

Lao National Mekong Committee

**REPORT
ON THE OUTCOMES OF
STUDIES AND
ANALYSIS CARRIED
OUT IN SUB-AREA 4L**

April 2004

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INTRODUCTION

Patterned according to the format contained in **Basin Development Plan. Draft guideline. Sub-area analysis** prepared by MRC Secretariat BDP Team (Phnom Penh, Cambodia, September 2002), this report is written in order to provide an introduction to the problems, expectations, as well as the vision of the future of sub-area 6L, regarding mainly water related issues. It is based on the internal documents of the Planning and Cooperation Committee, data conveyed by the relevant provinces in the sub-area, as well as existing documents at Lao National Mekong Committee, collaborative efforts of line ministries when the National Sector Review has been written, and existing literature. Sincere thanks are to be expressed to all concerned parties who have made this report to be written.

MAP OF SUB-AREA 4L

EXECUTIVE SUMMARY

I. Sub-area 4 L is made up, from north downward, of Xieng Khuang Province, Saysomboun Special Zone, Vientiane Capital, Vientiane Province, Bolikhamsay Province, Khammouan Province, and Savannakhet Province. Most of this sub-area is hilly and mountainous formed by Nakai (Khammouane Province), as well as steep mountains, in particular the highest peak in Laos, Phou Bia (2,820 meters), and also along the Vietnamese border. The remaining 30% is formed by the four large plains of Vientiane (58,000 hectares), Paksan (12,000 hectares), Se Bang Fay (49,000 hectares), and Se Bang Hieng (83,800 hectares) as well as other less extended plains. These plains constitute the rice loft for the sub-area as well as for the whole country. The fifth plain is located in sub-area 6L, Se Dong Plain (42,500 hectares).

II. Sub-area 4L is made up of diverse entities with Xieng Khuang which is one of the poorest province of the country, while Vientiane Capital and Savannakhet relatively constitute the growth engine of the country.

III. Development programme of sub-area 4L is determined by the national development strategy towards 2020 with its objectives and goals which include poverty reduction; economic growth at the most appropriate rate; progressively and strongly developing production in the agriculture, industry and service sectors; progressively improving the living standards in term of both physical and mental well-being; disseminating the education and health service throughout the country; providing social welfare; foster the human resource development; protecting a peaceful society and the political stability; broadly opening up the country to the international cooperation and integration into the world's changing environment.

IV. Besides specific policies of each component of sub-area 4L, the short term objectives for the development sub-area 4L are:

- To design and present development projects for funding.
- To cooperate in the implementation of projects which have been approved and funded with foreign assistance.
- To continue to fully structure the economic sectors for the advantage of the ethnic minorities who are settling down from the mountains, and to reduce poverty of the rural population.

- To create and spread wealth in sub-area 4L.
- To create a suitable environment in sub-area 4L.
- To fully cooperate with the Mekong River Commission and to promote a long-term cooperation to manage rivers and water resources in the Mekong River basin in the Lao People's Democratic Republic.
- To exploit new sources of raw water to be treated for domestic use as well as for drinkable water.
- To promote sanitation among the rural population.
- To reduce the burden for women and children forced to fetch water far from their home.
- To extend the access of the population to clean water in sufficient quantity and good quality.

V. The long-term objectives for the development for sub-area 4L aimed at:

- To expand the strategic plan of the Lao National Mekong Committee and the Mekong River Commission while adapting it to the reality of the country's development, to reduce poverty, to improve the livelihoods of the population, and to make the environment sustainable.
- To expand the ownership and participation of the public in the implementation of the strategic plan of the Lao National Mekong Committee.
- To strengthen the capability of officials, particularly administrators and planners.
- To manage the environmental, socio-economic trans-boundary problems.
- To create favorable conditions for the population of sub-area 4L to eradicate poverty.
- To reduce mortality and illness originating from raw water as well as to reduce the unhealthy way of life.
- To eradicate the slash and burn cultivation in general and the opium culture in particular.

VI. The policy adopted by the Government in order to achieve the short term and long term objectives regarding sub-area 4L is embodied in its decentralization policy in order to strengthen the local administration by

exploiting all natural resources potentialities as well as the protection of the environment and water resources.

Legal documents have already been adopted to help achieve this policy such as the Forestry Law, Water and Water Resources Law, Law on Agriculture, Electricity Law, Environmental Protection Law, Decision on the Decentralization, Decree on the Management of the Economic and Social Plan (2002).

VII. The action plan designed to carry out these objectives and policy is detailed as follows:

- To produce enough foods in order to meet the needs of other sub-areas characterized by chronic deficit.
- To make sub-area 4L the base for commodity production, industrial sector development, and transit service expansion.
- To promote the special economic zone and free trade zone in Savannakhet.
- To propagate the implementation of the policy and plan of the Party, the decisions of the Government aiming at achieving the target of eradicating poverty, such as to eradicate poverty within more than half of the poor families in the targeted 11 poorest districts in sub-area 4L.
- In 2003-2004, to succeed to reduce poverty among 21,495 families, to stop the slash and burn cultivation of about 3,090 hectares, and the opium growing of about 582 hectares.
- To concentrate on food production, commodity production, and services providing in the areas of the large plains along the Mekong River for domestic use and for export.

In this respect, the struggling targets are:

- Rice production up to 1,545.135 million tonnes (an increase of 13.6%)
- Cultivated surface aims at reaching 407,516.5 hectares (an increase of 7.9%)
- Rice cultivation in the wet season to increase by 9.7%
- Rice cultivation in the dry season to increase by 10.09%
- Slash and burn cultivation to decrease by 16%.

- To create a fund for poverty eradication with resources pooled from all economic sectors.
- To continue to allocate land and forest along with the settling of the population in a fixed places, especially in the targeted areas to eradicate poverty.
- To create necessary infrastructure in the targeted areas to eradicate poverty.
- To improve educational network by increasing the percentage of primary schooling, and the percentage of alphabetization of people over 15 years old.
- To increase the salary of teachers.
- To solve the insufficient number of teachers and the problem of absenteeism.
- To basically improve and expand the health care network in the rural area, particularly in the poorest districts to decrease the death percentage among mother and new-born children.
- In 2005, more than half of rural villages have to have access to drinkable water and running water for domestic use.
- To train local officials as developers for villages and families in the targeted areas to eradicate poverty.
- To consider credit policy, tax policy, and other policies regarding poor families, villages and districts.
- To promote and improve the raising of livestock, husbandry, and vegetables, fruit trees, and industrial trees growing.
- To develop the sub-area 4L to become the hub of economic and social, industrial, and manufacturing development as well as finance, banking, culture, and media which have to be continuously expanded. Sub-area 4L is to be the center of the development of domestic trade and the focal point for North-South, and East-West exchange and transit center.

VIII. In particular, taking advantage of the international environment and the characteristics of sub-area 4L, this sub-area has to totally concentrate its own development plan on the following:

1. The priority sectors of development in sub-area 4L are:
 - Agriculture, Irrigation, Hydropower
 - Fishery, Integrated Watershed Management, Tourism and Recreation
 - Clean water for industry and domestic use

- Flood control and management
- River works and navigation

2. The development of sub-area 4L has to be continuous, effective, and strong, while striking a balance between the economic growth, the cultural and social development, and the protection of the environment.
3. Development has to be balanced between economic and social sectors, and between various parts and sectors of sub-area 4L, between provinces, and between cities and rural areas, by giving a strong impetus to private economic sector and production of the population, while aiming at efficiently using natural resources, water resources, and human assets for such achievements, thus guaranteeing the fair and just allocation of profit.
4. Economic and social development has to go along with the strengthening of institutions and organizations, the increase of solidarity and national unity, the expansion of people's democracy under the leadership of the Party.
5. While relying on the assets and endowments of sub-area 4L, to skillfully take opportunity of the era to tailor for this sub-area a significant role by threading relations and fostering the cooperation, within its own jurisdiction, with the Mekong River Commission.
6. Economic and social development must be closely intertwined with the protection of water resources and environment.

In the implementation of the plan regarding sub-area 4L, the slash and burn cultivation has to be drastically eradicated, the opium and marijuana growing has to be stopped, projects to grow foodstuffs, commodity production, poultry, fishery in the plains of Vientiane, Bolikhamsay, Se Bang Fay (Khammouan Province), Se Bang Hieng (Savannakhet Province) have to be strongly encouraged and supported.

IX. While all the plans and programmes, and their targets are ambitious, sub-area 4L is to succeed with Vientiane Capital included in its realm.

INTRODUCTION

1. The longest river in Southeast Asia, a geographic spine for the sub-region, the Mekong, over a total of 4,800 km, with its length of 1,760 km is winding throughout the Lao People's Democratic Republic. Its tributaries contribute the biggest share of some 5,270 m³/s equivalent to 35% of the whole river runoff. The 202,000 km² catchment area covers nearly 90% of the national territory or one quarter of the entire Mekong basin. These mere figures show the significance of the Mekong River to the country and its population.

2. The Mekong is considered as one of the most important resources of the country to harness in order to achieve the target that has been set since 1996 when the 6th Party Congress defined long-term development objective as freeing the country from the status of least developed country by the year 2020. This will be achieved by transferring the nation from a natural resource based economy to an intensive economy, a goal re-emphasized and strengthened in 2001 by the 7th Party Congress and the Government's Fifth Socio-Economic Development Plan (2001-2005). The Fifth Socio-Economic Development Plan has the following objectives:

- 7-7.5% annual GDP growth
- 4-5% annual growth for agriculture
- 10-11% annual growth for industry
- 8-9% annual growth for the service sector
- Agriculture and forestry products cover 47% of GDP
- Industrial products covers 27% of GDP
- Single digit annual inflation
- Stable exchange rate
- Increased annual budget revenue: the budget revenue should be 18% of GDP by 2004-2005. The budget deficit should be around 5% of GDP
- Reduced trade deficit to 6% of GDP
- Public investment covers 12-14% of GDP and saving should be about 12% of GDP in 2005
- In 2005, the population would be around 5.9 million, and the GDP per capita should be US\$ 500 to 550.

3. For the development in Lao People’s Democratic Republic, the basic principles adhered to poverty alleviation such as: social equity, gender equality, environmental sustainability, technical feasibility, economic viability and good governance.

4. All these targets and principles are translated directly or indirectly in the sub-area 4L as within its limits are located Vientiane Capital as well as the thriving city of Savannakhet.

CONTEXT AND SCOPE CONTEXT OF THE SUB-AREA ANALYSIS

As sub-area has been delineated to provide a more focused analysis of local concerns and requirements, they are also the regional scale units for integrating and reporting on water resources planning in a catchment context. The current version regarding the sub-area has been delineated with the help of the National Mekong Committees, in a consultation process.

The outcomes for each sub-area analysis will be:

- Summary of present conditions and context for development
- Summary of water availability, ecological demands and present water uses
- Identification of opportunities, concerns and risks
- Formulation of development objectives.

Straddling the central position of the country, sub-area 4L as defined by the Mekong River Commission is formed by six entities, including the Lao People’s Democratic Republic’s Capital, Vientiane, and a Special Zone, Saysomboun, and the provinces of Xieng Khuang, Vientiane, Bolikhamsay, Khammouan, and Savannakhet. With its 86,605 km², the north of sub-area 4L touches the provinces of Sayabouly, Luang Prabang, and Hua Phan, while at the east, its limits run along the border with Vietnam, and on the west is bordering Thailand with the Mekong forming a 720 km length frontier.

PROVINCES AND SUB-AREAS

Sub-area	Province	Area (km ²)	% of province in	% of sub-area

			sub-area	comprised by province
1L	Vientiane	2789	21%	3%
1L	Xieng Khuang	1685	13%	2%
4L	Luang Prabang	186	1%	0%
4L	Vientiane Capital	3317	100%	4%
4L	Xieng Khuang	5016	44%	7%
4L	Vientiane	10582	79%	13%
4L	Bolikhamsay	14364	100%	17%
4L	Khammouan	16544	99%	20%
4L	Savannakhet	20698	97%	25%
4L	Saysomboun	8720	100%	10%
4L	Saravane	2454	25%	3%

Most of this area is hilly and mountainous formed by Nakai (Khammouane Province), as well as steep mountains, in particular the highest peak in Laos, Phou Bia (2,820 meters), and also along the Vietnamese border. The remaining 30% is formed by the four large plains of Vientiane (58,000 hectares), Paksan (12,000 hectares), Se Bang Fay (49,000 hectares), and Se Bang Hieng (83,800 hectares) as well as other less extended plains. These plains constitute the rice loft for the sub-area as well as for the whole country. A fifth major plain of the country is located in sub-area 6L, Se Dong Plain (42,500 hectares).

PART I. NATIONAL OVERVIEW

National macro issues for water related basin planning and ranging from Irrigated agriculture, Integrated watershed management to Flood control and management do not impinge on the Mekong River or the water use, in general, as the pace and the scope are contrived by under-development.

I. Irrigated agriculture

I.1. As the agriculture and forestry sector provides the economic livelihood, the social and cultural base for more than 80 per cent of the population, and accounts for about 53 per cent of GDP, the Government is earnestly striving to modernize this sector to fully meet sustainable practice, and to achieve food security and better life for all Lao people. The goal of poverty eradication and graduation from Less Developed Country status depends on a more productive agriculture and forestry sector.

