Cambodia • Lao PDR • Thailand • Viet Nam
For sustainable development

Council Study

Work Plan: Formulation of Development Scenarios for the Hydropower Thematic Area

5th RTWG Meeting
Siem Reap, Cambodia
13-14 August 2015

Three main development scenarios approved during 3rd RTWG Meeting

Scen #	Name	Level of Development*					
		ALU	DIW	FPF	HPP	IRR	NAV
1	Early Development Scenario 2007	2007	2007	2007	2007	2007	2007
2	Definite Future Scenario 2020	2020	2020	2020	2020	2020	2020
3	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040

Note:
*Levels of developments for the various thematic areas: ALU = Agric/Landuse Change; DIW = Domestic and Industrial Water Use; FPF = flood protection/floodplain infrastructure; HPP = hydropower; IRR = irrigation; and NAV = Navigation

Three thematic sub-scenarios

- The thematic sub-scenarios are based on 2040 Planned Development Scenario incorporating **plausible deviations** in the 2040 planned level of development for the thematic area of interest.
- A plausible deviation is the result of external factors such as changes in national priorities, policies, budgets, technologies, etc

HPP Thematic Sub-scenarios

- **Subset of Planned mainstream HPs implemented (HPS1):** No Joint Operation with minimal coordination) where each hydropower dam will be operated to maximize their individual energy production
- **Reservoir Operation Alternative 1 (HPS2):** With Joint Operation and good coordination among all MS Dams taking account operation for navigation lock, fish passages, sediment flushing as well as measure to maintain acceptable water quality during and after sediment flushing.
- **Reservoir Operation Alternative 2 (HPS3):** With Joint Operation and good coordination among all MS Dams to strengthen flood management and flood protection measures throughout the Lower Mekong Basin as well as to maximize navigability from the Delta areas to the far possible upstream reaches

Subset of Planned mainstream HPs implemented (HPS1):

No Joint Operation with minimal coordination:

- All dams operate on "an independent basis"
- Each hydropower dam will look to maximize their individual energy production

1. Assuming that only Sesan 2 HPP built in Cambodia
2. Some 6 - 8 Mainstream Dams which mainly are in the Lao PDR,
3. About some 80% of Tributary hydropower dams built in Lao PDR;
4. All the 6 Chinese dams should be included in this scenario.

In million US

HPS2 (JO): Reservoir Operation Alternative 1

- With Joint Operation and Coordination and good coordination among all MS Dams
- Take into account detail operation for navigation lock, fish passages, sediment flushing
- as well as measure to maintain acceptable water quality during and after sediment flushing.

1. Assuming that only Sesan 2 HPP built in Cambodia
2. Some 6 - 8 Mainstream Dams which mainly are in the Lao PDR,
3. About some 80% of Tributary hydropower dams built in Lao PDR;
4. All the 6 Chinese dams should be included in this scenario.

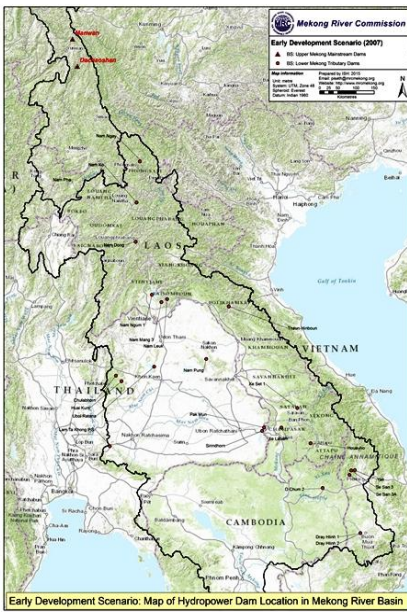
HPS3 (JO): Reservoir Operation Alternative 2

- With Joint Operation and good coordination among all MS Dams
- to strengthen flood management and flood protection measures throughout the Lower Mekong Basin
- as well as to maximize navigability from the Delta areas to the far possible upstream reaches

1. Assuming that only Sesan 2 HPP built in Cambodia
2. Some 6 - 8 Mainstream Dams which mainly are in the Lao PDR,
3. About some 80% of Tributary hydropower dams built in Lao PDR;
4. All the 6 Chinese dams should be included in this scenario.

