22 MARCH

WORLD WATER DAY 2026 - WATER AND GENDER



IRRIGATION DEPARTMENT



Message from the Director General of Irrigation

World Water Day 2026

As we celebrate World Water Day 2026, we are reminded of our shared responsibility to preserve this precious resource for present and future generations. We are well aware the multiple roles play by water as a natural resource in promoting gender equality, sustainable development, environmental protection, and economic prosperity.

All over the world, the demand for water has steadily increased to meet the diverse needs of people across all sectors of society. In the past, however, women in many rural communities bore a disproportionate burden, often traveling long distances to collect water due to limited access to reliable water resources. Ensuring equitable access to water is therefore essential in advancing gender equality and improving quality of life.

Over the last 125 years, the Irrigation Department has implemented numerous water resource development projects across Sri Lanka to enhance the standard of livelihood and strengthen food security, serving communities without distinction of gender. These developments were achieved through number of multi-purpose development projects and at present this mission continues with commitment through initiatives such as Yan Oya, Uma Oya, Elle wewa, and specially Lower Malwathu Oya Reservoir Project; which is expected to benefit the people of Mannar, Vavuniya, and Anuradhapura Districts, further supporting regional development.

On this World Water Day, let us reaffirm our commitment to conserve and protect water resources. Furthermore, working together while ensuring sustainable water management, we will secure a thriving future signaling long - term success of growth.

Eng. K. Weligepolage

Director General of Irrigation

Irrigation Department

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2026 ලෝක ජල දිනය

2026 ලෝක ජල දිනය සමරන මේ මොහොතේ, වර්තමාන සහ අනාගත පරම්පරාවන් සඳහා මෙම වටිනා සම්පත සංරක්ෂණය කිරීම සඳහා පැවරී ඇති වගකීම අපට මතක් කර දෙනු ලැබේ. ස්ත්‍රී පුරුෂ සමානාත්මතාවය, තිරසාර සංවර්ධනය, පාරිසරික ආරක්ෂාව සහ ආර්ථික සමෘද්ධිය ප්‍රවර්ධනය කිරීමේදී ජලය වැදගත් කාර්යභාරයක් ඉටු කරයි.

ශ්‍රී ලංකාවේ, සමාජයේ සෑම අංශයකම ජනතාවගේ විවිධ අවශ්‍යතා සපුරාලීම සඳහා ජලය සඳහා ඇති ඉල්ලුම ක්‍රමයෙන් වැඩි වී තිබේ. කෙසේ වෙතත්, අතීතයේ දී, බොහෝ ග්‍රාමීය ප්‍රජාවන්හි කාන්තාවන් අසමානුපාතික බරක් දැරූ අතර, විශ්වාසදායක ජල සම්පත් සඳහා සීමිත ප්‍රවේශය හේතුවෙන් ජලය රැස් කිරීම සඳහා බොහෝ දුර ගමන් කළහ. එබැවින් ස්ත්‍රී පුරුෂ සමානාත්මතාවය ඉදිරියට ගෙන යාම සහ ජීවන තත්ත්වය වැඩිදියුණු කිරීම සඳහා ජලයට සාධාරණ ප්‍රවේශයක් සහතික කිරීම අත්‍යවශ්‍ය වේ.

වසර 126 කට වැඩි කාලයක්, වාරිමාර්ග දෙපාර්තමේන්තුව ශ්‍රී ලංකාව පුරා ජීවනෝපායන් වැඩි දියුණු කිරීම සහ ආහාර සුරක්ෂිතතාව ශක්තිමත් කිරීම සඳහා, ස්ත්‍රී පුරුෂ භේදයකින් තොරව ප්‍රජාවන්ට සේවය කිරීම සඳහා වාරිමාර්ග යෝජනා ක්‍රම රාශියක් ක්‍රියාත්මක කර ඇත. මන්නාරම, වවුනියාව සහ අනුරාධපුර දිස්ත්‍රික්කවල ජනතාවට ප්‍රතිලාභ සැලසෙනු ඇතැයි අපේක්ෂා කරන පහළ මල්වතු ඔය ජලාශ ව්‍යාපෘතිය වැනි ප්‍රධාන සංවර්ධන මුලපිරීම් හරහා අපි මෙම කැපවීම දිගටම කරගෙන යන අතර, කලාපීය සංවර්ධනයට සහ ස්ත්‍රී පුරුෂ සමානාත්මතාවයට තවදුරටත් සහාය වෙමු.

මෙම ලෝක ජල දිනයේදී, ජල සම්පත් සංරක්ෂණය හා ආරක්ෂා කිරීම සඳහා අපගේ කැපවීම නැවත තහවුරු කරමු. එකට වැඩ කිරීමෙන්, වඩාත් සාධාරණ හා සමෘද්ධිමත් අනාගතයක් සඳහා තිරසාර ජල කළමනාකරණය සහතික කළ හැකිය.

ඉංජී. කේ. වැලිගෙපොලගේ

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Section1 - Technical Papers

Table of Content – Section 1 (Technical Papers)

FLOOD CONTROL PERFORMANCE OF THE DEDURU OYA RESERVOIR BY IRRIGATION DEPARTMENT DURING CYCLONE DITWAH (2025) 3

DEVELOPING STRATEGIES FOR EFFECTIVE WATER MANAGEMENT IN ANURADHAPURA DISTRICT AMID CLIMATE CHANGE - A CASE STUDY OF THE PADAVIYA RESERVOIR 8

FLOOD INUNDATION MAPPING USING THE HEIGHT ABOVE NEAREST DRAINAGE (HAND) MODEL INTEGRATED WITH FIELD DATA COLLECTION: A CASE STUDY OF THE ATTANAGALU OYA BASIN, SRI LANKA 14

BALANCING IRRIGATION, WILDLIFE HABITAT AND TOURISM: INTEGRATED WATER MANAGEMENT OF MINNERIYA TANK IN SRI LANKA 23

"SECURING IRRIGATION WATER AFTER FLOOD DAMAGE: A RISK ASSESSMENT OF TEMPORARY REHABILITATION OF THE ELAHERA ANICUT FOLLOWING THE DITWA FLOOD EVENT." 32

EXPERIENCES FROM THE DITWAH CYCLONE – NOVEMBER 2025: FLOOD MONITORING, FORECASTING, AND EARLY WARNING DISSEMINATION BY THE IRRIGATION DEPARTMENT, *SRI LANKA* 40

COMPREHENSIVE EVALUATION OF WATER QUALITY STATUS IN THE MAHAWELI RIVER 51

STUDY ON THE IRRIGATION WATER QUALITY OF MAJOR RESERVOIRS IN ANURADHAPURA DISTRICT, SRI LANKA - 2024 58

FLOOD CONTROL PERFORMANCE OF THE DEDURU OYA RESERVOIR BY IRRIGATION DEPARTMENT DURING CYCLONE DITWAH (2025)

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Abstract

Extreme hydrological events increasingly challenge reservoir flood management in Sri Lanka. Cyclone Ditwah, which struck the island between 26 and 29 November 2025, generated unprecedented rainfall and widespread flooding across multiple river basins. This paper elaborates the role of the Deduru Oya Reservoir which is a major reservoir located in Kurunegala district manage by Irrigation Department in mitigating downstream flooding during the cyclone. Hydrological data, reservoir discharge records, and flood warning reports were analyzed to assess reservoir operations and downstream impacts. The results indicate that the reservoir played a critical role in moderating peak inflows through controlled spill releases approximately 110,000 cubic feet per second (3100 cubic meters per second). Despite these mitigation measures, sustained heavy rainfall across the catchment exceeded storage and regulation capacity, causing flood conditions in several downstream locations. The findings highlight the importance of adaptive reservoir operation, improved forecasting systems, and integrated basin management to enhance flood resilience under extreme climate events.



1. Introduction

Floods are among the most destructive natural hazards affecting Sri Lanka, particularly during monsoon periods and tropical cyclones. Increasing climate variability has intensified extreme rainfall events, posing challenges to existing hydraulic infrastructure and flood management strategies.

Cyclone Ditwah, which affected Sri Lanka in late November 2025, produced exceptionally high rainfall across the island. Some meteorological stations recorded more than 300 mm of

daily rainfall, while a maximum daily rainfall of 540 mm was recorded in the Central Province. The event caused water levels to rise in more than 100 rivers across the country and led to widespread flooding in several river basins.

The Deduru Oya basin, located in the northwestern region of Sri Lanka, is one of the major river systems prone to flooding due to intense rainfall in its upper and middle catchment areas. The Deduru Oya Reservoir (**Capacity of 75 MCM**), constructed primarily for irrigation and water regulation, also serves as a flood moderation structure. During Cyclone Ditwah, rapid inflow increases forced authorities to release large volumes of water through spill gates to prevent structural and operational risks.

This article elaborates the performance of the Deduru Oya Reservoir in controlling flood conditions during Cyclone Ditwah and evaluates its effectiveness in reducing downstream flood impacts.

2. Affected Area

Deduru Oya Reservoir is located in the North Western Province of Sri Lanka and serves irrigation schemes across the Kurunegala and Puttalam districts. The reservoir regulates flows of the Deduru Oya River, which eventually drains into the Indian Ocean near Chilaw.

The Deduru Oya basin includes several Divisional Secretariat divisions such as Wariyapola, Nikaweratiya, Kobeigane, Bingiriya, Pallama, Arachchikattuwa, and Rasnayakapura, many of which are vulnerable to flooding due to their low elevation and proximity to river floodplains.

The region experiences seasonal rainfall associated with the Southwest and Northeast monsoons, but extreme rainfall events associated with cyclonic systems can produce rapid runoff and flash flooding.

3. Hydrological Conditions During Cyclone Ditwah

Cyclone Ditwah produced continuous heavy rainfall across Sri Lanka between 26 and 29 November 2025, resulting in extreme inflows into major reservoirs and river basins. The Deduru Oya basin experienced significant rainfall across its upper and mid-catchment regions, leading to rapid increases in river discharge and reservoir storage levels.

As water levels in the reservoir approached critical thresholds, the spill gates were opened to regulate the water level by the responsible officers in Irrigation Department. Initial releases exceeded approximately **5,000 cubic feet per second**, and later increased gradually further as inflow continued to rise.

At peak conditions, controlled releases were reported to reach **approximately 110,000 cusec (3100 cumec)**, significantly increasing downstream flow levels.

Due to these releases and sustained rainfall, flood warnings were issued for several downstream areas along the Deduru Oya valley.

4. Reservoir Flood Control Operations

The flood management strategy for the Deduru Oya Reservoir during the cyclone involved controlled spillway operations designed to balance two key objectives:

1. Maintaining reservoir structural safety by preventing overtopping.
2. Minimizing downstream flooding through gradual water release.

Reservoir operations followed a staged release strategy as inflows increased. Early releases began when flood warnings received to reduce the storage level, allowing Irrigation Department officials to maintain a buffer capacity for incoming floodwaters.

However, continuous rainfall across the catchment reduced the effectiveness of this strategy. As inflows increased beyond expected levels, discharge rates had to be increased significantly to maintain safe reservoir levels. The initial gate opening was done on 22 November and gradually increased as illustrated below.

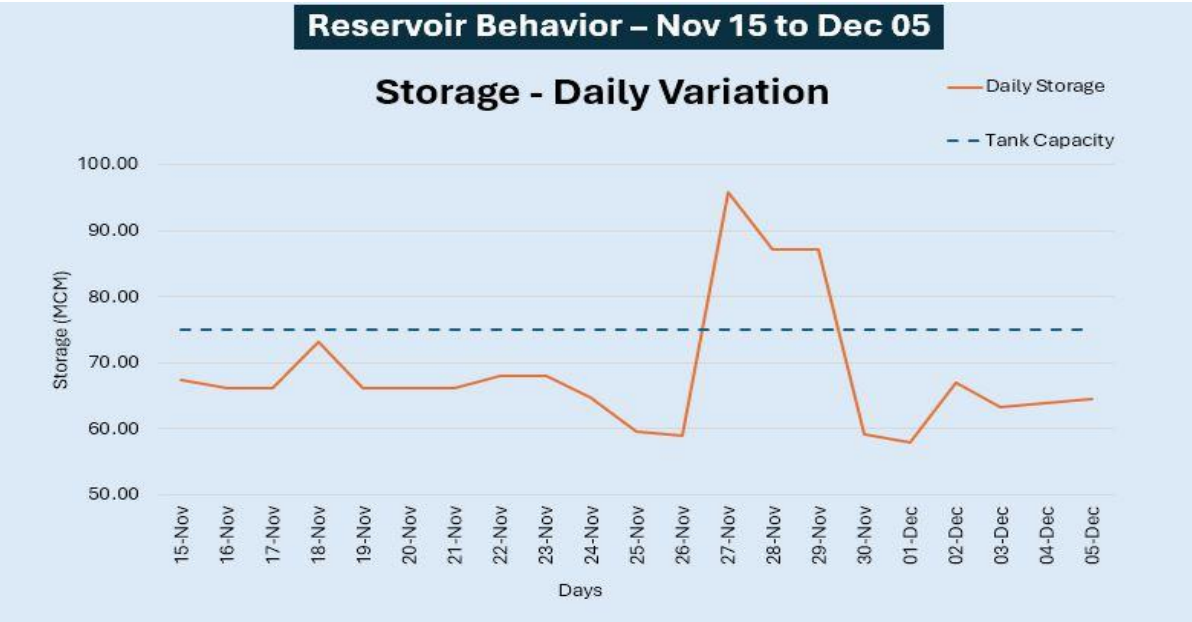


Figure 4.1 Daily variation of storage

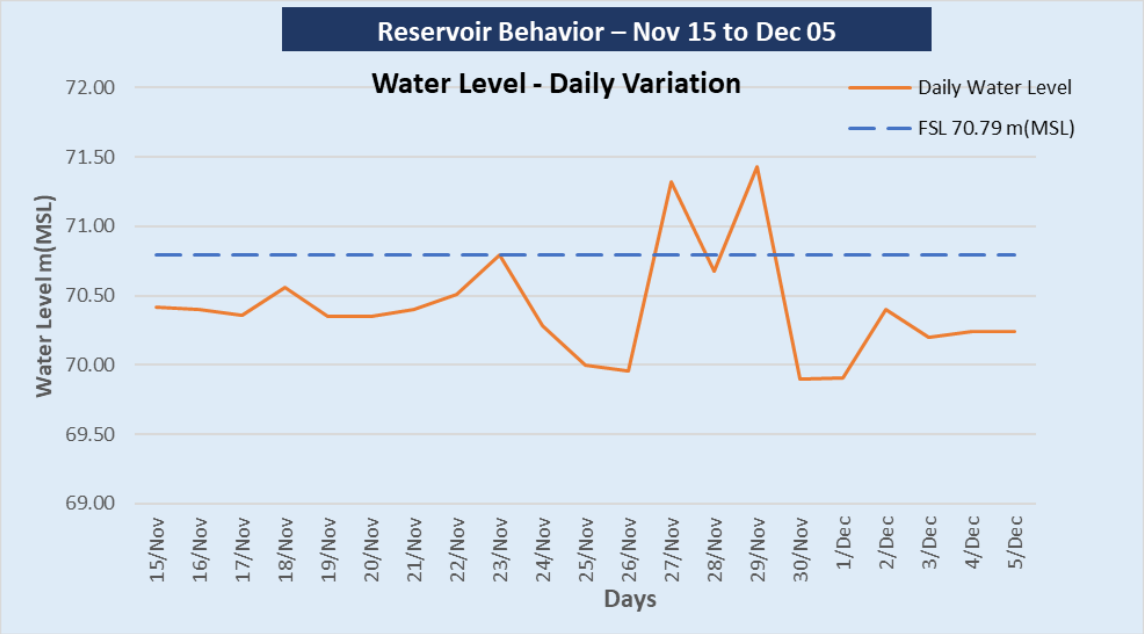


Figure 4.2 Daily variation of water level

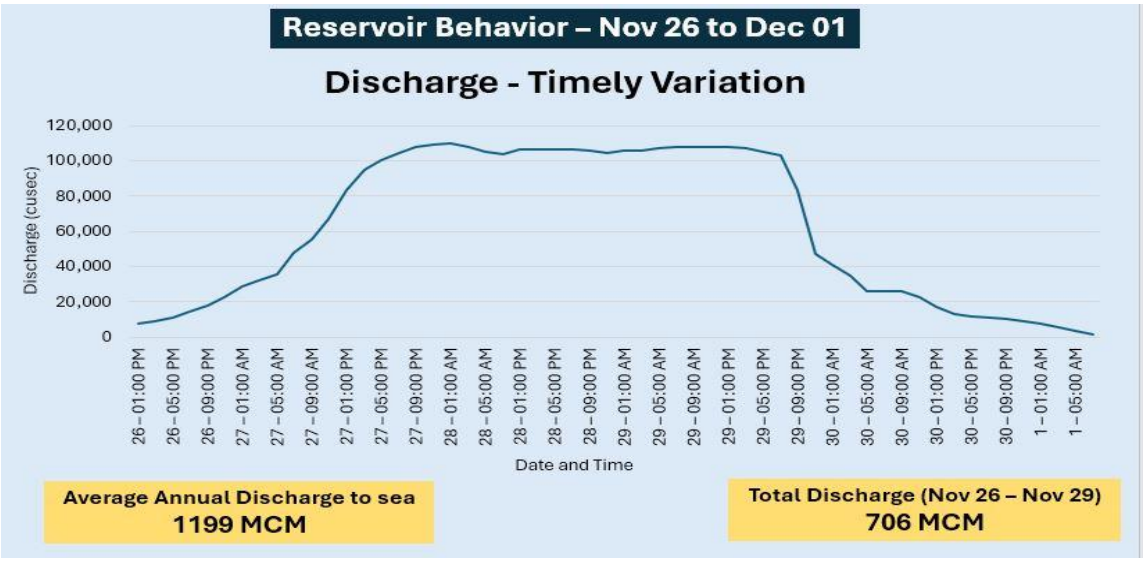


Figure 4.3 Spil discharge variation

Despite these challenges, the reservoir helped delay and reduce the peak flood wave reaching downstream communities.

5. Downstream Flood Impacts

Flood warnings were issued for several Divisional Secretariat divisions including:

- Wariyapola, Nikaweratiya, Mahawa, Kobeigane, Bingiriya, Pallama, Chilaw, Arachchikattuwa and Rasnayakapura

These areas experienced rising river levels and localized inundation during the event.

Although the reservoir helped regulate flood flows, the combination of extreme rainfall, saturated soils, and high river discharge led to flood conditions in parts of the basin.

6. Discussion

The Deduru Oya Reservoir demonstrated partial effectiveness as a flood mitigation structure during Cyclone Ditwah. Its ability to temporarily store floodwaters and regulate releases helped moderate downstream flow rates.

However, several limitations were identified:

1. **Extreme rainfall intensity** exceeded reservoir storage capacity.
2. **Limited flood storage allocation**, as the reservoir is primarily designed for irrigation.
3. **Rapid catchment response** due to steep terrain and high runoff coefficients.

These findings suggest that future flood risk management should include improved hydrological forecasting, enhanced reservoir rule curves for extreme events, and basin-wide flood mitigation measures.

7. Conclusion

Cyclone Ditwah (2025) was one of the most significant hydrometeorological events affecting Sri Lanka in recent decades. The Deduru Oya Reservoir played an important role in moderating flood flows within the Deduru Oya basin by implementing controlled spill releases. The officials of Irrigation Department have successfully managed the reservoir operation by significantly reducing the impact on downstream as well as protecting the reservoir and its components by preventing a major disaster.

Although the reservoir helped reduce the severity of downstream flooding, extreme rainfall conditions exceeded its regulation capacity, resulting in flood impacts in several low-lying areas.

Future improvements in reservoir operation strategies, early warning systems, and integrated basin management will be essential to enhance flood resilience in the Deduru Oya basin under increasingly variable climatic conditions.

DEVELOPING STRATEGIES FOR EFFECTIVE WATER MANAGEMENT IN ANURADHAPURA DISTRICT AMID CLIMATE CHANGE - A CASE STUDY OF THE PADAVIYA RESERVOIR

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Abstract

The number of droughts events are becoming more critical and frequent due to climate change, which is a major threat to water security and food production in reservoir dependent regions. This study analyses and examines how the Padaviya Reservoir in Anuradhapura District, Sri Lanka, has resilience to hydrological drought based on the Water, Efficiency, Resilience and Drought (WERD) framework. The research examines 34 years (1990 - 2024) of daily monitoring data at the Divisional Irrigation Engineer's Office, Padaviya and provides a 20% reservoir capacity (19.98 MCM) threshold capacity used to assess hydrological drought events and uses the "Day to Day Zero" (DDZ) value to measure system resilience. Findings indicate that the existing paddy dominant system has a severely low hydrological drought resiliency (DDZ = 43.5 days), which is not adequate to sustain all the 26 historical events of hydrological droughts. Crop diversification turns out to be the most important resilience variable, and green beans need 4.0 times less water than paddy. Mix crops cultivation of the season would add DDZ to 67.5 days and efficiency gains would offer water savings every year. It is also projected in terms of climate that resilience will be reduced by 2050 and hence the significance of adaptive management with a combination of crop diversification, efficiency gains, enhanced farmers involvement based on the Kanna meetings.

Keywords: Hydrological Drought, Padaviya Reservoir, WERD Framework, Crop Diversification, Climate Change Adaptation, Day to Day Zero (DDZ), Alternate Wetting and Drying (AWD)

1. Introduction

The Padaviya Reservoir, an ancient large irrigation reservoir, in the Anuradhapura District, with a capacity of 104.85 MCM and irrigable area of 3,514 ha (Irrigation Department). The reservoir is in the Dry Zone and sustains paddy farming and supports the livelihoods of thousands of farming families. However, the increasing climate variability has resulted in more frequent and sever hydrological drought events. Based on the 34 years of reservoir (1990 - 2024) data, it is observed that capacity has moved under the critical 20% mark in 8.7% of all the days recorded, and 26 major hydrological droughts have occurred, the longest of which was 665 days (1996/97). The historic reliance on water intensive paddy farming, with inefficiencies in the irrigation systems, with water loss of more than 30 - 40% (FAO, 2017) has made the system extremely vulnerable. This research uses Water, Efficiency, Resilience and Drought (WERD) framework (Lankford et al., 2023) to evaluate the

hydrological drought resilience systematically and develop adaptive water management strategies for balancing agricultural productivity with water sustainability.

2. Methodology

The WERD framework treats drought resilience as a function of irrigation area, water use efficiency, and storage capacity. The primary dataset comprised daily monitoring records (water level, capacity, outflow, and rainfall) from the Irrigation Department for 1990 - 2024. A hydrological drought threshold capacity was established at 20% of effective capacity (19.98 MCM), validated through historical performance analysis. Drought events were defined as periods when capacity remained below this threshold for at least 30 consecutive days. The "Days to Day Zero" (DDZ) metric was calculated as, DDZ = (Current Storage - Drought Threshold Storage) ÷ Average Daily Withdrawal Rate. Crop water requirements were computed using the ETc = Kc × ETo. Where, ETc - Crop evapotranspiration (mm/day), Kc - Crop coefficient, ETo ‑ Reference evapotranspiration (mm/day). Three cropping scenarios (Paddy Only, Green Beans Only, Mixed Cropping) and three pathway scenarios (Resilient, Balanced, and Growth) were evaluated. Climate change impacts were assessed using moderate scenario and sever scenario projections from the Meteorology Department of Sri Lanka.

3. Results and Discussion

3.1. Reservoir Water Level Behavior and Drought Threshold

The Padaviya Reservoir exhibits a distinct annual cycle, with peak capacity during December to February following the Northeast monsoon and minimum levels during August to September. The mean daily capacity was 52.6% of maximum, with 8.7% of days falling below the 20% drought threshold. 26 major hydrological drought events were identified between 1990 to 2024, with an average duration of 176 days. Table 1 summarizes the most severe historical droughts.

Table 1: Characteristics of Severe Historical Drought Events

Year	Duration (Days)	Min. Capacity (%)
1996/97	665	4.7
1992	328	4.7
2018	275	5.9
1990	267	4.7
2017	259	4.7

Figure 1 illustrates the annual variation in the storage capacity of the Padaviya reservoir during the period from 1990 to 2024.

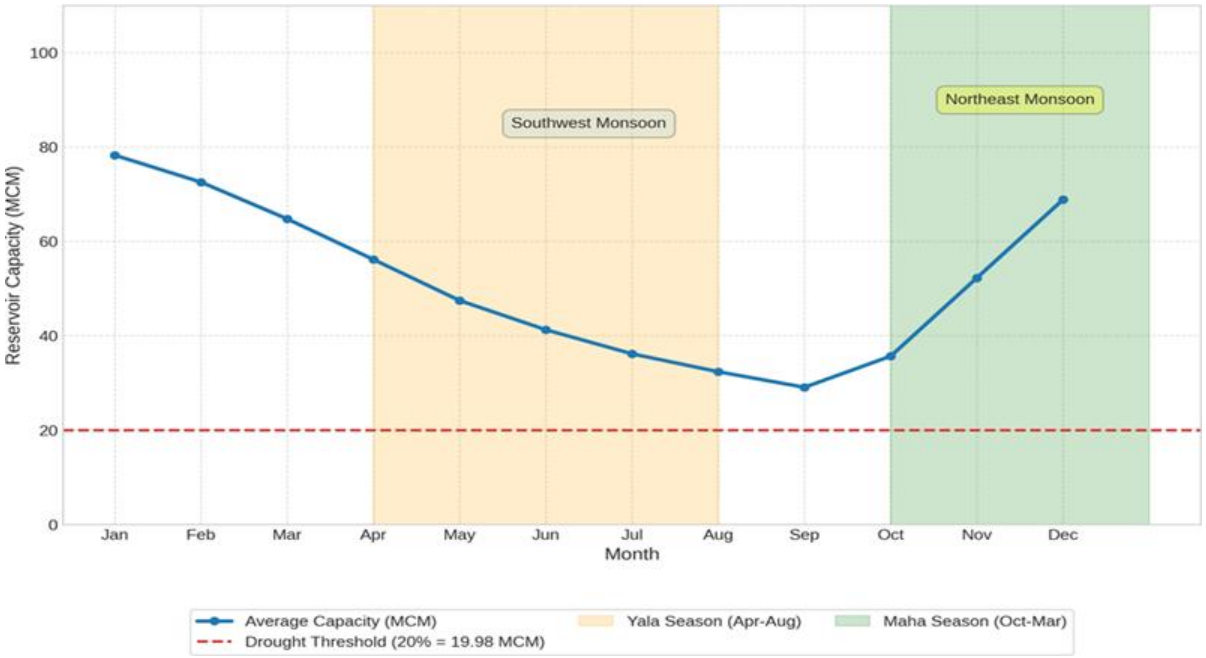


Figure 1: Annual Cycle of Padaviya Reservoir Capacity (1990–2024)

3.2. Hydrological Drought Resilience and the WERD Framework

Under current paddy cultivation, the system's DDZ is only 43.5 days, classified as "Low" resilience by the WERD framework (below the 100-day threshold for "Low" resilience) (Lankford et al., 2023), insufficient for 100% of historical droughts. Crop selection proved to be the most significant factor, as shown in Table 2. The Green Beans Only scenario achieved a DDZ of 150.0 days ("Moderate" resilience), sufficient for 53.8% of historical droughts, while Mixed Cropping achieved 67.5 days. Figure 2 illustrates the DDZ comparison across the three crop diversification scenarios, clearly demonstrating the substantial improvement achievable through crop substitution.

Table 2: Comparison of Crop Water Requirements and Resulting DDZ

Crop	**Water Duty (m^3/ha)**	**Water Duty (Ac.ft/acre)**	**DDZ (Days)**
Paddy	18,288	6.0	43.5
Green Beans	4,572	1.5	150.0

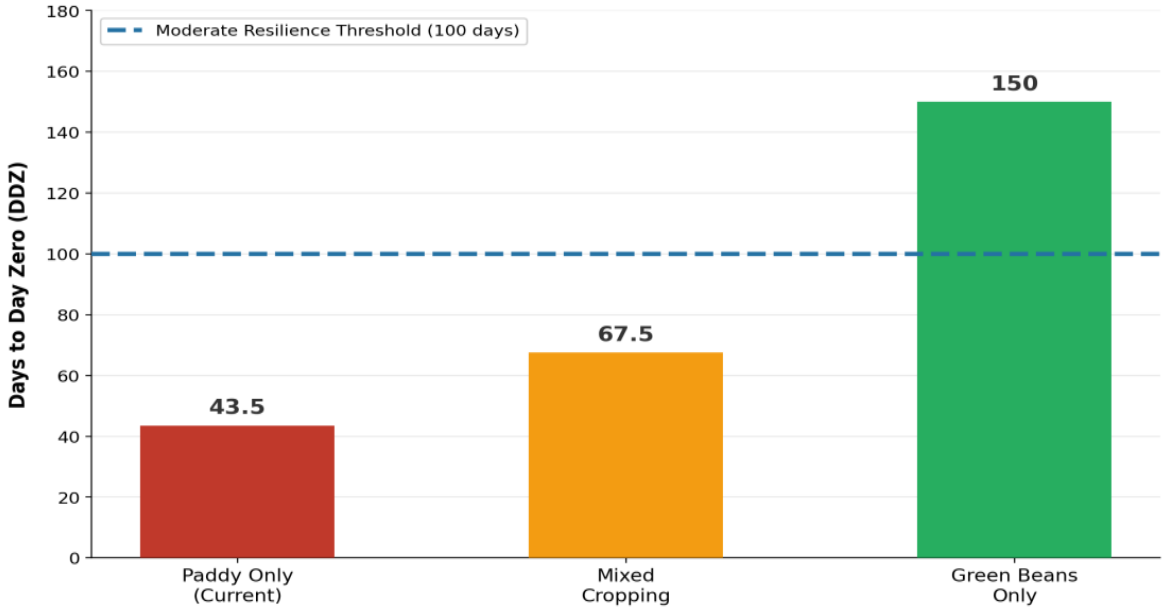


Figure 2: DDZ Comparison Across Crop Diversification Scenarios

3.3. Potential Water Savings from Efficiency Improvements

Crop diversification, targeted efficiency improvements within the irrigation system can generate substantial water savings and enhance overall system performance. Key interventions include canal lining to reduce seepage losses and improve conveyance efficiency, the adoption of Alternate Wetting and Drying (AWD) practices in paddy cultivation to minimize excessive water use without compromising yields, proper land leveling to ensure uniform water distribution and reduce ponding losses, improved irrigation scheduling based on crop water requirements and climatic conditions to optimize timing and quantity of water releases, and the introduction of drip irrigation systems for non-paddy crops to increase application efficiency and reduce evaporation and percolation losses. Collectively, these measures can significantly strengthen water use efficiency and contribute to the long-term sustainability of the irrigation scheme.

3.4. Farmers' Influence and Phased Implementation

The influence of farmers on crop variety selection is a decisive factor in the system's drought resilience. Traditional preference for paddy, driven by food security concerns, cultural significance, and established market chains, has maintained the system in a state of low resilience. The "Kanna meetings," community-based forums for seasonal cultivation planning, provide a critical mechanism for collective decision making on crop types and water allocation. However, without targeted interventions demonstration farms, market linkages for alternative crops, seed supply chains, and farmer training the transition to diversified cropping remains challenging. A phased implementation approach is therefore recommended to gradually shift cropping patterns while building farmer confidence, as illustrated in Figure 3. Phase 1 (Years 1 - 2) involves piloting with 20 - 30% of farmers in the dry season, Phase 2 (Years 3 - 4) expands to 50 - 60% of farmers including wet season

adjustments, and Phase 3 (Year 5+) targets system wide adoption with an optimized crop mix.

