

Participatory Watershed Management for the Ping River Basin

Final Project Report



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Part I. The Ping Sub-basin Management Pilot Project

1. Introduction and background	1
1.1. Project background	1
1.2. Initial status of the Ping River Basin	5
2. Project structure, approach and activities	13
2.1. Component 1. Developing sub-basin level participatory watershed management models	13
2.2. Component 2: Enhancing the capacity of communities in pilot watersheds	16
2.3. Component 3: Strengthening regulatory and incentive measures for improved behavior of users in pilot watersheds	17
2.4. Component 4: Project coordination, results measurement and dissemination	18

Part II. Results of Project Implementation

3. <i>Component 1. Developing sub-basin level participatory watershed management models</i>	20
3.1. Pilot sub-basin selection	20
3.1.1. Technical criteria and recommended indicators	20
3.1.2. Participatory selection process	31
3.2. Identifying long-term organizational models and development processes	33
3.2.1. Review of relevant international experience and national context	33
3.2.2. Alternative models for river sub-basin management organizations	38
3.2.3. Proposed process for developing sub-basin management organizations	44
3.3. Developing sub-basin organization and planning processes	46
3.3.1. Ping part 1 (Upper Ping) sub-basin	48
3.3.2. Mae Kuang sub-basin	60
3.3.3. Ping part 5 (Lower Ping) sub-basin	70
3.4. Creating implementation handbooks	79
4. <i>Component 2: Enhancing the capacity of communities in pilot watersheds</i>	80
4.1. Selecting sub-basin facilitators, community facilitators and community members	80
4.2. Analyzing community training needs and developing training curricula	81
4.2.1. Overview of sub-basin training needs	81
4.2.2. Training curriculum for main target groups	84
4.3. Conducting training and transferring knowledge	85
4.3.1. Training for sub-basin facilitators	85
4.3.2. Training for community facilitators	86
4.3.3. Training and study tours for community members	87
4.3.4. Training for local government leaders	88

5. Component 3: Strengthening regulatory and incentive measures for improved behavior of users in pilot watersheds	89
5.1. Classifying and selecting pollution sources	89
5.1.1. Ping part 1 (Upper Ping) sub-basin	90
5.1.2. Mae Kuang sub-basin	92
5.1.3. Ping part 5 (Lower Ping) sub-basin	96
5.2. Reviewing economic incentive measures	100
5.2.1. Types of economic incentive measures	101
5.2.2. Experience with economic incentive measures	103
5.3. Participatory development of incentive measures	103
5.3.1. Opinions of polluters regarding proposed economic incentive measures	105
5.3.2. Opinions on social measures	113
5.3.3. Opinions concerning supplementary measures	113
5.4. Implementing incentive measures	114
6. Component 4: Project coordination, results measurement & dissemination	117
6.1. Results measurement framework	122
6.1.1. Overall framework	122
6.1.2. Ping part 1 (Upper Ping) sub-basin	129
6.1.3. Mae Kuang sub-basin	132
6.1.4. Ping part 5 (Lower Ping) sub-basin	134
6.1.5. Further development of indicators, roles & responsibilities	136
6.2. Capacity building requirements to implement results measurement	143
6.3. Dissemination of project results	146
 Part III. Lessons and Recommendations for Expansion 	
7. Major lessons from project experience	147
7.1. Overall approach	147
7.2. River sub-basin organizations (RSBOs)	149
7.3. Action planning processes	151
7.4. Capacity building	153
7.5. Economic incentive measures to reduce pollution	154
7.6. Results-based measurement	155
8. Recommendations for further expansion to other sub-basins	157
Appendix: Project Outputs	161

Figures

<i>figure</i>	<i>title</i>	<i>page</i>
1-1	Twenty currently official sub-basins of the Ping River Basin	3
1-2	Ping River Basin in the Chao Phraya	5
1-3	State forest lands in the Ping Basin	8
1-4	Ping Basin watershed classes	9
2-1	Steps and methods used in developing pilot sub-basin organizations	14
2-2	Steps and methods used in developing pilot sub-basin action plans	15
3-1	Lower, middle, and upper Ping sub-basins	22
3-2	Sub-Basin Shares of Major Ping River Basin Characteristics	23
3-3	Previous rankings of Ping sub-basins	24
3-4	Sub-basin selection criteria and sub-criteria proposed by watershed consultant	25
3-5	Natural resource indicator scoring for Ping sub-basins	26
3-6	Socio-economic indicator scoring for Ping sub-basins	27
3-7	Organization & administration indicator scoring for Ping sub-basins	28
3-8	Overall summary of weighted sub-basin scores by watershed consultant	28
3-9	Simplified criteria and indicators for pilot sub-basin selection	29
3-10	Sub-basin technical indicator scores for ranking by implementation consultants	30
3-11	Sub-basin priorities from technical assessments	31
3-12	Participants in Water Forum events for pilot sub-basin selection	31
3-13	Selected pilot sub-basins	32
3-14	Relative area scales of hierarchy units	35
3-15	Sub-basin as an interface venue	36
3-16	Components of the institutional context in Ping sub-basins	37
3-17	Comparison chart of five alternative models for sub-basin organizations	43
3-18	Phases of Ping RSBO development	44
3-19	Management plan components	45
3-20	Proposed common characteristics for all RSBOs	47
3-21	Sub-basin data table: Ping part 1	48
3-22	Sub-basin map: Ping part 1	49
3-23	Working Group: Ping part 1	50
3-24	Preliminary problem identification: Ping part 1	51
3-25	Identification of underlying problems: Ping part 1	52
3-26	Ping part 1: Sub-basin vision and goal	53
3-27	What does a good plan look like?	54
3-28	Ping part 1 Sub-basin Action Plan: Strategies & component measures	54
3-29	Initial review of existing local organizations: Ping part 1	56
3-30	Initial organization SWOT analysis: Ping part 1	56
3-31	Initial RSBO structure proposed by implementation consultants: Ping part 1	57
3-32	Ping part 1 RSBO: Roles and duties	58
3-33	Ping part 1 RSBO: Membership structure	58
3-34	Ping part 1 RSBO: Four pillars	59
3-35	Sub-basin data table: Mae Kuang	60
3-36	Sub-basin map: Mae Kuang	61
3-37	Working Group: Mae Kuang	62
3-38	Issues and problem situations: Mae Kuang	63
3-39	Mae Kuang: Sub-basin vision, goal and objectives	64
3-40	Mae Kuang Sub-basin Action Plan: Strategies and component measures	65

<i>figure</i>	<i>title</i>	<i>page</i>
3-41	Initial review of existing local organizations: Mae Kuang	67
3-42	Initial organization SWOT analysis: Mae Kuang	67
3-43	Initial RSBO structure proposed by implementation consultants: Mae Kuang	68
3-44	Mae Kuang RSBO: Roles and duties	68
3-45	Mae Kuang RSBO: Membership structure	69
3-46	Sub-basin data table: Ping part 5	70
3-47	Sub-basin map: Ping part 5	71
3-48	Working Group: Ping part 5	72
3-49	Issues and problem situations: Ping part 5	73
3-50	Ping part 5: Sub-basin vision, goals and objectives	74
3-51	Ping part 5 Sub-basin Action Plan: Strategies and component measures	75
3-52	Review of existing local organizations: Ping part 5	76
3-53	Organization SWOT analysis: Ping part 5	77
3-54	Ping part 5 RSBO: Roles & duties	77
3-55	Ping part 5 RSBO: Membership structure	78
4-1	Training needs identified through focus groups	82
5-1	Crop types and locations of agricultural pollution sites in Ping part 1 sub-basin	90
5-2	Selected pollution sources in the Mae Kuang sub-basin	93
5-3	Selected municipalities in Mae Kuang: Basic water and wastewater patterns	95
5-4	Selected municipalities in Mae Kuang: Basic solid waste patterns	96
5-5	Sources of pollution selected in the Ping part 5 sub-basin	97
5-6	Selected municipalities in Ping part 5: Basic water and wastewater patterns	97
5-7	Selected municipalities in Ping part 5: Basic solid waste patterns	98
5-8	Crop types and locations of agricultural pollution sites in Ping part 5 sub-basin	98
5-9	Experience with economic measures reviewed by the study	103
5-10	Summary of measures with potential for use in managing pollution problems	104
5-11	Pollution sources selected as case studies in pilot Ping River sub-basins	105
5-12	Ranking of economic measures for managing community wastewater	106
5-13	Ranking of economic measures for managing community solid wastes	108
5-14	Ranking of economic measures for managing industrial wastewater	108
5-15	Ranking of economic measures for managing wastewater from crop production	111
5-16	Ranking of economic measures for managing wastewater from livestock	112
6-1	Logical chain of results-based management	117
6-2	Typical logical framework format	118
6-3	Major components of the results-based Logical Framework Approach (LFA)	119
6-4	Ten steps to building a results-based monitoring & evaluation system	120
6-5	Steps and methods in implementing project monitoring and evaluation	124
6-6	Model structure of a Logical Framework Matrix	125
6-7	Four evaluation principles	125
6-8	Generalized structure of a sub-basin plan	127
6-9	Summary of levels and terminology in current sub-basin plans	129
6-10	Ping part 1 Strategies: Types of expected outcomes	130
6-11	Ping part 1 Overall Sub-basin Workplan: Types of expected outcomes	131
6-12	Mae Kuang Strategies: Types of expected outcomes	133
6-13	Mae Kuang Overall Sub-basin Workplan: Types of expected outcomes	133
6-14	Ping part 5 Strategies: Types of expected outcomes	135
6-15	Ping part 5 Overall Sub-basin Workplan: Types of expected outcomes	137
6-16	Stakeholder group roles and responsibilities in monitoring and evaluation	140

Abbreviations

ADB	Asian Development Bank
ALRO	Agricultural Land Reform Office
ASB	Alternatives to Slash-and-burn Consortium of the CGIAR
ASEAN	Association of Southeast Asian Nations
AWGWRM	ASEAN Working Group on Water Resources Management
BAAC	Bank for Agriculture and Agricultural Cooperatives
CCPE	Coordinating Committee for Protection of Ping River Basin & Environment
CDD	Community Development Department
CGIAR	Consultative Group for International Agricultural Research
CMU	Chiang Mai University
DLD	Department of Land Development
DMC	Developing member countries (ADB term)
DNP	Department of National Parks, Wildlife & Plant Conservation
DoLA	Department of Local Administration
DWR	Department of Water Resources
EPA	United States Environmental Protection Agency
EU	European Union
GIS	Geographic information system
GWF	Green World Foundation
GWP	Global Water Partnership
GWP-SEATAC	Global Water Partnership Southeast Asia Technical Advisory Council
GWP-TAC	Global Water Partnership Technical Advisory Council
ICRAF	World Agroforestry Centre
IFPRI	International Food Policy Research Institute
IRBM	Integrated river basin management
IWMI	International Water Management Institute
IWRM	Integrated water resources management
JWA	Japan Water Agency
KUFF	Kasetsart University Faculty of Forestry
masl	Meters above sea level
MCC	Multiple Cropping Center, Chiang Mai University
MoAC	Ministry of Agriculture & Cooperatives
MoI	Ministry of Interior
MoNRE	Ministry of Natural Resources & Environment
MoPH	Ministry of Public Health
NARBO	Network of Asian River Basin Organizations
NASA	U.S. National Aeronautics and Space Administration
NESDB	Office of the National Economic and Social Development Board
NGO	Non-governmental organization
NSO	National Statistics Office of Thailand
OAE	Office of Agricultural Economics
OECD	Organization for Economic Cooperation and Development
ONEP	Office of Natural Resource & Environmental Policy & Planning
OTOP	One Tambon One Product program of the Thai government
PDF	Portable Document Format (readable with Adobe Acrobat)
PLP	Participatory land use planning approach
PRA	Participatory rapid appraisal

PYB	Village headman (<i>phuyaibaan</i>)
RBC	River basin committee
RBO	River basin organization
RFD	Royal Forest Department
RID	Royal Irrigation Department
RSBO	River sub-basin organization
TA	Technical assistance
TAO	Tambon Administration Organization
TEI	Thailand Environment Institute
TOR	Terms of reference
TRF	Thailand Research Fund
UN	United Nations
USAID	United States Agency for International Development
WB	The World Bank
WFT	Wildlife Fund Thailand
WME	Watershed management expert
WWC	World Water Council
WRI	World Resources Institute

Part I. The Ping Sub-basin Pilot Project

The first part of this report contains two chapters. The first chapter provides a brief introduction and background to the major trends, processes and events that led to the development and implementation of this project. The second chapter turns to an introductory overview of the objectives, structure and activities of the project under its four major components. These chapters set the stage for part two of the report, which seeks to summarize results of project implementation in chapters focusing on each of the four components of the project. The third part of the report contains chapters that provide brief summaries of lessons learned from our project implementation experience, and recommendations for efforts to further expand support for development of sub-basin management organizations.

1. Introduction and background

In order to help explain the context in which this project emerged, discussions in this chapter are divided into two major sections. The first section provides background on the emergence of river basin management in Thailand, with focus on the role of the Ping River Basin in these processes. The second major section provides a very brief overview description of the diversity of conditions in the Ping River Basin and recent trends of change being driven largely by economic development and by evolving approaches to resource governance in Thailand. This very brief summary is intended to provide context for the description of the project structure and activities in the next chapter

1.1. Project background

Thailand has demonstrated impressive economic growth for more than 40 years, and its resilience is being demonstrated through its recovery from the Asian economic crisis. The development strategy that has brought this growth and structural change to the Thai economy has long relied on intensification of agriculture, rapid industrialization, and expansion of mining, fisheries, and tourism. These processes have also involved the drawing down of natural assets such as forest, water, mineral ores, fisheries, and land resources.

Public awareness of the growing negative impacts of economic development on environmental conditions and quality of life has increased rapidly during recent years. Greater integration into global information systems has helped strengthen environmental awareness and efforts to seek creative means to improve environmental sustainability, including emergence of advocacy oriented civil society institutions. At the same time, efforts to reform governance structures and processes in Thailand also seek to integrate environmental and natural resource management concerns. As a result, deforestation, water scarcity and pollution, declining fish stocks, haphazard urbanization and air pollution have emerged as important issues of concern in the national public policy arena.

Moreover, there is also growing awareness that much of the impact of problems associated with environmental change falls on the poor, whose livelihoods are disrupted and health is threatened. And as livelihood options of the poor become foreclosed, many are forced to turn to alternatives that are seen as causing further natural resource and environmental degradation.

Recent establishment of the Ministry of Natural Resources and Environment (MoNRE) was in recognition that rapid economic growth cannot be sustained if natural assets are not well maintained. Its missions to conserve, protect and rehabilitate natural resources and the environment are consistent with government objectives that include sustainable development and

equitable growth. And, since the 1997 national constitution specifically entrusts the environment and natural resources of the nation to its people, and mandates their participation and involvement in environmental management and conservation, the government is now seeking to delegate more responsibility to local communities, and encourage their participation in improving environmental quality.

River basin management

Among the range of environmental issues of growing concern, seasonal water availability and water quality are currently particularly high priorities for both the government and the general public. Serious floods and landslides have generated many headlines during recent years, while growing demand for dry season water and concern about water pollution from upstream agriculture and industry are a common feature of increasing public anxiety and conflict in many local areas. Given the perceived importance of interrelationships among forest, water and land management to these issues, the government is seeking to develop a river basin management framework for encouraging, facilitating and supporting participatory multi-sectoral collaboration that can help to improve management of natural resources and the environment, and to reduce rural poverty.

According to Dr. Apichart Anukularmphai, river basin management in Thailand was first initiated in 1994 when the government allocated budgets to study and prepare a strategic plan for water management in the Chao Phraya river system. The study formulated a comprehensive water management strategy for river basins, and a committee was appointed in 1998 to establish a river basin committee (RBC) for the Chao Phraya. Pilot river basin committees in the Upper Ping, Lower Ping and Pasak 'sub-basins' were officially established in 1999. Of the 25 officially delineated river basins of the country, the Ping Basin was selected as a pilot river basin both because of its strategic importance in relation to resources, livelihoods and rural poverty, and because of strong concern about impacts of deforestation, soil erosion, sedimentation, water use and pollution.

Upper and Lower Ping 'sub-basin' committees

As part of water sector studies in the Upper Ping and Lower Ping 'sub-basins' supported under a loan from the Asian Development, three working groups were established with responsibility for preparing basin plans, collecting and maintaining basin data and information, and conducting public relations and awareness raising campaigns. It was also agreed to sub-divide the Upper Ping into 15 smaller sub-basin watershed working groups, and the Lower Ping into 18 district working groups. Although meetings in 2000 sought to prepare plans for pilot areas, agencies did not want to change agency plans they had already made. This experience led to development of a Water Sector budgetary request process to provide authority for river basin committee planning.

Workshops began making it clear that stakeholders must play a higher role than government officials, and in 2001 more stakeholders, NGOs and academicians were added to river basin committees. But since projects are implemented by agencies, representatives of agencies remained necessary. As Dr. Apichart notes, stakeholder participation increased after establishment of working groups for basin planning, information systems, and public relations and awareness. Stakeholders started realizing their roles, and their desire to have their share in planning and decision-making processes. Stakeholder motivation became clear as key players started to emerge and play leading roles in consultative meetings. They began questioning roles of government agencies and their contribution to RBCs, and soon began demanding changes in the organizational set-up and composition of members that were implemented in 2001. Selection procedures for stakeholder representation were also challenged, resulting in a broader stakeholder

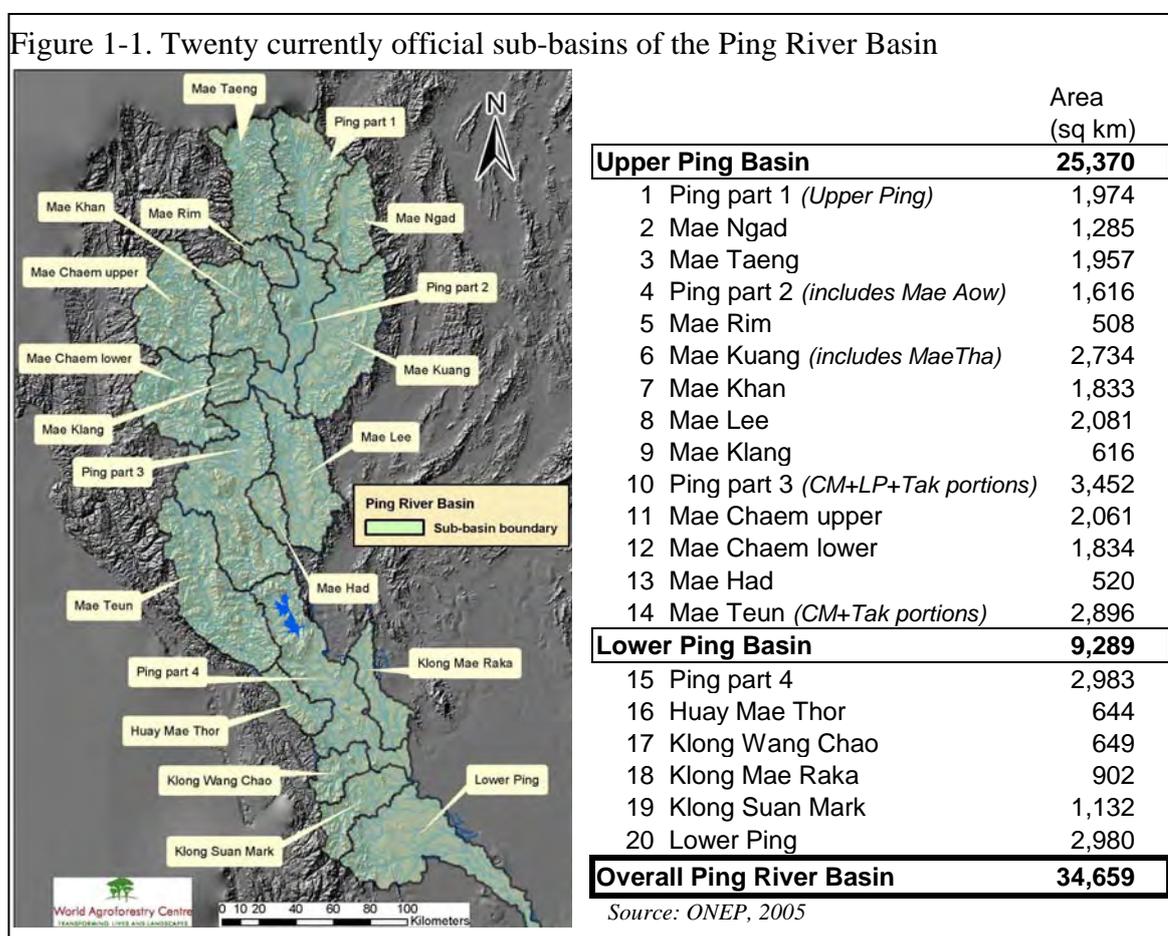
base with representation down to village level with selection by either election or popular consent. While some RBC groups conducted extensive processes seeking to ensure transparency and achieve effective and active representation, agency interaction in other areas is still limited to ‘consultative participation’.

DWR Planning Process

With establishment of the Ministry of Natural Resources and Environment (MoNRE) in 2003, river basin programs found a new home in the Department of Water Resources (DWR). During the transitional stage, consultants prepared a basin water resource management framework under instructions to assist basin working groups and stakeholders to identify their own needs and their own ideas of how to solve their problems, through grassroots level workshops and building local capacity in planning processes. Large detailed sets of water resource-focused assessments, plans and projects were reported in a six volume final report to the Department of Water Resources.

DNP-DWR Planning Process

With endorsement by the Prime Minister, the new MoNRE leadership embraced efforts to make the Ping River Basin a model for effective river basin organization, and began launching a new round of initiatives. During April 2003, a meeting was organized in Chiang Mai to gather ideas for a united multi-sector approach for managing the Ping River Basin. In order to broaden the mandate for river basin management, accelerate implementation, and draw in more field resources of the new ministry, a new Cabinet Resolution in July 2003 established the Ping River Basin Restoration Project to be conducted in the 20 sub-basins of the Ping River Basin shown in Figure 1-1. MoNRE then convened a meeting of Upper Ping and Lower Ping “sub-basins” during September 2003 to seek ideas for appropriate approaches for the project. During



December 2003 the Prime Minister attended a meeting of 2,500 people from the Ping River Basin convened at Chiang Mai University to announce the policy of the Ping River Basin serving as a pilot project, and to launch united participatory efforts to raise consciousness and awareness of the value of natural resources and the importance of their role in the heritage of future generations. Religious and cultural traditions were also mobilized to help seek the commitment of people in the Ping River Basin

Under this new wave of effort the Department of National Parks, Wildlife and Plant Conservation (DNP) took the lead for activities in the Upper Ping Basin, while activities in the Lower Ping Basin were under the Department of Water Resources. Sub-basins became the main units for more localized operations, with 14 sub-basins specified for the Upper Ping and 6 sub-basins for the Lower Ping. In May 2004, a 47.5 million baht budget was approved to begin implementing priority activities in the Ping River Basin. Under these efforts:

- The DWR quickly launched a series of planning activities in Lower Ping sub-basins that built on results of their previous studies and plans. This enabled them to move quickly to implementing specific projects, which initially focused mainly on 'check dams'. Other plans for larger water resource structures required more time for design, approval and construction.
- In the Upper Ping, the DNP launched a new round of 'participatory action planning' processes through committees and working groups under their leadership, resulting in another set of plans and projects. DNP appears to have made considerable efforts to formulate plans based on local ideas and perceived needs, and the scope was expanded to forest and watershed conservation, and environmental issues such as garbage and use of agricultural chemicals.
- The Department of Environmental Quality Promotion and the Office of Natural Resources and Environmental Policy and Planning (ONEP) began commissioning studies and activities to support various efforts, but coordination among efforts appears to have been limited.

Planning efforts sought to identify short, medium and long-term projects. Much of the focus of priority short-term activities to address natural resource and environmental issues focused on reforestation, planting *vetiver* grass, building check dams, establishing data systems that would seek to integrate scientific and local knowledge, and developing campaigns and environmental volunteer networks in sub-basins.

ONEP-World Bank Planning Process

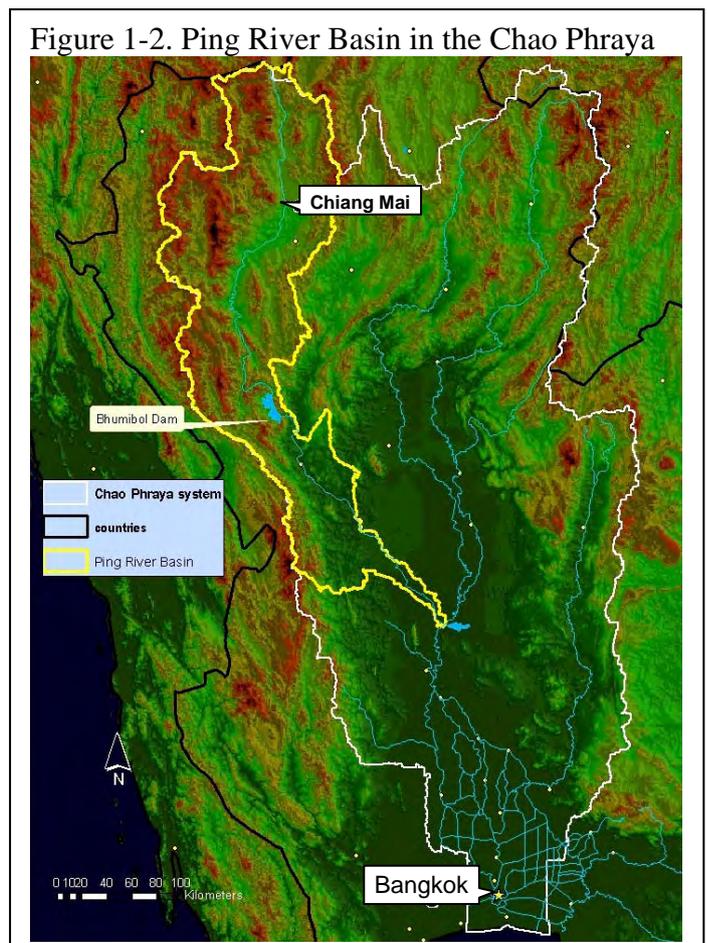
Also during 2004, the Office of Natural Resources and Environmental Policy and Planning obtained funding assistance from the ASEM II fund managed by the World Bank for technical assistance for the Participatory Watershed Management for the Ping River Basin Project. This project, which is the subject of this report, has sought to establish and test 'pilot' sub-basin management organizations that are able to conduct action planning processes to develop short, medium and long term plans to address natural resource, environment, health and poverty issues in the pilot sub-basins. Details of the project design and implementation are summarized in subsequent chapters of this report. Considering the above context, it should not be too difficult to understand why various government agencies, local governments, local communities, civil society organizations and other stakeholders initially saw this project as another in a series of waves of planning for river basin activities.

1.2. Initial status of the Ping River Basin

The Ping River Basin is the largest of the eight river basins that together form the Chao Phraya river ‘system’. The Chao Phraya system covers about 30 percent of Thailand’s land area. It is home to about 40 percent of the national total population and is said to employ more than three-fourths of its work force, and generate about two-thirds of national GDP. Lower portions include fertile Central Plains ‘rice bowl’ agricultural production areas, most historically important centers of power in the Siamese Kingdoms, and the urban-industrial mega-city of Bangkok.

With a catchment area of about 35,000 km², the Ping River Basin covers about 22 percent of the larger Chao Phraya river system within which it is nested (Figure 1-2), and contributes about 24 percent of the system’s average annual runoff. Along with the Wang, Yom and Nan river basins, the Ping is one of the four ‘upper’ tributary river basins that merge together and become known as the Chao Phraya River at Nakhon Sawan. Together, these four tributary basins contribute more than 70 percent of the total average annual runoff that feeds the entire Chao Phraya river system and its highly complex system of downstream barrages and irrigation canals. Thus, from the centers of political and economic power in the lower Chao Phraya, the four ‘upper’ river basins are viewed as areas to be protected from any activities that would threaten water-consuming downstream processes.

When it was completed in 1964, the Bhumibol Dam conceptually and functionally split the Ping River Basin into lower and upper portions. Protection and maintenance of the capacity of this strategically important irrigation, water control and electrical generation facility has become another major feature of efforts to manage water and watersheds, especially in ‘upper’ portions of the Ping River Basin.



Gradients of diversity in the Ping River Basin

Overall, the Ping River Basin is part of a gradient of change that begins in Bangkok and passes through the lowlands of the Central Plains, before entering the Ping River Basin at Nakhon Sawan. It then proceeds through the lower North into major valleys of the upper North, before ending in mountainous upper sub-basins with very small areas where lowland traditions can be established. This gradient is physical in terms of terrain and its upstream direction, it is demographic in terms of population density, it is economic in terms of integration, and it is cultural and linguistic in terms of traditions, language, livelihoods and lifestyles. The ‘center-periphery’ character of this gradient is underscored by the concentration of rural poverty in uppermost sub-basins.

The 'lower' portions of the Ping River Basin below the Bhumibol Dam are located near the western margin of the 'lower north' region in Nakhon Sawan, Kamphaengphet and Tak provinces. While the Ping Basin covers substantial portions of Tak and Kamphaengphet, it includes only a quite small portion of Nakhon Sawan province. Areas within the Ping Basin are strategically important, and provincial capital cities are all located within or near the boundary of Ping Basin. Especially in lowland areas of Nakhon Sawan and Kamphaengphet provinces that are contiguous with the lowlands of the Central Plains, irrigated commercial agriculture and industrial activities have been growing in major valleys along the Ping River. Irrigated paddy rice production is extensive in valley lowlands, while reserved forest on gently sloping uplands have been displaced by large production areas of industrial crops such as cassava and sugarcane, as well as maize, oranges and other crops. Penetration of these processes into smaller tributary valleys to the west, has often been fairly limited, but livestock production is widespread. While some of these processes have also extended into lowland areas of Tak Province, this province also includes more substantial 'upland' areas of hills and mountains, as well as more remote valleys beyond the western boundaries of the Ping River Basin. With the Bhumibol Reservoir located within its boundaries, this province is located at the transition between the 'lower' and 'upper' parts of the Ping River Basin.

Within the 'upper' portion of the Ping River Basin further to the north, lowlands of the inter-montane Chiang Mai – Lamphun Valley are home for a major center of people and economic activity that has evolved from the Lanna empire, for which it was the center of power before its 'merger' with Siam as part of Thailand's nation-building process. Dominant cultures in the Chiang Mai – Lamphun Valley also have strong traditions based in lowland irrigated paddy agriculture, water management, and river bank life. Major lowland valleys have been integrated into Thailand's economic and social development infrastructure and programs, and Chiang Mai City is Thailand's second largest city (but still more 10 times smaller than Bangkok). Boundaries of Chiang Mai and Lamphun provinces provide a close, but not quite perfect fit with natural boundaries of 'upper' portions of the Ping River Basin. Intensive mixed farming, horticulture and tree crops have been expanding in the lowlands, along with part-time farming, while upland field crops such as maize have been shifting to more remote valleys.

Still within the 'upper' Ping, but beyond its large river valleys lie a set of 'uppermost' tributary valleys, where lowland paddy-centered civilizations have been limited to relatively small valley floors, nested within large areas of steeply sloping lands and mountain ridges. These 'uppermost' tributary areas include a diverse range of ethnic groups employing various livelihood strategies and agroecosystem management practices. Some groups are believed to pre-date ethnic Thai groups, while others are seen as fairly recent migrants into Ping Basin areas. Different groups employ various combinations of paddy, mid-elevation rotational forest fallow agriculture with preserved forest patches, or highland 'pioneer'-type shifting cultivation in the past included opium production. Opium crop substitution brought intensive vegetable and fruit tree horticulture to highland zones, while commercial upland crops such as maize have joined upland rice in the midland zones.

Until recent years, mountain ethnic minorities were not considered part of mainstream society, they had no citizenship, and government administration treated them as a 'welfare' issue or as a target for opium crop substitution, shifting agriculture eradication, or in some cases resettlement. Their land use claims were precluded by declaration of forest reserves that blanketed those areas, and are now being replaced by more stringent protected watershed and expanded national park and wildlife sanctuary status. These areas are home for most of the rural poor in the Ping River Basin, and their land use practices are seen as threats to water resources and biodiversity.

While this ‘center-periphery’ gradient has existed in the Ping River Basin for a substantial period of time, there is nothing static about conditions along this gradient. Major processes of change have already swept through the Ping River Basin into even its furthest reaches, and these processes are continuing to evolve rapidly. Perhaps the two strongest forces driving change at this point in time are grounded in economic and governance processes, and their growing links with change at international and global levels.

Economic change in Ping River Basin provinces

Economic change has various faces as it passes through the gradient of conditions found along the Ping River Basin.¹ It has brought commercialization, capitalization and industrialization of agriculture in valley lowlands, including significant shifts in crops and cropping practices, which together with opium crop substitution and road programs now reaches even formerly remote mountain areas. Timber stocks in remaining upland natural forests have already been largely logged out and sold. A major tourism industry has emerged in some areas, and rapid growth associated with commerce, industry and service sectors is driving urbanization at strategic river valley locations. Government programs emphasize development of local entrepreneurship (such as OTOP) and local micro-finance mechanisms. This entire system, however, is now faced with questions about how economic activities can best adapt and restructure themselves in response to international free trade agreements, growing competition from neighboring countries with lower production costs, and perceptions of a deteriorating natural resource base.

The growth of these types of activities has left their ‘footprint’ on the land use patterns of Ping Basin provinces. While there has not been dramatic expansion of the total area in recognized farm land holdings during the last 20 years, shifts among components of land use within farm land holdings has been associated with changing demands for water resources. In earlier times, main season rice crops were the primary focus of lowland water demand, and a second crop of rice or other post-rice crops was a ‘luxury’ possible in areas that were particularly well located in terms of water resources. As production has shifted more into year-round intensive multiple cropping systems and perennial orchards, however, a dependable year-round supply of irrigation water moves from being a luxury into becoming a necessity. And especially as perennial fruit tree orchards have expanded into upland rainfed areas around the periphery of irrigated lowland areas, growers have learned that availability of irrigation water at critical times in the fruit production cycle are an extremely important element of the abundance, marketability and profitability of the crops produced. Thus, overall demands in the lowlands and surrounding upland areas for a reliable year-round supply of irrigation water have been growing.

At the same time, year-round water demands are increasing for growing major urban and industrial centers located in the lowlands, as well as demands for water to irrigate golf courses, supply resorts and tourist facilities, and various other types of uses that emerge along with structural shifts in the economy. Moreover, often extremely high land values in expanding riverside urban centers has also brought strong incentives for encroachment into flood plains, drainage channels, canals and river banks, as well as pressure to build roads, bridges and various other structures that can impede water flows. These factors contribute to increased incidence and impacts of flooding during peak flow seasons.

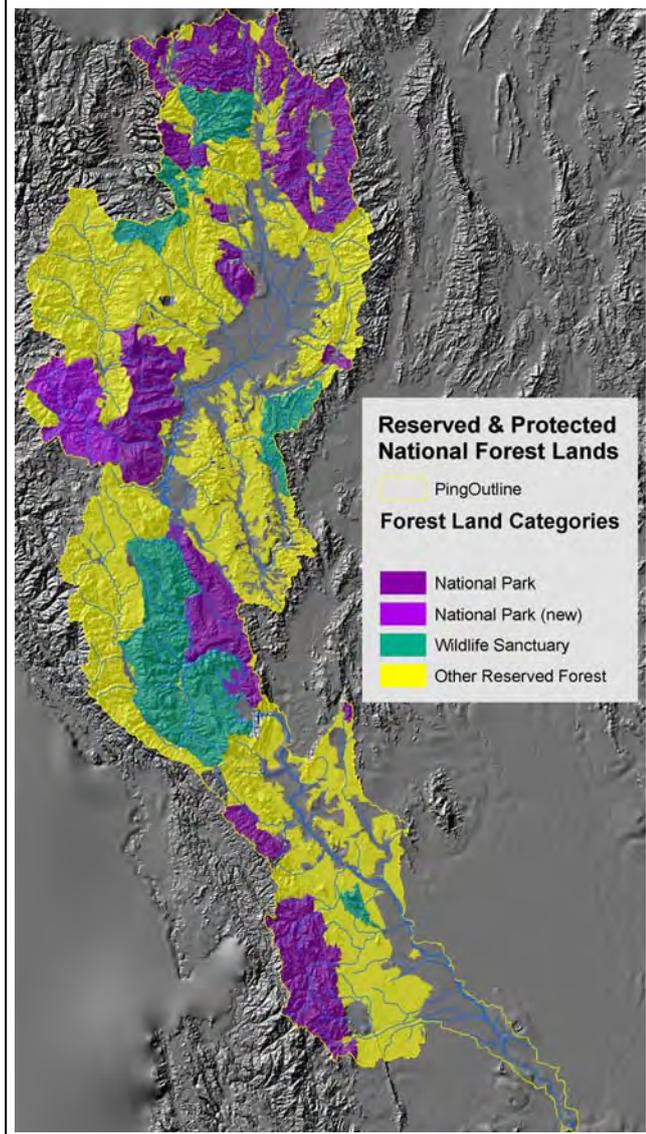
Watershed issues in Northern Thailand, and especially in the Ping River Basin, have long been a focus of concern at national policy levels. The 1959 World Bank report on Thailand associated with the first national development plan recommended protection of forest cover in mountainous

¹ More detailed discussion and data can be found in the watershed consultant’s final report [Thomas 2005].

areas, in order to maintain reliable supplies of water for production areas in the Central Plains. A legal basis was later provided for declaring national forest reserves, national parks and wildlife sanctuaries. During the 1960's and 1970's, forest reserve status was declared over most all Ping Basin areas except flat lowlands in major valleys. Various reserved forest areas then began to be declared protected national parks and wildlife sanctuaries. Figure 1-3 displays a depiction of the extent of protected forest areas and remaining reserved forest lands. There are additional protected areas still in the process of being established. Many of these areas included lands where people were living.

One of the implications of this official land status was that these communities and their lands were not eligible for land tenure documents issued under land title programs. Initially, life in these communities was little changed because forest laws were rarely enforced. As conditions changed, however, migrants from elsewhere moved into local areas and claimed local lands. In cases when local communities did not have enough force to maintain their claims, they could not get support from authorities because their lands were not legally recognized. These problems grew worse as infrastructure was established and opened access to remote communities.

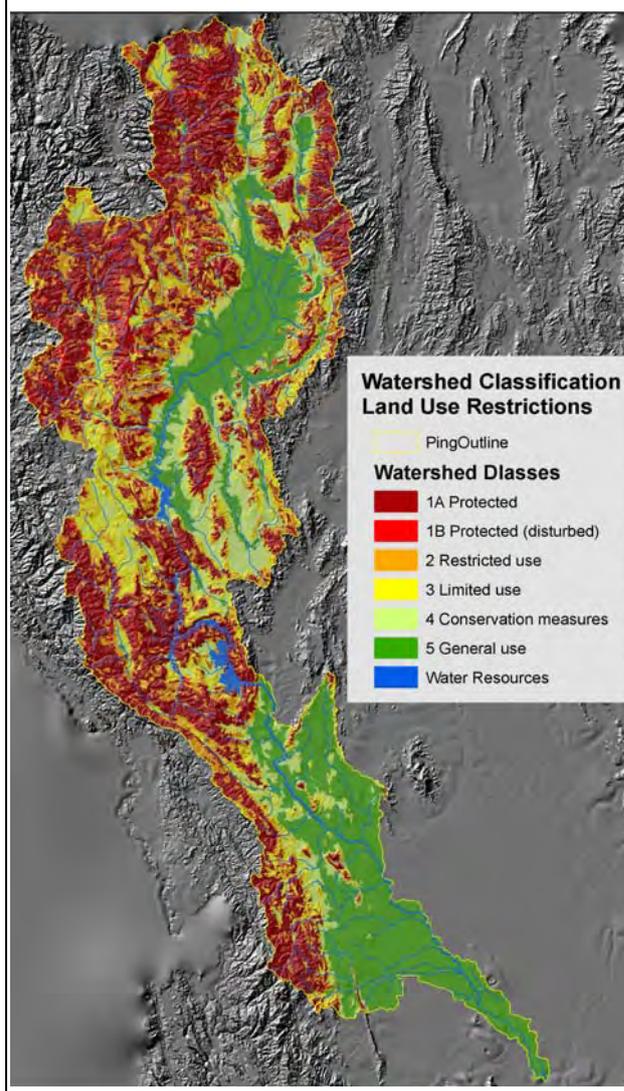
Figure 1-3. State forest lands in the Ping Basin



Then the government began seeing long-established communities as 'encroachers' in national forest reserves and protected areas. Since they had no legal right to reside there, and most had no Thai citizenship, they were lumped together with recent migrants into the area under the general banner of *chao khao* (poorly, but popularly translated as 'hilltribes'). They then became targets for programs ranging from well-intentioned efforts to improve medical care, education or livelihood opportunities, to attempts to bring 'civilization' to their world. Conditions have improved during recent years, and most mountain communities in the Ping Basin (except recent migrants from Myanmar) now have citizenship and are being integrated into local administration and governance systems. The lack of any legal recognition of land holdings and local boundaries, however, remains a major obstacle for local land use management.

Effects of population growth and economic change have brought increasing resource scarcity, incentives for commercial activity, and new stakeholder interest groups that profoundly changed the operating environment of mountain communities. While lowland society has long condemned all forms of mountain shifting cultivation (no matter how well managed), it is the expansion of commercial agriculture that is now seen as the source of serious forest and soil degradation in mountain watersheds today. Economic incentives for expansion of upland field crops has driven

Figure 1-4. Ping Basin watershed classes



expansion of lowland agriculture into reserved forest areas in Lower Ping provinces during the 1970's, as well as later expansion of agro-industrial crops (especially maize) into mountain areas. This was further facilitated by programs that forced conversion of mountain systems to fixed field agriculture that required chemicals to replace agronomic and ecological functions of forest fallow. Meanwhile, success of opium crop substitution and expansion of road access brought market forces and commercial crops into highland areas including sprinkler irrigation and use of agricultural chemicals. Expansion of tourism brought incentives to develop resorts, golf courses, vacation homes, and associated facilities. With no legal boundaries to land holdings in reserved or protected forest lands, there are few tools available to manage rising levels of competition for land resources and resulting changes in land use patterns. And some of newer stakeholders are backed by wealthy and powerful investors, who can sometimes use their connections and wealth to 'purchase' land documents not available to local long-term residents.

Authorities responsible for management and maintenance of reserved and protected forest lands responded to these changes during the mid-1980's by classifying all lands in the

country according to watershed zones meant to serve as a basis for restricting land use practices in critically important areas. Figure 1-4 depicts the outcome of this process for the Ping Basin.

Another source of concern relates to the total proportion of land under forest cover. For more than 50 years, Thai foresters (and more recently environmentalists) have claimed that a minimum of 40 to 50 percent forest cover is necessary for environmental sustainability. Since most lowland areas were converted to non-forest land use long ago (as in Lower Ping provinces), large areas of forest cover must be maintained in mountain areas in order to achieve this overall percentage. This percentage approach is enshrined in national policy, and accepted by environmentalists, and many segments of Thai society.

In addition to forest clearing by lowland communities expanding into upland crop production (as in the Lower Ping Basin), most deforestation is widely believed to be caused by shifting cultivation practiced by mountain communities. And in addition to shifting cultivation and conversion of forest to other types of land use, foresters and environmentalists are now emphasizing qualitative degradation that is occurring inside of areas classified as having forest cover.

But environmental concerns about watershed management are not limited to forest cover and quality, and they are not the exclusive domain of environmental activists and foresters. Public environmental awareness and concern about land use in upper watershed areas has been fed by trends, events and perceived risks that can strongly affect people in their everyday lives, such as:

- Flash floods and landslides. There is strong media coverage of incidents involving local flash floods and landslides resulting in serious agricultural and property damage, and sometimes loss of lives. Sites in the Ping River Basin are included, and they are usually located in upper tributary valleys at the foot of steeply sloping small mountain stream valleys.
- Main channel floods. Damage caused by major floods along the main channel of the Ping River and its major tributaries have also been featured in mass media, and there is a general impression that they are increasing in frequency and magnitude. Recent examples include heavy floods in Chiang Mai City during 2005, and other serious floods are expected during 2006. And due to riverside and floodplain development during their damage is very great.
- Dry season agricultural water shortages. Rising demand for reliable year-round water for downstream irrigated agriculture has increased competition for water during the dry season. Thus, many are looking critically at uses of both land and water at upstream locations.
- Inadequate village and urban water supplies. Efforts to improve water supplies for drinking and domestic use in villages and urban areas provide another element of water resource competition, which reaches a peak during dry seasons and during El Nino years.
- Diminishing ground water supplies. A growing number of communities are investing in shallow and deep wells to provide water for agricultural, domestic and even industrial uses. In some areas, receding groundwater tables that are causing increasing alarm.

Another dimension of public concern relates to water quality, and begins making the link between natural resources and public health more directly. Areas of particular concern include:

- Waste water pollution. A growing volume of wastewater is being generated at village, urban and industrial levels. This includes sewage and domestic wastewater, as well as toxic chemicals and other substances in wastes from various types of business. While waste treatment has expanded, the pace has been inadequate to meet the challenges faced.
- Poisoning by agricultural chemicals. Increasing use of agricultural chemicals is perceived as posing two types of public health threats: applicator poisoning and pollution of waterways. Many perceived both as serious and growing threats.
- Effects of industrial pollution. Waste by-products of industrial processes of various types and scales are also a growing concern. Most concern is with disposal of toxic or disease-laden substances into waterways, but air and noise pollution can be locally important.

This latter point introduces two additional important issues that are also growing concerns of communities and general populations within the Ping River Basin:

- Solid waste disposal. Garbage is currently the main issue here. Rising levels of solid waste are associated with processes of economic integration and lifestyle change, and many communities find it difficult to cope with the problem. Waste reduction programs are still in their infancy.
- Air pollution. Emissions from vehicles and industry are primarily an urban-related problem. Emissions from industry and power plants are quite localized, but emissions from burning are more general. Seasonal burning due to land clearing and agriculture can

be very widespread (in both lowland and mountain areas). Government restrictions are emerging, but enforcement will not be easy.

While these problems are widely associated with a variety of natural resource management and public health issues, agency personnel and their programs often underestimate the importance of the livelihood issues with which they are associated. Many of the practices associated with these problems reflect the lack of viable alternative livelihood opportunities available to the people employing them. Moreover, the poorest components of the population are the ones who most frequently encounter constraints on their access to such alternatives. And at the same time, they are also often among those most vulnerable to the negative impacts that they cause.

It has also become quite clear that approaches of the past have been inadequate to effectively deal with most of these issues. It is increasingly recognized that there are serious gaps in resource governance structures and processes located at levels that are intermediate between national and local community levels. More functional arrangements at these levels are necessary in order to analyze and understand problems that emerge at broader landscape levels, to identify and negotiate viable, practical and equitable means for addressing those problems, and to mobilize the range of human and financial resources required to implement such solutions.

Changing approaches to resource governance

Changes in local governance processes accelerated rapidly after passage of the 1997 national constitution and related reforms. Most all communities in the Ping River Basin now have citizenship and elected local governments at the sub-district (*tambon*) level, even in more remote mountain areas. Tassabans and Tambon Administrative Organizations (TAO) are building their capacity in many areas, including levying and managing local taxes. Mandates are in place for communities and *tambons* to increase their role and participation in natural resource governance, but many *tambon* and *tassaban* governments lack relevant information and skills, and most of their constituents (especially in poorer areas) feel the need to place higher priority for use of scarce funds on providing basic infrastructure and services that are necessary to improve aspects of their livelihoods that are perceived to be of more immediate day-to-day concern. At the same time, many government ministries and their agencies and programs are being reorganized to provide more emphasis at local levels, especially for support of initiatives by local communities. There has also been a surge in efforts by local communities to organize themselves in various forms and formats, including local networks and now alliances at broader levels.

All of these changes are overlaid by growing education, information flow, and public awareness that are increasingly linked with trends at international and global levels. One important dimension of these linkages that is of particular relevance to this project relates to environmental awareness and action. Many environmental problems are now perceived and identified in the Ping River Basin, and local initiatives are being developed and launched to help address them.

- Major problems perceived in lowland areas near main river channels include lack of proper planning, administration and management of fluvial systems, environmentally insensitive river engineering projects, inappropriate development of flood plain areas, pollution of rivers from sewage and agricultural and industrial drainage, encroachment into river corridors and water bodies that narrows rivers and canals and reduces public access, and loss of river landscape quality, aesthetic beauty and cultural legacies. Excessive groundwater extraction is a problem in and around urban areas, as well as in some areas of intensive agriculture.
- In mountain areas, perceived environmental problems focus on deforestation of watershed headlands that is believed to cause loss of biodiversity, accelerated soil erosion, and a range

of impacts on hydrological systems. Highland agriculture and roads are seen as the worst offenders, along with stream pollution by agricultural chemicals, and dry season water use by sprinkler irrigation. Forest fallow agriculture and use of fire are seen as the source of major negative problems in the midlands, along with field crop production expanding into sloping lands above lowland paddies.

Although environmental concerns began to be integrated into agendas of civil society organizations as they emerged in the national political arena 20 years ago, a significant division has taken place during the last decade or so. There still seems to be basic agreement on their opposition to dam construction, logging concessions and large forest plantations, and on issues regarding environmental problems in lowland, urban and industrial areas, and along main river channels. All tend to blame most of these problems on unbridled commercialization, support for export-oriented production, growth of consumerism, and weak planning and regulatory mechanisms easily overridden by the wealthy and powerful. Their division is most apparent, however, in rural, and especially mountain areas:

- On the one hand, ‘deep green’ environmental groups are pushing hard for severe restrictions on midland and highland land use and segregation of local communities from forest lands, including strong efforts to expand national parks and wildlife sanctuaries to cover all class 1 watersheds and remaining natural forest areas in the Kingdom.
- On the other side, ‘populist’ environmental groups are pushing for community management and control of forest lands, based on local traditions, knowledge and practices. They have lobbied hard for passage of community forestry legislation ‘stuck’ in Parliament, and support resistance by communities threatened with displacement by protected area expansion.

Both sides have been very active in the Ping River Basin, and have built alliances that include different factions in academia, government and other sectors of society. Tension has even resulted in open conflict, but few seem to want a repeat of such unproductive and divisive events.

And perhaps most importantly, as local communities are exposed to the arguments and advocacy from both sides, many are listening to both points of view and seeking to identify a ‘middle way’ to improve their overall quality of life and safeguard the legacy of future generations. Many have begun to invest considerable effort to develop ‘peoples organizations’ based largely on informal networks among local communities, and some are developing broader alliances among networks. Astute government agencies and urban-based NGOs have seen the importance of these networks, and have begun seeking ways to support and facilitate their further development.

Moreover, Thailand’s Royal Family have shown exceptional leadership in these issues, and are constantly urging Thai society to develop a common vision of the future that combines improved livelihoods with sustainable natural resource management. This is a very important source of inspiration for efforts seeking unity across government, business, civil society, and local community sectors of society.

It is in this context that river basin management programs and this project have emerged.

2. Project structure, approach and activities

The main objective of the Participatory Watershed Management for the Ping River Basin Project is to improve environmental quality, which will contribute to achieving enhanced livelihood and health outcomes for people in the Ping River Basin, and to replicate experience from project technical assistance, especially participatory models of integrated river basin management to other river basins in the country.

This project was implemented by the Office of Natural Resources and Environmental Policy and Planning (ONEP) under the auspices of the Ministry of Natural Resources and Environment. The ministry received financial assistance from the World Bank under the ASEM II fund to hire technical consultants that included implementation consultants (Panya Consultants Company, Ltd.), persons conducting activities on the participatory watershed management process (Wildlife Fund Thailand), organizers of training to strengthen capacity of local communities in watershed management (Mr. Sanchai Sutipanwihan), and international specialists in watershed management (Dr. David Thomas) and economics (Dr. Dominic Moran), who conducted studies and activities in project areas during February 2005 through August 2006.

The main development objective of this technical assistance team was to be achieved by:

- Developing participatory sub-basin management models providing access to all stakeholders (communities, local governments, non-governmental organizations, and private entrepreneurs) in the decision making process, and demonstrating model implementation;
- Enhancing capacity of stakeholders, especially community groups and local government, to participate in the planning, implementation and monitoring of interventions;
- Strengthening regulatory and incentive mechanism to modify behavior of watershed users;
- Developing a results measurement framework to monitor environmental, health and livelihood outcomes.

The project's activities were conducted in three sub-basins selected for project implementation: the Ping Part 1 Sub-basin (upper Ping) covering part of Chiang Mai province, the Mae Kuang Sub-Basin covering parts of Chiang Mai and Lamphun provinces, and the Ping Part 5 Sub-basin (lower Ping) covering parts of Kamphaengphet and Nakhon Sawan provinces.

In order to achieve its objectives, activities were conducted under four project components, as follows:

2.1. Component 1. Developing sub-basin level participatory watershed management

This component focuses on developing participatory integrated watershed management models related to stakeholders from all sectors in the three pilot sub-basins.

2.1.1. Selecting pilot sub-basins

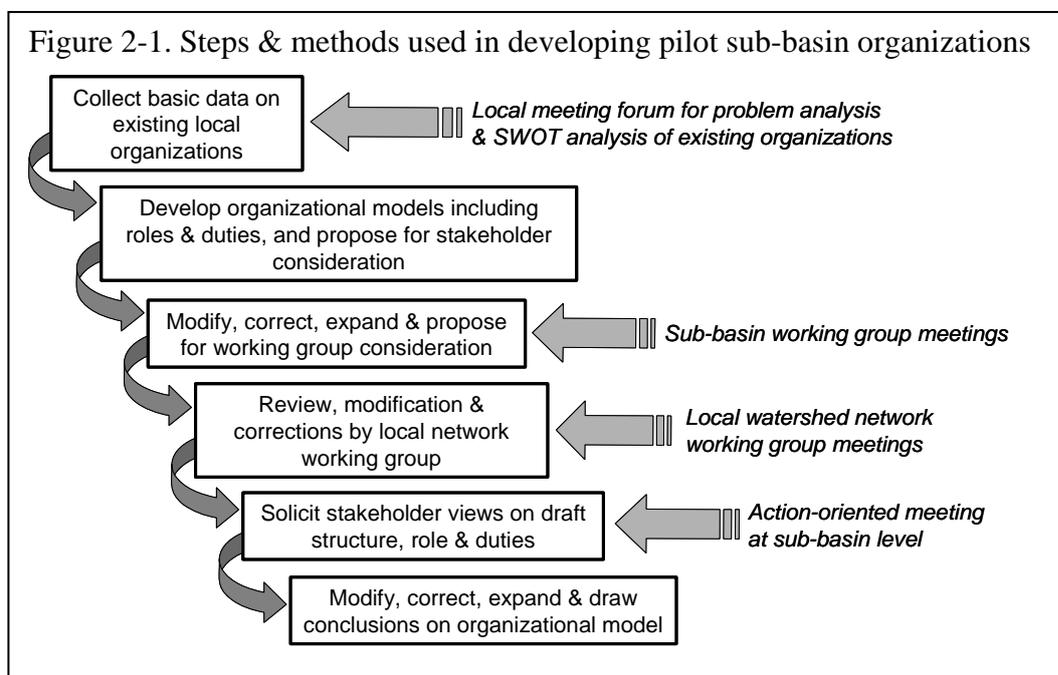
The objective of this project sub-component was to select three pilot sub-basins in which further project activities would be focused. These decisions were to be made using an informed participatory process that considered the range and distribution of conditions in the Ping River Basin, and resulted in selection of a pilot sub-basin to represent conditions found in each of three major sub-divisions: upper Ping sub-basins, middle Ping sub-basins and lower Ping sub-basins. This was intended to sample the range of diversity in major types of conditions found in Ping River sub-basins, in order to increase the potential for application of project results in efforts to

expand support for development of management organizations in other Ping River sub-basins, as well as in other river basins in the country.

In order to help achieve this objective, assessments were made of data from secondary sources, and two systems of technical indicators were developed and merged to provide examples of data analysis that could help inform the decision making process. Selection itself centered on “Water Forum” workshops where representatives from all Ping River sub-basins met to consider the technical assessments and determine the actual selection of pilot sub-basins to represent lower, middle and upper sub-basins of the Ping River Basin.

