HYDROPOWER DEVELOPMENT IN MEKONG RIVER BASIN: DOWNSTREAM IMPACTS AND NEW CHALLENGES IN THE CONTEXT OF CLIMATE CHANGE

By Nguyen Nhan Quang

Independence consultant

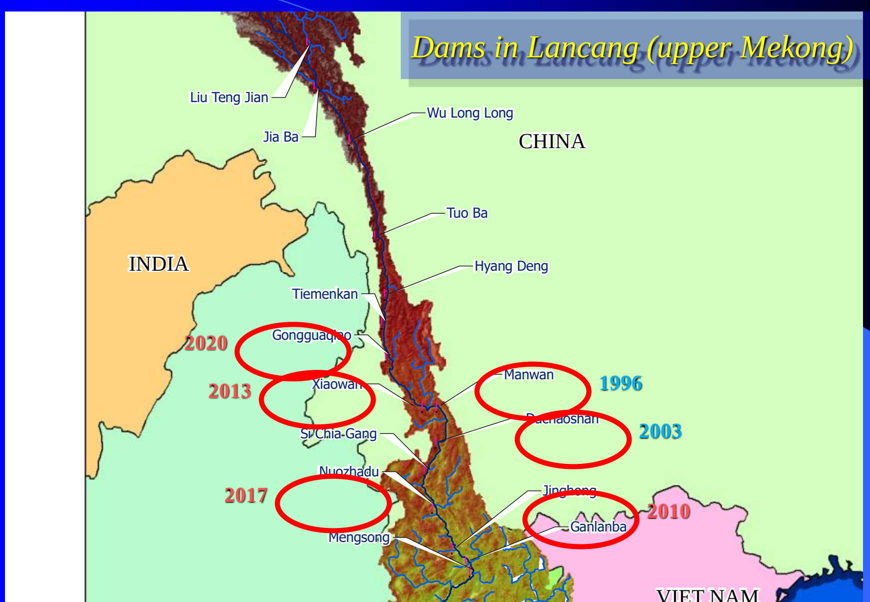
In the upper Mekong (Lancang-China)

1980 Hydropower development plan:

- 25 hydropower dams in the mainstream with total installed capacity is 25,870 MW
- 120 hydropower dams in tributaries with total capacity of 2,600 MW

Hydropower development in China:

Name	Catchment area (km2)	Capacity (MW)	Status
Gonguoqiao	97,200	750	Under Const.
Xiaowan	113,300	4,200	2001 – 2010
Manwan	114,500	1,500	1986 - 2003
Dachaosan	121,000	1,350	1996 – 2003
Nuozhadu	144,700	5,500	Under Design
Jinghong	149,100	1,500	2003 – 2010
Ganlanba	151,800	250	Under design
Mengsong	160,000	600	Under design



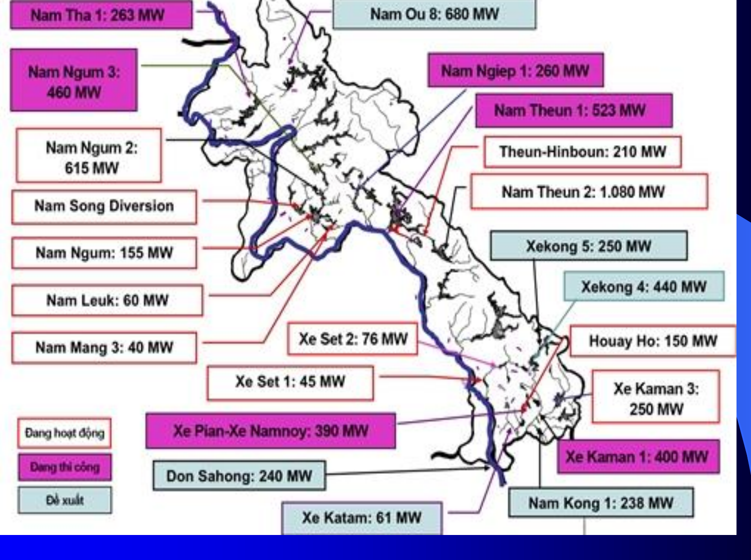
Lower part:

- **Mainstream (being built and planned):**
  - Pak Beng (912 MWW, 442 mil.m3)
  - Luang Prabang (1,400 MW; 1,256 mil. M3)
  - Xayabury (1,280 MW; 225 mil. M3);
  - Pak Lay (770 MWW)
  - Sanakham (684 MWW)
  - Don Shahong (260 MWW; 115 mil. M3);
- **Tributaries:**

