

# Identification of Village Tank Cascade Systems (VTCS) in Vavuniya District, Sri Lanka as a Strategy for Sustainable Water Management

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## Abstract:

An attempt was made to identify and validate the Village Tank Cascade Systems (VTCS) and to study the water flow from one village tank to another in each VTCS located in the eight Agrarian Service Centre (ASC) divisions in Vavuniya district to increase the quantity of available water as VTCS contributes a major share for available water resources for the livelihoods of households in Vavuniya district. The 1:10,000 topographic map of the Survey Department, satellite images and the Digital Elevation Model (DEM) were used to identify the cascades and flow direction map for the study area using ArcGIS 10.2.2. This study was conducted from October 2017 to December 2018. Among 756 village tanks in the district, 80 VTCS comprising 514 village tanks were identified, and only 69 cascades were validated in the field. Further, this study identified 111 isolated village tanks without connecting with other village tanks and 131 abandoned village tanks. Further investigation is recommended to explore the possibilities of increasing the cascade areas in the study area by connecting isolated tanks with VTCS. Initiation taken towards rehabilitation of cascades would enhance the livelihood of farm households in Vavuniya district and would lead to sustainable water resource management.

Keywords: Cascades; DEM; GIS; livelihood; Validation; Village tanks

## Highlights:

1. The VTCS plays a crucial role in sustainable management and water conservation.
2. The very first study identified 80 VTCS across the Vavuniya district.
3. Tank siltation and human activities altered the natural settings of the VTCS.
4. The findings will benefit urban planners for developmental activities and farmers for their livelihood.

## INTRODUCTION:

The VTCS is ‘a connected series of tanks organized within a micro-catchment of the dry zone landscape, storing, conveying and utilizing water from an ephemeral rivulet’ (Madduma Bandara, 1985). These systems were developed by the ancient kings during the Rajarata hydraulic civilization as the water conservation strategy by harvesting rainwater to optimize the water utilization for the irrigation in the dry zone. Rainwater is the sole input to the VTCS, thus these are considered as the rainwater harvesting structures. The excess water received by the upstream tank is allowed to spill out through sluices to flood the rice fields/other vegetation in the downstream, then the excess water from the rice fields/vegetation is captured by the adjacent downstream reservoir. Thus, the water resource is continuously recycled (Lakshman et al. 2002). Hence, the cascade lines are considered as an adaptation strategy to overcome threats from the long-term changes as a result of climate change (Galagedara et al. 2018 and Withanachchi et al. 2014).

Village tank cascade systems (VTCS) and the unconfined aquifer of groundwater are the available water resources for the livelihoods of households in Vavuniya district. Vavuniya District falls under dry zone of Sri Lanka and receives less rainfall (annual average <1200 mm), high evaporation (mean annual 1700 – 1900 mm); and high temperature (mean annual 26 – 34°C), results to hot weather and water shortage especially during the period of May – August. Madduma Bandara (1985) reported, these VTCS contributed to the recharge of the shallow regolith aquifer to maintain high water table. Previous studies found the substantial