CHAPTER 5

Initiating the Improvement of River-Basin Management: Ombilin River Subbasin, West Sumatra, Indonesia

Helmi¹

Introduction

The Inderagiri river originates in the highlands of West Sumatra and flows to the east coast of Sumatra Island. The upper part of the Inderagiri river basin in the West Sumatra Province consists of three major rivers, one of which is the Ombilin river. This river originates from the Singkarak lake, which is fed by two other major rivers, Lembang/Sumani and Sumpur. The water supply in the Ombilin river depends largely upon the outflow from the Singkarak lake. The construction and operation of a hydroelectric power plant at the Singkarak lake since late 1997 have diverted (transferred) part of the water from the Singkarak lake to the Anai river basin, which flows to the west coast of Sumatra Island. This has reduced water supply and increased pressure on water users along the Ombilin river. Since then the improvement of Ombilin river water management has become a concern for various stakeholders.

River basin management and water allocation have increasingly become issues in West Sumatra as competition for water use between irrigated agriculture and other sectors of the economy increases. Integrated Water Resource Management (IWRM) is an important development agenda to address institutional problems and capacity building for the use, control, preservation and sustainability of water systems. The Government of Indonesia is in the processes of reforming its water resources management policy, putting IWRM principles into action. One of the elements of the new policy is related to the improvement of river-basin management. Although experience with river basin management has been developed in one basin, the Brantas river basin in East Java, this was not the case for other regions of the country until recent times. This paper presents the case of water management on the Ombilin river in Sumatra and attempts to identify relevant issues and their implications related to IWRM.

The next section of the paper outlines the policy and institutional context of river basin management in Indonesia. This provides an overview of the water management policy reforms and identifies aspects of the policy relevant to the improvement of river basin management in West Sumatra. The third section describes the setting of the Upper Inderagiri river basin and the Ombilin river subbasin. The fourth section discusses the impact of transbasin diversions and the institutional challenges facing water management in the subbasin. The last section presents tentative action plans for initiating improvement of river basin management.

¹Center for Irrigation, Land and Water Resources, and Development Studies, Andalas University, Padang, Indonesia.

Policy and Institutional Context of River-Basin Management

Water Resources Management Policy Reform

The Government of Indonesia is currently reforming its water resources and irrigation management policy. This section presents the reform principles, which are closely related to the improvement of river basin management, especially in the West Sumatra context. There are four objectives of the reforms (BAPPENAS 2000):

- Improving the national institutional framework for water resources development and management.
- Improving organizational and financial framework for river basin management.
- Improving regional water quality management regulatory institutions and implementation.
- Improving irrigation management policy, institutions and regulations.

The first and the second objectives are closely related to the improvement of water allocation and river basin management. One of the five sub-objectives of the first objective clearly mentions the involvement of stakeholders (including the private sector) in river basin management and decision making. The proposed reforms in this subobjective cover three areas:

- Issuing government regulations, which put emphasis on the participation of stakeholders (public agency institutions, community, and the private sector) in water resources development and management.
- Amending the ministerial regulation to a) include stakeholder representatives in provincial- and basin-level water management coordination committees (Indonesian acronyms PTPA and PPTPA), and b) merging provincial water management committees (PTPA) with provincial irrigation committees.
- Establishing functional PTPA and PPTPA with stakeholder representation in key river basins in about eight provinces.

The second objective contains three subobjectives one of which is the improvement of the provincial regulatory framework for the management of the river basin and aquifers. This will be the basis for the development of effective water management institutions at the provincial and basin level.

With the enactment of the new water policy and subsequent related activities, there is a clear commitment by the government to improve river basin management in Indonesia. As mentioned earlier, even though there is experience with regard to the river basin management in the Brantas river basin (and lately in the Citarum river basin), this approach is not yet widely implemented. The new policy provides a basis for initiating the improvement of river basin management in other priority river basins in Indonesia.

