

EXPECTED LIFE OF WATER BODIES

Over last few years, studies of recent lakes and reservoir sediments have become of increasing importance in many aspects of environmental appraisal. Sediment entered into the water bodies deposits slowly on the lake floor in natural process of sedimentation and reduces its storage capacity, encourages biotic growth and affects the functioning of lake ecosystem. As the accurate sedimentation rate is of vital importance not only for estimating the useful life of water bodies, but also to prepare strategies for management and conservation of the water bodies; it is therefore, a matter of great concern to the authorities to know the accurate sedimentation rates and causes of higher rate of sedimentation in order to save the water bodies from diminishing.

TECHNOLOGY

Various techniques, such as bathymetric survey, sediment balance method, stratigraphic method, remote sensing and radiometric dating techniques exist to determine the sedimentation rate, but radiometric dating techniques have proved to be one of the most reliable tools for the estimation of sedimentation rate in water bodies and are being used the world over. Although, several radioisotopes are useful in geo-chronological studies of lake sediment

that occur naturally and artificially in the environment; among all the radioisotopes, ^{137}Cs (Cesium-137) and ^{210}Pb (Lead-210) have been found very useful for dating the sediments of lakes/reservoirs. One can determine very accurately the sedimentation rate in the past 100 years of water bodies using ^{210}Pb dating technique. In case of ^{137}Cs technique, sedimentation rate can be determined for the last 50 years with high accuracy, because natural fall out of ^{137}Cs has been found considerable in the years 1953-54, 1957-58, 1963-64, 1978-79, and 1986-87 due to testing of various atomic devices and nuclear accidents. These peak years act as a marker horizon in determining the sedimentation rate.



Figure - 1 Sediment cores collected from lake

In case of ^{210}Pb dating of sediments, the unsupported activity of ^{210}Pb is determined and the slope of ^{210}Pb activities versus depth enables to determine the sedimentation rate accurately. ^{210}Pb techniques can be applied in case of low or high sedimentation rates while ^{137}Cs technique may fail in case of high sedimentation rates (>2 cm/yr).

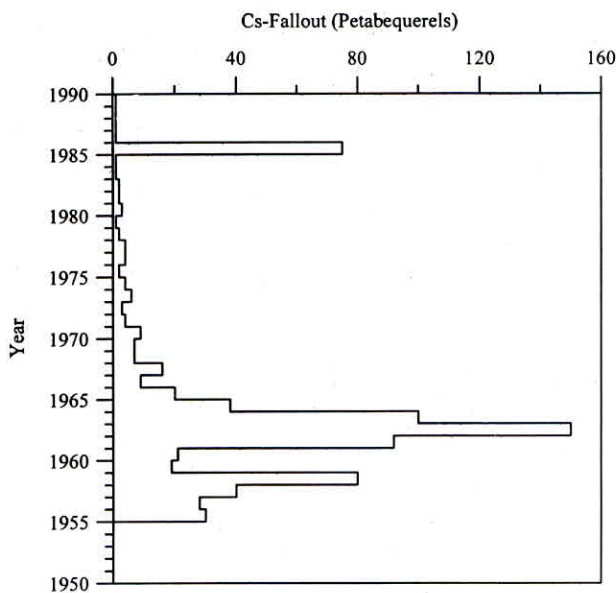


Figure - 2 Fall-out pattern of ^{137}Cs in Northern hemisphere

Average sedimentation rate on weighted area basis is determined from sedimentation rates estimated at different locations in water body and then expected useful life is determined accurately by dividing the average depth of water body by average sedimentation rate. The National Institute of Hydrology, Roorkee has employed this technology to

determine the sedimentation rates and expected useful life of Nainital, Bhimtal, Naukuchiyatal, Sat-tal lakes in Uttaranchal; Mansar and Dal-Nagin lake in Jammu and Kashmir; Sagar and Bhopal lakes in Madhya Pradesh and Barapani reservoir in Meghalaya.

ENVIRONMENTAL IMPACT

As this technology involves the use of environmental isotopes (natural level activity), it does not have any adverse impact on the environment.

ECONOMICS

Generally, 10 sediment cores of more than 40 cm are required to be collected from a water body of size 1 sq km. The total expenditure in collection and dating of sediment cores using ^{137}Cs technique will be approximately Rs. 2.00 lakh for water body of size 1 sq. km while the same will be around Rs. 3.00 lakh for ^{210}Pb technique (excluding travel charges).

BENEFICIARIES

Lakes, tanks and reservoir management authorities.

INTELLECTUAL PROPERTY RIGHTS

The National Institute of Hydrology, Roorkee, owns the Intellectual Property Rights, being the developer of the methodology.