I.2. As most of the irrigation schemes located in the upland and mountainous area are of small size (less than 100 ha), and made with natural materials which are temporary, the role assigned to irrigation in this respect is crucial and is planned to develop along the following directions:

- To expand the development of irrigation to the rural areas, and contributing to change natural economy, semi-natural economy into commodity production.

- To protect the environment by stabilizing the areas of production, and to create new settlements for people previously practicing slash and burn cultivation, as well as to avert all setbacks linked to the irrigation works.

- To build new irrigation schemes, to rehabilitate and to improve existing irrigation projects, to strengthen facilities for the implementation of the development of irrigation.

- To develop human resources, particularly at managerial level.

I.3. The last few years, especially since 1996, the Government has given great importance to the irrigation sector translated by the leap forward of the irrigated area during the dry season from 24,000 hectares in 1996 to 214,832 in 2003. It results that about 65% of agricultural production of the country, as well as 20% of rural population benefit from irrigation.

I.4. In the meantime, the Government will support small-scale irrigation projects initiated or practiced by families or communities, to foster the participation of farmers and private sector in the irrigation development, and to secure the socio-economic development as well as the protection of the environment.

II. Integrated watershed development.

II.1. Laos is a resource-rich country, in terms of natural resources in proportion to the population, with high potential for future economic growth.

However, unsustainable resource management practices are beginning to reverse this favorable situation; the fragile mountain ecosystems are severely at risk. For instance, forest cover has declined from 70% to 47% over the last 50 years.

II.2. In order to preserve the natural resources as a basis for Lao People's Democratic Republic's sustainable development and maintenance of the overall system of the natural resources, the integrated watershed management approach was fully endorsed in 2002 by the National Agriculture and Forestry Conference.

II.3. The country is divided into 64 watersheds with 53 watersheds or 91% of the land area drained into the Mekong River and the remaining into Vietnam from Xieng Khuang and Huaphan provinces.

II.4. Eight of case studies or model development representing district and provincial level integrated watershed management plans have been developed nationwide.

II.5. By 2010 integrated water management should have been developed for the whole country at district and provincial levels.

III. Fisheries

III.1. While the Lao are living mostly along rivers, and have their life intertwined with them, fish is one of the main food for the population and accounts for about 42% of animal protein consumed.

III.2. In 2001, fish production amounts 73,100 tonnes and contributes as 7 to 8 % of GDP. The trend is progressing over the years as from 1996 to 2001 capture fisheries as well as aquaculture increased 152% with the production of fish from aquaculture totaling 18,000 tonnes in 1996 up to 43,100 in 2001.

III.3. With the increasing population from 4,7 million people in 1996 to an estimated 8,2 million in 2020, the total demand in fish amounting 48,000 tonnes in 1996 is expected to reach 188,600 tonnes in 2020.

III.4. To meet this demand, increase in production from capture fisheries may not be possible in the spirit of sustainable use, appropriate management

and protection of natural resources including aquatic biodiversity. The only way is the increase in fish production from aquaculture or enhanced fisheries that are still in infancy.

III.5. The Lao Government since 1989 attached priority to develop its fishery resources by seeking funds and know-how to develop technical manpower, fishery infrastructure, credit schemes, processing and cold chain including marketing avenues and by cooperation with regional and international ventures for the sound exploitation and management of its resources in accordance to the “FAO Code of Conduct for Responsible Fisheries.”

III.6. The Government’s policy regarding fisheries products will center around:

- The contribution to food security with more emphasis in supplying more animal protein to the rural area particularly the rural farming communities.
- The contribution to poverty reduction in the sense of getting a complementary source of income.
- Gradual integration of sustainable aquaculture farming into agricultural mixed farming, generating new employment in the sub-sector.
- Supplementary food supplies to the growing urban population by promoting peri-urban semi-intensive aquaculture (pond, cage, pen...) with attention to animal health and good management practices.

IV. Hydropower

IV.1. With 87% of its land area considered as hilly and mountainous, Lao People’s Democratic Republic is endowed with more than 60 “promising” sites for hydropower generation that have been identified on the tributaries of the Mekong River. It has been estimated that the country has a generating potential of 12,000 MW, of which only 930 MW has been developed so far.

IV.2. Steady progression of electricity supplied to the population is noticeable. From 33 MW produced in 1975, the figure reaches 627 MW in 2000. Families benefiting of the use of electricity expand from 5,000 to 293,495 during the same period of time, meaning that 35.8% of the population have access to electricity.

IV.3. While projection for future use of energy is expected to expand, it is obvious that the use of energy per capita and per year which is around 124.23 KW/h/per capita/per year remains the lowest one among ASEAN countries.

IV.4. The bulk of energy originates from hydropower (98%), and only the remaining 2% from other sources such as petrol or solar energy. The State is however not the main producer.

IV.5. Regarding the hydropower sector, the Government's aims are:

- To focus on the production of electricity for internal use, and to reduce imported fuel.
- To support rural development, and to reduce regional power imbalance within the country.
- To encourage private investment in hydropower investment.
- To earn foreign currency for socio-economic development.
- To minimize environmental impacts.
- To develop watershed management.

V. Navigation, transport and river works

V.1. The Mekong River forms the natural artery of Laos and flowing through more Lao territory than other countries in the region, it was a convenient communication facility for peoples living on its shores using traditional means characterized by small volume of merchandises and limited passenger number.

V.2. However, the Mekong River in its Lao section is plagued with dangerous rocks, obstructed with shoals in parts, in most cases barely identified, if not with poor aids to navigation. The solution requires trans-boundary cooperation to pool efforts to harness and exploit the potentialities of the Mekong River for the socio-economic development of the region.

V.3. With the achievement of the Phase 1 in the improvement of the navigational channel and in the setting-up of navigation aids from China's border to the Golden Triangle, the northern reach is increasingly busy. Environmental problems are expanding with the rapid increase of the traffic on the Mekong River, but they are still under control. This northern section will be increasingly used as Road no. 13 is far from the Mekong River, thus the competition between land transport and river transport will not be

detrimental to the navigation as it is for the southern reach between Vientiane and Savannakhet.

V.4. While contributing in the past to the economic development of the country, river transport reveals to be a relatively low-cost infrastructure investment, energy saving with minor pollution, and to decrease heavy land traffic, the Government's strategy regarding navigation is mainly focusing on:

- To maintain current transport capability by river.
- To improve navigation aids and information for travel safety.
- To encourage use of river transport in the wet season instead of poor roads.
- To protect the riverbanks from erosion.

V.5. Efforts have been concentrated for 2002 to 2005 to create new facilities or improve existing ports along the length of the Mekong River. Aids to navigation had been installed from Vientiane up to Paklay.

V.6. Particular trans-boundary setbacks regarding river works are to be noticed. The river's bank protection made on the Thai side along the Mekong River creates severe erosion on the Lao shore, particularly in the provinces of Bokeo, Vientiane, Bolikhamsay, Khammouan, and Vientiane Capital. Construction of ports on Thai shore as well as of road to exploit sand have deep effects by changing the flow direction.

V.7. For the next twenty years, efforts will focus on:

- *Using local materials in the protection of the river's banks.
- *Constructing or improving ports and services according to international standards.
- *Using navigation aids agreed upon by all parties.

VI. Tourism and recreation

VI.1. There has been a very strong growth in the Lao tourism sector since 1990, from only 14,400 international arrivals in 1990 to 735,662 arrivals in

2002. Tourism is now a major contributor to national income (7 to 9 per cent of GDP) and employment.

VI.2. The Lao People's Democratic Republic's tourism strategy favors pro-poor, community-based tourism development, the enhancement of specific tourism-related infrastructure improvements, and sub-regional tourism cooperation. Current activities include: awareness initiatives focusing on tourism benefits and environmental and cultural conservation and enhancement; awareness programmes on prevention of HIV/AIDS, sexual exploitation and trafficking of women, and information on successful regional experiences.

VI.3. Sub-regional co-operation for sustainable tourism is an important aspect of the Government's tourism strategy.

VII. Water supply and sanitation

VII.1. Domestic water and sanitation are essentials for the life, health and productivity of the population.

VII.2. The national production of the existing 36 water treatment plants is 188,380 m³/per day. But the average production is only 157,340 m³/per day supplying water to 525,395 people or 37.67% of the urban population. This means that only 300 liter/per day/per person is provided by these plants. Water supplying people in urban towns and cities originates mostly – about 85% - from the Mekong River and its tributaries, and represents only 0.04% of the annual discharge of the Mekong River.

VII.3. The thrust of the Government's development policy is to increase amenity of life in urban areas by providing affordable, reliable and quality services in commercial water supply and in sanitation.

VII.4. With regard to water supply in rural areas, it is estimated that in 2002, about 60% of the population in rural areas has drinkable water from a public tap, or hand pump or spring. The goal is to reach the figure of 90% by the year 2020, as the Government's development policy is:

- To improve water supply and environmental health in rural areas;
- To focus on inaccessible, poverty-ridden areas; and,
- To encourage private supply and sanitation ventures in easy-to-reach areas.

VII.5. The percentage (41%) of people having access to sanitation is relatively low in 2002. The goal set for 2020 is to significantly improve the situation and raise the figure up to 80%.

VII.6. Waste water is mainly from domestic usage, as only 2.5% of the piped water is used in industrial activities. The average of the dilution of rain and waste water into the Mekong, in Vientiane, is estimated to be 1000:1. The figure of dilution would be 800:1 during the dry season.

VIII. Flood control and management

VIII.1. Most of cities and towns of the Lao People's Democratic Republic lies along the Mekong River and its tributaries, thus prone to flooding during the rainy season.

VIII.2. About 80 percent of the rural flooding and 20 percent of the urban flooding is caused by tributaries. The four major flood prone areas are situated along the mainstream near large tributaries: Vientiane Plain, Thakhek, Savannakhet in sub-area 4L, and Pakse in sub-area 6L.

VIII.3. Since 1990, the Government has provided data to the Mekong River Commission, and cooperated about flood warning.

VIII.4. The network to monitor the hydrological situation was strengthened in two phases, in 1998, and in 1998-2000, with the repairing and establishment of staff gauges.

VIII.5. Dykes to protect against floods, water gates, and diversion canals had been built by the Government's budget, loans and foreign assistance in major cities and towns (Vientiane Capital, Bolikhamsay, Khammouan, Savannakhet, and Champassak) located along the Mekong River.

VIII.6. Development plans for the next twenty years have the following components: (1) Complete the construction and the re-structuration of hydro-meteorological stations along the Mekong River and its tributaries. (2) Achieve the automatic collecting and dispatching of data at the 13 existing stations. (3) Complete the forecast of flooding through GSM mobile phone at Luang Prabang and Pakse. (4) Ensure a nation-wide system of flood

warning. (5) Compile the hydrological and meteorological databases. (6) Water drainage construction plan in Vientiane Capital (2003-2005).

CONCLUSION.

With the headquarters of the Mekong River Commission to be relocated in Vientiane from June 2004 onward, the Lao People's Democratic Republic is strongly supporting national and international efforts to contribute to make the vision for the Mekong River Basin come true as an economically prosperous, socially just and environmentally sound Mekong River Basin.

PART II. SUB-AREA BASELINE STUDY

II.1. Development objectives, plans and policies

II.1.A. Development objectives, plans and policies for sub-area 4L

II.1.A.a. Short term objectives

- 1.To design and present projects for funding.
- 2.To cooperate on the complete implementation of projects which have already been approved and have received assistance.
- 3.To continue to fully structure the economic sectors for the benefit of the ethnic minorities settling down from the mountains, and to reduce poverty of the rural population.
- 4.To create and spread wealth in sub-area 4L.
- 5.To create a suitable environment in sub-area 4L.
6. To fully cooperate with the Mekong River Commission and to promote a long-term cooperation to manage rivers and water resources in the Mekong River basin in the Lao People's Democratic Republic.
- 7.To exploit new sources of raw water to be treated for domestic use as well as for drinkable water.
8. To promote sanitation among the rural population.
9. To reduce the burden for women and children forced to fetch water far from their home.

10.To extend the access of the population to clean water in sufficient quantity and good quality.

II.1.A.b. Long-term objectives

1.To expand the strategic plan of the Lao National Mekong Committee and the Mekong River Commission while adapting it to the reality of the country's development, to reduce poverty, to improve the livelihoods of the population, ad to make the environment sustainable.

2.To expand the ownership and participation of the public in the implementation of the strategic plan of the Lao National Mekong Committee.

3.To strengthen the capability of officials, particularly administrators and planners.

4.To manage the environmental, socio-economic trans-boundary problems.

5.To create favorable conditions for the population of sub-area 4L to eradicate poverty.

6.To reduce mortality and illness originating from raw water as well as to reduce the unhealthy way of life.

7.To eradicate the slash and burn cultivation in general and the opium growing in particular.

II.1.A.c. Policy

The Government has carried out its decentralization policy in order to strengthen the local administration by relying on the sustainable exploitation of the natural resources as well as the protection of the environment and water resources.

Legal documents have already been adopted to help achieve this policy such as the Forestry Law, Water and Water Resources Law, Law on Agriculture, Electricity Law, Environmental Protection Law, Decision on the Decentralization, Decree on the Management of the Economic and Social Plan (2002).

II.1.A.d. Action Plan

-To produce enough foods in order to meet the needs of other sub-areas characterized by chronic deficit.

