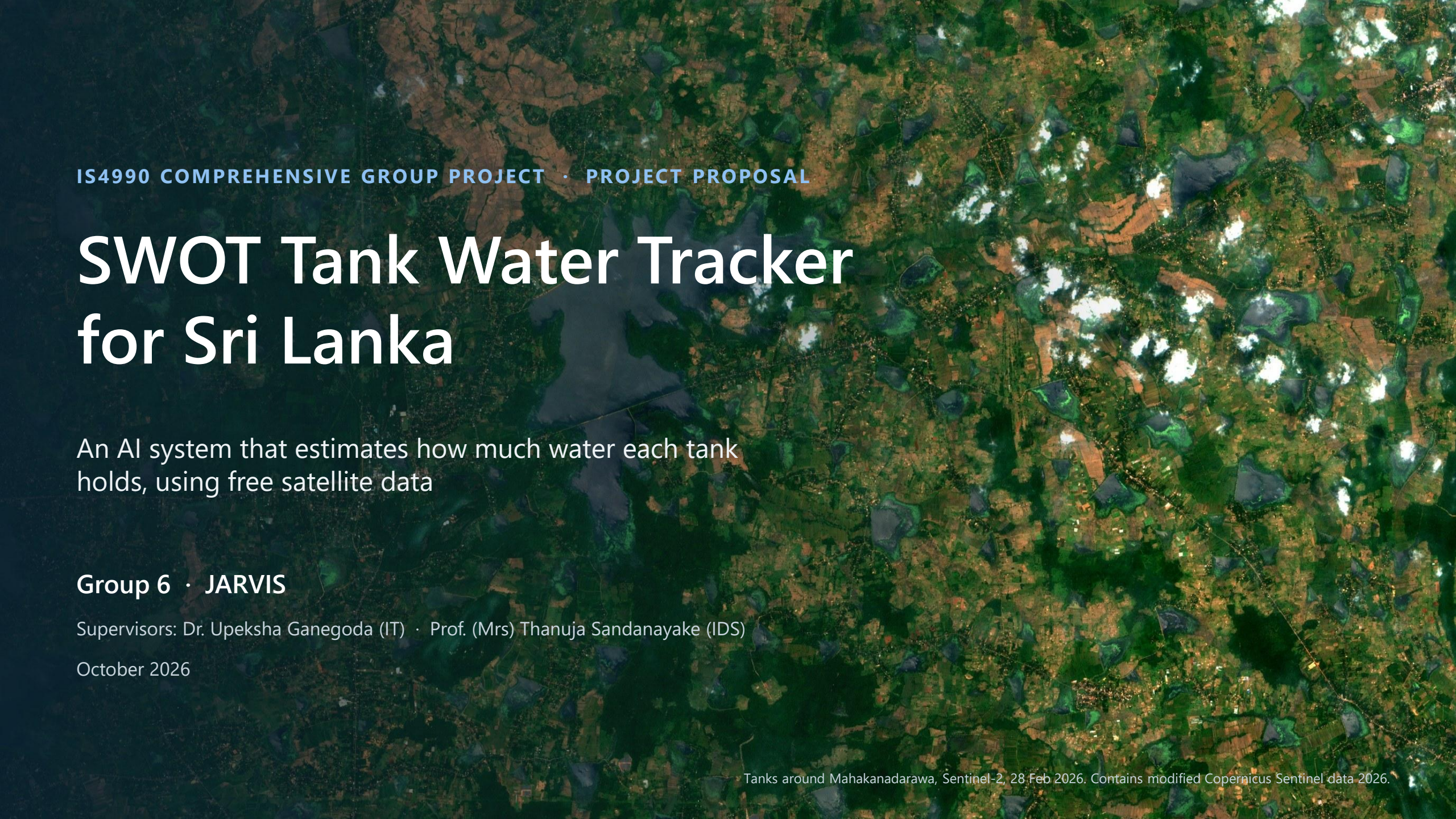




IS4990 COMPREHENSIVE GROUP PROJECT · PROJECT PROPOSAL

SWOT Tank Water Tracker for Sri Lanka

An AI system that estimates how much water each tank holds, using free satellite data

Group 6 · JARVIS

Supervisors: Dr. Upeksha Ganegoda (IT) · Prof. (Mrs) Thanuja Sandanayake (IDS)

