reported in terms of time, address, and format.	• Include firm control of time and progress. • Work schedule & an overall timetable should be developed. • Schedule should be able to avoid conflicts in work. • Routine checks should be made. • Reporting including periodic and final reporting. • Database management should be well-organised to permit monitoring and periodic evaluation in order to detect changes and management impact over time.		• Subjects to be monitored include biophysical data, socio-economic data, but not in balance (predominantly by biophysical data).
12.	Revision of the plans.	Revision of the project plans to meet changing conditions.	Review and follow up.		Revision of the plans has not been done adequately.
N/A = information not available					

The explanation in the last two columns shows that the practice of the planning process in Indonesian watershed management is not complete and has not follow recommendations on how it should be done.

In fact, not all of the data required for effective planning (Table 6.2) is available in the Indonesian practice. An assessment of data availability and adequacy status in four watershed examples in Indonesia is displayed in the following matrix (Table 6.4):

Table 6.4. Data availability and their adequacy status in Indonesia
(Key: (++) = available, comprehensive and accurate; (+) = available, but not complete and accuracy is unknown; (-) = limited, insufficient, not complete and not adequate; (--) = absent)

No.	Data Group/Sub-Group	Data Type (data required)	Data availability in watershed case:			
			A[10]	B[11]	C[12]	D[13]
1.	**GENERAL DATA/ INFORMATION**	General data: Watershed name, location, boundaries, size, elevation, the presence of streams, tributaries.	++	++	++	++
		General information: Population, administrative districts, accessibility and roads.	++	++	++	++
2.	**BIOPHYSICAL DATA**					
	2.1 PHYSICAL DATA	Geology data	++	+	++	+
	Geomorphological data:	Drainage patterns, streams density and order, channel profiles.	+	+	+	+
	Data on soil hydrologic conditions:	Density of the forest and undergrowth	+	+	+	+
		Kind, density, and thickness of the ground cover	+	+	+	+
		Soil textures and infiltration rates	+	++	++	++
		Site conditions, including slope, elevation, erosion.	++	++	++	++
		Land slope information	++	++	++	++
	2.2 CLIMATE, HYDROLOGY and WATER RESOURCE DATA	Precipitation (form, amount, distribution, intensity), wind (speed and direction), evaporation, temperature (maximum, minimum, mean, frost days), humidity, radiation.	+	+	++	++
		Rainfall intensities	++	++	++	++
		Hydrological data: Stream flow, runoff and sedimentation (suspended load, bedload and total sediment deposits)	+	+	+	++
		Information on flood damage, drought and other hydrologic problems.	++	++	++	++

[10] Ciliwung-Cisadane Watershed
[11] Bengawan Solo Watershed
[12] Progo Watershed
[13] Brantas Watershed

Table 6.4. (cont.)

No.	Data Group/Sub-Group	Data Type (data required)	Data availability in watershed case:			
			A	B	C	D
		Water balance or water budget of the watershed	+	+	+	+
		Water use problems (regarding both quantity and quality, and legal and economic aspects of water use): Water shortage Water quality problems (e.g. sediment) Various use rights Related laws or regulations	+	+	+	+
	Information on water use problems (regarding both quantity and quality, and legal and economic aspects of water use):	Information on water shortage	+	+	+	+
		Information on water quality problems (e.g. sediment)	+	+	+	+
		Information on various use rights	- -	- -	- -	- -
		Information on related laws or regulations	- -	- -	- -	- -
	2.3 LAND USE, LAND CAPABILITY AND BIOLOGICAL DATA	Present land use	++	++	++	++
		Land use history and future trends	- -	- -	- -	- -
		Land capability or suitability data	++	++	++	++
		Vegetation data	++	+	++	+
		Erosion data: Erosion rate, erosion type and causes of erosion	++	++	++	++
3.	**SOCIO-ECONOMIC AND INFRASTRUCTURAL DATA**					
	3.1 SOCIAL CONDITIONS	Population condition and its trend in the watershed	++	++	++	++
		Possible barriers toward innovative technology	-	-	-	+
		Social factors constraining the development and management of the activities in the watershed	-	-	-	+
		Existing social structures, systems or hierarchy influencing the individual or community development in the watershed	+	+	+	+
		The main need of the community in the watershed	- -	- -	- -	- -
		The status of women in the community/society, their role and responsibilities	- -	- -	- -	- -
		Level of awareness and consciousness of the community of the causes and problems facing the watershed; and adoption level of community on the conservation activity.	+	-	+	-
		The perception of the community on the protection and development of the watershed.	-	-	+	-

Table 6.4. (cont.)

