

Appendix **5**

Lao PDR Country Review: Water Sector and Sustainable Development in Lao PDR: Mainstreaming Water Resources Development Management towards the More Integrated Manner and Sector-based Approach

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Appendix 5

Lao PDR Country Review

A.5 Water Sector and Sustainable Development in Lao PDR: Mainstreaming Water Resources Development Management towards the More Integrated Manner and Sector-based Approach

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1. Introduction

Lao PDR classified as the most abundant on water resources per capita in ASEAN by the annual providing capacity of surface water to each of its individual citizen of 55,000 m³ per capita, while ground water is considerably untouched. Both surface and ground waters are generally in the same status. Around 80% of the country's area lies within the Mekong River Basin. The remaining 20% drains through Viet Nam directly to the South China Sea. The total annual flow of water from the Mekong tributaries within the territory of Lao PDR is estimated at 270,000 million cubic meters, equivalent to 35% of the average annual flow of the whole Mekong Basin. Besides the major tributaries of the Mekong, there are hundreds of small streams which mostly have a torrential regime during the rainy season and have a very low or no flow during the dry season. The monthly distribution of the flow of the rivers in Lao PDR closely follows the pattern of rainfall: about 80% during the rainy season (May-October) and 20% in the dry season, from November to April. For some rivers in the central and southern parts of the country (particularly Se Bang Fai, Se Bang Hieng and Se Done) the flow in the dry season is less: around 10 to 15% of the annual flow.

Main rivers of the Lao PDR dominantly consist of the first and second tributaries of the Mekong River. There are about 39 main tributaries in the Mekong river basin, in which 11 main rivers that have catchments areas of more than 5,000 km² are originated and/or passed through the Lao territory. Total watershed area of the main tributaries is estimated at about 183,000 km². There are only 2 main rivers, namely Nam Ma and Nam Ka rivers, are located outside of the Mekong River Basin and expanded in the eastern area of Houaphan and Xieng Khuang provinces. Both drain through Viet Nam directly to the South China Sea (DMH, 2007). The limited information on these rivers restricts assessment of their potential.

Water is an essential part of the life and culture of Lao people, and also contributes to the socio-economic development goals of the country. Ultimately the welfare of Lao PDR is bound up with water and all development plans will depend on water resources in some way. Country's water consumptions and uses are mostly extracted from numeral steams, tributaries as well as the mainstream itself of the Mekong River, which are considerably in good quality, excepted in some spots. Contributions of the water sector have been examined through related development agencies, including irrigation, hydropower, navigation, fisheries, urban and rural water supplies and sanitation, tourism, cultures, etc.

Sustainable development emerged as a new development paradigm and has been adopted by international community as an overarching development goal since the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro in 1992. The key principle adopted was 'sustainable development' after the report by Brundtland to the United Nations. Lao PDR is committed to Agenda 21 as well as to the conventions adopted at the Conference including the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity and the UN Convention to Combat Desertification. The Lao PDR agreed to other key international commitments in the area of sustainable development including the Human Rights, the Millennium Development Goals (MDGs) and other Multi-lateral Environmental Agreements (MEAs).

Ten years later in 2002, in Johannesburg, a follow-up conference produced the millennium development goals. In line with other states, the Lao Government adopted the Johannesburg Plan of Implementation (JPOI), which called upon countries to take immediate steps to make progress in the formulation and elaboration of the National Sustainable Development Strategy (NSDS), and begin implementation by 2005. One of particular targets of the JPOI is to apply the Integrated Water Resources Management (IWRM) approach as a component of NSDS of the country.

The objectives of the paper aim to

- identify major existing and potential issues on water resources management, influencing to the socio-economic development of the country;
- evaluate legal and institutional evolution in line with national policy support for the more integrated management of the water resources; and

- address major capacity development needs to overcome existing and potential issues toward sustainable development.

2. Serious problems from economic growth

The integration of water resources management and improvement of multi-sectoral coordination and management has been initially implemented in the last ten years, in order to ensure that the water and other key natural resources have been used and managed wisely. During the period, the country has made considerable progresses in achieving its strategic goals on the IWRM and continuously steps upward to the more consistent management approach by the means of local, national, regional and international integrations. Along with these implementations, more challenges and opportunities are being the key factors influencing to the IWRM goals of the country. In parallel to the national arrangement, water resources management by applying river basin administrative approach is also being introduced and scaled up. Behind this institutional evolution, some logistic backgrounds, which were considered as significantly historical changes in the water sector in Lao PDR, will be briefly reported.