2.1.2. Developing sub-basin level management organizations

Initial sub-basin working groups were established to guide project implementation in each pilot sub-basin. One major line of activity conducted by these working groups was to consider development of a long-term sub-basin management organization appropriate for the conditions in their sub-basin. Steps in this process (Figure 2-1) included:



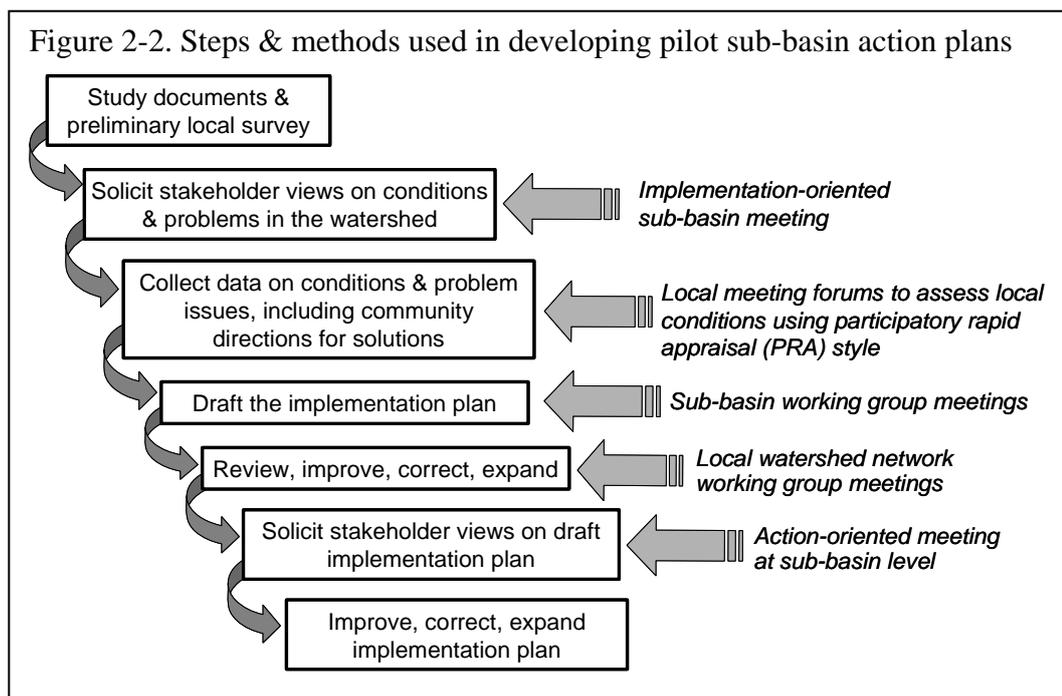
1. As part of project activities in pilot sub-basins, project implementation consultants assisted sub-basin working groups in collecting basic data on existing local organizations in their sub-basin. Information on these organizations was then assessed using SWOT (strengths, weaknesses, opportunities, threats) analysis techniques in association with meetings focused on analysis of problems in each sub-basin.
2. At the same time, the participatory watershed management consultant conducted a review of literature on experience with river basin management organizations, both internationally and within Thailand. This was used as a basis for determining structural considerations that need to be made in configuring sub-basin organizations, and in constructing a set of alternative organizational models for long-term river sub-basin management organizations. This was combined with development of a proposed process through which any of the selected models could be further adapted and developed over the long term
3. Information on existing organizations was combined with information on proposed alternative models of sub-basin organization for consideration by sub-basin working

groups. Project implementation consultants proposed organizational arrangements for each sub-basin based on their assessments of available information. These arrangements were then corrected and modified by sub-basin working groups, resulting in a draft configuration for long-term river sub-basin organizations for each pilot sub-basin.

4. Proposed draft sub-basin management organizations were then submitted for further review, modification and correction by a broader group of local network leaders in each pilot sub-basin.
5. The review was then further expanded through larger meetings of stakeholders convened by local network leaders in each sub-basin to review the structure, roles and duties for the long-term sub-basin management organization.
6. Synthesis of these views provided a basis for further revising and improving proposed organizational arrangements, resulting in conclusions about organizational arrangements seen as most appropriate for each pilot sub-basin.

2.1.3. Developing the action planning process

The second major line of activity conducted by sub-basin working groups was to develop initial action plans for managing natural resources and environment in each pilot sub-basin, including aspects related to livelihoods and public health. This steps involved in this process (Figure 2-2) included:



1. Collection and study of existing planning documents from various sources, and a preliminary rapid survey of local conditions conducted by the project implementation consultant team;
2. Convening an initial implementation-oriented meeting in each pilot sub-basin to solicit stakeholder views on conditions and problems in their sub-basin;
3. Collecting further data in each sub-basin on conditions and problem issues, as well as views on local community directions for solutions to problems, through a series of local meetings with key people using rapid appraisal-type techniques;

4. A series of meetings of sub-basin working groups to review available information as a basis for drafting initial sub-basin action plans for each pilot sub-basin:
5. Initial draft sub-basin action plans were then submitted for further review, modification and improvement by groups convened by local network leaders in each pilot sub-basin.
6. The review was then further expanded through larger meetings of stakeholders convened by local network leaders in each sub-basin to solicit views on revised draft action plans.
7. Synthesis of these views provided a basis for further revising and improving sub-basin implementation plans for each pilot sub-basin.

2.1.4. Creating implementation handbooks

The final sub-component focused on developing implementation handbooks that would be useful in helping further develop capacity of local communities related to sub-basin management. Three types of handbooks were developed to provide information that is easy understand and apply related to: (1) technical aspects of natural resource and environmental management; (2) organizational and planning aspects related to sub-basin management; and (3) methods to help further build consciousness and participation in sub-basin management activities.

2.2. Component 2: Enhancing the capacity of communities in pilot watersheds

The objective of this component was to place emphasis on building capacity of sub-basin stakeholders, especially local governments and community groups. The aim was to provide capacity to participate in action planning processes, including translating plans into action and monitoring their implementation. The process used to achieve this objective had four steps:

2.2.1. Selecting sub-basin facilitators, community facilitators and community members

The project had four main target groups for project capacity building activities:

- **Sub-basin facilitators.** Five local people with interest, knowledge and experience related to natural resource and environmental management issues and activities were selected to become sub-basin facilitators in each pilot under the project. It is anticipated that they will be leaders of activities under future sub-basin management organization programs.
- **Community facilitators.** Fifteen interested and experienced local people were selected to become community facilitators in each sub-basin. They are seen as potential future leaders and resources for implementing sub-basin management activities at more local levels.
- **Community members.** Sub-basin facilitators and community facilitators in each sub-basin selected up to 150 people from major stakeholder groups in the sub-basin to participate in a field study tour-oriented training session conducted for each sub-basin. This experience hopes to encourage participants to be active in sub-basin management activities and programs.
- **Local government leaders.** Since leaders of local governments [tambon administration organizations (TAO) and municipalities (*tessaban*)] are stakeholders that will play a very important role in sub-basin management of natural resources and the environment, the project also provided them with overview training on management of natural resources and the environment at the sub-basin level..

2.2.2. Analyzing community training needs and developing training curricula

Training needs of communities in pilot sub-basins were determined from information derived from several project activities, including: (1) preliminary assessments of Ping Basin conditions;

(2) pilot sub-basin selection workshop; (3) rapid assessments of pilot sub-basin conditions; (4) the first round of sub-basin action planning workshops; (5) mapping of pollution sources in pilot sub-basins; and (6) a special training needs assessment conducted using focus groups.

Development of training curricula began with summarizing identified training needs into three topic areas: (1) subjects related to conducting activities at the level of communities or local sub-watersheds; (2) subjects related to activities that cover wide areas in sub-basins or groups of local sub-watersheds; (3) subjects that emphasize integrated watershed management. Separate curricula for training of each type of target group were then developed according to the characteristics and roles of each group.

2.2.3. Conducting training and strengthening knowledge

Training was organized according to the perceived leadership relationships among the three main target groups for project capacity building activities:

Sub-basin facilitators were considered to be local leaders in sub-basin management activities, so their training was more diverse and detailed than other groups, and was conducted by project consultants and resource persons.

Community facilitators were considered to have enough knowledge and experience that they could provide support for local leaders, collaborate in conducting project activities, and have the capacity to become leaders themselves. Their training at an intermediate level was conducted by sub-basin facilitators with assistance from consultants and resource persons.

Community members were people from stakeholder groups in the general population who have knowledge and experience with real conditions in local areas. Their training was more general, emphasizing study tours and interaction among participants. It was conducted by sub-basin and community facilitators, together with knowledgeable people at study tour sites and specialists.

Training for *local government leaders* was more focused on roles for local governments in sub-basin organization and management, and was conducted by more senior resource persons.

2.3. Component 3: Strengthening regulatory and incentive measures for improved behavior of users in pilot watersheds

The objectives of this project component were: (1) to develop and adapt appropriate incentive mechanisms through participation of pollution source groups to find solutions to pollution in the Ping River Basin; and (2) to reduce impacts due to water pollution on health and water resource conditions of poor people. Project activities are groups under four sub-components:

2.3.1. Classifying and selecting pollution sources

The project initially specified focus on pollution sources in pilot sub-basins as: (1) agricultural pollution sources would be the focus in the upper pilot sub-basin; (2) industrial pollution would be the focus in the middle pilot sub-basin; and (3) pollution from municipalities and communities would be the focus in the lower pilot sub-basin. Based on assessments of pollution sources in the three pilot sub-basins, however, this structure was modified to better reflect actual conditions and major concerns in each sub-basin, and to allow for some cross-sub-basin comparisons.

Initial assessments of pollution sources were based on (1) secondary data on natural resources, socio-economic conditions and pollution; (2) rapid assessments of natural resource and environment conditions conducted by the implementation consultant team; (3) study of pollution in sub-basins through field observation and discussion with local people and relevant agency officials; (4) analysis and evaluation of pollution situations in pilot sub-basins; and (5) collection

of qualitative and quantitative data on pollutants from both secondary sources and field interviews with polluters in pilot sub-basins.

Selection of 20-25 representative pollution sources in each sub-basin was conducted through a process that included: (1) preparation of land use maps for each pilot sub-basin; (2) preliminary checking of pollution sources and their map locations; (3) developing criteria for selecting polluters according to the type of source (municipal/community, industrial, agricultural, livestock); (4) selection based on criteria and operating guidelines; and (5) field examination of selected representative polluters, including location checks, interviews, and requesting their participation in the project.

2.3.2. Reviewing economic incentive measures

Development of incentive mechanisms began by reviewing existing incentive measures for pollution management in Thailand and other countries. This included an overview of the various types of incentive measures, as well as experience with economic incentive measures classified according to their use in relation to municipal, industrial or agricultural wastewaters.

2.3.3. Participatory development of incentive measures

Based on identification of pollution sources in pilot sub-basins and the review of experience with economic incentive measures, a set of economic incentive measures with potential for application in addressing problems found in pilot sub-basins was constructed.

A participatory approach was then employed to help assess the potential for application of these measures in pilot sub-basins. First potential economic measures were matched with types of pollution source sites selected as case studies in each sub-basin. A series of dialogues was then conducted **with** representatives of each category of polluters in the pilot sub-basins. This resulted in information on their views on the importance of, attitudes toward, and feedback about, measures with potential for use in managing water quality in their sub-basins. Recommendations and comments on incentive measures were also collected from academics and relevant agencies.

2.3.4. Implementing incentive measures

Information from the above activities was used to help refine assessments of economic incentive measures, and formulate recommendations on next steps toward implementing priority activities in each sub-basin. This included recommendations about roles of government agencies, development of indicators to monitor and evaluate their use, and guidelines for application of incentive measures in pilot sub-basins.

Although requirements for implementing most of the recommended measures were too complex to allow their establishment and testing during implementation of this project, efforts were made to assist with initial steps toward establishing selected high priority measures. Focus of these efforts was on providing initial training related to high priority incentive measures for major target groups in all three sub-basins. Training was organized and coordinated by staff of the Office of Natural Resources and Environmental Policy and Planning, in collaboration with staff from other key agencies and universities.

2.4. Component 4: Project coordination, results measurement and dissemination

2.4.1. Results measurement framework

This focus of this project sub-component was on developing a results measurement framework to monitor environment, health and livelihood outcomes of sub-basin management programs.

The status of outcome indicators in sub-basin action plans was assessed, and steps proposed for improving outcome indicators, and allocating responsibilities among community groups, local government and external institutions for implementing a results measurement approach.

2.4.2. Training in use of the results measurement framework

This sub-component provides a guidance note on capacity building requirements for the various relevant partners to be involved with further developing and applying the results management framework in association with sub-basin management programs.

2.4.3. Dissemination of project results

Project publications and workshops convened at regional and national levels are the main formal modes for the dissemination of project results to those concerned with developing management organizations elsewhere in the Ping River Basin and other river basins in the country.

Part II. Results of Project Implementation

This part of the report presents a summary review of the results of implementation activities conducted under the project. Results are organized under four chapters, with each chapter covering one of the four major components of the project, as introduced in part I.

3. *Component 1. Developing sub-basin level participatory watershed management models*

The first major component of the project focused on participatory development of sub-basin level action plans and organizational models for long-term participatory management of natural resources and the environment in pilot sub-basins, including elements addressing related livelihood and public health issues. Thus, the first section of this chapter focuses on the process through which the set of three pilot sub-basins were selected. The second section turns to results of efforts under the project to identify long-term organizational models and development processes, and the third section summarizes results of project efforts to facilitate implementation of these processes in each of the three pilot sub-basins.

3.1. Pilot sub-basin selection

The project aimed to select three Ping River sub-basins where intensive pilot projects would develop, establish and test “model” participatory sub-basin management systems. Results from these pilot sub-basins are then to be applied to assist management efforts in other sub-basins in the Ping River Basin.

In order to maximize the potential relevance of results in the pilot basins for application elsewhere in the larger basin, the three pilot sub-basins needed to represent a reasonable range of conditions present in the Ping River Basin. Thus, from a technical point of view, sub-basin selection needed to focus to a large degree on sampling issues, and particularly on sampling those conditions that are likely to affect the nature of sub-basin management organization structure, composition and participatory processes, as well as the range of potential and actual natural resource management problems that need to be addressed.

At the same time, there is substantial variation among sub-basins in the complexity and difficulty of building effective participatory management organization. While the sample needed to avoid selecting only the easiest cases, which would limit their relevance for other sub-basins, it also needed to avoid a focus on only the most difficult cases, which would make it unlikely that significant results could be achieved within the limited time frame of the pilot projects.

3.1.1. Technical criteria and recommended indicators

Although it is an intellectually interesting exercise to imagine innovative conceptual approaches for criteria that could help inform selection of pilot sub-basins (*aka* “micro-watersheds”) under this project, reality called for a far more pragmatic approach. Indeed, the approach needed to be able to build on existing data from readily available secondary sources, to be relatively easy to implement within a very short time horizon, and to be simple enough to be readily communicated to a wide range of stakeholders in the Ping Basin. At the same time, however, it had to be reasonably rigorous, quantitative, logically sound, and able to address major issues that underlie motivation for initiating, conducting and providing funding support for this project.

In order to help articulate an approach that could meet as many of these divergent needs as possible, the project requested the participatory watershed management consultant to develop and evaluate a set of technical criteria and indicators that would be appropriate for selecting three pilot sub-basins. The project implementation consultants then selected elements of this approach to merge with their own ideas, which were then to be presented to representatives from all sub-basins in the Ping River Basin. This was seen as a means for helping to inform the participatory decision making processes through which the pilot sub-basins were to finally be selected.

Major Divisions of the Ping River Basin

Project design documents stated that the three pilot sub-basins should be selected so that “lower, middle and upper” sections of the Ping River Basin are represented by one sub-basin each. This was initially interpreted by the project implementation consultants (and others) to mean southern, middle, and northern portions of the Ping River Basin. After considerable discussion among consultants and ONEP staff, it was agreed that other interpretations would be considered.

The watershed consultant proposed an alternative approach for interpreting the “lower, middle and upper” sub-basin issue that is based on the physical characteristics of sub-basins. Many conditions and issues differ between what have been called “upper tributary watersheds” and their more “lowland-dominated mainstream” counterparts. One of the major characteristics that helps distinguish between these types of watersheds is the relative proportions of the area that is located within different altitude zones. Three major altitudinal zones have commonly been recognized around the region, corresponding to what can be characterized as: lowland, midland and highland zones. Indeed, this distinction is so basic that distinct terms in the Lao language [Lao loum, Lao theung, Lao soung] have been used for generations to refer to the people whose history and culture is most closely associated with each zone.

In northern Thailand, natural forest and ecological conditions vary among similar types of altitude zones, as do the traditional (before about 1960) land use systems and associated ethnic groups. While current land use and settlement patterns often deviate from traditional ones due to a variety of government policy, economic and social forces that have brought change to this region during recent decades, many important characteristics of natural resource and environmental management issues remain closely related to these altitude zones.

It was widely agreed that the “lower” portion of the Ping River Basin should refer to sub-basins located below the Bhumibol Reservoir, since this structure fundamentally affects conditions and issues associated with watershed management in those sub-basins, and because this distinction has been in use since construction of the reservoir was completed in 1964.

But distinctions between “middle” and “upper” portions of the Ping River Basin appear to be more appropriate when made on the basis of the relative distribution of land among altitude zones. Thus, altitudes of 600 and 1,000 m.a.s.l. were used to distinguish lowland, midland, and highland zones in the Ping River Basin, and GIS tools were used to calculate the relative amounts of area in each sub-basin that fall into each of these zones. Simple weights were then used to calculate a “lowland zone area bias score” for each sub-basin, which allowed ranking and classification of sub-basins. Results of this classification process are shown in Figure 3-1 and values of sub-basin scores are included in Figure 3-8.

To help assess the degree to which this altitude zone-based process for establishing sub-basin groupings can really differentiate groups with significantly different characteristics, an analysis of secondary data summarized in Figure 3-2 showed these general patterns:

- Lower Sub-Basins** include a quite balanced 27 percent of the area, 28 percent of the people, and 26 percent of the total income of the Ping River Basin. They have a disproportionately large share, however, of the urban people (39%), industry (53%), and agriculture – both total (50%) and irrigated (48%) – due largely to their high concentrations in two larger sub-basins (Ping part 4, Lower Ping) through which the Ping River’s main channel flows. Perhaps not surprisingly, they also account for disproportionately low shares of the Ping River Basin’s total forest cover (19%), protected conservation forest (19%) and watershed (14%) forest zones, about half of which is located in three smaller tributary sub-basins. Their shares of runoff and soil erosion are roughly proportionate to their share of overall basin area.
- Middle Sub-Basins** account for 31 percent of the area, but 51 percent of the people and 56 percent of the total income of the Ping River Basin. They also have more than half (51%) of the people living in urban areas, and 41 percent of the listed industries in the Ping Basin. These high shares are largely due to concentrations of these features in the Ping part 2 and Mae Kuang sub-basins. The grouping has a roughly area proportionate overall share of agriculture (29% of total, 30% of irrigated), upland ethnic minorities (31%), total forest cover (29%) and total forest lands (28%), but a somewhat lower share of protected conservation (23%) and watershed (22%) forest zones, runoff (26% annual, 25% dry season), and estimated soil erosion (22%).
- Upper Sub-Basins** cover 42% of the area, but include only 21% of the people and 18 percent of the total income of the Ping River Basin. They account for only 9% of urban people and 6% of industry, but they have a share of agriculture (20% of total, 22% of irrigated) proportionate to their share of total population. Their disproportionately large shares are in upland ethnic minority populations (62%), total forest cover (52%), protected conservation (58%) and watershed (64%) forest zones, total state forest lands (49%), runoff (49% of annual, 52% of dry season), and estimated soil erosion (55%). Their spatially proportionate share of degraded forest (39%) is due to a concentration in the Ping part 1 sub-basin, whereas estimated soil erosion is disproportionately high in Mae Tuen and Mae Khan sub-basins.

Thus, this assessment confirmed significant differences among lower, middle and upper sub-basins of the Ping River Basin based on land area distributions among altitude zones.

Figure 3-1a. Lower Sub-Basins

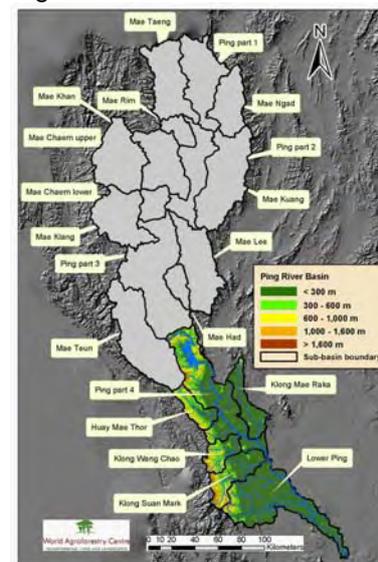


Figure 3-1b. Middle Sub-Basins

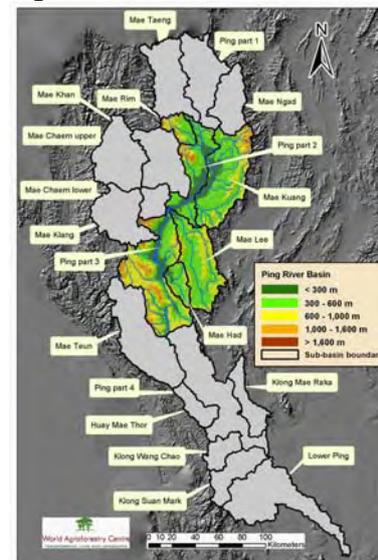


Figure 3-1c. Upper Sub-Basins

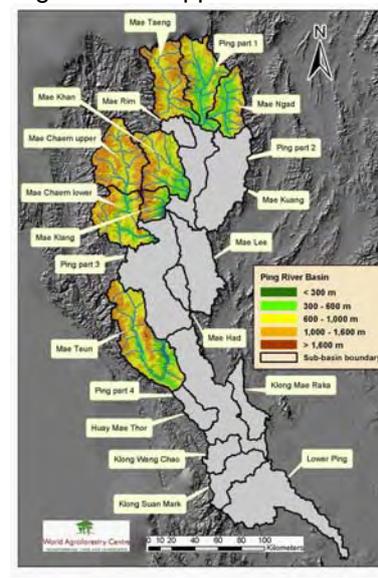


Figure 3-2. Sub-Basin Shares of Major Ping River Basin Characteristics

Sub-Basin	Terrain	Land		People, Settlement, Income						Cropped Area		Forest Cover Area			State Forest Zone Area			Soil Loss	Water		River	
	Lowland Bias	TOTAL AREA	URBAN AREA	POP Density	TOTAL PEOPLE	UPLAND MINORITY	URBAN PEOPLE	NO. OF INDUST	OVERALL INCOME	TOTAL AGRIC	IRRIG AGRIC	SCRUB FOREST	DEGRAD FOREST	TOTAL FOREST	FOREST LANDS	PROTECT FOREST	WS 1AB ZONE	TOTAL EROSION	ANNUAL RUNOFF	DRY SEAS RUNOFF	STREAM LEVEL	
<i>unit:</i>	score	% total		per km2	Percent of total Ping Basin						% total		% total			% total			% total	% total		score
602 Ping part 1	2.24	6	3	40	3	7	1	0	2	4	1	1	21	5	6	11	7	7	6	6	3	
603 Mae Ngad	2.27	4	3	52	3	2	1	0	3	2	4	1	2	4	4	9	5	4	4	4	2	
604 Mae Taeng	1.59	6	3	37	3	6	1	1	2	4	7	0	2	7	7	11	11	6	7	8	2	
608 Mae Khan	1.95	5	5	59	4	8	4	2	4	3	5	9	2	6	6	2	6	7	5	6	2	
610 Mae Klang	1.87	2	1	72	2	5	2	2	2	1	1	3	1	2	2	4	2	3	3	3	2	
612 Mae Chaem upper	1.43	6	1	**	**	**	0	0	**	1	**	0	1	8	7	0	11	**	**	**	2	
613 Mae Chaem lower	1.88	5	1	25	4	21	0	0	4	2	2	1	2	7	6	11	8	13	13	16	2	
615 Mae Teun	1.93	8	1	18	2	12	0	0	2	3	2	0	7	12	10	10	14	15	11	9	2	
Upper Sub-Basins	1.88	42	15	36	21	62	9	6	18	20	22	16	39	52	49	58	64	55	49	52		
605 Ping part 2	2.80	5	26	404	25	4	40	29	32	8	7	8	8	2	2	2	2	2	4	4	3	
606 Mae Rim	2.32	1	2	153	3	2	2	2	3	1	1	0	2	2	2	1	2	4	3	4	2	
607 Mae Kuang	2.63	8	20	108	12	2	7	9	12	10	13	13	9	6	6	3	5	5	9	6	2	
609 Mae Lee	2.59	6	6	71	6	12	1	1	6	5	6	17	6	6	5	1	3	4	3	2	2	
611 Ping part 3	2.33	10	5	23	3	10	1	0	1	4	0	20	3	12	11	14	8	4	5	5	3	
614 Mae Had	2.73	2	1	84	2	1	1	0	2	1	3	1	1	2	2	1	1	3	4	5	2	
Middle Sub-Basins	2.54	31	60	117	51	31	52	41	56	29	30	58	29	29	28	23	22	22	26	25		
616 Ping part 4	2.81	9	8	57	7	1	6	8	6	8	6	20	19	7	7	6	5	6	6	6	3	
617 Huay Mae Thor	2.54	2	0	25	1	1	1	1	1	0	0	0	3	2	2	2	2	2	1	1	2	
618 Klong Wang Chao	2.53	2	0	31	1	2	0	1	1	2	0	0	3	2	2	3	2	2	2	2	2	
619 Klong Mae Raka	2.99	3	1	31	1	0	2	1	1	4	2	4	5	2	2	0	0	1	2	2	2	
620 Klong Suan Mark	2.55	3	1	60	3	0	0	2	2	4	2	0	1	3	4	5	3	4	4	4	2	
621 Lower Ping	2.94	9	14	121	15	4	30	40	15	32	38	2	0	2	5	3	2	7	10	8	3	
Lower Sub-Basins	2.80	27	25	72	28	8	39	53	26	50	48	26	32	19	23	19	14	23	25	23		
Ping Basin	2.33	100	100	70	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

data source: ICRAF ONEP CMU calc Panya MOI Panya Panya Panya Panya Panya Panya Panya CMU CMU CMU KUFF KUFF ONEP Panya Panya Panya CMU

** These data for Mae Chaem cannot be split into upper and lower sub-basins – overall data listed under lower Mae Chaem

Disproportionately large share

Disproportionately small share

Based on this analysis and agreement by leaders from Ping River sub-basins during the “water forum” event (discussed below), the project adopted the groupings of sub-basins shown in Figure 3-1 as the definition of “lower”, “middle” and “upper” portions of the Ping River Basin for activities conducted under this project.

Previous priority rankings of Ping sub-basins

Project implementation consultants and the project watershed management consultant reviewed several other recent efforts to assess conditions in the Ping River Basin and rank sub-basins according to priorities used in their studies. Of particular relevance were: (1) a study commissioned by the Department of Environmental Quality Promotion; (2) a study conducted by Chiang Mai University for the Office of Natural Resource and Environmental Policy and Planning, and (3) a study conducted by Panya Consultants for the Department of Water Resources.

The scope of these studies and the approaches they used for assessing, scoring and ranking sub-basins were considered and compared with processes developed under this project. Results of priority rankings from those studies for sub-basins according to the three groups used under this project are shown in Figure 3-3.

Figure 3-3. Previous rankings of Ping sub-basins			
Sub-basin	DEQP	CMU	DWR
<u>Upper sub-basins</u>			
Ping Part 1 (upper Ping)	2	1	3
Mae Ngad	7	3	2
Mae Taeng	1	2	5
Mae Khan	4	5	1
Mae Klang	5	7	4
Mae Chaem – upper	3	6	7
Mae Chaem – lower	6	4	7
Mae Teun	8	8	6
<u>Middle sub-basins</u>			
Ping Part 2	1	1	2
Mae Rim	4	2	4
Mae Kuang	2	3	1
Mae Li	3	5	3
Ping Part 3	5	4	6
Mae Had	6	6	5
<u>Lower sub-basins</u>			
Ping Part 4	5	1	2
Huay Mae Thor	2	4	6
Klong Wang Chao	1	3	4
Klong Mae Raka	3	5	3
Klong Suan Mark	4	2	5
Ping Part 5 (lower Ping)	6	6	1
DEQP – Department of Environmental Quality Promotion			
CMU – Chiang Mai University			
DWR – Department of Water Resources			

Criteria & indicators from watershed management consultant

The overall structure of the criteria and indicators proposed and evaluated by the watershed management consultant are shown in Figure 3-4. The first criterion was directed at how sub-basins should be placed into lower, middle, and upper river basin groups, as discussed in the section above. Three additional major criteria are proposed, and each is broken down into sub-criteria that focus on important elements that can be measured. Specific indicators were then developed for each sub-criterion, taking into consideration data that was available for the project. A brief background for each of these three major criteria can be summarized as:

1. **Severity of natural resource issues**. Biophysical dimensions of perceived natural resource degradation in the Ping River Basin are a central focus of concern regarding the sustainable provision of important environmental services, and especially biodiversity and watershed functions. In addition to their implications for maintenance of biodiversity and general ecosystem ‘health’, conservationists are linking deforestation and deterioration of forest quality with decreased infiltration of rainfall into natural soil water and groundwater storage reservoirs, and thus disruption of seasonal stream flows and increased downstream flooding and dry season water scarcity. They also believe changes in soil properties associated with deforestation and agriculture in sloping lands are resulting in increased soil erosion and

Figure 3-4. Sub-basin selection criteria & sub-criteria proposed by watershed consultant.

- 1 **Groupings of Middle and Upper Sub-Basins** within the Ping River Basin should be made according to the relative bias in distribution of land area among lowland, midland and highland zones.
- 2 **NATURAL RESOURCE ISSUES.** Selected sub-basins should include conditions where issues will likely arise related to forest and land degradation, natural hazards, and water use.
 - 2.1 **DEGRADATION.** Priority should be assigned to sub-basins where conversion of forest to agriculture and other uses is substantial, and where deterioration of remaining forest and soil erosion rates are relatively high.
 - 2.2 **HAZARDS.** Priority should be assigned to sub-basins where conditions indicate there are high risks of flooding and/or landslides.
 - 2.3 **WATER USE.** Priority should be assigned to sub-basins where high proportions of irrigated agriculture are associated with low dry season stream flow and high rates of groundwater use. Highest priority should apply in selecting the middle sub-basin.
- 3 **SOCIO-ECONOMIC ISSUES.** Selected sub-basins should include areas where poverty and health problems are relatively high, where land use is restricted and conflict is likely, and areas where upland minorities or urban populations should play significant roles.
 - 3.1 **POVERTY.** Priority should be given to areas with relatively low incomes and overall conditions are indicative of economic and social difficulties.
 - 3.2 **LAND USE COMPETITION.** Priority should be given to areas where legal restrictions constrain local land-based livelihoods, and where agriculture is occurring in conflict with those restrictions. This priority should be highest for the upper sub-basin, but some presence would also be desirable in other sub-basins.
 - 3.3 **MINORITY & URBAN POPULATIONS.** The upper sub-basin should give priority to areas with strong upland ethnic minority presence, and other sub-basins should give priority to inclusion of densely settled areas.
 - 3.4 **HEALTH.** Priority should be given to sub-basins with relatively high levels of health problems associated with clean water supply, waste management, and use of toxic chemicals.
- 4 **SOCIAL ORGANIZATION CAPACITY & SIMPLICITY.** Selected sub-basins should have reasonable levels of local organizational capacities and relevant skills, but avoid areas where excessive administrative complexity may prevent adequate testing of model approaches within the project timeframe.
 - 4.1 **CAPACITY.** Priority should be given to sub-basins where local communities have high levels of participation in community activities, where they are experienced with local group organizations, and where they are actively involved in community learning processes. A reasonable mix of capacities of supporting local (sub-district) government should be included
 - 4.2 **SPECIALIST KNOWLEDGE.** Priority should be given to sub-basins with relatively widespread presence of relevant local knowledge specialists, as well as a strong cadre of local people who have received relevant training from outside organizations and agencies.
 - 4.3 **SIMPLICITY.** Priority should be given to sub-basins with relatively lower requirements for coordination across administrative units

landslides, with especially serious consequences in local sub-watersheds, but also in contributing to siltation of large reservoirs and water infrastructure at more distant downstream locations. Increased use of water for intensive agriculture and other human activities at various positions in watershed landscapes are seen as further exacerbating water scarcity problems by contributing to low dry season stream flows and groundwater depletion. Sub-basin management organizations will need to develop effective means for addressing these issues and concerns. Thus, three sub-criteria and 8 indicators were developed, evaluated, and summarized on a scale of 0 to 3, giving the final results shown in Figure 3-5.

2. **Severity of socio-economic issues.** Many social and economic aspects of natural resource management, use and deterioration in the Ping River Basin are related to equitable social distribution of benefits and costs of natural resource use and management. Rural poverty is widely believed to be both a cause and an effect of resource degradation, and reduction of rural poverty is a clear objective of government policies and of this project. But rural poverty is linked with inequitable access to resources and social and financial services, and especially with secure access to use of the land upon which their livelihoods depend.

Figure 3-5. Natural Resource Indicator Scoring for Ping Sub-Basins

Sub-Basin	2. Overall Natural Resource Issues		2.1. Degradation			2.2. Hazards		2.3. Water Use			
	Score	weighted total	2.1.1.	2.1.2.	2.1.3.	2.2.1.	2.2.2.	2.3.1.	2.3.2.	2.3.3.	
			Forest Conversion Score	Forest Deterior Score	Soil Erosion Score	Flooding Risk Score	Landslide Risk Score	Agric Irrigation Score	Groundwater Use Score	Low Dry Season Flow Score	
			source:	CMU	CMU	Panya	Panya	<<N/A>>	Panya	Panya	Panya
Upper Sub-Basins			weight:	0.4	0.5	1.8		-	1.8	0.1	1.4
				1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0
602 Ping part 1	2.5	8		0.6	2.4	1.6	1.4	-	0.7	0.0	1.4
603 Mae Ngad	2.7	8		0.6	0.3	1.6	1.2	-	2.3	0.1	2.2
604 Mae Taeng	3.0	9		0.7	0.2	1.4	2.8	-	2.7	0.0	0.8
608 Mae Khan	2.8	8		0.5	0.4	1.8	1.4	-	3.0	0.5	0.7
610 Mae Klang	1.9	7		0.5	0.5	2.3	1.6	-	1.5	0.0	1.0
612 Mae Chaem upper	*	*		*	*	*	*	-	*	*	*
613 Mae Chaem lower	0.0	6		0.3	0.1	1.6	1.6	-	0.9	0.0	0.9
615 Mae Teun	2.2	8		0.2	0.4	2.3	1.3	-	1.1	0.0	2.4
Middle Sub-Basins			weight:	1.0	0.9	1.0		-	1.9	1.3	1.8
				1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0
605 Ping part 2	3.0	13		2.0	3.0	0.7	1.5	-	1.5	2.2	1.9
606 Mae Rim	1.2	8		0.6	0.6	3.0	1.1	-	1.7	0.1	0.8
607 Mae Kuang	2.9	13		1.3	1.1	0.9	0.8	-	2.5	3.0	3.0
609 Mae Lee	2.1	10		0.8	1.1	0.9	2.2	-	1.7	1.0	2.5
611 Ping part 3	0.0	5		0.5	0.4	0.6	0.6	-	1.1	0.2	1.2
614 Mae Had	0.8	7		0.8	0.6	2.8	0.9	-	1.6	0.1	0.0
Lower Sub-Basins			weight:	1.6	1.2	1.2		-	1.6	0.4	1.9
				1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0
616 Ping part 4	1.0	8		1.1	2.0	1.0	1.0	-	1.2	0.0	1.7
617 Huay Mae Thor	0.0	6		0.2	0.9	1.7	1.0	-	0.3	0.1	2.1
618 Klong Wang Chao	0.6	7		0.7	0.8	1.7	3.0	-	0.2	0.0	0.9
619 Klong Mae Raka	0.8	8		1.3	1.7	0.7	1.1	-	0.7	0.0	2.2
620 Klong Suan Mark	0.4	7		1.1	0.3	1.7	1.4	-	0.7	0.1	1.8
621 Lower Ping	3.0	12		3.0	0.3	1.1	2.2	-	2.0	0.6	2.3
Ping Basin				0.9	0.7	1.4	1.5	-	1.7	0.6	1.6

* combined with lower Mae Chaem data

At the same time, there is growing global recognition that the natural resource base is limited. Thus, sustainable provision of environmental services upon which societies depend requires careful management and maintenance of ecosystem functions that are threatened as humans seek to increase the immediate benefits they can derive from natural resources. Different elements of society are developing different visions for the future, and competition is growing among the claims being made on natural resources. This competition is reflected in political, legal and institutional arrangements to facilitate, regulate or restrict how resources may be used.

If sub-basin management organizations are to become a means for improving both the equity and sustainability of natural resource use and conservation, they must include all elements of society among whom costs and benefits of improved management will be distributed. This means that ethnic minorities, who have often been marginalized, ignored, or blamed in the past, must be brought into these processes, especially in upper sub-basins and areas where their activities are believed to have impacts on natural resource management. It also means that densely settled cities and urbanizing areas need to play an important role, especially in middle and lower sub-basins where they are most prominent.

Another important objective of improved river basin management is to improve the health and well-being of local people and communities. Links between public health and environmental issues is an area of growing interest, but much more systematic data from monitoring key aspects of public health and environmental quality are needed.

While socio-economic issues such as these are a major concern under this project, there are still many constraints on the content and form of available data. It is also an area where many issues are very complex. Although organizations like the National Economic and Social Development Board (NESDB) are developing quality of life indicators, such data does not yet appear to be available in a format that would allow aggregation at a sub-basin level.

Figure 3-6. Socio-economic Indicator Scoring for Ping Sub-Basins

3. Overall Social & Economic Issues			3.1. Poverty		3.2. Competition		3.3. Minorities & Urban		3.4. Health		
			Score	weighted total	3.1.1. Low Income Score	3.1.2. Village Low Development Score	3.2.1. Land Use Restriction Score	3.2.2. Agricultural Conflict Score	3.3.1. Upland Ethnicity Score	3.3.2. Population Density Score	3.4.1. Water Supply Score
Sub-Basin			source: MCC / Panya	MCC - CDD	KUFF/onep	Panya/onep	ONEP, Panya	Panya	กขช.2ก / onep	กขช.2ก / onep	กขช.2ก / onep
Upper Sub-Basins			1.6	1.433	2.8	2.3	0.8	0.3	1.4	1.6	0.6
weight:			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
602 Ping part 1	3.0	15	0.8	2.4	2.6	2.2	0.8	0.3	2.8	2.2	0.9
603 Mae Ngad	0.8	9	1.2	0.6	2.8	1.4	0.3	0.4	2.1	0.3	0.5
604 Mae Taeng	1.8	12	1.4	2.2	3.0	2.8	0.7	0.3	1.3	2.2	0.1
608 Mae Khan	0.0	6	1.0	0.4	2.3	1.5	0.5	0.4	0.3	1.6	0.4
610 Mae Klang	2.3	13	2.2	3.0	2.8	2.6	0.8	0.5	1.2	3.0	0.4
612 Mae Chaem upper	*	*	*	*	*	*	*	*	*	*	*
613 Mae Chaem lower	2.7	14	3.0	1.8	2.9	3.0	1.5	0.2	1.9	2.5	0.6
615 Mae Teun	1.6	11	2.8	0.0	2.9	3.0	1.3	0.1	0.8	1.6	0.9
Middle Sub-Basins			0.6	0.4	1.8	0.7	0.2	0.8	0.8	1.7	0.4
weight:			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
605 Ping part 2	0.8	6	0.4	0.0	1.0	0.4	0.0	3.0	0.7	1.6	0.6
606 Mae Rim	2.0	8	0.6	1.2	2.3	1.4	0.0	1.2	1.4	1.9	0.3
607 Mae Kuang	0.0	4	0.5	0.1	1.6	0.4	0.0	0.8	0.6	1.6	0.1
609 Mae Lee	1.5	7	1.3	1.2	1.6	0.8	0.5	0.5	1.3	2.2	0.1
611 Ping part 3	3.0	10	1.1	1.8	2.3	1.1	3.0	0.0	0.8	1.6	0.7
614 Mae Had	1.4	7	0.0	2.2	2.0	1.6	0.1	0.6	0.4	1.8	2.0
Lower Sub-Basins			1.5	0.0	1.6	1.0	0.1	0.5	1.7	0.9	2.0
weight:			1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
616 Ping part 4	0.6	6	2.1		1.7	0.9	0.1	0.4	0.8	0.8	1.1
617 Huay Mae Thor	0.0	5	0.8		2.2	1.5	0.2	0.2	0.0	0.7	0.0
618 Klong Wang Chao	3.0	10	2.4		2.6	2.2	0.9	0.2	1.5	0.0	0.2
619 Klong Mae Raka	1.6	8	2.7		1.2	1.0	0.0	0.2	2.4	0.8	0.0
620 Klong Suan Mark	2.5	9	1.5		2.5	1.6	0.1	0.4	3.0	0.7	0.8
621 Lower Ping	0.6	6	1.1		1.0	0.8	0.1	0.9	2.0	1.1	3.0
Ping Basin											

* combined with lower Mae Chaem data

Thus, a quite simple and focused criterion was proposed for the sub-basin selection process. Since socio-economic factors would be further studied in pilot sub-basins, basins, those findings would then be incorporated into learning processes under the project. The four sub-criteria and nine indicators proposed and evaluated for sub-basin selection were summarized on a scale of 0 to 3, as shown in Figure 3-6.

- Local capacity & administrative complexity.** While it was very important to have representation of conditions under which a reasonable range of natural resource and socio-economic issues are likely to be key elements of pilot sub-basin management activities, it was also important to consider elements affecting the likelihood of significant progress being made under the project. We also needed to consider how other sub-basins will view the relevance of project activities in terms of the capacity of their local governments and communities to provide essential support for sub-basin activities. Thus, three sub-criteria and seven indicators were proposed and evaluated to assess key elements of these issues on which data was available, and summarized on a scale of 0 to 3 as shown in Figure 3-7.

In addition to the summary scores for each indicator, the above summary tables for each major criterion include lines where relative “weights” can be assigned to each indicator for each of the three groups of sub-basins. This allows different levels of importance or priority to be applied to different sub-criteria and indicators, in order to reflect the role that they are seen to have in the decision-making process. Thus, weights can be used as a transparent method for reflecting expert opinion, they can be derived through stakeholder consensus, or they can be used to assess how sensitive results are to changes in any particular indicators or sub-criteria.

In order to derive an overall ranking of sub-basins for the selection process, all three major criteria are combined in an overall summary table, as shown in Figure 3-8. The calculations shown in this table include weights that are assigned to various indicators according to reasoning and assumptions that are detailed in the watershed consultant’s final report.

The methods used for calculating scores for each indicator in this system are completely transparent, with details on calculations and data sources presented in the watershed consultant’s

final report, which is available in both English and Thai languages. The calculation tables are all integrated into a spreadsheet system version, so that if any changes to importance weights are made, all associated values are automatically recalculated.

Figure 3-7. Organization & Administration Indicator Scoring for Ping Sub-Basins

Sub-Basin	4. Overall Local Org Capacity & Simplicity		source:	4.1. Capacity				4.2. Specialist Knowledge		4.3. Simplicity
	Score	weighted total		4.1.1.	4.1.2.	4.1.3.	4.1.4.	4.2.1.	4.2.2.	4.3.1.
				Loc Govt Capacity Score	Community Participation Score	Group Organization Score	Community Learning Score	Local Specialists Score	Project-related Training Score	Admin Simplicity Score
				MOI / onep	MCC - CDD	MCC - CDD	MCC - CDD	กพร.2ก / onep	กพร.2ก / onep	Panya, ONEP
Upper Sub-Basins				0.5	1.9	1.9	1.7	2.3	2.1	2.6
<i>weight:</i>				1.0	1.0	1.0	1.0	1.0	1.0	1.0
602 Ping part 1	1.5	13		1.1	0.0	1.3	2.7	2.9	2.4	2.5
603 Mae Ngad	2.0	14		0.0	1.6	2.4	1.9	2.2	3.0	2.8
604 Mae Taeng	0.7	11		0.2	2.7	0.3	1.9	2.9	0.8	2.4
608 Mae Khan	3.0	16		1.2	3.0	3.0	1.6	2.6	2.5	2.2
610 Mae Klang	0.0	10		1.7	1.7	0.0	0.0	2.9	0.3	3.0
612 Mae Chaem upper	*	*		*	*	*	*	*	*	*
613 Mae Chaem lower	1.2	12		0.4	1.9	2.1	1.4	2.1	2.1	2.3
615 Mae Teun	0.5	11		0.0	1.9	1.9	1.4	0.3	2.5	2.7
Middle Sub-Basins				1.1	2.3	2.0	1.3	2.1	1.6	1.8
<i>weight:</i>				1.0	1.0	1.0	1.0	1.0	1.0	1.0
605 Ping part 2	1.3	12		3.0	2.5	2.0	1.2	2.0	1.2	0.0
606 Mae Rim	2.9	14		0.2	1.9	1.6	3.0	3.0	1.8	2.7
607 Mae Kuang	2.1	13		1.8	2.1	2.1	1.5	2.4	2.3	0.6
609 Mae Lee	0.0	10		0.5	2.2	1.9	0.4	1.9	0.5	2.5
611 Ping part 3	0.6	11		0.2	3.0	1.4	1.3	1.3	1.4	2.2
614 Mae Had	3.0	14		0.2	3.0	2.0	1.1	2.3	2.8	3.0
Lower Sub-Basins				0.8				0.7	1.5	2.4
<i>weight:</i>				1.0	0.0	0.0	0.0	1.0	1.0	1.0
616 Ping part 4	1.5	5		0.8				1.1	1.4	1.8
617 Huay Mae Thor	3.0	7		0.1				2.8	0.6	3.0
618 Klong Wang Chao	2.5	6		0.2				0.7	2.2	2.9
619 Klong Mae Raka	0.5	4		0.0				1.0	0.4	2.7
620 Klong Suan Mark	0.0	4		0.8				0.0	0.0	2.8
621 Lower Ping	1.6	5		1.5				0.5	2.0	1.2
Ping Basin				0.8				1.8	1.7	2.3

* combined with lower Mae Chaem data

Figure 3-8. Overall summary of weighted sub-basin scores by watershed consultant

Sub-Basin	Summary Overall Weighted Scores		1. Grouping Lowland Zone Bias Score	2. Overall Natural Resource Issues		3. Overall Social & Economic Issues		4. Overall Local Org Capacity & Simplicity	
	Score	weighted total		Score	weighted total	Score	weighted total	Score	weighted total
Upper Sub-Basins									
			1.88	<i>weight:</i>		3.00		1.50	
602 Ping part 1	3.0	119	2.24	3.0	13	2.3	24	0.6	10
603 Mae Ngad	1.9	96	2.27	1.9	11	0.7	17	1.7	12
604 Mae Taeng	1.9	109	1.59	1.9	11	1.9	23	0.5	10
608 Mae Khan	2.1	89	1.95	2.1	11	0.0	14	3.0	13
610 Mae Klang	1.9	114	1.87	1.9	11	2.3	24	0.0	9
612 Mae Chaem upper	*	*	1.43	*	*	*	*	*	*
613 Mae Chaem lower	2.8	117	1.88	0.0	8	3.0	27	0.7	10
615 Mae Teun	2.4	114	1.93	1.9	11	2.2	24	0.9	10
Middle Sub-Basins									
			2.54	<i>weight:</i>		3.00		1.50	
605 Ping part 2	3.0	95	2.80	2.4	18	3.0	12	0.0	9
606 Mae Rim	1.4	78	2.32	0.8	11	2.5	11	2.9	12
607 Mae Kuang	2.0	84	2.63	3.0	21	0.0	6	0.2	9
609 Mae Lee	1.8	82	2.59	1.8	15	1.7	10	1.2	10
611 Ping part 3	0.3	67	2.33	0.0	7	2.7	11	1.4	10
614 Mae Had	0.0	64	2.73	0.3	8	1.1	8	3.0	12
Lower Sub-Basins									
			2.80	<i>weight:</i>		3.00		1.50	
616 Ping part 4	1.5	58	2.81	0.9	11	1.1	8	1.0	3
617 Huay Mae Thor	0.0	44	2.54	0.1	9	0.0	6	0.7	3
618 Klong Wang Chao	2.1	64	2.53	0.0	8	3.0	13	1.0	3
619 Klong Mae Raka	2.0	62	2.99	0.8	11	2.1	11	0.0	3
620 Klong Suan Mark	2.1	63	2.55	0.4	9	2.3	11	3.0	4
621 Lower Ping	3.0	72	2.94	3.0	17	1.0	8	2.4	4
Ping Basin			2.33						

* combined with lower Mae Chaem data

Criteria from project implementation consultant team

The project implementation consultant team has a substantial database on characteristics of the Ping River Basin that reflects their history of work with various agencies and organizations. While the data is particularly rich in relation to water resources, a range of other types of data is also included. Indeed several of the indicators proposed by the watershed management consultant were evaluated using data from the implementation consultant's database.

In consultation with ONEP staff, project implementation consultants reviewed the criteria and indicator systems proposed by the watershed management consultant together with their own approach for developing criteria and indications for pilot sub-basin selection. While they felt the overall system proposed by the watershed management consultant was too complicated and difficult to present to Ping River Basin stakeholders, they did adopt the sub-basin grouping approach and several individual indicators. These were then integrated with some of their own data and indicators into a simplified system as shown in Figure 3-9.

Figure 3-9. Simplified criteria & indicators for pilot sub-basin selection

		Level Classification			(weight) Max Score	Weighted Level Scores		
		High	Medium	Low		High	Medium	Low
Natural Resources								
Forest Cover	percent of total area	< 60 %	60-70 %	70-80 %	15	15	10	5
Agriculture Area	percent of total area	> 30 %	10-30 %	< 10 %	10	10	6.6	3.3
Water Resources								
Runoff	(litres/second/km2)	< 8.5	8.5 - 10.0	> 10.0	5	5	3.4	1.7
Drought	dry season / annual flow	< 0.20	0.20 - 0.25	> 0.25	5	5	3.4	1.7
Flooding	(QMAX-QMIN)/QMEAN	> 2.75	1.50 - 2.75	< 1.50	5	5	3.4	1.7
Quality	quality level	>Level 4	Level 3	<Level 2	5	5	3.4	1.7
Social status								
population density	persons / km2	> 100	50 - 100	< 50	20	20	13.4	6.7
ethnic groups	% highland minorities	>30%	10-30%	<10%	5	5	3.4	1.7
Economic status								
conflicting land use	agriculture in forest lands	>100 points	50-100 points	<30 points	5	5	3.4	1.7
income	Baht / person / year	< 10,000	10,000 - 12,000	> 12,000	20	20	13.4	6.7
Potential of local government units								
	Potential level	>80 points	40-80 points	<40 points	5	5	3.4	1.7
					100			

Under this approach, data values for each indicator were first classified into high, medium or low categories. They were then converted to a score value using a maximum score for each indicator that reflected their perceptions of the relative importance it should be assigned in the decision making process. Weights were the same for sub-basins without regard for their being in lower, middle and upper sub-basin groupings.

Score values for each indicator were then calculated using this approach, based on data for each sub-basin. Results of score calculations are shown in Figure 3-10. Total score values were then used to rank sub-basins within each of the lower, middle and upper groupings of sub-basins within the Ping River Basin.

Figure 3-10. Sub-basin technical indicator scores for rankings by project implementation consultants

Sub-basin	Variable											Total Score
	Natural Resources						Social		Economic		Potential of local govt units	
	Forest cover	Agriculture area	Water resources				Population density	Ethnic minorities	Conflict in land use	Income	Potential level	
			Runoff	Drought	Flooding	Quality						
forest area / sub-basin area	agric area / sub-basin area	amt/time/area	dry seas/annual	(Q _{MAX} -Q _{MIN})/Q _{MEAN}	Level	persons / km ²	% highland minorities	agriculture in forest lands	Baht / person / yr			
<i>Maximum score:</i>	15	10	5	5	5	5	20	5	5	20	5	100
Upper Ping												
Ping part 1	5.0	6.6	3.4	1.7	3.4	1.7	6.7	3.4	3.4	20.0	3.4	58.7
Mae Ngad	5.0	6.6	5.0	3.4	3.4	1.7	6.7	1.7	3.4	6.7	1.7	45.3
Mae Taeng	5.0	6.6	3.4	1.7	5.0	1.7	6.7	3.4	5.0	13.4	1.7	53.6
Mae Khan	5.0	6.6	5.0	1.7	3.4	1.7	13.4	3.4	3.4	6.7	3.4	53.7
Mae Klang	5.0	6.6	1.7	1.7	3.4	1.7	13.4	3.4	3.4	6.7	3.4	50.4
Mae Chaem (combined)	5.0	3.3	3.4	1.7	3.4	1.7	6.7	5.0	5.0	6.7	1.7	43.6
Mae Teun	5.0	3.3	1.7	3.4	3.4	1.7	6.7	5.0	5.0	6.7	1.7	43.6
Middle Ping												
Ping part 2	15.0	10.0	3.4	1.7	3.4	3.4	20.0	1.7	1.7	6.7	5.0	72.0
Mae Rim	5.0	6.6	1.7	1.7	1.7	1.7	20.0	1.7	3.4	6.7	1.7	51.9
Mae Kuang	15.0	6.6	1.7	3.4	1.7	5.0	20.0	1.7	1.7	6.7	3.4	66.9
Mae Li	10.0	10.0	5.0	3.4	3.4	1.7	13.4	3.4	1.7	6.7	1.7	60.4
Ping part 3	5.0	3.3	5.0	1.7	1.7	3.4	6.7	5.0	1.7	6.7	1.7	41.9
Mae Had	10.0	6.6	5.0	1.7	1.7	1.7	6.7	1.7	3.4	6.7	1.7	46.9
Lower Ping												
Ping part 4	15.0	6.6	5.0	3.4	1.7	3.4	13.4	1.7	1.7	13.4	3.4	68.7
Huay Mae Thor	5.0	3.3	5.0	3.4	1.7	1.7	6.7	1.7	3.4	6.7	1.7	40.3
Klong Wang Chao	5.0	6.6	5.0	1.7	5.0	1.7	6.7	3.4	5.0	13.4	1.7	55.2
Klong Mae Raka	10.0	10.0	5.0	3.4	3.4	1.7	6.7	1.7	3.4	20.0	1.7	67.0
Klong Suan Mark	10.0	6.6	1.7	3.4	3.4	1.7	13.4	1.7	3.4	6.7	3.4	55.4
Ping part 5	15.0	10.0	3.4	3.4	5.0	3.4	20.0	1.7	1.7	6.7	3.4	73.7

Results from the initial technical assessment conducted by the participatory watershed management consultant and the simplified composite approach developed by the project implementation consultant team are compared in Figure 3-11.

Priorities assigned to sub-basins in the middle Ping are very similar under both assessment approaches. While first priority sub-basins are also the same for upper and lower groups of sub-basins, there are some quite significant differences in rankings of other sub-basins in these groups. Many of these differences in rankings between the two technical assessment approaches appear to relate to the high importance weight given in the simplified approach to population density, combined with lower importance given to ethnic minority and land use conflict indicators.

Figure 3-11. Sub-basin priorities from technical assessments

	Sub-basin name	Watershed consultant ranking	Implementation consultants ranking
Upper Ping	Ping Part 1 (upper Ping)	1	1
	Mae Ngad	6	5
	Mae Taeng	5	3
	Mae Khan	7	2
	Mae Klang	4	4
	Mae Chaem	2	6
	Mae Teun	3	7
Middle Ping	Ping Part 2	1	1
	Mae Rim	4	4
	Mae Kuang	2	2
	Mae Li	3	3
	Ping Part 3	5	6
	Mae Had	6	5
Lower Ping	Ping Part 4	5	2
	Huay Mae Thor	6	6
	Klong Wang Chao	2	5
	Klong Mae Raka	4	3
	Klong Suan Mark	3	4
	Ping Part 5 (lower Ping)	1	1

3.1.2. Participatory selection process

The participatory process for selecting pilot sub-basins centered on the Water Forum workshops held during March 2005 at Kamphaengphet for lower Ping sub-basins, and at Chiang Mai for middle and upper Ping sub-basins. Total numbers of different types of participants in these events are shown in Figure 3-12.

Figure 3-12. Participants in Water Forum events for pilot sub-basin selection

Meeting participants	Lower Ping (persons)	Upper Ping (persons)
1) Representatives of central government agencies	13	15
2) Representatives of provincial government agencies	40	44
3) Representatives of district government agencies	12	14
4) Representatives of local governments (administrators / members)	83	174
5) Representatives of farmers / sub-basin representatives	28	36
6) NGOs / independent technical specialists	2	6
7) Academics / technical specialists	3	4
8) Mass media	1	18
total	182	311

At the Water Forum events, senior members of the project implementation consultant team presented the background and objectives of the project, and the set of simplified criteria and indicators described above. Presentations included recommendations for candidate sub-basins based on priority rankings from the technical assessment, but they tried to make it clear that the forum was free to consider any sites. The floor was then opened for questions, discussion and general debate on sub-basin selection. At the Chiang Mai forum participants split into separate groups for middle and upper groupings of sub-basins.

