The MRC Regional Stakeholder Forum

14th – 15th December 2017

Vientiane, Lao PDR

MRC Council Study - Hydrologic and Water Resource Assessment

Presented by : Sopheap Lim, MRCS

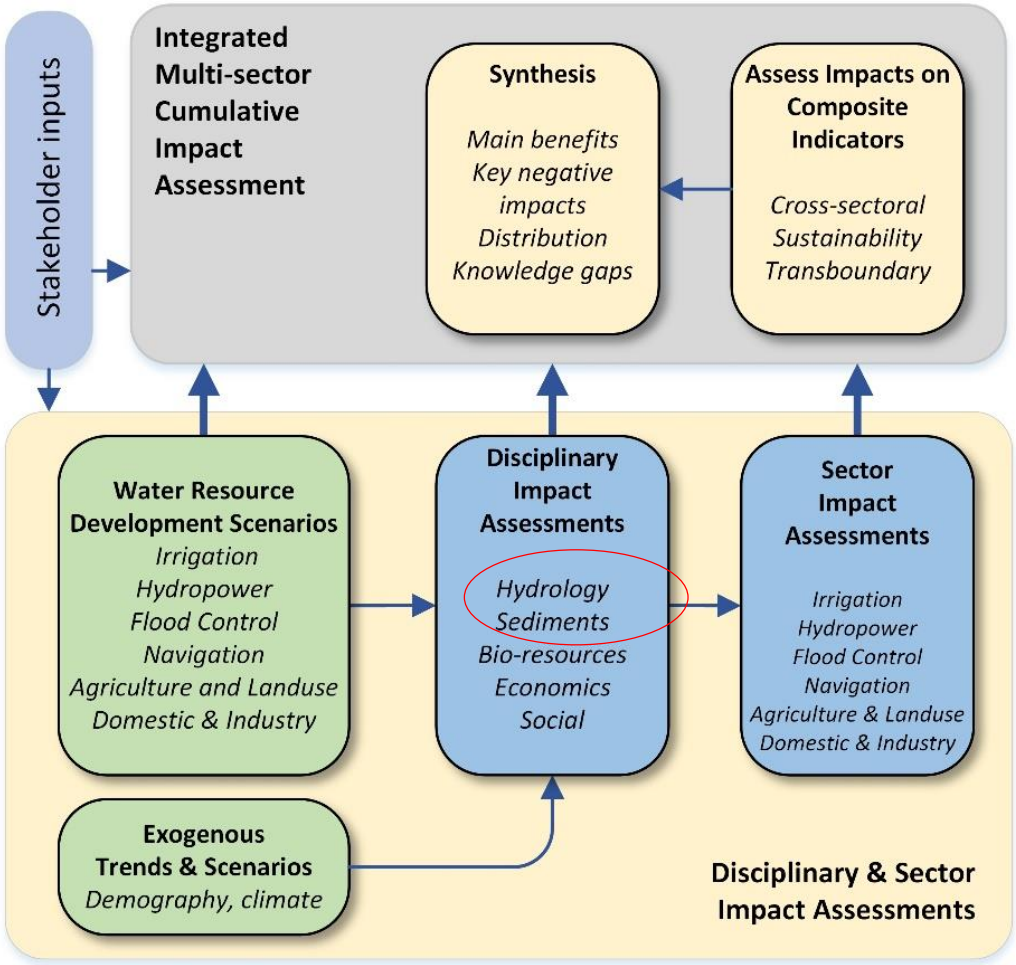
Outline of Presentation

- **Summary**

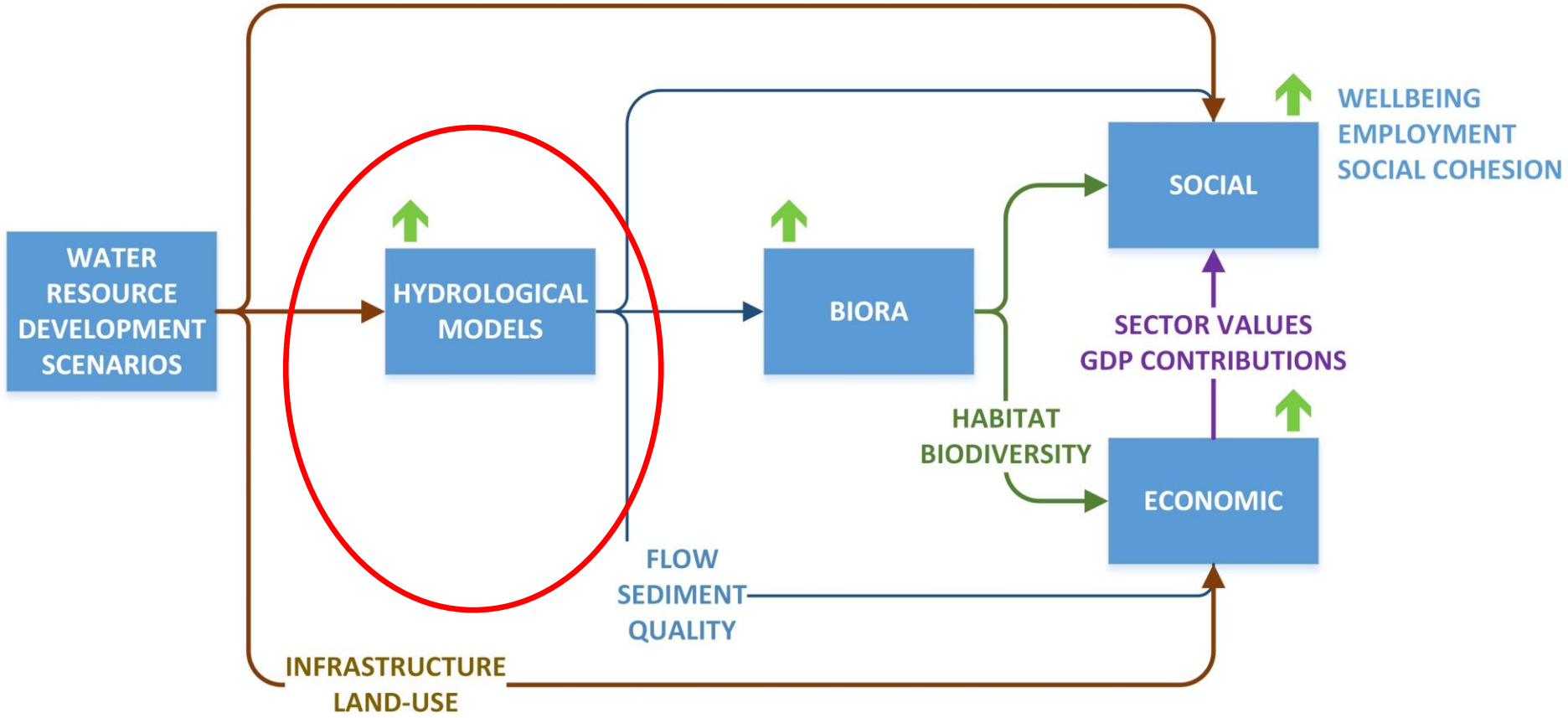
1. **Background**
2. **Modelling Approach**
3. **Modelling Results**
4. **Conclusion and Key Messages**

Summary

The hydrologic modelling assessment is the foundation for the subsequent analysis in this study.

