
Discussion paper

*Action-learning to
develop and test
upstream-downstream
transactions for
watershed protection
services: a diagnostic
report from Segara River
basin, Indonesia*

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Developing markets for watershed protection services and improved livelihoods

This study is part of a cross-country initiative coordinated by the International Institute for Environment and Development (IIED) with the above title.

IIED carried out a global review of markets for forest environmental services and their impacts on the poor, as part of its Instruments for sustainable private sector forestry project. Amongst the forest environmental services considered was watershed protection services. The review showed that markets are emerging around the services provided by watershed land use, particularly water quantity and quality. However, there has been little regard for the actual impacts of such markets, particularly upon those who manage the land in watershed areas. Thus there is a need to explore mechanisms for ensuring that these markets can both improve watershed services as well as contributing to poor people's livelihoods.

With support from DFID, IIED and its partners in the Caribbean, India, Indonesia and South Africa have been investigating these issues through the preparation of diagnostic studies, which look at the issues, demands, players and potential ways forward. These countries are home to watershed contexts where markets are showing signs of emerging and key actors recognise that such markets will need to be shaped if they are to deliver good land use and poverty reduction. The research has also produced detailed case studies of the impacts of existing watershed market mechanisms in Costa Rica and Ecuador, and a core of partners in further countries eager to expand links and seize opportunities in Peru, Mexico, China, the Philippines and Vietnam. The work has also developed an effective network - an incipient "policy community" - amongst those in a wide range of institutions around the world engaging with these issues.

Reports in this series are available from IIED on request, and are downloadable from www.iied.org/forestry. They include initial diagnostic analyses of markets for watershed protection services and improved livelihoods in the Caribbean, India, Indonesia and South Africa; as well as detailed case studies on the social/ poverty impacts of markets for watershed services in Costa Rica and Ecuador.

For a wide range of published reports from IIED's previous 3-year initiative on ***Instruments for sustainable private sector forestry***, including the global review of markets for forest environmental services and their impacts on the poor ("***Silver bullet or fools' gold?***") see www.iied.org/forestry/pubs/psf.html

Action-learning to develop and test upstream-downstream transactions for watershed protection services: a diagnostic report from Segara River basin, Indonesia

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A sub-study of the collaborative project coordinated by the International Institute for Environment and Development (IIED)
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1. Introduction

Water resources in Indonesia face increasingly complex management problems, associated with deterioration in water availability, quantity and quality. Policy to date has emphasized utilization of water. At the same time landslides, soil erosion and floods have increased in numbers, areas and losses. People who live in watershed areas are usually expected to bear the cost and risks of watershed management. Meanwhile water users tend to have little understanding of the need for, or means of, watershed protection. In general there are no direct links between the water charges paid by downstream users and investment in watersheds upstream. Inadequate payment mechanisms for watershed protection services and weak law compliance can threaten hydrological functions of watersheds. Moreover, rising demand for water and increasingly complex management problems will lead to deterioration of food security and public health, and constrain Indonesia's economic development.

It is therefore essential to change inappropriate water policies and regulations by using more effective and inclusive institutional frameworks, management and planning. In this regard, Indonesia has initiated policy reform for water resources management, which is currently underway through a Water Resources Sector Adjustment Loan (WATSAL) from the World Bank. Specific objectives of this reform are to set up: (1) national institutional frameworks for water resources development and management, (2) organizational frameworks for integrated river basin management, (3) regional regulatory institutions and implementation to monitor and maintain water quality, and (4) national irrigation management policies, institutions and regulations.

One of the big challenges is how to link the fees paid by water users with the quantity, quality and reliability of the water they receive. One possibility is to improve the tax or water charge system for water. Another, potentially more efficient, approach is to support the development of market-based payment mechanisms for protection of watersheds. Transfer payments for watershed protection services could combine benefits of maintained watershed functioning and improved livelihoods of people in watershed areas. This project aims to explore the potential for market-based payment mechanisms to deliver returns to livelihoods and watershed functions. An inception phase of action-learning on this subject has been implemented at Segara River basin on the island of Lombok, West Nusa Tenggara Province, Indonesia.

2. Aims and approach

The goal of this action-learning activity is to promote maintenance of water services that support local livelihoods. The purpose is to increase understanding of the potential role of market-based approaches in promoting the provision of watershed services for improving livelihoods in Indonesia. In order to provide a basis for further implementation of the project, the objectives of this inception phase are to select a site for the study, obtain baseline data, produce a diagnostic, and set local action in motion.

Primary data were collected through interviews, participatory rural appraisal, and a regional workshop. Interviews on issues related to the action-learning focus were conducted with various people in both villages and concerned regional offices. A two-day meeting was devoted to participatory rural appraisal. People residing in the upstream, midstream and downstream reaches of the Segara River were involved in the meeting,

along with other users of the water, for instance the local branch of the national drinking water company, a rafting company, upland farmers/foresters, farmers concerned with irrigation and village officials.

A regional workshop was conducted to discuss markets for watershed protection services and to raise findings from the interviews and participatory rural appraisal. The participants came from government agencies, universities non-government organizations and selected participants of the 2-day village meeting. The regional workshop was received with great interest, since in the past action has always been taken by a single agency. Participants proposed integration in watershed management. Who will synergise the stakeholders in this management is questionable – it is not easy to develop new forms of administration.

3. The Indonesian context

a. Background information

The Indonesian archipelago situated in south east Asia consists of five main islands (Sumatra, Java, Kalimantan, Sulawesi and Papua) and some 13,667 other smaller islands with a total area of 1.919 million km² with total land area of 1.826 million km². Geographically Indonesia is located between the latitudes of 6° 08' N – 11° 15' S and longitudes of 94° 45' E – 141° 05' E. The total population according to the 2001 estimate was 228.4 million with the forecast increase about 1.98% per year.

Rainfall in Indonesia is controlled by tropical monsoons. Rainfall varies between the rainy season from October to March and the dry season from April to September, with greater contrast in the drier east of the country than in the wetter west. The annual rainfall in Indonesia ranges between 1,500 mm and 4,800 mm.

There are 5,632 rivers in 90 river basins in Indonesia. Ten percent of those rivers are “flood-causing rivers”, and several rivers are considered as “degraded” due to excessive sand mining in the river. Others are known as “critical watersheds” (defined as prone to land erosion as the result of undesirable changes in land use, or improper farming practices). Nationally, there was a significant increase of the number of critical watersheds from 39 in 1992 to 59 in 1998.

b. Policy reform

In April 1999 the Government of Indonesia formulated the Letter of Sector Policy and Policy Reform Matrix, which forms the basis of the ongoing Indonesia Water Resources Sector Adjustment Program (WATSAP). The rationale for sectoral reform and structural adjustment is that Indonesia’s water resources and irrigation sector face increasingly complex long-term investment challenges and management problems, which, unless effectively addressed, will increasingly constrain the country’s economic development and lead to a deterioration in food security and public health, as well as irreversible damage to the environment.

The most important principle and driving force behind the sectoral reform is the broad policy of decentralization that has been changing the basis of governance in Indonesia over the past two years. The reform of Law no 11/1974 on water resources, and

relevant regulations deriving therefrom, will re-align the role of the government as follows:

- Central government will be limited to an enabling and regulatory role, responsible for promoting public–private partnerships at the regional and local levels, transferring resources to regional and local governments, and maintaining guidelines and networks for information exchange, monitoring and regulation.
- Sectoral mandates and implementation authority will be devolved to provincial, district and local government – and, at the most local level, to water user associations (WUAs).
- Provincial governments will be reorganized to serve the district and village levels and limit their executive roles to extra-jurisdictional functions and issues such as management of river basins covering several districts and/or provinces.

This ongoing overhaul of water policy is resulting in major reforms in legal, organizational and financing mechanism and rules, aimed at improving overall water resources and irrigation sector performance. Four key areas of change are (1) the overall national policy on water resources management, (2) participation and accountability at all levels, (3) water quality management and (4) irrigation management. These key areas are explained in more detail below.

(1) National policy on water resources management: the National Water Resources Policy (NWRP)

- New law on water resources to accommodate decentralization of government function and public administration
- Setting up of a national coordination body for water resources management
- Frameworks for private and public participation in water resources management to improve cost effectiveness without neglecting social aspects of water resources
- National data and information systems for hydrological management

(2) Participation and accountability in water resources management

- *Integrated water resources management for all river basins.* In less developed river basins, the government will set up basin level management units (local term: Balai PSDA). The roles, responsibilities, functions and financing are gradually evolving. The necessary regulations are in place to support the functioning of these institutions while detailed administrative and technical guidelines to implement various aspects of management need to be strengthened. As a result of the movement towards decentralization and regional autonomy, some Balai PSDA are also being given an operational role in the management of irrigation networks that transcend district boundaries.
- *River basin corporations.* In developed and strategic river basins, the government will strengthen the river basin water resources management by establishing self-financing, autonomous river basin management corporations. These may be centrally funded and managed state-owned enterprises, or regional government-owned corporations.
- *Coordination bodies at the river basin level and higher levels.* River basin management boards, and higher level “Apex Bodies”, will be set up to ensure regional participation in all river basins. Stakeholders in water resources management include relevant government institutions (forestry, public works, mining, environment), NGOs, people’s representatives, indigenous leaders,

university members, professionals and other bodies involved in water resources management. Stakeholder representativeness is reflected in the proposed membership of Water Resources Coordination Apex Bodies and management boards at national, provincial and river basin levels, which consist of 50% government representatives and 50% non-government representatives.

- *Assurance of water allocation for multiple users.* Effective water management policy requires a system of water rights. As demand increase and inter-sectoral competition increases for limited supplies, public regulation based on recognized water rights will be required to achieve societal goals. The government will establish enforceable formal national water and water quality rights. The problems of water rights for irrigation schemes will be explicitly addressed to include prevailing customary water rights concepts. The water rights system will be supported by appropriate regulations and a uniform provincial framework of water licensing for abstraction and discharges that covers all multiple use sectors.

(3) Water quality management

- *New government regulation on water quality management.* A new government regulation on water quality management and pollution control has already been issued. The new regulation provides an opportunity to harmonize water resources management and environmental management at the level of regional governments. River basin entities may be appropriate agencies for operational water quality management tasks under agreement with provincial pollution control agencies, whose primary role is regulation. The river basin board is a forum for stakeholders such as industries and municipal authorities to engage in a dialogue about water quality management. The regulation regulates surface and groundwater pollution and states that waste discharge fees and wastewater treatment plant charges must be utilized solely for water pollution control activities.
- *Setting up of water quality network.* Industrial water pollution control has been addressed through programs such as the Clean River Program (local term: Prokasih). Some reduction in water pollution has been achieved, but national discharge standards for each economic sector require stronger enforcement. Municipal effluent discharges and treatment have received little attention and funding, because of difficulties related to financing, cost recovery and available know-how. Attention has also been given to water conservation and water pollution caused by mining and non-point sources of pollution. Pollution source monitoring is the responsibility of river basin management corporations and a water quality sampling network will be established.
- *Improvement of water quality management.* Basin management entities may monitor water quality and waste water discharges, assist regional government in technical assessment for wastewater discharge permits, and collect effluent discharge fees either as a surcharge on potable water supply and bulk water, or via an environmental service fee collected through district governments. Central government will issue national guidelines to calculate water abstraction and effluent discharge fees, to determine the pollution assimilative capacity of individual rivers, and to specify mechanisms to integrate water quality and quantity management at the level of river basin corporations.

(4) Irrigation management

- *Rearrangement of tasks and responsibilities of irrigation management bodies.* A new government regulation on irrigation has been issued, which centers on transfer of decision-making and budgetary management to local groups of irrigation end-users, organized into water use associations (WUAs). The new irrigation management policy requires the governmental irrigation agencies and their financial and logistic resources to deliver the water use association support program. Redefinition of central, provincial and district level irrigation institutions roles and responsibilities in irrigation management has been set up, supported by an action plan indicating the key steps needed.
- *Facilitation of public-private partnership and administrative transparency* through joint management of large irrigation schemes, with commitment to a program of monitoring, evaluation and follow up activities that include financial and technical government support.
- *Empowerment of water user associations in irrigation management* through an institutional and fiscal framework to enable effective and sustainable operation and maintenance of a public irrigation network. The new irrigation management policy focuses on incentive and arrangements for participation and empowerment at all levels of irrigation management such as:
 - Democratic election of WUA leaders and flexible governance procedures to suit local irrigation and village management customs
 - WUAs vested with authority to discharge all their responsibilities, including developing and enforcing their own rules, levying fees, operating bank accounts and undertaking financial obligations
 - Voluntary federation of WUAs into higher level organization up to the scheme level to resolve water disputes and to engage in management at realistic scales
- *Sustainable irrigation systems.* The full transfer of irrigation responsibilities to regional governments will also require allocation of adequate operations and maintenance funding for the irrigation headworks, main canals and large secondary canals of schemes, which remain a government responsibility. This budget will be based on the total ISF payments collected by participating WUAs.
- *New irrigation financing for rehabilitation, operation and maintenance.* The new regulation will allow WUAs to collect and retain irrigation service fees (ISFs) in their bank accounts for maintenance of their schemes. Procedures will be simplified to determine the level of ISF for each scheme and to seek transparent payment methods. The institutional framework and financing mechanisms for irrigation infrastructure maintenance and rehabilitation will be fundamentally changed. In the new policy on irrigation management, the single water fee imposed to the farmers will include water tax, water retribution, and irrigation service fee. The financial sources required by WUA will come from many sources such as membership fee, economic enterprises run by the WUA, financial aids from the government and other financial lending agencies.

