

The MRC Regional Stakeholder Forum

14th – 15th December 2017

Vientiane, Lao PDR



MRC Council Study - Climate Change Impacts



Outline of Presentation

- 1. Climate Change scenarios and dataset**
- 2. Climate Change impact assessment approach**
- 3. Result of CC impact**
 - Hydrology
 - Sediment
 - Agriculture
 - Bio-resources
 - Socio-economic
- 4. Conclusions and Key Messages**



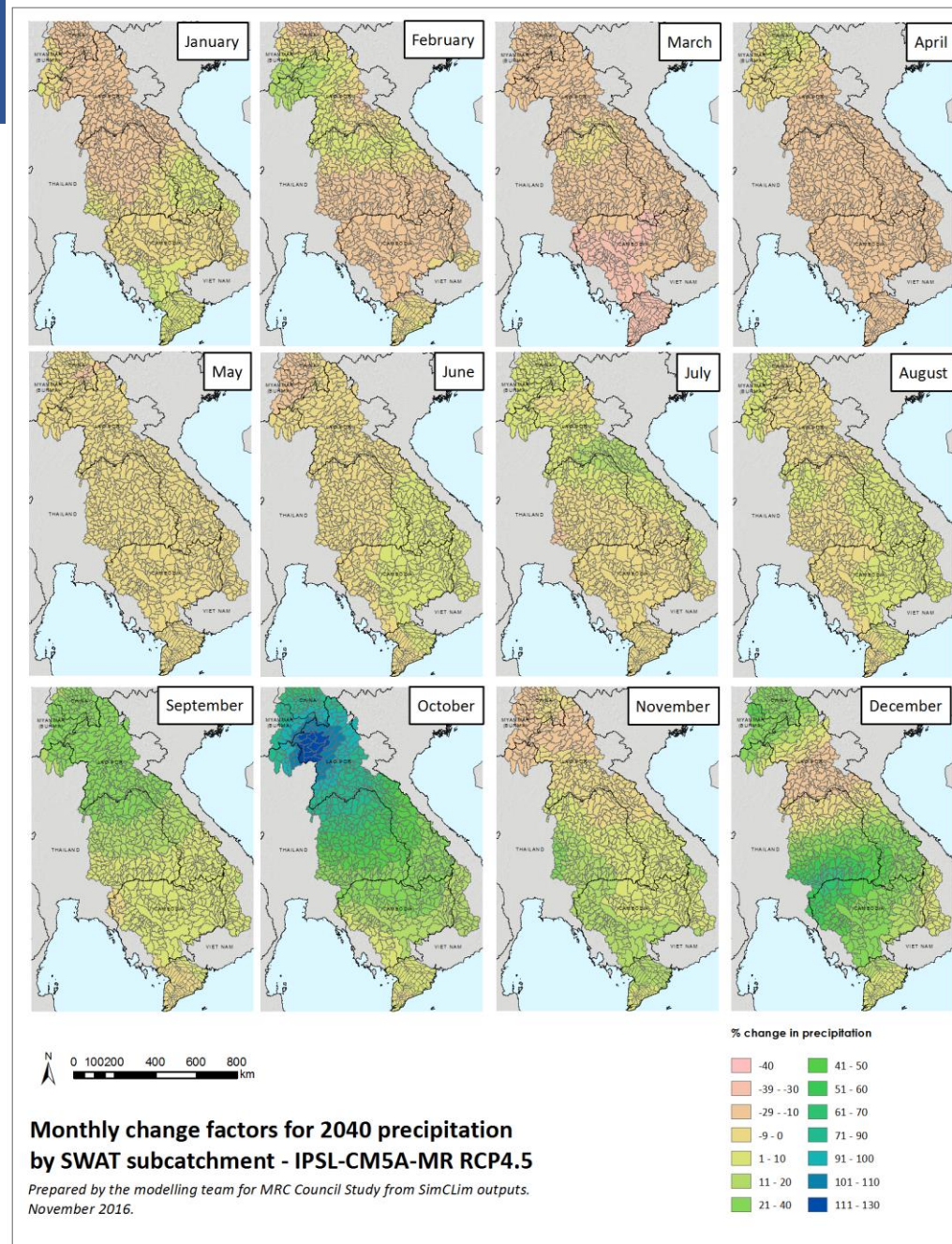
1. Background

❖ Scenarios

1. Climate scenarios: represent plausible future climate conditions of the LMB.
2. The selected CC scenarios: cover the range of CC projections produced
3. The number of selected scenarios: restricted to a minimum necessary to meet with time and resources constraints. 'Mainstreamed' in all subscenarios +M3CC.