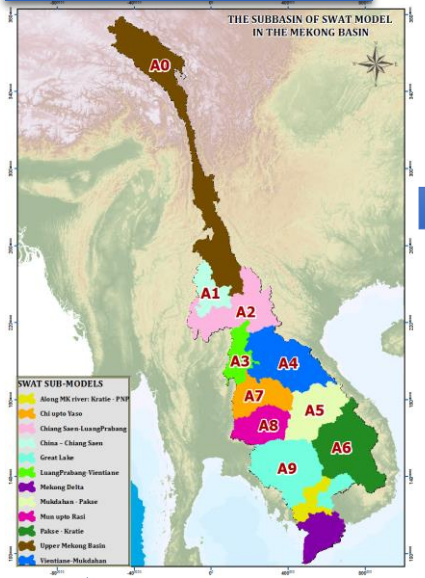


CONNECTION OF INDICATORS

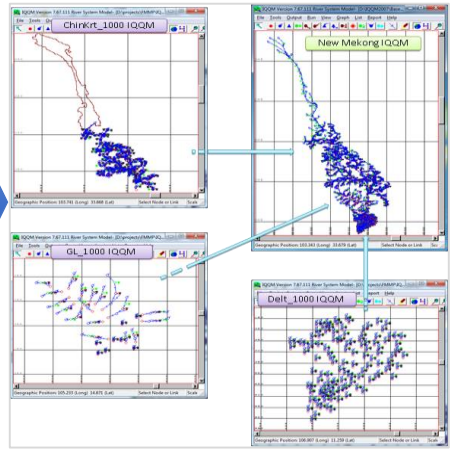


MODELLING FLOW, SEDIMENT AND QUALITY

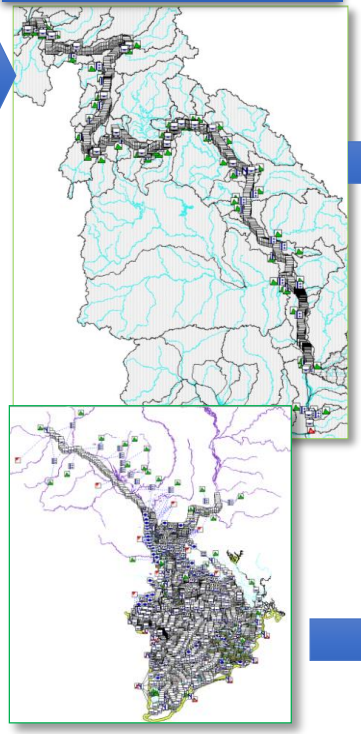
Soil and Water Assessment Tool –SWAT (DSF)



Water resource IQQM (DSF)

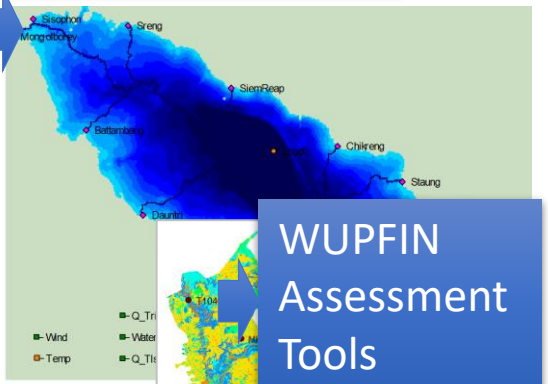


Hydrodynamic, sediment and water quality – ISIS (DSF)

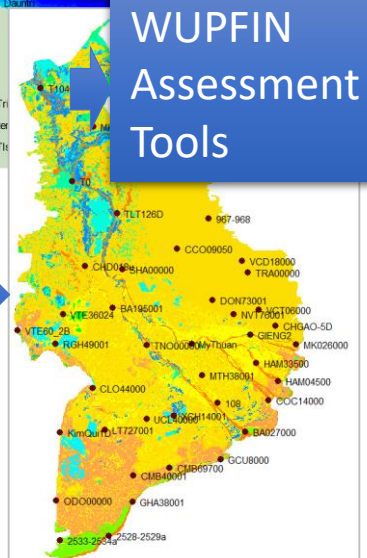


DSF Assessment Tools (DSF)

WUPFIN 3D-EIA Model Tonle Sap



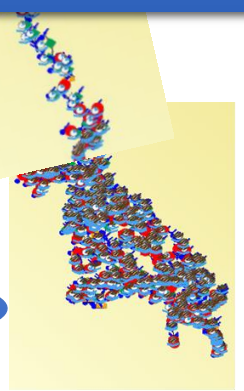
WUPFIN Assessment Tools



Data from MC

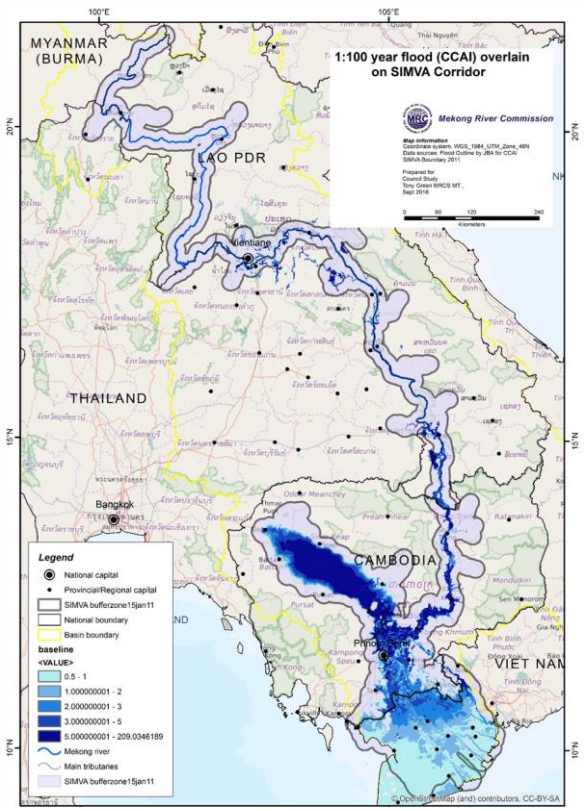
MRC Knowledge Base

Water/Sediment Resource -eWater SOURCE



DEVELOPMENT INFRASTRUCTURES USED IN MODEL

To assist in predicting development impact on economic, social and environmental condition, the following selected developments are modelled:



Dams in the Upper and Lower Part

Flood Protection Structure and Food plain Infrastructure

Irrigation development

Agriculture and Forest cover reduction and increase

Navigation

Domestic and Industrial Water use

MODELLING APPROACH

Definition of Scenarios

Combined Main Scenario

2007 Development → **M1 Early Development 2007**

+

Under construction and planned future change of related six sectors → **M2 Development 2020**

+

Anticipated future change of related water six sectors + **With Climate Change** → **M3 Development 2040**

Hydropower
Agriculture
Land use Change
Irrigation
Flood protection
Climate Change

