

The Study on Groundwater Development in Central Cambodia

Final Report

Main Report

LOCATION MAP

EXCHANGE RATE AND LIST OF ABBREVIATION

EXECUTIVE SUMMARY

CONTENTS

CHAPTER 1 INTRODUCTION.....	1-1
1.1 Background.....	1-1
1.2 Objectives and Scope	1-2
1.2.1 Objectives	1-2
1.2.2 Scope	1-2
1.3 Study Area	1-4
1.4 Study Schedule	1-5
1.5 Study Team.....	1-5
CHAPTER 2 NATURAL ENVIRONMENT	2-1
2.1 Climate	2-1
2.1.1 Seasons	2-1
2.1.2 Rainfall	2-1
2.1.3 Evaporation	2-2
2.2 Hydrology.....	2-2
2.2.1 River Water Level	2-2
2.2.2 River Discharge	2-2
2.3 Topography.....	2-3
2.3.1 Topographical Feature of Kampong Chhnang Province	2-3
2.3.2 Topographical Feature of Kampong Cham Province	2-3
2.3.3 Basin Division	2-3
2.4 Geology	2-4
2.4.1 Geological Units in the Existing Materials	2-4
2.4.2 Results of Field Reconnaissance Survey	2-5

CHAPTER 3 SOCIO-ECONOMY AND WATER SUPPLY	3-1
3.1 Socio-Economy	3-1
3.1.1 Population and Demographic Characteristics	3-1
3.1.2 Local Administrative Divisions	3-5
3.1.3 Economic Situation	3-6
3.1.4 Socio-economy in the Study Area.....	3-9
3.2 Rural Water Supply.....	3-16
3.2.1 Water Supply Organizations	3-16
3.2.2 Rural Water Supply Situation	3-17
3.2.3 Organization and Capacity of DRWS and PDRD.....	3-21
3.2.4 Five Year Rural Water Supply Plan.....	3-23
3.2.5 Financial Constraints.....	3-24
3.3 Health and Hygiene.....	3-26
CHAPTER 4 GROUNDWATER INVESTIGATION	4-1
4.1 Topography and Geology.....	4-1
4.1.1 Kg. Chhnang Province	4-1
4.1.2 Kg. Cham Province	4-2
4.1.3 Geological Unit	4-4
4.1.4 Hydrogeologic Structures.....	4-4
4.2 Test Well Drilling and Pumping Test	4-8
4.2.1 Drilling Sites	4-8
4.2.2 Results of Drilling.....	4-13
4.2.3 Hydrogologic Features	4-17
4.2.4 Pumping Tests.....	4-50
4.3 Groundwater Levels	4-120
4.3.1 Purpose.....	4-120
4.3.2 Methodology	4-120
4.3.3 Survey Results.....	4-125
4.4 Groundwater Quality.....	4-138
4.4.1 Purpose.....	4-138
4.4.2 Methodology	4-138
4.4.3 Results of Laboratory Analysis.....	4-140
4.4.4 Results of Field Measurement.....	4-194
4.5 Groundwater Resource Evaluation	4-260

4.5.1 Hydrogeological Unit	4-260
4.5.2 Aquifer Productivity	4-260
4.5.3 Groundwater Potential.....	4-263
4.6 Water Balance Analysis	4-266
4.6.1 Methodology	4-266
4.6.2 Measured Parameters.....	4-266
4.6.3 Estimated Parameters	4-267
4.6.4 Result of Computation.....	4-271
CHAPTER 5 VILLAGE SURVEY.....	5-1
5.1 Selection of Target Village.....	5-1
5.1.1 Conditions of Requested Villages	5-1
5.1.2 Selection Process and Criteria for the Target Villages.....	5-2
5.2 Survey of the 303 target villages	5-13
5.2.1 Objectives	5-13
5.2.2 Methodology	5-13
5.2.3 Socio-Economic Conditions.....	5-17
5.2.4 Water Supply Conditions	5-24
5.2.5 Health and Hygiene Conditions	5-40
5.3 SURVEY OF PRIORITY VILLAGES	5-44
5.3.1 Methodology Used	5-44
5.3.2 General Feature of Socio-Economy of the Area	5-45
5.3.3 Rural Water Supply Situation.....	5-54
5.4 Analysis on Hand Pump Well Utilization	5-75
5.4.1 Background of The Analysis and Data to Be Analyzed.....	5-75
5.4.2 Utilization of Hand Pump Well.....	5-77
5.5 Gender Analysis	5-84
5.5.1 Overview of Women's Situation in Cambodia	5-84
5.5.2 Field Survey on Gender Issues	5-87
CHAPTER 6 COMMUNITY PARTICIPATION PROGRAM.....	6-1
6.1 Objectives and Policy	6-1
6.1.1 Objectives.....	6-1
6.1.2 Community Participation Policy	6-1
6.2 Water Supply Facility.....	6-1
6.2.1 Deep Well.....	6-1

6.2.2 Hand Pump.....	6-2
6.2.3 Platform and Drainage (drawing shown in Figure 6.2.2).....	6-4
6.2.4 Iron Removal Device (drawing shown in Figure 6.2.3).....	6-5
6.3 Establishment of VWC and WPC	6-6
6.3.1 Central and Provincial Level Activities	6-6
6.3.2 Village Level Activities	6-7
6.4 Health and Hygiene Education.....	6-8
6.5 Operation and Maintenance Education	6-8
6.5.1 Purpose of Education	6-9
6.5.2 Scope of Education Program.....	6-9
6.5.3 Development of Education Materials.....	6-10
6.5.4 Main Topics of Education.....	6-10
6.5.5 Education Approach by Level.....	6-12
CHAPTER 7 GROUNDWATER DEVELOPMENT PLANNING	7-1
7.1 Groundwater Development Policy	7-1
7.1.1 Area distinction by groundwater potential.....	7-1
7.1.2 Development policy	7-1
7.2 Target Aquifers	7-3
7.2.1 Aquifers and Drilling Depth.....	7-3
7.2.2 Development Scale.....	7-4
7.3 Standard Well Design	7-4
7.3.1 Target Depth.....	7-5
7.3.2 Drilling Method.....	7-5
7.3.3 Well Completion	7-5
7.4 Groundwater Investigation Methodology in Kg.Chhnang.....	7-5
7.4.1 Topographical and geological reconnaissance survey	7-6
7.4.2 Water level and water quality survey	7-6
7.4.3 Electric resistivity survey (Vertical and Two dimensional)	7-6
7.5 Considerations for Water Quality	7-9
7.5.1 Arsenic and Fluoride	7-9
7.5.2 Nitrate.....	7-9
7.5.3 Acceptability aspects in the WHO Guideline	7-9
CHAPTER 8 WATER SUPPLY PLAN	8-1

