

Sediment and its movement as natural resources and environment

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1. Introduction

Sediment is not well recognized as a natural resource, compared with, for instance, forest and water. Sediment is also an important constituent of the environment but is not fairly acknowledged. In this paper, we identify benefits derived from sediment as a natural resource as well as a constituent of the environment. Problems caused by sediment movement are also located in various environmental settings. Then, we review an effective analytical framework of sediment movement and give research perspectives on sediment and its movement as natural resources and environment.

2. Terminology of ‘sediment’

‘Sediment’ refers to basically unconsolidated collection of solid particles in the size from clay to boulder consisting of rock clasts, mineral fragments, volcanic materials, weathering residual materials, biological remains etc. Solid particles may be coated by materials from different origins through adsorption and/or precipitation processes. ‘Debris’ is a synonym of ‘sediment’ but tends to be used when cobbles and boulders are included. ‘Deposit’ is also a synonym of ‘sediment’ but may be used particularly for settled sediment. ‘Sediment’ is a useful term which can be used for collection of solid particles in transport and after deposition, regardless of its particle size distribution.

3. Benefit and problems of sediment as natural resources and the environment

Sediment is a resource material for buildings and civil engineering structures. In some areas, humus-rich sediment is collected and distributed to agricultural fields as natural fertilizer. Sediment develops landforms, such as alluvial plains, river banks and beds, coastal banks and beaches, which provide the essential places for human life, agriculture and ecological habitats. On the other hand, sediment can cause various problems. 1) Sediment disaster is one of the most serious sediment-causing problems around the world. Other issues include 2) the problems in water quality and local water transportation in Lake Inle of Myanmar, 3) the problem in water quality by suspended sediment being delivered from many coastal catchments into the Great Barrier Reef lagoon in northwestern Australia, 4) heavy metal pollution by discharge of mine tailing (polluted sediment) from the Bor Mine into the Danube River in Serbia, 5) river incision and/or coastal erosion due to local deficit of sediment, and 6) deterioration of ecological habitat environments due to changes in landforms along rivers and coasts as well as in particle size distribution. Thus, sediment-causing problems commonly occurs by human interventions or extreme events (rain and earthquake) and extreme events (rain) are partly but importantly related to climate change.

4. Sediment budgets as an analytical framework

Many sediment-causing problems are commonly induced by rapid or sudden change in rates of erosion (or discharge) and deposition (or inflow) of sediment. ‘Sediment budgets’ are a quantitative, schematic

account of sediment movement in the target area, in which erosion (source) and deposition (sink) as well as outflow from the target area (output) are linked. It is displayed in the form of a simple diagram, which makes a sediment budget considerably useful in planning countermeasures for sediment-causing problems.

5. Research perspectives

Given that sediment is clearly a constituent of the environment, it should be better recognized, even in the academic arena, as an important natural resource, like forest and water. Scientific research will objectively analyze both benefits and problems concerning sediment and its movement. Such research encourages the multidisciplinary approach with earth, ecological and social sciences.

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