❖ Patterns

- 3 Scenarios 2040 using latest information IPCC all warmer but rainfall changes varies
- *i) Seasonal – wetter wet season drier dry*
- *ii) C2 Wetter Overall iii) C3 Drier Overall*



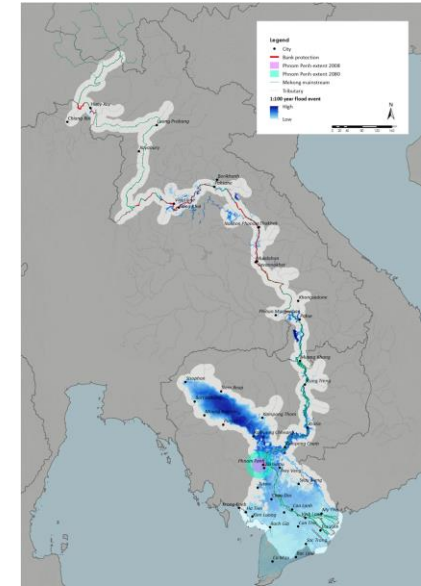
2. Methodology

❖ Models

1. *Simulate base and future conditions over 24 years for each scenario*
2. *Use Hydrology, Water Resource and Hydraulic Models. Monthly change factors*
3. *Outputs Flows, Water Levels, Sediment, Nitrogen, Phosphorus at over 7000 pts*

❖ Impact Tools

1. *Simulate changes in agriculture, fisheries*
2. *Biological resource assessment*
3. *Social and Economic changes at household and macro level*



