



Integrated Sediment Management in Rivers and Reservoirs

Jannes Kamphuis, Kristian Meerse

Dredging Consultancy Department, Royal IHC, Delft, The Netherlands

Email address:

j.kamphuis@ihc.nl (J. Kamphuis), k.meerse@royalihc.nl (K. Meerse)

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Abstract: Dam instability and loss of storage capacity are just a few of many problems caused by reservoir sedimentation. With over 5000 large dams in India the impact of reservoir sedimentation is significant and therefore sediment management is of crucial importance. Where the majority of the dams have been clogged up during the past decades, the active removal of sediment from these reservoirs by dredging is necessary to regain its capacity. Sediment removal by dredging is a costly process. However, these costs can be reduced by implementing an innovative circular sediment management plan. By re-using the dredged sediments instead of disposing it as a waste product additional revenue could be generated. A consortium of Dutch companies are preparing a full-scale pilot project to implement the circular sediment management plan for reservoir dredging in India. This paper gives a brief overview of the projected pilot including a circular sediment management plan and a technical approach of the proposed dredging method.

Keywords: Reservoir, Dredging, Sedimentation, Circular Sediment Management, Rehabilitation, Pilot

1. Introduction

Most natural rivers have a more or less balanced sediment inflow and outflow. Dam construction dramatically affects this balance [1]. This creates an impounded reservoir which results in extremely low flow velocities and sediment trapping. Incoming sediment will be accumulated until the impounded reservoir has become 'filled up' and a new balance is achieved.

To date, 58,319 dams worldwide are registered by ICOLD (International Commission On Large Dams) [2]. The global net amount of reservoir storage space has been decreasing in recent years because reservoir sediment management was not standard practice in the past [3]. This trend is the result of a decrease in the rate at which reservoir storage has been added since about 1980 and the continued loss of storage space to reservoir sedimentation, Figure 1.

Figure 1 shows that total net reservoir storage space, after accounting for storage loss due to sedimentation, has decreased since about 2000, while global storage space per capita has decreased since about 1980. The current per capita net reservoir storage space roughly equals what it was in 1965. The importance of implementing reservoir sediment management techniques to preserve reservoir

storage space is evident.

Many sediment-related problems can occur both upstream and downstream of the dam [1]. Among others, there is a significant annual loss in reservoir storage and efficiency. Second, there is the abrasion of turbines and other hydro mechanical parts. This is caused by sediment hitting the parts of the turbine with large velocities. Third, there is the downstream impact. Rivers downstream of dams suffer from erosion and bank failure due to a reduced sediment load and occasional clear water releases. Fourth there is the ecological impact. Nutritious silt is trapped in the reservoir upstream what can result in less fertile soil downstream of the dam, influencing the local agriculture. There is an growing risk of instability of the hydro dams due to the pressure by weight because of the increasing amount of sediment. And finally siltation causes besides a decrease in operating losses (calculated on the basis of storage capacity) in many cases also a decrease in the drinking water stock in a time with a growing need of drinking water caused by urbanization. Beside these local challenges, there is a worldwide exhaustion of raw materials and an increasing need for water safety. Because of the continues siltation by nature of dams and reservoirs sediment management is essential in order to achieve long-term sustainable use.

Notes On Sediment Management In Reservoirs

**George Constantinescu, Marcelo
Garcia, Dan Hanes**



Notes On Sediment Management In Reservoirs:

Notes on Sediment Management in Reservoirs Shou-shan Fan,1997 Sediment Management at the River Basin Scale Phil Owens,2007-10-03 Sediments are a natural part of aquatic systems and they are essential for the hydrological geomorphological and ecological functioning of those systems For society they are important and represent an important resource However due to the ever increasing use of river catchments sediments need to be managed in a balanced and sustainable way Sediment Management at the River Basin Scale reviews some of the key requirements and challenges facing scientists river basin managers and policy makers for sustainable sediment management at the river basin scale and puts forward important recommendations This volume also available as part of a 4 volume set ISBN 0444519599 Discount price for set purchase First book to consider management at the basin scale State of the art review chapters New conceptual frameworks and approaches to management **Notes on Sediment Management in Reservoirs** Shou-shan Fan,1997

