

Multi-Purpose Melamchi Project, Nepal

Several years ago, a volunteer project study team prepared a concept level Technical Report on the Multi-Purpose Melamchi Project (the MPMP, by Dan Jantzen, Bikash Pandey, Ratna Sansar Shrestha and Odd Hoftun, 2008). The ongoing Melamchi Project is single purpose project, to provide drinking water for the Kathmandu Valley. The Study Team wrote that the present Melamchi Project scope is limited and that its full potential should be harnessed by making it multi-purpose so that the more benefits are accrued to the people of Melamchi-Bagmati corridor. The MPMP authors propose a wide range of initiatives in hydropower generation, and making available additional water for irrigation in the Bagmati Irrigation Project. The cost estimates were prepared by Sanima Hydro and Engineering (P.) Ltd.; the Preliminary Environmental Assessment was undertaken by Dr. Toran Sharma; and the Irrigation Analysis was by Dilip Karki.

Furthermore, the study team has proposed to implement the MPMP as a Public-Private Partnership, where the hydropower component is taken by the private sector. In addition to the 26km Melamchi-Sundarijal tunnel, other long additional tunnels are proposed in the Himalayan Geology.

These ideas and proposals need to be further discussed for the benefits and risks, alike. The following is the **Executive Summary of the MPMP report**. The four figures presented are self-explanatory.

—Editor

The Melamchi Diversion Tunnel (MDT) is a single-purpose project designed to supply drinking water for the Kathmandu Valley. As currently planned the capacity of this very expensive tunnel is not being put to full use. This report describes how the excess capacity of the tunnel can serve as a key element in a multipurpose regional development program that will benefit the local people both upstream and downstream, and multiply the return on this heavy investment for the benefit of the nation as a whole.

This report is the result of a study made by a small team of volunteer experts who were engaged in the early stages of the MDT project. Motivated by their long-term interest in the subject they have carried out the study on their own time and expense, without any ties to or backing from other parties. This is a conceptual technical report, based on facts drawn from dependable sources, mainly the two issues of 'Melamchi Final Design Study Report' prepared by Norplan in 1999 and 2001, respectively.

The basic ideas of the MPMP were already presented some eight years ago, but the response then did not encourage any further initiatives. Due to slow progress on the MDT Project and major changes in the Nepal political picture that have taken place since then, the study team felt it was again time to bring up the concept. Through a series of meetings in November 2007 with top political and civil society leaders there was much enthusiasm for the ideas presented. Thereafter, the team set out to explore the technical, environmental and economical implications of the proposed multipurpose project and, in the process became convinced about its practical feasibility.

The MDT is a big project, involving large amounts of money and other input by the Nepal Government and foreign development agencies. It has one single purpose: To transfer water from the Melamchi River to meet the

growing need for drinking water in the Kathmandu Valley. That itself is a great challenge and a very meaningful project. *But the MDT can do much more if it is planned, implemented and managed with the wider perspective of nation building.*

The vision behind turning the MDT into a multi-purpose project is the following: This expensive tunnel has potential to be an avenue for progress and public benefit in many other ways, not only for the capital city, but for the whole Bagmati-Melamchi corridor, which besides Kathmandu City includes half a dozen districts that are in great need of economic development. Water from these snow-fed Himalayan rivers can unite this region by providing much needed hydropower for the nation and irrigation water for the southern lowland (the Nepal terai). If properly planned as a public-private undertaking, the MPMP can — through its activities from Helambu in the high hills, through the hills of South Lalitpur and Kavrepalanchowk and down to the terai districts of Rautahat and Sarlahi — provide jobs and initiate local projects that can galvanize community development in many ways. All of this can be accomplished through profitable investments paying attractive returns to the public and the private investors involved.

The MPMP is to be implemented in two phases: **Phase I** is directly linked to the MDT and located mainly within the Melamchi Valley. It consists of the **Timbu Hydro Power Project (THPP)**, which is designed for 290m head and 50MW capacity. It will discharge its tail water directly into the upstream end of the MDT. Included in this phase is also about 10 km tunnels for diverting water from the Yangri and Larke Rivers into the Melamchi River just above the THPP intake, thereby increasing the minimum dry season flow from around two to about six m³/s. In the current MDT plans it is expected that this would be done sometime in the future. The MPMP assumes that these tunnels will be constructed concur-

rently with or immediately after the THPP.