River-Basin Management in Indonesia

The Government of Indonesia started to recognize river basins as the units of water management in 1982 through the enactment of Government Regulation No. 22/1982 on Water Regulation, in which Article 4, Chapter III stressed the use of the river basin as the basis for water resources management. In 1989, the Public Works Ministerial Regulation No. 39/PRT/1989 was issued to specify 90 river territories in Indonesia. Each river territory is composed of one or several adjoining basins. The objective of this regulation was to ensure that conservation and use of water in the basins were conducted in a holistic and integrated manner.

In 1990, Public Works Ministerial Regulation No. 48/PRT/1990 specified the authority for the management of water and river basins. Out of the 90 river basins, 73 basins are managed by provincial governments, 15 basins fall under the management of the Ministry of Public Works, and 2 basins, Brantas river in East Java and Citarum river in West Java under the management of public corporations. Therefore, incorporation of the idea of river basin management into policy and action is relatively new to Indonesia and the management framework, other than in the two basins under public corporations, is not yet developed.

Based on the Public Works Ministerial Regulation No. 39/1989, West Sumatra Province falls into six river territories. One of these is the Inderagiri river basin that, according to the Public Works Ministerial Decision on the division of the river territories, is under the authority of the Ministry of Public Works because the basin is located in two provinces. The upper part of the Inderagiri river basin is located in West Sumatra while the lower part is located in the Riau Province.

Upper Inderagiri Basin and Ombilin Subbasin

Setting

The Upper Inderagiri basin contains three major rivers, Lembang/Sumani, Sumpur, and Ombilin, and two lakes, Dibawah and Singkarak. Water from the Lembang/Sumani and Sumpur rivers flows into Singkarak lake, while the Ombilin river originates from the Singkarak lake and flows east to the Inderagiri river. The altitude varies from 164 m asl at the lowest point (near the confluence of the Ombilin and Sinamar rivers) to 1,200 m asl at the highest point where the Lembang river originates from the Dibawah lake. The water supply in the Ombilin river depends largely upon the outflow of the Singkarak lake while this lake is influenced by inflow from the Lembang/Sumani and Sumpur rivers. The water supply in the Lembang/Sumani river is largely determined by the outflow from the Danau Dibawah lake.

The Upper Inderagiri river basin generally falls under the humid tropic climate covering almost all of Sumatra. Average rainfall in the subbasin area is 2,026 mm/yr. The Ombilin river subbasin is the driest part, with annual average rainfall of 1,789 mm/yr., compared to the Sumpur river basin, which is the wettest with an average rainfall of 2,484 mm/yr. This is slightly higher than in the Lembang/Sumani river basin with an annual average rainfall of 2,200 mm.

The total area of the Upper Inderagiri basin was estimated at 3,060 km². The area includes 400 villages within three districts and three municipalities. Most of these villages (around 87 percent) are rural. Within the Upper Inderagiri basin, about half the area lies in the catchment

(subbasin) of the Lembang/Sumani, around 13 percent in the Sumpur river basin and 30 percent in the Ombilin river subbasin.

Demography and Employment

The total population of the Upper Inderagiri basin in 1997 was 662,425, with an average population density of 408 persons/km². The ratio of the urban population to the rural population is 0.28. This implies that the water supply for urban needs will be an important issue in the near future. In terms of households, the population data show that, in 1997, there were 150,466 households in the basin area with an average household size of 4.59. Only about 13 percent (or some 18,898) households are served by piped water supplies. Aside from households, some industries, offices and other social facilities are also served by piped water.

According to a 1993 agricultural census, about 68 percent of households (or 94,508 out of 139,831 households) were categorized as farm households. Since most of the households in the area are engaged in agriculture, water demand for agriculture will be one of the major issues in the basin.

In terms of income levels, more than one-fourth of the villages in the Ombilin river subbasin is categorized as poor villages. In the West Sumatra Province the incidence of poverty has increased sharply during the last few years because of severe economic crises (BPS 1998). The number of persons living below the poverty line increased from 9 percent (or 384,582 persons) in 1996 to an estimated 31 percent of the population (or 1,403,559 persons in 1998).

