

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



Council Study

Development Scenarios under the Navigation Thematic Area

6th RTWG Meeting
Phnom Penh, Cambodia
17 December 2015

www.mrcmekong.org

Contents

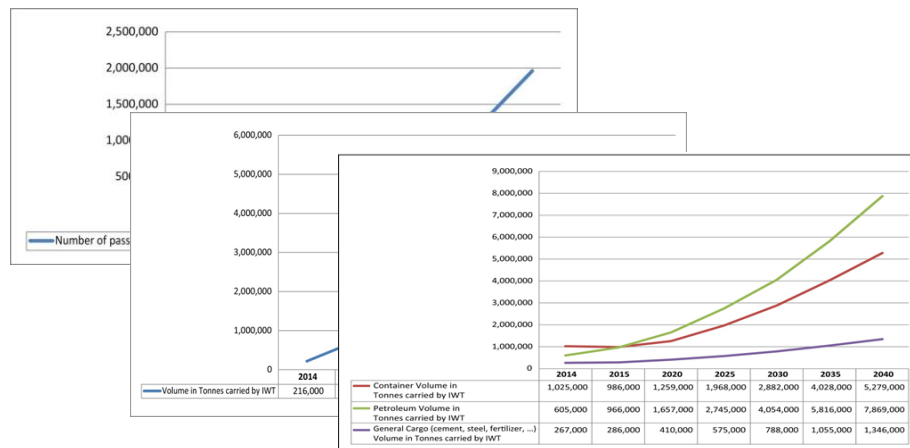
- I. Main points for the Navigation Thematic Area under the CS
- II. Scope of the Master Plan for regional Waterborne Transportation in the MB
- III. Navigation Development Scenarios
- IV. Conclusions

I. Main points for the Navigation Thematic Area under the CS

1. Navigation is one of the 6 Thematic Areas that involves determining both sector-specific and cumulative impacts of waterborne transport projects.
2. The study assesses the changes in river condition, navigation channel, transport facilities and livelihood activities as a result of infrastructure developments in the Lower Mekong River Basin (**Development Scenarios**).
3. These changes (based on the scenarios) can then be represented in the **Council Study Models** so simulations can be made that will help the MCs to decide on the future basin developments

Economic Baseline and Forecasts

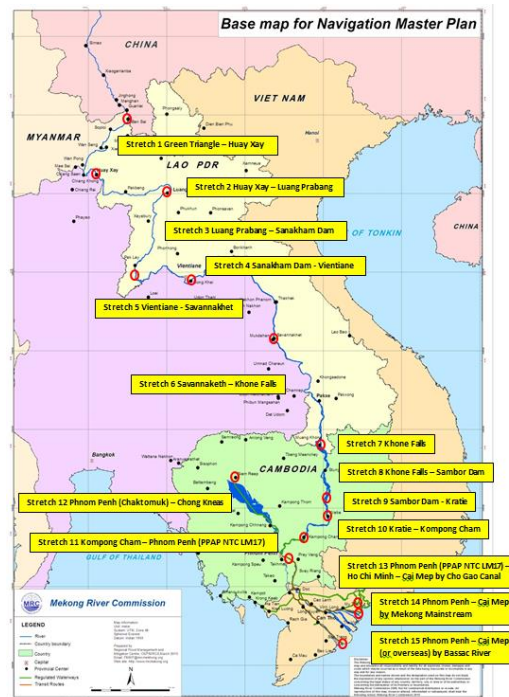
A detailed Socio-economic Assessment was made on River Transportation, and forecasts were prepared up to 2040



III. Development Scenarios under the Master Plan for Regional Waterborne Transportation

To develop the short term (2020) and long term (2040) development scenarios, the River was subdivided into 15 stretches:

1. Green Triangle to Huay Xay;
2. Huay Xay to Luang Prabang;
3. Luang Prabang to planned Sanakham dam;
4. Planned Sanakham dam to Vientiane;
5. Vientiane to Savannakhet;
6. Savannakhet to the Khone Falls;
7. Khone Falls
8. Khone Falls to planned Sambor dam;
9. Planned Sambor dam to Kratie;
10. Kratie to Kompong Cham;
11. Kompong Cham to PPAP NCT;
12. Phnom Penh to Chong Kneas;
13. PPAP NCT to Cai Mep over Cho Gao Canal;
14. PPAP NCT to Cai Mep over Mekong mouth;
15. PPAP NCT to Cai Mep over Bassac and Quan Chanh Bo Canal.

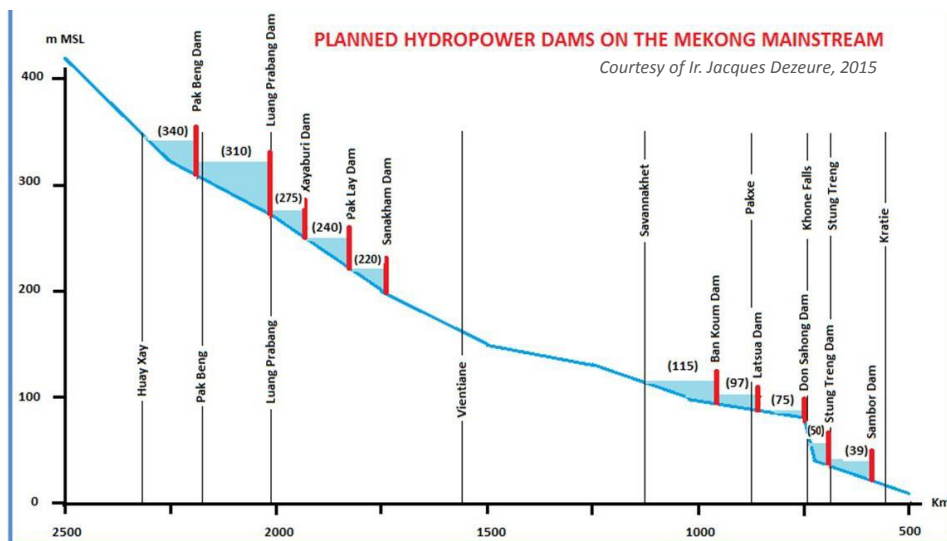


The MP design started from following **assumptions**:

- That in the Long Term, **ASEAN** will lead to a higher integration and transport facilitation in and between the MCs;
- That in the **Short Term (2020)**, the Xayaburi Dam and the Don Sahong Dam will be operational;
- For the **Long Term (2040)** there are 2 possible scenarios:

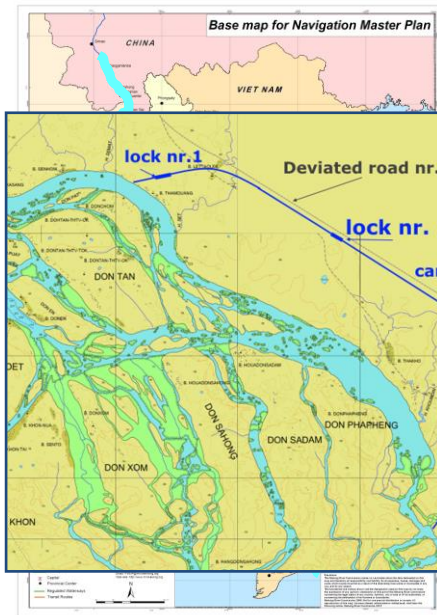
Long Term Scenario 1: all planned dams in the PR China and four dams in the Huay Xay - Vientiane stretch of the River are built

Long Term Scenario 2, all planned dams in the PR China and four dams in the Huay Xay - Vientiane stretch of the River are built **AND ALL four dams between Savannakhet and Kratie are built**



