**PAPER IX:** 

# WATER USE MANAGEMENT

# FINAL REPORT

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WUP-JICA TEAM

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### SUMMARY

#### 1. INTRODUCTION

- (1) The water use of the Lower Mekong Basin (LMB) shall be managed in a reasonable and equitable manner according to the principal policies in the 1995 Mekong Agreement (Agreement). The Agreement mandates the Joint Committee in the Mekong River Commission to prepare the water utilization rules among which the establishment of the acceptable minimum monthly flow (AMMNF) and water use monitoring system is technically the most important.
- (2) The AMMNF is considered similar to or the same as the required minimum flow in Japan. Further, the rivers in Japan are provided with detailed and sophisticated monitoring systems. Hence, the water use management system of Japan is considered useful for developing the discussions on the water utilisation rules in the LMB.
- (3) Paper IX presents the policies and experiences on water use management in Japan in Part I and discusses how to establish the AMMNF and monitoring system of the LMB in Part II, referring to the experiences in Japan.

### 2. WATER USE MANAGEMENT IN JAPAN

#### 2.1 Water Use Management by Water Right

The river water is managed by the River Law, which was firstly enacted in 1896 and thereafter, revised in 1964 and 1997.

River systems in Japan are legally categorized into two (2) classes: Class I and Class II. The Class I River is important for the country, and the drainage basin covers the land of more than two (2) prefectures in principle. The basin of the Class II River is located within only one (1) prefecture.

The Class I River is administered by the Central Government [river administrator: Minister, Ministry of Land, Infrastructure and Transport (MLIT)]. The Class II River is administered by the Local Government (river administrator: Governor of Concerned Prefecture). The river administrator manages and controls the river flow, river water use, river course, river environments, river structures, etc. All the river water abstractions are controlled by the river administrator based on the water right system.

Any person who intends to abstract the river water for such off-stream uses as domestic, irrigation, industrial, hydropower, and other purposes shall obtain the permission of the river administrator. The granted water right is protected from new water uses according to the Law.

River water for such in/on-stream uses as preservation of aquatic life, fishery, scenic view, preservation of water quality, navigation, prevention of salinity intrusion, prevention of estuary clogging, maintenance of groundwater table, etc. is maintained by establishing the necessary flow at principal river stations. The river administrator is responsible for maintenance of the minimum flow required for the existing off-stream and in/on-stream uses.

### 2.2 Design River Flow for Water Use Management

River water use is legally managed through the water right system. New water use is allowed only within the surplus natural flow at the design drought. Such a structure as storage dam is necessary to increase the design low flow in case that the new water use exceeds the available surplus natural flow.

Technically, the water use is managed by assuming natural flow; design low flow and required minimum flow to satisfy the existing water uses in the downstream.

#### (1) Natural Flow

River flow regime has historically changed according to the water use development in the past. However, the existing water uses are managed based on the current flow regime. New water uses shall be planned not to infringe on the existing water uses. Hence, the river flow under the existing water use conditions should be defined as natural flow when a new water development is discussed unless the existing water uses are revised.

However, the flow records during a certain period in the past are necessary for planning of a new water use. If the flow records during some period in the past are not significantly disturbed by the water use developments of the basin, they are usually employed as the natural flow.

#### (2) **Design Low Flow**

The river flow widely fluctuates throughout the year, and wet and dry seasons are not distinct. No available surplus natural flow is remained at the design drought time in most of the rivers and construction of storage dams is necessary to meet proposed new water uses. Usually, the flow regime of the typical drought year with a 10-year probability is assumed as the design flow regime based on the actual flow records in the past. All the water uses in any category are ensured to the extent of a 10-year drought. This simple static approach is employed for the planning of new water development for practical purpose.

It is because:

- (a) A number of people, communities, central/local government, NGO, water users, relevant experts are involved in the planning of new water development.
- (b) If the planning criteria are not fixed and have a certain range, the exploitable water quantity will vary within a certain range. It will cause many severe trade-off water conflicts among the concerned people and organizations.
- (c) Hence, the proposed plan must be well understood and accepted by all the concerned people and organizations. The planning methodology must be simple, practical and easy to understand as far as technically and scientifically allowable.

#### (3) **Required Minimum Flow**

The required minimum flow is designed to satisfy both existing reasonable off-stream and in/on-stream uses in each river section. The flow required for in/on-stream uses is called environmental flow. Any new water use must be developed in an appropriate manner that does not infringe on the required minimum flow. The reliability of all the off-water uses is determined to meet a 10-year drought probability.

The river environment, especially ecological environment, varies throughout the year corresponding to the flow variation of river. Theoretically, the environmental flow should be dynamically determined to meet the varying environmental requirement corresponding to the variation of river flow. However, this dynamic approach is not yet applied due to the following reasons.

- (a) Impacts of the flow variation on ecology are not yet clear.
- (b) Adoption of different reliabilities between off-stream and in/on-stream uses will make the water use management more complicated and difficult.
- (c) The river flow fluctuates to a large extent throughout the year. A spell of drought is severe in quantity but not so long in time. Hence, river flow of nearly natural pattern is usually expected except in drought time unless a large regulating reservoir is provided on the mainstream.

The required minimum environmental flow is statistically determined so that it can meet the in/on-stream uses in a 10-year drought in the same way as off-stream uses for practical purposes.

#### 2.3 Water Resources Development

#### (1) Water Conflicts of Inter-basin Diversion

There is no available surplus water in most of the rivers. New water use can be realized only by constructing storage dams and related diversion facilities. However, the storage dam sites and exploitable water resources are limited. Hence, many and complicated conflicts occur among water use sectors as well as water use regions concerning the allocation of water resources.

Especially, severe conflicts have occurred between the downstream and diversion areas in case of inter-basin diversion. The government has coordinated the conflicts based on the following principal policies.

- (a) The water resources development is planned to produce beneficial effects on both diversion and downstream areas. For this purpose, construction of multipurpose dams is essentially necessary.
- (b) The dams are planned to ensure the required minimum flow in the downstream, to meet the future water use in the downstream area as well as in the diversion area and to mitigate flooding problems in the downstream as required.

#### (2) Principles and Policy of Water Resources Development

The general principles for new water development are summarized below.

- (a) The maintenance of required minimum flow is prerequisite for the new water development.
- (b) New water will be developed in an appropriate manner that may not affect the required minimum flow at each principal station.
- (c) New water will be developed and allocated for users based on an integrated long-term water resources development and use plan of the river basin.

- (d) The new water development and use will be coordinated through consultation with the concerned organizations based on the related laws/regulations/rules.
- (e) No one/sector/region can reserve river water only for their future potential use when they have no concrete water use plan.

#### (3) Long-Term Water Resources Development Plan

The Water Resources Development Promotion Law was enacted in 1961 to promote the water utilization of the important major river basins. According to the Law, a long-term integrated water resources development and use plan has been prepared for each of the seven (7) major river basins, and a number of storage dams and diversion facilities have been implemented within the frame of the Plan.

The seven (7) objective river basins cover a total drainage area of  $44,500 \text{ km}^2$ , serving a total population of 62.0 million or approximately 50% of the national population (126.5 million).

#### (4) Optimum and Equitable Water Resources Development

The water resources development should be planned to produce equitable benefits on all the concerned sectors and regions in the river basins. Further, it should be planned to make the optimum use of the limited water resources and potential dam sites. Multipurpose dam is usually the key project to attain the optimum and equitable water resources development of the river basin.

The equitable water resources development of the river basin is difficult. Usually, the project mostly benefits the downstream areas. The upstream areas are submerged by the construction of proposed storage dam, causing serious problems of resettlements.

For coordination of these conflicts, a special law was enacted in 1973. This special law aims to promote the regional development for the surrounding areas of the proposed reservoir along with the ordinary compensation for the resettlement with the special financial assistances of central government, concerned local government and beneficiaries in the downstream. This coordination system has been applied for approximately 70 major dam projects since 1973.

#### 2.4 Water Use Coordination and Monitoring

#### (1) Water Use Restriction in Drought Time

The river water use is ensured to the extent of a 10-year drought. The water uses shall be partly cut when the river flow lowers than the design one. According to the River Law, such water use reduction shall be determined through the consultation among the concerned water users in principle. For this purpose, a drought coordination committee has been established for each river basin. The river administrator shall provide necessary data for the coordination and can arbitrate among the users when requested.

In the drought coordination committee, the river administrator and water users will provide or exchange the following information.

Concerned Person		Information
River Administrator •		River flow, water storage in dam and river water quality
	٠	Necessary rate of water use restriction based on the
		forecasting of future river flow and dam storage
Water Users	٠	Expected damages due to water use restriction
	٠	Dissemination of necessity of water use saving

During the period of water use restriction, the river administrator and the water users will perform the following activities.

Concerned Person		Activities
River Administrator •		Dam operation based on the water use restriction program
	٠	River flow monitoring and forecasting
Water Users	٠	Performance of water use restriction
	٠	Monitoring of damages

#### (2) Water Use Monitoring

- (a) According to the River Law, every water user shall monitor the water abstraction at intake by automatic gauge every day and report the data to the river administrator by the end of the year or month. When the user has a storage dam, he shall also monitor operation data of the dam. The user shall bear the cost of the above monitoring.
- (b) The river administrator shall evaluate the reported data and file them. He shall check the monitoring system and equipment once a year.
- (c) The river administrator himself has multipurpose dams, and rain and water gauging stations for river water management. He also monitors rainfall, river water level (discharge), and dam operation every day. He also monitors river water quality as required.
- (d) The data on rainfall, river water level (discharge), river water quality, river water abstraction and dam operation filed by the river administrator shall be open to any concerned water users and organizations for mutual understanding on water use and for smooth coordination of water conflicts in drought time. All the monitoring data shall be open also to the public according to the Information Publicity Law when requested.
- (e) The following real time data are accessible through Internet in all the Class I rivers:
  (i) rainfall/water level at principal stations, (ii) dam operation, (iii) drought management, and (iv) flood forecasting/warning.

### 3. WATER USE MANAGEMENT IN LOWER MEKONG BASIN

#### 3.1 Discussions on Acceptable Minimum Monthly Natural Flow

#### (1) **Purpose of Establishing the Acceptable Minimum Monthly Natural Flow**

According to Article 6 of the Mekong Agreement of 5 April 1995, the flow on the mainstream shall be not less than the acceptable minimum monthly natural flow (AMMNF) during each month of the dry season except in cases of historically severe droughts.

The AMMNF is considered to give the criterion to coordinate the conflicts between the existing and proposed water uses, and to evaluate the surplus water that can be allocated for the proposed water use.

#### (2) **Protection of Existing Water Uses**

- (a) According to the water laws of all the riparian states, the existing water uses will be protected as far as they are reasonable according to the water right system.
- (b) Both water law of each riparian state and the Agreement shall manage the proposed water uses on the mainstream. Hence, the Agreement should be interpreted consistently with the water law of each riparian state.
- (c) It is generally recognized in the water use management rules of international rivers that the existing water uses will be protected as far as they are reasonable.

From the above, it is considered natural to conclude that the existing water uses on the mainstream will be protected as far as they are reasonable by maintaining the AMMNF. Then, surplus water exceeding the AMMNF can be allocated for newly proposed water uses.

#### (3) Design Probability of AMMNF

The design probability of the AMMNF will be estimated in consideration of the following conditions:

- (a) If the design probability is set at 5-year drought, water use coordination will become necessary between the upstream and downstream users so often.
- (b) The AMMNF shall be maintained except in the cases of historically severe droughts. The probability of the AMMNF should be definitely larger than five (5) years.
- (c) If different design probabilities are adopted in the estimation of the AMMNF and surplus water, the existing and proposed water uses on the mainstream cannot be managed in a unified manner in the future. The management may be very complicated and difficult.
- (d) Waters of the LMB shall be developed in a sustainable manner according to the Agreement. Excessive water uses should not be planned. Hence, new water uses should be planned with sufficient reliability.

#### (4) **Definition of Natural Flow**

In the LMB, the natural flow should be defined in consideration of the following:

- (a) The natural flow is necessary to determine the AMMNF and evaluate the available surplus water on the mainstream.
- (b) The Agreement will not manage the existing water uses in the tributaries at all. Even the proposed water uses will be only subject to notification to the Joint Committee. The water uses in the tributaries will be independently managed by the water right system of each riparian state. Hence, all the existing water uses in the tributaries should be accepted by the riparian states.

- (c) If the existing water uses on the mainstream are protected by the AMMNF, the proposed water uses on the mainstream will be planned not to infringe on the existing water uses in the downstream as in the case of Japan.
- (d) In this case, the river flow under the existing water uses can be defined as natural flow when a new water development is discussed unless the existing water uses are changed.
- (e) However, the actual flow data during a certain period in the past are necessary for planning a new water development. The impact of the water use development of the basin in the past on the mainstream flow must be checked prior to using the data. If the impact is small, the data can be dealt as natural flow. When the impact is significant, imaginary flow under the existing water use conditions should be reproduced.
- (f) In this Study, a preliminary assessment was made concerning the impact of the historical water use development of the basin on the mainstream flow. It is preliminarily concluded that the water use development during the recent 40 years has caused no significant impact on the flow of the mainstream. Hence, the available flow data on the mainstream during the recent 40 years are all regarded as natural flow.

#### (5) Quantity of Existing Water Uses on the Mainstream

The major existing off-stream use on the mainstream is irrigation. The quantity of urban water use is negligible compared to the irrigation use. There is no hydropower use on the mainstream. The major in/on-stream uses are presumably salinity repulsion, fishery and navigation.

The existing areas irrigated by mainstream flow during the dry season in the upper and middle reaches are as given below.

Country	<b>River Reaches</b>	Dry Season Irrigation Area (ha)
Laos	Upstream Reaches	23,000
Thailand	Upstream Reaches	37,000
Cambodia	Middle Reaches	0

The total off-stream use is roughly estimated at 60  $m^3/s$ . It is definitely small compared to the river flow.

However, the water balance of the mainstream flow is severe in the Mekong Delta. A large quantity of irrigation water is abstracted from the mainstream. To secure this water use, a large quantity of salinity repulsion water is additionally necessary.

In the delta, the most severe drought in recent years occurred in 1998. The surplus water exceeding the irrigation use was roughly estimated as follows:

Flow/Use	Feb.	Mar.	Apr.	May
Inflow to Delta in 1998	3,671	2,028	1,645	2,084
Irrigation Use in 1998	863	753	841	814
Surplus Water	2,808	1,275	804	1,270

The available surplus water was limited since the above surplus water includes necessary salinity repulsion water.

#### **3.2** Discussions on the Water Use Monitoring System

#### (1) Necessity of Water Use Monitoring

Article 26 of the Agreement stipulates: (i) improving upon the mechanism to monitor intra-basin use, and (ii) setting up a mechanism to monitor inter-basin diversions from the mainstream.

The water use monitoring may be necessary at both national and regional level for the purposes of: (i) estimating the existing water uses, (ii) checking compliance of proposed water uses with the water use conditions, and (iii) coordinating the water uses in severe droughts, and (iv) sharing data of the existing water uses in the basin with one another.

Sharing of the water use data is essentially necessary for cooperation in the water use management of the LMB.

#### (2) Necessity of Integrated Monitoring of River Flow and Water Use

The river flow at the principal stations shall be monitored along with the water uses on the mainstream for the well-coordinated water use management. However, the flow regime of the mainstream may be changed by the proposed water uses in the tributaries. Hence, inflow from the major tributaries, mainstream flow at principal stations and water uses in the basin shall be monitored in an integrated manner.

#### (3) Kind of Water Use Monitored

The off-stream uses of irrigation, urban and hydropower purposes are to be monitored together with the related dam operation. The off-stream uses of domestic, industrial, fishpond and other uses in rural areas are to be omitted since their impact on the river flow is considered small.

#### (4) Technical Possibility of Water Use Monitoring

#### (a) Irrigation Water Use

The existing irrigation areas are widely distributed over the respective riparian countries. The total irrigation area in the LMB covers more than 3.0 million ha as shown below even if the irrigation projects smaller than 100 ha are cut off. However, the intake systems are old and complicated. Even, the available inventory of existing irrigation intakes and areas is not satisfactory.

Item	Laos	Thailand	Cambodia	Vietnam	Total
No. of Projects	703	1,426	386	85	
Whole Area (ha)	165,328	924,398	269,642	1,683,094	3,042,462
Dry Season Area (ha)	113,080	No data	138,466	1,417,549	

In these circumstances, water use monitoring by direct measurement is currently not easy. It may become possible in the future by selecting large/well-managed gravity and pumping projects which cover a considerable portion of the total irrigation area in Laos, Thailand and Cambodia. However, the direct measurement of water intake in the delta may be difficult due to the complicated tidal irrigation system. In the LMB, when direct measurement is difficult, irrigation water use has to be estimated by monitoring the irrigation area and cropping pattern. Remote sensing by satellite may be one of the indirect monitoring methods.

(b) Urban Water Use

Monitoring will be limited to Vientiane, Phnom Penh and several urban centres in the delta. Monitoring of the water intake is not difficult.

(c) Dam Operation including Hydropower Use

There are a number of large and small storage dams. Inventories are available for only limited large storage dams. No data is available for the others. However, operation of the selected large dams is currently being monitored on daily basis. Monitoring will be developed for the other dams in the future.

#### (5) Transparency of Data Monitoring

Ensuring the transparency of monitoring is essential. An effective monitoring mechanism to ensure the transparency shall be established, especially for the projects of inter-basin diversion and large intra-basin water use. The possible mechanism will include a system of periodical field check by MRC and installation of real-time remote monitoring system in which data are accessible from MRC on real time.

#### (6) Necessary Immediate Actions

The above-discussed monitoring system of the LMB will be developed in stages. However, the inventory of existing irrigation projects by MRC, which was preliminarily finalized in February 2002, should be completed as early as possible. Inventory of the existing storage dams also should be done together with this work. These inventories will give the basis to develop a practical monitoring system.

### **CHAPTER 1: INTRODUCTION**

The water use management system of the Lower Mekong Basin (LMB) should be established based on the 1995 Mekong Agreement (the Agreement). The following three (3) Articles in the Agreement are technically considered as the most important ones for establishing the management system.

Article 5:	Reasonable and Equitable Utilization
Article 6:	Maintenance of Flows on the Mainstream

Article 26: Rules for Water Utilization and Inter-Basin Diversions

In these Articles, there are many technical issues to be concluded. Among them, the following issues are considered to be the most basic ones.

- (1) Procedure to establish the acceptable minimum monthly natural flow on the mainstream.
- (2) Procedure to prepare the policies/guidelines for arriving at an agreement of proposed intra-basin use during the dry season and inter-basin diversion on the mainstream.
- (3) Procedure to manage the mainstream flow, especially, in severe drought including establishment of water use monitoring system.

This Paper IX consists of two (2) parts. In Part I, the water use management system of Japan is presented to give some materials/guidelines/suggestions necessary or useful for developing the above issues. In Part II, discussed are how to establish the acceptable minimum monthly natural flow and water use monitoring system in the Lower Mekong Basin (LMB), referring to the policies and experiences of water use management in Japan.

# **CHAPTER 2: RIVER WATER USE MANAGEMENT IN JAPAN**

#### 1. EXISTING WATER USE AND RIVER FLOW REGIME

#### **1.1 Land Area and Population**

Japan has a total land area of 377,900 km<sup>2</sup>. It had the total population of 126.5 million or an average population density of 335 persons/km<sup>2</sup> in 1998. It consists of 47 local administrative units (prefectures). A total land of 49,900 km<sup>2</sup> is devoted to agriculture; i.e., 27,200 km<sup>2</sup> for paddy, and 22,700 km<sup>2</sup> for upland crops and pasture. These are compared to the land area and population of the Lower Mekong Basin as shown below.

Land Area and Population in Japan							
Item	Land Area (km <sup>2</sup> )	Population (million)	Population Density (person/km <sup>2</sup> )	Agricultural Land (ha)			
Japan	377,900	126.5	335	4,990,000			
Lower Mekong <sup>1)</sup>	606,000 (795,000)	62.0	102	13,000,000			

Source: 1): Basin Development Plan, Inception Report, July 2002, MRC Note: Figure in parentheses indicate the total basin area including Upper Mekong.

# **1.2** Existing Water Use <sup>(1, 2)</sup>

Water resources in Japan have been highly exploited. The ratio of water exploitation reaches more than 30% in a drought year of 10-year probability. The yearly water use and water resources potential are compared in the following table. In this table, the water resources potential was obtained by deducting evapo-transpiration from the precipitation on land.

#### Existing Water Use and Water Resources Potential in Japan

DomesticAgriculturalIndustrialTotalDrought YearAverage Year16.458.613.788.7280.4421.7	-	Water Use (billi	ion m <sup>3</sup> /year)	Water Resources Pote	ential (billion m <sup>3</sup> /year)	
16.4 58.6 13.7 88.7 280.4 421.7	Domestic	Agricultural	Industrial	Total	Drought Year	Average Year
	16.4	58.6	13.7	88.7	280.4	421.7

Note: Domestic water use includes public, business and small industrial uses.

Agricultural water is used mostly for the irrigation of paddy (95%). Hence, agricultural water use concentrates in the summer season (May to September).

Most of the water use depends on river water. Eighty-eight percent (88%) of the necessary water is abstracted from rivers and 12% is from groundwater as shown below.

Water Source of the Existing Water Use in Japan							
Water Use	Total (%)						
Domestic	77	23	100				
Agricultural	95	5	100				
Industrial	70	30	100				
Total	88	12	100				

Note: Domestic water use includes public, business and small industrial uses.

Further, a total of 51,400 m<sup>3</sup>/s at peak is used for hydropower generation at 1,830 locations.

#### **1.3** River Flow Regime

In Japan, the period of dry and wet seasons are not distinct. The river flow always fluctuates (daily or weekly but not seasonally) to a large extent throughout the year. The river flow sharply rises at flood time, while it extremely lowers at drought time. The ratio of the drought flow rate (the 10th smallest daily flow rate in a year) to the average one in the major 100 rivers is estimated to be approximately 20% on the average.

The average flow regimes of the representative rivers in Japan are shown below, compared with that of the Mekong River.

	Flow Regime of the Representative Rivers								
River		Principal Station			Flow Regime (m <sup>3</sup> /s)				
River	C.A.	Station	C.A.	Max.	50%	75%	97%	Min.	Ave.
	$(km^2)$		$(km^2)$						
Tone	16,840	Kurihashi	8,588	11,444	159	110	77	6	252
Kiso	9,100	Inuyama	4,684	14,099	189	128	87	29	298
Yodo	8,240	Hirakata	7,281	7,970	195	148	107	43	273
River	C.A.	Station	C.A.	Max.	50%	70%	90%	Min.	Ave.
Mekong	795 500	Pakse	545 000	56 000	5 140	2 520	1 830	1 160	9 740

Flow Regime of the Representative Rivers

Source: 1): Japanese Rivers: Annual Report of River Discharge (1999), River Association (in Japanese)

2): Mekong River: JICA Estimate

Record Period: Tone (1938-1999), Kiso (1951-1999), Yodo (1952-1999), Mekong (1961-2000)

The Tone River supplies water to the Tokyo metropolitan and surrounding agricultural areas, the Kiso River to the Nagoya urban and surrounding agricultural areas and the Yodo River to Kyoto-Osaka-Kobe urban and surrounding agricultural areas.

The typical river flow variation in Japan is illustrated in Fig. 1, compared with that of the Mekong River.

#### **1.4** Storage Dam<sup>(3)</sup>

In Japan, the river water has been highly used since the olden days. Currently, there is no available surplus water in rivers during the drought period. Supplemental water cannot be abstracted from the rivers without construction of a storage dam. To meet the excessive water use, a number of storage dams have been constructed. At present, there are more than 3,100 dams (including dams higher than 15 m) with a total effective storage capacity of 24.2 billion m<sup>3</sup>.

### 2. WATER USE MANAGEMENT BY WATER RIGHT

#### 2.1 Principles of Water Use Management

#### 2.1.1 River Water

The river water including lake water is managed by the River Law, which was firstly enacted in 1896 and thereafter, revised in 1964 and 1997. River water is designated as public property according to the Law. All the river water abstractions are controlled by the River Administrator from the uppermost reaches to the river mouth based on the water right system.

The river systems in Japan are legally categorized into two (2) classes: Class I River System and Class II River System. They cover 92% of the national land territory as shown below. The remaining 8% is directly drained to the sea through small rivers and channels.

River System in Japan									
Category No. of River Systems Drainage Area (km <sup>2</sup> ) Share in National Territory									
Class I River	109	239,900	63.5%						
Class II River	2,719	109,300	28.9%						
Total	2,828	349,200	92.4%						

The Class I River is important for the economy, social welfare and environment of the country, and the drainage basin covers the land of more than two (2) prefectures in principle. The basin of the Class II River is located within only one prefecture.

The Class I River is administered by the Central Government [River Administrator: Minister, Ministry of Land, Infrastructure and Transport (MLIT)]. On the other hand, the Class II River is administered by the Local Government (River Administrator: Governor of Concerned Prefecture). The river administrator manages and controls the river flow, river water use, river course, river environments, river structures, etc.

Any person who intends to abstract the river water for such off-stream uses as domestic, irrigation, industrial, hydropower, and other purposes shall obtain the permission of the river administrator (water right). The granted water right is protected from new water uses according to the Law.

River water for such in/on-stream uses as preservation of aquatic life, fishery, scenic view, preservation of water quality, navigation, prevention of salinity intrusion, prevention of estuary clogging, maintenance of groundwater table, etc. is maintained by establishing the environmental flow (called "maintenance flow" in Japan) at principal river stations. The river administrator is responsible for maintenance of the minimum flow required for the existing off-stream and in/on-stream uses.

# 2.1.2 Groundwater

Groundwater is regarded as private property belonging to land, and the landowner can freely extract the groundwater under his land in principle. Groundwater use is not controlled for the management of water resources but it is only controlled for the prevention of public hazard.

The local government regulates groundwater extraction only within the specified areas where the groundwater extraction may cause a significant land subsidence.

### 2.2 Water Rights

### 2.2.1 Principles of Granting Water Right

Any person (usually representative of organization) who intends to use the water of a river shall obtain the permission of the river administrator (water right) according to the River Law. However, a number of river water uses (mostly for agricultural purpose) had been conducted even before 1896 when the River Law was firstly enacted. Those water uses are all regarded as granted water right (customary water right), which has the same legal status as the legally permitted water right.

A person who intends to obtain a new water right shall submit necessary application documents to the river administrator. The applied water use is permitted as far as its application satisfies the following conditions. However, no person/organization/region can reserve a water right only for potential water use in the future because the available river water is limited.

- (1) The applied water use shall be reasonable and contribute to the public interest.
- (2) The applied water use shall be certainly implemented in the immediate future.
- (3) The applied water use shall not affect the existing water uses (both off-stream and in/on-stream uses) in the downstream.
- (4) The applied water use shall be within the surplus natural river flow rate at a design drought. [Permissible new water use ≤ design low flow required minimum flow for downstream (including existing off-stream and in/on-stream uses)]. (See, Fig. 2 Case I.)
- (5) Such a structure as storage dam shall be provided to increase the design low flow in case that the applied water use exceeds the surplus natural river flow. (See, Fig. 2 Case II.)
- (6) The proposed structures for the applied water use shall not worsen flood situation or cause adverse effects on river environments.
- (7) The river administrator grants a water right to the applicant with the following water use conditions:
  - (a) Location of water abstraction.
  - (b) Water abstraction quantity (maximum quantity for domestic and industrial uses, maximum quantity by season for irrigation use, and maximum and firm quantities for hydropower use).
  - (c) Operation rule of storage dam and barrage (water abstraction, water release and water level).
  - (d) Conditions for water abstraction from intake and water storage in dam (conditions not to infringe on the required minimum flow at principal stations in the downstream and not to worsen the flood and environmental situations of the river).

#### 2.2.2 Necessary Consultation and Coordination prior to Granting Water Right

In the case of Class I rivers, the river administrator (Minister of MLIT) shall consult with the ministers of concerned ministries (see, table below) and the governors of concerned prefectures when he intends to permit the application of new water use in principle. In the Class II River, the river administrator (Governor of Concerned Prefecture) shall consult with the heads of concerned municipalities and shall obtain the agreement of the Minister of MLIT when he intends to permit the application of new water use in principle. The Minister of MLIT shall consult with the ministers of concerned ministries prior to the above agreement.

Concerna	Concerned Ministry of Water Cise					
Water Use	Concerned Ministry					
Domestic Water	Ministry of Health, Labour and Welfare					
Agricultural Water	Ministry of Agriculture, Forestry and Fisheries					
Industrial Water, Hydropower	Ministry of Economy, Trade and Industry					

Further, the river administrator shall give notification to the existing water users in the downstream when he has received an application for new water use. The existing water users may submit a statement of protest against the new water use to the river administrator, making clear the incurred loss due to the new water use, when they consider that their existing water uses may be affected by

the new water use. The river administrator shall not grant permission when the existing water uses are affected by the new water use in principle.

# 2.2.3 Priority Order

It is generally recognized that higher priority is given to old water right than new water right (first in time first in right) according to the instruction of the river administrator on the above-mentioned water use conditions. Domestic water is not always given the top priority.

However, the River Law says that in a severe drought exceeding the design drought, the quantity of each water abstraction shall be cut more or less through the consultation among the related users. When the consultation ends in failure, the river administrator can arbitrate among the users in response to their request. For this purpose, the water use coordination committee consisting of river administrator, water users and concerned organizations have been established in most of the major river basins.

### 2.2.4 Term of Validity

The water right is usually valid for approximately 30 years for hydropower use and about 10 years for other water uses. The original water use quantity, pattern and location may change in the future according to the socio-economic development of the river basin and hence, the contents of the water right needs to be reviewed in every certain period. However, the term of validity is renewed in every 10 or 30 years in principle as far as the water use is necessary and active, and no vital change occurs in the original water use plan.

# 2.2.5 Existing Water Rights <sup>(2, 4)</sup>

Class I rivers (consisting of 109 river systems) drain 64% of the national territory, supplying most of the consumptive water. They supply urban water to all the large and medium size cities, and irrigate approximately 80% of the paddy field in the country. The existing water rights in Class I rivers are summarized below.

	Total Existing Water Rights in Class I Rivers							
Water Use	Nos. of	Permitted Water Abstraction Quantity						
	Water Right							
Domestic	1,345	$487 \text{ m}^{3}/\text{s}$						
Industrial	841	$599 \text{ m}^{3}/\text{s}$						
Irrigation	35,670	9,231 m <sup>3</sup> /s (2,247,000 ha)						
Legal Right	13,059	5,983 m <sup>3</sup> /s (1,811,000 ha)						
Customary Right	22,611	$3,248 \text{ m}^3/\text{s}$ (436,000 ha)						
Miscellaneous	1,498	$196 \text{ m}^3/\text{s}$						
Sub-total	39,354	10,513m <sup>3</sup> /s						
Hydropower	1,486	Maximum: 47,260 m <sup>3</sup> /s, Firm: 14,116 m <sup>3</sup> /s						

Note: Domestic water use includes public, business and small industrial uses.

In the above table, the permitted water abstraction quantity shows the maximum one. Domestic and industrial uses are nearly constant throughout the year. However, irrigation use seasonally varies, showing the peak at puddling time. Hence, the total permitted quantity of irrigation use is larger than the actual use.

Irrigation projects of customary right mostly abstract water from the tributaries or uppermost reaches of the mainstreams and each project serves a small area. Large irrigation systems are mostly granted legal water right. Water quantity per unit area of the customary water right is very large compared to that of the legal water right due to the poor irrigation efficiency.

#### 3. DESIGN RIVER FLOW FOR WATER USE MANAGEMENT

#### 3.1 General

As mentioned before, river water use in Japan is legally managed through the water right system. New water use is allowed only within the surplus natural flow at the design drought. Such a structure as storage dam is necessary to increase the design low flow in case that the new water use exceeds the available surplus natural flow. (See, Fig. 2.)

Technically, this water use management is performed by assuming natural flow; design low flow and required minimum flow for the downstream. Definition, criteria, contents and estimation method of these river flows are described below.

#### 3.2 Natural Flow

The river water has continuously been developed since the olden days to meet the increasing water requirement of the river basin. Hence, the flow regime has historically changed according to the water use development.

Even in the past, new water uses (including storage/release of dam and abstraction from river) were planned based on actual flow regime at that time. The proposed new water uses were implemented by coordinating them with the water uses that had already existed.

At present, the existing water uses are managed based on the current flow regime. New water uses are planned and implemented not to infringe upon the existing water uses. Hence, it is considered impractical or unnecessary to reproduce the imaginary natural flow regime in the past days by removing the existing water uses when a new water use plan is prepared.

From the above considerations, the river flow under the existing water use conditions (including water abstraction and water storage/release of dam) should be defined as natural flow when a new water development is discussed unless the existing water uses are revised.

Usually, the flow records during a certain period in the past are necessary for planning of a new water use. However, they are employed for the analysis of flow characteristics, assessment of hydrological probability and preparation of the operation rule of the new water use. Accordingly, imaginary natural flow needs to be reproduced only when the flow regime has been largely disturbed by the water use development in the past. If the disturbance is not significant, the flow records in the past can be used as the natural flow under the existing water use conditions.

In most of the rivers in Japan, the natural flow has been almost all abstracted at drought time since the olden days. However, the river flow had not been regulated by large storage dam until the end of the World War II (1945). The large-scale water resources development of the major river basins (including large-scale storage dam and water diversion) started around 1955 - 1960. Those water resources development plans were prepared based on the observed flow regime during a certain period before 1955-1960 since the flow records were scarcely disturbed during the above period.

#### **3.3** Design Low Flow

The design low flow is determined to evaluate the available surplus natural flow. It is defined as the minimum rate of the natural flow regime (hydrograph) in the design drought. However, it is determined by each season when the water use seasonally varies.

#### **3.3.1** Probability of Design Low Flow

The design low flow varies depending on its hydrological probability. If the design probability (safety factor) is set lower, a larger design low flow may be estimated and, as a result, more new water abstraction can be permitted. In this case, however, the reliability of water use becomes lower. In the inverse case, the permissible new water use is limited and more river water will be wasted to the sea although the reliability of water use becomes higher.

In Japan, the design low flow is determined for the natural flow regime of a 10-year drought probability. All the water uses in any category are ensured to the extent of a 10-year drought. This design reliability of water use is considered higher than that in the Southeast Asian region. It is because:

- (1) A large quantity of river water is used for domestic and industrial purposes in the urban areas; and
- (2) A high reliability is required for such water uses since lack of water supply may cause vital damages on the urban and industrial activities in the country.

#### **3.3.2** Preparation of Design Flow Regime (Hydrograph)

#### (1) **Design Flow Pattern**

The river flow widely fluctuates throughout the year as shown in Fig. 1. Wet and dry seasons are not distinct. It is different from the Lower Mekong Basin.

As mentioned before, no available surplus natural flow is remained at the design drought time in most of the rivers. It is usually necessary to construct a storage dam to meet proposed new water uses.

A storage dam stores water at rain time and supplement water at drought time. Operation of the dam is more complicated than in the Lower Mekong Basin. The dam repeats water storage and release throughout the year according to the river flow and water requirement at the principal stations in the downstream. The operation must been done to cover the water requirement at all the principal stations.

Usually, the flow regime (flow hydrograph) of the typical drought year with a 10-year probability is assumed as the design flow regime based on the actual flow records in the past. For this design flow regime, the water balance at the principal stations is calculated and the required water supply from dam is estimated. (See, Fig. 2). This simple static approach is employed for the planning of new water development for practical purpose.

It is because:

- (a) A number of people, communities, central/local government, NGO, water users, relevant experts and others are involved in the planning of new water development.
- (b) Many people/organizations may benefit from the proposed development; however, some people/organizations may be affected by it.
- (c) In Japan, a large amount of cost is required to develop 1.0 m<sup>3</sup>/s of new water use due to the densely populated land use. Usually, the cost will be born by the central/local government, municipalities and water users (citizens, farmers and private enterprises).

- (d) If the planning criteria are not fixed and have a certain range, the exploitable water quantity will sometimes vary to a considerable extent. It will cause many severe trade-off conflicts among the concerned people and organizations.
- (e) Hence, the proposed plan must be well understood and accepted by all the concerned people and organizations. The planning methodology must be simple, practical and easy to understand as far as technically/scientifically allowable.

#### (2) Database of Flow Regime

The river flow always fluctuates (daily or weekly but not seasonally) widely throughout the year because the dry and wet seasons are not distinct. Hence, the river flow regime is usually established based on the 5-day average flow rate.

#### **3.3.3** Estimation of Future Design Low Flow

In the future, the design low flow in the downstream will change due to the effects of water development and use in the upstream. This change needs to be considered in planning the future river water use in the downstream if it is significant. The following effects should be considered besides river water abstraction.

#### (1) Return of Abstracted Water

In Japan, most of the domestic and industrial waters are used in the urban areas developed in coastal regions and little water is returned to the original river. Hence, the return of abstracted water is discussed mainly in relation to irrigation water.

A considerable portion of the irrigation water abstracted from a river will return to the downstream river sections. The irrigation water used in the areas near the river may immediately return to the river. However, the irrigation water on areas distant from the river may have a long time lag before returning to the river. An inter-basin diversion completely consumes the abstracted river water. On the other hand, the irrigation water in the alluvial plains or delta areas usually disperses in a wide direction and not all of it returns to the original river. The return flow mechanism is not always clear.

The observed river flow in a recent certain period (defined as natural flow) already includes the actually returned flow from the existing irrigation areas in the upstream. Hence, only the return of additional water abstraction in the future needs to be estimated for the determination of future design low flow in the downstream.

In Japan, however, all the return of additionally abstracted river water is not always taken into consideration in planning the water resources development projects in a river basin. Usually, the return rate is conservatively estimated to maintain a sufficient reliability of water use.

In most of the river basins, it is mainly considered in planning the water utilization projects in the river valleys where the return flow mechanism is clear. Consideration in the lower alluvial plains including delta areas is limited.

For the return flow model of a river basin, see Fig. 3.

#### (2) Effect on Flow Regime of Hydropower Dam

A storage dam for water supply intentionally increases the design low flow to meet the required new water use. On the other hand, a hydropower dam with a large storage

capacity coincidentally increases the low flow in the downstream. This effect should be considered in the estimation of future design low flow in the downstream if it is significant.

In Japan, hydropower dams with large storage capacities were mostly constructed in the river basins where the natural flow is abundant enough to meet the water use in the downstream. In these days, hydropower is generally developed as part of a multipurpose dam, but little or no exclusive storage capacity for hydropower generation is allocated and generation is mostly performed following the dam operation rule for the other purposes at drought time. Hence, the increase of low flow by hydropower dam is not usually considered in the estimation of future design low flow in the downstream to maintain a sufficient reliability of water use.

# 3.4 Required Minimum Flow

### **3.4.1** Objectives and Functions of the Flow

The river administrator must establish the minimum flow required for the maintenance of desirable river water functions in each river section according to the River Law. This flow is usually called "maintenance flow of normal river water function" in Japan, however, it is called "<u>required minimum flow</u>" in this Paper to avoid misunderstanding of the technical term. This flow is considered to be similar to or the same as the "<u>acceptable minimum monthly natural flow</u>" in the 1995 Mekong Agreement. Any new water use must be developed in an appropriate manner that does not infringe on the required minimum flow.

The required minimum flow is designed to satisfy both existing reasonable off-stream and in/on-stream uses in each river section. The off-stream use includes domestic, agricultural, industrial, hydropower and other off-stream uses. The in/on-stream water use covers preservation of aquatic life, fishery, scenic view, preservation of water quality, navigation, prevention of salinity intrusion, prevention of estuary clogging, maintenance of groundwater table, etc. The flow required for in/on-stream uses is usually called "river maintenance flow" in Japan, however, it is called "environmental flow" in this Paper to avoid misunderstanding of the technical term.

The policies and guidelines on how to establish the required minimum flow are presented in detail in Chapter 6.

### 3.4.2 Seasonal Variation of Flow

In Japan, the domestic and industrial water uses are nearly constant throughout the year. The agricultural water is used mostly for the irrigation of paddy. Paddy is cropped once a year during the summer season (May to September) and hence, the target irrigation area is fixed. The agricultural water use seasonally varies in pattern and is roughly divided into three (3) seasons: puddling season (May), growing season (June to September) and non-irrigation season (for miscellaneous uses).

The in/on-stream water uses also vary in time, according to the seasonal variation of their requirements. Hence, the required minimum flow is determined by season.

### 3.4.3 Reliability of Flow

The reliability of all the off-stream water uses in Japan is determined to meet a 10-year drought probability. Theoretically, however, the reliability of in/on-stream water use should be different by purpose and by river section.

Nevertheless, the same reliability is applied for both off-stream and in/on-stream water uses from the viewpoint of practical water management at present. Hence, the required minimum flow shall be maintained throughout the year with a 10-year probability in principle.

#### 4. WATER RESOURCES DEVELOPMENT

#### 4.1 Water Conflicts

#### 4.1.1 General

There is no available surplus water in most of the rivers. New water use can be realized only by constructing storage dams and related diversion facilities. However, the storage dam sites and exploitable water resources are limited. Hence, many and complicated conflicts occur among water use sectors as well as water use regions concerning the allocation of water resources. Especially, severe conflicts occur between the downstream and diversion areas in case of inter-basin water diversion.

#### 4.1.2 Inter-basin Water Diversion

A number of inter-basin water diversion projects have been implemented in Japan. Usually, the people and local governments in the downstream have made a protest against the diversion mainly due to the following reasons:

- (1) The diversion may possibly affect the required minimum flow (which satisfies both existing off-stream and in/on-stream uses) in the downstream in a severe drought exceeding the design one. In fact, the diversion of water cannot be completely stopped even in an abnormal drought time.
- (2) The diversion will decrease the water resources potential in the downstream, resulting in making it difficult more or less to promote the water resources development for the downstream.
- (3) The people in the downstream seek an equitable allocation of the benefits of water resources development in the river basin. They always say that "the downstream area receives the benefits of water use but suffers from flood damages, on the other hand, the diversion area only enjoys the benefits of water use."

All the major inter-basin water diversion projects have been implemented by the central government for smooth coordination between the concerned areas. The government has coordinated the conflicts based on the following principal policies:

- (1) The water resources development is planned to produce beneficial effects on both diversion and downstream areas. For this purpose, construction of multipurpose dams is essentially necessary.
- (2) The dams are planned to ensure the required minimum flow in the downstream, to meet the future water use in the downstream area as well as in the diversion area and to mitigate flooding problems in the downstream as required.

#### 4.2 Principles and Policy of Water Resources Development

#### 4.2.1 Maintenance of Required Minimum Flow

The maintenance of required minimum flow is prerequisite for the new water development. However, the existing design low flow (design low flow before construction of new storage dam) does not always cover the required minimum flow to meet the existing off-stream uses (water rights) and in/on-stream uses. It is because:

- (1) A number of customary water rights were granted in the olden days and the reliability of their water uses is mostly low.
- (2) The target reliability of water use has been raised up according to the socio-economic development of the country.
- (3) Necessity of river environmental improvement has increased in these days, resulting in increase of the required flow for in/on-stream use.

The river administrator is responsible for the maintenance of required minimum flow as well as flood control. He usually constructs multipurpose dams including new water uses (domestic, industrial, irrigation, hydropower) in addition to flood control and maintenance of required minimum flow. In this case, the multipurpose dams are designed to have necessary additional storage capacity to maintain the required minimum flow.

The river administrator bears the costs for flood control and maintenance of required minimum flow; whereas the new water users bear the remaining cost. As a result, the reliability of both required minimum flow and new water use is ensured as designed. (See, Fig. 2, Case II.)

However, when a new water user constructs a single purpose dam for his specific purpose, the dam does not need to supply water to maintain the required minimum flow. In this case, the required minimum flow is left as insufficient; however, the dam operation (water storage by dam) is restricted not to infringe on the existing off-stream and in/on-stream uses in the downstream.

#### 4.2.2 New Water Development

The general principles for new water development are summarized below.

- (1) New water will be developed in an appropriate manner that may not affect the required minimum flow at each principal station.
- (2) New water will be developed and allocated for users based on an integrated long-term water resources development and use plan of the river basin.
- (3) The new water development and use will be coordinated through consultation with the concerned organizations based on the related laws/regulations/rules.
- (4) No one/sector/region can reserve river water only for their future potential use when they have no concrete water use plan.

#### 4.2.3 Long-Term Water Resources Development Plan

To resolve the water conflicts and then, to promote the water utilization, a long-term integrated plan of water resources development and use is essentially necessary for each river basin.

For this purpose, the Water Resources Development Promotion Law was enacted in 1961. The Minister of MLIT shall designate the objective river basins, and prepare a long-term integrated water resources development and use plan for each objective basin in consultation with the ministers of the concerned ministries according to the Law.

A long-term integrated water resources development and use plan has been prepared for each of the seven (7) major river basins, and a number of storage dams and diversion facilities have been implemented within the frame of the Plan. The seven (7) objective river basins cover a total drainage area of 44,500 km<sup>2</sup>, serving a total population of 62.0 million or approximately 50% of the national population (126.5 million).

The Plan includes: (i) projection of water demand and supply balance in the future; and, (ii) water resources development facilities (such as storage dam, intake and diversion channel) necessary to meet the water requirement.

The Plan is prepared targeting 15-20 years after at the farthest since the projection of water requirement in the far future is difficult. The Plan has been revised several times, extending the target year according to the increase of the water requirement in the objective region.

### 4.2.4 Optimum and Equitable Water Resources Development

The water resources development should be planned to produce equitable benefits (or allocated benefits that can be agreed upon) on all the concerned sectors and regions in the river basins. Further, it should be planned to make the optimum use of the limited water resources and potential dam sites.

Multipurpose dam is usually the key project to attain the optimum and equitable water resources development of the river basin. The dam will include the following purposes: maintenance of required minimum flow, new water supply, flood control and hydropower generation.

The equitable water resources development of the river basin is difficult. Usually, the project mostly benefits the downstream areas. The upstream areas are submerged by the construction of proposed storage dam, causing serious problems of resettlements. The conflicts are especially severe when the prefectures that receive water benefits and suffer from the resettlements are different.

For coordination of these conflicts, a special law was enacted in 1973. This special law aims to promote the regional development for the surrounding areas of the proposed reservoir along with the ordinary compensation for the resettlement with the special financial assistances of the Central Government, concerned local government and beneficiaries in the downstream (local governments and water users). This coordination system has been applied for approximately 70 major dam projects since 1973.

### **4.3** Inter-basin Water Diversion of Yoshino River (Example)<sup>(1,5)</sup>

### **4.3.1** General Description of the Basin

The Yoshino River drains a total area of 3,750 km<sup>2</sup> with a trunk river length of 194 km, covering part of four (4) prefectures: Tokushima, Kouchi, Ehime and Kagawa. The catchment area covered by each prefecture is given below. Tokushima Prefecture covers the lower part of the basin, while the other three (3) prefectures occupy only the upstream watersheds. (See, Fig. 4.)

<u>_a</u>	atchinent Area of Prefectures Concerned in Yoshinoki							
	Prefecture	Catchment Area (km <sup>2</sup> )	Share (%)					
	Tokushima	2,260	60					
	Kouchi	1,070	28					
	Ehime	400	11					
	Kagawa	20	1					
	Total	3,750	100					

Catchment Area of Prefectures Concerned in YoshinoRiver

Nearly 90% of the basin is covered by forest and only 10% is developed for urban and agricultural uses. The developed 10% area is mostly located in the lower sub-basin belonging to Tokushima Prefecture. Hence, the river water had been used for a long time only for domestic, agricultural and industrial purposes in Tokushima Prefecture.

However, the river flow daily fluctuates to a large extent since the rainfall concentrates at a time of typhoon or low atmospheric pressure and as a result, the available natural flow is limited. The average natural flow regime at the principal river station is as shown below. This natural flow regime was prepared based on the records during the 20 years (1955-1974) before the large-scale water resources development was implemented.

Flow Regime at the Frincipal Station of Toshino River								
Station	C.A.	Flow Regime (m <sup>3</sup> /s)						
Station	$(km^2)$	Max.	26%	50%	75%	97%	Min.	Ave.
Ikeda	2,074	14,047	92	53	32	14	1	112

Tokushima Prefecture has been suffering from water shortage as well as flood damage since the olden days due to the unstable river flow regime.

#### 4.3.2 Old Inter-basin Diversion

The other three (3) prefectures, especially Ehime and Kagawa have been suffering from severe water shortage since the population and agricultural lands of the prefectures are mostly distributed outside of the basin where water sources are limited. They had planned inter-basin diversion many times to meet the long water shortages; however, Tokushima Prefecture had always objected to the diversion plan for fear that its water use rights might be infringed by the diversion in drought time.

Finally, four (4) small-scale inter-basin diversion projects (two projects for Ehime Prefecture and two projects for Kouchi Prefecture) were implemented during 1940 to 1966 with the strong coordination of the Central Government. The two (2) projects in Kouchi Prefecture were mainly for hydropower generation and those in Ehime Prefecture were mainly for agricultural and industrial water supply, and hydropower generation. However, no inter-basin diversion was implemented for Kagawa Prefecture since the prefecture occupies only a small territory within the basin. (See, Fig. 4)

All the four (4) projects included storage dams and hence, the conflicts with Tokushima Prefecture were settled by preparing appropriate dam operation rules that ensured the protection of water use rights in the downstream.

#### 4.3.3 New Inter-basin Diversion

Thereafter, the water requirement began to rapidly increase in the four (4) prefectures according to the high economic growth of the country. A large-scale inter-basin diversion became necessary besides the additional water supply to the downstream areas.

It had widely been recognized by the related organizations/people that a long-term integrated water resources development and use plan of the basin is essentially necessary to coordinate the expected water conflicts, and to attain a reasonable and equitable water allocation among the four (4) prefectures.

The long-term integrated water resources development and use plan of the basin was prepared in 1967 (called First Stage Full Plan) and revised in 1992 (called Second Stage Full Plan). The First Stage Full Plan was prepared to keep the water supply and demand balance during 1966 to 1983 and the Second Stage was during 1984 to 2000.

The water allocated for the four (4) prefectures by the two (2) Full Plans is as summarized below.

					(Unit: m <sup>3</sup> /s)
Water Use	Tokushima	Kagawa	Ehime	Kouchi	Total
Maintenance of Required	43.0 (24.5)	-	-	-	43.0 (24.5)
Minimum Flow					
Supply for New Water Use	17.6 (13.1)	15.8 (7.8)	7.8 (7.3)	1.2 (1.2)	42.4 (29.4)
Domestic	2.7 (2.2)	3.1 (3.1)	0.8 (0.8)	0.7 (0.7)	7.3 (6.8)
Agriculture	6.5 (2.5)	11.3 (3.3)	0.6 (0.1)	-	18.4 (5.9)
Industry	8.4 (8.4)	1.4 (1.4)	6.4 (6.4)	0.5 (0.5)	16.7 (16.7)
Total	60.6 (37.6)	15.8 (7.8)	7.8 (7.3)	1.2 (1.2)	85.4 (53.9)

#### Water Allocated by the Full Plan of Yoshino River Basin

Note: 1) Domestic water use includes public, business and small industrial uses.

2) Figures not enclosed in parentheses are monthly maximum, while those enclosed in parentheses are yearly average.

The required minimum flow for the downstream is secured prior to the development of new water uses. It was determined to meet the existing off-stream water uses [domestic, agricultural (7,500 ha) and industrial uses] and in/on-stream uses. It seasonally varies, showing the following flow rates: (i) irrigation period (late May to late September), max.: 43.0 m<sup>3</sup>/s, average: 39.1 m<sup>3</sup>/s; and, (ii) other periods: 15.0 m<sup>3</sup>/s constant.

The new water developed for Tokushima Prefecture is used within the basin, while those for Kagawa, Ehime and Kouchi prefectures are all diverted to the outside of the basin.

The following major water resources development projects have been implemented to satisfy the above required minimum flow and new water requirement. (See, Fig. 4.)

Multipurpose Dams implemented by the Full Plan of Yoshino Kiver Basin						
Item	Sameura Dam	Ikeda Dam	Shingu Dam	Tomisato Dam		
Location	Kochi Pref.	Tokushima Pref.	Ehime Pref.	Ehime Pref.		
Catchment Area (km <sup>2</sup> )	472	1,904	254	101		
Dam Height (m)	106	24	42	111		
Effective Storage (m <sup>3</sup> )	289,000,000	4,400,000	11,700,000	47,600,000		
Reservoir Area (km <sup>2</sup> )	7.5	1.44	0.9	1.5		
Houses Resettled (No.)	356	53	102	81		
Purpose	F, M, D, A, I, P	F, M, (D), (A),	F, A, I, P	F, D, I, P		
	(42,000 kW)	(I), P (5,000 kW)	(11,700 kW)	(6,500 kW)		
Year Completed	1978	1975	1976	2001		

#### Multipurpose Dams Implemented by the Full Plan of Yoshino River Basin

Note: F: flood control; M: security of minimum flow; D: domestic water supply; A: agricultural water supply; I: industrial water supply; P: hydropower generation; (D), (A), (I): water intake of respective purposes

#### Estuary Barrages Implemented by the Full Plan of Yoshino River Basin

Item	Old Yoshino River Barrage	Imakiri River Barrage
Location	Tokushima Prefecture	Tokushima Prefecture
Height (m)	7.3	6.0
Length (m)	192	220
Purpose	F, M, (D), (I)	F, M, (D), (I)
Year Completed	1976	1976

Note: F: flood control; M: security of minimum flow (control of salinity intrusion); (D): domestic water intake; (I): industrial water intake

Wate	Water Diversion Canals Implemented by the Full Plan of Yoshino River Basin							
Item	Kochi Inter-basin Diversion	Shingu Inter-basin Diversion	Yoshino River North Intra-basin Diversion	Kawaga Inter-basin Diversion				
Intake Site	Upper Tributaries	Shingu Dam	Ikeda Dam	Ikeda Dam				
Main Canal Length (km)	13.9	2.8	69.2	106.0				
Purpose	D/I/P for Kochi -D: (0.7 m <sup>3</sup> /s) -I: (0.5 m <sup>3</sup> /s) -P: (11,800 kW)	I/A/P for Ehime -I (3.3 m <sup>3</sup> /s) -A (700 ha, max. 0.5 m <sup>3</sup> /s) -P (11,700 kW)	A for Tokushima (6,300 ha, max. 14.8 m <sup>3</sup> /s)*	A/D/I for Kagawa -A: (30,700 ha, max. 11.3 m <sup>3</sup> /s) -D: (3.1 m <sup>3</sup> /s) -I: (1.4 m <sup>3</sup> /s)				
Year Completed	1978	1975	1990	1975				

Note: D: domestic water conveyance; A: agricultural water conveyance; I: industrial water conveyance; P: hydropower generation, \*: including existing agricultural water use

As mentioned above, inter-basin transfer to Ehime Prefecture newly diverts the total water of 7.8  $m^3$ /s. Of this amount, 3.8  $m^3$ /s is diverted through the Shingu Inter-basin Diversion Canal and the remaining 4.0  $m^3$ /s is diverted by using the old diversion canal (Yanase Inter-basin Diversion Canal) that was constructed in 1953.

#### 5. WATER USE COORDINATION AND MONITORING

#### 5.1 Water Use Restriction in Drought Time

#### 5.1.1 General

The water right is ensured for the design low flow with a certain probability (generally, 10-year drought). The water uses shall be partly cut when the river flow lowers than the design one. According to the River Law, such water use reduction shall be determined through the coordination among the concerned water users in principle. The river administrator shall provide necessary data for the coordination and can arbitrate among the users when requested.

For this purpose, 99 drought coordination committees have been established in 68 river basins among the 109 Class I river basins as of 1999. The committee consists of river administrator, water users, concerned ministries of central government and concerned local governments.

#### 5.1.2 Processes of Water Use Restriction

The water use is usually restricted through the following processes in a severe drought time by each river basin

#### **Step I: Start of Drought Management**

The drought management will start when:

- River flow lowers to a certain level. (1)
- (2) Remaining water storage in dam lowers to a certain level.
- (3) It is forecast that the water right may not be satisfied in the near future.

#### **Step II: Holding of Drought Coordination Committee Meeting**

In the Drought Coordination Committee, the river administrator and water users (mostly represented by the concerned divisions of local governments) will provide or exchange the following information.

Info	mation Exchanged in Drought Coordination Committee
Concerned Person	Information
River Administrator	• River flow quantity, water storage in dam and river water quality
	• Necessary rate of water use restriction based on the forecasting of
	future river flow and dam storage
Water Users	• Expected damages due to water use restriction
	Dissemination of necessity of water use saving

#### • . .

#### **Step III: Decision of Water Use Restriction**

The water use restriction program (restriction rate of each water use and date of commencement) will be determined through the coordination among the water users.

#### **Step IV: Performance of Water Use Restriction**

During the period of water use restriction, the river administrator and water users will perform the following activities.

Activities in Water Use Restriction				
Concerned Person	Activities			
River Administrator	<ul><li>Dam operation based on the water use restriction program</li><li>River flow monitoring and forecasting</li></ul>			
Water Users	<ul><li>Performance of water use restriction</li><li>Monitoring of damages</li></ul>			

#### 5.2 Water Use Monitoring

#### 5.2.1 Necessity of Water Use Monitoring

- (1) River water is abstracted at a number of locations along the river course from the upstream to the river mouth. Excessive water abstraction of the upstream users may cause water shortage in the downstream users. For prevention of the water use conflicts, any water users shall comply with the water use conditions attached to his water right.
- (2) Registered water right shows the maximum quantity of water abstraction. However, actual water use seasonally varies within the limit of the water right quantity. Daily management of river water shall be done based on actual water abstraction.
- (3) In Japan, there is no surplus natural flow during dry season in most of the rivers. Water shortage is supplemented from the upstream storage dams. For effective dam operation, actual water use in the downstream should be monitored.
- (4) In a severe drought time, water users shall partly cut their water abstraction. For rational coordination of the water use restriction, the actual water abstraction shall be monitored and reported by the water users.

#### 5.2.2 Water Use Monitoring System

(1) According to the River Law, every water user shall monitor the water abstraction at intake and report the data to the river administrator. When the water users own storage dam, they shall also monitor the dam operation (water level, inflow discharge, water abstraction and water release) and report the data to the river administrator. The standard monitoring and reporting rules are as follows.

Standard Womtoring and Reporting Kules						
Monitoring Item	Monitoring	Monitoring Measures	Data Reporting Time to			
	Interval		River Administrator			
Intake						
Abstracted Quantity	Every Day	Automatic Water Gauge	End of Year (or Month)			
Storage Dam						
Water Level	Every Day	Automatic Water Gauge	End of Year (or Month)			
Inflow Discharge	Every Day	Automatic Water Gauge	End of Year (or Month)			
Abstracted Quantity	Every Day	Automatic Water Gauge	End of Year (or Month)			
Released Discharge	Each Time	Automatic Water Gauge	End of Year (or Month)			

#### Standard Monitoring and Reporting Rules

(2) The water use monitoring shall be done at the cost of water user.

- (3) The river administrator shall evaluate the reported data and file them.
- (4) The river administrator shall inspect the structural and operational conditions of river water intake facilities and storage dam once a year. At that time, he shall also check the monitoring system and equipment.
- (5) The river administrator himself has a number of multipurpose dams, and rain and water gauging stations for river water management. He also monitors rainfall, river water level (discharge), and dam operation (water level, inflow discharge, water abstraction and water release) every day.
- (6) Monitoring of the river water quality is important as well as river water quantity for the management of water use. Mainly the river administrator, local governments and domestic water users monitor the river water quality. A river water pollution monitoring committee consisting of the river administrator and local governments has been established in each of the Class I river basins to promote water quality monitoring, to exchange information on water pollution, to cope with accidental water pollution, etc.
- (7) The data on rainfall, river water level (discharge), river water quality, river water abstraction and dam operation filed by the river administrator shall be open to any concerned water users and organizations for mutual understanding on water use and for smooth coordination of water conflicts in drought time.
- (8) The above data shall be open also to the public according to the Information Publicity Law when requested.
- (9) The river administrator publishes annual report on the rainfall, river water discharge and river water quality, and dam operation data at all the monitoring stations and dams under his jurisdiction. The Ministry of Environment also publishes annual report of the water quality in public water body. The major water users publish annual report of their river water abstraction.
- (10) The following real time data in all the Class I rivers are accessible through the Internet.

Real Time Data accessible through Internet				
Item	Real Time Data			
Rainfall	Rainfall at Principal Station, Radar Rainfall			
River Water	Water Level and Water Quality at Principal Station			
Storage Dam	Storage Volume, Inflow Discharge, Outflow Discharge,			
	Notice/Alarm of Flood Water Release			
Drought Management	Remaining Dam Storage Volume, Cut of Water Abstraction			
Flood Management	Flood Forecasting/Warning			

#### **Real Time Data accessible through Internet**

#### **5.3** Water Use Coordination and Monitoring in Tone River (Example)

#### 5.3.1 Main Features of the River Basin

The river with a trunk length of 322 km drains an area of 16,840 km<sup>2</sup>. The river flow largely fluctuates throughout the year. The flow regime of the river is shown below.

#### Flow Regime of Tone River

							(U	$nit: m^3/s)$
Station	$C.A (km^2)$	Max.	26%	50%	75%	97%	Min.	Ave.
Kurihashi	8,588	11,400	259	159	110	77	6	252
Source: Ann	ual Danart of I	Divor Dicoh	orgo (100	0) Divor A	acconintion	(in Ionon	202)	

Source: Annual Report of River Discharge (1999), River Association (in Japanese) Record Period: 1938-1999

The river water has been exploited to a high level. The river supplies drinking water to 27.1 million people in the basin/Tokyo metropolitan area, irrigates 180,000 ha farmland in the basin/surrounding area, and supplies industrial water to the factories in the basin/Tokyo metropolitan area.

To meet the water shortage in dry season, 11 major storage dams (including Watarase reservoir) have been constructed. The total storage capacity for water use is approximately 640 million m<sup>3</sup>.

The river system including major storage dams, water intake weirs and estuary barrages is shown in Fig. 5.

#### 5.3.2 Water Use Monitoring

The river water is abstracted from approximately 540 intakes for domestic, industrial and irrigation purposes. The total water right quantity is about  $850 \text{ m}^3/\text{s}$ .

