KEY POINTS RELATED TO WATER RESOURCE MANAGEMENT IN VIETNAM

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Historic large-scale hydraulic works in Vietnam

a. Thac Huong scheme

The Thac Huong scheme was designed and constructed in 1922 and finished in 1936. the initial task was the irrigation for 28,000 ha of the cultivation land in Phu Binh (Thai Nguyen) and Tan Yen, Viet Yen, Hiep Hoa and part of Bac Giang town (Bac Giang province). The work also routed flood for provinces downstream of Cau river and provided navigation.

The scheme includes the following components:
Main canal, floating canal and minor canals of secondary and tertiary having a length of 226.9 km with 906 on-canal structures:

- 2 large dams (Thac Huong, Da Gan)
- 40 side spillways.
- 19 head intakes
- 49 regulators
- 27 siphons
- 2 in-drainage sluices
- 37 concrete bridges
- 292 submerge sluices
- 12 ship locks
- 416 centipede-foot-shaped culverts

+ Thac Huong dam:

100m long with 5 compartments
Crest height = 6,5 m.
∇dam crest = 21,13m.
Q designed for spillway = 2580 m^3/s.
Sand sluice culvert on the right with 4 gates x 1,1 m x 1,6 m.

+ Da Gan dam:

To stop Van Gia stream to divert water into the system.
36m long with 3 compartments
Crest height = 8 m.
∇dam crest = 21,5m.
Q designed for spillway = 1300 m^3/s.
Sand flux sluice culvert on the left 1,1 m x 1,65 m.

+ 10 gate sluice:

constructed in July 1926. To take water in and control flood with 10 gates having dimension of 1,3 x 2,3 m.

∇bottom = 17,85 m.

∇upstream water level = 20,8m.

∇downstream water level = 20,35m.

Qsluice = 25 m^3/s.

The sluice was repaired in 1990 and in good condition so far.

+ on the main canal is Van Gia sluice which is a drainage sluice crossing the canal at K17 + 500. this is a under dyke sluice constructed in 1929 and is 53m long. The drainage catchment area is 51.3 km^2 with 5 gates which have been degraded seriously.

- The actual operation and duration show a degraded scheme. The canal system is in bad condition and suffer sedimentation despite repeated repairs. The regulators and headwork are deteriorated too whereas fund for repairing and improvement is not available. The river flow is reduced which results in lack of water in the spring crop. Rotation irrigation is now applied to overcome the situation. The low flow of 12 m^3/s as per design is reduced to 8-9 m^3/s, even 6 m^3/s in some year.
- In 1980 the system was redesigned to receive water from Nui Coc reservoir with design discharge of 11m^3/s. in fact, only 5 - 7m^3/s has been diverted.
- During 1992 - 1993: the Van Gia drainage sluice has been upgraded from state budget together with 10 gate head intake of Thac Huong.
- During 1998 - 1999: ADB funded the repair of headwork of Thac Huong and the construction of new car bridge H12 for transport. Another 19 out of 104 drainage sluices have been repaired, as well as 6 regulators. Slope lining has been done for 0.5km of main canal.
- During 1986 – 2001, annually the spring crops need additional water from Nui Coc reservoir for 1-3 times with a discharge of 6m^3/s and for 1 – 3 weeks. Especially, in 1988, towards the end of the spring crop, the water is added 5 times.

The total command area of Thac Huong is 21,610 ha. The gravity irrigation area is 17,887ha, the remaining area is irrigated by pumping stations of Thac Huong. the area actually irrigated makes up for only 64% of the design area which is 28,000 ha.

The reason why Thac Huong dam failed to irrigate the command area is because the long duration of operation and exploitation has resulted in degraded structures. Except for the 10-gate head intake Da Gan and Van Gia drainage sluice which have been improved recently, the common situation of the existing hydraulic structures is that the degradation is found in most of them. Some of them collapsed or ruined. the downstream parts are deeply eroded whereas the upstream slopes are sliding. The ship locks are no longer in use. The submerge sluices and siphons have been temporarily repair in response to immediate flood and rains.

b. Hoa Binh hydropower plant

1.Location :

Da river is the main branch of Red river which originate in Nguy Son mountain – China at the elevation of 1500 m. the river is 980 km long and join Red river at Trung Ha with the catchment area of 52,600 km^2, equaling to 31% of the Red river basin, yet the water volume is nearly half of the main river (48%). The average discharge is 1800 m^3/s, maximum flow observed in 1945 flood is 21,000 m^3/s and minimum flow is 120 m^3/s in 1993.

The Hoa Binh hydropower plant is constructed in Da river, 1.5 km away from Hoa Binh town and 51 km away from Trung Ha. The catchment area of the reservoir is 51.700 km^2.

2. Tasks of the reservoir

The Hoa Binh multipurpose reservoir is a very precious property which has been optimally exploited for different purposes, specifically:

- Routing floods for Red river delta in the event of big floods in 1945 and 1971, maintaining the water level in Ha Noi not to exceed +13.3 m.
- Exploiting electricity with a power production of 8.4 billion KWh and an installed capacity of 1920 MW in average year and 10 billion KWh in year having excessive water.

- Increasing the water flow in the dry season by 500 m^3/s for the downstream area to facilitate the agricultural production and domestic supply.
- Providing navigation routes of 200km along the reservoir and improving the channel for waterways in the delta. The reservoir also prevent salinity from intruding into the estuaries of Red river.
- The reservoir crests such a new landscape for tourism development and aquaculture etc…

3. Main parameters

- Water surface area : 230 km^2
- Full water supply level : + 115 m
- Dead water level : + 80 m
- reservoir capacity : $9,45.10^9 m^3$
- useful water capacity : $5,6.10^9 m^3$

4. Scope and structure of the work

River barrier:

- Form : mix earth and stone dam
- Height of dam : 128 m
- Length of dam crest : 743 m

Weir :

- Form : Concrete dam
- Bottom outtake : 12 gates, dimension 10 x 6 m, sill at elevation of 56m. operated by hydraulic shifting structure.
- Face outlet : 6 gates, dimension 15 x 15 m sill at elevation of 102m, upper face at elevation of 117m, operated by goat foot crane (2 x 125 ton).
- Maximum discharge: 35,400 m^3/s.

5. Hydropower plants

- the hydropower plant is located deep in the mountain. Length: 260m, width: 20m and height: 50m.
- Number of machine units : 8

  Turbine style PO 115/810-B-567,2

  Capacity 245 MW

  Calculated water head 88 m

  Minimum water head 60 m

  Maximum waterhead 109 m

  Discharge when the water head and regulated capacity is 305 m^3/s

- Generation machine CB 1190/215-48TB4

  Capacity 240 MW

  Standard voltage 15.75 KV
- Installed capacity 1920 MW

6. Construction duration : 1979 – 1994
7. Designed by : Mosceove Hydraulic Engineering Institute
8. Contractor : Da River Construction Incorporation
9. managed by : PMU of Hoa Binh Hydropower Plant