NAVIGATION DEVELOPMENT SCENARIOS 2040

SCENARIO 1



SCENARIO 2



GOAL OF THE MASTER PLAN

*to increase waterborne transport to at least 125% of the actual waterborne transport volume by 2020, and to at least 250% of the actual waterborne transport volume by 2040
and to make navigation safer and more sustainable for the people
and for the environment.*

This goal will be achieved by *(only related to the Council Study)*:

- **FLEET:** The use of larger ships than actually used over the total length of the Mekong River and over the whole year, including the use of sea-river ships
- **RIVER DESIGN:** The creation of a safe navigation channel, able to accommodate the larger ships over the whole year

- **PORTS:** The development of safe and efficient passenger ports and multimodal nodal points in the main cargo ports and dry ports;
- **SAFETY:** The improvement of safety of all types of ships, including the use of more save passenger ships and ships carrying dangerous goods;
- **ENVIRONMENTAL:** The integration of Strategic Environment Assessment (SEA)/Environmental Impact Assessment (EIA) into IWT planning to effectively manage social and environmental impacts, including the predicted impacts of climate change;
- **SOCIAL:** The creation of socio-economic opportunities to link local IWT transport with national and regional routes

FLEET DEVELOPMENT SCENARIOS 2040

Actual ships and ship sizes on the Lancang-Mekong River (Lao PDR, Myanmar, Thailand, PR China)



300 DWT (China)

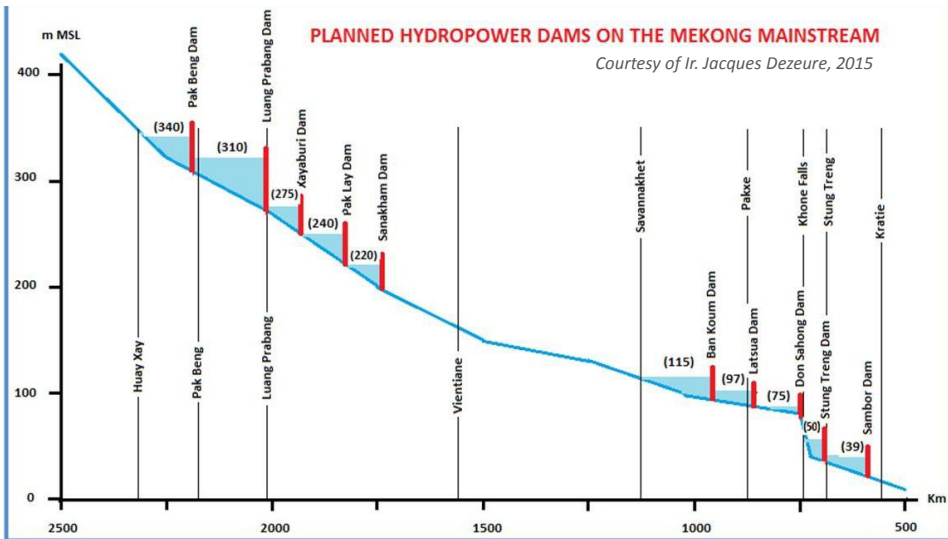
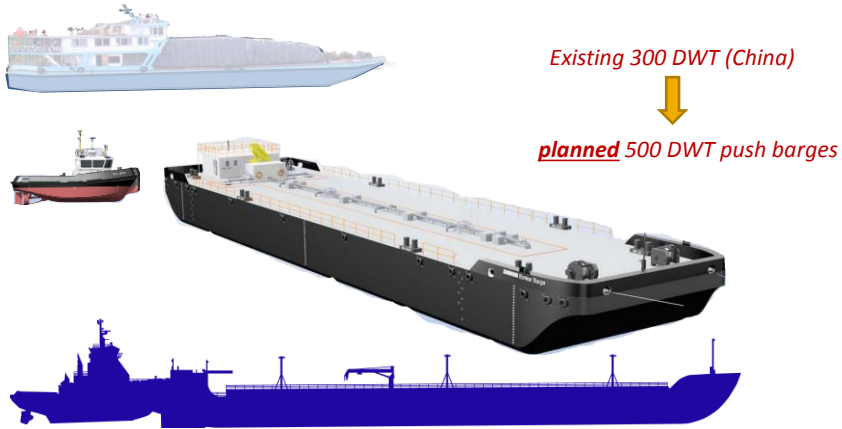


150 DWT (Lao PDR)

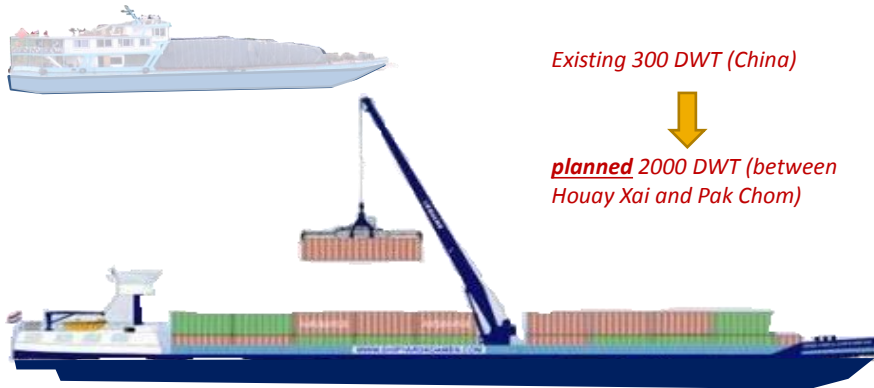


30 DWT (Lao PDR)

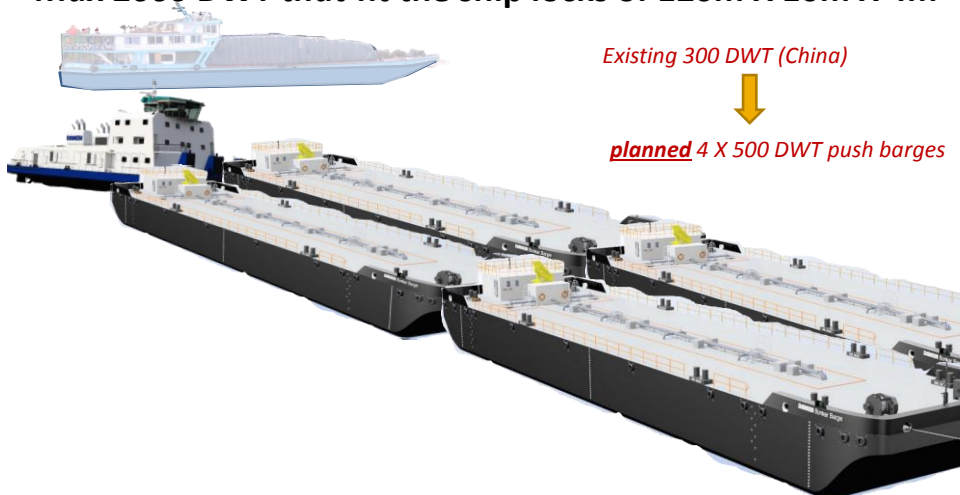
LONG TERM - 2040 ships and ship sizes *between Jinghong in PR China and Savannaketh: 500 DWT*