4. Site description

a. Site selection

Site selection took place in three stages. First, river basins with nascent or potential payment systems for watershed services were identified through conversations with colleagues and key informants. Second, of about ten sites identified, three were then chosen, on the basis of availability of information, a preliminary scoping exercise: the Segara River in West Nusa Tenggara Province, the Brantas River in East Java Province and the Cidanau River in Banten Province. The three preliminary scoping reports are presented in Annex 1.

Table 1. Selection criteria for three sites

Site	Potential lessons	Willingness to pay directly	Potential sellers	Relationship upstream and downstream	Local interest	PSDAL interest and practicality
Segara River	Mechanisms for sharing rights and responsibility	Payment mechanism exists for one village – potential for scaling up	Farmers with help of NGOs	Hydrology: some info Institutions: early in process	High for buyers and sellers	Experience and ongoing work
Brantas River	Large-scale governance, management coordination	Payment mechanism already exists but could be improved	Via Forest Services (livelihood challenge)	Hydrology: some info Institutions: PJT1 river authority	High for buyers Sellers not yet involved directly	New challenges
Cidanau River	Mechanism for shared management among different agencies	KTI is willing to pay – has local monopoly	Sellers not clear: both farmers and protected area	Hydrology: some info Institutions: early in process	High for buyers Sellers not yet involved directly	Experience and new stakeholder forum

The third stage of site selection was to choose one site for a more detailed diagnostic. The three sites were compared in terms of multiple criteria to express their potential for developing market-based payment mechanisms for watershed protection and the practicality of action-learning in each site (Table 1). It was agreed that most useful would be to continue work at all three sites, because of the different lessons offered by each. The favored way forward was to carry out action-learning at Segara and Cidanau, and to liaise with the river authority and other bodies at Brantas, a much larger river basin, to exchange lessons on integrated watershed management and finance. Limited project funding meant, however, that primary data for a diagnostic could be collected in one site only. Segara River was chosen, with the intention of bringing Cidanau into the action learning cycle at a later stage.

b. Lombok Island

Lombok island is located east of Bali island. Together with Sumbawa, Lombok makes up the province of West Nusa Tenggara (known in Indonesia as Nusa Tenggara Barat,

or NTB). Lombok has total population of 2,6 million with population density of 603 people per sq.km. The total area of Lombok island is 4,738 km² in which the total area of paddy land is about 120,000 hectares (1,200 km²). To irrigate this vast area of paddy land, 2 dams, 114 weirs, and 2,154 small dams have been constructed, and in the island also exist 113 springs, which mainly used for domestic water purposes.

Figure 1: Map of Indonesia, showing West Nusa Tenggara Province

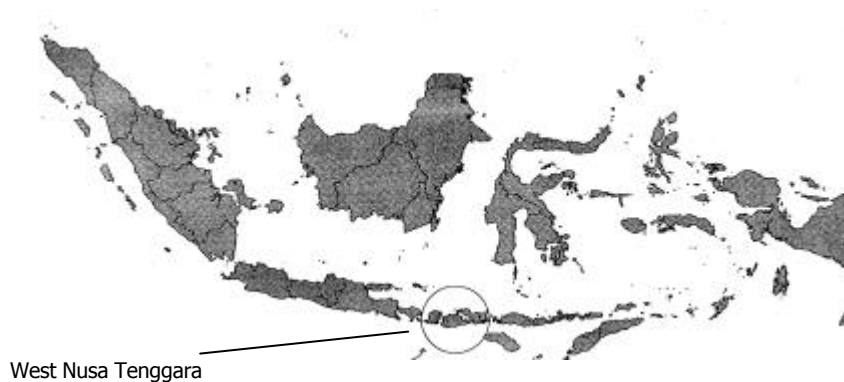
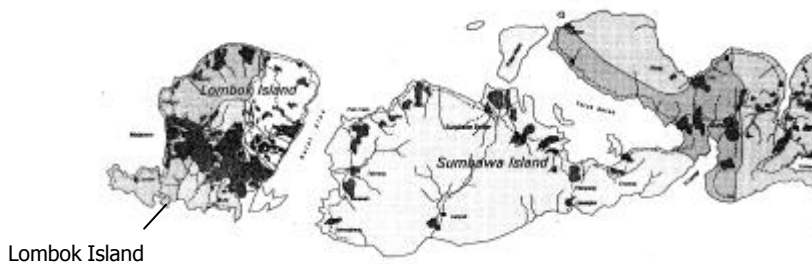


Figure 2: West Nusa Tenggara Province



In general the island can be divided into three parts stretching from west to east, the north mountainous region, the lowland in the middle part of the island and the hilly area in the south. The mountain of Rinjani (+3.775 m) is situated in the northern part of Lombok island. The mountain is surrounded by preserved tropical forest and is considered an important conservation area in Indonesia, protected by a national park.

b. Hydrology¹

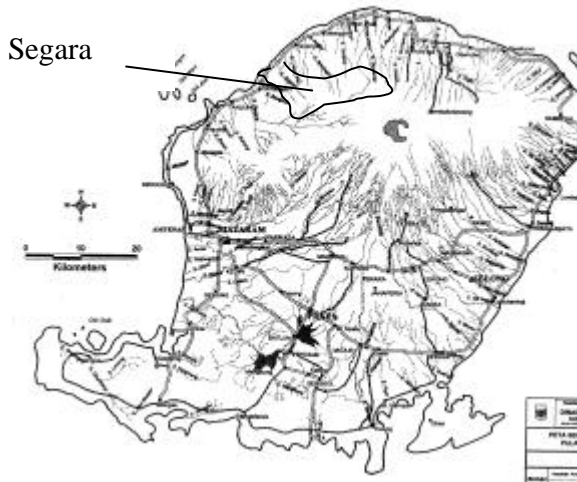
Segara River Basin is located in West Lombok District and has a tropical climate. The temperature ranges between 22 and 31 degrees centigrade. The area of this basin is about 132 square kilometer². The basin rises up to 444 meters above mean sea level (msl) in Solelos, to 500 m above msl in Batu Jangkar, and finally to 1420 m above msl at

¹ Hydrogeological map of Lombok and Western part of Sumbawa Island. 2000. Regional Office of ESDM Department, West Nusa Tenggara Province and Geological Map of Lombok, Nusa Tenggara part 1807. 1994. Center of Research and Development for Geology. Ditgen of GSM.

² Beture Setame, PT Nakarya Sembada and PT Cipta Sanita Mandiri, 1992. Lombok Water Supply Project.

the base of Buanmangge Hill, a foothill of Rinjani mountain (+3775 m). Average monthly rainfall varies from 14.8 mm to 327 mm. Annual rainfall is between 2000 mm in sub district of Tanjung, located in the western part of the catchment and 3800 mm on Buanmangge Hill³. The relative humidity varies from 74 to 91 percent, sun shines varies from 35 to 67 percent, and average wind velocity is 25 knots.

Figure 3: Location of the Segara Basin on Lombok Island



In recent decades, water quality has become an important issue as industrial development has taken place in several areas in the country. Although heavy industry does not exist in Lombok Island, pollution is coming from mining and domestic waste from other Indonesian islands. In the northern part of Lombok, results from water quality tests in 1999 indicated that several parameters has reached above acceptable standards. For example, the rate of ferum was double, natrium 200 times, and total coli almost 8000 times higher than the standard value (more details can be obtained from the Hydrology Unit of West Nusa Tenggara Province).

Lithological composition of the downstream part of the basin, along the coast and up to +100 msl, is sedimentary rock such as alluvium, gravel, fine gravel, sand, clay, peat and coral split. There is an aquifer layer, which has a medium to high transmission capacity and medium productivity. The ground water level is shallow with discharge varying from 5 to 10 liters per second. A layer of brackish water sits above the fresh water layer. Lithological composition in the middle part of the river basin area, from +100 to 500 m above msl, is a Kalibabak volcano rock formation, which comprises breccia and lava. Also found are pockets of Lekopiko volcanic rock, which comprises tuff, breccia and lava. Aquifers in this area are locally productive with high, though various, transmission capacities. The ground water level tends to be very deep and there are small discharges of spring water.

Lithological composition in the upstream basin area, at elevations of 500 to 2895 m above msl, is uninterrupted volcano rock, which comprises lava, breccia and tuff. Small aquifers in this area are locally productive with transmission capacity varying from very low to medium. Shallow ground water can be found in weathered zones of massive stone.

³ Isohyet Map Lombok RBU, 1999, Hydrological Unit, Water Resources Agency Province NTB

c. Demography

The population of West Lombok District in 2000 was 718,600, an increase of 134,693 since 1990 (at an annual rate of increase of 2.05%). The population density in West Lombok District is 430 people/km². The Segara River crosses two sub-districts: Tanjung to the west and south and Gangga to the east. The total population of Gangga Sub-District is 68,268 people with a population growth of 2.48% annually. There are two important villages in Segara basin, namely Bentek and Gondang. The area of Bentek Village is 37.2 km² with the population of 7,052, while the area of Gondang Village is 29.2 km² with the population of 8,235. Most of the families in the Segara basin are low-to medium-income farmers.

d. Forest land use

Forested areas in Bentek Village cover 1,370 ha, comprising 300 ha of protected forest and 1,070 ha of production forest, as well as smaller community plantations areas. A reforestation program for the watershed area is covered in a "multi-village annual activity plan" and accommodated in the budget of West Lombok District. For example, the reforestation program for community forest in Solelos Village (a sub-village of Bentek) costs about 5 million rupiah, financed ultimately by governmental Forestry Agency aid. Due to the vast area of "critical land" (susceptible to erosion) in the upstream part of the Segara basin, conservation measures for land and water are considered very important in order to maintain, or to restore, the upper catchment as a recharge area.

e. Primary water uses

i. Irrigation

Technically, the irrigation area in Bentek is 52 ha and in Gondang 289 ha. To water rice further downstream, an irrigation weir in Pekatan Village was built to irrigate 821 ha of paddy land area, with an expected cropping intensity of 198 %, via an east canal to irrigate 332 hectares of paddy land, and a west canal to irrigate 489 hectares of paddy land. At Lekok Village, still further downstream, another weir was built to irrigate 120 hectares of paddy land. The first dry season crop area is about 670 hectares and decreases to only 148 hectares in the second dry seasons.

The discharge of Segara River at Pekatan Weir has been recorded as 1.2 m³/second to 49.2 m³/second. According to Betame (1992), Segara River is able to divert water at more than 1 m³/second for as long as 10 months annually. The report also mentions that water diverted to the Pekatan Irrigation Area is discharged 1.2 m³/second to 3.75 m³/seconds.

ii. Drinking water / domestic uses⁴

Several springs found in Segara River Basin have been exploited for drinking water (see maps in Section 5):

- Belimbing spring at Pandan Mas forest area, used by Baru Village
- Setambing spring serves Bangket Village

⁴ Sub-District Tanjung Regional Drinking Water Company and field investigation

- Mejet spring, near the Setambung spring, for local use
- Sekuluh spring serves Loanglindung and Solelos Villages
- Erat Sedi spring, upstream in the former logging area
- Sebung Rawi spring, even further upstream
- Jong Plangka spring in Solelos Village, with a discharge of 70 to 100 liters per second, which is the most important of the springs at a broader scale

Jong Planka spring is used by Tanjung Regional Drinking Water Company (PDAM⁵ Tanjung), which has installed distribution pipes with an intake capacity of 45 liters per second. There are two intake pipes of 20 and 15 cm diameter for the PDAM Tanjung line and the Dasanbaro Village line respectively. The community of Dasanbaro has built two reservoir tanks using financial aid from P3KT (Provincial Public Works Department) and PDAM Tanjung. They have connected pipes of 10 cm diameter from three public tanks to 120 households. PDAM Tanjung provides piped water to the communities of Bentek, Gondang, Tanjung, Gangga and Sokong Villages. PDAM contributes an annual fee of 2 million rupiah (in 2001) to Bentek Village for the maintenance cost of the pipes. PDAM also provides land compensation of about 500 thousand rupiah per ha, for a 20-year concession, and has agreed to cover the land tax owed by affected farmers for 30 years.