8.1 Water Supply Plan Policy.....	8-1
8.2 Project Area and Village Selection.....	8-2
8.2.1 Target Project Area.....	8-2
8.2.2 Classification of 303 Villages	8-3
8.2.3 Target Village Selection.....	8-3
8.2.4 Alternative Water Source	8-4
8.3 Design Standards.....	8-5
8.3.1 Standard Amount for Water Consumption.....	8-5
8.3.2 Water Demand Projection	8-6
8.3.3 Hand Pump Selection	8-6
8.3.4 Required Hand Pumps.....	8-6
8.3.5 Number of Hand Pumps Required	8-7
8.4 Water Supply Facility.....	8-9
8.5 Project Cost	8-11
8.5.1 Condition of Estimate.....	8-11
8.6 Project Implementation	8-13
8.6.1 Implementing Body	8-13
8.6.2 Implementation Schedule	8-13
8.7 Operation & Maintenance and Monitoring Program.....	8-14
8.7.1 Policy.....	8-14
8.7.2 Organization	8-14
8.7.3 Notification system and maintenance record	8-19
8.7.4 Troubles to Happen	8-21
8.7.5 Spare Parts and Maintenance Tools	8-21
8.7.6 Operation and Maintenance Cost	8-23
8.7.7 Monitoring Program	8-24
8.8 Guidance in O&M & Sanitation Campaign	8-25
CHAPTER 9 HYGIENE EDUCATION PLAN	9-1
9.1 Present State of Villagers' Consciousness on Hygiene.....	9-1
9.1.1 Findings obtained by the Village Survey Results	9-1
9.1.2 Findings obtained by Hygiene Education Activity to Villagers.....	9-2
9.1.3 Evaluation of Villagers' Consciousness on Hygiene	9-3
9.2 Present State of Hygiene Education	9-4
9.2.1 Hygiene Education in School	9-4

9.2.2 State of Main Relevant Project	9-4
9.3 Hygiene Education Plan.....	9-6
9.3.1 Necessity of Hygiene Education and Its Effects to Projects	9-6
9.3.2 Evaluation of the Present State	9-7
9.3.3 Hygiene Education Policy.....	9-7
9.3.4 Proposed Method of Hygiene Education in the Implementation of HP Projects...	9-8
9.3.5 Implementation System.....	9-9
CHAPTER 10 PROJECT EVALUATION.....	10-1
10.1 Consideration for Evaluation	10-1
10.1.1 Overview	10-1
10.1.2 Increased Beneficiaries in the Target Villages.....	10-2
10.1.3 Improvement in Health Conditions.....	10-2
10.1.4 Time Saving Effect of Water Collection.....	10-4
10.1.5 Opportunities for Better Farming.....	10-4
10.2 Financial Analysis.....	10-5
10.2.1 Financial Project Cost	10-5
10.2.2 Financial Sources	10-6
10.2.3 Recovery of Capital Cost and Recurrent Cost	10-7
10.3 Economic Evaluation	10-8
10.3.1 Basic Assumptions	10-8
10.3.2 Economic Project Costs	10-8
10.3.3 Economic Benefits	10-9
10.3.4 Cost and Benefit Analysis.....	10-11
10.4 Social evaluation and WID	10-11
10.4.1 Village organization.....	10-11
10.4.2 Hygiene Awareness.....	10-12
10.4.3 WID.....	10-13
10.4.4 Other issues	10-13
10.5 Organizational and Institutional Evaluation.....	10-14
10.5.1 Central Agency.....	10-14
10.5.2 Provincial Agencies	10-15
10.5.3 Community Organizations	10-15
10.5.4 New O&M System.....	10-15
10.6 Initial Environmental Evaluation	10-16
10.6.1 Screening.....	10-16

10.6.2 Scoping	10-16
10.6.3 Result of IEE	10-17
CHAPTER 11 CONCLUSIONS AND RECOMMENDATIONS	11-1
11.1 Conclusions	11-1
11.1.1 Groundwater Development	11-1
11.1.2 Water Supply Plan	11-2
11.1.3 Project Evaluation	11-2
11.1.4 Social Cosideration/WID and IEE.....	11-3
11.2 Recommendations	11-3
11.2.1 Early Implementation of the Project.....	11-3
11.2.2 Water Supply Plan Coupled with Sanitation Plan.....	11-3
11.2.3 Water Quality Survey, Measures and Management	11-4
11.2.4 Promotion of Village Development with Emphasis on Water Supply.....	11-5
APPENDICES	
Hydrogeological Map	

CHAPTER 2

NATURAL ENVIRONMENT

CHAPTER 2 NATURAL ENVIRONMENT

2.1 Climate

2.1.1 Seasons

The climate in the Study area is tropical, dominated by seasonal winds of monsoons. The wet southwest monsoon arrives around May with heavy clouds and thundershowers and usually continue until November, with rains occurring almost daily during this season. The dry northeast monsoon normally starts from November and continue until April. From November to February, the weather is generally dry and relatively cool, while from March until the onset of the southwest monsoon in May, the Study area experiences very hot weather. In April, the maximum temperature exceeds 35 in the lowland. In summary, the Study area semiannually experiences dry season (November - April) and wet season (May - November). The year 2001, the study period, wet season began from the end of April.

2.1.2 Rainfall

National Mekong River Committee (1995) presented the distribution map of annual rainfall in Cambodia based on the data as shown in Figure 2.1.2.1. According to this figure, the annual rainfall is 1,200 to 1,900mm in the lowland area around Tonle Sap River and Mekong River. On the other hand, it is 2,000 to 3,000mm in the western mountainous area and eastern plateau area. The 80% of the annual rainfall concentrates in wet season.