-To make sub-area 4L the base for commodity production, industrial sector development, and transit service expansion.

-To promote the special economic zone and free trade zone in Savannakhet.

-To propagate the implementation of the policy and plan of the Party, the decisions of the Government aiming at achieving the target of eradicating poverty, such as to eradicate poverty within more than half of the poor families in the targeted 11 poorest districts in sub-area 4L.

-In 2003-2004, to resolutely reduce poverty among 21,495 families, to reduce the slash and burn cultivation of about 3,090 hectares, and the opium growing of about 582 hectares.

-To concentrate on food production, commodity production, and services providing in the large plains for domestic use and for export. Particularly, the struggling targets are:

- Rice production up to 1,545.135 million tonnes (an increase of 13,6%)
- Cultivated surface aims at reaching 407,516.5 hectares (an increase of 7,9%)
- Rice cultivation in the wet season to increase by 9.7%
- Rice cultivation in the dry season to increase by 10.09%
- Slash and burn cultivation to decrease by 16%.

-To create a fund for poverty eradication with resources pooled from various economic sectors.

-To continue to allocate land and forest along with the settling of the population in a fixed places, especially in the targeted areas to eradicate poverty.

-To create infrastructure in the targeted areas to eradicate poverty;

-To improve educational network by increasing the percentage of primary schooling, and the percentage of alphabetization of people over 15 years old.

-To increase the salary of teachers.

- To solve the insufficient number of teacher and the problem of absenteeism.
- To basically improve and expand the health care network in the rural area, particularly in the poorest districts to decrease the death percentage of mother and new-born children.
- In 2005, more than half of rural villages have to have access to drinkable water and current water for domestic use.
- To train local officials as developers for villages and families in the targeted areas to eradicate poverty.
- To consider credit policy, tax policy, and other policies regarding poor families, villages and districts.
- To promote and improve the raising of livestock, husbandry, and vegetables, fruit trees, and industrial trees growing.
- To develop the sub-area 4L to become the hub of economic and social, industrial, and manufacturing development as well as of finance, banking, culture, and media which have to be expanded continuously. Sub-area 4L should become the center of the development of domestic trade and the focal point for North-South, and East-West exchange and transit center.

In particular, taking advantage of the international environment and the characteristics of sub-area 4L, this sub-area has to fully concentrate its own development plan on the following:

7. The priority sectors of development in sub-area 4L are as follows:
 - Agriculture, Irrigation, Hydropower
 - Fishery, Integrated Watershed Management, Tourism and Recreation
 - Clean water for industry and domestic use
 - Flood control and management
 - River works and navigation
8. Development of sub-area 4L has to be continuous, effective, and strong, while striking a balance between the economic growth, the cultural and social development, and the protection of sustainable environment.

9. Development has to be balanced between economic and social sectors, and between various parts and sectors of sub-areas 4L, between provinces, and between cities and rural areas, by giving a strong impetus to private economic sector and production of the population, while aiming at efficiently using natural resources, water resources, and human assets for such achievements, thus guaranteeing the fair and just distribution of profit.
10. Economic and social development has to go along with the strengthening of institutions and organizations, the increase of solidarity and national unity, the expansion of people's democracy under the leadership of the party.
11. While relying on the assets and endowments of sub-area 4L, to skillfully take opportunity of the era to tailor for this sub-area a significant role by threading relations and fostering the cooperation, within its own jurisdiction, with the Mekong River Commission.
12. Economic and social development must be closely intertwined with the protection of water resources and environment.

In the future implementation of the plan regarding the sub-area 4L, the slash and burn cultivation has to be drastically eradicated, the opium and marijuana growing has to be stopped, projects to grow foodstuffs, commodity production, poultry, fishery in the plains of Vientiane, Bolikhamsay, Se Bang Fay (Khammouan Province), Se Bang Hieng (Savannakhet Province) have to be strongly encouraged and supported.

II.1.B. Development objectives, plans and policies for each of the seven constituencies of sub-area 4L

II.1.B.a. Vientiane Capital

Objectives set by the Five Year Plan for Vientiane capital are:

- Growth of 8 to 10% per year
- Budget of 3,247 billion kips
- And from 2006 forward, resources must be enough to be allocated for development and poverty eradication, and to make Vientiane Capital one among the attractive cities in the region, with a modern economic structure
- Food self-sufficiency
- Produce rice as commodity product.

- Poverty reduction for more than 60%
- To end the slash and burn by the year 2002.

II.1.B.b. Vientiane Province

Endowed with many assets, the struggling targets of the Five Year Plan for the province are:

- Growth of 7% per year
- Reduction in the number of poor families down to less than 50%
- Continuation of the land and forest allocation for the people to use and manage
- End of the slash and burn cultivation by the year 2005
- Organization of the fixed settlement for at least 5,400 families who practice the slash and burn cultivation.

II.1.B.c. Bolikhamsay Province

Located in the middle of the country with its network of roads, its large plain suitable for agriculture, and an infrastructure that can sustain the expansion of production such as the network of roads, hydroelectricity, and irrigation. Furthermore, the province is endowed with natural resources such as forest, rivers, minerals, tourist sites, etc.

The Five Year Plan set targets as follows:

- 13% of annual GDP growth
- Solve poverty within 80% of total family in the province
- Increased annual budget of 15%
- Self-sufficiency in food, especially rice
- Manage and allocate land and forest for the people to take care of and use in order to make a sustainable living, this has to be achieved in 2003
- End the slash and burn cultivation by the year 2005
- End opium and marijuana growing by the year 2003

II.1.B.d. Khammouan Province

With its nature suitable for agriculture and livestock raising, and mineral resources, as well as many rivers, Khammouan Province has its Five Year Plan's targets set as follows:

- 7% annual GDP growth, equivalent to 912.71 billion kips
- Solve poverty within 80% of total family in the province
- Increased annual budget of 15%
- Investment would amount to 5% of GDP
- In 2005, the GDP per capita should be US\$ 450 to 500/per capita/per year
- Solve poverty within 82% of total family in the province
- End slash and burn cultivation by the year 2003

II.1.B.e. Savannakhet Province

Rich in natural resources, particularly minerals which need to be exploited to sustain the socio-economic development, agricultural and forestry assets, industrial, service, transit, Savannakhet Province has its Five Year Plan's targets set as follows:

- 10 to 11% economic growth per year
- 614,790 tonnes of paddy production
- Budget increase/per year by 13 to 15%
- Commodity production increase by 10% per year
- Eradicate famine by 100%
- Reduction of poverty of more than 50% of the presently poor families
- End the slash and burn cultivation by the year 2003

II.1.B.f. Xieng Khuang

By implementing the National plan of poverty eradication, changing the subsistence economy into a regulated commodity production, and developing the human resources, the province has set targets for 2001-2005 as follows:

- The province is burdened with 80% of poor families. It is expected that in 2005, this percentage will be only 10 to 15%
- Create at least two places of fully integrated rural development at Papa-Vangboi, and Khet Mork.
- The province has to reach a balanced budget in 2003 with a revenue of 116.6 billion kips, or 7,8% of GDP.
- Growth of GDP of 7 to 8%, or amounting 355.4 billion kips in 2005.
- Sector growth in 2005: agriculture: 40-50%; industry: 20-25%; service: 30-35%.

II.1.B.g. Saysomboun Special Zone

With its dense forests, and its climate, suitable for forestry, husbandry, and to grow some commodity production, and collect forest products such as rattan, cardamom, and many medicinal plants, Saysomboun Special Zone's Five Year Plan's set targets are:

- 7% annual GDP growth per year
- Food self-sufficiency with 356 kilo of rice per capita
- Increase cultivated surface up to 5,000 or 5,500 hectares
- End basically the slash and burn cultivation
- End absolutely the opium growing

II.2. Institutional capacity

II.2.A. Historical context of State administration

Over three decades, local governments in Laos have seen their traditional status of being fairly independent entities first restricted by the attempts of the new political regime to put into place a centrally planned economy in 1975. They were then encouraged to achieve provincial self-sufficiency in food supplies (late 1970s) and to evolve, after 1986, towards a situation of administrative and financial autonomy at the provincial level. The Constitution of 1991 promulgated a drastic reform of central-local

relationships in which the principle of a unified de-concentrated state organization was enshrined.

The Constitution of 1991 abolished the Tasseng (commune) level of administration, thus bringing villages under the direct authority of districts. This created the current three tier local administration: villages, districts and the provinces. The rationale was to improve direct public service delivery by removing the intermediary tier.

Recent policies (March 2000) aim for a selective and progressive transfer of responsibilities back to the local administrations. These policies establish the provinces as the strategic development units, the districts as the main planning and budgeting units, and the villages as the main implementation units for the government's policies.

The government intends to use these decentralization policies to make the best use of available resources to further strengthen its participatory approach to poverty alleviation. Building the provinces into strategic units means that these units have to formulate their own socio-economic Five Year and annual plans as well as devise and implement their corresponding budgets. The provinces also have been granted indirect control over those projects which are under the direct supervision of the central government, but which are executed at the provincial level. Districts now have to define their five-year and annual socio-economic development plans, within the scope of their responsibilities as defined by the State. Villages are to become the implementation units; they need to formulate their own development and revenue collection plans, based on the individual plans of each family.

This recent decentralization policy aims to put more emphasis on the bottom-up process, through increased focus on the village and district levels. The purpose is to strengthen capacities to improve local development planning in order to ensure that government action and local projects are in line with local needs.

II.2.B. Assessment of local administration

Sub-area 4L is made up of 54 districts, 2433 villages, and 84,239 families, with a total population of 2,318,900 people, including 1,169,400 female. The population density is about 27 people/km².

However, in light of both the history of state administration and serious shortages of resources, the public administration capacities at both the central and local levels continue to be weak with greater demands being placed on them.

Coordination does barely exist between the various parts of sub-area 4L as well as with other sub-areas regarding planning and sharing vision. Generally, the capacities of human resources are low. Planning and coordination are weak, due to a lack of appropriate and quality information for decision-making. Lack of experience and skills is obvious in the balanced use of natural resources with the protection of water resources and environment, macro-economic management. Lack of budget and adequate method is noticeable in the development of irrigated agriculture, tourism services, industry, etc. While receiving assistance from the Government budget as well as from foreign aids for the implementation of plans and projects, but it appears that the skills in coordination need to be upgraded. Lack of professionals, managers of projects can be remedied by an in-country training.

But, sub-area 4L would appear to be privileged at some point as Vientiane Capital, is the siege of the Government and of the Party, and at certain period of the history, had been the exclusive recipient of foreign assistance. Further south, Savannakhet appears as the second largest city of Laos and has often been especially taken care by the Government and the Party. This explains the exceptional feature of Vientiane Capital and Savannakhet Province.

II.3. Socio-economic description and information on resource users

II.3.A. Human geography

Sub-area 4L reflects the main nation-wide ethnic feature composed of three major ethnic groups as follows: Lao Loum (75.9%), Lao Theung (15.7%), Lao Soung (5.9%), and foreigners (1.5%).

However, when considering the detailed breakdown the view would be as follows as there are four major ethno-linguistic families in the country, namely, Tai-Kadai, Mon-Khmer (Austroasiatic), Hmong-Mien, and Tibeto-Burmese. If non Tai-Kadai people are defined as “ethnic minority”, its share in population by province is shown as follows:

ETHNIC MINORITY PERCENTAGES BY PROVINCES

Province	Population (1997) (000)	Minority (%)
Vientiane Capital	555.1	7.4
Vientiane Province	303.5	59.8
Bolikhamsay	173.3	59.8
Khammouan	288.6	46.6
Savannakhet	711.5	42.5
Saysomboun	57.3	80.6
Xieng Khuang	212.5	55.7
Sub-total for sub-area 4L	2,301.8	52.57
COUNTRY	4,905.9	61.21

Source: Extract from Japan International Development Agency and Ministry of Agriculture and Forestry 2001, vol. III, p. AP15-3

Ethnic diversity is less accentuated than in sub-area 1L for instance. However agriculture production system and food security are influenced more by natural resource bases than by ethnicity. But, when it comes to specific project activities that are designed through village-based planning, the special needs and activities of different ethnic group will arise during bottom-up process.

II.3.B. Poverty.

Among them, 74,711 families are considered as poor in 11 poorest districts over a total of 47 poorest districts in the country, or 19.3%.

Nearly 80% of the population of sub-area 4L is mostly making living in agricultural sector while agricultural production is evolving from subsistence farming to a burgeoning commodity production. The base of the national economy which has been expanded, but is not strong enough, capital formation is still slow, the development of market while taking form is not wide enough, the efficiency of social work is still low, market economy has taking place in major towns and cities, as well as in areas linked by infrastructure. Science and technology, the educational system, health service are still dragging behind and slowly evolving; the multi-ethnic

people, for some part are still following practices which are adverse to modernization.

Development gap between towns and rural areas are still large, between remote areas and provinces, and among various social strata.

Business activities and development and environmental protection are still in infancy.