October 2026

Why: dry-zone farming depends on tank water

~23,000

small tanks of 80 ha or less in Sri Lanka, the base of dry-zone farming

National Tanks Survey, in Lopane et al., 2025

2

seasons a year. Before each, farmers plan the crop by the water in the tank

Cultivation meetings at village tanks, Oka et al., 2015

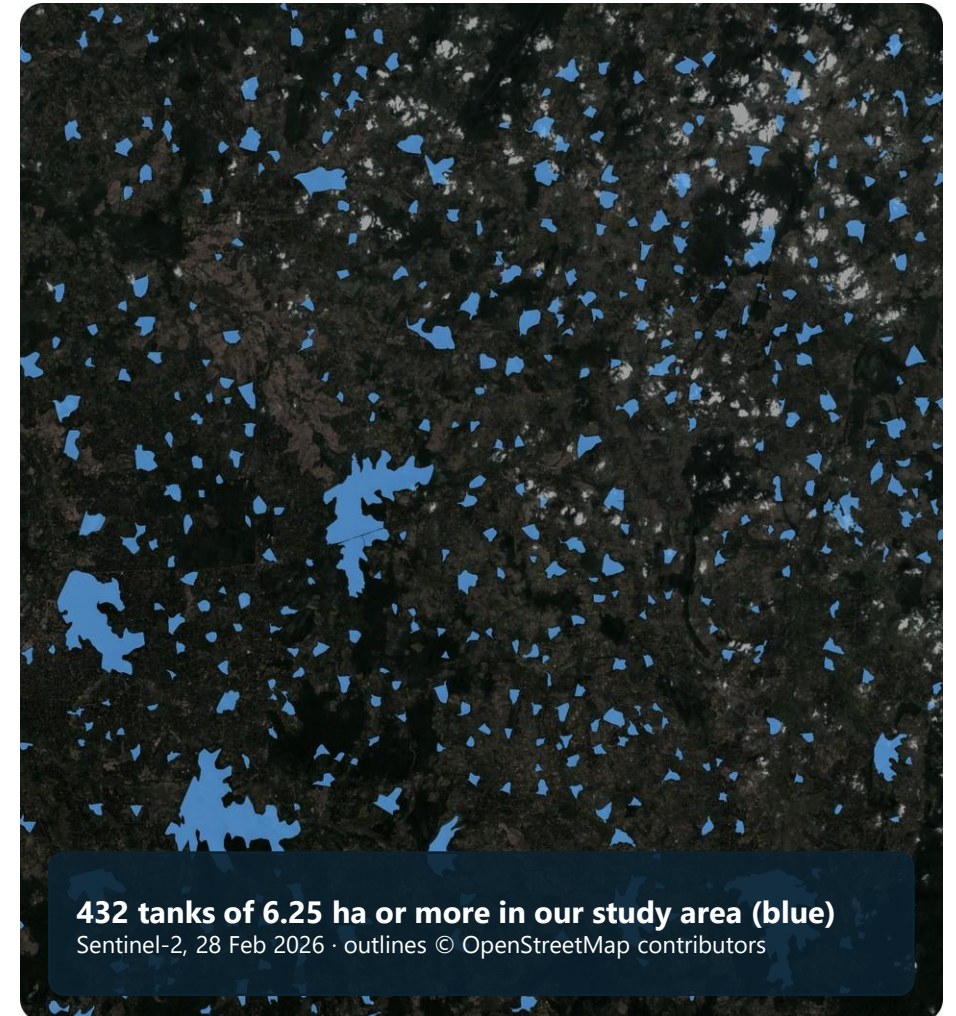
1,160

small tanks damaged by Cyclone Ditwah in November 2025

Department of Agrarian Development, December 2025

Knowing each tank's water helps farmers plan the season, and helps officers share water and prepare for floods.

But today, nobody can say how much water most tanks hold.



The problem we solve

THE PROBLEM

For most Sri Lankan tanks, nobody can say how much water they hold right now, and there is no low-cost way to measure it often.

WHY IT IS STILL UNSOLVED



No gauges on village tanks

Only 118 reservoirs publish daily water levels

Irrigation Department, Reservoir Status, 25 Oct 2026



Maps show area, not volume

IFAD maps over 10,650 water bodies, but by area only

IFAD, 2026



Clouds and water plants hide the water

Only 17–22% of Sentinel-2 dates were clear over our tanks; plants cover 3 of our 8 village tanks

Our data check, October 2026



SWOT gives height, not volume

Height only, and not yet checked on Sri Lankan tanks

NASA and CNES satellite, launched December 2022



Our answer: an AI system that turns free satellite data into each tank's storage, in m³ and % full, every 5–12 days, checked against gauges.

For farmer organisations, the Department of Agrarian Development (village tanks) and the Irrigation Department (reservoirs).

SWOT gives the height. We turn it into water



What SWOT gives

- The water height of each lake, about twice every 21 days
- Only for lakes in its prior lake list
- Mostly "suspect" readings on small village tanks
- No volume, and nothing between passes



What our project adds

- Water area from Sentinel-1 and Sentinel-2 by AI, even under cloud and water plants
- A height–area–volume curve for every tank
- Storage in m³ and % full, every 5–12 days
- Accuracy checked against Irrigation Department gauges
- A dashboard for irrigation officers and farmers

SWOT is the ruler. We turn its readings into water in the tank.

