

SEDIMENT DATA ACQUISITION

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Summary

To assess the amount of sediment present in flowing water or deposited in stagnant water, important information for the hydraulic design of sustainable water projects, a number of techniques exist for sediment data collection. Bed-load and suspended-load samplers are described, as are continuously measuring and recording instruments and indirect estimation methods.

Sediment characteristics, such as settling velocity, entrainment and deposition, the concentration and size distribution of different-size fractions, and the consolidation and density determination of sediment deposits by means of standardized laboratory techniques, are referred to.

Newer methods of addressing the elusive problem of exact and reliable sediment data capturing, such as acoustic and laser techniques, can provide even more dependable information relating to sediment for designing sustainable water projects.

1. Introduction

The acquisition of hydrological data involves the collection, recording, analysis, interpretation, and storage of information regarding all components of the hydrological cycle. Not only are the water cycle and mass balance equation of importance to water engineers but also the same cycle and equation for the sediment removed, transported, and deposited by the flow of the water. This is the domain of hydrologists, and

collecting data and finding means to do so is their constant occupation (see *Hydrological Data Acquisition Systems*).

Data acquisition for sedimentation studies is required to assess the following:

- the long-term sediment yield of a catchment
- the sediment transport capacity of a river
- critical conditions of re-entrainment of sediments from the bed
- the deposited sediment density/porosity and consolidation
- nonuniformity of sediment transport in a river cross section
- river plan form and slope changes
- sediment characteristics

2. Measurement of the Sediment Discharge of Rivers

Hydrologic data collection thus is necessary for determining the yield of a catchment for water supply purposes. Not only does the discharge of a river or stream need to be recorded but also the sediment discharge, or at least the sediment content of the flow. Such information aids the engineer in designing projects that are able to cope with threats of erosion and sedimentation (see *Sediment Phenomena*).

2.1. Background

Measurement of sediment discharge is necessary to directly determine the amount of sediment load present in the flow of rivers and streams. These measurements differ in principle according to the mode of transportation, i.e. bed load and suspended load. Various instruments have been developed to measure the sediment discharge, but few are universally accepted. Both bed load and suspended load need to be measured to obtain reasonable data on total sediment load (see *Hydraulics of Two-Phase Flow: Sediment and Water*).

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Biographical Sketch

Gerrit Basson is professor and head of the Water Division at the Department of Civil Engineering of the University of Stellenbosch, Republic of South Africa. He obtained the degrees B.Eng. (cum laude) and B.Eng. (Hons.) Civil from the University of Pretoria, South Africa, and the degrees M.Eng. and Ph.D. from the University of Stellenbosch, South Africa. He is a registered professional engineer in South Africa and member of the South African Institution of Civil Engineers (SAICE). He has 15 years' experience in consulting engineering, mainly in the fields of hydraulic engineering and water resources planning. He is a specialist in the subjects of reservoir sedimentation and its control and the dredging of reservoirs, on which he has coauthored several reports. His other publications number about 20. He is also active in research and data analysis on the hydraulic roughness of tunnels. He has served on the SAICE Water Division Committee since 1999. He is the representative for the International Association of Hydrological Sciences (IAHS) on the International Commission on Continental Erosion (ICCE) and member of the South African National Committee of the IAHS (SANCIAHS) (2000–2003).