MRC Council Study – Flood Protection and Floodplain Development

Outline of Presentation

1. **Flood scenarios**

2. **Impact Assessment Approach**

3. **Results and Findings**

   ➢ Hydrology

   ➢ Flood Risks and Benefits

   ➢ Bio-resources

   ➢ Socio-economic

4. **Summary and Key findings**

1. Flood Scenarios

➢ M3 Scenario existing (2015) FP in simulations

➢ FP1 – No FP or Bank Protection change from 2007
- include development in floodplain (urban and irrigation/agriculture Cambodia)

➢ FP2- Urban protection at 1:100 ARP
- floodplain management 1:10 ARP rural
- Flood Plain delineation to maintain flood storage and flood conveyance (will affect Irrigation areas in Cambodia)

➢ FP3 - Dams operated for multipurpose use

2. Impact Assessment Approach

❖ **Models**

1. *Consider future floodplain developments and urban expansion*

2. *Simulate base and future conditions over 24 years for each scenario*

3. *Use Hydrology, Water Resource, sediment and Hydraulic Models. Flood Frequency*
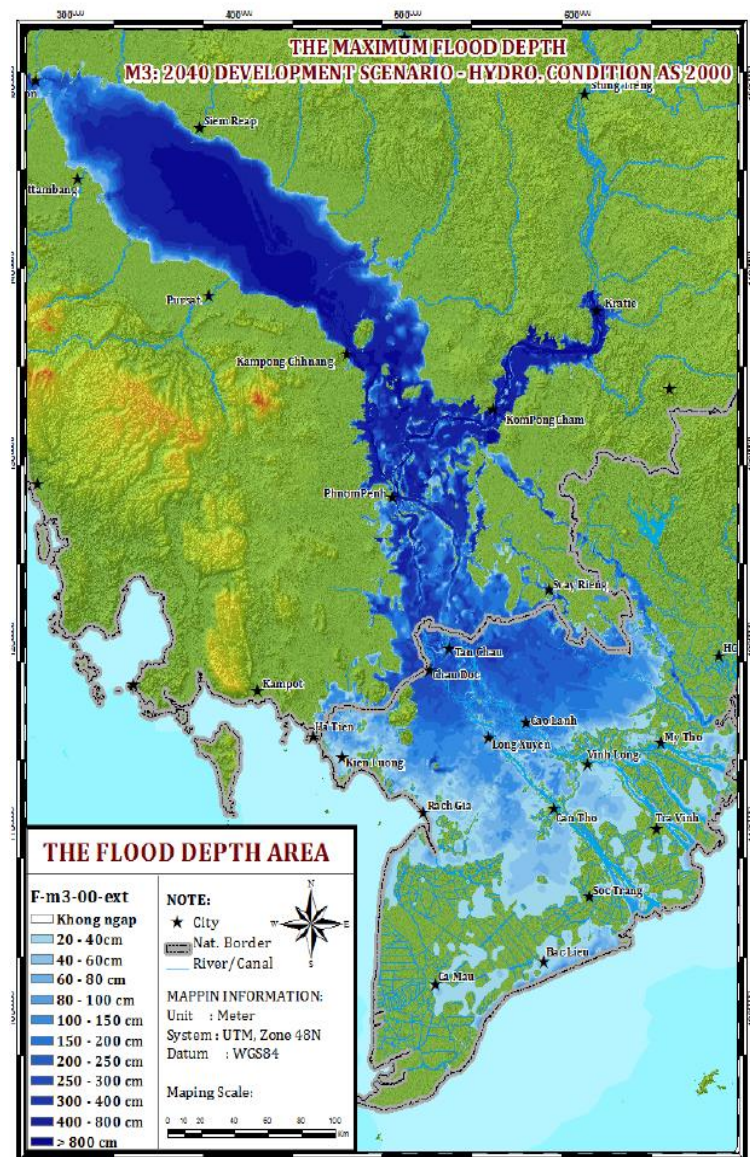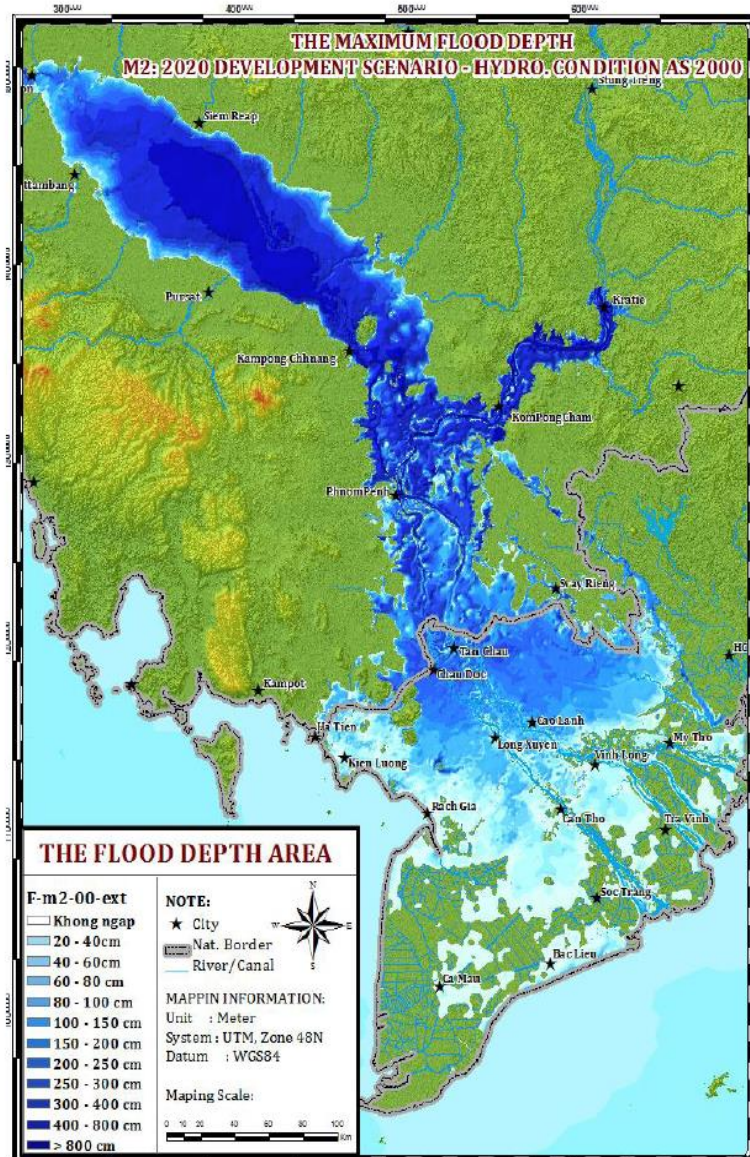
❖**Impact Tools**