The water right is granted to meet the maximum water demand. The domestic and industrial water uses are almost constant throughout the year. However, the irrigation water use seasonally varies. It is mostly used during April to September, showing the peak during May to August.

Water balance of the river becomes severe not only during the irrigation period but also during non-irrigation season due to the unstable flow regime. Hence, the river administrator monitors each water use every month throughout the year. For practical purposes, he usually monitors only the specified water uses of which water rights are larger than a certain quantity (domestic/industrial uses: larger than  $0.7 \text{ m}^3$ /s and irrigation use: larger than  $1.0 \text{ m}^3$ /s).

The total water use quantity (water right quantity) of all the domestic, industrial and irrigation intakes together with those of the specified intakes are shown below.

Intake Number and Quantity of Water Use in Tone River						
Category	Al	l Water Use	Speci	fied Water Use		
	No. of Intakes	Max. Water Use (m <sup>3</sup> /s)	No. of Intake	Max. Water Use (m <sup>3</sup> /s)		
Domestic	60	106	17	95		
Industrial	32	55	13	52		
Irrigation	445	686	121	603		
Total	537	847	151 (28%)	750 (89%)		

Note: Domestic water use includes public, business and small industrial uses.

The above table shows that monitoring was made on about 30% of the large intakes covering about 90% of the total water use.

The above-mentioned specified water users shall measure water abstraction quantity by automatic water gauge every day. They shall report the results of measurement to the river administrator at the end of each month together with the water abstraction program during the next month. The

Source: Inventory of Water Rights in Kanto Region, June 1994, Kanto Regional Bureau, Ministry of Construction (in Japanese)
river administrator evaluates the reported information and files them. The reported information is used for the low flow management of the river.

Usually, a slight rise of the cut-off level of monitoring much decreases the number of intakes to be monitored although it does not decrease the monitoring quantity so much. The relationships among the three (3) factors in the Tone River Basin are shown below.

Relationship among Cut-on level, intake Number and Quantity in Tone River							
Cut-off Level of Monitoring	Ratio of Monitoring	Ratio of Monitoring					
	Intake Number (%)	Quantity (%)					
All Intake Monitoring	100	100					
Intake Monitoring $> 1.0 \text{ m}^3/\text{s}$	28	89					
Intake Monitoring $> 2.0 \text{ m}^3/\text{s}$	15	80					
Intake Monitoring $> 3.0 \text{ m}^3/\text{s}$	11	72					

Note: The above monitoring covers domestic, industrial and irrigation uses but excluding hydropower use.

#### 5.3.3 Low Flow Control

#### (1) **Control Process**

The water demand is larger than the natural flow in dry season. The water shortage is supplemented by operation of the upstream storage dams. The operation rules of the storage dams are established based on the data/information of water uses, river flow and river water quality (if necessary).

The processes of low flow control are described below.

#### **Step I: Estimate of Water Abstraction**

The river water abstractions are estimated by river section based on the report of the water users including: (i) actual water abstraction during the last month, and (ii) water abstraction program during the next month.

#### **Step II: Establishment of Required Flow at Principal Station**

The required flow at a principal station are established in consideration to the total water abstraction quantity and necessary environmental flow in the downstream river section governed by the station and flow entering from the tributaries to the river section.

#### Step III: Data Collection of Climate and Hydrology

The following climatic and hydrological data are collected for forecasting of the future flow: (i) weather forecasting, (ii) rainfall, (iii) river flow and quality, and (iv) storage dam (inflow, outflow, remaining storage volume).

#### **Step IV: Forecasting of Flow**

#### Step V: Estimate of Necessary Water Release from Storage Dam

The total necessary water release of the storage dams is estimated and allocated to each storage dam.

#### **Step VI: Operation of Storage Dam**

Each storage dam are operated according to the rules of the above allocated water release.

#### (2) **Estimate of Required Flow at Principal Station of the Mainstream**

The major water supply and intake system of the Tone River is shown in Fig. 6. The eleven (11) storage dams are integrally operated to satisfy the required flow at all the principal stations. The required flow at a certain station is determined as the total abstraction quantity and necessary in/on-stream use minus the inflow from the tributaries in the downstream.

For example, the required flow at the principal stations along the mainstream is estimated as follows.

Ca	Calculation of Required Flow at Principal Stations of Tone River					
Principal	Total Water Abstraction and	Inflow from	Required Flow			
Station	Necessary In-stream Use (m <sup>3</sup> /s)	Tributaries (m <sup>3</sup> /s)	$(m^{3}/s)$			
Iwamoto	16 + 2 + 53 = 71	Azuma River = Q1	71 – Q1			
Yattajima	14 + 124 = 138	,	138			
Kurihashi	7 + 69 + 3 + 38 + 30 = 147	Kinu River = Q2	147 - Q2 - Q3			
		Kokai River = Q3				

The above water abstraction quantity varies daily or weekly, depending on the actual water demand on the farmland. The inflow from the tributaries including the return flow also varies depending on the change of natural flow and water use in the tributary basin.

Hence, the river administrator estimates the required flow at the principal stations of the mainstream in every 5 days based on the reported water use program of the users and estimated inflow from the tributaries.

The river administrator monitors the river flow at the principal stations not only in the mainstream but also in the major tributaries.

#### (3) **Monitoring Method**

The river administrator monitors rainfall, water level, water quality, and water abstraction in the Tone River Basin as shown below for the river flow management including flood at present. The public can access data on real time rainfall, water level, water quality and dam operation as shown in the following table through the Internet.

Existing Monitoring Data, Method and Organization in Tone Kiver						
Data	No. of Sites	Monitoring Method	Measurement Organization			
Rainfall (point)	128	Real Time by Telemeter	R.A.			
Rainfall (area)	1	Real Time by Radar	R.A.			
Water Level	230	Real Time by Telemeter	R.A.			
Water Quality (limited index)	37	Real Time by Telemeter	R.A.			
Water Quality	106	Once a Month Sampling	R.A.			
Dam Operation	11	Real Time by Telemeter	R.A./JWA			
Major Water Intake	4	Real Time by Telemeter	Users/JWA			
Other Water Intakes	147	Daily by Phone (as required) or Monthly Report	Users			

#### Existing Monitoring Data, Method and Organization in Tone River

Note: R.A.: River Administrator, JWA: Japan Water Agency Source: River Bureau, Ministry of Land, Infrastructure and Transport

#### (4) Water Use Restriction in Drought Time<sup>(6)</sup>

The water supply and demand balance of the Tone River Basin is tight due to the delay of water resources development program. During the recent 20 years, the basin suffered from severe water shortage six times, i.e., in 1987, 1990, 1994, 1996, 1997 and 2001. Water use was cut by 10 to 30% in every drought event.

Among them, the water shortage in 1994 was the most serious. The river water use was cut in stages corresponding to the remaining water volume of the storage dams in accordance with the result of discussions in the drought coordination committee, as follows.

water Use Restriction in 1994 Drought of Tone River						
Period	Cut Rate (%)					
	Domestic	Industrial	Irrigation			
1994 July 19 – July 27	10	10	10			
July 28 – August 14	20	20	20			
August 14 – August 28	30	30	30			
August 29 – September 18	20	20	20			
September 19 -	0	0	0			

#### Water Use Restriction in 1994 Drought of Tone River

Note: Domestic water use includes public, business and small industrial uses.

It has been simulated that all the storage dams in the basin would have been completely dried up in one month if no water use restriction was enforced.

#### 5.3.4 Reasons for Good Performance of Water Use Monitoring

The water use monitoring is well performed with the close cooperation of water users in the Tone River Basin due to the following reasons:

- (1) The River Law mandates water users to monitor their water abstractions every day and submit annual or monthly reports to the river administrator.
- (2) For practical purposes, the river administrator mandates monitoring only to water users who have water rights larger than a certain quantity.
- (3) The irrigation water intake systems have been unified and modernized in recent years. At the same time, many customary water rights were changed into legal water rights. This has improved the management of irrigation water use.

- (4) Each of the large intakes are provided with a control office, which have good monitoring systems.
- (5) The water users have suffered from water shortage many times. From these experiences, they have learned the importance of optimum operation of storage dams to prevent vital drought damage. They have also recognized that optimum dam operation can be attained based on the data of correct water use monitoring.
- (6) The river administrator checks the data of water use monitoring and provides them to the drought coordination committee. Opening of the data may force the water users to conduct correct monitoring and reporting.

#### 6. HOW TO ESTABLISH THE REQUIRED MINIMUM FLOW

#### 6.1 General

As mentioned in Chapter 3, the river administrator must establish the required minimum flow in each river section according to the River Law. The required minimum flow is designed to satisfy both existing reasonable off-stream and in/on-stream uses in each river section. The flow required for in/on-stream uses is called environmental flow.

The off-stream uses cover domestic, agricultural, industrial, hydropower and others that are permitted by water right. The in/on-stream uses include preservation of aquatic life, fishery, scenic view, preservation of water quality, navigation, prevention of salinity intrusion, prevention of estuary clogging, maintenance of groundwater table, etc. These in/on-stream uses are maintained by the environmental flow.

The required minimum flow has been proposed in nearly 50% of rivers among the total 109 Class I rivers since 1964 when its establishment was stipulated in the River Law (the existing New River Law was enacted in 1964). The proposed required minimum flow fully covers the off-stream uses in every river because the water right quantity of all the existing off-stream uses are registered in the office of the river administrator. However, coverage of the environmental flow in these rivers is not always satisfactory since estimation of the environmental flow has been difficult.

In 1997, the Government revised the River Law to include the preservation/recovery of river environment in addition to the conventional management of river including water use control, flood/drought control, and river space/course/structure management. The river administrator must prepare the environmental improvement plan to preserve/recover/improve the river environment and implement the plan in cooperation with the concerned governmental/non-governmental organizations, disciplinary experts and citizens.

In these circumstances, the River Bureau, Ministry of Land, Infrastructure and Transport (MLIT) has surveyed the existing ecological conditions of river and riverside areas of all the Class I rivers. This is called the "national river ecology census". The objective ecologies include riverside plants, aquatic plants, fishes, birds, animals, insects, benthos and others.

Further, the River Bureau, MLIT has developed the technical guidelines for establishing the required minimum flow including environmental flow. Based on the guidelines, the required minimum flow of all the Class I rivers have been studied. Among them, the flow has already been authorized in approximately 20 rivers, while it is still under discussion in the remaining rivers.

### 6.2 **Procedure to Establish the Required Minimum Flow**<sup>(7)</sup>

The procedure to establish the required minimum flow is described below according to the technical guidelines proposed by the MLIT.

#### 6.2.1 Basic Assumption

The river environment, especially ecological environment, varies throughout the year corresponding to the flow variation of river. Theoretically, the environmental flow should be dynamically determined to meet the varying environmental requirements corresponding to the variation of river flow. However, this dynamic approach has not yet been applied due to the following reasons. For practical purposes, the required minimum environmental flow is statistically determined to meet the in/on-stream uses in a design drought (usually, 10-year

drought) in the same way as off-stream uses. Environmental flow management by the dynamic approach has been deferred the further study.

- (1) Impacts of the flow variation on ecology are not yet clear.
- (2) Adoption of different reliabilities between off-stream and in/on-stream uses will make the water use management more complicated and difficult. For example, if design environmental flow yearly changes, operation (especially water storage) of upstream storage dams may be restricted for ecological uses in the downstream even at water abundant time. It may reduce the benefits of the storage dam.
- (3) In Japan, the wet and dry seasons are not distinct. The river flow fluctuates to a large extent throughout the year. A spell of drought is severe in quantity but not so long in time. Hence, river flow of nearly natural pattern is usually expected except in drought time unless a large regulating reservoir is provided on the mainstream. At present, flow regulation capacity of the existing storage dams is limited since they are mostly installed in the uppermost reaches.

Generally, the controlled river flow regime of the mainstream in the major rivers is not so much different from the natural pattern except in drought time and in some specific locations.

#### 6.2.2 Methodology

#### (1) **Division of River Course**

The river course is divided into several river sections. The required minimum flow is set to satisfy all the permitted off-stream uses and required environmental flow in every river section. The division is made in due consideration to the following factors.

- (a) <u>Inflow of tributary</u>: divided at a location immediately upstream of the confluence of major tributaries.
- (b) <u>Topographic conditions</u>: divided so that topographic conditions of river course (slope, width, etc.) may not largely change within a river section.
- (c) <u>Environmental conditions</u>: divided so that environmental conditions (aquatic life, water quality, etc.) may not largely change within a river section.
- (d) <u>Water balance</u>: river flow changes in longitudinal direction due to water abstraction, return and tributary inflow. The river is divided in consideration to the water balance.
- (e) <u>Tidal reach</u>: tidal reach (especially, brackish water zone) is separated from the upstream fresh water reach since the relationships between environmental characteristics and hydrological indexes are different.

#### (2) Estimation of Off-stream Uses

The objective off-stream uses are those registered with the office of the river administrator. The registered water rights are employed to estimate the off-stream water uses in principle. Sometimes, however, the water right quantity is larger than the actual use. They are checked and revised based on the result of a field survey as required.

Agricultural water use seasonally changes. It is set by season, at least, by irrigation and non-irrigation periods.

Finally, water intake location and quantity of all the off-stream uses is set by season.

#### (3) Estimation of Environmental Flow

Environmental flow is set to satisfy all the existing in/on-stream uses in each river section. The environmental flow is also set according to season to meet the seasonal changes of the in/on-stream use requirements.

The estimation method for environmental flow is described according to each in/on-stream use in the following Subsection 6.2.3.

#### (4) Estimation of Water Balance

Intake quantity of the off-stream uses is estimated as described above. However, a considerable portion of the abstracted water returns to the downstream of the river through drainage channels. Usually, the return flow of agricultural water use is significant and it cannot be neglected. This return flow quantity and location is estimated based on the result of a field survey.

Further, the river receives inflow of tributaries at many locations. The tributary inflow at a design drought is estimated.

Finally, water balance among the intake quantity, return flow and tributary inflow is calculated to estimate the net off-stream use requirement to be supplied from the main river. This water balance is calculated along the main river from upstream to downstream.

#### (5) Establishment of Required Minimum Flow

The required minimum flow to satisfy both off-stream uses and environmental flow is estimated for each river section and season. This flow is maintained at the upper end of each river section.

Actually, the required minimum flow is established at one to several principal river stations selected since it is too complicated to establish the required minimum flow at the upper boundary of each river section. Each selected principal station governs several river sections in the downstream.

The required minimum flow at each principal station is determined to satisfy all the required minimum flows in the governed river sections.

#### 6.2.3 Estimation Method of Environmental Flow

#### (1) Aquatic Life and Fishery

(a) General

Fish is adopted as the representative index of the aquatic lives in the rivers. Water depth and velocity larger than a certain value are necessary for the spawning, growing and moving of fishes. For sustainable fishing activities, the river must maintain also water width/area larger than a certain value so that the objective fishes can spawn, stay and move in groups with sufficient population density. The estimation method of the required minimum environmental flow for fish is described below.

#### (b) Selection of Representative Fish Species

A minimum hydraulic condition (water depth, flow velocity and water width) is necessary for the spawning and moving of fishes. On the other hand, the river channel is formed of shoals (shallow water) and pools (deep water), and they alternately appear in the river course from upstream to downstream. The above hydraulic condition is more affected in shoals than in pools when river flow decreases.

Hence, the fish species that spawn and live in shoals are damaged first when the river flow decreases. Fish species living in pools evacuate to other deeper pools by moving across shoals at drought time. The hydraulic conditions on the shoal are the most important for the existence of fishes in Japan.

Based on the above considerations, the representative fish species are selected from among the following species: (i) fishes that spawn and live in shoals, (ii) migratory (wandering) fishes. However, exotic species are excluded.

The representative fishes are selected for each river section and season. Each fish selected must represent the other similar fishes and require more flow quantity to spawn and live than the others.

(c) Required Minimum Water Depth/Velocity of the Representative Fish Species

The fish species living in the rivers are different from region to region. The number of pure freshwater fish species in Japan is said to be approximately 100 in total. Usually, 30-60 species live in one river.

The MLIT estimated the required minimum water depth and velocity for the approximately 40 representative fish species in Japan. The required minimum water depth and velocity for the most popular species, and their size and spawning season are shown below for reference. The spawning season varies by region. Pictures of these fishes are shown in Fig. 7.

Kequited Hydraune Conditions of the Representative Fishes in Sapan							
Fish Name	Hydraulics at		Depth for Size of Adult Fis		dult Fish	Spawning Season	
	Spawin		Diversion			- Season	
	Velocity	Depth	Depth (cm)	Length	Height		
	(cm/s)	(cm)		(cm)	(cm)		
Sweet-fish (Ayu)	60	30	15	30	5.5	OctNov.	
Plecoglossus altivelis							
Japanese dace (Ugui)	30	30	15	30	6.0	AprJun.	
Leuciscus hakonensis							
Pale chub (Oikawa)	5	10	10	15	3.0	May-Aug.	
Zacco platypus							
Dog salmon (Sake)	20	30	30	65	14.2	Mid Oct. to	
Salmo keta						Dec.	
Masu trout (Yamame)	20	15	15	30	7.4	Oct.	
Salmo masou masou							
Japanese char (Iwana)	5	15	15	30	5.8	Late Oct. to	
Salvelinus leucomaenis						Early Nov.	

#### Required Hydraulic Conditions of the Representative Fishes in Japan

Note: (1) Name in parenthesis: Japanese name

(2) Name in italic letter: scientific name

(3) Spawning season: season in Kanto Region (central part of Japan)

#### (d) Required Environmental Flow of the Representative Fish Species

As mentioned above, the most critical conditions of fishes for spawning, living and moving appear on the shoals in each river section. Hence, the required minimum environmental flow for the representative fishes is estimated by calculating the curves of flow rate-velocity–depth on the critical shoals.

On the other hand, fishes live in groups. Accordingly, a certain water width is necessary for the fishes to live in groups on the shoals. The above estimated minimum environmental flow is thus checked for the required water width.

#### (2) Scenic View

(a) General

Maintenance of beautiful scenic view is desired for river sections where people gather (scenic spots, resort area, riverside parks, etc.). River flow is one of the important factors that may govern the scenic view of rivers, especially in the middle reaches. The necessary river flow to maintain a satisfactory scenic view in the middle reaches is estimated as follows.

(b) Standard Evaluation Method of Scenic View

For example, when people see the river from a bridge, they may feel a satisfactory scenic view in cases where the ratio of water width (W) and river width (B) is above a certain level.

The MLIT made a questionnaire survey on the scenic views of 38 representative rivers in Japan. According to the above survey, a satisfactory scenic view is obtained when W/B is more than 0.2.

(c) Required Environmental Flow

The required environmental flow is estimated by calculating the curves of flow rate (Q) - ratio (W/B). The required ratio (W/B) is estimated based on the data of interview survey by each river. When no sufficient data are available, the above standard value (W/B=0.2) is employed.

### (3) **Preservation of Water Quality**

(a) General

The standard (target) water quality of river has already been set for each river section of all the major rivers based on the water pollution control law. The standard water quality is set corresponding to the existing off and in/on-stream uses as shown below. These standards are to be attained for low flows with 75% exceedance probability.

Vol.	II:	Supporting	Report,	Paper	IX:	Water	Use	Manage	ement
					W	UP-JI	CA,	March	2004

	Standard River Water Quanty corresponding to Water Usage in Japan						
Class	Water Use Level	pН	BOD	SS	DO	Coliform	
		_	(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)	
AA	(1) Domestic water: I	6.5-8.5	< 1	< 25	> 7.5	< 50	
	(2) Natural beauty preservation						
А	(1) Domestic water: II	6.5-8.5	< 2	< 25	> 7.5	< 1,000	
	(2) Fishery: I						
В	(1) Domestic water: III	6.5-8.5	< 3	< 25	> 5	< 5,000	
	(2) Fishery: II						
С	(1) Fishery: III	6.5-8.5	< 5	< 50	> 5	-	
	(2) Industrial water: I						
D	(1) Industrial water: II	6.0-8.5	< 8	< 100	> 2	-	
	(2) Agricultural water						
Е	(1) Industrial water: III	6.0-8.5	< 10	No	> 2	-	
	(2) General environ. preservation			dust			

Standard	River	Water	Quality	corres	ponding	to \	Water	Usag	e in Ja	pan
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Reducing pollution loads from the sources should controll river water pollution in principle. However, complete control of pollution load runoff to the rivers is impossible. Hence, the dilution effect of river water is expected to some extent to attain the target water quality of the rivers.

(b) Estimation Method of Required Environmental Flow

The required environmental flow for the preservation of water quality is determined in terms of BOD since BOD is the most important index to evaluate river water quality. BOD load runoff to the rivers is estimated under the following conditions and assumptions.

- (i) All the industrial pollutants are controlled according to the relevant regulations.
- (ii) Sewage is treated based on the long-term sewerage development plan of the government.

The BOD load in each river section is estimated. Then, the required river flow to dilute the BOD load up to the target quality level is calculated. As mentioned in Subsection 6.2.1, environmental flow is determined for the river flow of a 10-year drought (90% probability). The target BOD concentration of 10-year drought flow should be estimated by surveying the relationship between water qualities at the time of 75% and 90% flows in each river basin. However, BOD concentration is generally assumed to be twice of that of the 75% probability flow, as shown below.

					(Un	it: mg/l)
Flow/Class	AA	А	В	С	D	Е
BOD at 75% Flow	< 1	< 2	< 3	< 5	< 8	< 10
BOD at 10-Year Drought	< 2	< 4	< 6	< 10	< 16	< 20

Target BOD Co	oncentration at	10-vear l	Drought
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#### (4) Navigation

The environmental flow for navigation is estimated for river sections where ships currently navigate. For navigation, the necessary draft and water width must be maintained in each river section. The required flow is obtained through hydraulic calculations of the river channel. If necessary, the required flow is preserved by dredging part of the riverbed.

In Japan, cargo transportation by ship is limited to part of some rivers. However, navigation for tourism is popular in the upstream valley of many rivers.

#### (5) **Prevention of Salinity Intrusion**

In rivers with a gentle slope, saline water with a high concentration goes up in the channel at drought time, resulting in damage to urban and irrigation water uses. A certain quantity of river flow is necessary to control salinity intrusion.

The necessary environmental flow is determined through a hydraulic simulation to satisfy the allowable water quality of the objective water uses, or determined based on the river flow-damage curve in the past. In this flow determination, the following are taken into consideration:

- (a) River dredging may accelerate salinity intrusion.
- (b) If the required flow is too large, shifting of water intakes upstream or construction of estuary barrage should be considered to preserve the flow.

#### 6.3 Establishment of Required Minimum Flow in Shinano River (Example)<sup>(8)</sup>

#### 6.3.1 General

#### (1) Main Features of the Basin

The Shinano River originating in the central mountain range of Japan flows down northward to the Japan Sea at Niigata City. It drains a total area of  $11,900 \text{ km}^2$ . It is the longest river in Japan of which trunk river length is 367 km. The total population of the basin is approximately 3 million (See, Fig. 8). The flow regime of the river is as shown below.

#### (Unit: $m^3/s$ ) Station $C.A (km^2)$ 26% 50% 75% 97% Min. Max. Ave. 9 7 1 9 9.638 297 205 Oiiva 577 388 23 504

**Flow Regime of Shinano River** 

Source: Annual Report of River Discharge (1999), River Association (in Japanese) Record Period: 1951-1999

The river water is mainly used for hydropower and irrigation purposes. The existing off-stream uses are summarized below.

Existing Water Uses of Shinano River							
Water Use	Water Right Quantity (m <sup>3</sup> /s)	Nos. of Water Right	Remarks				
Hydropower*	4,006	115	Max. Output: 5,035 MW				
Agricultural	507	176	Irrigation Area: 99,500 ha				
Industrial	19	9					
Domestic	15	43	Served Population: 2.4 million				
Others	11	19	_				
Total	4,558	362					

Note: \* Including pumped up hydropower.

#### (2) **Objective River Reaches**

The MLIT had conducted studies on the required minimum flow on large portions of the mainstream and major tributaries in cooperation with concerned local governments and municipalities and environmental experts. The study for the middle and lower reaches of the mainstream is presented in this Paper as an example of how to establish the required minimum flow. (Please take note that in this Paper, the studies of the Ministry are slightly modified for easier understanding of readers.)

The objective mainstream is the river stretch of 201 km between Tachigahana Station and the estuary where the mainstream collects water from Uono River (C.A. =  $1,497 \text{ km}^2$ ) and a large number of small tributaries.

In the river valley at the middle reaches, the river water is diverted for hydropower use at two locations, Nishiohtaki Dam and Miyanaka Dam. In the lower reaches, the river splits into two streams, the Shinano Mainstream and the Nakanokuchi River, which again join with each other. Further, the river diverts floodwater to the Japan Sea through two flood diversion channels (Ohkouzu diversion and Sekiya diversion) on the midway.

The river system between Tachigahana Station and the estuary is shown in Fig. 8.

#### 6.3.2 Water Balance along the Mainstream

#### (1) Conditions and Assumptions

The water balance of the objective mainstream is estimated for the design drought of 10-year probability under the following conditions and assumptions:

- (a) The mainstream flow of the design drought at Tachigahana and Ojiya stations are estimated at 83 m<sup>3</sup>/s and 148 m<sup>3</sup>/s, respectively.
- (b) Design drought inflow of the tributaries to the mainstream is estimated by calculating the water balance of each tributary.
- (c) Part of the abstracted domestic and industrial uses is returned through sewerage outlets.
- (d) Part of the abstracted irrigation water is returned through drainage outlets. Real consumption of the irrigation water is assumed to be approximately 10 mm/day. The remaining water is assumed to return. However, it does not all return to the mainstream and a considerable portion is returned to the other river systems.

#### (2) Estimated Water Abstraction and Tributary Inflow

The objective mainstream is divided into the following five (5) sections. For the location, see Fig. 9(1/2) and Fig. 9(2/2).

Section	Location	River Distance (km)
А	Tachigahana Station – Ojiya Station	107
В	Ojiya Station – Ohkouzu Diversion	36
С	Ohkouzu Diversion – Nakanokuchi Branch	7
D	Nakanokuchi R. Branch – Nakanokuchi R. Confluence	38
Е	Nakanokuchi R. Confluence - Estuary	13

#### **Divided River Sections of the Objective Mainstream**

The water abstraction and tributary inflow from/to each river section is summarized below.

		Water Abstraction							Tributary		
Section	Urban			Irrigation			Hydropower			Inflow	
Section	No.	Q (m <sup>3</sup> /s)	No.	Q (m <sup>3</sup> /s)	Area (ha)	No.	Q (m <sup>3</sup> /s)	Max. Output (MW)	No.	Q (m <sup>3</sup> /s)	
А	2	1	31	6	3,000	2	172 (488)	285	79	68	
В	8	3	9	66	27,200	-	-	-	11	17	
С	2	1	8	8	1,600	-	-	-	3	6	
D	4	1	22	41	11,300	-	-	-	8	14	
Е	6	22	1	1	100	-	-	-	1	4	
Total	22	28	71	122	43,200	2	172 (488)	285	102	109	

Water Abstraction and Tributary Inflow in Each River Section

Note: (1) Urban: domestic and industrial uses

(2) Hydropower Q: outside of parenthesis is abstraction at design drought and inside of parenthesis is maximum quantity.

#### (3) **Estimated Water Balance**

The water balance of each river section during the irrigation period at the design drought is shown in Fig. 9 (1/2) and Fig. 9 (2/2). Further, a longitudinal variation of the mainstream flow during the irrigation period at the design drought is obtained by calculating the water balance at each river distance. It is shown in Fig. 10.

#### 6.3.3 Estimation of Required Environmental Flow

#### (1) **Preservation of Aquatic Life and Fishery**

In Shinano River, approximately 50 fish species have been identified by a recent survey. From them, the following six (6) fish species were selected to estimate the minimum environmental flow for the preservation of aquatic life and fishery.

(i) Sweet-fish, (ii) Japanese dace, (iii) Pale chub, (iv) Dog salmon, (v) Masu trout and (vi) Japanese char. For pictures of the fishes, see Fig. 7.

Among the above fishes, Japanese char lives only in the watershed areas. Sweet-fish, Dog salmon and Masu trout do not live in the lower reaches of the mainstream. They only pass through the reaches and river flow is large enough for their passing. Hence, the required minimum environmental flows of the lower and middle reaches were calculated for the following representative fishes. The required minimum velocity and depth for their preservation are presented in Section 6.2.3.

Representative Fishes of the Objective Mainstream							
Reaches	River Section	Representative Fishes for Study					
Lowe Reaches	Estuary (0.0 km) – Ohkouzu Diversion (58 km)	Japanese dace and Pale chub					
Middle Reaches	Ohkouzu Diversion (58 km) – Tachigahana St. (201 km)	Sweet-fish, Japanese dace, Pale chub, Dog salmon and Masu trout					

The required minimum environmental flow rates at the critical river sections (river distance) were calculated as shown in Fig. 10.

#### (2) Scenic View

As mentioned before, the ratio between water width (W) and river width (B) shall be larger than 0.2 to maintain a satisfactory scenic view of the river. People usually enjoy the scenic view of the river on bridges. The river flow necessary to maintain the ratio (W/B) more than 0.2 was calculated at the representative bridge sites. These are presented in Fig. 10.

#### (3) **Preservation of Water Quality**

Based on the water quality standards of the Shinano River, those of the objective mainstreams are shown below. These quality values are set for the low river flow with 75% probability.

River Section	Class	pН	BOD	SS	DO	Coliform
			(mg/l)	(mg/l)	(mg/l)	(MPN/100 ml)
Tachigahana St. (201 km) - Nakanokuchi R.	А	6.5-8.5	< 2	< 25	> 7.5	< 1,000
Confluence (14 km)						
Estuary (0.0 km) – Nakanokuchi R.	В	6.5-8.5	< 3	< 25	> 5	< 5,000
Confluence (14 km)						

#### Standard River Water Quality of the Objective Mainstream in Shinanao River

In this study, BOD is selected as the representative water quality index. The target BOD values at the design drought are assumed as twice of the above standard values as follows.

Target BOD Concentration of the Objective Mainstream at the Design Drought							
River Section	Class	BOD (mg/l)					
Tachigahana St. (201 km) - Nakanokuchi R. Confluence (14 km)	А	< 4					
Estuary (0.0 km) - Nakanokuchi R. Confluence (14 km)	В	< 6					

#### Target BOD Concentration of the Objective Mainstream at the Design Drought

The required minimum environmental flow for the preservation of river water quality was estimated at the representative stations as shown in Fig. 10 by simulating pollution load runoff to the river.

#### (4) Navigation

The mainstream is used for navigation in the middle/lower reaches for tourism and sand/gravel transportation as shown in the following table. The draft of ships is also shown below.

Existing Navigation in the Objective Mainstream							
River Section	Purpose	Draft of Ship (m)					
Uono R. Confluence (101 km) - Ojiya St. (94 km)	Tourism	0.7					
Ohkouzu Diversion (58 km) – Estuary (0.0 km)	Sand/Gravel Transport	1.6					

The required minimum environmental flow has been calculated as shown in Fig. 10.

#### (5) Others

There are no salinity intrusion problems in the lower reaches. It is because the mainstream is provided with a control gate immediately downstream of the Sekiya flood diversion site (8.5 km). In addition, the Sekiya flood diversion is also provided with a gate at the river mouth.

The riverine area has not experienced the lowering of groundwater table even in the driest year in the past. No estuary clogging has occurred in the past.

#### 6.3.4 Establishment of Required Minimum Flow

From the above studies, the present water use situations of the objective mainstream are assessed as follows for the design low flow of 10-year drought.

- (1) Necessary flow for the existing off-stream uses will be secured through the entire objective river reaches.
- (2) The fishes will be preserved enough except in the river valley between the Uono River confluence (101 km distance) and Nishiohtaki Dam (162 km distance). The river flow is too small for the preservation of fishes in this river section of approximately 60 km. It is due to the insufficient water release of the two dams, Nishiohtaki Dam and Miyanaka Dam. This problem may be mitigated or solved if the water release of the dams is increased.
- (3) Satisfactory scenic view will be maintained except at some locations of the above river valley. The scenic view in the river valley will improve if the water release of the dams is increased.
- (4) The river water quality will be preserved through the entire river reaches.
- (5) The navigation will be obstructed at a few locations of the lower reaches. Dredging the riverbed will solve this problem since the required dredging volume is not large.
- (6) For the other river environments (saline water intrusion, groundwater and estuary clogging), no problems will occur.

From the above assessment, the required minimum flow is set at 83  $m^3/s$  for Tachigahana Station and 148  $m^3/s$  for Ojiya Atation. The required minimum flow is secured for a 10-year drought.

#### 6.3.5 Further Study

As mentioned above, the river flow is very small in the river valley of 60 km distance between the Uono River confluence and the Nishiohtaki Dam due to the insufficient water release of the two dams. The water release of the dams must be increased to retrieve the habitats of fish and the scenic view in this river valley. For the dam and river conditions in the river valley, see Fig. 11.

The two dams were constructed in 1939. Under the existing water rights of the dams, Nishiohtaki Dam and Miyanaka Dam are obligated to release the minimum environmental flow of  $0.3 \text{ m}^3$ /s and  $7.0 \text{ m}^3$ /s respectively.

The MLIT is conducting a study on the retrieval of the river environments in cooperation with the local governments, municipalities, power companies and environmental experts. Increase of water release will improve the environmental conditions, but reduce the production of electric energy. Hence, the optimum operation rules of the dams shall be established based on the ongoing environmental studies.

### 6.4 **Retrieval of River Valley Environments**

### 6.4.1 General

In Japan, the existing hydropower stations were mostly constructed before World War II or at the latest in 1960-1965. They are located in the river valleys of the uppermost reaches. Usually, there

are no or little off-stream water uses for domestic/industrial and irrigation purposes in such river valleys. Hence, the obligated water release of the hydropower dams was set to be very small to maximize the power generation when the water right was granted.

However, maintenance of good river environments has become more important in the recent years. The people in many river basins have strongly requested retrieval of the river environments in such valleys. In these circumstances, the MLIT decided in 1988 to review and change (as required) the existing obligated water release of hydropower dams when the current water rights are renewed. In general, the validity of water rights for hydropower is approximately 30 years.

Change of the water release is studied, based on the following guidelines.

- (1) Change of the obligated water release (release of environmental flow) is made in the following cases:
  - (a) Inter-basin diversion.
  - (b) A significant water reduction occurs over a distance of more than 10 km with either of the following conditions: (i) drainage area of the dam is larger than 200 km<sup>2</sup>, (ii) the objective river section is located within a natural park, (iii) the objective river section is attractive for tourism, and (iv) others.
  - (c) Water of the objective river section does not satisfy the standard quality in drought time.
- (2) Quantity of the obligated water release is determined by the river administrator in due consideration of water width, water depth, water quality and aquatic life in the affected river section.
- (3) Increase of the obligated water release is limited to a certain extent since it reduces power generation. Standard quantity of the minimum water release is assumed to be  $0.1 0.3 \text{ m}^3$ /s per 100 km<sup>2</sup> for the drainage area of dam throughout the year.

#### 6.4.2 Environmental Water Release of Saga Hydropower Dam (Example)<sup>(9)</sup>

#### (1) General

The Saga hydropower dam is located at a river valley in the upper reaches of the Shimanto River, which is located in Shikoku Island, as shown in Fig. 12. The drainage area and trunk length of the river is  $2,270 \text{ km}^2$  and 196 km, respectively.

The dam is located at 110 km upstream from the river mouth and covers a drainage area of 378 km<sup>2</sup>. The water extracted by the dam is diverted into the Iyoki River for hydropower generation (inter-basin diversion) [See, Fig. 12]. The dam was constructed in 1937. Its water right has been renewed two times since 1937. The second water right is supposed to have expired in April 2001. The salient features of the hydropower dam permitted by the water right are as below.

Salient Features of Saga Hydropower Dam							
Item	Quantity	Remarks					
Maximum Water Use (m <sup>3</sup> /s)	12.5						
Maximum Output (kW)	15,000						
Yearly Generated Energy (MWH)	93,000	Average of recent 10 years					
Dam Height (m)	8.0						
Effective Dam storage (million m <sup>3</sup> )	0.7						
Minimum Water Release (m <sup>3</sup> /s)	1.0	Fishing season (Mar. – Oct.)					
	0.0	Other season (Nov – Feb.)					

The average river flow regime during the recent 10 years (1985–1994) at Saga Dam is summarized below.

Flow Regime at Saga Hydropower Dam Site								
Flow Rate	Fishing Seaso	n (Mar. – Oct.)	Other Season (Nov. – Feb.)					
	Inflow $(m^3/s)$	Release $(m^3/s)$	Inflow (m <sup>3</sup> /s)	Release $(m^3/s)$				
26% Probability	34.4	23.2	11.1	6.3				
50% Probability	16.7	4.8	5.4	0.2				
75% Probability	9.9	1.0	4.0	0.0				
97% Probability	4.4	1.0	2.7	0.0				
Minimum	3.4	1.0	2.4	0.0				
Average	38.6	29.4	10.1	6.1				

Flow Regime at Saga Hydropower Dam Site

The Shimanto River is one of the most famous rivers in the fishery and sport fishing of Sweet-fish. In the recent years, people of the basin have claimed that the water diversion has caused damage on the production of sweet-fishe, scenic view and other environments of the river.

Before the renewal of the water right scheduled in April 2001, the river administrator (Minister of MLIT) made a study on the required minimum water release of the dam in cooperation with the local governments, municipalities, the power company and environmental experts to retrieve the river environments in the downstream of the dam. Based on the study, the current minimum water release of the dam was revised in the new water right.

The study results on environmental flow are described below.

#### (2) **Objective River Section of the Study**

The river flow is much reduced by the diversion for an approximately 20 km distance between Saga dam and Tsuga hydropower station. In the downstream of Tsuga hydropower station, the impact of the diversion is mitigated by the discharge of Tsuga hydropower station. Accordingly; the study had concentrated on this river section. For location of the objective river section, see Fig. 12.

#### (3) Screening of the Environmental Factors

- (a) There are no off-stream and navigation uses in the objective river section.
- (b) There is no groundwater use in the riverine area of the objective river section.
- (c) The existing water quality of the objective river section satisfies the water quality standard for Class AA (see, Subsection 6.2.3). No problem is seen on this matter.

- (d) The water diversion may affect fish life and scenic view.
- (e) There are 12 representative fishes in the Shimanto River of which sweet-fish is the most important and popular one. Sweet-fish requires a larger flow velocity and water depth than the other 11 fishes. The places where sweet-fish can live are considered also suitable for living of the other 11 fishes. Hence, sweet-fish was selected for the study.
- (f) From the above considerations, the preservation of sweet-fish and the scenic view was studied.

#### (4) Study Results

The study was conducted based on the observed data in the past and the data obtained from the experiment that actually varied the water release quantity of the dam. The study results and recommendations are summarized below.

- (a) Ratio (W/B) of the water width (W) and river width (B) shall be maintained to be 0.2 at least to preserve the scenic view of the objective river section. For this purpose, water more than 1.13 m<sup>3</sup>/s (0.3 m<sup>3</sup>/s/100 km<sup>2</sup>) shall be released from the dam throughout the year.
- (b) Sweet-fish requires water depth of more than 30 cm and flow velocity of more than 40 cm/s for spawning and water depth of more than 15 cm for movement. These hydraulic conditions shall be maintained at all the shoals (shallows) of the objective river section. For this purpose, water more than  $1.13 \text{ m}^3/\text{s}$  ( $0.3 \text{ m}^3/\text{s}/100 \text{ km}^2$ ) shall be released from the dam throughout the year.
- (c) No water release of the dam may cause an extreme lowering of water temperature in winter season. It may affect the living of fish and other aquatic lives. Such problems will be solved if water of  $1.13 \text{ m}^3/\text{s} (0.3 \text{ m}^3/\text{s}/100 \text{ km}^2)$  is released from the dam.
- (d) For the growth of sweet-fish, sufficient water surface area is necessary. The water surface area of the objective river section increases at a high rate until the dam water release of 1.89 m<sup>3</sup>/s (0.5 m<sup>3</sup>/s/100 km<sup>2</sup>) and thereafter, does not increase so much. Hence, water more than 1.89 m<sup>3</sup>/s (0.5 m<sup>3</sup>/s/100 km<sup>2</sup>) shall be released from the dam during the growing season of sweet-fish (March–September).
- (e) Population density of sweet-fish decreases when the water release becomes less than  $1.89 \text{ m}^3/\text{s} (0.5 \text{ m}^3/\text{s}/100 \text{ km}^2)$ . Hence, water more than  $1.89 \text{ m}^3/\text{s} (0.5 \text{ m}^3/\text{s}/100 \text{ km}^2)$  shall be released from the dam during the growing season of sweet fish (March–September).
- (f) Too high water temperature in hot summer season may cause damage on Algae on the riverbed, resulting in the shortage of sweet-fish's bait. To solve this problem, water more than 2.65–3.4 m<sup>3</sup>/s (0.7–0.9 m<sup>3</sup>/s/100 km<sup>2</sup>) shall be released from the dam during July to mid-September.
- (g) The above-mentioned water release of the dam will decrease the existing water use for hydropower by nearly 10%. However, the reduction of hydropower water use (reduction of inter-basin diversion) will not affect the existing water uses in the Iyoki River (receiving river of the diverted water).

After consultation/discussions with the power company and the local government, the required minimum water release of the dam was set as shown below. Seasonal pattern of sweet-fish life is also shown below.



The dam features and river/water conditions at the representative location in the objective river section are shown in Fig. 13.

#### 6.5 Control of Salinity Intrusion

#### 6.5.1 General

Salinity intrusion occurs more or less in the lower reaches of every river. It sometimes causes severe damages on the domestic/industrial and irrigation water uses in gentle slope rivers at drought time. Generally, a large amount of river flow is required to push back the salinity intrusion.

In Japan, it is usually considered uneconomical to maintain the river flow required for pushing back the salinity intrusion. It is because the river water has been highly developed for off-stream uses and surplus water is limited. Damage by salinity intrusion has been prevented by shifting the location of water intakes to the upstream or by constructing estuary barrages in most of the rivers. There are approximately 30 estuary barrages in the lower reaches of the 109 Class I rivers.

# 6.5.2 Control of Salinity Intrusion in the Tone River (Example)<sup>(10, 11)</sup>

#### (1) Hydrological Features

The Tone River is the largest river in Japan with a trunk length of 322 km and a drainage area of 16,840 km<sup>2</sup>. For the river and water supply/intake systems, see Fig. 5 and Fig. 6.

The slope of the mainstream is very gentle in the lower reaches. The riverbed slope is -1/10,000 for the river distance of 0-20 km, level for 20-45 km, 1/4,000 for 45-60 km, 1/27,000 for 60-70 km and 1/8,000 for 70-85 km. The tidal effect reaches the 80 km distance where Fukawa river station is located. A high content of saline water goes up to the 40 km distance at drought time where Sawara City is located.

The mean sea water level at the river mouth is -0.14 m. The tidal variation is as follows. <u>Note</u>: water level is measured based on the topographic benchmark of Japan (datum line: mean sea level of Tokyo Bay).

Tidal Variation at the River Mouth of Tone River							
Tide	Mean High Water	Mean Low Water					
Spring Tide (m)	0.66	- 0.99					
Neap Tide (m)	- 0.04	- 0.44					

The large-scale integrated water resources development of the Tone river basin was started in 1955–1960 to meet the increasing water demand of the basin and Tokyo metropolitan area. However, the existing water uses in the basin had frequently suffered from water shortage. Hence, the development plan was proposed firstly to solve the water shortage of the existing users and then, to supply water to the new users.

In the development plan, the required minimum flow at Fukawa station during irrigation season (April–August) was assumed at 90 m<sup>3</sup>/s to satisfy the following existing off-stream and in/on-stream uses. The required minimum flow at Sawara station (upper end of salinity intrusion) comes to 80 m<sup>3</sup>/s as shown below, taking into account the water abstraction between the Fukawa and Sawara stations.

Required Minimum 110% in the Lower Reaches of 10he River							
Water Use	Required Mini. Flow at	Required Mini. Flow at					
	Fukawa $(m^3/s)$	Sawara $(m^3/s)$					
Domestic/Industrial	2	Small					
Irrigation	36	28					
Salinity Repulsion	50	50					
Total	88 pprox 90	78pprox80					

#### **Required Minimum Flow in the Lower Reaches of Tone River**

The water required for salinity repulsion (50  $m^3/s$ ) was assumed based on the experiences in the past.

The required minimum flow in the lower reaches of the river is illustrated below.



#### **Required Minimum Flow Distribution in the Original Plan**

The water resources development plan was prepared for the river flow regime in the design year (1955) with a probability of 5-year drought. The natural flow at Fukawa station during the irrigation season in 1955 is shown below. (Note: The water demand and supply balance of the Tone river basin is more severe than the other river basins in Japan so that the design drought of 5-year was adopted.)



River Flow at Fukawa St. in 1955

As shown in the above figure, the river flow is less than 90  $m^3/s$  during some periods in June, July and August. The planned storage dams shall supplement this water shortage to maintain the required minimum flow (90  $\text{m}^3/\text{s}$ ).

#### (2) **Damages by Salinity Intrusion**

A high content of saline water goes up to the Sawara City site (40 km upstream from the river month) at drought time. In the downstream of Sawara City site, there are 23 water intake facilities to irrigate a total paddy field of 30,000 ha. The intakes are located in the river sections of 25 km to 40 km from the river mouth. Those are summarized below.

Irrigation water Use prone to Samity Intrusion								
Irrigation Project	Irrigation Project Intake Site		Irrigation	Remarks				
	(km)	$(m^{3}/s)$	Area (ha)					
Ohtone Project	25	10	6,500	Development Period: 1935 - 1951				
Ryousou Project	40	15	21,100	Development Period: 1943 - 1965				
21 Small Projects	20 - 40	3	2,400					
Total		28	30,000					

The salinity intrusion has caused damage on the above irrigation projects in recent years. The damages (reduction of rice production) in the past are roughly estimated as follows.

Salinity Intrusion Damages in the Past									
Year 1954 1955 1956 1957 1958 1959 1960 1961								1961	
Rice Reduction (ton)	18	101	291	233	5,104	15	816	216	
Water Shortage (million m <sup>3</sup> )	55	169	150	64	386	70	186	169	

Note: Water Shortage: shortage of the required minimum flow (90 m<sup>3</sup>/s) during April–August at Fukawa Sta.

#### (3) Causes of Damage

Rice crops have been damaged more or less every year. The most serious drought occurred in 1958 and it affected not only the rice crop of 21,000 ha but also the drinking water of more than 34,000 people.

The major causes of the above damages may be as follows:

- (a) A high content of salinity intruded upward due to the shortage of river flow during the irrigation season. Especially, the river flow decreased to a large extent in 1958. The shortage in volume of the required minimum flow during April to August is shown in the above table.
- (b) The water resources development plan of the basin was prepared to secure the required minimum flow (90 m<sup>3</sup>/s) at Fukawa station by constructing new storage dams in the upstream watershed areas. However, this flow had not been secured until 1961 since the construction of new dams just started.
- (c) A large-scale river dredging started in 1949 to mitigate flood damage in the lower reaches. However, it accelerated the salinity intrusion. About 30 million m<sup>3</sup> was dredged by 1961.
- (d) The large irrigation developments in the recent years increased the damage potential of salinity.

#### (4) Hydraulic Analysis of Salinity Intrusion

In consideration of the frequent salinity damages in the recent years, the required minimum flow for the control of salinity intrusion was reviewed.

The salinity concentration at a certain river distance varies according to the river flow and age of the moon. A high concentration of salinity occurs around full moon or the new moon. The relationship among (i) river flow at Fukawa station, (ii) age of the moon, and (iii) salinity concentration was simulated for the representative river distances based on the continuous observation of salinity intrusion in the past.

As mentioned before, the river section prone to salinity intrusion is 0–40 km of which the existing water intakes are located in the river section of 25–40 km. Hence the Ichinobunme station located at 31 km river distance was selected as the representative station for the evaluation of the salinity intrusion.

The relationship among the river flow rate (at Fukawa station), age of the moon and salinity content (at surface) at Ichinobunme station is shown in Fig. 14. As shown in the figure, the existing required minimum flow of  $90m^3/s$  is considered insufficient to completely control the salinity intrusion if the allowable salinity content (Cl) for rice crops is assumed at 1,000 mg/l.

#### (5) Control Project of Salinity Intrusion

To control the salinity intrusion in a satisfactory manner, construction of an estuary barrage was considered necessary. On the other hand, enlargement of the original water resources development plan was considered necessary to meet the highly increasing water demand of Tokyo metropolitan area.

An estuary barrage was proposed at 18.5 km distance to control the salinity intrusion. The project can save the existing salinity repulsion water of 50  $m^3/s$  and then, allocate the saved water for new water uses.

However, the barrage needs to be completely closed for a long period at drought time if all the existing salinity repulsion water is allocated for new water uses. In this case, water in the upstream of the barrage will be stagnant and lacking in dissolved oxygen. On the other hand, water in the downstream will increase the salinity content to the level of seawater. These phenomena will cause severe damages on aquatic life, especially fishes and shells in both upstream and downstream of the barrage.

Finally, the existing salinity repulsion water of 50  $m^3/s$  was reduced to 30  $m^3/s$ , and 20  $m^3/s$  was allocated for new water uses as shown below.



#### **Required Minimum Flow Distribution in the New Plan**

The project started in 1966 and completed in 1971. For the features of the barrage, see Fig. 15.

The gate is operated based on the following policies.

- (a) <u>Control of Salinity Content in the Upstream</u>: Excessive salinity intrusion is controlled to prevent damage to the off-stream uses. Desirable salinity content is maintained to preserve aquatic lie. When salinity content is lacking, seawater is introduced by opening the gate at high tide to increase the salinity content.
- (b) <u>Maintenance of Water Level in the Upstream</u>: Proper water level is maintained not to affect the water abstraction for off-stream uses.
- (c) <u>Effective Release of Salinity Repulsion Water to the Downstream</u>: The minimum water quantity for salinity repulsion is 30 m<sup>3</sup>/s on daily average. The water is collectively discharged at low tide to attain effective salinity repulsion in the downstream, and the gate is completely closed at high tide.
- (d) When the river flow is large enough, the gate is completely opened.

## **CHAPTER3: WATER USE MANAGEMENT IN LOWER MEKONG**

# 1. DISCUSSIONS ON ACCEPTABLE MINIMUM MONTHLY NATURAL FLOW

#### 1.1 General

Article 6 of the Mekong Agreement prescribes "Maintenance of Flows on the Mainstream" as follows:

To cooperate in the maintenance of the flows on the mainstream from diversions, storage releases, or other actions of a permanent nature; except in the cases of historically severe drought and/or floods:

- A. Of not less than the <u>acceptable minimum monthly natural flow</u> during each month of the dry season;
- B. To enable the acceptable natural reverse flow of the Tonle Sap to take place during wet season; and
- C. To prevent average daily peak flows greater than what naturally occur on the average during the flood season.

The above <u>acceptable minimum monthly natural flow</u> (AMMNF) is considered similar to or the same as that of the <u>required minimum flow</u> in Japan (see, Part I, Chapter 6). In this Chapter 1 of Part II, the policies or guidelines for setting the AMMNF are discussed referring to the experiences in Japan.

### **1.2** Purpose of Establishment of the AMMNF

Article 5 of the Mekong Agreement prescribes the necessary procedures (notification/prior consultation/agreement to/by the Joint Committee) for the water uses of the Mekong River as follows:

- A. On tributaries of the Mekong River, including Tonle Sap, intra-basin uses and inter-basin diversions shall be subject to notification to the Joint Committee.
- B. On the mainstream of the Mekong River:
  - 1. During the wet season:
    - a) Intra-basin use shall be subject to notification to the Joint Committee.
    - b) Inter-basin diversion shall be subject to prior consultation, which aims at arriving at an agreement by the Joint Committee.
  - 2. During the dry season:
    - a) Intra-basin use shall be subject to prior consultation, which aims at arriving at an agreement by the Joint Committee.
    - b) Any inter-basin project shall be agreed upon by the Joint Committee through a specific agreement for each project prior to any proposed diversion. However, should there be a surplus quantity of water available in excess of the proposed uses of all parties in any dry season, verified and unanimously confirmed as such by the Joint Committee, an inter-basin diversion of the surplus could be made subject to prior consultation.

It is considered natural to interpret Article 5 as follows:

- (1) Article 5 prescribes the necessary procedures of only the proposed (new) water uses but does not mention anything on the existing water uses. A number of intra-basin water uses already exist on the mainstream. Prior consultation for them has no meaning.
- (2) The proposed water uses on the tributaries shall be subject to only notification to the Joint Committee. It may mean that each riparian state can independently manage the proposed water uses on the tributaries in accordance with their water law.
- (3) Prior consultation/agreement by the Joint Committee on the proposed water uses on the mainstream is stipulated to coordinate the following possible conflicts.
  - (a) <u>Conflicts between the existing and proposed water uses on the mainstream</u>. If a proposed water use is too large, it may affect the existing water uses in the downstream. The conflicts will be coordinated through prior consultation/agreement of the proposed water use by the Joint Committee.
  - (b) <u>Conflicts in allocation of the available water resources among the riparian states</u>. Available surplus water on the mainstream is limited during the dry season. If the total proposed water use of the riparian states exceeds the amount of the surplus water, allocation of the surplus water for the riparian states will be coordinated through prior consultation/agreement of the proposed water use by the Joint Committee.
- (4) A certain criterion is necessary to coordinate the conflicts between the existing and proposed water uses and to evaluate the surplus water that can be allocated for the

proposed water use. The AMMNF in the Article 6 is considered to be the criterion for the above conflict coordination and surplus water evaluation.

#### **1.3 Protection of the Existing Water Uses**

#### 1.3.1 General

In the Mekong Agreement, it is not clearly mentioned whether or not the existing water uses will be protected. However;

- (1) According to the water law of each riparian state, the existing water uses will be protected as far as they are reasonable by the water right system (see, the following Subsection 1.3.2).
- (2) The water law of each riparian state and the Mekong Agreement will both manage the proposed water uses on the mainstream. Hence, the Mekong Agreement should be interpreted consistently with the water law of each riparian state.
- (3) It is generally recognized in the water use management rules on international rivers that the existing water uses will be protected as far as they are reasonable (see, the following Section 1.3.3).

#### **1.3.2** Water Right System in the Riparian States

#### (1) Laos

Laos enacted its Water and Water Resources Law in November 1996. The Law prescribes that:

- (a) Water and water resources are the property of the national community. The State represents the community, and manages and allocates the use of these resources (Article 4). The water resources in this Law include both surface water and groundwater.
- (b) The use of water and water resources are classified into three (3) categories; small, medium and large scale uses (Articles 15, 16 and 17). Any person and organization have the right to use water and water resources as long as they have received approval from relevant authorized agencies (Article 4). Water and water resources management shall be centrally controlled according to water use right (Article 19).

Small-scale use needs no approval. Large-scale use has to be approved by the government. Medium-scale use shall be approved by a relevant agency of the government, but an important medium-scale use needs approval of the government (Articles 18 and 19).

- (c) Article 22 prescribes that water development activities must prevent ill effect arising from water. From this, the reasonable existing water uses will be protected from a new water use.
- (d) Monitoring and inspection of water use is assigned to relevant agencies of the government and local authorities (Article 19). A water user is obligated to participate in providing data to the relevant authority (Article 23).

### (2) **Thailand** $^{(1,2)}$

- (a) There is no water act that systematically manages surface water use at present. The watercourses in Thailand are classified as (i) general watercourses (rivers) and (ii) irrigation canals. The Civil and Commercial Code and the Private Irrigation Act of 1939 govern water use in general watercourses. The Royal Irrigation Act of 1942 manages water use in irrigation canals.
- (b) Section 1304 of the Civil and Commercial Code considers water in general watercourses as public property, which all individuals, business enterprises and government agencies have the equal right to use. However, this Code does not prescribe the regulation of water use in detail. Section 1355 only prescribes: "a riparian landowner has no right to withdraw water in the amount exceeding his reasonable need to the prejudice of other land abutting the same waterway."
- (c) Only water use for agricultural purpose is actually controlled by law. Agricultural water use in general watercourses is subject to the regulation of the Private Irrigation Act of 1939.

The Private Irrigation Act governs the operation of irrigation projects, which are divided into three categories: (i) Personal Irrigation, (ii) People Irrigation, and (iii) Commercial Irrigation. The authority concerned has the power to give or not to give approval to such irrigation projects, as summarized below.

Project	Project Type	Authority Concerned for Approval
Personal	Project constructed by a person	< 32 ha: Approval not required.
People	Project jointly constructed by local	32-80 ha: District Office
_	people	80–160 ha: Provincial Office
		> 160 ha: MOAC
Commercial	Project constructed by any person for remuneration to be obtained from people who use it	Concession of MOAC required.

Authorities for Water Use Approval by Private Irrigation Act

Note: MOAC: Ministry of Agriculture and Cooperatives

Further, the authority concerned may suspend temporarily the operation of irrigation projects for the purpose of water rationing during the period of drought.

(d) The Royal Irrigation Act of 1942 regulates the use of water within an irrigation project built and operated by the government, in particular, the Royal Irrigation Department (RID) of the Ministry of Agriculture and Cooperatives (MOAC). The Minister of MOAC designates watercourses used for irrigation purposes (either natural or man-made) as "irrigation canals."

Once designated as irrigation canal, the RID may prohibit anyone to withdraw water from the irrigation canal if such withdrawal will affect other people (Section 35). The gate of irrigation canal can be closed or opened only by the RID (Section 25).

- (e) Under these circumstances, there is an attempt to establish an integrated water resources management act including control by the water right system for all kinds of water uses. However, this is still under discussion.
- (f) However, the existing water right system under the Private Irrigation Act of 1939 and the Royal Irrigation Act of 1942 are considered effective for the water use

management of the Mekong River Basin in the Thailand territory where water is used mostly for irrigation purposes.

#### (3) Cambodia

There is no water act that systematically manages river water use at present. However, a draft of the Law on Water Resources Management of the Kingdom of Cambodia was submitted to the Council of Ministers in March 2001. The draft Law prescribes that:

- (a) All water and water resources, rivers, canals, lakes and reservoirs are owned by the State (Article 3).
- (b) The Government shall control the use of water by means of licensing. All water uses except minor ones need approval of the government (Articles 9 and 10). The Ministry of Water Resources and Meteorology (MOWRAM) are responsible for the issuance of water use licenses (Article 4). Before granting a water use licence to a person, the MOWRAM shall consult with the other agencies concerned on such applied water use (Article 11). From Article 11, it may be interpreted that a new water use shall not cause damage on the existing water uses.
- (c) The MOWRAM shall keep a centralized database of the water resources of the country. Data collected by the other governmental agencies and local authorities shall be submitted to the MOWRAM. The above data may be provided to any person requesting them, subject to the payment of fees.

#### (4) Vietnam

Vietnam enacted the Law on Water Resources in May 1998. The Law prescribes that:

- (a) Ownership of water resources belongs to the entire population under the unified management of the State (Article 1). Further, Articles 57 and 58 prescribe that the responsibility to manage the water resources is laid on the State. The water resources in this Law include both surface water and groundwater.
- (b) Water users shall obtain licenses for water use from the State or the Provincial People's Committee, depending on the scale of water use scheme except small-scale water use for households/others (Article 24). The responsible agency of the State is the Ministry of Agriculture and Rural Development (MARD). The MARD issues licenses for large-scale water uses, while the Provincial People's Committee grants licenses for the remaining water uses as shown below.

11		
Water Abstraction	MARD	PPC
Important State Project Approved by Prime Minister	All Projects	-
Groundwater for Concentrated Water Supply Project	$>1,000 \text{ m}^{3}/\text{d}$	$<1,000 \text{ m}^{3}/\text{d}$
Surface Water for Agricultural/Industrial/Mining/Domestic Use	$>2 \text{ m}^{3}/\text{s}$	$<2 m^{3}/s$
Surface Water for Hydropower	>500 kW	<500 kW

Authorities for Water Use Approval

Note: PPC: Provincial People's Committee

Source: Documents in the national workshop training on water allocation, January 2001

(c) Water users that exploit and use water resources shall not cause obstruction or damage on the legitimate exploitation and use of water resources of other users. Further, the water users shall comply with the terms attached to the license (Article

23). From this, the reasonable existing water uses will be protected from a new water use.

(d) The MARD shall assess the water resources and build the database on water resources with cooperation of other ministries/agencies of the government, and the people's committees of provinces and specified cities (Article 60).

On the other hand, water users that exploit and use water resources shall supply information with a view to inventorying and evaluating water resources when requested (Article 23).

#### **1.3.3** Water Management Rules for International Rivers

Article 8 of the Helsinki Rules on the Uses of the Waters of International Rivers, 1966 (Helsinki Rules) prescribes that, "an existing reasonable use may continue in operation unless the factors justifying its continuance are outweighed by other factors leading to the conclusion that it be modified or terminated so as to accommodate a competing incompatible use."

Article 7 of the Convention on the Law of the Non-Navigational Uses of International Watercourses, 1997 (Non-Navigational Use Law) also prescribes that "watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States."

#### **1.3.4** Preliminary Conclusions

From the above discussions, it is considered natural to conclude that:

- (1) The existing water uses on the mainstream will be protected as far as they are reasonable by maintaining the AMMNF. Then, surplus water exceeding the AMMNF can be allocated for proposed (new) water uses
- (2) The AMMNF at a principal river station shall be determined with a certain reliability (hydrological probability) to satisfy the reasonable existing water uses including off-stream and in/on-stream uses in the downstream.
- (3) It may be difficult to rationally determine the AMMNF only from the river flow regime. The AMMNF of larger flow rate is more desirable for the downstream regions, while a smaller one is more desirable for the upstream regions.
- (4) According to Article 5, the waters of the Mekong River system shall be used in a reasonable and equitable manner in their respective territories. According to the Helsinki Rules on the Uses of the Waters of International Rivers, 1966, the major factors to be considered in a reasonable and equitable share of the waters among the riparian states are as listed below.
  - (a) Extent of drainage area in the territory of each riparian state
  - (b) Contribution of water by each riparian state
  - (c) Existing water use of each riparian state
  - (e) Economic and social needs of each riparian state
  - (f) Population dependent on the waters of the basin in each riparian state

#### (g) Others

Equitable allocation of the available water for the riparian states should be made in terms of total water use (existing plus proposed water uses). If the existing water use in a certain state is very large, the proposed water use of the state should be adjusted to maintain the equity among the riparian states.