Zones of the Ombilin River Subbasin

Seven major rivers discharge into the Ombilin river, as shown in figure 1 and the dependable flow of these rivers is shown in figure 2. The Selo river has the biggest inflow into the Ombilin river, while the lowest is from the Silaki river. Based on the type of water use, the Ombilin river can be divided into three zones.

Zone A (upstream) is from the Singkarak outlet to the confluence with the Selo river. In this zone, water is mainly used for irrigation where water is lifted by waterwheels. Three rivers flow in to Ombilin river in this zone: Bengkawas, Katialo and Silaki rivers. In this zone, there were 58 waterwheels of which only 30 are currently functioning.

Zone B (midstream) runs from the confluence with the Selo river to the confluence with the Malakutan river. There are three types of water use in this zone: irrigation, domestic and industrial. The inventory found 77 irrigation waterwheels in this zone, with 38 of them being functional. In addition to the waterwheels, there are 5 pumping stations for irrigation. For domestic and industrial use, there are two pumping stations for drinking water and one pumping station for coal washing.



Figure 1. Tributaries, water uses, and zones of the Ombilin river.

Figure 2. Dependable flow of seven rivers into the Ombilin river.



Zone C (downstream) starts from the confluence with the Lunto river and extends to the confluence with the Sinamar river. In this zone, water is mainly for irrigation, lifted by waterwheels. Two rivers flow into the Ombilin river, Lunto and Lasi rivers. In this zone, there are 231 waterwheels for irrigation of which only 116 are functioning. In addition, the zone has 9 pumping stations for irrigation.

Water uses vary among the three major rivers and lakes. At the Ombilin river, water is used for irrigation, industry, electric power generation and domestic water supply. In two other rivers, water is mainly used for irrigation and domestic water supplies.

Water Accounting for Ombilin-River Subbasin

Water balance computations were carried out for each zone. The average inflow to the Ombilin river from the Singkarak lake is estimated to be 3.333 m³/s. The results of water balance computations for each zone showed that the discharge flows in each zone are still much higher than the outflows or water uses for various purposes, as shown in table 1. In Zones A, B, and C only about 5.4 percent, 30.6 percent, and 12.7 percent, respectively, of the water is being used. The data tended to suggest that in Zone B pressure on water resources is highest followed by Zones C and A.

	Zon	ie A	Zon	e B	Zone	e C	
Items	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	
	m ³ /s						
Singkarak lake	3.33	-					
Bengkawas river	1.19	-					
Katialo river	2.97	-					
Silaki river	0.07	-					
Irrigation (agriculture)	-	0.41					
Water balance	7.56	0.41	7.15				
Selo river			3.96				
Irrigation (agriculture)			-	0.92			
Talawi Domestic WS Co	ompany		-	0.04			
PLN thermal power plan	nt		-	0.01			
TBO thermal power pla	nt		-	1.9			
Coal washing			-	0.14			
Rantih pump station (De	omestic W	S)	-	0.4			
Water balance			11.11	3.41	7.71		
Malakutan river					1.32	-	
Lunto river					0.64	-	
Lasi river					2.02	-	
Irrigation (agriculture)					-	1.49	
Water balance					11.69	1.49	10.2

Table 1. Results of water balance computation for the Ombilin river.

Further classification of the water balance components into water use categories (water accounting) indicated that the depleted fraction of gross and net inflow for the part of the Ombilin river under study is 0.34 (in this case, gross inflow is equal to net inflow). The process fraction of depleted water is 1 (because total depletion is assumed to be equal to process depletion), and the process fraction of available water is 0.43.