SWOT: a satellite that measures water height



Illustration: NASA/JPL-Caltech

Dec 2022

launched by NASA
and CNES (France)

120 km

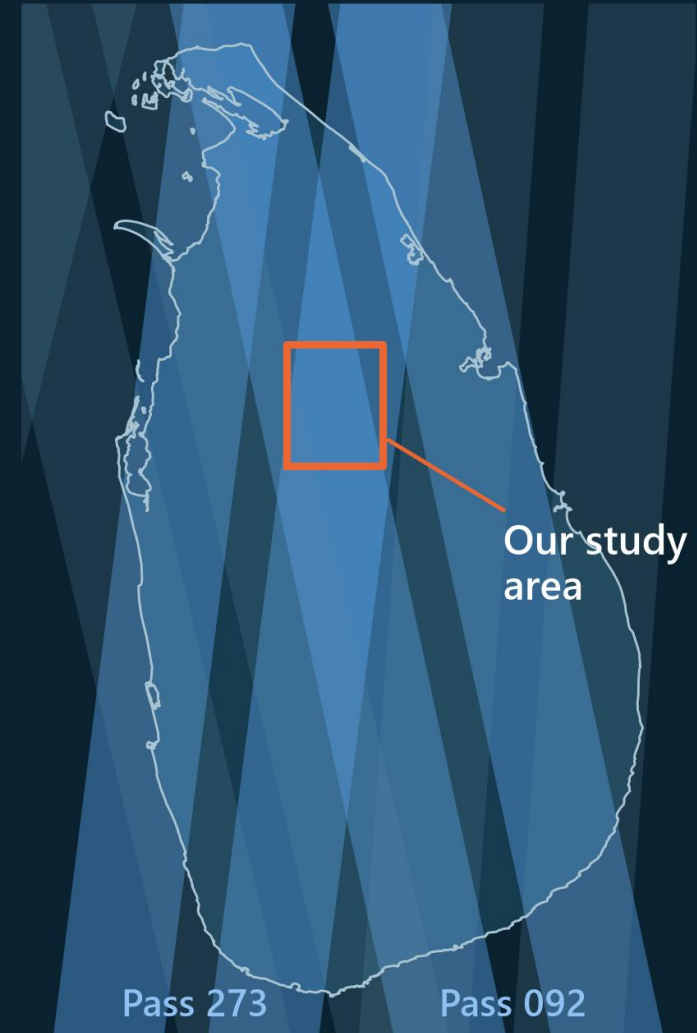
wide strip measured
on each pass

21 days

until the same pass
comes back

2 passes

see our tanks: 273
and 092



What SWOT sees: one pass, every lake at once

198

lakes measured in a single pass

SWOT pass 273 on 11 Oct 2026, in our 44 × 55 km study area



Each colour is the water height SWOT measured, in metres above sea level.

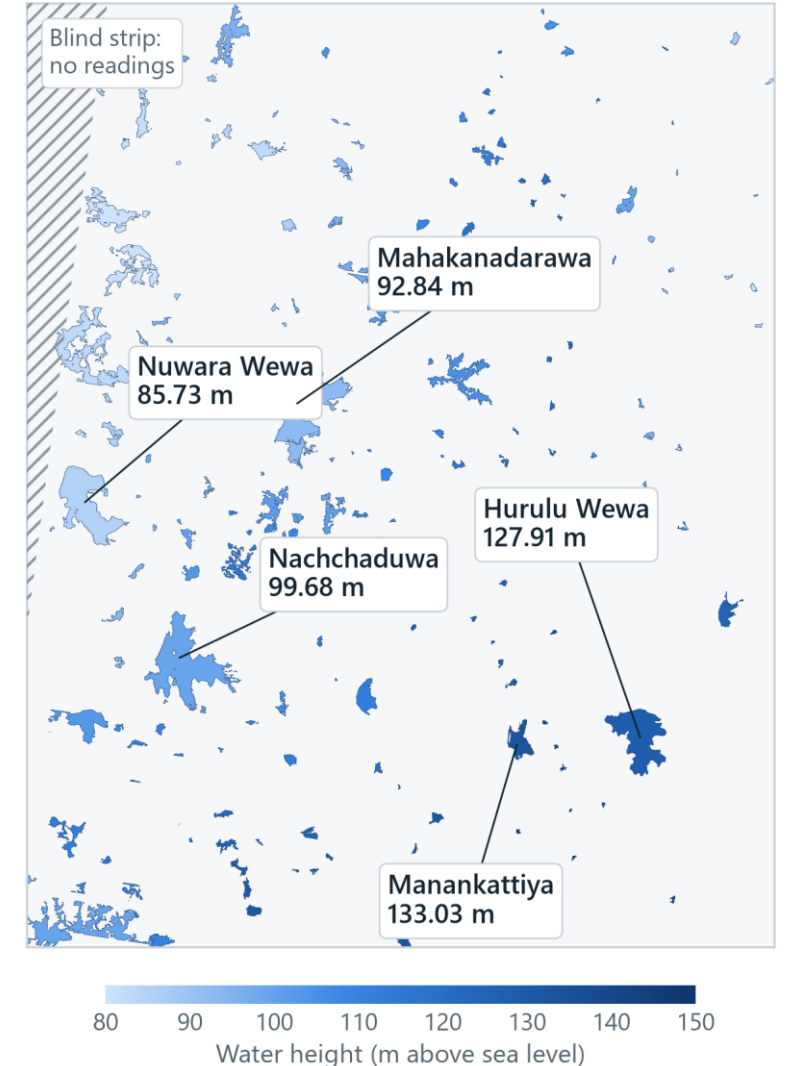


All 5 of our reservoirs were measured on this pass, for example Hurulu Wewa at 127.91 m.