Early Development Scenario 2007

No.	CODE	Project Name	COD @ 2013	Status @ 2013	Installed Capacity	Annual Energy	Live Storage	Gross Storage
	Lao PDR							
1	L002	Nam Dong	1970	E	1	4.8	0.015	0
2	L003	Xelabam	1970	E	5	25	0.8	0.8
3	L001	Nam Ngum 1	1971	E	155	1025	4700	7003.99
4	L004	Xeset 1	1990	E	45	180	0.3	2.33
5	L009	Nam Ko	1996	E	1.5	5	0.0045	0
6	L005	Theun-Hinboun	1998	E	210	1356	15	29.94
7	L006	Houaytho	1999	E	152.1	450	527	674.1
8	L007	Nam Leuk	2000	E	60	215	228.2	345.36
9	L010	Nam Ngay	2002	E	1.2	3	0.674	0.7
10	L008	Nam Mang 3	2004	E	40	138	45	140.73
	Cambodia							
11	C001	O Chum 2	1992	E	1	3	0.12	
	Viet Nam							
12	V014	Dray Hinh 1	1990	E	12	100	1.5	2.9
13	V003	Yali	1998	E	720	3868.392	779.02	1037.1
14	V004	Se San 3	2006	E	260	1325.354	3.8	92
15	V005	Se San 3A	2007	E	96	479.3	4	80.6
16	V011	Dray Hinh 2	2007	E	16	94	1.5	2.9
	Thailand							
17	T003	Nam Pung	1965	E	6.3	17	156.8	170
18	T006	Ubol Ratana	1966	E	25.2	56	1695	2250
19	T005	Sirindhorn	1971	E	36	90	1135	1970
20	T001	Chulabhorn	1972	E	40	59	144.5	180
21	T002	Huai Kum	1982	E	1.18	2	20	20
22	T004	Pak Mun	1994	E	136	280	125	225
23	T007	Lam Ta Khong PS	2001	E	500	400	299.6	319.9
		Total			**2,520.48**	**10,175.85**	**9,882.83**	**14,548.35**



Early Development Scenario: Map of Hydropower Dam Location in Mekong River Basin

Dams in China to include in the EDS scenario:

1. Manwan Dam
2. Dachaoshan Dam

Cambodia	Lao PDR	Thailand	Viet Nam
Lower Se San 2	Xeset 2		Plei Krong
	Nam Theun 2		Buon Tua Srah
	Nam Lik 1-2		Buon Kuop
	Nam Ngum 2		Se San 4
	Nam Nhone		Sre Pok 3
	Nam Ngum 5		Sre Pok 4
	Xekaman 3		Se San 4A
	Theun-Hinboun expansion		Sre Pok 4A
	Theun-Hinboun exp. (NG8)		Upper Kontum
	Nam Long		
	Xenamnoy 1		
	Tad Salen		
	Nam Song		
	Nam Sana		
	Xekaman 1		
	Xekaman-Sanxay		
	Nam Lik 1		
	Nam Khan 2		
	Houay Lamphan Gnai		
	Nam Ngiep 2		
	Nam Hinboun		
	Xekatam		
	Nam San 3		
	Nam Beng		
	Nam Mang 1		
	Nam Ou 2		
	Nam Ou 5		
	Nam Ou 6		
	Nam Suang 1		
	Nam Suang 2		
	Nam Kong 2		
	Nam Ngum 3		
	Nam Theun1		
	Nam Ngiep 1		
	Nam Ngiep-regulating dam		
	Xepian-Xenamnoy		
	Xayaburi (L)		
400	7304.6	0	1503

