Water Resources Management - Part I

Holistic Approach

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Introduction

The paper article appeared in a daily newspaper on November 9, 2005 titled 'Improvements to Western Province Potable water supply' by Eng. W. A. Karunatathna, former General Manger of the National Water Supply and Drainage Board (NWS&DB) prompted me to invite the readers' attention to much broader issues on water resources management that includes planning and development too.

The purpose of this article is to highlight the necessity of looking the development of water resources in a holistic manner by integrating sectoral issues instead of looking at the water related issues from individual angles of hydro power, irrigation, flood control, drinking etc. While appreciating the concerns expressed by Mr. Karunaratna regarding the drinking water supply to Colombo City solutions to this problem can be found by looking the water resources development strategies in a broader perspective. It has to be noted that while NWS&DB is planning to solve the drinking water supply problem in Colombo during the droughts with the salinity barrier at Ambatale, Irrigation Department is concerned with the floods in Kelani Ganga during the monsoons and planning to raise the flood bunds on either side of the river to safeguard the city of Colombo.

Drinking Water Demand in the Colombo City:

Sixty percent of the total water requirement in Colombo is met by pumping water from the Kelani Ganga at Ambatale. The present population of greater Colombo is about 1.5 Mn and the present pumping rate is 6.0 cumecs (520,000 cu.m. per day). The projected population in 2020 is 3.0 Mn according to the NWS&DB and therefore projected water demand has been estimated as 10.8 cumecs (930,000 cum per day)by the NWS&DB. However the authority on city planning is the Department of Physical Planning and according to their estimate the population in Colombo in 2025 would be closer to 4.0 Mn. Therefore projected water demand of 14.4 cumecs (1,250,000 cu.m.day) will be required to meet the population projected by the Department of Physical Planning.

Water Availability:

Before the implementation of the Mahaweli Project, the Mahaweli Ganga was the largest river with 10,000 sq.kms of catchment discharging 10,000 mcm of water annually to the sea. This amount has been now reduced due to the large scale water regulations in the basin with gigantic reservoirs. In view of the above, today Kalu Ganga has become the number one with the largest amount of river discharge and it is of the order of 4000 mcm. The river has an uninterrupted catchment area of 2688 sq.kms. The Kelani Ganga comes second and it carries 3400 mcm of water annually to the sea and it has 2278 sq.kms of catchment. However from the Kelani catchment about 12% of the catchment area is intercepted by hydro reservoirs in Norton Bridge and above. Therefore it is logical to assume a higher water potential in Kalu Ganga than Kelani Ganga due to higher rainfall and larger catchment in Kalu Ganga basin in contrast to what was mentioned in Karunarathna's article.

For Kelani Ganga low flow analysis was done by the Irrigation Department by analysing the flow records for last 55 years and the statistical average of low flow was estimated as 19.0 cumecs. This is slightly higher than the estimate provided by Karunarathna in his article. However in the years 1992 and 2004 measured lowest river flows were 11.1 cumecs and 13.0 cumecs above Ambatale intake and therefore in these two years river flow went below the estimated average. Regular releases of water from hydro reservoirs above Norton Bridge make a certain contribution to keep the natural low flow conditions at a higher level in Kelani Ganga

It is also not rational to plan the utilization of total quantity of water available in a river at any location as certain amount of water has to be released below for ecological and other reasons. In Kelani Ganga the Kelanitissa Power Station located below the Ambatale intake takes Kelani water for cooling and therefore in addition to the ecological reasons a certain amount of water has to be released downstream. From the above it is clear that water available during the low flow period in Kelani Ganga is not sufficient to meet the projected demand for year 2020 which is 14.4 cumecs according to the Department of Physical Planning.

