


カンボジア国
鉱工業エネルギー省

カンボジア国
再生可能エネルギー利用地方電化
マスタープラン調査
ファイナルレポート
第5巻：付属資料

平成 18 年 6 月
(2006 年)

独立行政法人
国際協力機構 (JICA)

 日本工営株式会社
株式会社 コーエイ総合研究所

経済

JR

06-081



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略語表

略語	英語表記	日本語表記
ADB	Asian Development Bank	アジア開発銀行
Ah	Ampere hour	アンペア時(電池の容量表示等に使われる。電池から1アンペアの電流を定期的に取り出す時に電池が何時間持つかを指す。)
ASEAN	Association of South East Asian Nations	東南アジア諸国連合
ATP	Ability to Pay	支払能力
BCS	Battery Charging Station	バッテリー充電所
CBO	Community Based Organization	コミュニティ組織(外部支援者からの呼称)
CDC	Council of Development for Cambodia	カンボジア開発評議会
CDM	Clean Development Mechanism	京都プロトコルによるクリーン開発メカニズム
CEC	Community Electricities Cambodia	カンボジア国コミュニティ電化組合
CER	Certified Emission Reduction	排出削減量
CF	Community Forestry	コミュニティフォレスト
CFR	Complementary Function to REF	REF(地方電化基金)補完機能
CIDA	Canadian International Development Agency	カナダ国際開発庁
DAC	Development Assistance Committee	国際開発援助委員会
DIME	Department of Industry, Mines and Energy	鉱工業エネルギー省州事務所
DNA	Designated National Authority	指定国家代表部
EAC	Electricity Authority of Cambodia	カンボジア電力庁
EdC	Electricite du Cambodge	カンボジア電力公社
EIA	Environmental Impact Assessment	環境影響評価
EIRR	Economic Internal Rate of Return	経済的內部収益率
ESA	Energy Service Agent	エネルギーサービス事業者
ESCO	Energy Service Company	エネルギーサービス会社
EU	European Union	欧州共同体
FIRR	Financial Internal Rate of Return	財務的內部収益率
FS	Feasibility Study	フィージビリティ調査
GDP	Gross Domestic Product	国民総生産
GEF	Global Environment Facility	地球環境基金
GHG	Greenhouse Gas	温室効果ガス
GIS	Geographic Information System	地理情報システム
GS	Grid Substation	変電所
GWh	Giga Watt hour (one million kWh)	百万キロワット時
ha	hectar	ヘクタール
HQ	Head Quarter	本部
HV	High Voltage	高圧
IBRD	International Bank for Reconstruction and Development	国際復興開発銀行(世界銀行)
IEE	Initial Environmental Examination	初期環境評価
IEIA	Initial Environmental Impact Assessment	初期環境影響評価
IMF	International Monetary Fund	国際通貨基金
IPP	Independent Power Producer	独立発電事業者
IRR	Internal Rate of Return	内部収益率
JBIC	Japan Bank for International Cooperation	国際協力銀行
JICA	Japan International Cooperation Agency	独立法人 国際協力機構
KfW	Kreditanstalt für Wiederaufbau	ドイツ復興金融公庫
kW	kilo Watt	キロワット(1,000ワット)
kWe	kW-electricity	電気出力でのkW
kWh	kW-hour	キロワット時

略語	英語表記	日本語表記
kWp	kW-photovoltaic	光起電力の kW
MDG	Millennium Development Goals	ミレニアム開発目標
MEF	Ministry of Economy and Finance	経済財務省
MHP	Micro Hydro Power	小水力発電
MIME	Ministry of Industry, Mines and Energy	鉱工業エネルギー省
MOE	Ministry of Environment	環境省
MOI	Ministry of Interior	内務省
MOWRM	Ministry of Water Resources and Meteorology	水資源気象省
MP	Master Plan	マスタープラン
MRC	Mekong River Commission	メコン委員会
MV	Medium Voltage	中圧
MW	Mega Watt	メガワット(1,000 kW)
NASA	National Aeronautics and Space Administration	航空宇宙局
NEDO	The New Energy and Industrial Technology Development Organization	新エネルギー・産業技術総合開発機構
NGO	Non-Governmental Organization	非政府組織
NIS	National Institute of Statistics	国家統計局
O&M	Operation and Maintenance	運転・維持管理
ODA	Official Development Assistance	政府開発援助
PAGE	Potential Area of Grid Electrification	系統電化の可能地域
PEC	Provincial Electricity Company	州電気会社
PEU	Provincial Electricity Utility	州電気事業者
PPP	Public Private Partnership	官民共同事業(本質的には PFI と同義)
RDB	Rural Development Bank	地方開発銀行
REE	Rural Electricity Enterprise	地方電気会社/事業者
REF	Rural Electrification Fund	地方電化基金
RET	Renewable Energy Technology	再生可能エネルギー技術
RFP	Request for Proposal	提案要請状
RGC	The Royal Government of Cambodia	カンボジア王国政府
RPC	Regional Power Company	地域電気会社/事業者
SA	Special Account	特別勘定
Seila	Seila is a Khmer word that means a foundation stone. The Seila Program initiated officially in 1996 institutes decentralized systems and strategies for poverty alleviation and good governance at the provincial and commune levels.	Seila (セイラ)とはクメール語で礎の石の意味である。Seila プログラムは公式に 1996 年に開始され、州とコミューンレベルにおける貧困緩和と良い統治を目的とした分権化システムと戦略を設定しているプログラムである。
SHS	Solar Home System	太陽光戸別給電システム
SMEC	Small and Medium Enterprise Cambodia (NGO)	カンボジア中小企業(NGO)
SPC	Special Purpose Company	特別目的会社
SW	Scope of Works	業務範囲/調査内容
TA	Technical Assistance	技術協力
UNDP	United Nations Development Program	国連開発計画
USAID	United States Agency for International Development	アメリカ国際開発庁
VAT	Value Added Tax	付加価値税
VO	Village Organization	村落組織
WB	World Bank	世界銀行
WTP	Willingness to Pay	支払意思額
WWII	World War II	第 2 次世界大戦

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小水力発電

カンボジア国
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第5巻 付属資料

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Appendix-A Micro Hydro Power

1. SUPPLEMENTARY INFORMATION/CONSIDERATIONS FOR FORMULATION OF MICRO HYDRO POWER SCHEMES

(1) Existing Hydro Power Stations

There are two existing hydropower stations in Cambodia, namely Kirirom I power station in Kampong Speu Province and O Chum II power station in Ratanak Kiri province. Principal features of these two schemes are as follows:

Table AP-A.1.1 Principal Features of Existing Hydro Power in Cambodia

Scheme Name	Province	Installed Capacity	Load center	Remarks
Kirirom I	Kampong Speu	12 MW	Phnom Penh, Kampong Speu	Started operation in 2002
O Chum II	Ratanak Kiri	1 MW	Banlung provincial capital)	Started operation in 1993

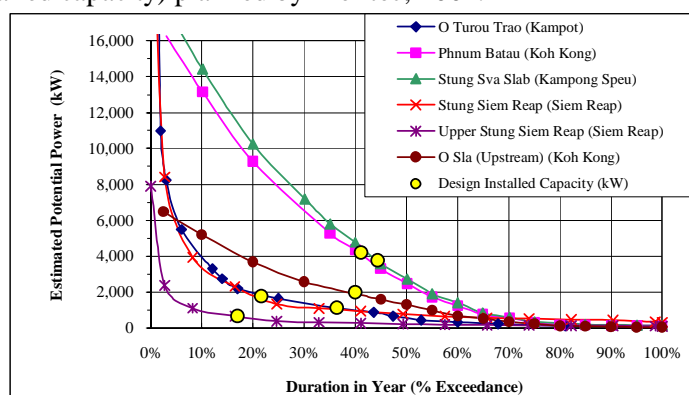
Source: MIME

Kirirom I station was built as an IPP scheme in 2002 and supplies electricity mainly to Phnom Penh. There is a substation in Kampong Speu Town on the transmission line from Kirirom I to Phnom Penh. From this substation 0.5 MW are supplied to Kampong Speu town.

O Chum II station utilizes discharge released from O Chum reservoir. O Chum reservoir is created by an earthfill dam having crest length of about 700 m and height of about 30 m. Stored water is released from its intake tower for power generation. O Chum II power station is located about 2 km downstream of O Chum reservoir. O Chum II has an installed capacity of 1MW consisting of two units of 500 kW each. There is another scheme of O Chum I proposed to utilize unused head available on the 2 km long river reaches between O Chum Reservoir and O Chum II power station.

(2) Concept of Installed Capacity Selection for Micro Hydro

Figure AP-A.1.1 shows flow duration curves and design plant discharge (a design discharge corresponding to installed capacity) planned by Meritec, 2002.



Source: Developed by the JICA Study Team based on "Development of Pipeline of Small Hydropower Projects in Cambodia", Final Pre-Investment Study Report, World Bank, Meritec, May 2002

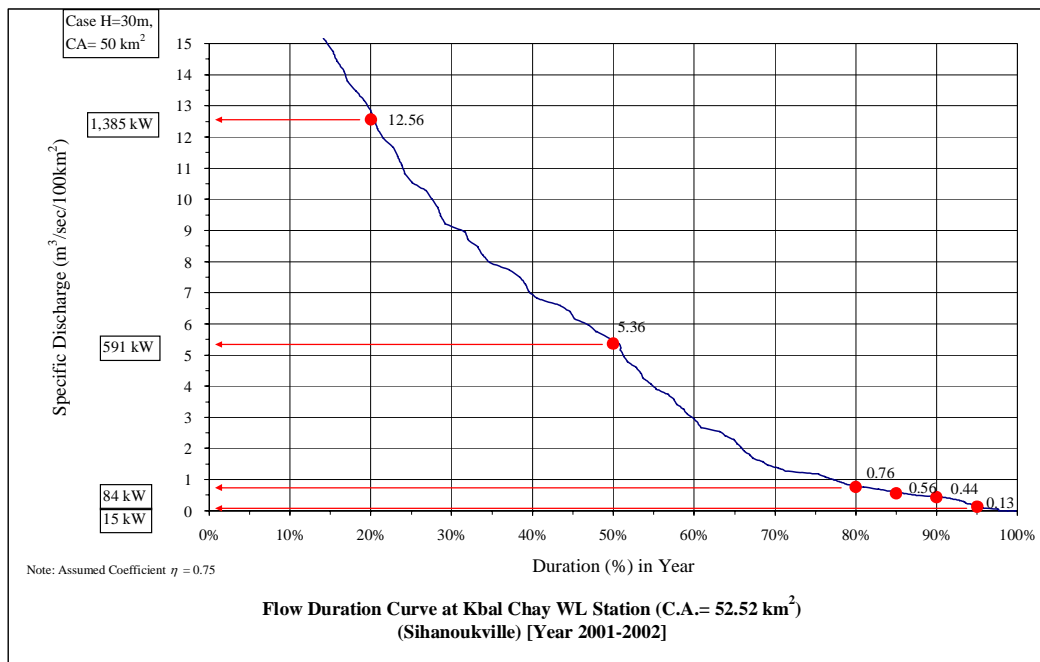
Figure AP-A. 1.1 Flow Duration Curve and Installed Capacities of WB Projects

Since these projects will supply electricity to existing grids, the installed capacities were selected with exceedence probability of 15 to 45%, that is, the power output will reach the installed capacity only for 1.8 to 5.4 months a year. The main objective of these is to feed low cost energy to save high cost fuel of diesel power plants in the grids.

Because of the low dry season flow, the power output available for rural electrification in the off-grid areas will become very low compared to those installed capacities planned by Meritec for mini hydros to save fuel consumption in the rainy season. An example is shown in Figure AP-A.1.2 for a river in Sihanoukville province. The figure shows the following options for installed capacity of this micro hydro site:

- 15 kW should the output be secured for 95% of the time or 347 days per year (there would be power shortage in 18 days a year);
- 84 kW should the output be secured for 80% of the time or 292 days per year (there would be power shortage in 73 days a year);
- about 590 kW should the output be secured for 50% of the time or 6 months per year (there would be power shortage in 6 months a year);
- about 1,400 kW should the energy output be maximized to feed existing grids neglecting those output drops in the dry season.

For the rural electrification in the off-grid areas, 15 kW may be adopted if it can meet the demand. If not, up to 84 kW may be adopted accepting drops in the power supply up to about 2 months a year. In view of the limited potential of micro hydro in Cambodia, villagers would be required to accept such inconvenience as to save electricity consumption in the dry season, for example to use only one light. An option to back up the drop by diesel generator is technically possible but is financially questionable unless people can afford to share such cost.

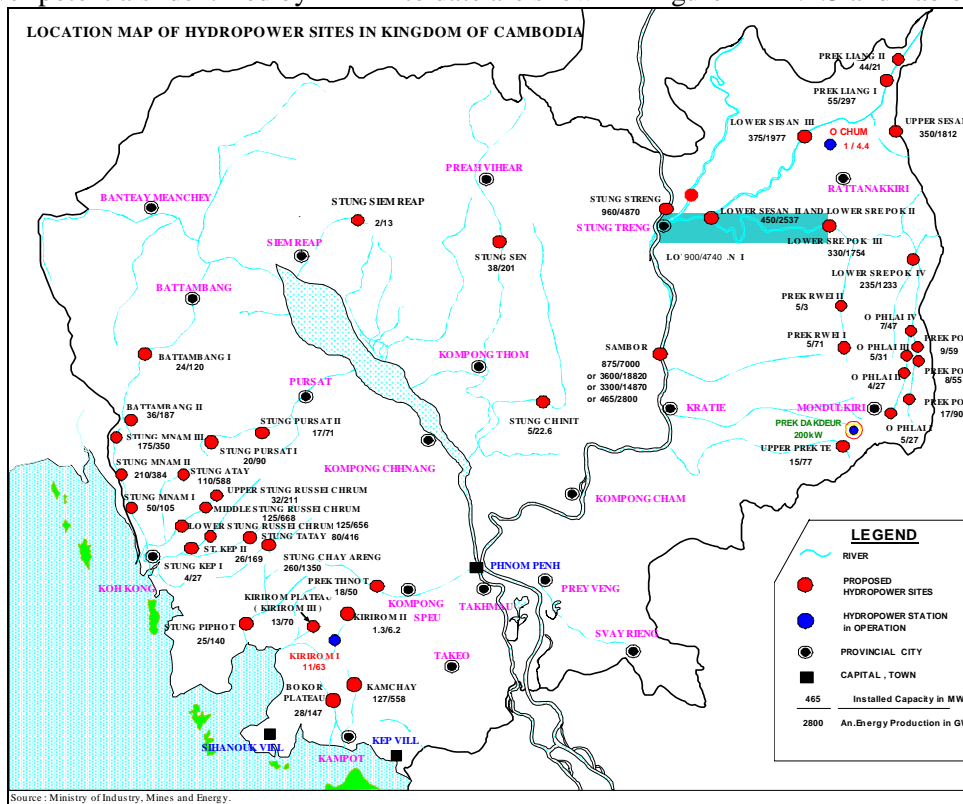


Source: JICA Study Team

Figure AP-A.1.2 Flow Duration Curve and Possible Options of Installed Capacity

(3) Existing Plans for Hydropower Development

Hydropower potentials identified by MIME to date are shown in Figure AP-A.1.3 and Table AP-A.1.2.



Source: MIME

Figure AP-A.1.3 Location Map of Proposed Hydropower Projects in Cambodia

In Cambodia, there has been a great number of medium to large scale hydropower development proposed by MRC, Russia, Japan, etc. since 1960s. However, there have been less numbers of development plans of micro hydro that can contribute to rural electrification in the off-grid area.

Of the several past studies, “Pre-Investment Study of Community Scale Hydro Projects, Cambodia” NZ Ministry of Foreign Affairs & Trade, by Meritec 2003 was for rural electrification. In this study several examinations were made on micro hydro of village scale. 45 locations were identified by desk screening in nine provinces. Further, 6 locations were selected as priority communities for site survey and socioeconomic survey. Finally, Pre-F/S was conducted for 10 schemes.