The process that followed in all three sub-basin groupings was probably inevitable given the size and formality of the meeting, as well as the types of activities previously under other efforts to

develop river basin management organization in Thailand. The main outcome was that the discussion soon began to reflect a sense of competition for sub-basin selection. This was probably at least partly due to impressions that large amounts of financial resources might be granted to selected sub-basins. This type of thinking was stimulated by misunderstandings about the role of the World Bank in the project, and by recent announcements by Thai government leaders that major funding would be allocated to river basin restoration and development.

As a result, the technical assessment approach faded into the background, although speakers arguing for one sub-basin or another would often include references to particular indicator data that supported their argument. More faction-based (*pak puak*) blocks began to form, and it soon became clear that a reasoned compromise outcome would be unlikely. Thus, calls for a direct vote soon emerged. And, since there was no previously agreed upon basis for how representation should be reflected in voting, most all participants were allowed to cast a vote. While the voting process was transparent, it was biased by the disproportionate presence of people from different sub-basins. This effect was amplified by the departure of representatives from some more remote sub-basins when the direction the process was taking became clear. Thus, there is a high correlation between the three selected sub-basins and their accessibility to the meeting site.

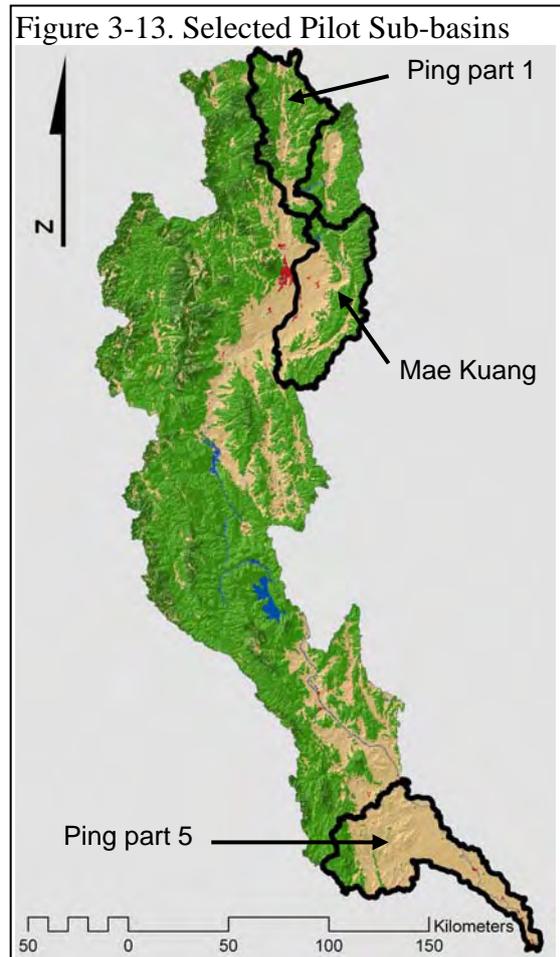
The outcome of this decision making process was selection of the three pilot sub-basins (Figure 3-13):

Upper Sub-Basin: Ping Part 1

Middle Sub-Basin: Mae Kuang (including Mae Tha)

Lower Sub-Basin: Ping Part 5 (Lower Ping)

While these decisions were made through basically political processes that emerged during the Water Forum events, implementation consultant staff were able to compare numbers of voting participants with the outcome of the voting process. It was clear that the total number of votes cast for the “winning” sub-basins was far higher than the number of voting participants from those sub-basins. This is evidence that a significant number of participants did vote for a sub-basin other than their own, although we can only speculate about their reasons for doing so.



It is also useful to compare results of pilot sub-basin selection under the Water Forum process to results of the preliminary assessments based on technical criteria and indicators, as shown in Figure 3-11. The pilot sub-basins selected to represent upper and lower sub-basin groupings are exactly the same as the sub-basins assigned first priority by technical assessments. And for middle sub-basins, the selected pilot sub-basin was the second highest priority in both technical assessments.

While it is difficult to know what conclusions to draw from this outcome, at least it is clear that there is no significant difference between selection of sub-basins at the Water Forum events and selection that would have followed from use of the more technocratic quantitative approaches.

It may be important to note, however, that it may not be realistic to expect that processes requiring clear reasoning and evidence-based negotiations can be conducted through large workshops organized at the river basin level. At least at this point, such processes appear to require more of the types of common identity, mutual familiarity, understanding and trust that are so far only found at much more local levels of social organization.

3.2. Identifying long-term organizational models and development processes

The participatory watershed management consultant was assigned the task of proposing organizational models for sub-basin management organizations that could be tested within pilot sub-basins. There were two main components of this work. The first component focused on development of model structures for sub-basin management organizations, while the second component centered on the long-term processes required for establishing and developing the management organizations within sub-basins of the Ping River Basin.

3.2.1. Review of relevant international experience and national context

Efforts to develop and propose model structures for sub-basin management organizations began with review of experience with river basin management organizations at the international level and within Thailand. Further details are in the watershed management consultant's final report.

At the international level, global trends toward river basin management are reflected in:

- intergovernmental agreements and institutional policies, beginning with the Dublin Principles that were accepted at the 1992 global Conference on Environment and Development, and subsequent developments under the European Union Water Framework Directive and policy reforms at the World Bank and the Asian Development Bank.
- global and regional civil society organizations that have emerged to support integrated water resource management in river basin contexts around the world, such as the World Water Council, the Global Water Partnership, the Network of Asian River Basin Organizations, and the growing range of programs and websites to provide support for river basin organizations.
- the rapid growth and evolution of international literature on river basin organizations that reflects activity by a global web of international research centers and their colleagues in countries around the world, including recent publications on comparative studies of experience with integrated river basin management sponsored largely by the World Bank.

Major lessons that can be drawn from global experience with river basin organizations include:

- There are no “blueprint” models for river basin organizations (RBOs). It is clear that RBOs need to be ‘localized’ in their specific environmental, historical, cultural, social, political and economic context. While there are many lessons to be learned from the diverse experience with RBOs around the world, they need to focus on basic operational principles that are associated with different types and degrees of RBO performance, as well as considerations regarding organizational structure of RBOs that can facilitate or constrain their performance.
- The scope of integrated river basin management has grown because the increasingly complex and contentious context of water resource and river basin management requires its integration with a growing range of natural resource, environmental, economic, political, social, and cultural considerations. Experience shows that RBOs with relatively wide mandates are better able to attract and hold interest of major stakeholders, who feel they are involved with work that is relevant to their needs, especially in basins where there are multiple major problems.

Clarity and mutual understanding of the scope of an RBO mandate is essential, however, as well as the capacity, organizational arrangements and resources needed to implement it.

- The concepts of subsidiarity and decentralization are of central importance to efforts to manage complex systems with the highest possible overall levels of efficiency and equity. Subsidiarity results in decisions being made at the most local level where they are possible and viable. Appropriate decentralization can improve many aspects of efficiency and equity in most decision making processes, but it requires basic rules, procedures, and capacities in local institutions, and often clearly defined rights and priorities regarding access to and use of water and related natural resources.
- Improved accountability is a key principle that depends (1) on adequate local institutions to prevent benefit and organization capture by groups of local elites, (2) on accessibility to venues for negotiation of disputes, and (3) on sufficient stakeholder participation, leadership, expertise, information and financial resources. Both upward and downward accountability are required in RBO organizational hierarchies.

Assessments of international experience with RBOs have also identified structural characteristics of the organizations that can help to facilitate or constrain RBO performance, or which may be particularly important for success in specific social and cultural contexts. Key examples include:

- Type of organization. RBOs come in a great variety of forms, that include agencies, committees, commissions, companies, NGOs, etc., and numerous variations within each type. The main issue is the RBO must be able to function effectively to achieve its objectives under its mandate. No matter what type of organizational format it has, this will depend on what it seeks to do, how it seeks to do it, and how specific forms of organization are operationally, technically and legally defined and operated in the context of that society.
- Levels of organization. There is wide variation among RBOs regarding the number of hierarchical levels of organization. Some have a single organizational level, while others have several nested organizational levels. Where relevant existing groups already exist, RBO performance is better when they become building block units at their appropriate level. As sub-units become smaller or larger, their relative advantages for various functions change. The appropriate combination and balance of organizational levels will depend largely on the local context of the RBO.
- Stakeholder representation and roles. RBOs using integrated water resource management principles clearly function best when the full range of stakeholders is represented and actively participating. While RBOs vary widely in how they seek to achieve stakeholder participation, RBOs that are able to maintain active participation over time are able to convince stakeholders (1) that they are engaged in important issues, (2) that their views and interests are welcome and considered, (3) that they actually participate in important decisions, (4) that stakeholders with different views are treated fairly, and (5) that real progress is being made toward achieving RBO objectives in an open, fair and equitable manner. It is also very important that stakeholder groups have representatives who really represent their views.
- Leadership. Experience shows that leadership is a very important factor in RBO performance. But top-down institutional leadership appears to have a negative effect on performance. And where leadership is focused on particularly charismatic local leaders, it may be difficult for other leaders to emerge, and to maintain long-term organizational sustainability.
- Responsibilities. While there is a wide range in the roles played by RBOs, most all of them have a major role in planning, policy and/or coordination functions. These are seen as the key roles of most RBOs. Depending on local context, the RBO may also have a major role in monitoring conditions and identifying and analyzing problems, and there may be activities, projects or operations that it conducts directly. Some RBOs also have a major role in

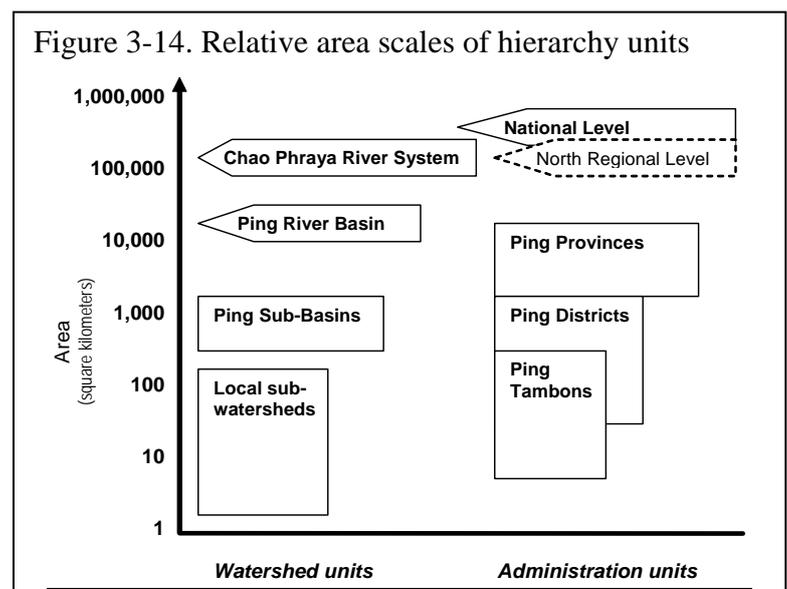
operating regulatory or economic incentive tools, including registration, zoning, allocation, licensing, fees, etc. Where RBOs operate and maintain water resource infrastructure, such as irrigation, water supply, drainage, or electrical generation, they often establish self-financing units that can take on the form of a government enterprise or private company.

- **Information.** Most all assessments of experience agree on the need for high quality information with open access to it. In some societies, this can be provided from other sources with which the RBO can collaborate. In many others, however, information and data are scarce and of questionable quality, gaps are wide, expertise is low or concentrated in a few agencies or stakeholder groups, and public access to information is not a common practice.
- **Coalitions and alliances.** Increasingly, RBOs face a situation where they are expected to respond to broader mandates, but in a more decentralized manner. Experience confirms that, under the right conditions, this can increase stakeholder participation, accountability, efficiency and equity. But ‘right conditions’ include needs for capacity, tools, information, and other resources at local levels where such things are often scarce. Moreover, RBOs cannot do everything themselves, and most of them depend on agencies, local governments, civil society organizations, and private sector interests to implement their plans and provide various types of material, social and intellectual support for their operations. Accordingly, it is now widely recognized that RBOs need to join with a range of other groups and organizations to build networks, coalitions, and alliances at various levels, beginning within their basins, but extending outward in all relevant directions.

Experience with RBOs in Thailand was reviewed in terms of its interactions with developments at the international level, in terms of government policy responses to perceived problems in managing watersheds, natural resources and the environment, and in terms of specific river basin management initiatives that have emerged since the government first began efforts to formulate a comprehensive water management strategy for river basins [see chapter 1]. Particular attention was given to establishment of Upper Ping and Lower Ping ‘sub-basin’ committees, and to river basin planning processes conducted under the leadership of the Department of Water Resources and the Department of National Parks, Wildlife and Plant Conservation.

Consideration was also given to the potential role of sub-basins in the hierarchies of administration units and watershed units found in the Ping River Basin (Figure 3-14). These types of considerations are important for helping to clarify the potential role for RSBOs and the types of relationships they will need to develop with other types of organizations.

Thus, the review also extended to other types of planning processes already being conducted in sub-basins, including regular planning processes of provincial and local governments, as well as various non-governmental planning initiatives.



This resulted in identification of several key gaps and operational issues related to current river basin and sub-basin initiatives, including:

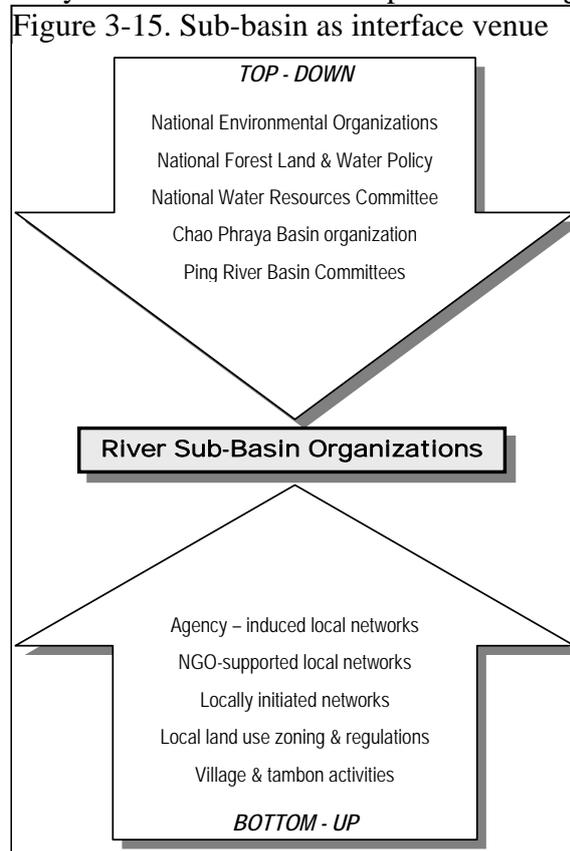
- Effective and consistent efforts need to be made to reduce confusion and uncertainty about river basin and sub-basin programs, which is largely due to repeated rounds of planning under changing mandates and shifting responsibilities of agencies and organizations, without a clear commitment to actual implementation.
- Venues and processes should foster stakeholder discussion and debate aimed at building mutual understanding of commonalities and differences in interests and visions of the future, development of a common identity among stakeholders at the sub-basin level, and an atmosphere where reasoned compromise solutions can be formulated.
- Government agencies need to examine their own strengths and weaknesses, and join with other stakeholders in identifying means for overcoming problems associated with poor coordination and cooperation among agencies, and lack of downward accountability.
- Problem identification and analysis needs to become more empirical and data based, and recognize the need for negotiating trade-offs among the benefits and costs accruing to different stakeholder groups. There needs to be less focus on winning/losing, and more focus on equitably achieved ‘best possible’ outcomes.
- Principles of subsidiarity and specialization need to be used in identifying and building appropriate coalitions that can help achieve broader and more difficult goals.
- In order to provide a solid basis for transparency, accountability and learning, sub-basin management organizations should place substantial emphasis on building their capacity to conduct three types of monitoring: (1) project inputs and outputs; (2) progress toward achieving program and plan objectives; (3) status of the range of conditions corresponding to their overall mandate. Partnerships and coalitions will be needed to effectively achieve all these types of monitoring.
- A systematic and effective information management system needs to be developed at the Ping River Basin level. It needs to build on previous and on-going work, and provide linkages with emerging sub-basin organizations in order to support their functions and further development.

In considering the potential role for RSBOs in helping to address these gaps and operational issues in current efforts to build effective river basin management organizations, one of the first fundamental questions is whether a sub-basin organization will be viewed as:

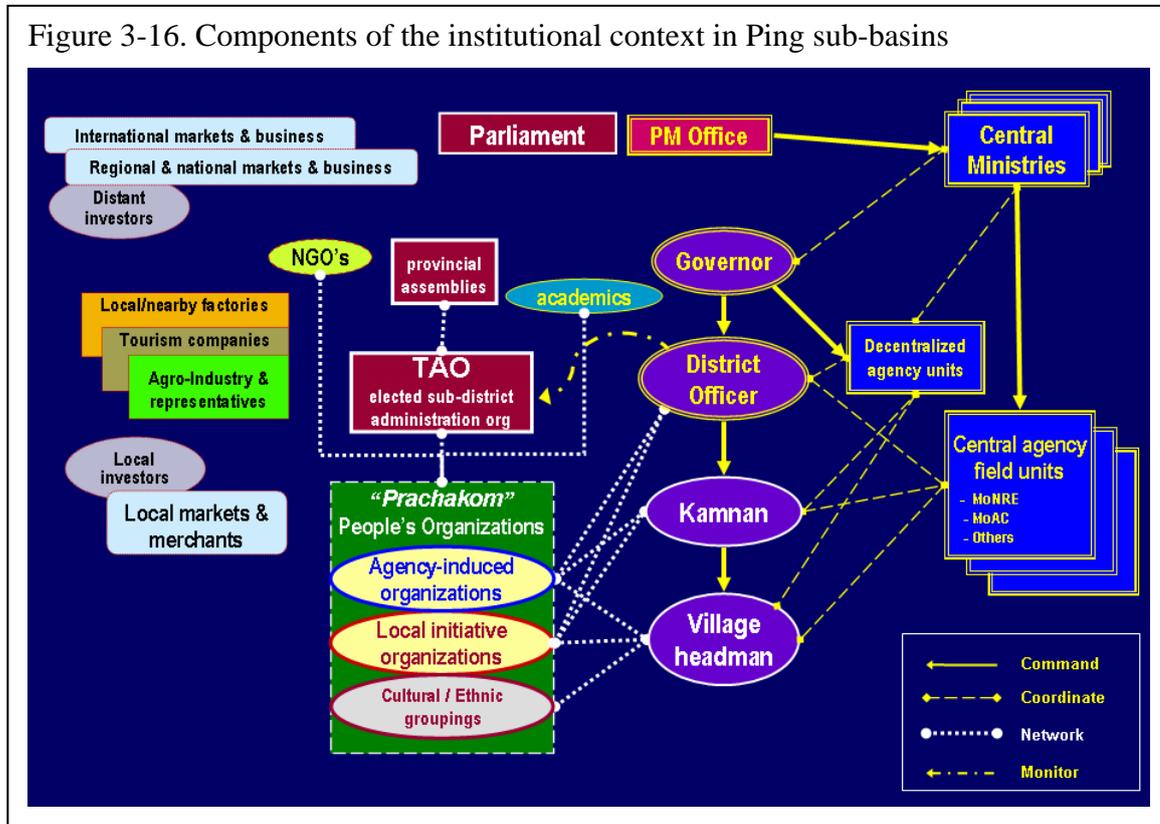
- a downward extensions of top-down processes
- an upward extensions of bottom-up processes
- a forum where bottom-up processes can interface with top-down processes

All three perspectives are possible, and different stakeholders will no doubt advocate each of these points of view.

When comparing the relative strengths and weaknesses, however, it appears that the sub-basin



level may be most suited to provide the interfacing functions suggested in the third option and shown in Figure 3-15. This follows both from characteristics that provide potential strengths at the sub-basin level, and from weaknesses of other levels to provide these functions. However, the relative degree to which an organization may link more closely with top-down or bottom-up processes may not be the same for all sub-basins.



In order to further explore the context of sub-basin management organizations, a review was also made of the range of relevant stakeholder and institutional interests as viewed from more local levels within Ping River sub-basins. Key sets of stakeholders included: (a) central government agencies; (b) provincial and district administrations; (c) forestry agencies and policies; (d) agriculture of various types; (e) private business; (f) urban centers; (g) local government; and (h) civil society and academia. Village-reported data from the national rural development database was used to help provide a quantitative dimension for this assessment.² A diagrammatic framework for relationships among these stakeholders is shown in Figure 3-15. Although highly simplified, this diagram gives us somewhat of an overview of the institutional stakeholder complexities that sub-basin organizations must face – in addition to institutional factors introduced by the river basin organization system itself.

² Detailed findings and data are in the watershed consultant's final report [Thomas 2005]

3.2.2. Alternative models for river sub-basin management organizations

Based on review of experience at both international and Ping River Basin levels, six areas of consideration were proposed for priority consideration in developing models of organization for river sub-basin management organizations (RSBOs):

- Mandate, responsibilities and authority. Conditions in the Ping Basin favor a broad and integrated mandate for RSBOs, but their roles and responsibilities need to constructively complement regular development planning processes and the administration hierarchy. Both ‘expert’ and local knowledge need to be combined in problem identification and analysis, but either agencies or local organizations probably need to take a leadership role. Program and project planning is an area for RSBO leadership, but an overall sub-basin management plan is needed to provide goals, objectives, priorities, and resource allocation. RSBOs need to clarify their roles in terms of project implementation and any regulation functions. Conditions in the Ping Basin argue for a strong RSBO role in monitoring and learning. Access to sources of authority will depend on a common sense of ownership.
- Representation: core membership, constituencies and selection processes. Particular attention needs to be given to achieving appropriate stakeholder balance among sectors, between central and local government, among elements of local governance systems, and between gender groups. The main RSBO ‘assembly’ or decision-making body needs to be of a manageable size, probably in the range of 20-50 representatives, with appropriate working sub-groups. Selection of stakeholder representatives needs to be transparent and participatory, while allowing flexibility for election or consensus processes. Those outside the entourage of an organized interest group also need representation, and mechanisms such as fixed terms are needed to assure all representatives are accountable to their constituents.
- Leadership. While flexibility needs to be maintained, attention needs to be given to the individual leadership qualities and characteristics of potential leaders. Where numerous factions exist, cohesion may be encouraged by election standards higher than a plurality of voters. If new selection procedures are established, current leaders should be encouraged to become candidates.
- Institutional positioning and linkages. RSBOs will need to develop linkages with other organizations at levels above and below the sub-basin in organizational hierarchies, as well as peer-to-peer linkages among organizations at similar levels. The principle of subsidiarity implies more local levels should take the lead in most issues, and raise issues they have difficulty addressing to the RSBO. The RSBO should pass issues they cannot resolve to river basin or other higher levels. All levels need sufficient authority and resources to take initiative at their level, and all must be accountable for their actions. Alliances will be needed among local organizations within sub-basins, among sub-basins in the context of river basin level issues and processes, and among local groups with similar concerns in networks that cross sub-basin boundaries. RSBOs should seek partnerships to strengthen their overall operations.
- Legal status. RSBOs should consider the advantages and disadvantages of different options for their official legal status, and there should be flexibility for it to change over time as capacity develops and conditions change.
- Operational components and specialists. While RSBOs should have flexibility to design their own structure, they need to consider at least 3 basic types of components: (a) an RSBO assembly where the full range of stakeholder representatives conducts overall deliberations and decision-making processes; (b) permanent and temporary working groups to lead efforts in program and project planning, data and communications, public participation and

awareness, problem identification and analysis, and monitoring and learning; (c) a secretariat to conduct administrative and operational tasks, support working groups, and manage facilities. Location of the secretariat needs careful consideration.

There are clearly various alternative structural options under each of these considerations. At an overall organizational level, however, various options tend to ‘cluster’ around alternatives that are at least internally consistent and able to support viable RSBO structures and functions.

In order to help clarify how various internally consistent and compatible combinations can provide a set of realistic alternative structures for RSBOs, five alternative organizational models were described to represent variations falling under three generic types. The unifying theme for distinguishing these generic types centers on identity, participation and subsidiarity issues discussed in the previous section.

Under a participatory watershed management project, it must be stakeholders within a sub-basin who decide for themselves what type of ‘model’ of organization is best for them. Thus, to help facilitate decisions by sub-basin committees and stakeholders regarding the type of RSBO they want to establish, a comparison chart of the major structural and organizational characteristics of each type of model was developed, as shown in Figure 3-17.

In addition to providing an overview of model types, the chart can also be used in considering how changes in various components are associated with changes in overall orientation of alternative types of RSBOs. Indeed, it was anticipated that choices made in pilot sub-basins, and the similarity or differences among them, should be very informative for efforts to develop support services, and to anticipate options and needs for Ping sub-basins at the overall level.

It is also important to note that attributes described for each model could be altered or adjusted in various ways. Thus, the specific combinations shown are meant to indicate a certain type of RSBO organizational model, but each can be further adjusted to improve its performance under specific conditions

Government-oriented models

These two models continue past trends in Thailand toward establishment of RBOs and RSBOs through central government initiative aimed primarily at improving government programs.

Type 1. Focused government model

The central focus of this model is on efficiency and effectiveness in utilizing the institutional arrangements of a single ministry to implement activities within the mandate of that ministry – the Ministry of Natural Resources and Environment (MoNRE). Thus, participation under the RSBO is primarily to assist and improve the design and implementation of MoNRE programs.

While in many ways this appears to be a government agency business-as-usual model, there are still several ways in which it would be an improvement over current conditions. It would, for example, require some real coordination among departments of MoNRE, in order to develop a uniform set of ministry guidelines regarding sub-basin boundaries, leadership, responsibilities, a single set of sub-basin organizational arrangements, *etc.* Moreover, many of the issues related to confusion could be clarified in the context of a relatively narrow focus, and action plans could be adapted quite readily from earlier plans already produced under activities led by DWR and DNP. In comparison to other approaches, this model would be relatively quick and easy to define and organize, and it could be established through a ministry-level directive issued by MoNRE.

The key potential weaknesses of this model relate to its tendency to be dominated by the views and policies of a single ministry. The identity of the RSBO will likely tend to become regarded as a public relations unit for MoNRE and its agencies and associates. Emphasis will tend to be strong on water, soil and forest conservation, water use and pollution, garbage reduction and disposal, and any other major programs of the ministry. Remedial measures will tend to be strong in these areas, but unable to address major underlying causes that require broader consideration or action by other ministries or sectors.

RSBOs preferring this type of model might seek to mitigate potential weaknesses by modifying arrangements to include, for example, at least some elected leaders and broader local network and civil society representation, by employing public hearings and other types of tools to enhance public participation and transparency, and/or by seeking stronger interaction with planning processes of local governments in the sub-basin regarding broader underlying issues and associated development needs.

Type 2. Broader government model

The main focus of this model is still on efficiency and effectiveness in utilizing government institutional arrangements and mechanisms, but the scope is broadened to include activities within the mandate of multiple ministries. Given the difficulties in coordination among ministries at high levels, the provincial local administration hierarchies are brought in as a partner to assist with coordination and integration of plans at more local levels.

Relative to the focused government model, this may be a more ambitious model to implement, but it also provides some important additional features. In addition to requiring substantially improved coordination among MoNRE policies and agencies, the model also seeks coordination among multiple ministries. As this is not likely through normal channels, the model relies on an umbrella high-level directive or cross-ministry agreement, combined with a partnership with provincial governors and local administration to help coordinate activities at sub-basin and more local levels. With broader government participation, it may be able to consider and address some more complex underlying causes and effects of sub-basin problems, and encourage more broad-based local participation.

The key potential weaknesses of this model relate to tendencies toward domination associated with its strong links with central and provincial government. It may be difficult to attract and maintain participation by strong local leaders who want to avoid domination by officials, and local factions friendly with government officials may seek to capture control. Moreover, there may be a tendency for the RSBO to be regarded primarily as a source of government funds, resulting in local tendencies to say what they think central agencies want to hear in order to obtain funds that can help boost the prestige and welfare of various local factions.

RSBOs preferring this type of model might seek to mitigate potential weaknesses, for example, by modifying arrangements to include at least some elected leaders, by more transparency and local initiative in selecting local representatives, and by employing public hearings and other types of tools to enhance public participation and transparency. It may also want to emphasize strong interaction with planning processes of provinces and local governments in the sub-basin regarding broader underlying issues and associated development needs, both within and beyond mandates of participating ministries.

Multi-level partnership models

These two indicative models employ multi-level partnerships to establish the sub-basin level as the primary venue for an interface between top-down and bottom-up processes.

Type 3. Central – local partnership model

This model places its main focus on creating a real partnership among groups and organizations from central to local levels, but with a degree of asymmetry that assigns somewhat greater weight to central and provincial government agencies. Primary coordination and integration functions are shifted to provincial and local levels, and implementation plans are integrated into the regular development planning process. This reduces or eliminates needs for formal cross-ministry agreements at high levels, while expanding the range of issues available for RSBO consideration.

This model represents efforts by MoNRE and its agencies to reach downward in administrative and natural resource hierarchies to form a real partnership with local administration, local governments, civil society and other local stakeholder groups. While the ministry and province local administration still provide a degree of leadership, this model encourages and requires much more active local participation and decision-making.

Key potential weaknesses relate to its greater complexity and needs for coordination, as well as a need for strong local leadership that can balance tendencies toward domination by government, local elites, business interests or other locally influential factions.

RSBOs preferring this type of model might seek to mitigate potential weaknesses by seeking multi-level dialogue with partner institutions, and by seeking ways to encourage and strengthen capacity of local leaders, as well as mechanisms to assure transparency, accountability and access to information.

Type 4. Local – Central partnership model

The main focus is also on creating a real partnership among groups and organizations from central to local levels, but with a degree of asymmetry that assigns somewhat greater weight to local government and civil society groups and institutions.

This model represents efforts by local governments and organizations in the sub-basin to organize themselves and reach upward in administrative and natural resource hierarchies to form a real partnership with provincial administrations, government agencies under MoNRE and other participating ministries, and other relevant stakeholder groups. Its structure helps reduce threats of government domination, but requires strong local leadership, participation, and initiative.

Key potential weaknesses relate to its complexity, to threats of domination by local factions, or to stagnation if different local interests cannot negotiate effectively among themselves.

RSBOs preferring this type of model might seek to mitigate potential weaknesses by seeking ways to strengthen the roles and capacity of local networks, civil society institutions, local government, and constituency groups, by encouraging local leadership and initiative, by strengthening negotiation and conflict management capacity, and by providing regular forums for communication among all sectors, as well as through mechanisms to assure transparency, accountability, and strong public information, education and participation programs.

Non-government alternative models

This model views the RSBO as a further extension of bottom-up non-governmental processes.

Type 5. Local non-government model

The main focus is on effectiveness in mobilizing non-governmental groups and civil society institutions to formulate, advocate and monitor activities within the mandate of the RSBO.

This model represents efforts by local non-governmental groups and organizations in the sub-basin to lead efforts to organize themselves into an independent RSBO outside the government sphere. They would conduct independent analyses, program planning and monitoring activities that seek to provide advice and some assistance to local governments, provincial administrations, and central agencies, as well as strong efforts to raise public awareness and mobilize public support and pressure for integrating improvements into all relevant decisions made in the public policy arena. Its strengths relate to its independence, flexibility, and strong grounding in local communities and conditions, and its access to information, advice and assistance from a wide range of non-governmental and academic sources. Similar models have sometimes been applied internationally, such as in the Fraser River Basin in Canada where strong issues between the government and Native American communities made it the option most acceptable to all stakeholders.

Key potential weaknesses relate to the absence of formal links with government organizations, which may result in weakened ability to influence develop planning processes, less access to government information, less ability to interact constructively with higher policy levels representing wider stakeholder interests beyond the sub-basin, and less access to basic support to sustain its operations over the long term.

RSBOs preferring this type of model could seek to mitigate potential weaknesses by upgrading roles for at least local governments, by building mechanisms to assure regular constructive interaction with relevant government institutions and agencies at multiple levels, by registering with ministry funding programs for NGOs and peoples organizations, as well as by seeking clear *prachakhom* recognition by all TAOs and *tessaban* in the sub-basin. The RSBO secretariat may also want to include a unit responsible for exploring a wide range of possible funding sources.

Figure 3-17. Comparison chart of five alternative models for sub-basin organization.

	Focused Government	Broader Government	Central-Local Partners	Local-Central Partners	Local Non-Government
Scope of Mandate					
<i>water use</i>	X	X	X	X	X
<i>forest land use</i>	X	X	X	X	X
<i>agriculture land use</i>		X	X	X	X
<i>pollution</i>	X	X	X	X	X
<i>solid waste / trash</i>	X	X	X	X	X
<i>health</i>		X	X	X	X
<i>education</i>			X	X	X
<i>infrastructure</i>			X	X	X
<i>livelihoods</i>			X	X	X
Duties					
<i>identify & analyze problems</i>	advice/assistance	advice/assistance	lead	lead	lead
<i>planning</i>	advice/assistance	advice/assistance	lead	lead	lead / advise
<i>implementation</i>		advise	advise	advise / assist	advise
<i>implementation monitoring</i>		advise	advise	assist	advise
<i>environmental monitoring</i>	advice/assistance	advice/assistance	lead	lead	advise / assist
<i>impact monitoring</i>		advise	lead	lead	lead / assist
Main authority sources					
	ministry	ministries - prov	min - prov - TAOs	TAOs - prov - min - public	TAOs advisor / public awareness
Representation					
<i>ministries</i>	MoNRE agencies	MoNRE, agric, health	MoNRE, other relevant	MoNRE, other relevant	invited advisors
<i>province / district</i>	Prov - Dist Officers	Prov - Dist Off-Kamnan	Prov - Dist Off-Kamnan	Prov - Dist Off-Kamnan	invited advisors
<i>local government</i>	TAOs, Kamnan	TAOs	TAOs	TAOs	invited advisors
<i>business / industry</i>	selected	selected	invited / voted	voted / group-selected	voted / group-selected
<i>livelihood groups</i>	selected	selected	invited / voted	voted / group-selected	voted / group-selected
<i>civil society</i>	<informal>	selected	invited / voted	voted / group-selected	voted / group-selected
<i>local communities</i>	selected PYB	selected	invited / voted	voted / group-selected	voted / group-selected
Leadership					
<i>chairman / deputies</i>	Officials	Officials	voted	voted	voted local non-gov
<i>Secretariat</i>	Officials	Officials	officials / voted	voted	voted
<i>Technical info/advice</i>	Officials	Officials / consult	offic / acad / priv / non-gov	offic / acad / priv / non-gov	gov / acad / priv / non-gov
Primary Linkages					
<i>Upward</i>	Ministry	PingRB / Ministries	PingRB / Prov / Min	PingRB / Prov / Min	PingRB
<i>Downward</i>	Min units / District	Districts / TAOs	District / TAOs	TAOs / Networks / groups	Networks / groups
Main funding sources					
	MoNRE	Ministries	Min / Prov / TAOs	TAOs / Prov / Min / non-gov	TAOs / grants / non-gov

3.2.3. Proposed process for developing sub-basin management organizations

A five phase process was proposed for developing river sub-basin management organizations (RSBOs) in the context of the Ping River Basin.³ This sequence of phases has now already begun, and would extend far beyond the timeframe of this project. International experience confirms that development of effective long-term river basin organizations is a long-term process. Thus, expectations about the contributions that a project such as this one can make to RSBO development in Ping sub-basins need to be realistic, and they need to be formulated and assessed within this longer-term framework.

These five phases of RSBO development are based on assessments from international literature.

But they are also constructed in a manner that reflects the particular circumstances faced by this project in the context of current conditions in the Ping Basin, as discussed in previous sections of this report. The five phases are listed in Figure 3-18.

This project has focused on efforts to implement the first two phases in the pilot sub-basins, and to make as much progress as possible toward building the basic foundation for activities to

be completed during the third phase. Progress toward achieving these objectives in each of the pilot sub-basins is summarized in the next section of this chapter.

1. Getting started. This phase builds on existing organizations and plans in establishing an initial sub-basin working group and formulating initial action plans. Emphasis is on articulating a vision, goals, objectives, criteria, and priorities to select action plan component projects, review and screen existing sub-basin plans, link with TAO and provincial plans, and select priority activities and local studies for implementation.
2. Establishing long-term organization and process. This phase centers on participatory review of experience with planning processes at sub-basin and other relevant levels, and selection and localization of an initial organizational model for a long-term RSBO. The five alternative types of organizational models described in the previous section can be a useful input into this process. While the initial design of the organization should reflect what is appropriate and viable under current conditions in the sub-basin, views should also be solicited about directions in which the RSBO should evolve. This should help identify directions for developing capacity and other aspects of the organization.
3. Launching implementation in a River Basin Management framework. This phase moves into 'multi-tasking' mode, wherein priority activities under the initial action plan begin implementation, and monitoring and results-based measurement systems begin to be

Figure 3-18. Phases of Ping RSBO Development

1. **Getting started**
 - Preliminary sub-basin committees
 - Initial action planning process
2. **Establishing long-term organization and processes**
 - Review initial planning experience
 - Select, localize and establish long-term RSBO organizational model
3. **Launching implementation in a River Basin Management framework**
 - Outline initial long-term River Basin management plan
 - Begin implementation and monitoring
 - Begin systematic capacity building
 - Build parallel Ping Basin – level support capacities
4. **Strengthening long-term management planning and learning processes**
 - Management plan elaboration, refinement and consensus building
 - Annual progress reviews, learning and adjustments
5. **Maintaining long-term organizational relevance, vitality & performance**

³ More detailed discussion of each phase can be found in the watershed consultant's final report [Thomas 2005]

established and activated. It builds on experience during the first phase and begins operating under the long-term RSBO structure established during the second phase. Its central focus is on outlining a broader RSBO Management Plan (see Figure 3-19), which includes strategies for monitoring, information, partnerships, capacity building and funding. Initial high priority components of the capacity building strategy begin to be implemented. Particular emphasis is on

starting learning processes associated with the monitoring and information strategy, and on identifying approaches for assuring that views of all major stakeholder groups in the sub-basin are considered. This may require systems to provide support for negotiations, and to assure transparency, accountability and equity. These are processes that should be supported through parallel efforts at the Ping River Basin level to build support capacities in terms of a knowledge center, mobile technical support teams, and data and analytical systems.

4. Strengthening long-term management planning and learning processes. This phase moves to a multi-year approach, with emphasis on broadening and deepening understanding and consensus within and among stakeholder groups in the sub-basin. RSBO structures, plans and processes are further refined, based on careful consideration of various views, and emphasis on learning from experience with actual implementation activities. These are processes that cannot be unduly rushed by unreasonable time constraints. To help stimulate these considerations, several sets of initial questions are proposed under more detailed discussions in the watershed management consultant's final report. An annual review process would become part of a long-term continuous learning cycle of problem identification, analysis, planning, monitoring, and outcome and impact assessment. This process should be participatory, inclusive, transparent, accessible, and both downwardly and upwardly accountable. Continuing efforts to improve these processes will need support, and the specific needs in a sub-basin are likely to change over time. Thus, they could benefit greatly from a Ping River Basin level knowledge center that would include information access, mobile technical support teams, and data and analytical systems.
5. Maintaining long-term organizational relevance, vitality and performance. The final open-ended phase takes well-functioning RSBOs into long-term operation and maintenance mode. In addition to annual learning and adjustment cycles, a second perhaps 5 to 6 year cycle is added to focus on longer-term changing conditions, and on assessments of RSBO performance and stakeholder satisfaction. This includes reassessment of needs for programs and operations, as well as ways to improve structures and functions to respond to those needs.

Figure 3-19. Management Plan Components

RSBO Management Plan

1. Statement of priority problems to be addressed in the management plan
2. RSBO vision statement, goals and objectives
3. Action plans for achieving goals and objectives
4. Monitoring and information strategy
5. Partnership and capacity building strategy
6. Funding strategy

3.3. Developing sub-basin organization and planning processes

Project activities in pilot sub-basins have sought to complete the first two phases of the five phase process described in the previous section, and to make as much progress as possible toward building the basic foundation for activities to be completed during the third phase. This section summarizes the progress made in each pilot sub-basin.

Implementation of specific activities in the three pilot sub-basins under component 1 of the project was conducted under two distinct stages of activity. In addition to what has already been mentioned in Part I of this report, there are a few additional characteristics of these stages that will help clarify the discussions of activities in each pilot sub-basin in following parts of this section:

(1) Initial Sub-basin Working Groups facilitated by implementation consultants

In order to understand the context of efforts by the project to facilitate the development of sub-basin action plans and sub-basin level organizations for management of natural resources and the environment in the 3 pilot sub-basins, it is important to begin with the structure, composition and duties of the initial sub-basin working groups under the project.

Since these working groups were established by directives issued by the Office of Natural Resources and Environmental Policy and Planning, their leaders needed to be officials under the jurisdiction of that agency. Other members of the working groups were seen as trying to provide a reasonable balance of various important stakeholder groups in the sub-basins.

Duties of initial sub-basin working groups focused on: (1) conducting planning processes to produce an initial action plan for management of natural resources and environment in each pilot sub-basin, including aspects related to livelihoods and public health; and (2) considering the structure and functions for a long-term sub-basin management organization that could be established to lead implementation and further development of management processes in each sub-basin. Project implementation consultants served as facilitators for these efforts.

Since the project implementation consultant team facilitated working groups in all three pilot sub-basins and were responsible for preparing overall project reports during this stage, they encouraged working groups to conduct their planning processes in a fairly similar manner, and to produce outputs that were in a similar format. They also sought agreement among all three pilot sub-basins on a similar basic type of long-term organization structure (Figure 3-20). They believed that these types of similarity across the three pilot sub-basins could improve their chances of being accepted by central government systems, and improve their ability to be replicated in other sub-basins around the Ping River Basin.

(2) Review and modifications facilitated by sub-basin networks

After initial action plans and proposed arrangements for long-term sub-basin management organization were developed and drafted, they were then submitted for further review and modification by major stakeholder groups in the sub-basin. This work was facilitated by a small team of local staff in collaboration with existing relevant networks in each sub-basin.

Main concerns of these review teams centered on how well the draft plans and organizational arrangements matched with current situations and local views among major stakeholder groups within each of the individual sub-basins. The scope of their review included processes and assumptions used during development of draft plans and organizational arrangements, as well as the content of the products resulting from the first stage. They believe that close matching of

plans and organizations with specific local conditions and views in each of the three pilot sub-basins will greatly improve their ability to bring real improvement for local livelihoods and for the sustainable management of natural resource and the environment.

Figure 3-20. Proposed common characteristics for all RSBOs

Implementation consultants concluded that long-term sub-basin management organizations in all sub-basins should have these structural elements:

1. Membership

- Chairmen & vice-chairmen are high-level government officials from NRE agencies in the area, in order to have efficient directives and coordination.
- Secretaries & assistant secretaries are from government units in the area responsible for care of NRE, in order to have people who can coordinate among members, communicate & conduct documentation.
- Members are people representing all parties related to benefits received from resource use, including local governments, local specialists, & existing network organizations.

2. Advisors. Organizations need an advisory group affiliated with the Ministry of Interior & local governments, to provide advice, recommendations & support for activities of the organizations at sub-basin & network levels.

3. Roles & duties:

- Formulate action plans for NRE management in the sub-basin
- Monitor and evaluate implementation of activities and projects
- Consider, review & modify action plans that are not efficient & relevant to real local conditions
- Conduct dissemination & public relations
- Coordinate & implementation jointly with Coordination offices for NRE restoration
- Consider establishment & certification of network organizations
- Negotiate and mediate disputes related to resource management & use

4. Organization support requirements:

- Organizational strengthening. Increasing knowledge, understanding, skills, & experience of organizations at various levels through training, study tours, meetings/seminars, & research studies to develop organization management, monitoring & evaluation of implementation results.

Estimated budget requirement: 880,000 baht /year / sub-basin

- Organization administration. Reliable basic support for organization management, including budgets for durables, expendables, communications, & travel, & for local meetings, monitoring, evaluation, and dispute mediation.

Estimated budget requirement: 1,240,000 baht /year / sub-basin

Thus, the plans and organizational arrangements presented in the following sections have resulted from the combination of tensions and compatibilities between these two types of approaches. In the process, parties with quite widely different views have had the opportunity to make significant inputs. As the following sections indicate, some types of results have varied greatly among the three pilot sub-basins, while others show substantial consistency across the three sites. While the time has been very limited, many important principles and issues have managed to enter into the process and have impacts on the results.

3.3.1. Ping part 1 (Upper Ping) sub-basin

Sub-basin Context

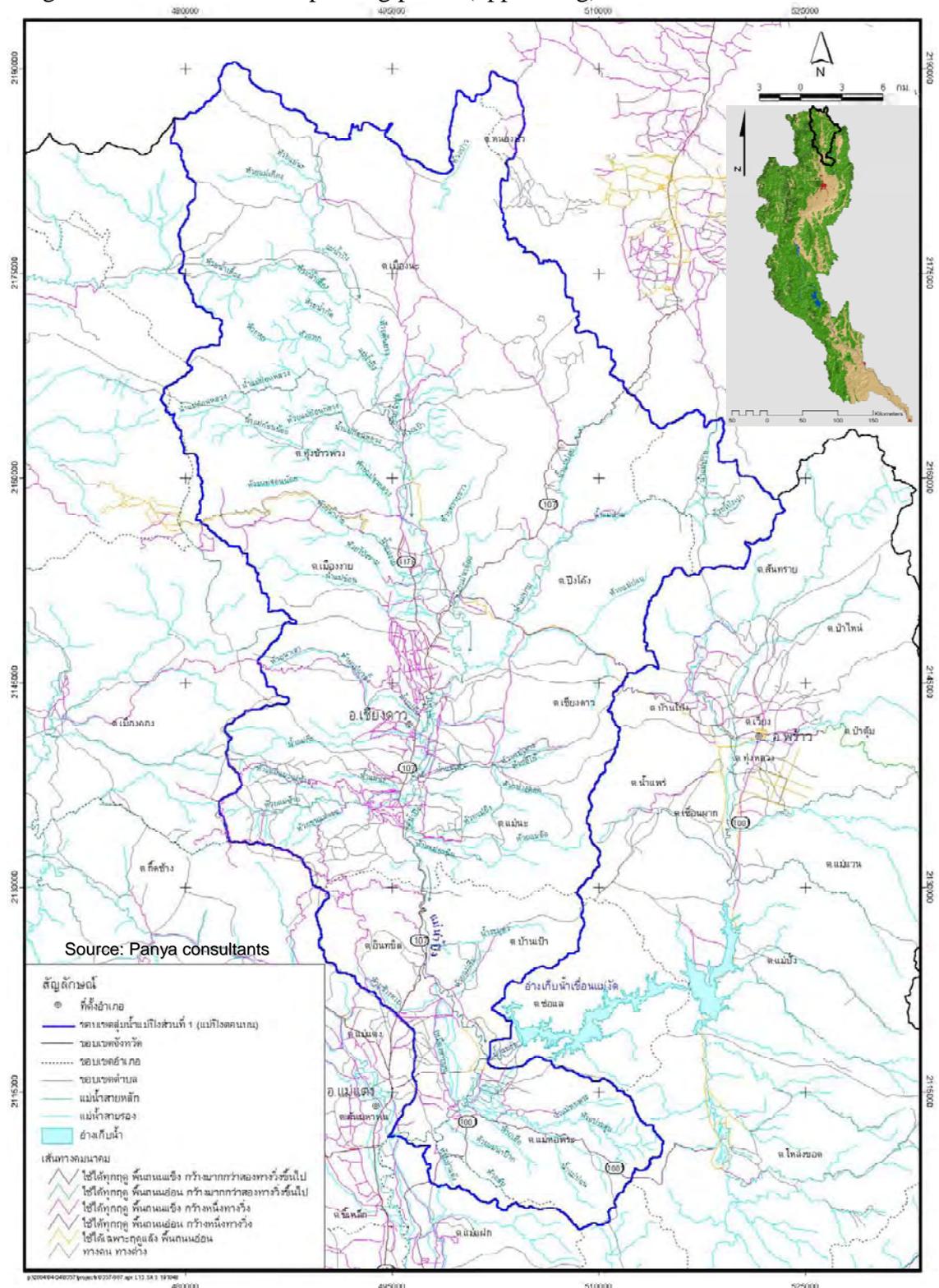
As the northernmost sub-basin of the Ping River Basin, the Ping part 1 sub-basin is located entirely in Chiang Mai province and contains the headwaters of the main channel of the Ping River. Thus, it is often referred to as the “upper Ping” sub-basin. Under this project, the Ping part 1 represents the group of “upper” sub-basins described in section 3.1.1. Basic data describing the physical, demographic, administrative, and land and resource use features of the sub-basin as

Figure 3-21. Sub-basin data table: Ping part 1

Sub-basin total area	kilometer ²	1,974	Population		
Altitude zones			- total population	persons	79,711
< 600 masl	% land area	40	municipalities	percent	46
600 - 1,000 masl	% land area	43	rural	percent	54
> 1,000 masl	% land area	16	- overall population density	pers/sq km	40
Watershed classification			Administrative units		
1A	protected forest	% land area	municipalities	number	4
1B	protected forest	% land area	tambons	number	14
2	restricted uses	% land area	districts	number	5
3	limited uses	% land area	provinces	number	1
4	conservation measures	% land area			
5	unrestricted	% land area			
Climate			State forestlands		
- average temperature	degree C	25.6	- national park	number	3
hottest month	degree C	36	declared area	% land area	56
coolest month	degree C	14	- wildlife sanctuary	number	1
- total average rainfall	mm	1,272	declared area	% land area	9
rainy season	mm	1,121	- reserved forest	number	7
dry season	mm	150	declared area	% land area	26
- total average runoff	million m ³	536	Total state forestlands	% land area	90
rainy season	million m ³	398	Land outside state forestlands	% land area	10
dry season	million m ³	138	Land use		
Water storage	million m ³	9	- forest cover	% land area	72
- large scale	number	-	- not under forest cover	% land area	28
capacity	million m ³	-	- suitable for agriculture	% land area	20
service area	% land area	-	suitable for rice	% land area	14
- medium scale	number	-	suitable for field/tree crops	% land area	6
capacity	million m ³	-	- agriculture	% land area	26
service area	% land area	-	- settlements	% land area	1
- small scale	number	11	- water & other	% land area	1
capacity	million m ³	9	Municipality pollution		
service area	% land area	0.7	municipalities	number	4
Water requirements	million m ³	128	population	persons	36,656
- irrigation	million m ³	85	- total wastewater	million m ³ /yr	1.7
large-scale	million m ³	-	- biochemical oxygen demand - BOD	tons / year	166
% land area		-	- garbage	tons / year	13,954
medium / small / pumping	million m ³	56	Agriculture pollution		
% land area		4	- pesticide use		
people's local irrigation	million m ³	30	rice	tons / year	0.03
% land area		1	field crops	tons / year	0.3
- consumption & domestic	million m ³	5	fruit trees / horticulture	tons / year	3.7
municipalities	million m ³	2	- nitrogen use		
rural	million m ³	3	rice	tons / year	127
- industry & tourism	million m ³	0.003	field crops	tons / year	336
- ecological balance	million m ³	37	fruit trees / horticulture	tons / year	501
			- phosphorus use		
			rice	tons / year	30
			field crops	tons / year	59
			fruit trees / horticulture	tons / year	75
			- estimated BOD		
			rice	tons / year	118
			field crops	tons / year	94
			fruit trees / horticulture	tons / year	90

shown in Figure 3-21, and the spatial configuration of the sub-basin is presented in Figure 3-22. As with most upper sub-basins, the Ping part 1 retains extensive areas of forest and 90 percent of its area is claimed as state forestlands. Areas suited for lowland paddies are very limited, and its northern Thai and ethnic minority communities manage agroecosystems that include upland and managed forest areas, many of which are now claimed as protected state forestlands. Economic development has brought expansion of upland crops such as maize, and orchard crops such as longan and oranges, as well as expansion of commercial livestock production, tourism and some cottage industry.

Figure 3-22. Sub-basin map: Ping part 1 (upper Ping)



While the role of forest agencies is very prominent in this sub-basin, there have also been strong efforts by local communities to build their own organizations and networks to improve management of natural resources. Support for their efforts has come from both state agencies and non-government organizations. The growing strength and capacity of local organizations has been reflected in the manner in which they have participated in project activities.

Project implementation leadership in the Ping part 1 Sub-basin

The structure and composition of the initial project working group that provided leadership for project implementation in the Ping part 1 sub-basin is shown in Figure 3-23. Although not all members were able to attend all meetings, a quorum was always present. The project implementation consultant team facilitated work by the Ping part 1 working group. This included providing information both from their rapid initial surveys in the sub-basin and from secondary sources, as well as organizing and analyzing data for the working group. They also helped prepare meeting agendas and documents, and provided various specialists to assist with particular topics as appropriate. Members of ONEP staff and their watershed consultant also attended major meetings of the Working Group.

Figure 3-23. Working Group: Ping part 1

Chairman	
Head, Province NRE office (CM)	1
Secretary	
Province ONEP officer	1
Members	
Province governments	1
Province NRE office - nat. res. working group	1
Government agency - Royal Forest Dept.	1
Project implementation consultant	1
Local officials	2
Upper Ping Committee	1
Local organization supported by DNP	1
Local specialists	3
Peoples representatives	5
Peoples organizations	2
NGO	1
Business representative	2
TOTAL	23

The subsequent process to review and modify sub-basin plans and proposed organizational arrangements was led by well-known people in the sub-basin who are active in networks and organizations related to management of natural resources and the environment. Facilitators for this process were independent development workers who are native to or long-term residents of the Ping part 1 sub-basin. Deliberations of major meetings and forums conducted under this process are documented.

Remaining parts of this section discuss the results of these processes in terms of the progress made toward completing the requirements of phases 1 and 2 of the five phase process for developing sub-basin management organizations summarized in section 3.2., and developing the basic components of a draft long-term sub-basin management plan for phase 3.

Identification of sub-basin problems

The first basic component of a long-term sub-basin management plan is clear statement of the problems to be addressed by a sub-basin organization and its planning process. Problem assessments facilitated by project implementation consultants using “PRA”-type techniques resulted in identification of the range of problems listed in Figure 3-24. These problems were reviewed and adjusted by the Working Group, and used as an input into development of a draft sub-basin action plan that sought to address many of these problems.

This preliminary listing of problems places strong emphasis on current problems associated with the state of natural resources and the environment, but also identifies some important economic and social issues in the sub-basin. Although some linkages between these two major types of

issues and problems appear to be likely, no specific efforts to identify cause-effect relationships are apparent.

Figure 3-24. Preliminary problem identification: Ping part 1

<i>Important issues</i>	<i>Problem</i>
1. Natural resources	
(a) <i>forests</i>	
1. Forest encroachment, especially in watershed forest, due to needs of land for residence & cultivation	
2. Illicit timber harvest and forest destruction	
3. Forest fires due both to natural causes and to people in the area	
4. Policies and laws related to forest resources are not in line with current conditions	
5. Conflict in use of forest lands	
(b) <i>land</i>	
1. Erosion of topsoil in sloping lands	
2. Landslide hazards due to improper agriculture & no soil conservation practices or cover crops	
3. Degraded soil and lack of soil fertility	
4. Soil acidity; soil structure destroyed by continuous cropping without proper soil maintenance	
5. No tenure rights in farm land because most land in protected forest & watershed areas	
(c) <i>water</i>	
1. Lack of water during the dry season and absence of local water resources	
2. Natural disaster problems during rainy season	
3. Problems due to conflict over water use between upstream and downstream communities	
2. Environment	
1. Water quality not suitable for consumption & domestic use	
2. Use of chemicals and pesticides in agriculture	
3. Air pollution by particulate matter, smoke & foul odors from distilleries, pig farms, burning weeds in agricultural fields, and burning trash	
4. Untreated wastewater of communities, residences, farms & industrial factories released into streams	
5. Increasing amounts of garbage & waste, but no systematic collection or control processes	
3. Health	
1. Air pollution problems due to dust, soot, smoke & odors affect nearby community health through allergies & contagious diseases, such as intestinal, respiratory, & skin diseases	
4. Economy	
1. High agriculture investment cost, but low product prices determined by merchants/middlemen	
2. Problems of poverty, unemployment, lack of secure occupations, landlessness & debt	
3. Lack of occupational capital and income, cannot make living during agriculture off-season due to lack to other occupational skills	
5. Social issues	
1. Local population growth due to births & in-migration cause local conflicts over land for residences & fields, and cause forest encroachment, water use, garbage & social problems such as drugs & killings	
2. Change & modern technologies entering daily life cause old community lifestyles based on sufficient economy to change, including unnecessary debt & problems in passing on local knowledge	
3. Migration & relocation cause lack of health care knowledge & awareness; inappropriate community sanitation	
4. Educational problems due to lack of opportunities for children & youth to study	
5. Problem of construction of good basic public utilities in the area	

While results of the “PRA”-type summary of natural resource and environmental problems in the sub-basin identified a number of important issues, the subsequent review by sub-basin networks felt the information and analysis was insufficient to identify the important issues that underlie and drive most of these problems.