No.	Data Group/Sub-Group	Data Type (data required)	Data availability in watershed case:			
			A	B	C	D
	3.2 ECONOMIC STATUS	The present economic activities in the watershed	++	+	++	++
		The potential for economic improvement or development	-	-	+	+
		The constraints or problems of development from an economic point of view	--	--	-	--
		Various costs of cropping and farming activities and their returns, the cost and benefit of watershed conservation work, and other related economic figures.	+	--	+	+
	3.3 INFRASTRUCTURE IN THE WATERSHED	Information on rural development	-	-	+	-
		Detailed investigations of roads, housing and domestic water and energy supplies.	+	+	+	+
4.	**INSTITUTIONAL AND CULTURAL INFORMATION**					
	4.1 INFORMATION ON INSTITUTIONS AND LEGISLATION	Information on watershed policy and legislation	-	-	-	-
		Information on related government organisations and coordination	--	--	--	--
		Information on present and past programmes in watershed management	--	--	--	--
		Information on existing education, training and extension and the need there for.	+	-	++	+
		Information on local community development	-	-	+	-
		Information on land users' organisations, community and special interest groups	+	-	+	+
		Information on marketing and others	+	-	+	+
	4.2 CULTURAL INFORMATION AND CONSIDERATIONS	Compatibility with cultural patterns	--	--	--	--
		Traditional practices	-	-	+	+
		Religious influences	--	--	--	--
		Cultural activities	--	--	--	--
		Urban and rural activities	-	-	-	-
		Attitudes towards group action	--	--	-	-

The result of the assessment in Table 6.4 shows that the limitation is mainly related to the socio-economic, cultural and institutional information. Most of the biophysical data required for effective watershed management, that is suggested by the international guidelines, is available in the practice in Indonesia. There is still some biophysical data that is available, but is not sufficient, complete, or necessarily accurate. Overall, there is imbalance between physical and non-physical data. Whereas, as has been discussed

previously, for developing countries, most issues in watershed management and planning are more related to non-physical aspects rather than physical aspects of the watersheds. This imbalance might result in the inefficiency and ineffectiveness of the planning. No matter what the size of the budget is that has been allocated and focused on the physical aspects, without adequate attention being given to the non-physical aspects it will not be too useful.

The following table shows the data and information in the reviewed watershed management plans that are lacking (Table 6.5). Possible effects caused by them are also analysed. The lack is in terms of quantity, diversity and also quality of the data and information.

Table 6.5. Limited or unavailable data/information for Indonesian watershed management planning and the possible effect

No.	Data/information	Status :	Possible effect:
A.	*Biophysical data:*		
1.	Information on various use rights of water resources	(0)	Use rights of water resources are not acknowledged and therefore community's roles in water resource planning are not well-incorporated.
2.	Information on laws or regulations related to water resource	(0)	The users are not well-informed about the legal background of the plans.
3.	Land use history and future trends	(0)	Improvement of land use management is not achieved since there is no feed back from the previous land use and from the predicted ones. The change in land use practices is a critical factor in achieving successful programmes (Brooks & Eckman, 2000, p.18).
B.	*Socio-economic and infrastructural data*		
4.	Possible barriers toward innovative technology	(-)	Inefficient use of high technology.
5.	Social factors constraining the development and management of the activities in the watershed	(-)	Ineffectiveness and inefficiency in watershed management programmes.
6.	The main need of the community in the watershed	(0)	One-sided and imbalanced planning process; ineffective watershed management.
7.	The status of women in the community/society, their role and responsibilities	(0)	Ill-empowered potential society/community element.
8.	Information on the level of awareness and consciousness of the causes and problems facing the watershed; and adoption level by community on the conservation activity	(-)	The effectiveness of watershed management programmes is not well-identified. There is no feedback from the community towards the improvement of the programmes.

Table 6.5. (cont.)

No.	Data/information	Status :	Possible effect:
9.	The perception of the community on the protection and development of the watershed	(-)	The need of the community is unknown. Community is not well-involved in the watershed management activities.
10.	The potential for economic improvement or development	(-)	The economic benefits of watershed management programmes are not optimally achieved.
11.	The constraints or problems of development from an economic point of view	(0)	The economic benefits of watershed management programmes are not optimally achieved.
12.	Information on rural development	(0)	The management alternatives offered might not suit the local need and synchronise with existing rural development programmes.
13.	Information on related government organisations and coordination	(0)	Duplication of efforts and/or voids in responsibilities.
14.	Information on present and past programmes in watershed management	(0)	There is no adequate feed back towards the improvement of watershed management planning and implementation in the future. There is a trend to repeat the similar techniques and approaches without adapting to changing circumstances (Brooks & Eckman, 2000, p. 17).
15.	Information on existing education, training and extension and the need there for	(-)	Inefficiency of management caused by the ignorance of opportunity to employ education as a policy tool in watershed management.
16.	Information on local community development	(-)	Limited information will obstruct the effort to assist in developing the local communities, meaning less support from a worthwhile investment in a watershed management project.
17.	Information on land users' organisations, community and special interest groups	(-)	Planning and management might be ineffective since we miss the opportunity to be more productive caused by the ignorance of local organisations.
C	*Cultural information and considerations*		
18.	Compatibility with cultural patterns	(0)	The management alternatives offered might not be favourable and well-accepted by the local people since they are not compatible with local cultural patterns; therefore the management is not efficient.
19.	Traditional practices	(-)	The local users might not accept the offered management alternatives since their traditional practices are not well-acknowledged. The management can be more productive and more efficient by using them rather than by using introduced technology and ideas immediately (Brooks et al, 1990). Planning needs to integrate the technical and human dimensions of watershed management; otherwise the outcomes will be less optimal and the benefits flow will be diminished when the activities are terminated (Brooks & Eckman, 2000).