Meritec also conducted “Development of Pipelines of Small Hydropower Projects in Cambodia” funded by WB in 2002. The mini hydro will be connected to grid. Electrification of local villages was not intended. This study aims at promoting fuel saving of thermal power in the rainy season. To increase B/C (benefit by cost ratio) of mini hydro, installed capacities are optimized taking account of full power generation in the rainy season. This makes the project scales much larger than the dry season power output and lowers kWh cost. However, it may be noted their dependable power in the dry season is negligibly small compared to the installed capacity.

Table AP-A.1.2 List of Identified MHP Sites in Cambodia

Site No.	Hydro Project Name	Province	Load Centre	Load Centre Demand MW	Installed Capacity (1) kW	Distance from Demand Centre to Power House km	Distance from Existing Transmission Line km	Catchment Area km²	Mean Annual Rainfall mm/yr	Mean Annual Evaporation mm/yr	Run-off Coefficient	Mean Annual Flow m³/sec	Power Flow m³/sec	Net Head m	Dam Crest Length m	Reservoir Area km²	Note			
																	MIME List	MIME List	NEDO Study	JICA 事前
1	O Chum 2	Ratanak Kiri	Ban Lung	1.0	300	8	3	0.3	-	1,200		3.8	3.8	10			○			
2	O Katieng	Ratanak Kiri	Ban Lung	1.5	1,076	10	10	44	3,000	1,000		2.8	2.8	3	43.05		○	○		
3	O Katieng	Ratanak Kiri			224			42.9	2,200		0.50	1.5		20	500	1.512	○			
4	O Kachagn	Ratanak Kiri			82			31.2	2,200		0.50	1.1		10	350	1.325	○			
5	O Chum III	Ratanak Kiri			74			22.7	2,200	1,000		1.4	1.3	8.96			○			
6	Ta Ang	Ratanak Kiri			10			19	2,200	1,000		0.7	0.07	23.91			○			
7	Bay Srok	Ratanak Kiri			78			115	2,200	1,000		4.4	0.68	17.99			○			
8	Prek Dak Deur	Mondul Kiri			201			139	2,600	1,200		6.2	0.62	25.81			○			
9	Prek Dak Deur (MIME List)	Mondul Kiri			113			53.65	2,100		0.42	1.5		10	180	1.24	○	○		
10	Prek Dak Deur (5)	Mondul Kiri	Sen Monorom	0.5	200	11.3	11.3	53	2,600	1,200		2.4	1.6	14.3			○			
11	Prek Dak Deur (Meritec site) (5)	Mondul Kiri	Sen Monorom	0.5	721	13	13	102	2,800	1,000		5.8	5	17.52			○			
12	O Phlat	Mondul Kiri	Sen Monorom	0.5	3,478	27	27	95	2,800	1,000		5.4	4.5	92.78			Selected			
13	Prek Por	Mondul Kiri	Sen Monorom	0.5	4,800	30	30	198	2,800	1,000		11.3	15	38.53			Selected			
14	Busra	Mondul Kiri	Sen Monorom	0.5	54			198	2,600	1,200		8.8	0.15	56.9			○			
15	O Moleng (a)	Mondul Kiri			148			56.64	2,200		0.50	2.0		10	400	0.3125	○			
16	O Moleng (b)	Mondul Kiri			50			47.55	2,100		0.42	1.3		5	200	0.325	○			
17	O Romiss	Mondul Kiri			91			43.26	2,100		0.42	1.2		10	120	0.1	○			
18	O Yong Ngol	Mondul Kiri			68			32.23	2,100		0.42	0.9		10	110	0.362	○			
19	Preak Antap	Kampong Cham			44			234.81	2,400		0.42	7.5		15	700	4.875	○			
20	Preak Lpeak (Irrig. Weir)	Kampong Cham			42			41.25	1,600		0.27	0.6		10	320	1.7	○			Selected
21	Preak Chou (Irrig. Weir)	Kampong Cham						4.4									○			Selected
22	Chom Ta Hing (Irrig. Weir)	Kampong Cham															○			Selected
23	Toeuk Char (Irrig. Weir)	Kampong Cham															○			Selected
24	Chroch Takok	Kampong Cham						1.2				0.2					○			Selected
25	Siem Reap No.1(extg French Irrigation Weir)	Siem Reap	Siem Reap Town	3.3	-	15	11.9	600	1,200	1,000		3.8	0	0			○			
26	Siem Reap No.2 (Disused Irrigation Weir)	Siem Reap	Siem Reap Town	3.3	-	0	0.2	670	1,200	1,000		4.2	0	0			○			
27	Siem Reap No.3(extg Western Irrigation Reservoir)	Siem Reap	Siem Reap Town	3.3	-	17.7	7.8	600	1,200	1,000		3.8	0	0			○			
28	Stung Siem Reap (5)	Siem Reap	Siem Reap Town	3.3	1,732	47.9	44	115	1,600	1,000		2.2	3	69.25			Selected			○
29	Upper Stung Siem Reap (5)	Siem Reap	Siem Reap Town	3.3	656	52.7	48.8	86	1,600	1,000		1.6	3	26.22			Selected			○
30	Phnum Kulen	Siem Reap	Siem Reap Town		1,561			123.75	1,700		0.39	2.6		80	450	0.35	○			○
31	Phnum Kbal Spean	Siem Reap	Siem Reap		18							0.2		15			○			○
32	Preak Thum	Siem Reap			506			80.15	1,700		0.39	1.7		40	80	0.7	○			○
33	O Sam Rang	Siem Reap			149			117.9	1,700		0.39	2.5		8	1400	2.45	○			○
34	Stung Touch	Siem Reap			79			49.95	1,700		0.39	1.1		10	310	3.75	○			○
35	O Sam Kaong	Siem Reap			334			211.6	1,700		0.39	4.5		10	620	3.6	○			○
36	Stung Chi Kreng	Siem Reap							1,700		0.39						○			○
37	Tum Nup Baraing	Siem Reap			1,500												○			○
38	Barray Reservoir	Siem Reap															○			○
39	Stung Muong No.1	Battambang	Muong District Town	0.4	400	34	34	546	1,800	1,000	0.51	13.9	4	20			○			○
40	Stung Muong No.2	Battambang	Muong District Town	0.4	400	18.8	18.8	550	2,000	1,000	0.51	14.0	13	4			○			○
41	O Samrel	Battambang						12									○			○
42	Ta Taok	Battambang						14									○			○
43	Kampong Lpov	Battambang						8	2,200	1,000		0.3					○			○
44	Stung Pursat No.1	Pursat	Pursat Town	1.0	100	40	40	700	1,600	1,000		13.3	4	2			○			○
45	Stung Prey Klong	Pursat	Phnom Krovath District Town	0.5	100	20	20	555	1,600	1,000		10.6	3	2			○			○
46	Stung Prey Kloug'	Pursat			886			862	1,600		0.27	11.8		10	950	7.125	○			○
47	O Pramote	Pursat			36			75	2,200	1,000		2.9	0.3	20			○			○
48	Stung Kraing Pontley	Kampong Chhnang			221			483.1	1,600		0.24	5.9		5	570	1.9	○			○
49	Stung Boribour	Kampong Chhnang			815			791.05	1,600		0.27	10.8		10	180	0.8	○			○
50	Stung Bannak	Kampong Chhnang			403			392.4	1,600		0.27	5.4		10	210	1.3	○			○
51	Stung Kbal Siem	Kampong Chhnang						1,600			0.27			10	440	0.75	○			○
52	Kirrom III	Koh Kong	Phnom Penh / Kampong Speu	80.0	8,342	140	40	98	2,500	1,000		4.7	5	250.36			○			○
53	Phnom Batau Downstream	Koh Kong	Phnom Penh / Kampong Speu	80.0	4,197	140	44	105	2,500	1,000		5.0	5	100.78			Selected			○
54	Phnom Tunsang Unstream (5)	Koh Kong	Phnom Penh / Kampong Speu	80.0	3,143	140	2	32	2,500	1,000		1.5	2	188.66			Selected			○
55	Phnom Tunsang Downstream (5)	Koh Kong	Phnom Penh / Kampong Speu	80.0	3,002	140	7	53	2,500	1,000		2.5	4	90.11			Selected			○
56	O Sla Upstream	Koh Kong	Phnom Penh / Kampong Speu	80.0	1,953	140	3	54	2,800	1,000		3.1	3	78.15			Selected			○
57	O Sla Downstream	Koh Kong	Phnom Penh / Kampong Speu	80.0	4,483	140	7	75	2,800	1,000		4.3	5	107.64			○			○
58	Prek Toeuk Chhu	Kampot	Kampot Town	1.0	762	15.6	4.8	710	3,500	1,100	0.57	54.0	5	18.28	200	0.15	Selected			○
59	O Turou Trao	Kampot	Kampot Town	1.0	1,122	13.1	2.7	20	3,500	1,100	0.57	1.5	1	134.73			Selected			○
60	Bokor Plateau	Kampot	Kampot Town	1.0	1,000	13.1	2.7	44	3,500	1,100		3.3	3	40			Selected			○
61	Bokor	Kampot			4,509			14.4	3,500		0.57	0.9		660	800	2.95	○			○
62	Upper Kamchay	Kampot	Kampot Town	1.0	3,132	26	13	243	3,500	1,100	0.57	18.5	10	37.6			Selected			○
63	Sare Cheng	Kampot						36									○			○
64	Tomnup Kuon Satv	Kampot			100			77.45	3,500		0.57	2.3		5	225	1.25	○			Selected
65	Snam Prampir	Kampot			101			21.25	3,500		0.57	1.3		10			○			○
66	Preak Kaoh Touch	Kampot			317			21.65	1,800		0.57	5.4		60	120	0.08	○			Selected
67	Churouh Rokar	Kampot, Takeo			119			32.55	1,800		0.57	1.1		15	900	2.2	○			○
68	Stung Trv	Kampot, Kampong Speu			243			266.1	1,600		0.24	3.2		10	480	5.7	○			○
69	Stung Sva Slab	Kampong Speu	Phnom Penh / Kampong Speu	80.0	3,804	80	30	205	2,200	1,000		7.8	8	56.66			Selected			○
70	Takeo Waterfall	Takeo			30	40	40	5	1,481	1,000		0.1	0.067	60			○			○
71	O Chhleung	Takeo			30			5	1,481		0.27	0.1		60			○			○
72	Khall Chay	Sihanoukville	Sihanoukville Town	8.0	312	17.1	8.5	45	3,500	1,100	0.51	3.4	3	12.49	190	0.65	Selected			○

Notes
 1 Determined by Peak Demand at Load Centre
 2 Cost does not include financing costs or O & M.
 3 Projects are in a cascade and development is interdependent
 4 Production costs determined from 20% discount rate and an operating life of 30 years

Source: Compiled by the JICA Study Team, individual source is given in the rightmost column.

Table AP-A.1.3 List of MHP Sites Identified through Map Study (1/4)