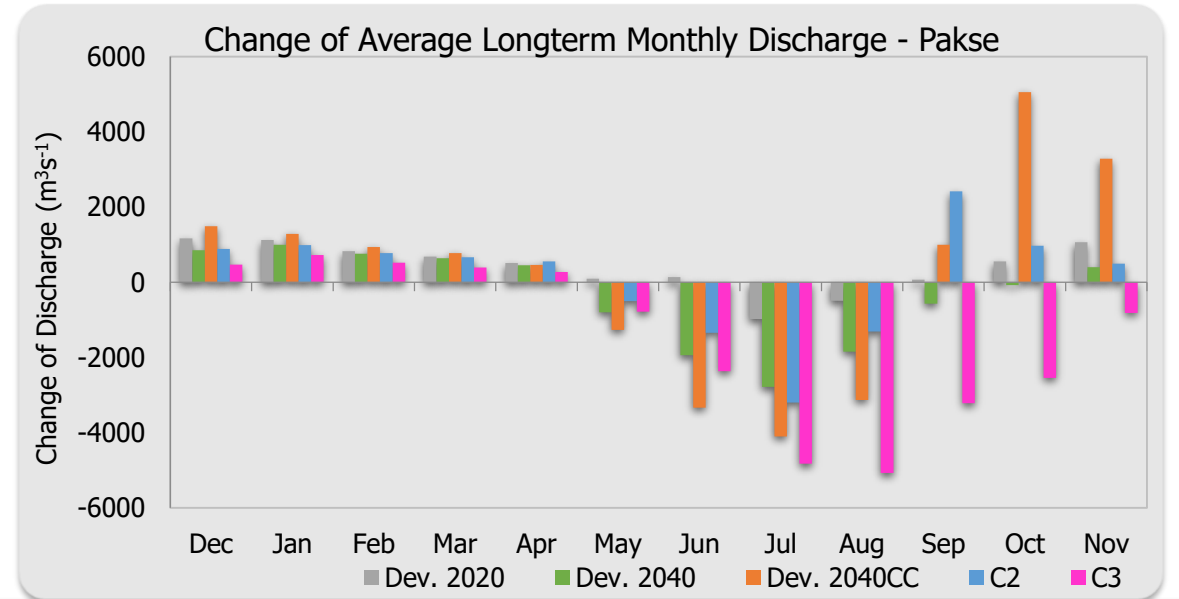
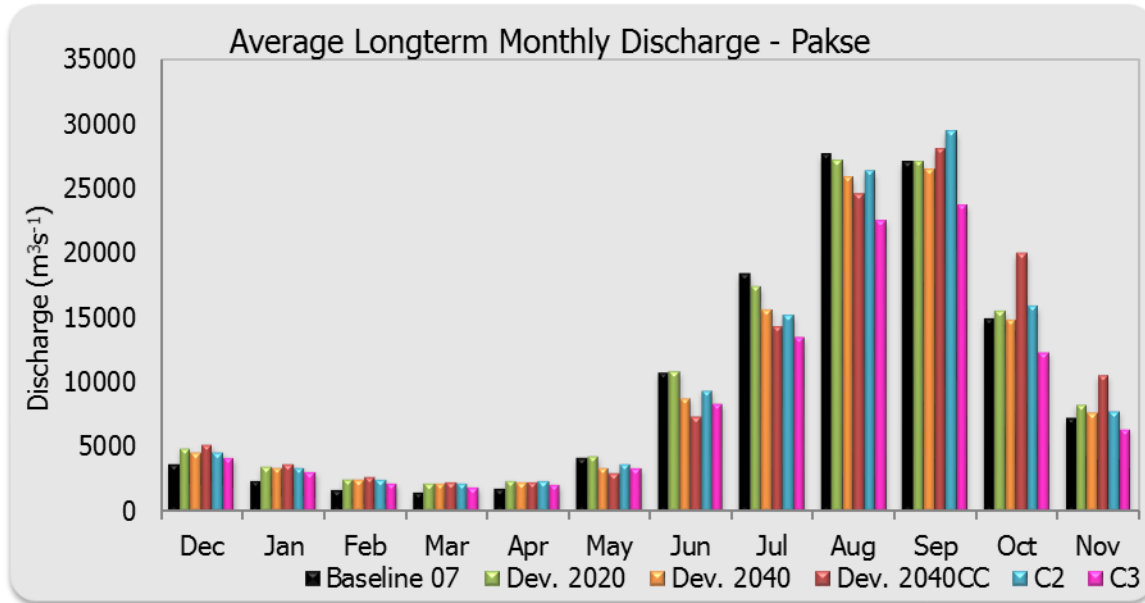
Integrate models and impact tools to show how changes in all 6 water sectors change with 3 Climate Scenarios by 2040

Social-Environment-Economic

IMPACTS

- Impacts in Hydropower and Agriculture significant especially for drier scenario C3 including increasing flow demands (reported in sector presentations)
- Drier climatic conditions reduce flooding thus also increase fish losses by ca 15%.
- Flood Protection 'benefit' of upstream dams reversed for C1 and C2
- Extreme events for flood and drought worsened with lower flows in some key months even with hydropower releases and higher flood peaks giving high extreme event damages.