SWOT cannot measure the strip right under itself, shown hatched on the map.

Data: NASA/JPL and CNES, SWOT Lake Single-Pass product, version D, from NASA PO.DAAC.

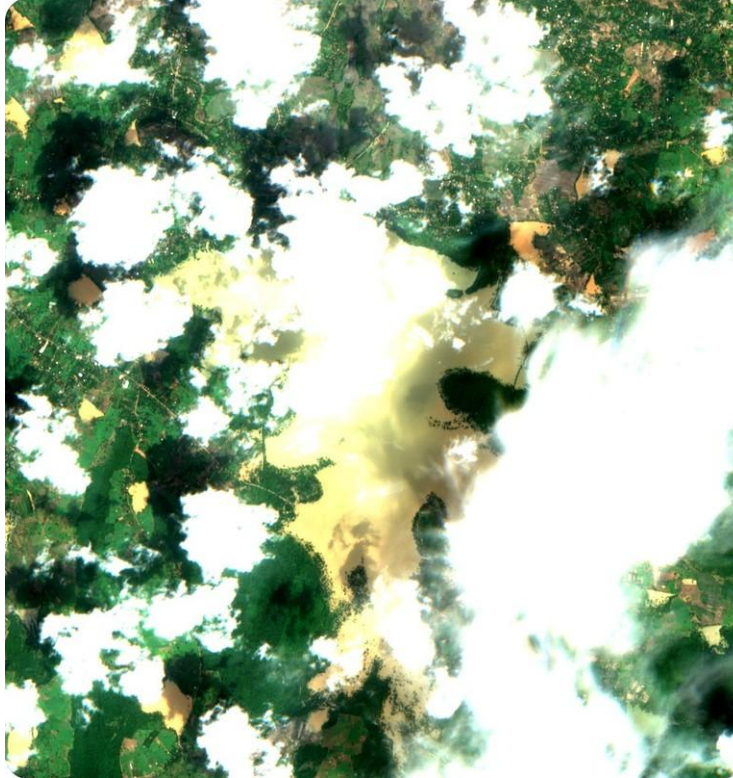


Clouds hide the tanks. Radar sees through them



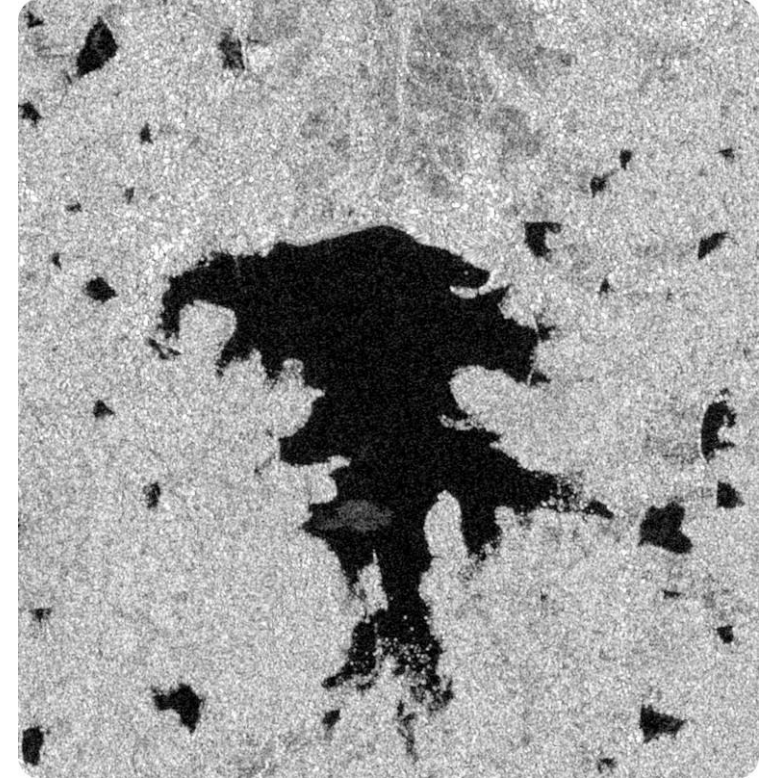
Sentinel-2, clear day

Hurulu Wewa, 28 Feb 2026 · optical, 10 m



Sentinel-2, monsoon cloud

Hurulu Wewa, 30 Nov 2025 · the tank is hidden



Sentinel-1 radar

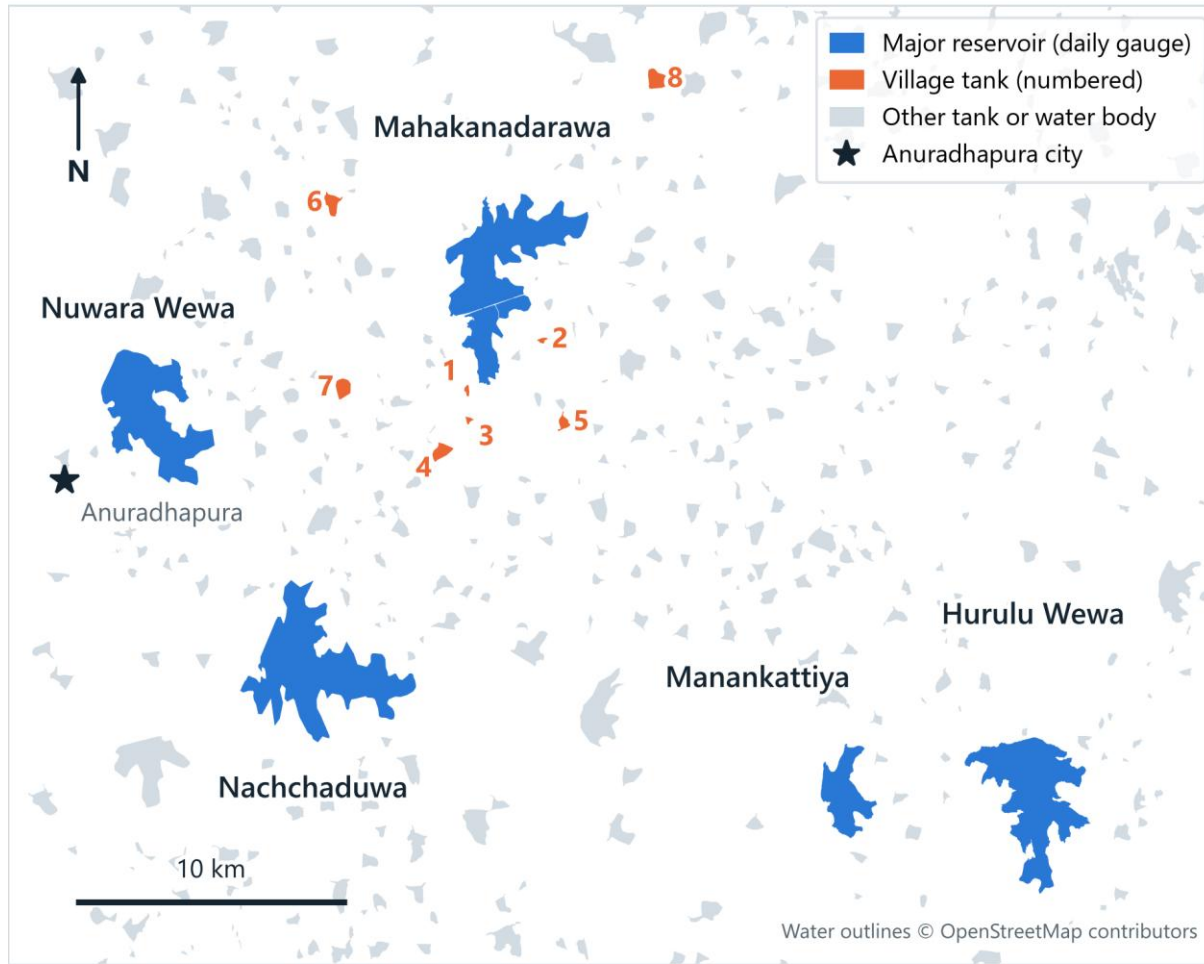
Hurulu Wewa, 2 Dec 2025 · water shows dark



Only 17–22% of Sentinel-2 dates were clear over our test tanks, so radar is a core input.

Contains modified Copernicus Sentinel data 2025–2026.

Study area: 5 reservoirs and 8 village tanks



5 major reservoirs

Hurulu Wewa, Mahakanadarawa, Manankattiya, Nachchaduwa and Nuwara Wewa, all with daily gauge readings



8 village tanks

0.4–5 km from Mahakanadarawa: 2 open water, 3 mixed and 3 mostly covered by water plants



Seen by SWOT passes 273 and 092

All 13 tanks, about twice every 21 days, with 47–90 usable readings each since July 2023



Why here

Dry-zone tank cascades (ellanga), flat land, and official gauges to check against