#### 1.4 Design Probability of AMMNF

According to Article 6, the AMMNF shall be maintained except in the case of historically severe drought. If the design probability of the AMMNF is set higher, the existing water uses in the downstream will be protected with a high reliability (safety). However, this will result in decrease of the development potential of new water uses.

In Japan, a 10-year drought is adopted in principle in consideration of the intensive urban water uses. On the contrary, the existing water use on the Mekong mainstream is mostly the irrigation purpose. The irrigation water use in Southeast Asian countries is usually planned to meet a 5-year drought.

The design probability of the AMMNF shall be estimated in consideration to the followings conditions:

- (1) If the design probability is set at 5-year drought, water use coordination (water use saving in drought time) will often be necessary between the upstream and downstream users.
- (2) The AMMNF shall be maintained except in the case of <u>historically severe drought</u>. The probability of the AMMNF should be definitely larger than five (5) years.
- (3) If different design probabilities are adopted in the estimation of the AMMNF and available surplus water, the existing and proposed water uses on the mainstream cannot be managed in a unified manner in the future. The management may be very complicated and difficult.
- (4) Waters of the Mekong River shall be developed in a sustainable manner according to the Mekong Agreement. Excessive water uses should not be planned. Hence, new water uses should be planned with a sufficient reliability.
- (3) The probable monthly mean discharges at the principal stations of the mainstream during the dry season (January–June) are estimated as follows. As shown in the following table, the difference between the probable discharges of 5-year and 10-year is not large in the driest months.

								(U	nit: $m^{3}/s$ )
Station		Vientiane	2		Pakse		Meko	ng Delta I	nflow
Drought	Min.	10-yr.	5-yr.	Min.	10-yr.	5-yr.	Min.	10-yr.	5-yr.
January	1,100	1,414	1,486	1,982	2,220	2,371	5,199	7,052	7,256
February	856	1,117	1,204	1,667	1,734	1,889	3,190	4,120	4,941
March	755	957	1,027	1,393	1,488	1,647	1,852	2,224	3,449
April	766	969	1,025	1,282	1,513	1,600	1,820	2,191	2,433
May	931	1,245	1,331	1,476	2,014	2,197	2,016	2,371	2,703
June	1,697	2,057	2,435	3,210	4,811	5,821	4,156	4,161	4,641

#### **Probable Monthly Mean Discharge at Principal Station**

3 . .

Note: Mekong Delta inflow is estimated by totalling the discharges at Tan Chau and Chau Doc stations.

#### **1.5 Definition of Natural Flow**

The technical term "natural flow" is employed in Article 6 of the Mekong Agreement. However, it is not defined in detail. What is the natural flow? The actual flow data at a principal station of the mainstream are those affected by the water use developments in the past. Is it necessary to reproduce an imaginary natural flow regime to establish the AMMNF?

In Japan, the natural flow is generally defined as follows:

- (1) The river water has continuously been developed since the olden days to meet the increasing water requirement of the river basin. Hence, the flow regime has historically changed according to the water use development.
- (2) However, the existing water uses are managed based on the current flow regime. New water uses are planned and implemented not to infringe upon the existing water uses. Hence, the river flow under the existing water use conditions (including water abstraction and water storage/release of dam) should be defined as natural flow when a new water development is discussed unless the existing water uses are revised.
- (3) Usually, the flow records during a certain period in the past are necessary for planning of a new water use. However, they are employed only for the analysis of flow characteristics, assessment of hydrological probability and preparation of the operation rule of the new water use. Accordingly, imaginary natural flow needs to be reproduced only when the flow regime has been largely disturbed by the water use development in the past. If the disturbance is not significant, the flow records in the past can be used as the natural flow under the existing water use conditions.

In the Lower Mekong Basin (LMB), the natural flow should be defined in consideration of the following:

- (1) The natural flow is necessary to determine the AMMNF and evaluate the available surplus water on the mainstream.
- (2) The Mekong Agreement will not manage the existing water uses in the tributaries at all. Even the proposed water uses will be only subject to notification to the Joint Committee. The water uses in the tributaries will be independently managed by the water right system of each riparian state. Hence, all the existing water uses in the tributaries should be accepted by all the riparian states.
- (3) If the existing water uses on the mainstream are protected by the AMMNF, the proposed water uses on the mainstream will be planned not to infringe on the existing water uses in the downstream as in the case of Japan.
- (4) In this case, the river flow under the existing water uses can be defined as natural river flow when a new water development is discussed unless the existing water uses are changed.
- (5) However, the actual flow data during a certain period in the past are necessary for planning a new water development. The impact of the water use development of the basin in the past on the mainstream flow must be checked prior to using the data. If the impact is small, the data can be dealt as natural flow. When the impact is significant, imaginary flow under the existing water use conditions should be reproduced.

In the LMB, the flow data are available at several principal stations for the recent 40 years (1960-present). The historical water use development during the 40 years is estimated as follows to assess the magnitude of the impact on the mainstream flow.

#### (1) Laos

MRC prepared an inventory of the existing irrigation projects for the whole country in February 2002. According to the inventory, there are presently 703 irrigation projects of which size is larger than 100 ha each. The number of projects and the irrigation areas by construction year are summarized below.

Historical Irrigation Development in the Whole Country				
Age	Not Clear (before 1960?)	1960s	1970 to Present	Total
Intake from Mainstream				
No. of Projects	15	0	86	101
Whole Irrigation (ha)	2,826	0	25,959	28,785
Dry Irrigation (ha)	1,531	0	21,554	23,085
Intake from Tributaries				
No. of Projects	69	21	512	602
Whole Irrigation (ha)	15,283	4,041	117,219	136,543
Dry Irrigation (ha)	7,618	708	81,669	89,995
Total				
No. of Projects	84	21	598	703
Whole Irrigation (ha)	18,109	4,041	143,178	165,328
Dry Irrigation (ha)	9,149	708	103,223	113,080

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

In the inventory, the construction year of 84 projects are not clear. In this Report, it is assumed that the 84 projects were constructed before 1960.

As shown in the above table, the paddy irrigation area of dry season has increased by approximately 100,000 ha during the recent 30 years (1970–present) in the whole country. It is roughly estimated to have decreased the river flow by 100 m<sup>3</sup>/s during the dry season if a real unit water consumption of the paddy irrigation is assumed at 1.0 m<sup>3</sup>/s/1,000 ha.

On the other hand, there is only one (1) reservoir (Nam Ngum Hydropower Dam) that can regulate the river flow to a significant extent in the country. The Nam Ngum Project has been developed in three (3) stages during the period 1972-2000, resulting in gradual increase of the low flow of the Nam Ngum River. The low flow increase during the dry season (February-April) has been estimated at around 190  $m^3/s$ .

From the above discussions, it is preliminarily concluded that:

- (a) There was no large water use development during the 1960s.
- (b) Large water use developments were implemented during the recent 30 years. However, they have caused no significant impact on the flow regime of the mainstream.

#### (2) Thailand

In North-eastern Thailand, there are presently 10 seasonal-regulating large reservoirs supplying the supplementary water for irrigation. Among them, four (4) reservoirs are

Large-scale Water Use Development in the Past					
River Basin	Drainage Area	No. of	Effective Storage	Irrigation Service	
	$(km^2)$	Reservoirs	$(million m^3)$	Area (ha)	
Mun River	71,000	3	1,626	56,097	
Chi River	49,000	3	3,100	100,716	
Mekong Tributaries	50,000	4	736	83,168	
Total	170,000	10	5,462	239,981	

provided with hydropower plants. The effective storage and irrigation service area are summarized below.

The reservoirs in the Mun and Chi rivers were completed during 1966 to 1971. In the Mekong tributaries basin, two (2) reservoirs were completed in 1965 and 1973. The remaining two (2) reservoirs were completed in 1984 and 1988.

The hydrological impacts of water use developments in the Mun-Chi River basin were roughly assessed based on the river flow records at Ubon Station in the past (1961-1998). The station is located in the lowermost reaches of Mun-Chi River and covers 104,000 km<sup>2</sup>, or 87% of the total basin area of Mun-Chi River (120,000 km<sup>2</sup>).

The river flow rate during the dry season (February-April) was less than 50 m<sup>3</sup>/s before the mid-1960s. Thereafter, it has slightly increased, varying within the range of 50–100 m<sup>3</sup>/s during 1970-1998. These facts mean that:

The natural flow of the Mun-Chi River during the dry season had been completely consumed by the middle of 1960s. The dry season irrigation area developed after mid-1960s has been water supplied from the above-mentioned reservoirs. The reservoirs store water in the wet season and supply it in the dry season. The irrigation water use and reservoir water supply are balanced.

From the above, it is preliminarily concluded that the recent water use developments in North-eastern Thailand have caused no significant impact on the flow regime of the mainstream.

#### (3) Cambodia

According to the inventory study by MRC in February 2002, there are presently 386 irrigation projects of which size is larger than 100 ha each. Number of the projects and irrigation areas by construction age are summarized below.

Historical Irrigation Development in Whole Country					
Age	Before 1953	Not Clear (after	1975 - Present	Total	
		1960?)			
Intake from Mainstream					
No. of Projects	23	3	36	62	
Whole Irrigation (ha)	12,850	2,000	17,340	32,190	
Dry Irrigation (ha)	12,220	1,750	13,877	27,847 <sup>1)</sup>	
Intake from Tributaries					
No. of Projects	13	105	206	324	
Whole Irrigation (ha)	18,888	71,845	146,719	237,452	
Dry Irrigation (ha)	8,377	46,043	56,199	110,619	
Total					
No. of Projects	36	108	242	386	
Whole Irrigation (ha)	31,738	73,845	164,059	269,642	
Dry Irrigation (ha)	20,597	47,793	70,076	138,466	

Note: 1) This area is supplied with water from the reservoirs/ponds that store water of the mainstream in wet season. No water is abstracted from the mainstream in dry season.

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

In the inventory, the construction year of 108 projects are not clear. In this Report, it is assumed that the 108 projects were constructed after 1960.

The irrigation area of the dry season has increased by 117,869 ha during the recent 40 years of 1960 to 2000 in the whole country.

However, no water is abstracted from the mainstream in the dry season. The dry season irrigation areas depending on the mainstream are supplied with water from the reservoirs/ponds, which store water of the mainstream in the wet season.

Further, the dry season irrigation areas depending on the tributaries do not abstract all their water from the tributaries. Part of them is supplied withwater from the reservoirs, which store water of the tributaries in the wet season.

The dry season irrigation areas of the tributaries are classified by water source and by construction age as follows.

Historical Development of Dry Season Irrigation Project on Tributaries						
Age	Dry Season Irrigation Area of Tributaries by Water Source (ha)					
	No.	River Water	Nos.	Reservoir		
Before 1953	5	1,088	8	7,289		
Not Clear (after 1960?)	99	42,293	6	3,750		
1975 - Present	164	25,707	42	30,492		
Total	268	69,088	56	41,531		

As shown in the above table, the dry season irrigation area depending on the river flow has increased by 68,000 ha during the recent 40 years of 1960 to 2000. They are assumed to have decreased the river flow in the dry season by 68 m<sup>3</sup>/s during 1960 to 2000 if the real unit water consumption of the paddy irrigation is assumed at 1.0 m<sup>3</sup>/s/1,000 ha.

From the above, it is preliminarily concluded that the water use developments during the recent 40 years have caused no significant impact on the flow regime of the mainstream.

#### (4) **Preliminary Conclusion of the Assessment**

As discussed in the above, the flow regime of the mainstream during the recent 40 years (1960 to 2000) has been scarcely affected by the water use developments in the basin. Hence, the available flow data at the principal stations of the mainstream are all defined as natural flow.

#### **1.6** Quantity of Existing Water Use on the Mainstream

#### 1.6.1 General

The major existing off-stream use on the mainstream is irrigation. Urban water use is negligible in quantity, compared to the irrigation use. There is no hydropower use on the mainstream. The major in/on-stream uses are likely salinity repulsion, fishery and navigation. Water for salinity repulsion is required in the lowermost reaches. Large ships navigate from the estuary to Phnom Penh Port. Small ships go up and down through the whole reaches. Fishery is active through the whole reaches.

The existing in/on-stream uses have not been estimated quantitatively. They are being studied by MRC. The existing off-stream uses (irrigation uses) are estimated based on the available data as below.

#### **1.6.2** Water Use in the Upstream and Middle Reaches

The existing paddy irrigation area depending on the mainstream during the dry season is estimated by the inventory study of MRC for Laos and Cambodia. Details are shown in Table 1(1) and Table 3(1). However as mentioned in Section 1.5, no irrigation area in Cambodia abstracts water from the mainstream during the dry season. All the dry season irrigation areas depending on the mainstream are supplied with water from the reservoirs/ponds, which store water of the mainstream in the wet season.

The whole irrigation area depending on the mainstream in Thailand has been estimated by the study of the Asian Institute of Technology. In this Paper IX, this irrigation area is assumed also as irrigated during the dry season. The estimated irrigation areas of the three (3) countries in the dry season are summarized below.

Country	River Reaches	Nos. of Project	Dry Season Irrigation Area (ha)
Laos	Upstream Reaches	101	23,000
Thailand	Upstream Reaches	143	37,000
Cambodia	Middle Reaches	62	0 (28,000)*

#### Existing Dry Season Irrigation Area on the Mainstream in Upstream/Middle Reaches

Source: (1) Land Resources Inventory for Agricultural Development, Feb. 2002, MRC for Laos and Cambodia.

(2) Study of Potential Development of Water Resources in Mae Khong River Basin, May 1994, AIT, for Thailand.

Note: \* 28,000 ha is irrigated by the reservoirs that store water of the mainstream in wet season.

In Laos and Thailand, the above irrigation projects are distributed on the riverbanks of the mainstream from the upper boundary to the lower boundary of each country. They are irrigated by pumping. The abstracted water exceeding net consumptive water use will return to the mainstream immediately downstream. The real irrigation water consumption is roughly estimated at about 60 m<sup>3</sup>/s by assuming a real unit water consumption of  $1.0 \text{ m}^3/\text{s}/1,000 \text{ ha}$ .
Drought Flows of Mainstream at Principal Station											
Station	1	Vientiane (m <sup>3</sup> /	(s)		Pakse $(m^3/s)$						
Drought	Min.	10-yr.	5-yr.	Min.	10-yr.	5-yr.					
January	1,100	1,414	1,486	1,982	2,220	2,371					
February	856	1,117	1,204	1,667	1,734	1,889					
March	755	957	1,027	1,393	1,488	1,647					
April	766	969	1,025	1,282	1,513	1,600					
May	931	1,245	1,331	1,476	2,014	2,197					
June	1,697	2,057	2,435	3,210	4,811	5,821					

On the other hand, the drought flows of the mainstream at the principal stations (Vientiane and Pakse) are estimated as shown below (see, Section 1.4).

The mainstream flow in the upstream and middle reaches is abundant enough to meet the existing off-stream uses.

## **1.6.3** Water Use in the Mekong Delta

According to the inventory study of MRC in February 2002, there are currently 1,418,000 ha of dry season irrigation area in the delta of Vietnam. However, this irrigation area is the gross one including the areas of settlement, upland crop, fishpond, road, water channel and others. The net paddy irrigation area should be clarified to estimate the existing irrigation water use in the delta.

On the other hand, the Sub-Institute for Water Resources Planning in Ho Chi Minh City has estimated the irrigation water use in the past by using the developed hydraulic simulation model. The irrigation use seasonally changes according to the applied cropping pattern. The farmers have established the cropping pattern corresponding to the river flow regime. The estimated irrigation water use during the dry season in 1998 and 2000 are shown below.

Irrigation Water Use during Dry Season in Mekong Delta									
Irrigation Water Use in Mekong Delta (m <sup>3</sup> /s)									
Year/Month	Jan.	Feb.	Mar.	Apr.	May	Jun.			
1998	1,003	863	753	841	814	526			
2000	964	1,113	774	540	550	498			
Average	984	988	764	691	682	512			

On the other hand, monthly inflows to the Mekong Delta in the dry seasons of 1998 and 2000 are shown below, compared to probable drought discharge.

Inflow to Mekong Delta during Dry Season										
	Monthly Inflow to Mekong Delta (m <sup>3</sup> /s)									
Actual/Probable	Jan.	Feb.	Mar.	Apr.	May	Jun.				
1998	7,053	4,120	2,225	1,820	2,426	4,641				
2000	8,476	5,523	3,906	3,407	6,584	16,652				
Min.	5,199	3,190	1,852	1,820	2,016	4,156				
10-year Drought	7,052	4,120	2,224	2,191	2,371	4,161				
5-year Drought	7,256	4,941	3,449	2,433	2,703	4,641				
Average	8,580	5,807	4,120	3,204	3,656	7,685				

As shown in the above table, the year 1998 is a 10-year or severer drought, while the flow in 2000 is nearly average one. The surplus water exceeding the irrigation use in 1998 is calculated as follows.

Surplus Water exceeding Irrigation Use (m <sup>3</sup> /s)								
Flow/Use	Jan.	Feb.	Mar.	Apr.	May	Jun.		
Inflow in 1998	7,053	4,120	2,225	1,820	2,426	4,641		
Use in 1998	1,003	863	753	841	814	526		
Surplus Water	6,050	3,257	1,472	979	1,612	4,115		

Surn	lus Water ex	ceeding Irriga	tion Use in	1998 (by Tan	Chau/Chau	Doc Flow)
Durp	ius matei ex	cecums minga	uon ose m	1))) (by 1an	Chau/ Chau	

The surplus water was all or partly used for salinity repulsion. The minimum monthly surplus water (including required salinity repulsion flow) in 1998 was about  $1,000 \text{ m}^3/\text{s}$ .

The above-mentioned monthly inflows in 1998 and 2000, and probable monthly inflows were estimated through the following processes:

- (1) Regression curves of daily mean discharge–daily mean water level from the hourly discharge observation records at Tan Chau and Chau Doc stations during 1997–2001 are obtained.
- (2) Daily mean discharge is estimated from daily mean water level and monthly mean discharges for Tan Chau and Chau Doc stations are calculated.
- (3) Probable monthly inflows to the delta are estimated.

However, it may be unavoidable to include some error in the above estimated inflows due to the large tidal effect at both stations.

Further, JICA estimated the daily mean discharges at Chrui Changvar and Phnom Penh Port for the period 1997-2001 by preparing rating curves based respectively on the discharge observations in the dry season of 2003. Inflow to the delta is estimated by totalling the discharges at the two (2) stations. The estimated inflow is considered comparatively correct since the tidal effect at these stations is not large. However, probable inflow cannot be calculated due to the lack of water level records in the past.

The surplus water exceeding irrigation use in the delta in 1998 becomes as follows if the above estimated inflow is employed.

	······································								
Surplus Water exceeding Irrigation Use (m <sup>3</sup> /s)									
Flow/Use	Jan.	Feb.	Mar.	Apr.	May	Jun.			
Inflow in 1998	5,924	3,671	2,028	1,645	2,084	-			
Use in 1998	1,003	863	753	841	814	526			
Surplus Water	4,921	2,808	1,275	804	1,270	-			

Surplus Water exceeding Irrigation Use in 1998 (by Phnom Penh Flow)

## **1.6.4** Comments on Surplus Water on the Mainstream

There is plenty of surplus water in the upstream and middle reaches as far as off-stream use is concerned. However, water balance in the delta is tight during March–May in the drought year (for example 1998) since some quantity of salinity repulsion water is required to abstract the necessary irrigation water. Accordingly, estimation of the required minimum salinity repulsion water may be the most important for the determination of AMMNF.

## **1.7** How to Increase Water Utilization Rate

Usually, the AMMNF and new water use development on the mainstream are planned for the design river flow regime with a certain probability (for example, 10-year drought probability) to maintain the necessary reliability of water use. In this case, the design quantity of the AMMNF and new water use is determined every month, but the quantity cannot be changed annually. Hence, a large quantity of water is wasted to the sea in normal or water abundant years. Utilization rate of the river water may be low unless large regulating reservoirs are provided. This planning method is called "static planning".

The flow regime at the entrance of the Mekong Delta during the dry season is shown below.

		_				(Unit:	$m^3/s$ )
Monthly Discharge	Jan.	Feb.	Mar.	Apr.	May	Jun.	Ave.
10-year Drought	7,052	4,120	2,224	2,191	2,371	4,161	3,687
Average	8,580	5,807	4,120	3,204	3,656	7,685	5,509
1.1-year Drought	9,801	7,104	5,189	3,689	5,074	12,405	7,210

#### Probable Inflow Discharge to Delta during Dry Season

Even if the AMMNF at the entrance of Mekong Delta is assumed to be the minimum flow rate in the past (1,820  $\text{m}^3$ /s in April, 1998), surplus water in a 10-year drought is limited during March to May. New water use cannot be developed so much without construction of storage dams.

To increase the water utilization rate, another method called "dynamic planning" can be applied. In this case, the quantity of the new water use is determined corresponding to the variation of river flow regime. The quantity will vary not only per month but also per year. In the design drought year, the minimum quantity has to be set. On the other hand, a larger quantity is to be set in a water abundant year. However, this dynamic planning will contain the following problems.

Irrigation service area will change year by year. Hence, irrigation facilities with an excessive capacity should be constructed to meet such a varying water supply. However, the yearly variation of irrigation water supply may become smaller in the following cases, for example.

- (1) A large storage dam is constructed in a tributary. Required irrigation water is mainly supplied from the mainstream in a water abundant year, while in the drought year, the stored water of the dam is used to the maximum extent to supplement the limited available mainstream water.
- (2) Inter-basin diversion to a river basin that has a different pattern of flow regime. The yearly varying surplus water of Mekong mainstream will be supplemented by water of the receiving basin. In Japan, a project of this type is called "river flow regime adjustment project"

## 2. DISCUSSIONS ON WATER USE MONITORING

## 2.1 General

Article 26 of the Mekong Agreement mandates the Joint Committee to prepare and propose the "Rules for Water Utilization and Inter-Basin Diversions" including water use monitoring as below.

## Article 26 Rules for Water Utilization and Inter-Basin Diversions

The Joint Committee shall prepare and propose for approval of the Council, inter alia, Rules for Water Utilization and Inter-Basin Diversions pursuant to Article 5 and 6, including but not limited to;

- (1) Establishing the time frame for the wet and dry seasons,
- (2) Establishing the location of hydrological stations, and determining and maintaining flow level requirements at each station,
- (3) Setting out criteria for determining surplus quantities of water during the dry season on the mainstream,
- (4) Improving upon the mechanism to monitor intra-basin use,
- (5) Setting up a mechanism to monitor inter-basin diversions from the mainstream.

This chapter identifies the necessities and problems of water use monitoring. It further gives some discussions and suggestions on the monitoring system based on the experiences in Japan, and available data of the existing water uses and river flow in the LMB.

## 2.2 Necessity of Water Use Monitoring

The water use in the LMB is to be managed based on the water right system at the national level. On the other hand, it is to be managed in accordance with the 1995 Mekong Agreement at the regional level. For proper management of the water uses in the LMB, water use monitoring is necessary at both national and regional levels as described below.

## 2.2.1 Monitoring Necessity at National Level

As mentioned before, the river water uses in the riparian states will be managed based on their own water right systems. In all their systems, the existing reasonable water use shall be protected and only surplus water (available river water exceeding the existing reasonable water uses) will be allocated for proposed water uses (new water uses). For promotion of the water use management by the water right system, periodical monitoring of all the existing and proposed water uses except minor ones will be necessary. For the water right systems of the four (4) riparian states, see Subsection 1.3.2 of Chapter 1.

## (1) For Estimate of Existing Water Uses

Firstly, the existing reasonable water uses shall be identified and quantified, and registered to protect them. Then, water use license (or customary right) shall be given to these water

uses and once granted a license, even the existing users shall comply with the conditions of the water use licenses. Compliance with the conditions shall be monitored.

## (2) For Compliance with the Conditions of Proposed Water Uses

A proposed water use shall need permit of the concerned authority and the water user shall comply with the conditions attached to his permit. Compliance with the conditions of the proposed water use shall also be monitored.

## (3) For Water Use Coordination in Severe Drought

The permitted water uses are ensured with a certain hydrological probability. Hence, the water uses of a river basin shall be restricted or redistributed during droughts more severe than the design one.

The above water use restriction or redistribution cannot be coordinated without the monitoring data of actual water use together with river flow and dam operation.

## 2.2.2 Monitoring Necessity at Regional Level

#### (1) For Sharing Existing Water Use Data

For implementation and promotion of the water use management in the LMB, data of the existing water uses in each river section of the mainstream and each tributary basin are necessary. However, they are only partly available. Even, the inventory of existing irrigation areas has not yet been completed.

Sharing of water use data with a sufficient transparency is essentially necessary for cooperation in the water use management of the LMB.

#### (2) For Compliance with the Conditions of Proposed Water Uses

Any proposed water use in the LMB shall be subject to notification to or prior consultation with or specific agreement by the Joint Committee pursuant to Article 5 of the Mekong Agreement, as summarized below.

	110	cessury recedures of r	oposed water eses
River	Season	Water Use Type	Necessary Procedures
Tributaries	Any Season	Intra-basin Use	Notification to the Joint Committee
		Inter-basin Diversion	Notification to the Joint Committee
Mainstream	Wet Season	Intra-basin Use	Notification to the Joint Committee
		Inter-basin Diversion	Prior consultation which aims at arriving at an
			agreement by the Joint Committee
	Dry Season	Intra-basin Use	Prior consultation which aims at arriving at an
			agreement by the Joint Committee
		Inter-basin Diversion	Agreed upon by the Joint Committee through
			a specific agreement for each project

#### **Necessary Procedures of Proposed Water Uses**

The above notification, consultation and agreement shall contain the water use conditions such as intake location, service area, intake quantity, intake/dam structures, dam operation rules, etc. Compliance with these conditions shall be confirmed through the water use monitoring.

## (3) For Water Use Coordination in Severe Drought

On the mainstream, the existing reasonable water uses shall be protected by the AMMNF and only the surplus water shall be exploited for the proposed water uses.

According to Article 6 of the Mekong Agreement, however, the AMMNF will not be fully secured in cases of historically severe droughts. On the other hand, Article 6 prescribes that the Joint Committee shall adopt guidelines on the location and level of flows, and monitor and <u>take action necessary for their maintenance</u> as provided in Article 26. This "take action necessary for their maintenance" will include water use coordination in severe droughts.

Based on these principles, the AMMNF and proposed water uses on the mainstream need to be coordinated (partly cut) through the consultations among the riparian states in severe droughts. The water use coordination may not be achieved without the monitoring data on actual water uses.

## 2.2.3 Necessity of Integrated Monitoring of River Flow and Water Use

For water use management of the mainstream, water balance of the mainstream needs to be estimated for each river section. For this purpose, the river flow at the principal stations shall be monitored along with the water uses on the mainstream. However, the flow regime of the mainstream may be changed by the proposed water uses in the tributaries.

Flow of the mainstream is much supplied from the tributaries even in the driest season. The flow regime in April at the principal stations of Chiang Saen and Pakse are shown below along with the contribution of the tributaries joining between two (2) stations.

J	0		
Station	Chiang Saen	Pakse	Contribution of Tributaries
Drainage Basin. (km <sup>2</sup> )	189,000	545,000	356,000
5-Year Monthly Flow Rate $(m^3/s)$	800	1,600	800
10-Year Monthly Flow Rate (m <sup>3</sup> /s)	700	1,500	800
Minimum Monthly Flow Rate (m <sup>3</sup> /s)	600	1,300	700

#### Tributary Inflow between Chiang Saen and Pakse in Driest Month (April)

The inflow from the tributaries during the dry season may change in the future according to the water resources development and use in the tributaries. The proposed irrigation developments will abstract water from the tributaries, while the proposed storage dams including hydropower dam will increase low flow of the tributaries in the dry season.

Further, the mainstream flow at Chiang Saen will also change according to the water resources development and use in the Upper Mekong Basin.

Hence, inflow from the major tributaries, mainstream flow at principal stations and water uses in the LMB shall be monitored in an integrated manner.

## 2.3. Discussions on Water Use Management of the Mainstream

## 2.3.1 How to Manage Water Use on the Mainstream

Water use on the mainstream during the dry season will be managed by separating the stream into several river sections from Chiang Saen to the river mouth. The water use of an objective river section will be managed by monitoring water balance between the river flow at the principal

station and water requirement in the river section. Usually, the principal station is installed at the upper end of the objective river section. The water requirement for the objective river section is a constant value determined per month (= AMMNF + monthly proposed water use).

The water balance of the objective river section (Section A) is illustrated below.



Water Balance of Objective River Section

## 2.3.2 How to Coordinate Water Use in Severe Drought

In a typical dry season (December to May), the LMB is blessed with no or negligible rainfall. Water of the mainstream is supplied by the sub-surface runoff of the tributaries in addition to the mainstream flow at Chiang Saen. The mainstream flow decreases at a constant rate (exponentially constant) to the minimum in April as illustrated below.

## Attenuation Curves of Mainstream Flow during Dry Season



The water balance of the mainstream will become tighter from December to April. It is generally the smallest in April. It may become deficit in a severe drought beyond the design one. In such a drought, some re-allocation may become necessary between the AMMNF and the proposed water use.

The mainstream flow at the principal stations in April can be forecasted from that in December with a sufficient lead-time to coordinate the water uses. Hence, the water use coordination in a severe drought is considered technically possible if the time required for obtaining the monitoring data of river flow and water use is short.

Water use of the mainstream will be managed by taking advantage of this hydrological characteristic to the maximum extent.

## 2.4 Discussions on Water Use Monitoring System

## 2.4.1 Kinds of Water Uses Monitored

## (1) Necessity of Groundwater Use Monitoring

In the LMB, the amount of groundwater use is considered small compared to that of river water use. Groundwater is mostly used for small-scale domestic or industrial uses of which locations are widely distributed over the LMB. Lowering of the groundwater table due to its extraction may be limited in depth and area. It will recover soon in the next wet season. Necessity of the groundwater use monitoring is doubtful for the basin-wide management of water resources.

Hence, the water use monitoring will be limited to river water use.

## (2) Kinds of River Water Use Monitored

River water uses are generally categorized into two (2) types: off-stream use and in/on-stream use. In the LMB, major off-stream uses are irrigation, urban (including domestic, public, business and industrial uses) and hydropower uses, while major in/on-stream uses include the uses for salinity repulsion, navigation and preservation of aquatic life.

The off-stream uses usually change river flow and may affect the other off-stream uses and in/on-stream uses in the downstream. Hence, the off-stream uses need to be monitored.

On the other hand, the in/on-stream uses do not affect the other water uses although they may be sometimes affected by the off-stream uses. The in/on-stream uses are managed by monitoring the river flow at the principal stations.

Hence, only the off-stream uses of irrigation, urban and hydropower uses will be monitored together with the related dam operation. The off-stream uses of domestic, industrial, fishpond and other uses in rural areas will be omitted since their impact on the river flow is considered small.

## 2.4.2 How to Monitor Existing Irrigation Water Use

## (1) Existing Irrigation Area<sup>(3,4)</sup>

There are a number of irrigation projects in the LMB. Total number and irrigation area of the existing projects are estimated as follows based on the recent inventory study of MRC.

Existing Irrigation Area in Lower Mekong Basin								
Item	Laos	Thailand	Cambodia	Vietnam	Total			
				(Delta)				
Nos. of Project	2,532	8,764	1,012	85 <sup>1)</sup>				
Whole Area (ha)	224,232	941,425 + α	392,117	1,683,094 <sup>2)</sup>	$3,240,868 + \alpha$			
Dry Season Area (ha)	151,940	No data	181,506	1,417,549 <sup>2)</sup>				

Existing	Irrigation	Area in	Lower	Mekong	Basin
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Note: 1): Number of irrigation blocks that are further divided into many small projects.

2): Gross area including settlements, fishponds, uplands, roads and water channels.

3): α: means the area served by 5,788 RID small irrigation projects (no available data).

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

In this Study, the irrigation projects smaller than 100 ha are tentatively defined as minor water use that may cause no significant effect on the river flow. In this case, the total project number and irrigation area of the respective riparian states become as shown below.

Existing Irrigat	tion Area in Lower	· Mekong Basin	(excluding Minor	r Project)

Item	Laos	Thailand	Cambodia	Vietnam	Total
				(Delta)	
Intake from Mainstream					
No. of Projects	101	143 <sup>1)</sup>	62	85 <sup>5)</sup>	
Whole Area (ha)	28,785	37,459 <sup>1)</sup>	32,190	1,683,094	1,781,528
Dry Season Area (ha)	23,085	37,459 <sup>2)</sup>	27,847 <sup>4)</sup>	1,417,549	1,505,940
Intake from Tributaries					
No. of Projects	602	$1,283^{(3)}$	324	None	
Whole Area (ha)	136,543	886,939 <sup>3)</sup>	237,452	None	1,260,934
Dry Season Area (ha)	89,995	No data	110,619	None	
Total Intake					
No. of Projects	703	1,426	386	85 <sup>5)</sup>	
Whole Area (ha)	165,328	924,398	269,642	1,683,094 <sup>6)</sup>	3,042,462
Dry Season Area (ha)	113,080	No data	138,466	1,417,549 <sup>6)</sup>	-

Note: 1): Data from the Study of Potential Development of Water Resources in Mae Khong River Basin, May 1994, Asian Institute of Technology.

2): JICA estimate (Dry season area is assumed to be equal to wet season area)

3): JICA estimate (Total Intake – Intake from Mainstream).

4): This area is supplied water from the reservoirs/ponds that store water of the mainstream in wet season and no water is abstracted from the mainstream in dry season.

5): Number of irrigation blocks that are further divided into many small projects.

6): Gross area including settlements, fishponds, uplands, roads and water channels

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

For the breakdown of each irrigation project or irrigation block, see Table 1(1) and Table 1(2) for Laos, Table 2 for Thailand, Table 3(1) and Table 3(2) for Cambodia, and Table 4 for Vietnam.

#### (2) **Existing Monitoring Performance**

Intake water quantity has scarcely been monitored in the LMB except the simulated irrigation water use by a hydraulic model in the delta of Vietnam. Even data on intake location, and irrigation area are partly available.

## (3) Technical Possibility of Existing Water Use Monitoring

#### (a) Laos

The irrigation projects larger than 100 ha during dry season are selected from Table 1(1) and Table 1(2). Number of the projects, and their project size and irrigation area by irrigation type are summarized below.

Existing Dry Season Irrigation Area by Irrigation Typ	e
(excluding Minor Project)	

(excluding winter reject)								
Item	G	Pump Type						
		EP	DP	Р	Total			
No. of Projects	63	324	80	27	431	494		
Project Size (ha)	100-2,300	100-2,300	100-450	100-1,500				
Irrigation Area (ha)	22,239	65,276	10,693	5,256	81,225	103,464		

Note: G: gravity, EP: electric fixed pump, D: diesel fixed pump, P: fixed pump (type: no data)

The above irrigation projects include a number of small gravity and pump projects. Intake water of the electric fixed pump projects may be easily estimated from the pump operation records or consumed electricity. It is considered difficult to monitor the small gravity projects since their intake systems are not good.

If the monitoring is performed for the gravity projects larger than 500 ha and all electric fixed pump projects, it may cover nearly 80% of the total irrigation area during the dry season as shown below.

## Selected Possible Monitoring Projects during Dry Season

		- •J•••• • • • • • • • • • • • • • • • •			
Item	G	EP	DP	Р	Total
No. of Monitoring Projects	10	324	0	0	334
Size of Monitoring Project (ha)	500 - 2,300	100 - 2,300	0	0	
Monitoring Irrigation Area (ha)	12,841	65,276	0	0	78,117
Monitoring Coverage (%)	58	100	0	0	76

Note: G: gravity, EP: electric fixed pump, D: diesel fixed pump, P: fixed pump (type: no data)

The above monitoring is considered technically possible. However, good and continuous cooperation of the local offices/persons is necessary since operation of many pump projects must be well recorded.

#### (b) Thailand

The irrigation water use in the LMB is managed by three (3) agencies: the Royal Irrigation Department (RID), the Department of Energy Development and Promotion (DEDP), and the Ministry of Interior (MOI). The table in Subsection 2.4.2(1) shows the irrigation projects during wet season consisting of RID large/medium size projects, all DEDP projects, and all MOI projects. These projects are all larger than 100 ha. RID small projects are excluded since their data are not available. However, they are considered mostly smaller than 100 ha that are defined as minor water use.

The RID projects are irrigated by gravity, DEDP by mostly electric fixed pump, and MOI by gravity, fixed pump, mobile pump, traditional lift and their mixtures. Total project numbers and irrigation areas of the respective agencies are shown below.

Existing Wet Season Ir	rigation Area b	y Responsible Ag	gency (excluding M	inor Project)
Item	RID	DEDP	MOI	Total
No. of Projects	157	950	319	1,426
Project Size (ha)	112 - 50,416	101 – 90,411	100 - 1,200	
Total Irrigation Area (ha)	327,783	513,178	83,437	924,398
Irrigation Type	G	Mostly Elec. P.	G, P, M, T, Mixed	

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift

The irrigation projects of MOI are mostly small and their irrigation type is complicated. Intake water monitoring of MOI projects is considered not easy.

Intake water measurement of the gravity irrigation projects is also considered difficult. Hence, the monitoring will be limited to the selected large projects for practical purposes. On the other hand, intake water of the electric fixed pump irrigation projects may be easily estimated based on the pump operation records or consumed electricity.

If monitoring is targeted for the RID gravity projects larger than 1,000 ha and all the DEDP pump projects, the monitoring will cover 86% of the total irrigation area as shown below.

Selected I ossible wet Season Projects for Monitoring								
Item	RID	DEDP	MOI	Total				
No. of Monitoring Projects	54	950	0	1,004				
Monitoring Project Size (ha)	1,008 - 50,416	101 – 90,411	0					
Monitoring Irrigation Area (ha)	281,975	513,178	0	795,153				
Monitoring Coverage (%)	86	100	0	86				

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The above table is prepared based on the data during the wet season since the data during the dry season are not available. However, a considerable number of projects may not be irrigated during the dry season. In fact, only six (6) large projects are irrigated among the above 54 RID projects. Number of the monitoring projects of DEDP during the dry season is considered also fewer than the above

From the above discussions, monitoring of the intake water quantity during the dry season is considered technically possible if good and continuous cooperation of the local offices/persons is obtained.

However, data on the irrigation projects during the dry season are necessary for final evaluation on the technical possibility of monitoring.

(c) Cambodia

As shown in the table in Subsection 2.4.2(1), the total irrigation area during the dry season is approximately half of the whole irrigable area. The total irrigation area of the projects larger than 100 ha during the dry season is estimated as follows.

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	И	UP-JI	CA,	March	2004

Existing Dry Season Irrigation Area and Selected Monitoring Projects									
Item	Dry Season Total	Dry Season Monitoring							
	Projects	Projects							
	(> 100 ha)	(> 500 ha)							
No. of Projects	191	59							
Project Size (ha)	100 - 21,150	500 - 21,150							
Irrigation Area (ha)	136,729	107,029							
Monitoring Coverage (%)	-	78							

The existing irrigation systems are complicated and not all in good condition. A mixture of gravity, fixed pump, mobile pump and traditional lift, irrigates many projects. Monitoring is technically possible but it is considered a difficult work. Hence, the monitoring will be concentrated on the selected large projects as far as they can cover a sufficient portion of the total irrigation area during the dry season.

If the cut-off level of the monitoring is set to be 500 ha, the number and irrigation area of the monitoring projects are estimated as shown also in the above table. In this case, a sufficient monitoring coverage can be secured.

The technical possibility of monitoring will much depend on the conditions of the intake systems of the selected monitoring projects. Existing conditions of their intakes need to be further surveyed for final evaluation on the technical possibility of monitoring.

#### (d) Vietnam

The irrigation area in the delta consists of 85 blocks that are further divided by canals into a number of small irrigation projects. The projects are mostly irrigated by tidal irrigation system or mobile pump. Farmers individually irrigate their farmlands by using canal water. In tidal irrigation system, they introduce the canal water into their farmlands through small culverts or conduit pipes at high tide and close them individually at low tide. The system is illustrated below.



It may be technically difficult to directly measure the water taken by tidal irrigation system or mobile pump since there are too many intakes.

## (4) Monitoring Method

In the above four (4) countries, when direct measurement of the intake water quantity is difficult, the irrigation water use has to be estimated by monitoring the irrigation area and cropping pattern. In this estimation, unit intake water quantity per hectare monthly varies according to the cropping pattern and it should be assumed based on sampling observations or studies in the past.

Remote sensing by satellite can be employed as one of the indirect monitoring methods of the irrigation area.

## 2.4.3 How to Monitor Existing Urban Water Use

The major urban water uses in the LMB are those of Vientiane, Phnom Penh and urban centres in the delta of Vietnam. The existing river water abstraction for these urban uses is roughly estimated as follows.

			8
Country	Urban Center	Intake Water Quantity	Remarks
Laos <sup>1)</sup>	Vientiane	98,280 m <sup>3</sup> /d (1.14 m <sup>3</sup> /s)	
Cambodia <sup>2)</sup>	Phnom Penh	$185,000 \text{ m}^{3}/\text{d} (2.14 \text{ m}^{3}/\text{s})$	
Vietnam (Delta) <sup>3)</sup>	Can Tho	95,000 m <sup>3</sup> /d (1.10 m <sup>3</sup> /s)	Incl. groundwater source
	My Tho	$40,000 \text{ m}^3/\text{d} (0.46 \text{ m}^3/\text{s})$	Incl. groundwater source
	Long Xuyen	$40,000 \text{ m}^3/\text{d} (0.46 \text{ m}^3/\text{s})$	-
	Rach Gia	$36,000 \text{ m}^3/\text{d} (0.42 \text{ m}^3/\text{s})$	Incl. groundwater source
a () Hal		• • • • •	

#### Existing Major Urban Water Uses in Lower Mekong Basin

Source: 1): JICA expert report on Lao PDR, 2000

2): Phnom Penh Water Works

3): Estimated based on the data in the Mekong Delta Master Plan, 1991

River water for urban uses is abstracted by pumping system. Monitoring of the river water abstraction is easy. All the urban water intakes larger than a certain quantity will be monitored by direct measurement.

## 2.4.4 How to Monitor Existing Hydropower Use and Dam Operation

There are 13 major storage dams in the LMB, seven (7) dams of which are provided with hydropower stations. Salient features of the 13 storage dams are shown below.

	Salient Features of Existing Major Storage Dams in LMB									
Country	Name of Dam	Name of	C.A.	Purpose	Effective					
		River	$(km^2)$	_	Storage					
			. ,		$(\text{mill. m}^3)$					
Laos	Nam Ngum	Nam Ngum	8,460	P=150 MW	4,700					
	Houay Ho	Se Kong	193	P=150 MW	523					
Thailand	Lam Dong Noi	Nam Mun	2,097	A=24,000 ha, P=36 MW	1,191					
	Lam Ta Khong	Nam Mun	1,430	A=22,000 ha	290					
	Lam Phra Ploeng	Nam Mun	807	A=10,097 ha	145					
	Chulabhorn	Nam Chi	545	A=9,600 ha, P=40 MW	145					
	Ubolratana	Nam Chi	14,000	A=40,700 ha, P=25 MW	1,695					
	Lam Pao	Nam Chi	5,960	A=50,416 ha	1,260					
	Huai Luang	Nam Luang	666	A=12,800 ha	113					
	Nam Oon	Nam Oon	1,100	A=29,728 ha	475					
	Huai Mong	Nam Mong	1,307	A=8,640 ha	26					
	Nam Pung	Nam Pung	297	A=32,000 ha, P=6.3 MW	122					
Vietnam	Ialy	Se San	7,455	P=720 MW	779					
Total				A=239,981 ha,	11,464					
				P=1.127.3 MW						

Note: A: agricultural (irrigation) use, P: hydropower use Source: MRCS and other reports

The hydropower water use may be easily estimated from the generated electricity. In fact, daily hydropower water use has been reported in some projects. All the hydropower uses of dam type will be monitored together with the monitoring of dam operation. Monitoring of the hydropower uses of run-of-river type may be unnecessary since they do not change the river flow.

Water level, outflow and inflow of the storage dams shall be monitored for proper operation of the dams. In fact, these have been monitored on daily basis throughout the year in the existing major storage dams of the LMB.

## 2.4.5 How to Monitor Proposed Water Use

## (1) **Proposed Intra-basin Water Use**

The proposed water uses including dam operation will be monitored in the same way as the existing water uses. Monitoring of the proposed irrigation projects will encounter no serious technical problem different from the case of the existing projects. It is because the proposed projects may be mostly large in scale and their intake systems may be good.

## (2) **Proposed Inter-basin Diversion**

The monitoring is technically easy since the diverted water can be directly measured in the diversion tunnel/channel. The most important issue is how to secure transparency of the monitoring.

## 2.4.6 How Often will Water Use be Monitored

## (1) Monitoring Period

It may be impractical or not cost-effective to monitor the existing water uses of irrigation, urban and hydropower every year in the future. Monitoring of the existing water uses may be concentrated in the initial stage to estimate the existing water use quantity. However, the existing water uses may change in the future according to the variation of water

requirement. The monitoring will be done to check the change of water use conditions (location, pattern, served area/population and quantity) once in several years in the future.

The proposed irrigation, urban and hydropower projects required for the notification, consultation or agreement of the Joint Committee would be limited to the major projects that may cause significant impacts on the existing water uses in the LMB. These proposed water uses will be regularly monitored to comply with the conditions of the notification, consultation or agreement.

Intra-basin water uses of irrigation, urban and hydropower will be monitored during the dry season. However, inter-basin diversion will be monitored throughout the year in view of its importance.

Operation of the major storage dams will be monitored throughout the year since their impacts on the river flow are large. Even during rainy season, the dam operation will be monitored to avoid or minimize the harmful effects on the downstream as currently being monitored in the large storage dams.

## (2) Monitoring Frequency

Irrigation, urban and hydropower uses will be monitored at a proper interval to correctly estimate their average monthly water uses. Dam operation will be monitored at a proper interval to correctly estimate the effects on the river flow in the downstream.

## 2.4.7 How to Secure Transparency of Monitoring Data

An effective monitoring mechanism to secure the transparency will be established, especially for the projects of inter-basin diversion and large intra-basin water use. The possible mechanism will include a periodical field check system by MRC and installation of real-time remote monitoring system in which data are accessible from MRC on real time.

## 2.4.8 Recommendation

The above-discussed monitoring system of the LMB could be developed in stages. However, the inventorying of the existing irrigation projects by MRC, which was preliminarily finalized in February 2002, should be completed as early as possible. Inventorying of the existing storage dams also should be done together with this work. These inventories will give the basis to develop the practical monitoring system.

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Fig. 1 Typical River Flow Variation



Fig. 2 River Water Utilization in Japan



Fig. 3 Abstraction and Return of Irrigation Water



Fig. 4 Yoshino River Water Resources Development



Fig. 5 Major Storage Dam and Intake Sites in Tone River Basin



Fig. 6 Major Water Supply and Intake System of Tone River



**Fig. 7 Representative Fishes** 



Fig. 8 Location of Shinano River Basin



Fig. 9 (1/2) Water Balance of Shinano Mainstream



Fig. 9 (2/2) Water Balance of Shinano Mainstream



Fig. 10 Drought River Flow and Required Environmental Flow of Shinano Mainstream



Nishiohtaki Dam

Miyanaka Dam



River Valley (Downstream of Miyanaka Dam)

Ojiya Site

Fig. 11 Dam and River Conditions of Shinano Mainstream



Fig. 12 Location of Shimanto River Basin and Saga Dam



Dam Water Release: 1.1m3/s/100km2(3.99m3/s)



Fig. 13 River Flow Change Corresponding to Dam Water Release



Fig. 14 Relationship among River Flow, Moon Age and Salinity Content at the Representative Station



Fig. 15 Tone River Estuary Barrage

## Table 1(1) Irrigation Area and Water Sources (Mekong Mainstream) of Laos (1/2)

No.	MRC ID	Project ID	Project Name	Irrigation	Irrigation	Area (ha)	River Name	Province
		-	-	Туре	Whole	Dry	-	Name
1	L1171	VMSK008	Kao Liao No.2	EP	1200	950	Mekong	Vientiane Mun.
2	L2445	CPPT009	Sakmuang	EP	1100	850	Mekong	Champasack
3	L2444	CPPT008	Savang	EP	1090	450	Mekong	Champasack
4	L1131	VMHP023	Dong Phosy	EP	800	700	Mekong	Vientiane Mun.
5	L2519	CPXB034	Boungkha	DP	800	450	Mekong	Champasack
6	L2160	CPCP002	Phaphin	EP	700	650	Mekong	Champasack
7	L2474	CPSM014	Boungkeo	EP	700	700	Mekong	Champasack
8	L2161	CPCP003	Katup 1	EP	600	550	Mekong	Champasack
9	L1152	VMPN009	Mak Nao Neua	EP	600	450	Mekong	Vientiane Mun.
10	L2517	CPXB032	Nakeo	EP	600	450	Mekong	Champasack
11	L1150	VMPN007	Thinthieng Neua	EP	550	400	Mekong	Vientiane Mun.
12	L1174	VMSN001	Hong Thong	EP	530	400	Mekong	Vientiane Mun.
13	L1116	VMHP008	Tha Pha	EP	500	450	Mekong	Vientiane Mun.
14	L1521	KMNB013	Xieng vang	EP	500	350	Mekong	Khammuane
15	L1606	KMTK027	Muang Kao	EP	500	450	Mekong	Khammuane
16	L2170	CPCP012	Phanon 1	EP	500	450	Mekong	Champasack
17	L1153	VMPN010	Mak Nao Tai	EP	450	350	Mekong	Vientiane Mun.
18	L1129	VMHP021	Na Hay	EP	450	400	Mekong	Vientiane Mun.
19	L2171	CPCP013	Vatthat	EP	430	430	Mekong	Champasack
20	L1592	KMTK013	Muang kao	Р	400	325	Mekong	Khammuane
21	L1175	VMSN002	Phan Man	EP	400	380	Mekong	Vientiane Mun.
22	L1828	SVSK036	Nongbuatha	EP	400	250	MeKong	Savannaket
23	L1181	VMST005	Khok Pheung	EP	350	300	Mekong	Vientiane Mun.
24	L1931	SVXT004	Thadan	EP	300	250	MeKong	Savannaket
25	L1932	SVXT005	Kanthachan	EP	300	250	MeKong	Savannaket
26	L1808	SVSK016	Nafong	EP	300	250	MeKong	Savannaket
27	L1146	VMPN003	Na Koung	EP	300	250	Mekong	Vientiane Mun.
28	L1117	VMHP009	Thin Thene	EP	300	280	Mekong	Vientiane Mun.
29	L1149	VMPN006	Makhiao	EP	300	280	Mekong	Vientiane Mun.
30	L1934	SVXT007	Thapho	EP	300	250	MeKong	Savannaket
31	L1748	SVKL006	Pakka	EP	300	250	MeKong	Savannaket
32	L1178	VMST002	Sam Phan Na	EP	300	300	Mekong	Vientiane Mun.
33	L1125	VMHP017	B.Hom	EP	300	280	Mekong	Vientiane Mun.
34	L1936	SVXT009	Huene hin	EP	300	250	Mekong	Savannaket
35	L1123	VMHP015	Hat Dok Keo	EP	280	250	Mekona	Vientiane Mun.
36	L1933	SVXT006	Dontamngen	EP	250	200	MeKona	Savannaket
37	L1810	SVSK018	Sabusav	EP	250	200	MeKona	Savannaket
38	L1811	SVSK019	Nonadeun	EP	250	200	MeKona	Savannaket
39	L1812	SVSK020	Thapachoom	EP	250	200	MeKona	Savannaket
40	L2446	CPPT010	Phaling	EP	250	200	MEkona	Champasack
41	L1145	VMPN002	B.Don	EP	250	200	Mekona	Vientiane Mun.
42	L1179	VMST003	Sa kav	EP	250	200	Mekona	Vientiane Mun.
43	L1180	VMST004	Ang nov	EP	250	200	Mekona	Vientiane Mun.
44	L1160	VMPN017	Nong Khiat	EP	250	181	Mekona	Vientiane Mun.
45	11122	VMHP014	Keng Gnang	FP	250	250	Mekong	Vientiane Mun.
46	L1794	SVSK002	Nondbua	 P	200	100	Mekona	Savannaket
47	L1796	SVSK004	Nonadeun 2	P	200	100	Mekong	Savannaket
48	L1109	VMHP001	Km 19	P	200	100	Mekong	Vientiane Mun
49	L 1110	VMHP002	Nonavena	P	200	25	Mekong	Vientiane Mun
50	11111	VMHP003	Savfong	P	200	40	Mekong	Vientiane Mun
51	L1147	VMPN004	None Xai	EP	200	150	Mekona	Vientiane Mun.

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

## Table 1(1) Irrigation Area and Water Sources (Mekong Mainstream) of Laos (2/2)

No.	MRC ID	Project ID	Project Name	Irrigation	Irrigation	Area (ha)	River Name	Province
				Туре	Whole	Dry	-	Name
52	L1114	VMHP006	Nong Heo 1	EP	200	200	Mekong	Vientiane Mun.
53	L1118	VMHP010	Simmano	EP	200	180	Mekong	Vientiane Mun.
54	L1119	VMHP011	Na Long (1)	EP	200	180	Mekong	Vientiane Mun.
55	L2429	CPPS009	Donkhoa	EP	200	200	Mekong	Champasack
56	L1752	SVKL010	Thasano2	EP	200	200	MeKong	Savannaket
57	L1170	VMSK007	Kao Liao No.1	EP	200	180	Mekong	Vientiane Mun.
58	L0909	VTSK033	Sanakham nua	DP	200	150	Mekong	Vientiane Prov.
59	L1530	KMNB022	Bungsanha	EP	200	150	Mkong	Khammuane
60	L1159	VMPN016	B.Park-ngum	EP	200	150	Mekong	Vientiane Mun.
61	L1121	VMHP013	Tha Na	EP	200	180	Mekong	Vientiane Mun.
62	L1128	VMHP020	Sythan Tai	EP	200	180	Mekong	Vientiane Mun.
63	L1133	VMHP025	P.P.nongphong	EP	200	180	Mekong	Vientiane Mun.
64	L2518	CPXB033	Ngiou	EP	200	200	Mekong	Champasack
65	L1935	SVXT008	Don sa nod	EP	200	200	Mekong	Savannaket
66	L1937	SVXT010	Vernkoon 1+2	EP	200	150	MeKong	Savannaket
67	L1301	BXPS001	Na Pho	Р	180	80	Mekong	Bokeo
68	L2378	CPMM067	Xiang vang	DP	175	150	Mekona	Champasack
69	L1355	BXTB001	Pak Thouy Tay	Р	150	100	Mekong	Bokeo
70	L1113	VMHP005	Thadua	EP	150	150	Mekona	Vientiane Mun.
71	L1165	VMSK002	Dongna Sok	EP	150	100	Mekona	Vientiane Mun.
72	11168	VMSK005	Nong Douang	FP	150	100	Mekona	Vientiane Mun.
73	L1176	VMSN003	Chi nai mo	EP	150	150	Mekona	Vientiane Mun.
74	1.0908	VTSK032	Pak phang	DP	150	100	Mekong	Vientiane Prov.
75	1482	KMHB076	Pungnua	FP	150	150	Mkona	Khammuane
76	L1126	VMHP018	Thin Pia	EP	150	150	Mekona	Vientiane Mun.
77	L1127	VMHP019	Sav Phong	EP	150	120	Mekona	Vientiane Mun.
78	L1173	VMSK010	Nong Da	EP	150	150	Mekona	Vientiane Mun.
79	L2344	CPMM033	Pamokkang	DP	142	130	Mekona	Champasack
80	12377	CPMM066	Pamok nua	DP	131	131	Mekong	Champasack
81	12342	CPMM031	Duatia	DP	130	120	Mekong	Champasack
82	L 1586	KMTK007	Pak Peng	P	126	41	Mekong	Khammuane
83	12323	CPMM012	B HouaDonHi	P	120		Mekong	Champasack
84	11164	VMSK001	Nong Bouathong	FP	120	120	Mekong	Vientiane Mun
85	1.0309	LBCP019	Tha kham	EP	120	120	Mekong	Luanoprabano
86	12348	CPMM037	Huahi 1		108	100	Mekong	Champasack
87	1 2334	CPMM023	Salaosong	DP	100	100	Mekong	Champasack
88	1 2341	CPMM030	Thadua	DP	101	100	Mekong	Champasack
80	1 2372	CPMM061	Mai	DP	101	101	Mekong	Champasack
90 90	11503	KMTK014	Tha He	P	101	20	Mekong	Khammuane
Q1	1418	KMHB012	Pung Nua	P	100	20 50	Mekong	Khammuane
02	12166		Sombong	י פח	100	100	Mekong	Champasack
02	1 22/2		Nodi 1	חס	100	100	Mekong	Champasack
93	L2343	SV/KI 000	Theseno1		100	100	Mekong	Savannakot
94 05	11607	SVILL009	Hatkham		100	100	Mekong	Khammuana
90	11610	KMTK020	Chom Chong		100	100	Mekong	Khammuano
90		KMTK020			100	100	Mekona	Khommussa
97			i na Ngam	EP	100	100	Nekora	Miantiona Mur
98	L1134			۲ ۲	100	50	Nekong	vientiarie Muh.
99	L2420		Phong phok 1	DP	100	100	iviekong Makar T	Champasack
100	L2362		Phonepuay	DP	100	100	iviekong Makar T	Champasack
101 Total	L2303	CPIVIIVIU52	Pakse	UP	100	100	iviekong	Champasack

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
1	L1140	VMNT006	Nam Souang	G	2800	2300	Nam Souang	NAM NGUM	VM
2	L1655	KMXF027	Vang vieng phi	EP	2700	2300	xebangfai	SE BANG FAI	KM
3	L1139	VMNT005	Nam Houm	G	2500	2250	Nam houm	NAM NGUM	VM
4	L2012	SRSR005	Nong deng	G	2200	1841	Xe set	SE DONE	SR
5	L1306	BXPS006	Houei Nangni	G	2000		H.Nang ni	NAM SANE	BX
6	L1307	BXPS007	Houei Thong	G	2000	1000	H.Thong	NAM KADUN	BX
7	L0852	VTPH003	B.that	Р	1900	1500	Name Lik	NAM NGUM	VT
8	L1190	VMXN008	Km-6	EP	1800	1400	Nam ngum	NAM NGUM	VM
9	L2064	SRWP013	Dong mon	G	1800	1650	Houytapoung	SE DONE	SR
10	L0548	XYMP002	Namtan G	G	1600	1200	Namtan	NAM PHOUL	XY
11	L0814	VTKS042	Nam kai	G	1500	800	Nam kai	NAM NGUM	VT
12	L0229	BKHS001	Nam Tin	G	1270	300	Nam Tin	NAM NGAM	BK
13	L1187	VMXN005	Nakun-tongmang	EP	1200	950	Nam ngum	NAM NGUM	VM
14	L1156	VMPN013	Nabong khoksa	EP	1200		Nam ngum	NAM NGUM	VM
15	L0865	VTPH016	N.xuang 2 cp	G	1000	800	N.xuang	NAM NGUM	VT
16	L2521	CPXB036	Xolo Noy	EP	1000	500	Xedone	SE DONE	CP
17	L1702	SVCP016	Yor Huay Bak	G	950	500	Huay Bak	SE BANG HIENG	SV
18	L0988	VTVV015	Nam khan	G	880	350	Nam khan	NAM NGUM	VT
19	L0537	XYKT008	Nam Tam	G	820	350	Nam Tam	NAM HEUNG	XY
20	L2514	CPXB029	Ngoua deng	EP	700	500	Xedone	SE DONE	CP
21	L1798	SVSK006	lahakhok 1+2	Р	600	200	Xe banghieng	SE BANG HIENG	SV
22	L0642	XKMK015	Jonh	G	600	50	Nammat		XK
23	L1822	SVSK030	Lahanarm 1	EP	600	450	XeBanghhieng	SE BANG HIENG	SV
24	L2411	CPPP031	Nongkane	G	600	250	Nongkane	H.BANG LIENG	CP
25	L15/4	KMNL019	Tha thot	G	600	200	N.nhon	SE BANG FAI	KM
26	L1148	VMPN005	B.Phao 1	EP	550	350	Nam ngum		VM
27	L18//	SVXL009	Ionnen	EP	540	400	Xe BangFai	SE BANG FAI	SV
28	L0364	LBIVINU19	H. seng	G	500	500	H. seng		
29	L0764		Knamxang	EP	500	350	Nam IK		
30	L1192		Nomkoung 1		400	450	Namingum		
20	L0992	VTVV019		G	475	200	Hausinamam		
১∠ ৫০	L0904			G	450	500	Nom khu		
34	L1205	VMXN003	Houei Chiam	ED	450	420	Nam ngum		
35	L1032		Ban cheng 1	ED	450	350	Nam ngum		
36	L0952	SVSK034	Lahanarm 2	EP	450	350	XeBanghhieng	SE BANG HIENG	SV/
37	11530	KMNB031	Namanna	EP	450	300	vebanafai	SE BANG FAI	KM
38	1544	KMNB036	Huoisokhok	G	430	500	Hunisokhok	SE BANG FAI	KM
30	1745	S//KI 003	H Sav	G	410	30	Stream		SV/
40	11699	SVCP013	Huavsui	G	400	300	Stream	SE BANG HIENG	SV
40	11705	SVCP019	Huay Chiao	G	400	350	Huay Chiao	SE BANG HIENG	SV
42	L 1138	VMNT004	H son H soua	G	400	236	H son H sou	NAM NGUM	VM
43	1 0986	VTVV013	Nam pat	G	400	250	Nam pat	NAM NGUM	VT
44	1 0937	VTTK026	Pakkangung	FP	400	300	Nam ngum	NAM NGUM	VT
45	1 2144	APXX009	Houay Samong 1	G	400	350	H Samong	SEKONG	AP
46	11141	VMNT007	Na nhang	Ğ	400	000	H. sua	NAM NGUM	VM
47	0963	VTVK014	Pakkangung	FP	400	250	Nam ngum	NAM NGUM	VT
48	L2520	CPXB035	Yong	EP	400	377	Xedone	SE DONE	CP
49	L1774	SVMP015	Sa Khuang	G	400	180	Stream	SE BANG HIENG	SV
50	L0276	BKPD001	Nam kha	Ğ	375	150	N.kha	NAM PHO	BK
51	L1878	SVXL010	Bungxe 1	EP	350	300	Xe BangFai	SE BANG FAI	SV
52	L1206	VMXT003	B.Xok	EP	350	250	H. mak hiao	H.MA HIAO	VM
53	L1001	VTVV028	Nam mone	G	350	150	Nam mone	NAM NGUM	VT
54	L2025	SRSR018	Houy lat	G	350	300	Houy lat	SE DONE	SR
55	L1827	SVSK035	Lahanarm 3	EP	350	250	XeBanghhieng	SE BANG HIENG	SV