The rainfall data from 1994 to 2000 in the Study area is only available for two stations (Kg. Cham and Kg. Chhnang) from Ministry of Water Resources and Meteorology (see APPENDIX 2). Figure 2.1.2.2 shows monthly mean rainfall of these two stations during the last seven years by adding the data at Pochentong airport in Phnom Penh.

Due to the data before 1994, the maximum mean monthly rainfall usually appears in September and October. But, at Kg. Cham, it appeared in June in 1994 and 1999. At Kg. Chhnang, it appeared in June in 1994.

Figure 2.1.2.3 shows annual mean rainfall at the same three stations during the last seven years. Usually, the annual mean rainfall is about 1,500mm at Kg. Cham and Kg. Chhnang. But, it considerably exceeded 1,500mm in 1996 and 1999 at Kg. Cham and in 1994 and 2000 at Kg. Chhnang. On the other hand, it had small rain in 1996 and 1998 in Kg. Chhnang.

The rainfall pattern in 1998 at Kg. Cham and 1995 at Kg. Chhnang are most closely resemble in average rainfall fluctuation and rainfall amount.

2.1.3 Evaporation

The daily evaporation data during the last seven years was obtained only at Pochentong airport. It is maximum at about 8 to 10 mm/day in dry season and at 0.7 to 1.0 mm/day in wet season.

2.2 Hydrology

2.2.1 River Water Level

The data on the water level of Mekong River and Tonle Sap River from 1994 to 2000 were obtained from the National Mekong Committee. The water level was measured at Kampong Cham station for Mekong River and at Kampong Chhnang and Prek Kdam stations for Tonle Sap River .

Figure 2.2.1.1 shows the monthly mean river water level measured at the above three (3) stations. The maximum mean monthly water level of Mekong River (at Kg. Cham) appears in August and September and it reaches to 13 to 15m. Due to the data obtained in 1964-1973, however, it was about 12m. Then, the water level in Mekong River in the last 7 years is higher than that of 30 years ago. In wet season of 2001, the water level of Mekong River was about 3meters higher than the average level.

The maximum mean monthly water level in Tonle Sap River appears in September and October and it reaches 10 to 11m at Kg. Chhnang and 8 to 10m at Prek Kdam Station except in 1998. Due to the data obtained in 1964-1973, it was about 8m. Then, the water level in Tonle Sap River in the last 7 years is also a little higher than that of 30 years ago.

In wet season, backwater is found in Tonle Sap River since the water level of Mekong River is higher than that of Tonle Sap River.

2.2.2 River Discharge

River discharge data is only available for Kg. Cham during 1994 to 2000. Fig. 2.2.2.1 shows

the monthly mean river discharge of Mekong River at Kg. Cham. The maximum discharge appears in July and August and it reaches 35,000 to 50,000m³/s. The monthly mean river discharge in September was 38,710 m³/s before 1994. Then, the river discharge increased a little in the last 7 years.

2.3 Topography

2.3.1 Topographical Feature of Kampong Chhnang Province

In Kg. Chhnang Province, the western part is occupied by a part of Cardamom Massif with the highest point of 1,550m. The eastern half of the Province, on the other hand, is occupied by Tonle Sap River Lowland characterized by isolated hills with the highest point of 429m. Near Kg. Chhnang City, the stream of Tonle Sap River is straitened by the isolated hills developed on both sides of the River. The area between Cardamom Massif and Tonle Sap River Lowland, gentle slopes with inclination of 1/3,000 to 1/4,500 are developed and many small scale isolated hills are found on these gentle slopes. In the existing material, such gentle slope is defined as pediment.

2.3.2 Topographical Feature of Kampong Cham Province

Kg. Cham Province is divided into two areas by Mekong River Lowland. Mekong River Lowland (lower than 10m in elevation) becomes narrower in the upstream side, however it becomes wider with many sandbanks in the downstream side. Another noticeable point is that Mekong River has two crooks with right angle in Kg. Cham Province.

The topographical feature in the two areas on both sides of Mekong River Lowland, is characterized by several plateaus with flat top. Total thirteen (13) plateau units are recognized in Kg. Cham Province as arranged in Table 2.3.3.1. The relative height of these plateau unit ranges from 20 to 118m and some of them have an outstanding small peak and a crater. The outline of each unit is elliptic with 10~20km of long axis and 5~15km of short axis.

In the area except the above mentioned plateaus, flat plains with 10~30m in height widely develop.

2.3.3 Basin Division

Though the watershed in the Study area is not always clear because of gentle topographical

relief, the two Provinces were divided into several basins as shown in Table 2.3.4.1 for convenience.

Kg. Chhnang Province was divided into five (5) basins except Tonle Sap River Lowland. The main rivers of these five basins radiate from Cardamom Massif to Tonle Sap River Lowland.

Kg. Cham Province was roughly divided into five (5) basins except Mekong River Lowland. The river systems of the two basins (M-2, M-4) directly flow into the trunk of Mekong River, but the other river systems (M-3, M-5, M-6) flow into other rivers including a tributary of Mekong River. For convenience, the above five basins were further divided into several sub-basins respectively.

2.4 Geology

2.4.1 Geological Units in the Existing Materials

The general geology of Cambodia is summarized in the “Atlas of Mineral Resources of the ESCAP Region, Vol. 10, Cambodia ” (ESCAP, 1993). Figure 2.4.1.1 is the geological map of the Study Area.

According to this report, the geological units distributed in the Study area are classified as shown in Table 2.4.1.1.

Table 2.4.1.1 Geological Units Defined by ESCAP

Geological Age			Sedimentary Units	Volcanic Units	Intrusive Units
Quaternary	Holocene		Q ₄		
	Pleistocene	Upper	Q ₂₋₃		
		Middle		Basalt (QB)	
		Lower	N ₂ -Q	Basalt (N ₂ -Q ₁)	
Tertiary	Pliocene				
Mesozoic	Cretaceous		J ₃ -K		Gabbro, Diorite, Granite, Rhyolite (Y ₅ , Y ₆ , Y ₇)
	- Triassic		T		
Paleozoic	Permian		C ₃ -P		
	- Devonian		D-C		

Mesozoic and Paleozoic sedimentary units and intrusive units colored in gray in the upper table are collectively called as “basement rocks” in the following description for convenience.