II.3.C. Users

II.3.C.a. Water users

- The figure of those having access to clean water is one of the lowest in the region while the production capacity of water treatment plants are stretched to the limit.
- Industrial use of water is still limited with the low level of the development of the country. However, mining activities is increasing and will impact on the water use, as well as environment.
- Hydropower plants are limited in number and all located on tributaries of the Mekong River.
- Association and groups of irrigation users have been set up, but management capacity, maintenance skills are still in need. Water User's Association (786 in sub-area 4L over a national total of 1,676) is a formal farmer organization and a communal organization, governed by a steering committee representing the village in the irrigation scheme and operates the irrigation scheme. Water User's Groups (28 in sub-area 4L over a national total of 30) are established under the directive of Department of Irrigation for the operation and maintenance of the irrigation scheme; it is a village driven organization chaired by the chief or the deputy chief of the village. The unusually high number of Water User's Groups of 28 over 30 in sub-area 4L is meaningful regarding the awareness toward a better management of irrigation at village level.

- Fishery is still in infancy, and water used for this purpose is not unbearable.
- Associations of river navigation are numerous and active in many parts of Laos.

II.3.C.b. Land users:

In order to improve the livelihoods as well as to sustain the environment, those practicing slash and burn cultivation have to resettle in the allocated land and forest areas according to the general plan as follows for sub-area 4L:

PLAN FOR THE REDUCTION OF SHIFTING CULTIVATION AREA, 2000-2010

Provinces	Area remaining by year-hectares						
	2000	2001	2002	2003	2004	2005	2010
Vientiane Capital	0	0	0	0	0	0	0
Xiengkhouang	8,700	7,000	5,600	4,000	3,500	2,600	0
Saisomboun	2,000	1,600	1,200	800	500	0	0
Vientiane	2,200	1,300	1,000	800	500	0	0
Bolikhamsay	3,600	2,900	2,000	1,500	1,200	0	0
Khammouan	1,400	1,000	800	600	200	0	0
Savannakhet	3,800	2,100	1,800	1,200	800	0	0
Sub-total sub-area 4L	21,700	15,900	12,400	8,900	6,700	2,600	0
Nation-wide total	118,900	93,900	74,000	60,100	42,600	29,400	0
Nation-wide annual reduction		25,000	19,900	13,900	17,500	13,200	0

Source: Japan International Cooperation Agency and Ministry of Agriculture and Forestry 2001, vol. III, p. AP8-4

However, as a study states that in the past upland cropping was mostly in a long (15-20 year) swidden/bush fallow rotation with areas regenerated fully of secondary forest before the next cropping phase. “Whilst the majority of upland families now have been allocated land, they have been unable to adapt their farming systems as rapidly as their access to land has decreased. As a result they have not maintained productivity and living standards under the shortened fallow regimes. It is evident that many upland farmers are now caught in this vicious circle of decreasing production and increasing poverty. Therefore many families are forced to continue swidden rotations on un-recorded greater areas than they are allocated” (Japan International Cooperation Agency and Ministry of Agriculture and Forestry, vol. III, p. AP8-4).

In sub-area 4L, National Biodiversity Conservation Areas are currently facing a significant threat from shifting cultivation such as: Phou Phanang (Vientiane Capital, Vientiane Province), Nam Kading (Bolikhamsay Province), Dong Phou Vieng (Savannakhet Province), Nakai-Nam Theun (Khammouan and Bolikhamsay Provinces), Phou Hin Poun (Khammouan Province) (Japan International Cooperation Agency and Ministry of Agriculture and Forestry 2001, vol. II, p. SC-10)

II.3.C.c. Hydropower users

Electricity users are factories in sub-area 4L and numbering 11,710 with 98 large factories, 351 of medium scale and 11,261 of small scale. These factories constitute the base for the socio-economic development. Other users are private, and villages having access to electricity in sub-area 4L total 1,725 or 45.02% of the total villages of sub-area 4L.

II.4. Inventory of physical features and water resources

II.4.A. Land.

Land in general is apt for agriculture, especially to grow rice, livestock, and short-term or long-term production of commodities. Many high-graded minerals are conveniently exploitable such as iron ore, gold, silver, lignite.

II.4.B. Forests.

Sub-area 4L has 4,333,500 hectares of forest cover, or 54.23% of the surface of sub-area 4L. In general forests are perched in mountains which are also the source of many rivers and streams tributaries of the Mekong River such as: Nam Ngum (Vientiane Province), Nam Mang, Nam Ngiep, Nam San, Nam Kading (Bolikhamsay Province), Nam Se bang Hieng (Savannakhet),

Six of the twenty National Biodiversity Conservation Area of the country are in the sub-area:

NATIONAL BIODIVERSITY CONSERVATION AREA IN SUB-AREA 4L

	Name of National Diversity Conservation Area	Area (hectares)	Provinces
1	Phou Khao Khouay	200,000	Vientiane Vientiane Capital Bolikhamsay
2	Phou Phanang	70,000	Vientiane Vientiane Capital
3	Nam Kading	160,000	Bolikhamsay
4	Nakai-Nam Theun	353,200	Khammouan
5	Phou Hinboun	150,000	Khammouan
6	Phou Sang He	109,000	Savannakhet

Precious woods and pristine forests can be found in these conservation areas while pine trees exist in the provinces of Vientiane, Bolikhamsay, Khammouan and Special Zone Saysomboun.

To preserve forest covers, and to end the slash and burn cultivation, the Government has resettled families by allocating land and forest to them.

LAND AND FOREST ALLOCATION, 1999-2001

Provinces	No. of families			No. of villages			Areas (hectares)		
	1999	2000	2001	1999	2000	2001	1999	2000	2001

Vientiane Capital	11,950			108			11,592		
Xiengkhuang	2,386	925		43	17			174,092	
Vientiane Province	6,230	693	3,486	37	60	59	72,541	71,701	155,720
Bolikhamsay	6,340	2,764		113	64		155,811	84,018	32,445
Khammouan	41	1,012	3,624	1	30	20	7,235		61,322
Savannakhet	563	131	159	18	35	23	21,352	30,647	88,543
Saysomboun		371	1,051		30	129			
Sub total sub-area 4L	21,170	5,896	8,320	320	236	231	268,531	360,458	338,030
Country	42,400	21,789	29,361	587	555	508	906,720	820,545	935,545

Source: National Agriculture and Forestry Extension Service, Department of Forestry, Ministry of Agriculture and Forestry, 2001

II.4.C. Water resources

Many important tributaries of the Mekong River have their sources in the mountains of sub-area 4L or run through sub-area 4L.

II.4.C.1. Vientiane Province

a. Mekong River's tributaries.

a.1. Nam Ngum. Tributary of Mekong River, Nam Ngum can be divided into two stretches: upstream section, and downstream one.

The upper stretch of Nam Ngum starts from its source in Xieng Khuang Province, to dwindle through Saysomboun, Longsan District, to be harnessed by the hydropower dam.

The downstream stretch begins with the Nam Ngum dam when the river crosses Muang Keo Oudom, Muang Thoulakhom to join the Mekong at Ban Park Hay with 264 km across Vientiane Province.

a.2. Nam Feuang. A tributary of the Mekong River has its source at the mountainous range of Ban Pha Ka, to then join the stream Houay Tang Nay, crossing Ban Houai Yon, Ban Nam Feuang and finally emptying in the

Mekong River. Human settlements clutched along this tributary, and agriculture is practiced and navigation is frequent.

a.3. Nam Maed. This Mekong River tributary is formed by a junction of many streams at Muang Kansi to then cross nine to ten villages before joining the Mekong River. Besides allowing people to make a living out of it, this river is used for navigation purpose.

a.4. Nam Mi. With its source at Muang Maed, it crosses through Muang Sanakham to join the Mekong River at Ban Park Mi. Agriculture is thriving along this river.

b. Non-tributaries of the Mekong River.

b.1. Nam Lik, a tributary of Nam Ngum has its source formed by a junction of many streams at Muang Kasi such as: Nam Kai, Nam Ken, Huay Sana, Huay Phouk, and many other camlets. Nam Lik crosses Muang Kasi, Muang Feuang, Muang Hin Heub, and joins Nam Ngum at Ban Thin Keo, Muang Keo Oudom, and crosses for a length of 243km Vientiane Province.

An important tributary of Nam Lik is Nam Song with its source located at the mountainous range of Keokouang Thin Oon, crossing the area of Pha Tang, to then run along the Road No. 13 in the north and Muang Vang Vieng. A dam has been built to divert water to Nam Ngum Basin. After the Nam Ngum dam, Nam Song crosses Muang Hinheub to join Nam Lik at Ban Choudsong, Muang Hinheub. Its length is 126 km.

Nam Tong, another tributary of Nam Lik is formed by many streams joining at Nakhob Phonkham, Muang Feuang. It is an important river of the district of Muang Feuang and many villages can be seen along its shores, to then join Nam Lik. In 2001, the Tong Reservoir Project has been developed.

b.2. Nam Cheng is a tributary of Nam Ngum, sourcing from the peak of Ngot Cheng in the mountainous range of Phou Phanang, flowing through Phon Hong and Muang Viengkham plains, and joins Nam Ngum at Tha Phosay, Muang Viengkham. A water gate has been set up near the mouth of Nam Cheng to retain water for agricultural use within Muang Viengkham plain.

b.3. Nam Ngam, another tributary of Nam Ngum, is formed by the junction of two rivers, Nam Thon and Nam Hongpheng, running down from Phou Khao Khouay and with many canals altogether crossing through Muang Thoulakhom and various villages, to join Nam Ngum in the area of Na Koug, Muang Saythany, Vientiane Capital.

b.4. Nam Yang or Nam Mang, a tributary of Nam Leuk, has its source located in the mountainous range of Kao Nang and the mountainous range of Phou Khaokhouay to run down to Nam Leuk where a dam has been built up, and the water will be used for agricultural purpose in the area of Ban Napheng, Muang Thoulakhom.

b.5. Nam San is formed by the junction of Houay Sala and Nam Pang, and this river crosses Muang Longsan, and joins Nam Ngum at Ban Thamdin.

II.4.C.2. Vientiane Capital

Three rivers cross the territory of the Lao capital: Nam Ngum, Nam Sang and Nam Ton.

II.4.C.3. Bolikhamsay Province

This province has Nam Hi, Nam Mang, Nam Leuk, Nam Lo, Nam Ching, Nam Kab, Nam Thoai, Nam Ngiep, Nam San, Nam Kading, Nam deua, Nam Khou, and Nam Thon.

II.4.C.4. Khammouan Province

Nam Se Bang Fay, Nam Theun, Nam Pakan, Nam Hinboun, and Nam Ngom constitute the main rivers of Khammouan Province.

II.4.C.5. Savannakhet Province

Among the many water resources this province is endowed, two are the most important. The first one, Se Bang Hieng, crosses the area of Muang Nong and Muang Sepone, with its tributary Selanong. After Muang Sepone, are Se Bang Hieng's tributaries: Nam Sekong and Nam Sepone. After it crosses through Muang Tha Pangthong, Muang Sonbouly, and Muang Songkhon, are its tributaries: Se Sangsoy, Se Champhone, Se Bangmouan.

The second important river of Savannakhet Province is Se Bang Fay with its tributary Se Noy. Se Bang Fay crosses Muang Nayom of Muang Vilabouly, Muang Adsaphone.

II.4.C.6. Saysomboun Special Zone

Nam Ngum River takes its source in Xieng Khuang, to then cross Saysomboun, and Vientiane Province. Its catchment area is 416,790km², and its length is 438 km, with 100 km through Saysomboun. Nam Ngum's tributaries are Nam Ja, Nam Mo, Nam Meuy where hydropower can be produced as well as irrigation schemes be constructed.

Nam Ngiep with its sources located in Xieng Khuang and its length through Saysomboun, to end in Bolikhamsay Province has a catchment area of 4,490km², and a length of 185 km. Its length through Saysomboun is 55 km.

Nam San coming from Xieng Khuang, and crosses Saysomboun to end in Bolikhamsay Province. Its catchment area is 2,220 km², its length 157 km, including 40 km in Saysomboun Special Zone. Nam San's most important tributaries are: Nam Pheuak, Nam Tay, and Nam Yae where hydropower and irrigation schemes can be built.

Other small streams exist in sub-area 4L and can be used for small or medium scale hydropower plants as well as for irrigation schemes for the dry season and wet season to service agriculture and forestry. Irrigation schemes numbered 4,390 that can service 164,713 hectares in the wet season and 116,007 hectares in the dry season.

II.5. Economic sectors

II.5.A. Irrigated agriculture

The construction of 4,390 irrigation schemes in sub-area 4L originates from governmental budget, private funds, foreign assistance, and loans from overseas.

Irrigation is of many categories: 127 dams, 75 reservoirs, 746 pumps, 41 gates and dykes, 3,361 weirs, and 1383 gabions.

Cultivated area amounts 280,720 hectares, with 164,713 during the rainy season, and 116,007 in the dry season.

**IRRIGATED SURFACE BY PROVINCE IN SUB-AREA 4L
2002-2003**

Provinces	Irrigated surface (hectares)		Irrigated surface (hectares)	
	2002		2003	
	Wet season	Dry season	Wet season	Dry season
Vientiane Capital	42,480	36,729	42,510	36,732
Xieng Khuang	12,226	2,698	12,229	2,701
Vientiane	36,698	28,881	36,438	28,838
Bolikhamstay	20,812	15,630	20,807	15,625
Khammouan	23,435	15,431	23,420	15,431
Savannakhet	48,644	15,431	49,726	35,777
Saysomboun	2,547	355	2,514	375
Sub-total sub-area 4L	186,842	99,724	187,644	135,479
Sub-total sub-area 1L	57,778	29,333	60,193	29,402
Sub-total sub-area 6L	56,020	46,160	56,025	46,165
Sub-total sub-area 7L	6,458	3,789	6,308	4,786
COUNTRY	307,097	214,625	310,171	214,832

II.4. Features of irrigation schemes.