Reservoir Sediment Management Sahnaz Tigrek,Tuce Aras,2011-09-15 Siltation in reservoirs has become an important problem when dams are getting older and stop functioning when the sediment has accumulated to a certain extent With proper sediment management techniques negative effects of sediment can be avoided and reservoir life and performance can be improved This volume deals with reservoir sedimentation deposition and removal It provides the principles of sediment transport and gives guidelines to predict reservoir life It presents several removal techniques accompanied with detailed operation descriptions With the help of the RESCON open source software cost analysis tools to determine the optimum method for maintenance and operation of a reservoir can be applied To illustrate practice and to assist the reader in setting up a sediment management operation a number of case studies of existing large dams are included Written by two experts on reservoir operation this volume is intended for professionals and advanced students working on dam and reservoir design construction operation maintenance and rehabilitation **Reservoir Sedimentation** Kumkum Bhattacharyya,Vijay P. Singh,2019-01-03 Reservoir Sedimentation Assessment and Environmental Controls appraises the issues of sedimentation in reservoirs and discusses measures that can be employed for the effective management of sediment to prolong the operational life of reservoirs It provides information for professional consultants and policymakers to enable them to manage dams in the best possible way in order to ensure their sustainability as well as the sustainability of water resources in general It examines the effects of anthropogenic intervention and management of sediment in dams and reservoirs as water resources become more sensitive and the demand for clean water continues to increase Features Examines the issue of sedimentation in dams and reservoirs and presents water management strategies to alleviate environmental issues Presents methods to help ensure the environmental sustainability of dams and reservoirs as well as the sustainability of water resources with consideration of climate change and increased demand Illustrates the spatial distribution of sedimentation characteristics for several dams using geographic information systems GIS Explains the relationships between loss in capacity and catchment characteristics

Examines regional variation in sediment yield defines geomorphic regions on the basis of similar hydrometeorology physiography geology and vegetation affecting reservoirs **Evacuation of Sediments from Reservoirs** Rodney White,2001 This book is concerned with one of the methods of removing sediments from reservoirs namely the flushing of sediments through purpose built outlet works within the dam This technique can be applied to existing dams with adaptation of the engineering works and to new dams The book gives practical guidance on the necessary hydrological hydraulic sedimentological and topographical features for successful flushing In this book the author draws together his wealth of experience of working in this field **Reservoir Sediment Management** Sahnaz Tigrek,Tuce Aras,2011-09-15 Siltation in reservoirs has become an important problem when dams are getting older and stop functioning when the sediment has accumulated to a certain extent With proper sediment management techniques negative effects of sediment can be avoided and reservoir life and performance can be improved This volume deals with reservoir sedimentation dep *Reservoir Sedimentation Handbook* Gregory L. Morris,Jiahua Fan,1998 Focusing on reservoir sedimentation management and control this work defines the nature and severity of sedimentation reviews relevant physical processes describes techniques used to combat sedimentation and presents detailed case studies **The Grand Ethiopian Renaissance Dam, its Impact on Egyptian Agriculture and the Potential for Alleviating Water Scarcity** Youssef M. Hamada,2017-05-26 This book covers the entire Nile Basin and reflects the latest findings It provides unique and cutting edge insights into the region s agriculture water resources governance poverty productivity upstream downstream linkages innovations future plans and their implications Many international summits and conferences have declared that there is an urgent need to save agriculture from its demise Most international agencies now recognize that something must be done but what Beyond policy changes the restructuring of global governance and institutional reforms are called for Commitments must be translated into concrete actions leading to a renewed interest in agriculture and a return to the basic objective of achieving food security