Basalt erupted in Pliocene and Pleistocene is a member of plateau basalt widely occurring in southern Indochina (Figure 2.4.1.2).

2.4.2 Results of Field Reconnaissance Survey

The geological outcrops are very scarce in the Study area due to gentle topographical relief and thick cover of soil and vegetation. Then, the geological observation in the field was restricted to accessible isolated hills and small peaks outstanding from plains or plateaus.

At the isolated hills in Kg. Chhnang Province several kinds of basement rocks such as sandstone, shale, acidic tuff, gabbro, diorite, granite and rhyolite are observed. Almost all the part of the sedimentary rocks are very hard due to thermal metamorphism by intrusive rocks.

Around the top of plateaus in Kg. Cham Province, on the other hand, small scale of volcanic peaks and craters were confirmed.

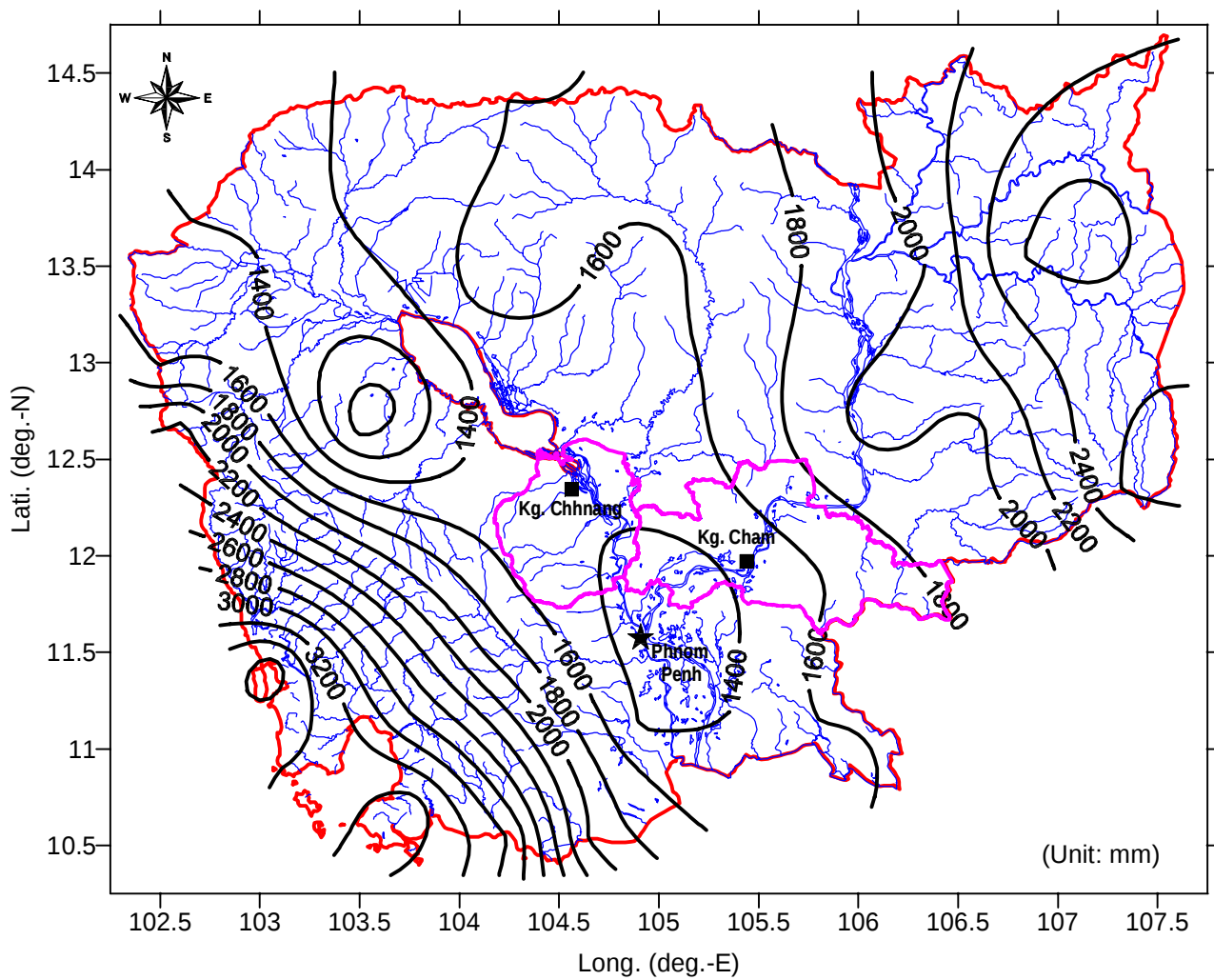


