**UNESCO-JASTIP** Joint Symposium on Intra-Regional Water Security and Disaster Management



United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme



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## EVALUATION ON THE IMPACTS OF UPSTREAM DAM DEVELOPMENT ON SALINITY INTRUSION INTO VIETNAMESE MEKONG DELTA

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### MAINSTREAM AND TRIBUTARY DAMS



## THE OVERALL OBJECTIVES OF THE PROJECT



## Map of the installed equipment

Turbidity meter Salinity meter





## **2. Specific objectives of the study**

- To assess the current status of the drought and salinity intrusion in 2016
- 2. To determine the correlation between the discharge to the delta and salinity concentration at some monitoring stations
- 3. To elucidate the impact of dam operation on salinity concentration and intrusion length by numerical simulations



## **3. Results and discussions**

4	5	3	2	6	1
Manwan	Dachaoshan	Jinghong	Xiaowan	Gongguoqiao	Nuozhadu
.986-1992 670MW_1993 0.92 x10 <sup>9</sup> m <sup>3</sup>	1996- Nov.2003 1350MW_2001 0.89 x10 <sup>9</sup> m <sup>3</sup>	2003-Apr.2008 1750MW 1.14 x10 <sup>9</sup> m <sup>3</sup>	2001-Dec.2010 4200MW 14.56 x10 <sup>9</sup> m <sup>3</sup>	2008 -Sep.2011 900MW 0.316x10 <sup>9</sup> m <sup>3</sup>	2006-Mar.2014 5850 MW- Sep.2012 23.7 x10 <sup>9</sup> m <sup>3</sup>

#### 3.1. The extreme salinity condition in 2016





- The salinity in 2016 is extremely high.
- The maximum salinity concentration  $(S_{max})$  in Jan almost equals to the peaks of other years
- The peak in 2016 shifts from Mar or Apr to Feb



#### 3.2. Change of flow and salinity concentration in the post-cascade dam period



- The flood flow recorded at Kratie station decreases significantly in the period 2009-2011 and 2012-2016. It is due to the appearance of the 2 large reservoirs, Xiaowan (2010 14.56x10<sup>9</sup>m<sup>3</sup>) and Nuozhadu (2014 23.7x10<sup>9</sup>m<sup>3</sup>)
- The active volume of the 2 reservoirs accounts for 12.2% of annual mean discharge in many years, from 1990 to 2009.

#### 3.2. Change of flow and salinity concentration in the post-cascade dam period



- In the dry season, the total active storage capacity of two Xiaowan and Nuozhadu dams accounts for 22.2x10<sup>9</sup>m<sup>3</sup>, about 25% of the average total dry flow (Nov - May) at Kratie station.
- The dam operation strongly affects on water releasing downstream and so as salinity intrusion in Vietnamese Mekong Delta
- The dry flow increases slightly in the middle of dry season

#### 3.2. Change of flow and salinity concentration in the post-cascade dam period



Correlation between discharge to the VMD and max salinity concentration in Jan and Feb, 2016

#### 3.3. Numerical simulation





## Comparison of observed and simulated discharge at Chau Doc station



Comparison of observed and simulated salinity concentration at Dai Ngai station

No.	Scenario	S <sub>max</sub> in Dai Ngai (g/l)	S <sub>max</sub> in Tra Vinh (g/l)	Salinity intrusion length	
				From Tran De estuary (km)	From Co Chien estuary (km)
1	Baseline (Sc0)	13.8	12.7	57	54
2	Sc1	7.4	8.3	41	47



No.	Scenario
Baseline (Sc0)	Real condition of dry season in 2016
Sc1	Dam operation 1 month earlier

## 4. Conclusions and recommendation

- The flood flow gets decreasing gradually but becomes considerable in the period of 2009-2011 and 2012-2015 due to the 2 largest dams completion and water storing process.
- The dry flow increases slightly in the mid-dry season. It should be due the dam operation for electric generation.
- The dam operation strongly affects on water releasing downstream and so as salinity intrusion in Vietnamese Mekong Delta
- The salinity intrusion tends to start and reach the peak sooner than previous years
- Information about dam operation and hydrological/meteorological data upstream should be transparent sharing for preparedness downstream, especially in the context of climate change and sea level rise.



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