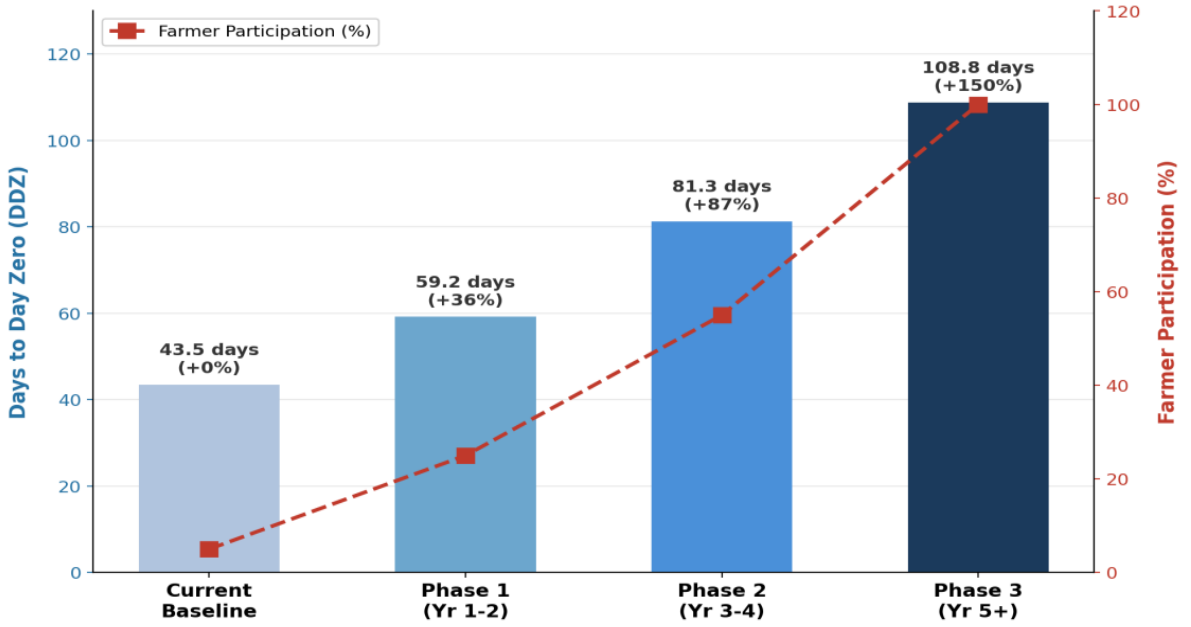


Figure 3: Phased Implementation – DDZ Improvement and Farmer Participation

3.5. Climate Change Impacts

Climate projections for the Anuradhapura District indicate a 1.5 - 2.8°C temperature increase and up to a 5% decrease in annual rainfall by 2050 (Meteorology Department, 2020). This is projected to increase drought frequency by 60% and duration by 42%. Consequently, DDZ values are expected to decrease by 17 - 29% across all scenarios under moderate scenario and Severe Scenario conditions, respectively (Figure 4). This reinforces the urgency for proactive adaptation.

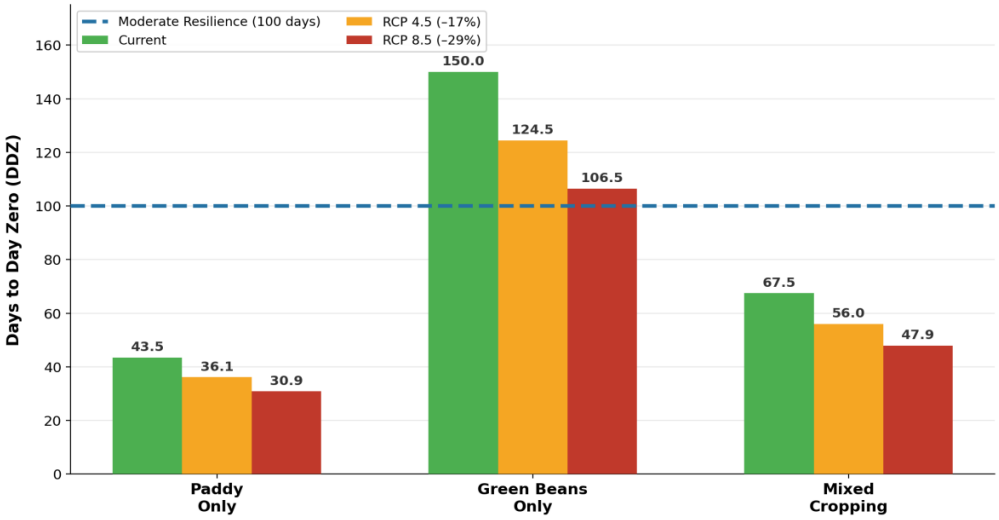


Figure 4: Climate Change Impact on DDZ Across Scenarios

4. Conclusion

The Padaviya Reservoir irrigation system demonstrates critically low hydrological drought resilience under current paddy dominant management practices. The WERD framework analysis reveals that crop diversification is the single most effective strategy for enhancing resilience, with potential to increase DDZ through complete crop substitution (from 43.5 days for paddy to 150.0 days for green beans, as shown in Table 2 and Figure 2). A practical seasonal rotation approach, combined with efficiency improvements and strengthened institutional coordination through “Kanna meetings”, offers a viable pathway to significantly improve drought resilience. Given that climate change is projected to further intensify drought frequency and duration, immediate and phased implementation of these adaptive strategies is essential to ensure the long-term sustainability of the Padaviya irrigation system and the livelihoods it supports.

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FLOOD INUNDATION MAPPING USING THE HEIGHT ABOVE NEAREST DRAINAGE (HAND) MODEL INTEGRATED WITH FIELD DATA COLLECTION: A CASE STUDY OF THE ATTANAGALU OYA BASIN, SRI LANKA

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Abstract

Flood inundation mapping serves as a cornerstone for urban planning, emergency response, and ecological assessment in disaster-prone regions. In Sri Lanka, the frequency of devastating floods is escalating due to climate changes. Nearly it was evidenced by Cyclone Ditwah (2025), which resulted in estimated damages of US$4.1 billion, nearly 4% of the national GDP. Despite the critical need for accurate geospatial intelligence, traditional flood mapping in tropical basins like Aththanagalu Oya faces significant technical hurdles.

This research proposes a high-resolution, data-driven framework that bypasses the limitations of remote sensing and hydrological models by combining the Height Above Nearest Drainage (HAND) terrain model with real-time field data. This study was performed by utilizing a 2x2m resolution Digital Elevation Model (DEM) created for Aththanagalu oya river basin, comprehensive processing to ensure flow path continuity. A drainage network was extracted using a calibrated 1.2km² threshold value, which was validated against existing vector drainage data to ensure topographic accuracy.

The main innovation of this study is localized calibration of the HAND model by utilizing the mobile application to collect actual flood depths and coordinates during the peak of the flood event. These field points were used to extract the corresponding HAND values and spatially joined with each sub catchment polygon. A Python-based algorithm was then deployed to extract local flood raster for each catchment and to get final flood depth raster.

The results demonstrate that while the Normalized Difference Water Index (NDWI) provided a useful flood inundation map for guiding field teams, it significantly underestimated the flood extent compared to the ground-truth data, particularly in vegetated and cloud obstructed zones. In contrast, this integrated model successfully delineated the spatial variation of water levels across the 448 sub catchments of Aththanagalu oya river basin, providing a continuous inundation surface even where satellite sensors failed.

The study concludes that the accuracy of terrain-based modeling is highly sensitive to the quality of field inputs. This framework offers a computationally efficient and cost-effective alternative for flood mapping in data-scarce regions, providing a vital tool for disaster preparedness and risk management in Sri Lanka.

Keywords: Flood inundation Map, Aththanagalu oya, Height Above Nearest Drainage (HAND), GIS

1. Introduction

Floods are among the most widespread natural hazards, causing significant damage to infrastructure, threatening living conditions, and leading to injuries and loss of life (Rogers et al. 2025). Flooding occurs when water covers normally dry land or when river or drainage flow exceeds channel capacity. If water is pooled with a high enough, for extended periods, they can significantly disrupt human activities (Sholihah et al. 2020).

Intense rainfall is the main cause of flooding in Sri Lanka, with most flood events associated with the South-West and North-East monsoon seasons (Nagamuthu 2023). The recent Cyclone Ditwah November 2025, was the most severe flood disaster recorded in Sri Lanka in the past two decades (United Nations Office for the Coordination of Humanitarian Affairs (OCHA) 2025).

Flood inundation mapping plays a key role in flood risk management by providing accurate information on the spatial extent of flooding. When integrated with Geographic Information Systems (GIS), these maps support decision-makers in assessing potential impacts such as human casualties, economic losses, and environmental damage. Although hydrological modelling is commonly recommended for estimating flood-prone areas, it requires specialized expertise and is often impractical for rapid assessments and time-sensitive situations (Dantas and Paz 2021; Jung et al. 2014).

Flood inundation maps can be produced using remote sensing imagery from satellite or airborne sensors to detect flooded areas during past events or near real-time situations. However, optical remote sensing is limited because it cannot penetrate clouds or dense vegetation. While active sensors can operate through cloud cover, their accuracy may still be reduced by factors such as backscatter errors, confusion with smooth surfaces, interference from urban areas and vegetation, and speckle noise in the imagery. (Edwards et al. 2025).

A simpler and faster approach for estimating flood-prone areas is the use of Digital Elevation Model (DEM) analysis, through the Height Above Nearest Drainage (HAND) method, which derives flood susceptibility based on terrain elevation relative to the nearest drainage network (Rennó et al. 2008). Major advantages of the HAND model over the old models are computational efficiency and less complexity with simplified input data requirements (Thalakkottukara et al. 2024).

The objective of this research is to develop a high-resolution flood inundation mapping framework for the Aththanagalu oya River Basin by integrating the HAND model with real-time field depth data collected via. a mobile application to the specific flood event Cyclone Ditwah (2025).

2. Methodology

2.1. Study Area

Aththanagalu oya River basin which shows in Figure 1 is located in the western part of Sri Lanka. Aththanagalu oya river basin has a catchment area of 839 km^2. The major tributaries of this river basin are Deyella Oya, Aththanagalu oya, and Uruwal Oya.

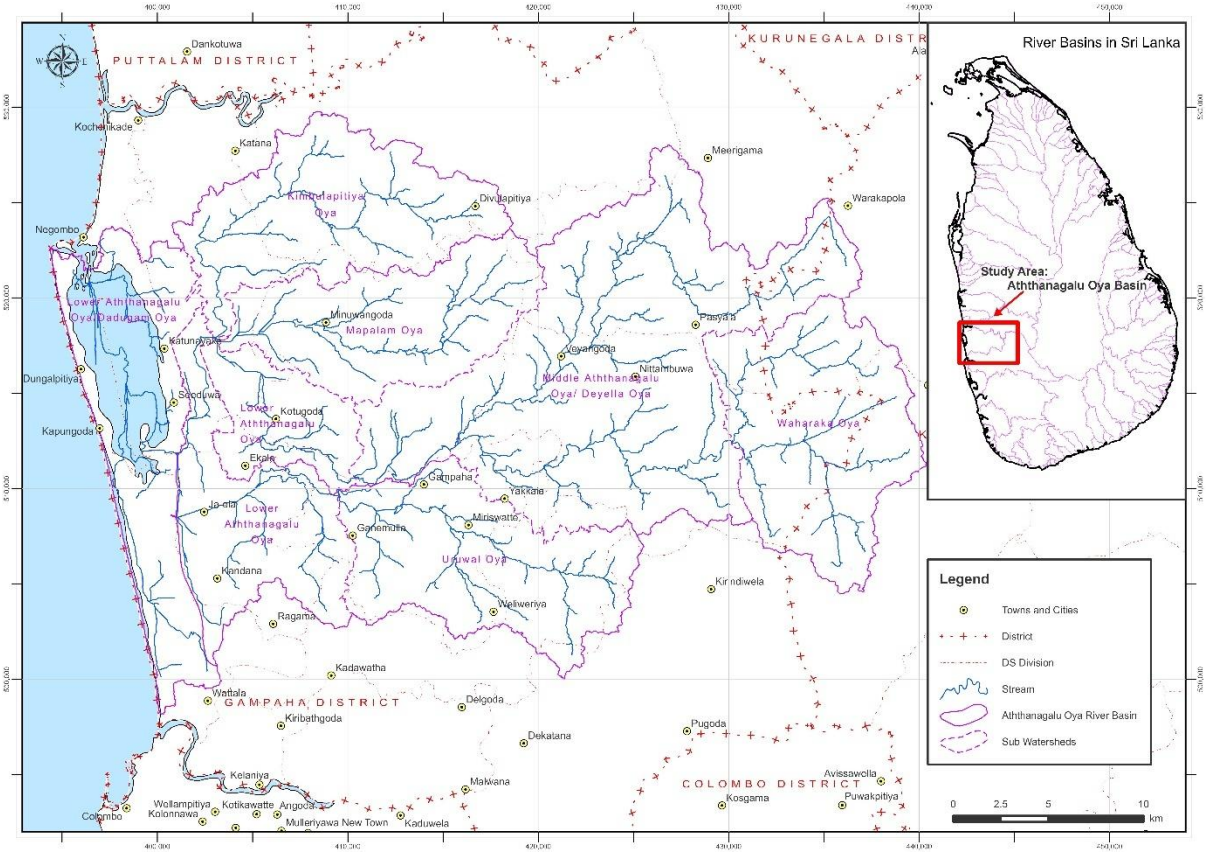


Figure 1 - Map showing Aththanagalu oya river basin

2.2. Data Source

The primary data collected for this study is field observed flood depth data which were collected through a mobile application. The secondary data are DEM Sourced from Climate Resilience Improvement Project (CRIP) and administrative boundaries which were collected from Survey Department.

2.3. Method

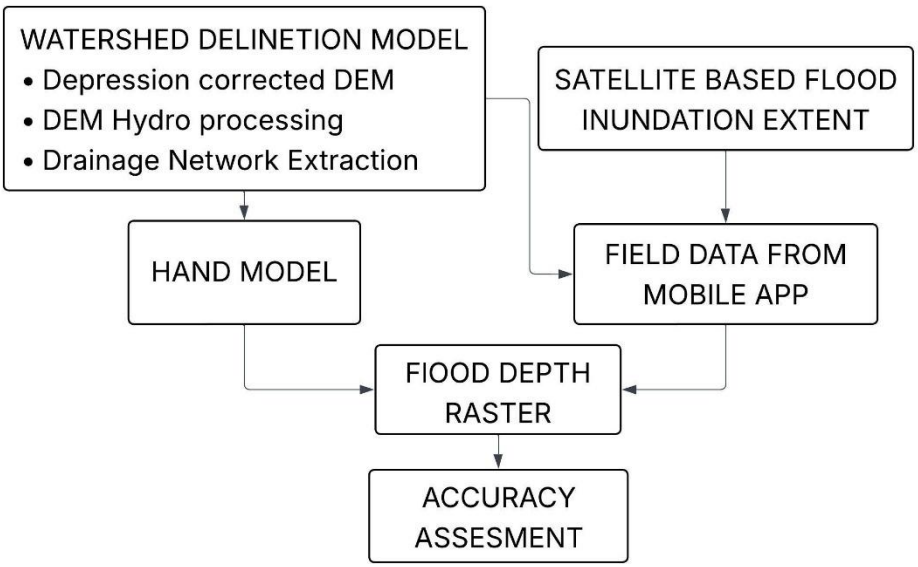


Figure 2 - Flow chart of the methodology

The satellite image-based flood inundation area was derived from Normalized Difference Water Index (NDWI) using Sentinel 2 satellite data. The following equation was used to calculate the Normalized Difference Water Index. Band 5 is the near-infrared (NIR) and Band 8 is Green Band. (Yang et al. 2017)

$$NDWI = \frac{Band\ 3 - Band\ 8}{Band\ 3 + Band\ 8}$$

Where, Band 3 – Green
Band 8 – Near Infrared

To carry out the Watershed Delineation model, first the DEM processing and after that watershed delineation and drainage network extraction were done as mentioned by Barnes et al. 2014; Purwanto, Andrasmoro, and Eviliyanto 2025; S.K. Jenson and J. O. Domingue 1988; Tarboton 1997. The drainage network was established based on the cumulative drainage area, calculated by applying a threshold to the accumulated area. In this study, after applying few threshold values 1.2km^2 was selected as best fitting value and particular drainage network was extracted. In this process vector filed drainage network sourced from the Climate Resilience Improvement Project (CRIP) was compared with drainage network derived from the DEM and most suitable threshold value (1.2km^2) was selected.

After that Height Above The Nearest Drainage (HAND) model was created (A.D. Nobre et al. 2011) terrain model that computes the differences in elevation between each grid cell and the elevations of the flow path connected downslope grid cell where the flow enters the channel.

For each raster cell:

$$HAND_i = z_i - z_{d(i)}$$

Where:

- z_i= DEM elevation
- $z_{d(i)}$= Elevation of nearest drainage cell

After that flood depth raster was created using a python language-based code. Flood depth value for each sub catchment were calculated,

$$Flood\ Depth = \text{Actual Flood heigth (H)} - \text{HAND value}$$

2.4. Model Validation

For the accuracy assessment of the study following steps were used(Hodson 2022).

At each field observation point j:

Observed depth:

$$Depth_j^{obs}$$

Model depth:

$$Depth_j^{model} = H - HAND_j$$

Model error:

$$Error_j = Depth_j^{model} - Depth_j^{obs}$$

Root Mean Square Error (RMSE):

$$RMSE = \sqrt{\frac{1}{n}\sum_{j=1}^{n}(Error_j)^2}$$

3. Results

Total inundation extent generated by the HAND model which shows in Figure 3 is 169.5km^2 and satellite image-based extent is 45.7km^2. Also, the zonal statistics show that most affected Divisional Secretariat divisions are Gampaha and Ja-ela which inundation extent is 27% with respect to its total land extent. The maximum depth of the flood with respect to nearest drainage level according to the flood depth raster is 6.875 and it is observed in Aththanagalla Divisional Secretariat.

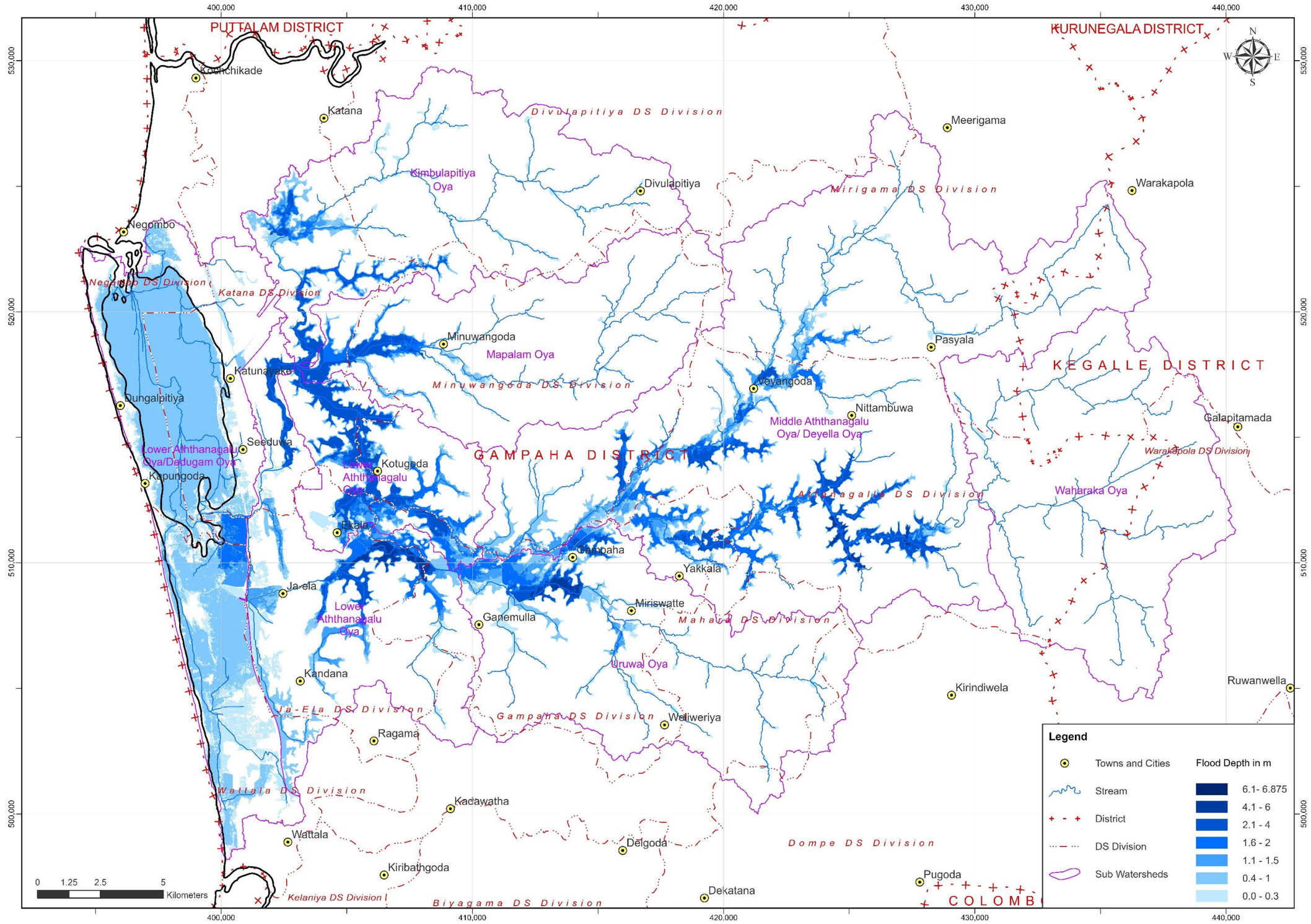


Figure 3 - Map showing flood inundation extent of due to Ditwah cyclone of Aththanagalu oya river basin

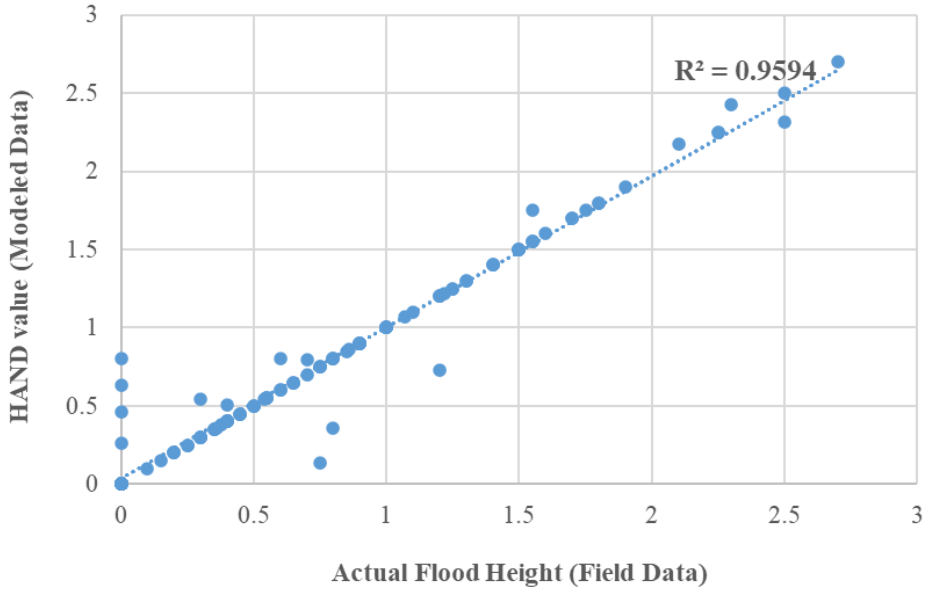


Figure 4 - Linear Regression curve between field observed flood depth and model derived flood depth

The validity of the final inundation map is confirmed by the high statistical correlation shown in the scatter plot (Figure 4), where the Root Mean Square Error (RMSE) value is 0.96.

4. Discussion

The final inundation map provides a high-resolution visualization of the potential flood extent across the Aththanagalu Oya Basin. The accuracy assessment process shows a RMSE of 0.96 and it indicates 96% of the variance in actual field depths is accurately captured by the generated HAND model. Such a strong relationship proves that the tool is highly reliable for operational use in the Aththanagalu Oya Basin. The scatter plot shows a few points where the map predicts depth, but the actual is zero, these represent the precise areas where field calibration is most vital to "fine-tune" the model's accuracy.

The HAND Model has been able to capture more than 123.8km^2 (73% of inundated extent) area which has not been captured by the satellite image-based method. This may encourage the HAND method to use accurate flood mapping in river basins of Sri Lanka. But critical further analysis should be carried out to improve and train the model. Also, Satellite Image-based method cannot be neglect completely. Because it gives us an extensive guide on field data collection.

Also, the zonal statistics of this study show that Gampaha and Ja-ela Divisional Secretariat divisions are the highly affected areas, and it may guide policy makers where should be the flood mitigation strategies should be implemented. This procedure can be extended up to Grama Niladhari division level to enhance regional decision making.

As a conclusion this study shows that HAND model gives a reliable flood inundation extent and it's a good tool for flood mapping instead of traditional complex, time consuming methods. Also, it is a better alternative to overcome the limitations of satellite image-based

method. This may accelerate the process of flood mapping, and it will enhance to improve activities such as Disaster Preparedness, mitigation strategies, administrative decision makings etc. Also, this method not only generating flood inundation extent but also it gives comprehensive idea about the spatial distribution of the flood depth which provide more information to Hydrologists, Engineers, urban planners etc.

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BALANCING IRRIGATION, WILDLIFE HABITAT AND TOURISM: INTEGRATED WATER MANAGEMENT OF MINNERIYA TANK IN SRI LANKA

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Abstract

Minneriya Tank is one of the most historically significant irrigation Tank in Sri Lanka and plays a vital role in irrigation, wildlife conservation, and tourism activities in the North Central Province. However, competing water demands between irrigated agricultural and wildlife habitat requirements have created significant management challenges in recent years, particularly with respect to maintaining the grasslands used by elephants in Minneriya National Park.

During 2021 and 2022, the seasonal water level behavior of the Tank deviated from the historical pattern due to several external factors. Increased inflows associated with hydropower releases from Moragahakanda Tank, reduced cultivated extent during the 2021 Maha season due to fertilizer shortages, and delayed cultivation during 2022 causing water levels of the tank to remain unusually high during the dry season.

As a result, requests were made by the Department of Wildlife Conservation Sri Lanka to reduce water levels in order to expose grasslands necessary for elephant feeding and wildlife tourism. However, maintaining a minimum storage level of approximately **72,000 acre-feet (89.5 MCM)** is essential to ensure reliable water supply to downstream irrigation systems including Kanthale Tank and Kaudulla Tank.

This study analyses the operational challenges experienced during this period and presents integrated water management strategies adopted through coordination among the Irrigation Department of Sri Lanka, Mahaweli Authority of Sri Lanka, the Department of Wildlife Conservation, and researchers studying Human–Elephant Conflict. The findings highlight the importance of coordinated Tank operation, improved cultivation scheduling, and future infrastructure improvements such as the Upper Elahera Canal in achieving sustainable water management.

1. Introduction

Minneriya Tank was constructed during the reign of King Mahasen (276–303 AD) and remains one of the most significant ancient irrigation works in Sri Lanka. Located in the dry zone of the country, the Tank continues to play a crucial role in supporting agricultural production, ecological sustainability, and regional socio-economic development.

The Tank directly irrigates more than 25,000 acres of paddy land within the Minneriya irrigation scheme and indirectly supports approximately 40,000 acres of paddy cultivation in downstream irrigation systems including Kaudulla Tank, Kanthale Tank, and Vandarasan Kulam.

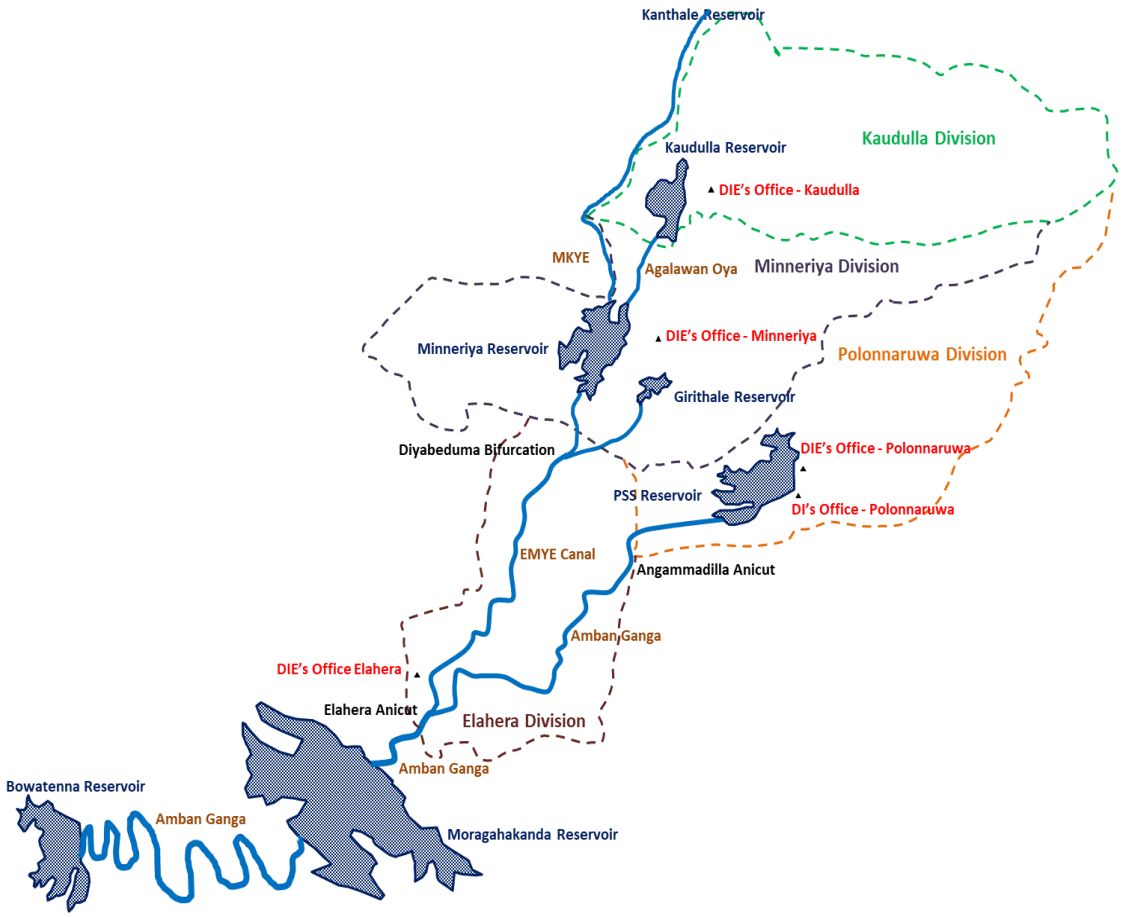


Figure 1: Irigation systems of Elahera- MInneriya including Kaudulla, Kanthale , and Vandarasan Kulam Tanks

Beyond its agricultural importance, the Tank plays a critical ecological role in sustaining the ecosystem of Minneriya National Park. During the dry season, receding Tank water levels expose extensive grasslands in the tank bed which serve as grazing grounds for elephants. This seasonal phenomenon, known as the **"Great Elephant Gathering,"** is recognized as one of the largest congregations of Asian elephants in the world and has been identified by the international travel guide **Lonely Planet** as one of the **"ten greatest wildlife spectacles in the world."** (Prakash, S. L. ,2022, September 6)

Tourism associated with this wildlife spectacle generates significant economic benefits for the local and national economy. However, Tank water management decisions must balance several competing demands including irrigation water supply, domestic water needs, wildlife habitat conservation, tourism activities, and inter-basin water transfers.

During 2021 and 2022, unusual hydrological and socio-economic conditions created significant operational challenges in Tank management. Requests from the Department of Wildlife Conservation to reduce water levels for elephant feeding grounds conflicted with irrigation requirements needed to maintain reliable water supply to downstream irrigation systems. These circumstances highlighted the need for a more coordinated and integrated water management approach.