Example Results - Flows



Changes in Averages – Dry season Increases and wet season reduction

Example Results – Flows Kratie vs Tan Chau in Mekong Delta

Kratie	Dev. 2020	Dev. 2040	Dev. 2040CC	C2	C3	TanChau	Dev. 2020	Dev. 2040	Dev. 2040CC	C2	C3
Dec	25.9	40.8	24.3	26.6	15.0	Dec	9.8	21.1	8.4	7.9	-6.4
Jan	39.2	52.7	41.6	42.0	33.1	Jan	13.2	25.9	14.0	24.8	9.1
Feb	43.6	54.3	46.4	47.3	37.3	Feb	15.5	26.7	17.5	23.7	6.8
Mar	39.5	44.7	37.6	38.9	24.6	Mar	31.6	48.4	30.6	20.7	-1.9
Apr	23.9	21.0	21.3	24.3	10.2	Apr	30.5	40.9	31.1	-15.5	-39.0
May	-9.5	-28.9	-20.5	-17.3	-24.8	May	2.5	0.9	-0.3	-42.1	-47.0
Jun	-16.4	-34.2	-21.7	-17.7	-28.3	Jun	-10.3	-26.8	-12.4	-21.5	-33.0
Jul	-13.2	-25.3	-17.6	-20.3	-28.3	Jul	-15.2	-31.2	-22.7	-22.8	-34.0
Aug	-6.8	-11.7	-8.0	-8.3	-18.4	Aug	-6.1	-18.6	-8.8	-9.6	-24.4
Sep	-2.7	2.0	-2.1	7.5	-9.4	Sep	-4.9	-6.0	-6.1	-2.8	-14.7
Oct	0.7	26.8	0.9	8.8	-10.5	Oct	-4.1	0.3	-4.7	-0.1	-12.3
Nov	8.9	41.8	8.5	11.0	-4.9	Nov	-1.9	10.4	-3.6	2.5	-12.5
Wet season	-5.4	-2.5	-6.7	-3.0	-16.4	Wet season	-6.4	-9.8	-8.9	-7.1	-19.9
Dry Season	22.6	25.1	19.7	21.7	11.2	Dry Season	14.4	25.0	14.1	7.7	-7.7

Changes in Averages : Dry season Increases and wet season reduces **BUT** Tonle Sap Lake impact for **DRY SEASON** flow maintenance is reduced

Example Results - Floods

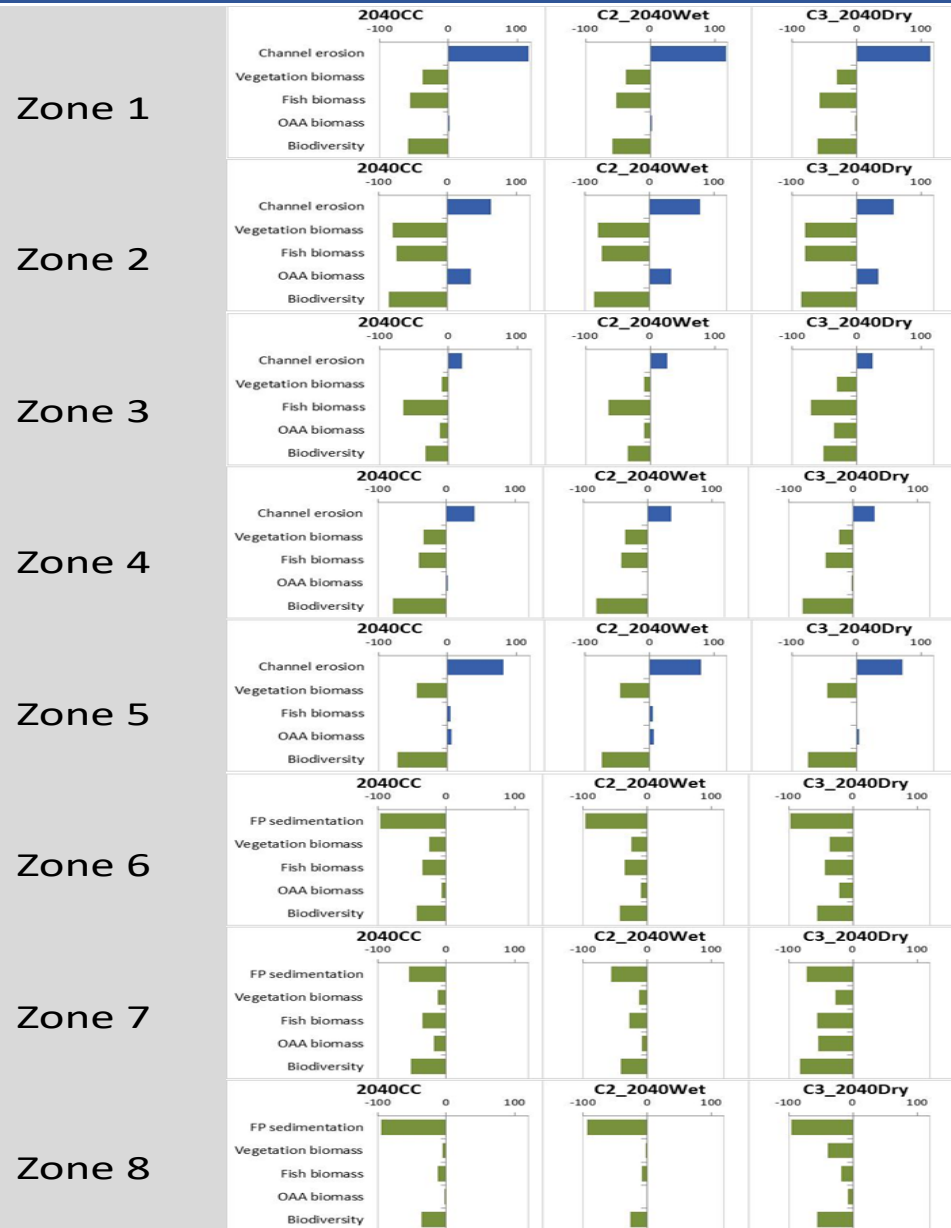
Scenario	Annual Flood	Chiang Saen	Luang Prabab	Nong Khai	Mukdahan	Pakse	Stung Treng
EDS	Mean	9,651	15,902	19,282	31,382	38,183	45,843
M2	Mean	9,158	14,932	18,069	29,808	36,713	43,588
M3 (NoCC)	Mean	9,158	13,879	17,372	28,972	36,463	43,622
M3 (CC)	Mean	10,252	15,439	20,356	31,800	39,683	46,734
EDS	Max	13,668	24,882	25,434	38,042	48,119	62,581
M2	Max	12,312	24,559	25,183	37,221	47,814	61,466
M3 (NoCC)	Max	12,315	20,697	21,295	36,395	45,569	62,351
M3 (CC)	Max	21,913	27,419	44,696	51,515	60,997	69,770