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

# Table 1(2) Irrigation Area and Water Sources (Tributaries) of Laos (2/11)

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	_	Name	Code
56	L0553	XYMP007	Nam Phieng 2	G	307	100	Nam Phieng	NAM PHOUL	XY
57	L0851	VTPH002	Phosy 2	Р	300	300	Namcheng	NAM NGUM	VT
58	L1510	KMNB002	Na Tai	Р	300	170	Xe bangfai	SE BANG FAI	KM
59	L1068	XSTT004	NamXan	Р	300		Nam Sane	NAM SANE	XS
60	L0858	VTPH009	Nam pha nai 1	G	300	80	Nam pha nai	NAM NGUM	VT
61	L0644	XKMK017	Na Dou	G	300	5	Namlan		XK
62	L0653	XKMK026	Nam Phord	G	300	47	Nam Phord		XK
63	L2141	APXX006	Houay Samong 2	G	300	250	H.Samong	SE KONG	AP
64	L1712	SVCP026	Thongponmuang	EP	300	250	Reservoir Su	SE BANG HIENG	SV
65	L1871	SVXL003	Buakai	EP	300	250	Xe BangFai	SE BANG FAI	SV
66	L1879	SVXL011	Kangpa 1	EP	300	250	Xe BangFai	SE BANG FAI	SV
67	L1888	SVXL020	Som Sa ad 1	EP	300	250	Xe BangFai	SE BANG FAI	SV
68	L1205	VMXT002	None Khor	EP	300	280	Hong seng	H.MA HIAO	VM
69	L0931	VTTK020	Thatmala	EP	300	250	Nam ngum	NAM NGUM	VT
70	L1188	VMXN006	Veun Kham 2	EP	300	300	Nam Ngum	NAM NGUM	VM
71	L0935	VTTK024	Boungphao 1	EP	300	250	Nam ngum	NAM NGUM	VT
72	L0766	VTKO005	Phonkham	EP	300	250	Nam lik	NAM NGUM	VT
73	L1252	BXKK023	Nam thip	G	300	200	Nam thip	NAM CADINH	BX
74	L1500	KMMX010	Mahasay tai	EP	300	250	xebangfai	SE BANG FAI	KM
75	L2119	APSX018	Xekhaman	DP	300	250	Xekhaman	SE KONG	AP
76	L1480	KMHB074	Donedu	EP	300	250	Hinboune	NAM HINBOUN	KM
77	L0941	VTTK030	Phonpheng	EP	300	250	Phonpheng	NAM NGUM	VT
78	L1195	VMXN013	Tha Cham Pa	EP	300	250	Nam ngum	NAM NGUM	VM
79	L1196	VMXN014	Pak Xap Mai	EP	300	280	Nam ngum	NAM NGUM	VM
80	L0910	VTSK034	Nam thun	G	300	150	Nam thun	NAM TON	VT
81	L0866	VIPH017	N.xuang Nong to	G	300	50	N.xuang	NAM NGUM	VI
82	L1158	VMPN015	B.Phao 2	EP	300	100	Nam ngum	H.MA HIAO	VM
83	L0757	VIFU044	Nam hon noy	G	300	150	N.hon noy	NAM NGUM	VI
84	L0998	VIVV025	Nam xong 1	EP	300	250	Nam song	NAM NGUM	VI
85	L0999	VTVV026	Nam xong 2	EP	300	250	Nam song	NAM NGUM	VI
86	L1000	VIVV027	Nam xong 4	EP	300	250	Nam song	NAM NGUM	VI
87	L0959	VIVK010	Pak cheng 2	EP	300	250	Nam cheng	NAM NGUM	VI
88	L0960	VIVK011	Don kuat	EP	300	250	Nam ngum	NAM NGUM	VI
89	L0971	VIVK022	Maiphosi 1	EP	300	250	Nam cheng	NAM NGUM	VI
90	L2414	CPPP034	Pathoumphone	G	300	250	Phiatai	HUAI TOMO	CP
91	L2057	SRWP006	vvapi neua	EP	300	250	xe don	SE DONE	SR
92	L1540	KMNB032	Tantnuang	EP	300	250	xebangtai	SE BANG FAI	KM
93	L1647	KMXF019	Hat knam nieng 1	EP	300	250	xebangtai	SE BANG FAI	KM
94	L2527	CPXB042	Kong thao	G	300	280	H. Kong thao	SE DONE	CP
95	L1654	KIVIXFU26	H. nnang	G	300	200	H. nnang		
96	L2432	CPPS012	Veunpakouang	EP	283	250	Xedone	SE DONE	CP
97	L0552		Nam Phieng 1	G	276	100	Nam Phieng		
98	L0939	V11K028	Nong phong tay	G	270	150	Nam nnam		
99	L1688	SVCP002	Thusakun Dahlah 4	P	250	140	Xe bangnieng	SE BANG HIENG	50
100	L1689	SVCP003	Baklak 4	Р	250	230	Xe banghieng		SV
101			Hat Slang Di	P	250	190	Xe bangiai		KIVI KM
102			Mitanhah Irr	G	250	50	Nom Lair	SE DAING FAI	
103	L044Z		Milaphab III.	G	250	200	Nam Leir		
104		VKMK040	Todiving	G	250	200	Todving	SE DUNE	JK VV
105			i au ving Nom non~ 1	G	250	50	Noming		ΛK \/ <del>T</del>
100	LU009	VINOUS/	Nam Khise	G	250	100	Nam Khisa		
107	L123/		Nam con~	G	250	100	Nam Kniao		BX
100	LU140		Nam sang		250	150	Nam sang		
110	L1718	SVCP031 SVCP032	Thong lak 4	EP	250 250	200	Reservoir Ba	SE BANG HIENG	SV

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC
No.	MRC ID	Project ID	Project Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Type	Whole	Dry	-	Name	Code
111	L1725	SVCP039	Sa kun 1	EP	250	200	Reservoir Su	SE BANG HIENG	SV
112	L1819	SVSK027	Singtha	EP	250	200	XeBanghieng	SE BANG HIENG	SV
113	L1184	VMXN002	Na Phork	EP	250	250	Nam ngum	NAM NGUM	VM
114	L0079	NTNT021	Thong di kao	DP	250	100	Nam tha	NAM THA	NT
115	L2143	APXX008	Ban Khang	DP	250	200	Xekona	SE KONG	AP
116	L1869	SVXL001	Thakam	EP	250	200	Xe BangFai	SE BANG FAI	SV
117	L1870	SVXL002	ThaKor	EP	250	200	Xe BangFai	SE BANG FAI	SV
118	1 1875	SVXI 007	hat kham di	FP	250	200	Xe BangFai	SE BANG FAI	SV
119	L 1876	SVXL008	Phoudin	EP	250	200	Xe BangFai	SE BANG FAI	SV
120	L 1880	SVXL012	Bunaxe 2	EP	250	200	Xe BangFai	SE BANG FAI	SV
121	L 1882	SVXL014	Kenaphosi 1	EP	250	200	Xe BangFai	SE BANG FAI	SV
122	1 1883	SVXL015	Pakoua 1	EP	250	200	Xe BangFai	SE BANG FAI	SV
122	L 1884	SVXL016	Dongyang	EP	250	200	Xe BangFai	SE BANG FAI	SV
124	1 1880	SV/XL021	SoumSaad 2	EP	250	200	Xe BangFai	SE BANG FAI	SV/
124	11108	VMCL005	Bor na Ngoua	ED	250	200	Hong Deng		VM
120	L1100	SV/XI 022	No viona kon		250	220	Yo BongEoi		\$1VI \$1/
120	1 1022	SVALU23	Vixovcong		250	200	Xe Danghiona		SV
127	L1023	3V3KU31	Naysong		250	200	Xebangnieng		30
120			Naxuak		250	200	Xexou		AP
129	L1501	KIVIIVIX011	Dang	EP	250	200	xebangiai		
130	L0053	NTMS023	Nam yuane		250	50	Nam yuane		IN I
131	L2118	APSX017	марпок	DP	250	200	Xeknaman	SEKONG	AP
132	L2120	APSX019	Kengknam	DP	250	200	хекопд	SEKONG	AP
133	L0145	OXMH019	Nam haeng	G	250	45	Nam haeng	NAM BENG	OX
134	L1200	VMXN018	B.haythangone	EP	250	250	Nam ngum	NAM NGUM	VM
135	L1201	VMXN019	Nong pho	EP	250	250	Nam ngum	NAM NGUM	VM
136	L1154	VMPN011	Tha xieng le	EP	250	5	Nam ngum	NAM NGUM	VM
137	L1161	VMPN018	Tha Kok Hai	EP	250	10	Nam ngum	NAM NGUM	VM
138	L2515	CPXB030	Pakxone	EP	250	200	Xedone	SE DONE	CP
139	L1902	SVXL034	Kengphosi 2	EP	250	200	Xe BangFai	SE BANG FAI	SV
140	L1904	SVXL036	Pakpua 2	EP	250	200	Xe BangFai	SE BANG FAI	SV
141	L1905	SVXL037	B. lau	EP	250	200	Xe BangFai	SE BANG FAI	SV
142	L1649	KMXF021	Dang tha	EP	250	200	xebangfai	SE BANG FAI	KM
143	L1650	KMXF022	Yang kham	EP	250	200	xebangfai	SE BANG FAI	KM
144	L1853	SVSL023	Nong bua(sa ke)	DP	250	180	Xe xangXoy	SE BANG HIENG	SV
145	L1547	KMNB039	Sadunua	EP	250	200	xebangfai	SE BANG FAI	KM
146	L1887	SVXL019	Sakong	EP	240	200	Xe BangFai	SE BANG FAI	SV
147	L1872	SVXL004	Nonghuathong 1	EP	230	200	Xe BangFai	SE BANG FAI	SV
148	L0142	OXMH016	Nam Hence	G	230	5	Nam Hence	NAM BENG	OX
149	L1193	VMXN011	Hat Kieng	EP	220	180	Nam Ngum	NAM NGUM	VM
150	L1881	SVXL013	Thabo	EP	215	200	Xe BangFai	SE BANG FAI	SV
151	L1690	SVCP004	Ponmuang	Р	200	150	Xe champhone	SE BANG HIENG	SV
152	L1793	SVSK001	Donsanote	Р	200	50	Xe banghieng	HUAI SOM PAK	SV
153	L1795	SVSK003	Tannon	Р	200	140	Xe banghieng	SE BANG HIENG	SV
154	L1797	SVSK005	Nongdeun	Р	200	90	Xe banghieng	SE BANG HIENG	SV
155	L1799	SVSK007	Koklor	Р	200	100	Xe champhone	SE BANG HIENG	SV
156	L1907	SVXP001	Phoumouna	P	200	90	Sepon	SE BANG HIENG	SV
157	1760	SVMP001	Tamli	P	200	55	Xe banghieng	SE BANG HIENG	SV
158	L0916	VTTK005	Viengkham	P	200	200	Nam Noum	NAM NGUM	VT
159	L1698	SVCP012	Huavbak	G	200	180	Stream	SE BANG HIENG	SV
160	1 0068	NTNT010	Nam nhang	Ğ	200	80	Nam nhang	NAM THA	NT
161	1.0643	XKMK016	Nallna	Ğ	200	20	Nampiew		XK
162	1 0646	XKMK010	khav	G	200	50	Kua		XK
163	1 0813	VTKS041	Nam khat 2	G	200	100	Nam khat	NAM NGUM	V/T
164	1.0860	VTPH011	Nam khaneune ?	G	200	50	Nam khaneune	NAM NGUM	VT
165		VTSK024	Nam mi 4	G	200	50	Nam mi	NAM MI	VT
100	20000	101024	Trainini T	5	200	50			

### Table 1(2) Irrigation Area and Water Sources (Tributaries) of Laos (4/11)

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
166	L0748	VTFU035	Nam la	G	200	50	Nam la	NAM NGUM	VT
167	L0749	VTFU036	Nam sai 2	G	200	50	Nam xai	NAM NGUM	VT
168	L1713	SVCP027	Xevangket	EP	200	180	Xe champhone	SE BANG HIENG	SV
169	L1714	SVCP028	Dongmuang	EP	200	180	Xe champhone	SE BANG HIENG	SV
170	L1715	SVCP029	Kengpun	EP	200	150	Xe champhone	SE BANG HIENG	SV
171	L1716	SVCP030	Dongpueng	DP	200	180	Xe champhone	SE BANG HIENG	SV
172	L1726	SVCP040	Thamuang	EP	200	180	Xe champhone	SE BANG HIENG	SV
173	L1728	SVCP042	Kengkok Nua	EP	200	150	Xe champhone	SE BANG HIENG	SV
174	L1729	SVCP043	kadan 1	DP	200	180	Xe champhone	SE BANG HIENG	SV
175	L1730	SVCP044	kadan 2	DP	200	150	Xe champhone	SE BANG HIENG	SV
176	L1813	SVSK021	Thape'	DP	200	200	XeBanghieng	SE BANG HIENG	SV
177	L1814	SVSK022	Puaykao	DP	200	150	XeBanghieng	SE BANG HIENG	SV
178	L1816	SVSK024	Kengdon	EP	200	180	XeBanghieng	SE BANG HIENG	SV
179	L1817	SVSK025	Sagnek	EP	200	150	Nong Luang	SE BANG HIENG	SV
180	L1818	SVSK026	Dongsavangtong	DP	200	150	Nong Luang	SE BANG HIENG	SV
181	L1820	SVSK028	SongKone	DP	200	150	XeBanghieng	SE BANG HIENG	SV
182	L1821	SVSK029	Thoknamkeng	EP	200	150	XeBanghieng	SE BANG HIENG	SV
183	L0864	VTPH015	Vang mon	EP	200	10	Nam lik	NAM NGUM	VT
184	L2430	CPPS010	Nong kung	DP	200	200	Xedone	SE DONE	CP
185	L1945	SRKD008	Boualapha	EP	200	170	Xe don	SE DONE	SR
186	L1952	SRKD015	Khong gnai	EP	200	180	Xe don	SE DONE	SR
187	L1758	SVMN004	Nong	DP	200	150	Xe Lanong	SE BANG HIENG	SV
188	L1677	SVAT008	Nanamthiang 1	DP	200	150	Xe champhone	SE BANG HIENG	SV
189	L1679	SVAT010	Donghen	EP	200	100	Xe champhone	SE BANG HIENG	SV
190	L1785	SVPX001	XongXe'	DP	200	150	Xexangxoy	SE BANG HIENG	SV
191	L1786	SVPX002	Bungthale	DP	200	150	Xexangxoy	SE BANG HIENG	SV
192	L1787	SVPX003	KangXe	DP	200	150	Xexangxoy	SE BANG HIENG	SV
193	L1788	SVPX004	NaKuang	DP	200	150	Xexangxoy	SE BANG HIENG	SV
194	L1789	SVPX005	KengPam	DP	200	150	Xexangxoy	SE BANG HIENG	SV
195	L0933	VTTK022	Nongphongnua	EP	200	150	Nongphong	NAM NGUM	VT
196	L0767	VTKO006	Hatdua	EP	200	150	Nam lik	NAM NGUM	VT
197	L1211	VMXT008	B.Na Hay	EP	200	180	Nam ngum	H.MA HIAO	VM
198	L1731	SVCP045	Tansum	EP	200	150	Xe champhone	SE BANG HIENG	SV
199	L1732	SVCP046	laohuakam	EP	200	150	Reservoir Ch	SE BANG HIENG	SV
200	L1759	SVMN005	Tangalai	DP	200	150	Xe Lanong	SE BANG HIENG	SV
201	L1438	KMHB032	Phonemen	EP	200	150	Hinbuone	NAM HINBOUN	KM
202	L1440	KMHB034	Nonghoi	EP	200	200	N.pakane	NAM HINBOUN	KM
203	L1498	KMMX008	Nong pa khao	EP	200	150	Nam ou la	SE BANG FAI	KM
204	L0277	BKPD002	H.liang	G	200	90	H.lieng	NAM PHO	BK
205	L1526	KMNB018	Phonsaoei	EP	200	150	xebangfai	SE BANG FAI	KM
206	L1531	KMNB023	Namphou	EP	200	200	xebangfai	SE BANG FAI	KM
207	L1608	KMTK029	Tham	EP	200	150	Namdone	NAM MANG NHAI	KM
208	L0124	OXMB021	Nam Beng 2	G	200	70	Nam Beng	NAM BENG	OX
209	L0126	OXMB023	Nam Hao	G	200	50	Nam Hao	NAM BENG	OX
210	L0942	VTTK031	Haisiao	EP	200	150	Nam ngum	NAM NGUM	VT
211	L1197	VMXN015	Dong Bang	EP	200	180	Nam ngum	NAM NGUM	VM
212	L1143	VMNT009	Houei Xaymoun	G	200	120	H.Xaymoun	H.MA HIAO	VM
213	L1124	VMHP016	Nong Thong	EP	200	180	Nong Thong	H.MA HIAO	VM
214	L1212	VMXT009	B.Noy Xiang da	EP	200	180	Bung that I	H.MA HIAO	VM
215	L0770	VTKO009	Viengkham nua	EP	200	150	Nam lik	NAM NGUM	VT
216	L2417	CPPP037	Taouang	G	200	200	Taouang	SE KONG	CP
217	L2056	SRWP005	Wapi tai	EP	200	170	Xe don	SE DONE	SR
218	L2058	SRWP007	Bang kha	EP	200	150	Xe don	SE DONE	SR
219	L2002	SRLP009	NaPho	EP	200	150	Namkhong	SE BANG NUAN	SR
220	L1829	SVSK037	Nongdeun 1+2	EP	200	150	Nong Luang	HUAI SOM PAK	SV

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
221	L1830	SVSK038	Hua hat	EP	200	150	XeBanghieng	SE BANG HIENG	SV
222	L1916	SVXP010	Mungchane	DP	200	150	Xe Pon	SE BANG HIENG	SV
223	L1917	SVXP011	Hua khua	DP	200	150	Xe Pon	SE BANG HIENG	SV
224	L1925	SVXP019	Huay san	DP	200	150	Xe Pon	SE BANG HIENG	SV
225	L1754	SVKL012	Tha hua xang	EP	200	150	Nam khong	HUAI SOM PAK	SV
226	L1648	KMXF020	Na phok tha	EP	200	180	xebangfai	SE BANG FAI	KM
227	L1658	KMXT002	Nam piat	G	200	15	Nam piat	SE BANG FAI	KM
228	1 1683	SVAT014	Nanamthiang 2	FP	200	150	Xe champhone	SE BANG HIENG	SV
229	L 1866	SVVI 005	Nater	G	200	100	Xenov	SE BANG FAI	SV
230	L 1769	SVMP010	Tang Alai	DP	200	150	XeBanghieng	SE BANG HIENG	SV
231	L 1770	SVMP011	ke'	DP	200	150	XeBanghieng	SE BANG HIENG	SV
232	1 1771	SVMP012	Tamli	DP	200	150	XeBanghieng	SE BANG HIENG	SV
233	11735	SVCP049	Thamuang 2	FP	200	180	Xe champhone	SE BANG HIENG	SV
234	11736	SVCP050	Koklor	EP	200	150	Reservoir Ch	SE BANG HIENG	SV/
235	11840	SVSI 010	Kongyak	ED	200	150		SE BANG HIENG	SV
236	1 1 8 / 1	SVSL011	Xianghom	ED	200	150		SE BANG HIENG	SV/
230	118/2	SVSL011	Nahoaluang	ED	200	150		SE BANG HIENG	SV SV
201	1 1 9 1 1	SVSL012	Donghoon		200	150	Xe shamphono		SV SV
230	1 1 9 1 5	SVSL014	Bungyang		200	100		SE BANG HIENG	SV SV
239	L1040	SVSL015	Duriyxariy		200	100			5V SV
240	L1040	SVSL010	r doll Vong khon		200	100			5V SV
241	L1040	SVSLUIO	Tan nana		200	100			3V SV
242	L1049	SVSL019	Tan none		200	150	H. pa yong		5V SV
243	L1000	SVSL020	Nongoualao		200	100		SE BANG HIENG	5V
244	L1851	SVSL021	vangxung	DP	200	100	Xe xangXoy	SE BANG HIENG	SV
245	L1852	SVSL022	Nong bua knok	DP	200	150	Xe xangxoy	SE BANG HIENG	SV
246	L1966	SRKD029	Iviuangkao	EP	200	160	Xe don	SE DONE	SR
247	L2074	SRWP023	Houy knon	EP	200	170	Xe don	SE DONE	SR
248	L0654	XKMK027	Na long	G	200	5	Piew		XK
249	L0176	OXMX011	Nam Fen	G	193	30	Nam Fen	NAM OU	OX
250	L0177	OXMX012	Houay Lai	G	193	40	Houay Lai	NAM OU	OX
251	L0707	XKPX002	Fen	G	190	50	NamPouy		XK
252	L2083	SKLM005	Houei Khiao	G	188	180	H. Khiao	SE KONG	SK
253	L1988	SRLN009	Kep pheung	G	185	150	H. tapoung	SE DONE	SR
254	L0488	HPXK001	Mouanglong	G	180	0			HP
255	L0491	HPXK004	Mouanglong	G	180	0			HP
256	L0706	XKPX001	Khem	G	180	20	Namsen		XK
257	L1943	SRKD006	Houyxao	EP	180	150	Xe don	SE DONE	SR
258	L1950	SRKD013	Phangthangnai	EP	180	150	Xe don	SE DONE	SR
259	L1208	VMXT005	Hong Seng 1	EP	180	160	Hong seng	H.MA HIAO	VM
260	L1189	VMXN007	Veun Kham 1	EP	180	150	Nam Ngum	NAM NGUM	VM
261	L0025	NTML008	Nam an	G	180	60	Nam an	NAM MA	NT
262	L1532	KMNB024	Sadutai	EP	180	150	xebangfai	SE BANG FAI	KM
263	L1903	SVXL035	Kangpa 2	EP	180	150	Xe BangFai	SE BANG FAI	SV
264	L0233	BKHS005	H.Saynoy	G	175	70	Xaynoi	NAM NGAM	BK
265	L0524	XYHS002	nam Kan	G	174	80	nam Kan	NAM NGEUN	XY
266	L0527	XYHS005	Houy yer	G	170	30	Houy yer	NAM NGEUN	XY
267	L2081	SKLM003	Houei Vi	G	160	160	Houei Vi	SE KONG	SK
268	L0587	XYSH004	Namnan G	G	160	50	Namnan	NAM NGEUN	XY
269	L1968	SRKD031	Hinsiew 2	EP	160	130	Xe don	SE DONE	SR
270	L1973	SRKD036	Non kho	EP	160	150	Xe don	SE DONE	SR
271	L0682	XKMP011	Khangsy	G	155	20	Namxing	NAM NGUM	XK
272	L0111	OXMB008	Nam Lo	G	153	50	Houay Lo	NAM BENG	OX
273	L1687	SVCP001	Kada 3	Р	150	100	Xe champhone	SE BANG HIENG	SV
274	L1416	KMHB010	Pak Hin Bun Tai	Р	150	48	Hin boun	NAM HINBOUN	KM
275	L0913	VTTK002	Nakhong	Р	150	150	Nam Ngum	NAM NGUM	VT

# Table 1(2) Irrigation Area and Water Sources (Tributaries) of Laos (6/11)

No.	MRC ID	Project ID	Project Name	lrr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
276	L0915	VTTK004	Thonghap	Р	150	150	Nam Ngum	NAM NGUM	VT
277	L0917	VTTK006	Pakchengneua	Р	150		Nam Ngum	NAM NGUM	VT
278	L1692	SVCP006	Lambong	EP	150	100	Xe champhone	SE BANG HIENG	SV
279	L1697	SVCP011	H. Makmi	G	150	30	Stream	SE BANG HIENG	SV
280	L0066	NTNT008	Nam di 1	G	150	50	Nam di	NAM THA	NT
281	L1744	SVKL002	Bungwa	G	150	100	Stream	HUAI SOM PAK	SV
282	L1183	VMXN001	Na Khan Thoung	G	150	50	Houei Kay	NAM NGUM	VM
283	L0859	VTPH010	Hongkang	G	150	30	Hong kang	NAM NGUM	VT
284	L0171	OXMX006	Nam Hin	G	150	30	Nam Hin	NAM OU	OX
285	L0683	XKMP012	Ngam	G	150	20	Namthoum	NAM NGUM	ХК
286	L0688	XKMP017	Poung	G	150	20	Nam Kha	NAM NGUM	ХК
287	L0641	XKMK014	Ho Kang	G	150	20	Nammat		ХК
288	L0652	XKMK025	Vang Bua	G	150		Nam Phord		ХК
289	L0989	VTVV016	Nam ka	G	150	50	Nam ka	NAM NGUM	VT
290	L0902	VTSK026	Nam mi 2	G	150	100	Nam mi	NAM MI	VT
291	L0906	VTSK030	Nam mi 11	G	150	50	Nam mi	NAM MI	VT
292	L0907	VTSK031	Nam mi 12	G	150	72	Nam mi	NAM MI	VT
293	L1706	SVCP020	Kudken	G	150	30	Stream	SE BANG HIENG	SV
294	L0037	NTMS007	H. hin	G	150	15	Nam dai	NAM NUAO	NT
295	L1709	SVCP023	laonath	EP	150	150	Reservoir Ch	SE BANG HIENG	SV
296	L1710	SVCP024	Sikhod	EP	150	150	Reservoir Ch	SE BANG HIENG	SV
297	L1711	SVCP025	Huaysay	EP	150	100	Reservoir Ch	SE BANG HIENG	SV
298	L1719	SVCP033	Nonsithan 1	EP	150	100	Reservoir Ba	SE BANG HIENG	SV
299	L1720	SVCP034	Phaleng 1	EP	150	100	Reservoir Ba	SE BANG HIENG	SV
300	L1721	SVCP035	Phaleng 2	EP	150	100	Reservoir Ba	SE BANG HIENG	SV
301	L1722	SVCP036	Sa kun 2	EP	150	100	Reservoir Su	SE BANG HIENG	SV
302	L1727	SVCP041	Lambong	EP	150	100	Xe champhone	SE BANG HIENG	SV
303	L1860	SVTT007	Don Khao	DP	150	35	XeBanghieng	SE BANG HIENG	SV
304	L0076	NTNT018	Nam thung	DP	150	80	Nam thoung	NAM THA	NT
305	L0080	NTNT022	Boam phieng	DP	150	100	Nam thoung	NAM THA	NT
306	L1951	SRKD014	Bungkang	EP	150	120	Xe don	SE DONE	SR
307	L2128	APXT007	Xaisi	EP	150	100	Xekhaman	SE KONG	AP
308	L2133	APXT012	Hatsati	DP	150	100	Xekong	SE KONG	AP
309	L2135	APXT014	Sapouane	DP	150	150	Xekong	SE KONG	AP
310	L1675	SVAT006	Dongnakam	EP	150	130	Xe champhone	SE BANG HIENG	SV
311	L1678	SVAT009	LaiKatha	EP	150	100	Xe champhone	SE BANG HIENG	SV
312	L1873	SVXL005	Nonghuathong2	EP	150	120	Xe BangFai	SE BANG FAI	SV
313	L1885	SVXL017	Hatsaysung 2	EP	150	150	Xe BangFai	SE BANG FAI	SV
314	L1207	VMXT004	Sam Khe	EP	150	150	H. mak hiao	H.MA HIAO	VM
315	L1209	VMXT006	Vieng Cha leune	EP	150	130	Hong seng	H.MA HIAO	VM
316	L1191	VMXN009	Lat Khouay	EP	150	120	Nam ngum	NAM NGUM	VM
317	L0528	XYHS006	Nam leuk	G	150	100	Namleuk	NAM NGEUN	XY
318	L0936	VTTK025	Boungphao 2	EP	150	150	Nam ngum	NAM NGUM	VT
319	L1370	BXTB016	Na Kham 2	EP	150	150	Nam Khong	NAM THONG	BX
320	L1210	VMXT007	Phone thanh	EP	150	150	H. mak hiao	H.MA HIAO	VM
321	L0754	VTFU041	Keng sieng	DP	150	50	Nam lik	NAM NGUM	VT
322	L0938	VTTK027	Nam thon 1	G	150	120	Nam thon	NAM NGUM	VT
323	L1439	KMHB033	Hinbuntai	EP	150	150	Hinbuone	NAM HINBOUN	KM
324	L1346	BXPS046	Na aeung 2	EP	150	150	Nam Khong	NAM KADUN	BX
325	L1502	KMMX012	Phovatai	ÉP	150	150	xebangfai	SE BANG FAI	KM
326	L0089		Sene ane	DP	150	80	Sene ane	NAMIHA	NT
327	L0040	NTMS010	Nam sing	G	150	30	Nam ya	NAM NUAO	NT
328	L0042	NIMS012	Cha chan	G	150	25	H. na noy	NAM NUAO	NT
329	L0043	NIMS013	H. la	G	150	50	H. la 1	NAM NUAO	NT
330	L0054	NIMS024	Nam yuane	UΡ	150	50	Nam yuane	NAM NUAO	NT

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
331	L1528	KMNB020	Muang khay	ÉP	150	150	xebangfai	SE BANG FAI	KM
332	L1475	KMHB069	Paknampakan	EP	150	150	N.pakane	NAM HINBOUN	KM
333	L1481	KMHB075	KhamKoe	EP	150	150	Hinbuone	NAM HINBOUN	KM
334	L0943	VTTK032	Lingsan 1	EP	150	100	Nam ngum	NAM NGUM	VT
335	1 0948	VTTK037	B chum	EP	150	100	Nam ngum	NAM NGUM	VT
336	1 1194	VMXN012	Nona Khena	EP	150	150	Nam Noum		VM
337	11108	VMXN016	Nong No	FP	150	120	Nam ngum		VM
338	11100		Thadindeng	ED	150	120	Nam ngum		VM
330	11155		Tha yang	ED	150	120	Namingum		
340	L1120		Nong Veng	ED	150	120	Nong Viang		
2/1	10760				150	100	Nom lik		VT
242	L0703		Viongkoo 1		150	100	Nom lik		VT
242			Phon so yonh		150	100	Nam lik		VT
243			Nom obim		150	100	Nom ohim		VT
344			Nam chim 1		150	100	Nam chim		
345	L0073		Nam Chim T		150	100	Nam chim		
346	L0961		Pak cheng hua	EP	150	100	Nam ngum		
347	L0962	VTVK013	Pak cheng tai	EP	150	100	Nam ngum		VI
348	L0964	VTVK015	Vieng knam tay	EP	150	150	Nam ngum	NAM NGUM	VI
349	L0965	VIVK016	Thong hap 1	EP	150	120	Nam cheng	NAM NGUM	VI
350	L0966	VIVK017	Tha lad	EP	150	141	Nam ngum	NAM NGUM	VI
351	L2415	CPPP035	Namphak	G	150	150	Namphak	H.BANG LIENG	CP
352	L2027	SRSR020	Na teuam	G	150	130	Houy pao	SE DONE	SR
353	L0690	XKMP019	Nanou	G	150	20	Namsao	NAM NGUM	XK
354	L1926	SVXP020	B.Faung	DP	150	80	Xe Pon	SE BANG HIENG	SV
355	L1537	KMNB029	Navangthong	EP	150	150	xebangfai	SE BANG FAI	KM
356	L1538	KMNB030	Navangnoi	EP	150	150	xebangfai	SE BANG FAI	KM
357	L1541	KMNB033	Dongpakpua	EP	150	150	xebangfai	SE BANG FAI	KM
358	L1897	SVXL029	Xieng khay	EP	150	120	Xe BangFai	SE BANG FAI	SV
359	L1899	SVXL031	Pak xe bang fay	EP	150	120	Xe BangFai	SE BANG FAI	SV
360	L1546	KMNB038	Navangnua	EP	150	100	xebangfai	SE BANG FAI	KM
361	L1651	KMXF023	Som sa at	EP	150	100	xebangfai	SE BANG FAI	KM
362	L1867	SVVL006	Na nhom	DP	150	100	Xenoy	SE BANG FAI	SV
363	L1734	SVCP048	Sa kun 3	EP	150	100	Reservoir Su	SE BANG HIENG	SV
364	L1737	SVCP051	Phnethong	EP	150	100	Reservoir Su	SE BANG HIENG	SV
365	L1738	SVCP052	Kadan 3	EP	150	110	Bungkada	SE BANG HIENG	SV
366	L1843	SVSL013	Lampian	EP	150	100	Xe xangXoy	SE BANG HIENG	SV
367	L1847	SVSL017	Kabao	DP	150	100	Xe xangXoy	SE BANG HIENG	SV
368	L1967	SRKD030	Done muang	EP	150	130	Xe don	SE DONE	SR
369	L1576	KMNL021	Na pho say	EP	150	100	Nam nhon	SE BANG FAI	KM
370	L0655	XKMK028	Xang	G	150	20	Nam mat		ХК
371	L1313	BXPS013	Pak Pung 1	EP	146	146	Nam Pung	NAM KADUN	BX
372	L0138	OXMH012	Nam Teun	G	146	50	Nam Teun	NAM BENG	OX
373	L1347	BXPS047	Nong song hong	EP	141	141	Ang h.pung	NAM KADUN	BX
374	L0762	VTKO001	Namese	G	140	0	0 1 0	NAM NGUM	VT
375	L0621	XKKH006	NamGnion	G	140	10	NamGnion	NAM NHIEP	ХК
376	L0663	XKMM002	Thongnakhe	Ğ	140	10	NamLam	NAM CADINH	ХК
377	1 0665	XKMM004	Nam Nhien	G	140		Namnhien	NAM CADINH	ХК
378	10750	VTFU037	Pak ngua	G	140	150	Nam ngil	NAM NGUM	VT
379	1 0016	PI NO001	Nam xao	Ğ	140	140	Nam xao		PI
380	1 0141	OXMH015	Nam Kha	G	134	80	Nam Kha	NAM BENG	0X
381	1 1886	SV/XI 018	Hatsavsung 1	FP	130	120	Xe BangFai	SE BANG FAL	SV/
382	1 1317	BXPS017	Paksana Tai	ED	130	130	Nam Khong		BX
383	11105	VMCL002	Nona Pina	FP	130	110	Hong Deng		\/M
381	11338	RXDCU02	$l_{ak} A (1.2)$	ED	120	120	Nam Pung		RY
204	L 1616	KMTK032	Pak Pena	ED	130	100	Namhang		KW DV
505		1.001	i ak i eng	LF	130	120	ranibally		IXIVI

No.	MRC ID	Project ID	Project Name	lrr.	Irr. Are	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
386	L1235	BXKK006	Nam Thi	G	128	90	Nam Thi	NAM CADINH	BX
387	L2495	CPXB010	DonXe	Р	125	100	Xe done	SE DONE	CP
388	L0350	LBMN005	Nam Nane 6	G	121	111	Nam Nane	NAM PHUONG	LB
389	L1511	KMNB003	Sok bo	Р	120	101	Xe bangfai	SE BANG FAI	KM
390	L1514	KMNB006	Tan Theung	Р	120		Xe bangfai	SE BANG FAI	KM
391	L0853	VTPH004	Houachieme	Р	120	30	<b>J</b>	NAM NGUM	VT
392	L2390	CPPP010	Thongpha	G	120	80	Thongpha	HUAI TOMO	CP
393	L2391	CPPP011	Houavnamsai	G	120	50	Namsai	HUAI TOMO	CP
394	1 0648	XKMK021	Na xone	G	120	30	Piew		XK
395	L 1946	SRKD009	Khamthong	FP	120	100	Xe don	SE DONE	SR
396	1947	SRKD010	Hinsiew 1	EP	120	100	Xe don	SE DONE	SR
397	1 1948	SRKD011	Nonakoxona	EP	120	100	Xe don	SE DONE	SR
398	1 2015	SRSR008	Phon tan	FP	120	110	Xe don	SE DONE	SR
300	1 2131		Vatthat		120	100	Xekhaman		
400	1 1 3 1 4	BXPS014	Pak Pung 2	FP	120	100	Nam Pung		BX
400	10680	XKMD018	NaHov	G	120	100	Namkat		YK
407	1 0529		Namlare	G	120	80	Namkat		
402	1 2022	SPSP015		ED	120	100	Ye don		SP
403	1 1 2 0 7	BYTR022	Hong Thong 2		120	120	Nom Khong		
404	11/22	KMUR026	Khamkoo 2		120	120	Hinbuono		
405	11240		Rhankoe z Pok cono nuo		120	100	Nom cono		
400	L1340		Mahaaay nua		120	120	Nam Sane		
407	L1504			EP C	120	100	Xebangiai		
400	LU209		n. Nyani Dengeongom		120	100	Nalli Ngalli		
409	L1524		Dongsangam		120	100	xebangiai		KIVI
410	L1525		Dongkasin	EP	120	100	xebangtai	SE BANG FAI	KIVI
411		KIVINBU19	Haisaiphong	EP	120	120	xebangiai		KIVI
412	L1604	KIVITK025	Kok long	G	120	100			KIVI
413	L1613		Sa Ngom	EP	120	120	H.bangkhao		
414	L0944	VT1K033	Lingsan 2	EP	120	100	Nam ngum		
415	L0996	VTVV023	H. Iau	G	120	50	Nam lau		VI
416	L0968	VIVK019	Na khua	EP	120	100	Nam phin		VI
417	L2059	SRWP008	Phak kha	EP	120	100	Xe don	SE DONE	SR
418	L2060	SRWP009	Saphat	EP	120	100	Xe don	SE DONE	SR
419	L2066	SRWP015	Keng kou	EP	120	100	Xe don	SE DONE	SR
420	L1043	XSMH010	Nam poung gnay	G	120	15	Nam poung	NAM MANG	XS
421	L1535	KMNB027	Nong sa phang	EP	120	100	xebangtai	SE BANG FAI	KM
422	L1536	KMNB028	Nam phou 2	EP	120	100	xebangfai	SE BANG FAI	KM
423	L1739	SVCP053	Khok leng	EP	120	100	Nhot houei b	SE BANG HIENG	SV
424	L1959	SRKD022	Kengkhon	EP	120	100	Xe don	SE DONE	SR
425	L1960	SRKD023	Pakthoung	EP	120	100	Xe don	SE DONE	SR
426	L1961	SRKD024	Nathun	EP	120	100	Xe don	SE DONE	SR
427	L1962	SRKD025	Kenghouad	EP	120	100	Xe don	SE DONE	SR
428	L1963	SRKD026	Had dou	EP	120	100	Xe don	SE DONE	SR
429	L1964	SRKD027	Nongkhoulou	EP	120	100	Xe don	SE DONE	SR
430	L0227	OXPB001	Houay Hia 1	G	119	50	Houay Hia	NAM BENG	OX
431	L0904	VTSK028	Nam mi 7	G	116	60	Nam mi	NAM MI	VT
432	L0136	OXMH010	Nam Mao	G	112	80	Nam Mao	NAM BENG	OX
433	L0352	LBMN007	Hoeui Nane 4	G	111	111	Namnane	NAM PHUONG	LB
434	L0589	XYXY002	Nava	Р	110	110	Nam houng	NAM HOUNG	XY
435	L0549	XYMP003	Nam Phiang 4	G	110	90	Nam Phiang	NAM PHOUL	XY
436	L1315	BXPS015	Na Euang	EP	110	110	Nam Khong	NAM KADUN	BX
437	L0122	OXMB019	Nam Hao	G	110	15	Nam Hao	NAM BENG	OX
438	L0522	XYBT006	Nam Ham 2	G	110	20	Nam Ham	NAM HEUNG	XY
439	L2088	SKLM010	Tadhoikhon	G	109	95	Xenamnoy	SE KONG	SK
440	L0192	OXMX027	Nam Mao	G	108	80	Nam Mao	NAM OU	OX

No.	MRC ID	Proiect ID	Proiect Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
			1 10,000 1100	Туре	Whole	Dry		Name	Code
441	L1633	KMXF005	Keng Ka Si	P	100		Xe bangfai	SE BANG FAI	KM
442	L0530	XYKT001	Moungmo	Р	100	100	Name heung	NAM HEUNG	XY
443	L2493	CPXB008	B.XoLoGnai II	Р	100		Xe done	SE DONE	CP
444	L2102	APSX001	Naxaithong	Р	100	15	Se kong	SE KONG	AP
445	L2103	APSX002	ThongNaLuk 4	Р	100	37	Se kong	SE KONG	AP
446	L1509	KMNB001	Na Vang Tai	Р	100	31	Xe bangfai	SE BANG FAI	KM
447	L1069	XSTT005	PhoneXao I	Р	100	100	Nam Sane	NAM NGUM	XS
448	L1070	XSTT006	B.PhoneLao II	Р	100	100	Nam Sane	NAM NGUM	XS
449	L0918	VTTK007	Phonhung	Р	100	100	Nam Ngum	NAM NGUM	VT
450	L1006	XSLS001	HinSo I	Р	100	100	Nam Sane	NAM NGUM	XS
451	L1691	SVCP005	Salongkieng	G	100	0		SE BANG HIENG	SV
452	L1801	SVSK009	H. Payong	G	100	0		HUAI SOM PAK	SV
453	L1396	KMBL001	Nam Ka Ta	G	100	15		SE BANG FAI	KM
454	L0857	VTPH008	Houasime	G	100	100	Houasime	NAM NGUM	VT
455	L0639	XKMK012	Vang boua	G	100	50	Nam tiene		XK
456	L1696	SVCP010	H. Nonglaad	G	100	50	Stream	SE BANG HIENG	SV
457	L1703	SVCP017	Nongdeun	G	100	50	Stream	SE BANG HIENG	SV
458	L0443	HPME005	Na Pa	G	100	50	Houay Kuang		HP
459	L0494	HPXK007	Sob Sanh	G	100	50	Houay Sanh		HP
460	L0453	HPSB002	H.Mouang	G	100	100	Nam Hang		HP
461	L0454	HPSB003	Ta lang	G	100	100	Houay TaLang		HP
462	L0067	NTNT009	Nam di 3	G	100	30	Nam di	NAM THA	NT
463	L0071	NTNT013	Nam ngene 1	G	100	0	Nam ngene 1	NAM THA	NT
464	L2092	SKTT003	Houei Tok Lok	G	100	90	H. Toklok	SE KONG	SK
465	L2093	SKTT004	Houei Tid	G	100	90	H. Tid	SE KONG	SK
466	L2096	SKTT007	Houei Tid	G	100	90	H. Tid	SE KONG	SK
467	L1234	BXKK005	Nam Koua	G	100	50	Nam Koua	NAM CADINH	BX
468	L1136	VMN1002	Houei Xaykhao	G	100	71	H.Xaykhao	NAM NGUM	VM
469	L1137	VMN1003	Houei Son	G	100	100	Houei son	NAM NGUM	VM
470	L0928	VIIK017	Nam nnam	G	100	60	Nam nnam		VI
471	L0744	VIEU031	Nam sai 1	G	100	50	Nam xai		VI
472	L0035	NTMS005	Nam keo	G	100	50	Nam sing 1		
473	L0036	NTMS006	Nam dai	G	100	3	Nam sing 2		
474	L0685	XKIMP014	Phat	G	100	20	Namko		XK
475	L0623		Phao No Llung	G	100	50	Namngiou		
470	L0708		Na Hung	G	100	20	Namsen		
4//	L0807	VINSU35	Nam muna	G	100	50	Nam Knat		
478	L0929		Nam ghung	G	100	20	Nam ngung		
479	L0001		Nam phot	G	100	30	Nam phot		
400	L0001	VTSK025	Nam nga	G	100	50	Nam priet		VT
401	10005	VTSK025	Nam mi 0	G	100	20	Nam mi		VT
402	L0905	SVKI 005	Nongtao	G	100	20	Stream		SV/
403	1 1 8 1 5	SVICE003	Kengtangan		100	100	YeBanghieng		SV
404	11186		Duengboudy	ED	100	00	Nam ngum		VM
405			Thong pung		100	50	Nam thoung		NT
487	1 10/12	SRKD005	Tandiao		100	100	Xe don	SEDONE	SR
488	1 1044	SRKD007	O kat nov	FP	100	100	Xe don	SE DONE	SR
489	1 1956	SRKD019	Chanlanxe		100	80	Xe don	SE DONE	SR
490	1 2018	SRSR011	Kengkasa	DP	100	90 90	Xe don	SE DONE	SR
491	1 2130	APXT009	Sithau	DP	100	100	Xekhaman	SE KONG	AP
492	1 2132	APXT011	Hatsavkhao	DP	100	100	Xekhaman	SE KONG	AP
493	2134	APXT013	Xakhe	DP	100	100	Xekona	SE KONG	AP
494	11874	SVXI 006	Dongpao	FP	100	100	Xe BangFai	SE BANG FAI	SV
495	L1890	SVXL022	Naonua	EP	100	100	Xe BangFai	SE BANG FAI	SV

#### Table 1(2) Irrigation Area and Water Sources (Tributaries) of Laos (10/11)

No.	MRC ID	Project ID	Project Name	Irr.	Irr. Area	a (ha)	River Name	River Basin	Province
				Туре	Whole	Dry	-	Name	Code
496	L1318	BXPS018	Phonxay	EP	100	100	Nam Khong	NAM NHIEP	BX
497	L1323	BXPS023	Patxoum 1	EP	100	100	Nam Xan	NAM SANE	BX
498	L1325	BXPS025	Hang Xing 1	EP	100	100	Nam Khong	NAM THONG	BX
499	L1217	BXBK005	Ban Done 1.2	EP	100	100	Nam Xan	NAM SANE	BX
500	L1363	BXTB009	Hong Thong 1	EP	100	100	Nam Khong	H.SOPHAY	BX
501	L0934	VTTK023	Hatsuane	EP	100	100	Nam ngum	NAM NGUM	VT
502	L1365	BXTB011	Tha Bok 1	EP	100	100	Nam Mang	NAM MANG	BX
503	L1366	BXTB012	Na Kham 1	EP	100	100	Nam Khong	NAM THONG	BX
504	L1369	BXTB015	Pakthouay Neua	DP	100	100	Nam Khong	NAM THONG	BX
505	L0752	VTFU039	Na thua	DP	100	50	Nam tong	NAM NGUM	VT
506	L2087	SKLM009	Nava	EP	100	100	Xekong	SE KONG	SK
507	L1329	BXPS029	Lak 5	EP	100	100	Nam Pung	NAM KADUN	BX
508	L1333	BXPS033	Sivilay	EP	100	100	Nam Xan	NAM SANE	BX
509	L2433	CPPS013	Phone ngam	EP	100	100	Xedone	SE DONE	CP
510	L0755	VTFU042	Nam sai	DP	100	56	Nam sai	NAM NGUM	VT
511	L1381	BXTB027	Tha Bok 2,3	EP	100	100	Nam Mang	NAM MANG	BX
512	L1399	KMBP003	Nam ka ta	G	100	10	N.kata	NAM CADINH	KM
513	L1422	KMHB016	Hinkhan	EP	100	100	Hinboune	NAM HINBOUN	KM
514	L1427	KMHB021	Khoa nam pakan 1	EP	100	100	N.pakane	NAM HINBOUN	KM
515	L1429	KMHB023	Tha khene	DP	100	100	N.pakane	NAM HINBOUN	KM
516	L1435	KMHB029	Nongbua	EP	100	100	N.pakane	NAM HINBOUN	KM
517	L1445	KMHB039	Konglokang	DP	100	50	Hinbuone	NAM HINBOUN	KM
518	L1446	KMHB040	B. Oo	DP	100	80	Hinbuone	NAM HINBOUN	KM
519	L1447	KMHB041	Kong lo nua	DP	100	40	Hin boun	NAM HINBOUN	KM
520	L1452	KMHB046	Vang mone	DP	100	90	Hinbuone	NAM HINBOUN	KM
521	L1459	KMHB053	Hadsaikhang	DP	100	80	Hinbuone	NAM HINBOUN	KM
522	L1460	KMHB054	Thanatai	DP	100	100	Hinbuone	NAM HINBOUN	KM
523	L1462	KMHB056	Phahangnuaa	DP	100	90	Hinbuone	NAM HINBOUN	KM
524	L1463	KMHB057	Phonenhang	DP	100	80	Hinbuone	NAM HINBOUN	KM
525	L1464	KMHB058	Phahangtai	DP	100	80	Hinbuone	NAM HINBOUN	KM
526	L1344	BXPS044	Sin Xai 2	EP	100	100	Nam Khong	NAM KADUN	BX
527	L1497	KMMX007	Keng sa vang	EP	100	100	Xe bang fay	SE BANG FAI	KM
528	L1499	KMMX009	B. pho va nua	EP	100	100	H. pong	SE BANG FAI	KM
529	L1505	KMMX015	Nakaio	EP	100	100	xebangfai	SE BANG FAI	KM
530	L0041	NTMS011	Nam ya	G	100	30	H. hinh	NAM NUAO	NT
531	L0044	NTMS014	H. buakhu	G	100	50	H. la 2	NAM NUAO	NT
532	L0052	NTMS022	Xieng kheng	G	100	50	Xieng kheng	NAM NUAO	NT
533	L0030	NTML013	Nam an 1	DP	100	80	Nam an 1	NAM MA	NT
534	L2121	APSX020	Naxaithong	DP	100	60	Xekong	SE KONG	AP
535	L2147	APXX012	Ban Ouk	DP	100	100	Xekong	SE KONG	AP
536	L1603	KMTK024	Houay Bang Kao	G	100	80	Houay Bang K	NAM MANG NHAI	KM
537	L1609	KMTK030	Tha Khair	EP	100	100	Namdone	NAM MANG NHAI	KM
538	L1619	KMTK040	B. thum	EP	100	100	Nam done	NAM MANG NHAI	KM
539	L1465	KMHB059	Dong kang	EP	100	80	Nam khong	HOAAG HUA	KM
540	L1466	KMHB060	H. khau min	EP	100	80	Nam khong	HOAAG HUA	KM
541	L1472	KMHB066	Paknamhinbunnua	EP	100	70	Hin boun	NAM HINBOUN	KM
542	L1474	KMHB068	Phonkham	EP	100	100	N.pakane	NAM HINBOUN	KM
543	L0458	HPSB007	Kong Khoune	G	100	100	Nam Long		HP
544	L1483	KMHB077	Nong hang	UP DP	100	80	Hinbuone	NAM HINBOUN	KM
545	L1485	KMHB079	iviuang nua	ЧU	100	90	Hinbuone	NAM HINBOUN	KM
546	L0940	VIIK029	Hong pheng	G	100	50	Hong pheng	NAM NGUM	VI
547	L0946	VIIK035	Hong pheng	EP	100	80	Hong pheng	NAM NGUM	VT
548	L0947	VIIK036	Ban cheng 2	DP	100	70	Nam ngum	NAM NGUM	VI
549	L1202	VMXN020	Veune thene	EP	100	80	Nam ngum		VM
550	L1203	VIXIN021	Na the	EΡ	100	100	Nam ngum	NAM NGUM	VM

Note: P: fixed pump (power source not specified), EP: electric fixed pump, DP: diesel fixed pump