Stakeholder Identification

Four major groups of water users from various sectors have direct interests concerning water from the Ombilin river:

- Farmers irrigate, mainly using waterwheels to lift the water from the river.
- The coal mining company uses water for washing coal (used water goes back to the river).
- Domestic water suppliers provide water for the Sawah Lunto town and other consumers.
- The electricity company uses water from the Singkarak lake for hydropower generation and two thermal power plants are located along the Ombilin river.

There are other groups who do not cause consumptive depletion of water but use the river for various activities. They include fisherfolk; users of the river for bathing, washing and other personal needs; and those who collect building materials such as sand, gravel and stone from the river.

The Ombilin River Subbasin under Stress

This section analyzes four issues related to water management in the subbasin. These issues are a) interbasin water transfer, b) impact of the construction of the Singkarak HEPP on irrigated agriculture and other users, c) lack of a framework for licensing water rights and water charges, and d) lack of an organization for river basin management.

Interbasin Water Transfer

To gain sufficient head, the water used by the Singkarak HEPP is channeled by a tunnel through the mountain range to the Anai river, which flows to the west coast of Sumatra. To fulfill water requirements for power generation by the Singkarak HEPP, the outflow from the Singkarak lake to the Ombilin river was regulated to be between 2–6 m³/sec. This was a major reduction from the earlier average outflow of around 49 m³/sec. At the Ombilin river, especially along the 70-km length of the river that was the focus of this study, water is used for irrigation, industry, electric power generation and domestic water supply. The operation of the Singkarak HEPP has affected the availability of water for various uses along the Ombilin river, showing the competition for water use between the Singkarak HEPP and water users along the Ombilin river.

Water management responsibilities are fragmented among a number of government agencies. The tendency is that when any particular government agency has developed a particular water source, the control of water use is assumed to be in its hands. Other users are expected to adjust themselves to the changes in water availability.

The Impact of the Singkarak HEPP

The impact on irrigated agriculture mainly affects waterwheels, which were the main method of lifting water from the Ombilin river for irrigation until recently when some diesel pumps began to be used. No gravity irrigation scheme is found along the main stem of the Ombilin river. Pumping began because of the difficulties farmers faced in operating the waterwheels with the reduced flow in the Ombilin river. There are surface irrigation schemes on the tributaries of the Ombilin river, which are not affected by the operation of the Singkarak HEPP.

Farmers felt that waterwheels were the most suitable scheme under the previous physical conditions of the Ombilin river. The limited rice fields available; locations scattered over the narrow flat area along the river and the average width of the river around 50 m would make the construction of weirs for gravity irrigation very costly. In addition, the porous soil requires continuous flows of irrigation water.

The field inventory found some 184 waterwheels serving a total of 333 hectares of command area and 463 farmers. On average, one waterwheel serves 1.8 hectares and 2.5 farmers. At the time when the field inventory was conducted there were 14 pump irrigation units found along the Ombilin river, with a total command area of 138.5 hectares involving some 200 farmers.

The number of waterwheels, command area and number of farmers served declined markedly after the Singkarak HEPP was developed (table 2). Now, the number of waterwheels is only about half that before the operation of the Singkarak HEPP started in 1996. The current irrigated area is approximately 61 percent of that in 1996.

Year	Number of Waterwheels	Total Service Area	Total Number of Farmers
1996	366	549	729
1997	296	470	621
1998	237	405	556
1999	195	343	478
2000	184	333	463

Table 2. Waterwheels, service area, and farmers 1996–2000.

Source: Field inventory.

Increased O&M costs of the waterwheel irrigation scheme. For owners and operators of waterwheels, the reduction in the water discharge of the Ombilin river has caused several problems in the system operation and maintenance (O&M). The current discharge flows of Ombilin river, especially in the dry season, oftentimes cannot rotate the waterwheels or if they can, it is only with a very low rotation per minute (rpm). Consequently, operators have to lengthen the traditional weirs as a way of increasing water depth and directing water toward

the wheel so as to make its rotation faster. Another way of making waterwheels keep on operating is by reducing the number of water tubes so the waterwheel becomes lighter and easier to move. Nevertheless, the consequence of both choices is increased workload, cost of O&M and reduction in the capacity of the wheel to supply water that, in turn, decreases both the land that can be irrigated and the reliability of irrigation water.