Even though the country is rich in water resources, however, the National Water Sector Profile (1998) reported that some minor competitions within a single water sub-sector and between sub-sectors were existed. Due to the high level of socio-economic development, the need for natural resources uses, especially the core resources of land, forest and water, is also raised along, and then some signs of conflict observably have occurred. Observable information from many studies indicated that competition among users were occurred in specific areas: decrease of fish capture in the river downstream of dams; rainwater leaching the salt mining areas into water courses; competition among irrigators and other users pumping from the same stream; no enough or too much overflow water in seasons to supply for series of hydropower dams in the same river systems in some basins or sub-basins; water pollution problem occurred in some dense domestic dwellings and tourism destination towns, etc.

The National Human Development Report (CPI, UNDP, 2006) also reported that key possible negative impacts from the development, regarding international trade of the country are commodity price cycles, threats to the environment and quality of life, some mistreatment of workers, threats to Lao culture, threats from external shocks and threats to employment. For the threats to environment and quality of life, the projects may lead indirectly to illegal logging because of new road construction and transmission line rights-of-way. There is some loss of

habitat. And, in some cases, there may also be lower quality of life in the resettled villages if promises made are not kept and resettled households cannot find adequate new livelihoods. For the more specific threats to water and aquatic resources, hydroelectric projects can create some risks, including downstream effects on fishing and farming. Some mines also have downstream effects on fishing from tailings, erosion and leakage of chemicals used in processing including cyanide from gold mines. Tourism can have negative impacts by degrading environment in different aspects, including overbuilding in areas important for biodiversity conservation and increased air and water pollution, due to increased transport, higher amounts of solid waste and higher grey water discharges.

It is fortunately that the Lao PDR has generally abundant water and other natural resources, relatively low development status and less population, comparing to its neighboring countries, but its overall water resources management is considerably fragile. With the high ratio of socio-economic development growth rate (by 7.5% of GDP per year in 2008), its natural resources management should not following too far from development.

3. Identification of priority issues in order to promote sustainable development

At the end of the twentieth century, especially, since 1986 when the country has been approaching more market oriented socio-economic development, the rational growth of the country has considerably raised. The National Gross Domestic Products have averagely been growing by 6.1% from 1991 to 2004 (National Statistics Center, 2005).

Market-based orientation for the national economy has evidently observed, in which foreign/domestic investment has been raised along with business oriented public enterprises. On the other hand, public administrative authority has been decentralized for the more self-based responsibility, especially to the provincial level. In coping with the new economic mechanism, legal and institutional development, and capacity building have been seen as the urgently national priorities.

Within the National IWRM Support Program¹, one of the key elements is to develop the

¹ *The National Integrated Water Resources Management Support Program includes (1) National IWRM Capacity Building; (2) Upgrading of National Water Sector Policy and Strategy; (3) Revision of the Law on Water and Water Resources; (4) River Basin Management; (5) Water Quality and Ecosystem Management; (6) Strengthening of Groundwater Management; (7) Support for the Department of Meteorology and Hydrology; (8) Bachelor Degree's*

National Water Sector Policy, Strategy and Action Plan, which would be submitted to the Government for consideration and approval in late 2010. The draft Framework of National Water Sector Policy encompasses the IWRM principles in incorporating to the national priorities and needs. These include: (i) Water Resources Planning and Coordination (investment priorities to support national goals; national, river basin and sector planning; national to international coordination; and disaster management); (ii) *Water* Legal and Regulations (conjunctive water allocation and sharing; water pollution management; and drought management); (iii) Water and Water Source Protection (watershed management; river bed excavations / filling and other disturbances; groundwater protection); (iv) Water Environment Management (rivers, lakes and wetlands; flood plains and flood management; Riverine vegetation); (v) Organization and Funding (organizational structure and responsibilities; awareness and public participation; human resource development; and investment in water resource management); and (vi) Knowledge Management (data and Information management; modeling; and indigenous knowledge).

The National Water Sector Policy, Strategy and Action Plan will be a strong basis for cross-sectoral integrated water resources management and pave the way for legal and institutional strengthening in the future. The Development of these principle documents will bring the national integrated water resources management to the sector-based approach.