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

#### Table 1(2) Irrigation Area and Water Sources (Tributaries) of Laos (11/11)

Type         Whole         Dry         NAM NGUM         VM           551         L142         VMNT008         Nam Khon         G         100         30         Houei Khon         NAM NGUM         VT           552         L0869         VTPH020         Ham pha nai         2         G         100         50         Ham pha nai         NAM NGUM         VT           554         L0875         VTPH020         Nam chim         2         P         100         80         Nam chim         NAM NGUM         VT           556         L957         VTVK000         Nong onog khai         EP         100         50         nam ani         NAM NGUM         VT           556         L957         VTK003         Honghang         G         100         50         honghang         NAM NGUM         VT           557         L2045         SRSR021         Honghang         G         100         100         NAM SQUM         VT           561         L2033         SRSR021         Honghang         SE         DONE         SR           561         L2034         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR	No.	MRC ID	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	River Basin	Province
551         L1142         VIMPTOD8         Nam Khon         G         100         30         Houei Khon         NAM NGUM         VT           552         L0867         VTPH021         Nam pha nai         G         100         50         Nam pha nai         NAM NGUM         VT           551         L0870         VTPH021         Nam chim 3         EP         100         50         Nam pha nai         NAM NGUM         VT           556         L0957         VTVK008         Phon hang 2         EP         100         50         Nam nchim         NAM NGUM         VT           556         L2024         SRSR017         Hongphang         G         100         50         Hongphang         SK         NAM NGUM         VT           556         L2024         SRSR017         Hongphang         G         100         100         Xe don         SE DONE         SR           561         L2030         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP014         Ba med         EP         100         100         Xe don         SE DONE         SR           564         <			-	-	Туре	Whole	Dry	-	Name	Code
552         L0869         VTFH020         Hang long         G         100         50         Hang long         NAM NGUM         VT           554         L0875         VTFH026         Nam pha nai         EP         100         80         Nam chim         NAM NGUM         VT           556         L0950         VTVK008         Phon hang 2         EP         100         50         Nam ngum         NAM NGUM         VT           557         L0240         Phapho         G         100         50         Hang long         NAM NGUM         VT           558         L2416         CPPP036         Phon bok         EP         100         100         Houysoung         SE DONE         SR           561         L2024         SRSR021         Phon bok         EP         100         100         Xe don         SE DONE         SR           564         L2034         SRSR021         Dan nava         DP         100         100         Xe don         SE DONE         SR           564         L0263         SRWP016         Bangouthi         EP         100         100         Xe don         SE DONE         SR           564         L0263         SKWP021         Na	551	L1142	VMNT008	Nam Khon	G	100	30	Houei Khon	NAM NGUM	VM
553         L0870         VTFH021         Nam chim 3         EP         100         50         Nam pha nai         NAM NGUM         VT           554         L0850         VTVK001         Nong onog khai         EP         100         50         Nam chim         NAM NGUM         VT           556         L0957         VTVK008         Phon hang 2         EP         100         50         canal namche         NAM NGUM         VT           556         L2024         SRSR071         Hongphang         G         100         30         Phapho         SE         CP         556           560         L2028         SRSR071         Honsok         EP         100         100         Xe don         SE         DONE         SR           561         L2030         SRSR072         Lan nava         DP         100         Xe don         SE         DONE         SR           561         L2045         SRWP014         Ban med         EP         100         100         Xe don         SE         DONE         SR           561         L2045         SRWP014         Ban med         EP         100         100         Xe don         SE         DONE         SR	552	L0869	VTPH020	Hang long	G	100	50	Hang long	NAM NGUM	VT
554         L0875         VTFM026         Nam chim 3         EP         100         50         Nam chim         NAM NGUM         VT           556         L0867         VTFK008         Phon hang 2         EP         100         50         cananghe         NAM NGUM         VT           556         L0240         SRSR017         Hougphang         G         100         50         Hongphang         SE KONG         CP           551         L2024         SRSR017         Hougphang         G         100         Hou yosung         SE DONE         SR           561         L2035         SRSR021         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           563         L2065         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           564         L0067         SRWP016         Nam theng         G         100         Nam theng         NAM NHIEP         XS           564         L0067         SVXP013         Nasong         EP         100         80         Xe Pon         SE BANG FAI         KM           571         L1624         KVXP017         Hatam hieng 2	553	L0870	VTPH021	Nam pha nai 2	G	100	50	Nam pha nai	NAM NGUM	VT
555         L0950         VTVK001         Nong onong khai         EP         100         50         Nam gum         NAM NGUM         VT           556         L0949         VTTK038         Hongphang         G         100         50         Hongphang         NAM NGUM         VT           557         L0949         VTTK038         Hongphang         G         100         50         Hongphang         SK NOG         CP           558         L2024         SRSR017         Houssoung         G         100         Xe don         SE DONE         SR           561         L2030         SRSR021         Dan nava         DP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP016         Kengsoutthi         EP         100         100         Xe don         SE DONE         SR           565         L1924         SVKP018         Soh nam         EP         100         100         Xe don         SE DANE         SV           566         L1924         SVKP021         Nam song         EP         100         80         XePon         SE BANG FAI         KM           571         L1633         KMXF025 <td< td=""><td>554</td><td>L0875</td><td>VTPH026</td><td>Nam chim 3</td><td>EP</td><td>100</td><td>80</td><td>Nam chim</td><td>NAM NGUM</td><td>VT</td></td<>	554	L0875	VTPH026	Nam chim 3	EP	100	80	Nam chim	NAM NGUM	VT
556         L0967         VTTK008         Phon hang 2         EP         100         50         canal namche         NAM NGUM         VT           557         L0949         VTTK008         Phapho         G         100         50         Hongphang         NAM NGUM         VT           558         L2024         SRSR017         Houysoung         G         100         100         Vurty soung         SE DONE         SR           561         L2028         SRSR021         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           562         L2034         SRSR021         Dan nava         DP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP016         Bansgouthi         EP         100         100         Xe don         SE DONE         SR           566         L1082         XXMP018         Song         EP         100         100         Xe don         SE BANG HEING         SV           561         L1024         XVXP018         Song         EP         100         80         Xebangfai         SE BANG FAI         KM           571         L1645	555	L0950	VTVK001	Nong o nong khai	EP	100	50	Nam ngum	NAM NGUM	VT
557         L0949         VTTK038         Hongphang         G         100         50         Hongphang         SE         KONG         CP           558         L2044         SRSR017         Houysoung         G         100         100         Houpsoung         SE DONE         SR           560         L2028         SRSR021         Phon bok         EP         100         100 Xe don         SE DONE         SR           561         L2030         SRSR027         Dan nava         DP         100         100 Xe don         SE DONE         SR           562         L2067         SRWP016         Kengsouthi         EP         100         100 Xe don         SE DONE         SR           563         L3025         XKMP021         Nam theng         G         100         Nam theng         NAM NEUM         XK           564         L1924         SVXP018         Sob nam         EP         100         80 Xe Pon         SE BANG FAI         KM           576         L1633         KMNF017         Hat kam hieng 2         EP         100         80 Xeong         SE BANG FAI         KM           571         L1663         SVAT016         Pong dong         EP         100	556	L0957	VTVK008	Phon hang 2	EP	100	50	canal namche	NAM NGUM	VT
558         L2416         CPPP036         Phapho         G         100         30         Phapho         SE CONG         CP           559         L2024         SRSR021         Phon bok         EP         100         100         Xe don         SE DONE         SR           561         L2030         SRSR021         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           561         L2035         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR           563         L2065         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           564         L067         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           565         L1032         XVXP013         Nam theng         G         100         NAM NHIEP         XS           566         L1333         KMMR025         Nang         EP         100         80         XePon         SE BANG FAI         KM           570         L1645         KMK707         Hat kham hieng 2         EP	557	L0949	VTTK038	Hongphang	G	100	50	Hongphang	NAM NGUM	VT
559         L2024         SRSR017         Houysoung         G         100         Houysoung         SE DONE         SR           560         L2038         SRSR021         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           561         L2034         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR           562         L2065         SRWP016         Kangsouthi         EP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP016         Kangsouthi         EP         100         100         Xe don         SE DONE         SR           565         L1085         XSTT021         Nam theng         G         100         Na don         SR BANG HEING         SV           566         L1924         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG HEING         SV           568         L1927         SVXP021         Nam you         G         100         70         Nam bung         SE BANG FAI         KM           570         L1645         KMXF017         Hatkham hing	558	L2416	CPPP036	Phapho	G	100	30	Phapho	SE KONG	CP
560         L2028         SRSR021         Phon bok         EP         100         100         Xe don         SE DONE         SR           561         L2030         SRSR023         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           561         L2065         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           565         L1085         XSTT021         Nam theng         G         100         Na don         SE DONE         SR           566         L0692         XKMP021         Nam theng         G         100         Nam theng         NAM NHIEP         XS           567         L1924         SVXP018         Son nam         EP         100         80         Xe Pon         SE BANG HENG         SV           568         L1533         KMMS025         Thanuong         EP         100         80         Xe Pon         SE BANG FAI         KM           571         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           572         L1740         SVCP054         Khong pha leng	559	L2024	SRSR017	Houysoung	G	100	100	Houy soung	SE DONE	SR
561         L2030         SRSR023         Leun pa oup         DP         100         100         Xe don         SE DONE         SR           562         L2034         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR           564         L2065         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           564         L2065         SRWP014         Nam thend         G         100         Nam thend         NAM NHIEP         SS           566         L1924         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG FAI         KM           570         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           571         L1663         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           572         L1648         SVAT016         Pong dong         C         100         70         Nam bung         SE BANG FAI         KM           575         L1740         SVCP005	560	L2028	SRSR021	Phon bok	EP	100	100	Xe don	SE DONE	SR
562         L2034         SRSR027         Dan nava         DP         100         100         Xe don         SE DONE         SR           563         L2065         SRWP016         Kengsouthi         EP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP016         Kengsouthi         EP         100         100         Xe don         SE DONE         SR           565         L1085         XSTT021         Nam theng         G         100         Nam theng number         XS           566         L6082         XKMP017         Nam theng         EP         100         80         Xe Pon         SE BANG FAI         KM           576         L1927         SVXPO21         Na song         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           573         L1658         KMXT003         Huoi ka po         G         100         50         Ang bak         SE BANG HIENG         SV           575         L1740         SVCP054         Khong	561	L2030	SRSR023	Leun pa oup	DP	100	100	Xe don	SE DONE	SR
563         L2065         SRWP014         Ban med         EP         100         100         Xe don         SE DONE         SR           564         L2067         SRWP016         Kengsouthi         EP         100         100         Xe don         SE DONE         SR           566         L1083         XSTT021         Nam You         G         100         Nam theng         NAM NEILP         XS           567         L1924         SVXP021         Na song         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1927         SVXP021         Na song         EP         100         80         Xe Pon         SE BANG FAI         KM           570         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           571         L1658         KMXT003         Huo ik apo         G         100         50         Noi ka po         SE BANG HIENG         SV           573         L1658         KMXT003         Huo ing ap ang ang         DP         100         100         Xe champhone         SE BANG HIENG         SV           575 <l1741< td="">         SVCP054</l1741<>	562	L2034	SRSR027	Dan nava	DP	100	100	Xe don	SE DONE	SR
564         L2067         SRWP016         Kengsouthi         EP         100         100         Xed on         SE         SR           565         L1085         XSTT021         Nam theng         G         100         0         Nam theng         NAM NEUM         XS           566         L0692         XKMP021         Nam on         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1327         SVXP011         Na song         EP         100         80         Xe Pon         SE BANG FAI         KM           570         L1645         KMXF017         Hat kham hieng 2         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1653         KMX7007         Kok tong         DP         100         80         xenoy         SE BANG FAI         SV           573         L1740         SVCP054         Khong pha leng         DP         100         100         Xe anapxoy         SE BANG HIENG         SV           575         L1740         SVCP055         Sa long khien         G         100         60         Houei         SE BANG HIENG         SV           576 <t< td=""><td>563</td><td>L2065</td><td>SRWP014</td><td>Ban med</td><td>EP</td><td>100</td><td>100</td><td>Xe don</td><td>SE DONE</td><td>SR</td></t<>	563	L2065	SRWP014	Ban med	EP	100	100	Xe don	SE DONE	SR
565         L1085         XSTT021         Nam theng         G         100         Nam thagnongLua         NAM NHIEP         XS           566         L0692         XKMP021         Nam You         G         100         KhangnongLua         NAM NGUM         XK           567         L1924         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1533         KMNB025         Thamuong         EP         100         80         Xe Pon         SE BANG FAI         KM           570         L1645         KMXF017         Hat kham hieng 2         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1658         SVX1013         Huoi kapo         G         100         50         Ang bak         SE BANG FAI         KM           574         L1740         SVCP054         Kong pha leng         DP         100         100         Xexangxoy         SE BANG HIENG         SV           576         L1741         SVC005         Kalog any oy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           578         L1790	564	L2067	SRWP016	Kengsoutthi	EP	100	100	Xe don	SE DONE	SR
566         L0692         XKMP021         Nam You         G         100         KhangnongLua         NAM NGUM         XK           567         L1924         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1927         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG FAI         KM           570         L1645         KMKF017         Hat kham hieng 2         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1653         KMK7003         Hou ka po         G         100         70         Nam bung         SE BANG FAI         KM           573         L1659         KMXT003         Hou ika po         G         100         50         Ang bak         SE BANG HIENG         SV           574         L1685         SVAT016         Pong dong         EP         100         100         Xe champhone         SE BANG HIENG         SV           575         L1740         SVCP054         Khong pha leng         DP         100         100         Xe champhone         SV         SV           576         L1741<	565	L1085	XSTT021	Nam theng	G	100	0	Nam theng	NAM NHIEP	XS
567         L1924         SVXP018         Sob nam         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1927         SVXP021         Na song         EP         100         80         Xe Pon         SE BANG HIENG         SV           568         L1533         KMNB025         Thamuong         EP         100         80         xebangfai         SE BANG FAI         KM           570         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           571         L1668         SVVL007         Kok tong         DP         100         80         Xenoy         SE BANG FAI         KM           574         L1740         SVCP054         Kong pha leng         DP         100         100         Xe champhone         SE BANG HIENG         SV           576         L1741         SVCP055         Sa long khien         G         100         60         Houei         SE BANG HIENG         SV           578         L1790         SVP2006         Keng say noy         DP         100         100         Xexangxoy         SE BANG FAI         KM           580 <td>566</td> <td>L0692</td> <td>XKMP021</td> <td>Nam You</td> <td>G</td> <td>100</td> <td></td> <td>KhangnongLua</td> <td>NAM NGUM</td> <td>XK</td>	566	L0692	XKMP021	Nam You	G	100		KhangnongLua	NAM NGUM	XK
568         L1927         SVXP021         Na song         EP         100         80         X epon         SE BANG HIENG         SV           569         L1533         KMNB025         Thamuong         EP         100         100         xebangfai         SE BANG FAI         KM           571         L1645         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           572         L1659         KMXT003         Huoi ka po         G         100         50         Huoi ka po         SE BANG FAI         KM           574         L1659         KMXT003         Huoi ka po         G         100         50         Ang bak         SE BANG FAI         KM           574         L1659         KMT003         Huoi ka po         G         100         50         Ang bak         SE BANG HIENG         SV           575         L1740         SVCP055         Sa long khen         G         100         60         Houei         SE BANG HIENG         SV           576         L1741         SVCP056         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           579	567	L1924	SVXP018	Sob nam	EP	100	80	Xe Pon	SE BANG HIENG	SV
569         L1533         KMNB025         Thamuong         EP         100         100         xebangfai         SE BANG FAI         KM           570         L1645         KMXF017         Hat kham hieng 2         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1653         KMXT003         Huoi ka po         G         100         70         Nam bung         SE BANG FAI         SV           573         L1740         SVCP054         Khong pha leng         DP         100         50         Huoi ka po         SE BANG HIENG         SV           575         L1740         SVCP054         Khong pha leng         DP         100         50         H.pa yong         SE BANG HIENG         SV           576         L1740         SVCP054         Khong pha leng         DP         100         50         H.pa yong         SE BANG HIENG         SV           577         L1838         SVSL008         H.pa yong         G         100         Kexangxoy         SE BANG HIENG         SV           578         L1790         SVPX007         Pha lan nua         DP         100         100         Xebangfai         SE BANG FAI         KM	568	L1927	SVXP021	Na song	EP	100	80	Xe Pon	SE BANG HIENG	SV
570         L1645         KMXF017         Hat kham hieng 2         EP         100         80         xebangfai         SE BANG FAI         KM           571         L1653         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           572         L1659         KMXT003         Huoi ka po         G         100         5         Huoi ka po         SE BANG FAI         KM           573         L1659         KMXT003         Huoi ka po         G         100         5         Huoi ka po         SE BANG FAI         KM           574         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           576         L1741         SVCP055         Sa long khien         G         100         50         H. pa yong         SE BANG HIENG         SV           577         L1838         SVSL008         H. pa yong         G         100         100         Xeangxoy         SE BANG HIENG         SV           579         L1791         SVPX007         Pha lan nua         DP         100         100         Xeangxoy         SE BANG FAI         KM	569	L1533	KMNB025	Thamuong	EP	100	100	xebangfai	SE BANG FAI	KM
571         L1653         KMXF025         Nong bua         G         100         70         Nam bung         SE BANG FAI         KM           572         L1688         SVVL007         Kok tong         DP         100         80         Xenoy         SE BANG FAI         SV           573         L1685         SVAT016         Pong dong         EP         100         100         Xe champhone         SE BANG FAI         KV           574         L1685         SVAT016         Pong dong         EP         100         100         Xe champhone         SE BANG HIENG         SV           575         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           577         L138         SVSL008         H. pa yong         G         100         50         Hangxoy         SE BANG HIENG         SV           578         L1791         SVPX006         Keng say noy         DP         100         100         Xeangxoy         SE BANG FAI         KM           581         L1566         KMNL011         Hain nua         DP         100         50         xebangfai         SE BANG FAI         KM <td< td=""><td>570</td><td>L1645</td><td>KMXF017</td><td>Hat kham hieng 2</td><td>EP</td><td>100</td><td>80</td><td>xebangfai</td><td>SE BANG FAI</td><td>KM</td></td<>	570	L1645	KMXF017	Hat kham hieng 2	EP	100	80	xebangfai	SE BANG FAI	KM
572         L1868         SVVL007         Kok tong         DP         100         80         Xenoy         SE BANG FAI         SV           573         L1659         KMXT003         Huoi ka po         G         100         5         Huoi ka po         SE BANG FAI         KM           574         L1685         SVAT016         Pong dong         EP         100         100         Xe champhone         SE BANG HIENG         SV           575         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           577         L1730         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG HIENG         SV           579         L1791         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1567         KMNL011         Hai         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1567         KMNL014         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           5	571	L1653	KMXF025	Nong bua	G	100	70	Nam bung	SE BANG FAI	KM
573         L1659         KMXT003         Huoi ka po         G         100         5         Huoi ka po         SE BANG FAI         KM           574         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           576         L1741         SVCP055         Sa long khien         G         100         50         H.pa yong         SE BANG HIENG         SV           577         L1838         SVSL008         H. pa yong         G         100         50         H.pa yong         SE BANG HIENG         SV           578         L1791         SVPX006         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           580         L1566         KMNL011         Hai         DP         100         100         xexangxoy         SE BANG FAI         KM           581         L1568         KMNL014         Na ka tang         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL014         Na ka tang         DP         100         50         N.nhon         SE BANG FAI         KM	572	L1868	SVVL007	Kok tong	DP	100	80	Xenoy	SE BANG FAI	SV
574         L1685         SVAT016         Pong dong         EP         100         100         Xe champhone         SE BANG HIENG         SV           575         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           576         L1741         SVCP055         Sa long khien         G         100         60         Houei         SE BANG HIENG         SV           577         L1838         SVSL008         H. pa yong         G         100         100         Xexangxoy         SE BANG HIENG         SV           578         L1790         SVPX006         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           578         L1566         KMNL011         Hai         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1567         KMNL013         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1576         KMNL014         Na ka tang         DP         100         50         N.hon         SE BANG FAI         KM           <	573	L1659	KMXT003	Huoi ka po	G	100	5	Huoi ka po	SE BANG FAI	KM
575         L1740         SVCP054         Khong pha leng         DP         100         50         Ang bak         SE BANG HIENG         SV           576         L1741         SVCP055         Sa long khien         G         100         60         Houei         SE BANG HIENG         SV           577         L1838         SVSL008         H. pa yong         G         100         50         H. pa yong         SE BANG HIENG         SV           578         L1791         SVPX006         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           579         L1791         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1566         KMNL011         Hai         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL014         Na ka tang         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE DONE         SR           5	574	L1685	SVAT016	Pong dong	EP	100	100	Xe champhone	SE BANG HIENG	SV
576         L1741         SVCP055         Sa long khien         G         100         60         Houei         SE BANG HIENG         SV           577         L1838         SVSL008         H. pa yong         G         100         50         H. pa yong         SE BANG HIENG         SV           578         L1790         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG HIENG         SV           580         L1566         KMNL011         Hai         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1566         KMNL012         Phone keo         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1569         KMNL014         Na ka tang         DP         100         50         xebangfai         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam horn         SE BANG FAI         KM           584         L1971         KMNL014         Na ka tang         DP         100         50         Nam horn         SE BANG FAI         KM           584<	575	L1740	SVCP054	Khong pha leng	DP	100	50	Ang bak	SE BANG HIENG	SV
577         L1838         SVSL008         H. pa yong         G         100         50         H. pa yong         SE BANG HIENG         SV           578         L1790         SVPX006         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           579         L1791         SVPX007         Pha Ian nua         DP         100         100         Xexangxoy         SE BANG HIENG         SV           580         L1566         KMNL011         Hai         DP         100         100         Xebangfai         SE BANG FAI         KM           581         L1567         KMNL014         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1569         KMNL014         Na ka tang         DP         100         50         N.nhon         SE BANG FAI         KM           584         L1958         SRKD021         Nong heng         DP         100         80         Xekong         SE KONG         AP           586         L1958         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           589	576	L1741	SVCP055	Sa long khien	G	100	60	Houei	SE BANG HIENG	SV
578         L1790         SVPX006         Keng say noy         DP         100         100         Xexangxoy         SE BANG HIENG         SV           579         L1791         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG HIENG         SV           580         L1566         KMNL011         Hai         DP         100         100         Xexangxoy         SE BANG FAI         KM           581         L1567         KMNL012         Phone keo         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL014         Na ka tang         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1971         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           585         L2148         APX013         Som poy         DP         100         100         Xe don         SE DONE         SR           586	577	L1838	SVSL008	H. pa yong	G	100	50	H. pa yong	SE BANG HIENG	SV
579         L1791         SVPX007         Pha lan nua         DP         100         100         Xexangxoy         SE BANG HIENG         SV           580         L1566         KMNL011         Hai         DP         100         100         xebangfai         SE BANG FAI         KM           581         L1567         KMNL012         Phone keo         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL014         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1975         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976<	578	L1790	SVPX006	Keng say noy	DP	100	100	Xexangxoy	SE BANG HIENG	SV
580         L1566         KMNL011         Hai         DP         100         100         xebangfai         SE BANG FAI         KM           581         L1567         KMNL012         Phone keo         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL014         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1569         KMNL014         Na ka tang         DP         100         50         Nnhon         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1958         SRKD021         Nong heng         DP         100         100         Xe don         SE DONE         SR           587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           591         L1976	579	L1791	SVPX007	Pha lan nua	DP	100	100	Xexangxoy	SE BANG HIENG	SV
581         L1567         KMNL012         Phone keo         DP         100         50         xebangfai         SE BANG FAI         KM           582         L1568         KMNL013         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1569         KMNL014         Na ka tang         DP         100         50         xebangfai         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           584         L1978         SRKD021         Nong heng         DP         100         80         Xekong         SE KONG         AP           586         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           591         L1976         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           593         L1488	580	L1566	KMNL011	Hai	DP	100	100	xebangfai	SE BANG FAI	KM
582         L1568         KMNL013         Na den         DP         100         50         xebangfai         SE BANG FAI         KM           583         L1569         KMNL014         Na ka tang         DP         100         50         N.nhon         SE BANG FAI         KM           584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           585         L2148         APXX013         Som poy         DP         100         80         Xekong         SE KONG         AP           586         L1958         SRKD021         Nong heng         DP         100         100         Xe don         SE DONE         SR           587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD	581	L1567	KMNL012	Phone keo	DP	100	50	xebangfai	SE BANG FAI	KM
583L1569KMNL014Na ka tangDP10050N.nhonSE BANG FAIKM584L1571KMNL016Keng lekDP10050Nam nhomSE BANG FAIKM585L2148APXX013Som poyDP10080XekongSE KONGAP586L1958SRKD021Nong hengDP100100Xe donSE DONESR587L1969SRKD032BungmaneEP100100Xe donSE DONESR588L1972SRKD035Khong noyEP100100Xe donSE DONESR588L1975SRKD038Tanpiao 2DP100100Xe donSE DONESR590L1976SRKD042NahouabungDP10070Xe donSE DONESR591L1979SRKD042NahouabungDP10070Xe donSE DONESR592L2068SRWP017Tan soum 1DP10070Xe donSE DONESR593L1488KMHB082NakhokDP10050HinbuoneNAM HINBOUNKM594L1577KMNL023Phone setDP100100Nam nhonSE BANG FAIKM595L1578KMNL023Phone setDP100100NahonSE BANG FAIKM596L2149APXX014Hat say khamDP10050XekongSE KO	582	L1568	KMNL013	Na den	DP	100	50	xebangfai	SE BANG FAI	KM
584         L1571         KMNL016         Keng lek         DP         100         50         Nam nhom         SE BANG FAI         KM           585         L2148         APXX013         Som poy         DP         100         80         Xekong         SE KONG         AP           586         L1958         SRKD021         Nong heng         DP         100         100         Xe don         SE DONE         SR           587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD035         Khong noy         EP         100         100         Xe don         SE DONE         SR           589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           592         L2068         SRWP017 <td>583</td> <td>L1569</td> <td>KMNL014</td> <td>Na ka tang</td> <td>DP</td> <td>100</td> <td>50</td> <td>N.nhon</td> <td>SE BANG FAI</td> <td>KM</td>	583	L1569	KMNL014	Na ka tang	DP	100	50	N.nhon	SE BANG FAI	KM
585         L2148         APXX013         Som poy         DP         100         80         Xekong         SE KONG         AP           586         L1958         SRKD021         Nong heng         DP         100         100         Xe don         SE DONE         SR           587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD035         Khong noy         EP         100         100         Xe don         SE DONE         SR           589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082	584	L1571	KMNL016	Keng lek	DP	100	50	Nam nhom	SE BANG FAI	KM
586         L1958         SRKD021         Nong heng         DP         100         100         Xe don         SE DONE         SR           587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD035         Khong noy         EP         100         100         Xe don         SE DONE         SR           589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD039         Munpou 2         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL023	585	L2148	APXX013	Som poy	DP	100	80	Xekong	SE KONG	AP
587         L1969         SRKD032         Bungmane         EP         100         100         Xe don         SE DONE         SR           588         L1972         SRKD035         Khong noy         EP         100         100         Xe don         SE DONE         SR           589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD039         Munpou 2         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         70         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL023         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL02	586	L1958	SRKD021	Nong heng	DP	100	100	Xe don	SE DONE	SR
588         L1972         SRKD035         Khong noy         EP         100         100         Xe don         SE DONE         SR           589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD039         Munpou 2         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         60         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL023         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         A	587	L1969	SRKD032	Bungmane	EP	100	100	Xe don	SE DONE	SR
589         L1975         SRKD038         Tanpiao 2         DP         100         100         Xe don         SE DONE         SR           590         L1976         SRKD039         Munpou 2         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         60         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL023         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         50         Xekong         SE KONG         AP           596         L2149         APXX014         Hat say kham         DP         100         50         Xekong         SE KONG         AP           597         L2150         APXX	588	L1972	SRKD035	Khong noy	EP	100	100	Xe don	SE DONE	SR
590         L1976         SRKD039         Munpou 2         DP         100         70         Xe don         SE DONE         SR           591         L1979         SRKD042         Nahouabung         DP         100         60         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL022         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         APXX014         Hat say kham         DP         100         100         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761	589	L1975	SRKD038	Tanpiao 2	DP	100	100	Xe don	SE DONE	SR
591         L1979         SRKD042         Nahouabung         DP         100         60         Xe don         SE DONE         SR           592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL022         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         APXX014         Hat say kham         DP         100         100         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089	590	L1976	SRKD039	Munpou 2	DP	100	70	Xe don	SE DONE	SR
592         L2068         SRWP017         Tan soum 1         DP         100         70         Xe don         SE DONE         SR           593         L1488         KMHB082         Nakhok         DP         100         50         Hinbuone         NAM HINBOUN         KM           594         L1577         KMNL022         Nong ping         EP         100         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         APXX014         Hat say kham         DP         100         100         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH02         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973	591	L1979	SRKD042	Nahouabung	DP	100	60	Xe don	SE DONE	SR
593L1488KMHB082NakhokDP10050HinbuoneNAM HINBOUNKM594L1577KMNL022Nong pingEP100100Nam nhonSE BANG FAIKM595L1578KMNL023Phone setDP100100N.nhonSE BANG FAIKM596L2149APXX014Hat say khamDP10050XekongSE KONGAP597L2150APXX015B. pouyDP100100XekongSE KONGAP598L0761VTHH002PhonkhamDP10080H. khumphunNAM NGUMVT599L2089SKLM011ThongphabeueDP100100XenamnoySE KONGSK600L0973VTVK024Nam phin 1EP100100Nam phinNAM NGUMVT601L0876VTPH027Nam chim 4EP10080Nam chimNAM NGUMVT	592	L2068	SRWP017	Tan soum 1	DP	100	70	Xe don	SE DONE	SR
594         L1577         KMNL022         Nong ping         EP         100         Nam nhon         SE BANG FAI         KM           595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         APXX014         Hat say kham         DP         100         50         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	593	L1488	KMHB082	Nakhok	DP	100	50	Hinbuone	NAM HINBOUN	KM
595         L1578         KMNL023         Phone set         DP         100         100         N.nhon         SE BANG FAI         KM           596         L2149         APXX014         Hat say kham         DP         100         50         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	594	L1577	KMNL022	Nong ping	EP	100	100	Nam nhon	SE BANG FAI	KM
596         L2149         APXX014         Hat say kham         DP         100         50         Xekong         SE KONG         AP           597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	595	L1578	KMNL023	Phone set	DP	100	100	N.nhon	SE BANG FAI	KM
597         L2150         APXX015         B. pouy         DP         100         100         Xekong         SE KONG         AP           598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	596	L2149	APXX014	Hat say kham	DP	100	50	Xekong	SE KONG	AP
598         L0761         VTHH002         Phonkham         DP         100         80         H. khumphun         NAM NGUM         VT           599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	597	L2150	APXX015	B. pouy	DP	100	100	Xekong	SE KONG	AP
599         L2089         SKLM011         Thongphabeue         DP         100         100         Xenamnoy         SE KONG         SK           600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	598	L0761	VTHH002	Phonkham	DP	100	80	H. khumphun	NAM NGUM	VT
600         L0973         VTVK024         Nam phin 1         EP         100         100         Nam phin         NAM NGUM         VT           601         L0876         VTPH027         Nam chim 4         EP         100         80         Nam chim         NAM NGUM         VT	599	L2089	SKLM011	Thongphabeue	DP	100	100	Xenamnoy	SE KONG	SK
601 L0876 VTPH027 Nam chim 4 EP 100 80 Nam chim NAM NGUM VT	600	L0973	VTVK024	Nam phin 1	EP	100	100	Nam phin	NAM NGUM	VT
	601	L0876	VTPH027	Nam chim 4	EP	100	80	Nam chim	NAM NGUM	VT
602 L0465 HPVT006 Nam sat G 100 50 N.cad NAM KHAN HP	602	L0465	HPVT006	Nam sat	G	100	50	N.cad	NAM KHAN	HP

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (1/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
1	T2438	PW SONG 1	Pak Mae-nam Song	GMP	90411		NAM SONGKH		DEDP
2	T5787	T5787	Lam Pao Irr. Pro	G	50416	40640	NAM CHI	LOWER PART OF LA	RID
3	T5776	T5776	Nong Wai	G	42243		NAM CHI	LOWER PART OF LA	RID
4	T2425	PR PKPP 1	Ban Pak-kard8	Р	31776		H.BANG BOT		DEDP
5	T296	PW 52911 A	Lum-dome-yai	P	21344		NAM MUN	=	DEDP
6	16018	16018	Lam Takhong	G	19700	5100	NAM MUN	LAM TAKHONG	RID
(	12456	PW HLUA 1	Huey Luang1	MPT	14866		HUAI LUANG		DEDP
8	15653	15653	Huai Luang	G	13918	3200	HUAI LUANG	HUAI LUANG	RID
9	15946	15946	Lam Sae	G	13484	11312	NAM MUN	LAM SAE	RID
10	12437 T0404	PW HSAI 1	Ban Huey Sai3	GMP	12128		NAM SUNGKH		DEDP
11	12431	PW SUAT 1	Mae Nam-suey	GIVIP	11311				
12	15961	15961	Lum Nang Rong	G	10944	6400			RID
13	15934		Lum en bek (neng	CMD	10096	6400		LAW PHRAPHLONG	
14	15052		Lum ce bok (nong	GIVIP	10060				
10	10400 TE766		Lum-ce-bok (nong	GIVIP	0600				
10	T5053	T5053	Lum Plai Mat	G	9000				חוס
10	T5500	1 J 9 J 3	Kumphawani Posor	CMP	9000				
10	T2224			MDT	8640				
20	T5000	T5000	Huai Sanaad	G	8000				
20	T2/3/		Ban Nong-bua7	GMP	7872				
21	T50/3	T50/3	Linner Mun Dam	G	7636	5/88		LIPPER PART OF LA	RID
22	T265	PW/ 52303 A	Huai Sam Lan	P	7600	3400			
24	T5850	T5850	Lum Khan Choo	Ġ	7600		NAM CHI	LAM KHAN CHU	RID
25	T5691	T5691	Huai Pla Hang	G	6400		NAM SONGKHRA		RID
26	T2452	PW BSAL1	Huev Bang-sai	GMP	4960		HUAI BANG		DEDP
27	T2439	PW KONG 1	Pak Huev-kong5	GMP	4800		NAM SONGKH		DEDP
28	T5880	T5880	Lum Chiang Krai	G	4000		NAM MUN	LAM CHOENGKRAI	RID
29	T5836	T5836	Huai Aeng	Ğ	3371		NAM CHI	FOURTH PART OF L	RID
30	T5827	T5827	Huai Kho	Ğ	3360		NAM CHI	FOURTH PART OF L	RID
31	T330	JA0823305		P	3200		NAM KAM		DEDP
32	T5535	W KCHK 1	Kui Chuak Weir	GMP	3200		NAM CHI		DEDP
33	T5703	T5703	Huai Samphat	G	3200		NAM CHI	UPPER PART OF LA	RID
34	T5757	T5757	Huai Shanod	G	2880		HUAI BANG HA	NINETH PART OF M	RID
35	T5681	T5681	Huai Bang Bad	G	2560		H.BANG BOT	SEVENTH PART OF	RID
36	T5981	T5981	Ban Charat	G	2480		NAM MUN	HUAI SAMRAN	RID
37	T2430	PW BKOH 1	Ban Kor6	GMP	2400		NAM SONGKH		DEDP
38	T5512	R KBON 1	Kuan Bon Reservi	GMPT	2400		NAM CHI		DEDP
39	T5933	T5933	Lam Samlai	G	2400		NAM MUN	LAM PHRAPHLONG	RID
40	T5962	T5962	Lam Chang Han	G	2240		NAM MUN	LAM PATHAI	RID
41	T5993	T5993	Huai Chung La	G	2000		NAM MUN	LAM DOM YAI	RID
42	T5844	T5844	Phuttauttayan	G	1922		NAM MUN	LAM SA BAI	RID
43	T5511	R LANG 1	Kuan Lang Reserv	GMPT	1920		NAM CHI		DEDP
44	T5846	T5846	Huai Sa Baek	G	1920		NAM MUN	LAM SA BAI	RID
45	T5878	T5878	Huai Sap Pradu	G	1920		NAM MUN	LAM TAKHONG	RID
46	T333	JA0223303		P	1856		NAM KAM		DEDP
47	T5876	T5876	Huai Tum Khae	G	1821		NAM MUN	LAM SA	RID
48	T5833	15833	Huai Chok Khwang	G	1792		NAM MUN	LAM SIEO THAN	RID
49	15745	15745	Huai Yang	G	1760		NAM KAM	NAM PHUNG	RID
50	15792	15792	Huai Kaeng	G	1740		NAM CHI	LOWER PART OF LA	RID
51	15800	15800	Huai Wangnong	G	1644		NAM CHI	LAM NAM YANG	RID
52	15841	15841	Nong Ya Ma	G	1600		NAM CHI	FOURTH PART OF L	RID
53	15979	15979	Ban Thamnop	G	1600			HUAI SAMRAN	RID
54	15859	15859	Huai Bong	G	1454		NAM MUN		RID
55	15895	15895	Huai Charakhe Ma	G	1450		NAM MUN	HUAI TA KHONG	RID

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (2/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area (	ha)	River Basin	River Name	Agency
	ID	-	-	Туре	Whole	Dry	Name		
56	T5794	T5794	Huai Fa	G	1440		NAM CHI	LAM NAM YANG	RID
57	T5896	T5896	Huai Talad	G	1438		NAM MUN	HUAI TA KHONG	RID
58	T5659	T5659	Ang Kut Ling Ng	G	1408		HUAI LUANG	HUAI LUANG	RID
59	T5749	T5749	Huai Kan Lueng	G	1392		NAM KAM	HUAI NAM KAM	RID
60	T5803	T5803	Huai Khee Lek	G	1380		HUAI BANG I	HUAI BANG I	RID
61	T328	JA1023302		Р	1344		NAM KAM		DEDP
62	T5798	T5798	Huai Chum Chang	G	1333		NAM CHI	LAM NAM YANG	RID
63	T5699	T5699	Hiaui Somhong	G	1280		HUAI HO	EIGHTH PART OF M	RID
64	T5739	T5739	Huai Huad	G	1280		NAM KAM	NAM PHUNG	RID
65	T5765	T5765	Ban Petch	G	1280		NAM CHI	NAM PHROM	RID
66	T5793	T5793	Huai Sathot	G	1280		NAM CHI	LAM NAM YANG	RID
67	T5795	T5795	Huai Phung	G	1280		NAM CHI	LAM NAM YANG	RID
68	T5975	T5975	Huai Dan	G	1280		NAM MUN	HUAI THAP THAN	RID
69	T4420	52305A29	Huey Kla	G	1200		NAM MUN		MOI
70	T329	JA0823302	,	Р	1200		NAM KAM		DEDP
71	T613	JA0123001		Р	1200		HUAI THUAI		DEDP
72	T614	JA0423102		Р	1200		HUAI HO		DEDP
73	T5871	T5871	Nong Chang Yai	G	1200		NAM MUN	LOWER PART OF LA	RID
74	T5980	T5980	Huai Samran	Ğ	1200		NAM MUN	HUAI SAMRAN	RID
75	T5674	T5674	Huai Suang	Ğ	1120		NAM SONGKHRA	LOWER PART OF MA	RID
76	T5788	T5788	Huai Si Thon	Ğ	1073		NAM CHI	LOWER PART OF LA	RID
77	T594	JA0523101		P	1056		HUALHO		DEDP
78	T5828	T5828	Kaeng Loeng Chan	G	1040		NAM CHI	FOURTH PART OF L	RID
79	T4244	52302D07	Kra Bue Pueno	Ğ	1024		NAM MUN		MOI
80	T5842	T5842	Huai Ling Chon	G	1024		NAM MUN	LAM SA BAL	RID
81	T5675	T5675	Huia Kum	Ğ	1008		NAM SONGKHRA	LOWER PART OF MA	RID
82	T5865	T5865	Huai Kaeo	Ğ	960		NAM MUN	SECOND PART OF I	RID
83	T5897	T5897	Huai Sawai	Ğ	960		NAM MUN		RID
84	T5954	T5954	Huai Toei	Ğ	960		NAM MUN		RID
85	T6021	T6021	Soong Nern	Ğ	960		NAM MUN	LAM TAKHONG	RID
86	T688	P IA0923305	Coolig Nom	P	928				
87	T5667	T5667	Kan Luang	G	928		NAM SONGKHRA	LOWER PART OF MA	RID
88	T5754	T5754	Huai Dong Noi	G	928		NAM KAM	HUAI NAM KAM	RID
89	T4419	52305A28	Rong Kra Po	G	904				MOI
90	T5849	T5849	Huai Sai	G	880		NAM CHI	I AM KHAN CHU	RID
90 Q1	T470	10049		P	840		ΝΔΜΚΔΜ		
92	T468	IA0123802		P	832				
03	T5883	T5883	Ban Vang	Ģ	816				RID
90	T13//	A0621/01	Huev Nam-suev	GMP	800				MOI
95	T2353	R FPAN 1	Huev E-phup	MPT	800		NAM SONGKHRAM		MOI
96	T2608		Nona Mea	GMP	800				MOI
97	T2000	152000130	Huev Nam Khem	GMP	800				MOI
97	T665	PIC0122003	nuey Nam Knem	D	800				
00	T690	DIA0623305		D	800				
100	T5676	T5676	Hugi Tong	G	800				
100	T5750	T5750	Hugi Srikbun	G	800				
101	T5911	T5911	Hugi Cho Paka	G	800				
102	T5916	T5916		G	800				
103	T5701	T5701	La Lucity Wal	G	702				RID
104	T327	10101	nong rau	P	769		NAMKAM		
100	T696	D 100220002		P	760				
100	T6042	TE042	Hugi Khla	G	752				
107	T4544	10042 52402A34	Nong Kro Mun	GMP	771			I UAI SAWRAN	MOI
100	TE004	JZ402MJ4		GiviP	726				
109	10901	10901 246E	AIII PUII	G	730				
110	1920	240E		٢	120			-	DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (3/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
111	T5839	T5839	Huai Kut Daeng	G	720		NAM MUN	LAM SIEO NOI	RID
112	T5843	T5843	Huai Pho	G	720		NAM MUN	LAM SA BAI	RID
113	T5854	T5854	Huai Yang Palai	G	720		NAM CHI	SECOND PART OF	RID
114	T1483	A0921806	Huey Wang Thong	GMP	704		HUAI MONG		MOI
115	T326	JA0123201		P	704		NAM KAM		DEDP
116	1498	JA0223503		Р	704		HUAI BANG		DEDP
117	1663	PJA0122903		Р	704		NAM SONGKH		DEDP
118	1376	JC0122005		Р	698		NAM SUAI		DEDP
119	T1058	378E		Р	688				
120	1216	PJ 52709 A	So Dung	Р	680				
121	12/9 T1162	FJ 52505C0	Sarung		680				
122	TE726	135		P	680				
123	T2971	15750	Kud Log Nong Nom	CMPT	656			LAW NAW TANG	
124	T5712	LJ210410A	Hugi Sai Kamin	GIVIFI	640				
125	T5712	T5712	Huai Sai Kamin Huai Sai (unner)	G	640		NAM KAM		RID
120	T5715	T5715	Huai Daek	G	640		ΝΔΜΚΔΜ		RID
127	T5720	T5720	Huai Rua	G	640				RID
120	T5829	T5829	Huai Khakhang	G	640		NAM CHI	FOURTH PART OF I	RID
120	T5851	T5851	Huai Som Poi	G	640		NAM CHI		RID
131	T5860	T5860	Huai Chan Tai	G	640				RID
132	T1171	28F		P	637		NAM CHI		DEDP
133	T1035	306F		P	610		NAM CHI		
134	T5782	T5782	Nong Ya Ma	G	608		NAM CHI	I OWER PART OF LA	RID
135	T208	PJ 52202 A	itong i a ma	P	598		NAM MUN	2011211111111101 211	DEDP
136	T1150	6F		P	595		NAM CHI		DEDP
137	T478	JA0123302		P	594		NAM KAM		DEDP
138	T264	PJ 52303 A	Huai	Р	592		NAM MUN		DEDP
139	T268	PJ 52303 A	Huai	Р	592		NAM MUN		DEDP
140	T1161	9F		Р	570		NAM CHI		DEDP
141	T1524	B0322005	Ban Nard	G	560		NAM SUAI		MOI
142	T2351	W TACH 1	Ban Tha-chuang	GMP	560		NAM SONGKHRAM		MOI
143	T3620	L5150406B	Huey Yang	G	560		NAM MUN		MOI
144	T513	JA0723306		Р	560		HUAI BANG		DEDP
145	T659	PJA0122401		Р	560		NAM SONGKH		DEDP
146	T909	231E		Р	560		NAM CHI		DEDP
147	T1191	51F	Kud Tao	Р	560		NAM CHI		DEDP
148	T5689	T5689	Khambaknoi	G	560		NAM SONGKHRA	UPPER PART OF MA	RID
149	T5735	T5735	Huai Khi Hin	G	560		NAM KAM	NAM PHUNG	RID
150	T5779	T5779	Huai Tuey	G	560		NAM CHI	THIRD PART OF LA	RID
151	T1162	15F		Р	552		NAM CHI		DEDP
152	T1168	41F		Р	552		NAM CHI		DEDP
153	T1172	29F	Kud Kuangyai	Р	552		NAM CHI		DEDP
154	T2150	C0322304	Huey Nam-torn	GMP	548		H.BANG BOT		MOI
155	T730	100E		Р	547		NAM CHI		DEDP
156	11263	A0721403	Namion-huey Puan	GMP	544		NAM LOEI		MOI
157	11264	A0821403	Huey Puam	G	544		NAM LOEI		MOI
158	15888	15888	Huai Yang	G	544		NAM MUN	LAM PHRAPHLONG	RID
159	15919	15919	Huai Dan I	G	544				RID
160	16073	16073	Huai Sieo	G	544		NAM CHI	LOWER PART OF LA	RID
161	1361	JB0/21901		P	536				
162	1932	230E		۲ D	534				
103	1930			P P	533				
164	10/5	PJA0223302		۲ P	528				
105	1003	FJAU323305		۲	J20			-	DEDA

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (4/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
166	T1189	2F		Р	526		NAM CHI		DEDP
167	T5856	T5856	Ban Takhro	G	525		NAM MUN	LAM SA THAET	RID
168	T1065	388E		Р	520		NAM CHI		DEDP
169	T963	228E		Р	512		NAM CHI		DEDP
170	T5695	T5695	Huai Hin Taek	G	512		NAM SONGKHRA	HUAI NAM UN	RID
171	T5826	T5826	Huai Chiang Kham	G	512		NAM MUN	LAM SIEO THAN	RID
172	T5944	T5944	Huai Tap Kua	G	512		NAM MUN	LAM SAE	RID
173	T211	PJ 52206 A		Р	510		NAM MUN		DEDP
174	T1052	311E		Р	510		NAM CHI		DEDP
175	T1157	11F		Р	510		NAM CHI		DEDP
176	T1165	14F	Kud Jok Noi	Р	510		NAM CHI		DEDP
177	T1179	25F		Р	510		NAM CHI		DEDP
178	T756	177E	Kud Chienhg Mee	Р	506		NAM CHI		DEDP
179	T2345	W KAMP 1	Huey Kham Pang	GMP	500		H.BANG BOT		MOI
180	T1149	438E	, ,	Р	499		NAM CHI		DEDP
181	T439	JC0322301		Р	496		H.BANG BOT		DEDP
182	T213	PJ 52210 A		Р	494		NAM MUN		DEDP
183	T402	JA0322301		Р	493		H.BANG BOT		DEDP
184	T794	148E		P	493		NAM CHI		DEDP
185	T1070	377E		P	493		NAM CHI		DEDP
186	T260	PJ 53204 A	Lamdome Noi	P	490		NAM MUN		DEDP
187	T299	PJ 53204 A		P	490		NAM MUN		DEDP
188	T46	J 51108	Na Hang	P	480		NAM MUN		MOL
189	T47	J 51108	Na Hang	P	480		NAM MUN		MOI
190	T48	151108	Na Hang	P	480		NAM MUN		MOI
191	T49	151108	Na Hang	P	480		NAM MUN		MOI
192	T50	151108	Na Hang	P	480		NAM MUN		MOI
102	T51	151108	Na Hang	P	480				MOI
194	T52	151108	Na Hang	P	480				MOI
195	T53	151108	Na Hang	P	480		NAM MUN		MOI
196	T54	151108	Na Hang	P	480				MOI
197	T55	151109	Kra Buang	P	480				MOI
198	T56	151109	Kra Buang	P	480				MOI
100	T57	151109	Kra Buang	P	480				MOI
200	T58	151109	Kra Buang	P	400				MOI
200	T59	151109	Kra Buang	P	480				MOI
201	T60	151109	Kra Buang	Þ	480				MOI
202	T61	151100	Kra Buang	D	400				MOI
203	T62	151109	Kra Buang	P	400				MOI
204	T63	151109	Kra Buang	P	400				MOI
200	T64	151100	Kra Buang	D	400				MOI
200	T65	151109	Kra Buang	F D	400				MOI
207	T66	151109	Kra Buang	F D	400				MOI
200	T67	151109	Kra Duang	Г	400				MOI
209	T07		Nom Lon Huov von		400				MOI
210	T2395		Nam Lon Huey-yan		400				MOI
211	T2410		Nong Log		400				MOI
212	T2054	L5210009B	Nong Leg	Givir	400				MOI
213	13951	L3210413D	Liver Com Don	G	460				MOI
214	1430Z	52303404	Rung Kro Dong	G	400				MOI
210	14421 TEE00	52303A30		CNDT	400				
210	15523		Gud Na Saeng Res	GIVIPT	480				
217	1/30	90E		Р Г	48U				
210	1003	1040		۲ ۲	480				
219	1845			P	480				
220	1848	192E		<u>Р</u>	480				DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (5/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area (	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
221	T892	348E		Р	480		NAM CHI		DEDP
222	T901	68E		Р	480		NAM CHI		DEDP
223	T942	233E		Р	480		NAM CHI		DEDP
224	T5647	T5647	Huai Sai	G	480		HUAI NAM SOM	HUAI NAM SOM	RID
225	T5665	T5665	Huai Plea Nguak	G	480		H.BANG BOT	SEVENTH PART OF	RID
226	T5711	T5711	Huai Nam Bor	G	480		NAM SONGKHRA	HUAI NAM UN	RID
227	T5718	T5718	Huai Ang	G	480		NAM KAM	HUAI NAM KAM	RID
228	T5738	T5738	Haui Na Ang	G	480		NAM KAM	NAM PHUNG	RID
229	T5802	T5802	Huai Muk	G	480		HUAI MUK	HUAI MUK	RID
230	T5814	T5814	Huai Yang	G	480		NAM CHI	THIRD PART OF LA	RID
231	T5832	T5832	Nong Kaedam	G	480		NAM CHI	FOURTH PART OF L	RID
232	T5890	T5890	Huai Sakat	G	480		NAM MUN	LAM CHAKKARAT	RID
233	T5927	T5927	Tharn A Soke	G	480		NAM MUN	HUAI MUAK LEK	RID
234	T5960	T5960	Klong Ma Nao	G	480		NAM MUN	LAM NANG RONG	RID
235	T271	PJ 52501 C	Tao Tuad	Р	467		NAM MUN		DEDP
236	T1152	10F		P	467		NAM CHI		DEDP
237	T1153	38F		Р	467		NAM CHI		DEDP
238	T1159	8F		Р	467		NAM CHI		DEDP
239	T1177	23F		P	467		NAM CHI		DEDP
240	T1188	3F		Р	467		NAM CHI		DEDP
241	T5858	T5858	Bung Kraton	G	464		NAM MUN	LAM SA THAET	RID
242	T269	PJ 52303 A	None Sam Rong	Р	459		NAM MUN		DEDP
243	11167	17F		Р	459		NAM CHI		DEDP
244	1789	335E		Р	458		NAM CHI		DEDP
245	T917	243E		P	458		NAM CHI		DEDP
246	T515	JA0223306		Р	456		HUAI BANG		DEDP
247	T1108	24E		Р	450		NAM CHI		DEDP
248	T660	PJA0122901		P	448		NAM SONGKH		DEDP
249	11073	389E		Р	448		NAM CHI		DEDP
250	11087	18E		Р	448		NAM CHI		DEDP
251	15838	15838	Huai Kut Khaen	G	448		NAM MUN	LAM SIEO NOI	RID
252	1275	PJ 52504 C	Tung Po	Р	442				DEDP
253	11156	39F		P	442		NAM CHI		DEDP
254	1259	PJ 53204 A	None Ka Lonk	Р	440		NAM MUN		DEDP
255	1298	PJ 53204 A		P	440				DEDP
256	1362	JB0521901		P	437		H. KHOK		DEDP
257	T140	J 52206 A1		P	434				DEDP
258	1219	J 52206 A1		P	434				DEDP
259	1496	JAU123503		P	432				
260	16/3	PJA0123302		P	432				DEDP
261	1855	342E		P	432				
262	1996	287E		Р	432				
263	T1158	19F		P	426				DEDP
264	T1166	16F		P	426		NAM CHI		DEDP
265	T1098	398E		P	424				
266	T1181	33F		P	424				
207	11103		E Isl	P	424				
268	1270	PJ 52305 C	E-IOK	P	422				
269	1358	JB0321901		Р	422				
270	1/05	104E		۲ ۲	422				
2/1	18/9	334E		P	419				
212	1352 TE040				418				
213	10049 T040		пиау-піп-копд		410				
275	1010 T020	100E		۲ P	410				
210	1929	∠44⊏		r	410			_	DEDP

### Table 2 Irrigation Area and Water Sources (Total) of Thailand (6/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
276	T5714	T5714		G	416		NAM KAM	HUAI NAM UN	RID
277	T5719	T5719	Huai Klerm	G	416		NAM KAM	HUAI NAM KAM	RID
278	T5903	T5903	Suwannapha	G	416		NAM MUN	LAM CHI	RID
279	T914	253E	•	Р	414		NAM CHI		DEDP
280	T1005	284E		Р	414		NAM CHI		DEDP
281	T381	JC0321901		Р	410		H. KHOK		DEDP
282	T507	JA1023306		P	410		NAM KAM		DEDP
283	T1010	288F		P	410		NAM CHI		DEDP
284	T287	PJ 52506 A	Rung Fak	P	408		NAM MUN		DEDP
285	T129	1 52203 A0	rtang r an	P	405		NAM MUN		DEDP
286	T251	P.I 52907 A	Ta Poh	P	405		NAM MUN		
287	T293	P.I 52907 A	Tha Po Sri	P	405		NAM MUN		DEDP
288	T1031	304F	Kud Yae	P	405		NAM CHI		
289	T141	1 52206 Δ1		P	403				
200	T1203	A0521507	Huev Nam Lai	GMP	400				MOI
201	T1Z33	R0122501	Huoy Ma Khua	G	400				MOI
202	T2020	LE100217A		CMDT	400				MOI
292	12939	L3100317A		GIVIFI	400				
293	12909	L3170113D		G	400				
294	14353	52303A85	Hong Tee Ka	G	400				
295	14595	52404A12	Huey Ta 3	GIVIP	400				
296	15170	52604B11	Kud-ka-Ineb	G	400		NAM MUN		MOI
297	1155	J 52210 B2		Р	400		NAM MUN		DEDP
298	1349	JA0521901		Р	400		PHU PA HUA		DEDP
299	1353	JB0421901		P	400		H. KHOK		DEDP
300	1382	JC0421901		Р	400		H. KHOK		DEDP
301	T565	JA1222304		Р	400		H.BANG BOT		DEDP
302	T602	JA1423103		Р	400		HUAI BANG		DEDP
303	T654	PJA0221806		Р	400		HUAI MONG		DEDP
304	T685	PJA0723305		Р	400		NAM KAM		DEDP
305	T824	133E		Р	400		NAM CHI		DEDP
306	T826	138E		Р	400		NAM CHI		DEDP
307	T828	158E		Р	400		NAM CHI		DEDP
308	T843	84E		Р	400		NAM CHI		DEDP
309	T864	196E		Р	400		NAM CHI		DEDP
310	T870	249E		Р	400		NAM CHI		DEDP
311	T877	200E		Р	400		NAM CHI		DEDP
312	T893	211E		Р	400		NAM CHI		DEDP
313	T943	268E		Р	400		NAM CHI		DEDP
314	T1106	407E		Р	400		NAM CHI		DEDP
315	T1190	50F	Kud Pra Kob	Р	400		NAM CHI		DEDP
316	T5687	T5687	Huai Tray	G	400		NAM SONGKHRA	UPPER PART OF MA	RID
317	T5831	T5831	Nong Krathum	G	400		NAM CHI	FOURTH PART OF L	RID
318	T5840	T5840	Thawatchi	G	400		NAM CHI	FOURTH PART OF L	RID
319	T5951	T5951	Huai Hin	G	400		NAM MUN	LAM PLAI MAT	RID
320	T643	JA0121505		Р	398		NAM LOEI		DEDP
321	T939	264E		Р	397		NAM CHI		DEDP
322	T960	235E		Р	394		NAM CHI		DEDP
323	T856	195E		Р	392		NAM CHI		DEDP
324	T955	258E		P	390		NAM CHI		DEDP
325	T752	328E		P	389		NAM CHI		DEDP
326	T152	1 52210 A2		P	387		NAM MUN		DEDP
327	T443	JC0122301		P	387		H BANG BOT		
328	T5076	52204410	Huav-fak	GMP	386				MOI
320	T37	151105	Nam Dam	D	384				MOI
330	T38	151105	Nam Dam	P	384		NAM MUN		MOI
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# Table 2 Irrigation Area and Water Sources (Total) of Thailand (7/26)

No. M	IRC Project ID	Project Name	Irr.	Irr. Area (	(ha)	River Basin	River Name	Agency
	ID		Туре	Whole	Dry	Name		
331 T3	9 J 51105	Nam Dam	Р	384		NAM MUN		MOI
332 T4	0 J 51105	Nam Dam	P	384		NAM MUN		MOI
333 T1	420 B0122101	Huey Cheang-lee	G	384		HUAI LUANG		MOI
334 T1	67 J 52707 B3		Р	384		NAM MUN		DEDP
335 T3	47 JA0221806		Р	384		HUAI MONG		DEDP
336 T7	'34 117E		Р	384		NAM CHI		DEDP
337 19	41 206E		Р	384		NAM CHI		DEDP
338 T1	066 387E		P	384		NAM CHI		DEDP
339 15	867 15867	Nong Thajog	G	384		NAM MUN	LAM SIEO THAN	RID
340 15	949 15949	Huai Phriak	G	384		NAM MUN	LAM SAE	RID
341 11	155 40F		Р	382		NAM CHI		DEDP
342 12	12 PJ 52208 A	<b>D</b> V	Р	381		NAM MUN		DEDP
343 12	263 PJ 52303 A	Dong Yang	Р	381		NAM MUN		DEDP
344 12	267 PJ 52303 A	Dong Yang	Р	381		NAM MUN		DEDP
345 11	175 20F	Kung Tao	Р	381		NAM CHI		DEDP
346 11	178 26F		Р	381		NAM CHI		DEDP
347 19	54 265E		Р	378		NAM CHI		DEDP
348 T9	93 285E		P	376		NAM CHI		DEDP
349 T5	60 JB0222904		Р	374		NAM SONGKH		DEDP
350 T7	'95 146E		Р	374		NAM CHI		DEDP
351 T8	73 198E		Р	374		NAM CHI		DEDP
352 T1	026 297E		Р	374		NAM CHI		DEDP
353 T1	31 J 52204 A0		Р	373		NAM MUN		DEDP
354 T4	45 JA0122302		Р	373		H.BANG BOT		DEDP
355 T5	09 JA0123103		Р	373		HUAI BANG		DEDP
356 T1	46 J 52207 C1		Р	371		NAM MUN		DEDP
357 T8	18 150E		Р	370		NAM CHI		DEDP
358 T1	045 312E		Р	370		NAM CHI		DEDP
359 T6	78 PJA102330	5	Р	368		NAM KAM		DEDP
360 T8	38 83E		Р	368		NAM CHI		DEDP
361 T1	089 17E		Р	368		NAM CHI		DEDP
362 T5	638 T5638	Ang Huai E-lert	G	368		NAM LOEI	LOWER PART OF MA	RID
363 T5	72 JA1122304		Р	366		H.BANG BOT		DEDP
364 T9	05 250E		Р	365		NAM CHI		DEDP
365 T1	174 30F		Р	365		NAM CHI		DEDP
366 T5	577 JA1522304		Р	362		H.BANG BOT		DEDP
367 T5	83 JA0323002		Р	362		NAM SONGKH		DEDP
368 T3	66 JC1021901		Р	360		H. KHOK		DEDP
369 T1	080 391E	Kud Kong	Р	360		NAM CHI		DEDP
370 T1	34 J 52204 A0		Р	357		NAM MUN		DEDP
371 T4	38 JC0622301		Р	357		H.BANG BOT		DEDP
372 T7	77 144E		Р	354		NAM CHI		DEDP
373 T4	79 JA0323302		Р	352		NAM KAM		DEDP
374 T5	JA0623306		Р	352		HUAI BANG		DEDP
375 T6	77 PJA022330	5	Р	352		NAM KAM		DEDP
376 T6	84 PJA042330	5	Р	352		NAM KAM		DEDP
377 T5	761 T5761	Huai Lom Phai	G	352		NAM CHI	UPPER PART OF LA	RID
378 T5	780 T5780	Huai Wang Lin Fa	G	352		NAM CHI	LOWER PART OF LA	RID
379 T1	141 429E		P	350		NAM CHI		DEDP
380 T2	02 J 53002 A7		Р	349		NAM MUN		DEDP
381 T1	062 314E	Kloi	Р	349		NAM CHI		DEDP
382 T8	98 204E		Р	347		NAM CHI		DEDP
383 T4	21 JA0322902		Р	344		NAM SONGKH		DEDP
384 T1	037 303E		Р	342		NAM CHI		DEDP
385 T1	140 430E	Kud Ta Kien	Р	342		NAM CHI		DEDP

### Table 2 Irrigation Area and Water Sources (Total) of Thailand (8/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
386	T110	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
387	T111	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
388	T112	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
389	T113	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
390	T114	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
391	T115	J 52002	Hua Don Kard	Р	341		NAM MUN		MOI
392	T215	PJ 52708 A		Р	341		NAM MUN		DEDP
393	T280	PJ 52505C0	Sa Teng	Р	341		NAM MUN		DEDP
394	T608	JA1523103		P	341		HUAI BANG		DEDP
395	11129	412E		Р	341		NAM CHI		DEDP
396	11160	12F		Р	341		NAM CHI		DEDP
397	11164 T1100	18F		Р	341		NAM CHI		DEDP
398	T1180	31F		Р	341				DEDP
399	T1182	42F		P	341				
400	11186	35F		Р	341				DEDP
401	1354	JA0321901		Р	339				
402	1429 T055	JAU222301	Srang Kasa	Р	339				
403	1255	J 52911 AU	Srang Kaeo	P	338				DEDP
404	12300		Huey Tao		330				
405	T509	DIP0122002		Г	330				
400	T670	PJD0122903		г D	330				
407	T757	175E		Г D	336				
400	T02/	251E		P	336				
403	T5056	T5056	Hugi Thalok	Ġ	336			LAM NANG RONG	RID
410	T2342	W SORN 1	Huev Muen-son	GMP	333		HUALLUANG		MOI
412	T806	166E	They mach son	P	333		NAM CHI		DEDP
413	T906	219E		P	333		NAM CHI		
414	T1112	26F		P	333		NAM CHI		DEDP
415	T201	J 53002 A7		P	331		NAM MUN		DEDP
416	T786	191E		P	330		NAM CHI		DEDP
417	T841	82E		P	330		NAM CHI		DEDP
418	T1505	A0822002	Huev Chai Ya	GMP	329		NAM SUAI		MOI
419	T425	JA0122504	,	Р	326		NAM SONGKH		DEDP
420	T449	JA0522302		Р	326		H.BANG BOT		DEDP
421	T453	JA0722302		Р	325		H.BANG BOT		DEDP
422	T6046	T6046	Huai Chan	G	325		NAM MUN	HUAI SAMRAN	RID
423	T646	JA0321505		Р	323		NAM LOEI		DEDP
424	T844	193E		Р	323		NAM CHI		DEDP
425	T1185	34F	Kud Tom	Р	323		NAM CHI		DEDP
426	T1187	1F		Р	323		NAM CHI		DEDP
427	T258	PJ 53204 A	Na Ten	Р	322		NAM MUN		DEDP
428	T297	PJ 53204 A		Р	322		NAM MUN		DEDP
429	T1173	21F		Р	322		NAM CHI		DEDP
430	T84	J 51504	La Kore	Р	320		NAM MUN		MOI
431	T85	J 51504	La Kore	Р	320		NAM MUN		MOI
432	T86	J 51504	La Kore	Р	320		NAM MUN		MOI
433	T87	J 51504	La Kore	Р	320		NAM MUN		MOI
434	T1200	A1121402	Namlon-huey Puan	GMP	320		NAM LOEI		MOI
435	T1361	E0421402	Namlon-huey Puan	GMP	320		NAM LOEI		MOI
436	T1818	A0222903	Huey Tid-tai	G	320		NAM SONGKHRAM		MOI
437	T2343	W KANL 2	Huey Karn-luang	GMP	320		HUAI LUANG		MOI
438	T2363	R RKAM 1	Kood Ruae Kham	MPT	320		NAM SONGKHRAM		MOI
439	T2365	R SRAI 3	Nong Sa Rai	MPT	320		NAM SONGKHRAM		MOI
440	12369	VV YARM 1	Huey Nong Yam	GMP	320	11	NAM SONGKHRAM	•	MOI

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (9/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
441	T2760	L5140273A	Huey Kog	GMP	320		NAM MUN		MOI
442	T2786	L5200909B	Lum Seaw-yai	GMP	320		NAM MUN		MOI
443	T2819	L5180318A	Lum Seaw-yai	GMP	320		NAM MUN		MOI
444	T2871	L5200905A	Nong Song Hong	GMPT	320		NAM MUN		MOI
445	T3838	L5210416B	Huey Sean	GMP	320		NAM MUN		MOI
446	T4416	52305A25	Huey Kla	GMP	320		NAM MUN		MOI
447	T4417	52305A26	Huey Kla	G	320		NAM MUN		MOI
448	T5129	52601B01	Huay-lum-pong	GMP	320		NAM MUN		MOI
449	T5297	52709A15	Nong-he	PT	320		NAM MUN		MOI
450	T5327	52802B09	Huay-sao-reek	GMP	320		NAM MUN		MOI
451	T135	J 52204 A0		Р	320		NAM MUN		DEDP
452	T406	JA0322904		Р	320		NAM SONGKH		DEDP
453	T488	JB0123305		Р	320		NAM KAM		DEDP
454	T491	JB0323305		Р	320		NAM KAM		DEDP
455	T522	JA0423401		Р	320		HUAI BANG		DEDP
456	T609	JA0223102		Р	320		HUAI HO		DEDP
457	T687	PJA1123305		Р	320		NAM KAM		DEDP
458	T707	PJA0121503		Р	320		NAM LOEI		DEDP
459	T709	PJA0221503		Р	320		NAM LOEI		DEDP
460	T751	322E		Р	320		NAM CHI		DEDP
461	T927	207E		Р	320		NAM CHI		DEDP
462	T971	237E		Р	320		NAM CHI		DEDP
463	T991	289E		Р	320		NAM CHI		DEDP
464	T1046	310E		Р	320		NAM CHI		DEDP
465	T1048	385E		Р	320		NAM CHI		DEDP
466	T1054	375E		Р	320		NAM CHI		DEDP
467	T1084	32E		Р	320		NAM CHI		DEDP
468	T5642	T5642	Huai Nam Suai	G	320		NAM LOEI	HUAI NAM PUAN	RID
469	T5702	T5702	Huai Lao Yang	G	320		HUAI LUANG	LAM PHANIANG	RID
470	T5784	T5784	Nong Bua	G	320		NAM CHI	FOURTH PART OF L	RID
471	T5822	T5822	Huai Pradoo	G	320		NAM CHI	FOURTH PART OF L	RID
472	T5855	T5855	Huai Nam Khem	G	320		NAM MUN	LAM SA THAET	RID
473	T5868	T5868	Nong Phu	G	320		NAM MUN	LAM SIEO THAN	RID
474	T433	JC0822301	0	Р	318		H.BANG BOT		DEDP
475	T508	JA0823306		Р	318		NAM KAM		DEDP
476	T1169	5F		Р	318		NAM CHI		DEDP
477	T2199	C0222904	Huey Kok Chang	G	317		NAM SONGKHRAM		MOI
478	T566	JA0223302	, ,	Р	317		NAM KAM		DEDP
479	T904	216E		Р	317		NAM CHI		DEDP
480	T1145	433E		Р	317		NAM CHI		DEDP
481	T151	J 52210 A2		Р	314		NAM MUN		DEDP
482	T922	252E		Р	314		NAM CHI		DEDP
483	T1144	435E		Р	312		NAM CHI		DEDP
484	T1115	408E		Р	307		NAM CHI		DEDP
485	T1136	421E		P	307		NAM CHI		DEDP
486	T1146	431E		Р	306		NAM CHI		DEDP
487	T1184	44F	Kud Rua	Р	306		NAM CHI		DEDP
488	T399	JA0922301		P	302		H.BANG BOT		DEDP
489	T747	323E		P	302		NAM CHI		DEDP
490	T737	119E		P	301		NAM CHI		DEDP
491	T214	PJ 52707 B		P	298		NAM MUN		DEDP
492	T585	JA0423002		P	298		NAM SONGKH		DEDP
493	T882	210E		P	298		NAM CHI		DEDP
494	T887	218E		P	298		NAM CHI		DEDP
495	T897	215E		P	298		NAM CHI		DEDP
								=	

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (10/26)

No	MRC	Project ID	Project Name	Irr	Irr Area (h	na)	River Basin	River Name	Agency
	ID	1 10/00112	rejectrianie	Type	Whole [	Dry	Name		, igeney
496	T903	226E		P	298		NAM CHI		DEDP
497	T907	225E		Р	298		NAM CHI		DEDP
498	T911	254E		Р	298		NAM CHI		DEDP
499	T948	257E		Р	298		NAM CHI		DEDP
500	T953	256E		Р	298		NAM CHI		DEDP
501	T136	J 52205 A0		Р	296		NAM MUN		DEDP
502	T808	169E		Р	296		NAM CHI		DEDP
503	T813	167E		Р	296		NAM CHI		DEDP
504	T846	87E		Р	296		NAM CHI		DEDP
505	T945	275E		Р	296		NAM CHI		DEDP
506	T1117	401E		Р	296		NAM CHI		DEDP
507	T531	JA0923401		Р	294		HUAI BANG		DEDP
508	T805	168E		Р	294		NAM CHI		DEDP
509	T871	212E		Р	291		NAM CHI		DEDP
510	T952	234E		Р	291		NAM CHI		DEDP
511	T368	JC0121901		Р	290		H. KHOK		DEDP
512	T989	66E		Р	290		NAM CHI		DEDP
513	T74	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
514	T75	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
515	T76	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
516	T77	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
517	T78	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
518	T79	J 51402	Piea Kaeo	Р	288		NAM MUN		MOI
519	T153	J 52210 B2		Р	288		NAM MUN		DEDP
520	T188	J 52808 A6		Р	288		NAM MUN		DEDP
521	T254	J 52911 A0	Kang Dome	Р	288		NAM MUN		DEDP
522	T397	JA0422107		Р	288		HUAI LUANG		DEDP
523	T516	JA0723401		Р	288		HUAI BANG		DEDP
524	T558	JB0122904		Р	288		NAM SONGKH		DEDP
525	T601	JA0123102		Р	288		HUAI HO		DEDP
526	T619	JA0123804		Р	288		H.BANG KOI		DEDP
527	T626	JA0321301		Р	288		NAM HEUNG		DEDP
528	T760	110E		Р	288		NAM CHI		DEDP
529	T762	181E		Р	288		NAM CHI		DEDP
530	T812	113E		Р	288		NAM CHI		DEDP
531	T949	281E		Р	288		NAM CHI		DEDP
532	T1001	67E		Р	288		NAM CHI		DEDP
533	T1008	366E		Р	288		NAM CHI		DEDP
534	T1012	4E		Р	288		NAM CHI		DEDP
535	T1029	302E		Р	288		NAM CHI		DEDP
536	T1076	40E		Р	288		NAM CHI		DEDP
537	T1081	42E		Р	288		NAM CHI		DEDP
538	T1085	392E		Р	288		NAM CHI		DEDP
539	T1088	19E		Р	288		NAM CHI		DEDP
540	T1097	395E		Р	288		NAM CHI		DEDP
541	T1114	409E		Р	288		NAM CHI		DEDP
542	T5671	T5671	Huai Kum Phuk Na	G	288		NAM SONGKHRA	LOWER PART OF MA	RID
543	T5698	T5698	Huao Hin Chanae	G	288		NAM KAM	HUAI NAM KAM	RID
544	T506	JA0623401		Р	287		NAM KAM		DEDP
545	T394	JA0222107		Р	286		HUAI LUANG		DEDP
546	T514	JA0423602		Р	286		HUAI BANG		DEDP
547	T528	JA0323306		Р	285		HUAI BANG		DEDP
548	T538	JA0923103		Р	285		HUAI BANG		DEDP
549	T1050	313E	Kud Kieo	Р	285		NAM CHI		DEDP
550	T148	J 52208 A2		Р	283		NAM MUN	-	DEDP