Revision 1 (June2005)														Efficiency of Turbine, Generator				0.7		
No.	MHP ID No.	Province	Scheme	River	Power (kW) (n=0.7)	C. Area (km ²)	Specific Discharge (m ³ /s/km ²)	Discharge (m ³ /s)	Height (m)			Canal (km)	Access		Village		Coordination		Map No.	Note
									Total	EL Intake	EL PH		Road	Distance (km)	Name	Distance (km)	X	Y		
1	1-1	Battambang	Tributary of Stung Cra Nhung	Tributary of Stung Cra Nhung	330	244 ¹⁾	0.0020 ⁷⁾	0.488 ⁶⁾	100.0 ⁹⁾	275	175	3.5	B	0.3	Ta Taok Commune, Kampong Lpou Commune etc.	1	263,500	1,373,700	5533	
2	1-2	Battambang	Sangke (D/S)	Stung Sangke	59	696 ¹⁾	0.0017 ⁸⁾	1.150 ¹⁾	7.5 ⁶⁾	-	-	0.98	B	0.5	Ratanak Mondul District Samlout District, etc	15	268,875	1,411,162	5534	
3	1-3	Battambang	Sangke (U/S)	Stung Sangke	85	499 ¹⁾	0.0017 ⁸⁾	0.824 ⁶⁾	15.0 ⁶⁾	-	-	-	B	0.5	Ditto	15	255,200	1,402,400	5534	
4	1-4	Battambang	O Samrel	O Samrel	7	12 ³⁾	0.0030 ⁸⁾	0.036 ¹⁾	28.0 ¹⁾	-	-	-	-	-	Potential Target Villages covered with the scheme 1-1	-	268,866	1,381,692	5534	Meritec Study (2003) [33kW] *3)
5	1-5	Battambang	Ta Taok	O Chum	29	14 ³⁾	0.0043 ⁸⁾	0.060 ¹⁾	71.4 ¹⁾	-	-	-	-	-	Ditto	-	265,898	1,376,917	5534	Meritec Study (2003) [37.5kW] *3)
6	1-6	Battambang	Kampong Lpov	Ou Daem Chek	14	8 ³⁾	0.0033 ⁸⁾	0.026 ¹⁾	78.7 ¹⁾	-	-	-	-	-	Ditto	-	271,928	1,383,174	5534	Meritec Study (2003) [31kW] *3)
7	2-1	Kampong Chhnang	Stung Spean Ta Khum	Stung Spean Ta Khum	14	13 ¹⁾	0.0020 ⁷⁾	0.026 ⁶⁾	80.0 ⁹⁾	-	-	1.2	B	-	No village	-	415,500	1,342,500	5833	
8	2-2	Kampong Chhnang	Stung Oukhiley	Stung Oukhiley	8	14 ¹⁾	0.0020 ⁷⁾	0.028 ⁶⁾	40.0 ⁹⁾	-	-	0.5	B	-	No village	-	421,000	1,333,000	5833	
9	2-3	Kampong Chhnang	Stung Thum	Stung Thum	14	100 ¹⁾	0.0020 ⁷⁾	0.200 ⁶⁾	10.0 ⁹⁾	-	-	1.8	B	-	Kos Khtum	12	429,500	1,332,800	5833	
10	3-1	Kampong Speu	Ou Chambak	Ou Chambak	36	12 ¹⁾	0.0020 ⁷⁾	0.024 ⁶⁾	220.0 ⁹⁾	-	-	1.5	-	-	No village	-	402,500	1,256,000	5831	
11	3-2	Kampong Speu	Ou Ta Saek	Ou Ta Saek	14	10 ¹⁾	0.0020 ⁷⁾	0.020 ⁶⁾	100.0 ⁹⁾	-	-	0.8	B	-	No village	-	402,200	1,248,000	5831	
12	3-3	Kampong Speu	Stung Srae Chhlong	Stung Srae Chhlong	26	12 ¹⁾	0.0020 ⁷⁾	0.024 ⁶⁾	160.0 ⁹⁾	-	-	1.3	B	-	No village	-	401,500	1,245,000	5831	
13	3-5	Kampong Speu	Ou Voa Rovieng	Ou Voa Rovieng	10	35 ¹⁾	0.0020 ⁷⁾	0.070 ⁶⁾	20.0 ⁹⁾	100	80	1	C	-	(No Village ?)	-	402,000	1,281,000	5832	Low water, Low Output
14	3-6	Kampong Speu	Tributary Stung Areang	Tributary Stung Areang	20	12 ¹⁾	0.0020 ⁷⁾	0.024 ⁶⁾	120.0 ⁹⁾	-	-	1	B	-	No village	-	403,600	1,327,800	5833	
15	4-1	Kampong Thom	O Kmdny	O Kmdny	9	63 ¹⁾	0.0020 ⁷⁾	0.126 ⁶⁾	10.0 ⁹⁾	40	30	1.5	B	0	Village too far	-	565,500	1,414,800	6134	
16	5-1	Kampot	Ou Treb Da	Ou Treb Da	165	40 ¹⁾	0.0050 ⁷⁾	0.200 ⁶⁾	120.0 ⁹⁾	220	100	2	B	-	Stung Chhay (Koh Kong)	-	386,900	1,205,200	5730	
17	5-2	Kampot	Ou TrebDa (Alternative)	Ou Treb Da	247	40 ¹⁾	0.0050 ⁷⁾	0.200 ⁶⁾	180.0 ⁹⁾	220	40	3.6	B	-	Stung Chhay (Koh Kong)	-	386,900	1,205,200	5730	
18	5-3	Kampot	Preak Kaoh Touch	Kaoh Touch	-	22 ⁴⁾	-	0.000 ¹⁾	60.0 ⁴⁾	-	-	-	-	-	Kilou Dabpir village + Kaou Touch (Preak Chek)	-	399,035	1,171,179	5830	MIME List [317kW] (River dried up)
19	5-4	Kampot	Upper Kamchay Left Tributary A	Prek Tuek Chhu	722	263 ¹⁾	0.0050 ⁷⁾	1.315 ⁶⁾	80.0 ⁹⁾	240	160	3.2	B	-	No Village near, for Kampot	-	401,800	1,198,900	5830	
20	5-5	Kampot	Upper Kamchay Right Tributary B	Prek Tuek Chhu	410	299 ¹⁾	0.0050 ⁷⁾	1.495 ⁶⁾	40.0 ⁹⁾	200	160	3	C	-	No Village near, for Kampot	-	398,800	1,196,000	5830	
21	5-6	Kampot	O Tourou Trao	O Tourou Trao	55	20 ²⁾	0.0026 ⁸⁾	0.052 ¹⁾	154.3 ¹⁾	-	-	3	B	-	Kampot	-	401,427	1,180,460	5830	Meritec Study (2001) [1.12MW] *2)
22	5-7	Kampot	O Tourou Trao (Alternative)	Small Tributary of Prek Tuek Chhu Bouk Koul Platou	129	34 ¹⁾	0.0040 ⁷⁾	0.135 ⁶⁾	140.0 ⁹⁾	220	80	5.5	-	-	Kampot	-	396,700	1,178,200	5830	Additional Intake site at Bouk Koul Platou
23	5-8	Kampot	Ou Thum Irrigation Dam	Ou Thum	1	65 ¹⁾	0.0010 ⁷⁾	0.065 ⁶⁾	2.0 ⁷⁾	-	-	0.01	-	-	Koun Sat Village	-	422,200	1,172,000	5830	Existing Dam Head by Dam Up, Pico Hydro
24	5-9	Kampot	Srae Cheng (Srat Cheng)	Srae Cheng (Srat Cheng)	6	36 ⁴⁾	0.0005 ⁸⁾	0.017 ¹⁾	55.0 ¹⁾	-	-	0.6	-	-	Pong Tuek village, Srae Chaeng, Prey Khley, Kamnab	-	431,151	1,218,070	5831	Height measurement by Altimeter, Low output
25	6-1	Koh Kong	Preak Koun	Preak Koun	10	35 ¹⁾	0.0040 ⁷⁾	0.140 ⁶⁾	10.0 ⁹⁾	20	10	-	-	-	No Village	-	309,100	1,269,200	5631	
26	6-2	Koh Kong	Trib. Stung Trapeang Rung	Tributary of Stung Trapeang Rung	4	13 ¹⁾	0.0040 ⁷⁾	0.052 ⁶⁾	10.0 ⁹⁾	30	20	-	-	-	Ditto	-	315,000	1,263,200	5631	
27	6-3	Koh Kong	Trib. Preak Santung	Tributary of Preak Santung	14	17 ¹⁾	0.0040 ⁷⁾	0.066 ⁶⁾	30.0 ⁹⁾	50	20	-	-	-	Ditto	-	322,900	1,261,400	5631	
28	6-4	Koh Kong	Preak Santung	Preak Santung	31	28 ¹⁾	0.0040 ⁷⁾	0.112 ⁶⁾	40.0 ⁹⁾	80	40	-	-	-	Ditto	-	327,600	1,265,000	5631	
29	6-5	Koh Kong	Trib. Preak Ta Chan	Tributary Preak Ta Chan	7	12 ¹⁾	0.0040 ⁷⁾	0.048 ⁶⁾	20.0 ⁹⁾	40	20	-	-	-	Ditto	-	310,300	1,243,900	5631	
30	6-6	Koh Kong	Preak Khou Khav	Preak Khou Khav	15	28 ¹⁾	0.0040 ⁷⁾	0.110 ⁶⁾	20.0 ⁹⁾	30	10	0.9	-	-	-	-	300,000	1,237,000	5631	
31	6-7	Koh Kong	Stung Ko	Stung Ko	12	14 ¹⁾	0.0040 ⁷⁾	0.056 ⁶⁾	30.0 ⁹⁾	70	40	-	-	-	No Village	-	306,800	1,229,600	5631	
32	6-8	Koh Kong	Stung Russei-1	Stung Russei	198	90 ¹⁾	0.0040 ⁷⁾	0.360 ⁶⁾	80.0 ⁹⁾	500	420	-	-	-	Ditto	-	330,700	1,323,800	5632	
33	6-9	Koh Kong	Stung Russei-2	Stung Russei	1,690	1540 ¹⁾	0.0040 ⁷⁾	6.160 ⁶⁾	40.0 ⁹⁾	180	140	-	-	-	Ditto	-	294,300	1,313,500	5632	
34	6-10	Koh Kong	Stung Russei-3	Stung Russei	2,585	1570 ¹⁾	0.0040 ⁷⁾	6.280 ⁶⁾	60.0 ⁹⁾	80	20	-	-	-	Ditto	-	291,200	1,303,000	5632	
35	6-11	Koh Kong	Tributary of Stung Russei	Tributary of Stung Russei	72	44 ¹⁾	0.0040 ⁷⁾	0.176 ⁶⁾	60.0 ⁹⁾	300	240	-	-	-	Ditto	-	299,900	1,315,700	5632	
36	6-12	Koh Kong	Tatai (D/S)	Stung Tatai	59	423 ¹⁾	0.0007 ⁸⁾	0.284 ¹⁾	30.2 ¹⁾	-	-	1.5	-	-	Kokir Chrum , Trapeang Chuetrav Villages	-	325,927	1,289,335	5632	
37	6-13	Koh Kong	Tatai (U/S)	Stung Tatai	6	158 ¹⁾	0.0002 ⁸⁾	0.031 ¹⁾	28.0 ¹⁾	-	-	-	-	-	Kandal, Trapeang Khna, Spean Kdar Villages	-	340,963	1,307,608	5632	
38	6-14	Koh Kong	Stung Kep	Stung Kep	549	500 ¹⁾	0.0040 ⁷⁾	2.000 ⁶⁾	40.0 ⁹⁾	140	100	-	-	-	No Village near, 20km 134Hfs	-	310,400	1,288,900	5632	
39	6-15	Koh Kong	Stung Sala Munthun	Stung Sala Munthun	417	190 ¹⁾	0.0040 ⁷⁾	0.760 ⁶⁾	80.0 ⁹⁾	220	140	-	-	-	No Village near, 25km 200-300Hfs	-	299,800	1,292,500	5632	

Table AP-A.1.3 List of MHP Sites Identified through Map Study (2/4)

No.	MHP ID No.	Province	Scheme	River	Power (kW) ($\eta=0.7$)	C. Area (km ²)	Specific Discharge (m ³ /s/km ²)	Discharge (m ³ /s)	Height (m)			Canal (km)	Access		Village		Coordination		Map No.	Note
									Total	EL Intake	EL PH		Road	Distance (km)	Name	Distance (km)	X	Y		
40	6-16	Koh Kong	Kirirom- III (Dam) (China F/S)	3rd Tributary of St. Kaong	828	104 ¹⁾	0.0040 ⁷⁾	0.416 ⁶⁾	290.0 ⁹⁾	320	30	2.2	C	-	Grid Connect to Kirirom-I (for Kompong Speu & Phnom Penh)	-	370,200	1,243,500	5731	
41	6-17	Koh Kong	Phnom Batau (Run off-River Type)	3rd Tributary of St. Kaong	359	109 ¹⁾	0.0040 ⁷⁾	0.436 ⁶⁾	120.0 ⁹⁾	160	40	0.8	-	-	Grid Connect to Kirirom-I (for Kompong Speu & Phnom Penh)	-	372,000	1,241,800	5731	
42	6-18	Koh Kong	O Sla U/S (Meritec Proposed)	Ou Sla	126	54 ¹⁾	0.0040 ⁷⁾	0.216 ⁶⁾	85.0 ⁹⁾	280	195	2	C	-	Kampong Seila	15	377,474	1,243,116	5731	Meritec Study (2001) [1.96MW] *2)
43	6-19	Koh Kong	O Sla D/S	Ou Sla	283	86 ¹⁾	0.0040 ⁷⁾	0.344 ⁶⁾	120.0 ⁹⁾	140	20	4	-	-	Kampong Seila	-	376,880	1,238,770	5731	
44	6-20	Koh Kong	Prek Kampong Leu Tributary	Prek Kampong Leu Tributary	81	37 ¹⁾	0.0040 ⁷⁾	0.148 ⁶⁾	80.0 ⁹⁾	100	20	1.3	C	-	Kampong Seila	-	380,000	1,236,000	5731	
45	6-21	Koh Kong	St. Kampong Ta Chev	St. Kampong Ta Chev	144	131 ¹⁾	0.0040 ⁷⁾	0.524 ⁶⁾	40.0 ⁹⁾	120	80	2	C	-	No Village	-	376,600	1,259,500	5731	
46	6-22	Koh Kong	Prek Santung	Prek Santung	82	120 ¹⁾	0.0050 ⁷⁾	0.600 ⁶⁾	20.0 ⁹⁾	80	60	1.2	-	-	Tuek Lak	-	338,000	1,263,300	5731	
47	6-23	Koh Kong	Stung Dah	Stung Dah	31	91 ¹⁾	0.0050 ⁷⁾	0.453 ⁶⁾	10.0 ⁹⁾	50	40	0.1	B	-	No Village, covered with the other scheme	-	345,300	1,260,500	5731	
48	6-24	Koh Kong	Prek Tatai-1	Prek Tatai	530	138 ¹⁾	0.0040 ⁷⁾	0.552 ⁶⁾	140.0 ⁹⁾	580	440	-	-	-	Ditto	-	344,000	1,311,000	5732	
49	6-25	Koh Kong	Chay Areng D/S	Stung Chay Areng	15	890 ¹⁾	0.0004 ⁸⁾	0.367 ¹⁾	6.0 ¹⁾	-	-	1.2	B	-	Chmnoab, Pralay and Thma Donpov Communes	-	340,171	1,285,782	5732	Access is only by Motor Bike
50	6-26	Koh Kong	Khang Sa	-	214	78 ¹⁾	0.0040 ⁷⁾	0.312 ⁶⁾	100.0 ⁹⁾	380	280	-	-	-	No Village, covered with the other scheme	-	359,800	1,303,300	5732	
51	6-27	Koh Kong	O Toc Thola	O Toc Thola	92	84 ¹⁾	0.0040 ⁷⁾	0.336 ⁶⁾	40.0 ⁹⁾	280	240	-	-	-	No Village	-	359,500	1,286,500	5732	
52	6-28	Koh Kong	O Trapang Kholay	O Trapang Kholay	240	73 ¹⁾	0.0040 ⁷⁾	0.292 ⁶⁾	120.0 ⁹⁾	400	280	0.2	-	-	Ph. Tap Kholay	-	359,000	1,291,000	5732	
53	6-29	Koh Kong	Trib. Prek Kampong Saom	Trib. Prek Kampong Saom	99	18 ¹⁾	0.0040 ⁷⁾	0.072 ⁶⁾	200.0 ⁹⁾	400	200	-	-	-	No Village	-	363,500	1,282,000	5732	
54	6-30	Koh Kong	O Toc Srac	O Toc Srac	59	24 ¹⁾	0.0040 ⁷⁾	0.095 ⁶⁾	90.0 ⁹⁾	340	250	-	-	-	Ditto	-	344,800	1,279,200	5732	
55	6-31	Koh Kong	O Ruxay Xroc	O Ruxay Xroc	22	10 ¹⁾	0.0040 ⁷⁾	0.040 ⁶⁾	80.0 ⁹⁾	360	280	-	-	-	Ditto	-	342,400	1,278,000	5732	
56	6-32	Kaoh Kong	Stung Kaoh Sla Tributary Prek Kampong Leu	Stung Kaoh Sla Tributary Prek Kampong Leu	8	14 ¹⁾	0.0020 ⁷⁾	0.028 ⁶⁾	40.0 ⁹⁾	-	-	1	B	-	Ditto	-	402,000	1,232,000	5831	
57	6-33	Kaoh Kong	Prek Cong Pong Xom (S)	Prek Cong Pong Xom	81	37 ¹⁾	0.0040 ⁷⁾	0.148 ⁶⁾	80.0 ⁹⁾	-	-	0.4	B	-	No Target Village, a lot of MHP Schemes near.	-	380,000	1,236,000	5831	
58	6-34	Koh Kong, Kampong Speu	Prek Cong Pong Xom (S)	Prek Cong Pong Xom	22	40 ¹⁾	0.0040 ⁷⁾	0.160 ⁶⁾	20.0 ⁹⁾	60	40	-	-	-	No Village	-	377,500	1,276,500	5732	
59	6-35	Kaoh Kong, Kampong Speu	Stung Sva Slab	Stung Sva Slab	56	205 ²⁾	0.0005 ⁸⁾	0.096 ¹⁾	85.0 ²⁾	-	-	1	-	-	Chambak	8-15	395,710	1,261,360	5831	Meritec Study (2001) [3.80MW] *2) Almost no water in dry season.
60	7-1	Kratie	Prek Krieng	Prek Krieng	2	25 ¹⁾	0.0020 ⁷⁾	0.050 ⁶⁾	5.0 ⁹⁾	45	40	0.9	B	4	No Village	-	598,300	1,402,000	6134	
61	7-2	Kratie	O Dambal	O Dambal	1	155 ¹⁾	0.0003 ⁸⁾	0.050 ¹⁾	3.6 ¹⁾	-	-	2.3	B	0	Ph Prelay Triek	1.5	619,706	1,352,202	6233	JST (2005), x 6 time available if peak generation for 4 hrs
62	7-3	Kratie	O Dambal Lower	O Dambal	1	212 ¹⁾	0.0003 ⁷⁾	0.068 ⁶⁾	3.0 ⁷⁾	-	-	-	B	0	Ph Sre Soach	1.2	617,200	1,347,000	6233	Low output
63	7-4	Kratie	Prek Kat Dai	Prek Kat Dai	9	50 ¹⁾	0.0025 ⁷⁾	0.125 ⁶⁾	10.0 ⁹⁾	80	70	1.2	B	0	Ph Vatt Snuol	3.5	660,700	1,340,700	6233	Low output
64	7-5	Kratie	Ph Thpong Cham	Prek Kat Dai	-	4 ¹⁾	0.0004 ⁷⁾	0.002 ⁶⁾	5.0 ⁷⁾	-	-	-	A	1	Ph Thpong Cham	0	654,000	1,336,200	6233	Existing MHP in Poi Pot regime Assumed almost no water in dry season.
65	7-6	Kratie	Stung Samleng	Stung Samleng	9	53 ¹⁾	0.0025 ⁷⁾	0.133 ⁶⁾	10.0 ⁹⁾	60	50	2	B	0	S'at	1	644,600	1,333,000	6233	Assumed almost no water in dry season.
66	7-7	Kratie	Prek Prey	Prek Prey	0	165 ¹⁾	0.0000 ⁸⁾	0.007 ¹⁾	5.0 ⁷⁾	-	-	-	A	1.8	Prek Prey (4 Army camp families only)	-	668,328	1,337,375	6333	
67	7-8	Kratie	O Chrei Meing	O Chrei Meing	25	180 ¹⁾	0.0040 ⁷⁾	0.719 ¹⁾	5.0 ⁷⁾	-	-	0.05	A	4.5	Cheung Khle	-	664,149	1,335,908	6333	JST (2005), Dam (H=10m, DCL=400m) and Large flood, protection will be required.
68	8-1	Mondul Kiri	O Rang Tributary	O Rang Tributary	5	10 ¹⁾	0.0040 ⁷⁾	0.040 ⁶⁾	20.0 ⁹⁾	200	180	0.5	A	1.5	No Village	-	706,100	1,370,700	6333	
69	8-2	Mondul Kiri	Prek Pua	Prek Pua	49	90 ¹⁾	0.0040 ⁷⁾	0.360 ⁶⁾	20.0 ⁹⁾	180	160	1	B	0.8	51Hhs more than 10km far	-	712,000	1,364,300	6333	
70	8-3	Mondul Kiri	Prek So Long Tributary	Prek So Long Tributary	11	20 ¹⁾	0.0040 ⁷⁾	0.080 ⁶⁾	20.0 ⁹⁾	180	160	0.8	D	-	No Village	-	714,500	1,358,000	6333	
71	8-4	Mondul Kiri	Prek So Long Upper	Prek So Long	11	20 ¹⁾	0.0040 ⁷⁾	0.080 ⁶⁾	20.0 ⁹⁾	220	200	1.2	D	-	Ditto	-	717,000	1,356,800	6333	
72	8-5	Mondul Kiri	Prek So Long Lower	Prek So Long	42	76 ¹⁾	0.0040 ⁷⁾	0.304 ⁶⁾	20.0 ⁹⁾	140	120	3	B	0	Srelovi, Srae Preah	0	713,000	1,350,500	6333	
73	8-6	Mondul Kiri	Prek Te	Prek Te	494	900 ¹⁾	0.0040 ⁷⁾	3.600 ⁶⁾	20.0 ⁹⁾	150	130	2	B	1	Chorkcha, Pohoum	8	699,000	1,397,000	6334	
74	8-7	Mondul Kiri	Prek Te Tributary	Prek Te Tributary	41	150 ¹⁾	0.0040 ⁷⁾	0.600 ⁶⁾	10.0 ⁹⁾	140	130	2	B	3	No Village	-	692,000	1,405,000	6334	
75	8-8	Mondul Kiri	Prek Chhung	Prek Chhung	21	150 ¹⁾	0.0020 ⁷⁾	0.300 ⁶⁾	10.0 ⁹⁾	90	80	1.5	B	1.5	Ditto	-	674,000	1,401,500	6334	
76	8-9	Mondul Kiri	O Bumpa	O Bumpa	33	40 ¹⁾	0.0030 ⁷⁾	0.120 ⁶⁾	40.0 ⁹⁾	280	240	1	B	1.5	Potential Target Villages covered with the scheme 8-6	-	717,000	1,385,200	6334	