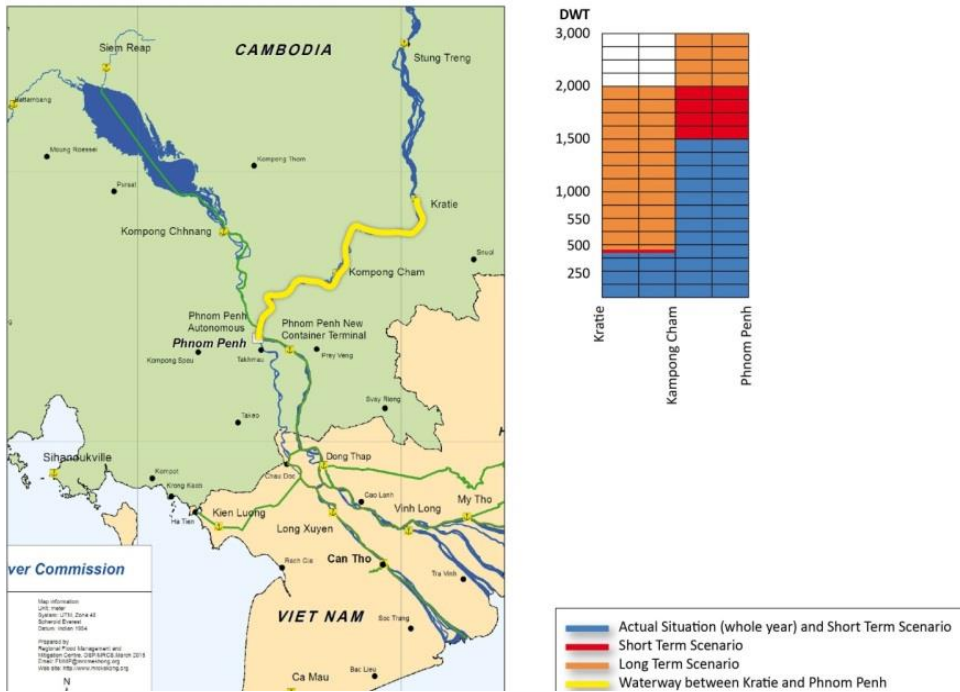


LONG TERM - 2040 between Houay Xai and Sanakham dam: Max 2000 DWT that fit the ship locks of 120m X 10m X 4m



LONG TERM - 2040 ships and ship sizes on the Lancang-Mekong River (Lao PDR, Myanmar, Thailand, PR China) between Houay Xai and Sanakham dam: Max 2000 DWT that fit the ship locks of 120m X 10m X 4m





LONG TERM - 2040 ships and ship sizes on the Mekong River between Kratie and Phnom Penh:
Between 2000 – 3000 DWT



Existing 500 DWT for cargo



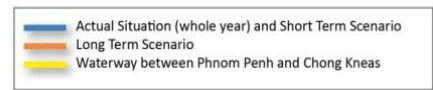
planned 2000 -3000 DWT. Inland Barges



M/s JOWI:

398 containers
 Draught = 3,50m

Development Scenarion between Phnom Penh and Chong Kneas

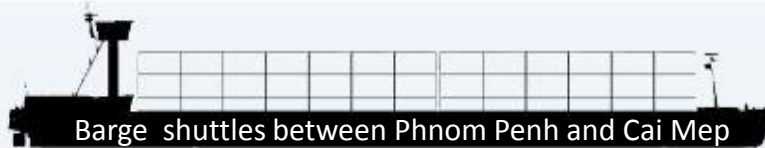


LONG TERM - 2040 ships and ship sizes on the Mekong River between Phnom Penh and Chhong Kneas (Siem Reap): **500 DWT**

Planned: 500 DWT cruise boats year round



LONG TERM - 2040 ships and ship sizes on the Mekong River System between Phnom Penh and the sea, with top-up in Can Tho: **up to DWT 10,000**



LONG TERM - 2040 ships and ship sizes on the Mekong River System between Phnom Penh and the sea, with top-up in Can Tho: **up to DWT 10,000**



Summary Fleet Actions

SFL1 Standardize the vessel classification

SFL2 Feasibility Study on the use of reinforced sea-river barges

SFL3 Develop short term and long term fleet policy

SFL4 Implement the Fleet Projects of the RAP for Transport of DG

LFL1 Develop ship construction and ship yard policy

LFL2 Implement standards for construction of new vessels.

WATERWAY DESIGN SCENARIOS 2020-2040

1. Investigated the river potential for navigation from its **existing** characteristics (baseline condition);
2. Investigated in a given stretch the **maximum** technical **potential** to which the stretches physically can be improved **for 2040**;
3. Prepared the **technical design** and calculated the volumes of *excavation* (rock, boulders and gravel) and/or volumes to be *dredged* (sand, silt, mud)
4. Assessed, through actual and future economical benefits, the **viability** of the technical solution above, and **adjusted** the technical solution to the economical viability, social concern, ecological concern and safety aspects

WATERWAY CLASSIFICATION

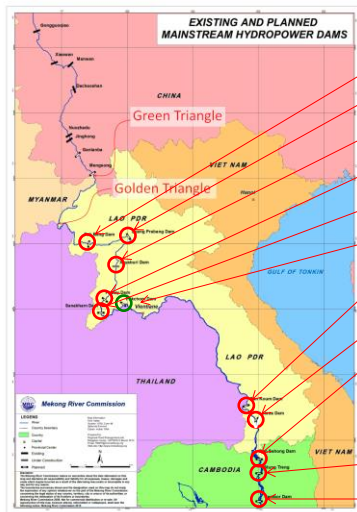
PART 1

Inland Waterway Classification Standard for the People's Republic of China

Class	Ship's dimensions			Fleet	Ls x Bs x Ts (m)	Waterway dimensions			Bridge dimensions			
	DWT	Single ship	Ls x Bs x Ts (m)			Depth T (m)	Width One way B (m)	Width Two way B (m)	Bend Radius R (m)	Height H (m)	Width One way Bb (m)	Width Two way Bb (m)
I	3000	Barge	90.0x16.2x3.5	(1)	406.0x64.8x3.5	3.5-4.0	125	250	1200	24.0	200	400
		Freighter	110.0x16.2x3.0	(2)	316.0x48.6x3.5		100	195	950	18.0	160	320
				(3)	223.0x32.4x3.5		70	135	670	18.0	110	220
II	2000	Barge	75.0x16.2x2.6	(1)	270.0x48.6x2.6	2.6-3.0	100	190	810	18.0	145	290
		Freighter	90.0x16.2x2.6	(2)	186.0x32.4x2.6		70	130	560	18.0	105	210
				(3)	182.0x16.2x2.6		40	75	550	10.0	75	150
III	1000	Barge	67.5x10.8x2.0	(1)	238.0x21.6x2.0	2.0-2.4	55	110	720	10.0	100	200
		Freighter	85.0x10.8x2.0	(2)	167.0x21.6x2.0		45	90	500	10.0	75	150
				(3)	160.0x10.8x2.0		30	60	480	10.0	55	110
IV	500	Barge	45.0x10.8x1.6	(1)	167.0x21.6x1.6	1.6-1.9	45	90	500	8.0	75	150
		Freighter	67.5x10.8x1.6	(2)	112.0x21.6x1.6		40	80	340	8.0	60	120
				(3)	111.0x10.8x1.6		30	50	330	8.0	45	90
				(4)	67.5x10.8x1.6		30	50	330	8.0	45	90

EXTERNAL DRIVERS

HYDRO POWER DAMS



Hydropower Projects planned and under construction between the Green Triangle and the Khone Falls