1. *Flood Damage estimates for different level of protection in agriculture, infrastructure, urban*

2. *Biological resource assessment*

3. *Social and Economic changes at household and macro level*

Integrate models and impact tools to show how changes by 2040
Social-Environment-Economic
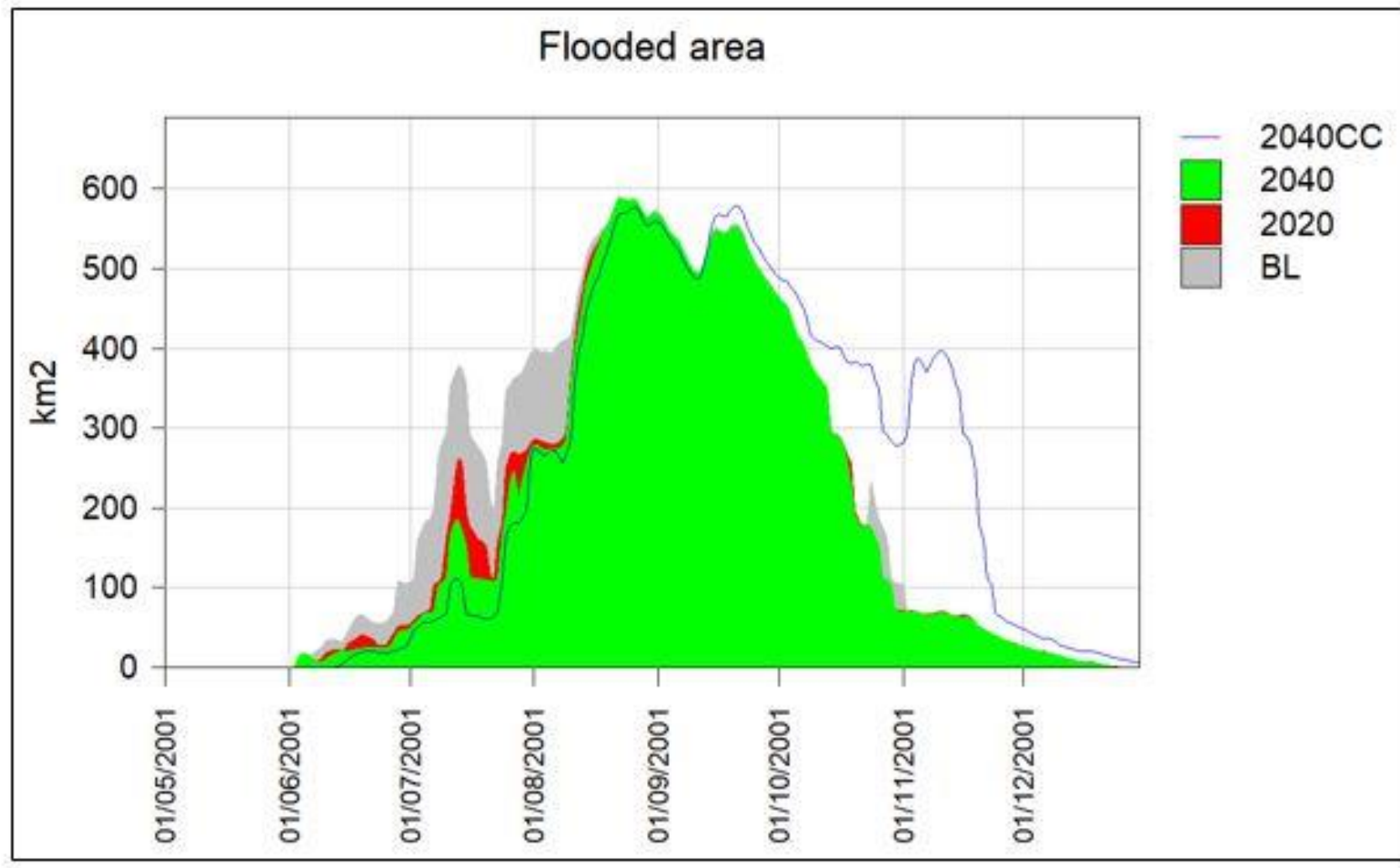
Figure·43.··Kampong·Cham·flooded·area·in·the·main·scenarios.¶

