Contribution ID: **153** Type: **Oral**

Radiotracer Study to Investigate the Spatial Dispersion Pattern of Dredged Materials in Hooghly Estuary, West Bengal, India

Tuesday, 25 April 2017 09:30 (15 minutes)

Maintenance of adequate draft in navigation channel for movement of ships from the sea to the port is a serious concern for port authorities. Available draft gets reduced in course of time due to silt deposition on the channel bed and one has to resort to maintenance dredging which is quite an expensive work. The problem of silt deposition is particularly critical for riverine ports like Kolkata and Haldia where the river and its tributaries carry large volume of silt. The navigational channel leading to Haldia from the Hooghly estuary requires maintenance dredging throughout the year. The dredgers use the tidal window to dredge over the critical shallow area in the navigation channel and then move to the dumping grounds to dispose of the dredged materials. Effectiveness of this dredging and dumping work depends on the location of the dumping site and the dispersion pattern of the dumped sediments, since there is always a possibility of return of the disposed materials to the dredged site during tides. Hence, it becomes essential to identify the pattern and rate of dispersion of the dumped sediments, which subsequently will help in identifying proper location of the dumping site.

Keeping this problem in perspective, a project was undertaken to study the movement and dispersion pattern of dredged materials near the dumping site in Hooghly estuary with the help of radiotracer experiment. Use of radioactive tracers offers a cost-effective method of determining transport of sediments caused by tidal currents and processes of erosion, transport, settling and deposition. Radiotracers can be used to obtain quantitative information, such as direction, velocity and thickness of sediment movement.

In this project, Scandium-46 in the form of scandium glass powder is used as the radiotracer for tracing the dredged sediments. The tracer is prepared by incorporating 1% of inactive Scandium in the glass composition, then grinding the glass to different grain size fractions to have the same grain size distribution as that of the dredged material. It is then irradiated in the reactor to produce Scandium-46. After preparation of the radiotracer, it is transported to the the dumping site in Hooghly estuary. A specially designed remote operated injection apparatus containing the radiotracer mixed with dredged sediments is lowered into the water with the help of a crane and the mixture is discharged on to the sea bed. After the injection, dispersions of the tracers were monitored using a waterproof scintillation detector mounted on a sledge which was dragged on the seabed. The concentration at different spatial locations are measured. This tracking work was performed during the next five months. Isocount contour maps are prepared from the tracking data, from which the general direction of movement of tracer is drawn and maximum longitudinal and lateral dispersion are estimated. It is observed that the overall movement of the sediments during these five months is away from the main navigation channel. A two-dimensional hydrodynamic model for the study area was also developed and the velocity distribution patterns are compared.

Country/Organization invited to participate

India

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Session Classification: B04

Track Classification: RADIATION TECHNOLOGIES FOR MEASUREMENT