  Potential capacity:

  - in Laos 13,000 MW;
  - in Thailand, Cambodia, Viet Nam: 4,000 MW

Some hydropower projects in Lao PDR



Tributary hydropower projects in Viet Nam

Name of Project	River	Catchment area	Installed capacity	Effective storge
		km2	MW	mil. m3
Upper Kontum	Se San/ Dak Bla/Dak Nghe	350	250.0	122.7
Plei Krong	Se San/ Kroong Po Ko	3,216	100.0	948.0
Yali	Se San	7,455	720.0	779.0
Se San 3	Se San	7,788	260.0	3.8
Se San 3A	Se San	8,084	96.0	4.0
Se San 4	Se San	9,326	360.0	264.2
Se San 4A	Se San	9,368	0.0	7.5
Duc Xuyen	Sre Pok/Krong Kno	1,100	49.0	413.4
Buon Tua Srah	Sre Pok/Krong Kno	2,930	86.0	522.6
Buon Kuop	Sre Pok	7,980	280.0	14.7
Dray Hlinh 2	Sre Pok	8,880	16.0	1.5
Sre Pok 3	Sre Pok	9,410	220.0	62.6
Sre Pok 4	Sre Pok	9,568	70.0	10.1
Dray Hlinh 1	Sre Pok	8,880	12.0	1.5
			2,519.0	3,155.6

Tributary hydropower projects in Thailand

Name of project	River	Inst. Capacity	Effective storage
		MW	mil. m3
Nam Oon	Nam Oon	0.40	475.0
Upper Mun	Nam Chae	0.30	134.0
Lam Sae	Lam Sae	1.80	275.0
LamTaKong	Lam Ta Khong	5.00	290.0
Lam Pao	Lam Pao	1.30	1,345.0
Lam Nang Rong	Nang Rong	0.20	118.0
Lam Kan Choo	Lam Kan Choo	1.50	18.6
Lam Plai Mat	Lam Plai Mat	0.50	98.0
Huai Luang	Huai Luang	0.50	108.3
Chonnabot	Chonnabot	1.50	16.0
Maha Sarakham	Maha Sarakham	1.00	35.0
Wang Yang	Wang Yang	1.00	33.9
Yasothorn-Panom Prai	Muang	2.00	22.4
That Noi	That Noi	4.50	56.1
Kamalasai	Kamalasai	1.00	18.5
Rasi Salai	Rasi Salai	1.50	75.0
Hua Na	Kanthararom	1.00	115.6
Lamdom Yai	Lamdom Yai	1.00	19.2
Chulabhorn	Nam Phrom	40.00	144.5
Huai Kum	Nam Phrom	1.30	22.8
Ubolratana	Nam Pong	24.90	1,760.7
Nam Pung	Nam Pung	6.30	156.8
Sirindhorn	Lam Dom Noi	24.00	1,135.0
Pak Mun	Mun	136.00	150.0
Lam Pra Pleang	Mun		106.3
		258.5	6,729.7

Possible downstream impacts caused by hydropower projects:

By the World Commission on Dams (2000)

- Change the downstream flow regime: daily or seasonal flows as compared with the natural flows, hence change the aqua-environment in the basin
- Impacts to the primary biological productivity of eco-systems(wetlands, riparian habitats, flooded plains…).
- Impacts in retaining sediment and nutrients in reservoirs → negative impacts to aqua-species then to livelihood of riparian people…

Regarding the change of flow regime:

- It is difficult to forecast in-flow in the Delta hence difficult for crop arrangement.
- Dams and reservoirs with large capacity of storage may cause impacts relating to seismic hence impacts to dam safety themselves. Dam break shall cause serious disaster (human disaster).
- The above-mentioned impacts could cause impacts water and food security for people in the region and in the world