The THPP construction work will not require building any new access roads. Construction will rely on transport by a heavy-duty permanent ropeway from Timbu to the headworks site and onwards to Yangri and Larke. This ropeway will in the future be available to meet transport needs for the local communities in the affected area.

Phase I will reach full production only after Phase II has been completed. In order for Phase I to become economically feasible it has to be planned and developed along with Phase II. It is therefore *absolutely essential that Phase I and Phase II are developed, owned and operated by one single owner, who should be a public/private consortium financed and operated on a commercial basis, but giving due attention to local social and environmental aspects.*

Phase II brings the hills and terai lowlands together by constructing two new hydropower tunnels: One is a 17.8km long extension of the high-level diversion tunnels of Phase I. It will add water from the Balephi River and increase the minimum dry season flow through THPP and the MDT from six to 13 m³/s. This will meet all possible future demand for drinking water in the Kathmandu Valley, and will discharge a large quantity of excess water into the Bagmati River at Sundarijal. After having enhanced Kathmandu Valley's beauty with clean water, the Bagmati picks up the city's wastewater as it leaves the valley. The minimum dry season flow will at this point have increased from the present 1.5m³/s to about 14m³/s.

The Bagmati tunnel starts at a point approximately 2.5km below Dakshinkali. Over a total length of 26 km this tunnel creates a gross head of around 900 m, which is used by the **Bagmati Hydropower Project (BHPP)** to generate about 215MW of electric power, before releasing the water into the lower Bagmati River in the terai some 25km upstream of the existing Bagmati Barrage near the East-West Highway. Here the same water is diverted into already existing canals on either side of the river to provide additional dry season irrigation in Rautahat and Sarlahi Districts.

Cost estimates and financial analysis of the combined Phase I and Phase II of the MPMP hydropower component are included in the attached report and show the following salient data:

Total cost before financing	551.6 million US dollars
Total installed capacity	265 megawatts
Cost per installed kW without IDC	2,081 US dollars
Total energy production	1,821 gigawatts per year
Dry energy buy back rate	5.52 NRs
Wet energy buy back rate	3.90 NRs
Debt to equity ratio	3:1
Discount rate	10%
Benefit/cost ratio	2.42
IRR on project, from power sales alone	19.77%
Note that the costs are based on prices as of July 2008 when the exchange rate was 1 US dollar to 65 Nepalese rupees.	

In addition to the generation of 1821GWh/year of clean hydro energy, the MPMP will double the dry season irrigation in the Bagmati Irrigation Project command area, resulting in an estimated 853 million rupees per year net increase in agricultural production in Rautahat and Sarlahi Districts. This will all go to the farmers as increased net income.

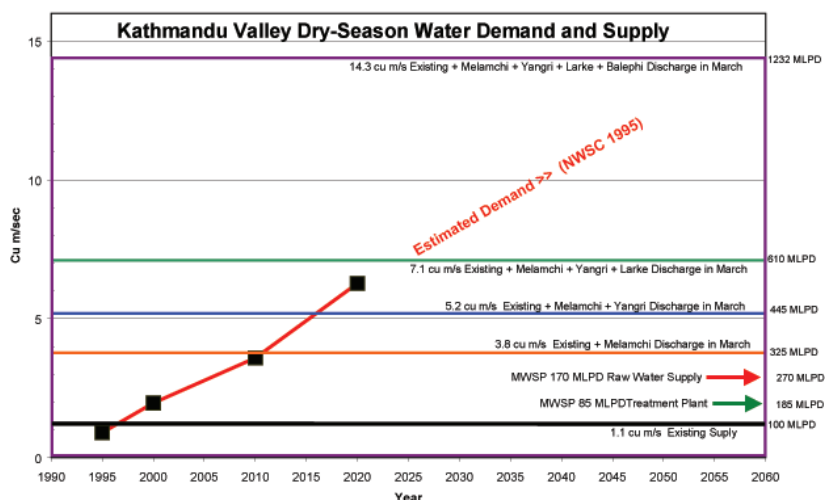


Figure 1. Estimated Dry -Season Water Demand Compared to River Flows in March

A full feasibility study and environmental impact assessment should be the next step in assessing the suitability of this concept in the national framework.

Reference

Jantzen, D., B. Pandey, R.S. Shrestha and O. Hoftun, 2008 (October), Multi Purpose Melamchi Project, Concept Level Technical Report, Kathmandu, Nepal.