Table 6.5. (cont.)

No.	Data/information	Status :	Possible effect:
20.	Religious influences	(0)	We might lose the opportunity to build successful management, or successful implementation of plans. Religious beliefs in most developing countries might influence the development of norms in the society, including values in managing watershed resources (Sheng, 1990, p. 60).
21.	Cultural activities	(0)	We might lose the opportunity to build and to develop successful management, or to successfully implement plans. Cultural activities can be effective media to communicate the management alternatives. They also can be an efficient tool to promote public involvement.
22.	Urban and rural relationships	(-)	There can be some problems in dealing with the issue of downstream and upstream links. Understanding urban and rural relationships will be helpful to establish closer links between the two areas (Sheng, 1990, p. 60) .
23.	Attitudes towards group action	(0)	It is difficult to empower the community as an important asset in developing and implementing planned watershed management.
(-) = limited (0) = not available at all			

Data and information are important as scientific tools to address the problems in watershed management. However, they will not be useful to the managers unless they are readily available, sufficient in quantity and quality, and easy to use (NRC, 1999). The FAO guidelines added, that to be effectively useful, socio-economic data from surveys or any other sources must be analysed as thoroughly as possible (Sheng, 1990). Adequate data are useful as a tool to analyse major problems and their possible solutions. According to some international experiences, this is because they can develop an accurate picture of a watershed condition and how they are influenced by human activities (Veale, 2003). Good data is also helpful to monitor on-going changes.

In the Indonesian situation, even though some primary and secondary social-economic data is available, it is often limited in quantity and quality. Most of it is also not analysed in an appropriate manner. Therefore, the results of socio-economic data analysis are not very powerful in supporting the planning for watershed management.

The limitations regarding socio-economic data and information can result in unsuccessful watershed management, particularly for developing countries. For

example, the ignorance about any possible social barriers will lead to inefficiency when employing technology, even the most sophisticated kind. The scientific support, from any discipline, should be well-connected with policy and any social development in the community (NRC, 1999). In a society, the legal system is a reflection of the society's consensus to judge and correct immoral behaviour. In other words, science and policy must be functioning together (Heathcote, 1998). As stated by the UNEP, there should be an incorporation of science and policy framework for watershed management (UNEP-DTIE, 2002).

Another important point is that, socio-economic research needs to be incorporated early in the planning stages of watershed management (Brooks & Eckman, 2000). This includes the incorporation of participatory approaches. It is inappropriate to wait until the problems arise to bring the socio-economic study into the planning, as this might place undue responsibility on those not responsible for the planning. The late integration of socio-economic data and a participatory approach into planning will also lead to the ineffective contribution of top-down approaches, since these approaches often have inconsistent and unpredicted results (Brooks & Eckman, 2000).

The use of a participatory approach in watershed management and planning involves social features of the watersheds. Social features or dimension should be identified from various data and information. Without involving social features, the planning of watershed management is not collaborative and not participatory. For example, if the main need of the community is not well-identified, the planning process will be carried out in a one-sided manner, which is only from the government's point of view. Without any adequate socio-economic and infrastructural data and cultural consideration, such planning can be ineffective and inefficient.

Referring to the comparison between three planning models illustrated by USDA Forest Service (NRC, 1999), the collaborative model is the most preferred and the most suggested by all of the reviewed guidelines. For the situation in Indonesia which is a developing country with a large population and complex community, this model might be the most suitable. The collaborative planning model actually has been suggested in the national guidelines. The incapability in practising this model leads to ineffectiveness of watershed management planning in Indonesia.

6.4 Assessment of the Indonesian Watershed Management and Planning

Summary of problems found in watershed management and planning in Indonesia, as the result of comparison between the theoretical frameworks and the existing practices is displayed in Table 6.6:

Table 6.6. Summary of the comparison between theoretical frameworks and practice

	Problem found:	Possible cause:	Evidence/ explanation:	Effect:
1.	The effectiveness and relevance of existing planning system is uncertain because plans are inadequate.	The existing planning does not meet the element of continuity (Brooks et al., 1990, p. 12) as one of the key elements that underlie the planning process. There is non-sustainability of positive watershed management project ideas and effect when the project is terminated.	Many of the developed plans (especially the medium-term/ 5 years plans) have not been reviewed. This means failure in doing reiteration in the planning process.	Inefficiency and ineffectiveness of planning process. There is no continual feed back towards the improvement of the management.
		The existing planning does not meet the element of diffusion (Brooks et al., 1990, p. 12), since the ideas and technology are not well-spread and adopted throughout watershed. There is lack of dissemination effort of the developed plans. Therefore the adoption of user on the ground/field is very low.	The dissemination effort of the developed plans is very little, mostly limited only to the government officials who are especially likely to stay in their office. The plans and the offered management alternatives have not been well-understood by the real users in the field.	Inefficiency and ineffectiveness of planning process. The plans that have been developed and the management alternatives that have been offered can not be adopted and applied well in the field.
			Participation of public and non-governmental stakeholders is very limited. They hardly have been involved in the planning process, or well-informed about the planning itself.	