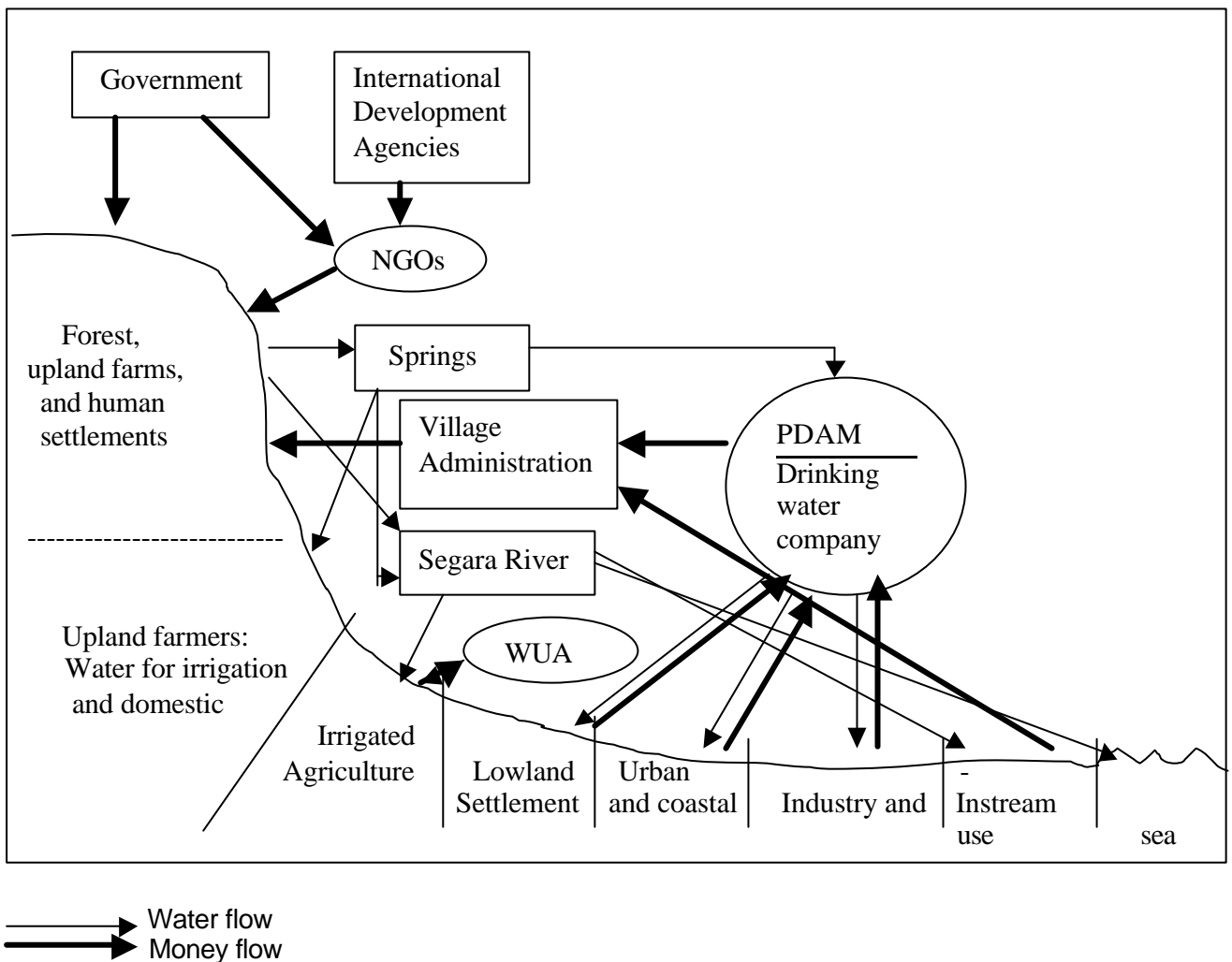
f. Financing watershed protection

Watershed protection is largely regarded as cost-centered in development. This understanding influences how the stakeholders behave towards watershed resources. In general they tend to exploit the resource for revenue gain. Recently, watershed degradation in many river basin areas is beginning to be perceived as critical problem, mainly by downstream communities because of, for instance, soil erosion, flooding and unstable water supplies.

The most important agencies involved in watershed management are government departments engaged in forestry and forest-related programs agencies at both national and regional levels. The government implements programs either by itself, or in cooperation with other parties, such as international development agencies. Unfortunately, none of the programs adopted to date have made use of links between land managers in the higher watershed areas and downstream water users (Figure 4).

⁵ PDAM stands for **P**erusahaan **D**aerah **A**ir **M**inum. PDAMs exist in most districts of Indonesia, functioning as semi-autonomous state-owned enterprises.

Figure 4: Simplified diagram of the water cycle



Although formal governmental programs have not made the best of links between upstream land managers and downstream water users, several financial arrangements for water and related environmental services have sprung up independently in the Segara basin (Table 2). Several of these can be regarded as investments of basic social capital to promote sustainable use of water in the area. Important downstream buyers of watershed protection services are the regional drinking water company PDAM and a tourist rafting company, Lombok Inter Rafting. In the future, these and other water consumers such as hotels, light industry and domestic users could be encouraged to provide financial contributions to watershed protection. They are the “potential buyers” of watershed services. However, considerable development of workable mechanisms for charging, transfer and investment of such funds will be needed.

Table 2: Existing water service payments in Segara basin

Name of payment	Details / Amount paid	Used for	Contributed to	Contributed by
Sawinih	Sawinih: Rp 7,500 per 0,5 ha paid once a year at the second rice crop	Operational budget of Water Users' Association (WUA) and infrastructure improvement	Pelopon WUA, Gondang Village, Gangga Sub-District	Farmers with irrigated land
Sawinih, Irrigation Service Fee (ISF) and Operational fee	ISF: Rp 15,000/ha/year Sawinih: Rp 5,000 /cropping season Operational fee for head of tertiary irrigation block: Rp 5,000/ha	Rehabilitation of irrigation system Sawinih is for WUA operation Operational fee is collected when water is scarce	Sumber Rejeki WUA	Farmers with irrigated land
Contribution to village development	Bentek and Jenggala Villages: Rp 600,000 per village/year	Meeting of Majelis Kerama Adat (customary council)	Majlis Kerama Adat	Lombok Inter Rafting Company
Social fund	Ad hoc payments depending on existing social activities	Tree-planting and other social or environmental activities	Upstream community groups	Lombok Inter Rafting Company
Contribution to village development	Rp 2,000,000 (2001), Rp 5,000,000 (2002).	Salary of Lang-lang Jagad (forest guards) and local work on reviving and codifying traditional rules on environmental protection	Upstream community groups	Drinking water company (PDAM)
Land tax	Variable annual cost – PDAM has contracted to pay for 30 years	Payment of land tax on behalf of individual land-owners affected by route of water pipes	Local government	Drinking water company (PDAM)
Ngaji-Lawat	Voluntary payments to cover costs of buffalo sacrifice, other food etc	Celebration of Berangkat religious ceremony, which links forest protection to lessons of the <i>ngaji</i> (Holy Qur'an)	Upstream community groups	Downstream residents
Sedekah Gumi Paer	Voluntary payments to cover costs of food etc	Annual religious / environmental ceremony at Bebekeq Grave	Organizers of ceremony	Other Bentek residents

5. Local perspectives on watershed management

This section describes how local stakeholders deal with watershed issues in their area. The views stated by local people are drawn from two participatory rural appraisal (PRA) exercises, supplemented by views of local government officials expressed during a regional workshop.

a. Aim and approach

The overall aim of the PRA exercises, conducted upstream and downstream, was to explore potentials and problems related to the relations of water users in the downstream area and the upstream communities in maintaining the function of watershed. Specific objectives of this activity were to:

- Understand management and utilization of the Segara watershed by the upstream community, mainly in terms of conservation efforts, economic and socio-institutional aspects of the community.
- Understand water management by communities in downstream areas, including use and capacity of water, and payment systems (including ability to pay).
- Identify issues in water management faced simultaneously by upstream and downstream communities in terms of conservation, distribution, and problems.

Methods used in this appraisal were qualitative, with decisions made jointly with the communities in determining information required, techniques and sources. As a general reference, the following concept was prepared beforehand.

i. Kinds of information

A checklist of wanted data was compiled and classified prior to the PRA exercises:

Group	Data checklist
Upstream	<ol style="list-style-type: none">1. Pollution and livelihoods2. Condition of vegetation3. Land use and ownership4. Water uses5. Initiatives for conservation6. Sedimentation and erosion
Downstream	<ol style="list-style-type: none">1. Water uses2. Condition and capacity of water utilization3. Mechanism of water distribution among water users4. Population and livelihoods5. Ability and readiness of the community to pay6. Initiatives of the community in water management
Relation of downstream and upstream	<ol style="list-style-type: none">1. Type and amount of existing compensation for water conservation and economic improvement2. Relations of upstream and downstream communities in water management3. Regulation, monitoring, and mechanism of existing conflict resolution

ii. Techniques of data collection

Specific techniques included:

- a) Mapping, to explore data such as physical environment and social variables
- b) Trend and change diagrams, to explore changes and progress of the issues concerned
- c) Venn diagrams, to explore data concerning the relationships among stakeholders

iii. Participants

Preparation for the meeting included consultations and prior discussions with community members, local NGOs and local government. Community representatives, village officials and other stakeholders were invited to the PRA events as follows:

Type of participants	Components	Number of participants
Community	1. Water Users' Association	4 person
	2. Majelis Kerama Adat (Customary Council)	4 person
	3. Traditional community	3 person
	4. Community groups for forest management	1 person
	5. Women's group	2 person
Government and private agencies	1. PDAM	1 person
	2. Water resources observer	1 person
	3. Village administration	1 person
	4. Rafting company	1 person
Non-governmental organizations	1. KONSEPSI	1 person
	2. YLKMD	1 person
Total number of participants		20 people

b. Water resources

Compared with 1997, water flow in the Segara River had decreased, mainly during the long drought of 2002. At least there are three springs in the forest area with good condition. The biggest one is Jong Planka spring (also known as Selolos spring, after the village where it is found) with a production of 70-100 liters/second. It is utilized by PDAM.

Participants felt that in spite of forest degradation (see below), the quality of water flowing from the Segara watershed is good. Only in 2000 and 2002 was the quality bad, due to soil erosion caused by landslides and flooding from the catchment area. Huge erosion occurred in 1999 and the deposition destroyed gardens and rice fields over an area of 125 hectares downstream. In addition, water pipes were badly damaged.

Benefits of water resources in the upper reaches area are domestic use, irrigation, drinking water and rafting. Since 2000 the amount of water available for domestic use

has tended to decrease, and the better springs are too far from home. The water-piped system installed by PDAM has been unable to deliver services to some hamlets in downstream areas, in the dry season in particular.

To some downstream communities, the massive soil deposition in 1999 that destroyed water supply infrastructures has resulted in difficulties they find difficult to shoulder. Among other problems, the flow in the two irrigation canals diminished and has not yet recovered. Hence the controls and limits over irrigation that are in place today. Decreasing flows of water, and diversified use-demand, require a new and widely legitimate policy for equitable water allocation and distribution.

Since 1998 the Segara River has also provided opportunity for rafting activity, which is handled by a company (Lombok Inter Rafting) based in Senggigi Tourism Center. The tourism market is still new and small. Users of this service are only about 50-75 people per month for the six months of the year when flows are high enough (November to April). As a result, no significant impacts on community economic advancement or environmental function are yet discernible.

c. Forest resources

As a part of the larger Moyosari watershed, the Segara area has a significant position for regional development in West Lombok, particularly in supporting agricultural practices. Moyosari includes the national park of Rinjani and the Monggal production forest. Prior to 1997, the upper Segara watershed was well-wooded. The community of Bentek maintained the area as a reserve without large-scale timber exploitation. Extraction from the forest area was strictly controlled under collective regulation, known in Indonesia as *adat*.

Unfortunately, the Mayosari area suddenly changed drastically after issue of a forest extraction permit to a private company, PT Angkawijaya, timber extraction from the Monggal production forest. An estimated 4,000 ha was clear-felled in 1997. Local communities initiated illegal logging as a protest and worsened this degradation. Poverty and limited access to economic activities triggered the local communities to behave differently than before. Hence, huge soil erosion was unavoidable.

The post-Suharto reformation era encouraged communities all over Indonesia to rise up in defense of their own rights and values, and in Segara to protest against the operations of PT Angkawijaya by burning its base camp. Pressures were also directed to the government via the Commission for Regional Forestry Reform to withdraw the permit from the company. Similar pressure came from the regional legislative body.

In 2000 the logging operation was closed, although the permit has not yet been withdrawn from the company concerned. Since then there has been opportunity for communities to get benefits from the ex-logging area by employing agroforestry techniques. Local non-government organizations continue to facilitate communities in Bentek Village in a community forestry program. These efforts have already brought significant impacts to rehabilitation of the degraded forest, but legal recognition from the government for the communities remains in question. Accordingly, conflict in land acquisition between local community and newcomers is unavoidable. This conflict stimulates decreasing cover of the forest.

d. Land resources

Rates of out-migration are relatively low in the upper watershed area. Hence Bentek, with 2,000 households (12,000 persons) is fairly densely populated. Land resources are limited by steep slopes and the large area of state forest land. This situation will, of course, come to seriously threaten the sustainability of rural livelihoods, particularly for those living at higher altitudes.

The families of the Bentek area mostly depend for their livelihoods on agriculture, which comprises 56% irrigated agriculture and 43% garden by area. Since average land ownership is only 0.3 ha, farmers have difficulty generating sufficient income from farming. The average income in Bentek Village is approximately Rp 254,000 /person/year. Opportunities to earn more income from non-farming activities such as trading, industry, services and government employment are limited. These circumstances drive farmers to open forestland for plantations of cash crops, a realistic course of action given that particular capital and skill are not required. Moreover, the high price of cacao, coconut, and coffee during Indonesia's economic crisis has encouraged the development of plantations on forestland. Households in the Bentek area have occupied 1 to 2 ha on average, and even 4 ha in some cases.