2. Methodology

This study is based on the analysis of Tank operational data, water level records, and field observations collected from Minneriya Tank during the period 2015**–2025**.

Data sources included:

- Divisional Irrigation Engineer's Office – Minneriya
- Water Management Secretariat of the Mahaweli Authority of Sri Lanka
- Department of Wildlife Conservation

The analysis focused on identifying key factors influencing Tank operation, including:

- Tank storage and release patterns
- Irrigation water requirements for downstream command areas
- Wildlife habitat requirements for elephant grazing
- Hydropower releases from Moragahakanda Tank
- Cultivation patterns and socio-economic constraints affecting farmers

In addition, stakeholder discussions and coordination meetings were reviewed to understand how competing water demands were managed through collaborative decision-making processes.

3. Results and Discussion

3.1. Operational Challenges in 2021–2022

During 2021 and 2022, the seasonal water level pattern of Minneriya Tank significantly deviated from historical trends as show in figure 2.

Firstly, increased hydropower generation at Moragahakanda reservoir resulted in higher inflows to the Minneriya system. Secondly, the cultivated extent during the **2021 Maha season** was reduced due to fertilizer shortages following national policy changes. This reduction in cultivation resulted in lower irrigation water demand.

In addition, the **2022 cultivation season** was delayed due to nationwide fuel shortages, which affected land preparation and agricultural activities.

As a result of these combined factors, Tank storage remained unusually high from **June to September**, submerging the grasslands that normally appear in the tank bed during the dry season. These grasslands are essential feeding grounds for elephants in Minneriya National Park and also support wildlife-based tourism activities.

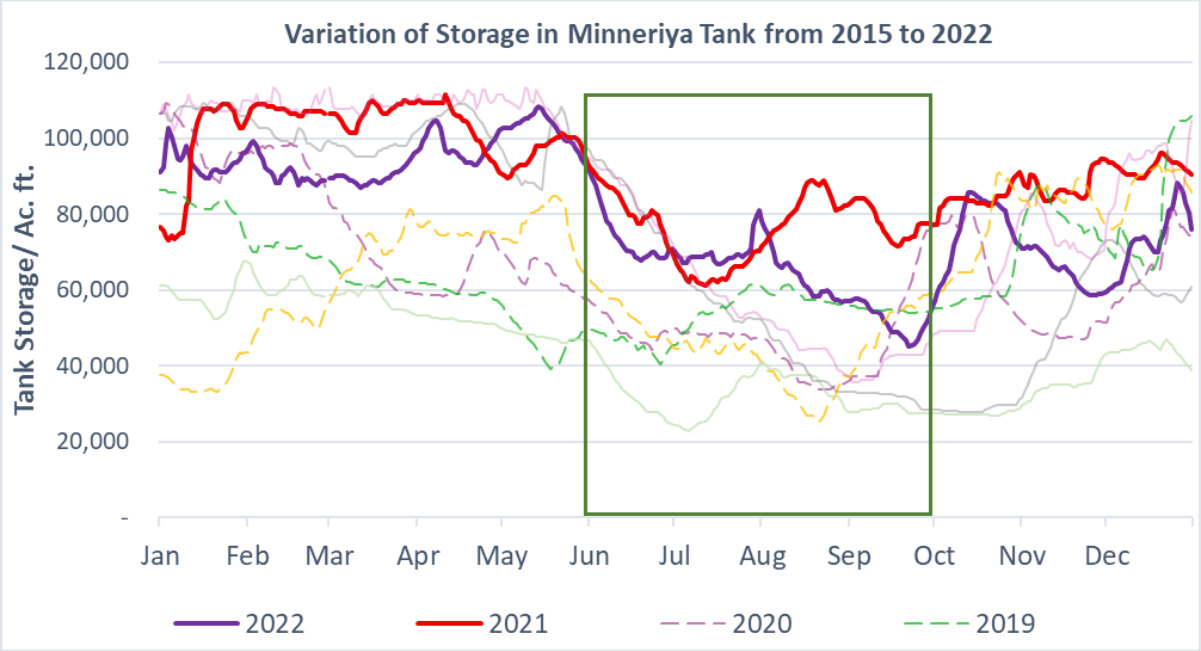


Figure 2 : Variation of storage in Minneriya Tank from 2015 to 2025

3.2. Wildlife Conservation and Tourism Considerations

The **Elephant Gathering** at Minneriya National Park represents one of the largest seasonal congregations of Asian elephants in the world and is a major attraction for international wildlife tourism.

The wildlife spectacle typically occurs between **May and October**, with peak elephant numbers observed during **August and September**, when nearly **400 elephants** may assemble on the exposed grasslands of the Tank bed (Pilapitiya, S., 2026).

According to Pilapitiya, S., 2026, a researcher who has conducted long-term studies on elephants in the park, the number of elephants participating in the gathering has declined since 2018 following water releases associated with the Moragahakanda project.

Observations indicate that the **average daily number of elephants recorded in September** declined from **402 in 2017 to 354 in 2018**, and subsequently dropped sharply to approximately **20 elephants per day by 2021** as shown in table 1.

Table 1: *Average Daily Number of Elephants Recorded in September in Minneriya National Park, (Pilapitiya, S., 2026)*

YEAR	MONTH	AVERAGE DAILY NUMBER OF ELEPHANTS
2016	September	389
2017	September	402
2018	September	354
2019	September	223
2020	September	210
2021	September	20

The loss of traditional dry-season grazing grounds can also intensify **human–elephant conflict**, as elephants may increasingly enter nearby villages and agricultural fields in search of food. According to data from the Department of Wildlife Conservation, human-elephant conflict incidents in the region increased in 2021 and 2022 compared with 2017(Pilapitiya, S., 2026).

Female elephants and calves rarely engage in crop-raiding behavior and are therefore particularly vulnerable to habitat degradation. When natural grazing areas disappear, these animals often face starvation and malnutrition, raising serious concerns about the long-term survival of the **Sri Lankan elephant (*Elephas maximus maximus*)**, an endemic subspecies of the Asian elephant.

3.3. Irrigation System Constraints

For reliable irrigation water supply to downstream systems, Minneriya Tank must maintain a **minimum storage level of approximately 72,000 acre-feet (89.5 MCM)**.

This requirement arises because the outlet sill levels of the **Agalawana Canal** and **Minneriya-Kanthale Yoda Ela (MKYE)** canal are relatively high. If Tank water levels drop below this threshold, gravity flow to downstream irrigation systems becomes difficult.

***Table 2** – Key Hydraulic Constraints of Irrigation Systems depend on storage of Minneriya Tank*

Irrigation Scheme	*Command Area (ha)*	*Primary Water Source*	*Control Structure / Sill Level (m MSL)*	*Minimum Storage Required for Reliable Operation*
Minneriya	9,098	Minneriya Tank with diversions from Moragahakanda via EMYE	RB Sluice – 84.83 LB Sluice – 83.82	**45,000 Ac.ft** required to ensure reliable irrigation supply to tail-end areas
Kaudulla	7,095	Kaudulla Tank with diversions from Minneriya	Agalawana – 89.92	**70,000 Ac.ft** required in Minneriya Tank to safely divert **250 cusecs**
Kanthale	9,300	Kanthale Tank with diversions from Minneriya via MKYE	MKYE Radial Gates – 91.44 Flat Gates – 90.22	**72,000 Ac.ft** required in Minneriya Tank to safely divert **250 cusecs**
Vendarasan Kulam	700	Kanthale Tank with diversions from Minneriya via MKYE	MKYE Radial Gates – 91.44 Flat Gates – 90.22	**72,000 Ac.ft** required in Minneriya Tank to safely divert **250 cusecs**

These systems collectively support more than **26,000 hectares of irrigated land** and provide livelihoods for over **21,000 farming families**, making irrigation reliability a critical priority for regional food security and rural livelihoods.

3.4. Integrated Water Management Approach

Managing the competing demands of irrigation water supply, wildlife habitat conservation, and tourism activities at Minneriya Tank requires an integrated and adaptive water management approach. During recent years, several management strategies and institutional coordination mechanisms have been developed to address these challenges.

One important long-term solution is the completion of the Upper Elahera Canal (UEC) under the Mahaweli Water Security Investment Program implemented by the Ministry of Irrigation. Once completed, the canal will divert approximately **190 MCM of water annually from the Moragahakanda Tank** to irrigation systems in the North Central Province. As a result, irrigation demand in those areas will increasingly depend on Moragahakanda water, which is expected to reduce the need to augment Minneriya Tank during the June–September period. This could help restore the historical seasonal water level pattern of the Tank and allow the grasslands in the Tank bed to emerge naturally during the dry season.

A second infrastructure-based option discussed is the construction of a **closed conduit canal from the Diyabeduma bifurcation to the MKYE canal through the Minneriya Tank bed**. This option would enable more controlled water transfers to downstream systems such as Kanthale Tank and Vandarasan Kulam without maintaining unnecessarily high storage levels in Minneriya Tank. However, this option requires substantial financial investment and detailed technical feasibility studies before implementation.

Another important management strategy involves **adjusting the cultivation calendar**, particularly advancing the Yala cultivation season. Starting Yala cultivation earlier, preferably in March or early April immediately after the Maha harvest, would allow irrigation releases to begin earlier in the year. Consequently, Tank water levels could gradually decline before the peak elephant gathering period between July and September. However, this approach requires significant behavioral changes among farmers, as many farmers in the Minneriya and Kaudulla systems traditionally begin Yala cultivation only after the April New Year period. Nevertheless, some progress has been observed in the Kanthale Irrigation Scheme, where farmers have recently shown interest in starting cultivation earlier. In 2026, farmers in the Kanthale scheme are planning to begin Yala cultivation on **1 April**, while farmers in several minor irrigation schemes such as Matale Wewa and Rota Wewa supplied through the MKYE canal typically commence cultivation around **mid-March**.

In addition to these structural and operational measures, **institutional coordination among stakeholders** has played a critical role in improving Tank management. The Irrigation Department Sri Lanka, Mahaweli Authority of Sri Lanka, Department of Wildlife Conservation Sri Lanka, and researchers studying Human–Elephant Conflict have engaged in regular consultations to develop mutually acceptable Tank operation strategies. Efforts were made to formalize coordination through a Memorandum of Understanding (MoU) among the relevant government agencies responsible for irrigation management and environmental conservation. As all government institutions operate in alignment with national interests,

the agencies collectively agreed to follow an operational approach aimed at maintaining tank water level patterns similar to historical conditions prior to the construction of the Moragahakanda project. This approach was developed through inter-agency dialogue and coordination in order to balance irrigation requirements with environmental considerations associated with the tank system.

Following the implementation of the integrated water management approach, the seasonal storage pattern of the Minneriya Reservoir during **2023–2025** has gradually returned to a pattern comparable to historical conditions, particularly showing the characteristic mid-year drawdown between June and September, as illustrated in Figure 3. Correspondingly, the peak elephant population observed during the **Great Elephant Gathering** has also shown signs of recovery, reaching **342 elephants across Minneriya and Kaudulla National Parks**, a level comparable to observations recorded in **2017** (Pilapitiya, 2026).

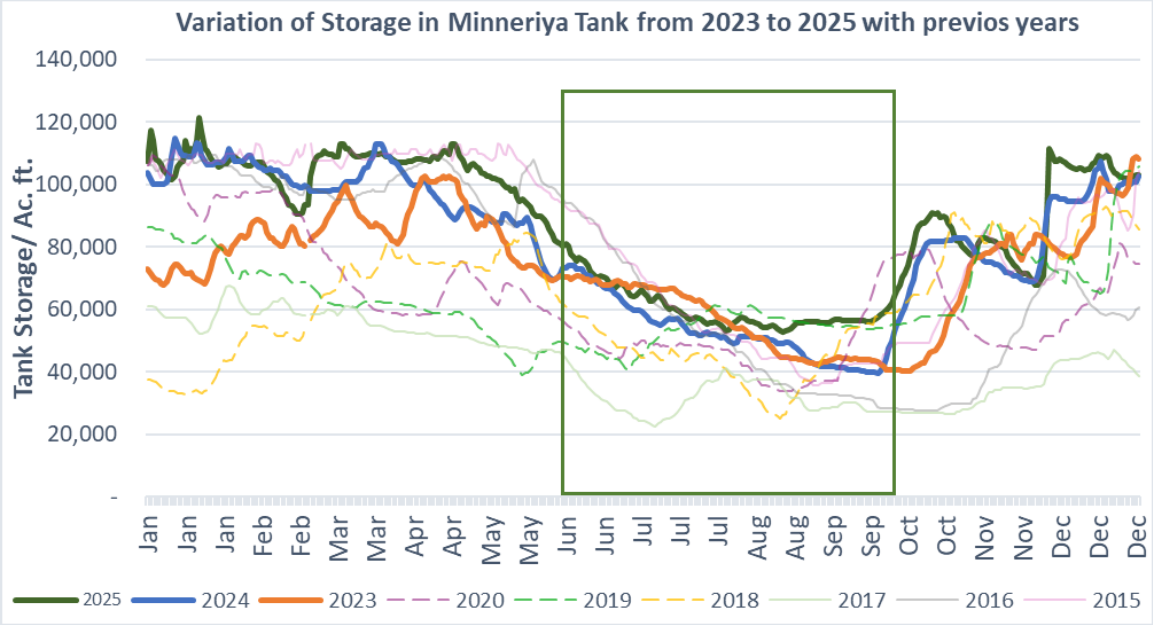


Figure 3: Variation of storage in Minneriya Tank from 2023 to 2025 with previous years

3.5. Proposed Tank Operation Framework

Based on operational experience and historical Tank behavior, a **Seasonal Tank Operation Rule Curve** can be proposed for Minneriya Tank.

The framework aims to maintain relatively high storage levels after the **Maha cultivation season (March–April)** while allowing gradual drawdown during the **Yala season**.

Controlled irrigation releases should begin early in the year, preferably **before mid-June**, enabling Tank storage to gradually decline during **June–August**. By the end of August, the Tank storage should ideally reach **45,000–55,000 acre-feet**, allowing sufficient grassland exposure for elephant grazing while maintaining adequate irrigation security. The successful reservoir operation during **2024–2025**, together with the **projected operational pattern for 2026**, is illustrated in **Figure 4**.

Sudden fluctuations in Tank water levels should be avoided as far as possible because such changes may disrupt elephant movement patterns and habitat use. Successful implementation of this framework requires continuous coordination among water management agencies and active participation from farmer organizations and wildlife researchers.

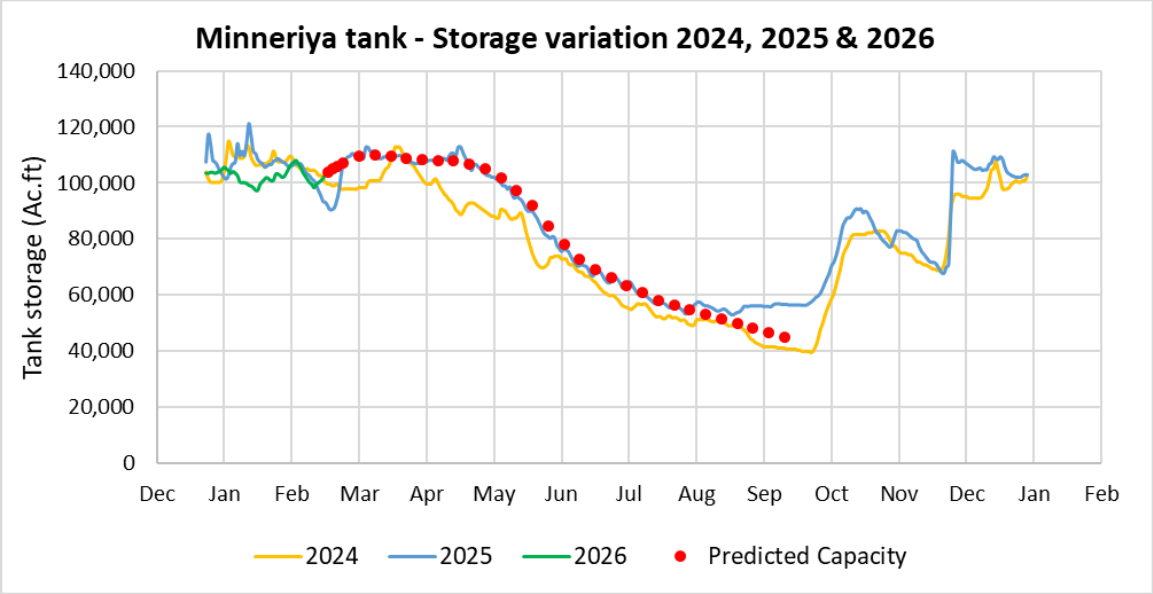


Figure 4: Variation of storage in Minneriya Tank in year 2024,2025 and 2026

3.6. Economic Benefits of Irrigation and Tourism

Wildlife-based tourism associated with Minneriya National Park generates significant economic benefits. The total tourism-related economic value associated with the park was estimated at approximately **Rs. 8,608 million in 2018**, while ticket revenue from local and foreign visitors reached approximately **Rs. 608 million in 2025** (Pilapitiya, S., 2026).

An economic assessment of the Elephant Gathering indicates that **each elephant observed during a tourist season can generate approximately Rs. 10 million in economic value** through tourism-related activities including park entrance fees, safari jeep services, and accommodation.

In comparison, irrigation supported by the Minneriya system generates even greater economic value through agricultural production. The Minneriya, Kaudulla, Kanthale, and Vandarasan Kulam irrigation systems collectively support **26,193 hectares of irrigated land**, **21,680 farming families**, and produce approximately **283,165 metric tons of paddy annually**, with an estimated economic value of **Rs. 36,810 million** (Table 03).

These figures demonstrate the critical importance of integrated Tank management in sustaining agricultural productivity, rural livelihoods, wildlife conservation, and tourism-based economic development.

***Table 3** : Estimated economic Status of Minneriya – Kaudulla – Kanthale Irrigation Systems (Both seasons)*

SCHEME	IRRIGABLE AREA (HA)	FARM FAMILIES	ANNUAL PADDY PRODUCTION (MT)	VALUE (RS. MN)
MINNERIYA	9,098	8,050	98,356	12,786
KAUDULLA	7,095	5,530	76,702	9,971
KANTHALE	9,300	7,500	100,540	13,070
VANDARASAN KULAM	700	600	7,567	983
TOTAL	**26,193**	**21,680**	**283,165**	**36,810**

Average Yield - 5.405 M.ton per Ha, Paddy Price - Rs. 130.00 per kg

4. Conclusion

The management of Minneriya Tank illustrates the complexity of operating a multipurpose water resource system where irrigated agricultural, wildlife conservation, and tourism interests intersect.

The operational challenges observed during 2021–2022 demonstrate the need for adaptive and integrated water management strategies. Maintaining minimum storage levels is essential for irrigation reliability, while seasonal water level management is necessary to sustain wildlife habitats and tourism opportunities.

Improved institutional coordination, better cultivation planning, and future infrastructure development such as the Upper Elahera Canal will further enhance the sustainability of the Minneriya water management system.

A coordinated Tank management framework supported by scientific analysis and stakeholder engagement is essential for balancing socio-economic benefits with ecological sustainability in multipurpose Tanks such as Minneriya.

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"SECURING IRRIGATION WATER AFTER FLOOD DAMAGE: A RISK ASSESSMENT OF TEMPORARY REHABILITATION OF THE ELAHERA ANICUT FOLLOWING THE DITWA FLOOD EVENT."

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Abstract

The Elahera Anicut plays a critical role in securing irrigation water for paddy cultivation and rural livelihoods in the Polonnaruwa District of Sri Lanka. However, Ditwa flood event has caused structural damages to the anicut, disrupting water diversion and became a threat to agricultural productivity. This study examines the temporary rehabilitation measures implemented to restore irrigation functionality following flood damage. Pressure and Release model (PAR model) is used to this assessment to describe, how field-based descriptive approach was adopted, incorporating site observations, stakeholder participations, and technical assessments of emergency repair works. The study highlights how collaborative emergency engineering interventions and community engagement helped restore irrigation flow and mitigate agricultural losses. Temporary interventions included reinforcement of breached earth bund sections using sandbags and controlled flow redirection to ensure continuous water supply. The study concludes that stakeholder participation plays a critical role in ensuring that rehabilitation works are effective, sustainable, and socially inclusive, while highlighting the need for long-term flood-resilient design improvements at Elahera Anicut.

***Keywords**:* Irrigation management, flood rehabilitation, Elahera Anicut, participatory approach

1. Introduction

Sri Lanka's dry-zone agriculture depends heavily on irrigation networks that distribute water from rivers and reservoirs to paddy cultivation systems. In Polonnaruwa District one of the key diversion structures in this network is the Elahera Anicut, constructed during the reign of King Vasabha (67– 111 AD) and later improved during successive historical periods. The structure diverts water from the Amban Ganga, a tributary of the Mahaweli River, into Elahera Minneriya Yoda Ela (EMYE) feeding major reservoirs such as Minneriya, Giritale, Kaudulla and Kanthale.

The exceptionally high spill discharges from the Moragahakanda Reservoir, combined with continuous heavy rainfall on 27th and 28th November 2025, caused severe damage to the Elahera Anicut system. The most critical failure occurred in the earthen bund section from chainage 0+465km to 0+535km, located between the Elahera New Anicut and the Old Anicut, which was completely breached and washed away. As a result of this failure, diversion of water into the EMYE Canal became impossible, disrupting irrigation supplies to the Mahaweli System G scheme, Giritale, Minneriya, Kaudulla, and Kanthale reservoirs

during the 2025/26 Maha season. However, temporary coffer dam was quickly repaired and action taken to divert irrigation water to Elahera Minneriya Yoda Ela by Irrigation Department using wide range of their resources such as technical knowledge, machine fleets and hard-working gang of department. Because of this prompt action, Irrigation Department could gain good reputation from the local farmers, politicians and other high authorities.



Fig 01: - Breached earth bund



Fig 02: - Site map of the flood damaged area

2. Conceptual Framework: The Pressure and Release (PAR) Model

The Pressure and Release (PAR) Model is a framework used to understand disasters. It emphasizes that disasters happen not just because of natural hazards, but because vulnerable communities are under "pressure" from social, technical, and financial aspects. The model shows how these pressures combine with natural hazards to create disasters.

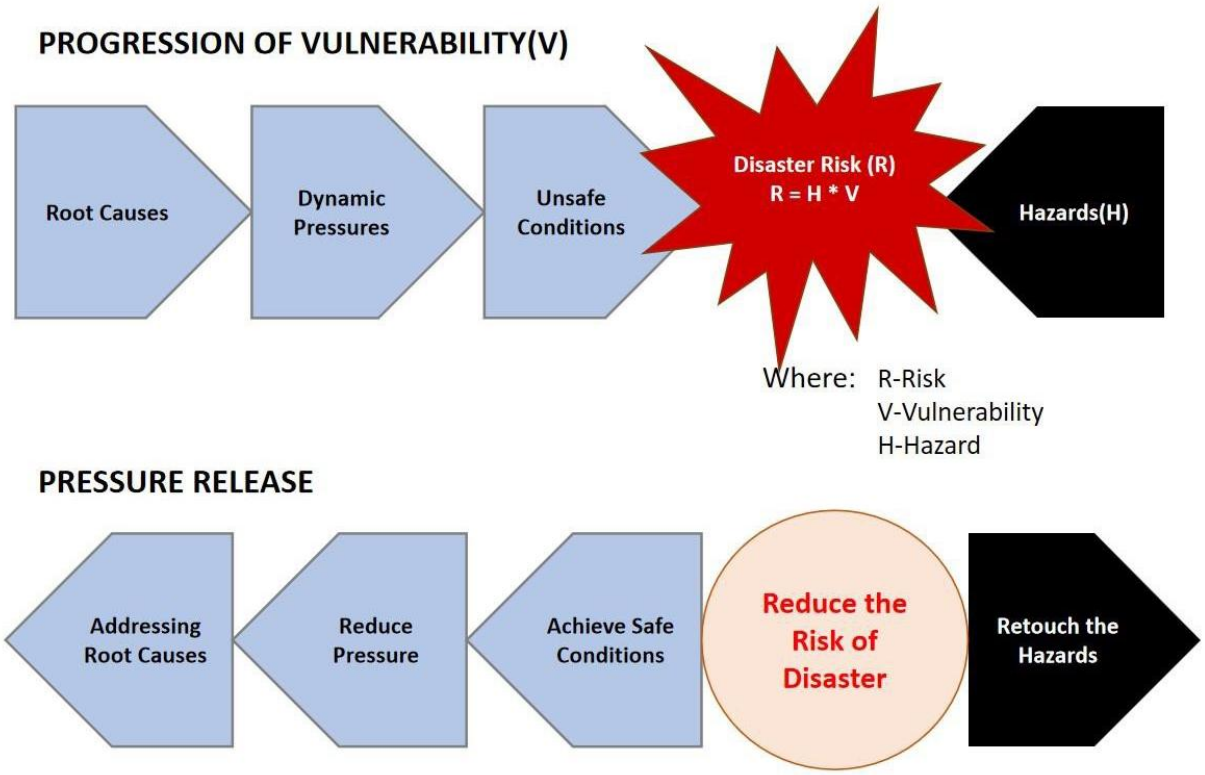
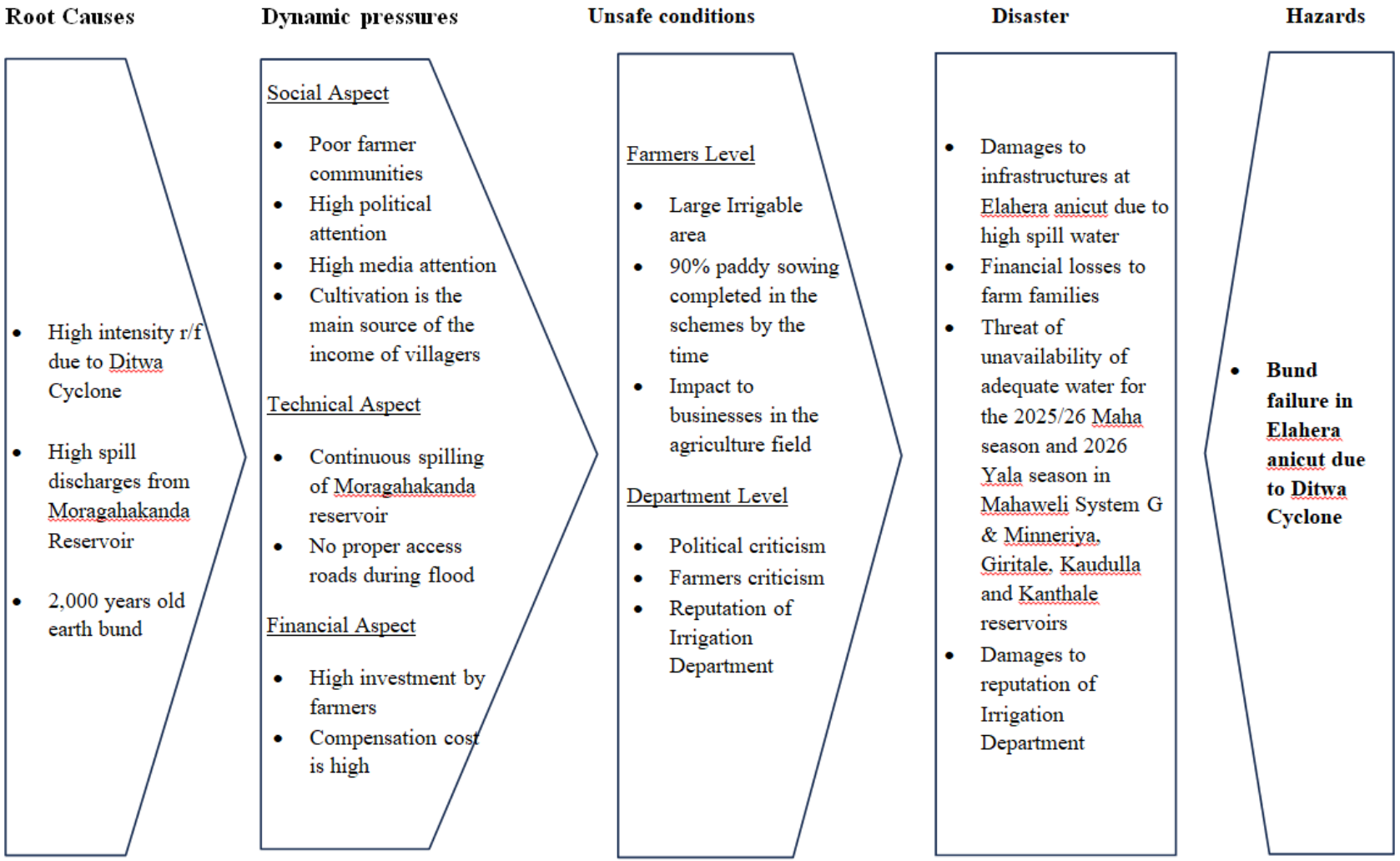
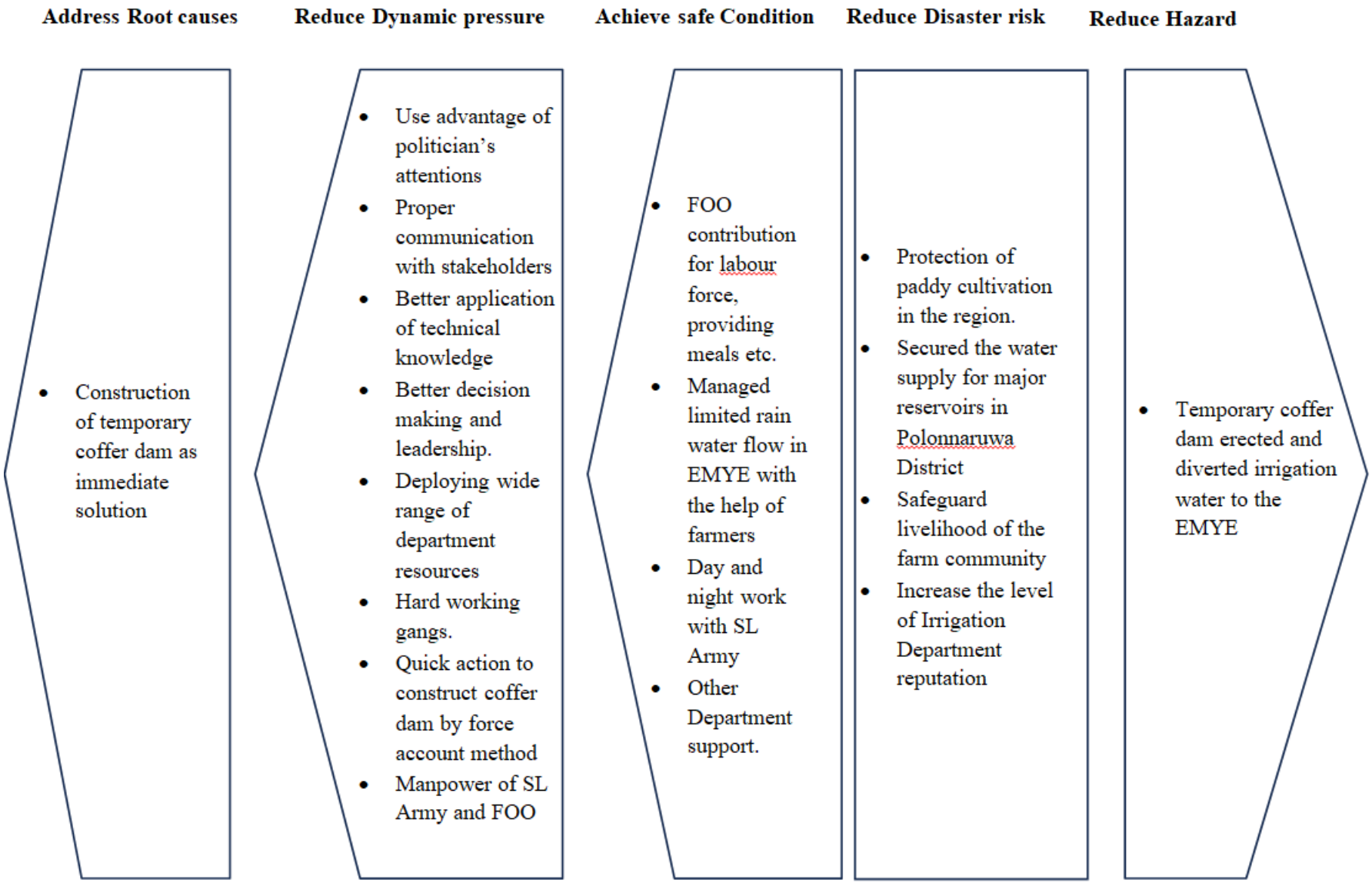


Fig 03: - PAR Model

3. Applying the Pressure and Release Model




Address Root causes
Reduce Dynamic pressure
Achieve safe Condition
Reduce Disaster risk
Reduce Hazard
Construction of temporary coffer dam as immediate solution
Use advantage of politician's attentions
Proper communication with stakeholders
Better application of technical knowledge
Better decision making and leadership.
Deploying wide range of department resources
Hard working gangs.
Quick action to construct coffer dam by force account method
Manpower of SL Army and FOO
FOO contribution for labour force, providing meals etc.
Managed limited rain water flow in EMYE with the help of farmers
Day and night work with SL Army
Other Department support.
Protection of paddy cultivation in the region.
Secured the water supply for major reservoirs in Polonnaruwa District
Safeguard livelihood of the farm community
Increase the level of Irrigation Department reputation
Temporary coffer dam erected and diverted irrigation water to the EMYE

4. Participatory Approach with SL Army and Local Farmers

Construction of a massive coffer dam within a shorter duration is not an easy task for any organization. It requires a lot of machine strength and labour strength. In that situation Sri Lanka Army played a key role in the rapid rehabilitation of the anicut. They deployed 150 Nos of army personals to workday and night shifts during the construction period. Local farming communities contributed significantly to the rehabilitation process through providing labour force and meals. Finally, Department –Army–Community collaboration enabled faster construction of massive coffer dam and minimized agricultural disruption.