Table 6.6. (cont.)

	Problem found:	Possible cause:	Evidence/ explanation:	Effect:
			Most of the local people in the watersheds are still the object of the management and planning rather than being involved in the activities.	
2.	Planning has not been well-synchronized with the regional/local regulations. Planning has not been adequate to answer the challenge of new issues on regional autonomy/ decentralisation.	Fragmentation of watershed management activities and responsibilities among varied government agencies.	There is fragmentation of responsibility between agencies under the Ministry of Forestry and the Ministry of Public Works.	There might be some elements of responsibilities that are not touched or even elements that overlap with each another (duplicated).
		Lack of coordination among varied agencies involved.	Each agency has its own plan/program that is not well-integrated and communicated; sometimes they overlap or are not even compatible with each other.	Planning is not efficient.
		The unavailability of legislation that promotes and focuses on coordination among agencies involved in integrated watershed management.	There is no legislation that specifically administers or governs the coordination or acts as a strong legal base for coordination among agencies involved in watershed management.	It is difficult to promote coordination among the agencies involved since there is no enforcement from a strong legal system.
		Lack of comprehension of governmental agencies about the upstream and downstream relationship as a form of both spatial and temporal externalities (Brooks et al., 1990, p. 13).	The local government agencies in different regions often work partially. Their involvement in the planning process is little, usually only in the approval (final stage of the process) of plans.	Limited effort from the government to solve the conflict between upstream and downstream areas.

Table 6.6. (cont.)

	Problem found:	Possible cause:	Evidence/ explanation:	Effect:
		Lack of understanding about the fact that the interactions in watershed management do not follow political boundaries, and instead, cut across them.		
		Inadequate participation of local governmental agencies in the planning process.	The involvement of local government in the planning process is still limited.	Planning results do not suit the local condition.
		The absence of a coordinating body.	The guidelines have suggested some alternatives for coordinating bodies, but there is no implementation.	Promotion of the coordination of watershed management is weak.
		The relationship between upstream and downstream areas of watersheds has not been studied.	Study and analysis on this relationship are not available in the plans.	Misunderstand-ing and conflicts between both areas.
3.	Inadequate data for planning and need to set comprehensive criteria and indicators for monitoring and evaluation.	Lack of appropriate technical and analytical skills; Lack of decision support tools (Veale, 2003).	Data available in planning are not complete and some of them are not accurate.	Inefficiency in planning and management.
		The use of high-technology that is not optimal.	GIS has been available and employed in planning, but the skills and expertise to analyse the results are limited.	Inefficiency in planning and management.
		Lack of attention about the social impact of watershed management activities.	Inadequacy in socio-economic data.	Imbalance between social and physical aspects/ dimensions in management.

Data inadequacy:

The inadequacy of data available in Indonesia can be caused by many factors, leading to inefficiency in watershed planning and management. The first factor is the lack of appropriate technical and analytical skills. Many kinds of data may be available but they are not well-analysed, therefore are not very powerful as material in decision making. The use of high technology such as GIS and remote sensing is not optimal unless adequate skills to analyse the output are available. The unavailability of many kinds of social-economic information may be caused by the lack of attention given to the socio-impact of watershed management activities. The data collection and planning has been mainly focused on the biophysical aspects.

The failure of continuity in planning:

There is little continuity in planning, even though the Indonesian guidelines have stated that, based on the results of monitoring and evaluation, a review of the developed plans should be carried out (Ministry of Forestry, 2001). This means that the guidelines stressed the importance of iteration in planning. In practice, many watershed development plans developed for watersheds in Indonesia, especially the short term plans, have not been reiterated. Some of them are out of date and might be not relevant any longer to the actual situation. Therefore it is difficult to indicate the appropriateness and effectiveness of the planning.

Inadequacy of planning process:

Compared to the other guidelines, there is no progress in the development of a monitoring and evaluation system in the planning process suggested in the Indonesian guidelines. CSI-WFD Project (2003) stated that the establishment of monitoring and evaluation programmes is one of the main components that is important, to link the other stages in an iterative planning process.

To succeed in this linking stage, there should be information and consultation of the public, as well as active involvement of interested parties. The assessment shows that planning in the Indonesian watershed management is lacking in participation. There is no adequate public consultation in the planning process. The public, particularly local people, are mostly seen as the object of management rather than a partner in doing planning. The involvement of interested parties or stakeholders is also limited. The list

that is made in order to collaborate the planning usually consists of governmental agencies. This fact leads to the opinion that watershed management planning in the country is dominated by government interest.