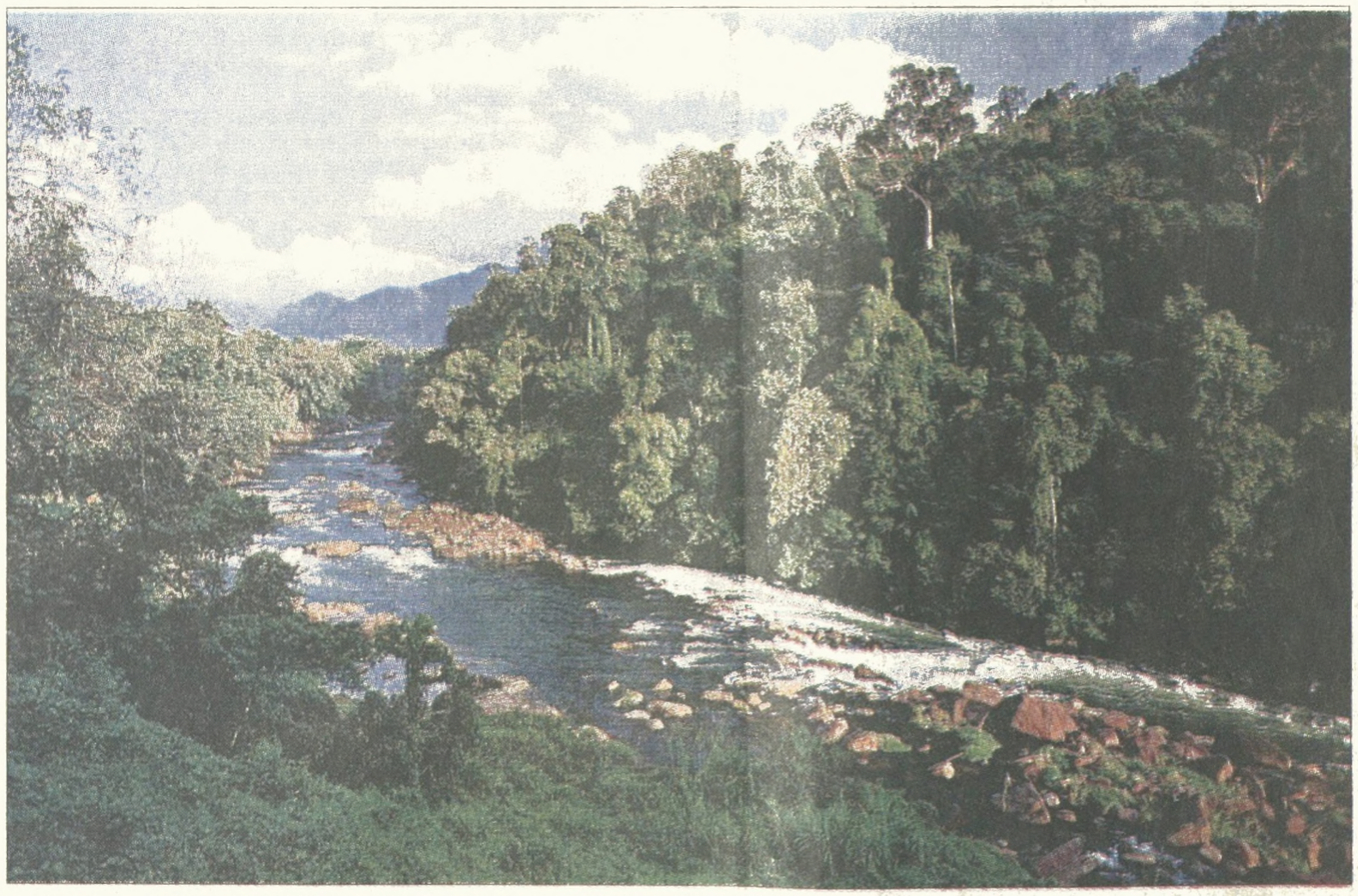
The analysis of low flow in Kalu Ganga was done by the consultants (Nippon Coei) at Putupaula, that is very much downstream of the present water intake for greater Colombo. The site selected for the analysis was after the confluence of Kuda Ganga with Kalu Ganga, because the original intake site for the Greater Colombo water supply was after Kuda Ganga confluence. The estimate of low flow on the same basis as Kelani Ganga was 22.0 cumecs for a two year return period (average) and flow corresponding to 10 year return period was taken as 14.4 cumecs according to the estimates made by the consultant (Nippon Coei). Then allowing 10.0 cumecs for the river maintenance flow, 4.2 cumecs was considered at 10 year return period for the year 2020 as the water availability for extraction. The flow rate of 2.1 cumes (182,000 cu.m. per day) is the design flow for the stage I of the project and it is not the total water potential of Kalu Ganga . It should be noted that originally proposed intake site to extract water to Colombo was below the confluence of Kalu Ganga and Kuda Ganga and these estimates were made for that site and not for the present site at Naragala.