- Pak beng: 1,230 MW
- Luang Prabang: 1,410 MW
- Xayaburi (under construction): 1,285 MW
- Pak Lay: 1,320 MW
- Sanakham: 570 MW
- Pak Chom¹⁹: 1,079 MW
- Ban Khom: 2,000 MW
- Phou Ngoy (Latsua): 800 MW
- Don Sahong (under construction): 260 MW

and between the Khone Falls and the Delta in Vietnam

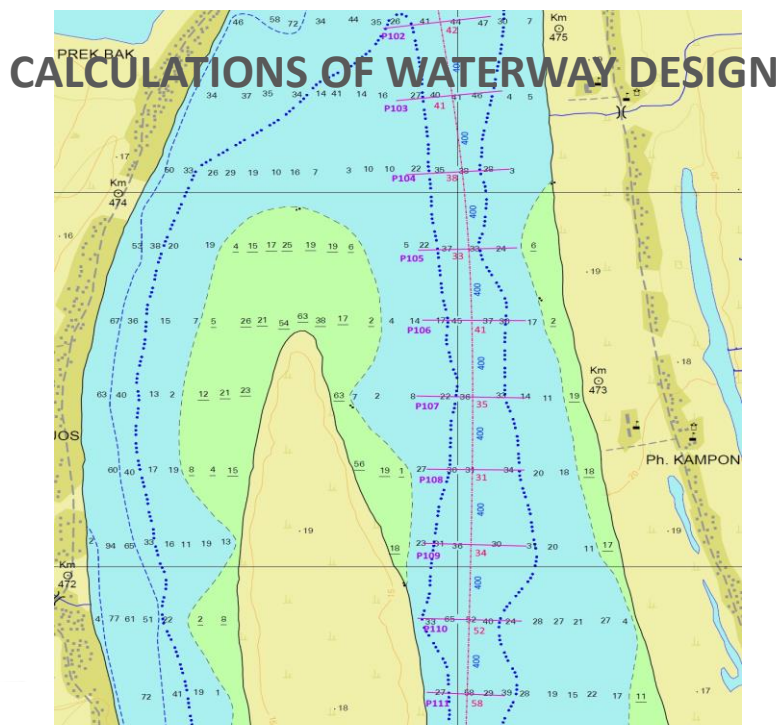
- Stung Treng: 980 MW
- Sambor²⁰: 460 MW



THE DAMS AND SEDIMENTS

HYDRO POWER DAMS: negative impact

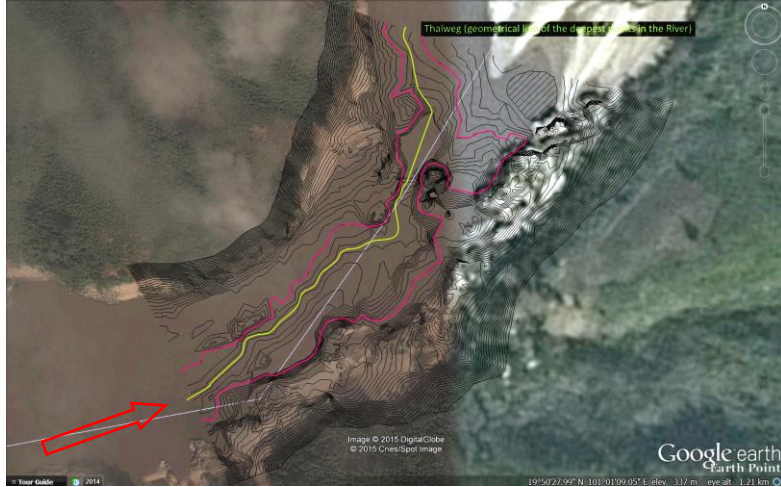


A major negative impact from dams is the sediment trap in the reservoir. Sediments settle in order of their size and gravity in the upper part of the reservoir. Only fine suspension arrives at the dam itself. Draw-down operations have been programmed to flush the sediment at the beginning of the flood season down the dam.

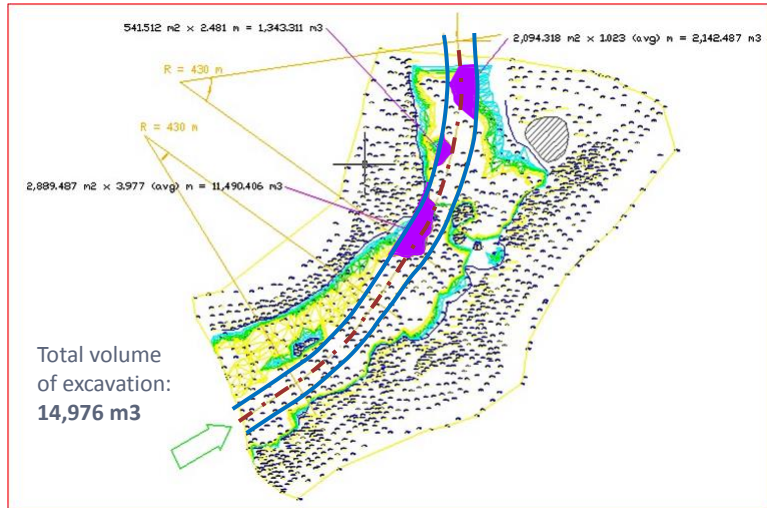


-  = thalweg, geometrical line of the deepest points in the river
-  = contourlines of 4 meters water depth in the river

FIXED RIVER BED (ROCK)

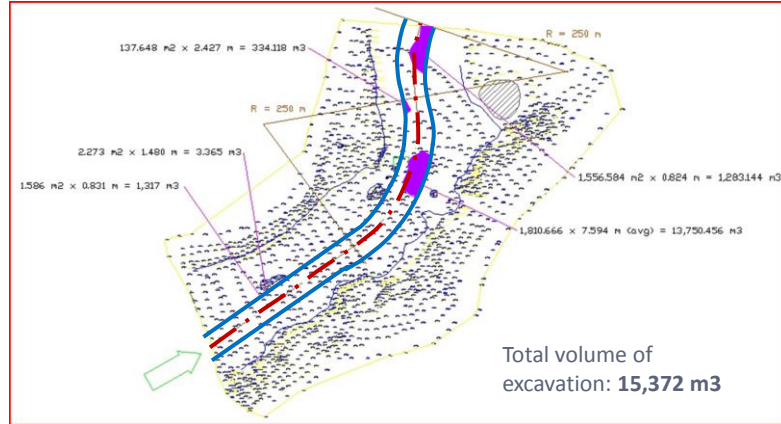


FIXED RIVER BED (ROCK)



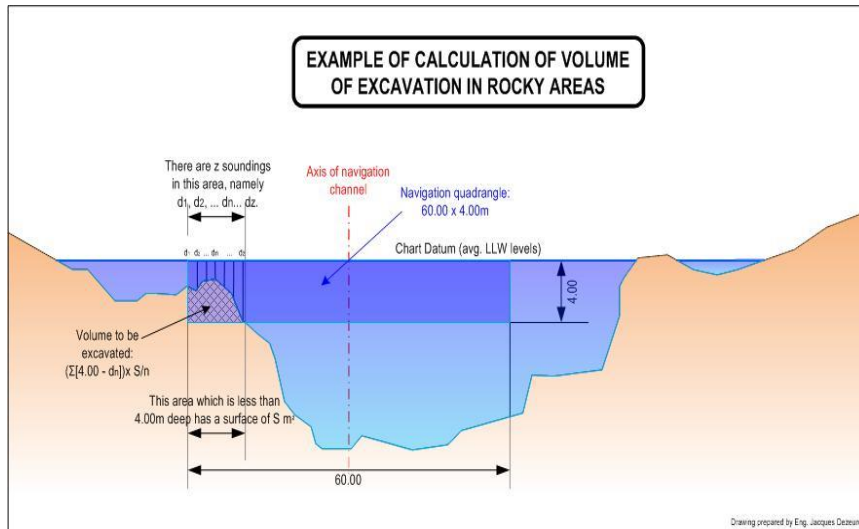
Channel with R = 430 m (big channel)