Failure in organising and coordination:

The national Indonesian guidelines have suggested an alternative form of organisation that can act as a coordinator in watershed management in the country. This idea is similar to the one suggested by the varied international guidelines. For instance, the ASEAN guidelines mentioned that it is necessary to have an organisation that has overall responsibility and plays the role of coordinator. This organisation is to promote cooperation among agencies involved in the actual management, so that the overlapping of responsibilities can be avoided (Brooks et al., 1990). In determining the most suitable coordinating body, the FAO guidelines suggest that a careful study is needed. This study includes the history, possible forms and mechanisms of coordination, and success and failures in the past. ADB stressed the urgency of collaboration in regard to the cross- boundary issues of watershed management.

Some useful ways to develop collaborative frameworks suggested by the ADB include the mapping of physical and institutional resources, information sharing, and the establishment of a regional legal system (ADB, 2002; p. 29). In addressing the cross-boundary issue in a watershed, ADB also advocates to include an assessment of the upstream-downstream relationship and its impact on collaborative framework development.

Unfortunately, there is no indication that this idea has been brought into practice in Indonesia. There has been no coordinating body or organisation that has coordinated the watershed management and planning at any level in Indonesia until recently. This problem has a significant effect on the practice of watershed management at the local level. The policy on watershed management that has been set at the national level can not be effectively implemented in the field, since there is no support or assistance from a coordinating body. The absence of the coordinating body also means the absence of supervision to monitor and evaluate the implementation of policy from the top government. Therefore there is no adequate information on the success of watershed management in the field.

However, it should be realized that the direction to establish a watershed management body is not an easy task. Even though this idea has been recommended, there is still gap between this 'prescription' and practice. The appearing obstacles are usually associated with politics, as argued by Blomquist & Schlager (2005). The complexity of political situation might have hindered the establishment of watershed management body in Indonesia, even though alternatives have been offered by the national guidelines.

Inadequate legal support:

In the reviewed planning, there is no information on the laws, regulations or any legislation related to planned watershed management activities. Given this, the users of the plans are not well-informed with the legislations supporting the planning. This problem is not because the legislation is unavailable, but because the legal system is inadequate. A long list of legislations at the national level is available, but most of them are not well-interpreted so they can be compatible and synchronous with regulations at the regional and local levels. This situation results in inefficiency of watershed management and planning in the country.

6.5 Filling the Gaps with Best Practices from Other Countries' Experiences

Obviously, the practice of watershed management and planning in Indonesia is facing many problems and therefore is considered ineffective. How can we improve the existing situation? How can we fill the gaps found in the previous discussion? What can we learn from other countries' experiences in order to fill those gaps? The following matrix (Table 6.7) recommends alternatives best practices from others' experiences to address the problem in Indonesia. The agreement of the recommended practices from the perspectives of the international guidelines is shown by the dots.

Table 6.7. Best practices from others' experiences to address the Indonesian problems

Problem addressed:	Alternative practice to solve the problem	The international guidelines referred:				
		ASEAN	FAO	UNEP	ESCAP	ADB
Inadequate data for planning and incomprehensive criteria and indicators for monitoring and evaluation.	Development of comprehensive criteria and indicators for sustainable watershed management in order to ensure the conservation of watershed areas. (Philippines)	●	●	●	-	-
	Establishment of a national watershed information system to carry out the systematic collection, review and dissemination of information for improved watershed management. (Philippines)	-	-	●	●	●
	Adoption of an integrated planning and resource management approach at national level which recognises the global need for sustainable development and recognises the need to coordinate environmental and physical planning. (Malaysia)	-	-	-	●	●
	Provide the staff of related watershed management agencies with adequate skills, information and equipment which allow them to understand the complexity of watershed systems. (Malaysia)	●	●	●	●	●
	Adequate support for on-going research efforts. (Malaysia)	●	-	●	-	●
Lack of stakeholders' partnership.	Adoption of multi-sectoral, multi-disciplinary and inter-agency partnership for watershed management . (Philippines)	-	-	-	-	●
	Establishment of a formal partnership agreement and cooperation commitment among representatives of relevant central government departments. (Thailand)	●	-	●	●	●
	Involvement of Local Government Units (LGUs), line agencies, and Non-Government Organisations (NGOs) in the development and implementation of a comprehensive training programme. (Philippines, Thailand and India)	●	●	●	-	●

Table 6.7. (cont.)