Erosion and Sediment Control for Reservoir Sedimentation from Agricultural Activities in Highlands Prof. Lariyah BTE Mohd Sidek,Ir. Hidayah BTE Basri,Dr. Mohamed Ahmed Hafez,2019-10-08 For years the lands in Cameron Highland have been opened and leveled for agricultural farming and intensive crop production The overall agricultural coverage is relatively small and is mostly done on steep slopes The high usage of fertilizer and pesticides by local farmers accompanied by the increase in the frequency of major storm events had given rise to high levels of soil erosion and environmental pollution In this study a guideline has been established to be used by the local authorities and farmers to conserve soil protect the natural waterways and the surrounding environments from man made pollutions **Agricultural Conservation Practices and Related Issues** ,2004 HEC-6 ,1995 Reservoir Sedimentation Anton J. Schleiss,Giovanni de Cesare,Mario J. Franca,Michael Pfister,2014-08-12 Despite the mechanisms of reservoir sedimentation being well known for a long time sustainable and preventive measures are rarely taken into consideration in the design of

new reservoirs To avoid operational problems of powerhouses sedimentation is often treated for existing reservoirs with measures which are efficient only for a limited time

River Flow 2016 George Constantinescu, Marcelo Garcia, Dan Hanes, 2016-06-22 Understanding and being able to predict fluvial processes is one of the biggest challenges for hydraulics and environmental engineers hydrologists and other scientists interested in preserving and restoring the diverse functions of rivers The interactions among flow turbulence vegetation macroinvertebrates and other organisms as well as the transport and retention of particulate matter have important consequences on the ecological health of rivers Managing rivers in an ecologically friendly way is a major component of sustainable engineering design maintenance and restoration of ecological habitats To address these challenges a major focus of River Flow 2016 was to highlight the latest advances in experimental computational and theoretical approaches that can be used to deepen our understanding and capacity to predict flow and the associated fluid driven ecological processes anthropogenic influences sediment transport and morphodynamic processes River Flow 2016 was organized under the auspices of the Committee for Fluvial Hydraulics of the International Association for Hydro Environment Engineering and Research IAHR Since its first edition in 2002 the River Flow conference series has become the main international event focusing on river hydrodynamics sediment transport river engineering and restoration Some of the highlights of the 8th International Conference on Fluvial Hydraulics were to focus on inter disciplinary research involving among others ecological and biological aspects relevant to river flows and processes and to emphasize broader themes dealing with river sustainability River Flow 2016 extended abstract book 854 pages full paper CD ROM 2436 pages contains the contributions presented during the regular sessions covering the main conference themes and the special sessions focusing on specific hot topics of river flow research and will be of interest to academics interested in hydraulics hydrology and environmental engineering

Missouri River Basin Project United States. Bureau of Reclamation. Region 7, 1951

Annotated Bibliography on Sedimentation, 1950

Reservoir Fish Habitat Management L.E, Miranda, 2017-03-01 This document is organized into an introduction and 13 sections Section 1 is based on a nationwide survey of reservoir habitats completed by the Reservoir Fisheries Habitat Partnership RFHP The RFHP canvassed agency professionals about various aspects of reservoir fish habitat degradation and identified 12 comprehensive factors that captured most degradation The sections developed in this document parallel these 12 factors to identify management practices that address the perceived degradation Most sections are organized similarly background information about the degradation factor is followed by a listing of alternative management practices Deciding on appropriate management action can be complex because there are often several options for addressing degradation problems Different options may have different cost effectiveness and consequences A simplified decision model to choose among management options is suggested in section 12 Habitat management often goes far beyond the manpower available to agencies involved in reservoir habitat management so suggestions on working with stakeholders are included in section 13 Ballpark costs of reservoir fish habitat

management practices are given in the Appendix **Annotated Bibliography on Sedimentation** United States. Soil Conservation Service,1950 **Manual on Sediment Management and Measurement** Xiaoqing Yang,World Meteorological Organization,2003 This report covers a wide range of issues related to sedimentation Its objectives are to present to readers a basic understanding of operational methods of sediment transport measurement and serve as a practical reference in dealing with sedimentation engineering Publisher s description **The Reservoir as an Asset** British Dam Society. Conference,British Dam Society,1996 Very Good No Highlights or Markup all pages are intact

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