FIXED RIVER BED (ROCK)

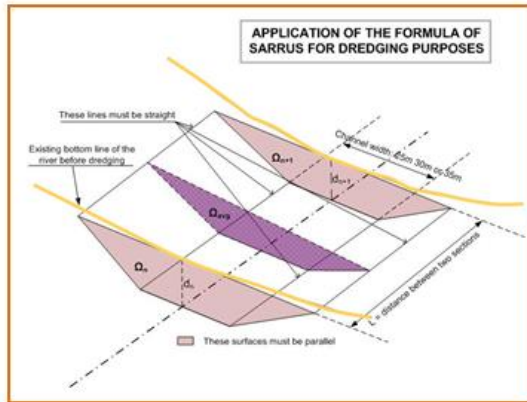
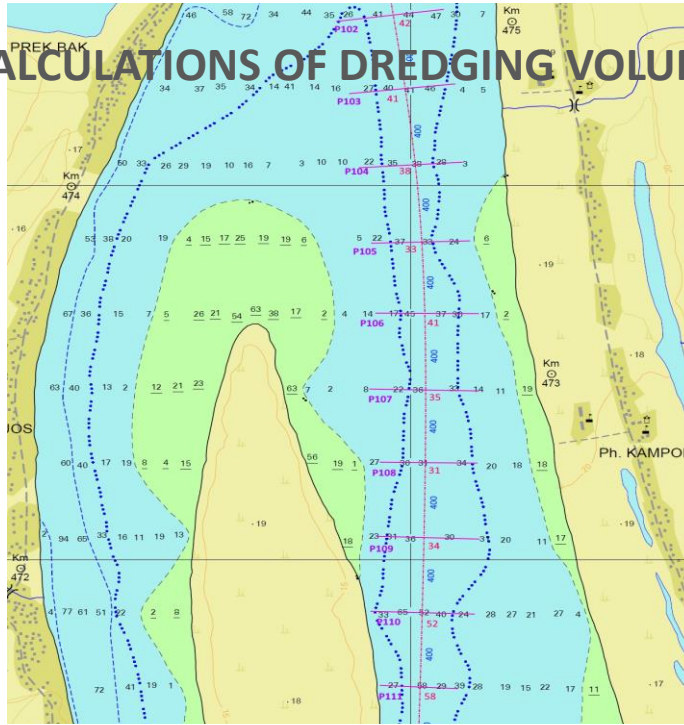


Channel with R = 250 m (small channel)

CALCULATIONS OF WATERWAY DESIGN



CALCULATIONS OF DREDGING VOLUMES



Indeed, once the depth d_n and d_{n+1} to be dredged in the various sections are known, the surfaces Ω_n and Ω_{n+1} can be calculated and from there the Ω_{avg} . The navigation channel width is a given dimensions (60.00m) and the underwater slopes of the channel (8/4) defined by the soil characteristics.

$$\Omega_n = \frac{1}{2}(60 + [60 + 4 \cdot d_n]) \cdot d_n$$

$$\Omega_{n+1} = \frac{1}{2}(60 + [60 + 4 \cdot d_{n+1}]) \cdot d_{n+1}$$

$$\Omega_{avg} = \frac{1}{2}(60 + (60 + 2 \cdot [d_n + d_{n+1}])) \cdot \frac{1}{2}(d_n + d_{n+1})$$

EXAMPLE OF CALCULATION OF DREDGING VOLUMES IN MOVEABLE SOILS WITH THE FORMULA OF SARRUS

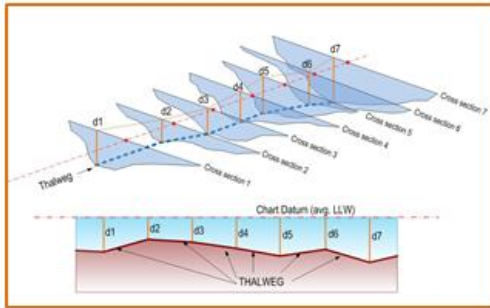
Channel width = 60m (at the bottom)
 Channel depth = 6.00m
 underwater slopes = 8/4
 minimum radius of curvature = 800m

Profile	A	B	C	D	E	F	G
depth to be							
average							

With L = 400 meter (distance between two cross sections), the volume calculated according to the formula of Sarrus is then:

$$V = \frac{L(\Omega_n + \Omega_{n+1} + 4 \cdot \Omega_{avg})}{6}$$

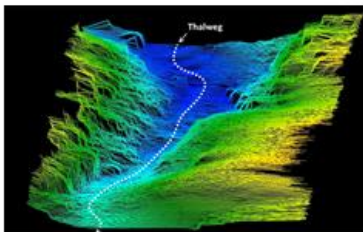
2. Definitions: Thalweg and Least Available Depth



The **thalweg** is the geometrical line of the all the deepest points in the longitudinal stretch of the river. The thalweg is usually derived from soundings in the river over a number of cross sections at regular intervals.

The example here next shows only 7 cross sections. Each cross sections has somewhere its deepest point, named: $d_1, d_2, d_3, d_4, d_5, d_6, d_7$.

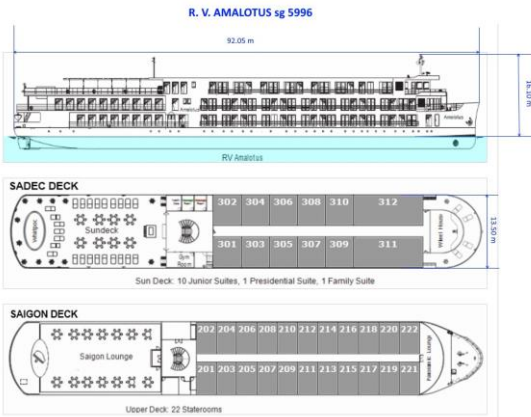
These deepest points are not necessarily situated in the axis of the navigation channel (red dotted line) although they usually will not be far away from the axis. The connection of these deepest points is "the Thalweg".



The 3D computer graph of a section of the scanned riverbed by multi-beam scanner allows to define the thalweg in the river.

From the longitudinal profile of the entire thalweg in a river stretch, the Least Available Depth (LAD) can be defined. It is the shallowest point in the Thalweg (see picture above).

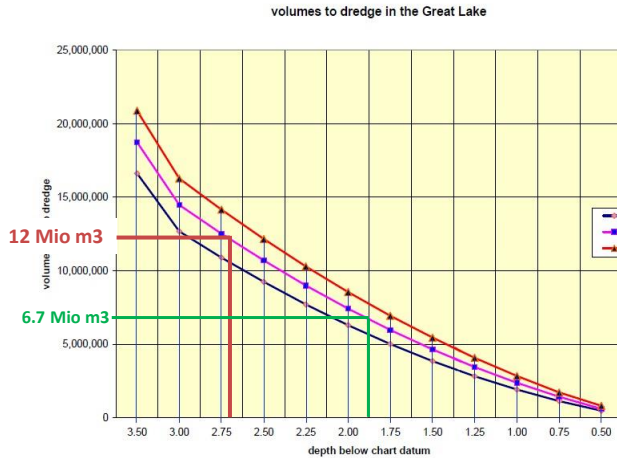
Dredging the Great Lake ?



Some of these luxury VIP-passenger vessels and hotel ships have impressive dimensions: $L = 92.05m$, $B = 13.10m$ (cannot pass the ship-locks), $H = 16.10m$ (some bridges cannot be passed!). Ship drafts are usually between $0.90m$ and $1.85m$.