		ASEAN	FAO	UNEP	ESCAP	ADB
Lack of effective coordination.	Establishment of coordinating committees at all levels (national, ministerial, and local/project level); where each of them has clear responsibility. (Thailand)	●	-	-	●	●
	Coordination among several key ministries. Good distribution of jobs, activities and responsibility among these ministries along with their respective line departments, so each of them focuses on a different aspect and activity in watershed management.	●	●	●	●	●
Lack of public participation.	Promotion of community involvement in watershed management through the development of educative programmes involving school children and local communities. (Malaysia)	●	●	-	●	●
	Development of a consultative programme that involves all levels of the community in the decision-making process. (Malaysia)	-	-	-	-	●
	The acknowledgement of women's role, traditional cultures and religious values in watershed management and planning. (India)	●	●	-	-	●
Ineffective and less powerful planning to be applied in the field.	The consistency in the use of the watershed as the unit of planning and monitoring and evaluation; while the village, as the smallest territorial unit, is used as the unit of implementation. (India)	●	●	●	●	●
	Establishment of a national watershed information system to carry out the systematic collection, review and dissemination of information for improved watershed management. (Philippines)	-	-	●	●	●
	An adequate and effective dissemination of watershed management guidelines to communicate the guidelines and their use at all levels. (India)	●	●	●	●	●

Note : ● = as agreed and suggested by the referred guidelines
(-) = information not available

Inadequate data for planning and incomprehensive criteria and indicators for monitoring and evaluation:

This problem can be addressed in several ways that are related to one another. The Philippine experience proved that the development of comprehensive criteria and indicators for sustainable watershed management is a must in ensuring the conservation of watershed areas. To promote this development, they established a national watershed information system with which they can systematically carry out the collection, review and dissemination of information required for the improvement of watershed management. This approach is recommended for the Indonesian situation, since it is suitable in respect to the complexity of the biophysical and socio-economic aspects of the country. Establishing a central national watershed information system will enable the watershed managers to collect, manage and assess the data and information creating better management and planning in a more practical, systematic and efficient way.

An idea gleaned from Malaysian best practice, which is to provide the staff of management agencies with adequate skills, information and equipment is most likely applicable in the Indonesian situation. Like most developing countries, the problem of poorly-qualified staff in Indonesia is often the case (Pereira, 1989). The use of high technological assistance might not be too helpful unless the users have appropriate skills and principal knowledge on watershed systems. The improvement of the staff's capability will be very supportive for data collection, their analysis and then the development of comprehensive criteria and indicators for effective management. Thus, these will increase the efficiency of management alternatives developed in the planning.

Many international guidelines recommend the incorporation of research into watershed management. Therefore the international organisations support the research in watershed management in developing countries, either technically or financially. Malaysia's experience is that the result of the research has been useful for the watershed management development in their country. Therefore they stated that there must be adequate support for on-going research efforts. Indonesia should learn from this experience. Many research efforts have been initiated, but not many of them have been well-maintained. More support for on-going research efforts is required to achieve more efficient watershed management.

Lack of stakeholders' partnership:

The Philippines experience suggests adopting the practice of a multi-sectoral, multi-disciplinary and interagency partnership in watershed management. For such a country which has varied natural resources and complex stakeholders in their management, this practice will be useful. There should be a way to accommodate the complexity of the interests, tasks, and responsibilities in managing watershed resources. A partnership is defined as "a mutually agreed arrangement between two or more public, private or non-governmental organisations to achieve a jointly determined goal or objective or to implement a jointly determined activity, for the benefit of the environment and society" (Mitchell, 1990). Given the reasons for complexity and the possibility of changes (uncertainty) in management, partnership that involves multi-sector, multi-discipline stakeholders will be a suitable means to integrate the perspective, knowledge, understanding, and experience of various groups and people. As a result of this, policy and planning of watershed management can be more easily synchronised with those at the regional and local level.

The involvement of NGOs, representative of user groups and academia, as well as local communities, should be encouraged in partnership in watershed management. ADB recommend this as they play the role of development partners of government agencies (ADB, 2002). As partners, they are to be consulted in the process of policy making so that watershed management can more effectively meet the development challenge. Through consultation, watershed management concerns can be matched practically with the requirements of local government jurisdictions. Therefore, consultation helps to ease the application of guidelines in the field.

Lack of effective coordination:

It is important to establish a simple but optimal coordination mechanism (Heathcote, 1998), as the interrelationship among the related agencies has already been complicated. A way to simplify the mechanism is to establish a coordinating organisation (taking the form of a committee or body) following the hierarchy in planning. This practice proved to be effective in Thailand through the experience of the Chao Phraya basin development (World Bank in Le Moigne et al., 1992) and especially the Thachin watershed water-quality management (Simachaya, 2003). The committee at the higher level must be well-coordinated with the one at the most local level, to ensure that

planning and implementation are always harmonised at all levels. To support this, a comprehensive and synchronised legislation system is required in a watershed management framework, as learned from the case of the Nam Pong Watershed Project. In addition, Blomquist & Schlager (2005) advised that understanding of politics in a watershed will help to explain why there are difficulties in realising the establishment of watershed management body. Three issues within politics in a watershed need to be understood, as suggested by both scholars, are boundary definition, choices about decision-making arrangements, and accountability (Blomquist & Schlager, 2005).