Figure 2.1.2.1 Distribution of Annual Rainfall in Cambodia

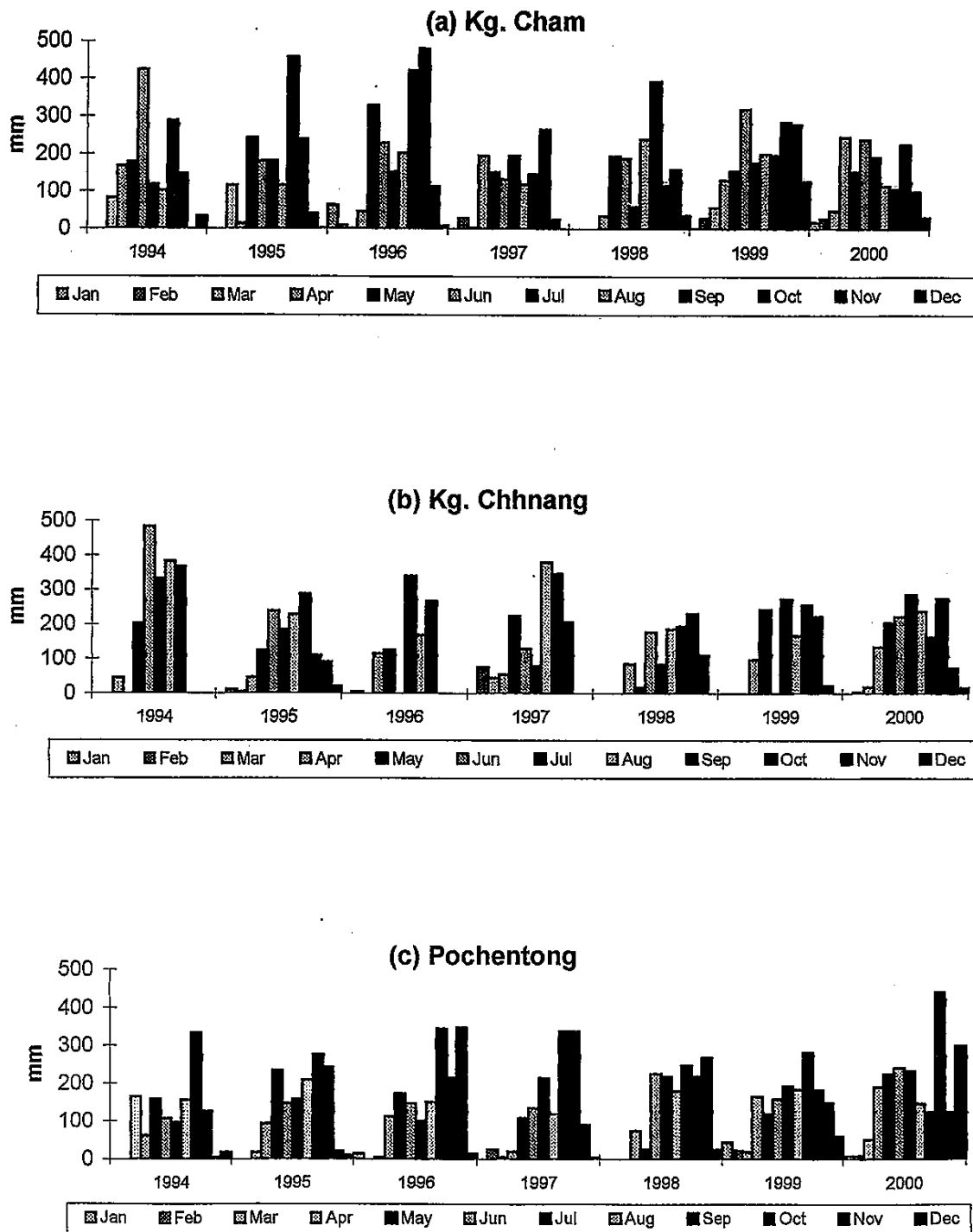


Figure 2.1.2.2 Monthly Mean Rainfall from 1994 to 2000

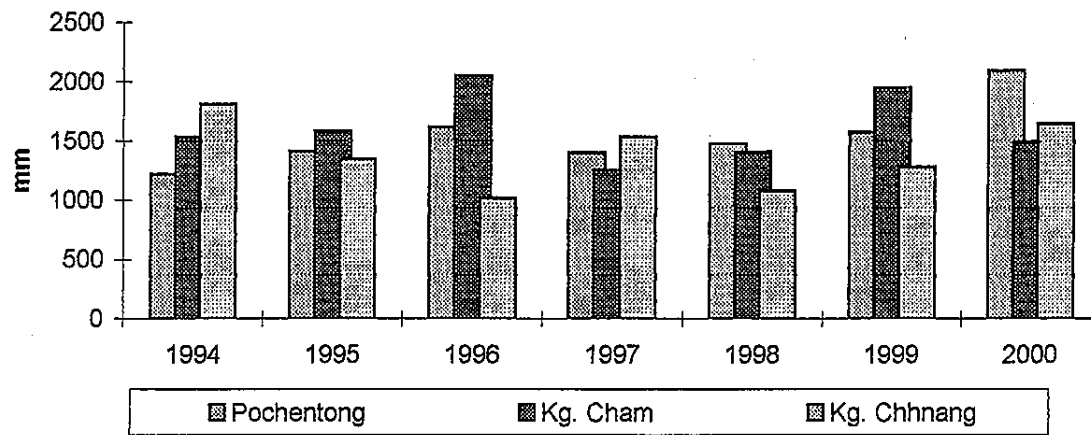


Figure 2.1.2.3 Annual Mean Rainfall

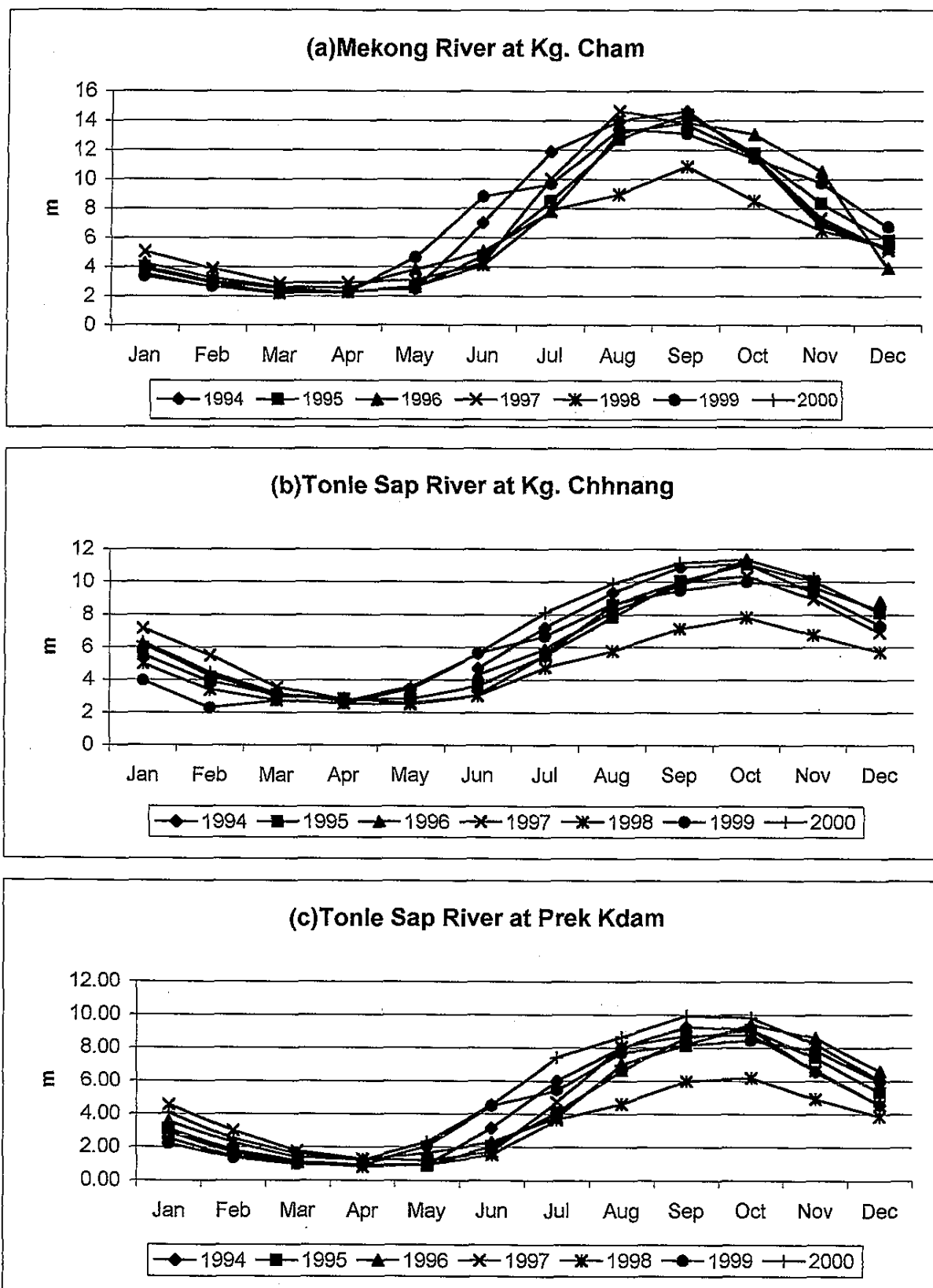


Figure 2.2.1.1 Monthly Mean River Water Level from 1994 to 2000

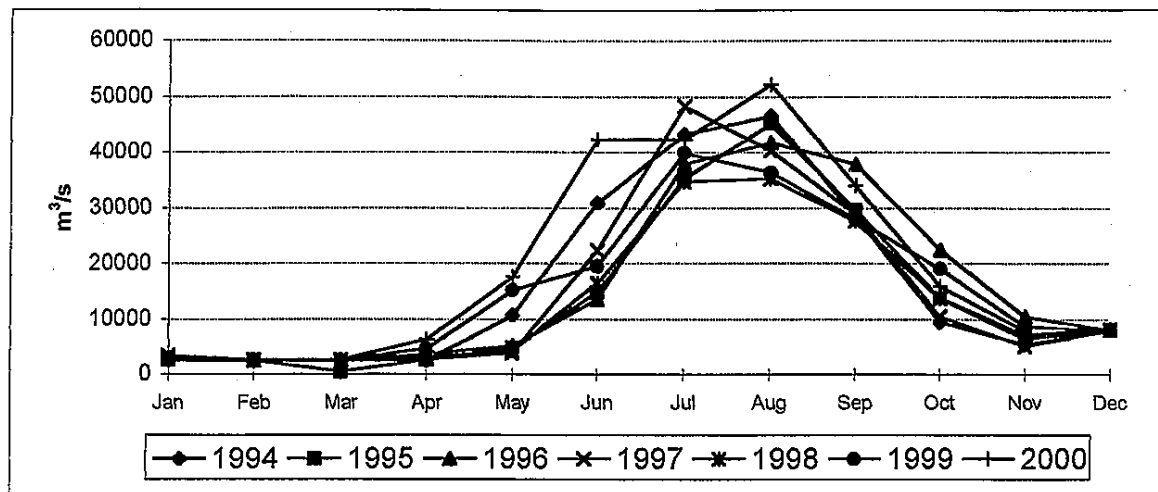
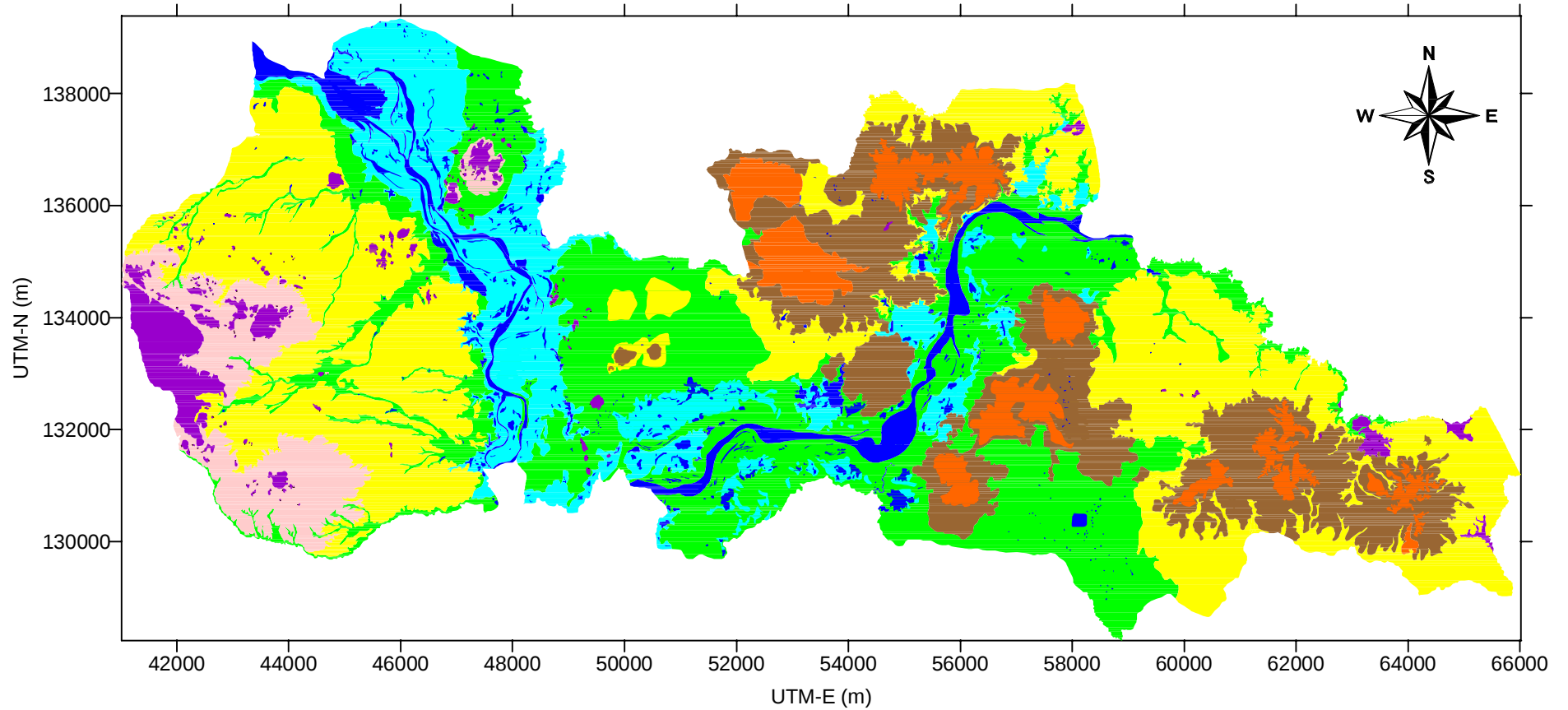