Thus, they developed and proposed the additional framework for assessing watershed problems shown in Figure 3-25. This framework reflects elements of the analytical processes that local network organizations have been developing and using within the Ping part 1 sub-basin. While it accepts the existence of the types of problems listed in Figure 3-24, its orientation is toward identification and understanding of the types of processes of change that have resulted in these problems. Their hope is that this can help them to identify and develop approaches for

addressing these basic issues in order to increase the sustainability of both natural resource management and livelihood development.

Figure 3-25. Identification of underlying problems: Ping part 1

<p>1. Problems based in legal structures</p> <ul style="list-style-type: none"> a. Declaration of conservation forests displaced community areas, agricultural fields and community forests for subsistence and rituals long used by local communities b. Declaration of agricultural land reform areas caused the framework for land holdings to be outside forest lands, & not under the land law, making people unable to have correct land tenure arrangements
<p>2. Problems based in policies</p> <ul style="list-style-type: none"> a. Promotion of planting monocrops brought rapid expansion of monocrops such as large-scale orange orchards, use of chemicals, soil degradation, topsoil erosion, and conflict over use of resources such as water & forest b. Opening of free trade areas, especially for major local garlic & longan crops, caused villager output prices to fall, feeding conflict in resource access and use, soil degradation, & arguments due to competition for resources c. Conversion of assets to capital led to encroachment & expansion of areas held by capital groups, such as in <i>miang</i> forest tea garden areas
<p>4. Problems following from impacts of legal & policy problems on communities</p> <ul style="list-style-type: none"> a. Conflict between communities and the state, between communities and capital investors, & among communities b. Degradation of land, water and forest resources c. Debt problems, and various other problems, including many listed in Figure XX.

Sub-basin vision, goals and objectives

Initial efforts by the Working Group centered on articulating a sub-basin vision statement, goals and objectives, in a structure that was somewhat similar to those being developed in other sub-basins. In an effort to facilitate thinking, the project implementation consultants presented similar elements from various previous planning processes conducted under programs of other agencies working in the sub-basin. Local leaders in the Working Group resisted completion of this process in a single working session without the opportunity to confer with other local colleagues. Thus, they deferred their response until the next Working Group meeting. Although this was still not enough time for very much interaction at the local level, they at least felt more comfortable with agreeing upon a general structure by the second meeting, which was then used in the initial draft sub-basin plan.

The subsequent sub-basin review process felt this was a quite important deficiency in the initial planning process. In their view, a vision statement should be what people and communities in the sub-basin hope will happen, with characteristics of an ideal image or “dream image”. Thus, it should be developed collaboratively. But sub-basin goals and objectives in the initial draft plan seem to emphasize only directions for conservation, care and restoration in order to restore natural resource fertility. They saw a need to expand the issues being emphasized in the goals and objectives to be in line with resource access and use of resources using local knowledge. This is to improve sustainability and acceptance of community knowledge in resource management. At the same time, there should be emphasis on building awareness in communities, and building capacity of community organizations in managing resources following the diverse ways of life and culture in the sub-basin.

As a result of this review and refinement process, major revisions were made to this level of the initial draft action plan for the Ping part 1 sub-basin. The overall logic of the plan was simplified to include only a vision statement and a single goal, as seen in Figure 3-26. In this approach, the vision statement is a combination of three elements, and each element is then more clearly defined. These three definition statements can be seen as equivalent to objective statements that are specifically and clearly linked with the overall vision. These ideas are then integrated into a single overall goal statement for the sub-basin plan.

Figure 3-26. Ping part 1: Sub-basin vision & goal

<p>Vision Beautiful forests, clear water, development with united hearts & promoting local wisdom</p> <p><i>Beautiful forests, clear water</i> means resources are rich, have biodiversity, are sources of food and medicines to care for disease, and communities have access to their benefits</p> <p><i>Development with united hearts</i> means collaborative linkage mechanisms among all local parties, no matter if at the level of groups, peoples organizations, local agencies, local governments, temples, schools, etc.</p> <p><i>Promoting local wisdom</i> means rehabilitation and gathering of local knowledge, presenting information, and building acceptance</p>
<p>Goal</p> <p>Communities have knowledge & awareness about local resource problem situations, and apply it in building participatory strategies with all local parties for sustainable management of natural resources in the watershed</p>

This is an interesting and innovative approach that seeks to combine the necessary types of information into a format that is quite simple, straightforward, and easy to understand.

Action Plan for the Ping part 1 Sub-basin

Efforts by the Working Group combined their initial sub-basin vision statement, goals and objectives, with a set of strategies that could be roughly matched with those being developed in other sub-basins. A long list of hundreds of locally proposed projects collected by the implementation consultants was then sorted according to sub-basin strategies. The sub-basin Working Group then selected and grouped small projects into larger projects that logically fit under each sub-basin strategy. Although it was logistically difficult to consider so many projects in such a short period of time, efforts were made to select priority types of activities from the lists of projects and project groups.

The initial draft action plan for the sub-basin was then submitted for review by local networks in the sub-basin. Local leaders reviewed draft action plan documents and reports and prepared summary materials for joint consideration by a local working group and specialists. The local review group included representatives of villagers, various local networks, and others related to management of natural resources and the environment. After several rounds of review and modification, the revised plan structure was presented and reviewed at a sub-basin forum with more than 150 participants from the sub-basin.

During the review process, much initial emphasis was placed on clarifying the basic directions and characteristics of the sub-basin action plan. Local reviewers felt that a watershed resource management plan that really brings increased efficiency to implementation probably results not only from high-level knowledge in its activities, from its good looks, or from its beautiful language. It is also due to its efforts to give importance to processes in preparing components related to implementation and participation by groups and organizations, including various networks, as well as the knowledge base, the base of experience in direct and indirect ways of managing resources, and many other factors in building participation in action planning.

Considerable importance was given to local exchange of ideas related to the question of “what should a good plan be like?” This resulted in articulation of seven principles for a good plan, as listed in Figure 3-27. These views also reflect emphasis by local sub-basin networks on long-term processes for developing sub-basin plans, including emphasis on processes that need to occur before planning in order to prepare people, build data, conduct exchange and build understanding. Such initial processes are then followed by identification of the content,

components and procedures of the planning process, and then finally by determining the strategies, measures and indicators contained in the plan.

While the networks sought to employ this approach as much as possible during the short time available for refinement of this initial sub-basin action plan, they also integrated these processes into the revised plan in order to support the longer-term processes required for building capacity, real participation, and development of a “good” long-term sub-basin plan.

Results of their efforts are reflected in the revised structure of the Ping part 1 sub-basin action plan as in Figure 3-28.

Figure 3-27. What does a good plan look like?

- 1 A plan must have life, which means it must have flexibility to adapt according to conditions and it can really be implemented
- 2 A plan must have a real database, whether it is data on knowledge or data on various conditions
- 3 A plan must emphasize processes with real participation of the people
- 4 A plan must be easy to understand, not confusing, and written in language that can be easily understood
- 5 A plan must not be driven by funds & budgets, it should be led by heart & thought
- 6 A plan must have continuity and seek sustainability
- 7 A plan must be in line with current contexts, conditions & problem situations

Figure 3-28. Ping part 1 Sub-basin Action Plan: Strategies & component measures

<p>Strategy 1. Building capacity of community organizations (human resource development)</p> <ol style="list-style-type: none"> 1.1 Support and promote provision of knowledge to community organizations at all levels 1.2 Further build on the base of resource management activities conducted by local peoples organizations 1.3 Promote establishment of networks among peoples organizations to manage natural resources in the sub-basin and sub-watersheds 1.4 Support and promote continuing inheritance of local knowledge 1.5 Support and promote providing knowledge in occupations appropriate for community potential and location 1.6 Support and promote sanitation and hygiene for improving quality of life and health
<p>Strategy 2. Studying and gathering of community datasets and knowledge</p> <ol style="list-style-type: none"> 2.1 Make information system for peoples resource-based management organizations in sub-basin & sub-watersheds 2.2 Study & collect knowledge datasets & local knowledge about local natural resource & environmental management 2.3 Establish implementation-based research in collaboration with local communities in the watershed 2.4 Establish processes for data analysis and evaluation of problem conditions in the watershed
<p>Strategy 3. Building mechanisms for collaboration with local parties</p> <ol style="list-style-type: none"> 3.1 Build collaboration among communities and local government organizations in managing resources in watersheds 3.2 Raise the level of communities in natural resources and environment planning that can join with local governments 3.3 Promote establishment of networks among peoples organizations to manage natural resources in the Ping part 1 sub-basin and local sub-watersheds
<p>Strategy 4. Promote and support natural resource management activities (natural resource conservation)</p> <ol style="list-style-type: none"> 4.1 Restore natural resources and environment 4.2 Control and protect community natural resources 4.3 Community collaboration in determining directions of resource management 4.4 Use ways of life and culture as tools in management and activities
<p>Strategy 5. Managing resources and watershed management organization structure</p> <ol style="list-style-type: none"> 5.1 Raise the level of community organizations in holistic watershed management 5.2 Develop organizational mechanisms for managing watersheds and community organizations 5.3 Formulate plans for managing sustainable use of resources
<p>Strategy 6. Policy monitoring and advocacy</p> <ol style="list-style-type: none"> 6.1 Monitor, examine and present opinions about state resource management policies 6.2 Supplement processes of various networks in following laws demanded by communities, such as the community forestry law

At this point, further detail of the plan consists of (1) lists of example types of activities to be conducted under each strategy, and (2) identification of first-year priority activities under each strategy for each sub-district in the sub-basin. Indicators have also been developed at the level of measures, but they are really closer to statements of expected outcomes, as discussed in more detail in section 6.1.1, below.

Other strategy components for a long-term sub-basin management plan

As leaders in the Ping part 1 sub-basin move toward further improvement and development of a full-scale long-term river sub-basin plan, they should consider any needs for further work on other strategies associated with a full-scale long-term sub-basin management plan, as follows:

- Monitoring and information strategy. Descriptive names of measures and activities listed under each strategy of the action plan indicate there are many activities aimed at building and using local knowledge and data bases, including expanding local monitoring of natural resources, the environment, and other dimensions of sub-basin livelihoods and quality of life. Moreover, these are aimed at sub-basin, local organization and community levels, where they would both generate and use various types of important information.

Once the sub-basin management organization is established and its roles and duties become clear, it may be useful to extract and assemble these components, and begin systematic identification of the full range of monitoring and information needs of the sub-basin. This could help in developing an overall monitoring and information strategy to meet the range of needs in the most systematic and efficient manner possible.

- Partnership and capacity building strategy. There also appears to be very strong emphasis on capacity building of organizations at sub-basin and more local levels, as well as on building of partnership linkages among organizations in the sub-basin. Partnerships with local governments are also the focus of specific measures, while collaboration with outside networks receives attention under strategy 6. Partnerships with other types of organizations based outside the sub-basin are mentioned, but are not yet very clear.

After the sub-basin management organization is established and its roles and duties become clear, it may also be useful to extract and assemble these components, and begin systematic identification of the full range of capacity building and partnership needs of the sub-basin. This could help in developing an overall strategy to meet the range of needs in the most systematic and efficient manner possible.

- Funding strategy. The current uncertainties surrounding funding support for activities of the sub-basin management organization, and for activities contained in the sub-basin action plan, are still too great for sub-basin leaders to be able to identify a potential structure for an overall sub-basin funding strategy. Discussions have already begun, however, regarding alternative funding sources that may have potential for providing support for different types of projects and activities under the action plan. It is already clear that local governments (TAO, *tessaban*, PAO), province administrations, and various relevant central government agencies are seen as important partners and sources of support for particular types of activities. Discussions in the Ping part 1 sub-basin also include efforts to develop proposals to seek support from a wider range of government, non-government, and possibly even international outside sources

One important current question is whether or not the relevant central government agencies will be willing and able to provide basic core support for operation and development of the sub-basin organization itself. Once the source of this type of support can be identified, it will become more feasible to explore additional potential sources of support, and to make more progress toward developing an overall sub-basin funding strategy.

River Sub-basin Management Organization (RSBO) for the Ping part 1 sub-basin

Initial efforts by the sub-basin Working Group toward identification of an appropriate structure for a long-term sub-basin management organization began with a review of existing local organizations in the Ping part 1 sub-basin. Facilitated by implementation consultants, this initial review focused on the types of organizations shown in Figure 3-29. In the case of the Ping part 1 sub-basin, half of the types of organizations identified were established by local people and communities themselves. The other three types were established through efforts by government agencies, with each agency supporting its own local organization.

Figures 3-29. Initial review of existing local organizations: Ping part 1

<i>Existing organization</i>	<i>Established by</i>	<i>Remarks</i>
Restoration of natural resources & environment		
1 Joint sub-committee for restoration of natural resources & environment, Ping part 1 sub-basin, with sub-district working groups	Dept. Nat. Parks	<i>established 2005</i>
Forest conservation		
2 Community forest network	local people	<i>strong</i>
Water conservation, watershed forest		
3 Ping River stream network	local people	<i>strong</i>
Water management		
4 Irrigation water administration group	Irrigation Dept	<i>strong</i>
5 Muang fai weir irrigation groups	local people	<i>strong</i>
6 Water management working group, Ping part 1 sub-basin (Upper Ping management sub-committee)	Dept. Water Resources	<i>no supporting budget until DWP got funds for 2006-07</i>

Figure 3-30. Initial organization SWOT analysis: Ping part 1

Strengths
1 have customs, traditions & ways of life that depend on forests; local knowledge in forest resource conservation & use
2 have strong local natural resource conservation groups, such as soil doctors, muang fai, forest conservation groups & groups opposing pollution
3 have watershed management committees in every sub-district with established regulations and penalties regarding water use; & have sub-district-level natural resource restoration working groups
4 receive technical support, techniques, methods & funds from various development organizations
Weaknesses
1 absence of coordination linkages among state agency units and local groups
2 some villages and groups still lack forest management
3 coordination among local organizations has not yet received participation
4 management organizations are complicated
5 state does not understand work by the people's sector
6 various information communications & public relations are conducted too slowly
7 lack of funding support for conducting activities
Opportunities for group development
1 state policies, work plans, & projects that provide full support for natural resource conservation
2 state provides support for people's participation in managing natural resources & environment
Limitations
1 related agency units do not provide real and continuous support so that results can meet goals
2 outside investors encroach on forests and use land inappropriately
3 duplication in implementation work of agency units
4 frequent change of administrators & political policies of supporting organizations result in no implementation continuity

Working groups then conducted a SWOT analysis of these existing organizations, with assistance from implementation consultants, and the results are summarized in Figure 3-30.

After reviewing SWOT analyses from all pilot sub-basins, and developing an overall framework for a uniform type of RSBO structure,⁴ project implementation consultants proposed an initial structure for a long-term RSBO for the Ping part 1 sub-basin. Its characteristics are summarized in Figure 3-31. Leadership positions are all assigned to government officials according to positions that they occupy, and members are to be selected according to allocations under 4 types of forest and water management issues.

Results of this process generated a great deal of discussion and analysis during the subsequent review and modification process facilitated by local sub-basin networks.

One key issue raised by local network reviewers was the very limited range of types of existing local organizations considered during this process. Types of relevant organizations used in local analysis should include:

- Old existing community organizations related to ways of life, culture and religion
- Groups and organizations established by the government
- Groups emerging in response to problem situations related to forest, land, water, etc.
- Groups of local government organizations / administration groups
- Groups of entrepreneurs related to businesses that use or sell resources
- Technical specialist groups / private development organizations (NGO).
- Groups of central or provincial government organizations or their local working units

Using this type framework, assessments by local networks came to the conclusion that a long-term RSBO for the Ping part 1 sub-basin should place strong emphasis on development of local

Figure 3-31. Initial RSBO structure proposed by implementation consultants: Ping part 1

Chairman	
Head, Coordination office for Upper Ping NRE restoration	1
Vice Chairman	
Representative, Office of NRE, Chiang Mai Province	1
Secretary	
Head, sub-basin coordination working group, Coordination office for Upper Ping NRE restoration	1
Assistant Secretary	
Head, environment working group, Office of NRE, Chiang Mai Province	1
Members	
Upper watersheds (forest conservation)	
Farmers	1
Ethnic minority groups	2
Local government (TAO)	2
Non-government organizations (NGO)	1
Monks	1
Community specialist – forest	1
Community specialist – soil	1
Agriculture water pollution	
Farmers (paddy rice) – medium to large size fields	1
Farmers (longan) – medium to large size orchard	1
Farmers (orange) – medium to large size orchard	1
Farmers (maize) – medium to large size fields	1
Tourism entrepreneur	1
Public health specialist	1
Water shortage / water management	
Heads of tradition water management groups (muang fai)	3
Tourism entrepreneur	1
Village philosopher	1
Kamnan	1
Village headmen	1
Local government (TAO)	1
Non-governmental organizations (NGO)	1
Sub-basin facilitator – water	1
Sub-basin facilitator – organizations	1
Floods	
Rep. Center to prevent & abate public hazards, Chiang Mai	1
Local government (TAO)	1
Total membership: 32	

⁴ See section 3.3 introduction

capacities to be the primary source of leadership and initiative for sustainable management of natural resources and environment in the sub-basin, as required to achieve their vision (Figure 3-26) and to effectively implement their action plan (Figure 3-28).

Thus, the roles and duties of a long-term RSBO for the Ping part 1 sub-basin were revised to include the eight major areas of activity listed in Figure 3-32.

Accordingly, another important revision has been in the membership composition and structure of the long-term RSBO. As indicated in Figure 3-33, members are to provide appropriate representation of the range of existing local organizations that are the building blocks for the RSBO. All leaders are to be elected locally, domination by government agencies or other powerful outside interests is not seen as desirable.

Establishment of this approach requires an initial selection committee, and acceptance by major stakeholders of a process for building the capacity and strength of the RSBO:

- *A Selection Committee* is to be composed of honorable individuals who have relationships with local management of natural resource and the environment. They will conduct processes to select individuals to participate in the organizational structure, also known as the Watershed Committee. In order to conduct this process, the selection committee must be appointed and roles must be specified.
- *Building organizational strength.* One important aspect of directions for building the strength of the sub-basin organization is to give importance and acceptance to the form of local network organizations conducting management duties. This is especially important for government units and local governments, who will have important roles in providing continuing support for action plans and activities of organizations. The state must show sincerity by using a supporting approach in order for real participatory management to emerge both in the roles and duties of the organization, and in sub-basin

Figure 3-32. Ping part 1 RSBO: Roles & duties

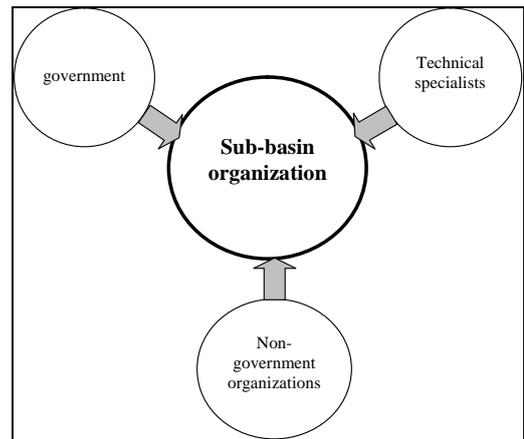
1.	Administer, manage and plan activities and budgets of local organizations in the watershed
2.	Promote working processes of local organization networks in conducting local-level natural resource management activities
3.	Disseminate and publicize information, activities, and knowledge related to resource management to people in the area, the public and related organizations, in order for them to receive and understand results or various implementation methods under natural resource and environmental management action plans
4.	Link & coordinate partnership mechanisms at local area level and at network level
5.	Conduct duties to negotiate and mediate conflicts arising in local areas related to management and uses of natural resources and environment in the watershed
6.	Conduct policy-oriented monitoring of proposals by local community organization networks on management of natural resources and the environment or of large-scale development projects in the area
7.	Consider, review and modify action plans for watershed management to increase efficiency and relevance to the state of local areas
8.	Consider certification of the status of local network organizations

Figure 3-33. Ping part 1 RSBO: Membership

Chairpersons & secretaries	
Elected locally	
Sub-committees	
Linkages with local sub-watershed committees	
Membership composition:	
Old existing community organizations	6
Community forestry networks	3
Ping River stream conservation network	2
Farmers networks	2
Ethnic minority groups	3
Housewives groups, Women's development groups	3
Local government (TAO, <i>tessaban</i> , PAO)	4
Kamnan / village headmen	3
Government officials, agency local units	3
Local specialists	2
Non-governmental organizations (NGO)	2
Private investor / entrepreneur groups	2
Total membership: 35	

action plans. The main theory is 4 pillars (Figure 3-34): The basic idea is to allow the watershed organization to be the main structural pillar, and have non-government development organizations, government organizations, and technical specialists provide support under the roles, duties and conditions established by the local sub-basin organization.

Figure 3-34. Ping part 1 RSBO 4 Pillars



3.3.2. Mae Kuang sub-basin

Sub-basin Context

The Mae Kuang sub-basin is a quite large sub-basin that covers most of the eastern side of the Chiang Mai – Lamphun valley, including areas in both of those provinces. Under this project, Mae Kuang represents the group of “middle” sub-basins described in section 3.1.1. Basic data on the physical, demographic, administrative, and land and water resource use features of the sub-basin are shown in Figure 3-35, and the spatial configuration of the sub-basin is presented in

Figure 3-35. Sub-basin data table: Mae Kuang

Sub-basin total area	kilometer ²	2,734
Altitude zones		
< 600 masl	% land area	69
600 - 1,000 masl	% land area	25
> 1,000 masl	% land area	6
Watershed classification		
1A	protected forest % land area	26
1B	protected forest % land area	1
2	restricted uses % land area	17
3	limited uses % land area	9
4	conservation measures % land area	12
5	unrestricted % land area	35
Climate		
- average temperature	degree C	25.9
hottest month	degree C	37
coolest month	degree C	14
- total average rainfall	mm	1,126
rainy season	mm	1,002
dry season	mm	123
- total average runoff	million m ³	912
rainy season	million m ³	759
dry season	million m ³	153
Water storage		
- large scale	million m ³	348
number		1
capacity	million m ³	263
service area	% land area	10.2
- medium scale	million m ³	26
number		4
capacity	million m ³	26
service area	% land area	1.9
- small scale	million m ³	59
number		51
capacity	million m ³	59
service area	% land area	2.4
Water requirements		
- irrigation	million m ³	577
large-scale	million m ³	316
medium / small / pumping	million m ³	161
people's local irrigation	million m ³	69
consumption & domestic	million m ³	21
municipalities	million m ³	11
rural	million m ³	10
- industry & tourism	million m ³	10
- ecological balance	million m ³	-
Population		
- total population	persons	290,988
municipalities	percent	50
rural	percent	50
- overall population density	pers/sq km	106
Administrative units		
municipalities	number	14
tambons	number	69
districts	number	10
provinces	number	2
State forestlands		
- national park	number	2
declared area	% land area	2
- wildlife sanctuary	number	1
declared area	% land area	11
- reserved forest	number	15
declared area	% land area	50
Total state forestlands	% land area	63
Land outside state forestlands	% land area	37
Land use		
- forest cover	% land area	56
- not under forest cover	% land area	44
- suitable for agriculture	% land area	30
suitable for rice	% land area	22
suitable for field/tree crops	% land area	8
- agriculture	% land area	33
- settlements	% land area	7
- water & other	% land area	3
Municipality pollution		
municipalities	number	14
population	persons	145,473
- total wastewater	million m ³ /yr	6.9
- biochemical oxygen demand - BOD	tons / year	687
- garbage	tons / year	35,781
Agriculture pollution		
- pesticide use	rice tons / year	0.2
field crops	tons / year	0.1
fruit trees / horticulture	tons / year	8.1
- nitrogen use	rice tons / year	931
field crops	tons / year	75
fruit trees / horticulture	tons / year	1,091
- phosphorus use	rice tons / year	216
field crops	tons / year	13
fruit trees / horticulture	tons / year	163
- estimated BOD	rice tons / year	866
field crops	tons / year	21
fruit trees / horticulture	tons / year	195

Although forest agencies have a substantial presence, irrigation agencies are very strong here, and several agencies and organizations have strong linkages with local groups in different parts of the sub-basin. While various local groups have grown quite strong in different parts of the sub-basin, their interaction and collaboration appears to have been limited. The resulting tensions between tendencies toward competing factions, and their common desire to build local capacity and leadership to address natural resources and environment issues has been reflected in the manner in which they have participated in project activities.

Project implementation leadership in the Mae Kuang Sub-basin

The structure and composition of the initial project working group that provided leadership for project implementation in the Mae Kuang sub-basin is shown in Figure 3-37. The project implementation consultant team facilitated work by the Mae Kuang working group. This included providing information both from their rapid initial surveys in the sub-basin and from secondary sources, as well as organizing and analyzing data for the working group. They also helped prepare meeting agendas and documents, and provided various specialists to assist with particular topics as appropriate. Members of ONEP staff also attended major Working Group meetings.

The subsequent process to review and modify sub-basin plans and proposed organizational arrangements was led by well-known people the sub-basin who are active in networks and organizations related to management of natural resources and the environment. Deliberations of major meetings and forums conducted under this process are documented.

Figure 3-37. Working Group: Mae Kuang

Chairman	
Heads, Province NRE offices (CM, LP)	2
Secretary	
Province ONEP officer	1
Members	
Province governments	2
Province NRE office - nat. res. working group	1
Province NRE office - water working group	1
Government agency - Royal Forest Dept.	1
Project Consultant	1
Local officials	3
Upper Ping Committee	1
Local organization supported by DNP	1
Local specialists	2
Peoples representatives	4
Peoples organizations	1
NGO	1
Business representative	2
TOTAL	
	24

in

Remaining parts of this section discuss the results of these processes in terms of the progress made toward completing the requirements of phases 1 and 2 of the five phase process for developing sub-basin management organizations summarized in section 3.2., and developing the basic components of a draft long-term sub-basin management plan for phase three.

Identification of sub-basin problems

The first basic component of a long-term sub-basin management plan is clear statement of the problems to be addressed by a sub-basin organization and its planning process.

Problem assessments facilitated by project implementation consultants using secondary information and “PRA”-type techniques resulted in identification of a range of important problems. The review and revision process facilitated by local networks in the Mae Kuang sub-basin maintained the basic structure of this problem identification approach, but made a number of modifications in how problems are described. The listing of issue topics and problems shown in Figure 3-38 reflects the overall results of both of these processes.

In the documents that describe these problems, many specific situations and locations are identified to reinforce and further describe the nature of most of these problems. This is also

evidence of the very substantial amount of local thought and discussion that has been invested in identifying and understanding local problems during recent years. These processes clearly have been going on for some time, so that this project has sought to benefit from, and help facilitate expansion and integration of various lines of analytical activity in the sub-basin.

Figure 3-38. Issues and problem situations: Mae Kuang

<i>Issue Topics</i>	<i>Problems</i>
1. Natural resources	
<i>(a) forests</i>	
	<ol style="list-style-type: none"> 1. Illicit timber harvest and forest destruction in upper watershed forests for non-timber forest products, timber, fuelwood and charcoal due to increasing outside demand and prices; and forest fires set to help obtain various production inputs, hunt wildlife, and make land use claims. 2. Forest encroachment in watershed forest areas, due to clearing of old land claims by residents for business, for new residents and farms, and for religious facilities including some backed by funds from overseas 3. Increased use of forest resources by private entrepreneurs for orchards, quarries, etc. under concessions, but with no restoration after concessions expire. 4. Government organizations request and obtain forest land for colleges, schools, agricultural extension 5. Policies & laws related to forest resources not in line with current conditions, such as declaring national parks over community agriculture areas; promoting investment and trade competition that encourages forest resource use
<i>(c) water</i>	
	<ol style="list-style-type: none"> 1. Increased use of water for agriculture, industry, services, and community settlements 2. Inefficient management of water resources with conflict among communities, and among state agencies and organizations,, business sector, and local people over water resource structures, diversions, pumping, etc. 3. Headwater sources have less water storage capacity 4. Shortage of supplemental water supplies for use during dry season 5. Shallower waterways, accumulation of sediment, riverbank scouring during high flow periods 6. Flooding in some areas 7. Encroachment in riverside areas 8. Loss of riparian ecology and aquatic biodiversity due to landscape modifications, dredging and projects by central and local governments, private sector and local people
<i>(b) land</i>	
	<ol style="list-style-type: none"> 1. Deteriorated soil from use of chemicals and incorporation of chemicals into the soil 2. Erosion of topsoil from agriculture and flooding; soil acidity from pumping groundwater 3. Topsoil degradation and erosion 4. Lack of tenure rights in farm land, and leaving areas as wastelands
2. Environment	
	<ol style="list-style-type: none"> 1. Wastewater from communities, pig farms, dairy farms, industrial factories, laundries, paper & textile production 2. Increasing amounts of garbage without proper sanitary disposal 3. Air pollution by dust, soot and smoke from industrial factories, rice mills, forest fires and burning garbage 4. Pollution from agricultural chemical residues in produce, which causes problems for consumers
3. Population, Economy & Society	
	<ol style="list-style-type: none"> 1. Changing social values and increasing consumption and resource use 2. Increasing agricultural expenses, such as fertilizers and pesticides 3. Decreasing income from agriculture due to reduced production and quality; decreasing amounts & types of food from natural sources 4. Less consciousness of community members about resource conservation and development 5. Less role for communities and their participation in managing natural resources and the environment 6. Roles of existing community organizations in managing natural resources and the environment are being replaced by central government agencies and local governments 7. Various projects, such as projects related to narcotics and an establishment for care of ethnic minority children
3. Health	
	<ol style="list-style-type: none"> 1. Status of illness due to intestinal and respiratory diseases 2. Status of illness due to agricultural chemical use 3. Provision of public health services

Sub-basin vision, goals and objectives

Given the issues and problems related to natural resources, environment, livelihoods and health that were identified in the Mae Kuang sub-basin, the next step under the project was to facilitate identification and articulation of what people hope to achieve by developing and implementing action plans for managing natural resources and environment in the sub-basin. The implementation consultants assisted the Mae Kuang Working Group in developing an initial overall vision statement, along with overall goals and objectives for the sub-basin.

During the review and modification process facilitated by local sub-basin networks, a considerable amount of debate emerged about the directions for sub-basin management of natural resources and environment. Much of this debate related to the different views that have developed in different areas of the Mae Kuang and Mae Tha watersheds, which have been combined into the Mae Kuang sub-basin. The simplest description would be that people in the upper portions of watersheds are concerned mainly about conservation, while people in middle parts of watersheds place emphasis on resource use and competition, and people in lower watershed areas focus largely on the negative impacts of upstream behavior.

Various groups, organizations and networks have been working in each of these areas, and most have already developed various visions and plans. Some of these groups are quite strong and have support from various government agencies and other powerful interests. Thus, it was a fairly difficult process to seek a synthesis that has a sufficient balance among the views of different stakeholder groups.

The compromise that finally emerged from this process used the vision, goals and objectives developed by the Mae Kuang Working Group, but with several key modifications and additions. The results are shown in Figure 3-39.

Figure 3-39. Mae Kuang: Sub-basin vision, goal & objectives

<u>Vision:</u> Restored local knowledge; Mae Kuang sub-basin has abundant water; Soil, water and forest deterioration disappears; Increased economic value; Support for all communities
<u>Goal:</u> To conserve and restore natural resources and improve environmental quality in the Ping watershed in order to provide good livelihoods and sanitation for the people
<u>Objectives:</u> <ol style="list-style-type: none"> 1. To provide the Mae Kuang sub-basin with rich & productive natural resources & environment, especially water resources that are the main basic resource in the local reservoir named by H.M. the King as Udom Thara 2. To care for and restore soil, water, and forest resources, which are natural resources that are important for livelihoods of the people in the Mae Kuang watershed, and to build capacity, knowledge, strength and participation of people in the watershed 3. People in the watershed are able to have balanced livelihoods, have strong community economies, and are able to have basic household incomes that are in balance with nature 4. People in the watershed have good quality of life, livelihoods, and physical health, and communities in the watershed have strength to better themselves by helping each other

Action Plan for the Mae Kuang Sub-basin

Initial project efforts to develop a sub-basin action plan for management of natural resources and the environment were facilitated by the implementation consultants. This process began with collecting many hundreds of proposed projects already identified by local organizations, along with some new projects that were identified through their “PRA”-type techniques or through members of the Mae Kuang Working Group.

The implementation consultants then classified and grouped individual projects according to how they fit with the general overall strategy structure they were proposing for all action plans. Measures for each strategy were then developed to reflect the types of projects considered by the Mae Kuang Working Group to be important under each strategy.

During the review and modification process facilitated by local sub-basin networks, there was again much debate among the various groups in the sub-basin. In addition to the different types of activities emphasized by different groups, several of the groups had also developed their own plans under activities supported by different government agencies. Since different agencies use different types of forms and planning models, it was again a quite difficult process to try to merge and synthesize plans from different areas of the sub-basin.

Finally, another compromise emerged based on fairly minor modification and rearrangement of the action plan structure developed by the Mae Kuang Working Group and implementation consultants. The resulting strategies and measures contained in the action plan are listed in Figure 3-40. Final project reporting documents from the sub-basin also include a revised list of names and locations for a total of 111 projects and groups of projects proposed for implementation under the 14 measures contained in the action plan.

Figure 3-40. Mae Kuang Sub-basin Action Plan: Strategies & component measures

<p>Strategy 1. Management of natural resources and environment through participation of the people</p> <p>1.1 Control and enforcement of regulations and laws related to pollution prevention</p> <p>1.2 Restore existing local organizations to have knowledge and capacity</p> <p>1.3 Build people's participation in management of natural resources and the environment</p> <p>1.4 Establish holistic natural resources management organizations in the watershed</p>
<p>Strategy 2. Conserve and restore natural resources to be fertile and productive</p> <p>2.1 Care for and look after natural resources and the environment to be fertile and productive</p> <p>2.2 Strictly enforce use of laws and local codes and punish violators destroying forest resources</p> <p>2.3 Develop potential and build networks to guard natural resources & the environment</p> <p>2.4 Promote conservation-based tourism, and preservation of livelihoods, traditions, culture and local knowledge</p>
<p>Strategy 3. Build economic strength of communities to increase basic household & community incomes</p> <p>3.1 Promote employment and local occupations by supporting occupational knowledge and methods appropriate for local potential</p> <p>3.2 Campaign for people to recognize savings so they can control and reduce unimportant household expenses</p> <p>3.3 Build opportunities for people and community entrepreneurs to access occupational finance sources</p>
<p>Strategy 4. Good quality of life, health and livelihoods</p> <p>4.1 Training and providing knowledge related to community hygiene</p> <p>4.2 Improve community environmental conditions to be pleasant</p> <p>4.3 Promote, campaign and public relations on sanitation for better quality of life, health and livelihoods</p>

Other strategy components for a long-term sub-basin management plan

As leaders in the Mae Kuang sub-basin move toward further improvement and development of a full-scale long-term river sub-basin plan, they should consider needs for further work on other strategies associated with a full-scale long-term sub-basin management plan, as follows:

- **Monitoring and information strategy.** Based on the descriptive names of projects listed under each measure of the action plan, there a considerable number of activities are being proposed that would expand local monitoring of natural resources and the environment, and that would both generate and use various types of information. Most of these appear to be directed toward specific issues or particular groups or organizations in the sub-basin.

Monitoring and information needs at the sub-basin level will need to be further identified and developed as part of the process to develop the sub-basin management organization discussed in the next section. Once the sub-basin management organization is established and its roles and duties become clear, it would be useful to begin identifying the full range of monitoring and information needs of the sub-basin. The next step would then be to develop an overall monitoring and information strategy to meet the full range of needs in the sub-basin in the most systematic and efficient manner possible.

- Partnership and capacity building strategy. The current situation regarding this strategy is similar to the monitoring and information strategy. There appears to be many projects that aim to build awareness and capacity among organizations, groups and people in the sub-basin. And many projects are being proposed by groups or organizations that already have or want to develop strong linkages with government agencies or other outside institutions, organizations, groups or networks. Furthermore, it appears that building of network linkages and partnerships among organizations and groups within the sub-basin will be a very important concern of the long-term sub-basin management organization. Thus, it would also be useful for the new sub-basin management organization to develop an overall partnership and capacity building strategy aimed at meeting the full range of needs in the sub-basin in the most systematic and efficient manner possible.
- Funding strategy. The current uncertainties surrounding funding support for activities of the sub-basin management organization and for projects and activities contained in the sub-basin action plan are still too great for sub-basin leaders to be able to identify a potential structure for an overall sub-basin funding strategy. Discussions have already begun, however, regarding alternative funding sources that may have potential for providing support for different types of projects and activities under the action plan. It is already clear that local governments (TAO, *tessaban*, PAO), province administrations, and various relevant central government agencies are seen as important partners and sources of support for particular types of activities.

One of the most important current questions is whether or not the relevant central government agencies will be willing and able to provide basic core support for operation and development of the sub-basin organization itself. Once the source of this type of support can be identified, it will become more feasible to explore additional potential sources of support, and to make more progress toward developing an overall sub-basin funding strategy.

River Sub-basin Management Organization (RSBO) for the Mae Kuang sub-basin

The sub-basin Working Group's initial effort toward identification of an appropriate structure for a long-term sub-basin management organization began with a review of existing local organizations in the Mae Kuang sub-basin. Facilitated by implementation consultants, the initial review focused on the types of organizations shown in Figure 3-41. In the case of the Mae Kuang sub-basin, most types of organizations identified were established through efforts by government agencies, with each agency supporting its own local organization.

Working groups then conducted a SWOT analysis of these existing organizations, with assistance from implementation consultants, and the results are summarized in Figure 3-42.

After reviewing SWOT analyses from all pilot sub-basins, and developing their overall framework for a uniform type of RSBO structure, project implementation consultants proposed an initial structure for a long-term RSBO for the Mae Kuang sub-basin. Its characteristics are summarized in Figure 3-43. Leadership positions are all assigned to government officials

according to positions that they occupy, and members are to be selected according to organizational sector and zones within the sub-basin.

Figure 3-41. Initial review of existing local organizations: Mae Kuang

<i>Existing organization</i>	<i>Established by</i>	<i>Remarks</i>
Restoration of natural resources & environment		
1 Joint sub-committee for restoration of natural resources and environment, Mae Kuang - Mae Tha	Dept. Nat. Parks	<i>established 2005</i>
2 Urban environmental network conservation organization		<i>no supporting budget</i>
3 Group against garbage	local people	
Plant forest, community regulations, forest care & maintenance		
4 Forest conservation and forest fire protection group	Dept. Nat. Parks	<i>no supporting budget</i>
Care for, conserve, rehabilitate, improve & maintain soil		
5 Soil doctor group	Land Development Dept	<i>no supporting budget</i>
Safe agriculture		
6 Composting group (biological fertilizer) and chemical safe home garden produce	Dept. Agricultural Extension	<i>no supporting budget</i>
Provide clean water		
7 Village water supply group (consumption & domestic use)		
Water management		
8 Mae Kuang Tara Dam irrigation water user organization	Irrigation Dept.	<i>strong</i>
9 Muang fai weir irrigation groups	local people	<i>strong</i>
10 Mae Kuang and Mae Tha sub-basin working group (Upper Ping basin management sub-committee)	Dept Water Resources	<i>no supporting budget until DWP got funds for 2006-07</i>

Figure 3-42. Initial organization SWOT analysis: Mae Kuang

Strengths
1 customs, traditions and culture of people in the area related to conservation or natural resources are strong, and they support working together and dependence on each other
2 local governments - especially TAO - are ready to provide support for conducting management work
3 have clear organization management systems
4 people have real participation in conducting activities / conservation
Weaknesses
1 insufficient water resources for consumption, domestic use, agriculture and industry
2 lack of implementation budgets
3 lack of coordination among development organizations in the area
4 no legal basis for organization implementation work
5 Local governments in some areas do not give importance to resource development
Opportunities for group development
1 state policies, work plans, & projects that provide full support for natural resource conservation
2 state provides support for people's participation in managing natural resources and environment
Limitations
1 related agency units do not provide real and continuous support so that results can meet goals
2 outside investors encroach on forests and use land inappropriately
3 duplication in implementation work of agency units
4 frequent changes in administrators and political policies of supporting organizations result in lack of implementation continuity
5 lack of benefits among members, among groups of individual outsiders, some stakeholders provide little collaboration

Results of this process generated much discussion and analysis during the subsequent review and modification process facilitated by local sub-basin networks.

One key issue raised by local network reviewers was the very limited range of types of existing local organizations considered during this process. Types of relevant organizations used in their local analysis include:

- Old existing community organizations related to ways of life, culture and religion
- Groups and organizations established by the government
- Groups emerging in response to problem situations related to forest, land, water, etc.
- Groups of local government organizations / administration groups
- Groups of businesses such as industrial estates or resorts
- Technical specialist groups and private development organizations (NGO).
- Groups of central or provincial government organizations or their local working units

Figure 3-43. Initial RSBO structure proposed by implementation consultants: Mae Kuang

Chairman	
Head, Coordination office for Upper Ping NRE restoration	1
Vice Chairmen	
Representative, Office of NRE, Chiang Mai Province	1
Representative, peoples sector	1
Secretary	
Head, sub-basin coordination working group, Coordination office for Upper Ping NRE restoration	1
Assistant Secretary	
Head, environment working group, Office of NRE, Lamphun Province	1
Members	
Local government (TAO, tessaban, PAO) – Mae Kuang (upper)	2
Local government (TAO, tessaban, PAO) – Mae Kuang (middle)	2
Local government (TAO, tessaban, PAO) – Mae Kuang (lower)	2
Local government (TAO, tessaban, PAO) – Mae Tha (upper)	2
Local government (TAO, tessaban, PAO) – Mae Tha (lower)	2
Government agency – irrigation	1
Government agency – water resources	1
Government agency – Royal Development Study Center, HHK	1
Conservation organization – soil	1
Conservation organization – water	1
Conservation organization – forest	1
Conservation organization - environment	1
Youth representative	2
Women's group representative	2
Religious leader	1
Education institution representative / resource person	1
Peoples sector – Chiang Mai Province	8
Peoples sector – Lamphun Province	7
Non-government organizations / Local specialists	2
Entrepreneur – services sector	1
Entrepreneur – industry sector	1

Total membership: 47

This wider range of types of existing local organizations is seen as the source of existing components that can provide the foundation for the RSBO. With this approach, the roles and duties of the RSBO, as shown in Figure 3-44, would focus on activities that would complement those of these other existing organizations, which would function in a partnership role.

Figure 3-44. Mae Kuang RSBO: Roles & duties

1. Administer projects and budgets
2. Coordination & joint implementation with the coordinating office for restoration of natural resources & the environment
3. Monitor & evaluate implementation of activities and projects
4. Consider roles & improve action plans for management of natural resources & the environment in the sub-basin that are not efficient and relevant to the real state of local areas
5. Disseminate & publicize work plans & projects
6. Consider certification of the status of local network organizations
7. Negotiate and mediate conflicts related to management and uses of resources

There have also been major revisions to the membership structure of the RSBO, as shown in Figure 3-45. Leaders would all be elected locally, while membership would focus on representing an appropriate range of stakeholder networks and organizations.

A *Selection Committee* is required to establish the RSBO. It is to be composed of honorable individuals who have relationships with local management of natural resource and the environment. They will conduct processes to select individuals to participate in the organizational structure, also known as the Watershed Committee. In order to conduct this process, the selection committee must be appointed and roles must be specified.

Experience under this project appears to have helped local leaders appreciate the need for a real locally-led management organization at the sub-basin level, which is not dominated by one or a few particular factions in the sub-basin, or by links with one particular agency. The main missing roles that need to be conducted at the sub-basin level center on activities such as coordination, support, information, negotiation, monitoring and evaluation. These are exactly the types of functions that need to be present in order to avoid the types of difficulties that arose during implementation of this project.

Figure 3-45. Mae Kuang RSBO: Membership

Chairpersons & secretaries	
Elected locally	
Sub-committees	
Linkages with local sub-watershed committees	
Membership composition:	
Old existing community organizations	6
Community forestry networks	3
Stream conservation network	3
Farmers networks	3
Ethnic minority groups	3
Housewives groups, Women's development groups	3
Local government (TAO, <i>tessaban</i> , PAO)	6
Kamnan / village headmen	6
Government officials, agency local units	4
Local specialists	4
Non-governmental organizations (NGO)	2
Private investor / entrepreneur groups	2
Total membership: 45	

3.3.3. Ping part 5 (Lower Ping) sub-basin

Sub-basin Context

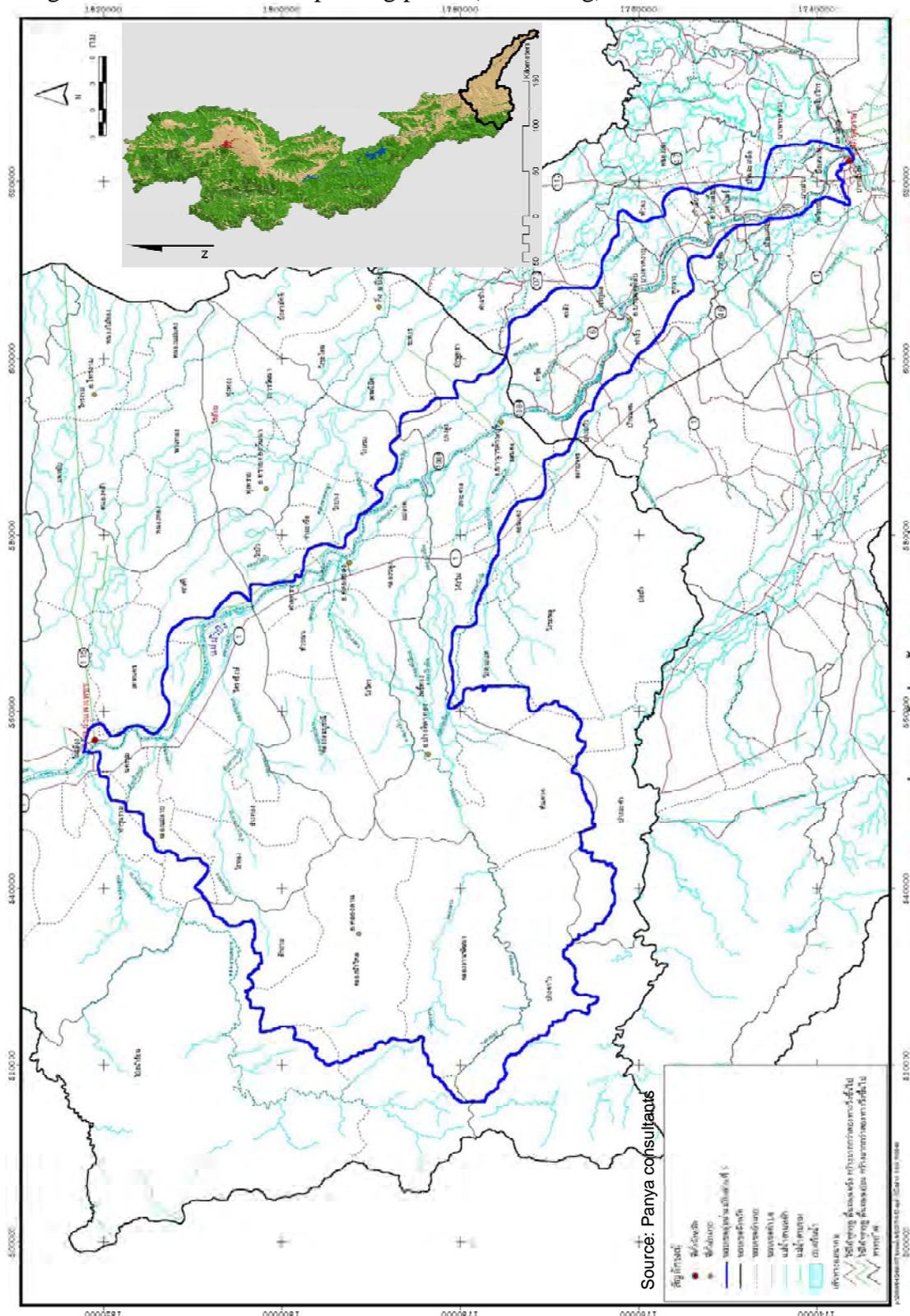
Located at the southern end of the Ping River Basin in Kamphaengphet and Nakhon Sawan provinces, the Ping part 5 sub-basin is the final sub-basin through which the Ping River flows before joining other major tributaries in Nakhon Sawan to form the main channel of the Chao Phraya River. Thus, it is also known as the “lower Ping” sub-basin. Under this project, the Ping part 5 sub-basin represents the group of lower sub-basins located below the Bhumiphol

Figure 3-46. Sub-basin data table: Ping part 5

Sub-basin total area	kilometer ²	2,980	Population			
Altitude zones			- total population	persons	378,141	
< 600 masl	% land area	95		municipalities	percent	
600 - 1,000 masl	% land area	5		rural	percent	
> 1,000 masl	% land area	1	- overall population density		pers/sq km	
Watershed classification			Administrative units			
1A	protected forest	% land area	8	municipalities	number	
1B	protected forest	% land area	0	tambons	number	
2	restricted uses	% land area	3	districts	number	
3	limited uses	% land area	3	provinces	number	
4	conservation measures	% land area	2	State forestlands		
5	unrestricted	% land area	84	- national park	number	
Climate			- average temperature	degree C	27.4	
- average temperature	degree C	27.4	hottest month	degree C	37	
hottest month	degree C	37	coolest month	degree C	18	
coolest month	degree C	18	- total average rainfall	mm	1,054	
- total average rainfall	mm	1,054	rainy season	mm	942	
rainy season	mm	942	dry season	mm	113	
dry season	mm	113	- total average runoff	million m ³	645	
- total average runoff	million m ³	645	rainy season	million m ³	519	
rainy season	million m ³	519	dry season	million m ³	125	
dry season	million m ³	125	Land use			
Water storage			- forest cover	% land area	14	
- large scale	number	-	- not under forest cover	% land area	86	
capacity	million m ³	-	- suitable for agriculture	% land area	65	
service area	% land area	-	suitable for rice	% land area	45	
- medium scale	number	-	suitable for field/tree crops	% land area	20	
capacity	million m ³	-	- agriculture	% land area	79	
service area	% land area	-	- settlements	% land area	5	
- small scale	number	8	- water & other	% land area	2	
capacity	million m ³	5	Municipality pollution			
service area	% land area	0.6	municipalities	number	11	
Water requirements			population	persons	146,697	
- irrigation	million m ³	1,897	- total wastewater	million m ³ /yr	8.5	
large-scale	million m ³	834	- biochemical oxygen demand - BOD	tons / year	851	
medium / small / pumping	million m ³	378	- garbage	tons / year	53,483	
people's local irrigation	million m ³	350	Agriculture pollution			
- consumption & domestic	million m ³	18	- pesticide use	rice	tons / year	
municipalities	million m ³	8	field crops	tons / year	0.3	
rural	million m ³	10	fruit trees / horticulture	tons / year	4.8	
- industry & tourism	million m ³	1	- nitrogen use	rice	tons / year	
- ecological balance	million m ³	315	field crops	tons / year	1,348	
			fruit trees / horticulture	tons / year	5,143	
			- phosphorus use	rice	tons / year	
			field crops	tons / year	314	
			fruit trees / horticulture	tons / year	909	
			- estimated BOD	rice	tons / year	
			field crops	tons / year	1,254	
			fruit trees / horticulture	tons / year	14,353	
				tons / year	78	

Reservoir. Basic data on physical, demographic, administrative, and land and water resource characteristics of the sub-basin are shown in Figure 3-46, and the spatial configuration of the sub-basin is shown in Figure 3-47. It includes large areas of irrigated lowland paddy, and extensive gently sloping areas that were declared reserved forest land, but only a few mountainous areas declared protected forest. Economic development has brought intensive commercial production to paddy areas and urban centers near the Ping River. It has also attracted settlement of reserved forest lands by communities that include migrants from Isan and some ethnic minorities, producing sugarcane, cassava, oranges, other crops and livestock.

Figure 3-47. Sub-basin map: Ping part 5 (lower Ping)



This sub-basin has much stronger economic and social linkages with the adjacent Central Plains region, and is well integrated into a broad range of government agencies and systems at multiple levels. Thus, most all local organizations related to management of natural resources and the environment are linked closely with government agencies and their working styles, and especially with those related to irrigation and water resources. This has been reflected in the manner in which they have participated in project activities.

Project implementation leadership in the Ping part 5 Sub-basin

The structure and composition of the initial project working group that provided leadership for project implementation in the Ping part 5 sub-basin is shown in Figure 3-48. The project implementation consultant team facilitated work by the Ping part 5 working group. This included providing information both from their rapid initial surveys in the sub-basin and from secondary sources, as well as organizing and analyzing data for the working group. They also helped prepare meeting agendas and documents, and provided various specialists to assist with particular topics as appropriate. Members of ONEP staff also attended major Working Group meetings.

Figure 3-48. Working Group: Ping part 5

Chairman	
Heads, Province NRE offices (KPP, NSW)	2
Secretary	
Province ONEP officer	1
Members	
Province governments	2
Province irrigation offices	2
Province NRE office - water working group	2
Project Consultant	1
Local officials	1
Lower Ping Committee	1
Local organization supported by DWR	1
Local specialists	2
Peoples representatives	4
Peoples organizations	2
NGO	1
Business representative	2
TOTAL	24

The subsequent process to review and modify sub-basin plans and proposed organizational arrangements was led by well-known people working in the sub-basin who are actively involved with networks and organizations related to management of natural resources and the environment. Deliberations of major meetings and forums conducted under this process are documented. There was much more continuity between these two stages of project implementation in the Ping part 5 sub-basin than in the two pilot sub-basins located in the Upper Ping basin.

Remaining parts of this section discuss the results of these processes in terms of the progress made toward completing the requirements of phases 1 and 2 of the process for developing sub-basin management organizations summarized in section 3.2., and developing the basic components of a draft long-term sub-basin management plan.

Identification of sub-basin problems

The first basic component of a long-term sub-basin management plan is clear statement of the problems to be addressed by a sub-basin organization and its planning process.

Problem assessments facilitated by project implementation consultants used secondary information, previous planning information, and “PRA”-type techniques, resulting in identification of a range of important problems. Much of the initial assessment was able to build on earlier planning processes supported by the Department of Water Resources, so that it could focus largely on topics such as livelihoods, public health and some types of pollution, which were not part of the previous planning processes. The subsequent local review and revision process facilitated by local networks in the Ping part 5 sub-basin continued to maintain the basic structure

of this problem identification approach, and only made a few modifications in how problems are described. The resulting list of issue topics and problems identified in the Ping part 5 sub-basin is shown in Figure 3-49.

Figure 3-49. Issues & problem situations: Ping part 5

<i>Important issues</i>	<i>Problem</i>
1. Forest resources	<ol style="list-style-type: none"> 1. High levels of forest resource usage without allowing for restoration 2. Encroachment and forest destruction in watershed forest areas 3. Policies and laws related to natural resource use and conservation are not in line with current conditions 4. Some officials responsible for forest resources lack sincerity in implementing their duties
2. Water resources	<ol style="list-style-type: none"> 1. Water shortages; lack of supplemental water sources for dry season; flooding during rainy season 2. Problems of river bank collapse and accumulation of sediment cause waterways to become more shallow 3. Encroachment into waterways and riverside areas 4. Inefficient water resource management by all parties
3. Land resources	<ol style="list-style-type: none"> 1. Lack of tenure in farm lands and lands left uncultivated due to rapid purchase & hoarding of land for speculation by investors 2. Erosion of topsoil from agriculture and flooding; soil acidity from excessive pumping of groundwater 3. Soil deterioration from accumulation of agricultural chemicals, use of chemicals in orange orchards 4. Encroachment into lands along water distribution canals
4. Environment	<ol style="list-style-type: none"> 1. Problem of deteriorating water quality in surveyed areas of 11 municipalities, resulting from contamination by organic chemicals and household and community sewage, from pig farms in some areas, and from various of the 208 industrial factories 2. Garbage in municipal areas surveyed is currently at the level of 126 tons/day & steadily increasing; garbage is disposed of in vacant areas not in accordance with sanitary principles, and may be a source of disease impacting the health of the people 3. Air pollution from vehicles and construction is not severe, but from forest fires and burning of vacant areas causes dust, soot, and smoke that affects air quality 4. Pollution from agriculture; toxic chemical use is highest in fruit orchards
5. Livelihoods & public health	<ol style="list-style-type: none"> 1. Health and sanitation: there is good access to public health services; intestinal and respiratory illness rates are higher than other diseases; illness rates related to water are high, especially diarrhea; chemicals are used in agriculture, but no reports of impacts on illness rates; traffic accidents are quite high
6. Natural resource management	<ol style="list-style-type: none"> 1. State policies are not in line with current conditions 2. Management is not an integrated system, each unit goes its own way 3. No clear implementation plans 4. People have no participation in resource management 5. People in watershed communities lack consciousness in using and caring for natural resources 6. Communities have no host organization and lack knowledge about management and solving environmental problems

Sub-basin vision, goals and objectives

Based on the issues and problems related to natural resources, environment, livelihoods and health that were identified in the Ping part 5 sub-basin, the project next sought to facilitate identification and articulation of what people hope to achieve by developing and implementing action plans for managing natural resources and environment in the sub-basin. The implementation consultants assisted the Ping part 5 Working Group in developing an initial overall vision statement, along with overall goals and objectives for the sub-basin.

