RESERVOIR SEDIMENTATION

During the last five decades, India has constructed more than 4000 major and medium river valley projects involving construction of dams and creation of reservoirs for flood control, irrigation and hydropower. Due to soil erosion in the catchment areas and its transport and deposition, the reservoirs are losing their storage capacity with time. To determine the useful life of a reservoir, it is essential to periodically assess the sedimentation rate. In addition, knowledge about the sediment deposition pattern in various zones of a reservoir is essential for proper allocation and management of water in a reservoir. With the up-to-date knowledge of sedimentation process going on in the reservoir, timely remedial measures can be undertaken and reservoir operation can be planned for optimum water utilization.

Systematic capacity surveys of a reservoir are conducted periodically to estimate the rate of sedimentation. The conventional techniques of sedimentation quantification in a reservoir, like the hydrographic surveys and inflow-outflow methods, are cumbersome, costly and time consuming. Further, prediction of sediment deposition profiles using empirical and numerical methods requires large amount of data and still the results may not be accurate.

TECHNOLOGY

Remote sensing technology, through its spatial, spectral and temporal attributes, can provide synoptic, repetitive and timely information regarding the current water spread area in a reservoir. By using the digital analysis techniques and the geographic information system in conjunction, the temporal change in waterspread area is analysed to evaluate the sediment deposition pattern.

A digital interpretation technique of the satellite data has been developed at NIH to identify the water pixels. Although spectral signatures of water are quite distinct from other land features such as vegetation, built-up area and soil surface,

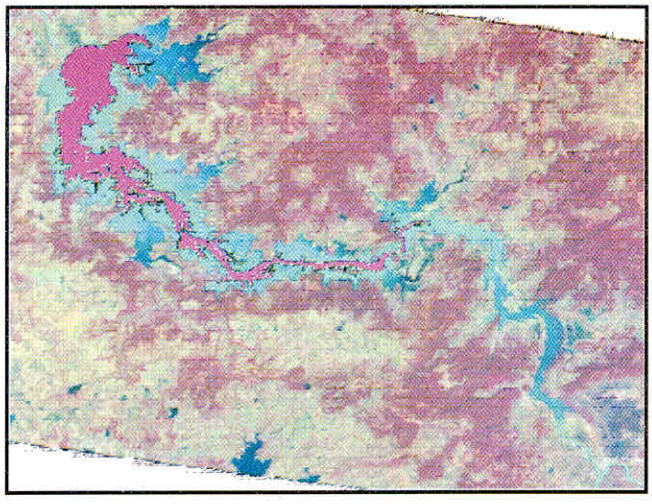

Figure – 1 Remote sensing image (October) of BARGI reservoir in M.P. overlaid with waterspread area in June

yet, identification of water pixels at the water/soil interface is very difficult and depends on the interpretative ability of the analyst. To overcome this problem, a mathematical algorithm has been developed for identifying the water pixels using the data of different bands. The algorithm checks for the condition, "If the radiance value of near-IR band of a pixel is less than the radiance value of the red band and the green band, and the normalized difference water index is less than a specified value, then it is classified as water otherwise non-water" for each pixel. If the condition is satisfied, then it is recorded as water, otherwise not.

The reduction in reservoir capacity between consecutive contour levels is computed using the prismoidal formula. The overall reduction in capacity between the lowest and the highest observed water levels can be obtained by adding the reduced capacity at all levels.

Using remote sensing technique, a number of case studies of reservoir sedimentation assessment have been carried out at NIH. The reservoirs that have been studied include Ukai, Bhakra, Dharoi, Ramganga, Tandula, Somasila, Bargi, Ghatprabha and Lingnamakki.

ENVIRONMENTAL IMPACT

It does not involve any adverse impact on the environment.

ECONOMICS

It will have tangible and intangible benefits.

BENEFICIARIES

Capacity estimation by remote sensing technique at regular time interval can give important information like annual rate of sedimentation and sediment deposition pattern in the reservoir area. The beneficiaries of the studies will be dam operating authorities, water resources planners, hydropower organizations, and State Irrigation Departments.

INTELLECTUAL PROPERTY RIGHTS

No element of Intellectual Property Rights is involved in the use of this technology.