Lack of public participation:

There are several ways to encourage and improve public participation in watershed management and planning. One of Malaysia's best practices is to do this through the use of education. Education has been found to be an effective and efficient means to promote community involvement in watershed management. Malaysia developed an education programme that involves school children and local communities. The advantages of the educational approach in promoting public participation is that it is easy to establish, provides a non-confrontational form of intervention, and requires little financial commitment (Parminter, 2003). Moreover, education can also minimize bureaucratic enforcement, so it can reduce the dependency on a top-down approach. These advantages enable education to be a more favourable approach for Indonesian watershed management.

The employment of an educational approach to encourage public participation can also be successfully combined with any other tools, for instance, voluntary initiative. Acknowledgement of the culture and local tradition, including traditional practice, will assist in encouraging local people to willingly participate in watershed management activities. The increasing acknowledgement of the role of women in India, and the role of monks in Thailand, has been helpful in understanding the social dimensions in both countries and this has supported the success of watershed management. In Thailand, a partnership agreement has been established, involving civil society groups that voluntarily bring to the fore their awareness and commitment to be actively participating in watershed management activities. Parminter (2003) stated that the establishment of voluntary groups promote community spirit, social solidarity, and political participation – which all are important for developing countries.

Those examples from other countries can be useful for Indonesia. From the social and cultural points of view, Indonesia is about diversity. The acknowledgment and understanding of this diversity will promote public participation. However, the existing situation shows that the public, especially local people with all the diversity, is mostly being treated as the object of the watershed management. Mitchell (1997) said that generally, natural resource management agencies have been unsuccessful in dealing with socio-political and cultural aspects of resource management, because they usually do not give the appropriate amount of attention to them. If the diverse social and cultural conditions can be seen as an opportunity, which has potential, rather than being a hindrance, successful watershed management can be achieved more easily and efficiently.

Ineffective and less powerful planning to be applied in the field:
Many suggestions are workable to address the failure of planning application in the field. The first is offered from India's experience, which has successfully combined the use of watershed as the suitable unit of resource management, with the village as the smallest physical unit in local development. Such consistency in the use of watersheds brings about efficiency in the planning and monitoring of watersheds, while the use of a village is administratively and politically practical for implementation in the field. In Indonesia, this consistency has not been well-maintained. 'Kelurahan' or 'desa', which are equal to village, have been recognised as the official administrative units for a long time. This fact is an opportunity to improve the situation. In the future, the use of villages as the smallest unit of administration needs to be more integrated with the concept of the watershed as a management unit.

The establishment of a national watershed information system is the initial step that is important, to provide a strong foundation for the successful management of watersheds. The Philippines experience shows that an adequate national information system will provide good data and information for planning, as well as adequate criteria and indicators for the monitoring of a watershed management programme in the field (as supported by Veale, 2003). Secondly, the establishment of a watershed information system needs to be coordinated with the establishment of watershed management guidelines. All of the information is to be disseminated to all of the stakeholders. Sometimes watershed management is unsuccessful even though good guidelines,

data/information, and legislation has been available – simply because they are not well-communicated and disseminated to the users.

In India, an attempt has been made for the guidelines for watershed management to be to be well-communicated and to make them accessible to all types of users, ranging from officials to farmers. The attempts have been made through the translation of the guidelines from English to local languages and by the development of a supporting operational manual. In Indonesia, there have been guidelines and a manual for watershed management at each level, but they are presented in a technical language that is addressed to the official users. The guidelines and related information (including legislations) should be disseminated to be more communicative and 'local user' friendly to make them more applicable in the field.

A review of the countries' experiences shows that problems regarding policy generally occur in similar forms in varied places, despite differences in the natural condition. The World Bank agrees with this. However in practice they have suggested that the solution should be suitable for the different institutional settings (Guggenheim, 1992). For instance, the solution for countries with a federal government should be different than those with a unitary government. A difference in institutional setting might appear in Indonesia compared to other reviewed countries, especially Thailand and Malaysia. Malaysia has a federal government under the commonwealth; Thailand is a monarchy nation, while the Indonesian government is a republic. For a country, the institutional settings at the national level may also influence those at regional and local level. Therefore, in the context of watershed management, there is a need to comprehend the institutional settings in each watershed. Every watershed management agency should incorporate a thorough study and analysis of institutional setting of a particular watershed into the planning.

When adopting of a tool or an approach to watershed management, its advantages and disadvantages need to be considered. This is to know whether it is suitable or not for such a place. For example, the use of an educational approach in encouraging public participation which is inspired by the experience in Malaysia might be suitable for the Indonesian situation. However, there is a limitation to this tool, in that it cannot achieve results instantly (Ribaudo and Horan, 1999, in Parminter, 2003). Another limitation is

that for developing countries, education programmes in natural resource management will only be effective and attractive for people if it is beneficial enough for them. Considering these limitations, the government agencies might need to anticipate a gradual result through the use of any other compatible approaches. It is suggested that education should bee used in conjunction with other approaches, for example, with voluntary initiatives or regulations to reinforce education. A combination of education and economic tools such as incentives or subsidies is also possible to encourage public participation in watershed management.