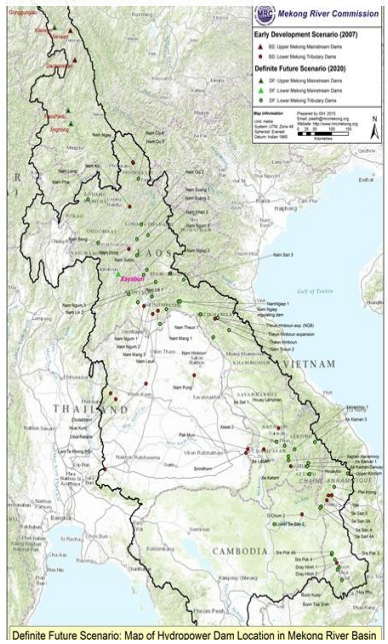
Definite Future Scenario 2020

M/S Dam:

1. Xayaburi Dam

Chinese Dams:

1. Manwan Dam
2. Dachaoshan Dam
3. Jinghong Dam
4. Xiaowan Dam
5. Nuozhadu Dam
6. Gongouqiao Dam



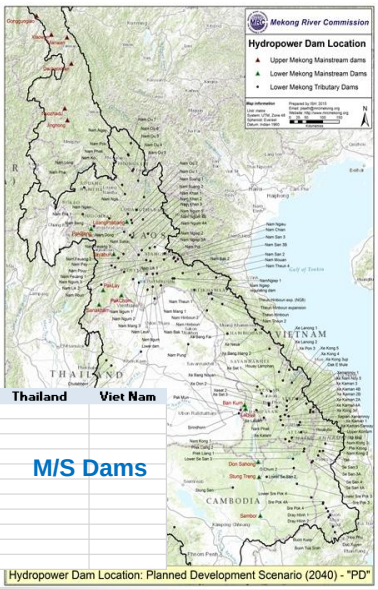
Definite Future Scenario: Map of Hydropower Dam Location in Mekong River Basin

Cambodia	Lao PDR	Thailand	Viet Nam
Battambang 1	Xe Nam Noy 5		Duc Xuyen
Battambang 2	Nam Chian		
Stung Pursat 1	Nam Pot		
Pursat 2	Nam Phak		
Lower Se San 3	Nam Hinboun 1		
Prek Liang 1	Nam Hinboun 2		
Prek Liang 2	Xe Pon 3		
Lower Sre Pok 3A	Xedon 2		
Lower Sre Pok 4	Nam Tha 1		
Stung Sen	Xekong 4		
Sekong	Nam Kong 1		
Lower Se San 1	Xe Kong 3up		
Lower Sre Pok 3B	Xe Kong 3d		
Lower Prek Chhlaung	Xe Kong 5		
Upper Prek Chhlaung	Nam Ou 1		
Prek Por	Nam Ou 3		
Prek Ter	Nam Ou 4		
	Nam Ou 7		
	Nam Nga		
	Nam Feuang 1		
	Nam Feuang 2		
	Nam Feuang 3		
	Xe Kaman 2A		
	Xe Kaman 2B		
	Xe Kaman 4A		
	Xe Kaman 4B		
	Dak E Mule		
	Nam Khan 1		
	Nam Khan 3		
	Nam Ngum 4A		
	Nam Ngum 4B		
	Nam Ngum, (down) Lower dam		
	Nam Pay		
	Nam Pouy		
	Nam Poun		
	Nam Ngao		
	Nam Ngieu		
	Nam San 3B		
	Nam San 2		
	Nam Pok		
	Xe Bang Fai		
	Xe Neua		
	Nam Theun 4		
	Nam Mouan		
	Xe Bang Hieng 2		
	Xe Set 3		
	Xe Bang Nouan		
	Xe Lanong 1		
	Xe Lanong 2		
	Nam Phak (Houykatam)		
	Xeru		
	Houay Champi		
	Nam Bak 1		
	Nam Bak 2		
	Nam Ham		
	Nam Leng		
	Nam Ngiep (Mouang Mai)		
	Nam Phouan		
	Sekong Downstream		
	Xebangfaeng 1		
	Nam Ang Tha Beng		
	Xepian-Houaysoy		
	Nam Kong 3		
	Nam Pha		
1267	4935	0	58