- Flow at Key Gauges and
- Water levels at district locations for damage calculation
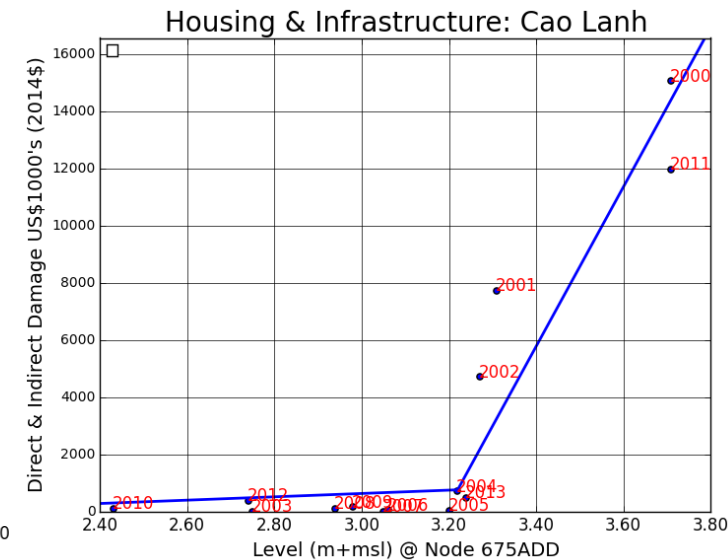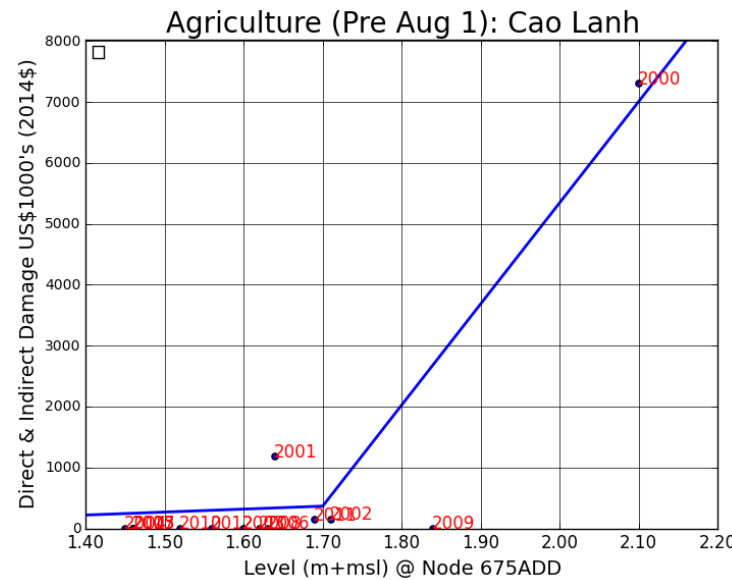