Figure 2.2.2.1 Monthly Mean River Discharge of Mekong River at Kg. Cham Station



- Water area
- Alluvial clay (Lake or swamp deposits)
- Alluvial sand
- Residual sand (Eluvial sand)
- Laterite
- Basalt (Pleistocene volcanics)
- Plio-Pleistocene sediments
- Basement rocks (Pre-Tertiary)

Figure 2.4.1.1

Geological Map of Study Area

**THE STUDY ON GROUNDWATER DEVELOPMENT
IN CENTRAL CAMBODIA**

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

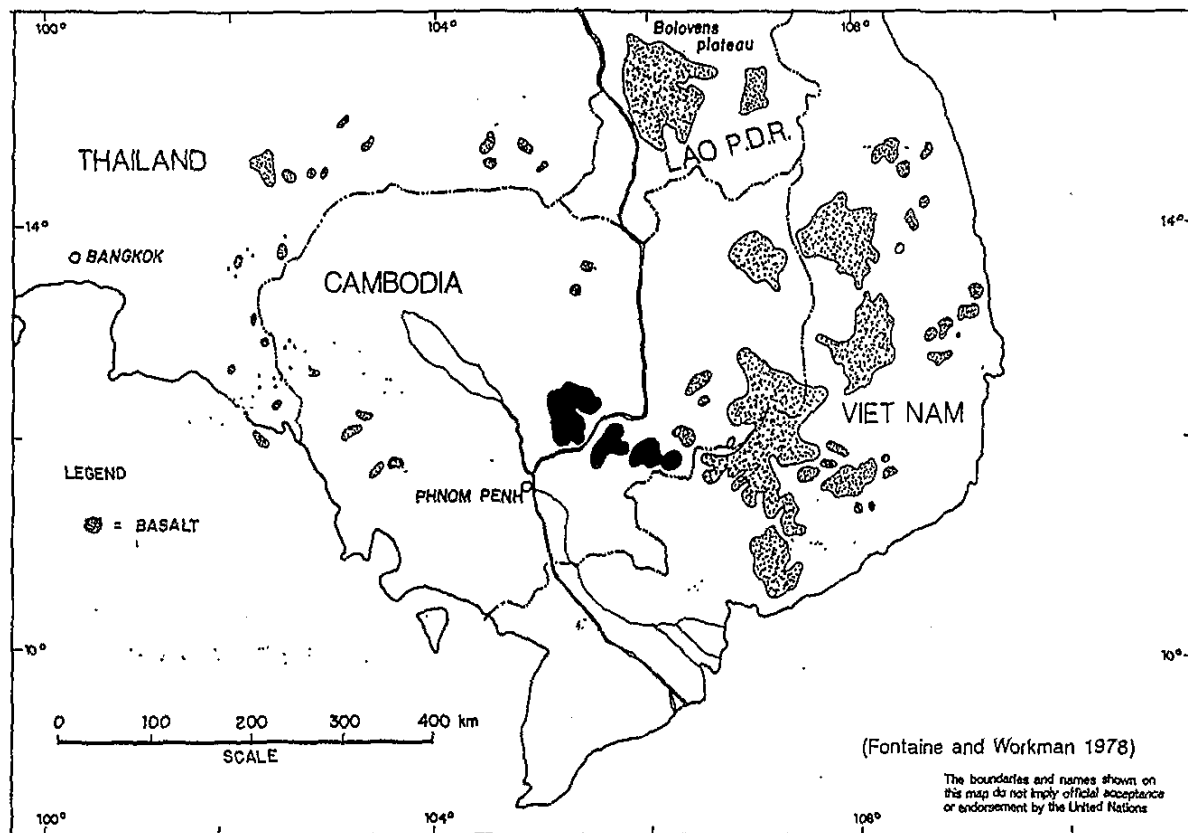


Figure 2.4.1.2 Distribution of Plateau Basalt in Southern Indochina

Table 2.3.3.1 Plateau Units in Kg. Cham Province

Plateau Unit ¹⁾		Map	Elevation (m) ²⁾		Relative Height (m)	Crater ³⁾	Direction of Long axis	Scale of the Unit (km × km)	Remarks
No.	Name		Top	Bottom					
Right Bank of Mekong River									
	Cheung Prey	6033 III	40	20	20	with (?)	E-W	10 × 4	with 97m peak
	Kampong Siem	6033 II	50	30	20	with	E-W	11 × 9	with 104m peak
	Chamkar Leu (N)	6033 IV	96	60	36	without	NW-SE	12 × 12	
	Chamkar Leu (S)	6033 II	136	80	56	with	E-W	18 × 12	with 202m peak
	Stueng Trang (E)	6133 IV	122	100	22	with	E-W	10 × 8	
	Stueng Trang (W)	6033 I	127	100	27	without	E-W	7 × 7	
Left Bank of Mekong River									
	Krouch Chmar	6133 III	97	60	37	without	NW-SE	14 × 8	
	Tboung Khmum	6132 IV	99	60	39	with	NE-SW	14 × 10	
	Ou Reang Ov	6132 IV	95	50	46	with	NW-SE	11 × 7	with 96m peak
	Dambe (W)	6132 I	76	40	36	without	N-S	12 × 6	
	Dambe (E)	6132 I	153	100	53	without	N-S	16 × 6	
	Memot (W)	6232 IV	202	100	102	without	N-S	19 × 10	
	Memot (E)	6232 I	218	100	118	without	NE-SW	18 × 14	