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (11/26)

No. N	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
551 TS	912	213E		Р	283		NAM CHI		DEDP
552 T1	150	J 52209 A2		P	282		NAM MUN		DEDP
553 T1	163	J 52707 B3		Р	282		NAM MUN		DEDP
554 13	364	JG0121901		Р	282		H. KHOK		DEDP
555 I1	1018	295E		Р	282				DEDP
556 I1	1107	400E		Р	282				DEDP
557 11	1123	405E	Liver New Let		282				DEDP
558 11	1294	AU721507	Huey Nam Lai	GIVIP	281				MOI
509 14	4331	52303A63	Rong Din Dom	G	280				
561 T2	201	PJ 53204 A	Fong Din Dam	P	280				
562 T/	300 456	100822302		P	200				
563 TE	632	IA0221601		P	270				
564 T1	1057	381E		P	278		NAM CHI		DEDP
565 T1	1126	422E		P	277		NAM CHI		DEDP
566 T1	1128	424E		P	274		NAM CHI		DEDP
567 T1	1345	A0721401	Huev Nam-suev	G	272		NAM LOEI		MOI
568 T2	286	PJ 52506 A	Bok Kee Yang	P	272		NAM MUN		DEDP
569 T3	369	JC0521901		P	272		H. KHOK		DEDP
570 T7	753	174E		Р	272		NAM CHI		DEDP
571 T7	759	173E		Р	272		NAM CHI		DEDP
572 T9	975	280E		Р	272		NAM CHI		DEDP
573 T1	1109	399E		Р	272		NAM CHI		DEDP
574 T1	1573	B0222107	Nam Pan	G	270		HUAI LUANG		MOI
575 T6	622	JA0121301		Р	269		NAM HEUNG		DEDP
576 T1	1055	390E		Р	269		NAM CHI		DEDP
577 T3	351	JD0121901		Р	267		H. KHOK		DEDP
578 T1	138	J 52206 A1		Р	266		NAM MUN		DEDP
579 T1	182	J 52710 A5		Р	266		NAM MUN		DEDP
580 T2	217	J 52206 A1		Р	266		NAM MUN		DEDP
581 T1	1363	E0621402	Huey Nam-puan	G	264		NAM LOEI		MOI
582 T4	4246	52302D09	Bag Cha-nung	GMP	264		NAM MUN		MOI
583 T3	370	JC0221901		P	264		H. KHOK		DEDP
584 18	858	338E		Р	264		NAM CHI		DEDP
585 I1	1095	393E		Р	264				DEDP
586 15	534	JA1323103		Р	262		HUAI BANG		DEDP
587 17	119	189E		P	262				DEDP
500 T2	130	J 52203 AU		P	261				
500 TE	509	JA0322104		г D	201				
501 T2	200	DI 52206 A		г D	201				
502 T2	209	PI 52200 A		P	259				
503 T2	387	IC0621901		P	259				
594 T7	772	331E		P	259		NAM CHI		
595 T1	142	J 52206 A1		P	258		NAM MUN		DEDP
596 T3	360	JB0621901		P	258		H KHOK		DEDP
597 T1	184	J 52805 A5		P	256		NAM MUN		DEDP
598 T4	458	JC0122302		P	256		H.BANG BOT		DEDP
599 T5	564	JA1322304		P	256		H.BANG BOT		DEDP
600 Te	642	JA0121509		Р	256		NAM LOEI		DEDP
601 Te	682	PJA0523305		Р	256		NAM KAM		DEDP
602 T7	750	321E		Р	256		NAM CHI		DEDP
603 T8	890	344E		Р	256		NAM CHI		DEDP
604 T1	1024	298E		Р	256		NAM CHI		DEDP
605 T1	1072	382E		Р	256		NAM CHI		DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (12/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area (ha	a)	River Basin	River Name	Agency
	ID	1.10,000112	i lojoot i laino	Type	Whole D	ry	Name		, geney
606 T	Г1110	406E		P	256	,	NAM CHI		DEDP
607 T	Г1151	7F		Р	256		NAM CHI		DEDP
608 T	Г1154	37F		Р	256		NAM CHI		DEDP
609 T	Г177	J 52710 A4		Р	254		NAM MUN		DEDP
610 T	Г1148	437E		Р	254		NAM CHI		DEDP
611 T	Г195	J 53002 A6		Р	253		NAM MUN		DEDP
612 T	Г518	JA0523306		Р	253		HUAI BANG		DEDP
613 T	Г977	278E		Р	253		NAM CHI		DEDP
614 T	Г1028	301E		Р	253		NAM CHI		DEDP
615 T	Г355	JA0121901	Kong Nang	Р	251		PHU PA HUA		DEDP
616 T	Г262	PJ 52303 A	Nong I-ya	Р	250		NAM MUN		DEDP
617 T	Г266	PJ 52303 A	Nong I-ya	Р	250		NAM MUN		DEDP
618 T	Г597	JA0323101		Р	250		HUAI HO		DEDP
619 T	[1170	27F	Kud Lom	Р	250		NAM CHI		DEDP
620 T	[191	J 52809 A6		P	248		NAM MUN		DEDP
621 T	503	JA0123303		P	248		NAM KAM		DEDP
622 1	544	JA0123703		Р	248		HUAI MUK		DEDP
623 T	F561	JB0722904		P	245		NAM SONGKH		DEDP
624 1	1036	307E		Р	245		NAM CHI		DEDP
625 I	11134	417E		Р	245				DEDP
626 I	444	JA0222302		Р	243		H.BANG BOT		DEDP
627 I	11101	394E		Р	243				DEDP
628 I	11120	411E		Р	243				DEDP
629 I	FF 40	425E		P	243				DEDP
630 T	1542 F40	JB0223602	These Leve	Р	242				DEDP
631 I	110 F44	J 50206		Р	240				MOI
032 I	[]] [40	J 50206		P	240				MOI
624 T	1 1 Z F 1 2	J 50206	Thong Long	P	240				MOI
635 T	г 13 Г14	1 50206	Thong Long	г D	240				MOI
636 T	Г 14 Г15	150206		F D	240				MOI
637 T	Г 721	151001	Rachanatana	P	240				MOI
638 T	T68	151303	lok Tiea	P	240				MOI
630 T	T60	151303	lok Tiea	Þ	240				MOI
640 T	Γ70	151303	Jok Tiea	P	240				MOI
641 T	Г71	1 51303	Jok Tiea	P	240		NAM MUN		MOI
642 T	Г72	1 51303	Jok Tiea	P	240		NAM MUN		MOI
643 T	Γ <b>7</b> 3	1 51303	Jok Tiea	P	240		NAM MUN		MOI
644 T	F80	J 51503	Nong Kone	P	240		NAM MUN		MOI
645 T	Г116	J 52103	Klui Lom Yen	P	240		NAM MUN		MOI
646 T	Г117	J 52103	Klui Lom Yen	P	240		NAM MUN		MOI
647 T	Г118	J 52103	Klui Lom Yen	P	240		NAM MUN		MOI
648 T	Г120	J 52106	Klui	Р	240		NAM MUN		MOI
649 T	Г121	J 52106	Klui	Р	240		NAM MUN		MOI
650 T	Г122	J 52106	Klui	Р	240		NAM MUN		MOI
651 T	Г123	J 52106	Klui	Р	240		NAM MUN		MOI
652 T	Г124	J 52106	Klui	Р	240		NAM MUN		MOI
653 T	Г125	J 52106	Klui	Р	240		NAM MUN		MOI
654 T	Г126	J 52106	Klui	Р	240		NAM MUN		MOI
655 T	Г1207	A0621501	Huey Por	GMP	240		NAM LOEI		MOI
656 T	Г1211	A0421502	Huey Nam-koo	GMP	240		NAM LOEI		MOI
657 T	Г1266	A0221503	Huey Nam-kor	GMP	240		NAM LOEI		MOI
658 T	Г1574	B0422107	Ban Koke-yai	GMP	240		HUAI LUANG		MOI
659 T	Г1587	A0122901	Chueng Doy	G	240		NAM SONGKHRAM		MOI
660 T	Г1699	A0122405	Mae Nam Song-kra	GMP	240		NAM SONGKHRAM		MOI

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (13/26)

ID         Type         Type         Whele         Dy         Name           661         TH3T         A012203         Huey Tichai         G         240         NAM SONGKHRAM         MOI           662         T2246         60223101         Huey Hor         GMP         240         NAM SONGKHRAM         MOI           664         T27T         L5140246A         Wang Yao         GMP         240         NAM MUN         MOI           666         Taduz         L5140246A         Wang Yao         GMP         240         NAM MUN         MOI           666         Taduz         L5210417B         Huey Ra-wee         G         240         NAM MUN         MOI           668         T4650         L5210417B         Huey Tig Choo         GMP         240         NAM MUN         MOI           671         Ta7T3         S2904C13         Huay Tig Choo         GMP         240         NAM MUN         MOI           672         T5253         S2090A06         Nong-ban         P         240         NAM MUN         MOI           673         T6373         S2040C3         P         240         NAM MUN         DEDP           675         T165         J 52707 B3	No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
661         T1817         A0122903         Huey Tid-tai         G         240         NAM SONGKHRAM         MOI           662         T2246         G0223101         Huey Hor         GMP         240         NAM MUN         MOI           664         T277         L5140246A         Wang Yao         GMP         240         NAM MUN         MOI           666         T834         L5180319A         Kuo Log Nong Hin         GMPT         240         NAM MUN         MOI           666         T834         L510451A         Huey Rawee         G         240         NAM MUN         MOI           667         T6332         L5110451A         Huey Sean         GMP         240         NAM MUN         MOI           678         T4233         S2302C06         Huey Tig Choo         GMP         240         NAM MUN         MOI           671         T4242         S20304C13         Huay-pee-poun         GMP         240         NAM MUN         MOI           675         T165         J 52707 A3         P         240         NAM MUN         DEDP           677         T174         J 52709 B4         P         240         NAM MUN         DEDP           678		ID	-	-	Туре	Whole	Dry	Name		
662         T2246         GO23101         Huey Hor         GMP         240         HUAI HO         MOI           663         T2526         L5200260A         Nam Lon         GMP         240         NAM MUN         MOI           664         T2527         L5140246A         Wang Yao         GMP         240         NAM MUN         MOI           665         T2612         L5180319A         Kud Log Nong Hin         GMP         240         NAM MUN         MOI           666         T402         L5210417A         Huey Ra-wee         G         240         NAM MUN         MOI           667         T4233         S2302006         Huey Tig Choo         GMP         240         NAM MUN         MOI           671         T4773         S2904C13         Huay-jun-hom         GMP         240         NAM MUN         MOI           671         T5735         S2806800         Nong-ban         PT         240         NAM MUN         DEDP           677         T653         S2707 A3         P         240         NAM MUN         DEDP           677         T161         J S2709 B4         P         240         NAM MUN         DEDP           678         T176 <td>661</td> <td>T1817</td> <td>A0122903</td> <td>Huey Tid-tai</td> <td>G</td> <td>240</td> <td></td> <td>NAM SONGKHRAM</td> <td></td> <td>MOI</td>	661	T1817	A0122903	Huey Tid-tai	G	240		NAM SONGKHRAM		MOI
663         T225E         L520260A         Nam Lon         GMP         240         NAM MUN         MOI           664         T277         L514024A         Wang Yao         GMP         240         NAM MUN         MOI           665         T2814         L5180319A         Kud Log Nong Hin         GMPT         240         NAM MUN         MOI           666         T3352         L5110451A         Huey Ravee         G         240         NAM MUN         MOI           668         T4305         L5210417B         Huey Sean         GMP         240         NAM MUN         MOI           670         T353         S2020C013         Huay-jun-hom         GMP         240         NAM MUN         MOI           671         T4773         S2080805         Huay-jun-hom         GMP         240         NAM MUN         MOI           672         TS288         S2709A06         Nong-ban         P         240         NAM MUN         DEDP           675         T165         J S2707 B3         P         240         NAM MUN         DEDP           675         T174         J S2709 B4         P         240         NAM MUN         DEDP           676         T174 </td <td>662</td> <td>T2246</td> <td>G0223101</td> <td>Huey Hor</td> <td>GMP</td> <td>240</td> <td></td> <td>HUAI HO</td> <td></td> <td>MOI</td>	662	T2246	G0223101	Huey Hor	GMP	240		HUAI HO		MOI
664         T2777         L5140246A         Wang Yao         GMP         240         NAM MUN         MOI           665         T2814         L5180319A         Kulo go Nong Hin         GMP         240         NAM MUN         MOI           666         T3402         L5080108A         Kulo gy Nong Hin         GMP         240         NAM MUN         MOI           667         T3532         L5110451A         Huey Ra-wee         G         240         NAM MUN         MOI           668         T4050         L5210417B         Huey Fig Choo         GMP         240         NAM MUN         MOI           670         T4232         S2302006         Huay Fig Choo         GMP         240         NAM MUN         MOI           671         T4773         S2904C13         Huay-jun-hom         GMP         240         NAM MUN         MOI           672         T5288         S2709A0         Nong-ban         P         240         NAM MUN         DEDP           675         T165         J S2707 B3         P         240         NAM MUN         DEDP           675         T174         J S2708 B4         P         240         NAM MUN         DEDP           677 <t175< t<="" td=""><td>663</td><td>T2526</td><td>L5200260A</td><td>Nam Lon</td><td>GMP</td><td>240</td><td></td><td>NAM MUN</td><td></td><td>MOI</td></t175<>	663	T2526	L5200260A	Nam Lon	GMP	240		NAM MUN		MOI
665         T2814         L5180319A         Kuc Log Nong Hin         GMPT         240         NAM MUN         MOI           666         T3402         L5080108A         Klong Yang         G         240         NAM MUN         MOI           667         T3532         L5110451A         Huey Ra-wee         G         240         NAM MUN         MOI           668         T4233         S2302C0E         Huey Tig Choo         GMP         240         NAM MUN         MOI           670         T473         S2304C0E         Huay Tig Choo         GMP         240         NAM MUN         MOI           671         T4773         S2304C0E         Nong-ban         PT         240         NAM MUN         MOI           672         T5288         S2709A0E         Nong-ban         PT         240         NAM MUN         DEDP           674         T161         J S2707 B3         P         240         NAM MUN         DEDP           675         T174         J S2709 B4         P         240         NAM MUN         DEDP           677         T175         J S2707 B3         P         240         NAM MUN         DEDP           678         T174         J S2709	664	T2777	L5140246A	Wang Yao	GMP	240		NAM MUN		MOI
666         T3402         L5080108A         Klong Yang         G         240         NAM MUN         MOI           667         T5352         L5110451A         Huey Rawee         G         240         NAM MUN         MOI           668         T4050         L5210417B         Huey Tig Choo         GMP         240         NAM MUN         MOI           670         T4422         S2302C06         Huey Tig Choo         GMP         240         NAM MUN         MOI           671         T5472         S2304C13         Huay-jun-hom         GMP         240         NAM MUN         MOI           671         T5737         S2806B05         Huay-pee-poun         GMP         240         NAM MUN         DEDP           677         T575         J S2709 B4         P         240         NAM MUN         DEDP           677         T175         J S2709 B4         P         240         NAM MUN         DEDP           678         T176         J S2709 B4         P         240         NAM MUN         DEDP           679         T175         J S2709 B4         P         240         NAM MUN         DEDP           678         T176         J S2709 B4         P </td <td>665</td> <td>T2814</td> <td>L5180319A</td> <td>Kud Log Nong Hin</td> <td>GMPT</td> <td>240</td> <td></td> <td>NAM MUN</td> <td></td> <td>MOI</td>	665	T2814	L5180319A	Kud Log Nong Hin	GMPT	240		NAM MUN		MOI
667         T3532         L5110451A         Huey Ra-wee         G         240         NAM MUN         MOI           668         T4030         52302C06         Huey Tig Choo         GMP         240         NAM MUN         MOI           670         T4422         52305A31         Rung Kra Done Hu         G         240         NAM MUN         MOI           671         T4773         52904C13         Huay-pin-hom         GMP         240         NAM MUN         MOI           672         T5288         52709A06         Nong-ban         PT         240         NAM MUN         MOI           673         T613         J 52707 A3         P         240         NAM MUN         DEDP           675         T165         J 52709 B4         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           678         T187         J 52808 A5         P         240         NAM MUN         DEDP           680         T187         J 52808 A5         P         240         NAM MUN         DEDP           681         T254         J 52505 A0         Bung         P	666	T3402	L5080108A	Klong Yang	G	240		NAM MUN		MOI
668         T4050         L5210417B         Huey Sean         GMP         240         NAM MUN         MOI           670         T4422         52305041         Rung Kra Done Hu         G         240         NAM MUN         MOI           671         T4422         52305A31         Rung Kra Done Hu         G         240         NAM MUN         MOI           671         T427         52804C13         Huay-jun-hom         GMP         240         NAM MUN         MOI           672         T5288         52709A06         Nong-ban         PT         240         NAM MUN         MOI           673         T165         J 52707 B3         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           676         T175         J 52709 B4         P         240         NAM MUN         DEDP           677         T175         J 52709 B4         P         240         NAM MUN         DEDP           680         T187         J 52708 A5         P         240         NAM MUN         DEDP           681         T252         J 52911 A0         Na Luang         P	667	T3532	L5110451A	Huey Ra-wee	G	240		NAM MUN		MOI
669         74233         52302C06         Huey Tig Choo         GMP         240         NAM MUN         MOI           670         T4422         52305A1         Rung Kra Done Hu         G         240         NAM MUN         MOI           671         T4773         52904C13         Huay-jun-hom         GMP         240         NAM MUN         MOI           672         T5375         52806B0         Nong-ban         PT         240         NAM MUN         MOI           674         T161         J 52707 B3         P         240         NAM MUN         DEDP           675         T174         J 52709 B4         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           677         T175         J 52709 B4         P         240         NAM MUN         DEDP           678         T176         J 52709 B4         P         240         NAM MUN         DEDP           681         T236         J 52404 C0         Kayung         P         240         NAM MUN         DEDP           681         T236         J 52504 A         Bung         P         24	668	T4050	L5210417B	Huey Sean	GMP	240		NAM MUN		MOI
670       T4422       52305A31       Rung Kra Done Hu       G       240       NAM MUN       MOI         671       T44773       52904C13       Huay-jun-hom       GMP       240       NAM MUN       MOI         672       T5288       52709A06       Nong-ban       PT       240       NAM MUN       MOI         673       T5373       52806B05       Huay-pee-poun       GMP       240       NAM MUN       DEDP         675       T165       J 52707 B3       P       240       NAM MUN       DEDP         676       T174       J 52709 B4       P       240       NAM MUN       DEDP         677       T175       J 52709 B4       P       240       NAM MUN       DEDP         678       T174       J 52709 B4       P       240       NAM MUN       DEDP         678       T175       J 52709 B4       P       240       NAM MUN       DEDP         680       T187       J 52806 A5       P       240       NAM MUN       DEDP         681       T265       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         683       T265       J 52911 A0       Na Yia <td< td=""><td>669</td><td>T4233</td><td>52302C06</td><td>Huey Tig Choo</td><td>GMP</td><td>240</td><td></td><td>NAM MUN</td><td></td><td>MOI</td></td<>	669	T4233	52302C06	Huey Tig Choo	GMP	240		NAM MUN		MOI
671         174773         52904C13         Huay-jon-hom         GMP         240         NAM MUN         MOI           672         T5288         52709A06         Nong-ban         PT         240         NAM MUN         MOI           674         T5373         52806B05         Huay-pee-poun         GMP         240         NAM MUN         MOI           674         T161         J 52707 A3         P         240         NAM MUN         DEDP           675         T165         J 52707 B3         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           677         T165         J 52709 B4         P         240         NAM MUN         DEDP           677         T181         J 52710 A5         P         240         NAM MUN         DEDP           680         T187         J 52404 AC         Kayung         P         240         NAM MUN         DEDP           681         T236         J 52404 AC         Kayung         P         240         NAM MUN         DEDP           683         T257         J 52911 A0         Na Yia         P         240<	670	T4422	52305A31	Rung Kra Done Hu	G	240		NAM MUN		MOI
672         T5288         52709A06         Nong-ban         PT         240         NAM MUN         MOI           673         T5373         52806805         Huay-pee-poun         GMP         240         NAM MUN         DEDP           674         T161         J 52707 A3         P         240         NAM MUN         DEDP           675         T165         J 52707 B3         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           677         T175         J 52709 B4         P         240         NAM MUN         DEDP           678         T181         J 52709 B4         P         240         NAM MUN         DEDP           680         T187         J 52808 A5         P         240         NAM MUN         DEDP           681         T236         J 52914 A0         Na Luang         P         240         NAM MUN         DEDP           683         T256         J 52911 A0         Na Luang         P         240         NAM MUN         DEDP           684         T339         JC0221701         P         240         NAM MUN         DEDP	671	T4773	52904C13	Huay-jun-hom	GMP	240		NAM MUN		MOI
673       75373       52806805       Huay-pee-poun       GMP       240       NAM MUN       MOI         674       T161       J 52707 A3       P       240       NAM MUN       DEDP         675       T165       J 52707 B3       P       240       NAM MUN       DEDP         676       T174       J 52709 B4       P       240       NAM MUN       DEDP         677       T175       J 52709 B4       P       240       NAM MUN       DEDP         678       T176       J 52709 B4       P       240       NAM MUN       DEDP         678       T176       J 5208 A5       P       240       NAM MUN       DEDP         681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         681       T236       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         684       T257       J 5201 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       NAM S	672	T5288	52709A06	Nong-ban	PT	240		NAM MUN		MOI
674         T161         J 52707 A3         P         240         NAM MUN         DEDP           675         T165         J 52707 B3         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           676         T174         J 52709 B4         P         240         NAM MUN         DEDP           677         T181         J 52709 B4         P         240         NAM MUN         DEDP           679         T181         J 52710 A5         P         240         NAM MUN         DEDP           680         T187         J 52808 A5         P         240         NAM MUN         DEDP           681         T236         J 52404 C0         Kayung         P         240         NAM MUN         DEDP           682         T245         J 52505 A0         Bung         P         240         NAM MUN         DEDP           683         T256         J 52911 A0         Na Luang         P         240         NAM MUN         DEDP           684         T341         JC0121701         P         240         HUAI NAM S         DEDP           68	673	T5373	52806B05	Huay-pee-poun	GMP	240		NAM MUN		MOI
675       T165       J 52707 B3       P       240       NAM MUN       DEDP         676       T174       J 52709 B4       P       240       NAM MUN       DEDP         677       T175       J 52709 B4       P       240       NAM MUN       DEDP         678       T176       J 52709 B4       P       240       NAM MUN       DEDP         679       T174       J 52710 A5       P       240       NAM MUN       DEDP         680       T187       J 52808 A5       P       240       NAM MUN       DEDP         681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         682       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       NAM SUAI       DEDP         686       T434       JA0122801       P       240       NAM SONGKH       DEDP         687       T373       JA0222005       P       240       NAM SONGKH       DEDP <t< td=""><td>674</td><td>T161</td><td>J 52707 A3</td><td></td><td>Р</td><td>240</td><td></td><td>NAM MUN</td><td></td><td>DEDP</td></t<>	674	T161	J 52707 A3		Р	240		NAM MUN		DEDP
676         T174         J 52709 B4         P         240         NAM MUN         DEDP           677         T175         J 52709 B4         P         240         NAM MUN         DEDP           678         T176         J 52709 B4         P         240         NAM MUN         DEDP           679         T181         J 52709 B4         P         240         NAM MUN         DEDP           680         T187         J 52808 A5         P         240         NAM MUN         DEDP           681         T236         J 52404 C0         Kayung         P         240         NAM MUN         DEDP           682         T245         J 52505 A0         Bung         P         240         NAM MUN         DEDP           683         T256         J 52911 A0         Na Luang         P         240         NAM MUN         DEDP           684         T339         JC0221701         P         240         HUAI NAM S         DEDP           686         T341         JC012401         P         240         NAM SONGKH         DEDP           687         T373         JA022205         P         240         NAM SONGKH         DEDP	675	T165	J 52707 B3		Р	240		NAM MUN		DEDP
677         T175         J 52709 B4         P         240         NAM MUN         DEDP           678         T176         J 52709 B4         P         240         NAM MUN         DEDP           679         T181         J 52710 A5         P         240         NAM MUN         DEDP           680         T187         J 52808 A5         P         240         NAM MUN         DEDP           681         T236         J 52404 C0         Kayung         P         240         NAM MUN         DEDP           681         T256         J 52911 A0         Na Luang         P         240         NAM MUN         DEDP           684         T257         J 52911 A0         Na Luang         P         240         NAM MUN         DEDP           685         T339         JC0221701         P         240         HUAI NAM S         DEDP           686         T341         JO122005         P         240         NAM SUAI         DEDP           687         T373         JA0222005         P         240         NAM SONGKH         DEDP           687         T414         JA0322405         P         240         NAM SONGKH         DEDP	676	T174	J 52709 B4		Р	240		NAM MUN		DEDP
678       T176       J 52709 B4       P       240       NAM MUN       DEDP         679       T181       J 52710 A5       P       240       NAM MUN       DEDP         680       T187       J 52808 A5       P       240       NAM MUN       DEDP         681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         682       T245       J 52505 A0       Bung       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       HUAI NAM S       DEDP         686       T414       JA0122801       P       240       NAM SUAI       DEDP         687       T410       JA0122804       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T424       JA0122903       P       240       NAM SONGKH       DE	677	T175	J 52709 B4		Р	240		NAM MUN		DEDP
679       T181       J 52710 A5       P       240       NAM MUN       DEDP         680       T187       J 52808 A5       P       240       NAM MUN       DEDP         681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         681       T236       J 5205 A0       Bung       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       HUAI NAM S       DEDP         686       T341       JC0121701       P       240       HUAI NAM S       DEDP         687       T373       JA0222005       P       240       NAM SONGKH       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH <td< td=""><td>678</td><td>T176</td><td>J 52709 B4</td><td></td><td>Р</td><td>240</td><td></td><td>NAM MUN</td><td></td><td>DEDP</td></td<>	678	T176	J 52709 B4		Р	240		NAM MUN		DEDP
680       T187       J 52808 A5       P       240       NAM MUN       DEDP         681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         682       T245       J 52505 A0       Bung       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       HUAI NAM S       DEDP         685       T333       JC0221701       P       240       HUAI NAM S       DEDP         686       T341       JC0121701       P       240       NAM SONGKH       DEDP         687       T373       JA0222005       P       240       NAM SONGKH       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         690       T414       JA0322502       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         691       T424       JA0122903       P       240       NAM SONGKH	679	T181	J 52710 A5		Р	240		NAM MUN		DEDP
681       T236       J 52404 C0       Kayung       P       240       NAM MUN       DEDP         682       T245       J 52505 A0       Bung       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       HUAI NAM S       DEDP         686       T341       JC0121701       P       240       HUAI NAM S       DEDP         687       T373       JA0222005       P       240       NAM SONGKH       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322503       P       240       NAM SONGKH       DEDP         693       T414       JA0122903       P       240       NAM SONGKH	680	T187	J 52808 A5		Р	240		NAM MUN		DEDP
682       T245       J 52505 A0       Bung       P       240       NAM MUN       DEDP         683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       HUAI NAM S       DEDP         686       T341       JC0121701       P       240       HUAI NAM S       DEDP         687       T373       JA0222005       P       240       NAM SONGKH       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         689       T410       JA0122904       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322502       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM KAM       DEDP <td>681</td> <td>T236</td> <td>J 52404 C0</td> <td>Kayung</td> <td>Р</td> <td>240</td> <td></td> <td>NAM MUN</td> <td></td> <td>DEDP</td>	681	T236	J 52404 C0	Kayung	Р	240		NAM MUN		DEDP
683       T256       J 52911 A0       Na Luang       P       240       NAM MUN       DEDP         684       T257       J 52911 A0       Na Yia       P       240       NAM MUN       DEDP         685       T339       JC0221701       P       240       HUAI NAM S       DEDP         686       T341       JC0121701       P       240       HUAI NAM S       DEDP         687       T373       JA0222005       P       240       NAM SUAI       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         689       T410       JA0122904       P       240       NAM SONGKH       DEDP         690       T414       JA0322502       P       240       NAM SONGKH       DEDP         691       T417       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         6	682	T245	J 52505 A0	Bung	Р	240		NAM MUN		DEDP
684         T257         J 52911 A0         Na Yia         P         240         NAM MUN         DEDP           685         T339         JC0221701         P         240         HUAI NAM S         DEDP           686         T341         JC0121701         P         240         HUAI NAM S         DEDP           687         T373         JA0222005         P         240         NAM SUAI         DEDP           688         T404         JA0122801         P         240         NAM SONGKH         DEDP           689         T414         JA0322405         P         240         NAM SONGKH         DEDP           690         T417         JA0322502         P         240         NAM SONGKH         DEDP           691         T417         JA0322502         P         240         NAM SONGKH         DEDP           692         T422         JA0322504         P         240         NAM SONGKH         DEDP           693         T424         JA0122903         P         240         NAM SONGKH         DEDP           694         T473         JA0723202         P         240         NAM KAM         DEDP           696         T497	683	T256	J 52911 A0	Na Luang	Р	240		NAM MUN		DEDP
685         T339         JC0221701         P         240         HUAI NAM S         DEDP           686         T341         JC0121701         P         240         HUAI NAM S         DEDP           687         T373         JA0222005         P         240         NAM SUAI         DEDP           688         T404         JA0122801         P         240         NAM SONGKH         DEDP           689         T410         JA0122904         P         240         NAM SONGKH         DEDP           690         T414         JA0322405         P         240         NAM SONGKH         DEDP           691         T417         JA0322502         P         240         NAM SONGKH         DEDP           692         T422         JA0322504         P         240         NAM SONGKH         DEDP           693         T424         JA0122903         P         240         NAM SONGKH         DEDP           694         T473         JA0723202         P         240         NAM KAM         DEDP           695         T493         JA0523305         P         240         NAM KAM         DEDP           696         T497         JA0323503	684	T257	J 52911 A0	Na Yia	Р	240		NAM MUN		DEDP
686         T341         JC0121701         P         240         HUAI NAM S         DEDP           687         T373         JA0222005         P         240         NAM SUAI         DEDP           688         T404         JA0122801         P         240         NAM SONGKH         DEDP           689         T410         JA0122904         P         240         NAM SONGKH         DEDP           690         T414         JA0322405         P         240         NAM SONGKH         DEDP           690         T417         JA0322502         P         240         NAM SONGKH         DEDP           692         T422         JA0322502         P         240         NAM SONGKH         DEDP           693         T424         JA0122903         P         240         NAM SONGKH         DEDP           693         T424         JA0122303         P         240         NAM SONGKH         DEDP           694         T473         JA0723202         P         240         NAM KAM         DEDP           695         T493         JA0523305         P         240         NAM KAM         DEDP           696         T497         JA0123304	685	T339	JC0221701		Р	240		HUAI NAM S		DEDP
687       T373       JA0222005       P       240       NAM SUAI       DEDP         688       T404       JA0122801       P       240       NAM SONGKH       DEDP         689       T410       JA0122904       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T424       JA0122903       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       HUAI BANG       DEDP         697       T499       JA0523305       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       NAM KAM       DEDP         698       T501       JA0523401	686	T341	JC0121701		Р	240		HUAI NAM S		DEDP
688       T404       JA0122801       P       240       NAM SONGKH       DEDP         689       T410       JA0122904       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM SONGKH       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       HUAI BANG       DEDP         696       T499       JA0523305       P       240       HUAI BANG       DEDP         698       T501       JA0523401       P       240       HUAI BANG       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB012	687	T373	JA0222005		Р	240		NAM SUAI		DEDP
689       T410       JA0122904       P       240       NAM SONGKH       DEDP         690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       HUAI BANG       DEDP         696       T497       JA023304       P       240       HUAI BANG       DEDP         697       T499       JA0323503       P       240       HUAI BANG       DEDP         698       T501       JA0523401       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123401 <td>688</td> <td>T404</td> <td>JA0122801</td> <td></td> <td>Р</td> <td>240</td> <td></td> <td>NAM SONGKH</td> <td></td> <td>DEDP</td>	688	T404	JA0122801		Р	240		NAM SONGKH		DEDP
690       T414       JA0322405       P       240       NAM SONGKH       DEDP         691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       NAM KAM       DEDP         696       T497       JA0323503       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       HUAI BANG       DEDP         698       T501       JA0523401       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123504       P       240       HUAI BANG       DEDP         701       T523       JB0123504	689	T410	JA0122904		Р	240		NAM SONGKH		DEDP
691       T417       JA0322502       P       240       NAM SONGKH       DEDP         692       T422       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM SONGKH       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       NAM KAM       DEDP         697       T499       JA0323503       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123401       P       240       HUAI BANG       DEDP         701       T523       JB0123504       P       240       HUAI BANG       DEDP         702       T530       JA1123401	690	T414	JA0322405		Р	240		NAM SONGKH		DEDP
692       T422       JA0322504       P       240       NAM SONGKH       DEDP         693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0523103       P       240       HUAI BANG       DEDP         697       T499       JA0323503       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123401       P       240       HUAI BANG       DEDP         701       T523       JB0123504       P       240       HUAI BANG       DEDP         702       T530       JA1123401       P       240       HUAI BANG       DEDP         702       T530       JA1123401	691	T417	JA0322502		Р	240		NAM SONGKH		DEDP
693       T424       JA0122903       P       240       NAM SONGKH       DEDP         694       T473       JA0723202       P       240       NAM KAM       DEDP         695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0523305       P       240       HUAI BANG       DEDP         696       T497       JA0223103       P       240       HUAI BANG       DEDP         697       T499       JA0123304       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       NAM KAM       DEDP         698       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123401       P       240       HUAI BANG       DEDP         701       T523       JB0123504       P       240       HUAI BANG       DEDP         702       T530       JA1123401       P       240       HUAI BANG       DEDP         702       T540       JA020201       P       240       HUAI BANG       DEDP	692	T422	JA0322504		Р	240		NAM SONGKH		DEDP
694         T473         JA0723202         P         240         NAM KAM         DEDP           695         T493         JA0523305         P         240         NAM KAM         DEDP           696         T497         JA0223103         P         240         HUAI BANG         DEDP           697         T499         JA0323503         P         240         HUAI BANG         DEDP           698         T501         JA0123304         P         240         NAM KAM         DEDP           698         T504         JA0523401         P         240         NAM KAM         DEDP           700         T511         JB0123401         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP	693	T424	JA0122903		Р	240		NAM SONGKH		DEDP
695       T493       JA0523305       P       240       NAM KAM       DEDP         696       T497       JA0223103       P       240       HUAI BANG       DEDP         697       T499       JA0323503       P       240       HUAI BANG       DEDP         698       T501       JA0123304       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         699       T504       JA0523401       P       240       NAM KAM       DEDP         700       T511       JB0123401       P       240       HUAI BANG       DEDP         701       T523       JB0123504       P       240       HUAI BANG       DEDP         702       T530       JA1123401       P       240       HUAI BANG       DEDP         702       T530       JA1123401       P       240       HUAI BANG       DEDP	694	T473	JA0723202		Р	240		NAM KAM		DEDP
696         T497         JA0223103         P         240         HUAI BANG         DEDP           697         T499         JA0323503         P         240         HUAI BANG         DEDP           698         T501         JA0123304         P         240         NAM KAM         DEDP           699         T504         JA0523401         P         240         NAM KAM         DEDP           699         T511         JB0123401         P         240         HUAI BANG         DEDP           700         T511         JB0123504         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T540         JA022301         P         240         HUAI BANG         DEDP	695	T493	JA0523305		Р	240		NAM KAM		DEDP
697         T499         JA0323503         P         240         HUAI BANG         DEDP           698         T501         JA0123304         P         240         NAM KAM         DEDP           699         T504         JA0523401         P         240         NAM KAM         DEDP           699         T504         JA0523401         P         240         NAM KAM         DEDP           700         T511         JB0123401         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA0202001         P         240         HUAI BANG         DEDP	696	T497	JA0223103		Р	240		HUAI BANG		DEDP
698         T501         JA0123304         P         240         NAM KAM         DEDP           699         T504         JA0523401         P         240         NAM KAM         DEDP           700         T511         JB0123401         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T504         JA0202001         P         240         HUAI BANG         DEDP	697	T499	JA0323503		Р	240		HUAI BANG		DEDP
699         T504         JA0523401         P         240         NAM KAM         DEDP           700         T511         JB0123401         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T504         JA0202001         P         240         HUAI BANG         DEDP	698	T501	JA0123304		Р	240		NAM KAM		DEDP
700         T511         JB0123401         P         240         HUAI BANG         DEDP           701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP	699	T504	JA0523401		Р	240		NAM KAM		DEDP
701         T523         JB0123504         P         240         HUAI BANG         DEDP           702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T510         JA0230201         P         240         HUAI BANG         DEDP	700	T511	JB0123401		Р	240		HUAI BANG		DEDP
702         T530         JA1123401         P         240         HUAI BANG         DEDP           702         T530         JA1023001         P         240         HUAI BANG         DEDP	701	T523	JB0123504		Р	240		HUAI BANG		DEDP
	702	T530	JA1123401		Р	240		HUAI BANG		DEDP
703 1549 JA0323801 P 240 H.BANG KOI DEDP	703	T549	JA0323801		P	240		H.BANG KOI		DEDP
704 T553 JA0723801 P 240 HUALSOM P DEDP	704	T553	JA0723801		P	240		HUALSOM P		DEDP
705 T563 JB0322904 P 240 NAM SONGKH DEDP	705	T563	JB0322904		P	240		NAM SONGKH		DEDP
706 1573 JB0622904 P 240 NAM SONGKH DEDP	706	T573	JB0622904		P	240		NAM SONGKH		DEDP
707 1579 JA1622304 P 240 H BANG BOT DEDP	707	T579	JA1622304		P	240		H BANG BOT		DEDP
708 T580 JA2022304 P 240 H BANG BOT DEDP	708	T580	JA2022304		P	240		H BANG BOT		DEDP
709 T599 JA0723103 P 240 HUAI BANG DEDP	709	T599	JA0723103		P	240		HUAI BANG		DEDP
710 T607 JA0423103 P 240 HUAI BANG DEDP	710	T607	JA0423103		P	240		HUAI BANG		DEDP
711 T623 JA0421301 P 240 NAM HEING DEDP	711	T623	IA0421301		P	240		NAM HEUNG		
712 T630 JA0321601 P 240 H NAM HILAI DEDP	712	T630	JA0321601		P	240				DEDP
713 T633 JA0121503 P 240 NAMIORI DED	712	T633	JA0121503		P	240		NAMIOFI		DEDP
714 T638 [A0221509 P 240 NAM [OE] DEDP	71/	T638	140221500		P	240				
715 T640 B0221601 P 240 H NAM HIAI DEDP	715	T640	JB0221601		P	240				DEDP

No.	MRC	Project ID	Project Name	Irr.	Irr. Area (ha)	River Basin	River Name	Agency
	ID	,		Туре	Whole Dry	Name		0,
716	T641	JA0321509		P	240	NAM LOEI		DEDP
717	T645	JB0321601		Р	240	H.NAM HUAI		DEDP
718	T647	JA0221505		Р	240	NAM LOEI		DEDP
719	T649	JA0121401		Р	240	NAM LOEI		DEDP
720	T655	PJA0121806		Р	240	HUAI MONG		DEDP
721	T692	PJA0122904		Р	240	NAM SONGKH		DEDP
722	T698	PJA0321501		Р	240	NAM LOEI		DEDP
723	T699	PJA0221501		Р	240	NAM LOEI		DEDP
724	T701	PJA0121506		P	240	NAM LOEI		DEDP
725	1704	PJA0121505		Р	240	NAM LOEI		DEDP
726	1713	127E		Р	240	NAM CHI		DEDP
727	1714	126E		Р	240	NAM CHI		DEDP
728	1729	116E		Р	240			DEDP
729	1741	120E		P	240			DEDP
730	1742	118E		P	240			
731	1744 T740	97E		P D	240			
732	1740 T755	1096		г	240			
734	T767	1055		г D	240			
735	T773	103L		P	240			
736	T782	325E		P	240			
737	T783	332E		P	240	NAM CHI		
738	T791	185E		P	240	NAM CHI		DEDP
739	T798	184E		P	240	NAM CHI		DEDP
740	T804	151E		P	240	NAM CHI		DEDP
741	T815	155E		P	240	NAM CHI		DEDP
742	T822	161E		Р	240	NAM CHI		DEDP
743	T823	159E	Kud Kuang	Р	240	NAM CHI		DEDP
744	T830	355E	Ū	Р	240	NAM CHI		DEDP
745	T833	132E		Р	240	NAM CHI		DEDP
746	T836	157E		Р	240	NAM CHI		DEDP
747	T837	356E		Р	240	NAM CHI		DEDP
748	T850	88E		Р	240	NAM CHI		DEDP
749	T857	339E		Р	240	NAM CHI		DEDP
750	T866	230E		Р	240	NAM CHI		DEDP
751	T867	199E		P	240	NAM CHI		DEDP
752	T878	222E		Р	240	NAM CHI		DEDP
753	T881	78E		P	240	NAM CHI		DEDP
754	1886	221E		Р	240			DEDP
755	1888	203E		P	240			DEDP
756	1900 T010	223E		Р	240			DEDP
750	1910 T015	34/E		P D	240			
750	T010	2176		г	240			
760	T020	224E 227E		г D	240			
761	T925	232F		P	240	NAM CHI		
762	T931	247F		P	240	NAM CHI		DEDP
763	T938	255E		P	240	NAM CHI		DEDP
764	T944	239E	Kud Chum	P	240	NAM CHI		DEDP
765	T946	65E		P	240	NAM CHI		DEDP
766	T961	242E		Р	240	NAM CHI		DEDP
767	T964	261E		Р	240	NAM CHI		DEDP
768	T978	62E		Р	240	NAM CHI		DEDP
769	T994	58E		Р	240	NAM CHI		DEDP
770	T1002	56E		P	240	NAM CHI		DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (14/26)

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (15/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
771	11011	52E		P	240		NAM CHI		DEDP
772	T1023	296E		Р	240		NAM CHI		DEDP
773	T1038	373E		Р	240		NAM CHI		DEDP
774	T1043	37E		Р	240		NAM CHI		DEDP
775	T1051	384E		Р	240		NAM CHI		DEDP
776	T1060	36E		Р	240		NAM CHI		DEDP
777	T1067	39E		Р	240		NAM CHI		DEDP
778	T1068	45E		Р	240		NAM CHI		DEDP
779	T1069	379E		Р	240		NAM CHI		DEDP
780	T1071	44E		Р	240		NAM CHI		DEDP
781	T1078	15E		Р	240		NAM CHI		DEDP
782	T1079	397E	Kuang	Р	240		NAM CHI		DEDP
783	T1083	20E		Р	240		NAM CHI		DEDP
784	T1093	13E		Р	240		NAM CHI		DEDP
785	T1104	28E		Р	240		NAM CHI		DEDP
786	T1118	410E		Р	240		NAM CHI		DEDP
787	T1133	418E		Р	240		NAM CHI		DEDP
788	T1135	426E		Р	240		NAM CHI		DEDP
789	T5633	T5633	Ang Huai Haeo	G	240		NAM LOEI	LOWER PART OF MA	RID
790	T5660	T5660	Ang Nong Samrong	G	240		HUAI LUANG	HUAI LUANG	RID
791	T5668	T5668	Rung Rang	G	240		NAM SONGKHRA	UPPER PART OF MA	RID
792	T5669	T5669	Huai Sub Kum Ron	G	240		NAM SONGKHRA	LOWER PART OF MA	RID
793	T5704	T5704	Nong Pakho	G	240		NAM CHI	UPPER PART OF LA	RID
794	T5744	T5744	Huai Sai 1	G	240		NAM KAM	NAM PHUNG	RID
795	T5825	T5825	Eksat Sunthon	G	240		NAM CHI	FOURTH PART OF L	RID
796	T6017	T6017	Wang Khla	G	240		NAM MUN	LAM PLAI MAT	RID
797	T521	JA0123602	0	Р	238		HUAI BANG		DEDP
798	T540	JB0323602		Р	238		HUAI MUK		DEDP
799	T745	318E		Р	238		NAM CHI		DEDP
800	T569	JA1022304		Р	237		H.BANG BOT		DEDP
801	T979	262E		Р	237		NAM CHI		DEDP
802	T1139	423E		P	237		NAM CHI		DEDP
803	T551	JA0523801		P	235		H.BANG KOI		DEDP
804	T568	JA0922304		P	235		H BANG BOT		DEDP
805	T621	JA0121102		P	234		NAM HEUNG		DEDP
806	T884	349F	Kravom	P	234		NAM CHI		DEDP
807	T196	J 53002 A6	. a goin	P	232		NAM MUN		DEDP
808	T204	J 53004 A7		P	232		NAM MUN		DEDP
809	T615	JB0223801		P	232		H BANG KOI		DEDP
810	T763	178E		P	232		NAM CHI		DEDP
811	T5727	T5727	Huai Yang	Ġ	232		NAM CHI	LIPPER PART OF LA	RID
812	T451	10/2/	ridai rang	P	230		H BANG BOT		DEDP
813	T466	140722301		P	230		H BANG BOT		
814	T861	1075		P	230				
815	T076	260E		P	230				
816	T854	200L 336E		P	230				
817	T054	271E		P	223				
Q1Q	T000	2005		D	223				
010 910	T624	230L 1A0221201		F D	223				
820	T024	267E		r D	221				
020 924	T1110	102E		ı⁼ D	221				
02 I 822	T1642	F0222201	Ημον Ριι	CMD	221				
022 800	T042	1 50205	lan Tamra	P	220				MOI
821	T/60	100200	van ranna	P	224		H BANG BOT		
024 925	T555	JR0222304		r D	224				
020	1000	JD0022904		٢	224			-	DEDR

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (16/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area (	ha)	River Basin	River Name	Agency
	ID	•	•	Туре	Whole	Dry	Name		
826	T567	JA0423302		P	224		NAM KAM		DEDP
827	T570	JA0122506		Р	224		NAM SONGKH		DEDP
828	T758	106E	Kud Kan	Р	224		NAM CHI		DEDP
829	T797	352E	Kud Fang Dang	Р	224		NAM CHI		DEDP
830	T875	76E		Р	224		NAM CHI		DEDP
831	T895	229E		Р	224		NAM CHI		DEDP
832	T962	359E		Р	224		NAM CHI		DEDP
833	T1013	294E		Р	224		NAM CHI		DEDP
834	T1044	309E		Р	224		NAM CHI		DEDP
835	T1131	428E		Р	224		NAM CHI		DEDP
836	T500	JA0223304		Р	222		NAM KAM		DEDP
837	T536	JA1223103		Р	221		HUAI BANG		DEDP
838	T627	JA0121302		Р	219		NAM HEUNG		DEDP
839	T997	286E		Р	219		NAM CHI		DEDP
840	T483	JA0123701		Р	218		HUAI BANG		DEDP
841	T587	JA0523002		Р	218		NAM SONGKH		DEDP
842	T596	JA0223401		Р	218		HUAI BANG		DEDP
843	T776	324E		Р	218		NAM CHI		DEDP
844	T970	282E		Р	218		NAM CHI		DEDP
845	T185	J 52807 A5		Р	216		NAM MUN		DEDP
846	T194	J 53001 A6		Р	216		NAM MUN		DEDP
847	T2219	D0623001	Huev Nona Khem	G	215		HUAI THUAI		MOI
848	T732	96E		P	214		NAM CHI		DEDP
849	T765	327E		P	214		NAM CHI		DEDP
850	T442	JC0222301		Р	213		H.BANG BOT		DEDP
851	T593	JA0223101		P	213		HUAI HO		DEDP
852	T409	JA0622304		P	211		H.BANG BOT		DEDP
853	T552	JA0623801		Р	211		H.BANG KOI		DEDP
854	T1047	386E		P	211		NAM CHI		DEDP
855	T1094	34E		P	210		NAM CHI		DEDP
856	T1351	C0521401	Suev	GMP	208		NAM LOEI		MOI
857	T1682	B0822403	Huev Khao-lam	G	208		NAM SONGKHRAM		MOI
858	T2453	PW SAOL 1	Ban Sao-lao	GMP	208		HUAI LUANG		MOI
859	T149	J 52208 A2		P	208		NAM MUN		DEDP
860	T159	J 52604 A3		P	208		NAM MUN		DEDP
861	T189	J 52808 A6		P	208		NAM MUN		DEDP
862	T365	JC1121901		P	208		H. KHOK		DEDP
863	T590	JA0123101		P	208		HUAI HO		DEDP
864	T799	165E	Kud Kan	P	208		NAM CHI		DEDP
865	T874	201E		Р	208		NAM CHI		DEDP
866	T987	1E		Р	208		NAM CHI		DEDP
867	T1132	416E		P	208		NAM CHI		DEDP
868	T5634	T5634	Ang Huai Noi	G	208		NAM LOEI	LOWER PART OF MA	RID
869	T5685	T5685	Huai Chieng Yuen	G	208		HUAI HO	EIGHTH PART OF M	RID
870	T5755	T5755	Huai Wang Muang	Ğ	208		NAM KAM	HUAI NAM KAM	RID
871	T396	JA0822301	· · · · · · · · · · · · · · · · · · ·	P	205		H.BANG BOT		DEDP
872	T1075	43E		P	205		NAM CHI		DEDP
873	T133	J 52204 A0		P	203		NAM MUN		DEDP
874	T562	JA1422304		P	203		H.BANG BOT		DEDP
875	T992	259E		P	203		NAM CHI		DEDP
876	T1176	22F	Kud Ke Ped	P	203		NAM CHI		DEDP
877	T427	JA0422301		P	202		H.BANG BOT		DEDP
878	T527	JA0823401		P	202		HUAI BANG		DEDP
879	T584	JA0223002		P	202		NAM SONGKH		DEDP
880	T1520	A0522005	Huev Trad	GMP	200		NAM SUAI		MOI
								•	

Table 2 Irrigation	Area and V	Nater Sources	(Total) of	Thailand	(17/26)
Table 2 In Igauon	Alta allu v	valer Sources	(10tal)01	1 nananu	(1//40)

MRC	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Basin	River Name	Agency
ID		,	Type	Whole	Dry	Name		0,
T2652	L5190145A	Kud Log Nong Bum	GMPT	200		NAM MUN		MOI
T2874	L5180313A	Lum Nam Tao	GMP	200		NAM MUN		MOI
T3638	L5150307A	Huey Sa-no	GMP	200		NAM MUN		MOI
T5295	52709A13	Huay-num-keaw	PT	200		NAM MUN		MOI
T203	J 53004 A7	,	Р	200		NAM MUN		DEDP
T401	JA0121604		Р	200		H.NAM HUAI		DEDP
T726	101E		Р	200		NAM CHI		DEDP
T728	91E		Р	200		NAM CHI		DEDP
T908	205E		Р	200		NAM CHI		DEDP
T940	64E		Р	200		NAM CHI		DEDP
T1086	35E		Р	200		NAM CHI		DEDP
T1147	436E		Р	200		NAM CHI		DEDP
T533	JA0323103		Р	198		HUAI BANG		DEDP
T852	80E		Р	198		NAM CHI		DEDP
T543	JB0123602		Р	197		HUAI SOM P		DEDP
T768	329E		Р	195		NAM CHI		DEDP
T935	245E		Р	195		NAM CHI		DEDP
T1063	46E		Р	195		NAM CHI		DEDP
T350	JA0221901		Р	194		PHU PA HUA		DEDP
T359	JF0121901		Р	194		H. KHOK		DEDP
T840	85E		Р	194		NAM CHI		DEDP
T869	74E		Р	194		NAM CHI		DEDP
T876	346E		Р	194		NAM CHI		DEDP
T1	J 50501		Р	192		NAM MUN		MOI
T2	J 50504		Р	192		NAM MUN		MOI
T3	J 50604		Р	192		NAM MUN		MOI
T5	J 50203		Р	192		NAM MUN		MOI
T6	J 50203		Р	192		NAM MUN		MOI
T7	J 50203		Р	192		NAM MUN		MOI
T8	J 50203		Р	192		NAM MUN		MOI
T16	J 50605		Р	192		NAM MUN		MOI
T17	J 50605		Р	192		NAM MUN		MOI
T18	J 50701		Р	192		NAM MUN		MOI
T19	J 50701		Р	192		NAM MUN		MOI
T20	J 50902		Р	192		NAM MUN		MOI
T30	J 51005		Р	192		NAM MUN		MOI
T31	J 51005		Р	192		NAM MUN		MOI
T32	J 51005		Р	192		NAM MUN		MOI
T33	J 51005		Р	192		NAM MUN		MOI
T34	J 51005		Р	192		NAM MUN		MOI
T35	J 51005		Р	192		NAM MUN		MOI
T41	J 51106		Р	192		NAM MUN		MOI
T42	J 51106		Р	192		NAM MUN		MOI
T43	J 51106		Р	192		NAM MUN		MOI
T44	J 51106		Р	192		NAM MUN		MOI
T45	J 51106		Р	192		NAM MUN		MOI
T88	J 51603		Р	192		NAM MUN		MOI
T89	J 51603		Р	192		NAM MUN		MOI
T90	J 51607		Р	192		NAM MUN		MOI
T91	J 51607		Р	192		NAM MUN		MOI
T92	J 51607		Р	192		NAM MUN		MOI
T93	J 51607		Р	192		NAM MUN		MOI
T94	J 51607		Р	192		NAM MUN		MOI
T95	J 51607		Р	192		NAM MUN		MOI
T96	J 51607		Р	192		NAM MUN		MOI

 196
 J 51607
 P
 192
 NAIM IV

 I): \*: only RID large and medium projects, \*\*: excluding 5,787 RID small projects
 2)
 G: gravity, P: fixed pump, M: mobile pump, T: traditional lift

 e: Land Resources Inventory for Agricultural Development, February 2002, MRC

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (18/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID			Туре	Whole	Dry	Name		
936	T97	J 51607		Р	192		NAM MUN		MOI
937	T98	J 51607		P	192		NAM MUN		MOI
938	199	J 51607		Р	192		NAM MUN		MOI
939	T100	J 51607		Р	192				MOI
940	1101 T100	J 51607		Р	192				MOI
941	T102	J 51607		Р	192				MOI
942	T103	J 51607		P D	192				MOI
943	T104	J 51607		г D	192				MOI
944	T105	151607		P	192				MOI
946	T100	J 51607		P	192		NAM MUN		MOI
947	T108	151607		P	192		NAM MUN		MOI
948	T109	J 51701		P	192		NAM MUN		MOI
949	T119	J 52104		P	192		NAM MUN		MOI
950	T127	J 52110		Р	192		NAM MUN		MOI
951	T128	J 52110		Р	192		NAM MUN		MOI
952	T1201	A1221402	Namlon-huey Puan	G	192		NAM LOEI		MOI
953	T1360	E0321402	Huey Nam-puan	GMP	192		NAM LOEI		MOI
954	T1670	A0222402	Ban Dong Tong	G	192		NAM SONGKHRAM		MOI
955	T1676	B0222403	Huey Wang-oy-noo	GMP	192		NAM SONGKHRAM		MOI
956	T1677	B0322403	Huey Wang-oy-noo	GMP	192		NAM SONGKHRAM		MOI
957	T1678	B0422403	Huey Wang-oy-noo	G	192		NAM SONGKHRAM		MOI
958	T1681	B0722403	Huey Khao-lam(le	GMP	192		NAM SONGKHRAM		MOI
959	T1821	B0222903	Huey Sra-fai	G	192		NAM SONGKHRAM		MOI
960	T1946	A0823302	Huey Kwai Nam	G	192		NAM KAM		MOI
961	T2593	L5190132A	Nam Lon	GMP	192		NAM MUN		MOI
962	T3831	L5210316A	Huey Cham Roeng	GMP	192		NAM MUN		MOI
963	13854	L5210317A	Huey Cham Rae	GMP	192		NAM MUN		MOI
964	15289	52709A07	Huay-suan-pa	PI	192				MOI
965	T132	J 52204 AU		P	192				DEDP
966	T139	J 53002 A7		P	192				
907	T145	J 52207 C1		г D	192				
960	T158	1 52604 A3		P	102				
970	T168	J 52709 Δ4		P	192				
971	T169	J 52709 A4		P	192		NAM MUN		DEDP
972	T170	J 52709 A4		P	192		NAM MUN		DEDP
973	T183	J 52801 A5		P	192		NAM MUN		DEDP
974	T197	J 53002 A6		Р	192		NAM MUN		DEDP
975	T198	J 53002 A7		Р	192		NAM MUN		DEDP
976	T199	J 53002 A7		Р	192		NAM MUN		DEDP
977	T200	J 53002 A7		Р	192		NAM MUN		DEDP
978	T225	J 52303 A0		Р	192		NAM MUN		DEDP
979	T226	J 52303 A0		Р	192		NAM MUN		DEDP
980	T232	J 52305 C0		Р	192		NAM MUN		DEDP
981	T357	JB0121901		Р	192		H. KHOK		DEDP
982	T363	JG0221901		Р	192		H. KHOK		DEDP
983	T430	JC0922301		Р	192		H.BANG BOT		DEDP
984	T457	JC0222302		P	192		H.BANG BOT		DEDP
985	1462	JA0522304		Р	192		H.BANG BOT		DEDP
986	1475	JA0623202		P	192				DEDP
987	1487 TE10	JA0223305		Р	192				DEDP
988	1510 TE75	JDU223504		۲ P	192				
989	10/5	JA1722304		Р Р	192				
990	1003	JAU023103		۲ 	192		HUAI DAING		DEDP

<b>Table 2 Irrigation Area and</b>	l Water Sources	(Total) of	Thailand	(19/26)
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No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID	-	-	Туре	Whole	Dry	Name		
991	T700	PJA0121501		Р	192		NAM LOEI		DEDP
992	T715	123E		Р	192		NAM CHI		DEDP
993	T716	124E		Р	192		NAM CHI		DEDP
994	T718	92E		Р	192		NAM CHI		DEDP
995	T719	128E		Р	192		NAM CHI		DEDP
996	T720	315E		Р	192		NAM CHI		DEDP
997	T721	130E		Р	192		NAM CHI		DEDP
998	T722	95E		Р	192		NAM CHI		DEDP
999	T723	316E		P	192		NAM CHI		DEDP
1000	T724	98E		P	192		NAM CHI		DEDP
1001	1727	94E		Р	192		NAM CHI		DEDP
1002	1731	93E		Р	192		NAM CHI		DEDP
1003	1733	320E		Р	192		NAM CHI		DEDP
1004	1735	103E		P	192				DEDP
1005	1739	99E		P	192				DEDP
1006	1740	121E		Р	192				DEDP
1007	1743	319E		P	192				DEDP
1008	1746	122E		Р	192				DEDP
1009	1761	107E		Р	192				DEDP
1010	1764	176E		P	192				DEDP
1011	1760	179E		Р	192				
1012	1709	330E		P	192				
1013	T774	142E		P D	192				
1014	T770	1020			192				
1015	1770 T700	100E		P D	192				
1010	T794	103E 254E		г D	192				
1017	T797	112E		Г	192				
1010	T700	100E		P	192				
1013	T792	108E		P	192		NAM CHI		
1020	T703	100E		P	102				
1021	T796	326E		P	192		NAM CHI		DEDP
1023	T800	170E		P	192		NAM CHI		DEDP
1020	T807	114F		P	192		NAM CHI		DEDP
1025	T811	149F		P	192		NAM CHI		DEDP
1026	T814	163E		P	192		NAM CHI		DEDP
1027	T821	134E		P	192		NAM CHI		DEDP
1028	T825	140E		P	192		NAM CHI		DEDP
1029	T829	139E		P	192		NAM CHI		DEDP
1030	T832	136E		Р	192		NAM CHI		DEDP
1031	T834	135E		Р	192		NAM CHI		DEDP
1032	T835	160E		Р	192		NAM CHI		DEDP
1033	T842	131E		Р	192		NAM CHI		DEDP
1034	T851	81E		Р	192		NAM CHI		DEDP
1035	T853	358E		Р	192		NAM CHI		DEDP
1036	T860	75E		Р	192		NAM CHI		DEDP
1037	T880	351E		Р	192		NAM CHI		DEDP
1038	T883	214E		Р	192		NAM CHI		DEDP
1039	T889	75E		Р	192		NAM CHI		DEDP
1040	T891	361E		Р	192		NAM CHI		DEDP
1041	T913	70E		Р	192		NAM CHI		DEDP
1042	T919	209E		Р	192		NAM CHI		DEDP
1043	T921	69E		Р	192		NAM CHI		DEDP
1044	T926	73E		Р	192		NAM CHI		DEDP
1045	T934	71E		Р	192		NAM CHI		DEDP