Dredging the Great Lake ?

EVERY 10 CM OF WATERDEPTH = 588,000 M3 DREDGING



➤ Finnish Feasibility study for “dredging the Great Lake” takes an average of 1.30m to dredge with volume of 6.7 Mio m3, giving a channel water depth of **2.35m**

➤ The Master Plan for Cambodia (2006) estimated a total volume of 12.0 Mio m3 giving a channel water depth of **3.15m**

➤ This Master Plan opts for an average dredging volume with a total cost of **45,505,000 US\$**

Scenarios of the Transport Corridors in the Mekong Delta



ANALYSIS OF THE COSTS

LONG TERM ACTIONS – SCENARIO 1 vs. SCENARIO 2 : TOTAL COST PER STRETCH

nr	stretch	cost in US\$	million US\$									>10 million US\$									>20 million US\$									>30 million US\$								
			1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
1.1	Green Triangle - Huay Xay	84,950,000	[Bar chart]																																			
1.2	Huay Xay - Pak Beng	5,461,000	[Bar chart]																																			
1.3	Pak Beng - Luang Prabang	14,398,000	[Bar chart]																																			
1.4	Luang Prabang - Xayabouri	1,607,500	[Bar chart]																																			
1.5	Xayabouri - Pak Lay	1,609,500	[Bar chart]																																			
1.6	Pak Lay - Sanakham	9,622,000	[Bar chart]																																			
1.7	Sanakham - Vientiane	21,678,000	[Bar chart]																																			
2	Vientiane - Savannakhet	12,180,000	[Bar chart]																																			
3	Savannakhet - Khone Falls	93,960,000	[Bar chart]									93,960,000									[Bar chart]									[Bar chart]								
4	Khone Falls	469,000,000	[Bar chart]									469,000,000									[Bar chart]									[Bar chart]								
5	Khone Falls - Kratie	17,680,000	[Bar chart]																																			
6	Kratie - Kampong Cham	29,430,000	[Bar chart]																																			
7	Kampong Cham - NCT-PPAP	12,869,600	[Bar chart]																																			
8	Chaktomuk - Chong Kneas	45,505,000	[Bar chart]									45,505,000									[Bar chart]									[Bar chart]								
9	NCT-PPAP - Ho Chi Minh/Cai Mep via Cho Gao canal	6,594,000	[Bar chart]																																			
10	NCT-PPAP - Sea via Quan Chanh Bo Canal	16,641,900	[Bar chart]																																			
Scenario 1 total:		262,546,500																																				
Scenario 2 total:		843,186,500																																				

No	Title	Lao PDR Public	Private	Thailand Public	Private	Cambodia Public	Private	Viet Nam Public	Private	Loan Regional	Internat.	Grant Regional	Internat.	Total
Short term Fleet Actions														
SFL1	Standardize the vessel classification	40,000 2017-2018		40,000		40,000 2017-2018		50,000 2017-2018				120,000 2017-2018		290,000 2017-2018
SFL2	Conduct feasibility study on the use of reinforced sea-river barges				US\$ Year(s)		100,000 2017		100,000 2017			180,000 2017		380,000 2017
SFL3	Development of short and long term fleet policy											130,000 2016		130,000 2016
SFL4	Implement Fleet Projects of the RAP for Transport of Dangerous Goods	1,324,000 2016-2020	1,324,000 2016-2020	1,168,250 2016-2020	1,168,250 2016-2020	1,257,000 2016-2020	1,257,000 2016-2020	1,232,250 2016-2020	1,232,250 2016-2020					9,963,000 2016-2020
Short term Waterway Design Actions														
SWD1	Condition survey of the dangerous areas for navigation	400,000 2017-2018				55,100 2017-2018							4,100,000 2017-2018	4,555,100 2017-2018
SWD2	Standardize waterway classification in the Upper Part of the MRB											98,000 2018		98,000 2018
SWD3	Standardize waterway classification in the Lower Part of the MRB											51,600 2018		51,600 2018
SWD4	Design of river training works at the Sdao Canal in Cambodia					30,000 2016-2017							270,000 2016-2017	300,000 2016-2017
SWD5	Experimental test dredging in the Tonle Sap / Great Lake					150,000 2018-2019	150,000 2018-2019					370,000 2018-2019		670,000 2018-2019
Short term Navigation Safety Actions														
SNS1	Introduce a vessel inspection system	100,000 2017-2020		100,000 2017-2020		100,000 2017-2020		100,000 2017-2020			880,000 2017-2020			1,280,000 2017-2020
SNS2	Establish a framework for reporting marine accidents	60,000 2018-2019	30,000	30,000 2018-2019		45,000 2018-2019		80,000 2018-2019				140,000 2018-2019		355,000 2018-2019
SNS3	Development of a contingency plan	20,000 2018		30,000 2018		15,000 2018		30,000 2018				110,000 2018		185,000 2018
SNS4	Implement search and rescue units on the Mekong River	170,000 2018-2019		50,000 2018-2019		125,000 2018-2019		200,000 2018-2019				150,000 2018-2019		695,000 2018-2019
SNS5	Introduce safety books on safety issues and safe working practices	57,000 2018		57,000 2018		57,000 2018		57,000 2018						228,000 2018
SNS6	Introduce the obligation of AIS and VHF in the whole MRB	100,000 2017-2018		100,000 2017-2018		100,000 2018-2019		100,000 2018-2019				1,415,000 2017-2019		1,815,000 2017-2019
SNS7	Improve passenger safety between Huay Xay and Luang Prabang	100,000 2016	100,000 2016											200,000 2016
Short term Aids to Navigation Actions														
SAN1	Reconstruction and rehabilitation of the concrete French markers	4,000/y 2016-2020		4,000/y 2016-2020		5,000/y 2017-2021						265,000 2016-2017	50,000 2016	380,000
SAN2	Construction of clearly visible low water alert gauges	25,000 2016-2017		25,000 2016-2017		25,000 2018-2019		25,000 2018-2019			880,000 2016-2019	180,000 2016-2018		1,160,000