This process again showed strong continuity by building on and expanding analyses conducted under previous planning processes that were more narrowly focused on water resource and watershed management. The review and modification process facilitated by local networks in the

sub-basin again continued to further refine wording in the context of the same overall structure. The results are shown in Figure 3-50.

Figure 3-50. Ping part 5: Sub-basin vision, goals & objectives

Vision: Forest on the mountains, water in the fields, beautiful environment, sustainable nature
Goals: <ol style="list-style-type: none"> 1. Develop, promote, conserve, and restore natural resources and the environment 2. Use of natural resources that has value and is appropriate with ways of life 3. Reduce use of agricultural chemicals 4. Reduce pollution problems from the environment
Objectives: <ol style="list-style-type: none"> 1. To conserve and restore natural resources and the environment to be rich and sustainable for the people to have good quality of life 2. Promote people and communities jointly caring for, conserving and restoring natural resources and the environment, in order to build community capacity in managing natural resources and the environment 3. To provide people and stakeholders from all parts of the community with awareness and consciousness for participating in managing natural resources and the environment 4. To address community pollution through prevention, solution of problems, and efficient control 5. Community environments are beautiful and build the quality of life of people in the communities

Action Plan for the Ping part 5 Sub-basin

Initial project efforts to develop a sub-basin action plan for management of natural resources and the environment were facilitated by the implementation consultants. This process began with collecting many hundreds of proposed projects already identified by local organizations, many or most of which were already listed in plans from various sources in the sub-basin, along with some new projects that were identified through their “PRA”-type techniques or through members of the Ping part 5 Working Group. The implementation consultants then classified and grouped individual projects according to how they fit with the general strategy structure they were proposing for all action plans. Measures for each strategy were then developed to reflect the types of projects considered by the Ping part 5 Working Group to be important under each strategy.

During review and modification processes facilitated by local sub-basin networks, discussion focused largely on strengthening the reasoning that links strategies, measures and projects. Three factors appear to have helped make this process much more smooth and continuous than in the other pilot sub-basins:

- Previous organization and planning efforts at the river basin and sub-basin levels had been facilitated by a single government agency (Department of Water Resources), so that the leadership was similar and each new plan clearly built on and refined earlier ones.
- Most all local organizations and networks related to management of natural resources and the environment have been induced by government programs and have close links with specific government agencies.
- The general style of local organization and leadership appears to be very compatible with processes that follow standardized approaches and procedures of government agencies.

Thus, planning processes focused mainly on coordinating local organization and project approaches promoted by various government agencies. Resulting strategies and measures contained in the action plan are listed in Figure 3-51. Final project sub-basin reports include a

revised list of names and locations for a total of 1,498 projects and project groups proposed for implementation under the 4 strategies and 18 measures contained in the action plan.

Figure 3-51. Ping part 5 Sub-basin Action Plan: Strategies & component measures

<p>Strategy 1. Conservation & restoration of natural resources & the environment</p> <ol style="list-style-type: none"> 1.1 Developing & promoting knowledge on ways to restore natural resources & environment 1.2 Solving problems of water shortage, floods, & encroachment of waterways & riparian areas 1.3 Reforestation 1.4 Reducing agricultural chemical use & using natural materials in soil maintenance
<p>Strategy 2. Management of natural resources and the environment</p> <ol style="list-style-type: none"> 2.1 Provide knowledge & public relations for managing natural resources & environment, soil, water, air, forest, & wildlife 2.2 Establish networks to watch for threats of river bank collapse in riverside areas 2.3 Build networks to guard against illicit logging, forest destruction and forest fires 2.4 Establishing organizations for unified management of all sub-basin resources 2.5 Participation of the people in making management plans for natural resources & environment in Ping part 5 sub-basin 2.6 Promote & support in occupations appropriate for the potential of communities, natural resources & environment, and occupations that use local knowledge and principles of the sufficient economy philosophy
<p>Strategy 3. Management of environmental pollution for better quality of life, public health & livelihoods of the people</p> <ol style="list-style-type: none"> 3.1 Training to provide knowledge & understanding related to household hygiene practices, & campaigns & public relations on sanitation, for better quality of life, public health and health 3.2 Improving community environments to be more pleasant by considering community culture and local knowledge in managing natural resources & environment to increase safety and absence of disease 3.3 Manage garbage and wastewater and reduce air pollution
<p>Strategy 4. Build consciousness of environmental stewardship</p> <ol style="list-style-type: none"> 4.1 Build consciousness of community members to have awareness & participation in conserving & restoring natural resources & environment in their communities 4.2 Training to provide knowledge for youth as extremely important in national development & caring for natural resources & environment in the future 4.3 Environmental conservation campaign using public relations media that is modern, easy to understand & worth following 4.4 Training to provide knowledge & understanding related to use of chemicals in agriculture

Other strategy components for a long-term sub-basin management plan

As leaders in the Ping part 5 sub-basin move toward further improvement and development of a full-scale long-term river sub-basin plan, they may wish to consider further work on:

- **Monitoring and information strategy.** Based on the descriptive names of projects listed under each measure of the action plan, there are a number of proposed activities that would expand local capacity to monitor natural resources and the environment. Most appear to be directed toward specific issues, groups or organizations in the sub-basin.

Monitoring and information needs at the sub-basin level will need to be further identified and developed as part of the process of developing a long-term sub-basin management organization. Once the organization is established and its roles and duties become clear, it may be useful to begin identifying the full range of monitoring and information needs. An overall monitoring and information strategy could then be developed to meet the range of needs in the sub-basin in the most systematic and efficient manner possible.

- **Partnership and capacity building strategy.** There also appears to be many projects aimed at building awareness and capacity of organizations, groups and people in the sub-basin. Many

of the groups or organizations have or will develop linkages with government agencies or other outside institutions. Since it appears that building network links and partnerships among organizations and groups in the sub-basin will be an important concern of the long-term RSBO, it may be useful for it to develop an overall strategy for meeting partnership and capacity building needs in a systematic and efficient manner.

- **Funding strategy.** Current uncertainties surrounding funding support for activities of the RSBO and for projects and activities contained in the sub-basin action plan are still too great for sub-basin leaders to be able to identify a suitable structure for an overall sub-basin funding strategy. Discussions have begun, however, about various funding sources with potential for providing support for different types of projects and activities under the plan. Local governments (TAO, *tessaban*, PAO), province administrations, and relevant central government agencies are seen as key partners and sources of support for most types of activities.

One important question is whether relevant central government agencies will be willing and able to provide basic core support for RSBO operations and development. If a source for this type of support can be identified, it will be more feasible to explore additional potential sources of support and an overall sub-basin funding strategy.

River Sub-basin Management Organization (RSBO) for the Ping part 5 sub-basin

Initial efforts by the sub-basin Working Group toward identification of an appropriate structure for a long-term sub-basin management organization began with a review of existing local organizations in the Ping part 5 sub-basin. Facilitated by implementation consultants, this initial review focused on the types of organizations shown in Figure 3-52. In the case of the Ping part 5 sub-basin, most all types of organizations identified were established through efforts by government agencies, with each agency supporting its own local organization.

Figure 3-52. Review of existing local organizations: Ping part 5

<i>Existing organization</i>	<i>Established by</i>	<i>Remarks</i>
Conserve and restore natural resources and environment		
1 Network of natural resource and environment protection volunteers	Dept. Water Resources	<i>established 2005, groups just formed, difficult communications and coordination</i>
Manage natural resources & environment		
2 Networks of village and city natural resource and environment volunteers, Kamphaengphet and Nakhon Sawan Provinces	Dept. Environmental Quality Promotion	<i>established 2005, no incentives for work, lacks participation by villagers</i>
Reduce waste		
3 Materials handicraft group (natural materials scraps)		
Conserve forest		
4 Western forest committee network, Kamphaengphet Province	Dept. National Parks	<i>lacks important materials and equipment</i>
Manage soil		
5 Soil doctor volunteers	Land Development Dept.	
Agriculture		
6 Biological fertilizer producers group	Dept. Agricultural Extension	
Provide clean water		
7 Village water supply users groups		
Water management		
8 Irrigation water users group network	Irrigation Dept.	<i>lacks participation by local people</i>
9 Lower Ping basin water management working groups at province level (Kamphaengphet & Nakhon Sawan) and district level (11 districts)	Dept. Water Resources	<i>no supporting budget until DWP received funds for 2006-07</i>

Working groups then conducted a SWOT analysis of these existing organizations, with assistance from implementation consultants, and the results are summarized in Figure 3-53.

Figure 3-53. Organization SWOT analysis: Ping part 5

<p>Strengths</p> <ol style="list-style-type: none"> 1 have sacrifices in terms of effort and resources 2 people in the area use water frugally 3 have good participation in management 4 have a participatory planning model that is strong and has good participation 5 have a management committee model that is systematic and strong 6 have environmental groups & organizations to provide good support, such as NRE village volunteer networks
<p>Weaknesses</p> <ol style="list-style-type: none"> 1 some networks lack good coordination and public relations 2 lack budgetary support from various parties 3 members of some water user cooperative groups lack participation in paying water fees 4 lack knowledge in dissemination of correct information to the people 5 formal and informal groups and organizations in the area lack coordination in conducting their work, causing duplication and conflict
<p>Opportunities for group development</p> <ol style="list-style-type: none"> 1 state policies, work plans, and projects that provide full support for natural resource conservation 2 state provides support for people's participation in managing natural resources and environment
<p>Limitations</p> <ol style="list-style-type: none"> 1 related agency units do not provide real and continuous support so that results can meet goals 2 duplication in implementation work of agency units 3 frequent changes in administrators and political policies of supporting organizations result in lack of implementation continuity

Based on review of local organizations and local experience with sub-basin planning processes, the initial set of general RSBO roles and duties proposed by the implementation consultants was further modified for the context of the Ping part 5 sub-basin. Results are shown in Figure 3-54.

In a similar manner, the initial draft structure for a Ping part 5 RSBO as proposed by project implementation consultants was reaffirmed with only minor modifications during subsequent review and modification processes facilitated by local sub-basin networks.

Basic characteristics of the Ping part 5 RSBO are summarized in Figure 3-55. Leadership positions are assigned to government officials according to positions that they occupy, and

Figure 3-54. Ping part 5 RSBO: Roles & duties

1. Evaluate sub-basin physical & biological conditions, resource use & quality of life, to provide a framework for government agencies, networks & organizations managing natural resources & environment in the sub-basin, to conduct action planning
2. Monitor & evaluate implementation of activities and projects to manage natural resources & the environment
3. Consider, review & improve action plans for managing natural resources & environment by government agency units, networks, & organizations in the sub-basin, to be efficient & relevant to current conditions & realities in the sub-basin
4. Determine a frame for dissemination & public relations regarding management of natural resources & environment for government agency units, networks & people's organizations to know & understand various implementation methods under action plans to manage natural resources & the environment.
5. Coordinate & implement jointly with the coordinating office for restoration of NRE in the Lower Ping Basin
6. Consider certification of the status of local network organizations for managing natural resources & environment in the sub-basin
7. Promote & develop knowledge regarding mediation of disputes for organizations & networks to gain knowledge & capacity in reconciliation disputes in initial areas, & have duties in coordination & negotiating reconciliation of disputes related to NRE management & use that emerge within the sub-basin

members are to be selected in a manner that can help provide appropriate balance in each of the six major NRE “sector”-oriented network sub-committees of the RSBO.

This structure reflects a great deal of detailed consideration and substantial negotiation among the various stakeholder networks and associated government units and agencies closely linked with them in the Ping part 5 sub-basin operating environment.

Due in large part to the particular historical, demographic, social and economic characteristics of the Ping part 5 sub-basin, the primary local organizational building blocks for an RSBO are networks that have been induced and supported by government units and agencies. Thus, concern about balancing of roles within the context of the overall matrix of multi-level government organizations becomes a much more prominent feature for the Ping part 5 river sub-basin management organization.

Figure 3-55. Ping part 5 RSBO: Membership

Chairman	
Head, Coordination office for Lower Ping NRE restoration	1
Vice Chairmen	
Representative, Office of NRE, Kamphaengphet Province	1
Representative, Office of NRE, Nakhon Sawan Province	1
Secretaries	
Representative, Office of NRE, Kamphaengphet Province	1
Representative, Office of NRE, Nakhon Sawan Province	1
Members	
Water allocation	
Farmer representative – crop production	3
Farmer representative – livestock production	1
Farmer representative – fisheries	1
Water user organizations	2
Local specialists (water allocation)	3
Local government (TAO, tessaban, PAO)	2
Government agency – irrigation offices 3 & 4	2
Water for consumption & domestic use	
Provincial water supply organizations	1
Regional water resources office	1
Province industry offices	2
Water users – consumption & domestic use	2
Water users – industry	2
Government agency – public health	2
Flooding	
Center to prevent & abate public hazards, Kamphaengphet	1
Local government (PAO) – Kamphaengphet Province	1
Local government (PAO) – Nakhon Sawan Province	1
Local government (TAO/tessaban) – Kamphaengphet	1
Local government (TAO/tessaban) – Nakhon Sawan	1
Wastewater	
Local government (tessaban) – Muang Kamphaengphet	1
Local government (tessaban) – Nakhon Sawan	1
Local government (TAO, tessaban, PAO)	1
Farmer representative – paddy rice	1
Farmer representative – orange orchards	1
Soil Resources & agriculture	
Province agriculture office (Kamphaengphet)	1
Province agriculture office (Nakhon Sawan)	1
Province land development station (Kamphaengphet)	1
Province land development station (Nakhon Sawan)	1
Sub-basin specialist (soil)	1
Farmer representative – model organic farmer	1
Forests	
Conservation region 12 management office	1
Sub-basin specialist (forestry)	1
Non-governmental organization (NGO)	1

Total membership: 48

3.4. Creating implementation handbooks

In addition to project processes focused on action plans for management of natural resources and environment, and consideration of models for sub-basin organizations, the project also formulated documents aimed at supporting implementation processes related to participatory sub-basin management in the form of implementation handbooks. These implementation handbooks included 9 volumes under the title of “Handbooks for Building Community Capacity in River Basin Management”, divided into three sets:

- **Technical handbooks** include handbooks covering (1) natural resources and environment, (2) forest resources, (3) water resources, (4) soil resources, (5) pollution and (6) the sufficient economy approach;
- **Organization handbooks** include coverage of (7) policy and planning, (8) organization duties and responsibilities;
- A separate handbook covers (9) ways to **build consciousness and participation**.

The process used to formulate and develop all three sets of project handbooks began with analysis of conditions and emerging general problem issues in the Ping River Basin, and specific problems that have emerged in the pilot sub-basins. This was combined with analysis of needs to address these problems, and use of local knowledge to solve previous problems, in order to conduct an overall analysis and formulate the handbooks. This was done by persons experienced with developing curricula and designing publications. Use of these handbooks was pre-tested with sub-basin facilitators and community facilitators in the three pilot sub-basins (see the next chapter). Recommendations resulted in improvements to make the handbooks easy to understand and apply in further basin management work.

4. Component 2: Enhancing the capacity of communities in pilot watersheds

Implementation activities under this project component sought to help build capacity of sub-basin stakeholders related to participatory management of natural resources and environment at sub-basin and more local levels. This chapter summarizes results according to four main capacity building components of the project implementation process.

4.1. Selecting sub-basin target groups for capacity building activities

The project implementation strategy included four primary target groups for capacity building activities:

4.1.1. Sub-basin facilitators

Role and duties: (1) lead training for community facilitators; (2) lead training for community members; (3) collaborate with community facilitators in conducting activities according to negotiated agreements reached with local polluters; (4) collaborate with community facilitators and community members in planning and conducting community activities in the sub-basin; (5) serve as coordinators among agency units and organizations related to conducting activities.

Qualifications: In each pilot sub-basin 5 persons with the following qualifications were selected to be sub-basin facilitators: (1) must be local people that are accepted by local communities, agency units, and local organizations; (2) must be dedicated and willing to sacrifice time for the work; (3) must have preliminary knowledge about natural resources and environment and be able to communicate well with people in the area; (4) must have leadership skills and be enthusiastic about assisting people in the area; (5) must have experience in working together with local communities.

Additional selection considerations: (1) sub-basin facilitators in each sub-basin must have bases that are distributed among important areas within the sub-basin; (2) sub-basin facilitators in each sub-basin must have an overall distribution of knowledge among natural resources (soil, water, forest), agriculture (land use, agriculture systems, agricultural chemicals), industry environment (garbage, hazardous wastes, water quality), community environment (garbage, wastewater control, water quality), public sanitation; (3) in the Ping part 1 sub-basin, at least one of the 5 sub-basin facilitators must be from an ethnic minority group.

Selection process: Through a 3-step process consisting of: (1) Receive candidates from (a) qualified applicants for the position; (b) people nominated by the project steering committee (representatives from the 3 pilot sub-basins), or from agency units conducting activities in the area (Department of Water Resources or Department of National Parks, Wildlife and Plant Conservation); (2) Making a short-list of the most qualified candidates; and (3) Final selection through joint consultation among the project steering committee, selected experts, agency representatives, and provincial offices for coordination of natural resource and environmental restoration.

4.1.2. Community facilitators

Role and duties: To work together with sub-basin facilitators in building capacity of communities through conducting training activities for community members in pilot sub-basins. Training is to build their capacity to work together in improving environmental quality in order for the people to have better livelihoods and hygiene.

Qualifications: Each sub-basin was to have 15 community facilitators with qualifications similar to sub-basin facilitators. But they may have more limited specialized expertise in some topics or less diverse knowledge than sub-basin facilitators. The 15 selected community facilitators were to be distributed around the sub-basin area according to social, economic and knowledge needs.

Selection process: Since community facilitators must work closely with sub-basin facilitators and work together with them as a team in the long-term, each sub-basin facilitator nominated 3-5 persons to be community facilitators. Nominated persons were considered jointly by all 5 sub-basin facilitators in the sub-basin, and 3 persons were selected from those nominated by each of the five sub-basin facilitators in each sub-basin.

4.1.3. Community members

Role and duties: Community members who received training are to provide support for activities conducted by sub-basin facilitators and community facilitators, transfer knowledge and experience to people in the sub-basin area. This includes all local natural resource and environment management activities.

Qualifications: Community members were to be people with interests related to natural resources and the environment, and who are members of watershed conservation networks, community environment networks, or water user networks.

Selection process: In each sub-basin about 150 community members were to receive training on participatory basin management. The 150 community members were to be distributed among areas in the sub-basin according to their livelihoods, age, education, and ethnicity. They were selected by sub-basin facilitators and community facilitators.

4.1.4. Local government leaders:

It is clear that local governments [tambon administration organizations (TAO) and municipalities (*tessaban*)] are stakeholders that will play a very important role in sub-basin management of natural resources and the environment. Thus, the project also viewed leaders of local government units as a target group for training aimed at providing them with an overview level of knowledge and understanding about management of natural resources and the environment at the sub-basin level. It is hoped that they will be encouraged to become active stakeholders participating in sub-basin organizations and related planning and management processes, and that they will apply this knowledge and understanding in developing local plans within their jurisdictions. Participants in this component were selected according to their leadership positions in local government organizations.

4.2. Analyzing community training needs and developing training curricula

In order to develop training curricula appropriate for these major target groups, the project conducted

4.2.1. Overview of sub-basin training needs.

In addition to the rapid assessments of sub-basin conditions conducted in each of the three selected pilot sub-basins, an additional line of activity centered on identifying training needs perceived by major stakeholder groups in each sub-basin. This was accomplished by organizing focus group sessions in each sub-basin during 1-2 June 2006 in Chiang Mai (Ping part 1 sub-basin), Lamphun (Mae Kuang sub-basin), and Kamphaengphet (Ping part 5 sub-basin) provinces. Results of training needs identified for each sub-basin are shown according to topics in Figure 4-1.

Figure 4-1a. Training needs identified through focus groups

	Ping 1	M.Kuang	Ping 5
Natural Resources & Environment			
problems & impacts from nature			X
natural resource conservation			X
caring for the environment			X
status of problems in local areas			X
natural resource situations in local areas			X
importance of resources			X
relationships among forest, water, people & livelihood occupations			X
problem situations, impacts, future directions			X
- Forests			
forest ecology	X		
forest conservation	X		
forest management	X	X	
caring for forest, planting forest with people's participation		X	
forest resource use, benefits from forest, efficient methods for use		X	
encroachment / destruction by investors	X		
- Land & soil			
geology of the upper Ping watershed	X		
land use	X		
causes & impacts of soil degradation	X	X	
chemical accumulation in soil		X	
soil conservation	X		
soil erosion & its impacts; landslide prevention	X		
planting vetiver grass	X		
- Water			
resources from water that nourish life			X
water ecology	X		
natural water sources			X
resources in watersheds from the past until the present			X
water resource capital in upper parts of the country			X
upper origins of river basins			X
watershed area, clear boundary specification			X
water problems in local areas		X	
water, stream, swamp, canal, lake & river conservation	X		X
local knowledge in water resource management			X
thrifty use of water			X
water allocation and management			X
water sources & water use allocation (rainy / dry season) (upper/middle/lower watersheds)			X
water management in irrigation canals			X
water management, relations, local regulations on water use		X	
role of water users in maintenance		X	
case studies on water management	X		
causes of water turbidity, flooding, sediment deposits	X		
dredging waterways, check dam damage, flood prevention	X		
preventing encroachment on Ping River banks	X		
major flood disasters			X
pollution in watersheds			X
toxic contamination in water	X		
factors that cause water pollution			X
managing water quality	X		X
- Environmental pollution			
pollution in watersheds			X
sanitation in households, livelihoods, industry			X
solving problems in agricultural factories			X
garbage / waste			X
municipal waste			X
managing garbage & waste	X		X
agricultural chemicals	X		X
chemical use, pesticide use			X
reducing use of chemicals	X		
chemical-free & alternative agriculture	X		

Figure 4-1b. Training needs identified through focus groups (*continued*)

	Ping 1	M.Kuang	Ping 5
- Ecology			
resources and ecology			X
relationships among forest, soil, mountains			X
importance / relationships of resources, environment, living things			X
interrelationships among traditions, people, animals, things & nature	X		
Building Consciousness			
restraining globalization to reduce its impacts	X		
building consciousness			X
building awareness/consciousness in cherishing/conserving/caring for natural resources	X	X	X
system-based thinking / qualitative & quantitative information	X		
community culture	X		
methods to build understanding	X		
building ownership	X		
people's participation		X	
participation techniques			X
conducting activities conscientiously	X		
conflict management			X
adjusting leadership processes	X		
have a series of continuous projects	X		
training / venues	X		
Policy, Planning & Organizations			
systems-based thinking	X		
decentralization to have local natural resource management	X		
environmental planning clearly assigned to an organization	X		
organization goals			X
having communities participate in community / local planning emphasizing environment govts	X		X
groups / organizations have activities with clear roles of local organizations	X		
relationships among organizations, agency units, communities, networks, groups			X
role of watershed sub-committees			X
role of groups & organizations			X
roles & duties of local government & community planning	X	X	
role of local leaders			X
role of representatives of people in the watershed			X
role of youth and community participation			X
community forestry networks	X		
project formulation			X
continuous coordination	X		
laws, regulations, penalties related to municipal law	X		
seeking budgets, budget allocation		X	
Sufficient Economy			
examples & case studies of application of sufficient economy theory	X		X

Findings of the focus group assessments in each sub-basin were then summarized into an overall set of training needs, as follows:

1. *Technical information*

- Natural resources and environment
- Land and soil resources
- Water resources
- Forest resources
- Environmental pollution
- Sufficient economy

2. *Building consciousness*

- Building consciousness
- Participation in watershed management

3. *Planning and organizations*

- Planning management
- Organization management

Based on these findings, curricula were developed for the four target groups. Training materials were also drafted, and several of them contributed to development of the handbooks described in the final section of the previous chapter. The basic structure of training curricula for the target groups are as follows:

4.2.2. Training curricula for main target groups

Training curriculum for sub-basin facilitators

1. Management of natural resources and environment in sub-basins
 - Management principles
 - People's participation in sub-basin management
 - Management tools – plans, regulations, organizations
2. Public relations
 - Mass relations techniques
 - Public relations principles
 - Techniques for transferring knowledge
3. Management of environmental pollution
 - Environmental management and water pollution
 - Agricultural pollution management
 - Industrial and community pollution management
4. Community public health
 - Causes of disease
 - Methods for disease prevention
 - Health maintenance
5. Local knowledge
6. Ethnic groups

Training curriculum for community facilitators

1. Management of natural resources and environment
2. People's participation in sub-basins
3. Management tools: plans, regulations and organizations
 - Practice for stakeholders
 - Propose results of stakeholder analysis
4. Managing agricultural pollution
5. Managing community pollution
6. Managing industrial pollution
7. Economic dimensions of managing natural resources and environment

Training curriculum for community members

1. natural resources and environment
2. forest resources
3. soil resources
4. water resources
5. environmental pollution
6. building consciousness and people's participation
7. sufficient economy
8. policy and planning
9. organizations

Training curriculum for local government leaders

1. Policy, planning and organizations for managing the Ping River Basin
2. Natural resource and environmental crisis and trends in the Ping River Basin
3. Roles, duties and participation by local governments in Ping River Basin management
4. Setting priorities for problems and management plans for the Ping River Basin

4.3. Conducting training and transferring knowledge

After identifying key target groups and developing appropriate curricula, training was conducted for each target group. The following sections document the venue and participants in these training sessions, and data on participant evaluation of the overall value of training

4.3.1. Training for sub-basin facilitators

Training for sub-basin facilitators was conducted during 9-13 November 2005 at a training center of the Department of National Parks, Wildlife and Plant Conservation located in Tak province. A total of 21 participants from the three pilot sub-basins included:

Ping part 1 sub-basin (upper Ping)	7 participants
Mae Kuang sub-basin	8 participants
Ping part 5 sub-basin (lower Ping)	6 participants

Participants evaluated the results of each component of the training according to the training modules of the curriculum. In addition to operational and instructional aspects of the training, responses to the following four questions are indicative of participant perceptions of the overall quality and usefulness of the training.

1. How much did the instructor's communications abilities help problem understanding?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	71	24	5
Mass relations techniques	86	9	5
Public relations principles & knowledge transfer techniques	71	24	5
Environmental management and water pollution	67	33	-
Agricultural pollution management	47	37	16
Industrial and community pollution management	42	58	-
Public health: communicable disease related to water	67	33	-
Local knowledge	84	16	-
Ethnic groups	67	24	9

2. How much was your interest stimulated to learn more about the topic?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	71	29	-
Mass relations techniques	71	29	-
Public relations principles & knowledge transfer techniques	57	43	-
Environmental management and water pollution	72	28	-
Agricultural pollution management	37	53	10
Industrial and community pollution management	37	47	16
Public health: communicable disease related to water	56	39	5
Local knowledge	79	21	-
Ethnic groups	33	62	5

3. How much opportunity & encouragement was provided to express opinions?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	67	33	-
Mass relations techniques	71	24	5
Public relations principles & knowledge transfer techniques	57	43	-
Environmental management and water pollution	72	28	-
Agricultural pollution management	42	47	11
Industrial and community pollution management	37	58	5
Public health: communicable disease related to water	72	28	-
Local knowledge	69	26	5
Ethnic groups	52	43	5

4. How much increased knowledge did you gain from this training?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	67	28	5
Mass relations techniques	86	14	-
Public relations principles & knowledge transfer techniques	67	33	-
Environmental management and water pollution	83	17	-
Agricultural pollution management	58	37	5
Industrial and community pollution management	78	22	-
Public health: communicable disease related to water	83	17	-
Local knowledge	74	26	-
Ethnic groups	52	33	14

4.3.2. Training for community facilitators

Training for community coordinators was conducted during 27-30 November 2005 at the Phucome hotel in Chiang Mai province. A total of 61 participants from the three pilot sub-basins included:

Ping part 1 sub-basin (upper Ping)	19 participants
Mae Kuang sub-basin	24 participants
Ping part 5 sub-basin (lower Ping)	18 participants

Participants evaluated the results of each component of the training according to the training modules of the curriculum. In addition to operational and instructional aspects of the training, responses to the following four questions are indicative of participant perceptions of the overall quality and usefulness of the training.

1. How much did the instructor's communications abilities help problem understanding?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	50	31	19
People's participation in sub-basin management	29	52	19
Management tools: regulations & organizations	30	57	13
Stakeholder analysis and practice	54	31	15
Agricultural pollution management	74	22	4
Community pollution management	35	52	13
Industrial pollution management	30	57	13
Economic dimensions of managing natural resources and environment	73	27	-

2. How much was your interest stimulated to learn more about the topic?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	56	31	13
People's participation in sub-basin management	47	53	-
Management tools: regulations & organizations	52	35	13
Stakeholder analysis and practice	54	38	8
Agricultural pollution management	70	26	4
Community pollution management	35	61	4
Industrial pollution management	39	57	4
Economic dimensions of managing natural resources and environment	77	23	-

3. How much opportunity & encouragement was provided to express opinions?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	31	56	13
People's participation in sub-basin management	37	44	19
Management tools: regulations & organizations	52	39	9
Stakeholder analysis and practice	46	39	15
Agricultural pollution management	70	26	4
Community pollution management	39	61	-
Industrial pollution management	48	48	4
Economic dimensions of managing natural resources and environment	68	27	5

4. How much increased knowledge did you gain from this training?

Curriculum component	Evaluation Opinion (%)		
	Much	Average	Little
Management of natural resources and environment in sub-basins	50	37	13
People's participation in sub-basin management	35	65	-
Management tools: regulations & organizations	43	44	13
Stakeholder analysis and practice	62	38	-
Agricultural pollution management	74	26	-
Community pollution management	52	39	9
Industrial pollution management	52	39	9
Economic dimensions of managing natural resources and environment	77	18	5

4.3.3. Training and study tours for community members

Training and study tours for community members was conducted during August 2005 for the Ping part 1 sub-basin and the Ping part 5 sub-basin, and during December for the Mae Kuang sub-basin. A total of 424 participants from the three pilot sub-basins included:

Ping part 1 sub-basin (upper Ping)	124 participants
Mae Kuang sub-basin	131 participants
Ping part 5 sub-basin (lower Ping)	169 participants

In addition to the training curriculum modules, participants were able to visit several locations where promising activities relevant to management of natural resources and environment are taking place. This allowed discussions to include people at these sites who are actively conducting activities that can serve as examples for potential lines of future work in the pilot sub-basins.

4.3.4. Training for local government leaders

Training for community members was conducted during 20-22 August 2005 at the Bhumiphol Dam in Tak province. A total of 67 participants included heads, deputies and officials from TAO and *tessaban* governments from all three pilot sub-basins.

After conducting the modules in the training curriculum, participants brainstormed about their perceptions of priority issues in their local jurisdictions. In order to help get a clearer picture of their overall sense of priorities, a synthesis of their views was made by constructing a prioritized list of issues according to the number of participants voting for each issue. The results were as follows, with the number of participant votes indicated in parentheses:

1. Forest destruction and shifting cultivation (22)
2. Drought, insufficient water for domestic consumption, irregular rainfall, insufficient dry season water storage (20)
3. Garbage – no disposal sites, garbage put into waterways (17)
- 4a. Floods and related disasters (13)
- 4b. Air pollution from vehicles, agro-industrial dust, unpaved roads, and burning (13)
5. Degraded soil, chemical accumulation in soil – limits plant growth (10)
6. Wastewater from industry, pig farms, and agriculture (9)
7. Wastewater from garbage sites, community wastewater sources such as markets (8)
8. Chemical residues from agriculture (5)
9. Soil erosion, topsoil loss, soil filling waterways (3)
- 10a. No land tenure, insufficient crop land (2)
- 10b. Water scouring riverbanks, riverbank collapse (2)
- 10c. Reduced amounts of wildlife due to hunting and use as food (2)
- 10d. Public streams becoming shallow, encroachment into waterways (2)

Participants evaluated the results of each component of the training according to the training modules of the curriculum. In addition to expressing their satisfaction with operational and instructional aspects of the training, responses to the following questions are indicative of participant perceptions of the overall quality and usefulness of the training.

Aspect of evaluation	Evaluation Opinion (%)		
	Much	Average	Little
Satisfaction with training style & methods	31	65	4
Suitability of training handbooks & documents	76	22	2
Satisfaction with instructor presentations	53	47	-
Opportunities for participants to express opinions	82	18	-
Value of this training	57	41	2
Usefulness of the training	65	33	2

5. Component 3: Strengthening regulatory and incentive measures for improved behavior of users in pilot watersheds

Implementation of this project component included four major lines of activity under the sub-components introduced in chapter 2. Results are summarized below for each sub-component.

5.1. Classifying and selecting pollution sources

One fundamental requirement of the project was that study sites must be located in the three pilot sub-basins. Thus, 20 to 25 representative pollution sources were selected from each of these sub-basin areas. The pilot sub-basins had initially been broadly characterized in terms of types of pollution source as: (1) primarily pollution from agriculture in the Ping part 1 sub-basin; (2) primarily pollution from industry in the Mae Kuang sub-basin; and (3) primarily pollution from municipalities and communities in the Ping part 5 sub-basin. These categories of types of pollution sources were also a basic requirement of the project.

When results of pollution source surveys were analyzed and used to develop a representative set of pollution sources, however, they showed that a slightly different combination of categories would be better.

- Expansion of agriculture has been rapid in the highlands of the Ping part 1 sub-basin, which is considered an important area for watershed protection. Since the sub-basin is not industrialized and has a relatively low population density, sites in the sub-basin have been selected to represent agricultural pollution sources. Some agricultural pollution source sites were also selected in the Ping part 5 sub-basin, because it is the sub-basin with the highest rates of pesticide usage per unit area for rice, other field crops, and horticulture. Comparisons are made between pollution source sites from these two areas.
- Representative sources of industrial pollution were selected only from the Mae Kuang sub-basin. A large number of small-scale and cottage industries flourish in this area and cause considerable water pollution. These industries generally lack efficient treatment systems for wastewaters from their production processes. Because they do not require industrial licenses from the Ministry of Industry, they are not affected by legislation for factories or declarations promulgated by that Ministry. One such declaration states that factories must not discharge effluent unless it has passed through treatment processes other than dilution, and that discharged wastewater should meet quality standards for industrial effluent.
- Sites in the Ping part 5 sub-basin were selected to represent pollution sources from municipalities and communities. The area includes communities of diverse sizes, which is useful: Nakhon Sawan municipality is large, while Kamphaengphet represents a medium-sized community; small-sized communities are represented by sub-district municipalities and sub-district administrative organizations. Some medium-size municipalities were also selected in the Mae Kuang sub-basin so that they could be compared with those from the Ping part 5 sub-basin.

In addition to this sample of agricultural, industrial and municipal/community pollution sources, sample sites relating to pollution from community solid waste were selected in the Ping part 5 sub-basin, and to pollution from livestock in the Mae Kuang sub-basin.

Pollution issues and selected study sites in each sub-basin are summarized as follows:

5.1.1. Ping part 1 (Upper Ping) sub-basin

Sources of agricultural pollution

Agricultural sources of pollution were the focus of selection of pollution source sites in the Ping part 1 sub-basin. Project criteria for selecting representative sources of agricultural pollution included consideration of:

1. The crops grown must be economically significant in the provinces or pilot sub-basins
2. The farms (pollution sources) concerned must be at risk of being sued over effects of use of chemical fertilizers or pesticides on health of the local population or the environment.
3. The farms selected must use one of five groups of chemical pesticides: (a) Organochlorine (compounds of carbon, hydrogen and chlorine), with brand names that include Thiodan, Endosulphane, Sanfan, Teofos, Benefit 35, Dithong, Dynamite, *etc.* (b) Organophosphate (organic insecticides based on phosphorus compounds), with brand names that include Wave Super 505, Yaguza 500, Crothyon, Gurazan, Condomate, Pholidol Malate, *etc.* (c) Carbamate (compounds based on nitrogen with structure similar to organophosphates), with brand names that include Furadan, Carbofuran, Darin 85, Eswin 85, *etc.* (d) Pyrethrum and pyrethroids, with brand names that include Karate 2.5 EC, Pro exist 15, CS Sprint Tec, Super Clean, New Metric 30, *etc.* (e) Other chemicals/chemical groups considered which included Gramoxone, Glyphoset, Paraquat, Round-up, *etc.*
4. Selected farms must include use chemical fertilizers containing nitrogen and phosphorus.
5. There was good cooperation from farm owners in providing relevant information on the amount and frequency of use of chemical fertilizers and pesticides, and in visiting the selected pollution sources.

Based on these selection criteria, review of secondary data, and field surveys, 25 sites were selected to represent sources of agricultural pollution in the Ping part 1 sub-basin. The type of use made of agricultural land in the Ping part 1 sub-basin depends on local topography. For example, rice is grown mainly on the flood plains. If there is insufficient water in the dry season, farmers grow crops that are less water-dependent, such as soybeans, peanuts, sweet corn, potatoes, *etc.* Fields in upland areas are planted to field crops such as maize or peanuts, or to fruit trees such as longan or tangerines. Five types of crops were selected from the 25 representative sources as the basis on which to analyze agricultural pollution in the Ping part 1 sub-basin. Of the selected sources, rice was grown on five, maize on one, sweet corn on two, longan on eight and tangerines on nine farms. The specific locations are listed in Figure 5-1.

Figure 5-1. Crop types & locations of agricultural pollution sites in the Ping part 1 sub-basin

Crop type	Topography	No. of Sources	Location			No. of Farmers
			Sub-District	District	Province	
Rice	Undulating	1	Muang-Na	Chiang Dao	Chiang Mai	2
	Flat	2	Thung Khao Phuang	Chiang Dao	Chiang Mai	4
		1	Chiang Dao	Chiang Dao	Chiang Mai	3
	1	Muang Kaen Phattana	Mae Taeng	Chiang Mai	4	
Maize	Undulating	1	Muang- Na	Chiang Dao	Chiang Mai	4
Sweet corn	Flat	1	Thung Khao Phuang	Chiang Dao	Chiang Mai	3
		1	Muang Kaen Phattana	Mae Tang	Chiang Mai	1
Longan	Flat	2	Chiang Dao	Chiang Dao	Chiang Mai	2
		6	Muang Kaen Phattana	Mae Tang	Chiang Mai	7
Tangerines	Undulating	3	Muang Na	Chiang Dao	Chiang Mai	4
		2	Thung Khao Phuang	Chiang Dao	Chiang Mai	3
		4	Ping Khong	Chiang Dao	Chiang Mai	5
Total		25				42

Cropping practices and chemical use in these crops can be summarized as follows:

- **Rice**: The size of paddy fields in the study area ranged from about 3 to 12 rai. High yield varieties (HYVs) commonly grown are Ko-Kho 2, Ko-Kho 6, Ko-Kho 10, Niaw San Pa Tong 1 and Kao Dok Mali 105. In low-lying wetlands, wet seeding of rice is practiced, and HYVs grown are Ko-Kho 7, Ko-Kho10, Ko-Kho 15, Niaw San Pa Tong 1 and Suphanburi 60. Generally, the cultivation season is from May to August, and farmers use a seeding rate of 25-30 kg/rai. Main chemical pesticides used for rice are organo-phosphates, carbamates, and organochlorine compounds. Chemical fertilizers used include (N-P-K) 21-0-0, 46-0-0 and 16-20-0, *etc.* Rice can be harvested from October but highest productivity – typically between 500 and 700 kg/rai – is obtained by harvest in December.
- **Maize**: A single crop of rain-fed maize is grown each year. Maize is grown mainly in the highlands on farms that typically range in size from about 3 to 8 rai; cultivation is most extensive in Chiang Dao District. Weed management is done by burning vegetation in the fields before cultivation. The cultivation season for maize used as livestock feed begins in May or June, and crop harvest is in September or October; yields average 800 kg/rai. Popular high yield varieties are C.P. 888 and Cargil 919, with a seeding rate of about 2.5 kg/rai. Main chemical pesticides used are organophosphates and carbamates; chemical fertilizers commonly used include 15-15-15 and 46-0-0 (N-P-K).
- **Sweet corn**: The most common variety of sweet corn grown in the study area is ATS-2; other high yield varieties are also grown. Farm size ranges from about 2 to 10 rai, and the cultivation season starts in May or June. The main chemical pesticides used are organophosphates, carbamates and pyrethroid compounds. The main chemical fertilizer formulations used (N-P-K) include 21-0-0, 46-0-0, 18-46-0, 15-15-15, 13-13-21 and 14-14-21, *etc.* Depending on the variety grown, harvest may be anywhere between about 70 to 90 days after sowing. Average productivity is between 1,700 and 2,000 kg/rai
- **Longan**: The most common longan cultivar grown in the study area is the Edo variety. Typical farm size is between about 5 to 20 rai. Longan is an important export crop and may be sent to other countries as ripe or canned fruit, or dehydrated. The main chemical pesticides used in longan orchards are organophosphates and carbamates. Chemical fertilizer formulations (N-P-K) most commonly used include 15-15-15, 13-13-21, *etc.* Potassium chlorate can be used to produce off-season longans, but it is rarely used here because of high chemical cost and marketing limitations. Normally, the flowering season for longans is from late December to early February and they are harvested for sale from late June to September. The highest productivity is in August from longan trees that are 6 years old, when they may yield an average of 500 to 800 kg/rai.
- **Tangerines**: Tangerine farms in the study area range in size from about 10 to 300 rai. Most tangerines are grown in Chiang Dao District. Although they are available throughout the year, the main crop is harvested in the early rainy season. The most common varieties grown are Bang Mod, and Chogun or Sai Nam Phung. Tree density in orchards is about 44 per rai, and each tree yields an average of 40 to 60 kg (1,760 to 2,640 kg/rai). The main chemical pesticides used in tangerine orchards are organophosphates, carbamates and pyrethroid compounds. Chemical fertilizer formulations (N-P-K) used include 46-0-0, 15-15-15, 13-13-21, 14-14-21, 16-20-0+2Cao+15S, 15-15-15+Mgo+Cao+S, *etc.*

Summary of chemical fertilizer and pesticide use in agriculture that can cause pollution

The following summary of issues related to pollution is based on field survey results, as well as information from farmers, from agriculture officers in Chiang Dao and Mae Taeng districts, and from chemical fertilizer and pesticide dealers in local areas:

(1) Chemical fertilizers: Nine chemical formulations (N-P-K) are in common use: 21-0-0, 46-0-0, 15-15-15, 13-13-21, 14-14-21, 18-46-0, 16-20-0, 16-20-0+2Cao+15S and 15-15-15+Mgo+Cao+S.

(2) Chemical pesticides: three categories of pesticides are most commonly used:

- *Insecticides:* Farmers in the study area use ten types of insecticide to eliminate worms, aphids, moths and red mites: Eraset 25 EC, Wave Super, Itin, Yaguza 500, Anglo-Slug, Tamaron 600 SL, Lannate, White Date L, Metasistox R and Poss.
- *Fungicides:* Farmers in the study area use nine types of fungicide to eliminate sheath rot disease, bakanae disease, *Puccinia allii*, leaf spot, bacterial blight, downy mildew, powdery mildew, etc: Tax Super, Biocide, Pesry-85, Bentac Dithane LF, Dithane M 45, Apron 35 SD, Sulphur powder, and Rofral.
- *Herbicides:* Farmers in the study area use eight types of herbicide to eliminate narrow and broad leaf weed flora such as paragrass, large crab grass, beach wire grass, amaranth, purslane, torpedo grass, etc: Glyphoset 48, Paraquat, Gramoxone, Round-up, Pursuit, Touch Down, Galant 240 ME and Goal 2 E.

(3) Amount and frequency of chemical fertilizer and pesticide use depend on many factors such as the severity and spread of disease and insects, crop fertility, produce price trends, and the farmer's budget and available fund sources, as well as extent of the farmer's knowledge of proper agricultural chemical usage.

5.1.2. Mae Kuang sub-basin

Sample sources representing industrial pollution were selected only from the Mae Kuang Sub-Basin. A large number of small-scale and cottage industries flourish in this area and cause considerable water pollution. These industries generally lack efficient treatment systems for wastewaters from their production processes. Because they do not require industrial licenses from the Ministry of Industry, they are not affected by the 1969 legislation for factories or the 1982 declaration by the Ministry of Industry that factories must not discharge effluent unless it has passed through treatment processes other than dilution, and that wastewater discharge should meet quality standards for industrial effluent.

While selection criteria for Mae Kuang sub-basin focused on sources of industrial pollution, it was noted that other types of pollution sources also exist in the area, including both livestock farms and communities. Thus, the 24 pollution sources selected in the Mae Kuang sub-basin (Figure 5-2) include fourteen from industry, six livestock farms and four communities:

Sources of industrial pollution

Project selection criteria for sources of industrial pollution included consideration of five factors: (1) Factories generating wastewater; (2) Cottage industries generating wastewater, excluding factories operating or controlled under The Factory Act of 1992; (3) Industries generating either mixed/general wastewaters or wastewaters containing specific forms of pollutants, e.g., heavy metals; (4) Potential for results from selected factories in pilot sub-basins to be applied to other river basins; and (5) Factories located in the northern industrial estate at Lamphun are excluded from the selection process because their sewerage systems are under the control of the industrial estate.

Figure 5-2. Selected pollution sources in the Mae Kuang sub-basin

Source	Type	Location		
		Sub-district	District	Province
Pollution from industrial sources				
1	Mulberry paper factories	Ton Pao	San Kam Phaeng	Chiang Mai
2	Mulberry paper factories	Ton Pao	San Kam Phaeng	Chiang Mai
3	Mulberry paper factories	Ton Pao	San Kam Phaeng	Chiang Mai
4	Mulberry paper factories	Ton Pao	San Kam Phaeng	Chiang Mai
5	Traditional alcohol factory	Ton Pao	San Kam Phaeng	Chiang Mai
6	Thai vermicelli factory	Chom Phu	Saraphi	Chiang Mai
7	Pickled garlic factories	Umong	Muang	Lamphun
8	Pickled garlic factories	Umong	Muang	Lamphun
9	Pickled garlic factories	Umong	Muang	Lamphun
10	Pickled garlic factories	Pa Sang	Pa Sang	Lamphun
11	Pickled garlic factories	Mae Raeng	Pa Sang	Lamphun
12	Pickled garlic factories	Mae Raeng	Pa Sang	Lamphun
13	Pickled garlic factories	Mae Raeng	Pa Sang	Lamphun
14	Pickled garlic factories	Muang Noi	Pa Sang	Lamphun
Pollution from livestock sources				
15	Dairy farms	Chae Chang	San Kam Phaeng	Chiang Mai
16	Dairy farms	Chae Chang	San Kam Phaeng	Chiang Mai
17	Dairy farms	Chae Chang	San Kam Phaeng	Chiang Mai
18	Pig farm	Tha Sob Sao	Mae Tha	Lamphun
19	Pig farm	Tha Sob Sao	Mae Tha	Lamphun
20	Pig farm	Tha Sob Sao	Mae Tha	Lamphun
Pollution from community sources				
21	San Sai Luang Municipality	San Sai Luang	San Sai	Chiang Mai
22	San Kam Phaeng Municipality	San Kam Phaeng	San Kam Phaeng	Chiang Mai
23	Umong Municipality	Umong	Muang	Lamphun
24	Pa Sang Municipality	Pa Sang	Pa Sang	Lamphun

On the basis of project industrial pollution source selection criteria and a survey of the area, the most significant industrial pollution sources were found to be groups of cottage industries with similar size, productivity and processes. Factories selected include manufacturers of mulberry paper, traditional alcohol, Thai vermicelli, pickled garlic and batik cloth:

- ***Mulberry paper factories*** can be found throughout Mae Kuang sub-basin, but are mainly located in Ton Pao sub-district in the Sankamphaeng District of Chiang Mai Province. Interviews with officers of Ton Pao Municipality and results of a field survey show there are about 20 factories in the area. Four of them were selected for inclusion in the study.

Mulberry paper production begins with soaking mulberry pulp in water for one day. Then, 1kg of caustic soda, 16 kg of mulberry pulp and 200 liters of water are mixed and boiled for 3 to 4 hours. The mixture is then pounded and spun, before being dyed and left in water overnight. Finally, the mixture is stirred thoroughly in cement buckets, spread on a sieve and dried in the sun to form mulberry paper.

Interviews with owners showed that each mulberry paper factory produces approximately 5 to 10 m³/day of wastewater from manufacturing processes. This includes wastewater from boiling mulberry pulp, consisting of caustic soda with other alkaline salts, as well as foul-smelling wastewater contaminated with chemicals derived from the dyeing process. At present, many of the factories discharge wastewater into digestion tanks. The solids settle and clear water is discharged to fields and drainage ditches in the municipality, which affects the wider community. Because of this, some factories have been sued.

- ***Traditional alcohol factories.*** Traditional alcohol is a by-product of other agricultural products, and is produced throughout Sankamphaeng District of Chiang Mai Province. Since

manufacturing processes generates wastewater and wastes that could affect the environment in the future, one traditional alcohol factory was selected.

There are 4 major steps in production of traditional alcohol: Preparation of fermentation waters, distillation, quality improvement and packaging in bottles. First, rice fermentation waters are prepared by mixing sugar with yeast and allowing them to ferment for between 3 to 15 days. After this, the alcohol is extracted by distillation and the alcohol content is adjusted to improve the quality of the product. Finally, it is packed and labeled.

Factory owners explained that each traditional alcohol factory generates wastewater at a rate of between about 0.6 and 1 m³ wastewater per day from fermentation tanks, cleaning the boiler and molasses vats, and cleaning filter tanks, containers and other equipment. Manufacturing wastewater from traditional alcohol factories is discharged into collecting ponds from which only a small proportion overflows.

- **Thai vermicelli factories**. The one Thai vermicelli factory selected as a sample pollution source is located in Sarapee District in Chiang Mai. The manufacturing processes used generate wastewaters and waste that could affect the environment in the future. The wastewater from manufacturing processes contains about 2,000 mg./liter of BOD.
- **Pickled garlic factories**. A considerable number of pickled garlic factories are distributed throughout Kuang River Basin, but most are located in U-mong sub-district of Muang district in Lamphun Province. Information from U-mong municipality officers and results of a field survey show that there are ten factories in this area. Three of them were selected.

Wastewater from manufacturing is generated from both cleaning and pickling of garlic. The wastewater content is mostly organic, with about 2,000 mg/liter of BOD. If this water is discharged without proper treatment, it could cause environmental problems. According to some owners, wastewater from garlic pickling is generally discharged into a collecting pond, but they may then overflow into local rivers without treatment. Some complaints have been raised over this problem.

- **Batik factories** can be found throughout the Mae Kuang sub-basin, mostly in Mae Rang sub-district of Pa Sang District in Lamphun Province. According to municipal officers of Mae Raeng sub-district, there are thirteen batik factories in their area. From these, five were selected for use in the study: three from Mae Raeng sub-district, one from Pa Sang sub-district and one from Muang Noi sub-district.

An interview with factory owners and a field survey showed that the batik dying processes produce large quantities of wastewater, and efforts are currently being made to solve this problem. The wastewater has a high organic content with a BOD range of between about 100 and 1000 mg/liter; the pH is high and there is a significant load of heavy metals. Wastewater from batik production goes to a collecting pond and is then pumped out to the municipal drainage. Many complaints are received because of this.

Sources of livestock pollution

A field survey confirmed that dairy and pig farms are or can be significant sources of pollution. Such farms can be found widely throughout the Mae Kuang sub-basin:

- **Dairy farms**. There are a numerous dairy farms in the Mae Kuang sub-basin, mostly in Chae Chang sub-district of Sankamphaeng District in Chiang Mai Province. Data from interviews with officers of the Department of Livestock Development and a field survey show there are about 114 dairy farms in the sub-basin. Three were selected for this study.

From interviews with the farmers and the field survey, it was found that dairy cows can rest, sleep, eat and be milked all in the same barn. Feeding troughs for the cows are long, which makes the feeding process more convenient. (Dairy cows can be fed by any one of several different feeding processes) Some cows are also housed in cattle pens. Many of the processes involved in the raising of dairy cows could generate wastewater, especially the washing of cows and their stalls, and cleaning up after milking.

This study showed each dairy cow generates between 0.1 and 0.6 m³/day of wastewater via the various washing and cleaning processes. A 2005 report states this wastewater contains between 206 and 1,269 mg/liter of BOD. Most wastewater treatment systems in use on dairy farms in the sub-basin are comprised of a series of sedimentation and septic ponds. Water flows through such systems under gravity from the top down to the final pond. Around Chae Chang sub-district, many dairy cows are raised near the banks of the Mae Orn River. In this case, wastewaters from septic ponds flow directly into the Mae Orn River, which is polluted as a result. Sankamphaeng Municipality is trying to restore the river and overcome this problem.

- **Pig farms.** There are a numerous pig farms across the Mae Kuang sub-basin, and most are in Mae Tha District of Lamphun Province. Data from a field survey combined with information from officers of the Department of Livestock Development in Lamphun Province showed there are 90 pig farms in this area, from which three were selected.

Interviews with pig farm owners and the field survey showed most of the farms operate on a large scale, with more than 200 pigs each. Farmers' incomes are derived from increase in pig weight. Wastewater from pig farms, *e.g.* from washing out pig pens and pig waste (urine and faeces), usually contains high levels of BOD – typically about 3,000 mg/liter. Each pig can generate around 40 liters of wastewater/day.

Wastewater from small-scale pig farms is commonly discharged into collecting ponds from which the settled liquor overflows into paddy fields. Sometimes wastewater may be discharged directly into fields without pre-treatment. Larger-scale pig farms normally have proper waste treatment systems, some of which are designed to generate energy in the form of biogas from the waste biomass.

Pollution sources in communities

Although the main focus pollution source selection in Mae Kuang was on industrial pollution, pollution by communities is also important, especially in densely settled portions of the sub-basin. Thus, four medium-sized municipalities in Mae Kuang sub-basin were selected as case study sites as community sources of pollution. Findings from these study sites were compared with findings from the larger sample of communities in the Ping part 5 sub-basin.

Since the main pollution issues associated with communities are generation and management of wastewater and solid wastes, basic features of selected communities in Mae Kuang are summarized in terms of wastewater (Figure 5-3) and solid waste (Figure 5-4) management.

Figure 5-3. Selected municipalities in Mae Kuang: Basic water & wastewater patterns

Municipality	Water System <i>source</i>	Slaughterhouse		Wastewater	
		<i>anim/day</i>	<i>Water treatmt</i>	<i>collect</i>	<i>treat</i>
Chiang Mai Province					
San Sai Luang sub-dist	groundwater pumps, treat, distribute	120-150	ponds, EM treated	None	None
San Kam Phaeng sub-dist	District waterworks, some shallow wells	30-40	some hygienic	None	None

Municipality	Water System <i>source</i>	Slaughterhouse		Wastewater	
		<i>anim/day</i>	<i>Water treatmt</i>	<i>collect</i>	<i>treat</i>
Lamphun Province					
U-mong sub-dist	Province waterworks, some wells	(30 ton)	grease trap, septic tank	None	None
Pa Sang sub-dist	80% groundwater, some prov waterworks	35		None	(plan)

Figure 5-4. Selected municipalities in Mae Kuang: Basic solid waste patterns

Municipality	Population <i>persons</i>	Area <i>sq km</i>	Solid waste <i>tons/day</i>	Solid waste		
				<i>segregate</i>	<i>collect</i>	<i>dispose</i>
Chiang Mai Province						
San Sai Luang sub-dist	22,000	36	7.7	Plans	Munic	Private
San Kam Phaeng sub-dist	18,000	23	7.8	Project promoting	Munic	Private
Lamphun Province						
U-mong sub-dist	14,000	21	8.4	None	Munic contract	Private
Pa Sang sub-dist	9,700	12	6.5	None	Munic	Private (munic plan)

5.1.3. Ping part 5 (Lower Ping) sub-basin

The Ping part 5 sub-basin was the focus for considering selection of representative pollution sources from municipalities and communities. The Ping part 5 sub-basin includes communities of diverse sizes, which is useful. Nakhon Sawan municipality is large, while medium-sized communities are represented by the Kampaeng Petch and small-sized communities by the municipalities of sub-districts including sub-district administrative organization. Some representative localities were selected in the Mae Kuang Sub-Basin so that they could be compared with those from the lower part of the Mae Nam Ping Sub-Basin.