Upland farmers in Bentek were unable to avoid a serious attack of plant diseases that appeared in 2001 and have since been burdened with economic deterioration. Inappropriate use of technology in land management has resulted in soil erosion and low production. Compared to 1997, terracing for land conservation is less than optimal as farmers in the area are not able to muster skills and technologies previously available. Rights and access to forest and land resources are set to become an arena of more serious conflict among community members and/or between community and government.

e. Customary law (*Pranata adat*)

The northern part of Lombok, including Bentek Village, is known as an area that strictly holds to traditional systems of natural resource management, in keeping with a culture that is more traditional than modern Islamic in style. In Bayan Village for instance, there is a certain community who keep *Islam Waktu Telu*, meaning that they pray only 3 times a day, not 5 times as in conventional Islam.

These communities have long practiced community-based forest management governed by customary laws. Forest is common property. All community members are obliged to conserve forest. One of reasons is to protect water sources in the forest area, to maintain supplies of water for drinking, other domestic uses and irrigation. Logging is only admissible for building of public facilities, such as a mosque, school or community buildings.

Community tradition in Bentek shows their strengths in protecting forest. The community holds regular ritual celebrations through *Sedekah Gumi Paer*. This activity stems from both customary law and religion, which aims to protect community members from natural disasters and diseases. Both the Muslim and Hindu communities of Bentek participate in this occasion. There are two agendas: (1) to think of the sovereignty of the northern part of Lombok (no colonization e.g. by Dutch, Balinese or Javanese, has ever happened)

and (2) to meditate on appreciation and protection of the forest area that is so beneficial to the community's well-being.

As encouraged by Indonesia's far-reaching decentralization policy, Bentek Village has adopted its own long-standing customary law as a basis for drafting local law on natural resources management, which is commonly called "*awiq-awiq*." The aim is a clear formulation of rights and responsibilities of the community in forest management. Regulations are intended to create equitable and sustainable forest extraction. In short, the communities of Bentek and Seelos are attempting to foster and formalize "environmental ethics."

f. Mapping of water resources

Upstream and downstream community groups were invited to draw maps of the water resources and other natural resources in their areas as a basis for discussion. The communities' maps (Figure 5) identified problems as follows:

- a. The ex-HPH (timber concession) land has become an area of conflict among communities concerned.
- b. Three thousand people have occupied 6,000 ha of land area, for which PT Angkawijaya still holds the permit.
- c. The Mejet spring in the same area is also under conflicting claims with no management solution in sight.
- d. There are in total seven springs in the Segara watershed, of which Jong Plangka is utilized as source of water for PDAM.
- e. The small village community at Batu Ringgit manages Sebulu Bawi Spring.
- f. Downstream villages getting benefits from irrigation are as follows:

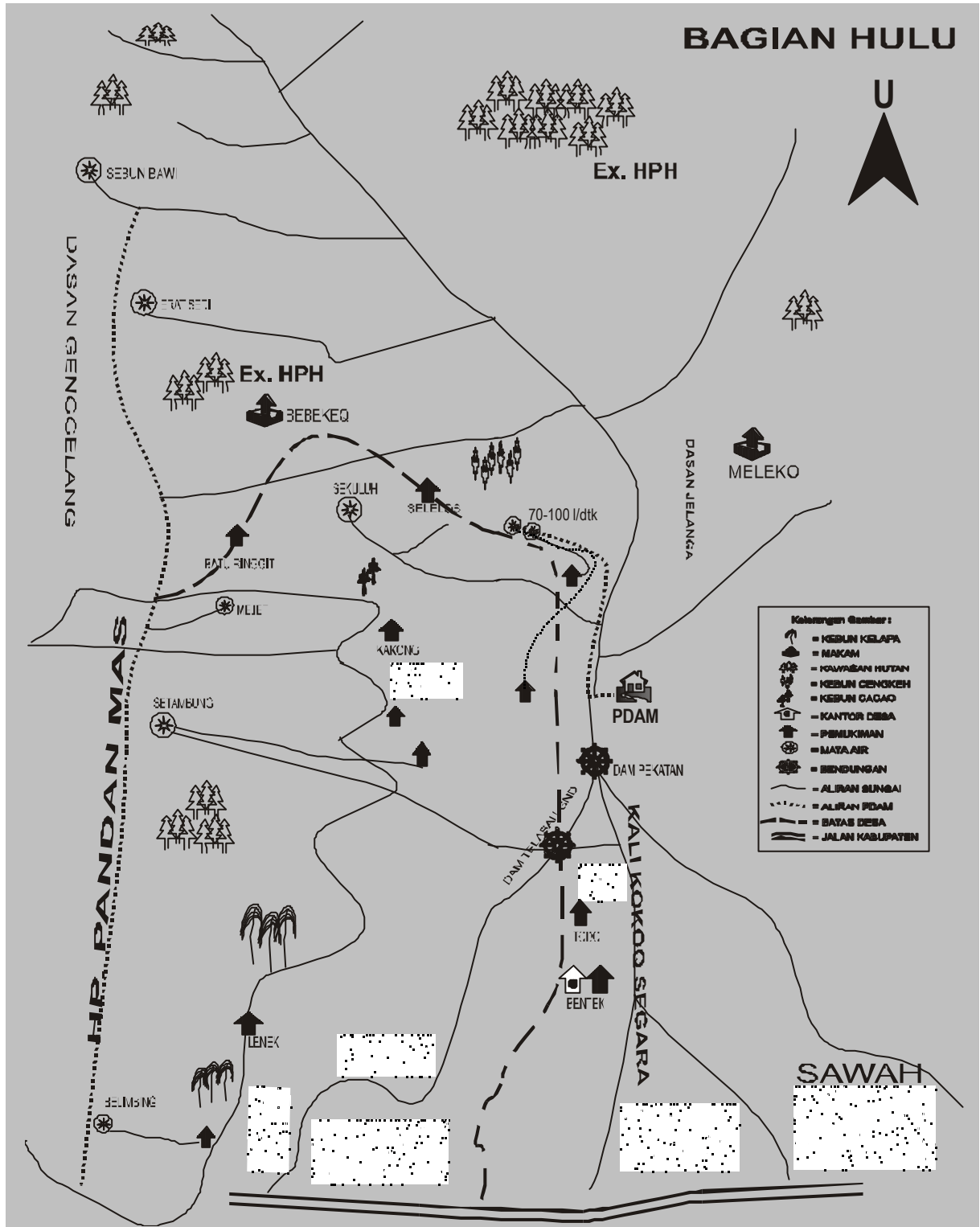
No.	Name of village	Number of hamlet	Area of rice-field	Number of pop.
1	Jenggala	6	271 ha	565 people
2	Tanjung	7	281 ha	-
3	Gondan	-	280 ha	-
4	Bentek		52 ha	
	Total irrigated area		882 ha	

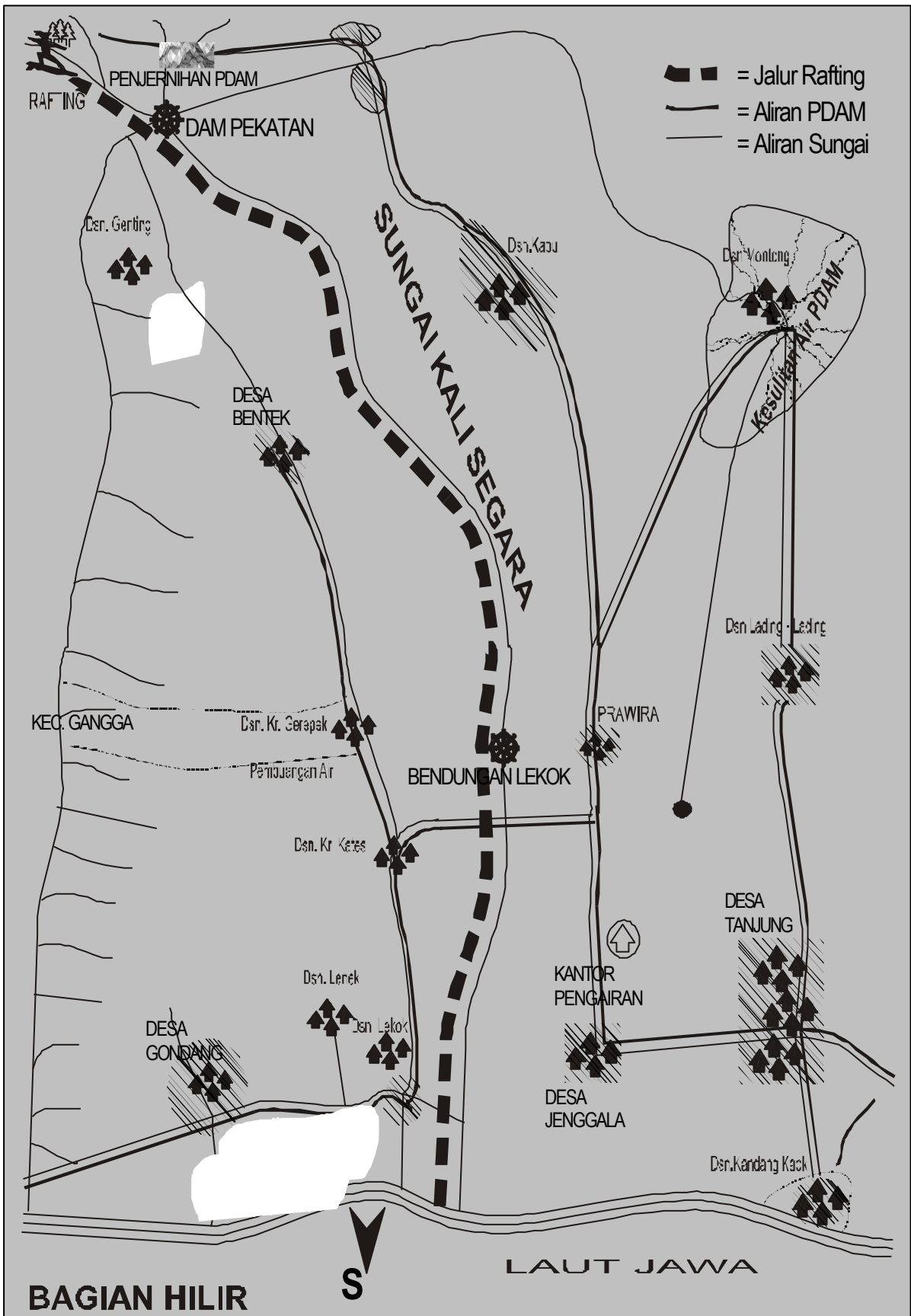
Of the total irrigated area, 120 ha belong to the local community (non-government irrigation). Jenggala village is composed of 7 hamlets with total population of 565 people. Using this figure, the total population benefiting from the river through irrigation is estimated at 2,260 people.

Translation of key to Figure 5 (overleaf):

Kebun kelapa	Coconut plantation	Aliran sungai	Route of the river
Makam	Grave	Aliran PDAM	Route of the PDAM pipe
Kawasan hutan	Forest land	Batas desa	Village boundary
Kebun cengkeh	Cassava plantation	Jalan kabupaten	District road
Kebun kakao	Cocoa plantation	Pemukiman	Settlement
Kantor desa	Office of the village head	Mata air	Spring
Bendungan	Weir		

Figure 5. Community maps of upstream (this page) and downstream (next page) areas of the Segara River basin