No. MF	C Projec	t ID Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
10	) ,	-	Туре	Whole	Dry	Name		
1046 T93	6 263E		Р	192		NAM CHI		DEDP
1047 T93	7 266E		Р	192		NAM CHI		DEDP
1048 T94	7 273E		Р	192		NAM CHI		DEDP
1049 T95	6 10E		Р	192		NAM CHI		DEDP
1050 T95	8 269E		Р	192		NAM CHI		DEDP
1051 T96	5 367E		Р	192		NAM CHI		DEDP
1052 T96	7 279E		Р	192		NAM CHI		DEDP
1053 T96	8 11E		Р	192		NAM CHI		DEDP
1054 T97	2 63E		Р	192		NAM CHI		DEDP
1055 T98	0 362E		Р	192		NAM CHI		DEDP
1056 T98	2 363E		Р	192		NAM CHI		DEDP
1057 T98	3 276E		Р	192		NAM CHI		DEDP
1058 T98	4 3E		Р	192		NAM CHI		DEDP
1059 T98	5 60E		Р	192		NAM CHI		DEDP
1060 T98	6 277E		Р	192		NAM CHI		DEDP
1061 T98	8 293E		P	192		NAM CHI		DEDP
1062 T99	0 292E		Р	192		NAM CHI		DEDP
1063 T99	5 364E		Р	192		NAM CHI		DEDP
1064 T99	8 57E		P	192		NAM CHI		DEDP
1065 110	00 2E		P	192		NAM CHI		DEDP
1066 T10	03 291E		P	192		NAM CHI		DEDP
1067 110	04 54E		Р	192		NAM CHI		DEDP
1068 110	06 55E		Р	192				DEDP
1069 110	07 365E		P	192				DEDP
1070 110	14 369E		Р	192				DEDP
1071 110	16 53E		P	192				DEDP
1072 T10	17 368E		P	192				DEDP
1073 110	20 51E		Р	192				
1074 T10	21 370E		P D	192				
1075 T10	22 300E			192				
1070 T10	30 0E		г D	192				
1077 T10	10 376E		Г D	192				
1078 T10	40 370L		Г D	192				
1079 T10	42 372L		P	192				
1081 T10	53 QE		P	102				
1082 T10	56 8E		P	192		NAM CHI		
1083 T10	61 7E		P	192		NAM CHI		
1084 T10	54 380E		P	192		NAM CHI		
1085 T10	74 41F		P	192		NAM CHI		DEDP
1086 T10	77 16F		P	192		NAM CHI		DEDP
1087 T10	R2 14F		P	192		NAM CHI		DEDP
1088 T10	90 33E		P	192		NAM CHI		DEDP
1089 T10	92 22F		P	192		NAM CHI		DEDP
1090 T10	96 396E		P	192		NAM CHI		DEDP
1091 T10	99 21E		P	192		NAM CHI		DEDP
1092 T11	00 27E		P	192		NAM CHI		DEDP
1093 T11	02 29E		Р	192		NAM CHI		DEDP
1094 T11	03 30E		Р	192		NAM CHI		DEDP
1095 T11	05 25E		Р	192		NAM CHI		DEDP
1096 T11	11 31E		Р	192		NAM CHI		DEDP
1097 T11	13 402E		Р	192		NAM CHI		DEDP
1098 T11	22 420E		Р	192		NAM CHI		DEDP
1099 T11	30 419E		Р	192		NAM CHI		DEDP
1100 T11	43 432E		Р	192		NAM CHI	_	DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (20/26)

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (21/26)

No. MRC	Project ID	Project Name	Irr.	Irr. Area (	ha)	River Basin	River Name	Agency
ID			Туре	Whole	Dry	Name		
1101 T5786	5 T5786	Nong Ma Chok	G	192		NAM CHI	LOWER PART OF LA	RID
1102 T463	JA0322304		Р	190		H.BANG BOT		DEDP
1103 T631	JA0121601		Р	190		H.NAM HUAI		DEDP
1104 T137	J 52205 A0		Р	189		NAM MUN		DEDP
1105 T243	PJ 52506 A		Р	189		NAM MUN		DEDP
1106 T284	PJ 52506 A		Р	189		NAM MUN		DEDP
1107 T588	JA0323102		Р	187		HUAI HO		DEDP
1108 T179	J 52710 A5		Р	186		NAM MUN		DEDP
1109 T517	JA0323602		P	186		HUAI BANG		DEDP
1110 T620	JB0123804		Р	186		H.BANG KOI		DEDP
1111 T933	272E		Р	186		NAM CHI		DEDP
1112 T36	J 51102		Р	184		NAM MUN		MOI
1113 T156	J 52210 B2		P	184		NAM MUN		DEDP
1114 T157	J 52210 B2		P	184		NAM MUN		DEDP
1115 T411	JA0122405		P	184		NAM SONGKH		DEDP
1116 T435	JC0522301		P	184		H BANG BOT		
1117 T485	JA0823002		P	184				
1118 T489	140323305		P	184		ΝΔΜΚΔΜ		
1110 T409	140423306		P	18/				
1120 T535	101123103		P	184				
1120 T505	100123401		D	194				
1121 1393	77E		F D	194				
1122 1003	2025			104				
1123 1003	202E			104				
1124 1099	220E			104				
1125 1112	404E			104				
1120 11124	+ 414E			104				
1127 11027	37 IE			102				
1120 1011	JAU622304			101				
1129 11123	413E			101				
1130 1754	100E	Liver New Trees	P	170				DEDP
1131 1227	AU223103	Huey Nam Teang	G	176				
1132 T178	J 52710 A5		P	176				
1133 1186	J 52808 A5		P	176				DEDP
1134 1192	J 53001 A6		Р	176				DEDP
1135 1455	JB0122302		Р	176		H.BANG BOT		DEDP
1136 1477	JA0323202		P	176				DEDP
1137 1520	JA0223602		Р	176		HUAI BANG		DEDP
1138 1582	JA0123002		Р	176		NAM SONGKH		DEDP
1139 1969	274E		Р	176		NAM CHI		DEDP
1140 1578	5 15785	Bung Aram	G	176		NAM CHI	LOWER PART OF LA	RID
1141 15824	15824	Nong Bo	G	176		NAM CHI	FOURTH PART OF L	RID
1142 1380	JC0721901		Р	174		H. KHOK		DEDP
1143 1461	JA0422304		Р	174		H.BANG BOT		DEDP
1144 T537	JB0523602		Р	173		HUAI MUK		DEDP
1145 T344	JA0121803		Р	170		HUAI MONG		DEDP
1146 T434	JC1022301		Р	170		H.BANG BOT		DEDP
1147 1102	50E		Р	170		NAM CHI		DEDP
1148 T166	J 52707 B3		Р	168		NAM MUN		DEDP
1149 T205	J 53004 A7		Р	168		NAM MUN		DEDP
1150 T345	JA0121806		Р	168		HUAI MONG		DEDP
1151 T539	JB0423602		Р	168		HUAI MUK		DEDP
1152 T617	JB0123801		Р	168		H.BANG KOI		DEDP
1153 T868	333E		Р	168		NAM CHI		DEDP
1154 T916	208E		Р	168		NAM CHI		DEDP
1155 T446	JA0422302		Р	166		H.BANG BOT	-	DEDP

# Table 2 Irrigation Area and Water Sources (Total) of Thailand (22/26)

No. N	MPC	Project ID	Project Name	Irr	Irr Aroa (k	22)	Pivor Basin	Pivor Namo	Agonov
NO. 1		FIOJECTID	FIOJECTINAILE			Drv	Name		Agency
1156 T	5666	T5666	Huai Sam	G	166	Diy		LIPPER PART OF MA	RID
1157 T	618	10000	nual Gam	P	165				
1158 T	7/0	172E		P	162				
1150 T	1100	A1021/02	Nam Lon	GMP	160				
1160 T	1252	A0521202	Huov Nom-khom	GMD	160				MOI
1161 T	1255	R0321303		GMP	160				MOI
1162 T	1200	A0821507	Huey Nam Lai	GMP	160				MOI
1162 T	1200	A0521601		GMD	160				MOI
1164 T	1320	A0521001	Huey Nam-huey	GIVIF	160				MOI
1165 T	1363	E0521402		G	160				MOI
1166 T	1368	Δ0021507	Huey Nam-lai	G	160				MOI
1167 T	1374	R0321507	Huov Klom	CMP	160				MOI
1160 T	1374	C0221002	Huey Mone(2 Vear	GMP	160				MOI
1160 T	1441	A0921803	Huey Wone 2 Teal	GMP	160				MOI
1170 T	1470	R0621804		G	160				MOI
1170 T	1470	C0222105	Huey Haew	CMP	160				MOI
1170 T	1640	A0322401	Huey Nam Sum Huey Song krom/b	GMP	160				MOI
1172 T	1045	C0222401		CMD	160				MOI
1173 T	1703	E0122801		GIVIF	160				MOI
1174 I 1175 T	2152	E0122001	Na-uan-noy Nam Lon	GMP	160				MOI
1176 1	2102	0222304	Huov Pong Huok/t	CMD	160				MOI
1170 14	2290	D SIEW 1			160				MOI
1170 T	2339		Huey Seaw		160				MOI
1170 T	2341		Huoy Nom Bor	MDT	160				MOI
1100 T	2304		Huey Nam Doi		160				MOI
1100 14	2319		Ron Song Too		160				MOI
1101 14 1102 T	2300	151201020	Huov Loop Muona	GMP	160				MOI
1102 12	2000	L5120102A		CMD	160				MOI
1103 14	2035	L5140259A	Lum Plub-plo	GMP	160				MOI
1104 T	2360	L5160713C	Kud Log Nong Nom	CMDT	160				MOI
1105 1	2261	L5160713C	Kud Log Nong Nam	CMPT	160				MOI
1100 1	2072	L5100713C	Klong The Long		160				MOI
1100 1	2072	L5080512A	Klong Tha Lang	CMPT	160				MOI
1100 T	1001	E3000312A	Nom Lon	CMD	160				MOI
1109 T	4234	52502C07		GMP	160				MOI
1101 T	4702	52506006	Nom Lon Huoy yon	GMP	160				MOI
1102 T	4711	52003400	Huav-fund-ne	DT	160				MOI
1102 T	5151	52603B02	Huay-lung-pe	GMP	160				MOI
110/ T	5210	52703B06	Huay-ki0y	GMP	160				MOI
1105 T	5213	52704B06	Huay-barn	DT	160				MOI
1106 T	5290	52709408	Huay-bann Huay-poon-kor	PT	160				MOI
1107 T	5206	52709A00	Huov Sai	G	160				MOI
1108 T	5367	52806405	Huay-tee	GMP	160				MOI
1100 T	5380	52000A03	I hai thung	DT	160				MOI
1200 T	1/3	152809 46	Linal-triang	P	160				
1200 T	143	1522003 A0		P	160				
1201 T	160	152604 43		P	160				
1202 T	164	1 52707 B3		P	160				
1200 T	171	1 52709 44		P	160		NAM MUN		
1204 T	172	1 52709 44		P	160		NAM MUN		
1206 T	172	152700 R/		P	160				
1200 T	180	152710 Δ5		P	160				
1208 T	190	1 52809 A6		P	160		NAM MUN		DEDP
1200 T	193	153001 46		P	160		NAM MUN		
1210 T	206	J 53004 A7		P	160		NAM MUN		DEDP
Noto:1):	*: 00		d modium projecto ***	ı ovoludir		mall	projecto		

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (23/26)

No. M	RC Project	ID Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	D		Туре	Whole	Dry	Name		
1211 T20	)7 J 53005 A	47	Р	160		NAM MUN		DEDP
1212 T22	28 J 52303 A	40	Р	160		NAM MUN		DEDP
1213 T22	29 J 52303 A	40	Р	160		NAM MUN		DEDP
1214 T23	J 52305 C	20	Р	160		NAM MUN		DEDP
1215 T33	34 JA012170	)2	Р	160		HUAI NAM S		DEDP
1216 T33	35 JA022170	01	Р	160		HUAI NAM S		DEDP
1217 T33	36 JA012170	01	Р	160		HUAI NAM S		DEDP
1218 T33	38 JB012170	01	Р	160		HUAI NAM S		DEDP
1219 T34	0 JA012170	03	Р	160		HUAI NAM S		DEDP
1220 T34	2 JA062190	01	Р	160		HUAI NAM S		DEDP
1221 T34	3 JA012180	)4	Р	160		HUAI MONG		DEDP
1222 T34	6 JA042190	01	Р	160		PHU PA HUA		DEDP
1223 T37	2 JC092190	01	Р	160		H. KHOK		DEDP
1224 T37	74 JA012200	05	P	160		NAM SUAI		DEDP
1225 T37	75 JA032200	)5	P	160		NAM SUAI		DEDP
1226 T37	78 JC022200	05	P	160		NAM SUAI		DEDP
1227 T37	79 JB012200	)5	P	160		NAM SUAI		DEDP
1228 T38	C 02012200	74	P	160		HUALLUANG		
1220 130		)5 )5	P	160		NAM SUAL		
1220 T38		35 14	P	160		HUALLUANG		
1230 130		) <del>,</del>	D I	160				
1231 130			Г	160				
1232 133	1 IA012210	7	Г	160				
1233 138	1 JA012210	7	Г	160				
1234 135	2 JA0J2210		г	160				
1235 138			P D	160				
1230 138			P D	160				
1237 138		J7	P	160				DEDP
1230 140		J/ 4	P D	160				
1239 140			P	160				
1240 140	)7 JAU22290	J4	P	160		NAM SONGKH		DEDP
1241 141	2 JA022240	J5	Р	160		NAM SONGKH		DEDP
1242 141	3 JA042240	J5	Р	160		NAM SONGKH		DEDP
1243 141	8 JA012290	JZ	P	160		NAM SONGKH		DEDP
1244 142	20 JA042290	)2	Р	160		NAM SONGKH		DEDP
1245 142	23 JA022250	)4	Р	160		NAM SONGKH		DEDP
1246 142	26 JA022290	03	Р	160		NAM SONGKH		DEDP
1247 142	28 JA052230	)1	Р	160		H.BANG BOT		DEDP
1248 143	32 JC112230	01	Р	160		H.BANG BOT		DEDP
1249 143	37 JC132230	01	Р	160		H.BANG BOT		DEDP
1250 144	0 JD012230	01	Р	160		H.BANG BOT		DEDP
1251 T44	1 JC042230	01	Р	160		H.BANG BOT		DEDP
1252 T44	I8 JA012260	01	Р	160		NAM SONGKH		DEDP
1253 T45	50 JA022260	01	Р	160		NAM SONGKH		DEDP
1254 T45	59 JC032230	02	Р	160		H.BANG BOT		DEDP
1255 T46	54 JA062230	01	Р	160		H.BANG BOT		DEDP
1256 T47	'1 JA022320	02	Р	160		NAM KAM		DEDP
1257 T47	2 JA062330	02	Р	160		NAM KAM		DEDP
1258 T48	30 JA082320	02	Р	160		NAM KAM		DEDP
1259 T48	31 JA012330	01	Р	160		NAM KAM		DEDP
1260 T48	32 JA052330	)2	Р	160		NAM KAM		DEDP
1261 T48	34 JA072330	05	Р	160		NAM KAM		DEDP
1262 T48	36 JA012330	05	Р	160		NAM KAM		DEDP
1263 T49	0 JB022330	05	Р	160		NAM KAM		DEDP
1264 T50	)2 JA032330	)4	Р	160		NAM KAM		DEDP
1265 T52	24 JB032340	)1	Р	160		HUAI BANG		DEDP

No. MRC	Project ID	Project Name	Irr.	Irr. Area (	ha)	River Basin	River Name	Agency
ID	•	•	Туре	Whole	Dry	Name		0,
1266 T525	JA0123306		P	160		HUAI BANG		DEDP
1267 T529	JA0323401		Р	160		HUAI BANG		DEDP
1268 T532	JA1023401		Р	160		HUAI BANG		DEDP
1269 T541	JB0623602		Р	160		HUAI MUK		DEDP
1270 T550	JA0423801		Р	160		H.BANG KOI		DEDP
1271 T556	JA0522904		Р	160		NAM SONGKH		DEDP
1272 T557	JA0422904		Р	160		NAM SONGKH		DEDP
1273 T559	JB0422904		Р	160		NAM SONGKH		DEDP
1274 T576	JA2122304		Р	160		H.BANG BOT		DEDP
1275 T592	JB0122502		Р	160		NAM SONGKH		DEDP
1276 T600	JA1023103		Р	160		HUAI BANG		DEDP
1277 T604	JA1623103		Р	160		HUAI BANG		DEDP
1278 T606	JA0523103		Р	160		HUAI BANG		DEDP
1279 T616	JB0323801		Р	160		H.BANG KOI		DEDP
1280 T628	JA0221302		Р	160		NAM HEUNG		DEDP
1281 T629	JA0121303		Р	160		NAM HEUNG		DEDP
1282 T634	JB0121601		Р	160		PHU LUONG		DEDP
1283 T635	JB0121503		Р	160		NAM LOEI		DEDP
1284 T639	JA0421509		Р	160		NAM LOEI		DEDP
1285 T644	JA0521509		Р	160		NAM LOEI		DEDP
1286 T648	JC0121503		Р	160		NAM LOEI		DEDP
1287 T691	PJA0123306		Р	160		HUAI BANG		DEDP
1288 T705	PJA0321503		Р	160		NAM LOEI		DEDP
1289 T706	PJB0421503		Р	160		NAM LOEI		DEDP
1290 T717	317E		Р	160		NAM CHI		DEDP
1291 T738	102E		Р	160		NAM CHI		DEDP
1292 T770	171E		Р	160		NAM CHI		DEDP
1293 T775	143E		Р	160		NAM CHI		DEDP
1294 T781	145E		Р	160		NAM CHI		DEDP
1295 T788	353E		Р	160		NAM CHI		DEDP
1296 T801	187E		Р	160		NAM CHI		DEDP
1297 T802	115E		Р	160		NAM CHI		DEDP
1298 T809	154E		Р	160		NAM CHI		DEDP
1299 T816	162E		Р	160		NAM CHI		DEDP
1300 T817	152E		Р	160		NAM CHI		DEDP
1301 T819	156E		Р	160		NAM CHI		DEDP
1302 T820	153E		Р	160		NAM CHI		DEDP
1303 T827	341E		Р	160		NAM CHI		DEDP
1304 T831	137E		P	160		NAM CHI		DEDP
1305 T839	357E		Р	160		NAM CHI		DEDP
1306 T847	337E		Р	160		NAM CHI		DEDP
1307 T849	89E		P	160		NAM CHI		DEDP
1308 T859	194E		P	160		NAM CHI		DEDP
1309 T862	340E		Р	160		NAM CHI		DEDP
1310 T863	343E		P	160		NAM CHI		DEDP
1311 T872	350E		P	160		NAM CHI		DEDP
1312 T894	248E		P	160		NAM CHI		DEDP
1313 T902	72F		P	160		NAM CHI		DEDP
1314 T923	360F		P	160		NAM CHI		DEDP
1315 T957	283E		P	160		NAM CHI		DEDP
1316 T959	238E		P	160		NAM CHI		DEDP
1317 T966	270E		P	160		NAM CHI		DEDP
1318 T974	241E		P	160		NAM CHI		DEDP
1319 T1009	5E		P	160		NAM CHI		DEDP
1320 T1015	299F		Р	160		NAM CHI		DEDP
1020 11010				100			_	

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (25/26)

No. MR	C Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
IC			Туре	Whole	Dry	Name		
1321 T103	4 47E		Р	160		NAM CHI		DEDP
1322 T103	9 48E		Р	160		NAM CHI		DEDP
1323 T104	1 308E		Р	160		NAM CHI		DEDP
1324 T109	1 23E		Р	160		NAM CHI		DEDP
1325 T111	6 12E		Р	160		NAM CHI		DEDP
1326 T112	7 415E		Р	160		NAM CHI		DEDP
1327 T114	2 434E		Р	160		NAM CHI		DEDP
1328 T563	5 T5635	Ang Huai Nam Pao	G	160		NAM LOEI	LOWER PART OF MA	RID
1329 T567	0 T5670	Ban Dong Ma Fai	G	160		NAM SONGKHRA	LOWER PART OF MA	RID
1330 T568	0 T5680	Ban Ta Yeam	G	160		NAM SONGKHRA	HUAI NAM YAM	RID
1331 T570	8 T5708	Kok Poo Mai 2	G	160		NAM SONGKHRA	HUAI NAM UN	RID
1332 T575	1 T5751	Huai Rai	G	160		HUAI BANG SA	HUAI BANG SAI	RID
1333 T581	9 T5819	Huai Sai	G	160		NAM CHI	THIRD PART OF LA	RID
1334 T587	0 T5870	Nong Lao Hin	G	160		NAM CHI	LOWER PART OF LA	RID
1335 T289	0 L5190137A	Nam Lon	GMP	157		NAM MUN		MOI
1336 T260	1 L5190142A	Lum Huev Kud-kan	GMPT	152		NAM MUN		MOI
1337 T4	J 50202		P	144		NAM MUN		MOI
1338 T150	4 A0722002	Huev Thong	GMP	144		NAM SUAI		MOI
1339 T198	1 A0123305	Nong Kood Klab	G	144		NAM KAM		MOI
1340 T218	6 C0522506	Huev Pla-fa	Ğ	144		NAM SONGKHRAM		MOI
1341 T210	5 B0222904	Nam I on Huev-van	GMP	144		NAM SONGKHRAM		MOI
1342 T232	0 D0323303	Huev Phai	GMP	144		NAM KAM		MOI
1343 T532	6 52802B08	Huay-pra-lao	GMP	144				MOI
1344 T154	L 52210 B2	riday più iao	P	144				
1345 T337			P	144		HILALNAMS		
1346 T604	140623103		P	144				
1340 T000	1255		P	144				
1347 T/12	0 105		D	144				
1340 T58	3 43L 3 T5222	Pong Hup Chang	F	144				
1349 T302	7 8022204	Ron Vang	GMP	132				MOI
1251 751	0 50701007	Nom Lon Huov von	CMD	132				MOI
1351 T511	0 J2/01A0/	Hugi Noi	GIVIF	132				
1352 136	2 10093	Huai Nui	G	130				
1353 1124	6 C0001600		CMD	120				
1354 1137	6 CU2216U2		GIVIP	120				
1355 1175	D DUZZZOUS	Huey Pa-wan	G	120				
1350 11/5	0 AUZZZ6UZ		CMD	120				MOI
1357 1164		Huey Kham Pang	GIVIP	120				MOI
1358 1247	0 L5200256A	Nam Lon	GIVIP	128				MOI
1359 1280	8 L5180238B	Nong Hin Khao Kao Dana	GIVIP	128				MOI
1360 1352		Naa kia Dong	GIVIP	120				
1361 1504	A R SAKA 1	Nong-sarm-кпа	IVIP I	128				MOI
1362 1513	0 52601B02	Ang-Inai	G	128		NAM MUN		MOI
1363 1524	3 52704B05	Sume-ni-were	GMP	128		NAM MUN		MOI
1364 1529	1 52709A09	Nong-tao		128		NAM MUN		MOI
1365 1532	4 52802B06	Huay-kum-lai	PI	128		NAM MUN		MOI
1366 1230	J 52303 A0		Р	128		NAM MUN		DEDP
1367 1356	JE0121901		Р	128		H. KHUK		DEDP
1368 1367	JC0821901		Р	128		H. KHOK		DEDP
1369 1385	JD0122005		Р	128		NAM SUAI		DEDP
1370 T415	JA0122502		Р	128		NAM SONGKH		DEDP
1371 T416	JA0222502		P	128		NAM SONGKH		DEDP
1372 T419	JA0222902		P	128		NAM SONGKH		DEDP
1373 T436	JC0722301		Р	128		H.BANG BOT		DEDP
1374 T469	JA0123202		Р	128		NAM KAM		DEDP
1375 T578	JA0123702		Р	128		HUAI BANG		DEDP

#### Table 2 Irrigation Area and Water Sources (Total) of Thailand (26/26)

No.	MRC	Project ID	Project Name	Irr.	Irr. Area	(ha)	River Basin	River Name	Agency
	ID	,		Type	Whole	Drv	Name		
1376 T	Г <b>7</b> 02	PJA0121504		P	128	,	NAM LOEI		DEDP
1377 T	Г896	345E		Р	128		NAM CHI		DEDP
1378 T	Г1033	38E		Р	128		NAM CHI		DEDP
1379 T	Г5835	T5835	Nong Hai	G	128		NAM MUN	LAM SIEO THAN	RID
1380 T	Г5941	T5941	Ba E-tan	G	128		NAM MUN	LAM PHRAPHLONG	RID
1381 T	Г1727	A0322501	Huey Rai	GMP	126		NAM SONGKHRAM		MOI
1382 T	Г4196	52301B30	Kud Log Nong Nam	GMPT	125		NAM MUN		MOI
1383 T	Г1354	C0321402	Namlon-huey Puan	GMP	123		NAM LOEI		MOI
1384 T	Г2044	D0623306	Nong Doog	G	120		NAM KAM		MOI
1385 T	Г2058	F0223306	Nong E-tood	GMPT	120		NAM KAM		MOI
1386 T	Г3030	L5170117B	Lum Plub Pla	GMP	120		NAM MUN		MOI
1387 T	Г5379	52806C02	Huay-num-come	PT	120		NAM MUN		MOI
1388 T	Г505	JA0923306	-	Р	120		NAM KAM		DEDP
1389 T	Г5875	T5875	Sra Saming	G	120		NAM MUN	LAM SA	RID
1390 T	Г5338	52802C10	Num-lon-huay-ja-	GMP	119		NAM MUN		MOI
1391 T	Г5863	T5863	Lung Pung	G	118		NAM MUN	SECOND PART OF L	RID
1392 T	Г1750	C0222502	Huey Kad-noy	G	115		NAM SONGKHRAM		MOI
1393 T	F526	JB0223401		Р	114		HUAI BANG		DEDP
1394 T	Г22	J 51004		Р	112		NAM MUN		MOI
1395 T	Г23	J 51004		Р	112		NAM MUN		MOI
1396 T	Г24	J 51004		Р	112		NAM MUN		MOI
1397 T	Г25	J 51004		Р	112		NAM MUN		MOI
1398 T	Г26	J 51004		Р	112		NAM MUN		MOI
1399 T	Г27	J 51004		Р	112		NAM MUN		MOI
1400 T	Г28	J 51004		Р	112		NAM MUN		MOI
1401 T	Г29	J 51004		Р	112		NAM MUN		MOI
1402 T	Г1458	A0721803	Huey Mong	GMP	112		HUAI MONG		MOI
1403 T	Г1919	A0423202	Na Phang	G	112		NAM KAM		MOI
1404 T	Г1920	A0523202	Huey Na Phang	GMP	112		NAM KAM		MOI
1405 T	Г2261	D0123102	Huey Bang Kor	GMP	112		HUAI HO		MOI
1406 T	Г2302	A0523302	Huey Tong	GMP	112		NAM KAM		MOI
1407 T	Г2896	L5140241A	Rueng Mon	GMP	112		NAM MUN		MOI
1408 T	Г3015	L5170108A	Nam Lon	GMP	112		NAM MUN		MOI
1409 T	Г5105	52207B03	Huay-pub	GMP	112		NAM MUN		MOI
1410 T	Г5359	52805A06	Huay-hin-lhek-fa	PT	112		NAM MUN		MOI
1411 T	Г5383	52806C06	Huay-Ihai	G	112		NAM MUN		MOI
1412 T	F227	J 52303 A0		Р	112		NAM MUN		DEDP
1413 T	Г494	JB0423305		Р	112		NAM KAM		DEDP
1414 T	Г554	JA0823801		Р	112		H.BANG KOI		DEDP
1415 T	Г581	JA1822304		Р	112		H.BANG BOT		DEDP
1416 T	Г5632	T5632	Huai Nam Wak	G	112		NAM HEUNG	FOURTH PART OF M	RID
1417 T	Г5879	T5879	Nong Kok	G	112		NAM MUN	LAM CHOENGKRAI	RID
1418 T	Г1679	B0522403	Wang Duan Ha	GMP	104		NAM SONGKHRAM		MOI
1419 T	Г1680	B0622403	Wang Duan Ha	G	104		NAM SONGKHRAM		MOI
1420 T	Г5298	52801A01	Nong Song-hong	PT	104		NAM MUN		MOI
1421 T	Г5325	52802B07	Ta-nang	PT	104		NAM MUN		MOI
1422 T	Г5352	52804A13	Pone-ngam	PT	104		NAM MUN		MOI
1423 T	Г467	JA0122304		Р	104		H.BANG BOT		DEDP
1424 T	Г447	JA0322302		Р	101		H.BANG BOT		DEDP
1425 T	Г1747	B0422502	Huey Tuey	G	100		NAM SONGKHRAM		MOI
1426 T	Г2604	L5120315B	Kud Log Lum Huey	GMPT	100		NAM MUN		MOI

 Total
 924398
 72,140\*

 Note:1): \*: only RID large and medium projects, \*\*: excluding 5,787 RID small projects
 :2) G: gravity, P: fixed pump, M: mobile pump, T: traditional lift

 Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

#### Table 3(1) Irrigation Area and Water Sources (Mekong Mainstream) of Cambodia

No.	MRC	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	Province
	ID			Туре	Whole	Dry		Name
1	C676	PV KLV 6	Prek Tatam	GMT	6000	6000	Mekong Via PrekTat	Prey Veng
2	C652	KC SST 2	Prek Pou Canal	PMIG	2966	0	Mekong	Kampong Cham
3	C695	PV PRO 2	Prekchik Canal	G	1850	1850	Mekomg Via Boeng P	Prey Veng
4	C832		Stung Angkor Borel	M	1500	1500	Bassac	l akeo Kandal
5	C420	KD KIUZ	Sias Brain Bey		1389	1389	Bassac	Kandal
0	C430		C Andoung Gale	MDC	10/0	10/0	Dassac	Kandal
0	C090		Chock Trou Dom	MPG	1240	1240	Mekong via Topla T	Ranual Prov Vong
0	C/00		Maleach Krobeykon	CT	844	844	Bassac & Mekong	Kandal
10	C409			GT	73/	73/	Bassac & Mercing	Kandal
11	C794	PV PRA 3	Snav Pul Station H17	PT	700	700	Mekong via Prek Sn	Prev Vena
12	C67	PV KI V 14	Barai Andet	G	700	700	Mekong Via Tonle T	Prev Veng
13	C52	PV BPN 4	Babong Canal	PG	650	650	Mekoma Via Boena P	Prev Veng
14	C725	PV PSD 15	Purlaos Stn.	P	500	500	Mekong Via Prek Tr	Prev Veng
15	C109	KC KMS 2	Boeng Kak Dam	GMT	500	500	Mekong	Kampong Cham
16	C175	PV PCR 10	Chak Khlanh Dam	PG	450	450	Mek Via Boeng Chak	Prev Veng
17	C71	PV PCR 9	Batithom Dam	MT	410	410	Mekong Via Prek Ba	Prev Veng
18	C104	KD KSV 3	Boeng Chomno	GMT	380	380	Mekong	Kandal
19	C128	PV PRA 16	Boeng The Dam	MPG	380	380	Mekong via Tonle T	Prey Veng
20	C103	PV KLV 18	Boeng Chankay Dam	G	360	360	Mekong Via Prek Tm	Prey Veng
21	C835	KC SST 1	Stung Dam	MT	356	356	Mekong	Kampong Cham
22	C72	PV PCR 11	Batitoeh	MT	350	350	Mekong via Tonle T	Prey Veng
23	C391	KD KSV 4	Kvenh Dach Res.	GMT	310	310	Mekong	Kandal
24	C58	KC KMS 3	Bakrothes Dam	GMT	300	300	Mekong	Kampong Cham
25	C640	PV KLV 4	Prek Laev	GMT	300	300	Mekong Via Prek Le	Prey Veng
26	C940	KD TKH 2	Toul Krasing	Р	287	0	Bassac	Kandal
27	C27	PV KLV 19	Angkanleng Chrei Dam	G	286	286	Mekong Via Prek Tm	Prey Veng
28	C73	KC SST 3	Bay De Dam	MT	254	254	Mekong	Kampong Cham
29	C131	PV PCR 3	Boeng Thom Reservoir	MPG	250	250	Mekong Via Beong T	Prey Veng
30	C86	KD LVE 2	Beng Krum Pstnh10	Р	250	250	Mekong	Kandal
31	C573	PV KGT 3	Phum Prekta	Р	250	0	Mekong Via Prek Tr	Prey Veng
32	C129	KD SAA 10	Boeng Thnot	GT	240	240	Rainfall/Bassac	Kandal
33	C234	KD KKD 13	Chrey Kombot	MPG	200	100	Mekong	Kandal
34	C134	PV PRA 14	Boeng Vein Dam	Т	200	50	Mekong via Tonle T	Prey Veng
35	C580	PV PRA 9	Plov Kdam Dam	MT	200	200	Mekong via Tonle T	Prey Veng
36	C135	PV PRA 11	Boeng Veng Dam	MT	200	200	Mekong via Tonle T	Prey Veng
37	C1	KC BTY 4	17 April Reservoir	GT	200	200	Mekong	Kampong Cham
38	C935	KC BTY 3	Toul Cham Reservoir	GT	200	200	Mekong	Kampong Cham
39	C895	KC KMS 4	Team Leang Res.	GMT	200	200	Mekong	Kampong Cham
40	C252	PV PVG 2	Deab Dam	GT	200	200	Mekong via Tonle T	Prey Veng
41	C533	PV PRA 15	Orkrachapprich Dam	Т	200	0	Mekong via Tonle T	Prey Veng
42	C132	PV KLV 7	Boeng Tol Reservoir	G	200	200	Mekong Via Beng Ka	Prey Veng
43	C654	PV KLV 12	Prek Pralach	GMT	200	200	Mekong Via Prek la	Prey Veng
44	C724	PV PCR 5	Puborei Dam	GMI	190	190	Mekong Via Boeng	Prey Veng
45	C751	PV PRA 7	Romlech Dam	GI	180	0	Mekong via Tonie T	Prey Veng
46	0127	PV PCR 8	Boeng Taov Dam		175	175	Mekong Via Tonie P	Prey Veng
47	0933	PV SKD 4	Totoeng Tho Av		170	80 405	Mekong flood water	Prey Veng
48	0404	KD LVE 3		GI	165	165	Mek./Boe. Tachum	Kandal
49	C494		O Samdam		160	160	Mekong	Kandal Dravi Vana
50	0000		Prek Slung Takao	GIVIT	160	160	Mekong via Prek st	Prey Veng
51	C585		Pong Pous Reservoir	CMT	140	20	Mekong Vie Drek Th	Prey Veng
52	C003		Piek Thiloung		140	140	Mekong via Piek III	Prey Veng
55	C130		Dumroi Srok		100	100	Mekong via prek Kil	Fley Veng
54	C200		Panthaay Thom Dom	MT	120	120	Mekong	Kampong Chom
55	C00		Banmeay morely		114	114	Mekong	Kampong Cham Kandal
50	C504		Prek Kol Dom	MT	110	110	Mekong	Kampong Cham
57	C705		Sne Canal		100	100	Mekong Via Roong P	Prov Vong
50	C265		Donn Saat Stn	Þ	100	100	Mekong Via Boeng P	Prev Vena
60	C30/	PV/PRA 12	Leach Dam	т	100	100	Mekong via Stung P	Prev Vena
61	C944	PV KI V 16	Touleand Canal	MPG	100	100	Mena Via Boena Pri	Prev Vena
62	C323	KC SGT 2	Kok Dam	GT	100	100	Mekona	Kampong Cham
Total	2020			01	32,190	27.847		

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift Source: Land Resources Inventory for Agricultural Development, February 2002, MRC
# Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (1/6)

No	MRC	Project ID	Project Name	Irr	Irr Arc	a (ha)	River Name	River Basin Name	Province
NO.		Појеств	i loject Name	Type	Whole	Drv			Name
1	C405	SR CKG 2	Makac Dam	MT	21750	2.9	Makac Dam	ST.CHIKRENG	Siem Reap
2	C150	BB BVL 3	Bovel	G	21150	21150		ST.MONGKOL BOREY	Battambang
3	C363	TK TKA 7	Kpob Tro Bek Res.	Ğ	11000	11000	Prek Don Phe	DELTA	Takeo
4	C68	SR PUK 2	Barai Reservoir	Ğ	8000	4000	Barai	ST.SIEM REAP	Siem Reap
5	C991	PT BAR 2	Tuk Char Reservoir	GT	6000	279	Prek Kbal Toeuk		K. Cham
6	C926	TK KVG 5	Ton Leap Res.	PG	5000	5000	Prek Ton Leap	DELTA	Takeo
7	C12	KN BRB 2	Achang	G	4140		St.Baribo	ST.BARIBO	K. Chhnang
8	C158	TK KAD 1	Canal 03	PG	4000	4000	St.Takeo	DELTA	Takeo
9	C201	KD KKD 3	Chhey Thom	MT	3850		Tonle Toch	DELTA	Kandal
10	C911	TK SAM 3	Thnot Te Res.	MPG	3700	3700	St.Svay Prey	DELTA	Takeo
11	C740	KS SRT 21	Rolang Chrey	GMT	3281	250	St.Prek Thnot	PREK THNOT	K. Speu
12	C951	SR SNI 1	Trachpok Dam	MT	3000		Trachpok	ST.SIEM REAP	Siem Reap
13	C961	BM PSK 1	Trapaengthma Reservoir	GPT	3000	3000		ST.MONGKOL BOREY	B. Meanchey
14	C845	TK TRG 6	Stung Takeo	Р	3000	3000		DELTA	Takeo
15	C433	KT KSY 2	O Ansa	MPG	3000		O Mean	St.Sen	K. Thom
16	C344	KS SRT 6	Kompong Tram	G	2972		St.Prek Thnot	PREK THNOT	Kandal
17	C809	SR KLH 4	Speansreng Dam	MT	2500		Speansreng Dam	ST.SRENG	Siem Reap
18	C19	KC PCH 8	Andong Ang	GT	2500	20	Prek Treang	SIEM BOK	K. Cham
19	C906	SR BSR 2	Thnal Tortung Dam	MT	2450	50	Thnal Tortung	ST.SIEM REAP	Siem Reap
20	C130	KD KSV 1	Boeng Thom	GMT	2300	2300	Boe.Th, St.Angkor	DELTA	Kandal
21	C290	PS SMS 3	Kbalhong Barrage	G	2000		Kbalhong barrage	ST.PURSAT	Pursat
22	C901	SV KRO 1	Thmei Canal	MPG	2000	2000	O Kompong Rou		Svay Rieng
23	C169	TK KAD 2	Canal 92	G	2000	2000	St. Takeo	DELTA	Takeo
24	C866	KD PLU 2	Ta Mouk Reservoir	MPG	1952	1952	T.Sap/O Romlich	ST.BARIBO	Kandal
25	C329	BB BNA 4	Kompeng Puey	G	1925	1925		ST.MONGKOL BOREY	Battambang
26	C854	KD KDS 1	System No 63	G	1520		St.Prek Thnot	PREK THNOT	Kandal
27	C910	TK TRG 3	Thnot Krochang Res.	MPG	1500	500	Pr.Toekhrou & Ochi	DELTA	Takeo
28	C996	TK TKA 1	Tumnup Lok Res.	G	1500	1500	St.Trac	DELTA	Takeo
29	C5	SR PUK 1	78 Dam	MT	1500	1500		ST.SIEM REAP	Siem Reap
30	C907	KT BAR 6	Thnel Cheat	GMT	1400			ST.CHINIT	K. Thom
31	C755	KC CPY 6	Russey Lor	GT	1200		Prek Kbal Toeuk	ST.CHINIT	K. Thom
32	C164	TK TRG 4	Canal 87	Р	1200	1200	St.takeo & Canal 1	DELTA	Takeo
33	C318	TK KVG 1	Koh Chhoeung Damrey Res.	G	1200	1200		DELTA	lakeo
34	C829	KTKSY3	Sro Ngey	MI	1200	1000	St.Staung	St.Sen	K. Thom
35	C53	KC PNK 1	Bak Ay Dam	GMT	1120		O Stung		K. Cham
36	0703	KN RLB 3	Prey Mean	G	1000	400	Stung Kung Kea	ST.BARIBO	K. Chnnang
37	C445	KT PSB 13		GI	1000	100	O Thnom	St.Sen	K. Inom
38	C909	TK KAD 7		PG	1000	1000	St. Takeo	DELTA	Такео
39	C245	KC DBE 1	Chumtaneing Dam	GI	1000	400	St. I nom		K. Cham
40	C402		Lomnach Thang Karng	P OT	1000	400	O Dhani		K Thom
41	C694	KI SIU 4	O To Luci	GI	1000		O Phaav		K. Thom
42	C209		O Ta Lvei Tok Tio Doto h26	GI D	1000	500	Prek Tatork		K. HIOH Dhoom Doob
43	C776		Sorika Kaay	г СТ	1000	520			
44	C202		Krong Vouv(2)   Dot h1		902	400			K. MOM
40	C518	KT SDA 2	$\Omega$ Thoch	GMT	900	400	O Chhou Tool	St Son	K Thom
40	C100		Roung Brook Bunlov	Givin	900	90	Pound Brook Bunlow		R. MOM
47	C100		78 Dom	MT	900	950	beung Flean Fulley		Siom Poon
-+0 ⊿0	C386	SR SPD /	Krope Barrage	C	800	800	Krope		Siem Rean
49 50	C885	DV/ KMP /	Tameak Dam	C C	800	000	Prok Trach		Prev Vena
51	C036		Toul Char Dam	C C	800				Prev Vena
52	C731	BR MPS /	Ream Koun	C C	800	800	C Aniony Verig		Rattambang
52	C50	KN TPH 1	Anlung Katen	G	800	000	O Don Fan	ST BARIBO	K Chhnang
54	C449	KC BTY 6	O Chrev Flood Dam	0	800		C DOIL COP	SIEM BOK	K Cham
55	C873	KT PRI 1	Ta Sal	GT	800		Ta Sav	ST STAUNG	K Thom
00	50.0			<u> </u>	000		uy		

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

# Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (2/6)

No.	MRC	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	River Basin Name	Province
_	ID	-	-	Туре	Whole	Dry			Name
56	C440	KT PSB 6	O Cheung Kruos	GT	800	40	O Andeng	St.Sen	K. Thom
57	C727	TK BAT 3	Put Sar Pstn	Р	800	300		PREK THNOT	Takeo
58	C661	KD KTO 5	Prek Sdei,pstn.no 6	Р	800	800		DELTA	Kandal
59	C419	TK BAT 8	Nakta Krahomkar	Р	800	400		PREK THNOT	Takeo
60	C336	TK BAT 7	Kompong Damrei Res.	PG	750	750	St.Tonle Bati	PREK THNOT	Takeo
61	C859	OM CKA 1	Chong Kal Res.	MT	750		Ta En	ST.SRENG	O. M. Chey
62	C500	KT PBL 7	O Snay	GMT	750			ST.STAUNG	K. Thom
63	C948	TK PKB 3	Tourl Rolok Res.	G	750	750	Prek Toul Lokok	DELTA	Takeo
64	C792	SR SRS 1	Sleng Spean Dam	MT	700		Sleng Speam	ST.SRENG	Siem Reap
65	C384	KD SAA 13	Krangyouv(2)ii,pstn-h2	Р	700	400		PREK THNOT	Kandal
66	C441	KT SDA 3	O Chheu Teal	GMT	700	70	O Thourk	St.Sen	K. Thom
67	C505	KI BAR 1	O Svay	GMT	700	100	Spring	ST.CHINIT	K. Thom
68	C882	SR CKG 3	Takoy	GMT	650	650	Tonle Sap	ST.CHIKRENG	K. Chhnang
69	C183	KS ODG 8		GMT	650	100	O Thom & O Toch	PREK THNOT	K. Speu
70	07	PV PRO 4	Stungslotpstn-n 12&17	P	650	650			Prey Veng
71	C7	SR PBG 5	78 Dam	MPG	640	640	Otoma Manaa	ST.SIEM REAP	Siem Reap
72	0525	SVSIBI	Vayco Dam	GPT	600		Stung vayco		Svay Kleng
73	C535		Angles Dec	G	600	600	Prek Pralet		Prey veng
74	C31		The Deck Poo	G	600	150	St. Takeo		Takeo Siom Boon
75	C905		Oroung Dom		600	150	Oroung Dom		Siem Boon
70	C354		Dong Kaparm Boo		600	600	Oroung Dam		Siem Reap
70	C4291		O Andong	P CT	600 EGE	600	O Prek Sandek	DELTA	Lakeo
70	C420	KIFSDS	D Anderig Boom Bol	GMT	560	05	O Tourk		K. THOM
19	C207	KN EMC 2	Krono Thom	GIVIT	500	20	Childreng Delev		K. Speu
00	C507		Riope mom	G D	500	50	St. Krang Poley		K. Speu Kondol
82	C203	KD SAA 7	Kdei Lvea Pstn-h24	г D	520	528			K Speu
83	C742		Rolenaken Petn21	P	528	528	St Prok Thnot		Kandal
8/	C508		Preak Anteas Petr-h16	P	528	528	St.FTEK THIOT		Prey Vena
85	C543	PV PRO 3	Peam Ro Pstn-h18	P	528	528			Prev Veng
86	C860	OM CKA 2	Ta En Dam	PT	525	520		ST SRENG	Siem Rean
87	C337	TK BAT 4	Kompong Dan Ko	G	500	500	St Tople Bati		Takeo
88	C442	KT BAR 3	O Chhlong	GT	500	10	Prek Kbal Toeuk	ST.CHINIT	K. Thom
89	C790	TK SAM 9	Sen Pe Ream Res	G	500	500	Prek Toul Lokok	DELTA	Takeo
90	C326	TK ABR 4	Komnon Res	Ğ	500	500	Prek Angkor	DELTA	Takeo
91	C20	KS PSR 5	Ang	GMT	500	000	O Thma Kambor	DELTA	K. Speu
92	C913	TK SAM 1	Thorm Vinev	PG	500	500	St. Slakou	DELTA	Takeo
93	C200	BM TPK 1	Chheung Khrous Dam	GPT	500	500		ST.SRENG	B. Meanchev
94	C797	KT PBL 5	So Vong	GMT	500		O Kroch	St.Sen	K. Thom
95	C477	KT STU 2	O Phaav	GT	500		St.Kampot	ST.CHINIT	K. Thom
96	C211	KT BAR 7	Chivak Pheap	GT	500	20	·	ST.CHINIT	K. Thom
97	C934	KC CKL 2	Toui Meas Dam	GT	500		Small Stream	ST.CHINIT	K. Cham
98	C914	KC PCH 5	Tmar Da Reservoir	GT	500		Prek Kbal Toeuk	ST.CHINIT	K. Cham
99	C798	TK KVG 3	Soam Res.(o Tavan)	G	500	500		DELTA	Takeo
100	C324	SR PBG 1	Kokchan Dam	PT	500			ST.SIEM REAP	Siem Reap
101	C522	KS KPS 3	O Treng Reservoir	GMT	500		O Kampot	PREK THNOT	K. Speu
102	C880	TK DKO 2	Takeo Res.	MPG	500	500		DELTA	Takeo
103	C22	TK SAM 12	Ang Bot Rokar Res.	G	500	500	O Sdok	DELTA	Takeo
104	C193	KS CMN 2	Chen Ke	GMT	493		O Kampot	PREK THNOT	K. Speu
105	C663	KD SAA 5	Prek Sleng	GT	475	475		DELTA	Kandal
106	C680	KR SNO 32	Prek Thlong Dam	G	475			PREK CHHLONG	Kratie
107	C872	SV SCM 1	Ta Saang	GPT	470	70	Prek Chamlong		Svay Rieng
108	C362	KS PSR 22	Kpal Beng	GMT	465		O Banh Cha	PREK THNOT	K. Speu
109	C312	PS KRK 6	Klakrope Res.	G	450		Klakrope Res.	ST.BARIBO	Pursat
110	C986	KN RLB 4	Tropang Trobek	G	450		St.Kung Kea	ST.BARIBO	K. Chhnang

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

# Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (3/6)

No. MRC	Project ID	Project Name	Irr.	Irr. Are	a (ha)	River Name	River Basin Name	Province
ID	-		Туре	Whole	Dry			Name
111 C519	KT PSB 11	O Thom	GT	450		O Chhouk	St.Sen	K. Thom
112 C253	TK TRG 1	Deam Po	MPG	450	450	St.Takeo	DELTA	Takeo
113 C287	KC TKM 5	Kbal O Dam	GT	450		Kbal O	DELTA	K. Cham
114 C144	PS KRK 14	Bonlak Barrage	G	436		Bonlak barrage	ST.BARIBO	Pursat
115 C76	KD SAA 2	Beng Chouk Res.	GT	420	420		DELTA	Kandal
116 C857	KS BST 5	Ta Deng &ta Noun Dam	GMT	404		O Kreul	DELTA	K. Speu
117 C969	OM SMR 4	Trapeang Veng Dam	MT	400	400	Trapeang Veng Dam	ST.SRENG	O. M. Chey
118 C851	TK BAT 5	Svay Khom Res.	G	400	350	Boeung Cheung Loun	PREK THNOT	Takeo
119 C23	TK SAM 10	Ang Chang Et Res.	G	400	400	O Sdok	DELTA	Takeo
120 C766	TK TRG 5	Samaki Res.	G	400	400		DELTA	Takeo
121 C186	KN TPH 3	Char Prong	G	400		St.Chaprang	ST.BARIBO	K. Chhnang
122 C257	TK PKB 1	Doeum Krolanch Res	G	400	400	Small Str.	DELTA	Takeo
123 C748	TK SAM 8	Rom Chang Pstn	Р	400	50		DELTA	Takeo
124 C482	KT SDA 6	O Pthourl	GMT	400	50	O Kro Hnak	St.Sen	K. Thom
125 C489	KT STU 3	O Ron	GT	400	30	O Anchang	ST.CHINIT	K. Thom
126 C595	KC CKL 3	Pramat Dei Dam	GT	400	50	O Pramat Di	ST.CHINIT	K. Cham
127 C711	TK BAT 2	Prey Svay Pstn-h7	P	400			PREK THNOT	Takeo
128 C446	TK PKB 2	O Chom Norm Res.	G	400	400		DELTA	Takeo
129 C264	KS PSR 3	Don Teav	GMT	393		O Krang Snaol	PREK THNOT	K. Speu
130 C195	KS PSR 24	Cheteal Kmom	GMT	392		O Banh Cha	PREK THNOT	K. Speu
131 C137	KT SEN 1	Boeung Ach Kheak	GMT	392		St. Prek Thnot	PREK THNOT	K. Speu
132 C137	KT SEN 1	Boeng Ack Kheak	GMT	392		St. Prek Thnot	PREK THNOT	K. Speu
133 C749	KR KTI 30	Rom Leach Dam	G	390	390		PREK TE	Kratie
134 C655	KD SAA 3	Prek Rang	G	380	380		PREK THNOT	Kandal
135 C546	KD KSV 5	Ph.prek Thom I,pstn	P	380	380	Prek Thom	DELTA	Kandal
136 C893	KD SAA 20	Tayo	GI	370	370	0.17	DELTA	Kandal
137 C364	KS BST 4	Kpom Rang Dam	GMT	351		O Kbea	DELIA	K. Speu
138 C813	PS SMS 6	Srang Res.	G	350	50	Srang Res.	ST.PURSAT	Pursat
139 C768	KS PSR 16	Samrong Bak	GI	350	50	O Krang Punley	PREK THNOT	K. Speu
140 C282	KS BSI 8	Kat Phiuk	GIVIT	350		St. Kat Phiuk	DELIA	K. Speu
141 C269		Kab Slov Psili	Р Т	350	250		ST.BARIBU	Prinom Penn
142 0393	PV SKD 5	Chrow Dom	СТ	350	350	Drok Ang Kom		Prey veng
143 0233		Chiey Dani Phlok Posov	CMT	330				K. Cham
144 C349			CT	225		O Charlsy		K. Speu Kondol
145 C102		Callal 60 + 59 Roung Don Bur	MPC	330		St. 111101/St. 10		Kandal
140 C99		A Throat	GT	330	220			Kandal
147 011		Srok Dom	G	330	530	Toplo Sop		K Chhnong
140 0001		Chhos Prop	GMT	320	09	Trib of St. O. Khon		K. Chininang
150 C775	KC PNK 2	Santhey Dam	GMT	313		St Toch	FRER HINOT	K. Opeu K. Cham
151 C54		Bak Chroul	MT	300	300	Tonle Toch		Kandal
152 C988		Tros Tortena	GT	300	300			Kandal
153 C33	KS BST 1	Angta Kep Reservoir	GMT	300	20	O AnlongThay O Mo	DELTA	K Speu
154 C699	KS BST 21	Prev Et Dam	GMT	300	20	O Nitean		K Speu
155 C704	TK SAM 7	Prev Mean Res	GT	300		o milouri		Takeo
156 C229	TK SAM 4	Chouk Sar Res	G	300	300	St Svav Prev	DELTA	Takeo
157 C620	TK ABR 3	Prek Chrach Res	G	300	300	Prek O Lat	DELTA	Takeo
158 C954	SV KRO 2	Tradet West	P	300	300	Prek Prasot		Svav Riena
159 C953	SV KRO 3	Tradet East	P	300		Prek Prasot		Svav Riena
160 C532	PV KMR 3	Orkok Dam	G	300		Small Stream		Prev Vena
161 C964	KC DBE 2	Trapeang Chhuk Dam	MT	300	20	Prek spean Louk	DELTA	K. Cham
162 C342	SR KLH 2	Kompong Thkouv Dam	MT	300	_5	Kompong Thkouv	ST.SRENG	Siem Reap
163 C496	TK TKA 5	O Saray Res.	G	300		O Thnan Thloc	DELTA	Takeo
164 C849	KN TPH 7	Svay Chek	Ğ	300		St.Sre Bak	ST.BARIBO	K. Chhnang
165 C272	KD SAA 12	Kampong Trea	Р	300	200	Prek kg.Trea	PREK THNOT	Kandal

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

## Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (4/6)