Project criteria for selecting sources of pollution from communities included consideration of four issues: (1) Communities in municipalities or sub-district administrative organization areas; (2) Existence/presence of large or very crowded communities housing many people; (3) Existence of municipalities or sub-district administrative organizations covering all or part of one of the pilot sub-basins; (4) Potential for results from selected communities to be applied to other river basins.

Although criteria for selecting the 20 to 25 pollution sources required in the Ping part 5 sub-basin are focused on community sources, the desk study and field survey showed that other sources of pollution, especially agriculture, also exist in the study area. Thus, results of the selection process for the Ping part 5 sub-basin, as shown in Figure 5-5, include 23 pollution sources – thirteen representing community-related pollution and to representing sources of agricultural pollution:

Sources of community-related pollution

Pollution sources associated with local communities have been the main focus in the Ping part 5 sub-basin. Thus, thirteen municipalities and sub-district administrative organizations of various sizes were selected as case study sites regarding community sources of pollution in the Ping part 5 sub-basin. Findings from study of these sites were compared with findings from the sample of for medium-sized communities in the Mae Kuang sub-basin.

Since primary pollution issues associated with communities are generation and management of wastewater and solid wastes, basic features of selected communities are summarized in terms of wastewater (Figure 5-6) and solid waste (Figure 5-7) management.

Figure 5-5. Sources of pollution selected in the Ping part 5 sub-basin

No.	Type	Location		
		Tambon	Amphoe	Province
Community-related pollution				
1	Kamphaeng Phet Municipality	Nai Muang	Muang	Kamphaeng Phet
2	Nakhon Chum Tambon Municipality	Nakhon Chum	Muang	Kamphaeng Phet
3	Pak Dong Tambon Municipality	Trai Trueng	Muang	Kamphaeng Phet
4	Tha Putsa Tambon Municipality	Tha Putsa	Khlong Khlung	Kamphaeng Phet
5	Tha Ma Khua Tambon Municipality	Tha Ma Khua	Khlong Khlung	Kamphaeng Phet
6	Khlong Khlung Tambon Municipality	Khlong Khlung	Khlong Khlung	Kamphaeng Phet
7	Khanu Woralaksaburi Tambon Municipality	Pa Phuttha	Khanu Woralaksaburi	Kamphaeng Phet
8	Salok Bat Tambon Municipality	Salok Bat	Khanu Woralaksaburi	Kamphaeng Phet
9	Banphot Phisai Tambon Municipality	Tha Ngio	Banphot Phisai	Nakhon Sawan
10	Kao Liao Tambon Municipality	Kao Liao	Kao Liao	Nakhon Sawan
11	Nakhon Sawan Municipality	Pak Nam Pho	Muang	Nakhon Sawan
12	Tambon Khlong Lan Administrative Organization	Khlong Lan	Khlong Lan	Kamphaeng Phet
13	Tambon Mae Lat Administrative Organization	Mae Lat	Khlong Khlung	Kamphaeng Phet
Agriculture-related pollution				
14	Rice	Khana Thi	Muang	Kamphaeng Phet
15	Rice	Khlong Khlung	Khlong Khlung	Kamphaeng Phet
16	Rice	Pho Thong	Pang Sila Thong	Kamphaeng Phet
17	Tangerine farm	Sak Ngam	Khlong Lan	Kamphaeng Phet
18	Tangerine farm	Sak Ngam	Khlong Lan	Kamphaeng Phet
19	Tangerine farm	Sak Ngam	Khlong Lan	Kamphaeng Phet
20	Tangerine farm	Pa Phuttha	Khanu Woralaksaburi	Kamphaeng Phet
21	Tangerine farm	Pa Phuttha	Khanu Woralaksaburi	Kamphaeng Phet
22	Jasmine	Maha Pho	Kao Liao	Nakhon Sawan
23	Jasmine	Bang Muang	Muang	Nakhon Sawan

Figure 5-6. Selected municipalities in Ping part 5: Basic water & wastewater patterns

Municipality	Water System <i>source</i>	Slaughterhouse		Wastewater	
		<i>head/day</i>	<i>Water treatmt</i>	<i>collect</i>	<i>treat</i>
Nakhon Sawan Province					
Nakhon Sawan City	City tap water system from Ping River	40	Stabilize pond	System into river	Under construct
Kao Lio sub-district	Province waterworks – old rusty pipes	Yes (?)	Stabilize pond	System into river	None
Banphot Phisai sub-dist	Village tap water from groundwater	Yes (?)	?	None	None
Kamphaengphet Province					
Kamphaengphet Munic	Province waterworks	Yes (?)	?	System into river	None
Salokbat sub-dist	?	47	Unusable pond	System into fields	Yes
Nakhon Chum sub-dist	Province waterworks from Ping River	10	?	System into river	None
Pak Dong sub-dist	Province waterworks from Ping River	None	-	Drain to fields	None
Tha Putsa sub-dist	Province waterworks from Ping River	None	-	Drain into canals	None
Tha Makhua sub-dist	Province waterworks	Not used	-	System into river	None
Khlong Khlung sub-dist	Province waterworks	None	-	Gutters into river	None

Municipality	Water System <i>source</i>	Slaughterhouse		Wastewater	
		<i>head/day</i>	<i>Water treatmt</i>	<i>collect</i>	<i>treat</i>
Khanu Woralaksaburi s-d	Province waterworks	None	-	Gutters into river	Yes
Khlong Lan TAO	?	None	-	Drain to fields-streams	None
Mae Lat TAO	?	None	-	Drain to fields-river	None

Figure 5-7. Selected municipalities in Ping part 5: Basic solid waste patterns

Municipality	Population <i>persons</i>	Area <i>sq km</i>	Solid waste			
			<i>tons/day</i>	<i>segregate</i>	<i>collect</i>	<i>dispose</i>
Nakhon Sawan Province						
Nakhon Sawan City			82.0	By people	City	City
Kao Lio sub-district			4.0	Employees/ project	Munic	Munic
Banphot Phisai sub-dist			3.0	None	Munic	NS City
Kamphaengphet Province						
Kamphaengphet Munic			20.0	Project promoting	Munic	Munic
Salokbat sub-dist	8,600	11.7	?	None	Munic	Munic /private
Nakhon Chum sub-dist	8,020	3.5	?	Few participate	Munic	KP munic
Pak Dong sub-dist	3,700	2.4	2.0	None	Munic	KP munic
Tha Phutsa sub-dist	1,600	4	1.0	None	Munic	Munic
Tha Makhua sub-dist	4,000	55	15.0	School campaign	Munic	Munic
Khlong Khlung sub-dist		27	2.0	None	munic	munic
Khanu Woralaksaburi s-d	8,400	11.6	6.0	Promote	Munic	Munic
Khlong Lan TAO			1.0	School campaign	None	None
Mae Lat TAO			< 2.0	School campaign	None	None

Sources of agricultural pollution

Although the Ping part 1 sub-basin was the main site for selection of sites representing agricultural sources of pollution, secondary data and field surveys indicate the highest rates of agricultural chemical use in the Ping River Basin are found in the Ping part 5 sub-basin. Thus, a second set of sites representing agricultural sources of pollution were selected in the Ping part 5 sub-basin, as described in Figure 5-8.

Figure 5-8. Crop types & locations of agricultural pollution sites in the Ping part 5 sub-basin

Type of Crop	Terrain	No. of Sources	Location			No. of Farmers
			<i>Sub-District</i>	<i>District</i>	<i>Province</i>	
Rice	Flat	1	Khon Thi	Muang	Kamphaengphet	7
		1	Khlong Khlung	Khlong Khlung	Kamphaengphet	3
		1	Pho Thong	Pang Sila Thong	Kamphaengphet	4
Tangerines	Flat	3	Sak Ngam	Khlong Lan	Kamphaengphet	9
	Flat	2	Pa Phuttha	Khanu Woraluksaburi	Kamphaengphet	11
Jasmine	Flat	1	Maha Pho	Kao Lio	Nakhon Sawan	7
		1	Bang Muang	Muang	Nakhon Sawan	9
Total		10				50

These sites were selected to represent three of the crops known to have the highest levels of agricultural chemical use in the Ping part 5 sub-basin:

- **Rice**: The average size of farms growing rice in the sub-basin is about 15 to 70 rai. On the right bank of Ping River, rice can be grown only in the rainy season, except where there are pumping stations. Since most of the area on the left bank of the Ping River is irrigated, rice can be grown as wet seeded paddy in both single-crop fields and low-lying wetlands. The rice cultivation season is from May to August and the most commonly grown high yield varieties are Chai Nat 1, Suphanburi and Kao Dok Mali 105, with seeding rates of 25 to 30 kg/rai. The main chemical pesticides used are organophosphates, carbamates, and organochlorine compounds. Chemical fertilizer use includes (N-P-K) 21-0-0, 46-0-0, 16-20-0, *etc.* Harvest starts in October but highest productivity – around 700 to 1,000 kg/rai – is obtained in December.
- **Tangerines**: The average size of farms growing tangerines in this area is about 20 to 150 rai. Tangerines are grown mainly in Khlong Lan and Khanuworaluksaburi Districts of Kamphaengphet Province. Harvest occurs throughout the year, but is mostly in the early rainy season. Most tangerines are cultivated on ridges. The main varieties are Bang Mod and Chogun. Tree density is 44 per rai, and trees yield between about 40 and 60 kg each – or about 1,760 to 2,640 kg/rai. The main chemical pesticides used are organophosphates, carbamates, and pyrethroid compounds. Chemical fertilizer formulas (N-P-K) include 46-0-0, 15-15-15, 13-13-21, 14-14-21, *etc.*
- **Jasmine**: Jasmine is grown in small areas of about 0.5 to 6 rai, mostly in private backyards, and most are located in Kao Liao and Muang districts of Nakhon Sawan Province. The main variety is Ratburana. Plant density is about 1,500 to 1,600 per rai, which yields 3 to 5 kg /rai. The main chemical pesticides used are organophosphates, carbamates, and pyrethroid compounds. Chemical fertilizer formulas (N-P-K) include 46-0-0, 15-15-15, 13-13-21, *etc.*

Summary of chemical fertilizer and pesticide use in agriculture that can cause pollution

The following summary of information on fertilizer and pesticide use is based on field survey results, as well as information from farmers, from staff of district agriculture offices, and from chemical fertilizer and pesticide dealers in local areas:

- (1) **Types of chemical fertilizers**: There are six main formulas in common use: 21-0-0, 46-0-0, 16-20-0, 15-15-15, 13-13-21 and 14-14-21.
- (2) **Types of chemical pesticides**: Chemical pesticides can be grouped into 3 main categories:
 - ***Insecticides***: Farmers in study areas use twelve types of insecticide to eliminate worms, aphids, moths and red mites: Sevin 85 WP, Padan 4 G, Malathion 83, Sumithion 50 EC, Cascade, Danitol, D. C. tron Plus, Omite, Nisorun, Lannate, Dencall and Poss.
 - ***Fungicides***: Farmers in study areas use seven types of fungicide to control sheath rot disease, bakanae disease, *Puccinia allii*, leaf spot, bacterial blight, downy mildew, powdery mildew, *etc.*: Dithane M 45, Furadan, White Date L, Dithane LF, Apron 35 SD, sulphur powder and Rofral.
 - ***Herbicides***: Farmers in study areas use nine types of herbicide control of both narrow and broad leaved weeds, *eg.*, paragrass, large crab grass, beach wire grass, amaranth, purslane, torpedo grass, *etc.*: Red Horse, Glyphoset 48, Paraquat, Gramoxone, Round-up, Pursuit, Touch Down, Galant 240 ME and Goal 2 E.
- (3) **Amount and frequency of chemical fertilizer and pesticide use** depends on many factors including the severity and spread of disease and insects, crop fertility, trends in the price of the

produce, and the farmer's budget and available funding sources, as well as the extent of the farmer's knowledge about the proper use of agricultural chemicals.

5.2. Reviewing economic incentive measures

Pollution is considered a very serious problem and leads to imbalances in economic, social and environmental systems. In the Ping River Basin, the potential for pollution problems can be identified particularly in things like the substantial increase in wastewater generation. Population growth and rapid development of the economy have affected water quality in the Ping River, which is a major tributary of the Chao Phraya River, the main water channel supporting populations in the central region of Thailand.

Two approaches are thought to be significant in the management of these pollution problems

- *The command and control (CAC) or regulatory approach* is implemented through legislation that seeks to change behavior of polluters by issuing environmental measures that polluters should practice, and/or by requiring polluters to treat their wastewater. The CAC system is based on sets of various regulations and fines.
- *Economic incentives (EIs)* provide continuous inducements to encourage responsible parties to change their behavior. EIs are based on a concept called the "Polluters Pays Principle" (PPP). Incentive measures are divided into different categories so that each category can be applied to different types of problems. The success of using EIs to solve pollution problems depends on the suitability of the measures available and the level of incentives (or disincentives) provided to motivate behavioral change and participation of those involved, especially the polluters.

In Thailand, the command and control (CAC) approach has been used to manage the environment by legislative means.

- Wastewater generated by communities is subject to special regulations in areas that are designated as special pollution control areas by the National Environment Commission. Discharge control standards have been specified for some types and sizes of buildings. Provisions under public health legislation seek to regulate cleanliness in marketplaces and public areas, and bathing and cleaning in public waterways.
- Community garbage and solid waste disposal is regulated by public health legislation and disposal facility regulations issued under the Factory Act, while types of plastic garbage bags and containers for public places are specified by the Pollution Control Department.
- Regulations for industrial activities related to distillation of alcohol specify wastewater treatment systems, and sewerage and environmental management systems that meet minimum specified standards must be clearly shown before permits are issued by the Excise Department. Wastewater from dyeing factories must meet standards set by the Ministry of Industry, the Pollution Control Department and the Harbor Department.
- In the case of water pollution from industrial estate areas, the Department of Industrial Works is responsible for issuing regulations and environmental measures, as well as for inspections and enforcement. These tools require those responsible for sources of pollution to control or reduce pollution to meet the prescribed effluent standards before discharging to public areas. Outside these areas, however, ambient standards for the control of discharges into public waters are set by the Pollution Control Department.
- Regulations related to pollution from agriculture include controls on chemical fertilizer factories and product labels, restrictions on manufacture and sales of hazardous chemicals,

and licenses for production of organic fertilizers. Pollution and wastewater discharged from pig farms is regulated by ministerial declarations under national environmental legislation, while public health legislation regulates allowing animals to defecate along roads or other areas where it is forbidden.

Away from major industrial areas, environmental inspection and enforcement become relatively expensive because sources are more widely dispersed and smaller. In addition, the regulations are inflexible, with homogeneous sets of standards that take no consideration of the size, type or location of pollution sources, which has decreased the reliability of these tools for managing the environment. Such features are especially important in developing countries where the resources available to deal with pollution are severely limited.

In many circumstances, economic incentives (EIs) have a number of advantages over traditional CAC methods for controlling environmental problems. In principle, EIs provide polluters with the necessary motivation to reduce pollution below permitted levels when it is economically feasible to do so. Technological improvement to reduce polluting activities will be stimulated, resulting in a cleaner environment. This type of approach can have a strong influence on polluting behavior of firms, farms and consumers, and can persuade them to move to more environment-friendly activities. In recent years, economic instruments have been used extensively worldwide, and some instruments have been applied in Thailand.

5.2.1. Types of economic incentive measures

Economic incentive measures that can be used to manage pollution problems can be classified into six different types:

1. **Taxes and charges/fees** are measures that are intended to increase awareness of polluters of their responsibility for the environmental damage they cause. Such measures require that polluters pay a tax (or a charge or fee) for each unit of pollution. As costs are explicitly imposed on polluting activities, these tools serve as an incentive for polluters to change their behavior through management or treatment of wastes prior to release, including making changes in production technology to benefit the environment. They also relate to production volumes and resource utilization in an appropriate way. Pollution-related taxes, charges and fees can be used in the following ways:
 - Product charges/ taxes refer to collection of charges or taxes from products that cause pollution problems, such as farm chemicals. They produce a change in the relative price of the chemical products concerned compared with substitutes such as organic materials. This should serve as an economic incentive to farmers and others to reduce their use of products that damage or destroy the environment.
 - Tax/ fee exemption is used to support pollution prevention and control activities and help manage environmental pollution. Thus, for example, favorable tax treatment or tax exemption might be given for products or equipment believed to pose relatively low environmental risks.
 - User charges involve collection of fees from polluters through provisions of central or local government treatment services. Levels of charges can be determined according to the volume or type of pollutants/polluted materials to be managed/treated, such as whether they are infected, or consist of dangerous refuse or household wastes, etc.
 - Effluent charges refer to collection of fees due to release of wastes such as polluted waters, etc, and are based on the volume and concentration of the waters released to public waterways, etc.

- **Administrative charges** involve collection of fees arising from the management of environmental problems. These are collected from polluters, often together with a license fee for each activity for each year.
2. **Financial support measures** refer to provision of positive incentives to enable polluters to manage pollution problems with financial support from the government. This support might take various forms, such as partial investment subsidies, interest at lower than market rates (soft loans) via loan sources established by financial institutions (such as the Bank for Agriculture and Cooperatives), environmental funds, *etc.* Financial support can also take the form of grants or cash subsidies for pollution control facilities. Financial assistance is used for activities involving waste treatment or reductions in pollution, in the form of end-of-pipe treatment, or changes in production methods or technology to more environment-friendly ways.
 3. **Eco-labeling** is a type of positive incentive measure through publication of standards and performance certification, *eg*, to show that production was achieved using environment-friendly technology, proper/suitable waste treatment, *etc.* Another variant is product identification and certification, such as labeling of agricultural products as being chemical-free and safe for consumers. Eco-labeling should lead to positive effects for businesses or people involved in building up markets for labeled products, and thus serve as an incentive for producers to implement eco-labeling.
 4. **Deposit-refund systems** require a monetary deposit at the time of sale of a product. The deposit is returned when the item is returned at the end of its use. One of the objectives is to discourage illegal or improper disposal of waste products. Under conditions of the deposit-refund system, consumers incur additional costs in handling used products which are normally harmful to the environment, such as various types of packages, batteries and rubber tires. When these products (which can still be recycled) are returned, the refund of the deposit increases the economic value of the product while, and reduces environmental problems, particularly in terms of the level of funds needed to manage the wastes. If some consumers are not able to return the residual product, deposits retained become revenues that can be used for management of pollution problems in the future.
 5. **Marketable permits** are measures intended to regulate volumes of wastes so that they remain at an acceptable level. Marketable permit systems work on the basis of a limit on the total amount of permitted releases of a pollutant. Trading in permits is allowed among polluters in order to minimize the cost of achieving the emissions limit specified. Those who are able to reduce their waste at relatively lower cost are able to sell their permits to those who cannot treat or reduce their waste based on their existing permits or have higher costs. Trading of permits or waste release has to go through a marketing channel, and the price of permits is based on supply and demand. In this system, those who can treat or reduce release of their wastes can also receive payment or rewards in the form of income from the sale of permits. At the same time, those who cannot treat their wastes have to pay a cost for their discharge. Thus, such systems offer positive incentives through the income arising from sale of permits, and negative incentives through payments needed to buy permits to discharge wastes. These incentives can lead to changes in behavior of polluters and help reduce pollution problems.
 6. **Information/ public disclosure** on environmental performance has provided a strong incentive for polluters to reduce their polluting emissions. When such information is made easily accessible to the public, workers and local communities should become more aware of the environmental risks that they face. If information disclosed to the public is negative, *eg*, the level of pollutants being released in excess of standards, this should lead to pressure for polluters to reduce their polluting activities in order to maintain their status and the image of

their business operations. On the other hand, if the information being disclosed to the public is positive, such as a list of industries that are able to reduce or treat their wastes, this can help to form a good image of the industries in the public mind, and good public relations with their employees and local communities. Disclosure of information on a positive long-term environmental performance record could affect business operations by making their products more desirable for consumers.

5.2.2. Experience with economic incentive measures

The various economic measures mentioned above can be used to solve pollution problems in many ways. In this study, focus is on water pollution problems in the Ping River Basin. Thus, both worldwide experience with such measures and some applications found in Thailand have been reviewed in relation to managing wastewater quality problems arising from three main pollution sources: communities, industry and agriculture (Figure 5-9).

Figure 5-9. Experience with economic measures reviewed by the study

Economic measure	Wastewater source					
	communities		industry		agriculture	
	<i>international</i>	<i>Thailand</i>	<i>international</i>	<i>Thailand</i>	<i>international</i>	<i>Thailand</i>
Taxes & charges/fees						
• product charge/tax		X	X		X	
• tax/fee exemption			X	X	X	
• user charges	X				X	
• effluent charge	X	X	X	X		X
• admin charges			X		X	
Financial support						
• environment fund		X	X	X		X
• subsidies	X	X	X		X	X
Certification / labeling		X	X	X		X
Refundable deposit						
Tradeable permits			X			
Public disclosure		X	X	X		
others				efficiency	toxic VAT	Q_GAP

5.3. Participatory development of incentive measures

Based on identification of pollution sources in pilot sub-basins and review of experience with economic incentive measures in Thailand and internationally, economic measures with potential for application in addressing problems found in pilot sub-basins were identified. These measures are summarized in Figure 5-10 according to the type of pollution problem that they could help address.

In order to further explore the potential for application of these measures using a participatory approach, pollution source sites selected as case studies in each of the pilot sub-basins were matched with potential economic measures according to the main type of pollution source at the site, as shown in Figure 5-11.

Figure 5-10. Summary of measures with potential for use in managing pollution problems

Economic measures		Supportive measures	Social measures
Policy measures	Measures to be used with polluters		
Community – Wastewater			
	<ol style="list-style-type: none"> Subsidies for building central treatment facilities Charges for wastewater treatment. Financial measures to promote “the use of septic tanks”. Projects to manage areas used by food booths, by zoning and supporting the installation of an area for washing and the collection of wastes. 		“community monitoring system” project
Community – Solid Waste			
<ol style="list-style-type: none"> Tax on the production of plastic bags / foam Promotion of a deposit-refund system Tax (or charge) reduction for materials or packages that can be re-used or refilled 	<ol style="list-style-type: none"> Project that sells garbage bags that are classified into three colors and sizes, with no fee for garbage collection Marketing measures to promote the business of waste collectors (Sa-Leng) Project to promote the production of compost fertilizer from wastes in the community through financial and marketing measures 	Promote cooperation to reduce plastic bag use in commercial & wholesale centers & convenience stores, by public relations or certify environment-friendly businesses.	community monitoring system” project
Industry			
	<ol style="list-style-type: none"> Clean technology project Effluent tax (charge) Charges for wastewater treatment Financial support for installation, etc, of central treatment systems Financial support for on site treatment 		community monitoring system” project
Agriculture – Crops			
Product charge	<ol style="list-style-type: none"> Incentive measures for use of organic materials to substitute for synthetic chemicals <ul style="list-style-type: none"> Providing credit in the form of organic materials (credit in kind) Project to produce organic materials by farmers (as individuals or groups) through financial and technical support GAP (Good Agricultural Practice) and Q standardization Promotion of integrated pest management (IPM system) and certification Safe agriculture project (contract farming in form of agreements to insure price and quality) 	<ol style="list-style-type: none"> Demonstration production plots using organic materials Mobile agricultural clinics Safe agriculture business network 	community monitoring system” project
Agriculture – Livestock			
	<ol style="list-style-type: none"> Subsidy for the production of biogas by pig and cattle farms <ul style="list-style-type: none"> Low interest credit Partial financial support Financial support for setting up on-site waste treatment for livestock farms (meeting farm standards) through dairy cooperatives Measures to support the processing animal manure to produce fertilizer pellets 		“community monitoring system” project

Figure 5-11. Pollution sources selected as case studies in pilot Ping River sub-basins

<i>Sub-Basin</i>	Community Size			Industry <i>product</i>	Agriculture	
	<i>Small</i>	<i>Medium</i>	<i>Large</i>		<i>Crop</i>	<i>Livestock</i>
Ping part 1 Sub-Basin					Tangerine, Longan, Maize, Rice	
Mae Kuang Sub-Basin		Sankhampaeng, Pasang, Umong, Sansai Luang		Mulberry (<i>Sa</i>) paper, Dyeing, Fermented garlic, Community liquor		Swine, Dairy cattle
Ping part 5 Sub-Basin	Banpotphisai, Kao-liew, Nakhonchum, Pakdong, Kloungklung, Khanuworaluck-buri, Salokbat, Thamakheua, Thaphutsa, Mae Lad TAO, Kloung Lad TAO	Muang Khamphaengphet (also solid waste)	Nakhon Sawan		Tangerine, Rice, Mali rice	

5.3.1. Opinions of polluters regarding proposed economic incentive measures

Incentive-based mechanisms are widely used and accepted in environmental management. They are used as instruments to give those responsible for pollution an incentive to change their behavior and adopt less polluting activities. But if economic measures are to be successful in application, measures that have potential to solve environmental problems must be fully accepted by the stakeholders involved.

Thus, this section summarizes views on the importance of, and opinions about, measures with potential for use in managing water quality in the Ping River Basin. These views are the results of dialogue with representatives of each category of polluters identified as case studies in the three pilot sub-basins. Overall attitudes and feedback expressed about the potential of the measures presented are discussed according to the three major pollution source categories - community, industry and agriculture.

Community sector opinions on economic measures

The main source of community-related pollution affecting the quality of the Ping River is wastewater from households, businesses and the various service-oriented areas. Another problem is leachates from community solid wastes, particularly when they have been buried close to public waterways. Thus, the measures discussed are intended to provide incentives to solve community-related pollution problems arising from both wastewater and solid waste. Opinions were received from representatives of all case study municipalities and TAOs.

Opinions about measures to assist with community wastewater pollution

The economic measures with potential for use in managing community-related problems arising from wastewater were discussed with representatives from municipalities and TAOs, as indicated in Figure 5-12.

Figure 5-12 Ranking of economic measures for managing community wastewater

Sub-Basin	Size of municipality ^{1/}	Number of respondent	Economic measure ^{2/}			
			Subsidy to build central treatment facilities	Charges for wastewater treatment	Financial support to promote use of septic tanks	Zone food stalls & install areas for washing & collecting wastes
Ping river Basin	Small	9	2 (8.63)	4 (5.06)	1 (8.81)	3 (5.44)
	Medium	6	2 (7.88)	4 (6.75)	1 (9.07)	3 (7.75)
	Big	1	3 (5.00)	2 (7.00)	1 (10.00)	3 (5.00)
Mae Kuang Sub-Basin	Medium	5	2 (7.75)	4 (4.50)	1 (8.13)	3 (7.50)
Ping part 5 Sub-Basin	Small	9	2 (8.63)	4 (5.06)	1 (8.81)	3 (5.44)
	Medium	1	3 (8.00)	2 (9.00)	1 (10.00)	3 (8.00)
	Large	1	3 (5.00)	2 (7.00)	1 (10.00)	3 (5.00)

^{1/} Small-sized municipalities have residents of not more than 10,000

Medium-sized municipalities have residents between 10,000 and 49,999

Large-sized have residents of 50,000 or more

^{2/} Figure in parenthesis indicates average score from 10

Views of these important stakeholder representatives in the relative potential importance of the four types of economic measures presented for consideration can be summarized as:

1. *Financial support to promote use of septic tanks* was assigned the highest importance. Large, medium and small-sized communities all agreed on the appropriateness of this measure. The relative importance of this measure is due to the fact that septic tank installation solves the problem at an early stage by treating wastewater before it is released to public waterways. It is also a relatively low-cost option and is easy to implement.

- Small-sized municipalities see use of septic tanks as important because it would enable each person in the community to become aware of the need to treat wastewater that they produce, and to participate in preventing environmental problems in their own community. This measure enables treatment of wastewater at the outset, and can be easily implemented even in a small community. On the other hand, acceptance in a small-sized municipality or TAO may be limited because it increases the expense burden in communities that often have low incomes, very small budgets for environmental management, and populations that do not attach much importance to the environment or pollution problems. Thus, weaknesses of the measure lie in the budget, especially when wastes are collected and managed together, and in campaigns not comprehensive enough to reach everyone.

- In medium-sized municipalities the impact of the measure may be limited by lack of acceptance by communities and business enterprises. This may occur because a municipality has characteristics of an urban community and it is difficult to gain access to the people. Thus, provision of public relations information could be a useful channel for promoting this measure.

2. *Providing a subsidy to construct a central wastewater treatment facility* was seen as the second most important economic measure to help solve water quality problems, especially by small and medium-sized municipalities. This may be because most do not currently have a central treatment facility, whereas large communities either are already using them or are in the process of constructing them. Thus, large municipalities consider establishing charges for

wastewater treatment more important than subsidies for installation of a central treatment facility. Small- and medium-sized municipalities believe this measure would also bring systematic management, easier monitoring and technical efficiency. Its weakness lies in high investment costs and difficulties involved in its administration and implementation, as well as subsequent problems of collecting wastewater treatment fees.

3. *Designation of food stall zones and joint washing and waste collection areas* was the third-ranked economic measure. Medium- and small-sized municipalities gave it importance because it is easy and convenient to implement and control. There is concern, however, that if designated zones are found unacceptable, spread of food stalls at various points outside the zone could lead to further difficulties for assembly or zoning.
4. *Collection of fees/charges for wastewater treatment* had the lowest score of the 4 measures presented, and was accorded the least importance from participants' perspectives. They indicate a major weakness is lack of acceptance by people of the need to pay the fees or charges. This would cause conflicts between the municipal authorities and the population, which would, in turn, become a political issue. On the other hand, the measure has the strength of generating income that can be used for the management and administration of the wastewater treatment facility, and to improve the locality.

Even though the collection of fees/charges for wastewater treatment is less acceptable than other economic measures, it is thought to be necessary for management of the environment. Although it establishes a negative incentive, it will certainly make polluters aware of the problems they have created and the attempt to reduce or solve them on the basis of the polluter pays principle. If people do not cooperate when the measure is introduced, however, efforts to collect fees/charges may fail. Social measures in the form of public relations or a campaign to build public consciousness and make people aware of the burden and problem would seem to be a prerequisite for this measure to be implemented successfully.

Opinions about measures to assist with community solid waste pollution

Economic measures with potential for use in managing community-related problems arising from solid waste pollution were discussed with representatives from small and medium-sized municipalities and TAOs located within the portion of the Ping part 5 sub-basin that is within Kamphaengphet province, as indicated in Figure 5-13.

Although scores given to alternative measures are quite similar, views of these important stakeholder representatives regarding the relative potential importance of the three types of economic measures presented for consideration can be summarized as:

1. The measure to *sell color- and size-coded waste bags* was accorded highest overall importance. The medium-sized municipality gave it the top ranking, but small-sized municipalities considered it the second most important measure. The strength of the measure was seen to be its potential to reduce the quantity of wastes and to make household waste segregation simpler. Its weakness is that municipalities receive no income from garbage collection fees or charges.
2. The measure to *promote production of compost from community wastes through financial/marketing support* was ranked second in importance. Small-sized municipalities gave it the highest ranking because it enables both waste reduction and reuse of materials, which may be farm, food or vegetable waste, etc. Its weakness is that it does not solve problems of non-degradable wastes.

Figure 5-13 Ranking of economic measures for managing community solid wastes

Sub-Basin	Size of municipality ^{1/}	Number of respondent	Economic measure ^{2/}		
			Pre-paid garbage bags / no garbage collection fee	Finance/marketing support to produce compost from community wastes	Marketing to promote business of waste collectors (<i>Sa-Leng</i>)
Ping river Basin	Small	7	2 (8.00)	1 (8.17)	2 (8.00)
	Medium	1	1 (9.00)	2 (8.00)	3 (7.00)
Ping part 5 Sub-basin	Small	7	2 (8.00)	1 (8.17)	2 (8.00)
	Medium	1	1 (9.00)	2 (8.00)	3 (7.00)

^{1/} Small-sized municipalities have residents of not more than 10,000

Medium-sized municipalities have residents between 10,000 and 49,999

Large-sized have residents of 50,000 or more

^{2/} Figure in parenthesis indicates average score from 10

3. The proposed marketing measure to *promote the business of waste collectors* or *sa-leng* was the least acceptable measure presented. The measure's strength is its ability to reduce amounts of non-degradable waste through recycling, while also increasing incomes and improving livelihoods of the *sa-leng* group. Its weakness is that it may be hard to implement because: a) the group of cart-driving buyers has little knowledge about separating wastes considered dangerous; b) some groups of cart-driving buyers tend to steal or destroy assets in public areas, and it is difficult for municipalities and TAOs to manage or control this type of activity. And in practice, municipalities and/or TAOs would still need to administer, collect and manage residual wastes not taken by cart-driving buyers, which are likely to include toxic or poisonous materials.

Industrial sector opinions about economic measures

Four types of community industries were included as case studies, including those producing community liquor, pickled garlic, mulberry (*sa*) paper, and dyed cloth. Their views on five potential economic measures are summarized in Figure 5-14.

Figure 5-14. Ranking of economic measures for managing industrial wastewater

Sub-Basin	Type of industry	Number of respondent	Economic measure ^{1/}				
			Clean technology program	Subsidy for on-site treatment	Subsidy for joint wastewater treatment	Charges for wastewater treatment	Effluent charges
Mae Kuang Sub-Basin	Community liquor	1	1 (10.00)	1 (10.00)	1 (10.00)	2 (3.00)	2 (3.00)
	Fermented garlic	3	2 (9.33)	1 (9.67)	1 (9.67)	3 (7.67)	4 (6.00)
	Dyeing	5	4 (6.80)	1 (9.60)	2 (9.00)	3 (7.80)	5 (6.20)
	Mulberry (<i>Sa</i>) paper	2	4 (5.50)	2 (6.50)	1 (7.50)	3 (5.00)	3 (5.00)

^{1/} Figure in parenthesis indicates average score from 10

These industries fall into two groups on the basis of the characteristics of pollutants in their wastewaters, including problems caused by the pollutants. Group 1 includes the community

liquor and pickled garlic producers; while group 2 consists of mulberry paper production and the dyeing industry. Wastewaters of the latter group characteristically contain insoluble solids, making wastewater treatment and management more difficult and complicated, often leading to conflicts with communities surrounding the factories.

Opinions from Group 1: community liquor and pickled garlic industries

1. Regarding economic measures for use in solving wastewater problems from Group 1 community industries, both the community liquor and pickled garlic industries accorded greatest importance to *financial support measures for setting up either a joint wastewater treatment system for the industry or on-site treatment systems* – both measures were given similar average scores. The scale, discharge patterns and treatment technical considerations for these two types of community industries suggest that such subsidy measures may also help community industries upgrade the type of treatment provided to more efficient systems. Views of representatives from the two industries indicate the strength of the financial support measure would be the resulting reduction in their own cost burden in setting up wastewater treatment. Especially for joint treatment systems, the weakness of the measure is in wastewater collection, and in negotiations among and between the businessmen.
2. The next most important measure in the view of the representatives of these two industries, is the *clean technology project*. For community liquor factories this might take the form of a tool to measure the amount of sugar or alcohol in the fermentation vat. This would improve liquor quality and reduce the risk of fermenting fluid being destroyed or fed to animals (*e.g.* pigs). The strength of this measure is that it solves the environmental problem directly, while providing indirect benefit by improving the reputation of the factory, which will be seen as being environment-friendly. Its weakness lies in its inability to deal with environmental problems as they occur, and to treat wastewaters to a high standard.
3. The *collection of effluent taxes and charges for wastewater treatment* are ranked at the very bottom of the list in importance, especially by the representative from a community liquor factory. This may be due to the resulting increase in the cost burden for the industries. Even though they are not very attractive to polluters, these measures would make businessmen aware of the environmental or external costs resulting from their operations, as well as the need to make more economic use of water.

Opinions from Group 2: textile dyeing and mulberry paper industries

1. Like those in the first group, the textile dyeing and mulberry paper industry representatives placed a high level of importance on *financial support for installing joint wastewater treatment facilities or on-site treatment systems* – average scores of these two economic measures are not very different. Treatment of wastewater with high suspended solids content and insoluble color particles usually depends on use of expensive and technically complicated measures and techniques that may not be suitable for community industries. Methods using chemicals to alter dyes to be more amenable to biological degradation do not work for all types of dyes, and can produce derivatives that adversely affect human health. Since systems that facilitate aerobic degradation of solids are better but have high investment costs, financial support may be needed to meet acceptable standards of wastewater treatment.
2. *Collection of charges and fees for wastewater treatment* was regarded by dyeing industry representatives as being of secondary importance. It would, however, tend to make water use more efficient in the industry because excessive use would increase their costs.
3. The *clean technology project* is ranked third. Since new technologies might enable use of smaller amounts of chemicals that are harmful to the environment, or allow a move from more to less concentrated colors, this measure may allow the industry to solve wastewater problems

directly and more efficiently. It may also help reduce costs through clean technology program inspections and suggested improvement in production processes. The main weakness of this measure is a lack of experts capable of transferring appropriate technologies to those involved, so that business owners may not feel confident problems can be solved efficiently.

4. *Collection of effluent taxes* was considered to have the lowest value of measures presented, because it increases production costs directly, which will inevitably affect the competitive ability of these small community industries.

Agricultural sector opinions on economic measures

Economic measures related to activities in the agricultural sector are assessed according to those directed toward crop production, and those focused on livestock production.

Opinions on economic measures relating to crop production

Agricultural activities conducted in upper and lower Ping River sub-basins produce a diverse range of cultivated crops, including rice, other field crops (*e.g.* maize), horticultural crops (*e.g.* tangerines, longan) and ornamental plants (*e.g.* jasmine). This leads to use of considerable amounts of agricultural chemicals, such as fertilizers, herbicides, pesticides, growth hormones, *etc.*, which can have negative environmental impacts on soil, water and atmospheric quality. Thus, incentive measures presented to farmers in this study are intended to reduce rates of chemical use or to change production systems to be more environmentally friendly. Five economic measures were offered for discussion in order to obtain opinions from farmer representatives, as shown in Figure 5-15.

Overall views of farmers growing all 5 crop types in both sub-basins can be summarized as:

1. The project for *chemical-free agriculture with a contract farming mechanism for price and quality assurance* was the highest ranked measure for reducing agricultural problems in both sub-basins. Most farmers held this opinion, especially if they felt they would be able to increase income stability by reducing marketing risks in selling their farm produce. It would also enable farmers to gain knowledge and other inputs from contractors. The weakness of the measure may lie in the pricing mechanism because prices of produce sold in local markets during some periods may be higher than the contracted price. Some farmers also lack confidence in implementation of agreed production quality standards, and in some cases companies or merchants/traders may take advantage of farmers by making slow or delayed payments.
2. The *GAP (Good Agricultural Practice) project and certification of Q standard* was the second-ranked economic measure. This measure already exists and farmers felt its strength comes from its systematic management on the basis of safety standards covering all aspects of the production process. It includes safety of the farmers within the process of certifying the standard of the produce. The measure also creates confidence in the minds of consumers, so that products meeting the Q standard can be sold at higher prices – which helps farmers to obtain higher incomes. On the other hand, qualification criteria to join the project are strict, and includes proper documentation to show farmers owns their land. This means that farmers owning no land cannot join the project. The project also emphasizes transfer of knowledge from experts who make recommendations and continuously monitor work. Farmers think for the project to be successful, they should have continuous access during implementation to an officer or organization that can provide relevant knowledge. Lack of this type of assistance caused maize farmers to rate this measure last.

Figure 5-15 Ranking of economic measures for managing wastewater from crop production

Sub-Basin	Type of crop	Number of respondent	Economic measure ¹⁷				
			Safe agriculture project (contract farming)	Q-GAP (Good Agricultural Practice & Q certification)	Incentives to substitute chemicals with organic materials		IPM (integrated pest management program & certification)
					Credit in kind: organic inputs	Finance-tech support to produce organic materials	
Ping river Basin		61	1 (8.88)	2 (8.20)	3 (7.99)	4 (7.48)	5 (6.80)
Ping part 1 Sub-basin	Tangerine	20	1 (8.75)	1 (8.75)	3 (8.35)	2 (8.45)	4 (7.75)
	Longan	2	1 (10.00)	1 (10.00)	1 (10.00)	3 (8.00)	2 (8.50)
	Maize	8	4 (5.25)	5 (5.13)	3 (7.25)	2 (7.63)	1 (8.13)
	Rice	6	1 (9.00)	2 (8.67)	3 (8.33)	4 (7.83)	5 (6.83)
Ping part 5 Sub-Basin	Tangerine	7	1 (9.00)	4 (6.71)	3 (7.29)	2 (7.43)	5 (5.14)
	Rice	11	1 (9.64)	3 (7.18)	5 (6.55)	4 (6.73)	2 (7.55)
	Jasmine	7	3 (6.86)	1 (7.86)	2 (7.43)	4 (6.43)	5 (5.00)

¹⁷ Figure in parenthesis indicates average score from 10

- Creation of incentives to use organic matter instead of chemical substances to build soil fertility, including *in-kind (organic) credits* and *provision of financial and technical support* for farmers producing organic materials, were ranked third and fourth, respectively. Farmers agreed that both measures are strong. Both can lead to reductions of investment needed in terms of production inputs, and make the whole process safe in terms of the health of farmers and consumers. Soil structure is rehabilitated and improved, as are other soil properties, due to increased organic matter content, which also reduces soil erosion. The quality of water resources is improved because of less accumulation of agricultural chemicals, so that farmers can use water for animals or plants from any source on their farms. Air quality is improved because of reduced spraying of chemicals, which poses danger both to farmers themselves and to others living in the area.

Farmers agreed the weakness of these measures lies in use of organic matter instead of chemicals. Some organic materials are less long-lasting than chemicals and/or do not provide the complete set of minerals necessary for crops, and their effectiveness can be quite slow. Thus, many farmers are hesitant to use large amounts of organic matter, and incentives derived from these measures are not as great as might be expected. Farmers also think technicians and experts should be available to come and provide knowledge about benefits and properties of organic matter to farmers, in order to encourage their use in place of chemicals.

- Promotion of pest management using IPM and certification of standards* was the lowest rated measure overall. Farmers agreed that IPM improves environmental conditions and encourages increases in crop diversity, which can increase farmers' incomes. This was the reason maize farmers rated this measure first. But most farmers felt they lacked sufficient knowledge and understanding of the implementation of IPM. Thus, application of IPM to a diversified plot sometimes leads to a decrease in yields of main products, and hence income. Another limitation is the relatively small size of farms, which cannot normally accept or afford risks of agricultural damage arising from not using chemicals.

Opinions on economic measures relating to livestock production

Two types of livestock farming – pigs and dairy cattle – were selected as case studies in the Mae Kuang sub-watershed. These two activities create water pollution problems because farmers normally discharge wastewater in the form of manure and other liquors that flow untreated into public waterways. This causes pollution and the quality of the receiving water is no longer good enough for it to be used by people living in the surrounding area. The three measures presented in dialogue with livestock farmers should enable livestock farms to achieve quality standards specified by the Department of Livestock Production. Results of the dialogue are shown in Figure 5-16:

Figures 5-16 Ranking of economic measures for managing wastewater from livestock

Basin/Sub-Basin	Type of livestock	Number of respondent	Economic measure ^{1/}			
			Support processing animal manure to fertilizer pellets	Subsidy to produce biogas		Subsidy of on-site treatment for dairy farm through coops
				Partial financial support	Low interest credit	
Ping river Basin		28	1 (8.29)	2 (8.00)	3 (7.69)	4 (7.64)
Mae Kuang Sub-Basin	Swine	9	2 (8.78)	2 (8.78)	1 (9.33)	3 (8.11)
	Dairy cattle	19	1 (7.79)	2 (7.21)	4 (6.05)	3 (7.16)

^{1/} Figure in parenthesis indicates average score from 10

Views of pig and dairy farmer representatives can be summarized as:

1. *Support for processing animal manure into fertilizer pellets* received the top rating. The strengths of this measure are seen to lie in the ability to recycle waste into fertilizer, and in reduction of production costs, while increasing farm incomes through sale of excess fertilizer. In dairy farming, it also helps to solve the problem of wastes in public areas and the smell of the manure. Its weaknesses are that processing of animal manure requires both knowledge and investment, and that if production of fertilizer is greater than demand, distribution of excess fertilizer could create other problems.
2. *Support of biogas production in the form of credit at low interest and/or partial financial support* was ranked second. The strengths of this measure are that it can solve problems of acrid smells in the local area, and that production of biogas could help reduce farm energy costs. Weaknesses are the need for a substantial area for construction, and high investment costs of biogas treatment. It is also important to include safety systems for biogas production, to prevent gas leakage and explosions. This includes need for regular safety inspections. Low interest credit for biogas production was rated first by pig farmers.
3. *Support for construction of simple wastewater treatment systems through dairy cooperatives* was the lowest ranked measure. According to farmers, the strength of this system is in solving wastewater treatment problems and improvement in the quality of effluent discharged to public waterways. This would enable farms to receive certification from the Department of Livestock Promotion. Its weaknesses are needs for a considerable area on which to set up the treatment facility, and high investment costs. Beyond this, the farmers have to bear operating and maintenance expenses of the system.

5.3.2. Opinions on social measures

The only social measure offered in discussion meetings was the *community monitoring system* program. All participants appeared to agree with the importance of this social tool because it allows local people to commit to and participate in monitoring of activities that may cause environmental damage in their locality.

Setting up an effective environmental network of local people will strengthen its activities and efficiency, and lead to long-term social and ecological sustainability. Weaknesses may arise, however, if some people are unwilling to collaborate because they perceive that the program would not benefit them directly, and because people must bear the opportunity costs of their participation. Security could be another problem under some circumstances, making those joining the network reluctant to talk about or report on damage, activities, *etc.*

In practice, networking is a time consuming process that needs to build knowledge, linkages, trust, and good perceptions for environmental management. Because of this, municipalities and local government organizations need to work closely with local people to improve knowledge and to develop a strong community environmental work force. The program should be evaluated continuously if its management is to be successful and sustainable.

5.3.3. Opinions concerning supplementary measures

Community sector. One supplementary measure was presented to representatives of the community sector. It was intended to help solve problems of solid waste, through collaboration with the commercial sector. It involves collaboration with large wholesale centers, department stores and convenience stores, in *reducing use of plastic bags through certification of environmentally-friendly businesses.*

Representatives from small- and medium-sized municipalities and TAOs agreed with this measure because it gives the business sector an opportunity to participate and become responsible for solution of environmental problems, especially those arising from excessive use of plastic bags. Waste generated from widespread use of plastic bags poses disposal problems as the bags themselves are not biodegradable and disposal involves some difficult waste management techniques. Municipalities spend a large amount of money each year on waste disposal. Implementation of this measure will need effort to inform and educate the public about the objectives and benefits of the program. Otherwise, it might have a negative effect on the sales of participating firms.

Agricultural sector. Three supplementary measures were presented to farming representatives to help in reducing water pollution from the agricultural sector. included the following:

1. Development of a *safe agriculture business network* was ranked as the supplementary measure of most importance. Such a network would help reduce use of chemicals in farming and, hence, agricultural water pollution. From the participants' perspective, networking of safe agriculture businesses will generate exchange of knowledge, and field or technical expertise with respect to food safety and related matters. These will serve as inputs relevant to further development of better production processes or systems in terms of quantity, quality and safety. In addition, linkages may provide a wider market channel and advertisement for the produce of group members. This should increase the desirability and sales of their produce. The weakness in the scheme, however, may be associated with the lack of available experts. A strong and capable leader and working team will be needed to drive the program successfully.

2. *Demonstration production plots using organic materials as fertilizers* were rated second in importance. The strength of this measure is that it actually demonstrates production and management processes, as well as output from farm sites in local circumstances and surroundings. Thus, greater credibility and reliability should be gained for the organic campaign if the demonstration farm operates successfully. This measure also enables local farmers to participate and learn, gaining experience that can then be applied to their own farms. Limitations in budget and plot sites advocated for demonstration would, however, prevent wide application of this measure in practice. Farmers living significant distances from the demonstration plots would not benefit from visits because of the traveling and time costs involved.
3. *Agricultural mobile clinics* appeared to be of least important of the three supplementary measures presented. The strength of the measure would be that problems could be solved directly by technical advice from experts, and farmers could learn more about the appropriate use of chemicals and other relevant management techniques, to supplement local wisdom. But weaknesses pointed out include the non-continuous operation of the clinics and the expenses to be borne by farmers. Beyond this, the program will need to receive wide collaboration and input from academics and experts if it is to effectively meet the demand from farmers.

5.4. Implementing incentive measures

Information from the above activities was used to help refine assessments of economic incentive measures, and formulate recommendations on next steps toward implementing priority activities in each sub-basin. This included recommendations about roles of government agencies, development of indicators to monitor and evaluate their use, and guidelines for application of incentive measures in pilot sub-basins. Requirements for implementing recommended measures were too complex, however, to allow their establishment and testing during implementation of this project.

Thus, implementation efforts under the project focused on assistance with initial steps toward establishing selected high priority measures in pilot sub-basins. These efforts emphasized initial training related to high priority incentive measures for major target groups in all three sub-basins. Training was organized and coordinated by staff of the Office of Natural Resources and Environmental Policy and Planning, in collaboration with staff from other key agencies and universities. Key components of the training included:

Training to promote Good Agricultural Practices (GAP)

The objectives of this training were to improve farmer knowledge, understanding and awareness related to the good agricultural practices program, in order to increase the capacity of target farmers to conduct these activities in their own local areas. This includes developing their agricultural production to higher standards through use of more environmentally friendly production processes. Training was held on 19 June 2006 at Chiang Dao District of Chiang Mai province. Participants included 42 farmers from target groups in the Ping part 1 and Ping part 5 pilot sub-basins, as well as 8 local government staff from the Ping part 1 sub-basin. Farmers participating in the training volunteered to join the GAP program.

Participants identified problems associated with implementation of this incentive measure to include: (1) lack of farmer knowledge about chemical use, (2) shortage of farm labor with knowledge about good agricultural practices, (3) shortage of knowledgeable people to provide continuous advice and assistance, (4) high initial investment costs, (5) lack of product price standards, and (6) climatic conditions not conducive for cultivating some types of crops.

Needs for government support identified by participants were to: (1) provide tangerine entrepreneurs with knowledge about GAP, (2) organize regular training related to GAP, (3) provide knowledge about how to apply modern technology, (4) establish networks, receive membership applications and disseminate data at local community level, (5) provide price guarantees and find markets for agricultural produce, (6) provide materials, equipment and production inputs used in organic fertilizer production, (7) conduct monitoring of water and soils in agricultural production areas, (8) provide data on appropriate use of various types of chemicals, and enforce penalties for excessive use.

Training for campaigns for farmers to use organic fertilizers instead of chemical fertilizers

Objectives for this training were (1) to provide farmers with knowledge and understanding about full cycle production of compost, including production, funding sources and sales, and to enable them to apply these in their own agricultural areas; and (2) to increase awareness of the importance of applying compost to reduce the amount of chemicals used in agricultural areas. Training was held on 20 June 2006 at Mae Jo University in Chiang Mai province. Participants included 55 farmers from target groups in the Ping part 1 and Ping part 5 pilot sub-basins, 3 local government staff from the Ping part 1 sub-basin, and a member of the staff of the Agriculture Research and Development Office Region 1. Most farmers participating in the training were able to apply the knowledge they gained to their own local areas.

In terms of problems associated with implementation of this incentive measure, participants identified: (1) lack of farmer knowledge regarding chemical use, (2) lack of knowledgeable people to provide advice, (3) farmers have insufficient investment capital, and (4) production takes a long time.

Thus, their perceived needs for government support include: (1) provide knowledge regarding organic fertilizers, (2) conduct regular training, (3) assign a person to be based in the area to provide knowledge for farmers when they encounter problems, (4) provide more knowledge regarding modern technology that can be applied, (5) establish networks receive membership applications and data for dissemination in local communities, (6) provide price guarantees and locate markets for agricultural produce, (7) provide materials, equipment and production inputs used in organic fertilizer production, (8) conduct monitoring of water and soils in agricultural production areas, (9) provide data on appropriate use of various types of chemicals, and enforce penalties for excessive use.

Training to promote use of “clean technology” in cottage industries

Objectives of this training were (1) to provide cottage industry entrepreneurs with knowledge, understanding and awareness about application of clean technology in production processes and wastewater management; and (2) to provide adjustments for production processes that can be used to reduce wastes generated by cottage industry. Training was held on 8 July 2006 at the Agro-Industrial Product Improvement Institute of Kasetsart University. Participants included 41 people from mulberry paper producing cottage industries and 4 municipality officials, all from the Mae Kuang sub-basin. Entrepreneurs and officers received increased knowledge about clean technologies that they could disseminate to their local communities and use in adjusting their industrial activities.

Participants perceived needs for government support to include: (1) providing knowledge about clean technologies, (2) organize regular training, (3) assign a person to be based in the area to provide knowledge for entrepreneurs when they have problems, (4) provide knowledge about

application of modern technologies, (5) accept members interested in clean technologies, (6) provide information for dissemination at the local community level.

Training on management of community wastewater treatment systems

The objectives of this training were (1) to provide knowledge and understanding, and to increase awareness of local government officers related to all levels of management of community wastewater treatment systems, and (2) to help local government officials be prepared and able to manage construction of wastewater treatment systems. Training was held on 27 June 2006 at the Kamphaengphet Municipality office. Participants included 47 officers from municipalities and TAOs in the Ping part 5 sub-basin. They gained increased knowledge they can use in public relations and dissemination to communities and factories located in community areas, and they also began drafting projects to construct community wastewater treatment systems.

Problems identified by participants related to wastewater management include: (1) most TAO and municipalities have not yet constructed wastewater treatment systems, (2) they lack budgets and people with specialized knowledge, (3) insufficient land area available to local governments for construction of wastewater treatment systems.

Needs for assistance from the state to local governments include: (1) budgetary assistance, (2) people with specialized knowledge to introduce local governments to wastewater systems appropriate for particular areas, (3) conduct regular training related to technologies for wastewater treatment management, and (4) provide information related to modern technologies for local dissemination.

6. Component 4: Project coordination, results measurement & dissemination

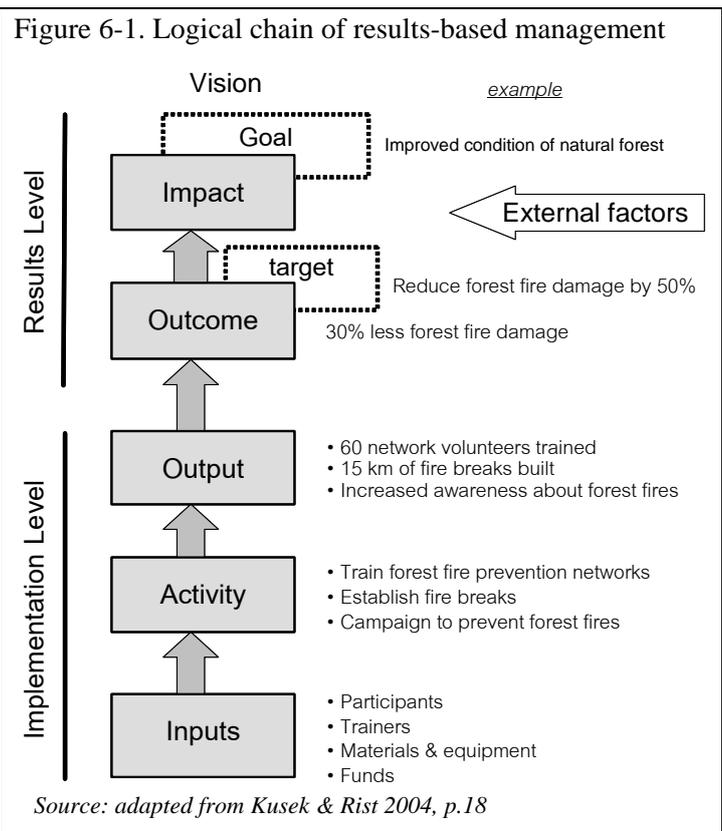
In this era of globalization, there are growing pressures on governments and organizations around the world to respond to demands of both internal and external stakeholders for good governance, accountability and transparency, more development effectiveness and delivery of tangible results. Stakeholders wanting better performance include governments, parliaments, citizens, the private sector, nongovernmental organizations, civil society, international organizations, and funding organizations. Results-based monitoring and evaluation of policies, programs and projects is seen as an important tool for helping to achieve these goals.⁵

Results-based management⁶ requires movement from traditional implementation-based approaches focused on project monitoring and evaluation, into the newer area of results-based approaches. The central question in a results-based approach is ‘so what?’. In other words, governments or organizations may successfully implement projects, plans or policies, but have they actually produced the intended results? How do people know how much progress is being made toward longer-term goals desired by stakeholders?

A basic example of elements of results-based approaches is shown in Figure 6-1. Example information is for a project aimed at improving the condition of natural forests by reducing damage caused by forest fires, through a set of training, action and public education activities.

