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New Remedial Measure for Silting in Dam

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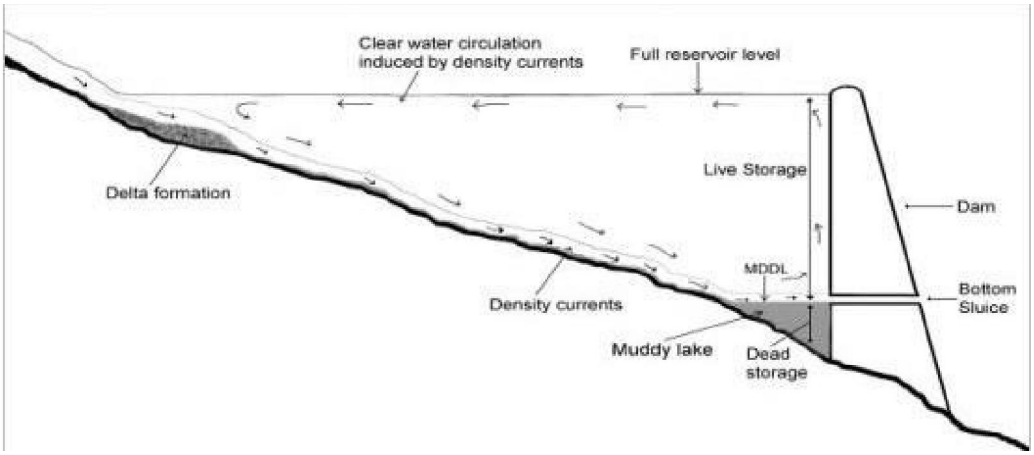
Abstract: *The shortage of rainfall and its increasing variability leads to moisture stress particularly indry and rain-fed areas. Reservoirs, created by dams, are constructed to store water for use in non-monsoon months. However, these benefits are not fully explored due to water storage loss due to siltation. The sediment management at dams and reservoirs have given rise to acute complications owing to its impact on water availability, reliability of infrastructure and impact on downstream users. methods to calculate the volume of siltation trapped by gravity dams play an important role in addressing these issues. we are learning the various methods that can be adopted to calculate sedimentation in reservoirs of dams. Silt is somewhere between the size of sand and clay, and is an important component in the sedimentary dynamics of rivers. Silt comes in several forms. It might be found in the soil underwater or as sediment suspended in river water. Silt is geologically classified by its grain size and texture going through a sieve. Letters are assigned to the grain of soil, whether it is gravel, sand, silt, clay, or organic. Then, it is further delineated as to whether the sample is poorly graded, well-graded, has a high plasticity, or low plasticity. The sample composition is determined by passing it through differently sized sieves, and the result is classified with the combination of letters assigned to it based on its physiochemical characteristics...*

Keywords: Dam

I. INTRODUCTION

Sedimentation is a process whereby soil particles are eroded and transported by flowing water or other transporting media and deposited as layers of solid particles in water bodies such as reservoirs and rivers (Tundu et al., 2019). It is a complex process that varies with watershed sediment yield, rate of transportation and mode of deposition (Ezugwu, 2013). Sediment deposition reduces the storage capacity and life span of reservoirs as well as river flows (Eroglu et al., 2010). Sedimentation continues to be one of the most important threats to river eco- systems around the world. A study was done on the world's 145 major rivers with consistency long term sediment records and the results show that about 50% of the rivers have statistically a significantly downward flow trend due to sedimentation (Walling & Fang, 2003). Sumi & Hirose (2009) reported that the global reservoir gross storage capacity is about 6000 km3 and annual reservoir sedimentation rates are about 31 km3 (0.52 %).



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This suggests that at this sedimentation rate, the global reservoir storage capacity will be reduced to 50% by year 2100. Reservoir sedimentation therefore is filling of the reservoir behind a dam with sediment carried into the reservoir by streams. The flow of water from the catchment upstream of a reservoir is capable of eroding the catchment area and of depositing material either upstream of the reservoir, or in the still water of the reservoir. The nature of the material in the catchment area and the slope of the catchment area and the inlet streams are a factor, as is the nature of the ground cover. The deposition of sediment will automatically reduce the water storing capacity of the reservoir, and if the process of deposition continues longer, a stage is likely to reach when the whole reservoir may get silted up and become useless (Garg, 2009).

Siltation is water pollution caused by particulate terrestrial clastic material, with a particle size dominated by silt or clay. It refers both to the increased concentration of suspended sediments and to the increased accumulation (temporary or permanent) of fine sediments on bottoms where they are undesirable. Siltation is most often caused by soil erosion or sediment spill.

It is sometimes referred to by the ambiguous term "**sediment pollution**", which can also refer to a chemical contamination of sediments accumulated on the bottom, or to pollutants bound to sediment particles. Although "siltation" is not perfectly stringent, since it also includes particle sizes other than silt, it is preferred for its lack of ambiguity

CAUSES

The origin of the increased sediment transport into an area may be erosion on land or activities in the water.

In rural areas, the erosion source is typically soil degradation by intensive or inadequate agricultural practices, leading to soil erosion, especially in fine-grained soils such as loess. The result will be an increased amount of silt and clay in the water bodies that drain the area. In urban areas, the erosion source is typically construction activities, which involve clearing the original land-covering vegetation and temporarily creating something akin to an urban desert from which fines are easily washed out during rainstorms

II. METHODOLOGY

There are new remedial measures for silting in dam.

PULSE FLUSHING

Pulse flushing" process for sedimentation and dams, also known as "drawdown flushing," involves lowering the reservoir water level significantly by opening low-level outlets in the dam, creating a strong current that scours and re-suspends deposited sediment, allowing it to be carried downstream and flushed out of the reservoir, effectively cleaning the sediment buildup behind the dam.

Key points about pulse flushing:

Low-level outlets:

The process relies on opening specific low-level outlets in the dam to release a large volume of water at a controlled rate, generating a strong current within the reservoir.

Sediment resuspension:

As the water level drops and the current increases, previously settled sediment is picked up and mixed into the water column, enabling it to be transported downstream.

Drawdown phase:

This method involves a significant drawdown of the reservoir, meaning the water level is lowered considerably to facilitate the flushing process.

Suitable conditions:

Pulse flushing is most effective in narrow reservoirs with steep slopes, as the increased flow velocity helps carry the sediment away efficiently

III. CONCLUSION

When the dead volume exceeds these limits and threatens the useful volume, the desilted of the dam becomes a mandatory outcome. Two solutions emerge, namely, the hydraulic dredging of the reservoir and the raising of the dike.

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Only the two options present a paradox of siltation; each time the dam is desilted, the annual siltation rate increases in intensity. In addition, silt cannot be removed from a dam continuously until the destination of the silt is unknown. Similarly, for stability reasons, the dike cannot be lifted each time the "dead" volume gains height. To this end, the valorization of the mud of the dam in the fields of construction and preferably agriculture can solve the problem of siltation. In this case, we speak of sustainable desilting; the dam will be equipped with one or more dredges that continuously suck up the mud. The mud is discharged directly into basins fitted out on the periphery of the dam in such a way that a closed circuit is created; the mud settles in the basins, and the water returns to the reservoir. Once dried, the mud will be transported to its place of use

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