Fig 04:- Work force from SL Army



Fig 05:- Work force from Local Farmers

5. Advantage of Low-cost method

During the field visit after Ditwa cyclone, it was observed that large sand deposits are accumulated upstream of the Elahera old anicut. By using this advantage, Irrigation Department officials decided to carry out Low-cost temporary rehabilitation method to restore Elahera earth bund breaching section. Jumbo bags and sands were used as main construction material for the coffer dam. Nearly 6,000 of jumbo bags and 25,000 of polysak bags were used to construct 12 m height and 75 m length coffers dam. Another advantage of this method was one of the main jumbo bag manufacturers is located in Polonnaruwa District. This low-cost method for temporary rehabilitation helped to reduce immediate financial pressure on irrigation department and could enabled structure's function with minimal funds.



Fig 06 :- Construction coffer dam using umbo bags



Fig 07 :- Large sand deposits – U/S of Elahera old anicut

6. Recommendations

- ✓ Strengthen the breached section of the Elahera anicut as a permanent solution.
- ✓ New spill way should be constructed to increase the spilling capacity in order to safeguard earth bund.
- ✓ Proper access road needs to be constructed for the Elahera anicut.

7. Conclusion

The temporary rehabilitation of the Elahera Anicut following the Ditwa flood events demonstrates the importance of participatory approaches in disaster recovery. By combining technical expertise from government agencies and the military with the local knowledge and labour of farming communities, irrigation water security was restored within a short time frame just like 25 days.

Using the Pressure and Release model, this study highlights how vulnerabilities at multiple levels can be addressed to significantly reduce disaster impacts significantly on agricultural infrastructure and rural livelihoods.

8. References

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EXPERIENCES FROM THE DITWAH CYCLONE – NOVEMBER 2025: FLOOD MONITORING, FORECASTING, AND EARLY WARNING DISSEMINATION BY THE IRRIGATION DEPARTMENT, *SRI LANKA*

Eng (Ms) T. Yasotha
DI (Dr & FS)

Abstract

Cyclone Ditwah, which struck Sri Lanka in late November 2025, highlighted the country's acute vulnerability to climate-induced disasters. Originating as a low-pressure system on 25 November, the cyclone intensified rapidly and crossed the island by 27 November, affecting all 22 districts. The event caused widespread flooding and infrastructure damage, with economic losses estimated at US$4.1 billion, equivalent to approximately 4 percent of national GDP.

The technical paper highlights the monitoring, forecasting, and early warning dissemination efforts undertaken by the Irrigation Department in close coordination with national and regional meteorological agencies. Real-time hydrological and reservoir data were systematically collected and shared internally, while flood warnings were issued to Disaster Management Authorities and the public to ensure timely preparedness. Despite these proactive measures, several challenges emerged, particularly in data integration, forecasting accuracy, institutional coordination, and public communication. Addressing these gaps remains essential for strengthening Sri Lanka's disaster resilience and ensuring that future flood events are managed with greater efficiency and reliability.

Key lessons learned include the need for enhanced interoperability of datasets, investment in coupled forecasting models, simplification of warning messages, and stronger community-level responses and engagement. Recommendations emphasize technical upgrades to monitoring networks, institutional reforms for unified warning protocols, and alignment of national resilience strategies with international frameworks. The findings underscore the importance of strengthening Sri Lanka's disaster preparedness and adaptive capacity to safeguard lives, livelihoods, and infrastructure against future climate extremes.

Keywords: Ditwah cyclone, Flood Monitoring, Forecasting and Early Warning

1. Introduction

Sri Lanka, an island nation in the northern Indian Ocean, is highly vulnerable to climate-related hazards. With a land area of 65,610 km² and a population of approximately 21.9 million (Department of Censes & Statics- 2024), the country consistently ranks among the most climate-vulnerable nations globally. Floods, droughts, and salinity intrusion are recurrent water related risks, exacerbated by rising temperatures and unpredictable rainfall (Dharmadas,2024).

The Irrigation Department, through its Hydrology and Disaster Management Division, holds the mandate to collect hydrological data, conduct flood forecasting, and issue early warnings to safeguard lives and property. The Water Management Division complements this role by monitoring reservoir operations and sharing data for catchment-based flood analysis.

This report documents the impacts of Cyclone Ditwah (November 2025), outlines institutional responses, and highlights lessons learned in monitoring, forecasting, and early warning dissemination.

1.1. Event Overview

On 25 November 2025, the Department of Meteorology and the Indian Meteorological Department reported the formation of a low-pressure system over the southern part of Sri Lanka. Within two days, by 27 November, this system intensified into a well-marked low-pressure area and subsequently developed into a cyclone that crossed Sri Lanka's landmass (UN,2025). The cyclone affected all 22 districts of the country, causing widespread devastation. The total damage is estimated at US$ 4.1 billion. This equivalent to approximately 4 percent of Sri Lanka's 2024 gross domestic product (GDP) and around 0.48 percent of the nation's capital stock of buildings and infrastructure (GRADE,2025).

2. Methodology

The Ditwah Cyclone of 2025 severely impacted 18 river basins in Sri Lanka under the jurisdiction of the Irrigation Department, including Kelani, Attanagala, Maha, Mahaweli, Kala Oya, Deduru Oya, Maduru Oya, Yan Oya, Gal Oya, Heda Oya, Kirindi Oya, Kumbukkan Oya, Mee Oya, Manik Ganga, Mungil Aru, Kalu, Mundeni Aru, and Maa Oya. These basins are continuously monitored and analyzed, with early warnings disseminated in advance to ensure timely preparedness and response of Disaster Management Authorities and public.

2.1. Flood Monitoring and Data Collection

Irrigation Department is one of the mandated organizations for issuing flood warnings. Hydrology and Disaster Management division is a specialized division of the Irrigation Department which is responsible for collecting, maintaining and analyzing the hydro-metrological information system in Sri Lanka. The hydro-Metrological data is analyzed and forecasted. This flood information was disseminated to Disaster Management Authorities for better management of disasters and public through media.

Flood monitoring, forecasting, and early warning rely on integrated hydro-meteorological data from multiple sources. The Irrigation Department operates its own data collection centers, which managed by the Hydrology and Disaster Management Division. During the cyclone, the emergency operations room was activated to provide 24/7 services to both the public and disaster-related agencies. The operation staff compile and analysis forecasted rainfall from the Department of Meteorology, catchment-based rainfall observations, river water levels, reservoir operations, and river level trends to generate reliable flood warnings.

By continuously monitoring and analyzing these datasets within each basin, advance alerts are issued to the Disaster Management Centre and the public. Warning messages were disseminated in three languages and published on the Irrigation Department's official website, ensuring wide accessibility.

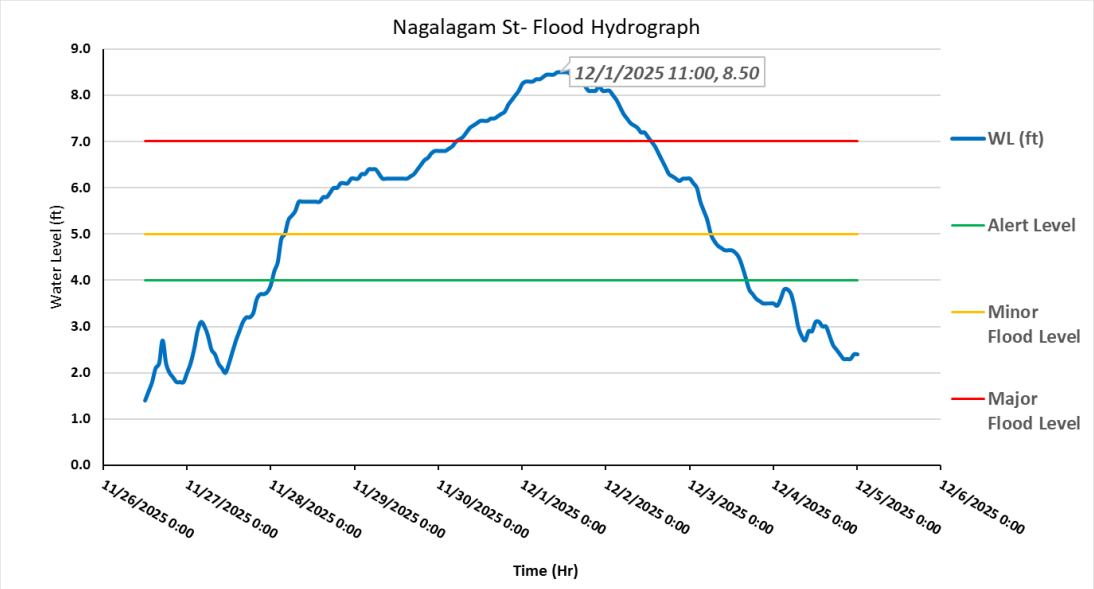
2.2. Tools used

The different tools are used for Ditwah cyclone to monitor river and reservoir water levels and inundation area.

a) River & Reservoir Water Level Monitoring

During both the pre-disaster and disaster periods, the Hydrology Division's Emergency Operations Room is activated to coordinate flood monitoring and forecasting. Flood forecasting messages are issued periodically based on the analysis of hydro-meteorological data, including both historical records and real-time observations collected through semi-automated and manual systems. Forecast information is further refined using real-time rainfall data from the Department of Meteorology (DOM), the National Building Research Organization (NBRO), and other available sources. In addition, numerical models are run to support decision-making, with their outputs integrated into the forecasting process before issuing warnings to the Disaster Management Centre and the public. Throughout this period, the operations room provides 24/7 services, ensuring continuous support to disaster-related agencies and timely dissemination of warnings.

A practical illustration can be drawn from the Kelani River's most downstream gauging station at Nagalagam Street. This station is equipped with a threshold-level system indicated by different colors, which provides a straightforward method for interpreting flood severity. The color-coded thresholds make it easier to disseminate flood warnings to relevant authorities and communities. Based on these thresholds, inundation forecasts issued expected affected Grama Niladhari (GN) and Divisional Secretariat (DS) divisions.



Gauging station at Nagalagam St -Kelani basin

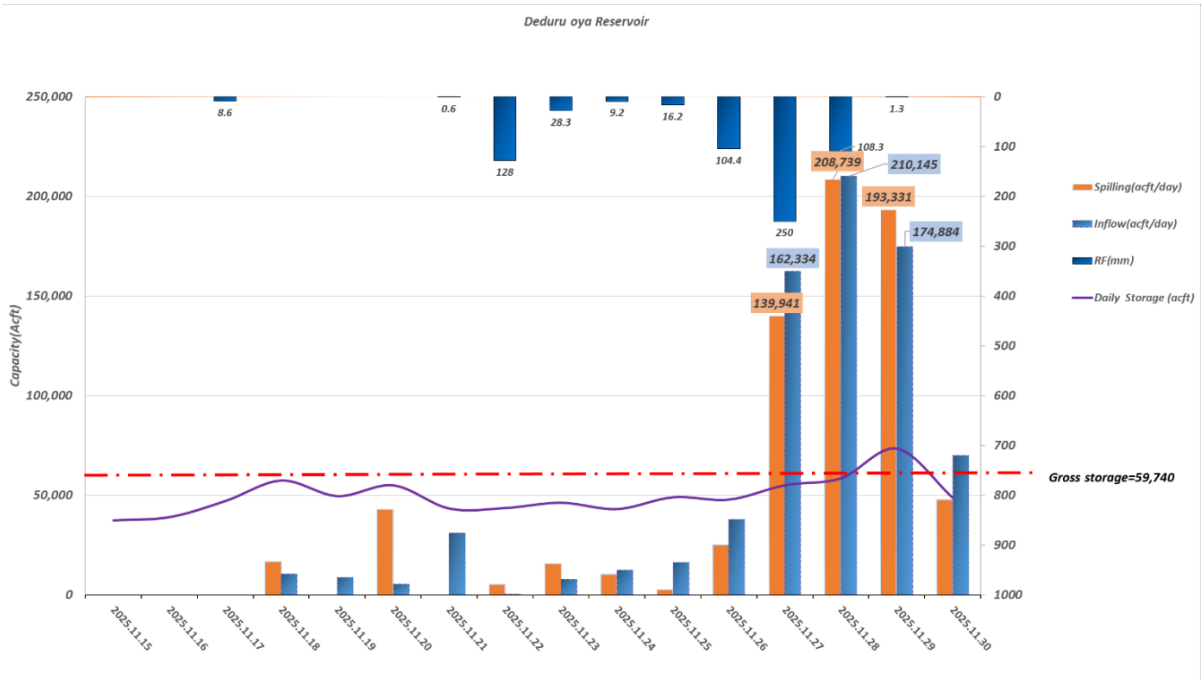
b) Reservoir Operation

Reservoir operation plays a critical role in managing both flood and drought conditions during disaster periods. Decisions regarding reservoir releases are guided by three main factors:

1. Inflow from the upper catchment – continuous monitoring of rainfall and upstream river discharge is essential to anticipate reservoir inflows.
2. Structural stability of the reservoir – ensuring dam safety under high inflow and storage conditions is a priority to prevent catastrophic failure.
3. Current and future water requirements – balancing immediate irrigation demand with forthcoming seasonal needs is vital for agricultural sustainability.

In Sri Lanka, reservoirs are predominantly constructed in the dry and intermediate zones to secure irrigation water during prolonged dry periods. Notably, the Second Inter-Monsoon and Northeast Monsoon seasons contribute more than 65% of the annual average rainfall within a span of 3–4 months. Consequently, reservoir storage must be managed carefully to meet irrigation demands over the remaining 8–9 months of the year.

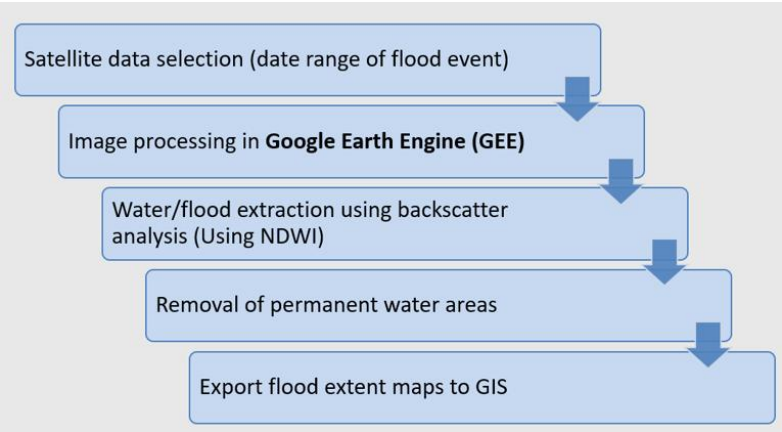
Reservoir operation thus becomes a key factor in balancing flood mitigation with drought preparedness. During flood events, the Water Management Branch is responsible for data collection, monitoring, and providing operational advice based on reservoir status. Field-level decisions on reservoir releases are taken in coordination with the Water Management Branch and Hydrology & Disaster Management Branch at the Head Office, ensuring that operational actions are aligned with both safety and water resource management objectives.



Deduru Oya Reservoir operation during the Ditwah cyclone 2025

As an example, from the Ditwah Cyclone, the operation of the Deduru Oya Reservoir demonstrated the critical role of adaptive reservoir management. Prior to the cyclone, around 80% of storage capacity was maintained. However, continuous and unexpected upstream rainfall over three days significantly increased inflows, requiring controlled releases to safeguard the dam from potential failure. On 28 November 2025, the maximum release reached approximately 210,000 acre-feet per day. By 30 November, the spilling quantity was reduced in line with the inflow received, ensuring both reservoir safety and downstream flood management.

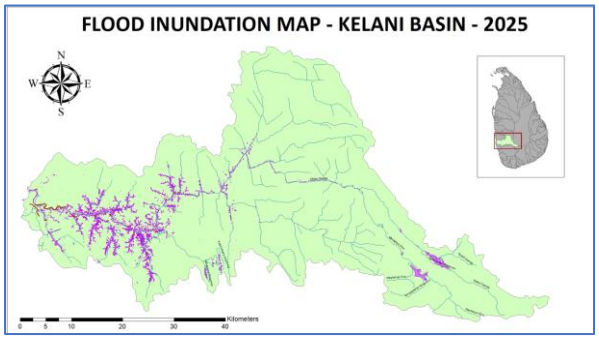
c) Flood Inundation Mapping and Remote Sensing Analysis



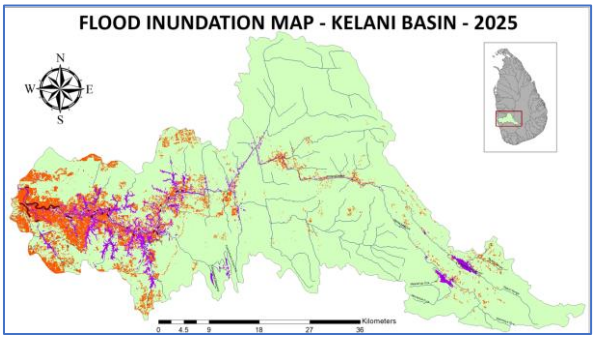
Methodology for create flood inundation map using remote sensing data

A satellite-based flood inundation mapping was conducted during the Ditwah Cyclone to assess impacts across Sri Lanka's vulnerable river basins. Flood mapping was performed across 18 severely affected basins using multi-date Sentinel-2 imagery(10m resolution), which provided high-resolution optical data suitable for water detection. To delineate inundated areas, water-specific indices, particularly the Normalized Difference Water Index (NDWI), were applied to enhance the separation of flooded zones from vegetation, soil, and built-up areas. The imagery was processed using Google Earth Engine (GEE), enabling rapid cloud-based analysis and efficient handling of large datasets. The outputs were exported as GeoTIFFs, integrated into GIS platforms for spatial analysis, and subsequently converted into shapefiles for mapping and overlaying with building layers, thereby supporting detailed impact assessments and model validation.

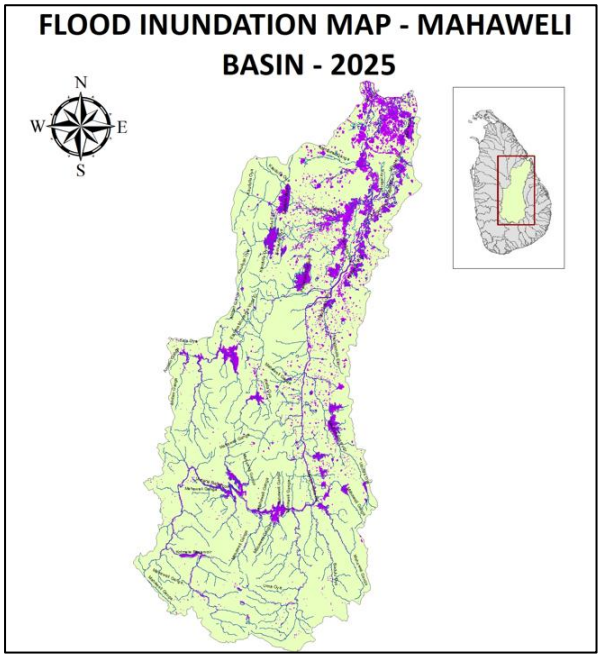
The following two catchments flood inundation map are visualized without and with building layer,



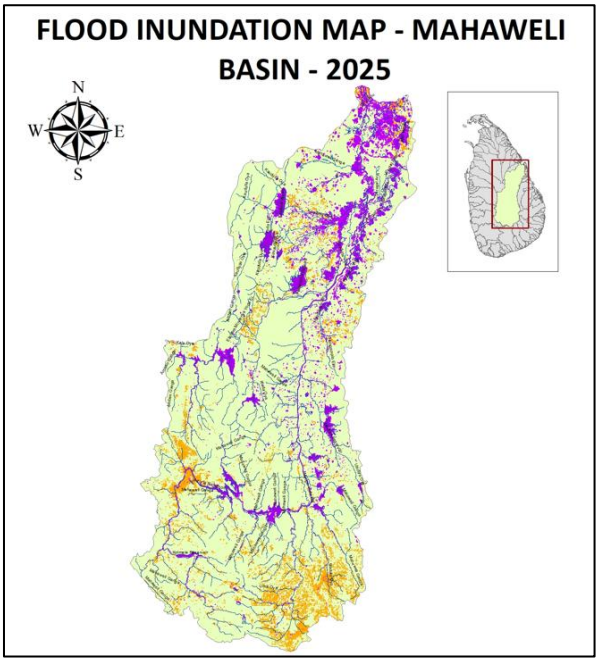
Flood inundation map



Flood inundation map with Buildings



Flood inundation map



Flood inundation map with Buildings

During the post-event analysis of the Ditwah cyclone, it was observed that flood inundation areas in the downstream reaches of several basins were underestimated. Remote sensing–based flood maps, while valuable, are subject to errors caused by cloud cover, building obstacles, dense forest canopy, and other land surface complexities that obscure the true extent of flooding.

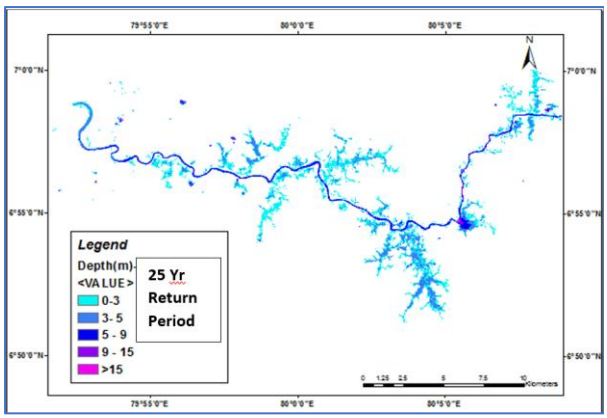
In particular, Sentinel-2 imagery from 27, 28, and 29 November 2025 was heavily clouded, limiting its usefulness for flood mapping. The dataset from 30 November, however, provided clearer imagery and was therefore selected for inundation analysis. Although the mapped flood extents derived from this imagery may not fully represent the actual ground situation, they offered a practical basis for understanding inundation patterns at ground level.

To enhance spatial relevance, base map layers and Grama Niladhari (GN) division boundaries were integrated beneath the inundation maps in ArcGIS. This layering allowed for the identification of affected administrative divisions, supporting more precise flood warning dissemination and impact assessment.

To ensure accuracy and reliability, it is therefore necessary to validate the flood extent maps with real field surveys and ground observations. Such validation will help reconcile discrepancies, improve confidence in the results, and provide a more robust basis for planning rehabilitation and disaster management interventions.

d) Modeling & Forecasting Tools

In addition to the satellite-based flood mapping, the HEC-RAS hydrodynamic model and GIS Platforms for Kelani basin was applied to forecast peak flows in the downstream reaches of the basins and to simulate floodplain inundation area and depth. Model inputs included rainfall and discharge data from the Ditwah Cyclone event, combined with catchment topography and channel geometry. Different return periods and past flood events were incorporated. The simulated flood extents were then mapped and compared with the Sentinel-2 NDWI derived flood inundation maps. This integration allowed identification of underestimation in remote sensing outputs, particularly in downstream areas, and provided a more reliable representation of flood extent. The combined approach, remote sensing analysis validated and supplemented by HEC-RAS modeling ensures a robust basis for flood monitored the major and minor flood protection structures were monitored for concern the safety of the people and their properties. Flood protection bunds in the Kelani Downstream also monitored and precaution methods were carried out to ensure the safety of the bunds during the flood event.



Flood protection bunds and structures



Flood inundation map-Kelani (Glencouse to Sea)

In the downstream reaches of the Kelani basin, four major flood protection bunds have been constructed to safeguard critical areas. The South Bund provides protection to Colombo city, ensuring the safety of urban populations and infrastructure, while the North Bund was established to protect extensive agricultural lands. In addition to these major structures, approximately 50 minor flood protection structures extend from Glencourse to the sea, collectively safeguarding around 10,500 acres of land. These bunds and associated structures form an integrated flood defense system, designed to mitigate flood risks and protect both located on the left and right banks of the Kelani River for the protection of Colombo and Gampaha districts.

As per the flood inundation model outputs, riverine flooding in the downstream reaches of the Kelani basin was effectively controlled by the flood protection bunds and associated structures. These defenses prevented overtopping and safeguarded protected areas during the Ditwah Cyclone 2025. However, the model results revealed an underestimation of flood impacts in low-lying and urban areas, where localized inundation was not fully captured. This discrepancy highlights the limitations of relying solely on riverine flood models. To address this, it is necessary to integrate urban flood models with riverine hydrodynamic simulations, thereby accounting for stormwater drainage, built-up environments, and micro-topography. Such a coupled modeling approach will provide a more accurate representation of flood hazards, strengthen preparedness, and support the effective operation of flood protection structures in both rural and urban contexts.

3. Limitations and Challenges in Flood Monitoring, forecasting and early warning

During the Ditwah Cyclone of 2025, several limitations and challenges emerged in monitoring, forecasting, and disseminating early warnings.

During the peak of the Ditwah cyclone, flood conditions reached critical levels across most locations. Several gauging stations became isolated due to inundation and access constraints, severely limiting real-time data collection. Both manual and automated monitoring systems experienced failures, resulting in significant gaps in hydrological observations. These disruptions hindered the accuracy of flood forecasting and reduced the

effectiveness of early warning dissemination, underscoring the vulnerability of monitoring infrastructure during extreme events.

The accuracy of hydro-meteorological data during extreme conditions, remote sensing imagery, DEMs, and forecasted rainfall inputs were limited, affecting the reliability of model outputs. The event was further complicated by unpredicted, continuous high rainfall over three days, which exceeded typical forecast ranges and placed severe time constraints on hydrodynamic modeling.

Many affected areas were remote and difficult to access, Communication network disruptions, making it challenging to obtain continuous ground data collection. Hydro-meteorological data forms the foundation of numerical modeling, serving as the basic input for simulating hydrological and hydraulic processes. The accuracy of field-level observations and forecasted rainfall data is critical to ensure reliable model outputs. Without precise measurements and dependable forecasts, models risk producing results that misrepresent actual conditions, undermining both planning and early warning systems. In addition, cloud cover, building obstacles, and dense forest canopy reduced the precision of satellite-based flood detection. These limitations highlight the need for improved data acquisition systems, integration of multiple flood models (urban and riverine), expand the basin wise Hydro-Dynamic models and stronger field survey mechanisms to enhance the accuracy of flood monitoring and forecasting.

Low community response to flood warning messages remains a significant challenge in disaster risk reduction. Many people hesitate to act due to limited trust in forecasts, communication gaps, or socio-economic constraints that make evacuation difficult. Strengthening engagement through localized messaging, multi-channel dissemination, and inclusive preparedness planning is essential to ensure that warnings translate into timely action. Building trust and providing practical support can transform alerts from simple notifications into life-saving interventions.

However, these limitations and challenges were successfully addressed by the Irrigation Department through the valuable expertise of specialists and close coordination among all disaster-related stakeholders. This collective effort ensured that monitoring, forecasting, and early warning dissemination were strengthened, enabling a more effective response during the cyclone.

4. Response and Lessons Learned

The experience of the Ditwah Cyclone 2025 highlighted several critical lessons for flood management and disaster resilience.

Early warning systems play a vital role in reducing disaster risk by providing timely alerts that enable rapid evacuation and preparedness. Enhancing the accuracy of forecasts and ensuring that warnings are communicated swiftly to vulnerable communities remain critical

priorities. Strengthening these systems not only improves public safety but also builds resilience by empowering people to act before hazards escalate into emergencies.

Strengthening coordination between government and non-governmental organizations is essential for an effective disaster response. Achieving this requires close collaboration among multiple agencies, including irrigation, disaster management, meteorological services, local authorities and international Agencies. The recent cyclone highlighted the critical need for clear communication channels and joint operational protocols to prevent duplication of efforts and ensure that resources are deployed efficiently.

Flood resilience infrastructure integrates monitoring and safe access systems to ensure communities remain protected during extreme events. Gauging stations, which measure river discharge and water levels, are often built on elevated platforms above historical flood marks, equipped with remote telemetry and backup power to guarantee uninterrupted data flow during inundations.

Community response, on the other hand, reflects how people act when hazards occur. Rapid, coordinated action depends on prior engagement, clear communication, and accessible resources. Well-prepared communities can mobilize volunteers, activate evacuation routes, and support vulnerable groups more effectively. Strengthening both engagement and response creates a cycle of resilience, where communities are not only recipients of warnings but active partners in safeguarding lives and livelihoods.

5. Recommendation and Conclusion

The Ditwah Cyclone highlighted both the resilience and limitations of Sri Lanka's flood monitoring and early warning systems. While timely alerts and coordinated responses reduced casualties, the event underscored the need for technological upgrades, broader data coverage, improve flood resilience infrastructure for gauging stations and stronger community engagement to face future climate-driven disasters.

For future flood risk management, conducting field-level surveys of inundation maps with depth measurements is vital. Such ground-truth data will enable more accurate calibration and validation of hydrological, hydraulic models and as well as satellite-derived flood maps, ensuring that simulations closely reflect real flood conditions. This will improve the reliability of forecasts, strengthen early warning systems, and support better planning for floodplain zoning and community preparedness.

Improving community preparedness and evacuation decision-making is vital for effective disaster management in Sri Lanka. Disaster Management Authorities should strengthen awareness programs, ensure clear communication of early warnings, and provide practical guidance on safe routes and shelters. By engaging communities through drills and education, people can make timely, informed decisions that reduce vulnerability and enhance resilience during emergencies.