The lower part of the figure shows implementation components of the management process, including the planned activities, the inputs they use and the outputs they produce.

Results components are in the upper part of the figure. The outcome is the actual changes in conditions that are linked with activities and their outputs, in this case a 30 percent reduction in damage from forest fires. The outcome is assessed through comparison with targets that projects have set for themselves, which in this case was a 50 percent reduction in forest fire damage. The impact is the extent to which the outcome helps achieve the higher level goal toward which the activities are aimed. In this example, the goal improved condition of the natural forest. Higher level goals usually



need to be achieved through several lines of activity. In our example, they might include reduced hunting, logging, land clearing, etc. Thus, impact assessment is usually in terms of contribution toward achieving the goal. For both outcomes and impacts, there are likely to be various other

⁵ For more detailed discussion and references, see project report on results-based measurement [Thomas 2006]

⁶ Also known as ‘managing-for-results’, ‘performance-based’ management, or other similar terms

factors that also influence the degree to which targets and goals are achieved. In our example this might include unusual rainfall, change in forest policy or economic conditions, etc.

The most prominent tool used for summarizing and presenting this type of logical structure is the Logical Framework matrix. Its basic components are shown in Figure 6-2. The vertical logic of the table reflects the components shown in the left side of Figure 6-1, while the horizontal logic shows how progress can be assessed, as well as assumptions and risks.

Figure 6-2. Typical Logical Framework format

	Narrative summary	Objectively verifiable indicators	Means of verification	Assumptions and risks
Results	Goal – the overall aim to which the project is expected to contribute	Measures (direct or indirect) to show the project's contribution to the goal	Sources of information and methods used to show fulfillment of the goal	Important events, conditions or decisions beyond the project's control necessary for maintaining the progress towards the goal
	Outcomes (or objectives) – the new situation which the project is aiming to bring about	Measures (direct or indirect) to show what progress is being made towards reaching the objectives	Sources of information and methods used to show progress against objectives	Important events, conditions or decisions beyond the project's control, which are necessary if achieving the objectives is going to contribute towards the overall goal
Implementation	Outputs – the results which should be within the control of the project management	Measures (direct or indirect) to show if project outputs are being delivered	Sources of information and methods used to show delivery of outputs	Important events, conditions or decisions beyond the project's control, which are necessary if producing the outputs is going to help achieve the objectives
	Activities – the things which have to be done by the project to produce the outputs	Measures (direct or indirect) to show if project activities are being completed	Sources of information and methods used to show that the activities have been completed	Important events, conditions or decisions beyond the project's control, which are necessary if completing activities will produce the required outputs
	Inputs	Resources – type and level of resources needed for the project Finance – overall budget Time – Planned start and end date		

Source: after Blakewell 2005, p. 3

Use of the Logical Framework matrix (or “Logframe”) to summarize the basic structure of a project or workplan is a very widespread practice around the world. While its use has been strongly promoted by international donor institutions, it is also widely used in national institutions and large organizations, including the government of Thailand.

But the logical framework matrix is intended to be used as only one tool in what is known as the Logical Framework Approach (LFA). Seven important components of this approach are listed in Figure 6-3. The LFA is concerned with wider planning procedures of problem analysis, development of objectives and indicators, and identification of risks and assumptions, as well as how they are used to help build the overall program plan. At least in principle, this type of program planning should be based in participatory development of a consensus among a wide range of stakeholders on a program of work, which can then be summarized in a logical framework matrix.

While these planning and management approaches are very common, there are also two major types of criticisms about them [Blakewell 2005]. The first type of criticisms center on ways the logframe matrix is used, rather than on the concepts and processes that it promotes. For example, the logframe has been used to make a ‘contract’ between a project implementing organization

Figure 6-3. Major components of the results-based Logical Framework Approach (LFA)

1. Identifying clear and measurable objectives (results), assisted by logical frameworks.
2. Selecting indicators that will be used to measure progress towards each objective.
3. Setting clear targets for each indicator, for use in judging performance.
4. Developing performance monitoring systems to regularly collect data on actual results.
5. Reviewing, analyzing and reporting actual results in comparison with the targets.
6. Integrating evaluations to provide complementary performance information not readily available from performance monitoring systems.
7. Using performance information for internal management accountability, for learning, and for decision-making processes, and also for external performance reporting to stakeholders and partners.

Source: Blakewell 2005, p. 4-5.

and its funding agency, which results in the logframe being seen as a ‘blueprint’ for implementation. This reduces flexibility to respond to unforeseen issues, problems or opportunities that emerge during the project. The second type of criticism is directed toward the very simple logic used in the Logframe and the LFA. Many argue that the real world is much more complex than what is explained by categories of information in the Logframe. Truly meaningful development requires a very responsive, adaptive, and experimental approach that integrates learning and change during implementation of a project or program. This can result in pathways of change that are much more complex and indirect than what is usually reflected by information in a logframe or a results-based (LFA) approach.

Despite these criticisms, use of the logframe and the results-based (LFA) approach is very common and continues to expand. Since no feasible alternative methodology has been proposed by critics, many people, especially in government and larger organizations, see the logframe and results-based approaches to be the best available tools to help them organize their work, improve the performance of their management systems, and document their progress and problems for concerned stakeholders. Thus, many efforts are being made to help the process become as participatory, responsive and flexible as possible.

A results-based approach places strong emphasis on developing objectives and indicators for the results level, as shown in Figures 6-1 and 6-2. It is important to note, however, that monitoring of indicators at the implementation level is still required to provide information that is very important for assessing performance in results-based management systems. Furthermore, performance measurement must be linked with evaluation, reporting, and use of findings if the overall system is to function properly.

In order to help bring together these various lines of thinking and experience into a useful format, the World Bank has recently published a handbook on what needs to be done to build an effective results-based monitoring and evaluation system [Kusek & Rist 2004]. The handbook describes a 10 step process that is summarized in Figure 6-4, together with a simple key question to be answered through activities conducted under each step. This handbook is primarily directed toward development of systems by national governments. But since the steps and basic recommendations are very relevant for many types and levels of organizations, it would be very useful to have a version of this handbook with examples directly relevant for organizations at more local levels, such as RSBOs.

Figure 6-4. Ten Steps to building a results-based monitoring & evaluation system

<i>Step or Component of the overall process</i>	<i>Key Question to Answer</i>
1 Conducting a Readiness Assessment	Do we have what we need to start?
2 Agreeing on outcomes to monitor and evaluate	What do we want to achieve?
3 Selecting key indicators to monitor outcomes	How do we know success?
4 Baseline data on indicators	Where are we today?
5 Planning for improvement – selecting results targets	How much change should we make during our projects or plan?
6 Monitoring for results	How do we measure change?
7 The role of evaluations	How do we know how much change resulted from our projects?
8 Reporting findings	Who needs to know about our information and findings?
9 Using findings	How will our information and findings help improve our work?
10 Sustaining the M&E system within the organization	How can we keep our system healthy and productive over the long term?

Source: adapted from Kusek & Rist 2004

If outcome measurement, monitoring and evaluation are to be fully integrated into the management system of an organization, it is very important to have high levels of stakeholder participation in all major types of activity. Since participation by local communities, groups and networks is an important reason for developing sub-basin organizations, strong efforts should be made to develop and apply tools to make their participation as effective as possible in activities that include: (1) defining outcomes and identifying indicators, perhaps using tools like participatory analysis and strategic planning; (2) conducting measurements and monitoring that use participatory methods and tools based on appropriate combinations of both scientific and local knowledge; and (3) using information in conducting analysis, program improvement, and further planning. Indeed, participation in all three types of activity should greatly increase understanding and the quality of results in each of the individual types. It should then become clearer where and why partnerships and further capacity building are needed to improve the overall process.

Building an effective results-based monitoring and evaluation system requires long-term effort and commitment. Thus, the World Bank handbook includes a ‘readiness’ assessment to help determine whether key commitments and basic capacities are in place and available.

Project studies have shown very substantial variation among sub-basins in the Ping River Basin, including the three pilot sub-basins under this project. Variation includes dimensions related to physical and ecological characteristics, to social, economic and cultural characteristics, and to the experience, capacity and general approach of local organizations and local governments. This appears to result in substantial variation in management approaches taken by watershed management organizations (RSBOs) in pilot sub-basins, and further differences are likely among organizations established in other sub-basins.

Thus, the project has proposed five alternative models of organization for RSBOs. Working groups in each sub-basin have been considering these different approaches as they draft sub-basin action plans and seek consensus on the initial design of a long-term management organization

appropriate for conditions in each of their sub-basins. The results of their considerations will influence the types of information their monitoring and evaluation system will need to provide, and how the information will be used. This, in turn, will influence which stakeholders and partners will need to be directly involved in operating and using the monitoring and evaluation system.

We are still only beginning to see emergence of issues related to interactions among sub-basins. The first concern seen is flooding in the Chiang Mai valley, which is resulting in concern about upstream land use. This raises the need for good monitoring and evaluation of how work plan outcomes affect flood-related environmental conditions. Results will be useful in interactions with other sub-basins located downstream.

This issue also points out the potential importance of monitoring and evaluation systems in providing information that is useful in negotiations among stakeholders. These types of negotiations can occur within a single sub-basin, or between local stakeholders and those representing the legitimate interests of downstream or larger society. Within a sub-basin, there may be important upstream-downstream issues such as water pollution or land use practices on sloping land that valley people believe are increasing risk of flash floods or landslides. External stakeholders may want evidence that activities in a sub-basin are not increasing risk of downstream main river channel floods, or are not destroying biodiversity or other resources important for the whole nation. Thus, another function of sub-basin monitoring and evaluation systems is its role in serving as a *negotiation support system*. And again, types of information the system needs to provide, and the appropriate roles for different stakeholders, will probably vary among sub-basins with different characteristics and conditions.

Another type of variation that sub-basin monitoring and evaluation systems will probably face relates to changes over time in national level policies. For example, activities to develop new laws related to water and community forestry have been going on for many years. It is possible, but still very uncertain, that such laws could be enacted in the near future. But terms and conditions in the draft laws are still not widely known by most people, and they may still be changed before they are finally enacted. Similarly, a new national 5-year plan is being developed, and various national policies are being modified. Current political turmoil at the national level may bring significant changes in national political leadership and many more changes in national policy. Even the basic support for developing sub-basin management organizations could be seen as associated with a political faction, which could lead to efforts by other factions to end all support.

Such change in national laws and policies can affect sub-basin management plans, activities, and expected outcomes and impacts. Thus, they can also affect the types of monitoring information that is needed, and especially ways in which outcomes are evaluated. In the results-based logical framework approach, these types of issues are seen as assumptions and risks. Many organizations that implement projects feel that risk management and coping with unexpected changes are critical for the success (or failure) of most development projects. Thus the assumptions column may be the most important part of the logical framework matrix [Blakewell 2005]. But much more emphasis is usually given to developing positive outcomes and indicators, so that consideration of assumptions and risks is often one of the weakest parts of the planning process. There is even some concern that too much attention to assumptions and risks could make the logic of a logframe become less clear, and thus reduce its chances for receiving funding.

Monitoring and measurement can tell managers and stakeholders what was done under an activity, project or workplan. Evaluation is needed to help them understand more deeply the quality of the work and why outputs have (or have not) resulted in the observed outcomes.

6.1. Results measurement framework

This section summarizes the proposed results measurement framework for sub-basin management organizations, and progress toward implementation in project pilot sub-basins.

6.1.1. Overall framework

Frameworks for monitoring and evaluation depend on objectives and important principles. Project-level monitoring and evaluation can generally be divided into two forms according to its characteristics and objectives:

- *Monitoring and evaluation of project implementation* (input monitoring & evaluation) emphasizes examining use of resources and implementation processes in order to evaluate efficiency of implementation, which requires information on project inputs and outputs.
- *Monitoring and evaluation of outcomes according to project objectives* (project results monitoring and evaluation) emphasizes evaluation of project results and impacts, and requires information on outputs, outcomes, and impacts.

Both of these types of monitoring and evaluation have characteristics that are similar in their level of importance, but they differ in their sources of information and in the timing of when they are conducted. For the first type, most data will come from agencies, implementers or project administrators, such as data on finance, personnel, or outputs from project implementation. For the second type, most information will be obtained from project beneficiaries or stakeholders, or from technical examination and measurement of results.

Results-based monitoring and evaluation is an important focus of this project component. But both forms of monitoring and evaluation are necessary, and their structures and implementation need to be linked together. Thus, the proposed monitoring and evaluation framework is based on a combination of both of these forms of monitoring and evaluation.

Levels of sub-basin management and operations

A monitoring and evaluation framework for pilot sub-basins also needs to consider the organizational and operational levels at which monitoring and evaluation will be conducted. Since the focus of this project is on development of new sub-basin management organizations and plans, it is also very important to consider the roles and responsibilities of existing organizations at other levels, and how they will be linked with the sub-basin level.

Experience under the project in working with all three pilot sub-basins has shown some similar directions in thinking about how sub-basin management organizations (RSBOs) should relate to other existing institutions and development plans. Implementation of at least most types of projects that use government funds is seen to be under the responsibility of local governments, provincial administrations, or agencies of the central government. These organizations already have their own planning systems, implementation procedures and budgets. They are also already required to collect and report various types of monitoring information related to projects they implement. There has been overall agreement that an RSBO should not try to compete with or duplicate these types of duties or functions. Thus, responsibilities and methods for most implementation-level monitoring and evaluation of projects will probably remain with these institutions.

All of these institutions are also seen as important partners participating in management processes under sub-basin management organizations (RSBOs). The role, responsibilities and leadership of each type of institution will depend on the type of organizational structure that is used in each sub-basin. There appears to be general agreement, however, that RSBOs will have important responsibilities in relation to the development, monitoring and evaluation of overall workplans for sub-basin management and development. Individual projects will be under the various strategies of overall sub-basin workplans. Thus, monitoring and evaluation at the results level will probably become a very important part of work managed and conducted by RSBOs.

Results under the first component of this project include specification of strategies, workplans and measures, together with various types of development projects for the three pilot sub-basins. Thus, the framework for monitoring and evaluation must set frames for two levels: the level of overall sub-basin development, which deals mainly with strategies and workplans; and the level of individual projects that are under each sub-basin development strategy and workplan. Accordingly, consideration of the framework for monitoring and evaluation is divided into two parts that specify a framework for project-level monitoring and evaluation, and a framework for workplan-level monitoring and evaluation.

Project-level monitoring and evaluation framework

Based on their experience with monitoring and evaluation systems under the results-based management approach of agencies in Thailand, project implementation consultants proposed a five step process for conducting monitoring and evaluation at the project level.

Frames and methods for monitoring and evaluation of individual projects, and especially parts related to outcomes and impacts, may vary according to types and categories of projects. This may be due in part to the project implementing agency or the agency evaluating the project, as well as to human resources and budget used in conducting monitoring and evaluation. Thus, the frame proposed here is not one that should be regarded as a definitive methodological framework. Rather, it is meant as an approach to make design, planning and implementation of monitoring and evaluation to be systematic according to the project cycle.

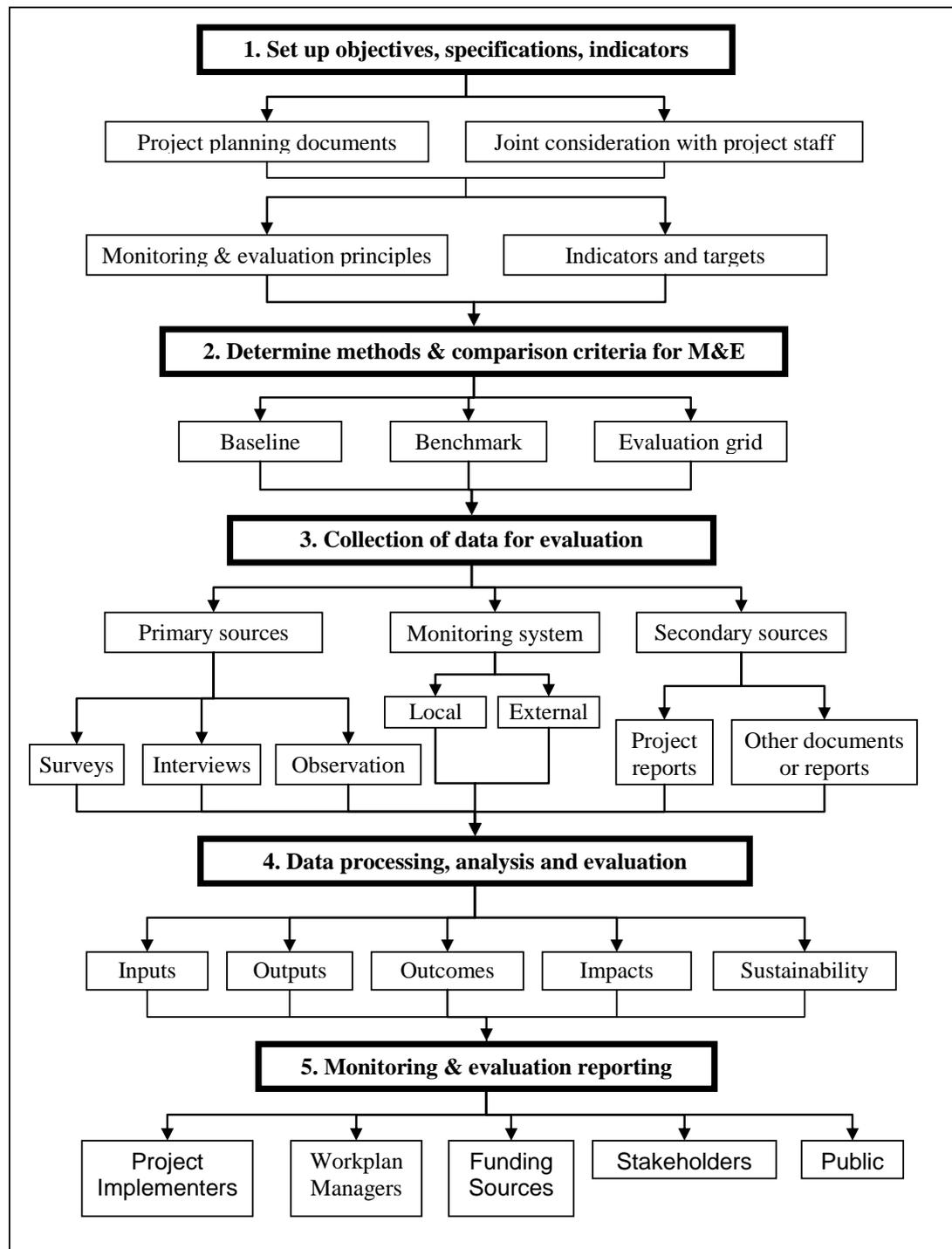
The frame for conducting project monitoring and evaluation has steps and important methods that must follow the sequence displayed in Figure 6-5. The main components of each step can be summarized as follows:

Step 1. Set up objectives, specifications and indicators

The objective of conducting this step is to specify the scope of the frame for monitoring and evaluation, which will depend on what is the objective of monitoring and evaluation. This will be linked to evaluation principles, and to indicators that will be used in evaluation.

This step begins with study, understanding and analysis of project management using the Logical Framework Approach as a tool in reviewing project organization. Under the government's results-based management (RBM) system, agencies managing projects must have specified objectives, outputs and outcomes for a project, along with clear measurable indicators and targets. These are shown in a project Logical Framework Matrix (Figure 6-6). A project analysis table can be used to clarify the basis for monitoring and evaluation and the specific objectives of evaluations to be conducted.

Figure 6-5. Steps & methods in implementing project monitoring & evaluation



Source: Panya Consultants

Criteria for selecting indicators used in the logframe matrix are:

- Indicators must be **clear** and correct, with no ambiguity about what is to be measured
- Indicators must be **relevant** to project objectives and needs of stakeholders
- Indicators must be **economical** in terms of cost, and have a clear data source
- Indicators must be **adequate** for use in measurements under evaluation principles of both efficiency and effectiveness
- Indicators must be **useful** for monitoring, and flexible if conditions change.

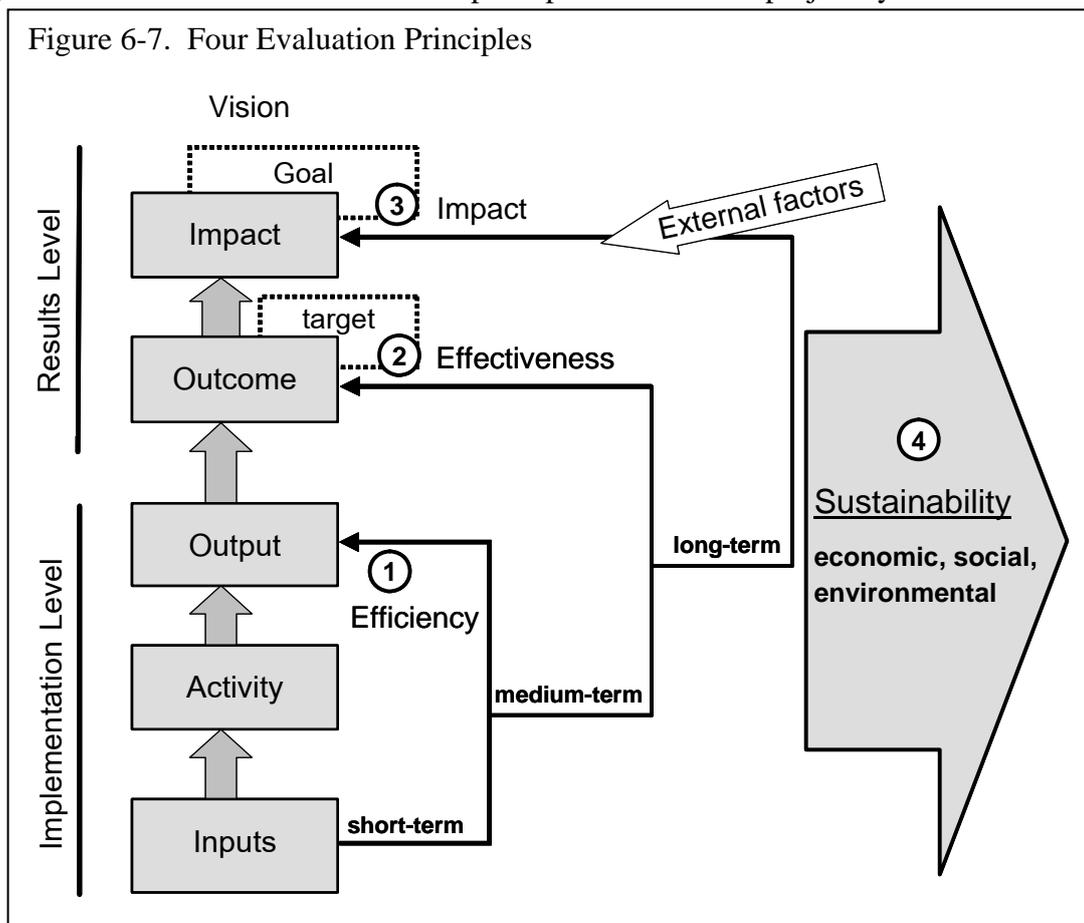
Figure 6-6. Model structure of a Logical Framework Matrix

	Summary of items / results	indicators	Data source & methods	Assumptions & risks
Goal / objective				
Outcome				
Output				
Activities		inputs	budget	
				Initial conditions

In terms of establishing principles for monitoring and evaluation, this can be done for all stages in the project cycle, or for only one stage. Thus, it is important to clearly specify monitoring and evaluation objectives. Common specifications will be in line with the project’s scope of work, by considering the order of relations in project plans. In specifying the scope of work, four main monitoring and evaluation principles are used as criteria for consideration of each project. All or only one of these principles can be used, depending on the evaluation objectives mentioned above.

- Efficiency considers use of project resources or inputs and outputs that are derived from it
- Effectiveness is investigated according to the objective of the project
- Impact considers project objectives, goals, and external factors
- Project sustainability considers economic, social and environmental aspects

Figure 6-7 shows how these evaluation principles relate to the project cycle .



Step 2. Determine monitoring & evaluation methods & comparison criteria

The objective of this step is to specify the methodological approach for monitoring and evaluation, and the criteria for comparing change in indicator values.

It is important to establish a starting point or baseline data for the indicator, and a final point or benchmark, as criteria for comparative evaluation of change. Baseline data for indicators is actual data on the status of indicators before implementation of the project. Benchmarks may be considered to be the highest target levels needed, and they may be determined from accepted standard values. An Evaluation Grid can be used as a tool for determining the scope of activities to be conducted according to evaluation principles.

Step 3. Collecting data for evaluation

Data collection can be divided into three main parts: one part for gathering data from primary sources, a second part for collecting data from secondary sources, and a third part for gathering data from monitoring systems at various levels. They may be summarized by data category, source, and data collection method, according to the evaluation principles.

Various types of monitoring systems can be important sources of information for project monitoring and evaluation. Since projects will be implemented in the context of sub-basins or smaller sub-watersheds, use of monitoring systems can be considered at two levels:

- *Local level monitoring systems* may include components that already exist within sub-basins or more local areas, or they may be developed as part of the sub-basin management process.
- *External monitoring systems* exist at national, regional, river basin, province and other levels, and may be able to provide important information useful for evaluating outcome, and especially impact levels.

Step 4. Data processing, analysis and evaluation

Data processing and data analysis will depend on requirements of evaluation principles to evaluate which aspects, what will be used as criteria in each aspect, and what different importance weights will be assigned to factors to be used in evaluation.

Step 5. Monitoring & evaluation reporting

Since monitoring and evaluation under this framework includes monitoring and evaluation in terms of both project implementation and project achievements, basic monitoring and evaluation reporting should be divided into two parts: a report on monitoring and evaluation of implementation process results, and a report on monitoring and evaluation of project outcomes.

At least five categories of potential users of reporting services need to be considered:

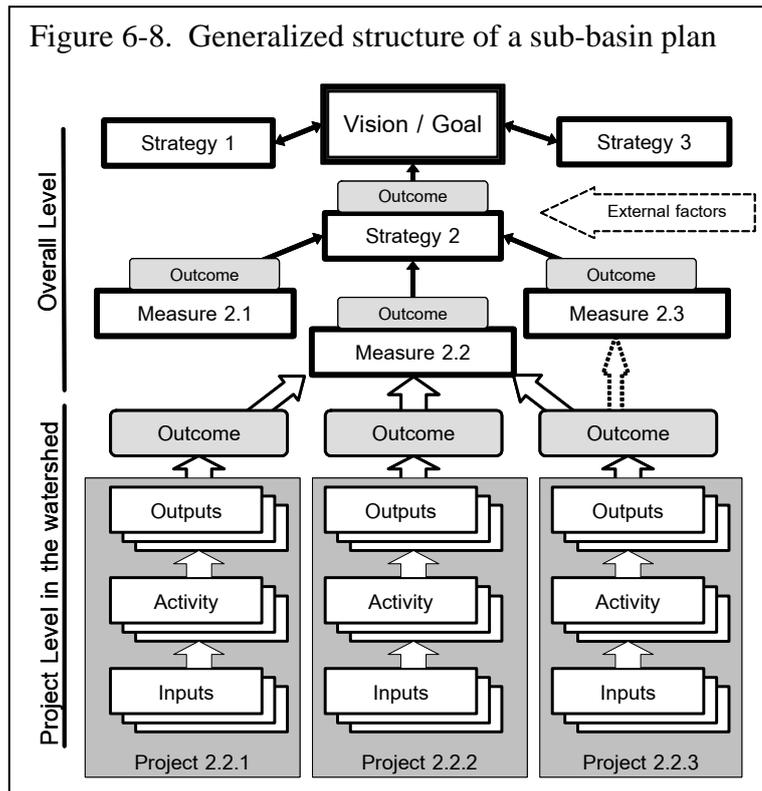
- *Project implementers* are the main target group for reports in implementation process results, and may be able to use some data directly from regular monitoring systems.
- Overall sub-basin *workplan managers* are a major target user of project outcome reports.
- *Sources of funding and support* will be prominent users of both implementation process reports and project outcome reports related to projects they support.
- *Stakeholders* need to see that sub-basin management is achieving important results and impacts on issues that are important to them. Information may need to be packaged in formats appropriate for different stakeholder groups.
- The *general public* can be an important user of findings from results-based measurement. Information can help maintain credibility of the sub-basin management process, and gain popular support that can help it remain viable over the long term.

Sub-basin management-level monitoring and evaluation framework

The main focus of this project is on developing sub-basin level management organizations and sub-basin-level management planning. Working groups in each of the three pilot sub-basins have developed planning frameworks for their sub-basins. These frameworks generally have an overall vision statement and various levels of goals and objectives that determine the direction of their management program or ‘workplan’. Sub-basin workplans are then sub-divided into three more levels of organization. Figure 6-8 shows a generalized example of how these workplans are organized.

The overall workplan seeks to achieve the sub-basin vision, which is quite broad. Thus, several strategies have been developed to achieve the sub-basin vision. There are then several measures through which each strategy will be implemented, and each measure is divided into various specific projects. This general structure has been adjusted to be more appropriate for conditions in each sub-basin, as discussed in section 3.3.

The framework for monitoring and evaluation at the project level has been discussed in the previous section. Project-level monitoring and evaluation includes forms of evaluation at both the project implementation process level, and at the project outcome and impact level.



The issue here is how to monitor and evaluate the overall workplan at the sub-basin and strategy levels. The main focus of monitoring and evaluation at these levels is on outcomes of projects, measures and strategies, and their impacts on overall economic social and environmental conditions in the sub-basin. Use of the logical framework matrix (Logframe) and the logical framework approach can also be useful in helping to provide systematic organization of the complex sets of concepts and information that are needed at this level.

In order to conduct monitoring and evaluation at this level, it is important to specify expected outcomes for each level where monitoring and evaluation will be conducted. Appropriate indicators must also be determined for each outcome, as well as baseline data and relevant benchmarks, in order to provide the basis for comparisons that can determine how much progress has been made. This will help identify strengths and weaknesses in strategies and in the overall workplan, which may need more attention or adjustments to improve the overall sub-basin management program.

Monitoring and evaluation at the program or “workplan” level builds on results from monitoring and evaluation of individual projects under the workplan. Methodologies for evaluation of the overall workplan follow the same framework as for individual projects under the workplan. Results of individual projects are integrated in order to evaluate overall results at the workplan strategy level using techniques to help match levels of inputs, outputs, outcomes and impacts. Evaluation combines results from all projects, and compares results with workplan targets, baselines or benchmarks.

Since the workplan level will be an overall evaluation of development at the whole sub-basin level, it will emphasize evaluation of outcomes or achievements and impacts of development plans under the various collaboratively determined strategies for the sub-basin. Although various parts may have the same indicators as some individual projects, the scale and coverage of the goals will be much larger than for individual projects.

It is important for those responsible for monitoring and evaluation reporting to develop mechanisms for communicating information in their reports to stakeholders other than project-level and sub-basin-level managers, for use in their work related to sub-basin analysis, planning and management. Thus information needs of stakeholders must be reviewed, and appropriate forms for communicating this information must be developed. Information must be in forms that are appropriate for the situation and information users in each sub-basin.

There needs to be an assessment of needs for continuous monitoring of some types of sub-basin conditions, and how such information could provide feedback to stakeholders at multiple levels. Some parts may be through partnerships with technical agencies or others collecting relevant time series data, while other parts may use local collaboration with participatory methods.

Sub-basin action plan logic and performance indicators

The framework for monitoring and evaluation discussed above uses a project design tool in the form of the logical framework matrix (or Logframe), which also helps determine the basis for monitoring and evaluation. Thus, specification of indicators for various levels of the project is usually determined during the project planning stage by those organizing the project.

Project organization may not always follow the form of the Logframe, however, or indicators may not always be clearly specified. Especially for indicators of outcomes and impacts of projects that involve linkages among natural resources and the environment, public health and livelihoods of people in the sub-basin, it may be important to review and re-determine indicators. It is particularly important for indicators to meet the criteria discussed above under step 1 of the project-level monitoring and evaluation framework. And once indicators are selected, baseline data must be established and benchmarks need to be determined, in order to provide a basis for comparative evaluation.

Since indicators are established according to the project logical framework described above, their determination will depend on how objectives and aims of workplans and important projects are specified. Thus, indicators specified in implementation plans (action plans) for managing natural resources and environment are examined for each of the 3 pilot sub-basins.

As already explained in chapter 3, efforts were made for the first initial draft of action plans for each of the three pilot sub-basins sought to have a similar overall structure. During the final round of revisions, however, working groups in each sub-basin responded to requests from stakeholders within their sub-basin to adjust the plans to fit more closely with local views of

conditions and problem situations in their sub-basin. This has demonstrated the importance of processes oriented more toward planning that is appropriate for local problems and conditions, than toward fitting a single template format. Resulting overall plan structures for each sub-basin are summarized in Figure 6-9, along with an indication of the level at which initial efforts have been made to establish indicators for monitoring and evaluation.

Figure 6-9. Summary of levels and terminology in current sub-basin plans

<i>Planning level</i>	Sub-basin		
	Ping part 1	Mae Kuang	Ping part 5
Vision / mission level	Vision statement	Vision statement	Vision statement
Policy / approach level	Goal (1)	Goal (1) Objectives (4)	Goals (3) Objectives (5)
Sub-basin level	Workplan	Workplan	Workplan
Broad components	Strategies (6)	Strategies (4)	Strategies (4)
Specific components	*** Measures (22)	*** Measures (14)	Measures (17)
Implementation level	Activities (35)	Projects/groups (111)	*** Projects (67)

*** level of specified "indicators"

The following sub-sections summarize information on the status of development of performance indicators in each of the three pilot sub-basins. As shown in Figure 6-9, sub-basin plans have sought to specify indicators at the level of either measures or projects. At this point, however, most of these "indicators" are really closer to statements of expected outcomes. Thus, the following summaries have classified these outcome statements and aggregated them at both strategy and overall workplan levels. This allows us to see more clearly what types of specific results are expected from sub-basin plans. These expected results can then be compared with the reasoning of each plan, as described earlier under section 3.3. It also allows us to see what types of more specific indicators and measurements will need to be further developed in order to implement a results-based measurement system.

6.1.2. Ping part 1 (Upper Ping) sub-basin

Outcomes at the strategy level. In order to help clarify the types of outcomes expected under different levels of the Ping part 1 sub-basin workplan, expected outcomes ("indicators") that have been specified at the measures level are listed in Figure 6-10 under the strategy with which they are associated. Outcomes are categorized on the left side according to the general type of outcome that is expected. This provides a general picture of the types of results expected from different strategies, which can then be compared with the title of the strategy for consistency.

This approach allows us to see quite clearly the expected results under each strategy:

- Strategy 1 is named "Building capacity of community organizations (human resource development)", and about half of the outcomes it seeks to achieve focus mainly on building knowledge and organizational capacities of existing local organizations at various levels within the sub-basin. Remaining outcomes focus on local participation and more direct (but still quite general) health and livelihood outcomes.

Figure 6-10. Ping part 1 Strategies – Types of Expected Outcomes

Strategy 1. Building capacity of community organizations (human resource development)		
KNOWLEDGE		1 Communities are aware of and understand problem conditions in the area, 2 Use of concepts & local knowledge consistent with community ecosystems
ORGANIZATION network	1	Existing local organizations join together in community networks to manage natural resources in the Ping part 1 sub-basin and local sub-watersheds with substance & participation
	knowledge 2	Local organizations at all levels in watersheds begin developing knowledge potential that can be used in participatory management of resources in the watershed
PARTICIPATION	1	and communities participate in managing natural resources & the environment
HEALTH	1	Have support for basic public health & household and community sanitation
LIVELIHOODS	1	Communities in the Ping part 1 sub-basin & local sub-watersheds receive promotion of occupations appropriate for community potential & the local area
Strategy 2. Studying and gathering of community datasets and knowledge		
ORGANIZATION data	1	Communities begin to use the knowledge base in NRE management planning, in order to bring relevance to problem conditions & needs of communities in the area
	2	Have studies & knowledge collections related to resource management, such as forest utilization, bamboo, fuelwood use, weir management
PARTICIPATION	1	Communities have capacity to initiate & collaborate in villager research
	2	Communities begin exchange on problem situations at local levels
Strategy 3. Building mechanisms for collaboration with local parties		
ORGANIZATION network	1	Existing villager organizations join together in community networks in order to manage natural resources in the Ping part 1 sub-basin & local sub-watersheds in a solid & participatory manner, together with building mechanisms to move community resource management plans into the organization
PARTICIPATION	1	Local governments in the area participate, support & promote activities of villagers
	2	Communities draft participatory NRE management plans that can join with local governments
Strategy 4. Promoting & supporting natural resource management activities (natural resource conservation)		
ORGANIZATION network	1	Networks of community organizations that manage resources have activities for resource conservation & restoration using community local knowledge
PARTICIPATION	1	Communities & the state collaborate in conducting activities
	nre 2	Communities participate in sustainable management & use of resources
FOREST-WATER-SOIL	1	Natural resources are fertile & abundant
Strategy 5. Managing resources and watershed management organization structure		
ORGANIZATION	1	(short term) get a community organization structure for watershed management & capable of adapting to various situations
	2	(long term) Begin study of villager organizational models for watershed management together with various partners
PARTICIPATION	1	Communities participate in thinking, analysis, determinations, & follow-up
Strategy 6. Policy monitoring & advocacy		
ORGANIZATION	1	Initiate mechanisms for following & advocating laws affecting communities
PARTICIPATION policy	1	communities become aware and join in advocating laws, such as the community forest law

- Strategy 2 is named “Studying and gathering of community datasets and knowledge”, and what it seeks to achieve focuses on building a local data and information system in local organizations that incorporates strong participation in increasing local capacities and in utilization of the system to assess and address local problem situations.
- Strategy 3 is named “Building mechanisms for collaboration with local parties”, and what it seeks to achieve focuses on building networks among local organizations, strengthening participation by local governments, and community-initiated planning that is able to join with local government processes.
- Strategy 4 is named “Promote and support natural resource management activities (natural resource conservation)”. Most of what it seeks to achieve appears to focus on building network organizational capacities and on participation by both communities and state agencies. A single outcome appears as a general outcome for all specific natural resource outcomes – this is a very clear example of a measures level outcome that needs to be broken down according to the expected outcomes of specific activities under the outcome aimed at directly affecting natural resources in the sub-basin.

- Strategy 5 is named “Managing resources and watershed management organization structure”, and what it seeks to achieve focuses on short- and long-term measures that would develop sub-basin organization structures, along with one outcome focusing on community participation in these processes.
- Strategy 6 is named “Policy monitoring and advocacy”, and what it seeks to achieve focuses on developing organizational alliance mechanisms to follow and advocate laws and policies affecting sub-basin communities, together with an outcome regarding local community participation in these processes.

Outcomes at the overall sub-basin workplan level. The same approach was used to aggregate outcomes at the overall sub-basin workplan level, as summarized in Figure 6-11. This overall view of expected outcomes stated in the Ping part 1 sub-basin plans shows that nearly 80 percent of expected outcomes at the measures level relate to improved organization and local participation in basic processes underlying sub-basin problem analysis, planning, management, monitoring and evaluation. Remaining outcomes focus (1) on awareness, understanding and use of knowledge, and (2) on direct impacts on natural resources, livelihoods and public health, which will need to be disaggregated by activities under the measures in order to be measurable. This summary of overall expected outcomes can now be compared with the sub-basin vision and goal, as shown in Figure 3-26.

Figure 6-11. Ping part 1 Overall Sub-basin Workplan – Types of Expected Outcomes

KNOWLEDGE	1 Communities are aware of and understand problem conditions in the area, 2 Use of concepts & local knowledge consistent with community ecosystems
ORGANIZATION	1 (short term) get a community organization structure for watershed management & capable of adapting to various situations 2 (long term) Begin study of villager organizational models for watershed management together with various partners 3 Initiate mechanisms for following & advocating laws affecting communities <i>network</i> 4 Existing local organizations join together in community networks to manage natural resources in the Ping part 1 sub-basin and local sub-watersheds with substance & participation 5 Existing villager organizations join together in community networks in order to manage natural resources in the Ping part 1 sub-basin & local sub-watersheds in a solid & participatory manner, together with building mechanisms to move community resource management plans into the organization 6 Networks of community organizations that manage resources have activities for resource conservation & restoration using community local knowledge <i>knowledge</i> 7 Local organizations at all levels in watersheds begin developing knowledge potential that can be used in participatory management of resources in the watershed <i>data</i> 8 Communities begin to use the knowledge base in NRE management planning, in order to bring relevance to problem conditions & needs of communities in the area 9 Have studies & knowledge collections related to resource management, such as forest utilization, bamboo, fuelwood use, weir management
PARTICIPATION	1 and communities participate in managing natural resources & the environment 2 Communities have capacity to initiate & collaborate in villager research 3 Communities begin exchange on problem situations at local levels 4 Local governments in the area participate, support & promote activities of villagers 5 Communities draft participatory NRE management plans that can join with local governments 6 Communities & the state collaborate in conducting activities 7 Communities participate in thinking, analysis, determinations, & follow-up <i>NRE</i> 8 Communities participate in sustainable management & use of resources <i>policy</i> 9 communities become aware and join in advocating laws, such as the community forest law
NATURAL RESOURCES	1 Natural resources are fertile & abundant
HEALTH	1 Have support for basic public health & household and community sanitation
LIVELIHOODS	1 Communities in the Ping part 1 sub-basin & local sub-watersheds receive promotion of occupations appropriate for community potential & the local area

Some of the single statement outcomes at the measures level are still quite complex and ambiguous about specific outcomes expected from each measure. They are, however, considerably more clear than the types of measures-level outcome statements in the Mae Kuang plan discussed in the next sub-section. One can reasonably expect that more specific measures for each of these outcomes could be developed as the specific activities to be conducted under each measure are designed in more detail and articulated using tools such as the LogFrame. Moreover, there are strategies during this initial phase that are specifically directed toward developing local information and data systems that could help identify specific measurable indicators, means of measurement, and appropriate baseline data.

6.1.3. Mae Kuang sub-basin

Outcomes at the strategy level. In order to help clarify the types of outcomes expected under different levels of the Mae Kuang sub-basin workplan, expected outcomes (“indicators”) that have been specified at the measure levels are listed in Figure 6-12 under the strategy with which they are associated. Outcomes are again categorized on the left side according to the general type of outcome that is expected. This provides a general picture of the types of results expected from different strategies, which can then be compared with the title of the strategy for consistency.

This approach again allows us to see quite clearly the expected results under each strategy:

- Strategy 1 is named “Management of natural resources and environment through participation of the people”, and what it seeks to achieve appears to focus mainly on improving organizations and increasing participation, including enforcement of laws and regulations to prevent pollution.
- Strategy 2 is named “Conserve and restore natural resources to be fertile and productive”. One portion of what it seeks to achieve appears to focus mainly on expanding network organizations to protect natural resources, and on increasing participation to care for and enforce laws and regulations related to natural resources. A second portion of what it seeks to achieve focuses on promoting eco-based tourism, and preservation of livelihoods, culture, traditions and local knowledge.
- Strategy 3 is named “Build economic strength of communities to increase basic household and community incomes”, and what it seeks to achieve appears to focus mainly on promoting “appropriate” local occupations, on encouraging households to increase savings and reduce unnecessary expenses, and on helping local people and entrepreneurs gain more access to sources of occupational finance.
- Strategy 4 is named “Good quality of life, health and livelihoods”, and what it seeks to achieve appears to focus mainly on increasing local knowledge about hygiene and sanitation, and on improving community environmental conditions to be more “pleasant”.

Outcomes at the overall sub-basin workplan level. The same approach was again used to aggregate outcomes at the overall sub-basin workplan level, as summarized in Figure 6-13. This overall view of expected outcomes currently stated in the Mae Kuang sub-basin plans shows that one-half of the outcomes would result in stronger organizations and increased participation, with considerable emphasis on conservation and enforcement of laws and regulations. Just over one-third of their outcomes relate to improving livelihoods through several still quite ambiguous lines of activity, and remaining outcomes focus on increased local knowledge about community hygiene and sanitation.

Figure 6-12. Mae Kuang Strategies – Types of Expected Outcomes

Strategy 1. Management of natural resources & environment through participation of the people

ORGANIZATION <i>knowledge</i>	1 increased establishment of holistic natural resource management organizations in the watershed 2 existing local organizations are restored by increased knowledge & capacity
PARTICIPATION <i>nre</i>	1 increased enforcement of regulations & laws related to pollution prevention 2 increased management of natural resources & environment through people's participation

Strategy 2. Conserve and restore natural resources to be fertile & productive

ORGANIZATION <i>netwk</i>	1 increased development of potential of networks to guard natural resources & the environment
PARTICIPATION <i>nre</i> <i>forest</i>	1 increased care for natural resources & environment to make them fertile & productive 2 increased enforcement of laws & local codes & strict punishment of violators destroying forest resources
LIVELIHOODS	1 increased conservation-based tourism & preservation of livelihoods, traditions, culture & local knowledge

Strategy 3. Build economic strength of communities to increase basic household & community incomes

LIVELIHOODS <i>fund</i>	1 local occupations receive increased promotion and support in knowledge & methods appropriate for local potential 2 People have increased recognition of savings and are able to control and reduce unimportant household expenses 3 People & community entrepreneurs have more ability to access occupational finance sources
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Strategy 4. Good quality of life, health & livelihoods

KNOWLEDGE <i>health</i>	1 increased training and provision of knowledge related to community hygiene 2 increased campaigns & public relations on sanitation
LIVELIHOODS	1 more community environmental conditions are improved to be pleasant

Figure 6-13. Mae Kuang Overall Sub-basin Workplan – Types of Expected Outcomes

KNOWLEDGE <i>health</i>	1 increased training and provision of knowledge related to community hygiene 2 increased campaigns & public relations on sanitation
ORGANIZATION <i>networks</i> <i>knowledge</i>	1 increased establishment of holistic natural resource management organizations in the watershed 2 increased development of potential of networks to guard natural resources & the environment 3 existing local organizations are restored by increased knowledge & capacity
PARTICIPATION <i>nre</i> <i>forest</i>	1 increased enforcement of regulations & laws related to pollution prevention 2 increased management of natural resources & environment through people's participation 3 increased care for natural resources & environment to make them fertile & productive 4 increased enforcement of laws & local codes & strict punishment of violators destroying forest resources
LIVELIHOODS <i>fund</i>	1 increased conservation-based tourism & preservation of livelihoods, traditions, culture & local knowledge 2 local occupations receive increased promotion and support in knowledge & methods appropriate for local potential 3 People have increased recognition of savings and are able to control and reduce unimportant household expenses 4 more community environmental conditions are improved to be pleasant 5 People & community entrepreneurs have more ability to access occupational finance sources

This summary of overall expected outcomes can now be compared with the vision, goals and objectives of the sub-basin plan, as shown in Figure 3-39.

Based on a review of the various plans and lists of projects that were assembled for consideration during the planning process, there is good reason to believe that there may be various lines of activity and types of projects that are not reflected in the higher level outcomes that are currently stated in the Mae Kuang sub-basin plan. For example, objective 1 places emphasis on water resources, but outcomes of strategy 1 do not indicate any direct effects on water. Indeed, there are not yet any outcomes related to direct effects on natural resources or health. One suspects that this is due to a combination of too little time available for work by sub-basin networks and leaders during the review process, and the difficulties they were having in reaching a rapid

consensus that could overcome some still quite basic differences of opinions. In any event, considerable work will be necessary to articulate clear outcomes and measurable indicators required for an effective results measurement system in the Mae Kuang sub-basin.

6.1.4. Ping part 5 (Lower Ping) sub-basin

Initial efforts in the Ping part 5 sub-basin to determine indicators for monitoring and evaluation focused at project level. Although at this point these are really expected outcome statements rather than indicators, most have become quite clear during the most recent round of revisions within the sub-basin.

Outcomes at the strategy level. In order to help clarify the types of outcomes expected under different levels of the Ping part 5 sub-basin workplan, expected outcomes (“indicators”) that have been specified at the project levels are listed in Figure 6-14 under the strategy with which they are associated. Outcomes are again categorized on the left side according to the general type of outcome that is expected.

Given the level of detail that this provides, it is now quite easy to get a general picture of the types of results expected from different strategies, which can then be compared with the title of the strategy for consistency.

- Strategy 1 is named “conservation and restoration of natural resources and the environment”, and what it seeks to achieve focuses mainly on building various type of knowledge in local communities, and on achieving tangible improvements in natural resources related mainly to water, but also to forest and soil conservation.
- Strategy 2 is named “management of natural resources and the environment”, and much of what it seeks to achieve is focused on building and strengthening organizations at local group, network and sub-basin levels. It also seeks to build some types of knowledge and increase local participation in natural resource management. Behavioral change is expected to affect local livelihoods by improving household financial management and supplementary occupations. Direct effects on natural resources aim to reduce damage from forest fires and soil erosion. There is one water-related health outcome.
- Strategy 3 is named “management of environmental pollution for quality of life, public health and better livelihoods of the people”. The focus of half of its outcomes is on directly improving health conditions, primarily through improved management of garbage. It also seeks to build knowledge and participation related to health-related issues, and to have some direct effects on health-related aspects of water and crop management.
- Strategy 4 is named “build consciousness of environmental stewardship”, and more than two-thirds of its achievements are expected to focus on building knowledge and providing information through media distributed through sub-basin organizations. It also seeks to expand participation by youth, and to have direct effects on health and livelihoods through improved handling of agricultural chemicals.

Figure 6-14a. Ping part 5 Strategies – Types of Expected Outcomes

Strategy 1. Conservation & restoration of natural resources & the environment

KNOWLEDGE	<i>NRE</i>	1 increased knowledge of nature conservation 2 people's knowledge about natural resources
	<i>agriculture</i>	3 increased number of people with knowledge of agricultural chemical hazards 4 increased number of people with knowledge about making compost
PARTICIPATION	<i>for</i>	1 increased participation of people in caring for forest
- FOREST		1 amount of forest not reduced, increased economic forest
- WATER		2 increased water source capital 3 increased moisture, more water source capital 4 increased water storage, no flood problems (2) 5 decreased river bank collapse problems
	<i>health</i>	6 sufficient water for consumption & domestic use
- PLANTS / SOIL		7 increased area of plants to provide soil cover

Strategy 2. Management of natural resources and the environment

KNOWLEDGE	<i>NRE</i>	1 increased consciousness of the people in conservation of NRE 2 people have increased knowledge in managing NRE
ORGANIZATION		1 increased budget for individual development 2 structure of NRE organization has increased efficiency 3 individuals involved in making NRE plans have increased efficiency 4 Organization members have increased capacity for managing water resources
	<i>networks</i>	5 increased number of networks to report river bank collapse threats
	<i>groups</i>	6 increased number of Lower Ping protection groups 7 increased number of strong community occupational groups 8 Increased number of efficient water user groups
PARTICIPATION	<i>NRE</i>	1 increased number of people participating in managing NRE
	<i>forest</i>	2 individual violators receive punishment
- FOREST		1 reduced damage from forest fires (2)
- PLANTS / SOIL		2 increased planting of vetiver grass
HEALTH	<i>garbage/water</i>	1 reduced disposal of garbage into river
LIVELIHOODS		1 increased number of households able to reduce expenses (2) 2 increased occupational funding source 3 communities have good supplementary occupations 4 increased efficiency in household finance

Strategy 3. Management of environmental pollution for quality of life, public health and better livelihoods of the people

KNOWLEDGE	<i>water</i>	1 increased number of households & entrepreneurs with knowledge about wastewater treatment
	<i>health</i>	2 increased number of people knowledgeable about medicinals
ORGANIZATION	<i>network</i>	1 increased number of easily understandable disaster warning systems
PARTICIPATION	<i>health</i>	1 increased number of people participating in sanitation activities 2 increased number of people participating in sanitation campaigns
- WATER	<i>health</i>	1 reduced amount of household waste water 2 reduced amount of wastewater from industrial factories
- PLANTS / SOIL	<i>health</i>	3 increased number of people planting home gardens
HEALTH		1 increased number of people participating in exercise activities 2 reduced number of people getting dengue fever
	<i>air</i>	3 reduced amounts of pollution from particulate matter & smoke
	<i>garbage</i>	4 increased number of garbage disposal sites 5 increased number of people burning leaves & garbage correctly 6 increased number of sanitary garbage disposal sites 7 increased number of households managing their garbage 8 increased number of households who separate garbage correctly

Figure 6-14b. Ping part 5 Strategies – Types of Expected Outcomes (*continued*)**Strategy 4. Build consciousness of environmental stewardship**

KNOWLEDGE	<i>NRE</i>	1 increased number of people in communities who highly value natural resource & the environment (2)
	<i>agriculture</i>	2 increased number of households knowledgeable about agricultural chemical hazards
ORGANIZATION		1 <environment camp project>
	<i>media-communic</i>	2 increased number of communications media on NRE that are easy to understand, modern, & worth following (6)
		3 increased amount of communication media on safe use of agricultural chemicals
		4 public relations that reaches communities well
PARTICIPATION	<i>NRE</i>	1 increased number of youth joining environment project (3)
HEALTH	<i>agriculture</i>	1 reduced amount of people affected by agricultural chemical hazards
LIVELIHOODS	<i>health</i>	1 increased number of people using agricultural chemicals safely

Outcomes at the overall sub-basin workplan level. The same approach was again used to aggregate outcomes at the overall sub-basin workplan level, as summarized in Figure 6-15. This overall view of the Ping part 5 sub-basin plans shows that more than half of the outcomes it seeks to achieve are focused on expanding and strengthening various forms of social organization, on increasing knowledge about natural resources, agriculture and health, and to a somewhat lesser degree increasing levels of participation in activities related to natural resources and health. The remaining expected outcomes are split between direct effects on natural resources (mainly water, but also forest, soils and home gardens), and direct effects expected to improve health and livelihoods, with particular emphasis on management of garbage, household financial management, supplementary occupations, and safety in using agricultural chemicals.

This summary of overall expected outcomes can now be compared with the vision, goals and objectives of the sub-basin plan, as shown in Figure 3-50.

6.1.5. Further development of indicators, roles & responsibilities

This section summarizes needs for further efforts to develop indicators at outcome levels of sub-basin plans, and the roles and responsibilities of various sub-basin stakeholders in monitoring and evaluation processes.

Further development of outcome indicators

Working groups in the three pilot sub-basins have been trying to develop indicators to measure outcomes at measure or project level. In most cases they are making good progress. Indicators in the first draft plan in each sub-basin were really just a rearrangement of the words used to describe the measure or project associated with them. In the case of the consolidated Mae Kuang workplan, they are still at this stage, although at least one of the component workplans that were merged into the consolidated plan included efforts to make some real outcome statements.

In all cases, what they have achieved at this point is really a set of expected outcome statements. Some of these are quite clear and can be used for at least the first round of results-based measurements. Other outcome statements, however, are still too broad and general to be measured, so that additional work will be needed before the results-based measurement framework can begin to be implemented.