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0.7

Table AP-A.1.3 List of MHP Sites Identified through Map Study (3/4)

No.	MHP ID No.	Province	Scheme	River	Power (kW) (η=0.7)	C. Area (km ²)	Specific Discharge (m ³ /s/km ²)	Discharge (m ³ /s)	Height (m)			Access		Village		Coordination		Map No.	Note	
									Total	EL Intake	EL PH	Canal (km)	Road	Distance (km)	Name	Distance (km)	X			Y
77	8-10	Mondul Kiri	O Long Mang	O Long Mang	123	56 ¹⁾	0.0040 ²⁾	0.224 ⁶⁾	80.0 ⁹⁾	680	600	4	B	0	Ph Pu Cheng etc.	2	764,000	1,371,000	6433	Access difficult. 13km over mountains
78	8-11	Mondul Kiri	O Dak Dam	O Dak Dam	2	4 ¹⁾	0.0050 ⁸⁾	0.020 ¹⁾	17.0 ¹⁾	-	-	-	A	0	-	-	751,859	1,372,642	6433	A lot of villages, but output poor
79	8-12	Mondul Kiri	O Moleng	O Moleng	82	50 ¹⁾	0.0040 ²⁾	0.200 ⁶⁾	60.0 ⁹⁾	600	540	2	A	1.2	Sen Monorom	3	735,000	1,376,200	6433	JICA Mondulhiri Study (2005) [130kW]
80	8-13	Mondul Kiri	O Romis	O Romis	19	35 ¹⁾	0.0040 ²⁾	0.140 ⁶⁾	20.0 ⁹⁾	640	620	1	A	0.1	Pu Rotang Sen Monorom	2.5	737,500	1,372,500	6433	JICA Mondulhiri Study (2005) [130kW]
81	8-14	Mondul Kiri	Prek Dak Deurr	Prek Dak Deurr	33	60 ¹⁾	0.0040 ²⁾	0.240 ⁶⁾	20.0 ⁹⁾	620	600	1	A	1	Pu Rotang Sen Monorom	0.5	737,200	1,368,700	6433	JICA Mondulhiri Study (2005) [110kW]
82	8-15	Mondul Kiri	Prek Dak Deurr D/S	Prek Dak Deurr	123	150 ¹⁾	0.0040 ²⁾	0.600 ⁶⁾	30.0 ⁹⁾	580	550	3.5	B	0	Pu Rotang Sen Monorom	1.5	734,100	1,370,800	6433	c
83	8-16	Mondul Kiri	Bu Sra	Prek Por	70	197 ¹⁾	0.0008 ⁸⁾	0.150 ¹⁾	68.0 ¹⁾	-	-	1	B	0	Busra commune	-	764,312	1,390,088	6434	Meritec (2003) [54kW] *3), 23m & 42m for 1st & 2nd fall. Supply to Busra Commune
84	8-17	Mondul Kiri	O Phlai	O Phlai	91	302 ¹⁾	0.0011 ⁸⁾	0.330 ¹⁾	40.0 ²⁾	-	-	1-5	A	-	Busra commune	-	758,800	1,387,700	6434	
85	8-18	Mondul Kiri	Prek Rwei	Prek Rwei	27	195 ¹⁾	0.0020 ²⁾	0.390 ⁶⁾	10.0 ⁹⁾	330	320	0.6	A	7	Phum Pucheichong, Phum Putang	1.6	747,600	1,403,000	6434	
86	8-19	Mondul Kiri	Prek Chbar Lower	Prek Chbar	66	120 ¹⁾	0.0040 ²⁾	0.480 ⁶⁾	20.0 ⁹⁾	240	220	1	B	2	No Village	-	727,500	1,412,500	6434	
87	8-20	Mondul Kiri	Prek Chbar Upper	Prek Chbar	33	60 ¹⁾	0.0040 ²⁾	0.240 ⁶⁾	20.0 ⁹⁾	320	300	1.5	B	1.5	Ph Trinh Nhang	7	737,500	1,395,500	6434	No Access
88	9-1	Pursat	Xtung Tun Po	Xtung Tun Po	55	101 ¹⁾	0.0040 ²⁾	0.404 ⁶⁾	20.0 ⁹⁾	220	200	0.7	-	-	Cat Ong, Ph. Tumpo	-	296,600	1,364,300	5633	
89	9-2	Pursat	Xtung Po Xat Lower	Xtung Po Xat Tributary	691	1260 ¹⁾	0.0040 ²⁾	5.040 ⁶⁾	20.0 ⁹⁾	100	80	-	-	-	No Village	-	321,000	1,363,000	5633	
90	9-3	Pursat	Xtung Po Xat Trib. Upper	Xtung Po Xat Tributary	140	85 ¹⁾	0.0040 ²⁾	0.340 ⁶⁾	60.0 ⁹⁾	200	140	-	-	-	Ditto	-	317,500	1,358,800	5633	a few villages farther than 20km
91	9-4	Pursat	Xtung Po Xat Trib. Upper	Xtung Po Xat Tributary	79	48 ¹⁾	0.0040 ²⁾	0.192 ⁶⁾	60.0 ⁹⁾	520	460	-	-	-	Ditto	-	322,500	1,350,000	5633	
92	9-5	Pursat	O Pramlo	Xtung Tun Po	31	75 ³⁾	0.0030 ²⁾	0.225 ⁶⁾	20.0 ⁹⁾	-	-	-	-	-	Ditto	-	292,300	1,370,500	5633	Meritec Study (2003) [36kW] *3)
93	9-6	Pursat	O Leach Meas	O Leach Meas	35	29 ¹⁾	0.0030 ²⁾	0.086 ⁶⁾	60.0 ⁹⁾	110	50	1	C	-	Ph. Chumnop, Kamraonh, Ph. Rovieng, Veal Angkroeng	-	337,700	1,365,200	5733	
94	9-7	Pursat	Sala Village MHP	?	8	14 ¹⁾	0.0020 ²⁾	0.028 ⁶⁾	40.0 ⁹⁾	100	60	2	C	-	Potential Target Villages covered with the scheme 9-6	-	345,000	1,357,000	5733	
95	9-8a	Pursat	Tributary of St. Santre	Tributary of St. Santre	7	24 ¹⁾	0.0020 ²⁾	0.048 ⁶⁾	20.0 ⁹⁾	240	220	0.15	-	-	No Village	-	390,200	1,336,500	5733	(a 5732)
96	9-8b	Pursat	Tributary of St. Santre (Alt)	Tributary of St. Santre	33	-	-	-	100.0 ⁹⁾	240	140	1.7	C	-	-	-	390,200	1,336,500	-	
97	9-9	Pursat	St. Mongri	St. Mongri	9	32 ¹⁾	0.0020 ²⁾	0.064 ⁶⁾	20.0 ⁹⁾	120	100	0.6	C	-	Ditto	-	339,000	1,344,800	5733	
98	9-10	Pursat	St. Kam Rang	St. Kam Rang	5	6 ¹⁾	0.0020 ²⁾	0.012 ⁶⁾	60.0 ⁹⁾	180	120	0.9	C	-	Ditto	-	344,000	1,345,000	5733	
99	9-11	Pursat	Upper St. Arai	St. Arai	30	24 ¹⁾	0.0030 ²⁾	0.072 ⁶⁾	60.0 ⁹⁾	220	160	0.4	C	-	Ditto	-	347,800	1,339,200	5733	
100	9-12	Pursat	Lower St. Arai	St. Arai	97	235 ¹⁾	0.0030 ²⁾	0.705 ⁶⁾	20.0 ⁹⁾	80	60	0.7	C	-	Ditto	-	359,000	1,345,000	5733	
101	9-13	Pursat	St. Sa	St. Sa	31	15 ¹⁾	0.0030 ²⁾	0.045 ⁶⁾	100.0 ⁹⁾	220	120	1	C	-	Ditto	-	351,500	1,333,000	5733	
102	9-14	Pursat	St. Peam	St. Peam	62	150 ¹⁾	0.0030 ²⁾	0.450 ⁶⁾	20.0 ⁹⁾	140	120	1.8	B	-	Ditto	-	372,500	1,329,500	5733	
103	9-15	Pursat	St. Svay Mul	St. Svay Mul	28	68 ¹⁾	0.0030 ²⁾	0.204 ⁶⁾	20.0 ⁹⁾	140	120	1	B	-	Ditto	-	373,500	1,336,700	5733	
104	9-16	Pursat	Ou Phleung	Ou Phleung	22	20 ¹⁾	0.0020 ²⁾	0.040 ⁶⁾	80.0 ⁹⁾	-	-	0.5	B	-	Ditto	-	408,200	1,340,000	5833	
105	9-17	Pursat	Stung kaoh	Stung Kaoh	21	15 ¹⁾	0.0020 ²⁾	0.030 ⁶⁾	100.0 ⁹⁾	-	-	1.5	B	-	Ditto	-	410,200	1,341,000	5833	
106	9-18	Pursat / Kampong Chhnang	Stung Preak Choar	Preak Choar	15	56 ¹⁾	0.0020 ²⁾	0.112 ⁶⁾	20.0 ⁹⁾	-	-	0.2	B	-	Chheu Tom	13	410,700	1,345,300	5833	
107	9-19	Pursat	Xtung Cran	Xtung Cran	25	90 ¹⁾	0.0020 ²⁾	0.180 ⁶⁾	20.0 ⁹⁾	520	500	2	B	0.5	-	1	305,900	1,334,900	5633	
108	10-1	Ratanak Kiri	O Kachan	O Kachan	32	31 ⁴⁾	0.0112 ⁸⁾	0.350 ¹⁾	13.2 ¹⁾	-	-	-	A	0.5	Kachan II	-	715,659	1,514,518	6336	MIME List [82kW] *2)
109	10-2	Ratanak Kiri	O Katieng	O Katieng	40	43 ⁴⁾	0.0096 ⁸⁾	0.410 ¹⁾	14.1 ¹⁾	-	-	-	A	0.5	Katieng I, II	-	714,128	1,511,427	6336	Meritec Study (2001) [1076kW] *2), MIME List [224kW]
110	10-3	Ratanak Kiri	O Katieng (D/S)	O Katieng	126	43 ¹⁾	0.0096 ⁸⁾	0.410 ¹⁾	44.7 ¹⁾	-	-	2-3	B	0.5-3	Katieng I & II, Kam Pleng, Katieng	-	714,128	1,511,427	6336	New Proposed Scheme by JICA Study Team
111	10-4	Ratanak Kiri	Ta Ang	O Cheng	12	19 ⁴⁾	0.0037 ⁸⁾	0.070 ¹⁾	25.0 ³⁾	190	165	1	A	1	Ta Ang Muoy, Ta Kab, Sek	-	709,708	1,511,423	6336	Meritec Study (2003) [10kW] *3)
112	10-5	Ratanak Kiri	Prek Banpong	Prek Banpong	42	38 ¹⁾	0.0040 ²⁾	0.152 ⁶⁾	40.0 ⁹⁾	220	180	2	C	-	Ph Banpong	12	715,200	1,564,700	6337	
113	10-6	Ratanak Kiri	Tributary of Prek Lalay	Tributary of Prek Lalay	23	42 ¹⁾	0.0040 ²⁾	0.168 ⁶⁾	20.0 ⁹⁾	180	160	1	C	-	No Village	-	709,500	1,564,000	6337	
114	10-7	Ratanak Kiri	O Houei Lalay	O Houei Lalay	198	180 ¹⁾	0.0040 ²⁾	0.720 ⁶⁾	40.0 ⁹⁾	180	140	1.7	C	-	Ditto	-	696,800	1,572,000	6337	
115	10-8	Ratanak Kiri	Tributary of O Houei Lalay	Tributary of O Houei Lalay	14	13 ¹⁾	0.0040 ²⁾	0.052 ⁶⁾	40.0 ⁹⁾	200	160	0.6	B	4	Ditto	-	693,200	1,571,000	6337	
116	10-9	Ratanak Kiri	O Chum I	O Chum	93	23 ³⁾	0.0661 ⁸⁾	1.500 ¹⁰⁾	9.0 ²⁾	-	-	-	A	0	Ta Long (Tharang Chong), Ou Chum, Svay	-	716,437	1,524,726	6436	Meritec Study (2001) [74kW] *2)

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Table AP-A.1.3 List of MHP Sites Identified through Map Study (4/4)