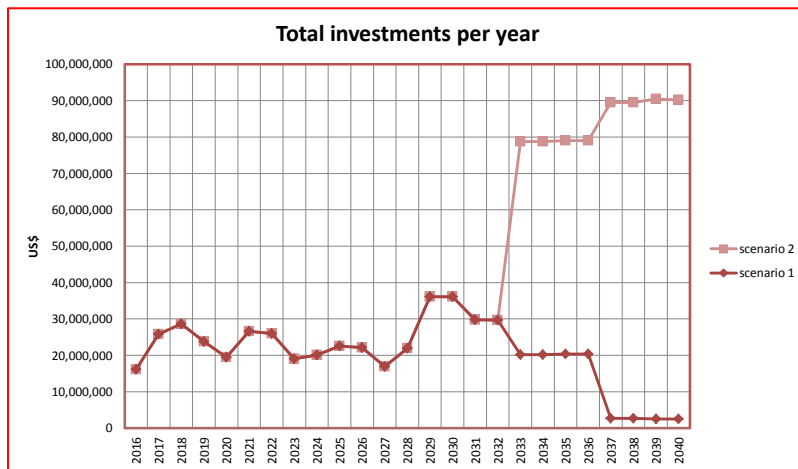
No	Title	Lao PDR		Thailand		Cambodia		Viet Nam		Loan		Grant		Total
		Public	Private	Public	Private	Public	Private	Public	Private	Regional	Internat.	Regional	Internat.	
SAN3	Install a compulsory GPS System from Green Triangle to Huay Xay												395,000 2018	395,000 2018
SAN4	Improve compulsory GPS System from Huay Xay to Luang Prabang	30,000 2016							US\$ Year(s)				150,000 2016	180,000 2016
SAN5	Install Lights and marks at Mekong, Bassac and Tonle Sap bridges	30,000 2017		30,000 2017		30,000 2017							200,000 2017	290,000 2017
SAN6	Upgrade ATN from Kompong Cham to mouth of the Mekong River					70,000 2018-2019		80,000 2018-2019			2,500,000 2018-2019		130,000 2018-2019	2,780,000 2018-2019
SAN7	Upgrade ATN in Vam Nao Pass and Bassac River							80,000 2018-2019			1,250,000 2018-2019		60,000 2018-2019	1,390,000 2018-2019
Short term Port Development Actions														
SPD1	Development of a port maintenance system	150,000 2016		50,000 2016		150,000 2016		50,000 2016					452,000 2017-2018	852,000 2016-2018
SPD2	Development of a port HSEM system	78,333 2018-2019	78,333 2018-2019	98,333 2018-2019	98,333 2018-2019	100,000 2018-2019	100,000 2018-2019	111,667 2018-2019	111,667 2018-2019				388,334 2018-2019	1,165,000 2018-2019
SPD3	For ports handling DG, implement the RAP for Transport of DG	454,000 2017-2020	454,000 2017-2020	481,667 2017-2020	481,667 2017-2020	452,000 2017-2020	452,000 2017-2020	551,667 2017-2020	551,667 2017-2020			155,000 2017-2020	1,939,334 2017-2020	5,973,000 2017-2020
SPD4	Rehabilitation and/or reconfiguring of 2 existing passenger ports			10,000 2017		10,000 2017								20,000 2017
SPD5	Construction of 10 new passenger ports and landing facilities										18,700,000 2017-2020			18,700,000 2017-2020
SPD6	Establish standards and organize audit for L, T, C, oil ports		27,000 2017		27,000 2017			27,000 2017						200,000 2017
SPD7	Expansion of New Phnom Penh Container Terminal – NCT LM 17										45,000,000 2016-2020			45,000,000 2016-2020
SPD8	Rehabilitation of existing petrochemical transfer ports in Viet Nam							646,000 2016-2020	646,000 2016-2020			646,000 2016-2020	646,000 2016-2020	2,584,000 2016-2020
SPD9	Rehabilitation of existing cargo ports in Viet Nam							646,000 2016-2020	646,000 2016-2020			646,000 2016-2020	646,000 2016-2020	2,584,000 2016-2020
SPD10	Update "Master Plan for Viet Nam Inland Waterway Sector"							646,000 2016-2020	646,000 2016-2020			646,000 2016-2020	646,000 2016-2020	2,584,000 2016-2020
Short term Regulatory Actions														
SRE1	Implement the Cambodian-Vietnamese Agreement					144,000 2016-2018		144,000 2016-2018						288,000 2016-2018
SRE2	Enforce harmonized rules under the Quadangle Agreement	66,000 2016-2017		66,000 2016-2017										132,000 2016-2017
SRE3	Enforce harmonized safety rules for Lao PDR and Thailand	90,000 2016-2017		90,000 2016-2017										180,000 2016-2017
SRE4	Adopt plans/procedures for port safety and emergency response												156,000 2016-2017	156,000 2016-2017
SRE5	Policy/recommendations to enhance legal protection of passengers												84,000 2016-2017	84,000 2016-2017

No	Title	Lao PDR		Thailand		Cambodia		Viet Nam		Loan		Grant		Total
		Public	Private	Public	Private	Public	Private	Public	Private	Regional	Internat.	Regional	Internat.	
SRE6	Ensure effective law enforcement	30,000 2016-2018		30,000 2016-2018		30,000 2016-2018		30,000 2016-2018					96,000 2016-2018	216,000 2016-2018
Short term Environmental Actions														
SEN1	Develop SEA, EIA, EMP and monitoring guidelines for IWT												125,000 2016	125,000 2016
SEN2	Conduct SEA for Lancang-Mekong Development Plan							US\$ Year(s)					350,000 2016	350,000 2016
SEN3	Optimisation study of dredging sand from the Mekong River												200,000 2017	200,000 2017
SEN4	Determine oil spill pollution from ports, terminals and vessels												80,000 2017	80,000 2017
SEN5	Start awareness campaigns on IWT pollution by vessels and ports												150,000 2017	150,000 2017
SEN6	Inventory air emissions cargo ports												100,000 2018	100,000 2018
SEN7	Study energy efficiency vessels and most sustainable route PHN to the Sea												200,000 2018	200,000 2018
Short term Social Actions														
SSO1	Analysis of Social Impact Monitoring Vulnerability Assessment												100,000 2017	100,000 2017
SSO2	Further surveys of passengers, boat owners and rural communities												150,000 2017	150,000 2017
SSO3	Identify and promote the eco-tourism and river-related tourism	25,000 2016	25,000 2016	25,000 2016	25,000 2016	25,000 2016	25,000 2016	25,000 2016	25,000 2016					200,000 2016
Short term Capacity Building Actions														
SCB1	Plan and implement IWT education and training actions	100,000 2016-2018		100,000 2016-2018		100,000 2016-2018		100,000 2016-2018					600,000 2016-2018	1,400,000 2016-2018
Short term Institutional Actions														
SIN1	Establish a "Regional Mekong Navigation Center" to implement MP												111,400/y 2016-2020	557,000
SIN2	Setting up "Navigation Data Management Centers"	11,000/y 2016-2020		11,000/y 2016-2020		11,000/y 2016-2020		11,000/y 2016-2020						220,000 2016-2020
SIN3	Setting up "Mekong IWT Promotion and Marketing Agencies"	25,000/y 2016-2020	30,400/y 2016-2020	25,000/y 2016-2020	30,400/y 2016-2020	25,000/y 2016-2020	30,400/y 2016-2020	25,000/y 2016-2020	30,400/y 2016-2020				50,000/y 2016-2020	1,358,000 2016-2020
SIN4	Study the need for cooperation on hydrodynamic research												126,000 2018	126,000 2018