Increased intensity of damage to traditional weirs and waterwheels occurs due to drastic increases in river discharge after sudden opening of the gate at the Singkarak outlet. According to the farmers, the gatekeeper usually opens it during the rainy season to avoid flooding the settlements and irrigated areas located in the lowlands surrounding the Singkarak lake. Consequently, the Ombilin river discharge increases during the rainy season because of the additional inflow coming from the Singkarak lake.

Items	Average Intensity/	Cost (per Season)	Percentage
	Before HEPP	After HEPP	of Increase
Waterwheel damage	1	2.5	150
Weir damage	1	4.5	350
Rehabilitation costs of waterwheel	Rp 150,000	Rp 1,100,000	633
Rehabilitation costs of weir	Rp 50,000	Rp 425,000	750

Table 3. Damage and rehabilitation costs before and after HEPP.

Source: Socioeconomic survey.

For the owners and operators of the waterwheel irrigation schemes, increased damage intensity means more labor capital and costs. Results of the socioeconomic survey show that, on average, damage increased from once per season before the operation of the Singkarak HEPP to 2.5 times per season afterward.

Most farmers reported that irrigation water supply has been unreliable after the development of the Singkarak HEPP. As a result, the yield of rice on land irrigated by waterwheels has declined markedly. Some farmers reported a lighter effect while some others noted a considerable decline. The results of the socioeconomic survey found that as a whole, rice yields have dropped from an average of 4.2 tons/ha before the development of Singkarak HEPP to 3.1 tons/ha in 1999.

The results of performance assessment suggest that the performance of irrigated agriculture has declined during the last 5 years. Seven indicators were used to measure the performance: a) output per unit of cultivated area, b) output per unit of command area, c) output per unit of irrigation water, d) output per unit of available water, e) relative water supply, f) relative irrigation supply, and g) financial self-sufficiency. The main factor that caused the decline was the reduction in total water supply and irrigation supply at the field level.

These problems can be attributed to the absence of water management institutions in the Ombilin river subbasin under growing inter-sectoral competition for water. With regard to irrigation water management, a major point raised is that the existing irrigation technology (particularly traditional waterwheels) is no longer suited to the current condition of water scarcity. Opportunities remain to increase the performance of irrigated agriculture in the area of the Ombilin river subbasin by establishing institutions for managing water in the basin, and by improving irrigation technology to cope with the increased scarcity of water.

Impact on industry and domestic water supply. The reduced flow in the Ombilin river has also affected the pump stations in the matter of coal washing and water quality for domestic water supply. PLN, the company operating the Singkarak HEPP, built a weir to improve the water level and so solved the problem.

Declining water quality in the Ombilin river has also resulted in some problems for the domestic water suppliers and consumers. The Selo river transports sediment, especially during the rainy season and from coal washing. Water quality downstream of the Ombilin river has declined since the operation of the Singkarak HEPP. Increased electric conductivity; soluble solid material (from 104 mg/l to 176 mg/l); pH (from 7.2 to 8.4); nitrate content (from 0.26 mg/l to 0.35 mg/l), chloride (from 4.62 mg/l to 8.4 mg/l); and sulfate (from undetected to 10.3 mg/l) were detected when records for 1994 and 2000 were compared.

The declining water quality has increased O&M costs of the domestic water suppliers. The manager of a domestic water company estimated that water treatment cost increased by almost 100 percent. However, at the time when the quality of raw water was very low, the domestic water suppliers did not perform water treatment since it would not yield any improvement in the quality of water. In such a condition, the domestic water company would distribute the raw water directly to the customers without treating it.