Sub-Scenario

M3

M3CC With Climate Change

- Sector modifications
- Changing only definition of each corresponding sector

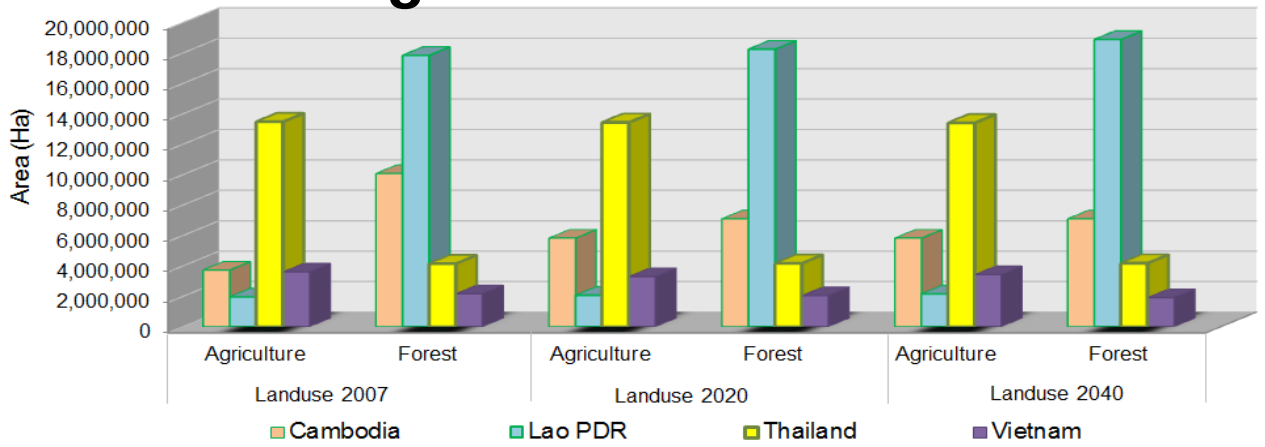
MODELLING APPROACH

Detail of Sub scenarios

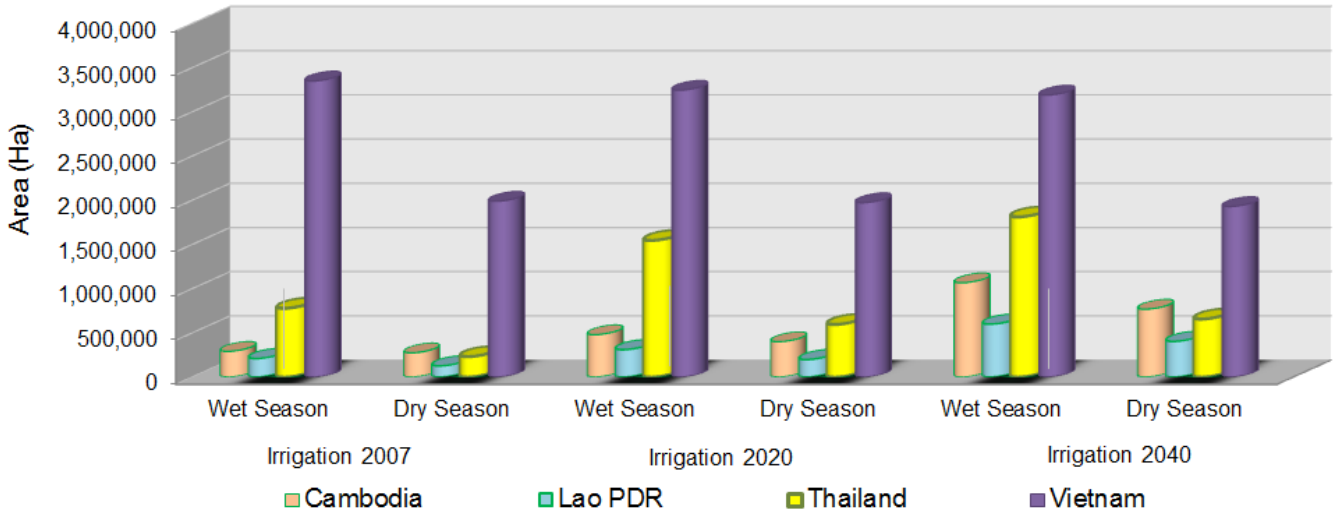
N^0	Description	Sub Scenarios Name	Detail information of sub-scenarios
1	Planned Development 2040 with CC Wetter	**C2**	M3 with climate change (GFLD)
2	Planned Development 2040 withCC Drier	**C3**	M3 with climate change (GISS)
3	Planned Development 2040 without HPP	**H1.a**	M3CC without dams development (**consider only dams in M1**)
4		**H1.b**	M3CC with **Chinese dams and tributary dams** *but without ALL LMB mainstream dams*
5	Planned Development 2040 with HPS1	**H2**	M3CC with a**ll dams in MB in 2040 =M3CC**
6	Planned Development 2040 with HPS2	**H3**	M3CC (with all dams but only mainstream dams are with mitigation and operation)
7	Planned Development 2040 without iRR	**I1**	M3CC without iRR
8	Planned Development 2040 with High Level	**I2**	M3CC with High Level iRR
9	Planned Development 2040 without ALU	**A1**	M3CC without ALU
10	Planned Development 2040 with High Level	**A2**	M3CC with High Level ALU
11	Planned Development 2040 without FPF	**F1**	M3CC without Flood Protection
12	Planned Development 2040 with FPF2	**F2**	M3CC with Urban protection at 1:100 ARP (100 year return period) + floodplain management 1:20 ARP
13	Planned Development 2040 with FPF3	**F3**	M3CC with Joint Operation among mainstream dams and selected tributary dams for flood management and protection

MODELLING APPROACH FOR LANDUSE AND IRRIGATION

Landuse Changes– Model In SWAT



Irrigation Changes – Model In IQQM/SOURCE

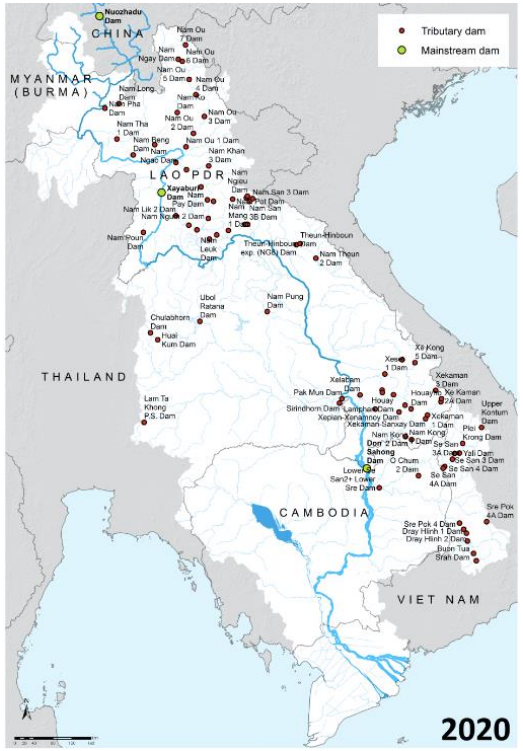


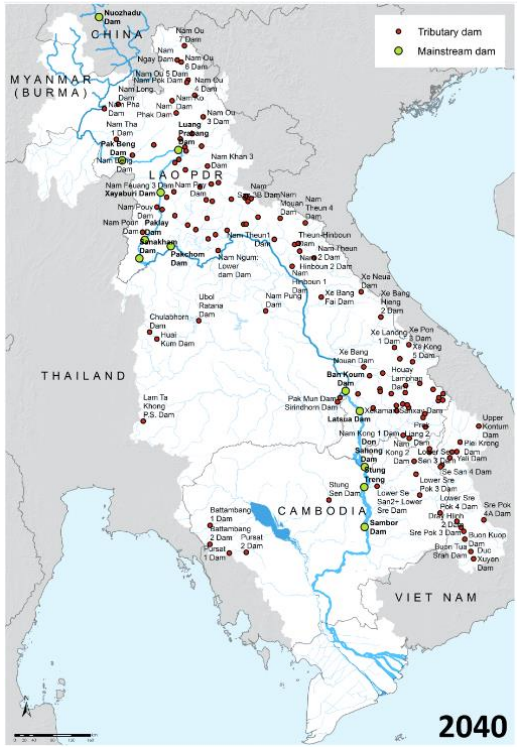
MODELLING APPROACH FOR HYDROPOWER

Tributary and China Dams - Model in IQQM/Source include rule curves and sediment Nutrient Trapping