4. Existing relevant national policy, legal and strategies

The National Constitution, set out the political and legal frameworks for overall legislative based development and management. The Article 17, 1991 Constitution and Article 19 of amended Constitution 2003 of Lao PDR provides that “all entities and people shall protect the environment, conserve natural resources such as land, forest, wild-life, watershed and air”. These policy statements provide a concrete foundation for natural resources and environment management as a whole, for water resources management in particular.

The long-term national development goal for Lao PDR, set in 1996 by the 6th Party Congress,

is to rise above the status of a Least Developed Country (LDC) by 2020 through sustained equitable economic growth and social development, while safeguarding the country's social, cultural, economic and political identity. The foundations for reaching this goal have been laid by moving consistently towards a market-oriented economy, building up the needed infrastructure throughout the country, and improving the well-being of the people through greater food security, extension of social services and environmental conservation while enhancing the spiritual and cultural life of the Lao multi-ethnic population.

The 7th Party Congress (March 2001) set the objectives of sustained economic growth with equity at an average rate of 7% per year and a reduction in poverty by one half by 2010 and eradication of mass poverty by 2020. It also indicated that shifting cultivation should be phased-out by 2010.

The National Long-Term Development Framework incorporates guidelines from the 6th and 7th Party Congresses and lays out five and ten-year objectives to reach the 2020 mass poverty elimination goal and systematically improve social well being.

The National Growth and Poverty Eradication Strategy - NGPES (2004) is the strategic framework under which all of the Government's future growth and poverty eradication programs will be developed and implemented. NGPES is a comprehensive framework for growth and development. It defines four main sectors (agriculture / forestry, education, health, and infrastructure – especially roads), supporting sectors (energy and rural electrification, agro-forestry, tourism, mining and construction materials) and cross-sectoral priorities (environment, gender, information and culture, population and social security).

The Millennium Development Goals Progress Report – Lao PDR, January 2004, which was jointly prepared by the Lao Government and the United Nations, classified as the high level document that set the issues of “Promote Gender Equity and Empower Women”, and “Ensure Environment Sustainability” among others as the key components of the document. More particularly, the document has set the target for population to access to safe drinking water by 80% and improve sanitation in the urban area by 70% in 2015.

Among other socio-economic development sectors, the national policy framework takes account water resources management as a cross-cutting issue and substitute to the natural resources and

environment. These functions have been guaranteed by the national constitution that all agencies and individuals obligate to protect the environment.

Further extensions from the constitution, other legislations and regulations in relation to natural resources and environment management have been passed through over the last ten year period. In October 11, 1996, the Law on Water and Water Resources (LWWR) has been passed. Main function of this legislation is to determines necessary Principles, rules, and measures relative to the administration, exploitation, use and development of water and water resources in the country to preserve sustainable water and water resources² and to ensure volume and quality providing for people's living requirements, promoting agriculture, forestry, and industry, developing the national social-economy and ensuring that no damage is caused to the environment. The Prime Ministerial Decree to implement the LWWR has also issued in October 9, 2001. The decree disseminates more detail roles and responsibilities of line agencies and provinces. Other roles are also provided through decrees and regulations, including the coordination roles of each agency at national and local levels on the development and management defined in the Prime Ministerial Decree to Implement the Law on Water and Water Resources, 2001. Other relevant legislations and subsidiary regulations have also been passed during the same period. These include the promulgations of Environment Protection Law in April 3, 1999, Decree on the Implementation of Environment Protection Law in June 4, 2001, Forestry Law in October 11, 1996, Land Law in April 12, 1997, Agriculture Law in October 10, 1998, Industrial Processing Law in April 1999, Mining Law in 1995, Hygiene and Disease Prevention Law in April 10, 2001, etc.

According to the provisions of those existing legislations, subsidiary regulations, guidelines and other forms of disseminations have been developed by relevant agencies and used as their basis for implementation and coordination. Moreover, some functions and even agencies have been created to fulfill the requirements of those legislations. These include the subsidiary role of Ministry of Agriculture and Forestry on the survey and inventory of water sources and watershed, and the establishment of the Water Resources Coordination Committee in 1999 for functioning as national water apex body.