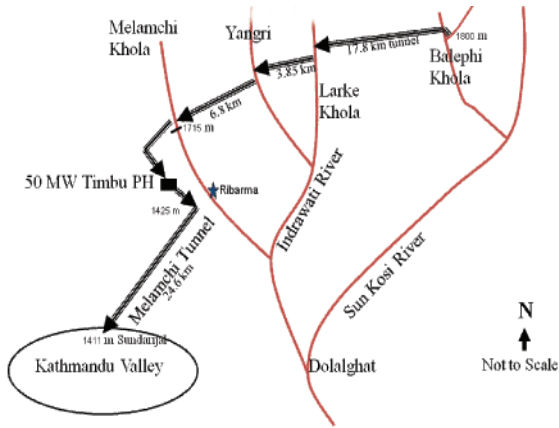


Figure 2. Sketch Map of MPMP Upper Section

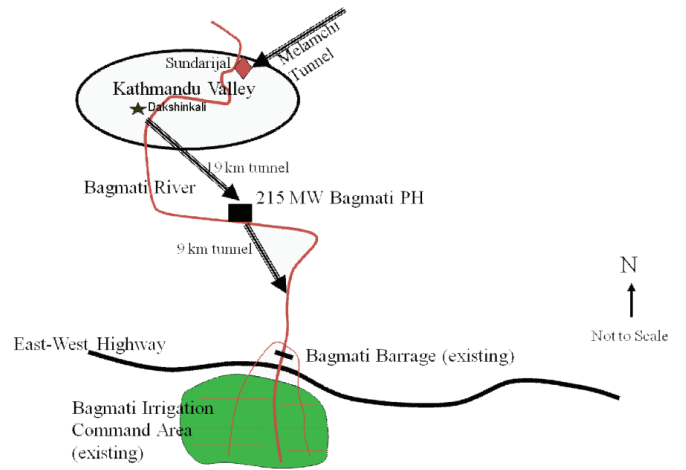


Figure 3. Sketch Map of MPMP Lower Section

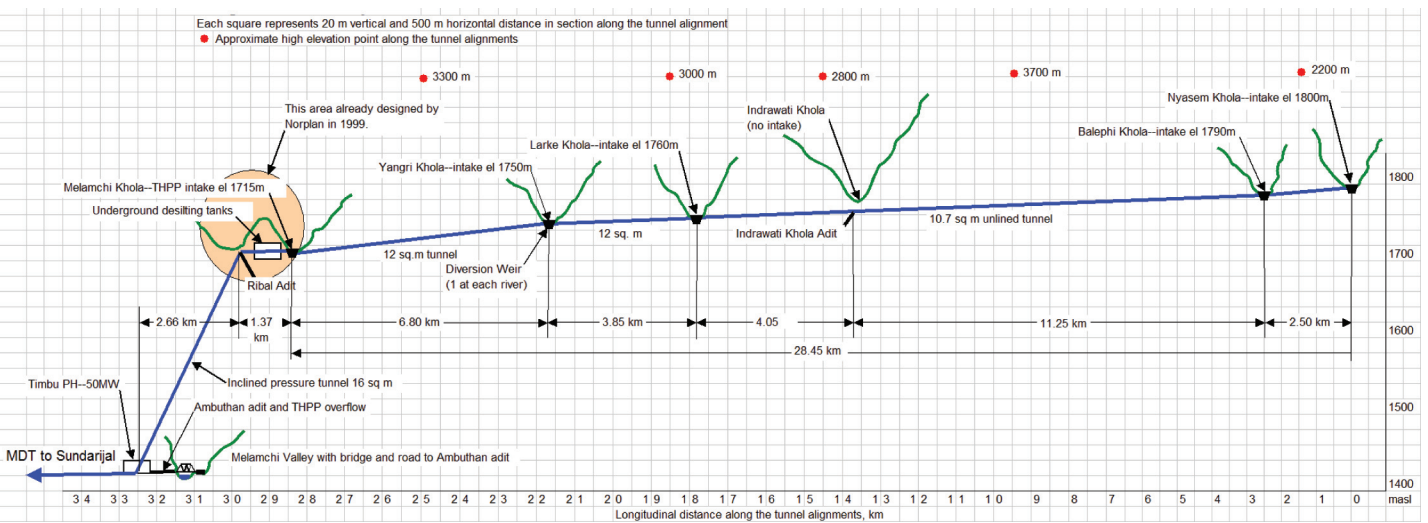


Figure 4. Rain Gutter Tunnel Layouts