1) District name was given to each unit. (N), (S), (E) and (W) added to the unit name mean north, south, east and west in the same district.

2) Bottom height is represented by the closing contour line of the unit.

3) Volcanic crater was supposed from the topographical feature on the map and/or field observation.

Table 2.3.4.1 Basin Division

Kg. Chhnang Province

Basin		Area (km ²)	Elevation (m)			Districts	Target Villages for Implementation Plan (bold letter: village for test drilling)
No.	Name		Top	Bott om	Plain		
G-1 Tonle Sap River Lowland			429 (isolated hill)	4	0 ~ 10	Kg. Leng, Chul Kiri Kg. Tralach Kg. Chhnang (PT)	4-8, 10, 12-25, 28, 29 61
G-2 Right Bank of Tonle Sap River							
G-2A	Baribou		1,181	10	10 ~ 30	Tuk Phos Basribo	174, 176–180, 182-184,186-188, 189 , 190, 193, 195, 196, 197 , 199, 201-203
G-2B	Preal		754	10	10 ~ 30	Tuk Phos Rolear Bier	109-116, 119-121, 123 62, 63, 65, 66, 72, 76 - 79, 81, 82, 83, 85
G-2C	Cheung Kreav		1,550	10	10 ~ 30	Tuk Phos Rolear Bier	90, 93, 96, 105, 130,
G-2D	Anlong Tba		674	10	10 ~ 30	Tuk Phos Kg. Tralach, Samaki Meanchey	30, 32, 34, 35 , 40-44, 45 , 46, 48, 50, 52-55, 57, 58 145-150, 154, 156, 158-161, 162 , 171
G-2E	Krang Ponley		1,230	10	10 ~ 30	Tuk Phos Samaki Meanchey,	165, 166, 168 , 169

Kg. Cham Province (1/2)

Basin		Area (km ²)	Elevation (m)			Districts	Target Villages for Implementation Plan (bold letter: village for test drilling)
No.	Name		Top	Bottom	Plain		
M-1 Mekong River Lowland			130 (isolated hill)	6	0 ~ 10	Kroch Chma Kaoh Soutin	229, 230, 255, 256 181, 192, 207, 209-211
M-2 Right Bank of Mekong River							
M-2A	Sambuar Banteay		125	8	0 ~ 10	Steung Trang	223, 225
M-2B	Kak		135	10	10 ~ 30	Stung Trang	214
M-2C	Ta Moi		202	10	10 ~ 30	Kg. Siem Chamkar Leu	354
M-2D	Anlong Chray		202	10	10 ~ 30	Kg. Cham (PT) Prey Chhor Cheng Prey Batheay	369, 371, 376
M-3 Steung Chinit River System							
M-3A	Khya		136	10	10 ~ 30	Batheay Cheng Prey Chamkar Leu	
M-3B	Sala		136	20	30 ~ 50	Chamkar Leu Stung Trang	363
M-3C	Da / Bekoi		135	20	30 ~ 50	Stung Trang	216, 221
M-4 Left Bank of Mekong River							
M-4A	Peam Chileang		99	10	10 ~ 30	Kroch Chma Tbong Khmum	238-241, 243, 248 , 290-292, 294, 295, 297-299, 304, 305
M-4B	Krapik		95	10	10 ~ 30	O Reang Ov	314-318, 320, 321 , 322, 324, 337 , 338, 340, 341, 345-349, 351

Kg. Cham Province (2/2)

Basin		Area (km ²)	Elevation (m)			Districts	Target Villages for Implementation Plan (bold letter: village for test drilling)
No.	Name		Top	Bottom	Plain		
M-5 Song Van Co Dong River System							
M-5A	Krabau		218	10	10 ~ 30	Tbong Khmum O Reang Ov Pomhea Krek Dambe	269 , 271, 272, 273 , 286-289 307, 310, 325, 327-332, 336 169, 170, 171 , 172-180 227, 228
M-5B	Krep / Am penh		202	20	10 ~ 30	Ponhea Krek	
M-5C	So		202	35	-----	Ponhea Krek Memot Dambe	11, 14, 15 , 16
M-5D	Som Pech		202	40	-----	Memot	7, 8 , 9, 13, 17, 18, 19 , 21
M-5E	Angkam		218	45	-----	Memot	22-39, 44, 143-145, 160, 167, 168
M-5F	Tonle Cham		195	30	-----	Memot	
M-6 Chhlong River System							
M-6A	Sri		218	30	-----	Memot	46, 47, 48, 50, 54, 55 , 56, 147
M-6B	An tap / Co ra ba		218	25	-----	Memot	68-71, 73-82, 85, 86- 91, 92 , 93, 96, 100, 110-114, 120, 121, 124-126, 127 , 128, 130, 132, 136-139, 141
M-6C	Sra dena		202	20	-----	Memot	102, 115 , 116
M-6D	Chheunkhloem		192	20	-----	Memot	106
M-6E	Danrei Slap		192	20	-----	Memot	59, 60, 64, 101
M-6F	Choam Mu		140	15	10 ~ 30	Tbong Khmum Dambe Kroch Chma	264 , 266, 284, 28
M-6G	Kampong Kor		192	14	-----	Dambe Memot	
M-6H	Chhlong lowland		65	14	-----	Memot Dambe	65 , 66, 104, 105