The Irrigation Department effectively managed the Ditwah Cyclone by addressing limitations through limited internal specialist expertise and strong coordination among disaster-related stakeholders. This collective effort strengthened flood monitoring, forecasting, and early warning dissemination, resulting in a more timely and effective response during the event.

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COMPREHENSIVE EVALUATION OF WATER QUALITY STATUS IN THE MAHAWELI RIVER

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Abstract

This study evaluates the water quality of the Mahaweli River, Sri Lanka's longest river, focusing on its suitability for potable and ecological purposes. Data from nine water treatment plant intakes, obtained from the NWSDB over a decade (2010–2020), were analyzed using statistical methods and the Canadian Council of Ministers of the Environment Water Quality Index (CCME WQI). Ten parameters representing physical, chemical, and biological aspects were examined to assess seasonal and spatial variations, with climatic seasons identified using the Inverse Distance Weighting (IDW) method and rainfall data from the Meteorological Department.

The findings reveal that the Mahaweli River's raw water is unsuitable for drinking without treatment, though chemical parameters generally meet the standards of Sri Lanka Standard 614 for potable water. This study follows statistical analysis on a temporal and seasonal basis, and then WQI analysis on a spatial basis. Correlation analysis was also done between parameters. According to the CCME WQI, a numerical value out of 100 is generated as the output. This is categorized as follows: a WQI of 100–95 is classified as excellent, 94–80 as good, 79–65 as fair, 64–45 as marginal, and 44–0 as poor.

Seasonal variations affect water quality, with wet seasons increasing turbidity and color due to erosion and runoff, and dry seasons elevating chemical and biological concentrations as water levels drop. Spatially, seawater intrusion downstream raises ion levels, while densely populated areas like Polgolla show lower ecological quality. In contrast, forested regions such as Dehiaththakandiya and Gallela have better biological quality. However, almost all the locations have a CCME WQI with respect to ecological standards higher than 52.

CCME WQI results show poor water quality for drinking (WQI = 42) but marginal to good quality for ecological use. Industrial and agricultural impacts are minimal, with low ion concentrations, and the river maintains a good ecological balance.

In conclusion, while the Mahaweli River supports ecological health, its raw water requires treatment for safe drinking. This study highlights the importance of preserving water resources and assessing other water bodies, such as wells, to ensure potable standards.

Keywords: Water Quality, Mahaweli River, Statistical Analysis, Water Quality Index, Temporal variations

1. Introduction

The river water is degraded for many reasons in developing countries as domestic, agricultural, or industrial wastes. Both natural and anthropogenic inputs change water quality into unsuitable status (Amadi et al., 2010). The regular evaluation of water quality at water resources is necessary to ensure safe usage by people. For that Water Quality Index (WQI) is an effective tool that gives an overall impact on raw water by many parameters together (Amadi et al., 2010). The most widely used WQI method is the Canadian Council of Ministers of the Environment (CCME) worldwide (Uddin et al., 2021). It has the flexibility to use any number of parameters and any type of parameters. That has no specific rules for parameter selection. This can be used for any end use purpose by varying the standard limits (Uddin et al., 2021). Usually, people use the treated water for potable usage. So, the river water needs to be evaluated based on other purposes such as irrigation, recreation, ecology and livestock by considering seasonal variations as well.

1.1. Objectives

This study aims to evaluate the water quality of selected water treatment plant intakes along the Mahaweli River from upstream to downstream across different aspects. The objectives are,

- To evaluate and analyze the WQI at selected locations.
- To conduct Statistical Analysis of water quality data

1.2. Significance

The Mahaweli River is the longest river in Sri Lanka, where 15 % of the entire population uses its water for many purposes (Bandara et al., 2011). Nine water treatment plant intakes along the Mahaweli River were evaluated in this research covering large geographical area as in Fig: 1.



1.Elpitiya
2.Ukuwela
3. Meewathura
4. Greater Kandy
5. Polgolla
6. Mahiyanganaya
7. Dehiaththakandiya
8. Gallela
9. Neelapola

Fig: 1 - Evaluated Water Treatment plant intake locations

2. Methodology

Nine locations located along the Mahaweli River at National Water Supply and Drainage Board intakes were selected for this study (Fig: 1). Rainfall data from the Meteorological Department was used to identify climatic seasons. From 2010 to 2020, ten water quality parameters were analyzed using various statistical methods. The first method involves examining the mean, maximum, and minimum values of the parameters. The second method is the Water Quality Index analysis, which considers both potable and ecological conditions. The third method is correlation and regression analysis, used to study relationships between the variables.

The ten parameters were selected to represent physical, chemical, and biological aspects of water quality. The physical parameters included color and turbidity. The chemical parameters comprised pH, electrical conductivity, total alkalinity, nitrate, total hardness, and total iron. The biological parameters consisted of total coliform and E. coli.

The WQI analysis, a statistical method, was conducted using the CCME WQI due to the previously mentioned properties. Below equations presents a summary of the CCME WQI calculations.

$$WQI = 100 - \left(\frac{\sqrt{F_1^{\,2} + F_2^{\,2} + F_3^{\,2}}}{1.732} \right)$$

- $F_1 = \left(\frac{\text{Number of Failed Variables}}{\text{Total Number of Variables}} \right) * 100$
- $F_2 = \left(\frac{\text{Number of Failed Tests}}{\text{Total Number of Tests}} \right) * 100$
- $F_3 = \left(\frac{\text{nse}}{0.01\ \text{nse} + 0.01} \right)$
- $nse = \frac{\sum_{i=1}^{n} excursion_i}{Total\ number\ of\ tests}$

According to the CCME WQI, a numerical value out of 100 is generated as the output. This is categorized as follows: WQI of 100–95 is classified as excellent, 94–80 as good, 79–65 as fair, 64–45 as marginal, and 44–0 as poor.

Climatic Seasons were identified statistically using the Inverse Distance Weighting (IDW) method as the water quality data locations and rainfall data locations are not the same. The months having more than 40% of rainfall from annual rainfall considered as wet season. If D refers to the distance from rainfall location to water quality data location,

- Weightage = 1 / D2

- Needed Rainfall= Weightage x Given Rainfall

The standard values taken for the selected parameters under ecological and drinking conditions are mentioned in Table 1.

Table 1: Standard Limits for Ecological and Drinking water

Parameters	Unit	Ecological Standards	Drinking standards
Color	Hazen Units	50	15
Turbidity	NTU	<=5	2
pH	-	6.5-8.5	6.5-8.5
EC	micro s /cm	1000	400
Total Alkalinity	mg/l	200	200
Nitrate	mg/l	10	50
Total Hardness	mg/l	100-200	250
Total Iron	mg/l	0.3	0.3
Total Coliform	CFU in 100 ml	1000	3
E. coli	CFU in 100 ml	100	0

3. Results and Discussion

3.1. Statistical Analysis: Temporal Variations

All nine locations were examined from 2015 to 2019, with no significant year-to-year deviations observed. The physical and biological parameters do not meet Sri Lankan Standard 614 (SLS 614) for potable water, whereas the chemical parameters comply. This indicates that the chemical impact from industries, domestic activities, or fertilizers on the Mahaweli River is minimal and can be considered negligible. Additionally, the Water Environment Capacity (WEC) of the Mahaweli River is at a good level, maintaining a natural balance in water quality. When comparing the maximum values to the Kelani River (Mahagamage et al., 2016), which is heavily polluted with ions, it can be confirmed that the Mahaweli River remains chemically undisturbed (Table 2).

Table 2: Comparisons of Kalani and Mahaweli rivers

Parameter	Kelani river	Mahaweli river
pH	3.85 – 5.5	5.5 – 8.0
EC µs/cm	20 – 917	22 - 330
Hardness (mg/l)	2 – 206	4 - 188

When considering spatial variations, most chemical parameter values show a slight increase from upstream to downstream, likely due to seawater intrusion into the river basin and the concentration of ions.

The highest mean values for color and turbidity were observed in Greater Kandy, near the Thakkawaththa Water Intake. Biological parameters recorded the highest mean value at Polgolla, likely due to the area's high population density. Conversely, the lowest biological mean values were observed at Dehiaththakandiya and Gallela, which are predominantly covered by forest areas. This suggests that human waste impacts the water quality of the Mahaweli River. Considering ecological standards, physical and biological parameters meet the limits at only a few locations.

3.2. Statistical Analysis: Seasonal Variations

Based on the seasons determined using the IDW method, the dry season varies by location, while the wet season consistently occurs from October to December across all locations. By considering the means values; many parameters exhibit variations depending on the climatic seasons. However, pH remains the same in Wet and dry seasons (Table 3 and Fig: 2). All the nine locations follow the same pattern.

Table 3: Seasonal Variations

Wet >Dry	Wet < Dry	Wet=Dry
Color Turbidity Iron	Alkalinity Hardness Conductivity Total Coliform E-Coli	pH

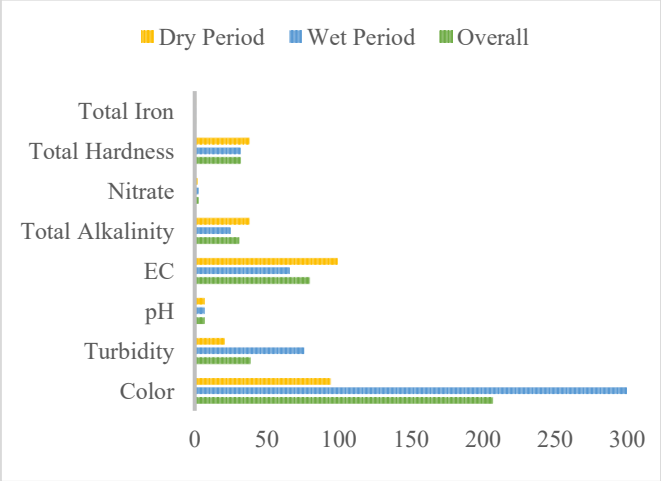


Fig: 2 - Graphical presentation of Seasonal Variations

During the wet season, color and turbidity increase due to runoff and riverbank erosion. In the dry season, the increase in chemical and biological parameters may result from the concentration of particles due to reduced water levels in the river. The buffering capacity of

the watershed likely helps maintain a relatively stable pH during both the dry and wet periods.

3.3. WQI Analysis: Spatial Variations

Considering overall data from 2010 – 2020 at all locations, WQIs were calculated with the CCME method. Under Potable conditions, 42 was the WQI value obtained for all locations which indicates the poor water quality. Under Ecological conditions, the water status was varying from marginal to good quality. The CCME WQIs obtained are in Fig: 3with the respective locations for the ecological condition.

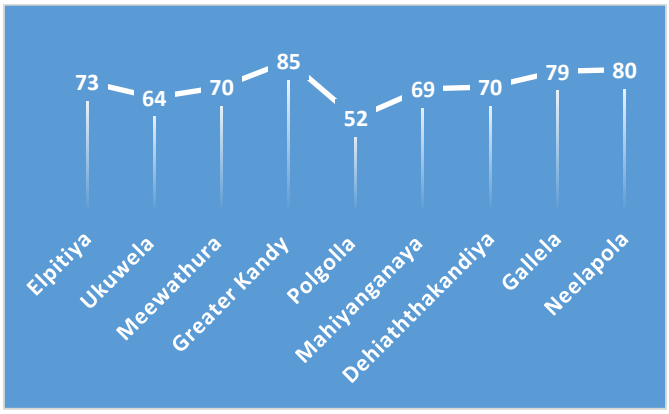


Fig: 3 - Graphical presentation of spatial variation of CCME WQI – Ecological Condition

3.4. Correlation Analysis

The correlation results reveal various relationships between the parameters, both positive and negative. Four of these relationships demonstrate strong correlations, as summarized in Table 4.

Table 4: Correlation Analysis – Strong relationships

Correlation value	Parameter bond
0.975	Conductivity – Alkalinity
0.952	Alkalinity - Hardness
0.946	Conductivity - Hardness

The Regression patterns can be identified in these relations. There are many moderate bonds between parameters also identified through the correlation analysis.

4. Conclusion

This study of the Mahaweli River using statistical methods reveals important insights into its water quality. The raw water is unsuitable for drinking without treatment but does not negatively impact the ecological balance. Seasonal variations significantly influence water quality, with wet seasons increasing turbidity and color due to soil erosion and runoff, while

dry seasons lead to higher concentrations of chemical and biological parameters due to reduced water levels.

Spatially, seawater intrusion contributes to higher ion concentrations downstream, while areas with higher population densities, such as Polgolla, exhibit lower ecological water quality. In contrast, forest-dominated regions like Dehiaththakandiya and Gallela maintain better biological water quality. The CCME WQI results indicate that water quality is poor for drinking but ranges from marginal to good under ecological conditions.

Notably, the Mahaweli River shows minimal industrial and fertilizer impacts than Kelani River, as indicated by low ion concentrations, and maintains good water environmental capacity under ecological conditions. While the river supports ecological health, continuous monitoring and effective management strategies are essential to ensure safe and sustainable water usage, particularly for potable purposes and in areas affected by human activities.

ACKNOWLEDGEMENT

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STUDY ON THE IRRIGATION WATER QUALITY OF MAJOR RESERVOIRS IN ANURADHAPURA DISTRICT, SRI LANKA - 2024

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Abstract

Anuradhapura district of the North Central Province is in the dry zone of Sri Lanka, and it is one of the key agricultural districts in the country. Irrigation with poor quality waters may bring undesirable elements to the soil in excessive quantities affecting its fertility and the hydrochemical studies can reveal the quality of water with its suitability for drinking, agriculture & other industrial purposes. We assessed the quality of water suitable for irrigation in our study area by analyzing water samples collected from eight reservoirs in two seasons. Based on the factors such as salinity hazard, sodium hazard & bicarbonate hazard, the suitability of water for irrigation has been evaluated according to the standard total dissolved salts/solids, sodium adsorption ratio, soluble sodium percentage (Na%) & residual sodium carbonate values under FAO guidelines.

Keywords: Anuradhapura, Dry zone, Water quality, Irrigation, Salinity

1. Introduction

Irrigation water is significant for agriculture as it enables crop production in dry areas, supplements insufficient rainfall and supports diverse agriculture practices, which enhances crop yields, improves quality, and boosts overall agricultural productivity. Irrigation water quality refers mainly to the chemical composition of the water, or more specifically, to the mineral composition of water. This water can be categorized as good or bad for irrigational use, after the laboratory analysis. Salinity hazard, Sodium hazard, Alkalinity & Toxicity are the four basic criteria & Residual Sodium Carbonate, pH value, Electrical conductivity, Total suspended solids & Total hardness can be mentioned as the other criteria for evaluating irrigation water quality.

2. Materials and Method

This study was conducted to evaluate the irrigation water quality of eight major reservoirs in Anuradhapura District during two distinct seasonal periods in 2024 (July and October). The selected reservoirs include Rajanganaya, Mahavilachchiya, Abaya Wewa, Thisa Wewa, Nuwara Wewa, Mahakanadarawa, Hurulu Wewa & Nachchaduwa. These reservoirs are distributed across different river basins, including Malwathu Oya, Kala Oya, Modaragam Aru, and Yan Oya, ensuring representative spatial coverage of the district's irrigation network.

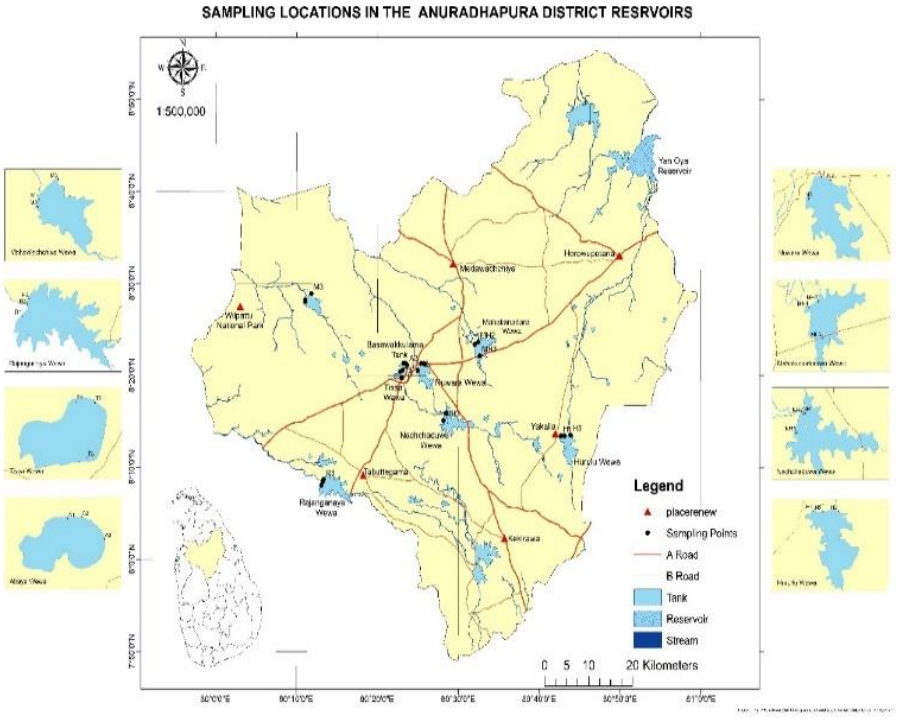


Figure 01: Spatial Distribution of Sampling Points Map

Water samples were collected from three sampling points in each reservoir during both seasons (Figure 01). The samples were collected using surface sampling method and 500 ml narrow mouth polypropylene sampling bottles were used. Before taken to the fields to collect samples, these bottles were washed by tap water & distilled water respectively and each bottle was washed by the sample itself before collecting.

Laboratory analyses were conducted using the methods derived from APHA & USEPA methods, to determine key chemical parameters including pH, Electrical Conductivity (EC), and concentrations of major cations (Na^+, K^+, Ca^{2+}, Mg^{2+}) and anions (Cl^-, CO_3^{2-}, HCO_3^-). For this process, pH-EC Meter, Flame Photometer, AAS Machine & Digital Burette were used in the laboratory. From these measured values, irrigation-relevant indices were calculated, including Total Dissolved Solids (TDS), Sodium Adsorption Ratio (SAR), Soluble Sodium Percentage (SSP or Na%), and Residual Sodium Carbonate (RSC).

The evaluation of water suitability was performed in accordance with FAO guidelines and established hydrochemical classification standards.

3. Calculation Formulae

1. $TDS = EC \times 640$
2. $SAR = \frac{Na^{2+}}{\sqrt{\frac{Ca^{2+}+Mg^{2+}}{2}}}$
3. $SSP = \frac{\text{Soluble Na concentration}}{\text{Total cations concentration } \left(Ca^{2+}+Mg^{2+}+Na^{+}+K^{+}\right)} \times 100\%$
4. $RSC = (CO_3^{2-}+HCO_3^-)-(Ca^{2+}+Mg^{2+})$

4. Results & Discussion

The pH values recorded during both sampling periods ranged within the acceptable irrigation water quality limits of 6.5–8.4. All the pH measurements from the eight reservoirs fell within this recommended range, indicating no acidity or alkalinity-related hazard for crop production.

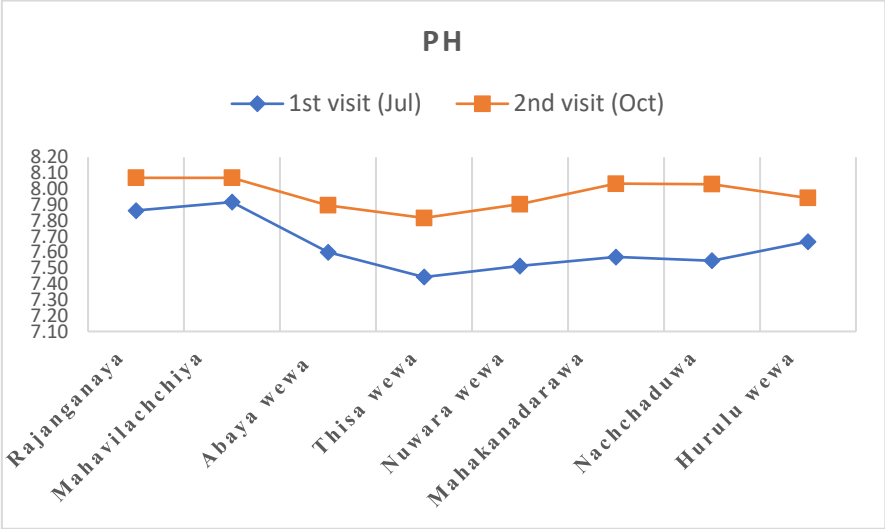


Figure 02: Comparison of pH values during two seasonal visits

A slight increase in pH was observed during October, though values remained well within "permissible" limits, suggesting stable buffering conditions and minimal seasonal variation in acidity–alkalinity characteristics.

Electrical Conductivity (EC), which indicates salinity levels, ranged between 0.33 and 0.72 dS/m across both seasons. According to FAO standards, all measured EC values fall within the acceptable region for irrigation.

Table 01: The standard EC values for Irrigation water

Water Salinity	EC (dS/m)	TDS (ppm)	Remark on quality
Low	0.1–0.25	64–160	Excellent
Medium	0.25–0.75	160–480	Good
High	0.75–2.25	480–1440	Doubtful
Very High	>2.25	>1440	Unsuitable

The corresponding TDS values approximately ranged from 211 ppm to 461 ppm, classifying all samples under medium salinity water, considered suitable for irrigation with minimal

management intervention. Among the reservoirs, Thisa Wewa consistently recorded the lowest TDS values, whereas Mahavilachchiya showed comparatively higher concentrations, though still within acceptable limits.

Sodium hazard was assessed using both Soluble Sodium Percentage (SSP) and Sodium Adsorption Ratio (SAR). SSP values indicated that most reservoirs fell within the "permissible" range (40–60%), with a small proportion categorized as "doubtful" during both seasons.

Table 02: The Sodium Hazard standards of Irrigation water based on SSP

Na% or SSP	Remark on quality
< 20 %	Excellent
20 – 40 %	Good
40 – 60 %	Permissible
60 – 80 %	Doubtful
> 80 %	Unsuitable

Specifically, during July, Mahavilachchiya showed doubtful SSP level, while during October, both Mahavilachchiya & Mahakanadarawa fell into this category.

Table 03: The Sodium Hazard standards of Irrigation water based on SAR

SAR	Remark on quality
< 10	Excellent
10-18	Good
18-26	Doubtful
> 26	Unsuitable

However, SAR values for all samples were below 10, classifying them as "excellent" with respect to sodium adsorption risk. This indicates that although sodium percentages may be moderately elevated in some locations, the combined presence of calcium and magnesium provides sufficient counterbalance to prevent soil structure degradation.

Table 04: The Bicarbonate Hazard standards of Irrigation water based on RSC

RSC	Remark on quality
< 1.25	Good
1.25 – 2.5	Doubtful
> 2.5	Unsuitable

Bicarbonate hazard, evaluated through Residual Sodium Carbonate (RSC), revealed that during July, Mahavilachchiya, Abhaya wewa & Nuwara wewa exhibited doubtful RSC levels (between 1.25 and 2.5 meq/l), while the remaining five showed good quality water. During

October, all reservoirs recorded RSC values below 1.25 meq/l, indicating no bicarbonate related hazard. The seasonal improvement may be attributed to hydrological changes, dilution effects, or variations in carbonate precipitation dynamics.

Overall classification of irrigation water quality indicated that during July (Table 05), 25% of reservoirs were categorized as excellent, 40.6% as good, 21.9% as permissible, and 12.5% as doubtful.

Table 05: The summary on water quality during July season

			Excellent	Good	Permissible	Doubtful	Unsuitable	HAZARD
July	Salinity Hazard	TDS	-	100 %	-	-	-	0%
	Sodium Hazard	SSP	-	-	87.5 %	12.5 %	-	12.5 %
		SAR	100 %	-	-	-	-	0%
	Bicarbonate Hazard	RSC	-	62.5 %	-	37.5 %	-	37.5 %
	QUALITY		25%	40.6 %	21.9 %.	12.5 %	0 %	

Table 06: The summary on water quality during October season

			Excellent	Good	Permissible	Doubtful	Unsuitable	HAZARD
October	Salinity Hazard	TDS	-	100%	-	-	-	0%
	Sodium Hazard	SSP	-	-	75%	25%	-	25%
		SAR	100%	-	-	-	-	0%
	Bicarbonate Hazard	RSC	-	100%	-	-	-	0%
	QUALITY		25%	50%	18.8%	6.2%	0%	

During October, improvements were observed, with 25% classified as excellent, 50% as good, 18.8% as permissible, and only 6.2% as doubtful. No reservoirs were classified as unsuitable during either season. Importantly, no severe salinity hazard or SAR-based sodium hazard was detected in any of the sampled reservoirs.

5. Conclusion

The hydrochemical assessment conducted for eight major reservoirs in the Anuradhapura District indicates that the irrigation water quality is generally suitable for agricultural use under present conditions. All measured pH values remained within the recommended limits for irrigation, confirming that the water does not pose acidity or alkalinity hazards to crop production.

The Electrical Conductivity (EC) and Total Dissolved Solids (TDS) values recorded in both seasons indicate medium salinity water**,** which is considered acceptable for irrigation in most agricultural soils. In Anuradhapura region, RBE (Reddish Brown Earth) soil type is common and during seasonal variations, the ions may washout and get accumulated in these water bodies causing ion concentration increase in the reservoirs . The absence of high salinity

levels suggests that the water currently poses minimal risk of salt accumulation in soils, particularly when used with proper irrigation management and adequate drainage.

Assessment of sodium hazard revealed that Sodium Adsorption Ratio (SAR) values were within the excellent category for all reservoirs**,** indicating a very low risk of soil structural degradation caused by sodium accumulation. Although Soluble Sodium Percentage (SSP) values in a few reservoirs fell within the doubtful range during certain periods, the low SAR values demonstrate that the presence of calcium and magnesium ions effectively balances sodium levels, reducing potential impacts on soil permeability.

The evaluation of bicarbonate hazard through Residual Sodium Carbonate (RSC) showed some seasonal variations. During the July sampling period, a few reservoirs exhibited doubtful RSC levels, suggesting the possibility of bicarbonate-related soil issues if such water is used continuously without management. However, the improvement observed during the October sampling period indicates that seasonal dilution and hydrological processes contribute to maintaining acceptable water quality levels**.**

Overall, the combined evaluation of salinity hazard, sodium hazard, and bicarbonate hazard confirms that the majority of reservoirs fall within excellent to good irrigation water quality categories, with only a small proportion showing marginal conditions during certain seasons. Importantly, no reservoir was classified as unsuitable for irrigation during the study period.

Nevertheless, irrigation water suitability should always be considered in relation to soil characteristics, crop tolerance, and field management practices**.** Even water categorized as permissible or marginal can be effectively used in well-drained soils or for crops with higher salt tolerance.

Therefore, it is recommended that periodic monitoring of reservoir water quality be continued to detect any long-term changes that may arise from climatic variability, agricultural activities, or watershed processes. Implementing appropriate irrigation management practices, improving water-use efficiency, and selecting suitable crops will help maintain soil health and sustain agricultural productivity. These findings support evidence-based land use planning and irrigation management decisions aimed at sustaining the vital agricultural systems of Sri Lanka’s dry zone.

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Section2 – Articles

Table of Content – Section 2 (Articles)

Sinhala

ලෝක ජල දිනය 2026 - "ජලය සහ ස්ත්‍රී පුරුෂ සමාජභාවය) "Water and Gender) 67

තිරසර කෘෂිකර්මය ,වන ජීවී සංරක්ෂණය ,සමාජ ආර්ථික සංවර්ධනය හා බැඳුනු මින්නේරිය වැවෙහි ඒකාබද්ධ ජල කළමනාකරණ ප්‍රවේශය 70

ශ්‍රී ලංකාවේ වියළි කලාපීය පද්ධතිය තුළ ආපදා අවදානම අවම කිරීමට ජල කළමනාකරණය කිරීමේ දී කාන්තා සහ පිරිමි දායකත්වය. 76

English

Empowering Women for Healthy Rivers and Resilient Communities 80

WOMEN IN IRRIGATION: From Community Fields to Engineering Leadership 83

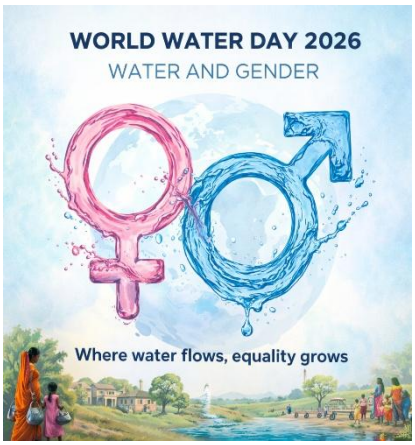
Tamil

ஆரோக்கியமான நதிகளுக்காகவும் உறுதியான சமூகக் கட்டமைப்புக்காகவும் பெண்களை வலுப்படுத்துதல் 87

சமூக அடிப்படையிலான நீர்ப்பாதுகாப்பில் பெண்களின் பங்கு 92

ලෝක ජල දිනය 2026 - "ජලය සහ ස්ත්‍රී පුරුෂ සමාජභාවය" (Water and Gender)

සෑම වසරකම මාර්තු 22 වන දිනට යෙදෙන ලෝක ජල දිනය, පිරිසිදු ජලයේ වැදගත්කම සහ තිරසාර ජල කළමනාකරණයේ අවශ්‍යතාවය පිළිබඳව ගෝලීය අවධානය යොමු කරවන සුවිශේෂී දිනයකි. 2026 වසරේ ලෝක ජල දිනය "ජලය සහ ස්ත්‍රී පුරුෂ සමාජභාවය" (Water and Gender) යන තේමාව යටතේ සමරනු ලබන අතර, එහි ප්‍රධාන පාඨය වන්නේ "ජලය ගලා යන තැන, සමානාත්මතාවය වැඩේ" (Where water flows, equality grows) යන්නයි. මෙම තේමාව මගින් ජල සුරක්ෂිතතාව සහ ස්ත්‍රී පුරුෂ සමාජභාවය අතර ඇති අත්‍යන්ත සම්බන්ධය අවධාරණය කරන අතර, ජල කළමනාකරණයේදී කාන්තාවන්ගේ භූමිකාව සහ නායකත්වය ඉහළ නැංවීමේ වැදගත්කම පෙන්වා දෙයි.



ගෝලීය ජල අර්බුදය සැමට එකසේ බලනොපායි. ලොව පුරා, නිවෙස්වලට ආරක්ෂිත පානීය ජලය සහ සනීපාරක්ෂක පහසුකම් නොමැති ප්‍රජාවන්හි, මෙම අසමානතාවයේ දැඩිම පීඩනයට ලක්වන්නේ කාන්තාවන් සහ ගැහැණු ළමුන්ය. එක්සත් ජාතීන්ගේ සංවිධානයේ දත්ත වලට අනුව,

ගෝලීය වශයෙන්, කාන්තාවන් බිලියනයකට අධික සංඛ්‍යාවකට (සම්පූර්ණ කාන්තා ජනගහනයෙන් 27.1% කට වඩා) ආරක්ෂිතව කළමනාකරණය කළ පානීය ජල සේවා සඳහා ප්‍රවේශය නොමැත. නිවෙස් බිලියන 1.8 කට තවමත් පරිශ්‍රය තුළම පානීය ජලය නොමැති අතර, නිවෙස් තුනෙන් දෙකක ජලය එකතු කිරීමේ මූලික වගකීම පැවරී ඇත්තේ කාන්තාවන්ටය.