Figure 6-15. Ping part 5 Overall Sub-basin Workplan – Types of Expected Outcomes

KNOWLEDGE	<p><i>NRE</i></p> <p><i>natural resources</i></p> <p><i>water</i></p> <p><i>agriculture</i></p> <p><i>health</i></p>	<ol style="list-style-type: none"> 1 increased consciousness of the people in conservation of NRE 2 people have increased knowledge in managing NRE 3 increased number of people in communities who highly value natural resource & the environment (2) 4 increased knowledge of nature conservation 5 people's knowledge about natural resources 6 increased number of households & entrepreneurs with knowledge about wastewater treatment 7 increased number of people with knowledge of agricultural chemical hazards 8 increased number of households knowledgeable about agricultural chemical hazards 9 increased number of people with knowledge about making compost 10 increased number of people knowledgeable about medicinals
ORGANIZATION	<p><i>networks</i></p> <p><i>groups</i></p> <p><i>media-communic</i></p>	<ol style="list-style-type: none"> 1 structure of NRE organization has increased efficiency 2 increased budget for individual development 3 individuals involved in making NRE plans have increased efficiency 4 Organization members have increased capacity for managing water resources 5 <environment camp project> 6 increased number of networks to report river bank collapse threats 7 increased number of easily understandable disaster warning systems 8 increased number of Lower Ping protection groups 9 increased number of strong community occupational groups 10 Increased number of efficient water user groups 11 increased number of communications media on NRE that are easy to understand, modern, & worth following (6) 12 increased amount of communication media on safe use of agricultural chemicals 13 public relations that reaches communities well
PARTICIPATION	<p><i>forest</i></p> <p><i>health</i></p>	<ol style="list-style-type: none"> 1 increased number of people participating in managing NRE 2 increased number of youth joining environment project (3) 3 increased participation of people in caring for forest 4 individual violators receive punishment 5 increased number of people participating in sanitation activities 6 increased number of people participating in sanitation campaigns
NATURAL RESOURCES		
- FOREST		<ol style="list-style-type: none"> 1 amount of forest not reduced, increased economic forest 2 reduced damage from forest fires (2)
- WATER		<ol style="list-style-type: none"> 3 increased water source capital 4 increased moisture, more water source capital 5 increased water storage, no flood problems (2) 6 decreased river bank collapse problems 7 sufficient water for consumption & domestic use 8 reduced amount of household waste water 9 reduced amount of wastewater from industrial factories
<i>health</i>		
- PLANTS / SOIL		<ol style="list-style-type: none"> 10 increased area of plants to provide soil cover 11 increased planting of vetiver grass 12 increased number of people planting home gardens
<i>health</i>		
HEALTH	<p><i>air</i></p> <p><i>garbage/water</i></p> <p><i>garbage</i></p> <p><i>agriculture</i></p>	<ol style="list-style-type: none"> 1 increased number of people participating in exercise activities 2 reduced number of people getting dengue fever 3 reduced amounts of pollution from particulate matter & smoke 4 reduced disposal of garbage into river 5 increased number of garbage disposal sites 6 increased number of people burning leaves & garbage correctly 7 increased number of sanitary garbage disposal sites 8 increased number of households managing their garbage 9 increased number of households who separate garbage correctly 10 reduced amount of people affected by agricultural chemical hazards
LIVELIHOODS	<p><i>health</i></p>	<ol style="list-style-type: none"> 1 increased number of households able to reduce expenses (2) 2 increased occupational funding source 3 communities have good supplementary occupations 4 increased efficiency in household finance 5 increased number of people using agricultural chemicals safely

To continue developing outcome measurements, suggested lines of further activity include:

- **Review expected outcomes (current plan “indicators”)** to see that they are clear, relevant, economical, adequate and useful. Since many outcome statements are still too broad and general to be measured, they need to be clarified so that specific measurable indicators can then be identified. Many of the most broad and complex indicators are provided at the level of measures, rather than the project level. Based on the example of the Ping part 5 sub-basin, the others may want to consider making clear outcome statements for each project or activity under the measure, which can then be aggregated to bring more clarity at the measure level.
- **Determine ways to make real measurements that can indicate progress toward expected outcomes.** Even in the case of Ping part 5, however, it is still not clear how various expected outcomes will actually be measured. In other words, they have not yet identified real measurable indicators. In many cases, a major part of the problem is that there are not yet enough details available about the design of individual projects or activities under each measure. Thus, once more detail on project design is available, outcome statements can be reviewed and modified, and appropriate measurable indicators can be identified. It may also be useful to provide sub-basin planners with more information on tools such as simple qualitative methods for measuring some types of outputs with which they are having difficulty.
- **Determine sources of needed baseline and benchmark data.** Once real indicators are identified, then they will need to seek appropriate baseline data and any relevant benchmark data. Many of the current outcome statements assume a baseline of zero, since the focus is on measuring what is actually done by the project. In some cases this will be appropriate, but in others this may be focusing too much on the project implementation process rather than on the results level. Where baseline data needs are identified, secondary sources or methods for collection of primary data will also be needed. Again, there are likely to be additional needs for assistance with access to information and/or methods and tools for collecting baseline data. Some measures include projects or activities that seek to build information systems in sub-basins that may also help provide baseline data for other measures.
- **Set clear outcome targets for projects and/or measures.** Once really measurable indicators have been identified and baselines have been established, targets need to be established for the amount of change that is expected to be achieved during implementation of the project, activity or measure. In many cases, initial efforts to set targets are likely to be difficult, and the targets are likely to be quite different from what can really be achieved during implementation. This is normal and should be expected. It will take time and experience to gradually improve abilities to make more accurate estimates of expected outcome targets.
- **Establish any local outcome-level monitoring systems that are needed.** For some types of information needed to assess progress toward expected outcomes, it may be necessary to develop local monitoring systems, as discussed at several points in this report. In establishing any local monitoring systems, careful consideration needs to be given to selection of indicators and measurement methods, as well as how often the measurements will be made, who will be responsible for measurements and keeping the data, and how will costs of operating the system be supported.
- **Identify who needs to receive information about results, and how it will be used.** This is a very important issue for at least two reasons. First, results measurements are a waste of time and resources if the findings are not used. And second, design of monitoring and

evaluation processes need to be matched with the needs of users. Several potential types of users whose needs may be considered are discussed under step 5 in the project monitoring and evaluation framework.

- ***Identify external partnerships or sources of assistance where needed.*** Good assessments of progress at the outcome level often require information that may be beyond the current capacity of individual projects or sub-basin management organizations to collect. In some cases, someone else may already be collecting relevant data. In other cases, there may be useful simple tools or participatory approaches that are not yet known in the sub-basin. These are only a few of many reasons why external partnerships and sources of assistance for developing and operating sub-basin results management systems should be explored.

One particularly important challenge is understanding and monitoring natural resource and environment processes and conditions that are now beginning to be linked with public health, livelihood and poverty issues. Initial directions are indicated in the expected outcomes of each pilot sub-basin. Considerable attention and probably assistance and exchange through external partnerships will be needed to further improve these approaches.

Determining roles and responsibilities

As explained earlier in this section, effective monitoring and evaluation, and especially results-based measurement processes, will require participation of various sub-basin stakeholders. At the same time, it is important to clarify the roles and responsibilities of different actors in this process, in order to avoid confusion and misunderstanding, and to help build appropriate capacities in a systematic manner. Particular attention needs to be given to roles for seven different groups of sub-basin stakeholders, as summarized in Figure 6-16.

Community groups, community organizations, networks and business groups

Since community organizations have areas of responsibility that are limited to only one part of a sub-basin, their roles and responsibilities in monitoring and evaluation should be mainly limited to the level of projects implemented within their community areas. In these cases, community organizations need to designate individuals responsible for project monitoring and evaluation duties. They will follow the framework, approach and steps for project monitoring and evaluation discussed above. Under the step for reporting results of monitoring and evaluation, persons responsible for monitoring and evaluation by community organizations will report their findings to the next higher level of management organization, so that they can be integrated into monitoring and evaluation at the sub-basin workplan level.

For some types of projects, specialized local groups, networks or even private sector organizations may play this type of role, either as the leader or in collaboration with a community organization. This is especially likely in cases where they are participating in implementation of the project and/or when they have special perspectives, knowledge or skills appropriate for monitoring and evaluation of particular types of projects or activities. Networks and private sector organizations may also help coordinate monitoring and evaluation activities when project implementation includes several local community areas.

All of these types of groups also have potential roles to play in monitoring and evaluation at the overall sub-basin level. Their roles at this level will place particular emphasis on information they can provide to overall sub-basin monitoring and evaluation processes. Some groups or networks may have important social, economic or environmental monitoring data they can provide. Many may be able to provide useful information in their status as stakeholders, and

Figure 6-16. Stakeholder group roles & responsibilities in monitoring & evaluation

	<i>Project Level</i>	<i>Overall Level</i>
1) Local community groups, organizations, networks, business groups		
<i>Leadership</i>	Projects under their responsibility	report project information to sub-basin
<i>Information source</i>	as participant or if have impacts	monitoring data, stakeholder, have impacts
<i>User of results measurements</i>	improve management & design	as sub-basin / RSBO stakeholder
2) Sub-basin management organizations (RSBO's)		
<i>Leadership</i>		Main Leadership
<i>Information source</i>	data to assist outcome/impact levels	sub-basin plans / database / monitoring
<i>User of results measurements</i>	help improve projects under workplan	improve management / sub-basin plans, help negotiations among stakeholders
3) Local governments (tessaban, TAO, PAO)		
<i>Leadership</i>	Projects under their responsibility	report project information to sub-basin
<i>Information source</i>	Project database / plans	information system / as key institution
<i>User of results measurements</i>	improve management & design	RSBO collaborator / stakeholder
4) Local units of central government agencies		
<i>Leadership</i>	Projects under their responsibility	report project information to sub-basin
<i>Information source</i>	Project database / plans as participant, or if have impacts	monitoring data, agency plan data, as stakeholder, if have impacts
<i>User of results measurements</i>	improve management & design, to help projects elsewhere	source of funds/assistance, status of programs, help programs elsewhere
5) Provincial governments		
<i>Leadership</i>		
<i>Information source</i>	data on outcome / impact indicators	monitoring data, province plans, stakeholder, other
<i>User of results measurements</i>	as source of funds / support, to help projects elsewhere	status of programs/conditions in province, as funding source, to help programs elsewhere
6) NGOs, independent institutes, higher-level networks		
<i>Leadership</i>	may assist with evaluations	may assist with evaluations
<i>Information source</i>	monitoring data, indicators, standards, methods, tools, & training	monitoring data, indicators, standards, methods, tools & training
<i>User of results measurements</i>	for dissemination, analysis	for dissemination, analysis
7) Academic institutions		
<i>Leadership</i>	may assist / lead evaluations	may assist / lead evaluations
<i>Information source</i>	monitoring data, indicators, standards, methods, tools, & training	monitoring data, indicators, standards, methods, tools & training
<i>User of results measurements</i>	for analysis, dissemination, teaching	for analysis, dissemination, teaching

particularly if they have experienced particular positive or negative impacts resulting from implementation of sub-basin plans.

Another type of role that community organizations and local networks can play at both levels is as a user of monitoring and evaluation findings, and a channel for communication and dissemination of findings to those who will find them useful.

Sub-basin management organizations

Since sub-basin management organizations have areas of responsibility that include their entire sub-basin, their roles and responsibilities in monitoring and evaluation should mainly cover the overall sub-basin workplan level. As with community organizations, sub-basin management organizations need to designate individuals to whom overall workplan-level monitoring and evaluation duties will be delegated. They will follow the framework, approach and steps for project monitoring and evaluation discussed earlier in this chapter.

Sub-basin management organizations also have an important role to play in terms of information for monitoring and evaluation. They will be the main point for collection of overall information on project monitoring and evaluation from different sources within the sub-basin. They will also have important responsibilities for collecting data and information needed for outcome and impact level evaluations at the overall sub-basin level, and some of this data may be useful for outcome-level evaluation at the project level. Thus, they will need to establish linkages with both local and external monitoring systems, and they may also support further development of local monitoring systems to improve data needed for management, monitoring and evaluation at different levels within the sub-basin.

Both the monitoring information and the results of evaluations at the overall sub-basin level will be important inputs into future sub-basin problem analysis and workplan development. This type of information can also be very important in supporting negotiations among different stakeholders during analysis and planning processes. Successful negotiations can increase participation by and benefits for various stakeholders, while reducing conflict and negative impacts.

Local government organizations

Local government organizations include Tambon Administrative Organizations, Province Administrative Organizations, and municipalities, which have been considered in parts of this study related to organizations. Individuals from some of these organizations – especially Tambon Administrative Organizations and municipalities – will have roles following from their status as designated members of the sub-basin management organization. Their roles and responsibilities in monitoring and evaluation may be limited to self-evaluation at the project level, with particular emphasis on project management processes. Additional roles and responsibilities of project implementers include building a project-related database at input, output and outcome levels in accordance with project plans. This will help support data for monitoring and evaluation by community organizations and the sub-basin management organization.

The main roles of Province Administrative Organizations will probably be as a source of funding and support, as well as helping with coordination between sub-basin workplans and province plans and development processes. Thus, their role in monitoring and evaluation should emphasize information on province plans and higher-level stakeholders. They should be a user of monitoring and evaluation findings to help them assess projects for which they have provided support, and they may use this information to help improve projects that they support elsewhere in the province.

Provincial and central government agencies & organizations

Two other types of government organizations are also important for monitoring and evaluation. Various central government agencies have field implementation units responsible for areas and various types of work in sub-basins. Individuals from some of these agencies will have roles that follow from their status as designated members of the sub-basin management organization. As with local governments, their leadership roles and responsibilities in monitoring and evaluation may be limited mainly to self-evaluation at the project level, with particular emphasis on project management processes. These agencies will have their own processes and procedures for monitoring and evaluation of projects directly under their responsibility. They will need to designate persons responsible for providing information on the results of their findings to the sub-basin management organization, in order to help build the sub-basin-level database. These units can also provide important linkages with monitoring systems operated by their agency, which can be of great assistance in providing information for evaluation at outcome and impact levels for

both individual projects and the overall sub-basin workplan. These agencies are also stakeholders representing interests of broader society in sub-basin management, and resources or conditions under their responsibility may have positive or negative impacts from sub-basin projects and/or workplans. They may also be a source of funding or other types of support for individual projects. Thus, they should be an important user of the results of monitoring and evaluation at both project and overall sub-basin levels.

The provincial government is another type of government organization important for monitoring and evaluation processes. Under the overall authority and responsibility of the Provincial Governor, the provincial government includes many different types of units at the province level, as well as district administrations, sub-district *kamnan*, and village headmen. While the results from this study project suggest that these officials are not likely to be directly in charge of implementing individual projects, they have responsibilities to monitor and supervise most types of activities taking place within their jurisdictions. They also have a leading role in the provincial planning process, and may be an important source of funding and other types of support for individual projects or activities. Thus, their main roles in monitoring and evaluation are likely to be as a source of various types of information, and as an important user of the results from monitoring and evaluation.

Academic and other organizations

Other organizations may include private sector organizations, public sector organizations, educational institutions, or other types of institutions related to natural resources and the environment, public health or livelihoods. Even though they may not be directly related with monitoring and evaluation of projects and workplans in the sub-basin, these organizations – especially educational institutions or natural resource and environment institutions – may have a role as an external evaluator, particularly in evaluation of the impacts of projects and workplans. Moreover, monitoring and evaluation of indicators for outcomes and impacts may require use of technical specialists to collect data. One example might be indicators of various types of pollution. Thus, it may be important to have an organization with technical specialists to be responsible for this type of evaluation. There are also a growing number of regional and national level networks that may help provide access to technical specialists from various types of institutions to help support or lead various monitoring and evaluation activities.

Various of these types of institutions may be able to provide access to different types of indicator monitoring data and information on standards, benchmarks, or new monitoring and evaluation tools that may be especially useful for evaluation at the outcome and impact levels. They may also be a potential user of the results of monitoring and evaluation at project and overall sub-basin levels as input into wider analysis and as a channel for dissemination of information and experience. Educational institutes may also be able to use such information in helping to strengthen their education and training programs.

6.2. Capacity building requirements to implement results measurement

Experience from governments and public and private organizations around the world has demonstrated that building an efficient and effective results-based measurement system requires a long-term process. The Thai government has been trying to build results-based measurement into its management systems for more than 10 years, and it is clear that many government officials either do not yet fully understand the system, or do not yet understand why it is important and useful.

In many ways, progress under this pilot project indicates that there is considerable potential for integrating results-based measurement into sub-basin management processes. Even at very local levels, people are becoming familiar with the idea of developing vision statements, objectives and strategies as part of their planning process. Working groups in pilot sub-basins also seem to understand the need to identify the expected outcomes of individual projects or groups of projects, and indicators that could help them know whether or how well results are being achieved.

Everyone acknowledges, however, that there are still many gaps and needs for improvement to build efficient and effective results-based measurement systems at sub-basin level.

Issues, gaps and needs for implementing results-based measurement

Gaps in understanding and capacity building need may be summarized into five issue areas:

- Understanding the results-based measurement approach
- Building and strengthening the approach through plans and the planning process
- Developing systematic methods for collecting necessary data and information
- Building skills and tools to analyze results
- Using the results to improve sub-basin management programs

In terms of understanding the results-based measurement approach, it is clear that the approach and some of the concepts it uses are still quite new for many people in pilot sub-basins, as well as for many officials and community workers who are sources of assistance for them. Thus, there is a need for practical basic introductory information on results-based management in a format that can be easily understood by people working with sub-basin management organizations and major stakeholders. Introductory information should focus on answering three basic questions: (1) Why is results measurement important? (2) How can it be used by managers and stakeholders to improve projects, management workplans and programs? (3) How can local information systems be built to support it?

Strengthening the logic of sub-basin management plans

The processes of analysis of local problems and development of sub-basin plans to help solve those problems are the obvious place to begin strengthening results-based management. And since the Logical Framework Approach and the Logical Framework Matrix (LogFrame) provide the basic organizing tools for results-based measurement, practical information, ‘hands-on’ training, and possibly a handbook could be developed in order to provide:

- A clear explanation of the Logical Framework Matrix (Logframe), what the rows and columns mean, how they relate to each other, and the types of information that it requires. This would provide the “basic training” in Logframe concepts and project analysis both for individuals in the sub-basin management organization, and for the various project implementing organizations in the sub-basin. It may be useful to have separate training sessions for managers of individual projects and managers who will work mainly at the

overall sub-basin plan level. The specific curricula or training content will depend on the current level of knowledge of the participants. In any case, it should include numerous relevant practical examples.

- What are its strengths and weaknesses? While the basic Logframe table may seem to appear quite simple, it is often very difficult to use with some types of activities. As introduced in the introduction to this chapter, the LogFrame has sometimes been used in ways that creates new types of problems. And in some cases its simple cause and effect relationships may not fit well with the processes a project or activity is trying to use. Some practical examples of both good applications and poor applications of the Logframe would probably be very useful.
- How can local participation be integrated into the Logframe approach? The Logframe approach is the process that develops the reasoning that is then used to fill in the Logframe Matrix. This process can be conducted by a few elite leaders sitting in a room, or it can involve a very long and complex process that includes detailed participation by a wide range of stakeholders. And many levels in between these two extremes are also possible. It is also possible to use other types of participatory processes to develop the reasoning for a project, measure or strategy, so that the information needed for the Logframe is just one part of what results from the processes. There are a growing number of English language publications that discuss many issues and approaches, and it may be useful to review, summarize and translate some of the main points into Thai.
- How to work with information that is difficult to measure. There is often a tendency for outcomes and indicators in a Logframe to place strong emphasis on things that a person can easily see and count. But some very important expected outcomes cannot be easily seen and counted, such as awareness and knowledge. Other expected outcomes, such as healthy forest ecosystems can be seen but are very difficult to measure. It may be useful to review the lists of expected outcomes in current sub-basin plans to identify major types of outcomes that will be difficult to measure, and suggest some approaches that can help sub-basin organizations to work with these issues. Some simple qualitative methods may be useful for this purpose.
- How to improve expected outcomes, indicators and measurement methods. Since development of an efficient and effective results-based measurement system is a long-term process, it may be useful to place initial emphasis on what is needed to get started with the types of information currently available. At the same time, however, people and local organizations need to be encouraged to look to the future in thinking about how they can improve their identification of expected outcomes and the ways that they measure results. They can then develop a capacity building strategy to develop their skills, tools, and sources of information through a process of gradual improvement.

The main roles and responsibilities for the sub-basin management organization in monitoring and evaluation are focused at the sub-basin level. But these processes will depend on good monitoring and evaluation information coming from those who are actually implementing individual projects under overall sub-basin workplans. It will also depend on external sources of monitoring data and other types of necessary information. Thus, it is clear that effective sub-basin results-based measurement processes will depend on good working relationships and close coordination with several types of organizations and levels of government.

In order to help build a strong foundation for this work, capacity building activities need to include practical information on how sub-basin results measurement can link with:

- TAO and *tessaban* planning and management systems
- Provincial planning systems

- Planning and management systems of government agencies related to natural resources and environment, public health, livelihoods, and any other key topics in sub-basin plans
- Higher level monitoring, evaluation and management at Ping River Basin levels
- Regional and national environmental monitoring systems
- Provincial and national systems that monitor health, livelihoods, income, poverty, etc.

Expanding the tools for results-based management

As this project encouraged sub-basin working groups to develop outcome statements and indicators for their plans, one very frequent type of complaint was the lack of information on and access to information on indicators from monitoring systems that already exist in Thailand, and the standards and benchmark values that they use. Thus, a ‘resource collection’ that compiled this type of information in a form that could be easily accessed and used by sub-basin organizations, and perhaps some training on how the information can be accessed and used, would be very useful contributions toward capacity development.

There are also a quite large and growing number of methods and tools being used by efforts to improve results-based management approaches in public and private organizations around the world. Much of this information is now available through the internet, but very little of it is available in Thai language. Thus, another useful capacity building approach would be to review this literature and select some of the most useful parts for translation into Thai language ‘resource collections’ of information on topics such as:

- participatory monitoring (environmental, economic, social aspects)
- use of both local and scientific knowledge in monitoring
- participatory evaluation
- participatory development of local visions and desired outcomes
- use of monitoring and evaluation information to support negotiations among stakeholders and management of conflict

Using information from results-based measurement

A results-based measurement system cannot help improve sub-basin management unless the information it produces is actually used. Five different potential user groups were identified under step 5 of the monitoring and evaluation approach described earlier in this chapter, and potential uses by various stakeholders were mentioned in section 6.1.5. The categories used in either or both of these sections could be used to develop a set of practical booklets that suggest and describe ways in which information from the results-based measurement system can be used for each of these types of groups. This could then provide the basis for local orientation and training sessions focused on each particular type of user.

As part of this process, it would be important to explain potential uses of the various types of potential reporting products from a results-based monitoring and evaluation system. This should include the time intervals at which different types of monitoring or evaluation information can be reported, and how this might match with processes such as project management, sub-basin-level reviews and planning, and even stakeholder negotiations and conflict management.

Training on monitoring and evaluation, and use of the results-based measurement framework

After initial development of the results-based measurement framework, the project organized training on monitoring and evaluation and use of the results-based measurement framework. Training participants included 150 officers from local government organizations in the three pilot

sub-basins. Objectives of the training were to build capacity of local government officers by providing knowledge and understanding about basic elements of project monitoring and evaluation, as well as use of the results measurement framework. This included establishing proper indicators and ability to apply knowledge from the training to future local project implementation.

6.3. Dissemination of project results

Three major workshops were organized by the project to disseminate project findings to wider audiences in Thailand.

- **RSBO Seminar.** The project organized a national-level seminar meeting on ‘Developing models for natural resource and environment management organizations at sub-basin level in the Ping River Basin’. The seminar was held on 6 July 2006 at the Miracle Grand Hotel in Bangkok. Sixty participants were invited to the seminar, including representatives of related government agencies, technical specialists and resource persons, representatives of non-governmental organizations, and representatives of villagers in the 25 major river basins of the country. Seminar objectives were to disseminate project implementation results related to natural resource and environmental management organization models, including exchange of ideas and soliciting suggestions about sub-basin management.

- **Regional and National Meetings.** After completion of project implementation, the project organized two major meetings to disseminate project implementation results of the Participatory Watershed Management for the Ping River Basin Project. Objectives of the meeting were to present results of implementation under the project, and to receive ideas and suggestions about results that can be used in adjusting results for application to participatory management of natural resources and the environment in other river basins of the country.

Meeting participants included representatives from related government agencies, technical specialists and resource persons from educational institutes and independent specialists, representatives of local governments, representatives of community organization networks and non-governmental organizations, and representatives of business and the private sector. A total of about 350 participants were invited to each meeting.

Regional Meeting. The northern regional-level project meeting was held on 25 August 2006 at the Lotus Pang Suan Kaew Hotel in Chiang Mai.

National Meeting. The national-level project meeting was held on 29 August 2006 at the Century Park Hotel in Bangkok.

Part III. Lessons and Recommendations for Expansion

The first chapter in this part briefly summarizes major lessons learned from implementing activities under this project, and the second and final chapter provides a brief summary of major recommendations for expanding application of lessons learned under the project to other sub-basins.

7. Major lessons from project experience

This chapter summarizes major lessons learned under this pilot project according to lessons regarding the overall approach to participatory integrated sub-basin management, and to lessons associated with major lines of activity under the project.

7.1. Overall approach

There already appears to be very substantial existing interest and basic awareness about issues related to management of natural resources and the environment in Ping River sub-basins. While their linkages with livelihoods and public health are less familiar points for public discussion, in most cases people appear to have little difficulty in understanding why and how such linkages are important. In association with this growing interest and awareness comes recognition of needs to further develop consciousness, knowledge, skills and other dimensions of the capacity of local organizations, communities, groups and individuals. This improved capacity is needed to effectively plan, conduct and assess activities that can improve sustainable management of natural resources and the environment while supporting viable livelihoods and improving public health and other aspects of the quality of life.

Thus, the broad approach of this project was not difficult for local leaders and communities to understand and appreciate. There were questions, however, about how such a broad approach could be achieved under programs of government agencies.

There is also substantial and growing familiarity and experience in Ping River sub-basins that is quite directly related to integrated management of resources in a watershed context. Indeed, considerable relevant work is already in progress at multiple levels in the Ping River Basin:

- **River Basin Level.** Efforts to establish management organizations at various Ping River sub-basin levels have been underway at least since 1999, when the Lower Ping and Upper Ping river basin committees were established. Under the leadership of the National Water Resources Committee, these organizations have gradually become more participatory, and have established working groups at sub-basin, as well as district, sub-district, and even more local levels. Efforts are underway at the national policy level to further strengthen and provide funding and possibly legal support for these organizations.

Various local leaders in all project pilot sub-basins have had contact with this process, and generally view this as a good idea. Especially in the two pilot sub-basins in the Upper Ping, however, there is some confusion about the role of these organizations, many observe that there seems to be no support available for implementing activities, and some local organizations and stakeholder groups feel that participation has not yet reached their level.

- **Government Agency Level.** Although establishment of the Ministry of Natural Resources and Environment included efforts meant to consolidate water resource programs such as development of river basin organizations, it also resulted in efforts to expand their focus on water management to include more attention to other natural resource and environment concerns that should be part of river basin management under MoNRE's mandate. Thus, the Department of Water Resources, the Department of National Parks, Wildlife and Plant

Conservation, the Department of Environmental Quality Promotion, and now the Office of Natural Resources and Environmental Policy and Planning have all conducted or supported various studies, projects and programs aimed at developing sub-basin level management. Unfortunately, there appears to have been little communication and coordination among some of these efforts, as well as various somewhat unclear relationships with Lower and Upper Ping River Basin Committees.

In the view of most local leaders in all pilot sub-basins, this has resulted in much confusion and uncertainty. Since various plans have been made, but very little implementation has taken place, some have begun to question how serious the government really is about river basin management in general, and about local participation in particular. Again, especially in the Ping part 1 and Mae Kuang pilot sub-basins, there are various local organizations and stakeholders who feel these efforts have put strong emphasis on government agency programs and concerns, while other views and needs have been poorly represented, distorted, or not included.

- **Local Community Level.** A wide range of more local level activities related to natural resources and the environment have also been developing for several years in Ping River sub-basins. Many of these have been induced and/or supported by various government agencies with which they are closely linked. Many others, however, have been developed by traditional local groups and organizations, or by newer locally-initiated issue-oriented local groups and networks, an increasing number of which use local sub-watersheds as an important organization and management unit. Some of these have received different types of support from various non-government, academic, government-related or international sources, while others depend only on local support.

The distribution of these types of organizations varies among the three pilot sub-basins. In the Ping part 5 sub-basin, government agency-induced groups and networks are dominant, while locally-initiated groups and networks are dominant in the Ping part 1 sub-basin. The Mae Kuang sub-basin has more of a mix between agency-associated and locally-initiated groups and networks, and there has been less interaction among them.

In terms of their views about participation in river basin programs thus far, most say that participation has focused mainly on those groups and networks most closely associated with the agencies who serve as the organizing patron of any particular river basin activity. Others feel that their views and activities have not been reflected in sub-basin plans, which they feel have been dominated by government agencies, or that they have never really participated in any of these processes. Some are skeptical of river basin programs so far, and concerned that important policy issues seem to be ignored.

It became clear during implementation of this project that all three of these levels of activity need to be considered. Thus, the project's participatory watershed management component (component 1) developed into a two-phase process.

- The first phase was conducted by project pilot sub-basin working groups and was facilitated by project implementation consultants. They made considerable effort to coordinate sub-basin planning activities with existing organizational structures at river basin and sub-basin levels under national and agency programs, as well as with existing plans at province and local government levels. Their work resulted in initial drafts of sub-basin action plans and proposed long-term sub-basin organization structures, with emphasis on similar structures among sub-basins.
- The second phase focused on review of these initial drafts by local leaders and local networks within pilot sub-basins, including both government agency-associated and locally-initiated community level groups according to the sub-basin context, as well as local government

leaders. They emphasized modifying proposed plan and organization structures to make them more appropriate according to local views and conditions.

The final plans and proposed organization structures found in this report were a result of this overall process.

The basic principle of decentralization in integrated river basin management is associated with more efficient and effective management where it is well adapted to local conditions. The differences found in project outcomes in the three pilot sub-basins reflect various aspects of the great diversity of conditions among Ping River sub-basins. Experience with the two phases under the participatory watershed management component of this project has helped clarify why a single uniform approach is not likely to succeed in all sub-basins, and what types of differences are likely to result from allowing sub-basins to adapt the approach to fit more closely with their perceived needs, views and capacities. These results do not suggest that the differences among sub-basin approaches will create major obstacles for efforts to build a larger system of overall management of the Ping River Basin. But they do suggest that efforts to try to force sub-basins to have uniform organizations and plans are likely to reduce the amount of local participation and the effectiveness of river basin management programs.

Results from this pilot project suggest that emphasis in efforts to develop basin and sub-basin management organizations and plans should be placed on developing and strengthening a long-term gradual learning approach at the sub-basin level. This means that these efforts should begin with recognition of the types of relevant organizations, approaches and plans that already exist within sub-basins, including their ideas and perceptions of directions in which they want to develop. Views from Bangkok and national-level programs tend to see the sub-basin as a very small local unit. Views from local areas, however, see the sub-basin as a fairly large unit that needs to incorporate, synthesize and build upon various smaller and more local units of organization and resource management. Results from project activities in the three pilot sub-basins appear to confirm the strong potential for sub-basins to provide an effective venue for interfacing, negotiating and integrating the top-down and bottom-up processes that are both seeking to achieve more efficient, effective, equitable and sustainable management of river basin natural resources and environment. But sub-basins need to have the flexibility, support and time that will be required to realize this potential.

7.2. River Sub-basin Organizations (RSBOs)

There have already been various efforts to begin establishing organizational structures at the sub-basin level, and a substantial amount of awareness and experience already exists. Thus, many people already see the potential value of organization at this level, and are already learning about many of the difficulties and obstacles that it will face.

This project has found considerable agreement across sub-basins on some of the basic roles and duties for a sub-basin management organization. These include:

- **Problem analysis** at the sub-basin level is an area where there is broad agreement for an RSBO role, although there are some differences among sub-basins in the degree to which agency officials or local people take the main leadership role in the analysis process;
- **Sub-basin planning** is seen as a very important role for RSBOs in all sub-basins. But there are again differences in whether the RSBO has a strong leadership role versus a role more focused on coordination, review and support. There is broad agreement that sub-basin plans need to be compatible with planning processes at local government and province levels, and to various degrees with planning processes of central agencies.

- The general areas of *participation and public education* are seen to include campaigns, building awareness and understanding, capacity building and mobilizing participation by local communities and other major stakeholders. This is another role where there is broad agreement on a strong RSBO role, with local leadership seen as very important.
- *Negotiating and mediating conflicts* among stakeholders is seen as an important role for RSBOs in all pilot sub-basins, and relevant skills of RSBO leaders are seen as an important topic for capacity building.
- *Monitoring and evaluation at the overall sub-basin level* is another RSBO role where there is complete agreement among pilot sub-basins. Although results-based measurement approaches are still new to most people in sub-basins, initial discussions appear to have been well received and there appears to be interest in learning more about how they might be further developed, adapted, implemented and used to improve sub-basin management.

In addition to the need to develop or strengthen various types of skills, leaders in all pilot sub-basins see *availability and access to information* as an important current constraint on their ability to conduct all these types of roles. There appears to be needs (1) for more access to accurate and consistent information from outside sources; (2) for explanation or training where needed in how to interpret and use outside information; (3) for more development of local sources of useful information and any appropriate monitoring systems that are needed; and (4) for development, updating and maintenance of appropriate river basin and sub-basin database and information systems.

In terms of its *implementation role*, there is also general agreement among pilot sub-basins that direct implementation of activities by an RSBO should be limited to those types of activities that are not already conducted by other existing organizations or institutions.

There were some significant differences, however, in the type of organization considered to be most appropriate to conduct these roles and duties in the different pilot sub-basins:

- *Ping 1 sub-basin*. Strong locally-initiated and led organizations have been developing for some time in this sub-basin, including traditional groups, newer issue-oriented groups, and networks among local community groups and among local governments. In this context, there is a strong preference for a sub-basin organization that has clear local leadership. Strong linkages with local levels would be supported by sub-committees based on local sub-watersheds, and by close coordination with local governments. They hope government agencies and other organizations would play important but clearly supporting roles.
- *Mae Kuang sub-basin*. Strong local groups exist in this sub-basin as well, but many are associated with different government agencies, and have their activities focused in different parts of the sub-basin. There are also traditional groups and various local networks. In this context, several factions have developed, and more time and effort is required to agree on a common approach at the sub-basin level. Most local leaders appear to want to develop a sub-basin organization with clear local leadership, but a local consensus needs to be developed regarding the nature of that leadership. Many feel that cooperation from government agencies, local governments, and provincial administrations is likely to be required for a workable consensus to emerge. RSBO sub-groups are likely to center on different areas in upper, middle and lower portions of the sub-basin.
- *Ping part 5 sub-basin*. In addition to local governments, relevant local organizations in this sub-basin are almost exclusively based on volunteer groups and networks induced by and closely linked with various government agencies. Given the mix of long established communities and more recent migrant communities, there are fewer traditional types of

organization and more heavy reliance on government administration systems for social organization related to natural resources and the environment. In this context, there is a preference for a sub-basin organization with clearly stronger roles for government representatives from local, provincial and central agency levels, and for functional sub-groups that roughly correspond with different agency mandates. This also results in considerable focus on concerns about government policy, legal and administrative issues that are obstacles for coordination, funding and action.

It is clear that initial suggestions to select a single type of organization for all three pilot sub-basins were not appropriate. Modifications made by individual sub-basins appear to make sense according to their local conditions. Differences that emerged among pilot sub-basins have had little impact on the ability of these sub-basins to interact and collaborate with each other under the project phase coordinated by Wildlife Fund Thailand. Sub-basins seemed to have little difficulty accepting the differences in views and orientations found in the different sub-basins. And none of them sought to impose their own views on the other sub-basins. This may be seen as a preliminary indicator that a uniform structure for organizations and processes is not a necessary element of building an overall system of sub-basin management organizations in the Ping River Basin, or perhaps other river basins of the country. Thus, the set of five alternative types of organizational options for RSBOs developed under this project may be a useful tool for helping other sub-basins to consider the range of possible options.

Additional factors that project experience suggests are important include:

- Allowing more time for local preparations to organize and plan for sub-basin management when sub-basins are especially large and complex with many diverse stakeholder groups that have had relatively little previous experience in working together. In such contexts it appears particularly important to find suitable ways to select people who can really represent interests and views of all major groups, as well as people who can negotiate and mediate conflicts.
- In sub-basins where there are multiple administrative jurisdictions (especially at the province level) a number of problems emerge that relate largely to participation and coordination of government units. Some feel that working in such contexts may make it necessary to establish an initial sub-basin committee with a structure or components that come from government agencies with management duties in the sub-basin. This would clarify lines of command to provide technical advice and both formal and informal coordination among agencies, networks, community organizations and other levels of river basin committees. More local leadership could then be gradually developed. Since not all stakeholder groups are likely to agree with this type of approach in some sub-basins, however, some type of compromise may be necessary.
- There is substantial concern among local leaders working with sub-basin activities under the project regarding the need for clear policy and reliable sources of basic operational funding support for further development of sub-basin management organizations.
- There is clear interest at sub-basin levels in ways to develop channels for interaction and exchange among sub-basin organizations in different areas.

7.3. Action Planning Processes

It was clearly important for the sub-basin action planning process to begin with review and consideration of existing sub-basin plans, as well as current development plans at sub-district (or municipality) and province levels. Experience appears to have already taught local leaders that conflict or competition among plans will only bring more problems. Thus, it is only by considering these other plans that appropriate sub-basin management plans can be developed.

Despite this common starting point, however, the basic orientation of the planning process and the composition of resulting action plans did vary among the three pilot sub-basins:

- **Ping part 1.** When given the opportunity, local leaders substantially re-oriented the sub-basin action plan to place heavy initial emphasis on local participation, organization and capacity building outcomes. Their view is that local organizations should take leadership in developing plans and projects that can then be integrated into plans of local governments, provincial plans and central agencies, as appropriate. They also feel the need to conduct activities directed toward addressing some of the policy issues that are particularly important in upper sub-basins. In order to effectively do all this, they need to further develop their analytical, planning, monitoring and organizational skills, as well as their supporting information and database systems. As these are developed, emphasis will shift toward more specific activities to improve management of sub-basin natural resources and environment. They hope government agencies and other organizations will help support this process.
- **Mae Kuang.** Several of the factions in this large complex sub-basin had already developed action plans in association with different patron government agencies, with particular focus on the issues and concerns in their portion of the sub-basin. Thus, much of the focus of action planning under this project has been on reaching a compromise agreement on the vision, goals and strategy of the sub-basin plan, and on matching and integrating measures and projects from the various separate plans. Most appear to want to move in the future toward more dialogue among the different portions of the sub-basin, so that they can develop more activities that can help address some of the issues associated with interactions and impacts among those areas, and to be able to function more effectively at sub-basin and higher levels. In order to help build a basis for work in this direction, their action plan places much emphasis on organization, participation and livelihood outcomes.
- **Ping part 5.** Due to the orientation in this sub-basin, the action planning process has been developing much more smoothly, despite the different projects and agencies that have sought to move it in different directions. Although this sub-basin is also large and complex, its reliance on agency-induced groups and networks results in sets of activities and projects that are endorsed by various agency officials and can be recombined in different ways. While there is still a strong focus on water resources, efforts have been made under this project to expand especially into health-related areas. Many see an important continuing role for provincial and central agencies in developing plans, with the RSBO and sub-basin networks providing coordination, support and monitoring. Their current action plan emphasizes public education, and organizing and mobilizing local participation in implementation programs. They expect this approach will result in a number of natural resource, health and livelihood outcomes that appear quite well aligned with those promoted by various government agencies.

Although differences among action plans in the pilot sub-basins are substantial, it does not appear that these differences should create major problems for provision of support from government sources. While it might be easier and more tidy from a government bureaucracy point of view if all action plans had similar strategies, measures and types of projects, so that uniform lines of financial resources could be allocated across all sub-basins, the resulting costs due to ineffective use of resources are likely to be unacceptably high.

Overall project experience also indicates that if the planning process is really meant to be participatory, it is clear that more time is required for planning-related activities at community and very local levels. This is not a process that can be conducted quickly by consultants working only through workshops with leaders. Even in the Ping part 5 sub-basin, where the process is easier because many projects are linked closely with agency programs, local leaders complained about insufficient time to consult with communities and other local leaders who needed to be

involved. In the other two pilot sub-basins, complaints were much stronger, with some local leaders doubting that any of the river basin management programs they have seen so far even intend to have real local participation.

At the same time, there is a clear and quite urgent need for sub-basins to receive at least enough funding support to allow them to begin implementing top priority projects and activities. Repeated cycles of planning without implementation are resulting in growing skepticism among sub-basin leaders and stakeholders about the intentions of government leaders and policies related to river basin management. And from an operational point of view, further learning needs to be much more experience-based and empirical, in order to maintain and expand interest and participation, further motivate and build consensus, and begin putting into place, testing and improving remaining components of a river sub-basin management system that are not yet fully established and functional.

Additional planning-related experience of the project has also shown that:

- A number of policy-level issues were discussed in all sub-basins during formulation of the action plans. It was only in the Ping part 1 sub-basin, however, where activities related to efforts to help address policy issues were included in the action plan, and that only happened during local review and modification of the initial draft action plan. Policy issues identified in pilot sub-basins relate especially to land use and economic development policies, and to conflicting policies among sectors, lack of government coordination, and many issues associated with outdated or inappropriate laws and the legal basis for sub-basin management activities.
- During action planning processes there were repeated complaints in all sub-basins about lack of access to relevant, high quality and consistent information and data.
- Many sub-basin leaders are interested in learning more about promising activities that are being conducted in other sub-basins, and in exchanging information and ideas about plans and projects. They are aware that there are diverse conditions, experience and ideas among different sub-basins, and they suspect that learning more about what works or not in other places may help improve planning and implementation in their sub-basin.

7.4. Capacity Building

The basic approach of this project in designating sub-basin facilitators, community facilitators and community members and providing training and capacity building activities for them was generally quite well received in pilot sub-basins. But it also became clear that sub-basin and community facilitators are people with many other activities in their lives, and they will not always be able to conduct or participate in every activity where they are needed. Thus, there have been suggestions from sub-basins that these types of capacity building efforts should be expanded to more people, especially through women's groups and youth groups, in order to begin developing a broader base of resource persons and future leaders related to management of natural resources and the environment in sub-basins.

While the handbooks developed under the project have been found useful by many people working in pilot sub-basins, some have suggested that it would be more useful if handbooks could be more detailed and specialized for various types of conditions found in different sub-basins. They also see a need to develop handbooks and/or other types of information materials that are adapted to different types of user groups, such as local governments, schools, health centers and hospitals, *etc.* Information access, packaging and dissemination are seen as important needs associated with capacity building in all pilot sub-basins. Many local leaders feel that

exchange of knowledge, experience, ideas and information across sub-basins could and should be seen as another useful approach for capacity building. This indicates that broader and more systematic methods to meet these needs may be necessary.

The general areas of information access and capacity building have been found to be major concerns in all pilot sub-basins. Information related to monitoring, problem identification and assessment, planning and operations will be needed on a continuing basis over the long term. It is also clear that the needs for capacity building are long-term, and that these needs are likely to change over time. Yet it appears difficult for existing types of services or education programs currently offered by institutions in the area to meet many of these needs. And even where useful services exist at various institutions in the northern region, information about them is often not available to local sub-basin leaders.

In response to these issues and needs, a proposal has been raised within the project for the establishment of knowledge and support center at the Ping River Basin level that could provide three types of support functions for RSBOs and other major stakeholders in the Ping River Basin. These functions include:

- Information center. Services would include (a) a library and clearinghouse for access to relevant training and extension materials and publications in a variety of forms; (2) a contact center to link groups, organizations, agencies and resource persons who can provide or exchange information on experience and tools; (3) a center for developing forms of materials appropriate for the range of stakeholders; (4) a center for coordinating translation and adaptation for international exchange and minority languages.
- Responsive technical support teams. Services would focus on helping guide and mentor RSBO-related groups, especially on topics where systematic local assistance is difficult to obtain. Topics might include technical and operating issues and processes, incentive measures for pollution control, representation, accountability, stakeholder interaction and negotiations, building consensus, improving equity and participation, using monitoring data in learning processes, managing information to provide wide access, transparency, public education, *etc.*
- RBO data and analytical support system. Services would focus on sophisticated tools to support RBO and RSBO programs and activities, such as spatial information systems, analytical modeling, instrumented monitoring, and other types of databases and analytical tools. This would build partnerships with ongoing work at CMU, DNP and elsewhere.

The center would depend on partnerships with institutions and groups in the Ping Basin, and serve as a focal point, convenor, and channel for information synthesis and dissemination to complement existing activities and increase their coverage and impact. It would not seek to duplicate or compete with other existing efforts or institutions.

This proposal has been reviewed and endorsed by a wide range of project staff, partners and local leaders, as well as by senior outside reviewers. All have agreed that these needs are very important and urgent, and that an approach like this is required to meet these needs.

7.5. Economic incentive measures to reduce pollution

Based on the situations found in pilot sub-basins, it appears that economic incentive measures need to be assessed and developed in close association with related regulatory and social measures. Regulatory measures can help support economic incentive measures, while economic incentive measures can help increase compliance with regulations. Social measures such as the community monitoring measure explored under this project can help increase the compliance and

credibility of both regulatory and economic incentive measures, while the existence of regulatory and economic measures provides more motivation for social measures.

Project experience has confirmed that development and implementation of appropriate and effective incentive measures to reduce pollution is very complex and must involve numerous agencies and institutions. For measures explored in pilot sub-basins this was found to include the Department of Pollution Control and Department of Environmental Quality Promotion under the Ministry of Natural Resources and Environment, the Department of Agricultural Research, the Department of Agricultural Extension and the Department of Livestock Promotion under the Ministry of Agriculture and Cooperatives, and units under the Ministry of Industry, as well as local governments, units in provincial governments, and various other government agencies and academic institutions.

The project has also shown that there is clear need for agencies responsible for reducing pollution to interact more closely with people and groups whose activities are associated with sources of the pollution. Development of incentive measures under the project was well supported by representative polluters who were keen to offer their opinions on the advantages and disadvantages of alternative measures. Information they provided clearly showed the importance of participation by polluter groups in developing economic incentives. These dialogues also show that representatives from different areas have different levels of satisfaction with economic incentives. This reflects considerations of economic incentives that include factors relating both to their enterprises and to their own situations. It also shows they offer their opinions freely, making the development of measures more reliable and practical.

Most participating polluters in each pilot sub-basin were pleased to accept the measures. But since measures were developed with participation of only 20 to 25 representative polluters from each sub-basin, results might not be acceptable to all enterprises in these areas. Thus, further steps toward implementing incentive measures should inform all enterprises in the sub-basin about the details of the program, assure that they understand their advantages and disadvantages, and invite their voluntary participation in the program. Public communications can be conducted with assistance from sub-basin facilitators and community facilitators as demonstrated under other components of this project.

The initial design of this project included implementation of economic incentive measures in pilot sub-basins on a trial and demonstration basis. But activities under the project to develop these measures showed that this would not be possible due to the institutional complexities involved, the amount of time required to effectively implement various incentive measures, and limitations in the terms of assistance from the World Bank. The project adapted in the short term by providing introductory training to increase local awareness and knowledge associated with priority measures in each sub-basin, and in the longer term by helping assure that activities to implement priority incentive measures are included in sub-basin implementation plans. In this regard, there are some concerns among some sub-basin leaders that costs associated with some types of pollution control measures are likely to be high, and it is not clear what kind of funding mechanisms will be available and viable.

7.6. Results-based Measurement

Activities under this project have clearly shown that leaders in all three pilot sub-basins agree that managing and conducting monitoring and evaluation at sub-basin level is seen as one of the most important roles and duties for RSBOs. Thus, project activities to develop a results-based measurement framework for sub-basin management have sought to develop this type of approach

in a manner that could be compatible with the diverse interests, capacities, and organizational and planning arrangements found in pilot sub-basins.

In order to help match the results-based measurement framework with organizational arrangements developed in pilot sub-basins, separate components of the framework focus on the project and overall sub-basin levels. This is necessary because individual partner organizations and agencies are expected to monitor and evaluate projects that they implement in local areas. The RSBO will combine results of project-level monitoring and evaluation with additional sub-basin level activities to monitor and evaluate overall sub-basin level plans, strategies and measures.

Overall sub-basin monitoring and evaluation requires input from various stakeholder groups, and will produce findings useful for participatory management processes in the sub-basin. Thus, roles and responsibilities of various stakeholder groups have been suggested.

In terms of results-based aspects of current sub-basin action plans, it is clear that progress has been made, and that further effort is necessary. Thus far, sub-basin action plans include basic expected outcome statements at the level of measures or projects. Assessments show that many of these need some further clarification, and specific measurable indicators (and appropriate baselines and targets) need to be determined for all of them. Indicators will need to be matched with types and sources of data and information that is either available or feasible to collect.

Data and information needs should link results-based measurement with wider needs for information from both outside and local sources. While some needs for monitoring data, especially at outcome and impact levels, may be met through access to monitoring information collected by outside sources, other types of information will need to be collected locally. Outside technical assistance and capacity building will be needed for conducting evaluation studies, as well as for developing local monitoring and information systems.

Another role for RSBOs that is seen as important in all sub-basins relates to negotiations and mediation of conflicts among stakeholder groups. Results-based measurement systems and the monitoring and information systems to which they are linked can make important contributions to this function. This should be another consideration in their further design and development.

The most important immediate need is for information and capacity building activities that are necessary for further development of results-based measurement approaches and systems in pilot sub-basins. An education campaign has been suggested to reach people responsible for management and other related stakeholders in pilot sub-basins. The campaign would focus on building knowledge, understanding and ability to apply the results-based measurement framework in assessing projects and sub-basin workplans. Emphasis would be on indicators and results evaluation criteria for various indicators, which would vary among the natural resource and environment conditions in each sub-basin.

8. Recommendations for further expansion to other sub-basins

Based on experience and lessons learned under this project, this chapter summarizes major recommendations for further efforts to expand learning from this project to other sub-basins in the Ping River Basin and possibly elsewhere in the northern region or the country.

8.1. Overall approach and policy commitment

Results from this project clearly do NOT support recommendation of another separate new approach to sub-basin management. Rather, recommendations for the overall approach to development of river basin management organizations center on consolidation of efforts by different organizations and agencies, and on commitment to some basic principles to help guide their further development.

Given the current confusion and uncertainty that exists at sub-basin levels regarding river basin management organizations, there is an *urgent need for clear high-level commitment* to this process. This commitment is necessary (1) so that people in river sub-basins will know that the time and effort they are investing in this process is important; (2) so that stakeholder groups in the sub-basin will be motivated to participate in organization, negotiation, planning and operation processes; (3) so that local governments and provincial administrations will see the importance of their participation in these processes; and (4) so that central government agencies will participate with sincerity and consistency.

This policy commitment should include clear support for some basic key principles that will be used to guide further development of management organizations at sub-basin level. These principles should include:

1. There will be a single system of river basin and sub-basin management organizations that will be used for developing relationships at that level with all government organizations and agencies; this should include agencies related to natural resource management and to pollution control that are located in various ministries;
2. Sub-basin management organizations and action programs must be developed through processes that are truly participatory, and emphasize balanced interaction between top-down national processes and bottom-up local processes;
3. Acceptance of the diverse conditions found in river sub-basins, and thus acceptance that there does not need to be a single set of ‘model’ structures for sub-basin organizations, action plans or management processes; exchange of experience among sub-basins will be promoted;
4. Acceptance that existing local and sub-basin level organizations and plans – of all major stakeholder groups – will be the starting point for any necessary synthesis, and for gradual improvement and development of sub-basin organizations and programs;
5. Acceptance that river basin and sub-basin management is a long-term process, with needs for support and assistance that will change over time;
6. Government commitment to provide continuous support for basic operations and capacity building for a long enough period of time that sub-basin organizations will be able to function effectively, and can be integrated into broader development, administrative, regulatory and social systems; incentives should be provided to help accelerate this process.

8.2. Participatory watershed management organization and programs

1. Based on these recommended principles, one of the first steps in expansion of support to additional sub-basins should be local surveys of existing organizations, groups and networks that can provide a basis for further organizational development at sub-basin level. In some sub-basins there will probably already be sub-basin level committees or groups that are working under this approach. In others, sub-basin level efforts thus far may have focused only on government-associated local groups and networks, or they may have not included various stakeholder groups. Approaches should be developed to assure that all major stakeholder groups and types of relevant organizations are included.
2. River basin programs should not try to avoid conflict by focusing on particular government-associated groups. Since broad representation and consensus are very important for the success of participatory sub-basin management, sub-basins should actively seek to identify sources of disagreement and conflict in their sub-basin, so that the issues can be openly discussed and managed. Long-term effectiveness should not be sacrificed for short-term convenience.
3. Based on their capacities, experience and views, sub-basins should be allowed to choose and develop their own organizational structure and arrangements. A single 'model' for sub-basin organizations should NOT be promoted. Rather, examples such as the five alternative forms of organizational 'models' developed under this project, and cross-basin exchange of experience should be used to help inform their decision. They should also be encouraged to consider what is currently most practical, as well as directions for any changes in organizational arrangements they would like to see in the future. There should be mechanisms at the river basin level to help assure that sub-basin organizations are not dominated by a narrow set of stakeholder groups.
4. The basic structure and content of sub-basin action plans should be determined through participatory processes in each sub-basin. A single 'model' for action plans should NOT be promoted, but diverse examples of plans should be circulated and cross-basin exchange of experience should be encouraged. Planning principles that should be promoted include compatibility of sub-basin plans with plans of local governments and provinces, as well as any needs for areas of compatibility needed for interactions among sub-basins within the context of the larger river basin.
5. Sub-basins should be encouraged to build their sub-basin action plans into a broader long-term plan for sub-basin management and development, and to work with all major stakeholder groups to improve the plan and build a broad consensus in the sub-basin to support the plan.
6. Sufficient funding should be made available to support at least implementation of some top priority activities and projects in sub-basins. This is needed to address concerns related to repeated planning with no implementation, and so that further learning can be more experience based and empirical. It will also provide needed additional motivation, as well as opportunities to begin testing monitoring and results-based measurement systems.

8.3. Information and capacity building

1. Urgent support should be provided to establish an information center and accessible database that compiles quantitative and qualitative data and information related to natural resources, environment, quality of life and related aspects of the Ping River Basin, including information related to their participatory management. The main objectives of the center and database should be (1) to provide access for river basin and sub-basin management

organizations to accurate and up-to-date data from all sectors relevant to basin management; and (2) to provide access to a wide collection of information that can help build capacity of river basin and sub-basin organizations to conduct efficient, effective, equitable and sustainable participatory river basin management programs.

2. The information center and skilled persons from other organizations and institutions should be provided with support to expand the range and availability of handbooks and other types of capacity building materials and media. Particular attention should be given to the needs of different sub-basin stakeholder and user groups, as well as to the different conditions found in different types of sub-basins.
3. Designation and development of sub-basin and community facilitators should be encouraged in other sub-basins. In addition to local people with knowledge, experience and leadership skills, capacity building programs should be conducted to develop more future leaders, with particular emphasis on women and youth.

8.4. Incentives for pollution control

1. An institutional assessment should be made to identify the most appropriate and effective methods to achieve coordination among government agencies in order to begin implementing economic incentive measures for pollution control in combination with associated regulatory and social measures. This should include identification of suggested improvements in relevant policies, regulations or laws that constrain coordination.
2. Sub-basin management organizations should help identify major sources of pollution in their sub-basins, and organize forums for discussions and negotiations with pollution source groups, with focus on identifying the most appropriate combinations of regulatory, economic and social incentive measures to address problems in the sub-basin.
3. Technical assistance should be made available to RSBOs to help them identify the range of potential incentive measures with potential to help them address pollution problems, and to build more in-depth and practical knowledge on incentives they seek to implement. This should include assistance services that can be available on a regular basis as local implementation issues and problems arise.

8.5. Monitoring and results-based measurement

1. A campaign should be conducted to provide sub-basin leaders and major stakeholder groups with easy-to-understand information on results-based measurement, why it is important, how it can be used to improve sub-basin management programs, and where they can find additional information and assistance. Emphasis in this initial campaign should be on building awareness, knowledge, and understanding.
2. Technical assistance should be provided to RSBOs to help build their capacity and improve their sub-basin action plans through clear outcome statements, identification of indicators that can really be measured, and sources of data and information that exist or will need to be developed locally. This can be done in association with relevant government agencies where that is appropriate. Linkages should be facilitated between RSBOs and relevant academic institutions or independent institutes from which further technical assistance can be provided.
3. Encouragement and technical assistance should be provided to develop appropriate and effective monitoring and multi-purpose information systems within sub-basins. In addition to basic knowledge and conditions, and to planning and project-related information needs, appropriate types of natural resource, environmental, livelihood and health-related monitoring

should be considered to supplement monitoring from outside sources. One useful example of approaches to local monitoring that may be useful is the stream detectives program supported by the Green World Foundation. Other types of examples should be identified and disseminated.

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Appendix 1. Project Outputs

<i>Consultants</i>	<i>Deliverables</i>	<i>Language</i>	<i>CD</i>
Panya Consultants Consulting Firm	1. Inception Report	English/Thai	-
	2. Sub-Basins Selection Report	English/Thai	-
	3. Component 1 Report (Draft)	Thai	-
	4. Component 2 Report (Draft)	English/Thai	-
	5. Component 3 Report	English/Thai	-
	6. Draft Action Plan for Natural Resources and Environmental Management Report for Ping Part 1, Mae Kuang and Ping Part 5 Sub-Basins	English/Thai	-
	7. Final Report (Draft) with Executive Summary	Thai	-
Dr. David Thomas Watershed Management Expert	8. Inception Report	English	-
	9. Interim Report	English	yes
	10. Final Report	English/Thai	yes
Dr. Dominic Moran Economic Expert	11. Inception Report: Practical Criteria for Identifying Key Pollution Sources	English	-
	12. Interim Report: Identification of Appropriate and Practical Incentive Mechanisms	English	-
Chan-Ek Tangsubutra Planning & Institutional Specialist	13. Participatory Action Planning Process Report	English/Thai	-
	14. Constitution of Sub-Basin Organization Report	English/Thai	-
Mr. Sanchai Sutipanwihan Training Specialist	15. Technical, Organizational, Education and Awareness Toolkits	Thai	yes
	16. Component 2 Report	English/Thai	-
Dr. David Thomas Watershed Management Specialist	17. Results Measurement Framework Report	English/Thai	yes
	18. Final Project Report	English/Thai	yes