‘Normal’ Floods reduced by upstream dams – though climate change increases again. BUT of more extreme floods dams DO NOT reduce in lower part AND Climate Change increases further.

Example Results

– Sediments and Channel Change

Bio Resource Assessment



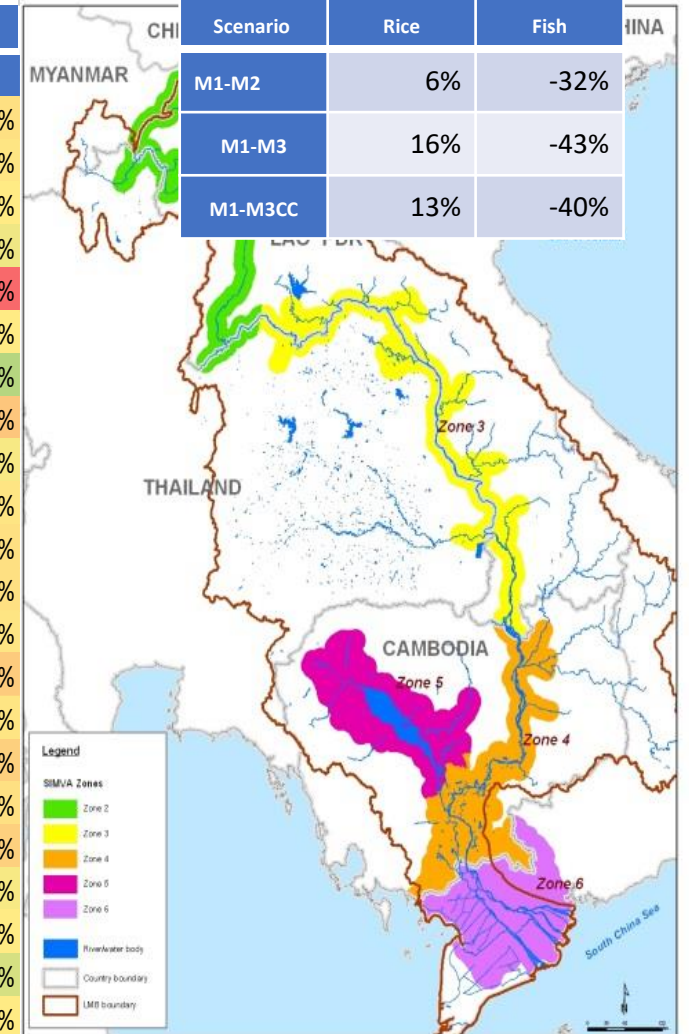
Social Impacts – Food Security

Reduction
in food surplus
by zone.