මෙම තත්ත්වය ඔවුන්ගේ අධ්‍යාපනය, සෞඛ්‍ය, ආර්ථික අවස්ථා සහ ආරක්ෂාව කෙරෙහි සෘජුවම බලපායි. දිනපතා පැය ගණනක් ජලය රැගෙන ඒම සඳහා වෙහෙසීම, අපිරිසිදු ජලය භාවිතයෙන් ඇතිවන රෝගාබාධවලට ගොදුරු වීම සහ ඒ හේතුවෙන් රෝගී වූ පවුලේ සාමාජිකයන්ට සාත්තු කිරීම වැනි කටයුතු නිසා ඔවුන්ගේ කාලය, ශ්‍රමය සහ අවස්ථා අහිමි වේ. එබැවින්, ජල අර්බුදය යනු "කාන්තා අර්බුදයක්" ලෙස හැඳින්වීම නිවැරදිය. මෙම අභියෝගය ජය ගැනීම සඳහා, ජල කළමනාකරණයේ සෑම මට්ටමකදීම කාන්තාවන්ගේ හඬට සවන් දීම, ඔවුන්ගේ නායකත්වය පිළිගැනීම සහ ඔවුන් සවිබල ගැන්වීම අත්‍යවශ්‍ය වේ.

ශ්‍රී ලංකාවේ වාරිමාර්ග ක්ෂේත්‍රය සහ කාන්තා දායකත්වය

ශ්‍රී ලංකාව පොහොසත් වාරි උරුමයකට හිමිකම් කියන ජල ශිෂ්ටාචාරයක් සහිත රටකි. අතීතයේ සිටම කෘෂිකාර්මික කටයුතුවලදී සහ ගෘහස්ථ ජල අවශ්‍යතා සපුරා ගැනීමේදී කාන්තාවන් සුවිශේෂී කාර්යභාරයක් ඉටු කර ඇත. වර්තමානයේදී ද, විශේෂයෙන්ම ග්‍රාමීය ප්‍රජාවන්හි, ජල කළමනාකරණයේ සහ භාවිතයේදී ඔවුන්ගේ දායකත්වය අතිමහත්ය. ජල සම්පත හා බැඳුනු මෙම ගැඹුරු දැනුම සහ අත්දැකීම්, තිරසාර ජල කළමනාකරණ ප්‍රතිපත්ති සම්පාදනය සඳහා අගනා සම්පතකි.

කෙසේ වෙතත්, ශ්‍රී ලංකාවේ ජල කළමනාකරණ ක්ෂේත්‍රයේ තීරණ ගන්නා මට්ටම්වල කාන්තාවන්ගේ නියෝජනය තවමත් ප්‍රමාණවත් නොවේ. ගම්මට්ටමේ ගොවි සංවිධාන සහ ජල කළමනාකරණ කමිටු වැනි ව්‍යුහයන් තුළ බහුතරයක් පිරිමින් නියෝජනය කරන අතර,

කාන්තාවන්ගේ හඬ බොහෝවිට පසුබැසී යයි. මෙය සමාජයේ පැවති සම්ප්‍රදායික ස්ත්‍රී පුරුෂ භූමිකා වෙන්කිරීම්වල ප්‍රතිඵලයක් වශයෙන් දක්නට ලැබේ. එහෙත්, ජලය සම්බන්ධයෙන් දෛනිකවම වැඩිම වගකීම දරන පිරිස කාන්තාවන් වන බැවින්, ඔවුන් තීරණ ගන්නා ක්‍රියාවලියෙන් බැහැර වීම තිරසාර ජල කළමනාකරණයට බාධාවකි.

කාන්තාවන්ගේ නායකත්වය: තිරසාරත්වයට මඟ

කාන්තාවන් ජල කළමනාකරණයේ සක්‍රීයව සම්බන්ධ වන විට ප්‍රජාවන්ට ලැබෙන ප්‍රතිලාභ බහුලය. පර්යේෂණවලින් පෙන්වා දෙන පරිදි, කාන්තාවන්ගේ සහභාගීත්වය සහ නායකත්වය සහිත ජල ව්‍යාපෘති දිගුකාලීනව සාර්ථක වීමට වැඩි ඉඩක් ඇත. එයට හේතුව වන්නේ කාන්තාවන් ප්‍රජාවේ සත්‍ය අවශ්‍යතා හඳුනාගෙන, දෛනික භාවිතයට ගැළපෙන විසඳුම් යෝජනා කිරීමේ හැකියාව තිබීමයි.

උදාහරණයක් ලෙස, ග්‍රාමීය ප්‍රදේශවල ජල මූලාශ්‍ර පිහිටීම, ජලය ගබඩා කිරීමේ ක්‍රම, සනීපාරක්ෂක පහසුකම් පිළිබඳ සැලසුම් කිරීමේදී කාන්තාවන්ගේ අදහස් ඇතුළත් කිරීමෙන් එම ව්‍යාපෘති වඩාත් කාර්යක්ෂම හා ප්‍රායෝගික වේ. එමෙන්ම, ජල සම්පත් ආරක්ෂා කිරීම, වැසි ජලය රැස් කිරීම, ගෙවතු වගාව සඳහා ජලය ප්‍රමාණවත් ලෙස භාවිත කිරීම වැනි ක්‍රියාකාරකම්වලදී ද කාන්තාවන්ගේ දායකත්වය අතිශය වැදගත්ය.

ජලය, අධ්‍යාපනය සහ ගැහැණු ළමුන්ගේ අනාගතය

ජල අර්බුදය ගැහැණු ළමුන්ගේ අධ්‍යාපනයට ද සෘජුවම බලපායි. ගෘහස්ථ ජලය රැගෙන ඒම වැනි වගකීම් නිසා බොහෝ ගැහැණු ළමුන් පාසල් අධ්‍යාපනය අත්හැරීමට හෝ පන්තිවලට ප්‍රමාද වීමට සිදු වේ. එමෙන්ම, පාසල්වල ප්‍රමාණවත් සනීපාරක්ෂක පහසුකම් නොමැති වීම, විශේෂයෙන්ම මානසික සෞඛ්‍ය කළමනාකරණය සඳහා අවශ්‍ය පහසුකම් නොමැති වීම, ඔවුන්ගේ අධ්‍යාපන අඛණ්ඩතාවයට බාධාවක් වේ.

එබැවින්, "ජලය සහ ස්ත්‍රී පුරුෂ සමාජභාවය" යන තේමාව යටතේ පාසල් ජල හා සනීපාරක්ෂක පහසුකම් වැඩිදියුණු කිරීම ප්‍රමුඛ කාර්යයක් විය යුතුය. සුරක්ෂිත ජලය සහ ගෞරවනීය සනීපාරක්ෂක පහසුකම් සැපයීම මගින් ගැහැණු ළමුන්ට බියකින් තොරව සහ ගෞරවයෙන් යුතුව අධ්‍යාපනය ලැබීමට අවස්ථාව සලසා දිය හැකිය.

දේශගුණික විපර්යාස සහ ජල අභියෝග

දේශගුණික විපර්යාසයන් හේතුවෙන් ලොව පුරා ජල සම්පත් අර්බුදයට ලක්වෙමින් පවතී. දිගු කාලීන නියඟ, අධික වර්ෂාපතනය, ගංවතුර සහ ජල දූෂණය වැනි තත්ත්වයන් වඩාත් දැඩි වෙමින් පවතී. ශ්‍රී ලංකාව වැනි කෘෂිකාර්මික රටකට මෙම තත්ත්වය විශාල බලපෑමක් එල්ල කරයි. විශේෂයෙන්ම වාරි කර්මාන්තය මත ජීවිතය පවත්වාගෙන යන ග්‍රාමීය ප්‍රජාවන්ට මෙය අභියෝගයකි.

මෙවැනි පසුබිමක, කාන්තාවන්ගේ දේශීය දැනුම සහ අත්දැකීම් අගනා වේ. වසර ගණනාවක් තිස්සේ පාරම්පරිකව පවත්වාගෙන ආ ජල සංරක්ෂණ ක්‍රම, බීජ තෝරා ගැනීම, වගා කාල සකස් කිරීම වැනි දේවල් දේශගුණික විපර්යාසයන්ට මුහුණ දීම සඳහා ප්‍රයෝජනවත් වේ. එබැවින්, ජල කළමනාකරණ ප්‍රතිපත්ති සැකසීමේදී කාන්තාවන්ගේ මෙම දැනුම විද්‍යාත්මක දැනුම සමඟ ඒකාබද්ධ කිරීම අවශ්‍ය වේ.

"ජලය ගලා යන තැන, සමානාත්මතාවය වැඩේ"

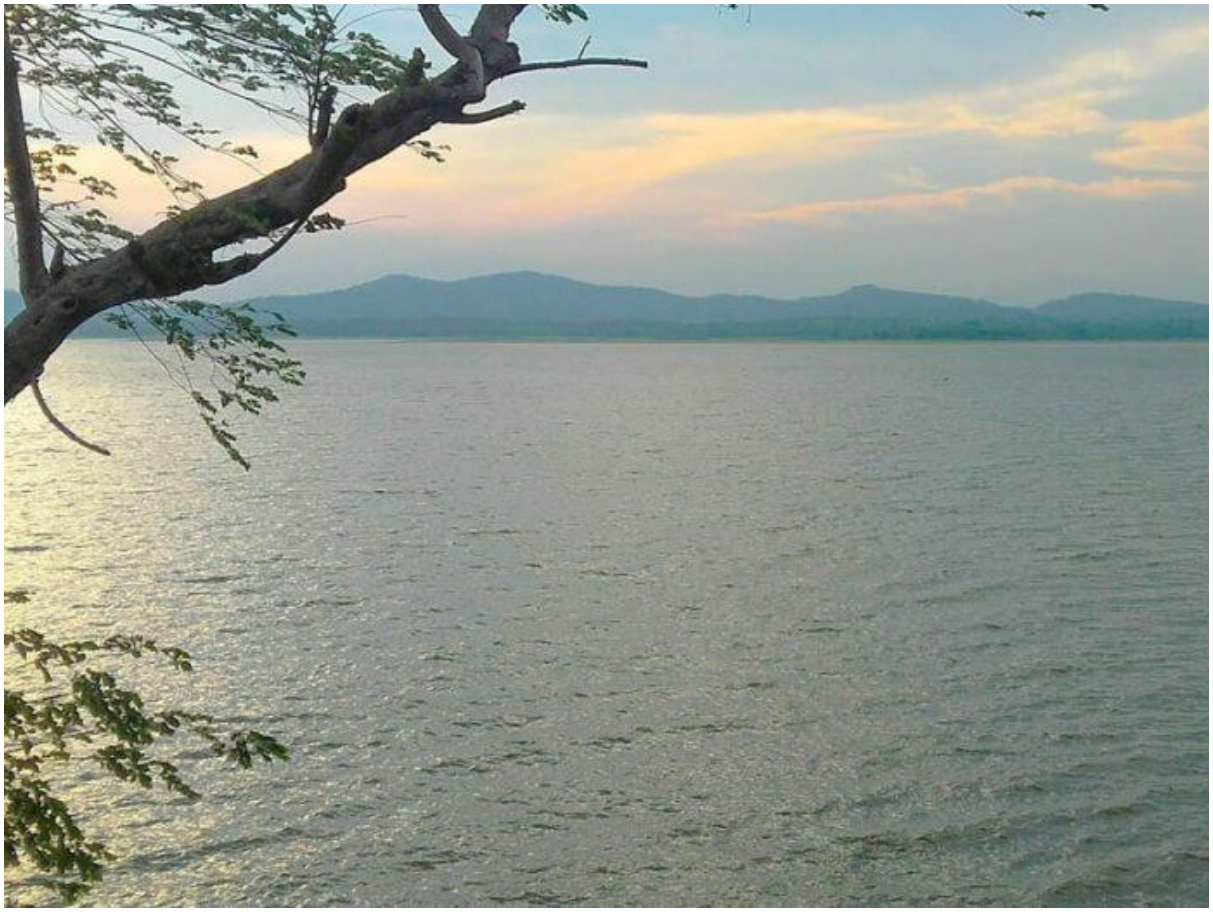
"ජලය ගලා යන තැන, සමානාත්මතාවය වැඩේ" යන පාඨය සරල වචනවලින් විශාල සත්‍යයක් කියාපායි. ජලය යනු ජීවිතයේ මූලිකම අවශ්‍යතාවය වන අතර, එයට සමාන ප්‍රවේශයක් තිබීම මූලික මානව අයිතිවාසිකමකි. සුරක්ෂිත ජලය සහ සනීපාරක්ෂක පහසුකම් සැපයීම මගින් සමාජයේ අසමානතා අඩු කර, සෞඛ්‍ය සම්පන්න, අධ්‍යාපනිකව සවිබල ගැන්වූ සහ ආර්ථිකව ස්ථාවර ප්‍රජාවක් ගොඩනැගිය හැකිය.

ලෝක ජල දිනය 2026 අපට මතක් කර දෙන්නේ ජලය පිළිබඳ කතාබහ පමණක් නොව, එය සමාජ සාධාරණත්වය පිළිබඳ කතාබහක් ද වන බවයි. කාන්තාවන් සහ ගැහැණු ළමුන් ජල කළමනාකරණය සඳහා වන දායකත්වය සක්‍රීයව ලබා ගැනීම මඟින්, අපට තිරසාර සංවර්ධන අරමුණු කරා වේගයෙන් ගමන් කළ හැකිය.

අවසන් වශයෙන්, ජලය යනු ගංගාවක ගලා යන දිය කඳක් පමණක් නොවේ. එය අවස්ථා, සමානාත්මතාවය සහ අනාගතය ගෙන එන බලවේගයකි. එබැවින්, අප සැමගේ වගකීම වන්නේ ජලය ආරක්ෂා කිරීම පමණක් නොව, එය සැමට සාධාරණව බෙදා හැරීමයි. ජලය ගලා යන සෑම තැනකම සමානාත්මතාවයේ මල් පිපෙන ලෝකයක් ගොඩනැගීම අපගේ පොදු අරමුණ විය යුතුය.

ඉංජී. කේ. ඩී. එල්. අයි. ජයතිලක
වාරිමාර්ග ඉංජිනේරු (ජල කළමනාකරණ අංශය)

තිරසර කෘෂිකර්මය, වන ජීවී සංරක්‍රක්ෂණය, සමාජ ආර්ථික සංවර්ධනය හා බැඳුනු මින්නේරිය වැවෙහි ඒකාබද්ධ ජල කළමනාකරණ ප්‍රවේශය



ශ්‍රී ලංකාවේ විශාලතම හා ඓතිහාසික වැදගත්කමක් ඇති ප්‍රධාන වැව් අතරින් එකක් වන මින්නේරිය වැව අනුරාධපුර යුගයේ ක්‍රි.ව 276 – 303කාල සීමාව තුළ රජකළ මහසෙන් රජුගේ සුවිශේෂී නිර්මාණයකි. ශිලා ලේඛන හා ඉතිහාස ග්‍රන්ථයන්හි මිණිහොරු, මිණිහිර, මිණහිර ආදී විවිධ නම් වලින් හැඳින්වෙන මෙම වැව යක්ෂ ගෝත්‍රිකයන්ට අයත් වැව් තුනක් එක් කර කළුදැකඩ රාළ නැමති වාරි තාක්ෂණවේදියා විසින් ඉදිකළ මහා වැවක් බව පුරාවෘත වල සඳහන් වෙයි.

මින්නේරිය වැවෙහි බිසෝ කොටුව තනි කලු ගලෙන් නිමකර ඇති අතර එය හෙළයන්ගේ වාපී තාක්ෂණයේ කූටප්‍රාප්තිය මහසෙන් රජ සමයේදී සනිටුහන් වූ බව මහාචාර්ය සෙනරත් පරණවිතාන මහතාගේ ප්‍රකාශය තහවුරු කිරීමට නිදසුන් සපයයි. ස්වභාවික තිරිවානා නිධියක් මත ඉදිකර ඇති මෙම වැවෙහි බැම්ම කුඩා වැවක බැම්මක් තරම් වීමද එකී ප්‍රකාශය තව දුරටත් තහවුරු කරයි. ක්‍රි .ව 1856 දී බ්‍රිතාන්‍ය ජාතික ආණ්ඩුකාර හෙන්රි වෝඩ් විසින් ද මින්නේරිය වැව විස්මිත නිර්මාණයක් බව වාර්තා කොට ඇත.

ඊසානදිග මෝසමෙන් වැසි ලැබෙන, වියළි කලාපය ලෙස හඳුන්වන දේශගුණික කලාපය තුළ මෙම වැව පිහිටා ඇත. නුවරගල කඳු පන්තියෙන් ඇරඹෙන කිරි ඔය හා වැවට වයඹ දෙසින් වූ කඳු මතින් ඇදී එන බටු ඔයේ ජලයෙන් මෙම වැව පෝෂණය වන නමුත් එය වසර පුරාම මෙම වැව ජලයෙන්

පෝෂණය කිරීමට අපොහොසත් වන බව දුටු පැරැන්නන් යල කන්නය වන විට ගොවිතැන සඳහා අවැසි ජලය සපයා ගැනීමට වෙනත් ජල ප්‍රභවයක් කෙරෙහි අවධානය යොමු කළහ. ඒ අනුව නිරිතදිග මෝසමෙන් වැසි ලැබෙන දුම්බර කඳු වැටියේ ජල පෝෂක ප්‍රදේශ හරහා ගලා එන අඹන් ගඟේ ජලය සැතපුම් 25 ක් පමණ වූ ඇළ මාර්ගයක් හරහා මින්නේරිය වැවට ගෙන ඒමට කටයුතු කර ඇත. මහසෙන් රජු කාර ගඟ හරවා වේලි බැඳ තලාතු ඇළ ඔස්සේ මින්නේරිය වැවට ජලය ගෙන ආ බව පූජාවලියේ දැක්වේ. දෙවන සේන රජු (ක්‍රි.ව 866 -901) එහි වානක් බැඳ ඇති අතර පරාක්‍රමබාහු රජු එය ප්‍රතිසංස්කරණය කර ඇත. නිශ්ශංකමල්ල රජු මෙම වැව සතුනට අභය භූමියක් ලෙස නියම කොට ඇත.

ඒ අනුව, වර්තමානය වන විට අඹන්ගඟ හරස්කොට ඇති ඇලහැර අමුණෙන් ජලය හරවා යවන ඇළහැර - මින්නේරිය යෝධ ඇල (EMYE) මඟින් ප්‍රධාන වශයෙන් මෙම වැව පෝෂණය වේ. මහවැලි ජලාශ පද්ධතියේ ප්‍රධාන ජලාශයක් වන මොරගහකන්ද ජලාශයෙන් මුදාහැරෙන ජලය වර්තමානයේදී මෙම ඇලහැර අමුණට එක්වේ. ඊට අමතරව මින්නේරි වැවට අයත් ජල පෝෂක ප්‍රදේශය මෙම වැව පෝෂණය කිරීම සඳහා විශාල දායකත්වයක් සපයයි.

ආසන්න වශයෙන් වර්ග සැතපුම් 92.6 (වර්ග කිලෝමීටර 240)ක පමණ ජල පෝෂක ප්‍රදේශයක් හා ඝන මීටර් මිලියන 135. 3(අක්කර අඩි 110,000 (ක ධාරිතාවයකින් යුතු මෙම වැව මින්නේරිය වාරි යෝජනා ක්‍රමයේ හදවත බඳු වේ .මින්නේරි ව්‍යාපාරයේ අක්කර 22,474 ක වගා බිම් ප්‍රමාණයක් මෙහි ජලයෙන් පෝෂණය වේ. මින්නේරිය ගොවිජනපද ව්‍යාපාරයට අමතරව මින්නේරිය-කන්තලේ යෝධ ඇළ (MKYE) හරහා කවුඩුල්ල හා කන්තලේ ජලාශවලටද ජලය සපයන මෙම වැව පුළුල් වාරිමාර්ග ජාලයක් හරහා ජලය සැපයීම සහතික කරමින් යල මහ දෙකන්නය තුළ වී හා අනෙකුත් බෝග වගා කිරීම සඳහා පහසුකම් සපයයි.

මින්නේරිය වැව 1903 හා 1953 වර්ෂයන්හිදී ප්‍රතිසංස්කරණය කර ඇති අතර එය වාරිමාර්ග දෙපාර්තමේන්තුව යටතේ පාලනය වන වැවකි .ඒ අනුව මෙය ගොවි ජනතාවට වාරි පහසුකම් සැපයීම උදෙසා වාරිමාර්ග දෙපාර්තමේන්තුව විසින් කළමනාකරණ කටයුතු සිදු කරන ප්‍රධාන වැව් 72න් එකක් බවට පත්වේ .භූගෝලීය වශයෙන් මින්නේරිය වේල්ල214079 E හා 315708 N හි පිහිටා ඇත. මෙම වාරිමාර්ග යෝජනා ක්‍රමය පොළොන්නරුව කලාපයෙහි පිහිටා ඇති අතර වාරිමාර්ග අධ්‍යක්ෂ ජනරාල්වරයා වෙනුවෙන් මින්නේරිය ප්‍රාදේශීය වාරිමාර්ග ඉංජිනේරුවරයා විසින් මෙම වැවෙහි පාලනය සිදු කරයි.

මින්නේරිය වැව සම්පූර්ණයෙන්ම 1997.08.12 දිනැති අති විශේෂ ගැසට් පත්‍රය මගින් ප්‍රකාශිත මින්නේරි ජාතික වනොද්‍යානයේ සීමාව තුළට ඇතුළත් වන වැවකි. මැයි මාසයෙන් ආරම්භ වන වියළි කාලයේදී වැව ක්‍රමයෙන් සිඳීයාමත් සමඟ මතුවන වැව් පිටියේ වර්ධනය වන නැවුම් තණකොළ අලි ඇතුන්ට රසවත් මෙන්ම පෝෂණීය ආහාරයක් වෙයි. ඒ අනුව ත්‍රීකුණාමලය, පොළොන්නරුව හා මාතලේ ප්‍රදේශ වල සිට සිය ගණනක් වූ වන අලි රංචු ආහාර සොයා මින්නේරිය වැව් පිටියේ නැවුම් තෘණ භූමිය කරා ඇදී එති .සැප්තැම්බර් මාසය වන විට මෙම එක් රැස්වීම උච්චතම අවස්ථාවට පත් වෙමින් අලි ඇතුන් 400 ක් පමණ මෙම බිම්කඩ තුළ එක් රැස් වෙයි. ජාත්‍යාන්තර සංචාරක මාර්ගෝපදේශන සහරාවක් වන ලෝන්ලි ප්ලැනට් (Lonely Planet) විසින් නම් කරන ලද ලෝකයේ විශාලතම වනජීවී ආශ්චර්යයන් 10 අතරට මින්නේරි වැව් පිටියෙහි සිදුවන දර්ශනීය ස්වභාවික සංසිද්ධියක් වන ‘‘හස්තීන්ගේ මහා හමුව’’ ද)The Great Elephant Gathering) ඇතුළත් කර ඇත්තේ මෙම ස්ථානය වෙත ජාත්‍යන්තර ආකර්ශනයක් අත්කර දෙමිනි. ඒ අනුව මෙම වැව ආශ්‍රිත ප්‍රදේශය වනජීවීන් හා ජාතික වනෝද්‍යාන ආශ්‍රිත සංචාරක කර්මාන්තයේ සුවිශේෂී සංධිස්ථානයක් බවට පත්ව ඇත.

කෙසේ වුවද ,2021 වර්ෂයේදී ඇතිවූ ඉන්ධන අර්බුදය හේතුවෙන් මොරගහකන්ද ජලාශයේ වැඩි ජල ප්‍රමාණයක් විදුලි උත්පාදනය සඳහා නිකුත් කළ නමුත් මෙම කාලසීමාව තුළ උද්ගත වූ පොහොර ගැටලුව හේතුවෙන් ගොවීන් සැලකිය යුතු ප්‍රමාණයක් වී වගාවෙන් ඉවත්වීම තුළ වගා කටයුතු සඳහා ජලය සැපයීම අඩු මට්ටමකට පත්විය. එතුළින් ජල අතිරික්තයක් ඇති වුවද වැඩි ජලය මුහුදට නොයවා මින්නේරි වැවේ රඳවා තැබීමට කටයුතු කරන ලදී. නමුත්, මින්නේරි වැවෙහි ජල මට්ටම ඉහළ අගයක පැවතීම හේතුවෙන් වැව් තාවුල්ල වෙත අලි එක් රැස්වීම ක්‍රමයෙන් අඩු වූ බවට හා වන අලින්ගේ පෝෂණය සම්බන්ධයෙන් විවිධ ගැටලු පැන නගින බවට විවිධ පාර්ශවන්ගෙන් අදහස් ඉදිරිපත් විය.

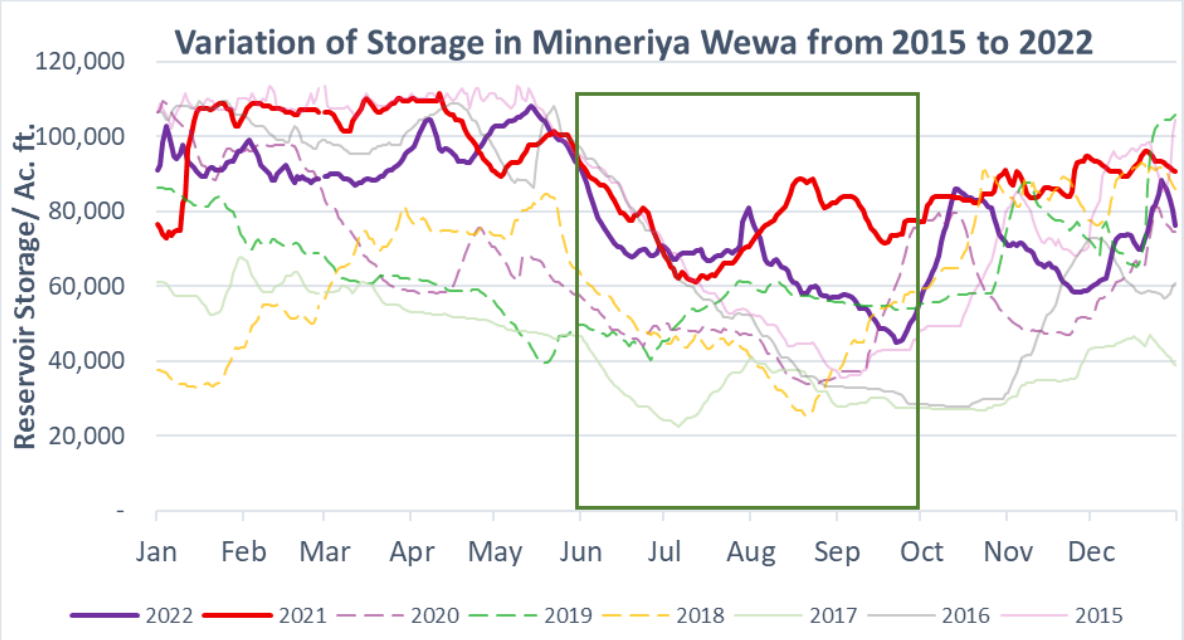
මින්නේරිය ජාතික වනෝද්‍යානයේ අලි ඇතුන් පිළිබඳ දිගු කාලීන පර්යේෂකයෙකු වන ආචාර්ය සුමිත් පිලපිටිය මහතාට අනුව මොරගහකන්ද ජලාශය මඟින් මින්නේරි වැව වෙත ජලය මුදා හැරීමෙන් පසු 2018 සිට මෙම ගැටළුව ක්‍රමයෙන් මතුව තිබේ. ඔහුගේ නිරීක්ෂණ වලට අනුව 2017 සැප්තැම්බර් මාසයේදී 402 ක් වූ දෛනික වන අලි සංඛ්‍යාව 2021 වන විට 20 දක්වා අඩු වී ඇත.

2016- 2021වර්ෂයන්හි සැප්තැම්බර් මාසයේදී මින්නේරි වනෝද්‍යානයෙහි වාර්තා වූ සාමාන්‍ය දෛනික වන අලි සංඛ්‍යාව) ප්‍රකාශ්, 2022.)

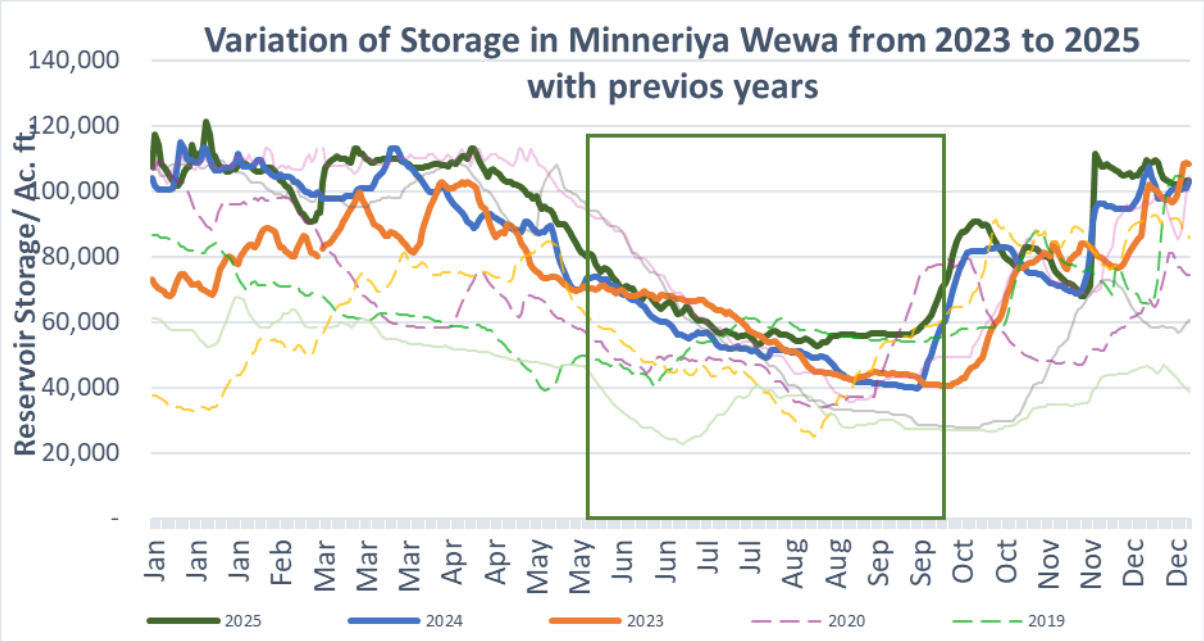
වර්ෂය	මාසය	සාමාන්‍ය දෛනික වන අලි සංඛ්‍යාව
2016	සැප්තැම්බර්	389
2017	සැප්තැම්බර්	402
2018	සැප්තැම්බර්	354
2019	සැප්තැම්බර්	223
2020	සැප්තැම්බර්	210
2021	සැප්තැම්බර්	20

වනෝද්‍යානය තුළ වන අලින්ට ප්‍රමාණවත් ආහාර නොමැති වීම හේතුවෙන් වන අලි ගම් වැදීම හා වගා විනාශ කිරීම් බහුල වූ අතර මෙම කාල වකවානුව තුළ අලි මිනිස් ගැටුම් වැඩි වූ බවද නිරීක්ෂණය කර ඇත. වනජීවී සංරක්ෂණ දෙපාර්තමේන්තු වාර්තා වලට අනුව ප්‍රදේශයේ අලි මිනිස් ගැටුම් 2017 වර්ෂයට සාපේක්ෂව 2021 වන විට ඉහළ ගොස් තිබිණ. ඒ අනුව වනජීවී සංරක්ෂණ දෙපාර්තමේන්තුව මින්නේරි වැවෙහි ජලමට්ටම් අඩු කර තෘණ භූමි නිරාවරණය කිරීම සම්බන්ධයෙන් ඉල්ලීම් ඉදිරිපත් කරන ලදී. නමුත් වියළි කාලයේදී වැවෙහි ජල මට්ටම් අඩු කිරීම වාරි ජලය සැපයීම සම්බන්ධයෙන් අවදානම් සහගත කරුණක් විය. මෙහිදී ඒකාබද්ධ ජල කළමනාකරණයක අවශ්‍යතාවය හඳුනා ගන්නා ලද අතර, වාරිජල සැපයුමෙහි විශ්වාසනීයත්වය තහවුරු කිරීම සඳහා අවම ජල මට්ටමක් පවත්වා ගැනීමටත් වනජීවීන්ගේ වාසභූමි වල තිරසර පැවැත්ම හා සංචාරක ක්ෂේත්‍රයේ අභිවෘද්ධිය වෙනුවෙන් ඍතුමය ජල මට්ටම් කළමනාකරණයක් සිදු කිරීමද අවශ්‍ය විය.

