Common Mistakes in Water Resources Designs

G.T. Dharmasena[8]

THIS PRESENTATION HIGHLIGHTS common mistakes in estimating some parameters related to water resources designs. Issues addressed here are mostly confined to some hydraulic and hydrologic parameters. These are briefly outlined below.

It is often required to estimate the average annual yield or average seasonal yield of a catchment, by analyzing the time series of flow volumes for 20 to 30 years. Similarly, we may have to estimate an average monthly or annual rainfall at a particular station from long-term records. During this process, the presence of outliers in the streamflow or the rainfall time series will lead to erroneous results, unless these outliers are properly identified and taken care of. The average value of a time series is also taken into account as an event with a 50 percent probability, though this is not necessarily true for the entire time series.

In low-flow analysis in the design of diversion structures for irrigation or drinking water, smoothing the flow series for a number of days is more appropriate instead of analyzing minimum daily flows.

In flood estimation the concept of probability is very common, but in the application of probability theories assumptions behind the concept are sometimes poorly understood. For example, the definition of a flood of a particular return period, interrelationship between the return period of a flood and the return period of the rain storm which causes the flood, and the mixing of the normal probability with combined and conditional probabilities can be sited.

Regarding the techniques of flood estimation for small catchments, rational formulae and Synders techniques are very popular. However, the limitations in the application of these techniques and estimation of parameters of these models need a review.

In the design of a weir, it is required to estimate the weir length to pass a certain magnitude of a flood. The required length of the weir at a particular point of a stream depends on the control of flow by the structure itself. Sometimes, oversized structures have been adopted by making an attempt to design the structure for a particular return period such as 50 years or 100 years, instead of designing the structure for bank full discharge with provision for outflanking.

In the estimation of irrigation water requirements, there is a considerable amount of uncertainty on losses due to percolation from rice fields and on conveyance losses in canal systems. Experiments carried out by some researchers show that percolation rates are very much more than what is assumed in conventional designs. In addition, the reduction of seepage losses in concrete lined canals in comparison to a well-consolidated unlined earthen canal is not very significant.

Regarding the crop water requirement for rice, the requirement of water has to be viewed in the light of agrochemicals. This requirement is quite different to the water requirement given in FAO 24 which is certainly relevant for other flood crops (OFCs), but not for rice. One should be aware of the fact that

---

[8]Deputy Director (Hydrology), Irrigation Department, Colombo.

even in the USA where rice is cultivated in a limited scale, the quantity of water used for a season is as high as 7.0 feet. Many forums where we discuss water management for rice cultivation, highlight weed control with water. This issue is debatable in the light of the cost-effectiveness of agrochemicals. Therefore, it is interesting to find out the multiple co-relationships between crop yield, quantity of water and the cost of agrochemicals used.