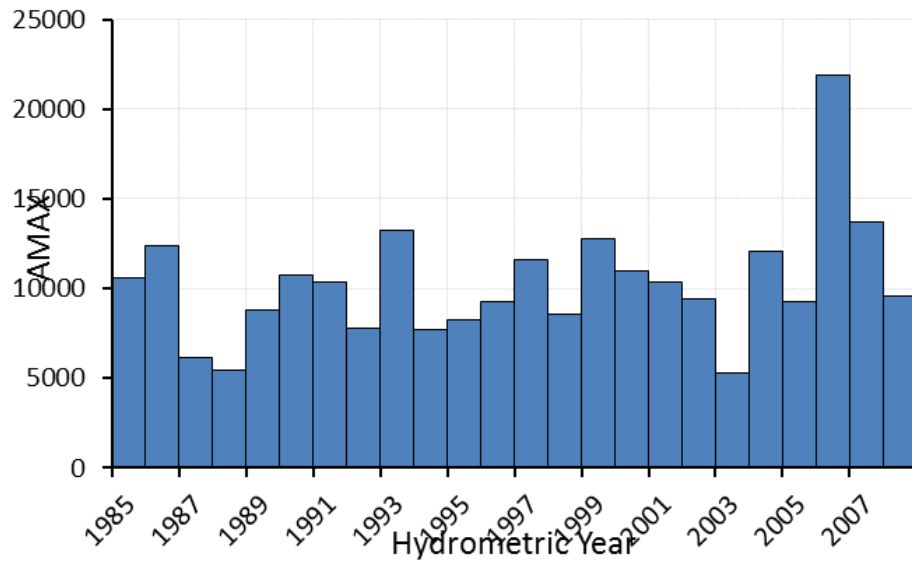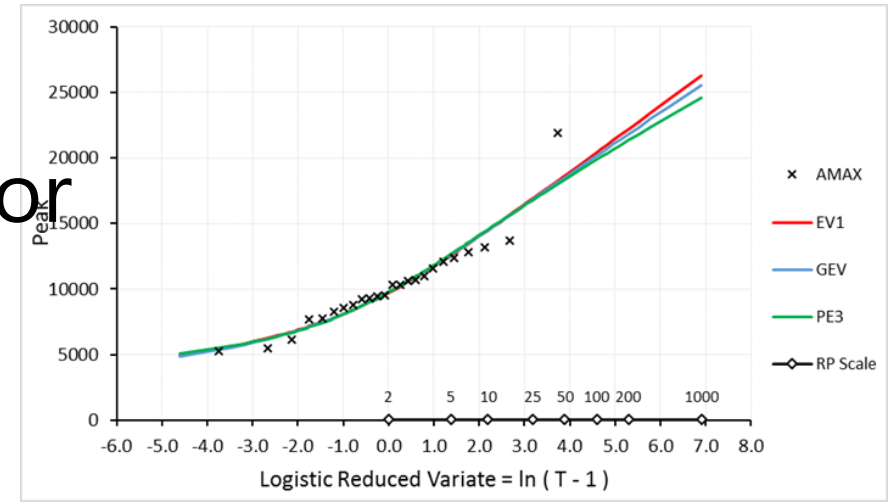
- Integrate Flood Damage Estimates
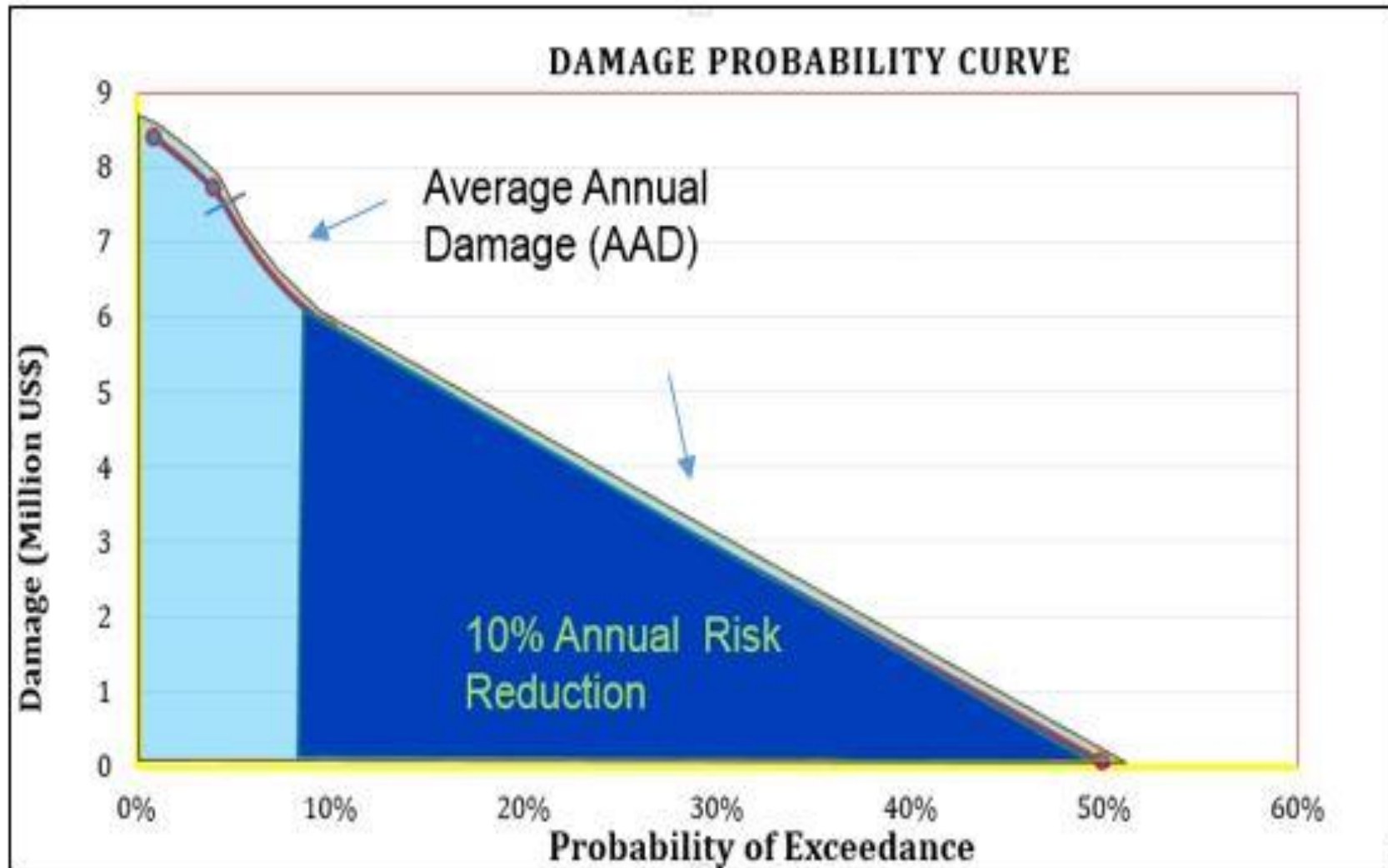
3. Findings – Flood Damage Analysis - Cambodia