Frameworks for Licensing Water Rights and Water Charges

In principle, water rights are supposed to be given in the form of use rights and allocated by the government through licensing. Since water and sources of water are considered as embodying social functions, there are uses of water that require licenses, and there are those that do not. Tapping water for noncommercial drinking water and other individual domestic uses is allowed without a license as long as it does not harm the source of water and other water users' interests. According to Ministerial Regulation No. 48/PRT/1990, a government license is required for uses like domestic water supply, municipality and real estate, irrigation, animal husbandry, plantation, fishery, industry, mining, energy, navigation and disposing of waste.

The Minister of Public Works and the Governor are authorized to issue licenses for water use rights within their respective basins. The Minister of Mining and Energy issues licenses for groundwater use. Licenses for water use may be given to individuals or groups of individuals or any legal entity. A group having a license to use water is authorized to arrange water distribution among its members based on government regulations. Those granted licenses must pay fees to the Ministry or to the Governor. According to MR No. 48/PRT/1990, the fee is to be used for financing O&M of water structures and maintaining the sustainability of the water source. Every license on water use has a time frame depending on the kind of use. The fee is supposed to be reset every 5 years.

The transfer of water licenses is restricted. Article 18 MR 48/PRT/1990 states that giving up a water license or selling it to other parties may be allowed if the agency issuing the license gives its permission. The regulation, however, is not explicit on this exception. Formal water use rights and allocation are hardly implemented, except perhaps to some extent, in the two basins managed by the publicly owned companies. The problems included, among others, the existence of gaps and inconsistencies in the formal regulations, policies and organizations. The lack of consensus on some key concepts (Pusposutardjo 1996) and the lack of hydrological data in most of the basins (Hehanusa et al. 1994), make it difficult for the government to conduct basin-level planning or even to make the right decisions on whether or not new uses of river water are justifiable.

Regulations provide that licenses for water uses that potentially affect the water balance must be based on general basin-level plans on development, protection and utilization of the basin water. In cases where such plans have not been made, the issuance of the licenses must be based on consensus made in the coordinating body, the PTPA.

In most of the basins, however, water allocation is governed by whatever the local communities accept as rules. In predominantly agricultural basins, *adat* (traditional customary rights) may govern water allocation. In the Ombilin river there were no local rules for water allocation since the challenge was in lifting the water from the river. In the context of waterwheel irrigation, the results of water accounting showed that, in aggregate, the water supply is sufficient, but the problem is the water level required to operate the waterwheels.

Where nonagricultural sectors have exerted their interests, claims over water may be based on political or economic power leading to transferring water from the agriculture sector (Kurnia et al. 1996). Nevertheless, government wields, and is sometimes capable of exercising, the authority in water allocation, including interbasin water transfer. Transferring water from the Ombilin river to the Anai-Sialang basin is an example. The decision about this transfer seems to have been made on the basis of studies done by the government. The original water users must now adjust to the new situation. The problems that have occurred with waterwheels and domestic water supplies downstream in the Ombilin river underline the importance of formalization of irrigation water rights in order to protect the interest of the poor and small farmers.

Lack of an Organization for River-Basin Management

As has been mentioned earlier, the incorporation of river basin management into policy and action is relatively new to Indonesia. Furthermore, the management framework is not yet developed, except in two basins in the island of Java managed by publicly owned corporations. In other provinces of Indonesia, the idea of river basin management is newly introduced. As the responsibility for water management is fragmented between a number of government agencies, a provincial water management committee (in Indonesian language abbreviated as PTPA) is supposed to be set up in all provinces. In West Sumatra the PTPA was set up in 1994. The characteristics of this committee are as follows:

- Its main function is to assist the Governor in coordinating water management at the provincial level.
- The specific tasks are a) data collection, processing and preparing materials to be used to formulate provincial policy on water management coordination; and b) providing considerations and advising the Governor on matters related to water supply, wastewater drainage and flood control.
- The members of the committee are from agencies related to water management (other stakeholders are not yet included as members of the committee).