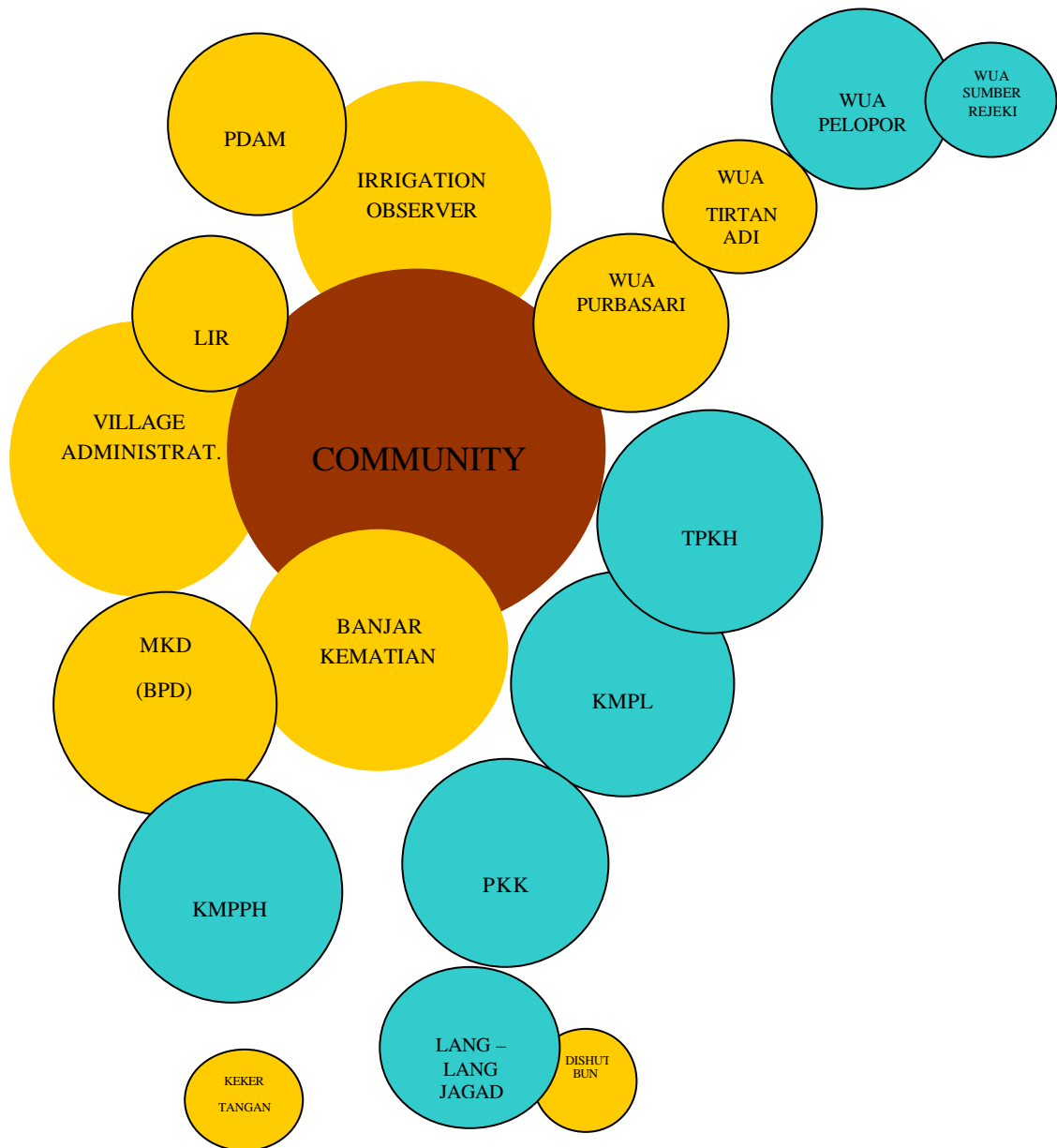




g. Institutions

A Venn diagram was used in Bentek Village to discuss the relations among various village and external organizations that influence village development in Bentek and neighboring villages (Figure 6). Among 19 institutions identified, 11 are able to respond to the public interest on issues such as water resource management. The four Water Users' Associations are especially important for intensively organizing farmers and delivering services through management of irrigation systems.

Figure 6: Diagram of institutional relations in the management of forest, river, garden, rice-field, and water resources in the Segara River basin



Key and notes to Venn diagram:

WUA	Water Users' Association (irrigation)
PDAM	Regional Drinking Water Company
LIR	Lombok Inter Rafting (tourist rafting company)
MKD (BPD)	Customary council
Banjar kematian	Community forest management group
KMPL	Community group for environmental management
PKK	Women's group
KMPPH	Community reforestation and forest management group
Keker tangan	Community group on tourism and environmental issues
Lang-lang jagad	Community forest guard
Dishutbun	Government Forestry Department

1. WUA Sumber Rejeki and WUA Pelopor are within one area
2. KMPPH, KMPL and Banjar have similar functions
3. MKAD drafts *awiq-awiq* (customary regulations), MKD issues *awiq-awiq*
4. Lang-lang jagad collaborates with KMPPH + KMPL in protecting forest
5. Irrigation observer (*Pengemet Pengairan*) is a government field officer

h. Changing conditions of natural resources

The "trend and change" technique was used to understand how the community perceives and values changes in the status of local natural resources during the last 5-6 years (Table 3). Some of the issues raised in discussion were:

- Water flow in the Segara River has decreased since 1997, mainly during period of 1999 to 2001. Villagers blame this on the upstream logging concession and the subsequent long drought.
- Water demand for agriculture increasingly arises due to extension of the irrigated area and decreasing fertility of the land. Therefore, since 1998 the demand for drinking water has been managed by PDAM.
- In 2002 forest cover rapidly decreased. As a result, villagers feel that the climate in the area has changed so that it is warmer than 5-6 years ago.
- Aside from PT Angkawijaya, the logging permit holder, destruction of forest cover has been stimulated by the increasing number of people who practice illegal logging. In 1997 only about 10 people were involved, but currently more than 100 people log the forest illegally. This figure does not include those who manage the forest for agroforestry activities.
- An increasing number of "forest pioneers" are clearing forest land for cultivation. This phenomenon is driven by the high population growth of about 2.5% per year, plus those who come in from other villages to use the forest around the Mejet spring.

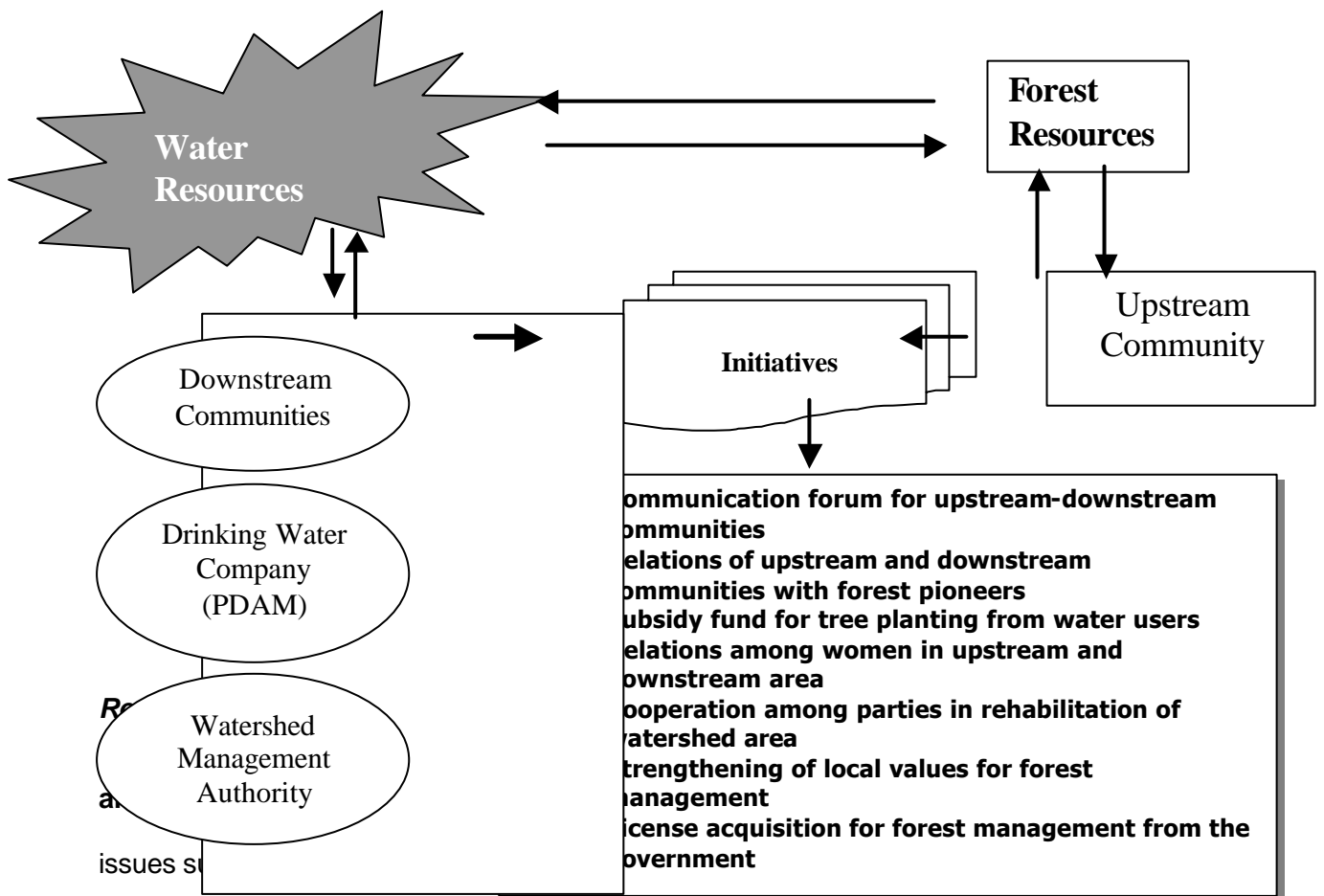
Table 3: Trends and changes in the Segara River basin, as identified by villagers

Parameter	Problems	Year						
		1997	1997	1998	1999	2000	2001	2002
Water Volume ☔☔☔☔☔	Supply fluctuates Dry season comes early Climate change Degradation of forest	••••••• •••••	••••••• •••••	••••••• •	••• ••	••••••• ••••	•••• ••••	••••••• ••••
Water Quality ◆ Rain Season ☔☔☔☔	Degradation of forest/erosion Low awareness among community about keeping the river clean	••••••• •••••	••••••• •••••	••••••• •	••• ••	•••• ••	•••• ••••	••••••• •
◆ Dry Season ○ ○ ○ ○		••••••• •••••	••••••• •••••	•••• ••••	•• ••	•••• ••	•••• ••	•••• ••••
Water Use ◆ Households 🏠🏠🏠	Dirty water Spring is far Conflict since water is not equitably distributed Sedimentation on canal and rice-fields Pipes broken by flooding and erosion Water volume is decreasing	••••••• •••••	••••~•••• ••••	••••~•••• ••	••••~•••• ••••	••••~•••• •	••••~•••• ••••	••••~•••• ••
◆ Irrigation/rice-fields 🌾🌾🌾		••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• •	••••~•••• ••	••••~•••• ••	••••~•••• ••••
◆ Drinking Water Company (PDAM) 🏢🏢🏢		••••~•••• •	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••
◆ Lombok Inter Rafting company 🚣🚣🚣				••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••	••••~•••• ••••
Condition of forest: vegetation and nature 🌲🌲🌲	Logging concession and illegal logging	••••~•••• ••••~••••	••••~••~•• ••••~••~••	••••~•••• ••••~••••	•••~••• •••~•••	•••~••• ••~••	••~•• ••~••	••~••
Condition of forest: conservation and reforestation 🌲🌲🌲	Competition for land acquisition in ex-logging area Illegal logging		••~••	••~•• ••	••~•• ••~••	••~•• ••~••	••~•• ••~••	••~••~••~•• ••~••~••~••
Soil Erosion 🏞️🏞️🏞️	Sedimentation				••••~•••• ••••~••••		••~•• ••	
Forest clearance in all West Lombok	Limited control of government Less employment opportunities	•	••	••~••	••~•• ••	••~•• ••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••
Land use for plantation	1982 began to plant cacao Fungal disease attacked trees	••~•• ••	••~•• ••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••
Technology and conservation	Terrace is unable to absorb soil Tree species for environment little known	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~••
Soil protection	Increasing agreement not to cultivate seasonal crops Tree planting for non-timber uses	••	••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~••~•• ••~••~••~••~••~••~••
Demography 👤👤👤	Increasing population (birth and migration)	••~••~••~••	••~••~••~•• ••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~•• ••~••~••~••~••~••	••~••~••~••~••~••~•• ••~••~••~••~••~••~••	••~••~••~••~••~••~••~•• ••~••~••~••~••~••~••~••	••~••~••~••~••~••~••~•• ••~••~••~••~••~••~••~••

Source of livelihoods	Dependent on nature Need more employment opportunities Working abroad main option	•••••	••• •••	••••• •••	••••• •••••	••••• •••••	••••• •••••	••••• •••••
Role of women's empowerment ♀ ♀ ♀	Emancipation/awareness rising Gender perspective better	•••••	••• •••	••••• •••	••••• •••••	••••• •••••	••••• •••••	••••• •••••
Culture	Weak understanding among community of tradition	•••••	•••••	••• •••	••••• •••••	••••• •••••	••••• •••••	••••• •••••
Security	Less law awareness Weak law enforcement Drinking and gambling	•••••	••• •••	•••••	••• •••	•••••	••• •••	••••• •••

i. Ways forward

At the end of the two-day PRA discussion, village participants came forward with ideas to be taken forward for addressing their problems and needs in the future. They summarised their ideas in the diagram presented below (Figure 7). This scheme describes proposed initiatives to be taken in the near future by synergizing stakeholders into a common program and shared implementation.



6. Regional workshop and learning group

The key objective of this workshop was to raise awareness of the management and financing in Segara River basin, and to assess / build up interest in a regional working group to spread the learning from this action-research more widely than the Segara basin. A total of 43 participants were invited, coming from local government (West Lombok, Central Lombok, East Lombok, and Mataram City), provincial government, non-governmental organizations, universities and local communities. Mr. Witardi of the local NGO Konsepsi acted as a chair and introduced the meeting. Mr. Munawir of PSDAL - LP3ES then presented results of the diagnostic.