- Summate from district to corridor for scenarios
- Consider change in Assets at risk.
- ➢ 2040 M3 Flood Damage less severe than M1 or M2 but with CC flood increases again
- ➢ Important that floodplain
- development does not encroach
- floodplain pathways

Corridor Cambodia	Socio economic Development	Water Infrastructure	Annual Average Damage ($m)		
	Year	Year	Agriculture	Other&Urban	Total
Scenario M1	2010	2007	4.6	4.1	8.7
Scenario M1	2040	2007	6.4	34.4	40.9
Scenario M2	2010	2020	2.8	2.6	5.4
Scenario M2	2040	2020	3.9	21.6	25.5
Scenario M3	2010	2020	2.8	2.6	5.4
Scenario M3	2040	2040	3.9	21.7	25.6
Scenario M3 CC	2010	2040	6.5	5.3	11.8
Scenario M3 CC	2040	2040	9.1	44.0	53.1
Scenario C2	2010	2040	14.4	14.1	28.5
Scenario C2	2040	2040	20.0	118.2	138.2
Scenario F1	2010	2040	8.9	7.2	16.1
Scenario F1	2040	2040	12.4	60.1	72.4
Scenario F2	2010	2040	3.8	0.6	4.5
Scenario F2	2040	2040	5.3	0.7	6.0
Scenario F3	2010	2040	16.8	16.8	33.6
Scenario F3	2040	2040	23.4	$ 141.16	$ 164.52

# 3. Findings – Flood Damage & Extreme Events - Vietnam

Flood defences
Extreme event

- Summate from district to corridor for scenarios
- Consider change in Assets at risk.
- ➢ 2040 M3 Flood Damage less severe than M1 or M2 but with CC flood increases again

Corridor Vietnam Fresh water	Socio economic Development	Water Infrastructure	Annual Average Damage ($m)			AAD With Defences 10yr Rural 100 yr Urban	Damage Extreme Flood Event ($m)
	Year	Year	Agriculture	Other&Urban	Total	With Defenses	1:100yr+
Scenario M1	2010	2007	5.4	24.8	30.2	2.6	155
Scenario M1	2040	2007	5.2	238.6	243.8	32.2	1,521
Scenario M2	2010	2020	3.7	16.9	20.5	3.7	123
Scenario M2	2040	2020	3.5	162.0	165.5	24.7	1,178
Scenario M3	2010	2020	3.6	16.7	20.3	3.7	121
Scenario M3	2040	2040	3.5	160.6	164.1	24.6	1,171
Scenario M3 CC	2010	2040	9.9	38.8	48.7	4.1	322
Scenario M3 CC	2040	2040	9.5	373.2	382.7	68.1	3,187
Scenario C2	2010	2040	21.8	56.6	78.4	18.2	427
Scenario C2	2040	2040	20.9	544.1	565.0	76.7	3,377
Scenario F1	2010	2040	15.2	44.3	59.5	15.3	330
Scenario F1	2040	2040	14.6	425.9	440.5	72.9	3,187
Scenario F2	2010	2040	9.9	6.6	15.3	Already	335
Scenario F2	2040	2040	9.5	63.4	72.9	Already	3,314
Scenario F3	2010	2040	16.8	33.6	16.8	9.3	427
Scenario F3	2040	2040	22.6	59.1	81.7	76.7	3,377