Most of the irrigation schemes located in the upland and mountainous areas of Saysomboun are of small size (less than 100 ha), and are not made in concrete, but with natural materials carried out by the population using woods, logs, or rocks, thus the name of “primitive weirs” or “people’s community’s weirs”. They are temporary and last one year, and subjected to erosion, embankment.

Of the 800,000 hectares cultivated, only a small portion is benefiting of irrigation and mostly located along the Mekong River and its tributaries (Vientiane Capital, Provinces of Vientiane, Bolikhamsay, Khammouan, Savannakhet in sub-area 4L) with water provided by individual pumps or pumping stations using electricity or petrol. Medium (101 to 1,000 ha) or large (more than 1,000 ha) scale irrigation schemes can be found in these provinces. The pumping stations needs to be maintained, improved, and even canals and ditches need to be under constant maintenance.

Potentialities remain vast, but to exploit them fully, old problems have to be solved first such as the pumping stations or individual pumps, maintenance, and management.

As the Government sets the target to produce 2.5 millions tonnes of rice in 2005, 3.5 millions tonnes of rice in 2010 and 5.2 millions in 2020, priority in expanding irrigation and surface irrigated is significant. Furthermore, irrigation is needed to help decreasing the slash and burn cultivation which has to be ended by 2010, to cease opium cultivation, and to make central and southern Laos as base for commodity production.

PROJECTION OF CULTIVATED AREAS ALONG THE MEKONG RIVER AND ITS TRIBUTARIES (2005-2010)

Unit: hectare

Plains along the Mekong River and its tributaries	Year 2005		Year 2010	
Vientiane	Irrigated ricefield	85,604	Irrigated ricefield	45,175
	Regular ricefield	72,889	Regular ricefield	86,090
	Non-rice crops	13,055	Non-rice crops	16,365
Bolikhamsai	Irrigated ricefield	25,000	Irrigated ricefield	30,000
	Regular ricefield	30,000	Regular ricefield	40,000
	Non-rice crops	8,500	Non-rice crops	8,500

Khammouan	Irrigated ricefield	8,200	Irrigated ricefield	14,000
	Regular ricefield	20,800	Regular ricefield	22,500
	Non-rice crops	2,500	Non-rice crops	4,700
Savannakhet	Irrigated ricefield	37,700	Irrigated ricefield	49,000
	Regular ricefield	99,320	Regular ricefield	104,000
	Non-rice crops	16,350	Non-rice crops	20,650

In the meantime, the Government has to promote and to support small-scale irrigation project initiated or practiced by families or communities, to foster the participation of farmers and private sector in the irrigation development, and to secure the socio-economic development as well as the protection of the environment.

II.5.B. Fisheries

In 2001, fish production nationally amounts 73,100 tonnes and contributes as 7 to 8 % of GDP. The trend is progressing over the years as from 1996 to 2001 capture fisheries as well as aquaculture increased 152% with the production of fish from aquaculture totaling 18,000 tonnes in 1996 up to 43,100 in 2001. Inland fisheries and its production come from the Mekong River and its tributaries, reservoirs, fallow irrigation and small reservoirs, swamps and wetlands for capture fisheries. Aquaculture is practiced in fish ponds, fish production cum rice in rice fields, rain-fed rice fields and irrigated rice fields, small natural pool oxbows, and irrigation weirs, cage culture.

TOTAL AREAS FOR FISH PRODUCTION BY PROVINCE, 2002

Unit: hectare

Provinces	Mekong and tributaries	Reservoirs	Irrigation canals	Swamps and wetlands	Rain-fed rice-fields	Fish production cum rice culture	Fish ponds	Dykes	Cage	Total
Vientiane Capital	x	1600	1500	8700	51155	170	3288	2600	1150	70163

Xieng Khuang	-	0	283	810	28000	1475	1183	130	0	31881
Vientiane	x	57025	1453	1665	41655	220	1537	1800	1020	106375
Bolikhamstay	x	1050	1233	15850	25055	40	150	3271	950	47599
Khammouan	x	6770	1500	8250	56155	50	100	400	1000	74225
Savannakhet	x	2060	3500	12150	101155	150	2225	1200	870	123310
Saysomboun	-	0	270	101	450	30	20	520	0	1391
Sub-total sub-area 4L		68505	9739	47526	303625	2135	8503	9921	4990	454944
COUNTRY	254150									254150
	254150	78018	13476	95686	477176	3500	15300	12934	5100	955331

Up till recently, policy and information relating to fisheries were sketchy, and limited to directives sent to administrative authorities to protect natural fauna, to disseminate to the population information on setbacks resulting from the use of dangerous and illegal devices to catch fishes. It was only in 1989 that a decree no. 118, dated 5/10/1989, regarding the Management, and Protection of Fauna was issued. However, it is only within the area of Nam Ngum that management of fisheries has been organized with the assistance of the Mekong River Commission, The Netherlands, Switzerland, and Denmark. During 1990-2000, development in cooperation on this issue is noticeable with assistance from international organizations, particular countries, as well as neighboring countries. This assistance allowed the listing, the synthesis, the physio-biological study of resources, the survey, the socio-economic study, extension of relevant information to communities, and the setting up of Living Aquatic Resource Research Center (LARReC). Since then, the focus on the issue of fisheries has grown in importance with a supporting policy, market demand, as well as the transfer of technology, especially in fingerling production mostly in sub-area 4L.

STATUS OF STATIONS FOR FINGERLING PRODUCTION (2001)

	Provinces	Stations for fingerling production		Fingerling production (millions)	Remarks
		State	Private		
1	Vientiane Capital	1.Nong Teng 2.Nong Hay 3.Huay Son 4.Nam Houm 5.Nam Suang		21.5 10 2.5 5.3 2.2	Operating

			1.Thā Ngon 2.Saengsavang- phanpa 3.Vansi 4.Khamsing 5.Km. 42	15.5 20.5 10 7.1 15.5	
2	Xieng Khuang	1.Khangpho 2.Longpiu 3.Ban Nam Mo		6.5 1.5	Operating On proposal
3	Vientiane	1.Km 61 2.Muang Kasi	1.Km 62 (Vanid) 2.Km 63 (Lao-Viet)	4.5 2.2	Under construction Under construction
4	Bolikhamsay	1. Tha Dork Khun			Under construction
5	Khammouan	1.Km 4 2.Vang Phi (Se Bang Fay)		4.3	Operating Under construction
6	Savannakhet	1.Pak Bo 2.Muang Sepon		6.7	Operating Under construction
7	Saysomboun Special Zone	1. Muang Saysombun			On proposal
Sub-total sub-area 4L		16	7	135.8	
COUNTRY		32	13	185.02	

II.5.D. Hydropower

Electricity users are factories in sub-area 4L which numbering 11,710 with 98 large factories, 351 of medium scale and 11,261 of small scale. These factories constitute the base for the socio-economic development. Other users are private, and villages having access to electricity in sub-area 4L total 1,725 or 45.02% of the total villages of sub-area 4L.

NUMBER OF FACTORIES IN SUB-AREA 4L, 2001

Provinces	Large scale factory >99 workers	Medium scale factory with 10 to 99 workers	Small scale factory <10 workers
Bolikhamsay	5	34	1520
Khammuan	19	25	1809
Savannakhet	10	57	2316
Saysomboun		2	161
Vientiane Capital	62	157	1750
Vientiane Province	2	65	2675
Xieng Khuang		11	1030
Sub-total sub-area 4L	98	351	11261
Country	116	542	23651

Existing hydropower plants, mostly in Bolikhamsay Province, produce enough electricity to meet internal demands and have to export most of the production. The problem is of insufficient power grid to connect provinces without hydroelectricity and those who have. In 2004, Laos exports 360 MW of power per year to Thailand. Laos normally buys 35 MW from Thailand to supply some provinces where the national power grid does not reach. The power will be used to supply Lan Xang Minerals limited which is mining gold and copper in Vilabouly, Savannakhet Province. Laos sells power for US3 cents per kW/h and buys it at US6 cents (Vientiane Times March 1, 2004, p. 9).

EXISTING POWER PLANTS IN SUB-AREA 4L

Plant Name	Province	Installed capacity (MW)	Average energy (GWh)	Commissioning
Nam Ngum 1	Vientiane	150	998	1971-1978, 1984
Nam Phao	Bolikhamsay	1.6	7	1995
Theun Hinboun	Bolikhamsay	210	1,620	1998
Nam Leuk	Bolikhamsay	60	230	2000
TOTAL		421.6	2,855	

A number of hydroelectricity schemes have been planned with various results for the sub-area, but internal consumption is limited.

STATUS OF HYDROPOWER PROJECTS IN SUB-AREA 4L

Provinces	Projects	Energy to be produced (MW)	Year of signature of MOU	Status
Xieng Khuang	Nam Ngiep2-3	495	1995	Cancelled
Xieng Khuang	Nam Ngiu	30	2003	Lao private company
Vientiane Province	Nam Ngum 2	615	1991	Postponed
Vientiane Province	Nam Mang 3	40	1994	In construction by EDL
Vientiane Province	Nam Lik	100	1994	Cancelled
Bolikhamsay	Nam Ngiep 1	440	1991	Reconsidered with a new MOU signed on 9/5/2003
Bolikhamsay	Theun-Hinboun	210	1993	In operation
Bolikhamsay	Nam Theun 1	540	1994	Postponed
Khammouan	Nam Theun 2	681	1994	In construction
Saysomboun	Nam Ja 1	115	1994	Cancelled
Saysomboun	Nam Ja 2	70	1994	Cancelled
Saysomboun	Nam Bak 2B	150	2002	Replace Nam Ja 1 and 2

Ten over twelve projects have been designed before the Asian financial crisis of 1997, and have been delayed or cancelled due to this crisis. The situation picks up again in 2002 private companies as investors, Independent Power Producer.

HYDROPOWER DEVELOPMENT PLAN (2004-2010) IN SUB-AREA 4L

No.	Projects	Installed capacity (MW)	Average energy/year (GWh)	Commissioning
1	Nam Mang (Vientiane Province)	35	133.5	2002-2004
2	Nam Ngum 5 (Xieng Khuang)	100	430	2005-2007
3	Nam Theun 2 (Khammmouan)	75	275	2004-2007

In its strategy for the year 2020, the Ministry of Industry and Handicrafts plans to construct 15 dams for hydropower plants on the tributaries of the Mekong. It is set 6,000MW as the targeted amount of electrical power to be generated by 2020. Surveys concluded that Laos has the capacity to produce electrical power totaling 23,000 MW, of which 13,000MW would come from tributaries of the Mekong River itself and 2,000 from other sources such as lignite and dams on rivers that were not branches of the Mekong. Electricity plants on the Mekong River will be the last option.

II.5.E. NAVIGATION AND RIVER WORKS

II.5.E.a. Navigation

Technically, the Mekong River in Laos is divided from the upstream end to the downstream end into six reaches with two situated in sub-area 4L. Vientiane-Savannakhet section is convenient for transportation, and the maximum weight comparing with other sections of the Mekong in Laos is transported in this section.

The Mekong length in sub-area 4L between Vientiane and Savannakhet is 459 km with four significant ports: Port at km4, Thakhek, Keng Kabao and Savannakhet.

The competition between land transport and river transport is detrimental to the navigation for the section between Vientiane and Savannakhet.

The Vientiane-Savannakhet section was the busiest before the strengthening of the road linking the two cities, particularly during the rainy season. Even with this road, the transport of bulk commodities on the Mekong River on this section is still significant as the dealt volume to-fro Vientiane and Savannakhet covers 52 to 71% of the total volume carried on boats in Laos. However, the volume is steadily decreasing with the roads constructed along the Mekong River and bridges in Vientiane, (and Pakse in sub-area 6L). This decreases the environmental impact of the navigation too.

The Savannakhet-Pakse section is unusable in the dry season as the shallow water averts any navigation. During the rainy season, the capacity to transport is the lowest comparing to other sections of the Mekong River.

The navigation on the Mekong River's tributaries is inconvenient. Small volume can be transported within the fifty kilometers from the junction with the Mekong River.

NAVIGATION ON THE MEKONG RIVER'S TRIBUTARIES IN SUB-AREA 4L

Tributaries	Length (km)	Boat capacity (tonnes)	
		Dry season	Rainy season
Nam Ngum	400	1.0	3.0
Nam San	260	0.2	1.0
Nam Kading	294	1.0	2.0
Se Bang Fay	230	0.2	5.0
Se Bang Hieng	332	0.5	1.0

Of the 15 ports servicing the navigation, nine are located in sub-area 4L, while the construction of seven new ports, all in sub-area 1L in the north of the country, is planned.