² *The Law on Water and Water Resources defines that (i) Water is one type of liquid natural resources which is the most basic and principal of resources among water resources: (ii) Water resources are natural resources which are comprised of things inhabiting in water or water resources which do or not have life e.g: plants, marine animals, rocks, minerals, sand, mud, stones, etc*

In April 8, 1998, the Government approved the establishment of the Water Resources Coordination Committee (WRCC) and its Secretariat (WRCCS). The members of this committee had been recruited from water related agencies. The Chairman of the Committee was the Vice Minister from the former Science Technology and Environment Agency (STEA), while Vice Chairman and Members were the director or deputy director levels, representing water related agencies³. General mandate of the WRCC was to provide the advice to the Government on matters relating to water and water resources. It also had the mandate to coordinate the planning, management, follow-up, inspection and protection of water and water resources aimed at sustainable development and utilization of water and water resources in line with the government policy of socio-economic development.

In July 2007, the Lao Government undertook a significant step by establishment of the Water Resources and Environment Administration (WREA) under the umbrella of the Prime Minister's Office. The WREA constitutes of line agencies, including the Department of Water Resources, Department of Environment, Lao National Mekong Committee Secretariat, Department of Hydrology and Meteorology, Water Resources and Environment Research Institute, and its administrative Cabinet, which also include the Greater Mekong Sub-region focal point unit. These agencies have the functions to be the national advisory bodies to the Government on matters relating to water resources and environment. The agencies also have the roles to holistically coordinate with other development agencies in particularly adverse problems occurred along with development activities. The Provincial Water Resources and Environment Offices and the District Water Resources and Environment Units are also being established and consolidated, which functioned as the WREA local counterparts and carry out the same roles in their respective local situations.

More particularly, the setting up of Department of Water Resources (DWR) aims to centralize the macro water resources management in a public administration system and integration among

³ *These agencies include Ministry of Agriculture and Forestry (MAF) functioned as water use for agriculture, livestock and fishery purposes; former Ministry of Industry and Handicrafts (MIH) functioned as uses of water for hydropower development and industry purposes; Ministry of Public Health (MPH) functioned as water uses for rural water supply and sanitation as well as drinking water quality control; the Lao National Mekong Committee Secretariat (LNMCS) represented the Lao PDR in relation to other riparian members of Mekong River Commission; former STEA functioned as water environment and ecology issues; Ministry of Justice (MoJ) functioned as coordinator for legal development, Lao Front for National Construction (LFNC) represented diversified ethnic groups and community of the country; Lao Women Union (LWU) shared the importance of women on water related issues; and the Office of National Assembly (NA) played the role as legislative body in which water resources legislation is a part*

water user agencies. The institutional arrangement for a national water apex body is being considered to be setup at the ministerial level to replace the existing WRCC. It comes up with two options on putting additional roles to the existing Lao National Mekong Committee (LNMC) in which the Minister of WREA is already shared with the memberships at vice-ministerial level or incorporating water resources management function to the National Environment Committee (NEC) at where the Vice Prime Minister shares with the memberships at vice-ministerial and provincial vice-governor levels. One of the DWR mandate is to act as Secretary to the new nation water apex body upon its establishment.

Further more, the Government of Lao PDR has taken many significant steps to introduce and strengthen IWRM into the water sector, which include preparation of a National Water Sector Strategy and Action Plan (1998), the Draft Water Sector Policy (Sep. 2000), the passage of Prime Ministerial Decree on the Implementation of the Law on Water and Water Resources (2001), the update of the National Water Sector Profile (2007), the preparation of the Nam Ngum River Basin Profile, Integrated River Basin Planning and preparation to establish the Nam Ngum River Basin Committee and other related legal and institutional steps are being progressively undertaken at the moments. The integrated water resources management and planning for Nam Theun/Nam Kading and Xedone Basins are also being initiated.

Simultaneously, capacities of different agencies have been built to cope with new socio-economic situation since the previous decade. Capacity buildings for water related agencies have been carried out in different forms, including short-term and long-term trainings in both in-country and abroad, on-the-job trainings and seminars with the topics designed to fit the particular needs of each agency (IWRM Training Plan, 2005). The more comprehensive training activities on IWRM for all water related agencies have been initiated since 2005 through the IWRM Training Plan. Implementation of this Training Plan is still going on.

5. The problem from implementation of existing relevant policy, legal and strategies

Based on the national assessment, the country's legal and institutional arrangements, including its technical and personnel capacities on water resources management were considerably at the primary level and insufficient to cope with existing circumstances, which turned the uses and management of water and other key natural resources into challenges and unsustainability (WRCCS, 2006).