3. Results – Biological Resource

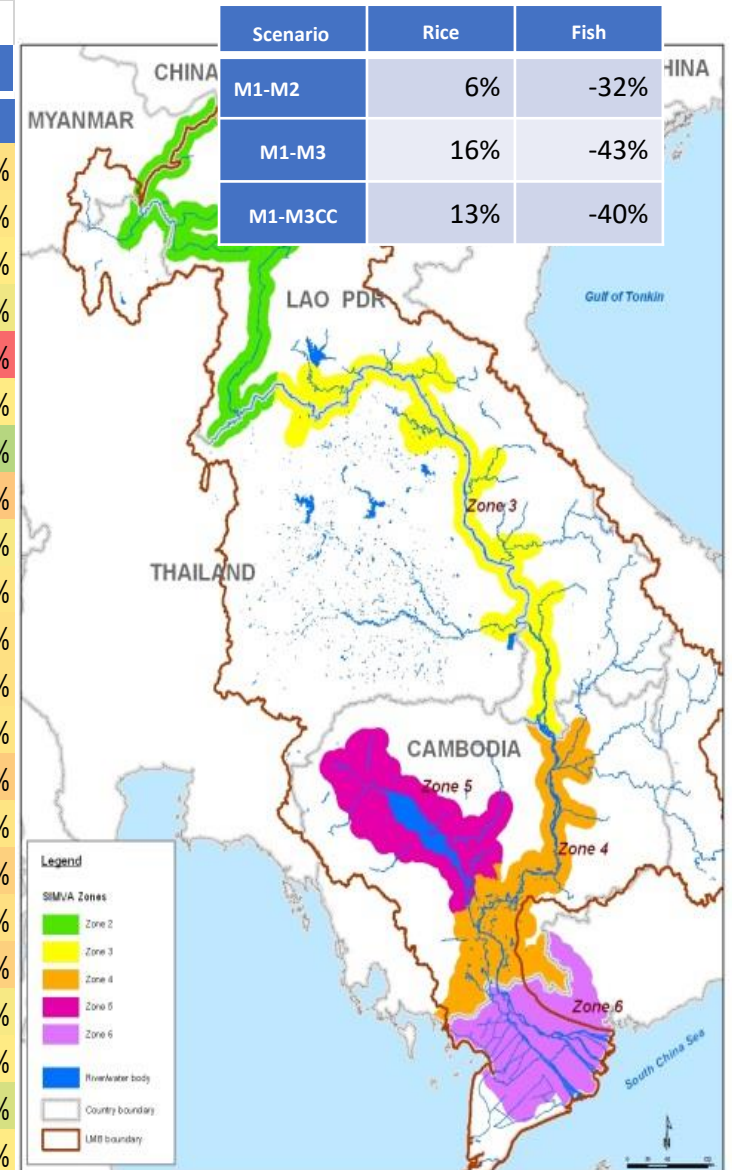– BioRA predict deterioration with Main Scenario M3CC but little additional change with flood protection
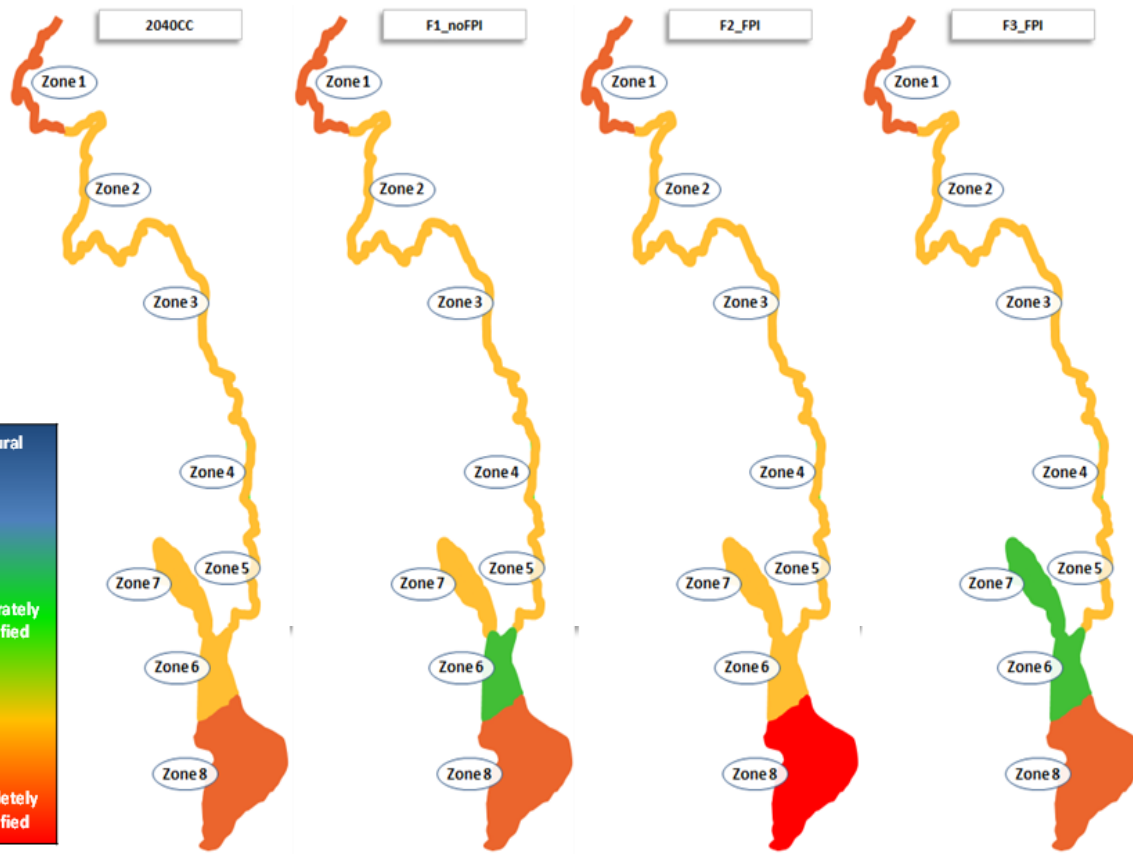
3. Social Impacts – Food Security