ID         Type         Whole         Dyv         Name         Name           166 C247         K K ORO 3         Cimong         GT         300         30         Spring         DELTA         K. Cham           167 C367         FV KMR 1         Trapeang Thian Dam         T         300         50         SixSan         K. Thom           169 C483         KT PBL 4         R towaun         GT         300         0         SixSan         K. Thom           171 C252         KF SbC 14         Ang Tuk         G         300         Very Stram         SixSan         K. Thom           171 C258         KF SbC 14         Ang Tuk         G         300         Very Stram         PREK KINNG         Kratie           172 C299         FS KDG 14         Kenony         G         300         50         O Kauon         St.San         K. Thom           175 C143         KT KSY 1         Bok Maka         MPG         300         300         DeLTA         Xake         K. Thom           176 C207         TK SM6         Chrony Strames         G         300         St.San         K. Thom         Take           176 C37 K K SR13         SR18 Jake         GMT         273         O Chauual Kramo </th <th>No. MRC</th> <th>Project ID</th> <th>Project Name</th> <th>Irr.</th> <th>Irr. Are</th> <th>ea (ha)</th> <th>River Name</th> <th>River Basin Name</th> <th>Province</th>	No. MRC	Project ID	Project Name	Irr.	Irr. Are	ea (ha)	River Name	River Basin Name	Province
166 C247         KC ORO 3         Cimong         GT         300         30         Spring         DELTA         K. Cham           167 C367         VK NR 1         Tragenag Than Dam         MT         300         Small Stream         ST.STAUNG         K. Thom           186 C437         KT SDA 1         O Mean         GT         300         Small Stream         ST.STAUNG         K. Thom           170 C428         KT PEL A         O Roveun         GMT         300         O Sway         ST.STAUNG         K. Thom           171 C25         KR SBO 14 Ang Tuk         G         300         Kratie         Pursat         Pursat           173 C648         PDGK 5         Pref. Lorengostn-L27         P         300         SD. O Rauem         ST.STAUNG         K. Thom           176 C2307         TK SAM6         Chrony Somrong Res.         G         300         SD. O Chauem         ST.SRENG         St.Sen         K. Thom           176 C247         KN BRB 3         Komreap         G         280         O Sanlung         ST.SRENG         St.Sen         K. Thom           176 C247         KN BRB 3         Komreap         G         280         O Sanlung         ST.SRENG         K. Thom           178 C275 </td <td>ID</td> <td></td> <td></td> <td>Туре</td> <td>Whole</td> <td>Dry</td> <td></td> <td></td> <td>Name</td>	ID			Туре	Whole	Dry			Name
167 C367         PV KMR 1         Tapeang Than Dam         T         300         Stung Kandal         Prey Veng           186 C473         KT PBL 4         Roveun         GT         300         50         Small Stream         ST.STAUNG         K. Thom           171 C263         KT PBL 4         A roveun         GMT         300         0         Svary         ST.STAUNG         K. Thom           171 C263         KT SBC 14         Ang Tuk         G         300         Venovy         PREK KIRNG         Kratie           172 C299         PS KDG 1         Keomony         G         300         St.Prey Proh         SLSan         K. Thom           175 C474         KT KSY 1         Bak Mak         MPG         300         50         O Kauem         ST.SRLNG         Siem Reap           177 C515         SR KLH 1         O Thono Kanh Chos         MT         280         O Sanlung         ST.BARIBO         K. Chhnam           178 C474         K BR 3         Karmeap         G         280         O Chauleal Karan         K. Speu           178 C474         K BR 3         Karmeap         G         270         O Chauleal Karan         K. Speu           178 C474         K SR ST 13         Skong Sanlung	166 C247	KC ORO 3	Cimong	GT	300	30	Spring	DELTA	K. Cham
168 C473         KT SDA 1         O Mean         MT         300         50         St.St.AU.NG         K. Thom           170 C492         KT PBL 8         Ta Lmeat         GT         300         Small Stream         ST.STAU.NG         K. Thom           171 C25         KK SBO 14         Ang Tuk         G         300         Small Stream         PREK KRIENO         Kratle           171 C25         KK SBO 14         Ang Tuk         G         300         Keamony         ST.STAU.NG         K. Thom           172 C299         PS KDG 1         Keomony         ST.STAU.NG         K. Thom         Prisst           173 C643         FX SY 1         Do Kh spret Krithon         St.Sen         K. Thom         St.Sen         K. Thom           176 C2207         TK SAM 6         Chrony Somroap         G         300         DeLTA         Takeo           178 C2347         KN BRB 3         Konreap         G         280         O Sanurg         ST.STAU.NG         K. Chhnang           178 C347         KN BRB 3         Konreap         G         280         O Sanurg         ST.STAU.NG         K. Chhnang           178 C347         KN BRB 3         Konreap         G         280         O Anong Runung         ST.ST	167 C967	PV KMR 1	Trapeang Thlan Dam	Т	300		Stung Kandal		Prey Veng
169 Ce63         KT PBL 4         Ta Lmeat         GT         300         Small Stream         ST.STAUNG         K. Thom           171 C22         KR SB0 14         Ang Tuk         G         300         PREK KRIENG         Kratle           172 C299         FS KDG 1         Keomony         G         300         Keomony         ST.STAUNG         K. Thom           172 C299         FS KDG 1         Keomony         G         300         St.Prey Proh         St.San         K. Thom           173 C684         FD CAS         Frek Tileongestn-h27         P         300         St.Prey Proh         St.San         K. Thom           176 C207         TK SM 6         Chirvoy Somrong Res         G         300         DeLTA         Takeo           177 C515         SR KLH 1         O Thmon Kanh Chos         MT         280         O Thmom         ST.BRENG         Siem Reap           178 C377         KN BR 3         Kommerap         G         270         O Chaulega St.Taken Print         K. Speu           181 C376         KS SRT 3         Trond Pauk         GMT         273         O Chaulega St.ThNOT         K. Speu           182 C376         KS SRT 3         Trond Pauk         GMT         270         O Tait	168 C473	KT SDA 1	O Mean	MT	300	50		St.Sen	K. Thom
170 C492         KT PBL 4         O Roveun         GMT         300         O Svay         ST.STAUNG         K. Thom           171 C25         KK SB0 14 Ang Tuk         G         300         Keomony         ST.PURSAT         Prisst           172 C258         PS KDG 1         Keomony         ST.PURSAT         Prisst         Prisst           173 C684         PD GK 5         Pret Tolengpstn-P2         P         300         50         Valuem         ST.STAUNG         K. Thom           174 C453         KT STO 10         O Doung         GMT         300         S.Prey Proh         SLSan         K. Thom           176 C423         KT SY1         Bok Maka         MC         300         D Thom         ST.SRENG         K. Thom           176 C424         KN BR3         Komreap         G         280         O Sanung         ST.BARIBO         K. Chhnang           178 C4247         KN BR3         KN BR3         Komreap         G         280         O Aniong Bunilan         K.Speu           180 C444         KS SRT 11         Aniong Sia         GMT         273         O Chalueal Krano         PREK THNOT         K. Speu           181 C376         KS SRT 3         Tmoral Parek         GMT         260<	169 C863	KT PBL 8	Ta Lmeat	GT	300		Small Stream	ST.STAUNG	K. Thom
171 C229       FX SBD 14 Ang Tuk       G       300       PREK KRIENO       Kratele         172 C299       FX DG 1       Keomony       G       300       Keomony       ST.PURSAT       Pursat         173 C684       PP DGK 5       Prek Theongstn-h27       P       300       50       O Kauem       ST.FAUNG       Nhom Penth         174 C435       KT KSY 1       Bok Mkak       MPG       300       St.Prey Proh       St.Sen       K. Thom         176 C207       TK SM 6       Chrinoy Somrong Res       G       300       O Thomo       ST.BARIBO       Kem Reap         177 C515       SR KLH 1       O Thomork ST.SENG       Siem Reap       G       280       O Sanlung       ST.BARIBO       K. Chrhnang         178 C347       KN BR 3       Komreap       G       270       O Kang Ampel       PREK THNOT       K. Speu         181 C376       KS SR 13       Tmor Pauk       GMT       273       O Arlong Rumich       PREK THNOT       K. Speu         182 C373       KS SR 24       Krang Pnav       GMT       273       O Arlong Rumich       PREK THNOT       K. Speu         182 C374       KS PS 28 11       Kandal       GMT       267       O Arlong Rumich       PREK THNOT	170 C492	KT PBL 4	O Roveun	GMT	300		O Svay	ST.STAUNG	K. Thom
172 C299       PS KDG 1       Keemony       ST MURSAT       Pursat         173 C684       PD GK 5       Frek ThNOT       Phomo Penh         174 C433       KT STO 10       O Doung       GM T       300       50       O Kauem       ST.STAUNG       K. Thom         176 C433       KT STO 10       O Doung       GM T       300       50       O Kauem       ST.STAUNG       K. Thom         176 C434       KT SY 1       Bok Maak       MPG       300       O Thom       ST.SEENG       Sime Reap         178 C347       KN BRB 3       Komreap       G       280       O Sanlung       ST.BARIBO       K. Chhnang         178 C731       KS SRT 11       Anlong SIa       GM T       273       O Krang Ampel       PREK THNOT       K. Speu         181 C375       KS SRT 18       Krang Pong Ro       GM T       270       O Chang Aumiel       PREK THNOT       K. Speu         182 C375       KS PSR 26       Krang Phang       GM T       270       O Talat       PREK THNOT       K. Speu         183 C331       Thor Pauk       GMT       250       Lei Dam       ST.SIEM REAP       Siem Reap         184 C397       KS PSR 11       Kandal       GMT       250 <t< td=""><td>171 C25</td><td>KR SBO 14</td><td>Ang Tuk</td><td>G</td><td>300</td><td></td><td></td><td>PREK KRIENG</td><td>Kratie</td></t<>	171 C25	KR SBO 14	Ang Tuk	G	300			PREK KRIENG	Kratie
173 C684       PP DGK 5       Prek Tielogpsin-h27       P       300       250       PREK TIENOT       Phnom Penh         174 C453       KT KSY1       Bok Mkak       MPG       300       50       Okauem       ST.STAUNGK       K. Thom         176 C207       TK SAM 6       Chrony Somrong Res.       G       300       300       DELTA       Takeo         177 C515       SR KLH 1       O Tmono Astanchos       MT       280       O Tmom       ST.BARIBO       K. Chrona         178 C347       KN BRB 3       Komreap       G       280       O Sanlung       ST.BARIBO       K. Chrona         180 C44       KS SRT 11       Anang Pong       GM       273       50       O Chneuleal Kramon       PREK THNOT       K. Speu         181 C376       KS SRT 3       Tmor Pauk       GMT       273       O Anlong Rumilch       PREK THNOT       K. Speu         182 C378       KS RS T3       Tmor Pauk       GMT       263       O Anlong Rumilch       PREK THNOT       K. Speu         184 C374       KS PSR 11       Kandal       GMT       263       O Anlong Rumilch       PREK THNOT       K. Speu         184 C374       KS PSR 11       Kandal       GMT       260       D Anlong	172 C299	PS KDG 1	Keomony	G	300		Keomony	ST.PURSAT	Pursat
174 C433       KT STD 10       O Doung       GMT       300       50       O Kauem       ST.XUNG       K. Thom         176 C433       KT SK1       Bok Maak       MPG       300       SUPrey Proh       SLSen       K. Thom         176 C207       TK SAM 6       Chhroy Somrong Res.       G       300       O Thom       ST.SRENG       Siem Reap         177 C315       SK RLH 1       O Thomon Kan Thomo Kan Thomo       G       280       O Sanlung       ST.BARIBO       K. Chhnang         178 C347       KN SRA 11       Anlong Sia       GMT       273       O Krang Ampel       PREK THNOT       K. Speu         181 C376       KS SRT 18       Krang Phong Ro       GMT       270       O krang Ampel       PREK THNOT       K. Speu         182 C373       KD SAA 17       Troiday Brey       GT       270       O along Rumich       PREK THNOT       K. Speu         183 C313       Thor Pauk       GMT       250       Cal Dam       ST.SIEM REAP       Siem Reap         184 C374       KS PSR 11       Kandal       GMT       250       Z50       Prek KTHNOT       K. Speu         185 C337       Thor Pauk       GMT       250       Z50       Prek Mand       St.SER K <td< td=""><td>173 C684</td><td>PP DGK 5</td><td>Prek Tloengpstn-h27</td><td>Р</td><td>300</td><td>250</td><td></td><td>PREK THNOT</td><td>Phnom Penh</td></td<>	173 C684	PP DGK 5	Prek Tloengpstn-h27	Р	300	250		PREK THNOT	Phnom Penh
175 C143       KT KSY 1       Bok Mkak       MPG       300       SLPrey Proh       SLSen       K. Thom         176 C207       K SAM 6       Ohrony Sommong Res.       G       300       OTnom       ST SRENO       Siem Reap         177 C515       SR KLH 1       O Thmor kanh Chos       MT       280       O Sanlung       ST BARIBO       K. Chhnang         178 C347       KN BR5 3       Kommeap       P       280       O Sanlung       ST BARIBO       K. Chhnang         180 C44       KS SRT 11       Kanng Ping       GMT       273       O Kang Ampel       PREK THNOT       K. Speu         182 C318       KS SRT 1       Troiday Brey       GT       270       O Anlong Rumilch       PREK THNOT       K. Speu         183 C318       KS SRT 3       Troiday Brey       GT       270       O Anlong Rumilch       PREK THNOT       K. Speu         184 C374       KS PSR 11       Kandal       GMT       267       O Talat       PREK THNOT       K. Speu         186 C387       SR PUK 5       Lel Dam       MT       250       250       DELTA       Kandal         186 C387       SR PUK 55       Lel Dam       MT       250       250       St St MT NOT       K. Speu	174 C453	KT STO 10	O Doung	GMT	300	50	O Kauem	ST.STAUNG	K. Thom
176 C207       TK SAM 6       Chirroy Sommong Res.       G       300       00       DELTA       Takeo         177 C515       SK RLH 1       O Thomo Kanh Chos       MT       280       O Sanlung       ST BARIBO       K. Chhnang         178 C347       KN BRB 3       Komreap       P       280       O Kang Ampel       PREK THNOT       K. Speu         180 C44       KS SRT 11       Anlong Sla       GMT       273       O Kang Ampel       PREK THNOT       K. Speu         181 C376       KS SRT 11       King Pong Ro       GMT       273       O Kang Ampel       PREK THNOT       K. Speu         182 C973       KS SRT 13       Tmor Pauk       GMT       288       O Anlong Rumich       PREK THNOT       K. Speu         186 C337       SR PRUK 5 Lel Dam       MT       250       Lel Dam       ST SIEM REAP       Siem Reap         186 C333       TK PKB 5       Konging Knochap       MT       250       250       Sunk Ampel       Takeo         187 C390       KD SAA 9       Prek Toch, Panth       P       250       250       Sunk Ampel       Takeo         188 C333       Thy RP45       Konn Kraal Dam       MT       250       Sunk Ampel       Takeo <t< td=""><td>175 C143</td><td>KT KSY 1</td><td>Bok Mkak</td><td>MPG</td><td>300</td><td></td><td>St.Prey Proh</td><td>St.Sen</td><td>K. Thom</td></t<>	175 C143	KT KSY 1	Bok Mkak	MPG	300		St.Prey Proh	St.Sen	K. Thom
177 C515       SR KLH 1       O Thmom Kahl Chos       MT       280       O Thmom ST SRENG       Siem Reap         178 C347       KN BRB 3       Kommeap       G       280       O Sanlung       ST BARBO       K. Chhnang         180 C44       KS BST 11       Sikun Patn.       P       280       O Kang Ampel       PREK THNOT       K. Speu         180 C44       KS SRT 18       Krang Pong Ro       GMT       273       50       O Chaug Ampel       PREK THNOT       K. Speu         182 C918       KS SRT 18       Krang Phnav       GMT       267       O Talat       PREK THNOT       K. Speu         184 C374       KS PSR 14       Kandal       GMT       267       O Talat       PREK THNOT       K. Speu         186 C337       SR PUK 5       Lel Dam       MT       250       Lel Dam       ST SERKO       O. M. Chey         187 C990       KD SAA 22       Troy Sia, Pstn-h4       P       250       250       Tel Ambel       DELTA       Kandal         188 C333       TK RB 5       Kompong Chaik Res.       PG       250       250       Komkend       ST SERKO       O. M. Chey         190 C380       MSM 3       Kom Kreal Dam       MT       250       Sconkunkeal <td>176 C207</td> <td>TK SAM 6</td> <td>Chhroy Somrong Res.</td> <td>G</td> <td>300</td> <td>300</td> <td></td> <td>DELTA</td> <td>Takeo</td>	176 C207	TK SAM 6	Chhroy Somrong Res.	G	300	300		DELTA	Takeo
178 C347       KN BRB 3       Komreap       G       280       O Sanlung       STBARIBO       K. Chhnang         178 C731       KS SRT 11       Anlong Sla       GMT       278       50       O Chaeuleal Kramo       PREK THNOT       K. Speu         181 C376       KS SRT 13       Tiorday Brey       GT       270       O Krang Ampel       PREK THNOT       K. Speu         182 C373       KD SAA 17       Troiday Brey       GT       270       O Krang Ampel       PREK THNOT       K. Speu         184 C374       KS PSR 26       Krang Phnav       GMT       263       O Anlong Rumich       PREK THNOT       K. Speu         185 C397       SR PRUK 5       Lel Dam       MT       250       Lel Dam       ST.SIEM REAP       Siem Reap         186 C393       SR PUK 5       Lel Dam       MT       250       250       Prek Ambel       DELTA       Kandal         180 C335       KPKB 5       Kompong Chak Res.       PG       250       250       Kounkreal       ST.SIEM CA.       Kandal         190 C359       MSMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SIEM CA.       Kandal         190 C350       MSMR 3       Koun Kreal Dam <td< td=""><td>177 C515</td><td>SR KLH 1</td><td>O Thmon Kanh Chos</td><td>MT</td><td>280</td><td></td><td>O Thnom</td><td>ST.SRENG</td><td>Siem Reap</td></td<>	177 C515	SR KLH 1	O Thmon Kanh Chos	MT	280		O Thnom	ST.SRENG	Siem Reap
179 C791       KS BST 11       Slaku PStn.       P       280       DELTA       K. Speu         180 C44       KS SRT 11       Inlong Sla       GMT       273       O Krang Ampel       PREK THNOT       K. Speu         181 C376       KS SRT 11       Tinday Brey       GT       270       270       O Krang Ampel       PREK THNOT       K. Speu         182 C376       KS SRT 13       Tinday Brey       GT       270       270       O Laita       PREK THNOT       K. Speu         184 C374       KS PSR 11       Kandal       GMT       263       O Lel Dam       PREK THNOT       K. Speu         186 C373       SR PUK 5       Lel Dam       MT       250       250       DELTA       Kandal         187 C390       DS AA2 2       Tory Sla, Pstn-h4       P       250       250       DELTA       Kandal         190 C380       OM SMR 3       Koun Kreal Dam       MT       250       250       Prek ThNOT       Kandal         190 C380       OM SMR 3       Koun Kreal Dam       MT       250       250       Prek Mukeampu       Strateg         190 C380       KK M5 5       Tarpeang       GMT       250       250       Prek Mukeampu       Kandal      <	178 C347	KN BRB 3	Komreap	G	280		O Sanlung	ST.BARIBO	K. Chhnang
180 C44         KS SRT 11         Anlong Sla         GMT         278         50         O Chineuleal Krang         PREK THNOT         K. Speu           181 C376         KS SRT 18         Krang Pong Ro         GMT         270         270         DKrang Anpel         PREK THNOT         K. Speu           182 C373         KD SAA 17         Trolday Brey         GT         270         270         Dalat         PREK THNOT         K. Speu           184 C374         KS SRT 18         Kang Phnav         GMT         263         DAlat         PREK THNOT         K. Speu           186 C397         SK SPSR 21         Kandal         GMT         263         Dalat         PREK THNOT         K. Speu           186 C397         SK PKS 11         Kandal         GMT         250         Lal Dam         ST.SIEM REA         Siem Reap           187 C390         KD SAA 22         Troy Sla, Petr-h4         P         250         250         Natol         DELTA         Kandal           190 C368         CSA 39         Prek Toch, Pan-h5         M         250         250         PREK THNOT         K. Kandal           192 C686         TK SA51         Nourne Lok Res.         G         250         250         Pret Nuk kompul	179 C791	KS BST 11	Slaku Pstn.	Р	280			DELTA	K. Speu
181 C376       KS SRT 18       Krang Pong Ro       GMT       273       O Krang Ampel       PREK THNOT       K. Speul         182 C973       KS SRT 3       Tmor Pauk       GMT       268       O Anlong Rumlich       PREK THNOT       K. Speul         184 C374       KS SRT 3       Tmor Pauk       GMT       267       O Talat       PREK THNOT       K. Speul         184 C374       KS SRT 11       Kandal       GMT       267       O Talat       PREK THNOT       K. Speul         186 C275       KS PSR 11       Kandal       GMT       267       O Talat       PREK THNOT       K. Speul         186 C375       KS PSR 11       Kandal       GMT       250       Lel Dam       ST.SIEM REAP       Siem Reap         187 C398       DS AA2 2       Troy Sla, Pstn-h4       P       250       250       Noticital       PREK THNOT       K. Andal         190 C359       OM SAN 3       Koun Kreal Dam       MT       250       250       Noticital       ST.SRENG       O. M. Chey         191 C466       KD SAA 1       Trapeang       GMT       250       250       Prek Toki Not       Kandal         192 C14       K KAD 5       Rolours Dam       G       250       50	180 C44	KS SRT 11	Anlong Sla	GMT	278	50	O Chheuleal Kramon	PREK THNOT	K. Speu
182 C973       KD SAA 17       Trolday Brey       GT       270       PELTA       Kandal         183 C918       KS SRT 3       Tmor Pauk       GMT       268       O Anlong Rumlich       PREK THNOT       K. Speu         184 C374       KS SRT 3       Tmor Pauk       GMT       267       O Talat       PREK THNOT       K. Speu         186 C397       SR PIX 5       Lel Dam       MT       250       Lel Dam       ST.SIEM REAP       Siem Reap         186 C397       KN PK8 5       Kompong Chak Res.       PG       250       250       Prek Ambel       DELTA       Kahdal         188 C333       TN PK8 5       Kompong Chak Res.       PG       250       250       Verk Ambel       DELTA       Kahdal         190 C359       ON SMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SRENG       O.M. Chey         191 C686       KD SAA 9       Prek Toch, Psnt-h5       M 250       250       Frek Muk kompul       SIEM BOK       Kandal         192 C626       TK SAD 5       Doeum Dong Res.       G       250       250       Prek Kokoko       PLTA       Kakeo         192 C626       TK SAD 5       Tonmunup Lok Res.       G       250	181 C376	KS SRT 18	Krang Pong Ro	GMT	273		O Krang Ampel	PREK THNOT	K. Speu
183 C918       KS SRT 3       Tmor Pauk       GMT       263       O Anlong Rumlich       PREK THNOT       K. Speu         186 C374       KS SPSR 21       Kanag Phnav       GMT       263       PREK THNOT       K. Speu         186 C374       KS PSR 11       Kandal       GMT       263       Lel Dam       ST.SIEM REAP       Siem Reap         187 C990       ND SAA 22       Troy Sla, Pstn-h4       P       250       250       DeL TA       Kandal         188 C331       TK PKB 5       Kompong Chak Res.       PG       250       250       Prek Ambel       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Prek Ambel       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Prek Mmpul       DELTA       Kandal         192 C14       KD MKP1       Ampou Deap       MPG       250       250       Prek Muk kompul       DELTA       Kandal         192 C14       KD MKP1       Rolours Dam       G       250       250       Prek Anlung Thom       Kandal         192 C45       TK SAM 5       Doeum Dong Res.       G       250       50	182 C973	KD SAA 17	Trolday Brey	GT	270	270		DELTA	Kandal
184 C374       KS PSR 26       Krang Phnav       GMT       267       O Talat       PREK THNOT       K. Speu         185 C275       KS PSR 11       Kandal       GMT       263       PREK THNOT       K. Speu         186 C397       SR PUK 5       Lel Dam       MT       250       Lel Dam       ST.SIEM REAP       Siem Reap         187 C390       KD SAA 22       Troy Sla, Pstn-h4       P       250       250       DeLTA       Kandal         188 C333       TK PKB 5       Kompong Chak Res.       PG       250       250       Prek Ambeil       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Prek Ambeil       DELTA       Kandal         192 C414       KD MKP 1       Ampou Deap       MPG       250       250       Prek Toul, Nak Kompol       DELTA       Kandal         193 C963       KS BST 2       Trapaang       GMT       250       250       Prek Toul, Nak Kompol       DELTA       Takeo         194 C256       TK SAD 5       Doeum Dong Res.       G       250       250       Prek Toul, Lokok       DELTA       Takeo         195 C6747       PV MES 1       Rolours Dam       MT       250<	183 C918	KS SRT 3	Tmor Pauk	GMT	268		O Anlong Rumlich	PREK THNOT	K. Speu
185 C275       KS PSR 11       Kandal       GMT       263       PREK THNOT       K. Speu         186 C397       SR PUK 5       Lel Dam       MT       250       250       DELTA       Kandal         187 C990       KD SAA 22       Troy Sla, Pstn-h4       P       250       250       DELTA       Kandal         188 C141       KD KKD 6       Boeung Krochap       MT       250       250       St. Totol       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SIEMG       O. M. Chey         191 C686       KD SAA 9       Prek Toch, Psnt-h5       M       250       250       Prek Muk kompul       SIEM BOK       Kandal         192 C14       KD MKP 1       Ampou Deap       MPG       250       250       Prek Muk kompul       SIEM BOK       Kandal         192 C14       KD MKP 1       Ampou Deap       MPG       250       250       Prek Toul Loko       DELTA       Kamdal         192 C147       FV MES 1       Rolours Dam       G       250       250       Prek Toul Loko       DELTA       Kamdal         193 C593       TK BAT 1       Bati Pstn-h22       P       250<	184 C374	KS PSR 26	Krang Phnav	GMT	267		O Talat	PREK THNOT	K. Speu
186 C397       SR PUK 5       Lel Dam       MT       250       Lel Dam       ST.SIEM REAP       Siem Reap         187 C390       KD SAA 22       Troy Sla, Pstn-h4       P       250       250       DELTA       Kandal         188 C333       TK PKB 5       Kompong Chak Res.       PG       250       250       Prek Ambel       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SRENG       O. M. Chey         191 C686       KD SAA 9       Prek Toch, Psnt-h5       M       250       250       Prek Muk kompul       SIEM BOK       Kandal         192 C614       KD MKP 1       Ampou Deap       MPG       250       250       Prek Muk kompul       DELTA       Kandal         193 C963       KS BST 2       Trapeang       GMT       250       250       Prek Anlung Thom       Prey Veng       194 Prey Veng       194 Prey Veng       196 C955       KAD 5       Turnup Lok Res.       G       250       50       Prek Anlung Thom       Takeo       197 C930       SR BST 1       Tor Dam       ST.SHENA       Siem Reap       Siem R	185 C275	KS PSR 11	Kandal	GMT	263			PREK THNOT	K. Speu
187 C390       KD SAA 22       Troy Sla, Pstn-h4       P       250       250       DELTA       Kandal         188 C333       TK PKB 5       Kompong Chak Res.       PG       250       250       Prek Ambel       DELTA       Kandal         180 C141       KD KKD 6       Boeung Krochap       MT       250       250       St. Totol       DELTA       Kandal         190 C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SRENG       O. M. Chey         191 C686       KD SAA 9       Prek Toch, Psnt-h5       M       250       250       Prek Muk kompul       SIEM BOK       Kandal         192 C14       KD MKP 1       Ampou Deap       MPG       250       250       Prek Muk kompul       SIEM BOK       Kandal         193 C696       KS BST 2       Trapeang       GMT       250       250       Prek Anlung Thom       Prey Veng       Prey Veng         194 C256       KC KL4       Phum Bei Dam       GT       250       Tor Dam       ST.SIEM REAP       Siem Reap         198 C565       KC KL4       Phum Bei Dam       GT       250       Sambar Thom       PREK THNOT       Takeo         199 C569       TK BAK1	186 C397	SR PUK 5	Lel Dam	MT	250		Lel Dam	ST.SIEM REAP	Siem Reap
188         C333         TK PKB 5         Kompong Chak Res.         PG         250         250         Pick Ambel         DELTA         Takeo           189         C141         KD KKD 6         Boeung Krochap         MT         250         St. Totol         DELTA         Kandal           190         C359         OM SMR 3         Koun Kreal Dam         MT         250         St. Totol         DELTA         Kandal           191         C686         KD SAA 9         Prek Toch, Psnt-h5         M         250         250         Prek Muk kompul         SIEM BOK         Kandal           192         C14         KD MKP 1         Ampou Deap         MPG         250         250         Prek Muk kompul         SIEM BOK         Kandal           192         C14         Roburs Dam         G         250         50         Prek Muk kompul         DELTA         Kandal           193         C963         TK KAD 5         Tumnup Lok Res.         G         250         50         Prek Anlung Thom         Takeo           197         C930         SR BS1 1         To Dam         MT         250         To Dam         ST.CHINT         K. Cham           198         C565         KD KAD 4         P	187 C990	KD SAA 22	Troy Sla, Pstn-h4	Р	250	250		DELTA	Kandal
189       C141       KD KD 6       Boeung Krochap       MT       250       250       Stool       DELTA       Kandal         190       C359       OM SMR 3       Koun Kreal Dam       MT       250       250       Kounkreal       ST.SRENG       O. M. Chey         191       C686       KD SAA 9       Prek Toch, Psnt-h5       M       250       Prek Muk kompul       ST.SRENG       Kandal         192       C264       KD MKP 1       Ampou Deap       MPG       250       250       Prek Muk kompul       St.EN BOK       Kandal         193       C963       KS BST 2       Trapeang       G       250       250       Prek Nuk kompul       DELTA       Kampong Speu         194       C256       TK SAM 5       Doeum Dong Res.       G       250       250       Prek Toul Lokok       DELTA       Takeo         195       C747       PV MES 1       Rolours Dam       GT       250       Tor Dam       ST.SIEM REAP       Siem Reap         197       C30       SR BSR 1       Tor Dam       MT       260       100       PREK THNOT       Takeo         199       C69       TK BAT 1       Bati Pstn-h22       P       250       100       PREK THNOT </td <td>188 C333</td> <td>TK PKB 5</td> <td>Kompong Chak Res.</td> <td>PG</td> <td>250</td> <td>250</td> <td>Prek Ambel</td> <td>DELTA</td> <td>Takeo</td>	188 C333	TK PKB 5	Kompong Chak Res.	PG	250	250	Prek Ambel	DELTA	Takeo
190         C339         OM SMR 3         Koun Kreal Dam         MT         250         250         Kounkreal         ST.SRENG         O. M. Chey           191         C686         KD SAA 9         Prek Toch, Psnt-h5         M         250         250         Prek Muk kompul         SIEM BOK         Kandal           192         C14         Ampou Deap         MPG         250         250         Prek Muk kompul         SIEM BOK         Kandal           193         C963         KS BST 2         Trapeang         GMT         250         7rek Muk kompul         DELTA         Kampong Speu           194         C256         TK KAD 5         Tumnup Lok Res.         G         250         7rek Joul Lokok         DELTA         Takeo           197         C303         SR BSR 1         To Dam         MT         250         Tor Dam         ST.SIEM REAP         Siem Reap           198         C656         KC KL4         Phum Bei Dam         GT         250         100         PREK THNOT         K.Speu           200         C220         KS SR SP         Shonhe Kach         GMT         246         O Sambar Thom         PREK THNOT         K. Speu           201         C353         KS PS A29         <	189 C141	KD KKD 6	Boeung Krochap	MT	250	250	St. Totol	DELTA	Kandal
191 C686KD SAA 9Prek Toch, Psnt-h5M250250PREK THNOTKandal192 C614KD MKP 1Ampou DeapMPG250250Prek Muk kompulSIEM BOKKandal193 C963KS BST 2TrapeangGMT250250Prek Muk kompulSIEM BOKKandal194 C256TK SAM 5Doeum Dong Res.G250250Prek Anug ThomTakeo196 C995TK KAD 5Tumnup Lok Res.G250O Pech SaDELTATakeo197 C930SR BSR 1Tor DamMT250Tor DamST.SIEM REAPSiem Reap198 C656KC CKL 4Phum Bei DamGT250O Cambar ThomPREK THNOTK.S. Speu200 C220KS SRT 5Chonde KachGMT246O Sambar ThomPREK THNOTK. Speu201 C337KS PS 29Kop ChkeahGMT210O ChansyDELTAK andal203C589KD PLU 4Por KambaurG210210St.Boeung PhteaDELTAK andal204C176KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAK andal205C37VP LU 4Por KambaurG210210St.Boeung PhteaDELTAK andal204C378KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAK andal204C378KD KKD 4KompasGMT200200Boeung Phtea <td< td=""><td>190 C359</td><td>OM SMR 3</td><td>Koun Kreal Dam</td><td>MT</td><td>250</td><td>250</td><td>Kounkreal</td><td>ST.SRENG</td><td>O. M. Chey</td></td<>	190 C359	OM SMR 3	Koun Kreal Dam	MT	250	250	Kounkreal	ST.SRENG	O. M. Chey
192       C14       KD       MKP 1       Ampou Deap       MPG       250       250       Prek Muk kompul       SIEM BOK       Kandal         193       C363       KS       BST 2       Trapeang       GMT       250       Delt X       MD       DELTA       Kanpong Speu         194       C256       TK SAM 5       Doeum Dong Res.       G       250       250       Prek Aulung Thom       DELTA       Takeo         196       C395       TK KAD 5       Tumnup Lok Res.       G       250       250       OPech Sa       DELTA       Takeo         197       C330       SR BSR 1       To Dam       MT       250       Tor Dam       ST.SIEM REAP       Siem Reap         198       C655       KC CKL 4       Phum Bei Dam       GT       250       Tor Dam       ST.SIEM REAP       Siem Reap         200       C220       KS SRT 5       Chonde Kach       GMT       246       O Sambar Thom       PREK THNOT       K. Speu         201       C353       KS PSR 29       KOp Likaah       MPG       210       St.Boeung Phtea       DELTA       Kandal         204       C156       KD KKD 4       Bromol Khla       MPG       210       210       St	191 C686	KD SAA 9	Prek Toch, Psnt-h5	М	250	250		PREK THNOT	Kandal
193 C963       KS BST 2       Trapeang       GMT       250       DELTA       Kampong Speu         194 C256       TK SAM 5       Doeum Dong Res.       G       250       250       Prek Toul Lokok       DELTA       Takeo         195 C747       PV MES 1       Rolours Dam       G       250       250       Prek Anlung Thom       Prey Veng         196 C995       TK KAD 5       Turnup Lok Res.       G       250       250       OPech Sa       DELTA       Takeo         197 C303       SR BSR 1       Tor Dam       MT       250       Tor Dam       ST.SIEM REAP       Siem Reap         198 C565       KC CKL 4       Phum Bei Dam       GT       250       Tor Dam       ST.SIEM REAP       Neme Reap         200 C220       KS SRT 5       Chonde Kach       GMT       246       O Sambar Thom       PREK THNOT       K. Cham         202 C217       KD SAA 15       Chonnelong Prov       MPG       220       220       DELTA       K. Snad         203 C589       KD PLU 4       Por Kambaur       G       218       218       SIEM BOK       Kandal         204 C156       KD KKD 14       Bromol Khla       MPG       210       210       Boeung Phtea       DELTA <td>192 C14</td> <td>KD MKP 1</td> <td>Ampou Deap</td> <td>MPG</td> <td>250</td> <td>250</td> <td>Prek Muk kompul</td> <td>SIEM BOK</td> <td>Kandal</td>	192 C14	KD MKP 1	Ampou Deap	MPG	250	250	Prek Muk kompul	SIEM BOK	Kandal
194         C256         TK SAM 5         Doeum Dong Res.         G         250         250         Prek Toul Lokok         DELTA         Takeo           195         C747         PV MES 1         Rolours Dam         G         250         50         Prek Anlung Thom         Prey Veng         Prey Veng           196         C995         TK KAD 5         Tumup Lok Res.         G         250         O Pech Sa         DELTA         Takeo           197         C930         SR BSR 1         Tor Dam         MT         250         Tor Dam         ST.SIEM REAP         Siem Reap           198         C665         KC CKL 4         Phum Bei Dam         GT         250         100         PREK THNOT         Takeo           200         C220         KS SRT 5         Chonlong Kach         GMT         2246         O Chansy         DELTA         K. Speu           202         C217         KD SA15         Chomlong Prov         MPG         220         20         DELTA         K. Andal           203         C589         KD PLU 4         Por Kambaur         G         218         218         SIEM BOK         K. Andal           205         C124         KD KKD 44         Kompas         GMT	193 C963	KS BST 2	Trapeang	GMT	250			DELTA	Kampong Speu
195       C747       PV MES 1       Rolours Dam       G       250       50       Prek Anlung Thom       Prey Veng         196       C395       TK KAD 5       Tumnup Lok Res.       G       250       250       O Pech Sa       DELTA       Takeo         197       C303       SR BSR 1       Tor Dam       MT       250       Tor Dam       ST.SIEM REAP       Siem Reap         198       C565       KC CKL 4       Phum Bei Dam       GT       250       Tor Dam       ST.CHINIT       K. Cham         199       C69       TK BAT 1       Bati Pstn-h22       P       250       100       PREK THNOT       K. Speu         200       C220       KS SRS 75       Chonde Kach       GMT       221       O Chansy       DELTA       K. Speu         201       C358       KD PLU 4       Por Kambaur       G       218       218       SIEM BOK       Kandal         204       C156       KD KKD 4       Kompas       GMT       201       210       St.Boeung Phtea       DELTA       Kandal         205       C124       KD KKD 4       Kompas       GMT       205       205       Boeung Phtea       DELTA       Kandal         207 <t< td=""><td>194 C256</td><td>TK SAM 5</td><td>Doeum Dong Res.</td><td>G</td><td>250</td><td>250</td><td>Prek Toul Lokok</td><td>DELTA</td><td>Takeo</td></t<>	194 C256	TK SAM 5	Doeum Dong Res.	G	250	250	Prek Toul Lokok	DELTA	Takeo
196       C995       TK KAD 5       Tumnup Lok Res.       G       250       250       O Pech Sa       DELTA       Takeo         197       C930       SR BSR 1       Tor Dam       MT       250       Tor Dam       ST.SIEM REAP       Siem Reap         198       C565       KC CKL 4       Phum Bei Dam       GT       250       Tor Dam       ST.SIEM REAP       Siem Reap         199       C69       TK BAT 1       Bati Pstn-h22       P       250       100       PREK THNOT       Takeo         200       C220       KS SRT 5       Chonde Kach       GMT       246       O Sambar Thom       PREK THNOT       K. Speu         201       C335       KS PSR 29       Kop Chkeah       GMT       210       O Chansy       DELTA       K. Speu         202       C217       KD SAJ 5       Chomlong Prov       MPG       210       210       St.Boeung Phtea       DELTA       Kandal         203       C589       KD KLD 4       Por Kambaur       G       218       218       St.BM BOK       Kandal         204       C156       KD KD 4       Kompas       GMT       205       205       Boeung Phtea       DELTA       Kandal         205	195 C747	PV MES 1	Rolours Dam	G	250	50	Prek Anlung Thom		Prey Veng
197 C930SR BSR 1Tor DamMT250Tor DamST. SIEM REAPSiem Reap198 C565KC CKL 4Phum Bei DamGT250Tor DamST. CHINITK. Cham199 C69TK BAT 1Bati Pstn-h22P250100PREK THNOTTakeo200 C220KS SRT 5Chonde KachGMT246O Sambar ThomPREK THNOTK. Speu201 C353KS PSR 29Kop ChkeahGMT221O ChansyDELTAK. Speu202 C217KD SAA 15Chomlong ProvMPG220220DELTAK. Kandal203 C589KD PLU 4Por KambaurG218218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200200Ch. RusseyST. SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST. SHARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboST.BARIBOK. Chhnang214 C4485<	196 C995	TK KAD 5	Tumnup Lok Res.	G	250	250	O Pech Sa	DELTA	Takeo
198C565KC CKL 4Phum Bei DamGT250ST.CHINITK. Cham199C69TK BAT 1Bati Pstn-h22P250100PREK THNOTTakeo200C220KS SRT 5Chonde KachGMT246O Sambar ThomPREK THNOTK. Speu201C353KS PS 29Kop ChkeahGMT221O ChansyDELTAK. Speu202C217KD SAA 15Chomlong ProvMPG220220DELTAKandal203C589KD PLU 4Por KambaurG218218SIEM BOKKandal204C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205C124KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal206C328KD KKD 4KompasGMT200200Ch. RusseyST.SIEM REAPSiem Reap209C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST.BARIBOK. Chhnang211C160KN RTL 1Onlung PutreaG200200St.Krang PonleyST.BARIBOK. Chhnang212C179TK BCS 1Chamlon Chker Res.G200200St.BariboST.BARIBOK. Chhnang212C179TK BCS 1OrlusG200200St.BariboST.BARIBOK. Chhnang212C179TK BCS 1OrlusG20	197 C930	SR BSR 1	Tor Dam	MT	250		Tor Dam	ST.SIEM REAP	Siem Reap
199 C69TK BAT 1Bati Pstn-h22P250100PREK THNOTTakeo200 C220KS SRT 5Chonde KachGMT246O Sambar ThomPREK THNOTK. Speu201 C353KS PSR 29Kop ChkeahGMT221O ChansyDELTAK. Speu202 C217KD SAA 15Chomlong ProvMPG220220DELTAKandal203 C589KD PLU 4Por KambaurG218218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SR 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD KAA 828 Kakada Res.G200200Tonle SapST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200St.TakeoDELTATakeo213 C705TK TRG 2Prey Mean Res.G200200St.BariboST.BARIBOK. Chhnang214 C485KN BB1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal Ampil	198 C565	KC CKL 4	Phum Bei Dam	GT	250			ST.CHINIT	K. Cham
200 C220KS SRT 5Chonde KachGMT246O Sambar ThomPREK THNOTK. Speu201 C353KS PSR 29Kop ChkeahGMT221O ChansyDELTAK. Speu202 C217KD SAA 15Chomlong ProvMPG220220DELTAK. Speu203 C589KD PLU 4Por KambaurG218218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200PREK THNOTKandal210 C530KN KTL 1Onlung PutreaG200200PREK THNOTKandal211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200St.BariboST.BARIBOK. Chhnang213 C705TK TRG 2Prey Mean Res.G200St.BariboST.BARIBOK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chnang215 C904KN KCN 1Thnal AmpilM <t< td=""><td>199 C69</td><td>TK BAT 1</td><td>Bati Pstn-h22</td><td>Р</td><td>250</td><td>100</td><td></td><td>PREK THNOT</td><td>Takeo</td></t<>	199 C69	TK BAT 1	Bati Pstn-h22	Р	250	100		PREK THNOT	Takeo
201 C353KS PSR 29Kop ChkeahGMT221O ChansyDELTAK. Speu202 C217KD SAA 15Chomlong ProvMPG220220DELTAKandal203 C589KD PLU 4Por KambaurG218218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN KTL 1Onlung PutreaG200200St.Krang PonleyST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboST.BARIBOK. Chhnang213 C705TK TRG 2Prey Mean Res.G200200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200200Trib.of St. O KbonPRE	200 C220	KS SRT 5	Chonde Kach	GMT	246		O Sambar Thom	PREK THNOT	K. Speu
202 C217KD SAA 15Chomlong ProvMPG220220DELTAKandal203 C589KD PLU 4Por KambaurG218218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RL1 1Onlung PutreaG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboST.BARIBOK. Chhnang213 C705TK TRG 2Prey Mean Res.G200200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK	201 C353	KS PSR 29	Kop Chkeah	GMT	221		O Chansy	DELTA	K. Speu
203 C589KD PLU 4Por KambaurG218SIEM BOKKandal204 C156KD KKD 14Bromol KhlaMPG210210St.Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal205 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST.SIEM REAPSiem Reap210 C530KN KTL 1Onlung PutreaG200200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang213 C705TK TRG 2Prey Mean Res.G200200St.BariboST.BARIBOK. Chhnang214 C485KN BR1 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOK. Addal<	202 C217	KD SAA 15	Chomlong Prov	MPG	220	220		DELTA	Kandal
204 C156KD KKD 14Bromol KhlaMPG210St. Boeung PhteaDELTAKandal205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST.BARIBOK. Chhnang210 C530KN KTL 1Onlung PutreaG200200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboSt.BariboK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOK. Andal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOK.	203 C589	KD PLU 4	Por Kambaur	G	218	218		SIEM BOK	Kandal
205 C124KD KKD 9Boeng PhteaG210210Boeung PhteaDELTAKandal206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200PREK THNOTKandal210 C530KN KTL 1Onlung PutreaG200200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboSt.BariBOK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOK. Andal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOKandal219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng219 C368<	204 C156	KD KKD 14	Bromol Khla	MPG	210	210	St.Boeung Phtea	DELTA	Kandal
206 C328KD KKD 4KompasGMT205205Boeung PhteaDELTAKandal207 C372PP DGK 4Kraing Pong RoP200P200PREK THNOTPhnom Penh208 C191SR SR P 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST.SIEM REAPSiem Reap210 C530KN KTL 1Onlung PutreaG200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BariboST.BARIBOK. Chnang213 C705TK TRG 2Prey Mean Res.G200St.BariboST.BARIBOK. Chnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOKandal219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng <td>205 C124</td> <td>KD KKD 9</td> <td>Boeng Phtea</td> <td>G</td> <td>210</td> <td>210</td> <td>Boeung Phtea</td> <td>DELTA</td> <td>Kandal</td>	205 C124	KD KKD 9	Boeng Phtea	G	210	210	Boeung Phtea	DELTA	Kandal
207 C372PP DGK 4Kraing Pong RoP200PREK THNOTPhnom Penh208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200PREK THNOTKandal210 C530KN KTL 1Onlung PutreaG200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BaceDELTATakeo213 C705TK TRG 2Prey Mean Res.G200St.BariboST.BARIBOK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PR KK 2Krachap DamP200200ST.BARIBOKandal219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C292KC ORO 2T	206 C328	KD KKD 4	Kompas	GMT	205	205	Boeung Phtea	DELTA	Kandal
208 C191SR SRP 2Cheay Russey DamGT200200Ch. RusseyST.SIEM REAPSiem Reap209 C3KD SAA 828 Kakada Res.GT200200PREK THNOTKandal210 C530KN KTL 1Onlung PutreaG200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.BacDELTATakeo213 C705TK TRG 2Prey Mean Res.G200St.BariboST.BARIBOK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOKandal219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C292KC ORO 2Tonle Sngout Res.GT20010O Cheu SaoyDELTAFrey Veng	207 C372	PP DGK 4	Kraing Pong Ro	Р	200		•	PREK THNOT	Phnom Penh
209 C3KD SAA 828 Kakada Res.GT200200PREK THNOTKandal210 C530KN KTL 1Onlung PutreaG200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200Tonle SapST.BARIBOK. Chhnang213 C705TK TRG 2Prey Mean Res.G200200St.TakeoDELTATakeo214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOKandal219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Cheu SaoyDELTAK. Cham	208 C191	SR SRP 2	Cheay Russey Dam	GT	200	200	Ch. Russey	ST.SIEM REAP	Siem Reap
210 C530KN KTL 1Onlung PutreaG200St.Krang PonleyST.BARIBOK. Chhnang211 C260KN RLB 5Dom RekG200200Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.TakeoDELTATakeo213 C705TK TRG 2Prey Mean Res.G200St.BariboST.BARIBOK. Chhnang214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C292KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	209 C3	KD SAA 8	28 Kakada Res.	GT	200	200		PREK THNOT	Kandal
211 C260KN RLB 5Dom RekG200Z00Tonle SapST.BARIBOK. Chhnang212 C179TK BCS 1Chamlon Chker Res.G200200St.TakeoDELTATakeo213 C705TK TRG 2Prey Mean Res.G200200St.TakeoDELTATakeo214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib. of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrev Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	210 C530	KN KTL 1	Onlung Putrea	G	200		St.Krang Ponley	ST.BARIBO	K. Chhnang
212 C179TK BCS 1Chamlon Chker Res.G200200St.TakeoDELTATakeo213 C705TK TRG 2Prey Mean Res.G200St.TakeoDELTATakeo214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrev Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	211 C260	KN RLB 5	Dom Rek	G	200	200	Tonle Sap	ST.BARIBO	K. Chhnang
213 C705TK TRG 2Prey Mean Res.G200DELTATakeo214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	212 C179	TK BCS 1	Chamlon Chker Res.	G	200	200	St.Takeo	DELTA	Takeo
214 C485KN BRB 1O RolusG200St.BariboST.BARIBOK. Chhnang215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	213 C705	TK TRG 2	Prey Mean Res.	G	200			DELTA	Takeo
215 C904KN KCN 1Thnal AmpilM20085Tonle SapST.BARIBOK. Chhnang216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	214 C485	KN BRB 1	O Rolus	G	200		St.Baribo	ST.BARIBO	K. Chhnang
216 C41KS PSR 2Anlong PrinhGMT200Trib.of St. O KbonPREK THNOTK. Speu217 C587KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	215 C904	KN KCN 1	Thnal Ampil	M	200	85	Tonle Sap	ST.BARIBO	K. Chhnang
217 C587 KD PLU 5Pongnea Loeu PstnP200200ST.BARIBOKandal218 C1000 PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	216 C41	KS PSR 2	Anlong Prinh	GMT	200		Trib.of St. O Kbon	PREK THNOT	K. Speu
218 C1000 PP RKE 3Tuol Bakha PstnP200ST.BARIBOPhnom Penh219 C368PV SKD 2Krachap DamT200200DELTAPrey Veng220 C929KC ORO 2Tonle Sngout Res.GT20010O Chheu SaoyDELTAK. Cham	217 C587	KD PLU 5	Pongnea Loeu Pstn	Р	200	200		ST.BARIBO	Kandal
219 C368     PV SKD 2     Krachap Dam     T     200     DELTA     Prey Veng       220 C929     KC ORO 2     Tonle Sngout Res.     GT     200     10     O Chheu Saoy     DELTA     K. Cham	218 C1000	PP RKE 3	Tuol Bakha Pstn	Р	200			ST.BARIBO	Phnom Penh
220 C929 KC ORO 2 Tonle Sngout Res. GT 200 10 O Chheu Saoy DELTA K. Cham	219 C368	PV SKD 2	Krachap Dam	т	200	200		DELTA	Prey Veng
	220 C929	KC ORO 2	Tonle Sngout Res.	GT	200	10	O Chheu Saoy	DELTA	K. Cham

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

### Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (5/6)

No	MPC	Project ID	Project Name	Irr	Irr Aro	a (ba)	Pivor Namo	Pivor Pacin Namo	Provinco
INU.		FIOJECLID	Floject Name	Type	Whole	a (IIa) Drv		River Dasin Mame	Name
221 (	C8/12		Stung Phoun Dam	MPG	200	Diy	O Chradena		K Cham
221	C642		Phorok Thom li Poto		200	200	D Childueng Brok Thom		Kandal
222 0	0047		Obektre Dom	r C	200	200			Takaa
223	C152	RM SCK 2	Brasst Bram Bosonyoir	CDT	200	200	O Kaon Kosai	ST MONOKOL BODEV	R Moonchov
224 1	C103		Kal Dom	DT	200	200			Siom Boon
225 0	0297				200	10		ST.SIEWIREAP	Sielli Keap
220 1	0476	KT SDA 8		CMT	200	10	0.0	St.Sen	K. Thom
227 0	C320			GIVIT	200	30	O Svay	St.Sen	K. Thom
228 1	0468		U La	GIVIT	200	000		St.Sen	K. Thom
229 0	C280			G	200	200	O Kaon Kosai		Lakeo
230 0		SR PBG Z	78 Dalli Kampang Chan	CMT	200	60	04 04-04-04-04		Siem Reap
231 0	0534	KI SIU Z	Rompong Chen	GIVIT	200	00	St.Staung	ST.STAUNG	K. Thom
232 0	0577		Phum Svay Canal	P	200	200	Б <u>К</u>	DELTA	Takeo
233 0	0521	KT PSB 14	O Tourk	GI	192	18	Boeng Kok	St.Sen	K. Inom
234 0	0974		Tronoul Chnnag Dam	G	186	186		PREKIE	Kratie
235	0879	KD SAA 14	Такео	GI	180	180		DELTA	Kandal
236	0125	PV SKD 3	Boeng Prey Dam		180	180		DELIA	Prey Veng
237 0	0980	KR CHL 31	Tropaeng Pres Dam		180	180		PREK CHHLONG	Kratie
238 (	0992	KD ANS 4	Tuk Phoor Reservoir	G	175	475		ST.BARIBO	Kandal
239 0	0537	KD SAA 18	Paemso	GI	175	175		DELIA	Kandal
240 0	0514	SR KLH 3	O Tatuk Dam	GI	175			ST.SRENG	K 0
241 (	C237	KS PSR 10	Chrok Ressey	GMT	170			PREK THNOT	K. Speu
242 (	C96	PS KRK 1	Benteay Krong Res.	G	170		Benteay Krong Res.	ST.BARIBO	Pursat
243 (	C392	KS PSR 13	La Ang	GMT	156		O Chansy	DELTA	K. Speu
244 (	C508	KS IPG 9	O Sya Dam	G	150	20	O Tang Ampil	PREK THNOT	K. Speu
245 (	C452	KD KKD 2	O Dam	MT	150	150	Tonle Toch	DELTA	Kandal
246 (	C555	SR SRP 1	Phnom Krom Dam	GT	150	150		ST.SIEM REAP	Siem Reap
247 (	C966	OM SMR 1	Trapeang Snor Res.	MI	150		Trapeang Snor	ST.SRENG	O. M. Chey
248 (	C377	KS PSR 20	Krang Preah Srok	GT	150	10		PREK THNOT	
249 (	C737	KD KDS 4	Roca Station	P	150	50	St.Prek Thnot	PREK THNOT	Kandal
250 (	C921	KD SAA 4	Toek Vilo,pstn-h9	P	150	150		PREK THNOT	Kandal
251 (	C696	PV PCR 6	Prekvy Canal	MPG	150	150	Prek Koh Sam Peu	DELTA	Prey Veng
252 (	C259	TK TKA 4	Dok Sap	G	150			DELTA	Takeo
253 (	C998	TK KAD 3	Tumnup Prey Bay Res.	G	150	150	O Pech Sa	DELTA	Takeo
254 (	C997	TK KAD 4	Tumnup Pich Sar Res.	PG	150	150	O Pech Sa	DELTA	Takeo
255 (	C599	PS KRK 16	Preaktabak Res.	G	150		Preaktabak Res.	ST.BARIBO	Pursat
256	C15	KT SEN 6	An Long Kranh	GMT	150			St.Sen	K. Thom
257 (	C512	KN RLB 1	OTasek	G	150		O Trapeang Thom	ST.BARIBO	K. Chhnang
258 (	C463	KS SRT 19	O Krang Ambel	GMT	150	100	O Krang Ampel	PREK THNOT	K. Speu
259 (	C371	TK BAT 6	Krain Krochang	G	150	150		PREK THNOT	lakeo
260 (	C115	PV SKD 1	Boeng Kropeu Dam	1	150	150		DELTA	Prey Veng
261 (	C665	KD LDE 43	Prek Speandek	MT	150	150		DELTA	Kandal
262 (	C875	KD LDE 11	Ta Van Canal	MT	150	150		DELTA	Kandal
263 (	C743	KR PPS 16	Rolom Pnav Dam	G	150	150		SIEM BOK	Kratie
264 (	C576	KR SBO 11	Phum Srouch Dam	G	150			PREK KRIENG	Kratie
265 (	C566	KT STO 5	Phum Chhek	GMT	150		St.Staung	ST.STAUNG	K. Thom
266 (	C321	KD KTO 3	Koh Thom Pstn	Р	150	150		DELTA	Kandal
267 (	C32	TK SAM 11	Angpreah Sdach	_	150			DELTA	Takeo
268	C538	IK SAM 13	Pana	P	150			DELTA	Takeo
269	C886	KS SRT 10	Tang Kompi	GMT	144		O Thom	PREK THNOT	K. Speu
270 (	0523	KS SRT 2	O Veng	GMT	141		St.Prek Thnot	PREK THNOT	K. Speu
271 (	C1013	TK TKA 6	Wat Champa	G	136		Local Small Str.	DELTA	Takeo
272 (	C919	KS PSR 9	Tnal Dach	GMT	132	10	St.Kut Phluk	DELTA	K. Speu
273 (	C1005	KS BST 10	Vat Po Dam	GMT	132	10	O Nitean	DELTA	K. Speu
274 (	C184	KS TPG 5	Chang Va Riel Dam	MPG	131		St. Krang Poley	ST.BARIBO	K. Speu
275 (	C719	SR SRP 3	Prohut Dam	GT	130	130	Prohut	ST.SIEM REAP	Siem Reap

Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

### Table 3(2) Irrigation Area and Water Sources (Tributaries) of Cambodia (6/6)

No	MRC	Project ID	Project Name	Irr	Irr Area	(ha)	River Name	River Basin Name	Province
	ID	i iojoot ib	i lojoot Namo		Whole	Drv		Haver Basin Hame	Name
276	C582	KC BTY 2	Po Ta Tres	.)po	130	2.9		ST CHINIT	K Cham
277	C279	KR SNO 22	Kanleng Phumsaat Dam	G	130			PREK CHHLONG	Kratie
278	C968	TK PKB 4	Trapeang Veeng Dam	G	130	130		DELTA	Takeo
279	C389	KD KKD 1	Kror Ven	MT	128	128		DELTA	Kandal
280	C1018	PV PRA 10	Yothsas Bokneng	MT	126	126	Tonle Toch	DELTA	Kandal
281	C1019	KD LVE 5	Yothsasbeng Kork	TGR	125	125	Tonle Toch	DELTA	Kandal
282	C261	KT BAR 5	Dombok Yun	GT	120	15		ST.CHINIT	K. Thom
283	C1021	KN SMC 1	Youtasas	G	120		St.Krang Ponley	ST.BARIBO	K. Chhnang
284	C351	KN RLB 2	Konleng Pher	G	120	60	Tonle Sap	ST.BARIBO	K. Chhnang
285	C678	KD LDE 27	Prek Tatouk	MT	120	120		DELTA	Kandal
286	C621	KD LDE 1	Prek Chrov	MT	120	120		DELTA	Kandal
287	C536	PS KDG 11	Osang Long Barrage	G	120		Osang Long barrage	ST.PURSAT	Pursat
288	C559	PS KDG 9	Phom Stung	G	120		Phom stung	ST.PURSAT	Pursat
289	C375	KS PSR 19	Krang Po	GMT	117	10		PREK THNOT	K. Speu
290	C51	KS PSR 28	Anlung Prinh	GMT	114	5		PREK THNOT	K. Speu
291	C373	KS PSR 21	Krang Chres	GMT	112		O Krang Punley	PREK THNOT	K. Speu
292	C422	KS PSR 23	Nea Yok	GMT	112		O Chansy	DELTA	K. Speu
293	C803	KD PLU 1	Somrong	Р	110	50	Poem Pisei	ST.BARIBO	Kandal
294	C645	KD LDE 2	Prek Nou	MT	110	110		DELTA	Kandal
295	C417	KS ODG 5	Mong Chen	MPG	105		Trib.of St. O Kbon	ST.BARIBO	K. Speu
296	C458	KS BST 19	O Kbear Dam	GMT	105	10	O Don Ang	DELTA	K. Speu
297	C447	KR SNO 2	O Chor Dam	G	105			PREK CHHLONG	Kratie
298	C722	PP DGK 2	Protes Lang(3)	Р	100	30		PREK THNOT	Phnom Penh
299	C729	SR PBG 4	Raing Te Dam	MT	100	100	Raing Te	ST.SIEM REAP	Siem Reap
300	C283	SR PBG 3	Kaun Smon Dam	GT	100	100	Kaun Smon	ST.SIEM REAP	Siem Reap
301	C241	SR SRS 2	Chrouy Res.	MT	100		Chrouy Res.	ST.SRENG	Siem Reap
302	C273	OM SMR 2	Kan Dek Res.	MT	100		Kan Dek	ST.SRENG	O. M. Chey
303	C796	KT PBL 3	So Krong	GMT	100		O Dambork Por	St.Sen	K. Thom
304	C105	PV PCR 4	Boeng Dak Res.	PT	100	100		DELTA	Prey Veng
305	C985	KS BST 15	Tropang Resey Dam	GMT	100		Ta Prach	DELTA	K. Speu
306	C707	KS BST 9	Prey Peay Dam	GMT	100		O Saok	DELTA	K. Speu
307	C819	KS BST 6	Sre Kantchor Dam	GMT	100		Ta Prach	DELTA	K. Speu
308	C525	KS BST 12	Odey Sar	GMT	100		O Kreul	DELTA	K. Speu
309	C114	KS BST 7	Boeng Krang Knol	GMI	100		Boeng Krang Knol	DELTA	K. Speu
310	0700	TK TKA 3	Ta Meng	G	100			DELTA	Такео
311	C709		Prey Rumdoul	G	100		O Prey Romdoul	DELTA	Takeo
312	0700	PV MES 4	Boeng Knmei Dam	G	100		<b>D</b>   A   <b>T</b>		Prey Veng
313	0720	PV MES 5	Purtamon Reservoir	MPG	100		Prek Aniong Thom		Prey Veng
314	C/18			MPG	100		Prek Uniphoc		Prey veng
315	C984	KN IPH 4	Tropang Phiong	G	100	10	St. I nom	ST.BARIBU	K. Chinnang
310	C938	KS BST 17	Vot Phong Dom	GIVIT	100	10	C Kontout		K. Speu
210	C1004		Anlong Kongon Doth	Givi i	100		O Kantout		R. Speu Dhnom Donh
210	C075				100		Brok Chomong		K Chom
319	C9/5		Kongovo Rogenvoir	CDT	100	100	Prek Chomeng		R. Cham
320	C407	DIVI JOF Z	Makak Posonusir	CDT	100	100			B. Moonshow
১∠। ৫০০	C506			GMT	100	100			K Thom
322	C255		O Ovay Deum Thkouy Dam	MT	100	100			N. THUIH Siem Rean
320	C108	KT SEN 0	Boong Kaek Poul	GMT	100	100		St. SIEWI REAF	K Thom
524	0100	KI GLIN 9	Dueny Naek Fuul	Givil	100			01.0011	N. 11011

 
 Total
 237452
 110619

 Note: G: gravity, P: fixed pump, M: mobile pump, T: traditional lift, R: recession irrigation
 Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

No.	MRC	Project	Project	Irr.	Irriga	ation Area (ha	a)	River Name	River Basin
	ID	ID	Name	Туре	Wet	Dry	3RD		Name
1	VDE3	VT3	LXQ/3	Μ	7173	3853	0	Delta Canal	DELTA
2	VDE4	VT4	LXQ/4	Μ	5044	4358	0	Delta Canal	DELTA
3	VDE5	VT5	LXQ/5	Μ	4924	4763	0	Delta Canal	DELTA
4	VDE8	VT8	LXQ/8	Μ	23369	15116	0	Delta Canal	DELTA
5	VDE9	VT9	LXQ/9	М	5693	3438	0	Delta Canal	DELTA
6	VDE10	VT10	LXQ/10	Μ	3897	3361	0	Delta Canal	DELTA
7	VDE11	VT11	LXQ/11	М	27659	19537	959	Delta Canal	DELTA
8	VDE12	VT12	LXQ/12	Μ	45953	39721	2184	Delta Canal	DELTA
9	VDE13	VT13	LXQ/13	Μ	71010	69503	235	Delta Canal	DELTA
10	VDE14	VT14	LXQ/14	Μ	53512	53016	522	Delta Canal	DELTA
11	VDE15	VT15	LXQ/15	Μ	10892	9630	0	Delta Canal	DELTA
12	VDE16	VT16	WB/16	М	68697	67666	13342	Delta Canal	DELTA
13	VDE17	VT17	WB/17	М	73355	68416	25190	Delta Canal	DELTA
14	VDE18	VT18	WB/18	Μ	33994	33682	25483	Delta Canal	DELTA
15	VDE19	VT19	WB/19	ML	16639	16639	15799	Delta Canal	DELTA
16	VDE20	VT20	WB/20	Μ	17056	17056	12030	Delta Canal	DELTA
17	VDE21	VT21	WB/21	Μ	13778	13778	7821	Delta Canal	DELTA
18	VDE22	VT22	WB/22	М	31223	31223	20839	Delta Canal	DELTA
19	VDE23	VT23	KS/23	ML	27084	26846	6579	Delta Canal	DELTA
20	VDE24	VT24	TN/24	Μ	10669	1165	0	Delta Canal	DELTA
21	VDE25	VT25	TN/25	ML	33182	32015	835	Delta Canal	DELTA
22	VDE26	VT26	BRL/26	ML	31743	29759	1567	Delta Canal	DELTA
23	VDE27	VT27	QLPH/27	Μ	9850	9709	0	Delta Canal	DELTA
24	VDE28	VT28	QLPH/28	Μ	22463	21296	0	Delta Canal	DELTA
25	VDE29	VT29	QLPH/29	Μ	27451	23826	0	Delta Canal	DELTA
26	VDE31	VT31	QLPH/31	Μ	16277	9832	0	Delta Canal	DELTA
27	VDE32	VT32	QLPH/32	Μ	14491	7288	0	Delta Canal	DELTA
28	VDE36	VT36	QLPH/36	Μ	10280	7426	0	Delta Canal	DELTA
29	VDE37	VT37	QLPH/37	Μ	8884	5132	0	Delta Canal	DELTA
30	VDE38	VT38	QLPH/38	Μ	7994	3154	0	Delta Canal	DELTA
31	VDE39	VT39	QLPH/39	Μ	2710	667	0	Delta Canal	DELTA
32	VDE40	VT40	QLPH/40	Μ	3783	1056	0	Delta Canal	DELTA
33	VDE42	VT42	QLPH/42	Μ	1395	1018	0	Delta Canal	DELTA
34	VDE51	VT51	UMT/51	М	822	48	0	Delta Canal	DELTA
35	VDE52	VT52	UMT/52	Μ	32217	14805	0	Delta Canal	DELTA
36	VDE67	VT67	NMT/67	Μ	8772	7672	0	Delta Canal	DELTA
37	VDE68	VT68	NMT/68	М	12841	11841	208	Delta Canal	DELTA
38	VDE69	VT69	NMT/69	Μ	3719	3719	81	Delta Canal	DELTA
39	VDE70	VT70	NMT/70	Μ	25110	25110	0	Delta Canal	DELTA
40	VDE71	VT71	NMT/71	Μ	1723	1323	28	Delta Canal	DELTA
41	VDE72	VT72	NMT/72	Μ	4087	3587	68	Delta Canal	DELTA
42	VDE73	VT73	NMT/73	Μ	5399	5399	566	Delta Canal	DELTA
43	VDE74	VT74	NMT/74	Μ	9788	9788	987	Delta Canal	DELTA

# Table 4 Irrigation Area and Water Sources (Delta) of Vietnam (1/2)

Note: M: mobile pump, L: tidal irrigation

Source: Land Resources Inventory for Agricultural Development, February 2002, MRC

Table 4 Irrigation Area :	and Water Sources	(Delta) of Vietnam	(2/2)
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No.	MRC	Project	Project	Irr.	Irriga	ation Area (h	ia)	River Name	River Basin
	ID	ID	Name	Туре	Wet	Dry	3RD		Name
44	VDE75	VT75	NMT/75	М	11174	11174	1126	Delta Canal	DELTA
45	VDE76	VT76	NMT/76	М	3442	3442	347	Delta Canal	DELTA
46	VDE77	VT77	NMT/77	М	14722	14722	4204	Delta Canal	DELTA
47	VDE78	VT78	NMT/78	Μ	17056	17056	4979	Delta Canal	DELTA
48	VDE79	VT79	NMT/79	М	31131	30124	27317	Delta Canal	DELTA
49	VDE80	VT80	NMT/80	ML	30197	29575	25805	Delta Canal	DELTA
50	VDE81	VT81	SMT/81	ML	26599	26249	18673	Delta Canal	DELTA
51	VDE82	VT82	SMT/82	ML	22387	21651	7990	Delta Canal	DELTA
52	VDE83	VT83	SMT/83	ML	20522	17020	250	Delta Canal	DELTA
53	VDE84	VT84	SMT/84	ML	29952	14794	67	Delta Canal	DELTA
54	VDE85	VT85	SMT/85	ML	41327	18168	681	Delta Canal	DELTA
55	VDE87	VT87	SMT/87	Μ	5785	1165	0	Delta Canal	DELTA
56	VDE88	VT88	BT/88	Μ	3135	3135	1641	Delta Canal	DELTA
57	VDE89	VT89	BT/89	ML	3363	3363	2004	Delta Canal	DELTA
58	VDE90	VT90	BT/90	ML	14274	1007	0	Delta Canal	DELTA
59	VDE92	VT92	BL/92	Μ	4462	4462	2524	Delta Canal	DELTA
60	VDE93	VT93	BL/93	ML	21422	15314	3717	Delta Canal	DELTA
61	VDE94	VT94	BL/94	ML	10714	3089	0	Delta Canal	DELTA
62	VDE96	VT96	GC/96	ML	5422	1478	0	Delta Canal	DELTA
63	VDE97	VT97	GC/97	ML	31552	26895	18255	Delta Canal	DELTA
64	VDE98	VT98	TA/98	Μ	31962	28230	22972	Delta Canal	DELTA
65	VDE99	VT99	PR/99	Μ	15373	15373	14643	Delta Canal	DELTA
66	VDE100	VT100	PR/100	Μ	14764	14764	14764	Delta Canal	DELTA
67	VDE101	VT101	PR/101	Μ	11656	11656	11656	Delta Canal	DELTA
68	VDE102	VT102	PR/102	Μ	3212	3212	2350	Delta Canal	DELTA
69	VDE103	VT103	PR/103	Μ	31213	31213	7936	Delta Canal	DELTA
70	VDE104	VT104	PR/104	Μ	43347	42996	4245	Delta Canal	DELTA
71	VDE105	VT105	PR/105	Μ	26531	21864	8866	Delta Canal	DELTA
72	VDE106	VT106	PR/106	Μ	23550	8190	1148	Delta Canal	DELTA
73	VDE107	VT107	PR/107	М	46169	39436	1676	Delta Canal	DELTA
74	VDE108	VT108	PR/108	Μ	38158	37008	0	Delta Canal	DELTA
75	VDE109	VT109	PR/109	Μ	14336	13636	1109	Delta Canal	DELTA
76	VDE110	VT110	PR/110	Μ	23273	21738	208	Delta Canal	DELTA
77	VDE111	VT111	PR/111	Μ	8012	7912	0	Delta Canal	DELTA
78	VDE112	VT112	PR/112	Μ	11037	10437	314	Delta Canal	DELTA
79	VDE113	VT113	PR/113	Μ	22708	21427	0	Delta Canal	DELTA
80	VDE114	VT114	WEVC/114	Μ	39581	33951	0	Delta Canal	DELTA
81	VDE115	VT115	WEVC/115	Μ	18177	15216	2659	Delta Canal	DELTA
82	VDE116	VT116	WEVC/116	Μ	16604	11337	1679	Delta Canal	DELTA
83	VDE117	VT117	WEVC/117	Μ	11879	9371	278	Delta Canal	DELTA
84	VDE118	VT118	CD/118	Μ	28717	16022	100	Delta Canal	DELTA
85	VDE120	VT120	CD/120	ML	7595	440	0	Delta Canal	DELTA
Tota					1,683,094	1,417,549	351,506		

Note: M: mobile pump, L: tidal irrigation Source: Land Resources Inventory for Agricultural Development, February 2002, MRC