No.	MHP ID No.	Province	Scheme	River	Power (kW) (η=0.7)	C. Area (km ²)	Specific Discharge (m ³ /s/km ²)	Discharge (m ³ /s)	Height (m)			Access		Village		Coordination		Map No.	Note	
									Total	EL Intake	EL PH	Canal (km)	Road	Distance (km)	Name	Distance (km)	X			Y
117	10-10	Ratanak Kiri	Bay Srok	O Sien Ler (O Paling Thom)	66	115 ⁴⁾	0.0036 ⁸⁾	0.410 ¹⁾	23.3 ¹⁾	176	152.7	0.7	B	0	Bay Srok, New Ka Laeng, New Sayos	-	726,215	1,503,449	6436	Meritec Study (2003) [78kW] *3)
118	10-11	Ratanak Kiri	O Ta Phlai	O Ta Phlai	26	62 ¹⁾	0.0030 ⁷⁾	0.186 ⁶⁾	20.0 ⁹⁾	200	180	0.6	B	1	Ping, Prak	2	728,500	1,531,700	6436	
119	10-12	Ratanak Kiri	O Pyol	O Pyol	11	14 ¹⁾	0.0093 ⁸⁾	0.130 ¹⁾	12.6 ⁹⁾				-		Ka Chut	-	752,917	1,538,257	6436	
120	10-13	Ratanak Kiri	Prek Liang	Prek Liang	768	700 ¹⁾	0.0040 ⁷⁾	2.800 ⁶⁾	40.0 ⁹⁾	200	160	2	B	15	Ta Ngach, Ke Kuong	7.5	742,500	1,576,500	6437	No demand
121	10-14	Ratanak Kiri	Stung Khampha	Stung Khampha	549	250 ¹⁾	0.0040 ⁷⁾	1.000 ⁶⁾	80.0 ⁹⁾	260	180	1.5	B	5	No Village	-	728,500	1,578,300	6437	
122	11-1	Stung Treng	O Baign Kla D/S	O Baign Kla	7	35 ¹⁾	0.0060 ⁸⁾	0.210 ¹⁾	5.0 ⁷⁾	-	-	1.2	-	-	Srae Krasan	-	607,817	1,475,073	6135	Proposed by DIME Survey by JST (2005) Low Output
123	11-2	Stung Treng	O Siembok	O Siembok	27	400 ¹⁾	0.0020 ⁷⁾	0.800 ⁶⁾	5.0 ⁹⁾	65	60	2	B	0	Doung	2.5	582,200	1,479,200	6135	
124	11-3	Stung Treng	O Lung	O Lung	28	405 ¹⁾	0.0020 ⁷⁾	0.810 ⁶⁾	5.0 ⁹⁾	55	50	1.5	B	3	Tonsang, Siem Bouk	5.5	590,900	1,465,700	6135	
125	11-4	Stung Treng	Tributary of O Talas	Tributary of O Talas	2	16 ¹⁾	0.0020 ⁷⁾	0.032 ⁶⁾	10.0 ⁹⁾	90	80	2	B	2.7	No Village	-	579,700	1,540,300	6136	
126	11-5	Stung Treng	O Kong Kang	O Kong Kang	3	22 ¹⁾	0.0020 ⁷⁾	0.043 ⁶⁾	10.0 ⁹⁾	110	100	1	B	0	Ditto	-	569,200	1,522,700	6136	Assumed almost no water in dry season.
127	11-6	Stung Treng	O Trel	O Trel	5	33 ¹⁾	0.0020 ⁷⁾	0.066 ⁶⁾	10.0 ⁹⁾	100	90	1.6	B	3.5	Ditto	-	579,100	1,511,400	6136	Assumed almost no water in dry season.
128	11-7	Stung Treng	O Kaak	O Kaak	1	18 ¹⁾	0.0020 ⁷⁾	0.036 ⁶⁾	5.0 ⁹⁾	60	55	0.5	A	5.5	Ditto	-	604,200	1,508,300	6136	
129	11-8	Stung Treng	O Chap	O Chap	1	15 ¹⁾	0.0020 ⁷⁾	0.030 ⁶⁾	5.0 ⁹⁾	55	50	1.4	B	1	Ditto	-	622,700	1,493,700	6136	
130	11-9	Stung Treng	O Chrop	O Chrop (O Samtit)	1	16 ¹⁾	0.0019 ⁸⁾	0.030 ¹⁾	5.0 ⁷⁾	-	-	0.8	A	0.5	Kirivongsa Leu	-	642,492	1,488,053	6235	Proposed by DIME Survey by JST (2005), Low Potential
131	11-10	Stung Treng	O Chrolong	O Chrolong (O Sralang)	10	128 ¹⁾	0.0025 ⁸⁾	0.320 ¹⁾	4.8 ¹⁾	-	-	2.4	B	0	O Ruessei Kandal	0	619,514	1,476,863	6235	Proposed by DIME Survey by JST (2005)
132	11-11	Stung Treng	Prek Khimin	Prek Khimin	4	32 ¹⁾	0.0020 ⁷⁾	0.064 ⁶⁾	10.0 ⁹⁾	65	55	1.8	B	3.5	No Village	-	623,300	1,529,400	6236	
133	11-12	Stung Treng	Prek Kmeng	Prek Kmeng	1	11 ¹⁾	0.0020 ⁷⁾	0.022 ⁶⁾	5.0 ⁹⁾	55	50	0.8	B	2	Ditto	-	628,000	1,504,000	6236	
134	11-13	Stung Treng	Tributary of Stung Moku	Tributary of Stung Moku	58	47 ¹⁾	0.0030 ⁷⁾	0.141 ⁶⁾	60.0 ⁹⁾	160	100	1	A	12	Ditto	-	658,000	1,585,000	6237	
135	11-14	Stung Treng	Tributary of Tonle Kong	Tributary of Tonle Kong	6	14 ¹⁾	0.0030 ⁷⁾	0.042 ⁶⁾	20.0 ⁹⁾	100	80	0.8	A	3.5	Ditto	-	658,200	1,598,500	6237	
136	11-15	Stung Treng	Tributary of Stung Tin Hiang	Tributary of Stung Tin Hiang	4	20 ¹⁾	0.0030 ⁷⁾	0.060 ⁶⁾	10.0 ⁹⁾	90	80	0.8	C	-	Ditto	-	637,000	1,591,200	6237	
137	11-16	Stung Treng	O Pou Chhuk	O Pou Chhuk	68	62 ¹⁾	0.0040 ⁷⁾	0.248 ⁶⁾	40.0 ⁹⁾	240	200	1.5	B	2	Ditto	-	683,500	1,563,800	6337	
138	11-17	Stung Treng	O Chrum	O Chrum	13	12 ¹⁾	0.0040 ⁷⁾	0.048 ⁶⁾	40.0 ⁹⁾	220	180	0.3	B	0	Ditto	-	673,000	1,577,300	6337	
139	11-18	Stung Treng	Tributary of O Chrum	Tributary of O Chrum	12	11 ¹⁾	0.0040 ⁷⁾	0.044 ⁶⁾	40.0 ⁹⁾	240	200	0.8	B	0.5	Ditto	-	669,300	1,579,000	6337	
140	11-19	Stung Treng	O Smang	O Smang	73	265 ¹⁾	0.0020 ⁷⁾	0.530 ⁶⁾	20.0 ⁹⁾	120	100	2.5	-	-	-	-	674,500	1,566,700	6337	
141	12-1	Shihanouk Ville	Kbal Chay W.F.	Preak Tuek Sab	28	55 ¹⁾	0.0050 ⁷⁾	0.273 ⁶⁾	15.0 ⁹⁾	30	15	0.5	-	-	Kbal Chay W.F. Tourist Spot	-	348,300	1,179,900	5730	
142	13-1	Preah Vihear	Tributary of O Kdak	Tributary of O Kdak	73	38 ¹⁾	0.0020 ⁷⁾	0.076 ⁶⁾	140.0	240	100	2	A	10	Sralay, Chhuk, Barbour	10	486,600	1,519,800	5936	
143	14-1	Siem Riap	Stung Siem Reap U/S	Stung Siem Reap U/S	73	84 ¹⁾	0.0042 ¹⁾	0.353 ⁶⁾	30.0 ¹⁾	-	-	-	B	1.5	Preas Anghom, etc	10	403,200	1,499,600	5836	MIME/JICA Study *11) 110kw
144	14-2	Siem Riap	Stung Siem Reap D/S	Stung Siem Reap D/S	348	115 ¹⁾	0.0042 ¹⁾	0.483 ⁶⁾	105.0 ¹⁾	-	-	-	B	0.2	Khnar Roveas, Khun Ream, etc	10	402,900	1,501,600	5836	MIME/JICA Study *11) 1,200kw
145	14-3	Siem Riap	Ou Andong Thna	Ou Andong Thna	7	25 ¹⁾	0.0042 ¹⁾	0.105 ⁶⁾	10.0 ⁹⁾	70	60	2	B	2	Sakmot	8	393,500	1,538,200	5836	

Sources:

- 1) JICA Study Team (JST) Surveyed
- 2) "Pipeline Development Program of Small Hydropower Project in Cambodia", WB / Meritec, (2001).
- 3) "Pre-Investment Study of Community-Scale Hydro Projects, Cambodia", NZ MoFA&T, Meritec (2003).
- 4) MIME
- 5) SEILA GIS Data Base
- 6) Estimated figures

Notes:

- 7) Assumed
- 8) Calculated from surveyed value
- 9) JST checked by Topo Map.
- 10) Eye measurement
- 11) "Basic Study for Mini-Hydropower Project for Rural Electrification - in the Province of Siem Reap Cambodia", MIME, JICA/KCEC, (2005)

Notes:

- A : National road, Wide road
- B : Small road or foot path
- C : No access road
- D : Unidentified road

*1 : Village name unconfirmed

Table AP-A.1.4 Details of Selected 44 Micro Hydro Schemes (1/2)

No.	MHP Reference No.	ID No. of RE Scheme	Name of RE Scheme	Target Villages				Micro Hydro					Remarks						
				Sub No.	Province	District	Commune Name	Village Name	ID No. by Seila ¹⁾	Potential Dry Season Power (kW)	Nos. of house-holds	Nos. of HH to be Electrified		Total Demand incl. loss (kW)	Backup Capacity P _{max} (kW)	Length of MV Trans. Lines (km)			
1 ^a	1-2 1-3	HBO209-01 HBO209-02	Sangke D/S Sangke U/S	1	Battambang	Rotanak Mondul	Treang	Chen Montrei	2070403	59	6,786	5429	706	362	115.0	Hybrid with Biomass			
				2	Battambang	Rotanak Mondul	Treang	Kich	2070401	63									
				3	Battambang	Rotanak Mondul	Treang	Picheav	2070402										
				4	Battambang	Rotanak Mondul	Treang	Chi Sang	2070404										
				5	Battambang	Rotanak Mondul	Treang	Svay Sa	2070406										
				6	Battambang	Rotanak Mondul	Treang	Ta Krak	2070407										
				7	Battambang	Rotanak Mondul	Phlo Meas	Chi Pan	2070304										
				8	Battambang	Rotanak Mondul	Phlo Meas	Ou Treng	2070305										
				9	Battambang	Rotanak Mondul	Phlo Meas	Tuck Sab	2070303										
				10	Battambang	Rotanak Mondul	Phlo Meas	Sek Sak	2070302										
				11	Battambang	Rotanak Mondul	Phlo Meas	Phlo Meas	2070301										
				12	Battambang	Rotanak Mondul	Phlo Meas	Ou Lunun	2070307										
				13	Battambang	Sambout	Mean Cheay	Sre Sdao	2090401										
				14	Battambang	Sambout	Mean Cheay	Sre Chi Pao	2090403										
				15	Battambang	Sambout	Mean Cheay	Ambih	2090405										
				16	Battambang	Sambout	Mean Cheay	Ta Non	2090406										
				17	Battambang	Sambout	Mean Cheay	Kampong Touk	2090402										
				18	Battambang	Rotanak Mondul	Phlo Meas	Ou Da	2070306										
				19	Battambang	Sambout	Ok Tan	Kea Chab	24010206										
				20	Battambang	Sambout	Ou Samrei	Ou Samrei Knom	2090206										
				21	Battambang	Sambout	Ou Samrei	Ou Rumchek Leu	2090202										
				22	Battambang	Sambout	Ou Samrei	Ou Samrei Leu	2090209										
				23	Battambang	Sambout	Ou Samrei	Ou Rumchek Knom	2090201										
				24	Battambang	Sambout	Ou Samrei	Chamlang Remeang Kn	2090203										
				25	Battambang	Sambout	Ou Samrei	Chamlang Remeang Kn	2090204										
				26	Battambang	Sambout	Mean Cheay	Kam Chat	2090404										
				27	Battambang	Sambout	Ta Sanh	Dnon Treck	2090702										
				28	Battambang	Sambout	Ta Sanh	Prey Rumchek	2090705										
				29	Battambang	Sambout	Ta Sanh	Ou Sigout	2090703										
				30	Battambang	Sambout	Ta Sanh	Ou Trum	2090704										
				31	Battambang	Sambout	Ta Sanh	Anheng Buak	2090701										
				32	Battambang	Sambout	Ta Sanh	Ta Sanh Khang Chhoeu	2090706										
				33	Battambang	Sambout	Ta Sanh	Ta Sanh Khang Thoeung	2090707										
				34	Battambang	Sambout	Sung	Kanh Chaeng	2090603										
				35	Battambang	Sambout	Sung	Sheung Mhuoy	2090607										
				36	Battambang	Sambout	Sung	Sheung Pre	2090608										
				37	Battambang	Sambout	Sung	Kandal	2090602										
				38	Battambang	Sambout	Sung	Sre Resch	2090606										
				39	Battambang	Sambout	Sambout	Bueung Run	2090506										
				40	Battambang	Sambout	Sambout	Kamout	2090502										
				41	Battambang	Sambout	Sambout	Sambout	2090504										
				42	Battambang	Sambout	Sung	Chamkar Chek	2090601										
				43	Battambang	Sambout	Sambout	Chhar RoKar	2090501										
				44	Battambang	Sambout	Sambout	Sre Andoung Moy	2090505										
				45	Battambang	Sambout	Sambout	Ou Chrab	2090503										
2 ^a	1-2	HBO209-03	Sangke D/S Alternative	1	Battambang	Rotanak Mondul	Phlo Meas	Phlo Meas	2070301	59	1,324	1059	138	79	13.0	Small scale of scheme 1 Target villages overlapped Hybrid with Biomass			
				2	Battambang	Rotanak Mondul	Phlo Meas	Tuck Sab	2070303										
				3	Battambang	Rotanak Mondul	Phlo Meas	Ou Treng	2070305										
				4	Battambang	Rotanak Mondul	Phlo Meas	Chi Pan	2070304										
				5	Battambang	Rotanak Mondul	Treang	Picheav	2070402										
				6	Battambang	Rotanak Mondul	Treang	Kich	2070401										
3 ^a	10-10	MH1605-02	Bay Srok	1	Ratanak Kiri	Lumphat	Ka Laeng	Bay Srok	16050204	65	560	448	58	0	3.0	Target village			
				2	Ratanak Kiri	Lumphat	Ka Laeng	New Ka Laeng	16050205										
				3	Ratanak Kiri	Lumphat	Ka Laeng	New Savos	16050206										
4 ^a	8-17	MH104-01	Bu Sra	1	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Mury	11040401	91	859	719	93	2	25.0	Use Water Fall or O Phlai River			
				2	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Pir	11040402										
				3	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Bei	11040403										
				4	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Brun	11040404										
				5	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Pram	11040405										
				6	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Prammoy	11040406										
				7	Mondul Kiri	Pech Chenda	Bu Sra	Phum Lekh Pramprir	11040407										
				8	Mondul Kiri	Pech Chenda	Srae Ampum	Phum Lekh Mury	11040301										
				9	Mondul Kiri	Pech Chenda	Srae Ampum	Phum Lekh Pir	11040302										
				10	Mondul Kiri	Pech Chenda	Srae Ampum	Phum Lekh Bei	11040303										
5 ^a	6-19	MH908-01	O Sla D/S	1	Koh Kong	Kampong Seila	Kampong Seila	Krang at	9080202	283	1,249	999	130	0	15.0				
				2	Koh Kong	Kampong Seila	Kampong Seila	Cham Srei	9080201										
				3	Koh Kong	Kampong Seila	Kampong Seila	Veal	9080204										
6 ^a	9-1	MH1506-02	Xtong Tun Po	1	Pursat	Veal Veang	Pramsoy	Sneung Thmei	15060403	55	451	361	47	0	11.0				
				2	Pursat	Veal Veang	Pramsoy	Tumpor	15060405										
				3	Pursat	Veal Veang	Pramsoy	Pramsoy	15060404										
7 ^a	5-9	HBO704-01	Srae Cheng	1	Kampot	Chum Kiri	Srae Chaeung	Pong Tack	7040404	6	284	227	30	24	8.0	Landmine Hybrid with Biomass			
				2	Koh Kong	Thma Bang	Ruessei Chrum	Kokar Chrum	9070404	62	155	124	16	0	10.0				
9 ^a	1-1	MH0209-01	Tributary Stung Cra Nhung	1	Battambang	Sambout	Ta Tack	Peam Ta	2090104	330	844	675	88	0	33.0				
				2	Battambang	Sambout	Ta Tack	Ou Treng	2090103										
				3	Battambang	Sambout	Ta Tack	Veal Rolaeum	2090108										
				4	Battambang	Sambout	Ta Tack	Ou Nonoung	2090101										
				5	Battambang	Sambout	Ta Tack	Ta Tuk	2090107										
				6	Battambang	Sambout	Ta Tack	Peam	2090105										
				7	Battambang	Sambout	Ta Tack	Ou Ta Tack	2090106										
				8	Battambang	Sambout	Ta Tack	Phnum Bai	2090109										
				9	Battambang	Sambout	Kampong Lpou	Ou Daem Chek	2090302										
				10	Battambang	Sambout	Kampong Lpou	Svay Chrum	2090301										
				11	Battambang	Sambout	Kampong Lpou	Ou Chom Leu	2090306										
				12	Battambang	Sambout	Kampong Lpou	Ou Chom Kandil	2090304										
				13	Battambang	Sambout	Kampong Lpou	Kandal	2090307										
				14	Battambang	Sambout	Kampong Lpou	Ou Chom Knom	2090305										
10 ^a	9-6	MH1504-01	O Leach Meas	1	Pursat	Phnum Kravanh	Samraong	Roveang	15040710	35	164	131	17	0	13.0				
				2	Pursat	Phnum Kravanh	Samraong	Onkrong	15040711										
11 ^a	8-5	MH101-01	Prek So Long Lower	1	Mondul Kiri	Kaev Seima	Srae Khnum	Srelov	11010403	42	286	229	30	0	14.0				
				2	Mondul Kiri	Kaev Seima	Srae Preah	Srae Preah	11010505										
				3	Mondul Kiri	Kaev Seima	Srae Khnum	Srae Khnum	11010407										
				4	Mondul Kiri	Kaev Seima	Srae Khnum	Sreampil	11010404										
				5	Mondul Kiri	Kaev Seima	Srae Preah	Pu Char	11010502										
12 ^a	2-3	MH0408-01	Stung Thum	1	Kampong Chhnang	Tuck Phob	Chiech	Kos Khnum	4080211	14	107	86	11	0	2.5				
13 ^a	5-1	MH1802-01	Ou Treb Da	1	Krong Preah Sihanouk	Prey Nob	Cheung Kou	Anlong Krpeu	18020407	165	61	49	6	0	8.0				
14 ^a	8-12	MH105-01	O Romis	1	Mondul Kiri	Saen Monorom	Monorom	Dareum Sral	11050101	82	1,434	1147	149	15	5.0	B/D on going by Japanese Grant Backup necessary			
				2	Mondul Kiri	Saen Monorom	Monorom	Chrey Saen	11050102	19									
16 ^a	8-14	MH105-03	Prek Dak Deurr D/S	3	Mondul Kiri	Saen Monorom	Sakh Dam	Meant Leaph	11050201	33					9.0	Will be sent to Semnorum mini-grid. The villages with * were not included in the demand call. They are a little far from the site.			
				4	Mondul Kiri	Saen Monorom	Sakh Dam	Dakh Kramon	11050202	206	1,434	1147	149	0	4.5				
				5	Mondul Kiri	Saen Monorom	Sakh Dam	Svay Chek	11050203										
				6	Mondul Kiri	Saen Monorom	Sakh Dam	Lankla	11050204										
				7	Mondul Kiri	Saen Monorom	Spaen Mean Chey	Ou Spean	11050301										
				8	Mondul Kiri	Saen Monorom	Spaen Mean Chey	Chambak	11050302										
				9	Mondul Kiri	Saen Monorom	Spaen Mean Chey	Kandal											