(see also
Irrigation and
Agriculture
presentation)

**Driest Scenario
Worst (C3)**

Effect of Climate Change on Food Security								
Zone	Food	M3	CC	C2	C3	CC	C2	C3
					Surplus Above Self Sufficiency (Average)			
					Change in Surplus			
Zone 4 C Cambodia Kratie to Viet Nam	Fish	34%	34%	34%	32%	0%	0%	-2%
	Rice	58%	63%	57%	57%	5%	-1%	-1%
Zone 5 A Cambodia-Tonle Sap river	Fish	5%	10%	14%	5%	5%	9%	0%
	Rice	45%	53%	47%	47%	8%	2%	2%
Zone 5 B Cambodia Tonle Sap lake	Fish	57%	53%	58%	32%	-4%	1%	-25%
	Rice	88%	89%	88%	88%	1%	0%	0%
Zone 2-Main – Lao PDR	Fish	-1%	9%	18%	8%	10%	19%	9%
	Rice	43%	38%	38%	36%	-5%	-5%	-7%
Zone 3-Main - Lao PDR	Fish	11%	14%	20%	12%	3%	9%	1%
	Rice	83%	83%	82%	82%	0%	-1%	-1%
Zone 2 B-Upper Thailand	Fish	43%	42%	44%	41%	-1%	1%	-2%
	Rice	86%	85%	85%	84%	-1%	-1%	-2%
Zone 2 C-Lower Thailand	Fish	84%	83%	83%	83%	-1%	-1%	-1%
	Rice	56%	54%	54%	50%	-2%	-2%	-6%
Zone 3 B Thailand-Mainstream	Fish	85%	84%	84%	84%	-1%	-1%	-1%
	Rice	64%	62%	62%	59%	-2%	-2%	-5%
Zone 3 C Thailand-Songkhram	Fish	84%	84%	84%	82%	0%	0%	-2%
	Rice	74%	72%	72%	69%	-2%	-2%	-5%
Zone 6 A VietNam Delta - freshwater	Fish	61%	63%	64%	62%	2%	3%	1%
	Rice	63%	64%	62%	63%	1%	-1%	0%
Zone 6 B VietNam Delta - saline	Fish	55%	62%	63%	60%	7%	8%	5%
	Rice	51%	52%	51%	51%	1%	0%	0%



Macroeconomic Impact

- 2040 GDP Projections**

	Cambodia	Lao PDR	Thailand	Vietnam	Total LMB
M1 Trend	48.3	39.2	79.8	82.3	249.6
M2	41.8	35.1	73.7	82.7	233.3
M3 (No CC)	39.6	30.2	68.9	82.5	221.2
M3CC	38.5	30.3	70.4	81.3	220.5
C2 (Wet)	36.3	30	69.6	78.9	214.8
C3 (Dry)	36.2	29.9	69.9	78.7	214.7

GDP Projections (average) for 2040 in constant 2017 Prices

	Cambodia	Lao PDR	Thailand	Vietnam	Total LMB
	Average	Average	Average	Average	Average
M3CC	3%	0%	-2%	1%	0%
C2 (Wet)	8%	1%	-1%	4%	3%
C3 (Dry)	9%	1%	-1%	5%	3%

% Reduction in GDP Projections for 2040 Due to Climate Change

SUMMARY & KEY FINDINGS

- **Climate change** will likely amplify negative impacts.
- Climate change poses a significant risk to both food security and GDP growth, particularly if predicted drier conditions materialise.
- Drier climatic conditions reduce hydropower benefits by up to \$2.2 billion in net present value and increase fish losses by ca 15%.
- The combined effects of over-investment in agriculture and hydropower and more severe climate change could compromise the prospects of lower Mekong basin countries achieving or sustaining lower or middle income status.
- Adaptation to climate change needs to take account of planned upstream developments and use climate financing opportunities (see MASAP).



