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Multiple use benefits

Miyagase Dam, Japan

Principally developed to meet increasing electricity demand during the post-war urbanization of Japan, Miyagase Dam also resulted in the ability to better manage flooding, provide potable water, improve environmental flows and develop a thriving tourist industry.

Overview

Originally known as Yanhee Hydroelectric Project, Bhumibol Dam was first conceived in 1951 to provide irrigation water to farmlands in the downstream Chao Phraya River Valley and to counter Thailand's electricity shortage. Construction commenced in 1952 and the first two turbines were commissioned in 1964. Six additional units were installed in later years to cope with the country's rapid growth in electricity demand.

Bhumibol is a concrete arch gravity dam constructed across the Ping River, a tributary of the country's main lifeblood, the Chao Phraya River. The dam is 154 meters high, 486 meters long and 6 meters wide at its crest, creating a storage of 13,462 million cubic meters. This is sufficient for flood mitigation and the provision of irrigation water for year round rice cultivation.

In an effort to maximize benefits, a lower barrage was constructed approximately 5.5 kilometers downstream of Bhumibol Dam in 1991, providing a lower pond suitable for the operation of a new reversible pump turbine. The concrete Lower Mae Ping Barrage is 8 meters high and 300 meters long and has a storage capacity of 5 million cubic meters.

The hydroelectric plant situated at the dam base has a total installed capacity of 743.8 MW from seven conventional generating units (Units 1-6 of 76.3 MW each and Unit 7 of 115 MW) and one reversible pump turbine unit of 171 MW. Bhumibol Unit 8 has a two-fold function, serving as a water pump during the off-peak hours to recapture water from the lower reservoir and pump it back up to the upper reservoir; and also operating as a generator to produce electricity during peak periods.

At the time of commissioning, Bhumibol Dam and its powerhouse operated as a baseload station and contributed 73.66% of the total Thai generating capacity. By 2003, the dam contributed only 2% of the nations electricity supply. Nonetheless, Bhumibol Dam remains an essential power generation asset during periods of peak electricity demand.

Dam Name

Scheme operator Ministry of Land, Infrastructure and Transport	Size of scheme (MW) 24.4
Country Japan	Catchment area 213.9km ²
River Nakatsu River	Effective reservoir capacity 200 x 10 ⁶ m ³
Construction years 1987-1991	Reservoir size 4.6 km ²

External recognition

Nil

Details

Despite its close proximity to very large populations, the Miyagase Dam catchment contains significant natural qualities, and is home to a range of wildlife including a number of rare insects.

A feature of the dam is the construction of a multi-level offtake to ensure that water releases meet temperature and dissolved oxygen guidelines, and the implementation of operating rules to ensure adequate environmental flows are maintained.

Aside from the generation of electricity, construction of the Miyagase Dam has resulted in multiple benefits to local communities, including:

- *Flood management*
The storage reserve, along with the 1700 m³ spillway discharge capacity has enabled management of flooding in Nakatsu River below the Dam.
- *Potable water supply*
The Miyagase Dam enables the storage of 200 million cubic metres of high quality drinking water and provides up to 1.6 x 10⁶m³ of water daily to 15 cities and 9 towns in the area.

- *Environmental flows*
The construction of the dam has enabled maintenance of flows in the Nakatsu River for the purpose of conserving and enhancing aquatic environmental values.
- *Tourism*
Approximately 650,000 visitors came to observe the dam during the construction phase, and the visitor centre and museum at the dam site receive around 300,000 visitors annually.

Other Aspects

Siting and Design

Design features of the dam include a multi-level offtake to ensure good water quality downstream of the facility and ‘softer’ architecture to blend with the natural environment.

Construction Impacts

To minimise construction impacts on the natural environment:

- access routes to the construction site were built within a dry river bed, reducing the impact on terrestrial flora and fauna of the area
- disturbed areas were rehabilitated using indigenous vegetation species and biotopes containing brooks, scarps, hills and bogs were created in soil disposal areas to expand available habitat and encourage greater biodiversity
- aggregate for the project was mined using the ‘Glory Hole Mining Method’, minimising scarring on the landscape.

Water Quality

The design and construction of a multi-level offtake ensures that water is always drawn near the surface of the lake, where temperature and dissolved oxygen concentrations are similar to those in the downstream environment.

Population Displacement

The Miyagase project resulted in the need to relocate 1136 people. Approximately 70 per cent of the people moved to a new suburb of the nearest city (Atsugi), where many had already found employment. Those who did not wish to leave the river valley were provided with two village sites near the Miyagase Nature Park. The relocation included the creation of an alternative graveyard in the lakeside area. Infrastructure for the resettlement areas cost US\$630 million. Residents of the resettlement areas receive subsidised water and electricity.

Further Information

Further Information

Source: Hydropower Good Practices Workshop, Annex VIII - Examples for Good Practice Report, Villach, Austria, October 2005. International Energy Agency.

http://www.wec.or.jp/center/jyouhou/kouenkai/seibi/JCOLD_2%20English.pdf

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