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%

Scenario	Rice	Fish
M1-M2	6%	-32%
M1-M3	16%	-43%
M1-M3CC	13%	-40%

Legend
SIMVA Zones
- Zone 2 (green)
- Zone 3 (yellow)
- Zone 4 (orange)
- Zone 5 (magenta)
- Zone 6 (purple)
- River/water body (blue)
- Country boundary
- LMB boundary

3. Macro-economic Impact

- ***2040 GDP Projections in 2017 prices***

	Cambodia	Lao PDR	Thailand	Vietnam	Total LMB
	Average	Average	Average	Average	Average
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
F1	39.5	30.4	70.4	82.7	223
F2	39.5	30.5	70.5	82.9	223.4
F3	39.6	30.4	70.4	82.9	223.3

GDP Projections for 2040 in constant 2017 Prices

	Cambodia	Lao PDR	Thailand	Vietnam	Total LMB
	Average	Average	Average	Average	Average
M3CC	0.0%	0.0%	0.0%	0.0%	0%
F1 (no FPI	2.6%	0.3%	0.0%	1.7%	1.1%
F2 Add FPI	2.6%	0.7%	0.1%	2.0%	1.3%
F3	2.9%	0.3%	0.0%	2.0%	1.3%

% Increase in GDP Projections relative to M3CC

- Flood risk and potential damage will increase 5 to 10 times as the value of assets increase with developing economies, especially in urban areas with higher exposure.

- Flood protection can be effective at reducing these damage increases but positive benefits of flooding will be reduced. Overall positive for GDP.

- Loss of sediment due to trapping upstream will lead to more bank erosion threatening the integrity of some defences

Thank you