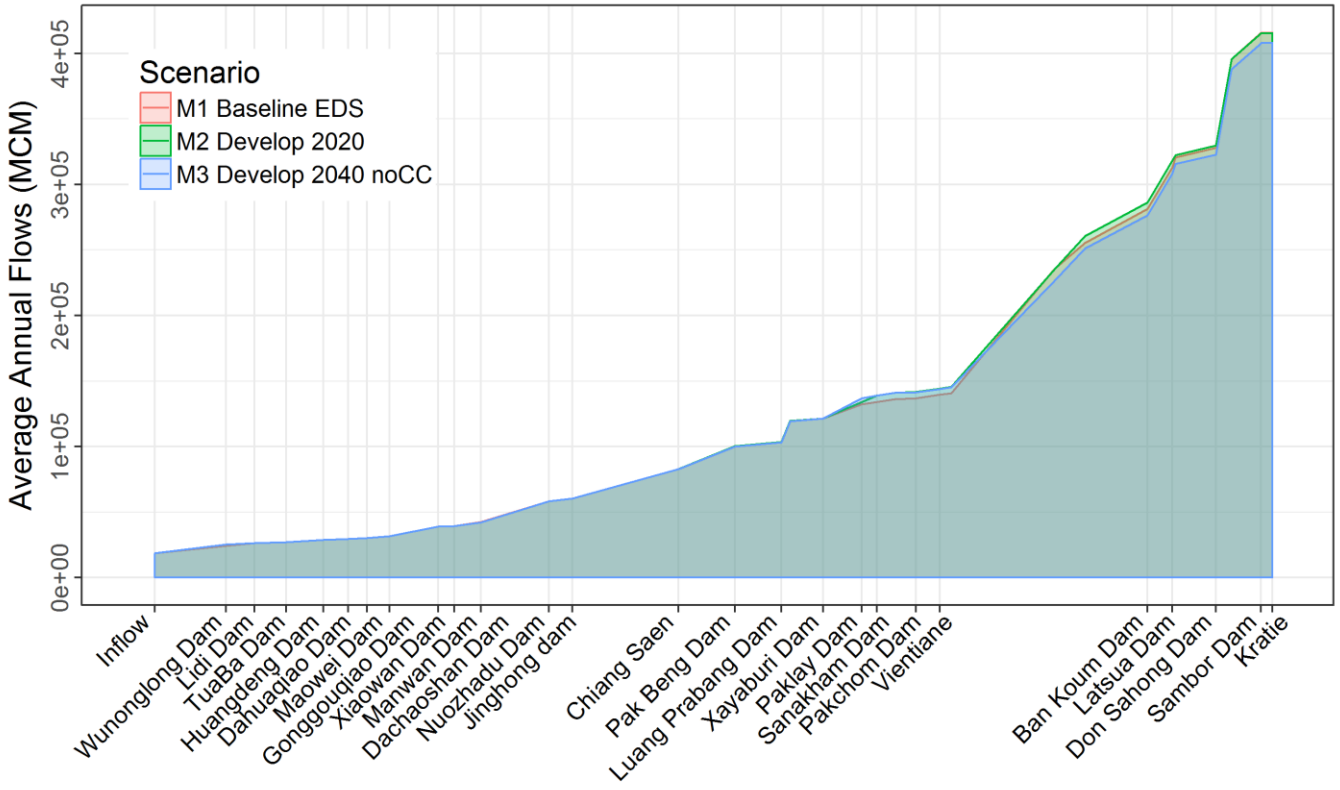
Mainstream Dams - model in ISIS Hydrodynamic and Sediment/Water Quality. Include Sediment Flushing and other operations according to Scenario

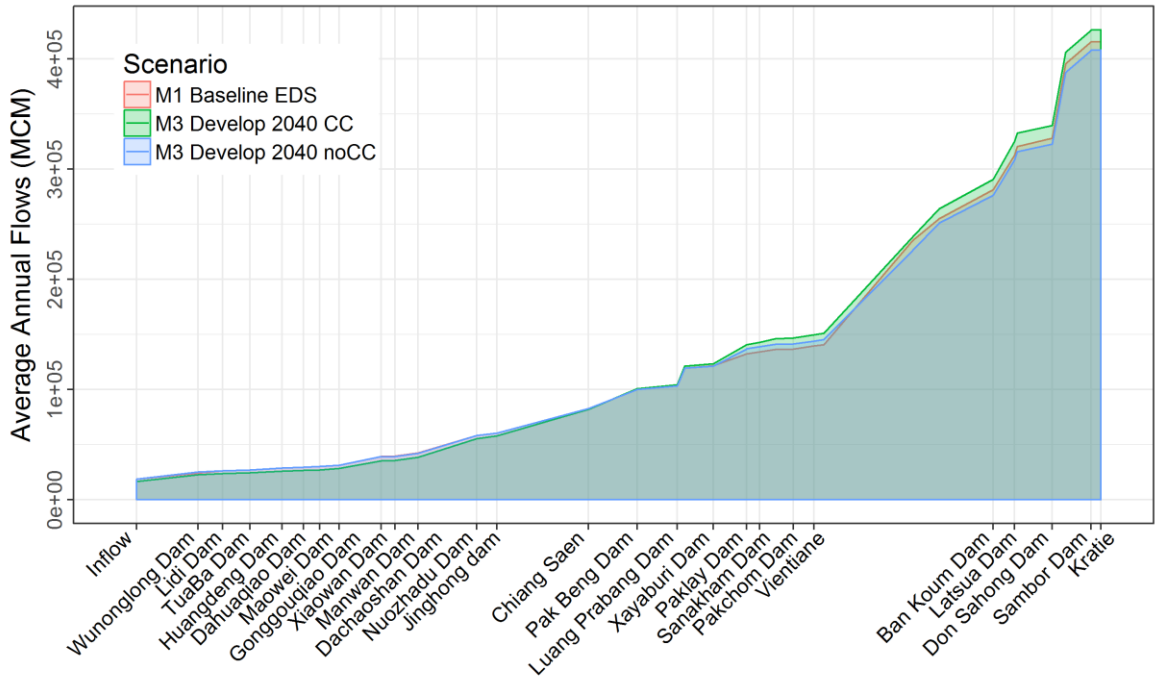
Scenario	Numbr of Project	Annual Energy (Gwh)
Early Development 2007	21	9373.5
Development 2020	101	33862.3
Development 2040	130	46824.3