How it works



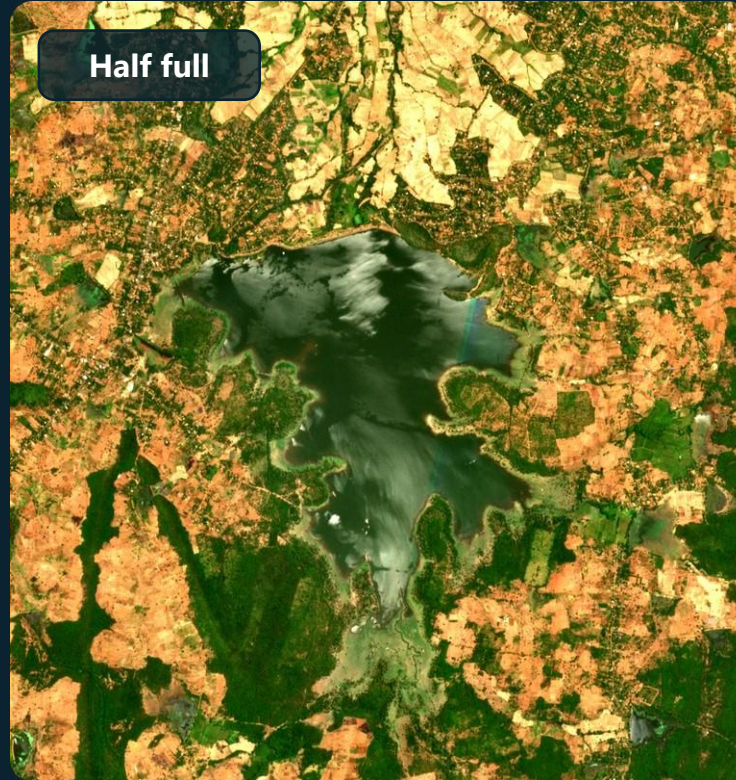
Our method in three pictures: Hurulu Wewa



127.59 m SWOT height

6.1 km² of water

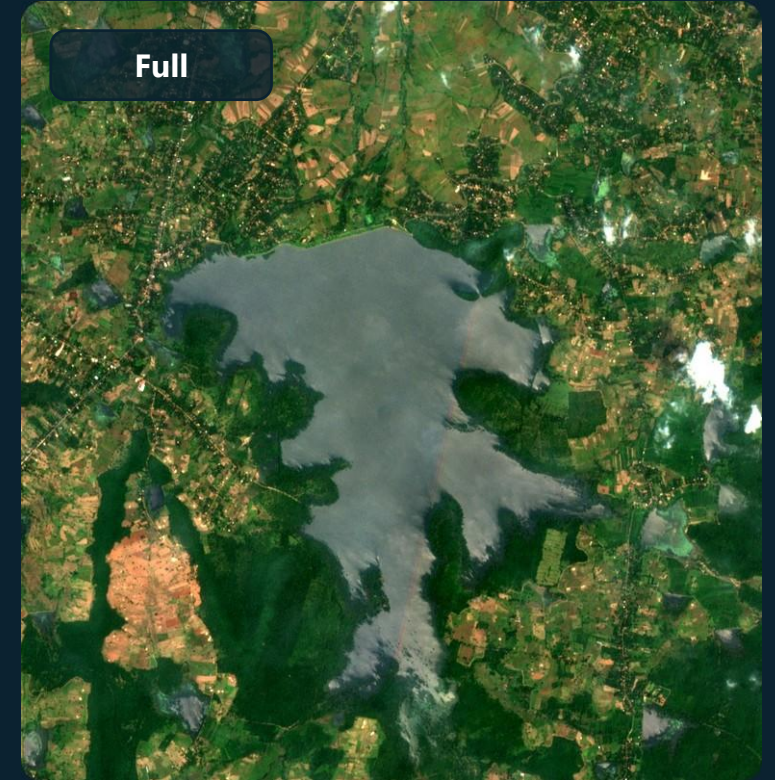
Sentinel-2 29 Jul 2023 · SWOT 30 Jul 2023