The current institutional problem in the water sector mainly relates to lack of co-ordination between agencies within the sector and with those of other sectors, and loose line of communication and co-ordination between the national agencies and their provincial counterparts. There has gradually been, especially since the last decade, a sign that the large number of agencies involved in water and water resources requires coordination to ensure the outcomes sought by government are achieved without adverse interactions. However, at that time, there was no formal structure for such coordination and it relied on informal arrangements developed on a case by case basis. Further more, there is a lack of legal backup to implement various key functions of IWRM. This has not resulted in many significant problems because of the low level of development.

Since the formal IWRM has been introduced the last decade, there were a lot of efforts the water sector has been dealt with in the context of the more holistic water resources and cross-cutting issue management. However, it was appeared that more affordable to reach the objectives were still required.

To date, it is analyzed that the activation of IWRM still faces several important issues and challenges. Major outstanding issues which need to overcome in the future are as follows:

- The Law on Water and Water Resources (LWWR) and the Prime Minister's Decree on Implementation of the LWWR have introduced some aspects of IWRM, including ownership of water resources, national and river basin planning, monitoring and assessment of water resources, water resource allocation according to integrated river basin plans, a specialized funding mechanism, public consultation requirements and watershed protection. Implementation of the LWWR, however, remains quite limited. As they are the master regulation, the law and its implementation decree can only give broad principles that being a guideline for further disseminations. Poor implementation is the result, in part, of incomplete policies and secondary legislation as well as gaps and areas of the law which are unclear.
- One of the weaknesses of the LWWR is its delegation of water resource policy and regulatory functions to water development ministries. These functions will conflict with the water development and service delivery roles of these ministries and their agencies. There is not a sufficient understanding of the need for separation of state management of water and water service levels at all levels. The 'decentralized' implementation approach relies on a 'coordination' role for the former Water Resources

Coordination Committee and Lao National Mekong Committee, which was unrealistic given their small size and limited capacity, as well as the lack of clarity on the respective roles of these two agencies.

- In comparing the existing IWRM principles and ToolBox, the LWWR also appears to have gaps with respect to such things as information management, the coordination of water resource and environmental management, international coordination and management of water resource development, conflict resolution, the role and administrative requirements for water resource management by provinces and other local authorities and mechanisms for water resource management and coordination at the river basin, provincial and lower levels, the management of natural disasters and public safety (such as dam safety).
- A national water sector policy, has been drafted in the last decade but not approved; national strategy and action plan was also prepared but implementation was very limited. These principal documents are being updated by the DWR and will be submitted to the Government for consideration and approval by the end of 2010.
- Planning is largely driven from districts and provinces or by major national agencies; however, plans are project-oriented and are not integrated within basins or across sectors.
- The Water Resources Coordination Committee exists with a mandate to advise government and coordinate water sector activities; WRCC still has low level membership and low capacity (chaired at vice-minister level, with technical level members; limited staff capacity and resources) and is largely dependent on donor funding. LNMC has a responsibility to advise Government and coordinate national agencies with respect to MRC activities and Mekong Basin water resources; duplication and confusion with WRCC mandate exists. Both agencies serve as coordination agencies in the Lao water sector. The WRCC mandate is directed toward national water resource management while the LNMC deals more with international aspects, although this is not a clear separation. Both agencies are relatively small and have inadequate legal powers and inadequate capacity to carry out coordination (regulation) of other ministries and agencies. International coordination of water resource management is mainly through the Mekong River Commission and the National Mekong Committees of the member countries under the 1995 Chiang Rai Agreement. It is difficult to separate national and international aspects of water resource management since Lao PDR is affected by, and affects, water management in other countries in the Mekong Basin.