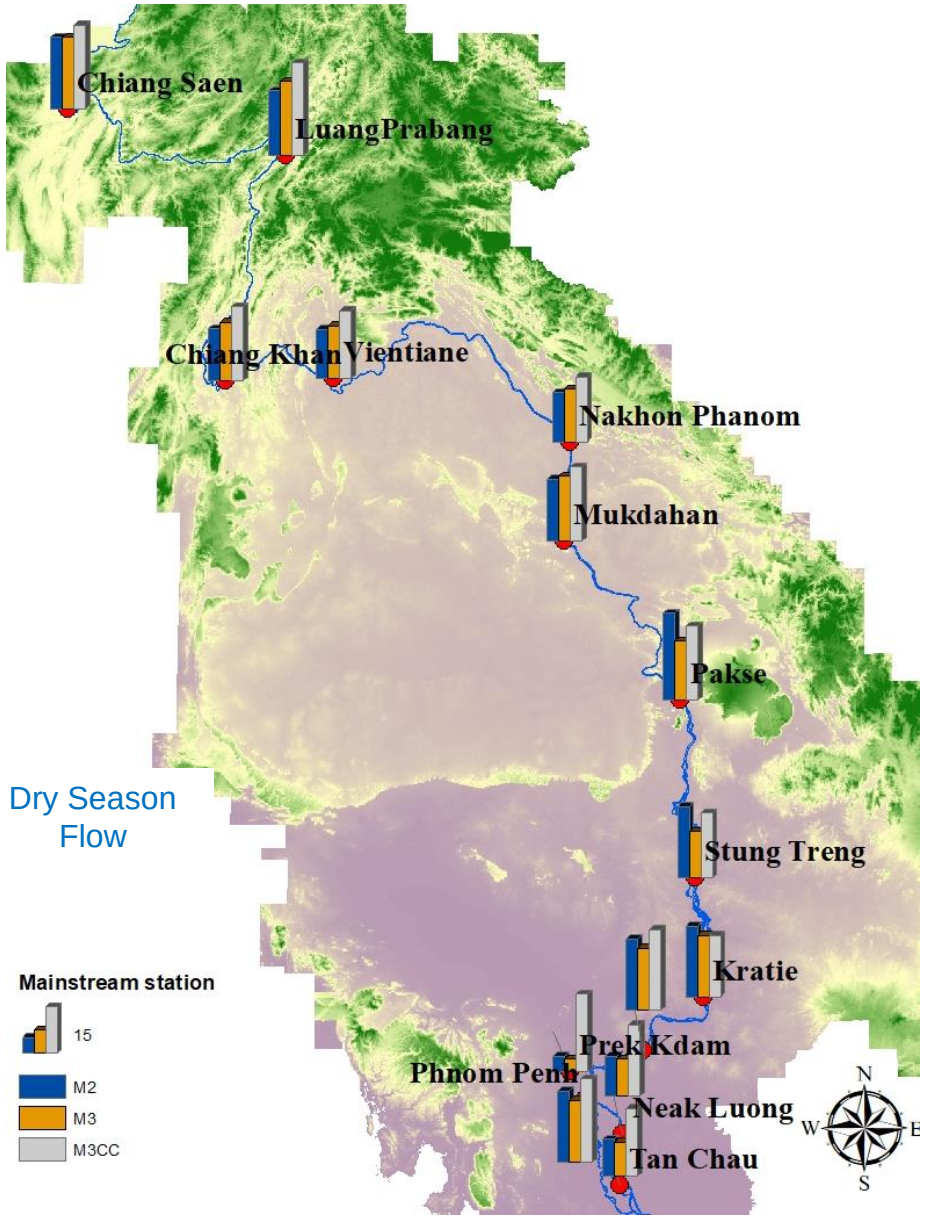


MODELLING RESULTS

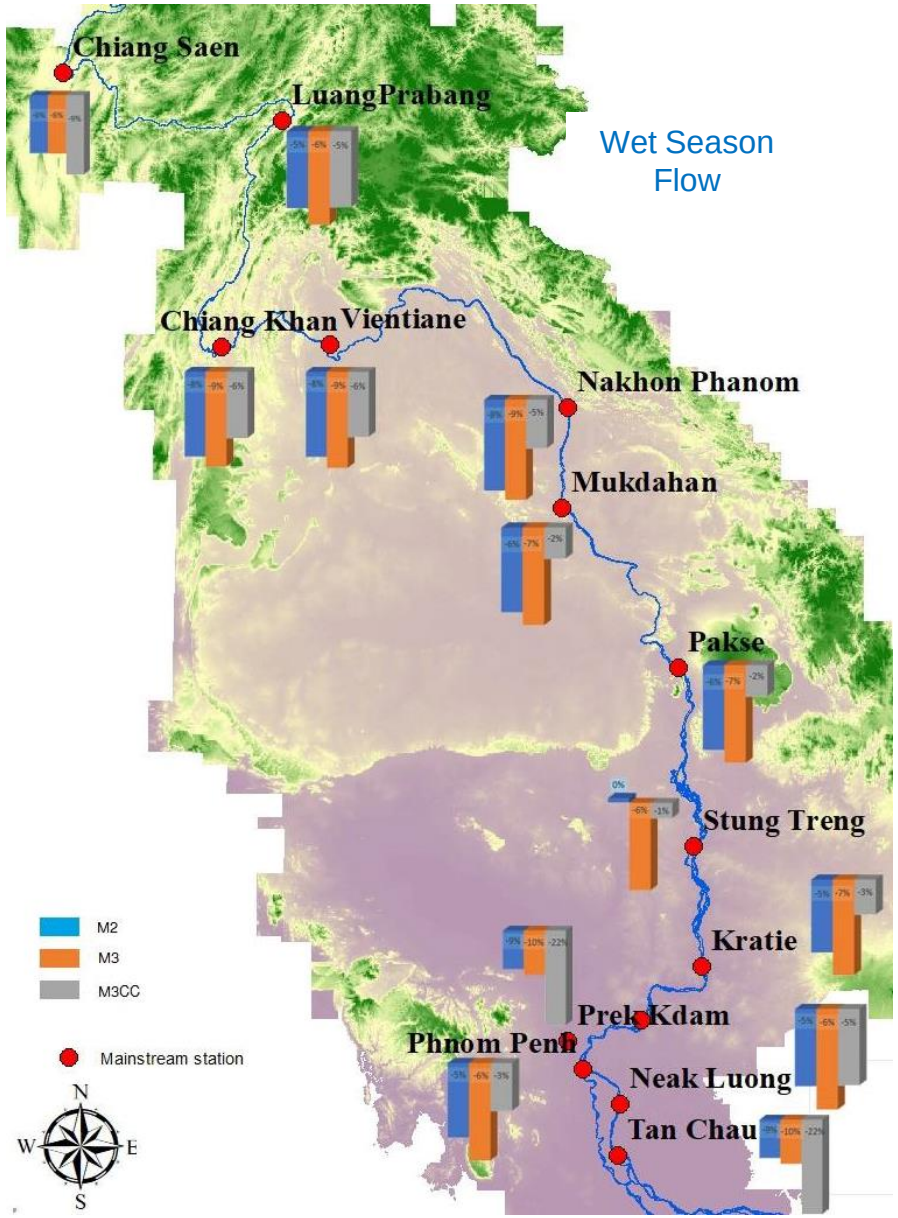




MODELLING RESULTS

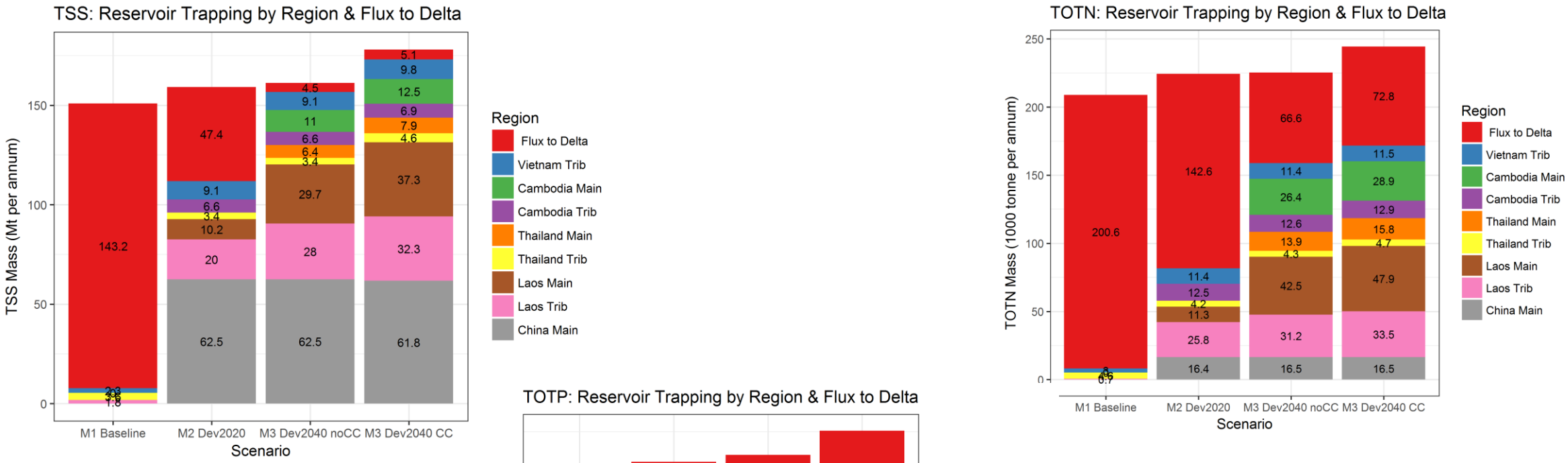


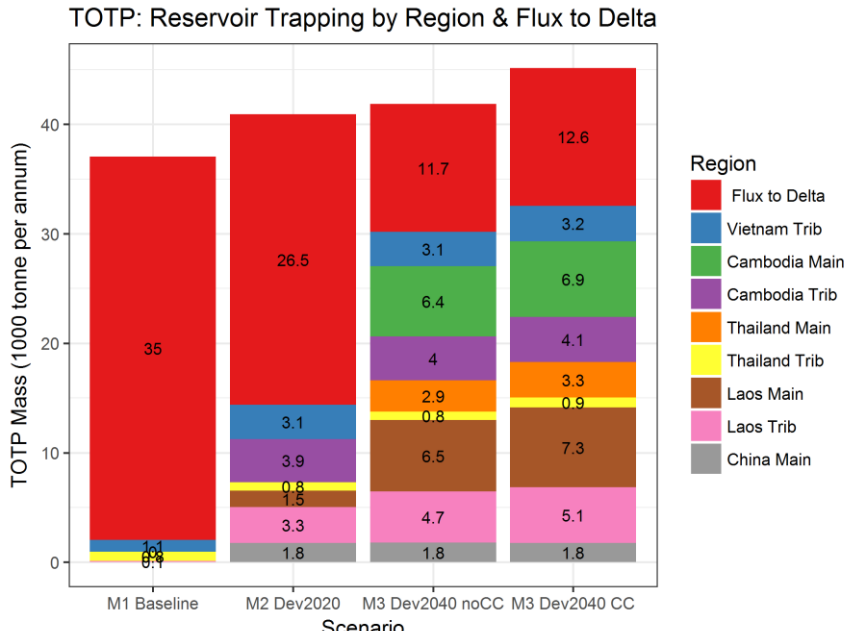
Dry Season Flow



Wet Season Flow

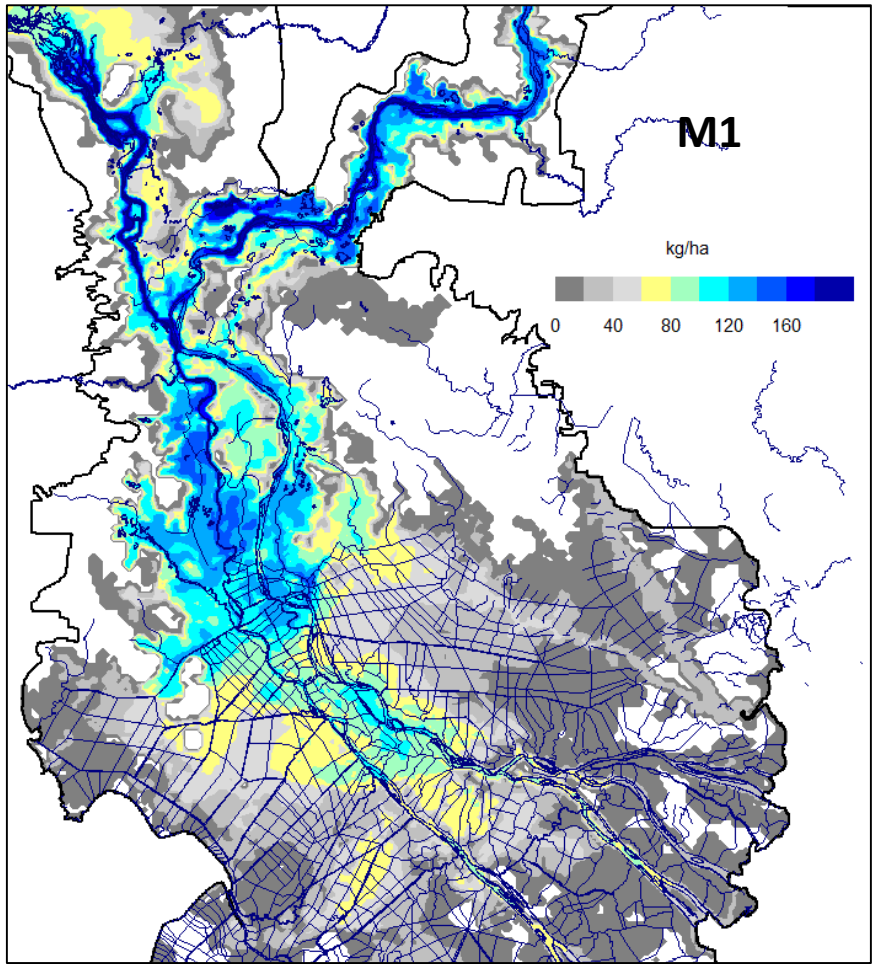
MODELLING RESULTS

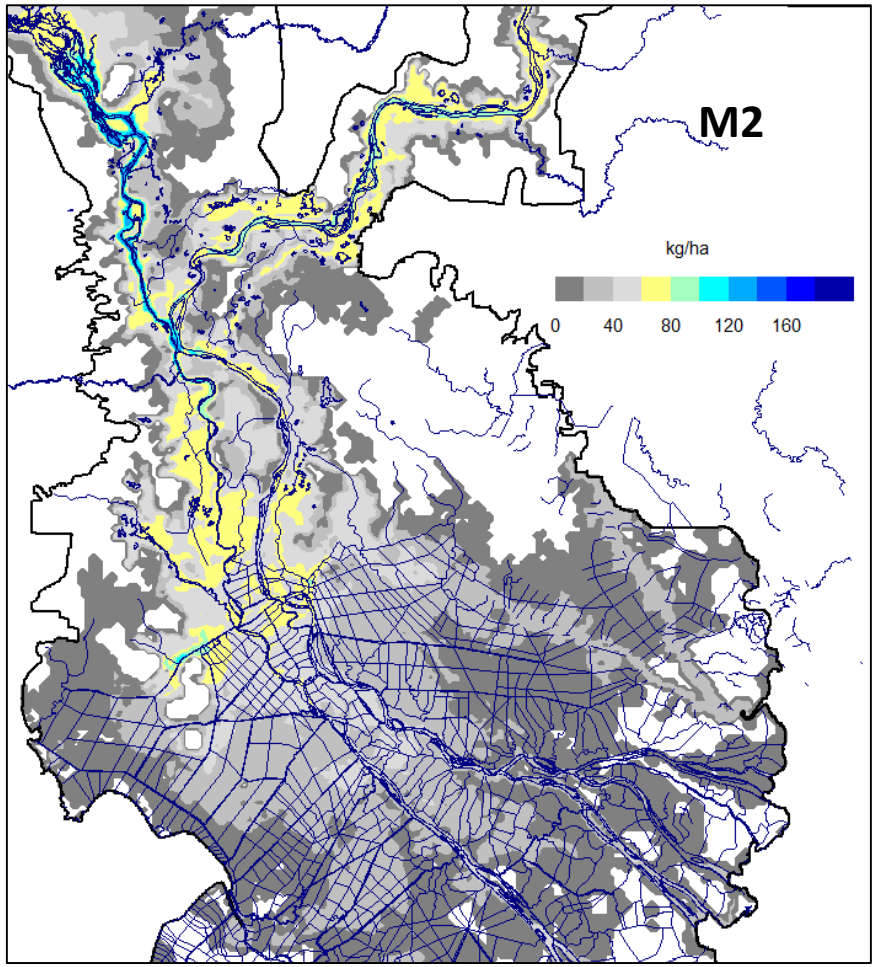




MODELLING RESULTS

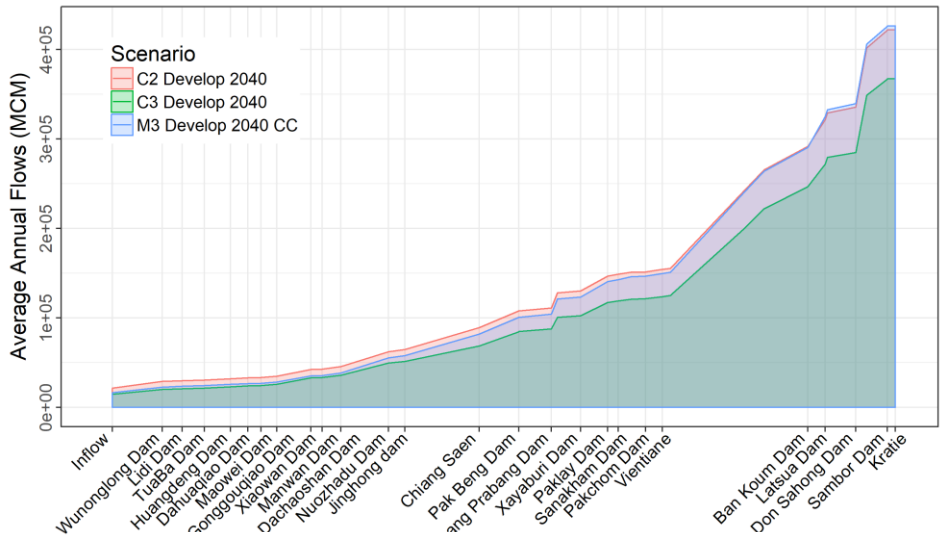
Delta fisheries