129.50 m SWOT height

8.3 km² of water

Sentinel-2 and SWOT, 30 Jul 2025



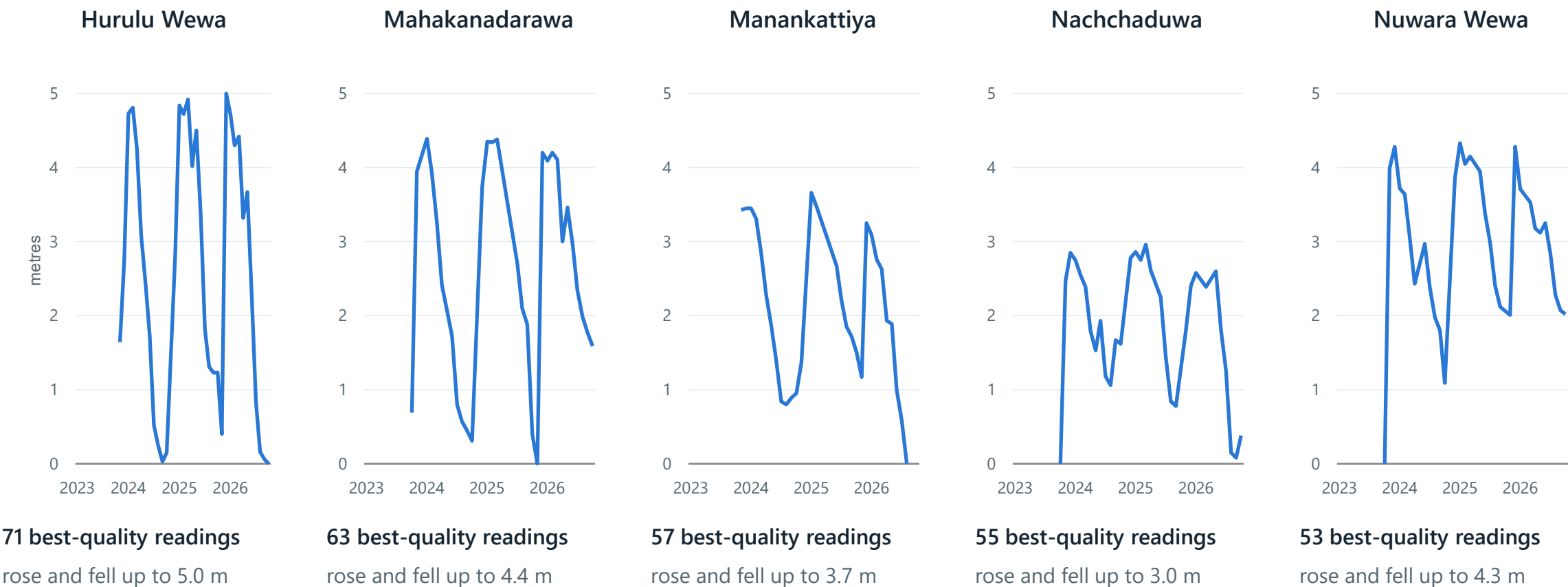
132.35 m SWOT height

10.8 km² of water

Sentinel-2 28 Feb 2026 · SWOT 10 Mar 2026

Three years of SWOT water levels

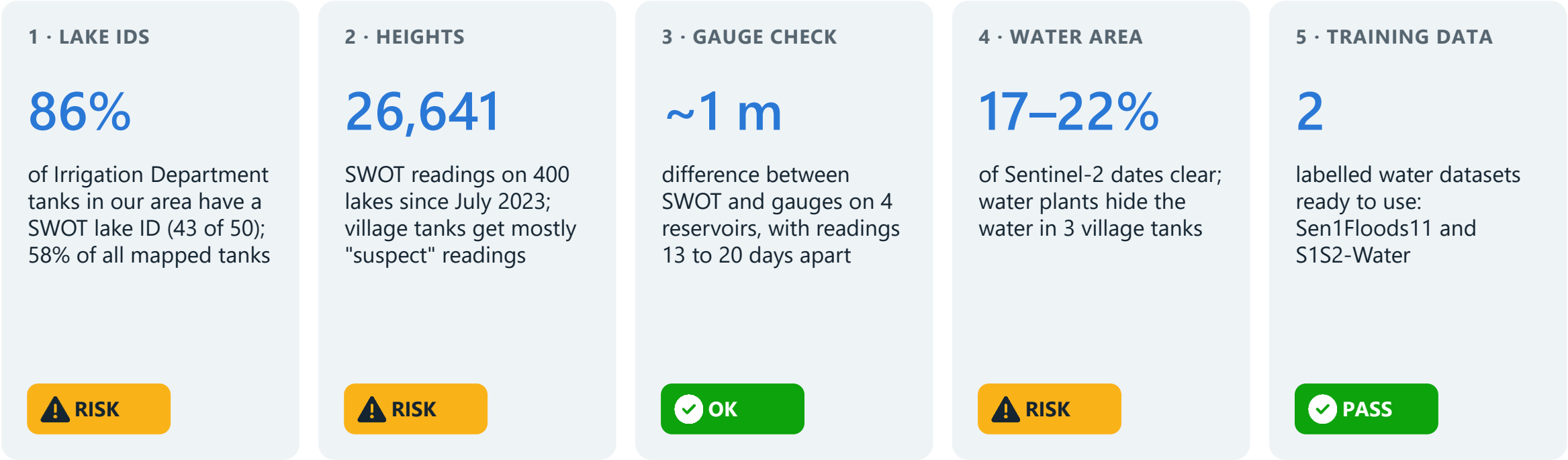
Monthly average of best-quality readings, in metres above each reservoir's lowest month.
The sharp rise at the end of 2025 is Cyclone Ditwah.



Source: NASA PO.DAAC Hydrocron, SWOT lake product version D, July 2023 to October 2026. Gaps are months without a best-quality reading.

We tested the data before proposing

Five quick checks in October 2026, using the real SWOT, Sentinel-2 and gauge data.





Verdict: GO, with changes. Sentinel-1 radar and a water-plant class became core parts of the plan, and RQ2 now tests SWOT's "suspect" readings.