2015- 2022කාලය තුළ වසරේ එක් එක් මාසයෙහි මින්නේරි වැවෙහි ජල මට්ටම



මෙහිදී වාරිමාර්ග දෙපාර්තමේන්තුව ,මහවැලි අධිකාරිය ,වනජීවී සංරක්ෂණ දෙපාර්තමේන්තුව, අලි මිනිස් ගැටුම සම්බන්ධයෙන් අධ්‍යයනයන්හි නිරත වන පර්යේෂකයින් ආදී අංශවල සම්බන්ධීකරණයෙන් හා ගොවි සංවිධාන සමඟ සන්නිවේදනයෙන් යුතුව මින්නේරි වැවෙහි මෙහෙයුම් උපායමාර්ග ක්‍රියාත්මක කිරීමට පියවර ගන්නා ලදී. ඒ අනුව මොරගහකන්ද ජලාශයේ අතිරික්ත ජලය කිසිදු අවස්ථාවක මින්නේරිය වැවෙහි රැස්කිරීමට කටයුතු නොකෙරෙන අතර ඒ අනුව වැවෙහි ජල මට්ටම මනාව පාලනය කරමින් පවත්වාගෙන යාමට මේ වන විට කටයුතු යොදා ඇත.



ඒ අනුව වියළි කාලයේදී මින්නේරි වැවෙහි ජලය ක්‍රමයෙන් අඩු වීමට ඉඩ හරිමින් වැව් පිටියේ රැස්වන වන අලි රංචුව සඳහා නැවුම් තණකොළ භුක්ති විඳීමට අවකාශය මේ වන සලසා දී ඇත. “අහසින් වැටෙන එක ජල බිඳුවකුදු ලෝකෝපකාරයෙන් තොරව මුහුදට ගලා යා නොදෙනු” යන මහා පරාක්‍රමබාහු රජතුමාගේ පාඨය ගුරුතැන්හිලා, පරිසරයද සුරැකමින්, තිරසාර ආර්ථික හා සමාජ සංවර්ධනය සහතික කරනු සඳහා රටේ ජල සම්පත් වලින් ලබාගත හැකි ප්‍රයෝජන ප්‍රශස්ත මට්ටමට ගෙන ඒම යන දැක්ම මුල් කර ගනිමින් කටයුතු කරන ආයතනයක් වශයෙන් වනජීවී පැවැත්ම තහවුරු කිරීමට හා මෙරට සංචාරක කර්මාන්තයේ අභිවෘද්ධිය උදෙසා මෙවැනි ක්‍රියාමාර්ග වෙත එළඹීමට වාරිමාර්ග දෙපාර්තමේන්තුව කටයුතු කර තිබේ.

වර්තමානය වන විට මින්නේරි වනෝද්‍යානය වෙත වන අලින්ගේ පැමිණීම 2017 වර්ෂයේ පැවති මට්ටමට ලඟා වී ඇති අතර, ඒ අනුව 2025වර්ෂයේදී මින්නේරි වනෝද්‍යානයෙහි දේශීය හා විදේශීය සංචාරකයන්ගේ ටිකට්පත් ආදායම ආසන්න වශයෙන් රුපියල් මිලියන 608 ක් පමණ වන බව නිල වාර්තා මගින් පෙන්වා දෙයි. වාරි ජලය සැපයීමෙන් ප්‍රදේශයේ සහල් නිෂ්පාදනයට අවශ්‍ය පහසුකම් සැපයීම තුළින් මෙරට ආර්ථිකයට දක්වන සෘජු දායකත්වයට අමතරව මින්නේරිය ජාතික වනෝද්‍යානය සම්බන්ධ සංචාරක ව්‍යාපාරය හරහා ජාතික ආර්ථිකයට සැලකිය යුතු ආර්ථික ප්‍රතිලාභයක් අත්කර දීමට ද වාරිමාර්ග දෙපාර්තමේන්තුව සිය දායකත්වය සපයා ඇති බව මෙමගින් මනාව පැහැදිලි වේ.



ඊට අමතරව ජාතික ජල සම්පාදන හා ජලාපවහන මණ්ඩලය විසින් හිඟුරක්ගොඩ හා ගිරිතලේ ප්‍රදේශයට ජලය සැපයීම සඳහා යොදා ගනු ලබන්නේද වාරිමාර්ග දෙපාර්තමේන්තුවේ පාලනය යටතේ පවතින මින්නේරි ජලාශයෙහි ජලයයි. එබැවින් මිනිස් පරිභෝජනයට සුදුසු වන ආකාරයට ජලයෙහි ගුණාත්මක බව ආරක්ෂා කිරීමට ද මෙම දෙපාර්තමේන්තුව කටයුතු කරයි.

එසේම ධීවර සමිතියක් හරහා මිරිදිය ධීවර කර්මාන්තයෙහි නියැලෙමින් බොහෝ පිරිසක් තම ජීවනවෘත්තිය පවත්වාගෙන යනු ලබන අතර එතුළින් ප්‍රදේශයේ ජනතාවගේ දෛනික ප්‍රෝටීන් අවශ්‍යතාවය සම්පූර්ණ කිරීමටද ඉහළ දායකත්වයක් සපයනු ලබයි. එබැවින් ධීවර කටයුතු සඳහා අවශ්‍ය අවස්ථාවල පහසුකම් සැපයීම ධීවර කර්මාන්තයේ පැවැත්ම සඳහා අවශ්‍ය වන ක්‍රියාමාර්ග ගැනීමට ද වාරිමාර්ග දෙපාර්තමේන්තුව සිය මැදිහත්වීම ලබා දෙයි.

ඒ අනුව, මින්නේරි වැව යනු කෘෂි කර්මාන්තයෙන් ඔබ්බට ගිය පාරිසරික, ඓතිහාසික, සමාජීය හා ආර්ථිකමය වැදගත්කමක් උසුලන වාරි කර්මාන්තයක්ය යන්න අවිවාදිත කරුණකි. එසේම වාරිමාර්ග දෙපාර්මේන්තුවේ පාලනය යටතේ පවතින මින්නේරිය වැව පැරණි ඉංජිනේරුමය ජල තාක්ෂණය, නවීන වාරිමාර්ග ක්‍රම, ජෛව විවිධත්ව සංරක්ෂණය සහ පාරිසරික සංචාරක ක්ෂේත්‍රයේ සංවර්ධනය යන අංශයන් හා බැඳුනු තිරසර ජල සම්පත් කළමනාකරණය පිළිබඳ මනා නිදසුනක් ලෙස පෙන්වා දිය හැකිය.

මූලාශ්‍ර:

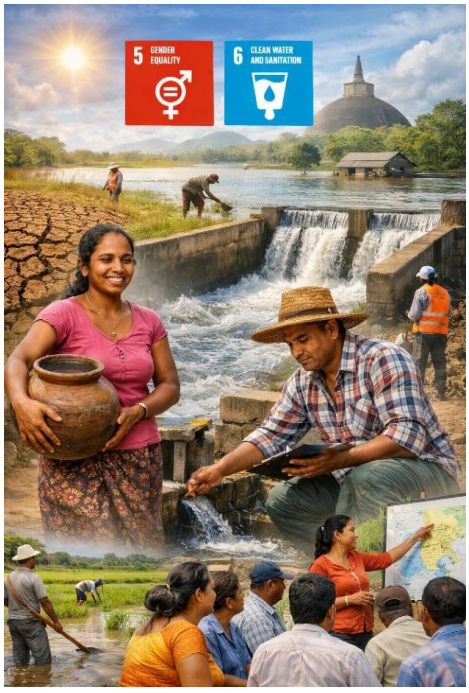
ප්‍රකාශ්,එස්. එල්.) 2022 (.**මින්නේරිය ලෝකයට ගෙන ගිය මහා වනජීවී ආශ්චර්යය අපට අහිමි වෙයිද?** ,මින්නේරිය ලෝකයට ගෙන ගිය මහා වනජීවී ආශ්චර්යය අපට අහිමි වෙයිද? – Vikalpa

ඉංජී .එස්.පී මලින්ද ජයතිලක
ප්‍රාදේශීය වාරිමාර්ග ඉංජිනේරු ,මින්නේරිය

ආර්.එම්.එස්.එන් කරුණානායක
සංවර්ධන නිළධාරී

ශ්‍රී ලංකාවේ වියළි කලාපීය පද්ධතිය තුළ ආපදා අවදානම අවම කිරීමට ජල කළමනාකරණය කිරීමේ දී කාන්තා සහ

පිරිමි දායකත්වය.



ශ්‍රී ලංකාවේ ඓතිහාසික වාරි හා කෘෂිකාර්මික සංස්කෘතියේ කොදු නාරටිය ලෙස සලකනු ලබන්නේ වියළි කලාපයයි .අනුරාධපුරය , පොළොන්නරුව ,අම්පාර සහ මන්නාරම වැනි දිස්ත්‍රික්ක වල ජනතාවගේ කෘෂිකාර්මික කටයුතු සහ දෛනික ජීවනෝපායන් වාරි පද්ධතිය තුල දැඩි ලෙස රඳා පවතී .

මෙම කලාපයේ ජලය හුදෙක් ,ස්වාභාවික සම්පතක් පමණක් නොව ජීවනෝපායන් හා සම්බන්ධ ආහාර නිෂ්පාදනය, ආදායම් ස්ථාවරත්වය සහ සමාජ සබැඳියාවන් තීරණය කරන ප්‍රධාන සාධකයකි .

තෙත් කලාපය මෙන් නොව, වියළි කලාපයේ කාලගුණික හා දේශගුණික වෙනස් වීම් මත ඇතිවන වර්ෂාපතනය අවිනිශ්චිත වේ .එමගින් දැඩි වර්ෂාපතනයන් පතිත වීම් මෙන්ම දිගු කාලීන වියළි කාලයන් ද වර්තමානයේ බහුලව දක්නට ලැබේ .කාලගුණයේ සිදුවන මෙම විචල්‍යතාවය නිසා, ජලය නිසි ලෙස කළමනාකරණය කිරීම ආපදා අවදානම අවම කිරීම සඳහා පූර්වෝපායක් ලෙස සෘජුවම සම්බන්ධ වේ.

එබැවින් ,ඵලදායී ලෙස වාරි කළමනාකරණය තුළින් කෘෂිකර්මාන්තයට සහාය වීම මෙන්ම නියඟය, ගංවතුර සහ ජලය ආශ්‍රිත විවිධ දුෂ්කරතා වලින් පෙළෙන මිනිසුන් ද ,සතුන් ද ආරක්ෂා කර ගැනීම මනාව සිදුකර ගත හැකිවේ.

ආපදා අවදානම අවම කිරීමේදී වාරි පද්ධති සහ ඒවායේ කාර්යභාර්යය.

පුරාණයේ පටන් ශ්‍රී ලංකාවේ පවතින වැව් සහ ඇළ පද්ධති අදටත් වියළි කලාපයේ ජීවය සඳහා වාරි ජලය සපයයි. මෝසම් කාලවලදී ලැබෙන වැසි ජලය ජලාශයන්හි ගබඩා කර ක්‍රමයෙන් කෘෂි වගාව සඳහා මුදා හරිනු ලබයි. කෙසේ වෙතත්, ජලාශයක් හෝ වැවක් ප්‍රයෝජනවත් වන්නේ එහි ජලය මනාව කළමනාකරණය කළ විට පමණි.

එසේම, කෘෂිකාර්මික කටයුතු වල කන්නයේ මුල් කාලයේ දී ඕනෑවට වඩා ජලය මුදා හැරියහොත්, තීරණාත්මක බෝග වර්ධන අවධීන්හිදී ජලය හිඟ වීම් ද ඇති විය හැකිය. නමුත්, අධික වර්ෂාපතනයන් ඇති කාල වලදී ජලාශ හා වැව් වල ජලය උපරිම ලෙස රඳවා ගන්නේ නම්, වාරි නිර්මිත වල ආරක්ෂාව හා පහළ ප්‍රදේශ වලට ඇතිවිය හැකි හදිසි ගංවතුර අවදානම වැඩි වේ. එබැවින්, වාරි ජල කළමනාකරණය කිරීම සඳහා වැව් හා ජලාශ ක්‍රියාකාරීත්වයේ අඛණ්ඩ අධීක්ෂණය සහ කාලෝචිත තීරණ ගැනීම අත්‍යාවශ්‍ය වේ.

ප්‍රායෝගික අත්දැකීම් අනුව, ජලාශ ක්‍රියාකාරිත්වය යනු දොරටු විවෘත කිරීම සහ වැසීම පමණක් නොවේ. එයට වර්ෂාපතන රටා තේරුම් ගැනීම, ජල මට්ටම් නිරීක්ෂණය කිරීම, ගොවි සංවිධාන සමඟ සාකච්ඡා කිරීම සහ ඒ අනුව වගා කාලසටහන් සැලසුම් කිරීම ද ඇතුළත් වේ. ජලය වෙන් කිරීම විනිවිද බාවයකින් යුතුව පැහැදිලිව සන්නිවේදනය කළ විට, ගොවීන් තම වගා රටා සකස් කිරීමට වඩා හොඳින් සූදානම් වේ. මේ ආකාරයෙන්, නිසි වාරි කළමනාකරණය ආපදා අවදානම අවම කිරීමේ ප්‍රධාන මෙවලමක් බවට පත්වේ.

ජල විද්‍යාත්මක නියඟය (Hydrological Drought) නිසා වියළි කලාපය තුල නිරන්තරයෙන් මුහුණ දීමට සිදුවන ආපදා තත්වය.

වියළි කලාපයට බලපාන වඩාත් පොදු ව්‍යසනකාරී තත්වය ජල විද්‍යාත්මක නියඟයයි. මෝසම් වැසි ප්‍රමාද වූ විට හෝ ප්‍රමාණවත් නොවූ විට, ජලාශ වල ජල මට්ටම වේගයෙන් පහත වැටේ. එවිට, වගාව ආරම්භ කළ යුතුද නැද්ද යන්න පිළිබඳව ගොවීන් අවිනිශ්චිත තාවයට පත්වේ. ජලය මුදා හැරීම් ප්‍රවේශමෙන් සැලසුම් නොකළහොත්, බෝග අතරමග අසාර්ථක විය හැකි අතර, එය මූල්‍ය පාඩු සහ සමාජ ආතතියට ද හේතු වේ. සමහර අවස්ථාවලදී ජලාශ වල පවතින සීමිත ජල ප්‍රමාණයන් සඳහා ඇතිවන තරඟකාරිත්වය ද ගොවීන් අතර ආතතියක් ඇති කළ හැකිය.

කෙසේ වෙතත්, සැලසුම්ගත ජල කාලසටහන් මඟින් සහ ප්‍රජා සහභාගීත්වය හරහා නියඟ තත්ව වලදී ජල හිඟතාවය නිසා වන බලපෑම් අඩු කළ හැකිය. ජල මුර බෙදා හැරීම, අඩු ජල මට්ටම් / ජලය හිඟ කාල වලදී කෙටි කාලීන අඩු ජල පරිභෝජනයක් සහිත බෝග දිරිමත් කිරීම සහ ගොවීන් සමඟ පෙර සන්නිවේදනයන් මගින් සිදුවිය හැකි පාඩු සැලකිය යුතු ලෙස අවම කර ගත හැකිය.

තවද, ක්ෂේත්‍රය තුළ අත්දැකීම් අනුව පෙනී යන්නේ, පවතින ජලය සහ සීමාවන් පිළිබඳ සාකච්ඡාවලට ගොවීන් සම්බන්ධ වන විට, ඔවුන් වඩාත් ඵලදායී ලෙස සහයෝගයෙන් එම කටයුතු කරන බවයි. එබැවින්, නියඟයට අදාළ අවදානම් අවම කිරීම සඳහා **සහභාගීත්ව ජල කළමනාකරණය** අත්‍යවශ්‍ය වේ.

මෝසම් කාල සීමාව තුල ගංවතුර අවදානම සහ කාලෝචිත සම්බන්ධීකරණයේ වැදගත්කම.

නියඟය සුලභ වුවද, දැඩි වර්ෂාපතන සිදුවීම් හේතුවෙන් ගංවතුර අවදානම් ඇති වේ. මෙම කාල වකවානුව වන විට දේශගුණික වෙනස් වීම් නිසා මෝසම් වැසි රටා වෙනස් වී ඇති අතර, කෙටි කාලයකදී තීව්‍රතාවය වැඩි අධික වැසි ඇති වීම නිසා ජලාශ ඉක්මනින් පිරීම හේතුවෙන් වාන් දොරටු විවෘත කිරීමට කඩිනම් පියවර අනුගමනය කිරීමට සිදුවේ. ජලාශ වල ජලය මුදා හැරීම හදිසියේ සහ නිසියාකාරව සම්බන්ධීකරණය නොකළහොත්, පහළ ප්‍රදේශවල ප්‍රජාවන්ට අනපේක්ෂිත ගංවතුරක් අත්විඳිය හැකිය.

මේ අනුව, වර්ෂාපතන පුරෝකතන නිරීක්ෂණය කිරීම, ක්ෂේත්‍ර නිලධාරීන් සහ ප්‍රාදේශීය නායකයින් අතර මනා සන්නිවේදනයක් පවත්වා ගැනීම ඉතා වැදගත් වේ. මෙවැනි ආපදා තත්වයක දී ඇතිවිය හැකි ගංවතුර අවදානම අඩු කිරීම භෞතික යටිතල පහසුකම් මත පමණක් නොව පූර්ව සූදානම සහ තොරතුරු බෙදාගැනීම මත ද රදා පවතී. ප්‍රජාවන් වෙත පූර්ව අනතුරු ඇඟවීමේ පණිවිඩ, පූර්ව දැනුම්දීම සහ අදාළ පාර්ශව සම්බන්ධීකරණය මඟින් තීරණ ගැනීම සියලු ප්‍රජාවනගේ භීතිය සහ ඇතිවිය හැකි හානිය අඩු කරයි. මෙලෙස වාරි පද්ධතිය කළමනාකරණය කිරීම ප්‍රජා ආරක්ෂාවට ඍජුවම දායක වේ.

වාරිමාර්ග ජල කළමනාකරණයේ පිරිමින්ගේ කාර්යභාරය.

සාම්ප්‍රදායිකව වාරි කර්මාන්තය ආශ්‍රිත ක්‍රියාකාරකම් වල පිරිමින් දෘශ්‍යමාන කාර්යභාරයක් ඉටු කරයි. ඔවුන් ඇළ මාර්ග නඩත්තුව, කෘෂි ක්ෂේත්‍ර සකස් කිරීම, ගොවි සංවිධාන නායකත්වය සහ කන්න රැස්වීම්, ජලය බෙදාහැරීමේ ක්‍රමවේද සකස් කිරීමේ රැස්වීම් සඳහා සහභාගී වේ. වාරිමාර්ග ව්‍යාපාර වල, වගා කාලසටහන් සහ ජල මුර සකස් කිරීම පිළිබඳ සාකච්ඡා වලදී බොහෝ විට පිරිමින් ගොවි පවුල් නියෝජනය කරයි.

වාරිමාර්ග පද්ධතිවල ක්‍රියාකාරිත්වය සඳහා භෞතික මෙහෙයුම් සහ නඩත්තු කටයුතු තීරණ සඳහා ඔවුන්ගේ සහභාගීත්වය ඉතා වැදගත් වේ. ඇළ මාර්ග නඩත්තු කිරීම හෝ සුළු ව්‍යුහයන් අලුත්වැඩියා කිරීම වැනි සාමූහික ක්‍රියාමාර්ගවල පිරිමින්ගේ සහභාගීත්වය, වාරිමාර්ග ව්‍යාපාර වල තිරසාරභාවය ශක්තිමත් කරයි. ගොවි සංවිධානවල ක්‍රියාකාරී සහභාගීත්වය හරහා, ඔවුන් විනිවිද බාවයකින් ජලය බෙදාගැනීමේ පිළිවෙත් සඳහා ද දායක වන අතර, එමඟින් ජලය හිඟ කාලවලදී ඇතිවන ගැටුම් වළක්වා ගැනීමට ද උපකාරී වේ.

ජලය ආරක්ෂා කිරීම සහ අවදානම් සඳහා ප්‍රජාව ඔරොත්තු දීමේ හැකියාව තුළ කාන්තාවන්ගේ කාර්යභාරය.

ක්ෂේත්‍ර මට්ටමේ වාරිමාර්ග මෙහෙයුම් වලදී කාන්තාවන්ගේ දායකත්වය සෘජුව දැකිය නොහැකි වුවද, ජලය කළමනාකරණයේ දී පවුල් ඒකක තුළ සිදු කරනු ලබන ඔවුන්ගේ කාර්යභාරය ද විශාල වශයෙන් වැදගත් වේ.

ග්‍රාමීය නිවාසවල, ගෘහස්ථ ජල අවශ්‍යතා කළමනාකරණය කිරීම, ආරක්ෂිත පානීය ජලය සහතික කිරීම, සනීපාරක්ෂාව පවත්වා ගැනීම සහ පවුල් සෞඛ්‍යය රැකබලා ගැනීම සඳහා කාන්තාවන් ප්‍රධාන වශයෙන් වගකීම් දරයි. නියඟ කාලවලදී සීමිත වන ජලය කාර්යක්ෂමව හා ඵලදායී ලෙස ගෘහස්ථව කළමනාකරණය කරනුයේ බොහෝ විට කාන්තාවන් ය.

ජලය හිඟ කාලවලදී සමාජීය බලපෑම් ද කාන්තාවන් තේරුම් ගනී. පානීය ජල මූලාශ්‍ර වියළී ගිය විට හෝ සනීපාරක්ෂාව දුෂ්කර වූ විට ඔවුන්ට එය සෘජුවම බලපායි. වර්තමානය වන විට ගොවි සංවිධාන සහ ජල කමිටුවල කාන්තා සහභාගීත්වය වැඩි වී ඇති අතර, එමඟින් තීරණ ගැනීමේ ක්‍රියාවලීන් ශක්තිමත් වී ඇත. කාන්තාවන් බොහෝ විට පවුල් යහපැවැත්ම, පාසල් දරුවන් සහ ප්‍රජා සෞඛ්‍යය සම්බන්ධ ප්‍රායෝගික ගැටළු මතු කරයි. එමඟින්, ජල කළමනාකරණ තීරණ කෘෂිකාර්මික සහ ගෘහස්ථ අවශ්‍යතා යන දෙකම සලකා බලන බව සහතික කරයි.

ජල කළමනාකරණ සැලසුම් සකස් කිරීම සහ සාකච්ඡා සඳහා දායක වීමට කාන්තාවන්ට ඉඩක් ලබා දුන් විට, වාරි ව්‍යාපාර වල ගැටළු අවම කරගනිමින් වඩාත් සමබර තීරණ වලට එළඹීමට හැකියාව පවතී. තවද, කාන්තාවගේ සහභාගීත්වය අවදානම් සඳහා ප්‍රජාවගේ ඔරොත්තු දීමේ හැකියාව වැඩි දියුණු කරන අතර සමස්ත ආපදා සූදානම වැඩි දියුණු කරයි.

තිරසාර සංවර්ධන ඉලක්ක (Sustainable Development Gole) සමඟ ජල කළමනාකරණය වැදගත්කම.

තිරසාර සංවර්ධන ඉලක්ක වල අංක 6 ලෙස සැමට පිරිසිදු ජලය සහ සනීපාරක්ෂාව අවධාරණය කරන අතර, අංක 5 ලෙස ස්ත්‍රී පුරුෂ සමානාත්මතාවය සහ කාන්තා බලගැන්වීම ප්‍රවර්ධනය කරයි. වියළි කලාපය තුළ, මෙම ඉලක්ක සමීපව අන්තර් සම්බන්ධිත වේ. ජලය පාලනයේ දී පිරිමින් සහ කාන්තාවන් යන දෙපිරිසගේම සාධාරණ සහභාගීත්වයෙන් ජලය කළමනාකරණය කිරීම තිරසාර ලෙස කළ හැකිය.

වාරි පද්ධති කළමනාකරණයේ දී ස්ත්‍රී පුරුෂ සමතුලිත සහභාගීත්වය ප්‍රවර්ධනය කිරීමෙන්, ශ්‍රී ලංකාවේ කෘෂිකාර්මික ඵලදායිතාව පමණක් නොව සමාජ සමානාත්මතාවය සහ ආපදා හමුවේ ඔරොත්තු දීමේ හැකියාව ද ශක්තිමත් කරයි. ජලය ආරක්ෂා කිරීම, ස්ත්‍රී පුරුෂ සමානාත්මතාවය සහ ආපදා අවදානම් අඩු කිරීම වෙන වෙනම බලපාන ගැටළු නොවන අතර ඒවා ගැඹුරින් එකිනෙකට සම්බන්ධ වේ.

ප්‍රජා පාදක ජල කළමනාකරණය ශක්තිමත් කිරීම.

වියළි කලාපය තුල, ජල කළමනාකරණය වැඩිදියුණු කිරීම සඳහා තාක්ෂණික සැලසුම්කරණය සහ ප්‍රජා සහභාගීත්වයේ ශක්තිමත් එකතුවක් අවශ්‍ය වේ. වර්ෂාපතන පුරෝකතන වඩා හොඳින් භාවිතා කිරීම, ක්‍රමානුකූල දත්ත නිරීක්ෂණය සහ දේශගුණික අනුවර්තී වගා සැලසුම් කිරීම මඟින් ආපදා සඳහා සූදානම වැඩි දියුණු කළ හැකිය.

කෙසේ වෙතත්, තාක්ෂණික දියණුවත් සමඟම වාරිමාර්ග නිලධාරීන් සහ ගොවීන් අතර අන්‍යෝන්‍ය සුහදතාවය මඟින් හා ප්‍රජා දැනුවත්භාවය තුලින් බෙදාගත් වගකීම් සමඟ වැඩ කටයුතු කිරීම අත්‍යවශ්‍ය වේ.

තරුණ සහභාගීත්වය දිරිමත් කිරීම, ජල පාලන කමිටුවල කාන්තා නියෝජනය වැඩි කිරීම සහ නිතිපතා දැනුවත් කිරීමේ වැඩසටහන් පැවැත්වීම ඇතිවිය හැකි ආපදා තත්වයන්ට ඔරොත්තු දීමේ හැකියාව තවදුරටත් ශක්තිමත් කළ හැකිය. තවද, තිරසාර වාරි කළමනාකරණය විශ්වාසය, විනිවිදභාවය සහ සාමූහික ක්‍රියාමාර්ග මත රඳා පවතී.

ආපදා සඳහා ඔරොත්තු දෙන අනාගතයක් සඳහා සාමූහික වගකීම.

වියළි කලාපයේ වාරි පද්ධතිය යනු, ජලාශ / වැව් සහ ඇළ මාර්ගවල භෞතික ව්‍යුහයන්ට වඩා වැඩි සමාජීය දායකත්වයක් දක්වන ජීවනාලියක් බඳුය. ඒවා ජලය, භූමිය සහ ජනතාව එකිනෙක සම්බන්ධ කර ජීවමානව පවත්වා ගැනීම සිදුකරයි.

ඵලදායී ජල කළමනාකරණය නියඟය, ගංවතුර සහ ජල අනාරක්ෂිතභාවයේ අවදානම අඩු කරයි. කෙසේ වෙතත්, මෙම වගකීම ආයතන හෝ නිලධාරීන් මත පමණක් රඳා නොපවතී. ජලාශ මෙහෙයුම් කටයුතු වල සිට කෘෂිකාර්මික කටයුතු වල ජලය සංරක්ෂණය දක්වාම සෑම මට්ටමකදීම පිරිමි සහ කාන්තා බෙදයකින් තොරව සියලුම ප්‍රජාවගේ ඒකාබද්ධ උත්සාහයන් අවශ්‍ය වේ.

පිරිමි සහ කාන්තා යන දෙපාර්ශවයම ජලය කළමනාකරණයට ක්‍රියාකාරීව සහභාගී වන විට, ප්‍රජාවන් ශක්තිමත් වන අතර අවිනිශ්චිතතාවයන් සඳහා වඩාත් සූදානම් වේ. ඥානාන්විත සහ ක්‍රමාණුකූල ජල කළමනාකරණයක් සිදු කිරීමෙන්, වියළි කලාපයේ කෘෂිකර්මාන්තය පවත්වා ගැනීම, ජීවනෝපායන් ආරක්ෂා කිරීම සහ අනාගත පරම්පරාවන් සඳහා ආපදා අවදානම් අඩු කිරීම දීර්ඝ කාලීනව සිදු කරගෙන යා හැකිය.

වර්තමානයේ අප විසින් වගකීමෙන් යුතුව ජල කළමනාකරණය කිරීම සිදු කලහොත්, පවතින වාරි පද්ධතීන් අපගේ මතු පරපුරට දායාද කල හැකිවනවා පමණක් නොව ඔවුන්ද ඒවා රැක ගැනීමට කටයුතු සිදු කරනු ඇත.

කේ. ඩී. විජේසූරිය
ඉංජිනේරු සහකාර - පාරිසරික අධ්‍යන අංශය

Empowering Women for Healthy Rivers and Resilient Communities

Water is the foundation of life, and rivers are the arteries that sustain our ecosystems, agriculture, and communities. The theme of **World Water Day 2026 – "Water and Gender"** reminds us that water management is not only an environmental or engineering challenge but also a social responsibility. Across many communities, women play a vital role in managing household water, safeguarding family health, and supporting livelihoods that depend on rivers. Therefore, the sustainable management of our rivers must recognize the important relationship between water resources and gender equality. From a riverine management perspective, protecting rivers from pollution, uncontrolled extraction, and erosion is not merely about conserving nature, it is about protecting the well-being, dignity, and resilience of the communities, especially women who rely on these rivers every day.

Role of Women in Water and River Systems

In many parts of the world, women are the primary managers of household water use. In rural communities especially, women often depend directly on rivers for domestic water supply, small-scale agriculture, livestock care, sanitation, and food preparation. Because of this close relationship with water resources, women are usually the first to experience the impacts of water scarcity, river pollution, and flooding. From a riverine management perspective, riverbank degradation, sedimentation, and contamination of river water directly affect community water access and household wellbeing. When rivers are poorly managed, women are often forced to travel longer distances to collect safe water, which increases their physical burden, reduces time available for education, income-generating activities, and childcare, and may also expose them to safety risks.

Gender Impact of River Degradation

Poor river management often affects women more than others. For example, illegal sand mining can lower groundwater levels and dry up nearby wells, forcing women, who are traditionally responsible for collecting household water to travel longer distances in search of safe drinking water, particularly in rural areas. River pollution from waste disposal, agricultural chemicals, and industrial discharge increases health risks for families, as contaminated water is often used for cooking, washing, and other domestic purposes. Flood disasters also affect women and children disproportionately, as they are often more vulnerable during natural disasters and face greater challenges related to safety, health, and access to basic needs.

In addition, riverbank erosion and degradation can destroy home gardens, small-scale farms, and livestock resources that many rural women depend on for food and family income. The loss of safe river access points can also increase the physical burden on women and reduce the time available for education, childcare, and economic activities. Furthermore, poor river

management can disrupt community sanitation and hygiene practices, increasing the risk of water-borne diseases.

Therefore, proper river management is essential not only for protecting river ecosystems but also for safeguarding community livelihoods, agriculture, and domestic water security. Strengthening sustainable river management practices, such as controlling illegal sand mining, preventing river



pollution, protecting riverbanks, and improving flood management can significantly reduce the burden on women and help build healthier and more resilient communities.