6.6 Concluding Remarks

The three points of the problems stated initially in this study have been addressed in this discussion chapter. The result of the assessment through comparison matrices show that those problems exist in Indonesian watershed management and planning. The analysis of the problems and their causes draws the conclusion that the Indonesian guidelines of watershed management and the existing practice have not been effective.

There are various features of this ineffectiveness, ranging from failure in the planning process, data adequacy, organising and coordination, stakeholders partnership/collaboration and public participation, and legal system adequacy. Overall, it can be concluded that the most influencing factors are from the social aspect of watershed management.

The assessment concluded that social issues are more emergent than biophysical ones in Indonesia, as well as in some other developing countries. The review of the experiences in watershed and planning resulted in some lessons to be learned for Indonesia. These examples of best practice need to be considered as recommendations in order to improve watershed management and planning in Indonesia.

Chapter 7

CONCLUSIONS AND FUTURE RESEARCH

7.1 Research Conclusions

7.1.1 International Perspectives of Watershed Management and Planning

The review of varied international guidelines of watershed management resulted in various perspectives on watershed management and planning. The differences between the watershed management practices of countries and development agencies are associated with the background of the organisations, the purpose for which the guidelines were issued or published, and the approaches that were used by the guidelines to address their purposes. Basically, all of the international guidelines have a general goal to assist developing countries in achieving effective and efficient watershed management. There is nothing contradictory among the perspectives, instead, all of them are complementary and can be used alternatively to suit the specific conditions. Many of the suggestions from these international guidelines have proven useful to improve the existing guidelines and their practices in Indonesia.

7.1.2 An Assessment of Indonesian Watershed Management and Planning

The existing practice of watershed management and planning in Indonesia has been shown to have limitations that significantly reduce the effectiveness. The limitations can be categorised into two areas. Firstly, inadequate guidelines which provide a theoretical framework of how the management and planning should be. Second, poor implementation of the existing guidelines.

The framework provided by the guidelines has not been adequate to support effective and/or successful management and planning. The criteria and indicators (also reflected by the list of data required) for effective watershed management and planning, set by the guidelines, has not been comprehensive. The regulation or legal system incorporated into the guidelines has not been adequate to support the effective planning and implementation at local level. The existing planning has been dominated by a 'top-down' approach.

On the other hand, practice has also not always conformed to the theoretical framework provided by the guidelines. This problem takes the forms of the weak participation of the public, the ignorance of people regarding the importance of watershed management, the failure to conduct a coordinating body, the poor coordination among stakeholders, and the unsynchronized legislations. The inconsistency between the guidelines and the 'reality' also appears in the existing practice of the planning process. The process has not been done iteratively. Many plans have not been reviewed; therefore they are considered not relevant to the actual situation. These problems are caused by many factors, namely inadequate socialisation and the dissemination of the guidelines and related legalisations to all stakeholders. Another cause is the lack of skill and knowledge of both the government staff and the public.

In summary, the areas of weakness evident in Indonesia's situation are generally: (1) data availability (quantity and quality) and their adequacy; (2) the continuity and consistency of the planning process; (3) the practice of the participatory approach and/or the stakeholders' partnership; (4) coordination; (5); organising; and (6) the legal system.

7.1.3 Lessons Learned from Other Countries Experiences

A review of the experiences of watershed management and planning in some other developing countries has resulted in some lessons that can be learned. The best management practices from other countries' experiences offer alternative solutions for the problems in watershed management and planning in Indonesia. They have made a difference in the previous situations and have been found to be effective in solving the problems. They have the potential to be replicated, adapted and transferred somewhere else. Due to the similarities in their conditions, especially in terms of social and economic aspects, many of their best practices are compatible and adoptable to the Indonesian situation.

Based upon an assessment of the experiences of watershed management and planning practices in Indonesia, the Philippines, Malaysia, Thailand, and India, the following recommendations are made with respect to watershed management in Indonesia.

(1) Establishment of an adequate national information system of watersheds and their management.

(2) Improvement of the planning system, to be consistent with planning hierarchy and to be iterative.

(3) Promotion of collaboration and partnerships by the government.

(4) Strengthening of the legal system as the foundation of effective watershed management and planning.

(5) Encouragement and strengthening of public participation in watershed management and planning.

7.2 Future Research

There is a need for a deeper study, calling for more transparent and more critical assessment on watershed management in Indonesia. This can be attempted through adequate field study, broader document review, and/or thorough case studies.

The assessment of watershed management in this study is mostly focused on the planning stage, while the monitoring and evaluation stage is only briefly overviewed regarding its link with planning. For further research, the efficiency assessment of watershed management in Indonesia can be further approached from the implementation or evaluation stage.

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