There was no specific budget allocated for this committee, so its activities were carried out mainly on an ad hoc basis. When there were problems related to water supply, drainage, or flooding, a meeting of provincial staff would be held but it was not very clear whether the meeting was a PTPA meeting or just a meeting related to the performance of general government tasks.

The government regulation on the provincial PTPA has also an article stating that the Governor could establish basin-level water management committees (PPTPA) to assist the PTPA in performing its tasks. However, up until now this committee has not been formed in any of the six river basins located in the West Sumatra Province. As the conflicts over water allocation and use are tending to increase in West Sumatra, as illustrated with the case of the Ombilin river, clearly, there is a need to develop a framework for improving river basin management in the province. The case of the Ombilin river can be used as the pilot activity to develop the framework and capacity for integrated water resources management at the basin level in West Sumatra.

Initiating the Improvement of River-Basin Management

Core Elements of the Tentative Action Plan

The discussions in the preceding sections indicate that there is a need to develop effective water management institutions. Action plans for improving water management in the Upper Inderagiri river basin (especially in the Ombilin river) would consist of the following elements.

For a short-term action plan, the options that can be considered are as follows.

- In the short term, especially during the dry season, the problems faced by the users need to be solved by reviewing the existing water allocation rules and releasing more water from the Singkarak lake to the Ombilin river. For this purpose the handling of water allocation needs to be done systematically. The affected users along the Ombilin river are proposing that a kind of water board, which consists of all of the stakeholders be set up and given authority to regulate water allocation from the Singkarak lake.
- The technology for lifting water for irrigation with waterwheels and diesel pumps needs to be adjusted, given the changes in water level in the Ombilin river and the cost of operating the pumps. The soil porosity is high and there is a need for a 24hour water supply. The waterwheels are very well suited for this environment but the reduced water level in the river is not sufficient to continue operating them efficiently with the current technology. With regard to the pumps, the farmers indicated that they have difficulties with the cost of pump O&M and are thinking about the possibility of using electric pumps for lifting water from the river. In this regard, the farmers proposed that the company dealing with electricity should provide a special discount for the electricity charge for the domestic water supply

and for the farmers who will use electric pumps for irrigation, as a "good-neighbor policy."

For the longer term, the government needs to take initiative to set up a coordinating body (PPTPA or a kind of water management board/committee) at the subbasin level. The main task of this body would be to regulate and enforce the water allocation rules effectively, for which the national water resources policy has provided a legal basis.

The long-term action plan to improve water management would consist of the following:

- Reviewing all the water-related laws and regulations at the provincial level and adjusting them in accordance with the direction of the new national water policy. This will include laws and regulations related to strengthening the water resources management coordinating committee at provincial level (PTPA); establishment of the water resources management coordinating committee at (sub-) basin level; and reviewing the possibility of charging a tax for the use of surface water, and using the income generated from this to finance the operation of the coordinating bodies as well as river and watershed maintenance.
- The preparation for setting up of a coordinating and/or operating body for river (subbasin) management by using the Ombilin river subbasin as the pilot site.

Tentative Action Plan

Based on the core elements of the action plan presented above, the detailed actions for initiating the improvement of river basin management in West Sumatra are presented in table 4.

Conclusions

The conclusion of this paper is that the water use competition has raised the need to improve water management in the Ombilin river. However, frameworks for this are not yet developed. Current water policy reforms in Indonesia clearly provide a basis for improvement of the management. Measures should be taken to review existing provincial regulations related to water management, and a framework should be developed for river basin management. Capacity building for river basin management can be initiated through efforts to solve the problems of the Ombilin river, from which lessons could be used for other river basins in West Sumatra. An action plan could consist of four points:

- Review and revise provincial laws related to water resources management.
- Strengthen the provincial water resources management committee (PTPA) and establish a water resources management coordinating committee at river basin level (PPTPA) with the involvement of stakeholders.
- Improve provincial water resources information and decision support systems.
- Implement short-term action plans.

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Table 4. Tentative action plan.

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