Table AP-A.1.4 Details of Selected 44 Micro Hydro Schemes (2/2)

MHP Reference No.	ID No. of RE Scheme	Name of RE Scheme	Target Villages				Micro Hydro						Remarks														
			Sub No.	Province	District	Commune Name	Village Name	ID No. by Seila ¹⁾	Potential Dry Season Power (kW)	Nos. of household	Nos. of HH to be Electrified	Total Demand incl. loss (kW)		Backup Capacity P _{av} (kW)	Length of MV Trans. Lines (km)												
19*	6-35	HB0506-01	Stung Sva Slab	1	Kampong Speu	Phnum Sraoch	Chambak	Krang Chek	5060101	56	665	532	69	13	12.0	Dry season little water Hybrid with Biomass											
				2	Kampong Speu	Phnum Sraoch	Chambak	Beng	5060102																		
				3	Kampong Speu	Phnum Sraoch	Chambak	Chambak	5060104																		
20*	14-1	MH1713-01	Stung Siem Reap U/S	1	Siem Reap	Svay Leu	Khang Phnum	Peas Angthom	17130308	73	604	483	63	0	23.0	MIME/JICA Study on going Sightsseeing Spot											
				2	Siem Reap	Svay Leu	Khang Phnum	Thmey	17130307																		
				3	Siem Reap	Svay Leu	Khang Phnum	Popel	17130306																		
				4	Siem Reap	Svay Leu	Khang Phnum	Kha Khnum	17130302																		
				5	Siem Reap	Svay Leu	Khang Phnum	Anlong Thum	17130305																		
				6	Siem Reap	Svay Leu	Khang Phnum	Thma Chrouh	17130303																		
				7	Siem Reap	Svay Leu	Khang Phnum	Sangkae Lak	17130304																		
				8	Siem Reap	Svay Leu	Khang Phnum	Ta Poh	17130301																		
21*	14-2	MH1703-01	Stung Siem Reap D/S	1	Siem Reap	Banteay Srei	Khun Ream	Knar Roveas	17030201	348	3,697	2958	385	37	55.0	MIME/JICA Study on going Back up necessary TL from That ?											
				2	Siem Reap	Banteay Srei	Khun Ream	Khun Ream	17030203																		
				3	Siem Reap	Banteay Srei	Khun Ream	Kampong	17030202																		
				4	Siem Reap	Banteay Srei	Khun Ream	Chksor	17030204																		
				5	Siem Reap	Banteay Srei	Knar Sanday	Toul Kralanh	17030106																		
				6	Siem Reap	Banteay Srei	Knar Sanday	Banteay Srei	17030101																		
				7	Siem Reap	Banteay Srei	Knar Sanday	Kakoy Chum	17030105																		
				8	Siem Reap	Banteay Srei	Knar Sanday	Knar	17030102																		
				9	Siem Reap	Banteay Srei	Knar Sanday	Prei	17030103																		
				10	Siem Reap	Banteay Srei	Knar Sanday	Sanday	17030104																		
				11	Siem Reap	Banteay Srei	Peak Dak	Ta Koh	17030305																		
				12	Siem Reap	Banteay Srei	Thong	Saib Khvav	17030604																		
				13	Siem Reap	Banteay Srei	Thong	Koten Thmey	17030605																		
				14	Siem Reap	Banteay Srei	Thong	Thong Lech	17030602																		
				15	Siem Reap	Banteay Srei	Thong	Thong Kaout	17030601																		
				16	Siem Reap	Banteay Srei	Thong	Vost	17030603																		
				17	Siem Reap	Banteay Srei	Rumchek	Roveng Ta Tum	17030403																		
				18	Siem Reap	Banteay Srei	Rumchek	Rumchek	17030401																		
22	8-6	MH1101-02	Prek Te	1	Mondul Kiri	Kaev Seima	Srae Chhok	Chorhka	11010302	494	1,101	881	115	0	27.0												
				2	Mondul Kiri	Kaev Seima	Chong Phlah	Poborum	11010202																		
				3	Mondul Kiri	Kaev Seima	Me Mang	Tourt	11010205																		
				4	Mondul Kiri	Kaev Seima	Me Mang	Pognov	11010202																		
				5	Mondul Kiri	Kaev Seima	Me Mang	Pongol	11010201																		
				6	Mondul Kiri	Kaev Seima	Me Mang	Pocha	11010203																		
				7	Mondul Kiri	Kaev Seima	Me Mang	Pokes	11010204																		
				8	Mondul Kiri	Kaev Seima	Chong Phlah	Potang	11010101																		
23	10-13	MH1608-01	Prek Liang	1	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Ta Ngech	16080207	768	1,014	811	105	0	42.0												
				2	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Ke Kiong	16080206																		
				3	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Phay	16080208																		
				4	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Phu Yang	16080205																		
				5	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Sieng Say	16080204																		
				6	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Kaoh Pong	16080203																		
				7	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Tumpoung Roeng Thum	16080201																		
				8	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Tumpoung Roeng Thum	16080209																		
				9	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Vieu Chan	16080210																		
				10	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Ta Veaseng	16080111																		
				11	Ratanak Kiri	Ta Veaseng	Ta Veaseng Kraom	Phlau Touch	16080110																		
24	6-22	MH0907-02	Prek Santung	1	Koh Kong	Thma Bang	Chi Phat	Chi Phat	9070601	82	491	393	51	0	12.0												
				2	Koh Kong	Thma Bang	Chi Phat	Sam Lot	9070604																		
				3	Koh Kong	Thma Bang	Thmor Doupovee	Kaoh	9070501																		
				25	8-18	HB1104-01	Prek Rwei	1	Mondul Kiri								Pech Chenda	Bu Chri	Phum puchichonghang	11040204	27	374	299	39	12	11.0	
								2	Mondul Kiri								Pech Chenda	Bu Chri	Phum putang	11040203							
								3	Mondul Kiri								Pech Chenda	Bu Chri	Phum puchayang	11040201							
								4	Mondul Kiri								Pech Chenda	Bu Chri	Phum bebay	11040202							
								26	13-1								MH1304-01	O Kdak Tributary	1	Preah Vihear							
2	Preah Vihear	Kulceen	Phnum Thaeog Pir							Chlak	13040501																
3	Preah Vihear	Kulceen	Phnum Thaeog Pir							Barbant	13040503																
27	5-6	MH0707-01	O Turou Trao							1	Kampong Speu	Kampong Speu	Meakprang	Mortpean	7070903	55			352	282							
								2	Kampong Speu	Kampong Speu	Meakprang	Bar Khel damrei	7070902														
28	11-19	MH1903-01	O Smang					1	Siem Reap	Siem Pang	Santepheap	Kirivongsa Leu	19030301	73	339	271	35	0	11.0								
								2	Siem Reap	Siem Pang	Santepheap	Kirivongsa Kraom	19030302														
				3	Siem Reap	Siem Pang	Sekong	Samma	19030204																		
29	7-6	HB1005-01	Stung Samieng	1	Kracheh	Snuol	Srae Char	Sr	10050406	9	294	235	31	22	0.6												
30	10-11	MH1006-01	O Ta Phlai	1	Ratanak Kiri	Ou Chum	Samakkhi	Pang	16060605	26	235	188	24	0	7.0												
				2	Ratanak Kiri	Ou Chum	Samakkhi	Prak	16060603																		
				3	Ratanak Kiri	Ou Chum	Samakkhi	Bu Nhek	16060604																		
31	9-19	MH1506-01	Xtong Cram	1	Pursat	Veal Veaseng	Ou Saom	Chhay Louk	15060103	24.7	203	162	21	0	9.0												
				2	Pursat	Veal Veaseng	Ou Saom	Kandal	15060102																		
				3	Pursat	Veal Veaseng	Ou Saom	Ou Saom	15060101																		
				4	Pursat	Veal Veaseng	Ou Saom	Kien Chongruik	15060104																		
32	9-18	HB1503-01	Preak Chhor	1	Pursat	Krakor	Chheu Tom	Khal Teabien	15030409	15	202	162	21	6	11.0												
33	10-5	MH1609-01	Prek Banpong	1	Ratanak Kiri	Veun Sai	Kaoh Pang	Lam av	16090502	42	159	127	17	0	15.0												
				2	Ratanak Kiri	Veun Sai	Kaoh Pang	Pa Tang	16090501																		
				3	Ratanak Kiri	Veun Sai	Kaoh Pang	Pa Hay	16090503																		
34	11-3	MH1902-02	O Lung	1	Siem Reap	Siem Boek	Tonsang	19020603	28	158	126	16	0	12.0													
				2	Siem Reap	Siem Boek	Siem Boek	Siem Boek								19020601											
35	6-28	MH0907-04	O Trampang Kholay	1	Koh Kong	Thma Bang	Pralay	Toap Khley	9070204	401	148	118	15	0	15.0												
				2	Koh Kong	Thma Bang	Pralay	Pralay	9070202																		
				3	Koh Kong	Thma Bang	Chummoab	Chrek Ruessas	9070202																		
				4	Koh Kong	Thma Bang	Chummoab	Chummoab	9070201																		
				5	Koh Kong	Thma Bang	Pralay	Sammoeng	9070203																		
36	11-2	MH1905-01	O Siembok	1	Siem Reap	Thala Barivat	Kang Cham	Doang	19050302	27	127	102	13	0	8.5												
				2	Siem Reap	Thala Barivat	Kang Cham	Kaas	19050301																		
37	7-8	HB1005-02	O Chrei Meing	1	Kracheh	Snuol	Pa Thru	Cheing Khle	10050201	25	114	91	12	0	0.5												
38	11-10	MH1902-01	O Chrolong	1	Siem Reap	Siem Boek	Ou Ruetsot Kandal	Ou Ruetsot Kandal	19020502	10.5	103	82	11	1	3.0												
39	10-4	MH1604-01	Ta Ang	1	Ratanak Kiri	Koum Mom	Ta Ang	Sek	16040304	12	98	78	10	0	1.5												
40	10-1	HB1604-01	O Kachang	1	Ratanak Kiri	Koum Mom	Sae Angkroeng	Phum Pir	16040202	32	98	78	10	0	1.0	Waterfall											
41	6-6	MH0902-01	Preak Khou Khav	1	Koh Kong	Kiri Sakor	Preak Khosch	Ta Kaev	9020302	15	97	78	10	0	8.0												
				2	Koh Kong	Kiri Sakor	Preak Khosch	Preak Khosch	9020201																		
42	6-25	MH0907-03	Chay Arong D/S	1	Koh Kong	Thma Bang	Chi Phat	Tuek Lak	9070602	15	96	77	10	0	1.0												
				2	Koh Kong	Thma Bang	Chi Phat	Tuek Lak	9070602																		
43	10-12	MH1601-01	O Pvol	1	Ratanak Kiri	Andoung Meas	Nhang	Ka Chut	16010301	11	91	73	9	0	1.3												
44	6-13	HB0907-01	Tatai U/S	1	Koh Kong	Thma Bang	Ta Tey Leu	Trapeang Khur	9070103	6	88	70	9	3	8.0												
				2	Koh Kong	Thma Bang	Ta Tey Leu	Kandal	9070102																		

Note: 1) Village data was quoted from SEILA Database 2003.

2) 21 Villages with the mark * * * are selected in electrification plan by micro hydro power as mentioned in Sub-section 1.4.1, Chapter 1, Part 2.

Source: JICA Study Team

2. RESULTS OF FIELD SURVEY OF MICRO HYDRO POWER STUDY

During the 1st field survey (November and December 2004) and 2nd field survey (January and February 2005), the Study Team conducted several site surveys with the following schedule. The location and schedule of field survey are shown in the **Figure AP-A.2.1**.