Session I: Presentation of the Study Results

Some crucial points raised during the presentation were:

- *Services and protection of water catchment area* – value of services, condition of services, threats to services, relations between community and forest.
- *Supply of water* – focus on “who provides services?”. Some alternative appear: *Majlis Kerama Adat* or *Desa* (traditional institutions), *Kelompok Masyarakat Peduli Lingkungan* (community group for the environment), *Tim Pengelola Kawasan Hutan Ex. HPH* (forest management team for the ex-logging area), *Banjar Pengelola Hutan Mejet* (Mejet forest management institution).
- *Demand for water* – users of the water from Segara River comprises: six Water Users’ Associations (921 hectare), PDAM drinking water company, Lombok Inter Rafting Company, and local communities.
- *Relation of land manager and water user* – contribution of drinking water company for environmental protection, huge protests of communities to 1999 flooding (which were affected by timber extraction license holder), local community groups for forest/plantation management. Other parties involved in the management of watershed area are the village administration, Forest Services, and non-governmental organizations.
- *Opportunities* – the main opportunity for a continuing agenda is the rising awareness among local communities about the importance of protecting natural resources, reflected in existing community organization in managing the forest such as *KMPL*, *TPKH*, *Banjar Pengelola Hutan*. Better links between downstream beneficiaries and upstream managers can be built up. The financial contributions of the PDAM drinking water company and Lombok Inter Rafting are a start.
- *Threats* – these include the absence of a “water user pays” principle (especially for the protection of water sources) no existing rules or mechanisms to allocate revenue from water to watershed protection services, and existing conflict potential between parties: water users vs. upland cultivators, water users’ associations vs. drinking water company, downstream vs. upstream communities, Bentek vs. non-Bentek communities.

Session II: Plenary Discussion

The discussion in the plenary meeting focused on three subjects: a) potential mechanisms of cooperation between upstream and downstream parties in the management of the watershed / river basin, (b) preparedness, capability and payment mechanisms for conservation of water resources and (c) community development and

environmental conservation. Inputs and responses from participants in the workshop are outlined below:

1. Kamardi, head of Bentek Village
Clarified that contribution of PDAM to *Pemusungan* (the traditional village administration) is in terms of payment of land tax, three public water taps, compensation for land acquisition at a rate of Rp 15,000 per square meter, and a fee of Rp 3,000,000 per year to support village projects.
2. Putrawadi, community group leader (TPKH)
He explained that the traditional law that is being drafted covers villages other than Bentek surrounding the forest, but excludes the villages where the timber concession (HPH) took place.
3. A. Zaini, PDAM drinking water company
 - a. To date the program of conservation has been dominantly oriented to physical matters, with only little attention given to socio-cultural aspects of the community.
 - b. The primary driving factor of environmental degradation is human behavior. Use of pesticides for agricultural practices that affect sources of water will obviously threaten human health.
 - c. Political will of local government is absolutely required to regulate revenue from (ground) water tax, which in turn can be returned to efforts of environmental conservation.
 - d. The provincial government of West Nusa Tenggara has successfully produced a Provincial Regulation on Fresh Water.
4. Syahbudin Sadar, Agriculture and Livestock Services
 - a. There should be a clear framework for community participation in management of natural resources.
 - b. We need to promote the concept of “relatedness of multiple parties” in natural resources management. Various perspectives are required for efforts of natural resources conservation.
 - c. It would be useful to apply the outcomes of this study to other districts / areas.
 - d. Regulation is also needed, to govern natural resources management across villages.
5. Ismail, Public Works Services
 - a. For the purpose of natural resources management, support is needed in the form of spatial planning that accommodates local conditions.
 - b. Policy formulation should be coordinated, directed, gradual, environmentally sound and sustainable.
6. Saleh Saad, Agriculture and Livestock Service
 - a. In order to synergize upstream and downstream communities, an institution that is able to accommodate interests of suppliers and users is truly required. The intentions and aims of both parties need to be made explicit within this forum.
 - b. Community empowerment programs have had a significant role in environmental protection.
7. Badrul Munir, West Nusa Tenggara Provincial Development Planning Board

- a. In the formulation of spatial planning, a system of participatory regional planning should cover physical, social and institutional aspects. Weakness in this formulation will affect in the use of land and the watershed area.
 - b. Efforts for conservation should include value-added components, in terms of both the economy and social interaction.
 - c. Any “intervention approach” should be based on the problems, needs and potentials of the community.
 - d. An approach adopted in development planning should be based on an integrated concept of the watershed area, since this resource includes forest, water, coastal / marine and mining. An integrated approach is important to build social commitment.
8. Kafrawi, head of Water Users’ Association
In protecting the environment, communities need to establish a multi-party forum able to raise awareness and common responsibility.
 9. Zanuuddin, upland farmer
Upland farmers have already rehabilitated three sites in the watershed area. What are the efforts of water users (in downstream area) and the government in protecting natural resources?
 10. Kamardi, head of Bentek Village
 - a. Local Government Regulation No. 21 on Redistribution (tax) will threaten degradation of the forest since it tends to be exploitative and the revenue is not for conservation.
 - b. The Sub-District Government turned down a version of the village strategic plan that prioritized non-physical aspects, in a new development paradigm that emphasized human resource development.
 11. Ihsan, South Lombok Forest Service
 - a. Strategic planning formulated by an agency should be systematic, operational and synergic with other agencies.
 - b. West Nusa Tenggara is prone to limited water availability. Water conservation should be a primary priority. If this priority is not tackled at once, the impact will be degradation of community livelihoods.

Session III. Conclusions and consensus

The plenary discussion focused on three main ideas: institutional mechanisms for watershed management, watershed conservation, and financial incentives. The following recommendations were widely supported:

- *Institutional mechanisms*
The following components are needed: a community empowerment program, interaction among sectors and areas and establishment of a watershed forum. The forum should integrate local values in synergy with sectoral programs, and give a primary role to the local community.
- *Watershed conservation*

Conservation efforts should follow agreement among all parties concerned in land use. One useful option is to delineate zones of the river and water sources where use of water is strictly controlled.

- *Financial incentives* The Local Government regulation No.21 on Forest and Timber Redistribution that encourages tree-cutting and threatens preservation of the environment needs to be revised.
- *Suggested areas for future action research*
 - Development of a multi-party forum for integrated river basin management
 - Revitalization of local values for the preservation of the environment
 - License acquisition from government for local communities to manage the forest / plantation area
 - Community empowerment in natural resources management
 - Promotion and development of payment mechanisms for watershed protection services

7. Opportunities for improved watershed management

Some community groups in the area are still regarded as traditional since they have cohesive values that tie themselves to common beliefs and rituals. The festivals of *Sedekah Gumi Paer* at Bebekeq Grave and *Ngaji-lawat* at *Berangkak* Grave, both in the forest, are good examples of this. The fundamental belief is that their lives are strongly dependent on the forest. Natural disasters and diseases that hit community members are considered a reflection of troubles in the forest. Thus, they are powerfully committed to forest protection.

Pemusungan (the traditional village administration) has initiated revival of traditional values via a legal drafting for the whole community in Bentek. The legal drafting is taking place in regular meetings, which involve representatives of all the different groups in the community. The output of this legal drafting is *Kitab Awiq-Awiq Adat* (KAHAT), which is formally legalized by *Pemusungan* to bind all Bentek community members. However, this is ineffective since its coverage is on limited number of villages. Over a larger area, efforts to adopt traditional values in forest protection will need to be encouraged by forester groups to cover the northern part of West Lombok, which includes Pemenang, Tanjung, Gangga, Kayangan and Bayan.

A variety of community groups have arisen in the Bentek area, indicating the level of local initiative. The KMPL (Community Group for Environment Preservation), for instance, was established as a response to the shifting cultivation employed by their parents. Before 1973, the usual practice was to rotate cultivated land and post-fire forest. As an alternative to these shifting farming practices, KMPL chose Pandan Mas with area of 650 ha as their newly-established farming area. In 1994 community members planted commercial trees (e.g. fruits, cacao, coffee, *kemiri*) and bamboo as a material for women's handicrafts. This group is also committed to protecting the three springs that exist within the area, for instance through tree planting around the springs. Other commitments are articulated in *awiq-awiq* (regulations), which are made voluntarily. Some of these *awiq-awiq* are:

- Forest is to be maintained as forest
- The land is not subject to gentrification or buying-selling
- Extension of cultivated land is not allowed
- Seasonal crops is not allowed (in soil erosion effect)
- Fire cannot be used, and must be controlled
- Community members with > 2 ha of cropland are not included in the scheme

With funding from AusAID, another local community group called *Tim Pengelola Kawasan Hutan* (TPKH) will play a role as a facilitator in the management of the ex-forest business license area. Communications with government will be made, including getting a license for management of the ex-forest business area. A variety of community members have marked and plotted land claims of various size. TPKH has mapped the area and the number of community members who have already come in. Of 2,400 ha of the ex-logging area, 400 ha will be devoted to community forest management. Trees planted already are for environmental protection and income generation, such as *durian*, *kemiri*, *nangka*, *nao*, bamboo, cacao and coffee.

Forest community groups are also collaborating with the Forest Service Office of the provincial government. The government promotes forest conservation program with a fund of Rp 20 million: Rp 15 million for conservation and the rest for operational costs. Five community groups in different areas are involved in leading the program by planting trees of *beringin*, *arak*, bamboo and *koak*. This effort is directly invested in conserving tributaries and springs at Tapang Bentot, Lokok Sisik, Sebun Bawi, Sekuluh and Mejet in the Segara basin. The community supplements this work with self-financed conservation efforts as well.

In Indonesia, water fees, such as the irrigation service fee, and water taxes are normal. But a fee specifically allocated to watershed or environmental protection is uncommon. This is why the experience at Segara watershed, where PDAM and Lombok Inter Rafting Company have given financial contributions to the traditional village administration for environmental protection is especially promising. The amounts given were voluntarily. This experience is a new thing for most of the participants at the workshop held in this study, and everyone is interested to see how it develops and whether it can be formalized – policies and mechanisms for such payments are not yet available.

8. Conclusions

There is increasing concern over several issues of water supply in different parts of Indonesia: floods, low dry season flows, upstream erosion, downstream sedimentation and poor water quality due to pollution from pesticides, industrial effluents or household waste. In the Segara basin, the main issues among residents downstream are shortages of water to both irrigated fields and piped domestic water in the dry season, as well as sedimentation that occurred following heavy rains onto the cleared area upstream beyond Bentek, where a large-scale timber concession had operated for a few years (Table 4). Meanwhile two commercial stakeholders, the PDAM water company and the Lombok Inter Rafting Company are sufficiently concerned with management of the Segara watershed to have entered into agreements with upstream residents in Bentek. Among the communities of Bentek and surrounding villages, the key issues are land-use decisions, which can affect water supplies downstream. Bentek residents seek

both to increase their revenues from farming, a preferred strategy being agroforestry plantations of perennial cash crops, and to strengthen community-based long-term proprietorship of forest land.

Table 4. Summary of main stakeholders in Segara basin

Stakeholders downstream	Main concerns
Irrigators, represented by Water Users' Associations	Supply of water to second crop in particular, charges payable to maintain service
Domestic users of piped water	Cost of water, and in some villages, supplies during the dry season
PDAM Regional Drinking Water Company	Water quality and hence low-risk maintenance of access to and condition of Jong Planka spring
Lombok Inter Rafting Company	Water flows, landscape beauty and good social relations along Segara River
Stakeholders upstream	Main concerns
Residents of Bentek	Secure access to land for farming, increased income from crops or other sources
Village institutions: Customary council Village administration Water Users' Association Community environmental groups	Strengthening of traditional rules over natural resource management Water supplies for irrigation Forest regeneration and management, in particular use of perennial tree crops
Government Forestry Department	Forest regeneration and control of access

Based on the information gathered in the inception phase and collated in this report, is it worthwhile to pursue a program of action research on pro-poor market-based mechanisms for watershed protection services in the Segara basin? The following paragraphs outline the key opportunities and constraints in this regard.

Key opportunities and reasons for going ahead with action research on pro-poor market-based mechanisms for watershed protection in Segara River basin:

- *Real concerns over water and land management:* Land use options upstream and the timing and quality of water supplies downstream are already of enough concern at Segara for several community-level institutions to establish and become well organized on these issues. Exchanges among these groups – discussion, goods and money – have arisen without outside encouragement. With the inception phase of this action research, there is now also a nascent learning group, ready to take forward the discussions held in the regional workshop into a more firmly grounded and long-term forum on water and watershed management.
- *Positive attitudes to environmental management:* A number of forest rehabilitation and management groups in the Bentek area (e.g. KMPPH, KMPL and Banjar) reflect the importance of natural resource management locally, and

people's commitment to a socially-based rather than individually-based mode of management. Strong local institutions also have external support and networks, for example the Mount Rinjani consortium of NGOs, universities and government that is working on integrated management of the Mount Rinjani National Park.