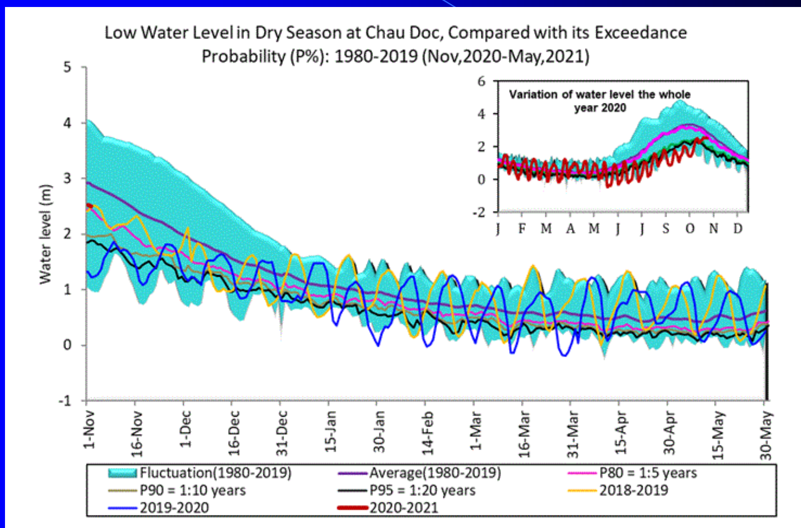
Impacts to the Delta caused by climate change:

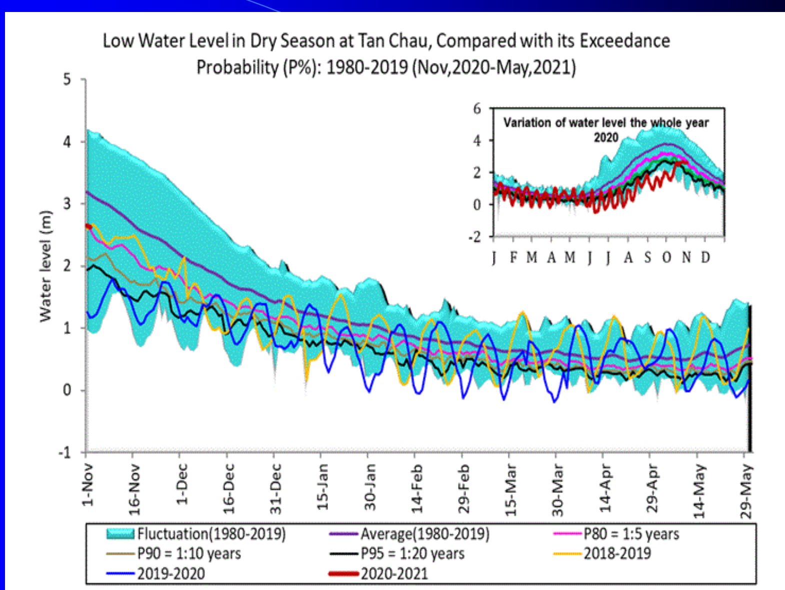
- Precipitation (locally or regionally) can cause impacts to flows to the Delta (e.g. years of 2016, 2019).
- If so-small in-flow to the Delta (cause by upstream reservoirs operation) in dry season, combines with "meteorological drought" (no or little rain), the serious drought will take place. This impacts will be aggravated in the Delta if sea-water level rises (salinity intrusion). In recent years, water storage started from early rainy season and also in the end of flood period resulting in salinity intrusion early appeared and late ebbing (some time sudden appearance) → negative impact to production (Winter-Spring and Summer-Autumn crops).

Impacts caused by climate change:

- In 2020, water volume stored in the Great Lake is about 9 billion m3 (lower than average of 23 billion m3, 2015 of 8 billion m3 and 2019 of 2 billion m3).
- In the case of heavy rain in the region resulting in in-flow to the upstream reservoirs increases dramatically and inundation in the lower part, the water releasing from dams will create the "double flood" to the Delta.
- Bank erosion occurs in many river stretches causing serious impacts to life and properties of riparians.
- Rules of natural flows disappears hence loss of fisheries income and sediment

Hydrographic showing water levels at Viet Nam's tidal stations Tan Chau and Chau Doc will decrease below their LTAs, effected by the tidal process in 1st week of November.





How to overcome:

- Undertaking active measures to cope with (rearrange crops, construction of local reservoirs…)
- Strengthening capacity in observation and forecasting flood and drought in the basin in combination with extreme phenomena of climate change,
- Strengthening cooperation through political commitments and existing mechanisms (MRC, LMC, … in an effective ways.
- Take the immediate actions in effective and relevant data and information sharing (at present, China has agreed to provide the MRC with year-round hydrological data, contributing to better river monitoring and flood and drought forecasting in the Mekong countries).
- Avoid conflicts in water resulting in political conflicts.