EXISTING DOMESTIC PORTS IN SUB-AREA 4L

Province	Port name	Distance from Vientiane (Km)
Vientiane Province	Sanakham	133
	Vang Village	89
Vientiane Capital	Kaoliao	15
	Km4	4
	Tha Deua	36
Bolikhamsay	Paksan	188
Khammouan	Khammouan	316
Savannakhet	Kengkabao	432
	Savannakhet	458

About 52 up to 71 % of volume of merchandises are dealt by Vientiane Port as well as Savannakhet Port, and only 29-48% by the remaining ports in the country. Boat capacity is only 30 tonnes during the dry season, to then

increase to 300 tonnes during the rainy season while on the downstream stretch of 256 km from Savannakhet to Pakse, boat capacity is only 50 tonnes during the wet season while the navigation is not possible in the dry season

The Government's strategy regarding navigation is mainly focusing on maintaining and improving current transport capability by river and by encouraging the use of river transport in the wet season instead of land transport on poor roads. Organization strengthening (facilities, and organization of river transport offices) is implemented for 2002 to 2004 in Vientiane province as well as Vientiane Capital. Associations of river transport have to be established or those existing have to be improved. Companies of river transport have to be upgraded in order to meet international standards aiming at applying to transportation between the four members of the Agreement on Commercial Navigation of 20 April 2000. To conduct the feasibility study of the expansion of existing shipyard in Vientiane set up with Vietnamese technical assistance. River patrol has to be organized along the Mekong, particularly in Vientiane, Thakhek, and Savannakhet. A study regarding the project of setting up inland clearing centers at ports related to the Asian road system such as: Vientiane and Road A12, Khammouan and Road A15, Savannakhet and Road A16 has to be conducted.

While contributing in the past to the economic development of the country, river transports reveal to be a relatively low-cost investment and secure infrastructure investment, energy saving with minor pollution, to decrease heavy land traffic. Despite that resources are limited (28 Associations of River Transports and six Companies of River Transport with eight focusing on merchandise and 26 on passenger transport), river transport is increasing steadily. The policy of the Government is to improve and develop this sector according to its plan up to 2020, particularly to construct and to strengthen ports, to improve navigational channels, and to adopt relevant regulatory framework to sustain the economic development.

II.5.E.b. River works: trends during the past ten years

The improvement of the road linking Vientiane to the Lao-Cambodian border, as well as the construction of bridges over the Mekong River, brought to a standstill river works and the navigation on this section of the Mekong River.

At present, river works are concentrated on a few projects. In the past five years, embankments have been built at Dong Phosi, Chomcheng and Sibounheuang Villages (Vientiane Capital), as well as further down at Paksan and Pak Kadan (Bolikhamsay Province), Thakhek (Khammouan Province), Savannakhet (Savannakhet Province). Government's budget, provinces' budget, and private funds as well as foreign assistance have been used for these works. The share of provinces' budget and private funds is increasing in this regard.

Construction of port has been undertaken at Ban Vang (Vientiane Province), and of port servicing ferryboat at Ban Hat-Ban Na.

Aids to navigation had been installed from Vientiane up to Paklay.

STATUS OF MODES OF TRANSPORTATION (2001)

	Location	Name of Association of River Transport	Operating on	Number of vessels			
				Merchandise transport	Passenger transport	Speed-boat	Ferry-boat
1	Vientiane Capital	1. Association of Merchandise Transport	Mekong River	4			
		2. Association of Passenger Transport (Tha Deua)	Mekong River		36		
		3. State Enterprise of River Transport (with a shipyard in Vientiane)	Mekong River	9	3		
2	Bolikhamsay	4. Association of Passenger Transport			7		
		5. Company of Sending and Transport					1
		6. Trans-border Transport Company					3

3	Vientiane Province	7.Veunkham Association of River Transport	677 owners of boat are registered for transport mainly on local tributaries of the Mekong River				
		8.Muang Maed Association					
		9.Muang Hom Association					
		10.Muang Longsam					
		11.Muang Hintheun					
4.	Khammouan	12.Ferryboat Association of Transport	Mekong River				11
		13.Association Nang Noy Phalit Hin	Mekong River				2
		14.Muang Mahasay	Se Bangfay				1
5	Savannakhet	15.Association of Passenger Transport	Mekong River		13		
		16.Chantho Ferryboat Company	Mekong River			1	
		17.Phonsak Company	Mekong River			2	
		18.Muang Sepon Transport Association	Sepon	30			
		19.Saybuly Association	Mekong River				
6	Saysomboun Special Zone	28. No association or company, but individuals registered in a number of 50					
Sub-total for sub-area 4L				43	59	3	18
COUNTRY				67	463	122	19

II.5.F. Tourism and Recreation

There has been very strong growth in the Lao tourism sector, from only 14,400 international arrivals in 1990 to 735,662 arrivals in 2002. Tourism is now a major contributor to national income (7 to 9 per cent of GDP) and employment.

REVENUES FROM TOURISM AND MAJOR EXPORTS, 1997-2002

Unit: \$ million

Product	2002	2000	1999	1998	1997
Tourism	113.4	113.8	97.3	79.9	73.3
Garments	99.9	100.1	94.4	76.5	72.6
Electricity	92.7	91.3	107.0	49.6	20
Wood products	77.8	80.2	71.3	41.2	79.3
Coffee	9.8	15.3	29.0	19.3	26.2
Agricultural products	25.6	5.7	5.0	NA	16.5
Minerals	3.9	4.9	6.0	29.4	NA
Handicrafts	2.7	3.8	5.1	3.0	1.6
Other industries	19.9	NA	NA	14.4	83.2

However, not all provinces are to evenly benefit from tourism.

VISITORS BY PROVINCE, 1997-2002

Province	1997	1998	1999	2000	2001	2002
Vientiane Capital	277,292	312,640	482,199	486,613	429,420	506,677
Khammouan	22,718	24,360	11,455	13,712	20,317	19,596
Savannakhet	140,412	144,840	90,910	109,033	113,287	98,962
Bolikhamsay	14,900	13,388	29,734	35,681	23,900	30,758
Xieng Khuang	1,771	4,500	NA	NA	35,744	16,223
Vientiane	NA	NA	NA	NA	NA	30,480

Tourism is a labor intensive industry and contributes directly to poverty reduction. Since the opening of the country, this service sector has expanding tremendously as shows the following table:

NUMBER OF ACCOMMODATION ESTABLISHMENTS, AND ROOMS, 1997-2002

Provinces	Number of establishments						Number of rooms					
	1997	1998	1999	2000	2001	2002	1997	1998	1999	2000	2001	2002
Boli-khamsay	3	8	8	16	23	23	61	96	115	200	331	331
Kham-mouan	4	11	11	13	16	17	124	196	236	281	320	295
Savan-nakhet	18	22	22	25	29	30	338	424	399	512	479	504
Vientiane Capital	68	81	81	98	119	113	1884	2099	2033	2351	2782	2739
Vientiane Province	10	10	14	14	53	52	157	165	184	184	899	900
Xieng Khuang	16	16	16	24	13	13	172	179	147	286	163	166
Saysom-boun	NA	1	1	1	1	1	NA	20	20	20	20	20
Sub-total sub-area 4L	119	153	153	191	254	249	2736	3179	3134	3834	4994	4955
COUNTRY	233	307	335	468	571	560	4108	5019	5544	7333	8797	8625

There is considerable potential for greatly expanding the sector, drawing on visitors to the region and highlighting their interest in Laos' natural environment, its history, cultural heritage and rich ethnic diversity. However, water is not used for tourism purpose up to now, except for navigation.

II.5.G. Water supply and sanitation

Domestic water and sanitation are essentials for the life, health and productivity of the population.

II.5.G.a. Water supply in cities and towns

Water supplying people in towns and cities originates mostly – about 85% - from the Mekong River and its tributaries, with the remaining from ground water, springs, and small streams.

The national capacity of the existing 36 water treatment plants to produce drinkable water is 188,380 m³/per day. But the average production is only 157,340 m³/per day supplying water to 525,395 people or 37.67% of the urban population. This means that only 300 liters/per day/per person is provided by these plants.

However, water resources from the Mekong River is hardly exhausted as the production of tap water is only 0.04% of the 140,000 million m³/per year of the Mekong River discharges.

At most, the installed capacity can meet the wants of only 629,000 people, while more than 765,800 city dwellers are outside the network of water supply in 2002.

Drinkable water produced in Vientiane by Nam Papa Lao covers 53.7% of the total produced in the country, while lesser production occurred in Luang Prabang, Pakse, and Khanthabouly. The volume of clean water serviced in Vientiane Capital represents only half of the needs in this city, while the water produced in Vientiane Province is more than needed.

WATER TREATMENT PLANTS IN VIENTIANE CAPITAL

Plants location	Daily production capacity (m3)	Raw water originated from
1. Kao Liao	20,000	Mekong River
2.Chinaimo	80,000	Mekong River
3.Tha Deua	600	Ground water
4.Than Ngon	500	Nam Ngum

In Vientiane Province, only two towns have piped water with Thourakhom using raw water from Nam Ngum, and Muang Phon Hong with raw water from Nam Lik.

In Bolikhamsay Province, water treatment plant at Paksan using ground water is able to service 1,610 families. In Muang Khamkeut, at Km 20, a water treatment plant has been built, and at Muang Bilikahan, using raw water from Nam San. In total, 16,395 families or 49% of the total of families within the provinces, or 95,977 persons, have access to clean water.

Situated on the Mekong River shore for a length of 129 km, Khammouan Province used piped water, particularly at Thakhek.

Savannakhet has piped water, but the quality of supplied water is not satisfactory yet.

CLEAN WATER PRODUCED IN SUB-AREA 4L, YEAR 2004

Province/ Capital/ Special Zone	No. systems	Raw water source			Production capacity m ³ /day		
		Spring	Ground water	River /stream	Spring	Ground water	River/ stream
Vientiane Capital	4		1	3		500	100,600
Vientiane	3			3			4,200
Xieng Khuang	1			1			5,600
Bolikham- say	1			1			2,900
Kham- mouan	3	1		2	4,000		3,800
Savan- nakhet	4		1	3		150	15,250
Saysom- boun	1			1			400
Sub-total sub-area 4L	17	1	2	14	4,000	1,000	132,750
Country	36	2	4	31	9,000	7,650	169,650

Source: Water Supply Authority, Ministry of Communications, Transport, Post and Construction, Lao People's Democratic Republic

The thrust of the Government's development policy is to increase amenity of life in urban areas by providing affordable, reliable and quality services in commercial water supply and in sanitation.

II.5.G.b. Water supply in rural areas

It is estimated that in 2002, about 60% of the population in rural areas has drinkable water from a public tap, or hand pump or spring; no houses have

been connected by piped water. The goal is to reach the figure of 90% by 2020. The average need would be 35 liters/per person/per day and the total need of water in rural area would be 204,900 m³/per day; this is based on an estimated increase of 2.5% of the rural population totaling 6,505,500 persons in the year 2020.

The Government's development policy is:

- To improve water supply and environmental health in rural areas;
- To focus on inaccessible, poverty-ridden areas; and
- To encourage private supply and sanitation ventures in easy-to-reach areas.

II.5.G.c. Sanitation

Meeting needs for adequate domestic water and sanitation services for each province is a great challenge as they are related problems as shown in the following table:

ACCESS TO CLEAN WATER AND SANITATION IN EACH PROVINCE (2002)

Provinces	Clean water (% of population served)	Sanitation coverage (%)
Bolikhamsay	57.16	23.98
Khammouan	52.37	47.59
Savannakhet	79.20	33.40
Saysomboun	37.33	21.00
Vientiane Capital	86.19	74.57
Vientiane Province	64.00	41.00
Xieng Khuang	62.00	51.00
Country	58.09	41.56

Presently, the percentage of population having access to sanitation is relatively low. With the targets set to bring piped water to the population in the whole country by 20% in 2005, and 50% in 2020, the access to sanitation in 2020 will significantly improve as follows:

ACCESS TO CLEAN WATER AND SANITATION, 1999-2020

Programmes	(% total population)						
	1999-2000	2001	2002	2005	2010	2015	2020
Clean water	52	55.1	58	66	75	82	90
Domestic sanitation	37.6	39.7	41	45	60	69	80
Sanitation in school	6.7	8.3	11	21	35	50	60

II.5.G.d. Waste water

Waste water is an issue as the drainage of urban waste water to discharging upstream of water supply pumping stations raw water such as at Pakse and Saravane in sub-area 6L. In Vientiane Capital, four factories directly discharge waste water in the Mekong River. In other towns, erosion and flooding in the rainy season by raising the level of water at the pumping stations caused water pollution, and required more chemicals to clean the raw water, thus increasing financial cost.

Waste water is mainly from domestic usage, as only 2.5% of the piped water is used in industrial activities. This is consistent with the limited number of factories as well as the water volume allocated to them.

As the range of economic activities of these factories is limited, the quantity of water required for all industrial purpose is very low, and in 2001 amounts 1,557,142 m³.

Regarding the situation in Vientiane Capital, the open drainage network is made up of three portions that are all discharging into the That Luang-Salakham marsh. These drains are directed first to Nong Chan, and waste water is treated to oxygen at six ponds with each pond to treat waste water originating from about 30,000 persons. Water treated is sent to the 13 km length of the That Luang marsh. From That Luang marsh, the water will run off to the Mekong River along 50 km of many camlets. Since 1990, no waste water was let running directly to the Mekong River as in the past.

With the low maintenance of the drainage canal as well as increasing waste around the That Luang marsh, the system is beginning to break down.