Planned Development Scenario 2040

Chinese dams

1. Manwan
2. DachaoshanDam
3. Jinghong
4. Xiaowan
5. Nuozhadu
6. Gongouqiao



Hydropower Dam Location: Planned Development Scenario (2040) - "PD"

Cambodia	Lao PDR	Thailand	Viet Nam
Sambor (Cam)	Don Sahong (L)		
Stung Treng (Cam)	Pakbeng (L)		
3500	Luangprabang (L)		
	Paklay (L)		
	Sanakham (L-T)		
	Sangthong-Pakchom (L-T)		
	Ban Kum (L)		
	Latsua (Phou Ngoy) (L)		
	Thakho (L)		
	8302		

M/S Dams

Planned Chinese dams in the lower reaches of Lancang river

No	Name	Installed Capacity (MW)	Annual Energy (GWh)	Total Storage (Million m3)	Active Storage (Million m3)	Dam Height m	Status Year 2012	Start construction	Commission
1	Gongguoqiao	750	3,940	510	120	130	Operation	2,008	2011
2	Xiaowan	4,200	18,890	15,043	10,382	292	Operation	2002	2010
3	Manwan	1,500	7,600	920	257	132	Operation	1986	1996
4	Dachaoshan	1,350	6,710	940	467	111	Operation	1996	2003
5	Nuazhadu	5,850	23,900	23,703	21,749	261.5	Impounding	Under-Construction	2016
6	Jinghong	1,750	7,620	1,233	249	108	Operation	2003	2010
7	Ganlanba	150	780	N/A	N/A	N/A	Planned	Planned	
8	Mengsong	600	2,890	N/A	N/A	N/A	Cancelled		Cancelled

Planned Chinese dams in the far upper reaches of Lancang river

DAM NAME	INSTALLED CAPACITY (MW)	DAM HEIGHT (M)	STATUS
Gushui	2600	220	Under site preparation
Wunonglong	990	136.5	Under construction
Lidi	420	74	Under construction
Tuoba	1400	158	Under site preparation
Huangdeng	1900	202	Under construction
Dahuaqiao	900	106	Under site preparation
Miaowei	1400	139.8	Under construction

Schedule

Task	Dates
Draft Work Plan for the Formulation of Development Scenarios	Completed
Progress Update – 5th RTWG Meeting	13-14 August 2015
Technical Work Sessions – Development of Operational Rule Curves and Data Review	??
National Consultations (combined with all other Thematic Teams)	September – October 2015 (Tentative)
Draft Final Data for the Development Scenarios and Report (Data and Map Specification Document)	October – November 2015 (Tentative)
Approval of Scenarios and Data 6th RTWG Meeting	October – November 2015 (Tentative)

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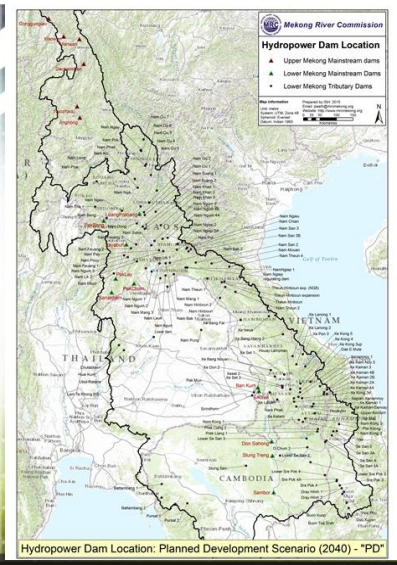

Hydropower Dam Location: Planned Development Scenario (2040) - "PD"

Thank you