Why these tanks? We checked all of Sri Lanka

6th of 187

Hurulu Wewa's rank among Sri Lanka's big lakes (1 km² or more), by best-quality SWOT readings



All 5 of ours are in the island's top 22, and they are the top 5 in our study area



The island's top tanks are spread from Puttalam to Hambantota, far from our village tanks

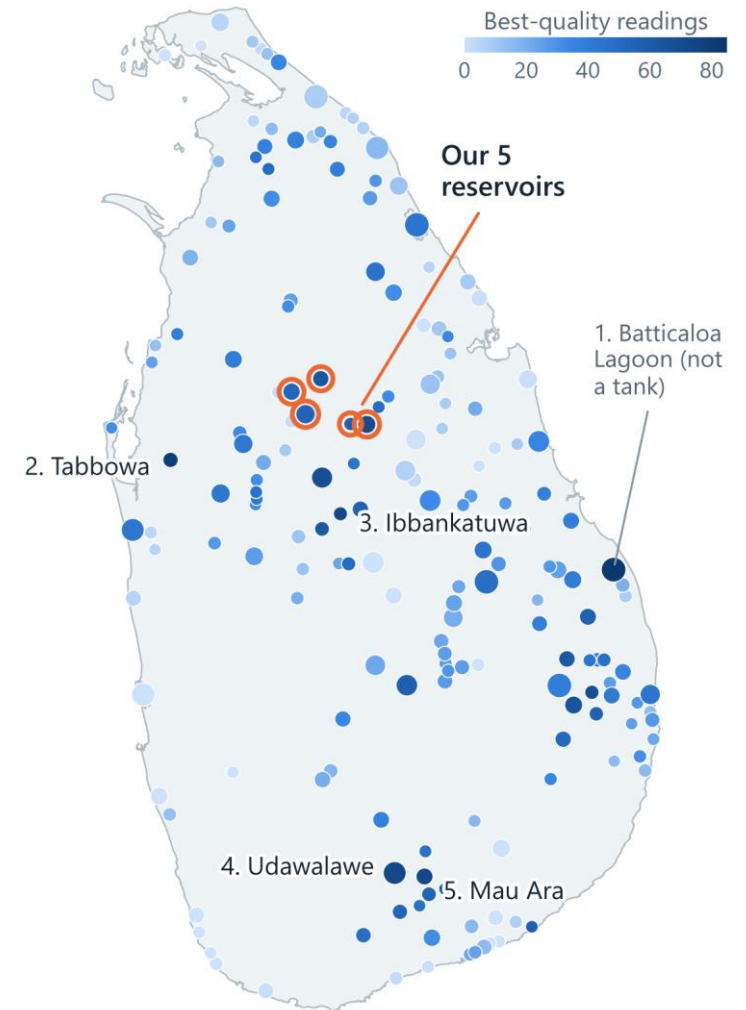


Ours sit next to the 8 village tanks and share the same 2 SWOT passes



All 5 have daily Irrigation Department gauges; 2 of the island's top 5 tanks do not

Best quality: quality flag 0, crossover flag 0–1, dark water 10% or less (Köhn and Nielsen, 2026).



Research questions

1

How accurately can deep learning map tank water from Sentinel-1 and Sentinel-2, even under cloud or water plants?

Measured by IoU and F1 against hand-labelled water masks

2

How accurate is SWOT on reservoirs and on small village tanks, and can its "suspect" readings be trusted?

Measured by error in cm against gauge readings

3

Does AI water area plus SWOT height give storage close to official and measured values?

Measured by error as a % of capacity

4

Can storage be forecast 2–4 weeks ahead from recent storage and rainfall?

Stretch goal, compared with a "no change" forecast

Who does what: one research question each

Each of us owns one core research question from start to finish.



MEMBER A

AI water maps

RQ1

- Labelled water masks of Sri Lankan tanks
- Sentinel-1 and Sentinel-2 deep-learning model
- A water-plant class for covered tanks

Output: water maps for all tanks



MEMBER B

SWOT and gauges

RQ2

- SWOT heights from Hydrocron, poor readings removed
- Gauge data: daily records, history and field photos
- Tests whether "suspect" readings can be trusted

Output: SWOT accuracy report



MEMBER C

Storage and dashboard

RQ3

RQ4 stretch

- Height–area–volume curve for each tank
- Storage every 5–12 days, checked against official figures
- Dashboard, and the forecast if time allows

Output: storage series and dashboard



All three: field visits on SWOT pass dates, labelling water masks, the thesis and the research paper.

What we will deliver, and when



A labelled dataset of Sri Lankan tank water masks



An AI water map that works under cloud and water plants



Height–area–volume curves for all 13 tanks



Storage every 5–12 days, shown on a dashboard



A research paper, for example for UoM's ICITR conference



Nov 2026

Proposal, ethics and data requests



15 Dec 2026

Study area confirmed after the cascade and name checks



Dec 2026 – Apr 2027

Labelled data, gauge readings, AI water model and SWOT curves



Mar – May 2027

Storage estimates, validation and dashboard



30 Jun 2027

Thesis, paper and final submission

Thank you

Questions and feedback are welcome.

Data sources

- SWOT: NASA/JPL and CNES, Lake Single-Pass product version D (PO.DAAC, Hydrocron)
- Sentinel-1 and Sentinel-2: ESA Copernicus (Earth Search and Microsoft Planetary Computer)
- Reservoir levels and outlines: Irrigation Department of Sri Lanka
- Tank outlines © OpenStreetMap contributors; Sri Lanka boundary: geoBoundaries
- SWOT illustration: NASA/JPL-Caltech



See SWOT readings for any lake:
[SWOT Lake and River Explorer](#)