- Basic principles of IWRM have been incorporated in the mandate of DWR and its provincial counterparts, but for facilitation of practice, legal back up needs to be developed soon.
- Agency responsibilities for water resource management are fragmented and many gaps exist; no lead water resource management agency exists.
- Water resource management is largely driven by hydropower development with limited reference to multi-sectoral water management issues.
- A national policy of decentralization is being actively pursued; however, provincial capacity for integrated water resource management is very low.
- No river basin organizations exist yet. Based on the national agenda, the setting of river basin organizations for Nam Ngum and Nam Theun Nam Kading Basins in the near future will be the models for other basin institutional arrangement of the country. On the other hand, river basin planning process will be created in incorporating to the national and provincial administrative planning.
- Some steps are being taken to develop a national water resource information management system; however at present data fragmentation, access and other issues limit the use of information in decision-making.
- Some IWRM training has been carried out, but is fragmented and has not resulted in a general understanding of IWRM or implementation of necessary functions
- Some steps are being taken to develop a national program for public awareness and participation.
- Funding for particularly IWRM of the country is limited and mostly received from donors in the form of project bases. The on-going water use tariff, eg. collected by domestic water supply sector, aims for only sustaining its business operation and maintenance, nor for maintaining and rehabilitating water sources and watershed. Other forms of fee collection from water resources development are done through investment and concessional charges by national and local administrations, while there is no systematic procedure to allocate these taxes for the water resources management purpose. At the time being, the more sustainable finding for water resources management is being discussed which is possibly obtained through water loyalty. Proportion of water fee for each development project will be studied and set as national water loyalty procedure. Some hydropower projects is considerably targeted as models for contributing reasonable proportion of their revenue to water resources management

fund, before extending to other beneficial water resources development projects in different sectors.

- Planning and monitoring take place through normal government processes but a coordinated and strategic approach is still lacking with respect to the water sector.

6. The Way Ahead

Sustainable water resources development needs effectively comprehensive water resources management. The incorporating of IWRM into the existing institutional, legal and implementation frameworks is the main and not easy task for the Lao PDR. To achieve this task, a great attempt has to be pursued. These include the institutionalization of the more effective coordination mechanism from both vertical and horizontal administrations for the respective national, local institutions and among their counterparts and other relevant organization, including clear roles and responsibilities of water service providers, managers and regulators; and enhancement of legal and regulatory systems. In supporting these, institutional and human capacity, including IWRM awareness should be built; data and information management system should also be strengthened.

Abundant water both quantity and quality of the country will be a great opportunity for the county for their socio-economic development, especially its industrialization in the future. There for well managed of water resources through their effective management arrangement will be for key factors determining the success of the country in the future. Further direction on the Lao IWRM implication includes:

- Dissemination from the more centralized authorization at central level to the more decentralized and integrated water resources management arrangement at locality, and from more realized locality to appropriately define national policy setting;
- Restructuring from the fragmented water resources management in line with water resources development to the more particular and professional water resources management arrangement;
- Shifting from the administrative boundary-based water resources management to the more cross-administrative / basin based-management approach;
- Shifting from project based-approach to program; and
- Shifting from program based-approach to sector;

7. Summary

Lao PDR classified as the most abundant on water resources per capita in ASEAN (55,000 m³/person/year). Around 80% of the country's area lies within the Mekong River Basin, while the remaining drains through Viet Nam directly to the South China Sea.

The total annual flow of water from the Mekong tributaries within the Lao territory is at 270,000 million m³, equivalent to 35% of the average annual flow of the whole Mekong Basin. The monthly distribution of the flow of the rivers closely follows the pattern of rainfall: about 80% during the rainy season and 20% in the dry season. Water quality is considerably in good condition.

Water resource is important for contribution to achievement of the national socio-economic development goals, which aims to shift from least development status in 2020. Water consumptions and uses are mostly extracted from numeral steams, tributaries as well as the mainstream itself of the Mekong River for mostly agriculture and negligible uses for other purposes comparing to its renewable availability.

Lao PDR is committed to principal international agreements on environment, especially the UNCED in 1992 and ratified to its subsidiary conventions. Dissemination and implementation of these agreements need to be strengthened.

The objectives of the paper aim to (i) identify major existing and potential issues on water resources management, influencing to the socio-economic development of the country; (ii) evaluate legal and institutional evolution in line with national policy support for the more integrated management of the water resources; and (iii) address major capacity development needs to overcome existing and potential issues toward sustainable development.

It is found that there is a high variation of seasonal water distributions, flood and draught, water pollution and watershed degradation and sedimentation, occurred at some spots or areas, caused by human activities. It is consider yet a major problem now, but could escalate in the future, if without appropriate management. The existing management arrangement is yet sufficient to support the sustainable water resources developments by different sectors, which needs strengthening.

Over a decode, the country has made a number of achievable progress, which extended from the more centralized authorization at central level to the more decentralized and integrated water

resources management arrangement at locality, and from more realized locality to appropriately define national policy setting; the fragmented water resources management in line with water resources development to the more particular and professional water resources management arrangement; the administrative boundary-based water resources management to the more cross-administrative / basin based-management approach; and project based-approach to program-based and pursue to the sector-based approach in the near future.

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