No. of Site Survey	Date	Province	Target Scheme	Study Team Member in charge
1st	Dec. 04, 2004	Kampong Speu	Sva Slab	Mr. K. Hirata (Small Hydro-1, JST) Mr. Nong Sareth (MIME)
2nd	Dec. 06 to 09, 2004	Kampot	Kaoh Touch Koun Sat Irrigation Dam Srat Cheng Merek Irrigation Dam	-ditto-
3rd	Jan. 04 to 10, 2005	Battambang	O Samrel Ta Taok O Chum Kampong Lpov O Daem Chek Stung Kronnung Stung Muong Prek Chik Ba Sak Kamping Puoy Irrigation Dam (Exsisting)	Mr. K. Hirata (Small Hydro-1, JST) Mr. N. Hashimoto (JICA Expert) Mr. Nong Sareth (MIME)
4th	Jan 17 to 28, 2005	Kratie,	O Dambal O Chrei Meing Prek Prey	Mr. K. Hirata (Small Hydro-1, JST) Mr. T. Okamura (Small Hydro-2, JST) Mr. R. Ohno (Environment, JST) Mr. N. Kawato (Small Hydro, JST) Mr. N. Hashimoto (JICA Expert) Mr. Chan Socheat (MIME) Mr. Nong Sareth (MIME) Mr. Suon Ponnarith (MIME)
		Stung Treng	O Pou Mong O Chrolong O Chap O Chrop O Baign Kla	
		Ratanak Kiri	O Chum I O Chum II P/S (Exising) O Kachang O Katieng O Katieng Downstream Bay Srok O Pyol Ta Ang	
		Mondul Kiri	O Dak Dam O Phlai Bu Sra	
5th	Feb. 04 to 06, 2005	Battambang	Stung Sangke Downstream Stung Sangke Upstream	Mr. T. Okamura (Small Hydro-2, JST) Mr. N. Kawato (Small Hydro, JST) Mr. Suon Ponnarith (MIME)
6th	Feb. 10 to 15, 2005	Koh Kong	Stung Tatai Downstream Stung Tatai Upstream Stung Chhay Areng	Mr. T. Okamura (Small Hydro-2, JST) Mr. Nong Sareth (MIME) Mr. Kimnhan Chan Amrin (MIME)

(JST: JICA Study Team)

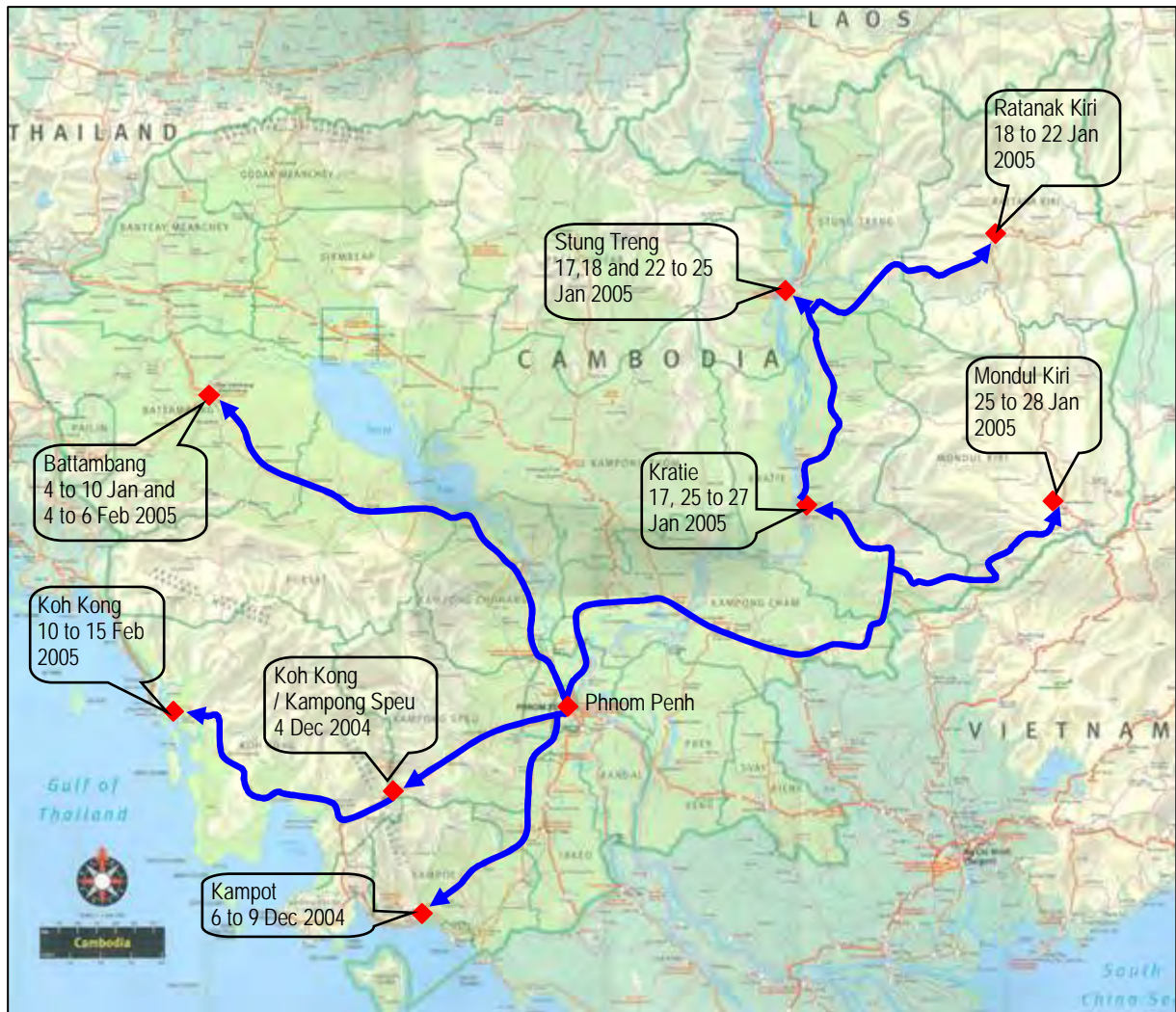


Figure AP-A.2.1 Location and Schedule of Micro Hydro Field Survey (Dec 2004 – Feb 2005)

Detailed description of site survey in each province is given as follows:

(1) KAMPONG SPEU PROVINCE

a) General

In Kampong Speu Province, there is an existing hydro power namely Kirirom I power station (11 MW). The Kirirom I scheme was developed as an Independent Power Producer (IPP) in 2002 and supplies electricity mainly to Phnom Penh. There is a substation in Kampong Speu town on the way from Kirirom I to Phnom Penh transmission line. From this substation only 0.5 MW is supplied to Kampong Speu Town. Some of micro/mini hydro power schemes were studied by Meritec financed by World Bank (WB)¹ in 2002. Stung Sva Slab hydro power project (3.8 MW) was selected and evaluated as a pre-investment level.

b) Involvement of DIME

On December 04, 2004, after arrival at Kampong Speu town, the Study Team visited DIME Kampong Speu for a meeting with DIME staff. A staff of DIME, a chief Kampong Speu provincial police and some other people from village joined the field survey on micro hydro potential sites.

c) Site Survey

1) Stung Sva Slab (date of survey: December 04, 2004)

According to the WB/Meritec Study (2002), the installed capacity of this scheme was designed to be 3.8MW. This scheme was developed aiming at supplying electricity to the grid for Phnom Penh during the rainy season. By using the current meter, Meritec Study measured the discharge on 21 April 2001 at 0.2 m³/s. The gross head of Meritec proposed site was measured by GPS and altimeter to be 60m.

Maeda Corporation themselves conducted the detailed topographic profile survey from intake site to powerhouse site at Stung Sva Slab River. As a result of survey, the total head of 85 m was found to be possible to develop.

On our field survey, the discharge measurement was conducted near the intake site proposed by Meritec. The observed discharge was 0.096m³/s (C.A. = 205km²). In Cambodia the discharge in the rainy season is more than 10 times of that in the dry season. It is said that the flow in the rainy season reaches top of the river section (W=30m, WL=2m) at the proposed intake site.

There are some villages of Being, Chambak, Traeng Trayueng, which are the demand centers of electricity. Each village has BCS with small diesel generator and most of households seem to have batteries. Many antennas could be seen in houses that have monochrome TVs.

¹ "Development of Pipeline of Small Hydropower Projects in Cambodia", Final Pre-Investment Study Report, World Bank, Meritec, May 2002.



2) Existing Peam Pul Irrigation Dam (date of survey: December 04, 2004)

After the survey of Stung Sva Slab scheme, the Study Team visited existing Peam Pul Dam constructed during Pol Pot regime. As there had been almost no maintenance works, the ground still downstream of the dam and the gate board became deteriorated, and rehabilitation is necessary. There was no equipment like winch for gate operation. The leakage was observed from the sluice gate board. The rehabilitation is scheduled to start in 2005 by MOWRAM and Army.

The reservoir water level was quite low because of the dry season. Due to little storage in the dry season, there was no flow release from the dam. Therefore, micro hydro potential using the dam is not likely, as the head is only for the height of the dam.



(2) KAMPOT PROVINCE

a) General

Up to present, power generation in Kampot town is by private power company Wanhe Limited. Total installed capacity of diesel generators of this private power station is around 1.5 MW. Wanhe Limited sells electricity wholesale to EDC (Kampot) whom then distribute and sell the electricity to the residential, commercial, industrial and public sectors. It is scheduled to be upgraded of distribution systems and new generation facilities (total 4 MW) in 2005 provided under the “Update of Power Rehabilitation II Project” and “8 Provincial Power Supply Project” by Asian Development Bank (ADB). There are also plans to construct the Kamchay hydroelectric power project (120/180 MW) on the Prek Tuuk Chhu river in Kampot. The Kamchay HEP project will start in 2005 as an

IPP project by Chinese company and the construction will be completed in 2009.

b) Involvement of DIME



On December 06, 2004, after arrival at Kampot town, the Study Team visited DIME Kampot for a meeting with director of DIME and other staffs. Mr. Korl Sokha, chief energy office of DIME Kampot, district officers and village people joined the field survey on micro hydro potential sites.

c) Site Survey

1) Prek Kaoh Touch (date of survey: December 06, 2004)

This scheme was identified by MIME and NEDO studies. A run-of-river type power station was proposed to use the head of the river flowing through the Damrei Mountains, which is located 10 km to the west of Kampot city. The net head is at about 60m with catchment area of 21.65 km². Access to the site is located left bank of Prek Kaoh Touch River from Kirou Dabpir village along the national road No.3.

On December 6, 2005, there is no flow near the proposed power house site in the Prek Kaoh Touch River. The riverbed was dried up but with large boulders. Longitudinal riverbed slope is steep and the flood flow is supposed to be large according to the flood mark. Hence there is no hydropower potential in dry season and it is difficult to protect from flood water. It is also necessary to examine the development scale of this hydropower potential because there is a possibility for this hydro to connect to the grid in the future.

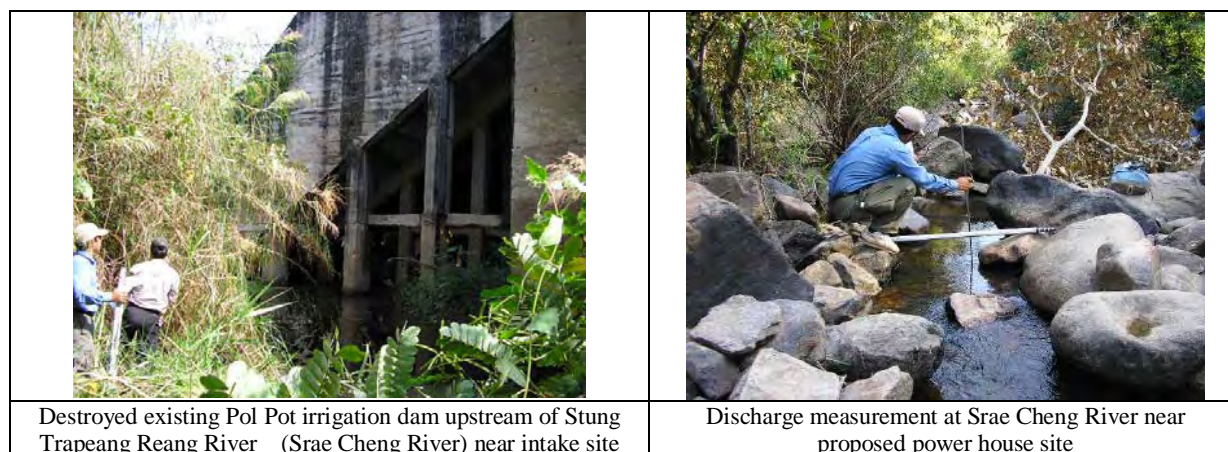
	
<p>Perk Kaoh Touch River near river mouth (effected section of back water from sea)</p>	<p>Riverbed of Prek Kaoh Touch River in the dry season (no surface water observed)</p>

2) Srae Cheng (date of survey: December 07, 2004)

This scheme was studied by Meritec (2003)². The proposed site of Srae Cheng community hydroelectric power is located in Chum Kiri district of Kampot province. The villages to be electrified by the proposed project are; Srae Cheng, Khnop Run, Pong Tuek, Kamnab and Prey Khley villages in Chum Kiri district. The proposed site of this project is located on the Stung Trapeang Reang River (Srae Cheng River) in Chumkiri district and is about 90km northeast of Kampot town. Summary of the proposed scheme by Meritec is as follows;

Catchment Area	Gross Head	Power Flow	Installed Capacity	Annual Energy Production	Load Factor	Water Way Length	Penstock Length	Electrified Household
48.0 km ²	45m	0.45 m ³ /s	126 kW (65kW x 2)	330 GWh/yr	41%	500m (pipeline)	80m	1,487 (2002)

There is an existing vehicular access road to the (lower) Stung Pei irrigation dam (to be rehabilitated) and is about 5km from the intake. From the lower Stung Pei irrigation dam there are several access tracks/roads to the intake site. These access tracks/roads are in poor condition.



There is also an existing irrigation dam named (upper) Stung Dong Pei irrigation dam at near proposed intake site in the upstream of Stung Trapeang Reang River (Srae Cheng River) that was constructed and also destroyed in Pol Pot regime (1977). The maximum height of dam (concrete & fill-dam) is around 10m and width is around 50m. At present, the dam was not in use without any rehabilitation.

The discharge measurement was conducted at near the proposed power house site by the JICA Study Team on December 7, 2004. Observed discharge was 0.017 m³/sec. This discharge is only 3.7% of proposed design power flow (0.45 m³/sec) by Meritec study. Gross head measured by JICA Study Team by using altimeter is around 55m. The primary MV transmission line is required about 7.3km long. Land mine clearance is necessary for detail survey in this area.

3) Koun Sat (Kaum Stav) Existing Irrigation Dam (date of survey: December 6 and 9, 2004)

Existing irrigation reservoir named Koun Sat (Kaum Stav) dam is located 13 km to the east of the Kampot town. Earth-fill and concrete combined dam constructed in 1977 was provided with two sites of concrete dams with 4 gates each to discharge irrigation water. The reservoir was used to

² Pre-Investment Study of Community-Scale Hydro Projects, Cambodia”, NZ Ministry of Foreign Affairs & Trade, Meritec, June 2003.

supply water for a few thousands ha of irrigation area at the construction. However, the area has been reduced to around 10 ha. Release water for irrigation in rainy season would be available for power generation.

During our visit on December 6th and 9th, 2005, there was no release water from the gates (only seepage from slice gate plates of about less than $0.1\text{m}^3/\text{sec}$). The power generation would be reduced because the power generation depends on the irrigation discharge that will be limited in the dry season. Therefore, the study on the irrigation water rights will be essential.



4) O Trou Trau (date of survey: December 08, 2004)

This scheme was proposed by WB/Meritec study (2002)³ to supply power for the grid of Kampot town. The project is located on the O Turou Trao stream, a tributary of the Prek Tuuk Chhu (Kamchay) River, which flows off the eastern side of the Bokor Plateau. The proposed powerhouse site is approximately 11.2km northwest from Kampot town. The gorge along the tributary located on the right bank of the Prek Tuuk Chhu (Kamchay) River will be used for development of a mini hydropower scheme. Catchment area is 20km^2 , head 130m, installed capacity about 1,100 kW. There is an existing perennial access road as close as 300m to the proposed powerhouse site. The existing access road was built in the 1960's and begins at the Kamchay pump-house, which supplies potable water to Kampot town.

Kampot town have been electrified with diesel generators. The power distribution area should be determined based on the power demand forecast of adjacent villages. It may be considered that this

³ "Development of Pipeline of Small Hydropower Projects in Cambodia", Final Pre-Investment Study Report, World Bank, Meritec, May 2002.

small hydropower project be developed as alternative to the diesel by increasing the installed capacity.

There is a plan to construct the Kamchay hydroelectric power project (180 MW) on the Prek Tuuk Chhu river in Kampot.

The Study Team conducted field investigation on December 8, 2004. The observed discharge near proposed intake site was 0.052 m³/sec and measured head by using hand-level was 154.3m.