No	Title	Lao PDR		Thailand		Cambodia		Viet Nam		Loan	Regional	Internat.	Grant		Total
		Public	Private	Public	Private	Public	Private	Public	Private				Regional	Internat.	
Long term Fleet Actions															
LFL1	Development of ship construction and ship yard policy													160,000 2021	160,000 2021
LFL2	Implementation of standards for construction of new vessels.	105,000 2029-2032		105,000 2029-2032		105,000 2029-2032		100,000 2029-2032						300,000 2029-2032	715,000 2029-2032
Long term Waterway Design Actions															
LWD1	Min. 500 DWT channel between Green Triangle and Vientiane	7,000,000 2029-2036		7,000,000 2029-2036								125,326,000 2029-2036			139,326,000 2029-2036
LWD2	Improved channel in the Vientiane-Savannakhet stretch	600,000 2029-2030		600,000 2029-2030			US\$ Year(s)				10,980,000 2029-2030				12,180,000 2029-2030
LWD3	[Scenario 2] Improved channel in Savannakhet- Khone Falls stretch	5,960,000 2037-2040										88,000,000 2037-2040			93,960,000 2037-2040
LWD4	[Scenario 2] Bypass canal at the Khone Falls including ship locks											469,000,000 2033-2040			469,000,000 2033-2040
LWD5	[Scenario 2] Improved channel in Khone Falls-Kratie stretch					884,000 2037-2040						16,796,000 2037-2040			17,680,000 2037-2040
LWD6	Improved channel Kratie-Kompong Cham stretch to 2,000 DWT					1,470,000 2025-2028						27,960,000 2025-2028			29,430,000 2025-2028
LWD7	Improved 3,000 DWT channel from Kompong Cham to PPAP NTC					643,500 2025-2027						12,226,500 2025-2027			12,870,000 2025-2027
LWD8	Improved 500 DWT channel in Phnom Penh-Chong Kneas stretch					1,137,625 2028-2032	1,137,625 2028-2032					43,229,750 2028-2032			45,505,000 2028-2032
LWD9	3,000 DWT Channel from PPAP NTC to Cai Mep via Cho Gao canal											6,594,000 2021-2022			6,594,000 2021-2022
LWD10	10,000 DWT Channel from PPAP NTC to Quang Cham Bo Canal					532,455 2021-2022		299,640 2021-2022				15,869,865 2021-2022			16,641,960 2021-2022
LWD11	Morphology study in the areas between Phnom Penh and the sea					100,000 2028		200,000 2028				180,000 2028			480,000 2028
Long term Navigation Safety Actions															
LNS1	Development of ENCs for the whole Mekong River												911,000 2025-2027		911,000 2025-2027
LNS2	Implementation of RIS over the total length of the Mekong River	450,000 2024-2028		150,000 2024-2028		350,000 2024-2028		500,000 2024-2028					820,000 2024-2025		2,270,000 2024-2028

No	Title	Lao PDR		Thailand		Cambodia		Viet Nam		Loan	Regional	Internat.	Grant		Total
		Public	Private	Public	Private	Public	Private	Public	Private				Regional	Internat.	
Long term Aids to Navigation Actions															
LAN1	Compulsory GPS System Luang Prabang to Savannakhet							US\$ Year(s)					1,190,000 2029-2030		1,190,000 2029-2030
LAN2	[Scen. 2] Compulsory GPS System from Savannakhet to Kratie												760,000 2017-2019		760,000 2017-2019
LAN3	Compulsory GPS System along the Tonle Sap River and Lake												410,000 2024-2025		410,000 2024-2025
LAN4	Install buoys and beacons from Kratie to Kompong Cham					60,000 2035-2036					530,000 2035-2036				590,000 2035-2036
LAN5	Maintain ATN from Kompong Cham to Cai Mep incl. Cho Gao Canal					104,000/y* 2023-2032		188,000/y* 2023-2032			"Channel fees"				2,520,000 2023-2032
LAN6	Maintain the ATN on the Yam Nao Pass and the Bassac River							188,000/y* 2029-2038							1,880,000 2029-2038
Long term Port Development Actions															
LPD1	Development of a long term port strategy and policy	200,000 2021-2024		100,000 2021-2024		200,000 2021-2024		100,000 2021-2024					1,600,000 2021-2024		2,200,000 2021-2024
LPD2	Construction 5 new passenger ports and landing facilities		2,000,000 2025-2028									4,200,000 2025-2028			6,200,000 2025-2028
LPD3	Construction 7 new port infrastructures for 500 DWT cargo											20,460,000 2029-2040			20,460,000 2029-2040
LPD3	[Scen. 2] Construction 2 new port infrastructures for 500 DWT cargo											2,400,000 2037-2039			2,400,000 2037-2039
LPD4	Study ports to handle containers (Green Triangle to Savannakhet)												100,000 2031		100,000 2031
LPD5	Expansion New Container Terminal – INCT UM 17											45,000,000 2021-2024			45,000,000 2021-2024
LPD6	Kratie - Development of a 2,000 DWT cargo port											3,000,000 2025-2028	100,000 2024		3,100,000 2024-2028
LPD7	Kompong Cham - Development of a 3,000 DWT + domestic cargo port											5,850,000 2025-2028	100,000 2024		5,950,000 2024-2028
LPD8	Kompong Chhnang - Development of a 500 DWT cargo port											3,400,000 2022-2024	100,000 2021		3,500,000 2021-2024
LPD9	Chong Kneas - Construction of a new passenger + cargo terminal											30,300,000 2023-2026	1,500,000 2021-2022		21,800,000 2021-2026
Long term Regulatory Actions															
LRE1	Full implementation of the Cambodian-Vietnamese Agreement												156,000 2021		156,000 2021
LRE2	Full implementation of the Quadripartite Agreement	7,600/y 2021-2040		7,600/y 2021-2040											304,000 2021-2040
LRE3	Harmonise regulations for IWT from Luang Prabang to Khone Falls	7,600/y 2021-2040		7,600/y 2021-2040											304,000 2021-2040
LRE4	Develop a regulatory framework for ports												250,000 2021-2024		250,000 2021-2024

No	Title	Lao PDR		Thailand		Cambodia		Viet Nam		Loan	Grant	Total
		Public	Private	Public	Private	Public	Private	Public	Private	Regional	Regional	Internat.
LRE5	Ensure effective enforcement of rules and regulations	60,000 2025-2028		60,000 2025-2028		60,000 2025-2028		60,000 2025-2028		US\$ Year(s)		240,000 2025-2028
Long term Environmental Actions												
LEN1	Trans boundary environmental management/monitoring systems										100,000 2026	100,000 2026
LEN2	Further SEA to determine zones for IWT or port restrictions										100,000 2021	100,000 2021
LEN3	Climate change adaptation within regional and national strategies										250,000 2021	250,000 2021
Long term Social Actions												
LSO1	Develop 10 landing facilities for local passenger transport	125,000 2021-2024				125,000 2021-2024						250,000 2021-2024
Long term Institutional Actions												
LIN1	Study the need for a "Mekong River Navigation Commission"										168,000 2033-2034	168,000 2033-2034
LIN2	Setting up of a water monitoring and management body in Laos	264,000/y* 2031-2040				*Hydropower companies						2,640,000 2021-2040
LIN3	Setting up a "Mekong Navigation Data Management Centre"	16,025/y 2021-2040		16,025/y 2021-2040		16,025/y 2021-2040		16,025/y 2021-2040				1,282,000 2021-2040
LIN4	Establishment of a "Mekong River IWT Promotion Agency"	10,000/y 2021-2040	19,800/y 2021-2040	10,000/y 2021-2040	19,800/y 2021-2040	10,000/y 2021-2040	19,800/y 2021-2040	10,000/y 2021-2040	19,800/y 2021-2040			2,384,000 2021-2040
LIN5	Establishment of a "Hydrodynamic and Nautical Research Centre"	87,000/y 2021-2040		87,000/y 2021-2040		87,000/y 2021-2040		87,000/y 2021-2040			950,000 2021	7,910,000 2021-2040



I. Main points for the Navigation Thematic Area under the CS

1. Navigation is one of the 6 Thematic Areas that involves determining both sector-specific and cumulative impacts of waterborne transport projects.
2. The study assesses the changes in river condition, navigation channel, transport facilities and livelihood activities as a result of infrastructure developments in the Lower Mekong River Basin (**Development Scenarios**).
3. These changes (based on the scenarios) can then be represented in the **Council Study Models** so simulations can be made that will help the MCs to decide on the future basin developments

Conclusions

1. Through their delegates in the Final Regional Workshop in Bangkok on 17-18 November, the Member Countries endorsed the Master Plan for Regional IWT. The Final MP will be submitted to the MRC JC early 2016.
2. The RTWG is kindly requested to take note of the Master Plan and its Development Scenarios, and
3. The RTWG is kindly requested to utilize the same Development Scenarios for the Navigation Thematic Area as formulated in the Master Plan Design.

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Thank you



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