It is estimated that rain water and waste water discharging by this way into the Mekong River average 120 million m³ per year, and comparing to the Mekong River volume which is 140,000 million m³ a year, the average of the dilution of rain and waste water into the Mekong, in Vientiane, will be 1000:1. The figure of dilution would be 800:1 during the dry season. With urbanization increasing as well as the expansion of tourism and industry, waste problem will soon become an issue.

II.5.H. Flood control and management

Most of cities and towns of the Lao People's Democratic Republic lies along the Mekong River and its tributaries, thus prone to flooding during the rainy season. Floods may, as in 2000, result in loss of life and property, and disrupt the social and economic life of the people.

II.5.H.a. Occurrence of severe floods

It is noticed that flooding is very much influenced by tributary flows. The combined effects of large runoff in the tributaries and the mainstream of the Mekong River cause serious damage, including flash floods on tributaries and bank overflow in lowland area. About 80 percent of the rural flooding and 20 percent of the urban flooding is caused by tributaries. The four major flood prone areas are situated along the mainstream near large tributaries: Vientiane Plain, Thakhek, Savannakhet, all three in sub-area 4L, and further down in sub-area 6L, Pakse.

During the rainy season, the water level rises rapidly, specially between July and September causing severe flood such as in 1966, 1968, 1970, 1971, 1974, 1978, 1990, 1991, 1995, 1996, 1998, 2000, and 2002 with loss of live and property as shown the following available figures:

DAMAGES CAUSED BY FLOODS, 1996-2002

Year	Damages (in \$ millions)	Areas damaged

1966	13.80	Central Laos
1978	5.70	Central and South Laos
1993	21.00	Central and South Laos
1994	21.15	Central and South Laos
1995	35.50	Vientiane Plain, Central and South Laos
1996	21	Central and South Laos
1998	3.50	Central and South Laos
2000	5	Central and South Laos
2002	3.50	Central, South Laos

Plains of central and southern Laos along the Mekong River are flooded more often than northern Laos as shown the previous table and the following table.

DAMAGES CAUSED BY FLOODS IN EACH PROVINCE, 1999-2002

Provinces	Areas inundated (hectares)			
	1999	2000	2001	2002
Sub-area 1L	0	20	240	1,810
Sub-area 4L	4,965	8,350	20,193	24,151
Vientiane Capital	395	1,290	5,080	5,493
Xieng Khuang	160		50	57
Vientiane Province	70	350	1,100	761
Bolikhamstay		250	8,370	5,644
Khammouan		4,000	4,440	7,040
Savannakhet	4,340	2,460	1,153	5,156
Saysomboun	NA	NA	NA	NA
Sub-areas 6L and 7L	3,935	4,530	1,790	8,103
Country	8,900	12,900	22,223	34,064

The flood occurring in 2000 was severe and encompassed many provinces.

DAMAGES CAUSED BY FLOOD IN THE YEAR 2000

Provinces	Persons affected	Ricefield inundated (hectares)	Ricefield damaged (hectares)
Sub-area 1L	670	30	20
Sub-area 4L	251,570	55,600	29,890
Vientiane Province		960	350
Vientiane Capital	10,350	3,650	1,290
Bolikhamsay	19,400	3,710	250
Khammouan	125,360	23,640	14,000
Savannakhet	96,460	23,640	14,000
Sub-area 6L	134,440	27,470	13,460
Sub-area 7L	12,080	1,930	1,070

II.5.H.b. Data collection and dissemination

Since 1990, the Government has provided data to the Mekong River Commission, and cooperated closely with the relevant international organizations in providing information about the level of the Mekong River and its tributaries in order to forecast flooding. These data are dispatched regularly by the Department of Roads from its various observation stations.

HYDROLOGICAL STATIONS SUPPLYING DATA TO THE MEKONG RIVER COMMISSION

	Station location	River
1	Port at Km 4	Mekong
2	Thakhek	Mekong
3	Savannakhet	Mekong
4	Paktaphan	Mekong
5	Keng Don	Se Bang Hieng

Information is also supplied by the Department of Meteorology and Hydrology; this Department monitors two rain gauge stations with one located in sub-area 4L at Paksan (Mekong River).

The network to monitor the hydrological situation was strengthened in two phases, in 1998, and in 1998-2000, with the repairing and establishment of staff gauges at the following stations with five in sub-area 4L and one in sub-area 7L:

IMPROVEMENT OF HYDROLOGICAL STATIONS

	River	Station	Established	Repaired	Donor
1	Nam Ngum	Pak Kha Yung (Vientiane Province)	1960	1998	Japan
2	Nam Ngum	Na Luang (Vientiane Povince)	1987	1998	Japan
3	Nam Theun	Siyo (Bolikhamsay Province)	1987	1998	Japan
4	Nam Ngiep	Muang May (Bolikhamsay Province)	1991	2000	Australia
5	Nam San	Had Xieng Tom (Bolikhamsay Province)	1986	2000	Australia

II.5.H.c. Flood control construction works

Based on the Prime Minister's Decree 204/PM, on 9 October 2001, dykes to protect against floods, water gates, and drainage canals had been built in major cities and towns located along the Mekong River.

Supported by the Government's budget, loans and foreign assistance, works carried out in Vientiane Capital, Bolikhamsay, Khammouan, Savannakhet, with a fifth project in sub-area 6L (Champassak) are as follows:

CONSTRUCTION OF DYKES AND WATER GATES AGAINST FLOODS IN SUB-AREA 4L

	Location	Length of dyke against floods (meters)	Height of dyke against floods (meters)	Level of flood (meters)	Number of water gates against floods
1	Vientiane Capital	72,000	172	12.50	2
2	Paksan, at Pakpeung	2,500		14.50	3
3	Thakkhek, at Huay Nang Li			13.50	4
4	Savannakhet			13.00	2

Vientiane Capital was flooded in 1966, 1978, 2000, and 2001. The causes of the flooding are multiple such as:

- Insufficient dykes;
- Where these dykes do exist, they are not high enough at some places;
- Lack of pumping stations or mobile pumps when inundation occurs;
- Natural canals to drain flood water are small and shallow;
- Land development is poorly organized; and lack of flood management standards, etc.

The building of diversion canals to discharge water from floods first took place in 1997 with a loan from Asian Development Bank, and is divided into two phases. During Phase I (1997-2000), the following works have been achieved:

- Hong Kae 3400 m
- Hong Khua Khao 2546 m
- Hong Thong 1790 m
- Hong Uai Luai 2751 m
- Hong Kai Keo 1356 m
- Hong Sak 2 1678 m
- Hong Thong Sang Nang 1275 m

- Hong Sak 1 558 m
- Hong Thong 1 258 m

Further downstream, Paksan is often subjected to flooding, north of Paksan, from tributary, Nam San, and southern side of the town, from Pak Peung. In 2002, a 2,500 meter length dyke and water gates were constructed at Nam San (Huai Nang Ni), and along the Mekong River (Huai Song Mae Luk, and Huai Pak Peung).

With an Asian Development Bank's loan, water gates against floods have been built at Thakkhek (Khammouan Province) in 2002-2003 at Pak Huai Sakham, Huai Nang Li, Huai Nang Sod, and Ban Chomcheng.

As Khanthabouli (Savannakhet Province) has been subjected to severe floods, particularly in 2002, water gates have been constructed at two locations: Huai Long and Huai Khi Lamang.

II.5H.d. Outline of a development plan for the next twenty years for sub-area 4L

The development plan mainly is to:

1. Complete the construction and the restructuration of hydro-meteorological stations along the Mekong River and its tributaries.
2. Achieve the automatic collecting and dispatching of data at the 13 existing stations.
3. Ensure a nation-wide system of flood warning.
4. Compile the hydrological and meteorological databases.
5. Continue the water drainage construction plan in Vientiane Capital (2003-2005):

- Hong Seng 4,200 meters
- Hong Wattay 1,650 meters
- Hong Kao Yod-Simuang-Pha Pho 957 meters
- Hong Khua Luang 163 meters
- Hong Suan Mon-Chomcheng-Khoknin 1,650 meters
- Hong Phon Papao 2,450 meters
- Hong Thong Sang Nang 500 meters

- Hong Huai Luai 985 meters
- Hong Sisavang Kang 683 meters
- Hong Kha Tai 780 meters

7. Carry out, in Bolikhamsay Province, the construction of water gates aiming at preventing inundation, with two more water gates to be installed at Nam Sa and Nam Kadan.

II.6. Environmental issues

II.6.A. Deforestation

Logging, slash and burn cultivation, fire are the main causes.

The Government is issuing drastic measures to punish illegal logging as well as to forbid the felling of new trees.

In the meantime, it needs to raise awareness among the population about the disastrous consequence of deforestation.

The most drastic measure is to end the slash and burn cultivation. However, policy is differing among provinces in sub-area 4L according to particular local circumstances.

II.6.B. Floods

The causes are:

- Climate change,
- Deforestation,
- Land degradation,
- Lack of timely and appropriate warning
- Poor organization,
- Lack of responsibility for water level observation,
- Lack of equipments,
- Lack of mobilization and of money.

For multiple causes, and especially logging and slash and burn cultivation, floods, particularly flash floods, are frequent and severe in Laos.

Measures have been taken in 2002, and this will continue up to 2005. But, with the erosion of the shores at some places, floods will occur in the future.

II.6.C. Problems resulting from irrigation works.

Land degradation, and lack of maintenance create numerous problems to the land as well as to the water.

II.6.D. Problems related to with hydropower plants

Specifically, the water used by Theun Hinboun dam is polluted, and it is difficult to treat it for the use of the population.

In general, with the change of the climate, the water ebbing, some dam cannot operate properly.

II.6.E. Navigation

Pollution causing by navigation on the stretches in sub-area 4L is decreasing as most of the transport taking away by road, and the navigation between Vientiane and Savannakhet is lowering comparing to the past.

II.6.E. Erosion banks

It results from the construction of embankments on the opposite side of the Mekong River, the change in the flow of the Mekong River. Erosion is severe in Vientiane Province, in Vientiane Capital, and downward to the south.

II.6.F. Waste water

While waste water is not an issue yet, however, the absence of efficient measures in this regard does bode well for the future with the fast urbanization of sub-area 4L.

PART III. Analysis

III.1. Development opportunities, needs and constraints

III.1.A. Development opportunities

III.1.A.a. Impressive opportunities.

Sub-area 4L presents impressive opportunities for development with its plains along the Mekong River which are favorable for agriculture, fishery, husbandry, and forestry with many rare essence, mining, tributaries for hydropower and irrigation schemes, numerous tourism sites, as well as being located at the crossroad of mainland Southeast Asia, and for the economic development, trade and tourism.

III.2.A.b. Secure.

The country is safe and secure, which creates a climate convenient for investments as well as for entrepreneurial people.

III.2.A.c. Location.

The location of sub-area 4L is such that with the inclusion of the country's capital in it eases communication and relatively help the decision-making process. The Government has a number of skilled and experienced officials, and the population is industrious.

III.1.B. Development needs

The Lao People's Democratic Republic development strategy for 2020, 2010, and 2001-2005, outlines the main national objectives as poverty reduction, economic growth at the most appropriate rate and improving the standard of living of the population.

III.1.C. Development constraints

III.1.C.a. Core problems.

In general, the various difficulties the Government has to face in implementing the development plan as a study highlighted them as follows:

- (1) "Relatively low-level socio-economic development during the 25 years compared to the potential and comparative advantages of the country.
- (2) Unsatisfactory level accomplishment of programs and projects under the Government's policy resulted in failure to achieve

macro economy targets as directed in the Fourth Socio-economic Development Plan.

- (3) Development of economic structure rather focusing on the service sector than agriculture and industry.
- (4) Poor, inconsistent and flimsy performance of macro policy with lack of accountability of central and local authorities for implementing a plan.
- (5) Slow and unsatisfactory translation of eight priority programs into specific projects.
- (6) Government's weakness in promoting and mobilizing the people's capability for boosting the economy in both the public and private sectors.
- (7) Poor state's management to follow principles and rules and to correct mechanism to abide by existing laws.
- (8) Insufficient progress of human resources development both in quantity and quality." (Japan International Cooperation Agency and Ministry of Agriculture and Forestry 2001, vol. III, p. AP2-3)

However, three particular points needed emphasis, besides the general statement made above.

III.1.C.b. Capital

Most of Public Investment Program comes from foreign assistance. The issue is that since 2003, European Union is switching its own assistance policy from grants to trade.

FOREIGN COMPONENT OF PUBLIC INVESTMENT EXPENDITURES (% of total)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Agri- culture /Fores- try	84	76	83	78	73	70	37	29	44	74
Industry	96	92	93	84	94	94	89	90	53	72
Commerce Transport	85	89	83	78	80	77	80	89	91	94
Education	31	62	66	70	64	70	72	88	73	77
Health	57	67	64	69	79	81	61	90	73	88
Culture	0	82	89	36	3	14	30	44	48	79

Social welfare	46	0	0	0	66	0	81	91	78	82
Offices housing	20	0	0	8	0	0	7	14	36	64
Rural Development	0	0	0	0	85	67	54	87	83	63

Source: Lao People's Democratic Republic 31 August 2000, p. 48

For instance, construction of new water treatment plants as well as the expansion of the existing ones are required to meet the needs of those who are left-out of this basic amenity. Based on the figure of 158 liters/per day/per person, approximately 195,480 m³/per day has to be produced to meet the needs of 80% of city dwellers. In 2020, the demand will require a production of 383,860 m³/per day.