<p>Topographic survey by using hand-level (near proposed intake site)</p>	<p>Discharge measurement at O Turou Trao River near proposed intake site</p>

(3) BATTAMBANG PROVINCE

a) General

Site survey in Battambang Province was conducted for two times in January and February 2005. There are still many mines remaining in Battambang Province, therefore, the Study Team obtained mine map from CMAC (Cambodia Mine Action Center) and examined it prior to the site survey.

b) Involvement of DIME

For both site survey in January and in February, Mr. Ros Visith of DIME Battambang assisted the site survey works. For safety, the Study Team decided to take security guard from Ratanak Mondul Town for site survey works.

c) Site Survey





1) O Samrel (Ou Tek Souk River) (date of survey: January 05, 2005)

This scheme was proposed by Meritec study (2003). The proposed site is located in Samlot district of Battambang province. The village to be electrified by the proposed project is Ou Khroch village (old name O Samrel village) of Ta Taok commune, Samlot district. The proposed site of this project is located on the Ou Tek Souk (O Samrel) River. Summary of the proposed scheme by Meritec is as follows;

Catchment Area	Gross Head	Power Flow	Installed Capacity	Annual Energy Production	Load Factor	Water Way Length	Penstock Length	Electrified Household
12 km ²	30m	0.18 m ³ /s	32 kW (2 x 16kW)	75 GWh/yr	37%	600m (pipeline)	80m	153 (2002)

In 2004, number of household in O Kroch village is 121 families (decreasing). There is an existing vehicular road for an access to Ou Khroch (O Samrel) village from Samlot district centre; it is required to cross the Stung Kranhung river on the way. In the rainy season the village is isolated as there is

currently no bridge crossing the Stung Kranhung river to Ou Khroch village. From Ou Khroch village there is an existing track to proposed power house site, approximately 3 km long. A new road/track, approximately 600-800 m long, to the intake would be required from the power house site. The new access road would require land-mine clearance by CMAC as the Samlot area is heavily mined. The Team conducted field investigation on January 05, 2005. The observed discharge near proposed intake site (just d/s of water fall) was 0.036 m³/sec and measured head by using hand-level was 28m.

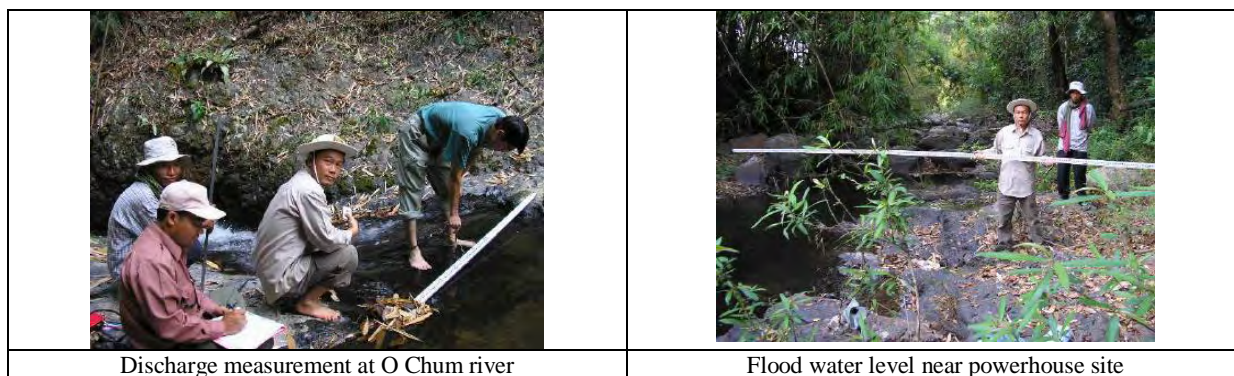
	
<p>Interview to villagers at O Kroch village (nearest village to O Samrel scheme)</p>	<p>Ou Tek Souk (O Samrel) river near powerhouse site (looking upstream)</p>
	
<p>O Samrel waterfall</p>	<p>Discharge measurement at downstream of O Samrel water fall</p>

2) Ta Taok (O Chum/O Thmar Kandor River) (date of survey: January 06, 2005)

This scheme was also proposed by Meritec study (2003). The villages to be electrified by the proposed project are Peam Ta, Ta Touk, Peam, Ou Nonoung, Veal Roleum, O Tre Ang and Ou Ta Tea villages within Ta Taok commune, Samlot district of Battambang province. Summary of the proposed scheme by Meritec is as follows;

Catchment Area	Gross Head	Power Flow	Installed Capacity	Annual Energy Production	Load Factor	Water Way Length	Penstock Length	Electrified Household
14 km ²	60 m	0.10 m ³ /s	38 kW (2 x 20 kW)	91.8 GWh/yr	40%	400m (pipeline)	100m	318 (2002)

There is an existing vehicular road to Veal Roling village in Ta Taok commune from Samlot district centre. There is a cable stayed boat across the Stung Kranhung river (“Battambang river”). A new road to the power house site would be required starting 1 km from this across site. The new access road would require land-mine clearance by CMAC as the Samlot area is heavily mined. The Study Team conducted field investigation on January 6, 2005. The observed discharge at near proposed intake site (at top of water fall) was 0.06 m³/sec and measured head by using hand-level was 71.4m.

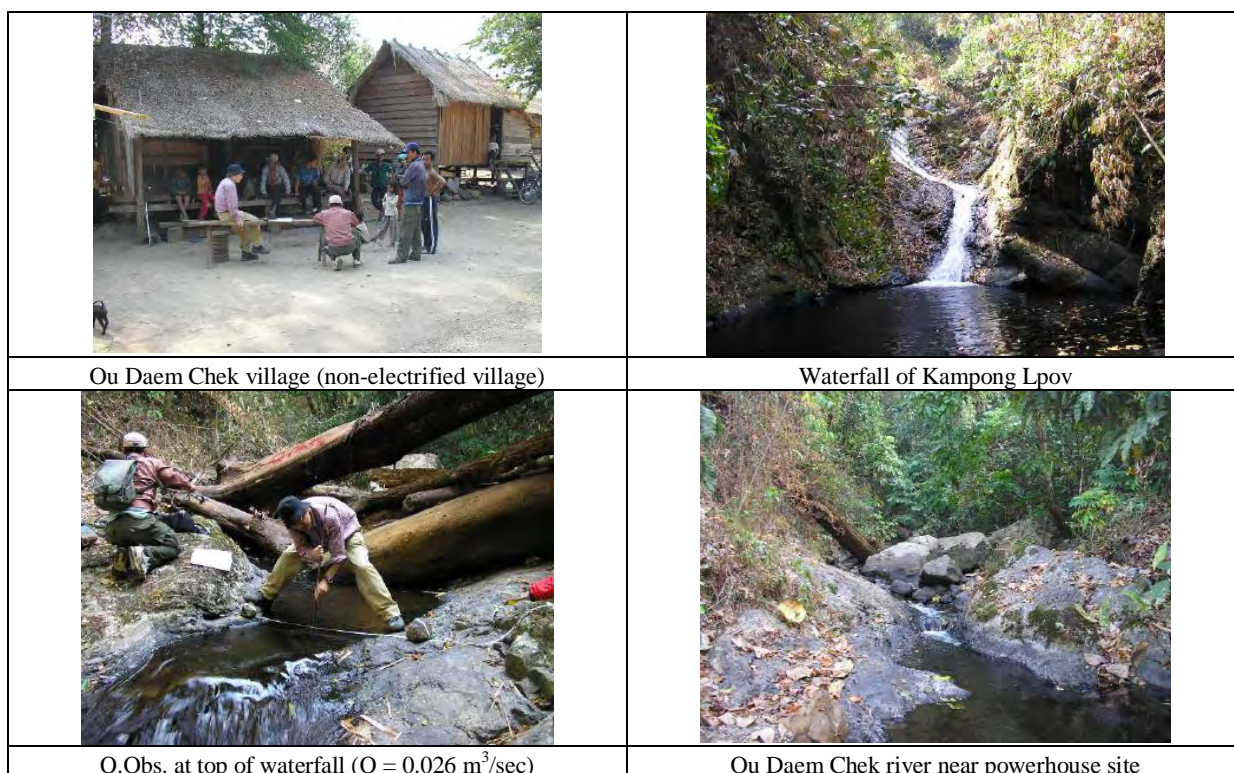


3) Kampong Lpov (Ou Daem Chek River) (date of survey: January 07, 2005)

This scheme was also proposed by Meritec study (2003). The villages to be electrified by the proposed project are Ou Dam Chek, Kampong Lpov, Svay Chrum/Chamlang Romonea villages within Kampong Lpov commune, Samlot district. There is an existing vehicular road to Ou Dam Chek village. From Ou Dam Chek village there is an existing logging track to the proposed power house site, approximately 2 km long. Summary of the proposed scheme by Meritec is as follows;

Catchment Area	Gross Head	Power Flow	Installed Capacity	Annual Energy Production	Load Factor	Water Way Length	Penstock Length	Electrified Household
8 km ²	50 m	0.10 m ³ /s	32 kW (2 x 16 kW)	69.5 GWh/yr	34%	700m (pipeline)	100m	323 (2002)

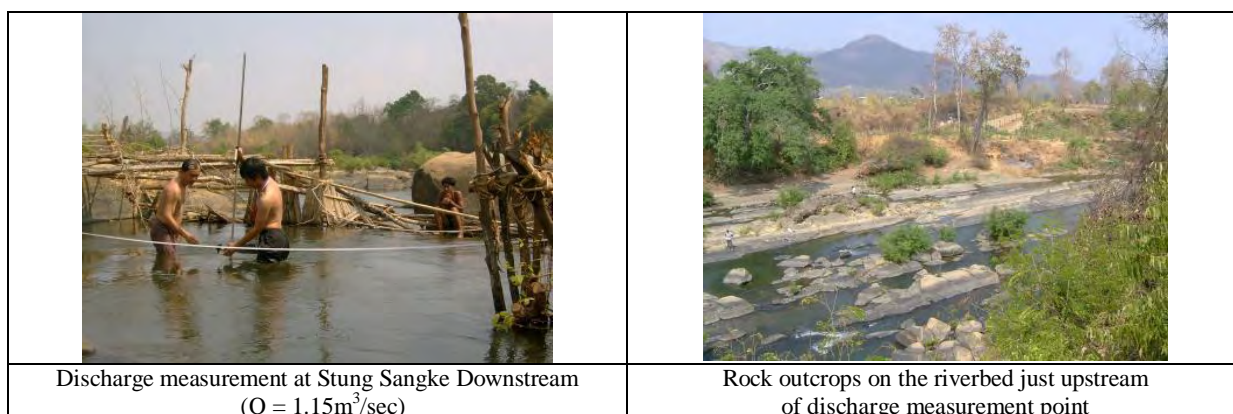
The Study Team conducted field investigation on January 7, 2005. The observed discharge at near proposed intake site (approx 50m upstream from top of water fall) was 0.026 m³/sec and measured head by using hand-level was 78.7m from proposed intake site to power house site. The head part of which is developed over 2 cascading waterfall each between 5 and 10m high over a distance of 300 m.



4) Stung Sangke Downstream (date of survey: February 05, 2005)

In Ratanak Mondul (about one hour from center of Battambang Town), the Study Team was assisted by a military police to go to Stung Sangke River. According to CMAC mine map, the potential area was indicated as a dangerous zone for mines. Due to such danger of mines, leveling survey was not conducted. Instead, height check was done by distance meter and clinometer in one point. Height between measured ground height and water surface was 9.6m (near the in a photograph below).

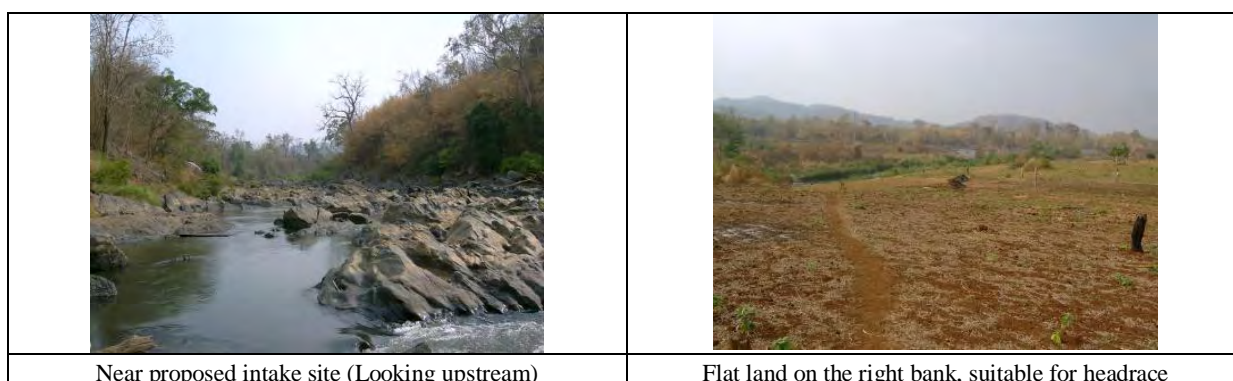
Discharge measurement was made where river flow concentrates in one location of about 6 m width as shown photograph below. Discharge was measured as 1.15 m³/sec, which is a significant amount for the dry season. In this scheme on the right bank, a very flat land continues about 1 km from an intake site to powerhouse site, which will provide a good route for headrace channel and head tank.



By assuming a head at 9.6m between the intake and the powerhouse sites, about 120 kW of power output could be expected even in the dry season. There is Dan Tong Bridge on Sangke River near Dan Tong Village. On this bridge a water level gauge was installed by a Korean company for development. But it seemed that measurement was not done due to project cancellation.

5) Stung Sangke Upstream (date of survey: February 05, 2005)

Taking the road from Dan Tong Bridge southward then westward, about one hour, the Study Team reached Stung Sangke upstream site. Due to limit of time and as there are not adequate site, discharge measurement was not made. From proposed intake site a flat farm land continues for about 2 km, which can be the route for a headrace channel.



(4) KRATIE PROVINCE

a) General

As a result of map study, it was realized that Kratie Province had less potential of micro hydro because of rather flat geography. In fact it was difficult to find potential site that had more than 10 m head in this province. Potential sites could only be found on the rivers that has a large area of catchment.

b) Involvement of DIME

On January 17, 2005, the Study Team stopped at Kratie DIME office to get information on potential sites in the Province. Discussions were made to get information on potential sites. On January 25, 2005, the Study Team visited DIME office again to organize site surveys for potential sites.



After the meeting the Study Team, MIME and DIME jointly conducted site survey on January 26 and 27. Mr. Iv Samith (Director of DIME) and his staff Mr. Heng Vantholien assisted the site survey works.

c) Site Survey

1) O Dambal (date of survey: January 26, 2005)



This site was proposed by DIME Kratie and local community (Phum Kroch, Prolay Tiek villages., Domorey commune, Chhrong District). Proposed site is located on O Dambal River approx 30km southeast from Kratie town. Number of household and population of Domorey commune is 872 families and 4,068 people, respectively. Proposed intake site on O Dambal River is approx 20m downstream from confluence point of Prek Kroch (main stream) and Prek Chor (tributary). The catchment area is 155km² according to the 1/100,000 topographic map. On January 26, 2005. there was no water in Prek Chor near the confluence point.

The Study Team conducted field investigation on January 26, 2005. The observed discharge near proposed intake site on O Dambal River, which approximately 20-30 m downstream from confluence point of Prek Kroch (main stream) and Prek Chor (tributary), was 0.050 m³/sec. Measured head by using hand-level was 3.6m from proposed intake site to wooden bridge site at Prolay Tiek village. The slope of river bed is gentle and there is a possibility of back-water effect from flood water of downstream Prek Chhlong River. River cross section near the proposed intake site in O Dambal River approximately 30 km is 10 m width and 2.5 m depth from river side ground. It is low potential for micro hydro power development at this site due to small discharge and gentle slope.

	
<p>Discharge measurement ($Q = 0.05 \text{ m}^3/\text{sec}$)</p>	<p>Leveling by DIME staff along waterway route</p>



2) O Chrei Meing (date of survey: January 27, 2005)

As seen in the photographs below, there is about 5 m difference of water level between the dry season and rainy season. Rainy season water mark can be seen on the pier of the bridge. Further, flood water mark can be seen 4 to 5 m above rainy season water mark.

	
<p>O Chrei Meing river under the bridge. Flood water mark can be seen on the pier of the bridge.</p>	<p>Discharge measurement at O Chrei Meing ($Q = 0.72 \text{ m}^3/\text{sec}$)</p>

3) Prek Prey (date of survey: January 27, 2005)

As seen in the photographs below, Prek Prey River has very little to almost zero discharge in the dry season. Due to shallow water level, discharge measurement was only possible by observing surface velocity using a leaf.

	
<p>Prek Prey River under the bridge of main road</p>	<p>River water was stagnant and the discharge was almost zero ($Q = 0.007 \text{ m}^3/\text{sec}$).</p>