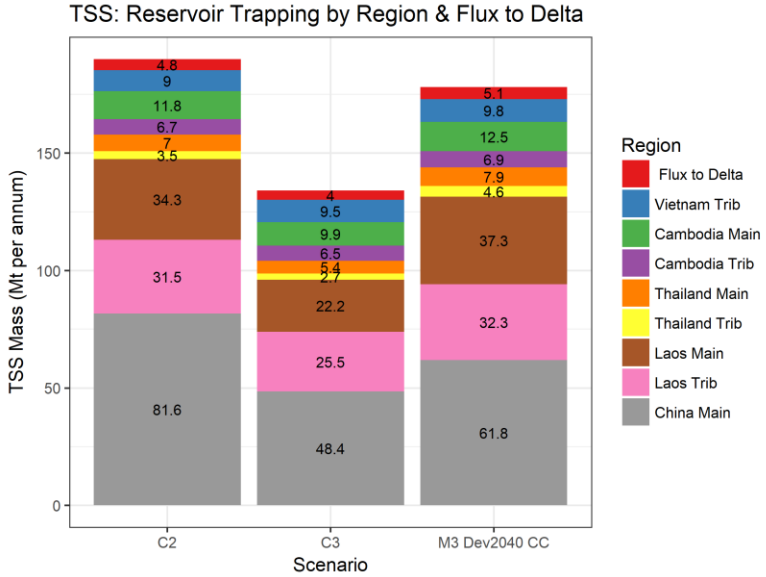




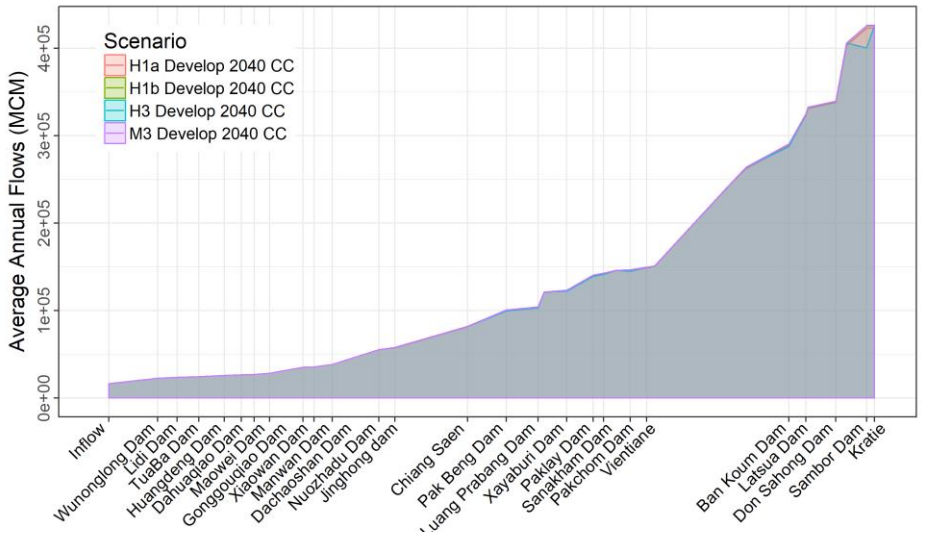
MODELLING RESULTS - SUBSCENARIOS

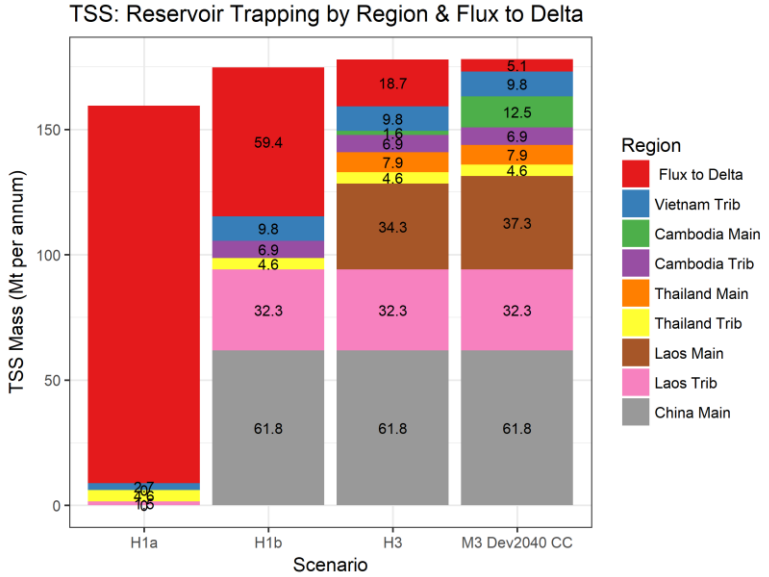
Climate Change





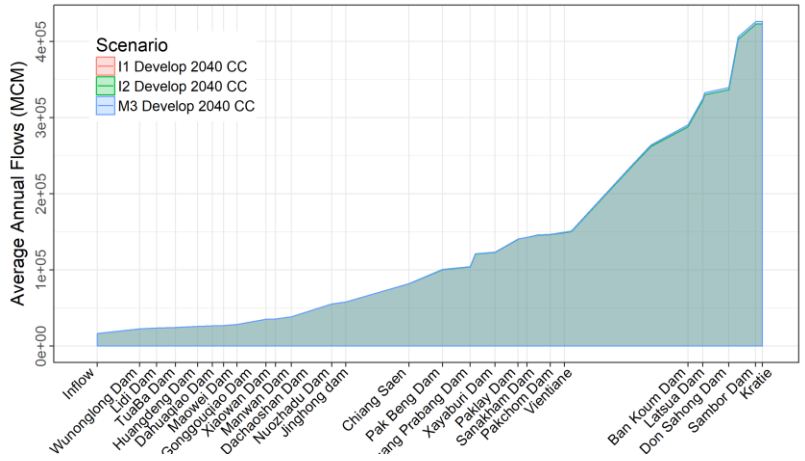
Hydropower

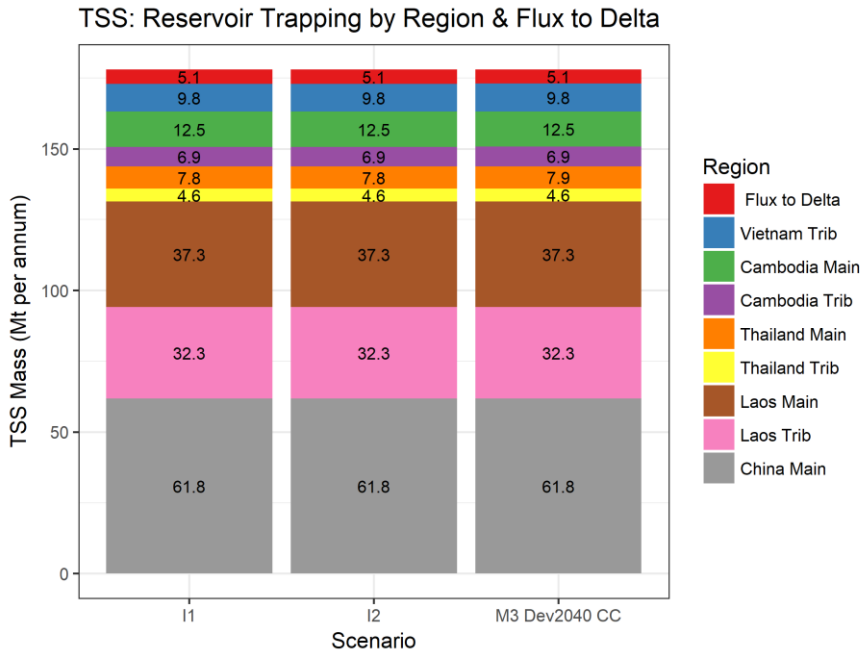




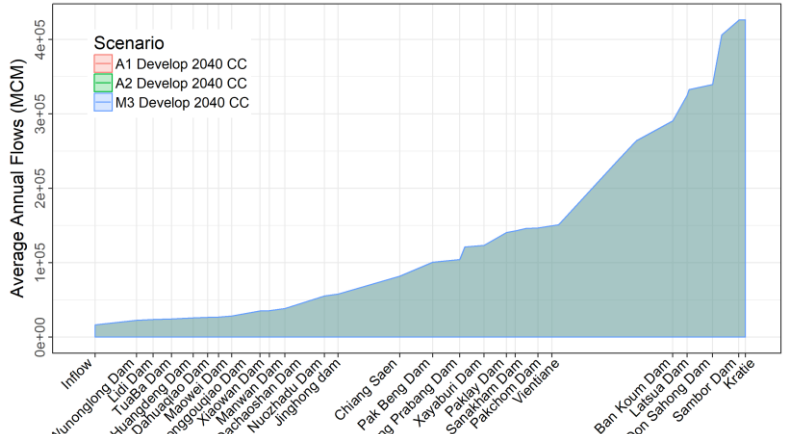
MODELLING RESULTS - SUBSCENARIOS

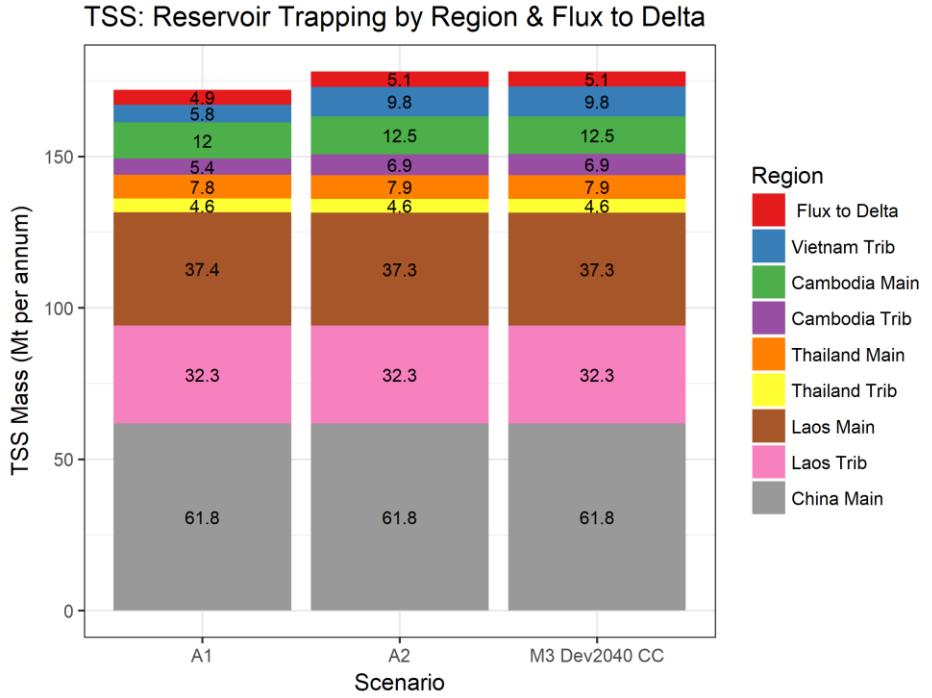
Irrigation





Land Use Change





CONCLUSION & KEY FINDINGS

- Methodology for Modelling is to use Accepted **DSF Tools/Models** together with **eWater** and **WUP-FIN Models** familiar to MCs
- Hydropower projects in the Mekong Basin **reduce wet season flows and increase dry season flows.** However, The differences in total flow volumes were subtle
- **Reduced sediment and nutrient transport downstream** caused by hydropower projects in the Mekong Basin, except for H1a
- **Dam mitigation measures** have the effect of increasing the sediment load reaching Delta
- **Full hydropower development** (other than scenario H1a and H1b) reduces lake, floodplain and coastal fisheries production 40% to 70% depending on the area
- **Issues associated with change** described in sector studies, bio resource assessment, socio and macro economics.

Thank you