To attain such a goal, the Government has sought a wide range of finance including loans and financial assistance. It has also encouraged private sector to contribute to the development in this field in order to insure that water is supplied in adequate volume and quality to all those in need of it.

This explains that in many fields, such as navigation, irrigation, hydropower, for instance, the Government is following the policy promoting the private sector and foreign investors.

III.1.C.c. Human resources

Human resources development is needed in all fields. It is an urgent and vital issue in the short and long term in order to achieve the targets set by the government. Education is the core of the issue. In sub-area 4L, the human resources development has been carried out for all generations, both sex, and all minorities, for leadership, for managerial position as well as professional through training and education in the country or overseas. In the same time, among civil servants, promotions, salaries, and posting have to be suitable to their qualification. The first pilot project about strengthening local governance and public administration is starting to be initiated only in one province, Luang Prabang, in sub-area 1L (Lao People's Democratic Republic and United Nations Development Programme 2002-2003).

Human resources development related to all sectors is necessary as there is an acute shortage of appropriately trained people. Human resources development includes language training as well as training in all matters

related to development. Training activities will be decentralized to some provinces.

III.1.C.d.Time

Development is a holistic process, and it is not a social engineering to try out solutions or pieces and bits taken from a different context. It needs time for all needed factors to mature. Time is needed for instance for the formation of a critical mass, that means a significant number and at an appropriate level, of educated people filling in all sectors is necessary to foster the sustainable development and equitable growth.

III.1.C.e. Case of rice and commodity production

Constraints to rice and commodity production which constitutes the core of the eventuality of a success to lift the country off the under-development by the year 2020 may serve to illustrate the above statements. A study made by Japan International Development Agency and the Ministry of Agriculture and Forestry (2001, vol. III, p. AP6-13-AP6-14) shows that:

“Lowland area

- The number of farmers using improved variety seeds of rice is limited.
- Lack of knowledge of improved technology including crop maintenance, pests control, irrigation water management, this is because the extension service is the process of developing.
- Flood and inundation damage during wet season in low land areas.
- Lack of access to credit for new investment and to purchase farm inputs.
- Predominance of labor intensive farm operation in which return per unit of labor is quite small.

Upland and mountain area

- Insufficient distribution of credit and fertilizer, especially in the remote areas.
- Poor access road for purchasing inputs and selling produce.
- Low soil fertility in terms of physical and chemical aspects.
- Lack of technology for cultivation of upland rice or alternative crops including land preparation, crop maintenance, pests, and weed control; this

is because the extension service is the process of developing or is underdeveloped.

- Limited development of adaptive research for upland and mountain areas.
- Lower productivity of upland rice under shifting cultivation leading to deterioration of the forest environment.
- Declining soil fertility and increasing water runoff, soil erosion under shifting cultivation.
- Large labor inputs due to manual practice in shifting cultivation.

Major constraints on commercial crop production

- Insufficient quality control and lack of grading and classification system for commercial crop production.
- Non-availability of improved varieties/hybrid seeds and plant materials.
- Lack of knowledge of improved technology.
- Limited development of adaptive research for integrated agriculture related to horticulture, livestock and fishery.
- Lack of access to credit and to new investment.
- Reluctance of farmers to use fertilizer and agro-chemicals due to high cost compared to crop income.
- Limited market channels and market information.
- Decreasing price incentive for commercial crop cultivation due to oversupply in the domestic market and low international prices.
- Limited or insufficient post harvest and agro-processing facilities for commercial crops.
- Limited availability of manpower or agriculture machinery in intensive agriculture.
- Limited information on suitable crops to be introduced based on area-specific natural conditions.”

III.2. Potential social, environmental and economic impacts of development

III.2.A. Potential social impacts of development

III.2.A.a. Population growth

It is generally estimated that the population growth in the country is strong. The National Statistical Center offers three population projections as follows:

ASSESSMENT OF POPULATION GROWTH

Unit: Million

	2000	2005	2010	2015	2020
Scenario 1	5.200	5.900	6.800	7.700	8.700
Scenario 2	5.100	5.800	6.400	7.100	7.700
Scenario 3	5.234	5.921	6.651	7.415	8.207

Source: National Statistical Center

Scenario 1 assumes a continuation of present fertility and mortality levels. Scenario 2 supposes a moderate decline in fertility and some improvement in mortality, and the decline in population growth is rapid. The last scenario is between Scenario 1 and Scenario 2, and assumes a decline in the rate of population from the current 2.60% down to 2.35% by 2010 and 2.05% by 2020.

III.2.A.b. Younger population

The majority of the population is young. This required schooling, acculturation, professional training, job creation, and expansion of the University, which the Government has already made by creating in 2002 a branch in south Laos, at Pakse, and another branch in 2004 in Luang Prabang. As the local market will not be sufficient for the job creation to absorb all the manpower, the migration of work force to neighboring countries would be more than to trickle down through the long border, as this phenomenon starts already.

III.2.A.c. Gradual shift in population mix

Current estimates are for the urban population growth rate to move ahead of the country's rate of population growth due to a migration from rural areas to cities. Basing on Scenario 3 above, and with a figure of 3.0% urban growth to 2010 and 3.2% growth from 2011 to 2020, it is expected that the projection will be as follows:

PROJECTION OF RELATIVE SHARE OF URBAN-RURAL POPULATION

	1995	2000	2005	2010	2015	2020
Rural	83.1	83.0	82.6	82.0	81.1	80.0
Urban	16.9	17.0	17.4	18.0	18.9	20.0

TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
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Source: Japan International Cooperation Agency and Ministry of Agriculture and Forestry 2001, vol. 1, p. 5-4.

III.2.A.d. Law and order.

This will be increasingly a necessity as urbanization and the population grows. Actually, this is already stretching to the limits. In the near future, the problem of law and order will be one of the fundamental one especially with the opening of the border, and a third bridge to be constructed over the Mekong River.

III.2.A.e. Better integration of Laos into the world.

The country is mainstreaming itself, by being an active member of ASEAN, and will be hosting the ASEAN Summit in 2004, and now applying to become member of World Trade Organization. All these are the push in the right direction to help Laos to adapt to the international environment and the 21st century era.

III.2.B. Potential environmental impact of development

III.2.B.a. Better awareness.

Obviously, a more educated population at all level will raise the awareness about the environment protection as well as the sense of ownership as in the south of Laos, people spontaneously constitute groups to protect capture fisheries.

III.2.B.b. Rule of law.

Use of chemicals will be restricted with the raising of the rule of law. More budget shares may be reserved for the treatment of waste water, and sanitation.

III.2.B.c. Difficulty to fully enforce the environment protection.

In the meantime, accelerated depletion of forest covers will be difficult to avoid. While in the Integrated Watershed Management areas, the population has been allocated land and forest to make a living and in the same time protecting the forests. But, exports of logs, illegal poaching and logging, slash and burn cultivation continue in the remote areas. All these factors contribute to dry up water sources, to erode the top soil, and to provoke drought, and during the wet season, the flash floods.

III.2.B.d. Floods.

Frequent flooding in Laos as a result of the previous issue will worsen as it was already frequent in the past.

III.2.B.e. Droughts.

With the scarcity of water in mountainous area, and the expensive price of gas that make not cost-effective to pump water from the Mekong River or its tributaries, droughts which are perennial would become worse.

III.2.B.f. Irrigation issue.

Irrigation has been developed particularly in sub-area 4L, but it is not yet cost-benefit, and not fully efficient. In sub-area 4L, the irrigated surface is potentially of 116,007 hectares, but in reality only 67,850 hectares are under cultivation during the dry season (in 2001-2002). This is shown in the surface irrigated while numerous and large irrigation schemes have been carried out. Generally, rice cultivation occurs only during the rainy season. The maintenance and protection of irrigation schemes are not satisfactory. The sense of ownership is still to be desired.

Furthermore, people are using less and less pumps to bring water from the Mekong River and its tributaries with the increasing price of gas which does not make the operation cost-benefit; while difficulty in finding a market for their production hampers the efforts of the rural people.

III.2.B.g. Waster water.

Waste water is not treated and is discharged directly in the rivers or in the Mekong River, such a in Vientiane Capital, where at least four major factories let their waste water to pour in the Mekong. In Khammouan Province, water coming out from the hydropower dam of Theun Hinboun is polluting the Hinboun River, while the mining at Phontiu evacuates waste water directly in the Mekong River. In Savannakhet, over ten important factories, only two have treated waste water before discharging it in the Mekong or its tributaries. The absence of treatment of waste water is widespread, and this will become a serious issue in the next coming year with the population growth, urbanization, industrialization, and development, as well a growing tourism industry.

III.2.C. Potential economic impacts of development

III.2.C.a. Achieve the goal set by 2020.

Economic growth and development will enable the Government to reach its targets to free the country of the less developed country status by the year 2020. Growth will be significant in sub-area 4L.

III.2.C.b. Increasing inequality.

However, in the same time inequality between regions that the Government tries to correct as well as among social strata will increase, while not so dramatically as in some Southeast Asian countries.

The Gini index of nominal per capita consumption increased at an annual rate of 2.5% whereas that of real per capita consumption increased at 2.7 %, which implies that changes in relative prices between 1992-1993 and 1997-1998 had an effect of increasing inequality, favoring the rich more than the poor.

GROWTH RATE OF PER CAPITA REAL CONSUMPTION BY QUINTILES

Quintille	1992-1993	1997-1998	Growth rate
First	2,356	2,325	-0.3
Second	3,296	3,466	1.0
Third	4,125	4,486	1.7
Fourth	5,489	5,982	1.7
Fifth	10,228	12,623	4.2
All quintilles	25,494	28,886	2.5

Source: National Statistical Center 2002, p. 13

III.2.c. Raising living costs.

Living costs will increase as State Enterprises will be restructured and the price of their service will reflect the costs of such service: water, electricity. Furthermore, with the importation of foods and commodities to meet tourism's requirement, it appears that domestic price will raise, as this is already noticed in Luang Prabang, the first Lao city to be listed as a World Heritage.

III.2.C.d. Country-wide market

As the country will go through the development of tertiary industry and urbanization, and the development of agro-processing industry which will accelerate the formation of production area. such changes will promote mass

consumption and distribution of commodities in both domestic and overseas markets responding to such phenomena.

III.2.C.e. A land ridge.

Infrastructure will be expanded with the consequence that domestic tourism as well as international tourism will become prominent. Furthermore, circulation of goods, and production of commodities for market will intensify. However, measures have discussed from now on to open opportunities window, and not let Laos to be only the land ridge for trucks with containers to run across it only.

III.3. Potential trans-boundary cross-regional issues and impacts

III.3.A. Potential trans-boundary cross-regional issues and impacts:
Particular effects regarding river works are to be noticed.

Construction of dams in the region of upper Mekong creates many problems, such as changing the water flow patterns.

The river bank protection made on the Thai side along the Mekong River creates severe erosion on the Lao shore. Severe erosions – 5 to 6 meters per year in Vientiane Capital - take place in at least six Lao provinces, and five are located in sub-area 4L, and the sixth in sub-area 1L, in Bokeo Province.

SEVERE RIVER BANK EROSIONS in SUB-AREA 4L

	Province	Location of severe erosions
II	Vientiane Province	1. Ban Phalad 2. Ban Sanakham
III	Vientiane Capital	1. Ban Samphanna 2. Ban May 3. Ban Nonkeo 4. Ban Suanmon-Chomcheng 5. Ban Thakhek 6. Ban Nahay 7. Ban Pak Peng 8. Ban Maknao 9. Ban Nonsay
IV	Bolikhamxay	1. Northern Paksan 2. Southern Paksan 3. Ban Pak Kadan 4. Ban Sod

V	Khammouan	<ol style="list-style-type: none"> 1. Ban Hadsay Kham 2. Ban Kava Neua 3. Ban Kava Tai 4. Ban Khao Min Yai 5. Ban Thakhek
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Construction of roads to exploit sand in the Mekong River has deep effects by changing the water flow patterns.

The setting of some navigation buoys may cause misunderstanding as some are misplaced regarding the border of the riparian countries

III.3.B. Potential trans-boundary cross-regional issues and impacts: water treatment and waste water.

The use of chemicals for the treatment of raw water impacts on the environment as well as the discharge of waste water in the Mekong River and its tributaries. These issues are not yet significant for the population, as well as animals, but it will become a growing one with time passing.

The Lao authorities are aiming at mitigating these issues by:

- Disseminating laws and regulations regarding environment for people of all walks of life to be aware of.
- Restricting chemicals especially on vegetables as well as on animals.
- Promoting the health care among the population.

III.3.C. Potential trans-boundary cross-regional issues and impacts: Illegal movements of goods and persons.

Bordering by Thailand and Vietnam, sub-area 4L is at a cross-road of ever increasing move of people and goods while border, particularly the Mekong River, is difficult to monitor especially on prevention of HIV/AIDS, sexual exploitation and trafficking of women. This is an issue that both Governments are trying to solve, especially through Lao-Thai Border Security Cooperation Committee as well as other existing mechanisms.

Conclusion

Sub-area 4L, with Vientiane Capital and Savannakhet's Special Economic Zone on the East-West Economic Corridor, should be the growth engine for the country, and the least is the rice loft, and with several potentials starting to be exploited. In the same time, it will be encountering many challenges and constraints.

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