Women as Key Stakeholders in River Protection

On the other hand, women should be encouraged to become active participants in river management, as their daily interaction with water resources provides valuable knowledge and practical experience. Their involvement can greatly strengthen community-based river management efforts. They can play a vital role in creating awareness about pollution control by educating families and communities on proper waste disposal and protecting water sources. In addition, women can actively participate in watershed conservation activities such as tree planting, soil conservation, and protecting catchment areas. Their involvement in flood preparedness activities, including community warning systems and emergency planning, can also improve disaster resilience. Furthermore, women-led environmental groups can play an important role in organizing and sustaining clean river initiatives, helping to protect rivers while promoting healthier and more sustainable communities.

Role of Riverine Management Programs

Riverine management programs play a vital role in protecting communities and ensuring sustainable use of river resources. Activities such as establishing river profiles help authorities better understand river behavior and flow patterns, which supports effective

flood management and reduces risks for vulnerable communities. Embankment protection works safeguard villages, agricultural lands, and livelihoods from riverbank erosion and flooding. Clean river programs help maintain water quality by reducing pollution and protecting rivers that many communities depend on for domestic use. In addition, community awareness programs conducted under riverine management initiatives educate and empower both men and women to take responsibility for protecting river ecosystems. Through these combined efforts, riverine management programs contribute not only to environmental protection but also to the safety, wellbeing, and resilience of river-dependent communities.

Conclusion

Healthy rivers create healthy communities. Effective riverine management must go beyond engineering solutions and embrace inclusive participation from all members of society. When women are empowered to participate in river conservation, watershed protection, and community awareness initiatives, river management becomes stronger and more sustainable. By integrating gender perspectives into river basin planning, flood protection, and river conservation programs, we can ensure that rivers continue to provide water, food security, and environmental stability for future generations. Empowering women in water stewardship is not only a step toward gender equality, it is a crucial step toward safeguarding our rivers and securing a resilient water future.

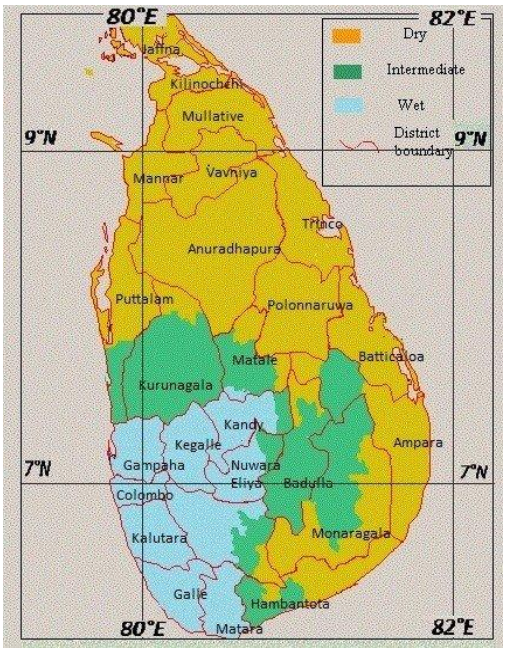
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WOMEN IN IRRIGATION: From Community Fields to Engineering Leadership

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Introduction

The Dry Zone of Sri Lanka covers approximately 70% of the country, mainly in the North, North Central, East, and Southeast regions, where **irrigation has long been the foundation of agriculture**. Both men and women participate in irrigated agriculture, but traditionally, it has been **male-**dominated, with women often viewed as helpers to their husbands. In the past, women primarily handled tasks such as collecting water, managing household water use, and maintaining sanitation, making them effective primary water managers for both household and agricultural needs (Somarathna & Wijesekera, 2007).



Map showing Sri Lanka's dry zone districts

However, in recent decades**, women's engagement in irrigation has increased significantly** in both at the community level and in technical roles. Today, women actively **manage local water distribution, participate in Farmer Organizations, and coordinate crop schedules**, while also entering professional careers in **irrigation engineering**, contributing to the design, management, and sustainability of large-scale irrigation systems. These changes illustrate how equitable **participation improves fair and sustainable water management.**

Community-Level Engagement

In the past, women's involvement in Sri Lankan irrigation systems was mostly unofficial and unrecognized. They managed water at home, maintained small-scale farm plots, and coordinated crop schedules. According to several researchers, women play a **major role in agriculture** in Sri Lanka and India, especially in hard, time-consuming tasks like planting and weeding. They often work **more hours than men** because they also do household chores, but they usually get **lower wages** and have fewer opportunities for training or leadership. Even though women's involvement in farming has increased, **social** barriers **and cultural** norms **still limit their decision-making and influence** in agricultural development (Weerakoon, 2017).

In Sri Lanka, women have increasingly participated in the management and rehabilitation of minor irrigation systems. Research highlights that women were actively involved in tasks such as repairing and maintaining small tanks, participating in labor for rehabilitation works, and contributing to decision-making in local water management committees. They received training and guidance in water allocation, crop management, and tank maintenance. Studies have shown that women's engagement in these committees improved irrigation efficiency and reduced conflicts over water distribution, illustrating the positive impact of their participation in irrigation management (van der Molen, 2001).



Women in Climate Adapted Agriculture Projects in Sri Lanka's Dry Zone (https://polity.lk/victims-or-saviours-women-in-climate-adapted-agriculture-projects-in-sri-lankas-dry-zone-nethmi-bathige/)

During the 2000s, the Integrated Rural Development Project (IRDP) in Ampara strengthened women's participation by encouraging them to join **Farmer Organizations** and take part in **water management meetings**. Surveys from this time showed that women played an important role in planning cropping schedules and managing small irrigation canals (Somarathna & Wijesekera, 2007). Recently, the Community Based Water Resources Management Program (CBWRMP) in **Vavuniya** provided women with leadership training and workshops on climate-smart agriculture. These initiatives enabled women to participate more actively in decision-making, planning, and the management of village-scale irrigation schemes (Weerakoon, 2017).

With the introduction of mechanized irrigation systems, many traditional field tasks previously carried out by women became less physically demanding, and in some cases, less necessary. To address the reduction in manual field work, institutional policies and programs were introduced to formally recognize women's participation in irrigation, ensuring that their roles in water management, planning, and leadership were legally and socially supported. This change helped women maintain a good involvement in irrigation even as machines replaced much of the manual labor.

Such programs shows that purposeful engagement, combined with training and recognition, can improve women's participation in irrigation activities. Although women's roles were mostly supportive before, these programs have helped them take a more active part in planning, organizing work, and managing water in their communities (Weerakoon, 2017).

Technical and Engineering Roles

While community participation in irrigation expanded, women's representation in technical and engineering professions remained relatively low. Traditionally, Engineering in Sri Lanka has been a male-dominated field, and women continue to face social and cultural barriers when entering and progressing within the profession. However, recent decades have seen gradual improvements as more women undertake engineering education and enter professional sectors. Research highlights that factors such as workplace support, professional development opportunities, and gender-sensitive institutional policies play an important role in empowering women engineers and improving gender balance in technical fields in Sri Lanka (Jayasinghe & Kesavan, 2025).

Women are now increasingly visible in technical and engineering roles within Sri Lanka's irrigation sector. Female engineers work in the Irrigation Department, consulting firms, and research institutions, contributing to canal design, reservoir rehabilitation, hydrological analysis, and watershed management. Today, women engineers also serve in field-level leadership positions like Divisional Irrigation Engineers, who are responsible for managing irrigation divisions in dry zone districts; Polonnaruwa, Anuradhapura, Ampara, and Vavuniya. In these roles, they oversee reservoir operations, canal maintenance, flood management, water allocation planning, and coordination with Farmer Organizations. Managing an irrigation division requires both technical expertise and strong leadership, as engineers must ensure efficient water distribution while addressing challenges such as climate variability, infrastructure maintenance, and community coordination.

At the same time, many female engineers balance these professional responsibilities with their roles as mothers and family members. Support from spouses, parents, and extended family members often plays an important role in enabling women to continue their professional careers while managing family life. Such family support systems allow women engineers to take on leadership roles while maintaining responsibilities at home.

Female engineers have increasingly taken up senior leadership positions within the Irrigation Department of Sri Lanka. Some now serve as **Additional Director Generals and Directors** positions that carry significant responsibility in guiding the department's work. In these positions, they manage professional and field staff, oversee major irrigation programs, and contribute to national water management initiatives. Their duties include **strategic planning, policy development, and supervision of large-scale irrigation development and rehabilitation projects**, reflecting the growing representation of women in leadership within Sri Lanka's irrigation sector. The highest technical and administrative position in the department, the Director General of Irrigation represents the leadership level that women engineers can aim to reach as professional opportunities continue to expand in future.

These developments highlight that women's contributions to irrigation are not confined to community participation alone. Through engineering expertise, administrative leadership,

and field management, women are increasingly shaping the planning, operation, and future development of irrigation systems in Sri Lanka.

Recommendations & Conclusion

From the early days of informal to formalized participation in community and professional roles, women's engagement in irrigation has expanded significantly.

Looking toward 2030 and beyond, several steps can further enhance women's contributions are,

- ✓ **Provide more leadership trainings** in Farmer Organizations and community irrigation committees.
- ✓ **Increase access to engineering education and technical workshops** for women in water management.
- ✓ **Encourage policies that recognize women as co-managers of irrigation systems**, not just participants.
- ✓ **Promote guidance and professional networks** to support women in irrigation engineering.
- ✓ **Share successful experiences** so other regions can use them.

By continuing these initiatives, it can be ensured that women's contributions are fully integrated into irrigation management, promoting sustainability, equity, and efficiency.

Over the past decades, women in Sri Lanka's dry zones have moved from supporting roles in irrigation to leadership positions in both community management and technical fields. Their growing participation has transformed local water governance, enhanced agricultural productivity, and built resilience against climate change.

As we celebrate World Water Day 2026, whose official theme is "Water and Gender" and campaign slogan "Where water flows, equality grows," the growing role of women in irrigation shows that water management works best when women and men work together, both in the fields and in engineering offices, to benefit everyone.

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ஆரோக்கியமான நதிகளுக்காகவும் உறுதியான சமூகக் கட்டமைப்புக்காகவும் பெண்களை வலுப்படுத்துதல்

நீர் வாழ்க்கையின் அடித்தளம். நதிகள் எங்கள் சுற்றுச்சூழல், வேளாண்மை மற்றும் சமூகங்களை தாங்கி நிற்கும் உயிர்நாடிகள். **உலக நீர் தினம் 2026** இன் கருப்பொருள் **"நீர் மற்றும் பாலினம்"(Water and Gender)** என்பதால், நீர் மேலாண்மை என்பது சுற்றுச்சூழல் அல்லது பொறியியல் சவாலாக மட்டும் இல்லாமல் ஒரு சமூகப் பொறுப்பாகவும் இருப்பதை நினைவூட்டுகிறது. பல சமூகங்களில் பெண்கள் குடும்ப நீர் பயன்பாட்டை நிர்வகிப்பதிலும், குடும்ப ஆரோக்கியத்தை பாதுகாப்பதிலும், நதிகளுடன் தொடர்புடைய வாழ்வாதாரங்களை நிர்வகிப்பதிலும் முக்கிய பங்கு வகிக்கின்றனர். எனவே நதிகளை நிலைத்தன்மையுடன் முகாமை செய்வதில் நீர்வளங்களுக்கும் பாலின சமத்துவத்திற்கும் இடையிலான முக்கிய தொடர்பை உணர்ந்து செயல்பட வேண்டிய கட்டாயத்தில் இருக்கின்றோம். நதி மேலாண்மை அடிப்படையில் நோக்கின், மாசுபாடு, கட்டுப்பாடற்ற வள சுரண்டல் மற்றும் நதிக் கரையரிப்பு ஆகியவற்றிலிருந்து நதிகளை பாதுகாப்பது இயற்கையைப் பாதுகாப்பதற்காக மட்டுமல்ல, தினமும் இந்நதிகளை நம்பி வாழும் சமூகங்களின், குறிப்பாக பெண்களின் நலன், மரியாதை மற்றும் நிலைத்தன்மையை பாதுகாப்பதற்காகவும் ஆகும்.

நீர் மற்றும் நதி சார்ந்து பெண்களின் பங்கு

உலகின் பல பகுதிகளில் பெண்களே குடும்ப நீர் பயன்பாட்டின் முதன்மை நிர்வாகிகளாக உள்ளனர். குறிப்பாக கிராமப்புற சமூகங்களில், பெண்கள் குடிநீர், சிறு அளவிலான விவசாயம், கால்நடை பராமரிப்பு, சுகாதாரம் மற்றும் உணவு தயாரிப்பு போன்ற தேவைகளுக்காக நேரடியாக நதிகளைச் சார்ந்துள்ளனர். இந்த நெருக்கமான தொடர்பினால், நீர் பற்றாக்குறை, நதி மாசுபாடு மற்றும் வெள்ளப் பாதிப்புகளை முதலில் அனுபவிப்பவர்கள் பெண்களே ஆகும். நதி மேலாண்மை பார்வையில்(River management perspective), நதிக் கரையரிப்பு, அடைமண் தேக்கம்(Sedimentation) மற்றும் நதி நீர் மாசுபாடு ஆகியவை சமூகங்களின் நீர் பெறு நிலையையும் (Community water access), குடும்ப நலனையும் நேரடியாக பாதிக்கின்றன. நதிகள் சரியாக மேலாண்மை செய்யப்படாதபோது, பெண்கள் பாதுகாப்பான நீரை சேகரிக்க நீண்ட தூரம் பயணம் செய்ய வேண்டிய சூழ்நிலை ஏற்படுகிறது. இது அவர்களின் உடல் சுமையை அதிகரிப்பதோடு, கல்வி, வருமானம் ஈட்டும் வாய்ப்புகள் மற்றும் குடும்பத்துக்காக செலவிடும் நேரத்தையும் குறைக்கிறது. மேலும், இது அவர்களின் வாழ்வியலைப் பாதிக்கிறது.

நதிகள் சேதமடைதலும் பெண்களில் ஏற்படுத்தும் தாக்கங்களும்

மோசமான நதி மேலாண்மை பல சமயங்களில் பெண்களை அதிகமாக பாதிக்கிறது. உதாரணமாக, சட்டவிரோத மணல் அகழ்வு நிலத்தடி நீர்மட்டத்தை குறைத்து அருகிலுள்ள கிணறுகளை உலரச்செய்கிறது. இதனால், வீட்டிற்கு நீர் சேகரிப்பதற்கான பாரம்பரிய பொறுப்பை ஏற்றுள்ள பெண்கள் பாதுகாப்பான குடிநீரைக் கண்டுபிடிக்க நீண்ட தூரம் செல்ல வேண்டிய நிலை



ஏற்படுகிறது. கழிவுகள், வேளாண் ரசாயனங்கள் மற்றும் தொழிற்சாலை கழிவுகளால் ஏற்படும் நதி மாசுபாடு குடும்பங்களின் ஆரோக்கியத்துக்கு அபாயத்தை ஏற்படுத்துகிறது. ஏனெனில் மாசுபட்ட நீரே சமையல், கழுவுதல் மற்றும் பிற குடும்ப தேவைகளுக்காக பயன்படுத்தப்படுகிறது. மேலும், வெள்ளப் பேரழிவுகள் பெண்களையும் குழந்தைகளையும் அதிகமாக பாதிக்கின்றன, ஏனெனில் இயற்கை அனர்த்தங்களின் போது அவர்கள் பாதுகாப்பு, சுகாதாரம் மற்றும் அடிப்படை தேவைகளுக்கான பெறு நிலையில் அதிக சவால்களை எதிர்கொள்கின்றனர்.

மேலும், நதிக்கரையரிப்பு மற்றும் சூழலியல் சேதம் பல கிராமப்புற பெண்கள் குடும்ப உணவு மற்றும் வருமானத்திற்காக நம்பும் வீட்டுத்தோட்டங்கள், சிறு விவசாய நிலங்கள் மற்றும் கால்நடை வளங்களை அழிக்கிறது. நதிக்கரையில் பாதுகாப்பான நீர் பெறும் இடங்கள் இல்லாமல் போனால் பெண்களின் உடல் சுமை மேலும் அதிகரிக்கும். இதனால் கல்வி, குடும்பம் மற்றும் பொருளாதார நடவடிக்கைகளுக்கான நேரம் குறைகிறது. மேலும், சரியான நதி மேலாண்மை இல்லாதபோது சமூக மற்றும் சுகாதார நடைமுறைகள் பாதிக்கப்படுவதால் நீரால் பரவும் நோய்களின் அபாயமும் அதிகரிக்கிறது.

எனவே, சரியான நதி மேலாண்மை என்பது நதிச் சூழலியலை பாதுகாப்பதற்காக மட்டுமல்ல, சமூகங்களின் வாழ்வாதாரம், வேளாண்மை மற்றும் குடும்ப நீர் பாதுகாப்பை உறுதிப்படுத்துவதற்கும் மிக அவசியமானதாகும். சட்டவிரோத மணல் அகழ்வை கட்டுப்படுத்துதல், நதி மாசுபாட்டைத் தடுத்தல், நதிக்கரைகளை பாதுகாத்தல் மற்றும் வெள்ள மேலாண்மையை மேம்படுத்துதல் போன்ற நிலைத்தன்மையான நதி முகாமைத்துவ நடவடிக்கைகள் பெண்களின் சுமையை குறைத்து ஆரோக்கியமான மற்றும் உறுதியான சமூகங்களை உருவாக்க உதவுகின்றன.

நதிகளின் பாதுகாப்பில் பெண்களின் வகிபாகம்

பெண்கள் நதி மேலாண்மையில் செயற்திறனுடன் பங்கேற்க ஊக்குவிக்கப்பட வேண்டும். ஏனெனில் அவர்கள் தினசரி நீர்வளங்களுடன் தொடர்பில் இருப்பதால் மதிப்புமிக்க அறிவும் அனுபவமும் பெற்றுள்ளனர். அவர்களின் பங்கேற்பு சமூக அடிப்படையிலான நதி மேலாண்மை முயற்சிகளை மேலும் வலுப்படுத்தும். மாசுக் கட்டுப்பாடு குறித்து குடும்பங்களுக்கும் சமூகங்களுக்கும் விழிப்புணர்வு ஏற்படுத்துவதிலும் அவர்கள் முக்கிய பங்கு வகிக்க முடியும். மேலும், மரநடுகை, மண் பாதுகாப்பு மற்றும் நீர்ப்பிடிப்பு பகுதிகளை (Watershed area) பாதுகாப்பது போன்ற செயற்பாடுகளிலும் பெண்கள் ஈடுபடலாம். வெள்ளத்திற்கான முன் தயாரிப்புகள், சமூக எச்சரிக்கை அமைப்புகள்(Community warning systems) மற்றும் அவசரத் திட்டமிடலில் அவர்களின் பங்கேற்பு பேரழிவை எதிர்கொள்ளும் திறனை அதிகரிக்கும். பெண்கள் தலைமையிலான சுற்றுச்சூழல் குழுக்கள் தூய்மையான நதிகளை உருவாக்குவதற்கான திட்டங்களை முன்னெடுத்து சமூகங்களையும், நதிகளையும் பாதுகாக்க உதவ முடியும்.



நதி மேலாண்மை திட்டங்களின் முக்கியத்துவம்

நதி மேலாண்மை திட்டங்கள் சமூகங்களை பாதுகாப்பதிலும் நதி வளங்களை நிலைத்தன்மையுடன் பயன்படுத்துவதிலும் முக்கிய பங்கு வகிக்கின்றன. நதிகளின் இயற்கை வடிவத்தை(River profiles) மீள நிறுவுதல் போன்ற செயல்பாடுகள் நதியின் ஓட்டநடை(Flow pattern) மற்றும் நடத்தை(River behavior) பற்றி அதிகாரிகளுக்கு தெளிவான புரிதலை வழங்குகிறது. இது வெள்ள மேலாண்மையை மேம்படுத்தி பாதிக்கப்படக்கூடிய சமூகங்களுக்கான அபாயங்களை குறைக்க உதவுகிறது. நதிக்கரை பாதுகாப்பு பணிகள் கிராமங்கள், விவசாய நிலங்கள் மற்றும் வாழ்வாதாரங்களை கரையரிப்பிலிருந்தும், வெள்ளத்திலிருந்தும் பாதுகாக்கின்றன. தூய்மையான நதி திட்டங்கள் மாசுபாட்டைக் குறைத்து பல சமூகங்கள் பயன்படுத்தும் நதி நீரின் தரத்தை பாதுகாக்க உதவுகின்றன. மேலும், நதி மேலாண்மை முயற்சிகளின் கீழ் நடைபெறும் சமூக விழிப்புணர்வு நிகழ்ச்சிகள் ஆண்களையும் பெண்களையும் நதிச் சூழலியலை பாதுகாக்க பொறுப்புணர்வுடன் செயல்பட ஊக்குவிக்கின்றன. இந்த ஒருங்கிணைந்த முயற்சிகள் சுற்றுச்சூழல் பாதுகாப்பை மட்டுமல்லாது நதியை சார்ந்த சமூகங்களின் பாதுகாப்பு, நலன் மற்றும் நிலைத்தன்மையையும் உறுதிசெய்கின்றன.

முடிவுரை

ஆரோக்கியமான நதிகள் ஆரோக்கியமான சமூகங்களை உருவாக்குகின்றன. பயனுள்ள நதி மேலாண்மையானது, பொறியியல் தீர்வுகளை தாண்டி சமூகத்தின் அனைத்து உறுப்பினர்களின் பங்களிப்பையும் உள்ளடக்க வேண்டும். பெண்கள் நதி பாதுகாப்பு, நீரேந்துப் பகுதி பாதுகாப்பு மற்றும் சமூக விழிப்புணர்வு நடவடிக்கைகளில் பங்கேற்க வலுவூட்டப்பட்டால், நதி மேலாண்மை மேலும் வலிமையானதாகவும் நிலைத்தன்மையானதாகவும் மாறும். நதி நீரேந்துப் பிரதேச திட்டமிடல்(River basin planning), வெள்ள பாதுகாப்பு மற்றும் நதி பாதுகாப்பு திட்டங்களில் பாலின சமத்துவத்தைப் பேணுவதன் மூலம், எதிர்கால தலைமுறைகளுக்காக நதிகள் நீர், உணவு பாதுகாப்பு மற்றும் சுற்றுச்சூழல் நிலைத்தன்மையை தொடர்ந்து வழங்க இயலும். நீர் பாதுகாப்பில் பெண்களை வலுப்படுத்துவது பாலின சமத்துவத்திற்கு ஒரு முன்னேற்றம் மட்டுமல்ல, அது நமது நதிகளை பாதுகாத்து உறுதியான நீர்வள எதிர்காலத்தை உருவாக்கும் முக்கியமான படியாகும்.

எந்திரி.சி.ஜெயன் பார்த்தசாரதி,

பிரதம பொறியியலாளர்,

நதிகள் மேலாண்மைப் பிரிவு,

நீர்பாசனத் திணைக்களம்.

சமூக அடிப்படையிலான நீர்ப்பாதுகாப்பில் பெண்களின் பங்கு

பெண்களுக்கும் நீருக்கும் இடையில் ஒரு பிரிக்க முடியாத பிணைப்பு எப்பொழுதுமே காணப்படுகிறது. இம்முறை உலக நீர் தினமானது "நீரும் பாலினமும்" என்ற தொனிப்பொருளில் கொண்டாடப்படுவதை நீர் முகாமைத்துவ துறையில் சேவையாற்றும் ஒரு பெண்ணாக நான் பெருமையாக கருதுகிறேன்.

நீர் முகாமைத்துவத்தில் பெண்களின் தலையீடு



நீரை அதிகம் பயன்படுத்துவோரில் பெரும் பங்கு பெண்களையே சாரும். அன்றாட தேவைகளுக்காகவும் உதாரணமாக துணி துவைத்தல், சமையல் செய்தல், குளித்தல், வீட்டுத்தோட்டம் செய்தல் என அனைத்தும் நீரையே எதிர்பார்த்து நிற்கின்றன. ஆனால் "நீர் முகாமைத்துவம்" என்று பேசப்படும் போது கொள்கை வகுக்கும் உறுப்பினர்களில் பெண்களின் பங்களிப்பு கடந்த காலங்களில் மிக அரிதாகவே காணப்பட்டது. பின்னர் பெண்களின் பங்களிப்பு இன்றி நீர் சம்மந்தபட்ட கொள்கைகளை வகுப்பது பொருத்தமற்றது என்பதை உலகம் புரிந்துகொள்ளத் தொடங்கியது.

அன்றாடம் வீட்டுத்தேவைகளுக்காக மட்டுமே நீரைப் பயன்படுத்தி வந்த பெண்கள் தற்போது விவசாயத்திலும் அதிகம் நாட்டம் செலுத்துவதைக் காணக்கூடியதாக உள்ளது. முக்கியமாக இற்றைக்கு ஐந்து ஆண்டுகளுக்கு முன் விவசாய சங்கங்களும் அது சம்மந்தபட்ட ஏனைய கூட்டங்களிலும் பெண்கள் உறுப்பினர்களாகவோ பார்வையாளர்களாவோ காண்பது மிக அரிது, ஆனால் இன்று விவசாய சங்கங்களில் பல பெண்கள் உறுப்பினர்களாகவே அங்கம் வகிக்கிறார்கள். இது வரவேற்கதக்க மாற்றமாகவே கருதவேண்டும்.

பெண்களின் தலையீட்டால் ஏற்படும் பயன்கள்

இந்நிலை மேலும் வலுவடையவேண்டும். இன்று முன்வந்து இப்பதவிகளை வகிக்கும் பெண்களை மேலும் ஊக்குவிக்க வேண்டும். முடக்கிவிடக் கூடாது, பொதுவாக பெண்கள் இவ்வாறான பதவிகளை வகிப்பது சவால்கள் நிறைந்தது இருந்தும் நீர் முகாமைத்துவத்தில் பெண்களின் பங்களிப்பு பாரிய வெற்றிகளை ஈட்டித்தரும். உதாரணமாக பெண்கள் ஈடுபடுத்தப்பட்டால் நீர் முகாமைத்துவத்தினை மேலும் சிக்கனமாக செயற்படுத்த முடியும். மேலும் பெண்கள் மூலம் சமூக விழிப்புணர்வை வினைத்திறனாக ஏற்படுத்த முடியும்.

இலங்கையும் நீரும்

நீரை அதிகம் பயன்படுத்தும் பெண்கள், நீரின் முக்கியத்துவம் பற்றி கட்டாயம் அறிவுறுத்தப்பட வேண்டியவர்கள். நீர் ஒரு மட்டுப்படுத்தப்பட்ட வளம். நாம் அதனை

பாதுகாக்க நடவடிக்கை எடுக்காவிட்டால், நாளை நஷ்டம் அடைபவர்கள் நம் சந்ததியினரே. இலங்கை நீரெனும் செல்வத்தால் நிறைந்த ஒரு வளமிக்க நாடு. மழை வீழ்ச்சியிலும் குறைவே கிடையாது. பல பெரிய குளங்களாலும் அணைக்கட்டுகளாலும் அழகுபடுத்தப்பட்ட சொர்க்க பூமி போல் ஜொலிக்கும் நாடு, இருந்தும் இவற்றை நாம் சரியாக பயன்படுத்த தவறினால் நிலைமை தலைகீழாக மாறவும் வாய்ப்புக்கள் உள்ளது. எனவே நீரை சிக்கனமாக சரியான முறையில் பாதுகாப்பது நம் தலையாய கடமையாகும்.

கழிவுகள் ஏற்படுத்தும் விளைவுகள்



நம்நாட்டில் நீரை ஓர் இடத்தில் இருந்து இன்னோர் இடத்திற்கு கொண்டு செல்வதற்கு வாய்க்கால்களே பெரும்பாலும் பயன்படுத்தப்படுகிறது. இதுவே சிக்கனமான முறையும் கூட. அவ்வாறன வாய்க்கால்கள் சுத்தமானதாக பாதுகாக்கப்படவேண்டும். மாறாக பெரும்பாலான வீட்டுப்பெண்கள் தங்கள் வீட்டு கழிவுகளை கொட்டும் குப்பை தொட்டிகளாகவே வாய்க்கால்களை தற்பொழுது பயன்படுத்தி வருகிறார்கள். வாய்கால்களில் குப்பைகள் கொட்டுவதால் அடைப்பு ஏற்பட்டு நீர்பாய்ச்சல் தடைப்படும், தடைப்படுவதால் வாய்க்காலின் மேற்பகுதியில் உடைவுகள் ஏற்படும், இதனால் நீர் விரையமாகும், நீர் அசுத்தமாகும். சிக்கன நீர்பரிமாற்ற முறையில் வீணான செலவீனங்கள் ஏற்படும். அதன் வினைத்திறன் குறையும்.

ஒதுக்கீட்டு பகுதிகளின் முக்கியத்துவம்



நீர்ப்பாசன ஒதுக்கீட்டு பகுதியில் பயிர்ச்செய்கை மற்றும் விவசாயம் செய்தல். அருகில் உள்ள படத்தில் ஒரு வாய்க்காலை சுற்றி அதன் ஒதுக்கீட்டுப் பகுதி பயன்படுத்தப்படும் விதம் காட்டப்படுகின்றது.

இன்று பாலின பாகுபாடு இன்றி அனைவரும் வீட்டுத்தோட்டம் செய்வதிலும் மர நடுகையிலும் ஆர்வம் காட்டுகின்றனர். இது ஒரு சிறந்த விடயமாக தெரிந்தாலும், பெரும்பாலான மரங்கள் நீர்ப்பாசன ஒதுக்கீட்டு பகுதியிலேயே நடப்படுகின்றன, தண்ணீர் ஊற்றுவதற்கு இலகுவாக என அவை கருதப்பட்டாலும் இவற்றால் காலப்போக்கில் பாரிய விளைவுகள் ஏற்படுத்தலாம். உதாரணமாக அருகே நடப்பட்ட மரங்களின் வேர்கள் வாய்கால்களினுள் ஊடுருவுவதால் வாய்க்கால்கள் உடைந்துபோகும் அபாயம் காணப்படுகிறது. மத்திய நீர்ப்பாசன திணைக்களம், மாகாண நீர்ப்பாசன திணைக்களம், விவசாய திணைக்களம் என பல அரச நிறுவனங்கள் வயல் நிலங்களுக்கு வினைத்திறனான முறையில் நீரை கொண்டு செல்வதற்காக வாய்க்கால்களும் அது தொடர்பான ஏனைய கட்டுமாணங்களையும் கட்டி அவற்றை நடைமுறைப் படுத்தவும் செய்கின்றன.

அதே நேரம் திட்டமிடப்பட்ட ஒதுக்கீட்டு பகுதிகளையும் அந்நிறுவனங்கள் வரையறுத்துள்ளன. இவ்வாறான ஒதுக்கீட்டு பகுதிகள் நீர்ப்பாசனம் தொடர்பான கட்டுமானங்களை பாதுகாக்கவும் பராமரிக்கவுமே வரையறுக்கபடுகிறது. அவற்றை நாமும் அறிந்து அந்த ஒதுக்கீட்டு பகுதிகளின் முக்கியத்துவத்தை உணர வேண்டும்.

எனவே பெண்களே விழித்தெழுவோம் நம் சிறிய தவறும் பெரிய விளைவுகளை ஏற்படுத்தும் என்பதை உணர்ந்து நம் நீர்நிலைகளையும், வாய்க்கால்களையும் அதனுடன் தொடர்புடைய கட்டுமானங்களையும் ஒதுக்கீட்டு பகுதிகளையும் பாதுகாப்போம் ஏனையோரையும் வழிநடத்துவோம். வழமான நம் திரு நாட்டை நம் சந்ததினரும் பயன்படுத்திட வழி செய்வோம்.

(ஆக்கம்:- பொறியியலாளர். எம்.எப். றிஸ்னா, நீர்ப்பாசன திணைக்களம்)



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