- *Enabling new policy environment:* National policy is changing in several sectors to provide a more supportive setting for locally based natural resource management and financing. Most fundamentally, the devolution of many decision-making and budget control functions from central government to district governments (*Otonomi Daerah*) since 2000 – one of the most ambitious decentralization exercises ever undertaken by any country – facilitates local solutions to natural resource management problems. In the water sector, the ongoing policy reform process has as its center the theme of integration in water management – integration among sectors and among stakeholders. In the forestry sector, central government is beginning to invest in its stated commitment to community-based forest management.
- *Manageable scale:* Both geographically and in terms of number of stakeholder groups involved, the Segara basin provides a manageable site for action research. There are also significant opportunities for scaling up from positive lessons – directly in neighboring river basins and districts, and through the national network of PDAM regional water companies.
- *Payment paradigm already accepted by larger stakeholders:* The concept of paying upstream land managers to carry out land management activities in return for environmental benefits downstream is already the basis of agreements between PDAM, the Lombok Inter Rafting Company and Bentek villagers. The acceptance of this paradigm is an essential precursor to experimenting with more explicit, proportional payments for watershed protection services.

Key constraints to going ahead with action research on pro-poor market-based mechanisms for watershed protection in Segara River basin:

- *Lack of hydrological evidence:* There is excellent general appreciation of the importance of watershed management among stakeholders in the Segara basin, but few data on the precise, quantitative links between upstream land use and downstream water supplies. This will stand in the way of developing a system in which payments can be scaled to services received. On the other hand, in Indonesia this does not, as it might in other countries, bring into question whether land management does in fact affect water supplies. Both “buyers” and “sellers” of watershed protection services in Indonesia may well be less convinced by information based on scientific studies than by other modes of knowledge.
- *Downstream water users have less money than upstream land managers:* One source of discontent in the Segara basin is that many of the downstream farmers, who are potential “buyers” of watershed services, have generally lower cash incomes than the upstream “sellers”. This is because of the differences in prices fetched by the rice grown downstream versus the luxury tree crops grown upstream. In fact, this makes for an interesting test of the concept of a “pro-poor” market-based mechanism for maintaining watershed protection services.

- *Uncertainty and resistance to change:* People tend to resist policy changes, especially where change is rooted in, and can aggravate, uncertainty. The Segara basin is no exception. Upstream landholdings tend to be very small (averaging 0.3 ha with more than half of people owning no land at all) and firm government backing to community management of forest lands has not yet materialized. Downstream there is obvious resistance to having to make greater payments, especially among irrigator farmers, and especially in a system not accountable enough to be sure that the funds really will be used to provide the intended service.

Certainly, the strongest point in favor of continued work in the Segara basin is the clear interest among many stakeholders in developing a more sustainable approach to water management. The participants in the action-learning process of this study felt strongly about how to improve management of the Segara River basin and it is worthwhile revisiting the priorities for action identified through the PRA and regional workshops. Parties at both field and government level raised suggestions as briefly described below.

- *Integrated approach to watershed management.* This approach is intended to get alternative, workable solutions to development models separately introduced by different agencies. Mechanisms should be promoted to guarantee involvement and coordination of agriculture, forestry, and water resources in the area. Links are needed not only among government agencies but also with and among watershed service suppliers, water users and third parties. A forum would be established as the basic mechanism, but the success of this depends largely on the political will of the government, especially at district level.
- *Funds for community empowerment.* Community empowerment both in terms of direct and indirect new development measures are key for improved livelihoods. Environmental awareness raising, transfer and improvement of know-how, and cultural and social capitalization are strategic inputs. Promotion and participation of local residents and community groups in the whole process of watershed management are absolutely required to consistently position villagers as the main development actors. One specific incentive for improved water management might be subsidized seedlings for tree species that both maintain perennial vegetation cover and provide cash crops.
- *Funding mechanisms for rehabilitation and management of the watershed area.* Funding of watershed conservation could be through direct payments from water users to watershed managers, or via more indirect schemes, such as additional charges on water bills (or waste water disposal in other areas). Policy formulation, or even legislation, is also required to encourage environmental solidarity amongst water users to share the costs and benefits of watershed protection. It seems infeasible for non-government stakeholders to draw up and manage a system of finance for water use and watershed protection entirely in the absence of government intervention. Lobbying of decisive actors in the legislative body and government is critical for policy change to be successful and locally adapted, responding directly to communities' felt needs and problems.

- *Licensing process for forest management.* Land tenure is an integral issue within improved forest management. Community members in Bentek hope that dialogue with government will lead to stronger legal backing for their use of forest land where the timber concession previously operated. The Forestry Department's community forest program is a feasible channel for getting such license. Besides legal backing from the government, social solidarity amongst different communities in the area is also a concern. Maintenance of forest cover might be one of prerequisites for license issuance. Thus, the license holder is obliged to guard the forest from illegal tree cutting.
- *Revitalization of local values for forest management.* Sustainable forest management has become a regional issue. Foresters in the region (northern part of West Lombok) have declared establishment of *Perekat Ombara*, which is a forum of traditional communities from five sub-districts. Since the region is recognized as being populated chiefly by traditional communities, their values are key to appropriate development. Social capitalization will increase through revitalization of local values in forest management. In the future, *Perekat Ombara* may be a more directly political force, encouraging separation of this region from West Lombok to become an independent district.

The key feature of the Segara case is that development of any new market-based or other payment system for watershed protection services will be primarily a tool for integrated river basin management, rather than an end in itself. To the people of the Segara basin, and perhaps in Indonesia more widely, what is critical is the need to bring stakeholders together to negotiate rights and responsibilities over water. Thus future work on financial mechanisms at the Segara basin or elsewhere would need to be closely linked to development of an appropriate forum for integrated watershed management.

Annex 1.

Result of Small Survey for Site Selection in Indonesia: Developing Markets for Watershed Protection Services and Improved Livelihoods

A. Case of Brantas River

Brantas is the second largest river on Java Island with length of 320 km² that crosses 15 districts/cities and basin area of 11,800 km². Its main stream largely flows around the mountain of Kelud and Anjasmoro. This river is joined by a left bank tributary, Lesti River with basin area of 625 km². Ngrowo river with basin area of 1,600 km² then joins the Brantas at lower site near Tulungagung City. It flows continue to the north until meets with a right bank tributary, Konto River with basin area of 687 km² and a left bank tributary, Widas (basin area of 1,538 km²) after passing Kediri City. At the downstream the Brantas turns to the east and branches of in Mojokerto City to Surabaya River and Porong River.

The Brantas River plays a significant role in supporting economic development not only in East Java but also for nationwide. A more holistic approach has come forward to the water resource development and management in the Brantas. A stated-owned company called Perusahaan Umum Jasa Tirta (PJT) was successfully established in 1990 with activity to facilitate operation and maintenance of the Brantas River basin and the management of the water resources.

Thirty nine tributaries supply water to the Brantas. Since the last 30 years more than 20 major structures basin have been constructed in the basin. On the upstream area we find some dams such as Sengguruh Dam, Sutami (Karangkates) Dam, Selorejo Dam, and Lahor Dam. Aside of structure construction, watershed protection of the basin is also concern of the PJT. Arbo Retrum is one of the examples.

Arbo Retum is a famous area. This area is known as one spring that flows to Brantas River. This area was acquired from local people. On the area of Arbo Retrum trees are planted by a variety of societal groups including expatriates of many countries. Scare trees also characterize uniqueness of the area. Arbo Retrum with 11 ha width is a symbol of multi-dimensional function of watershed area. Aside from protection of watershed area, Arbo Retrum also functions as a place for eco-tourism, education and research.

Perum Jasa Tirta I coordinates all uses of water from Brantas. However, license of water use is issued by Governor under technical recommendation of Perum Jasa Tirta I. Except for irrigation all users of water pay fee to Jasa Tirta. According to Mr. Edi Subagyo, Bureau Heed of Planning and Protection, money gained can only contribute about 30% of total budget. The rest budget is portion of Brantas River Basin Project through construction activity.

Water required for economic and/or social development

Brantas River Basin has strategic position in support of national development through water delivery for a variety of development sector. Use of the water is at least for hydropower electrical station, irrigation, industry and drinking water company. The following is brief description of such water uses.

1. Hydropower Electrical Station (HES)

Perum Jasa Tirta has 6 hydropower electrical stations, which are located in some dams such as in Sutami, Sengguruh, Lesti III, Genteng I and Kepanjen. All these stations produce 950 million kwh per year. The stations supply electric to Java and Bali through transmission lines.

2. Water for Irrigation

Most of available water (80%) in the Brantas Basin is currently allocated for irrigation. In the past irrigation depended on the natural runoff of rivers since there were no large dams in the basin. In order to respond such situation, irrigation management is implemented under three basin principles: rehabilitation of existing irrigation system, development of new area of rice fields (if possible), and guarantee of irrigation water through construction of multi-purpose dams.

The total area for irrigation is estimated at 345,000 hectare, including non-technical irrigation area. Of this area, 80,000 hectare benefits water delivery services from technical irrigation system. Non-technical irrigation system used to have simple water intakes that are often swept away in the floods. According to Mr. Edi Subagyo, Head of Planning and Controlling Bureau at Perum Jasa Tirta, water delivery services for irrigation support to 30 to 40% of national food stock. Until recently, all uses of water for irrigation are still free of charge.

3. Industrial Consumption of Water

Industry that utilizes water from Brantas River ranges 140 to 160 in number. They are located from upstream area such as Malang to Surabaya in downstream with total of 15 districts/cities). Annual consumption of water is about 140 million m³.

4. Drinking Water Company (PDAM)

Aside for hydropower, irrigation and industry, the water is also beneficial for human being instead of not all areas across the Brantas River utilize the water. At least 5 districts/cities (Malang, Mojokerto, Sidoarjo, Gresik and Surabaya) divert water from Brantas through their drinking water company (PDAM-Perusahaan Daerah Air Minum). Allocation of water for PDAM is 210 million m³ per year. Surabaya as the second biggest city of Indonesia annually consumes 200 million m³. To anticipate increasing demand particularly for drinking water, construction of Wonorejo dam was just completed.

Charge of water use

Charge of water is valid for all uses except for irrigation. Decision of tariff is not the authority of Perum Jasa Tirta. It is under the government through Governor Decree on Water Service Fee and water Tax. The tariff of water is varied depending on the sector.

So aside from tax collected by government, the users are also charged for service delivery. The fee is for Perum Jasa Tirta I. PLN (State Electrics Company) that has hydropower station on the dam is charged for Rp 15 per kwh. Charge for industrial use and PDAM is respectively Rp 56/M3 and Rp 35/M3. Since 1996 the charge for industry has not yet changed.

Interrelation between upstream and downstream constituents in terms of payment for watershed protection services

Action taken for watershed protection

Since 1997 Perum Jasa Tirta I took action for watershed protection. Because of its strategic location for watershed protection, Perum Jasa Tirta considered Malang as a prioritized area for action. In Malang at least we can find some dams such as Sutami, Sengguruh, Lesti III, and Lahor. And according to BRLKT (Soil Conservation and Land Rehabilitation Agency), critical land that exist in Malang is about 39.000 hectare. While budget of the government is limited. In this situation Jasa Tirta I is aware of watershed protection.

In doing protection of the watershed Jasa Tirta I cooperate with Malang Forestry Services Office. After being committed for cooperation, the office used to submit proposal to Research and Development Bureau of Jasa Tirta I. According to Mr. Hari Sungguh of Jasa Tirta I, since 1997 his company annually has allocated budget with range of 200 million to 350 million. This is understandable since the revenue is only 25% of the total budget. However, the willingness of Jasa Tirta I to contribute in the protection of watershed is to be appreciated.

Instead of the Forestry Services submits proposal for financial support, budget for watershed protection is also from itself. The budget allocation of the Forestry Services and of Jasa Tirta I is respectively for physical and social measures. Physical intervention adopted in the location is structures of soil erosion protection, rehabilitation of critical land, and terracing. While social activity includes partly social preparation, socialization of the program, and extension. Most of the area to be rehabilitated belongs to local community. Aspiration of the community and topography are considered for intervention, community forest and community garden as well.

In the implementation, Jasa Tirta I functions as controller and Forestry Services executes the program. In order to keep the program done, involvement of the community members and beneficiaries has existed. Good communication with village administration is truly required.

Aside of Forestry Services Foundation of Rural Development (*Yayasan Pengembangan Pedesaan*), an NGO based in Malang also has program on conserved farming system in catchments area. This NGO introduced model of Selani that means "suits with land and farmer." Area selected for this model adoption is in Mojorejo, sub district of Water, Blitar. Under the auspices of USAID this organization implemented the program from 1989 to 1990.

Stakeholder Forum for Watershed Protection

In September 2001 Governor of East Java Province has established Consultation and Coordinating Team for Rehabilitation of Forest and Landon the Brantas River Basin.

Membership of the team is composed of 11 agencies; among others are from Forestry, Food Security, Forest Company, Perum Jasa Tirta I, Non-Government Organization, University, and Soil Conservation and Land Rehabilitation. General role of this team is to foster concerned agencies at district/city level to protect and rehabilitate catchments area of Brantas.

This team encourages the districts/cities to allocate budget for rehabilitation of forest and land. Socialization of the team on its program was done in the concerned districts/cities. Following this activity, some districts/cities have issued Decision Letter for doing such efforts. For instance, they are Malang, Kediri, Pasuruan, Mojokerto, and Jombang. The team itself is searching for fund in order to make the program implemented.

Potential buyers and potential sellers of protection services

Examining information forwarded above, we can identify that Perum Jasa Tirta I is the most potential buyer. This is understandable since this company collects water delivery fee from all formal users. We can say that Jasa Tirta I is representative of all users in term of buyers.