When the consultants were about to finalize this proposal with the intake below the confluence of Kuda Oya, I pointed out at a meeting in the Housing Ministry that the possibility of salt water intrusion to this intake location as it was below the mean sea level. Then intake was shifted to the present location at Naragala, where Horana intake was located which is above the mean sea level. There is a reduction in the catchment due to exclusion of Kuda Ganga which has a catchment area of about 800 sq.kms. This new intake site is above the Kalu-Kuda Ganga confluence and therefore Kuda Ganga does not contribute to the present intake. It is not known whether a fresh low flow analysis was done for the present site at Naragala. The potential at the present Nalagala intake can be approximately estimated as 14.7 cumecs (1,250,000 cu.m. per day) and this excludes the potential of Kuda Ganga which is 7.1 cumecs (610,000 cu.m per day). Therefore from the above it is certain that Kalu Ganga has a greater water potential than Kelani Ganga.

Salinity Barriers:

Regarding the remedial measures to supply drinking water to Colombo Mr. Karunaratna argues the urgency of the salinity barrier across Ambatale in Kelani Ganga by highlighting the greater water potential in Kelani Ganga which I do not agree according to the figures quoted above. Further the necessity of a similar salinity barrier for Kalu Ganga also mentioned in this article. While I have no objection for the salinity barriers my concern is whether there will be sufficient water for us to meet the projected demand in the future unless we regulate the flow in these rivers.

It can be seen from the low flow analysis of Kelani Ganga by considering the downstream releases, there is no way to extract required water for drinking unless the river is regulated. Therefore it is clear that even if a salinity barrier is constructed there is no sufficient water to meet the future demand and if the flow regulation is done the salinity barrier becomes redundant. Therefore solutions to these problems have to be found in a holistic manner with a vision. This holistic approach will be explained in the latter part of this article.



Sixty per cent of the total water requirement in Colombo is met by pumping water from the Kelani Ganga at Ambatale

Water Policy:

Due to the absence of a clear water policy and an institution to coordinate the overall activities for water resources development and monitoring, many ill conceived development projects are being promoted with out a holistic approach and some important projects of national importance do not emerge. This is due to the institutional bias and inadequate capacity of the water sector institutions to formulate integrated multipurpose projects. Sometimes the lack of vision for an integrated approach to push the rational water resources development projects beyond their area of interest is also a common problem in some of the institutions.

This situation also has been aggravated due to the large number of ministries where water related functions are disintegrated to a level where normal coordination between the ministries is difficult. Despite the multiplicity of institutions and ministries, the present practice of water resources development, especially during the recent past has not been able to address the issues of national interest. Therefore rational projects do not get off the ground in the absence of a single apex body to coordinate the water resources development activities.

The following are few examples of water related issues to highlight the necessity for an apex body to coordinate the development and operational aspects.

i. Shortage of drinking water in the cities of Anuradhapura and Kandy is experienced while these cities are surrounded by large reservoirs. This is due to the conflicts in drinking water and irrigation sectors.

ii. Problem of water diversion at Polgolla from Mahaweli Ganga is experienced when there are water shortages in Anuradhapura, Polonnaruwa and Kantale for irrigation. This is due to the conflicts of interests between irrigation and power sectors.

ii. Problem of drinking water supply to Colombo during the months of February and March in certain years is experienced. This is due to salinity intrusion. This can be overcome to some extend if there is an operation policy to obtain water from Maussakelle and Castlereigh reservoir during these periods. This is again due to conflicts in drinking water and power sectors.

iv. Pollution of water in streams and rivers and degradation of water quality due to industrial waste and other human activities.

v. Degradation of river morphology due to large scale sand mining, encroachments of river reservations and removal of vegetation from river banks.

vii. Contamination of ground water due to solid and liquid waste dumping.

The article focusses on the necessity of a holistic approach to implement the rational water resources development plans. To illustrate this fact a few possible development plans for two major rivers in Sri Lanka namely Kalu Ganga and Kelani Ganga will be highlighted.

(To be continued)