Parties related to watershed area are varied. However, since protection of this area is mostly regarded as cost-centered, only little attention is paid. Those who are actively involved in watershed protection service is the Forestry Services. We consider this agency as potential sellers. Community members as its partners in protecting watershed needs for empowerment.

B. Case of Cidanau River

Cidanau River is located in Province of Banten that crosses two districts, Serang (upstream) and Cilegon City at the down stream. This location is about 175 km from Jakarta and two-hour drive through highway.

Cidanau River is a main stream of 13 tributaries where their sources of water run from three mountains of Karang, Kemuning and Kupak and continues until Sunday Bay. Volume record of the river's debit is 9, 97 m³/second in 1977 with maximum debit of 26, 44 m³/second and minimum 1, 76 m³/second. In some tributaries a variety of irrigation structures for water allocation to agricultural land. In the downstream one water pump station was constructed and under the management of Kratatau Tirta Industry (KTI). KTI deliveries water services to industries and drinking water company in Cilegon City.

The largest number of water use from Cidanau River is for Cilegon City. The water is utilized for industrial and domestic uses with total consumption 1,000 liter/second. Of the Cilegon demand for water is supplied by Cidanau River. KTI is authorized to manage distribution of the water.

General Condition of Catchments Area of Cidanau

Catchments area of Cidanau is composed of natural park "Rawa Danau" and buffer zone with total area of 22,260 ha. This area spreads out in two districts, Pandeglang and

Serang (38 villages of 6 sub-districts). Whereas the people who live in catchments area accounts for 133, 213 person (approximately 55% of them is productive age).

Location of the catchments area of the Cidanau River in the north is bordered by Mountain of Tukang Gede and Surean. While in the east is in border with Mountain of Pule and Karang, and in the west is bordered by Cilegon. Topography of the area is 39, 36% plain, 15, 16% slope, 19, 19% rather steep, 14, 63% steep, and 11, 66% very steep. Rainfall in the area is approximately 12, 50 mm per day with average temperature 23 o – 25 o C. While the soft humidity ranges from 31, 6% to 78, 6% with duration of the lowest sun shining in January and the highest in August.

A number of activities that exist in this area is: (1) aside from paddy cultivation on irrigated rice field, rain fed and swampy area. The community also cultivate second crops and vegetables; (2) plantation managed by PT Wabin Jaya Tama is 506,573 ha (since 1989), and the community plantation that coconuts, coffee and clove; (3) the community forest of *albazia* with direct selling to local industrial entrepreneur; (4) livestock, such as buffalo, cow, goat, and chicken; (5) home industry and private industry with respective production such as bricks, cakes, handicraft and mineral water. The last production is managed by PT Tunas Harapan and PT Lima Heksa Perkasa; and (6) industrial forest managed by PT Perhutani.

In general the land use on the catchments area of Cidanau is composed of thicket forest, swampy area (Rawa Danau), mixed garden, rubber plantation, rice field, rain fed land, industrial forest and human settlement.

Problems of Catchments Area at the Cidanau

First is erosion at the surface of soil, ravine, steeply sloping riverbank. Soil layer in the form of gravel, sand, soil runs through the flow of tributary that affect sediment on Cidanau River and Rawa Danau, which in turn results in narrowing and swallowing of both sources of water.

Second, enlarging use of land affects in degradation of the forest. Pressure of population and their dependence to farming system on such land is the cause. Since land conservation is not yet adopted in the farming activity, level of soil erosion is also high.

Stakeholders

Upstream stakeholder is those who live in the catchments area of Cidanau, Government of Serang, Serang Legislative Body, Agriculture Service (including forestry), Human Settlement and Regional Infrastructure Services, Drinking Water Company, non-government organization. While stakeholder in the downstream comprises PT Krakatau Tirta Industry, Government and Legislative Body of Cilegon, drinking water company, agriculture Services and water users.

Regulation and Policy

1. West Java Regulation No. 2/1996 on Management of Protected Area in West Java.
2. Serang District Regulation No. 2/1994 on Principle Model of Serang District Development that stated Rawa Danau as Natural Protection Area.
3. Decision Letter of Serang District Head No. 614/Kep.321-Huk/2000 on Field Technical Planning, and Land Rehabilitation and Soil Conservation (RTL-RLKT) on River Basin Area.

Activity of Catchments Protection

Agencies engaged in protection of the Cidanau catchments area are as follows:

Environment Section of the Serang District Secretariat: (1) facilitate meeting among those concerned with protection of Rawa Danau and catchments area of Cidanau as a whole; (2) formulate integrated program for protection of Rawa Danau. Until recently a Forum of Cidanau Catchments area has been established with membership of community, government, non-government organization and private sector.

Sub-Section of Conservation and Natural Resources (SSKSDA) Banten: (1) arranged the forest border lines; (2) transmigrates 274 households who illegally take benefits from the protected area; (3) In cooperation with PT Perhutani rehabilitated 200 ha of critical land; (4) formulate field technical planning and land rehabilitation and soil conservation on the Cidanau watershed; (5) rehabilitated Rawa Danau with area of 1,250 ha; and (6) extension to the community regarding natural resources conservation.

Ciliman-Ciujung Sub-Agency of Land Rehabilitation and Soil Conservation (Sub Balai RLKT): (1) Rehabilitation of natural protection area of Rawa Danau; (2) making of green belt at the border of the area; and (3) agroforestry.

PT Perhutani rehabilitated 724 ha through intercropping.

Krakatau Tirta Industry; (1) In cooperation with the community cleans of weeds and stream on the Cidanau River; (2) Routine monitoring of weeds and stream of the Cidanau River; (3) in cooperation with Biotrop Bogor conduct study of Rawa Danau preservation, (4) In cooperation with District Environment Office, Natural Resources Conservation Agency (BKSDA), PT. Indah Karya, BRLKT to conduct a variety of studies on catchments area of the Cidanau.

Local Non-Government Organization, "Rekonvasi Bumi": (1) community empowerment in the framework of protecting the Rawa Danau through sustainable development in Sub-District of Ciomas; (2) plant bamboo and fruit trees; (3) making documentation of natural protection area of Rawa Danau; (4) Socialization of Rawa Danau to various parties; and (5) facilitate establishment of Forum for Cidanau Stakeholder.

Forum of Stakeholders

For being aware of the Cidanau preservation, forum of stakeholder has been established. Member of this forum comprises government, legislative body, community,

non-government organization and private sector from the District of Serang, Pandeglang and Cilegon. In order to play role this forum is supported by some working groups: social economics, rehabilitation and conservation, law and regulation, financing, and evaluation.

Potential buyer

Potential buyer to the watershed protection services is PT Krakatau Tirta Industry (KTI). A part of the holding company of Cilegon Krakatau Industry Group, this company is authorized to manage water of Cidanau River and to delivery services to the whole industries in Cilegon and for domestic use in Serang and Cilegon as well. In order to do such work, KTI supplies 1,000 liter/second, and therefore it pays water tax to Government of Serang and Cilegon. In addition, KTI also conducts various works for rehabilitation of Cidanau River as outlined above.

C. Case of Segara River

Village of Bentek in Gangga Sub-District of West Lombok is located at watershed of Segara river basin. With area of about 1,197 km², Segara river basin has water potential of 1,413 Mcm or 1,180 Mcm/km². Of this potential it is estimated that 55% is utilized for domestic use and agriculture, including plantation. We can find in this basin Kokoq tributary with debit of 10,000 liter/second that annually reaches 315,360,000 m³. There also exist 18 tributaries of the Segara river basin with respective length of 12-20 km.

Position of the Segara River Basin is very strategic for the management of water resources in northern part of Lombok area. Aside of agricultural purposes, this basin is very potential to deliver drinking water services for western part of Lombok and a part of area of Mataram City as well as for tourism in northern of Lombok. Rinjani Natural Park where Segara Anak Lake exists, its half area is within the Segara river basin. Therefore almost 70% of the area is allocated for production forest and protected forest with very good condition of vegetation. Until 2000 PT Angkawijaya under HPH (license for forest exploitation) has exploited production forest in area of Monggol at the Segara river basin.

A very fertile area of Segara river basin has been subject of management by various parties including private sector and community. The end of contract PT Angkawijaya hold drives the local community (both individually and collectively) to initiate illegal logging. However, technology adopted is quite environmentally-sound since they integrate need for conservation and income-generating as well through customary system. As a result preservation function of the forest is still maintained. For instance, anybody who cuts trees without agreement of the community leader and does not follow customary regulation, penalty/sanction will be given by Lang-Lang (a name of community security organization that functions to take law action to problems of community/village security).

While utilization of water resources from Bentek Village is managed by Menang Drinking Water Company, Mataram. Operation capacity of this company is approximately 500 liter/second which intends to deliver water services to West Lombok and Mataram. By

directly diverting water from the spring, quality of water is classified as portable water. So the company plans to develop Bentek area as protected area.

Utilization of Segara River Basin

Extraction activity of natural resources from Segara area is relatively still limited comparing to Dodokan Basin. Unfortunately population pressure to the area is quite high as consequence of imbalance between population magnitude and land ownership. In effect intensive use of land for agriculture at the watershed area results in degradation of land as high soil erosion.

Other cause contributing to degradation of the Segara watershed is PT Angkawijaya that has exploited production forest of Monggol for 10 years. Often occurrence of flooding drives community of Bentek Village and its surrounding area in 2000 to protest this company by burning its working location. As a consequence in 2001 the company closed its operation from the area of Segara river basin.

Water resource available in the Segara river basin is utilized for various uses as follows:

Irrigation

The biggest use of water is for agriculture (both in upstream and downstream area) that reaches 184, 15 Mcm. Plantation and livestock also consume water of about 0, 52 Mcm. In order to optimize use of water, dam with capacity of 200 Mcm was constructed in Village of Monggol. Total area of irrigated agriculture is approximately 1,621 hectare.

Domestic Use

Water of the Segara river basin is also utilized for domestic use both traditionally managed by the community and Drinking Water Company as well. Total use of water amounts 18, 2 Mcm. Most of water allocation is to fulfill water demand of downstream communities such as in Sub-District of Tanjung and Mataram. Tourism industries of Senggih also utilize water from the Segara River.

Initiatives for watershed Protection and Improvement of Community's Economy

Since 2001 initiatives have arisen from community and stakeholder who utilize water from the Segara River. Initiatives taken for watershed protection and income generation of the community who live in the upstream area are as follows:

Plantation of one million trees

This activity is conducted by those involved in a movement of one-million tree plantations along the Segara River used for rafting. Key players of this movement are consortium of non-governmental organization, university and PT Angkawijaya as well as the village administration. Their participation is in the form of small trees provision and fund as well as manpower mobilization. According to information forwarded by Head of Bentek Village, until the end of 2001 there had been planted 3,000 trees.

Development of the Community Forestry

In order to preserve function of forest and generate income of the community around the forest, some non-governmental organization have initiated program of community forestry at the Segara River Basin. Two programs have been taking place, namely:

- Under the auspices of the Global Environmental Facilities (GEF) YLKMP has implemented program of income-generating through plantation of Ketak trees. This tree is used for materials of home industry such as basket and pencil box, etc.
- KONSEPSI in cooperation with Australian Agency for International Development has initiated program for development of community forestry. This program intends to provide access to the community around the forest to manage forest area of Ex-PT Angkawijaya by adopting agroforestry system. Community which comprises 384 households is authorized to manage 300 hectare of land by planting multi-purpose trees.

Credit for land Conservation

As an effort to generate income of the community as well as to rehabilitate land and conserve water, Ministry of Forestry has promoted credit for watershed protection (KUK-DAS). The credit is channeled through group of approximately 20 members with value of Rp 50 million for at least 15 hectare.

Royalty of the Drinking Water Company

As the biggest user of the water, this drinking water company annually provides royalty with amount of Rp 2 million to village administration where the source of water exists. In addition, the company also gives compensation to land of the community used for water piped lines construction. Amount of the compensation is Rp 500,000 per *are* for duration of 20 years. Moreover, the company is still obliged to pay tax of land/construction it uses from the community for 30 years.

Promotion of Local Regulation

In line with forest protection of the Segara River Basin, the community has initiated an issue of local regulation, which is commonly known as *awiq-awiq*. An emphasis of this *awiq-awiq* is to protect watershed. Sanction is in particular regulated in one section, 3 articles. Whereas in environmental management as a whole prohibition has taken place, such as poison is not allowed to use in Segara River, also shooting birds.

In terms of forest protection that is identical from avoidance from timber extraction, -- particularly in area of 500 meter from the spring – strong sanction is made available. There are 3 levels of sanction, which take place in Village of Bentek. First sanction is to pay Rp 100,000 per tree plus to provide 10 small trees of similar tree. For instance, a member of community who cuts trees one tree of Suren, he/she is obliged to plant 10 similar small trees plus fine of Rp 100,000.

If the same person violates the regulation for the second time, he/she would be fined as the first sanction plus *ngeruwah bumi*. *Ngeruwah bumi* is a publicly processed social sanction. If similar violation of the regulation occurs for three times, the transgressor is forwarded to the authority. Public pressure used to be given in order to ensure police enforce the law.