Results of OPEN-PROFILE

Webinar
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Contributions by the OPEN-PROFILE team
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Key Messages

- Dry and wet combined bathymetry can be obtained with off-the-shelf materials (< 12,000 US$ including spare materials):
- This can be done at very high quality in satisfactory amount of man-hours (3-5 persons team)
- It does require *skills* to work with several observation techniques

Discussion: OPEN-PROFILE move to local services?

Objectives

Develop a turnkey low-cost bathymetry/topography survey kit (drones + fishfinder + open-source software)

- Affordability
- Easy to deploy
- Enable local service providers

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Use cases

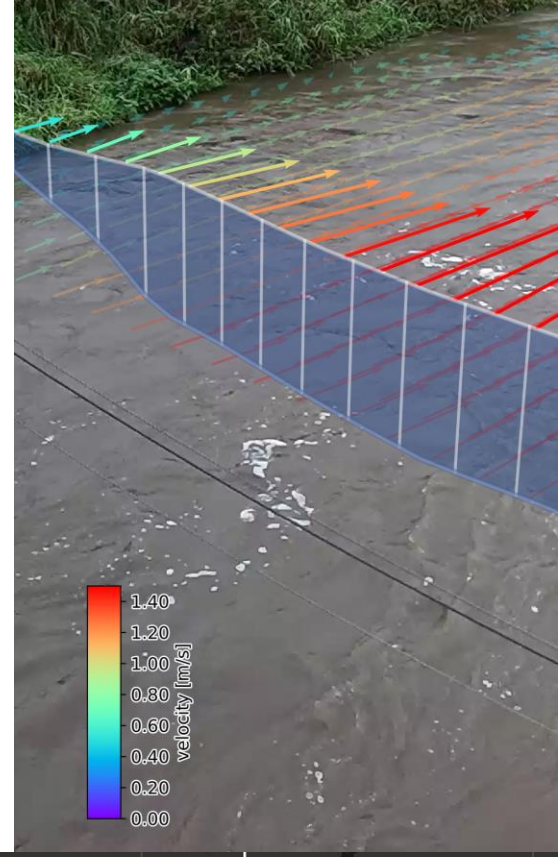
Hydraulic modelling

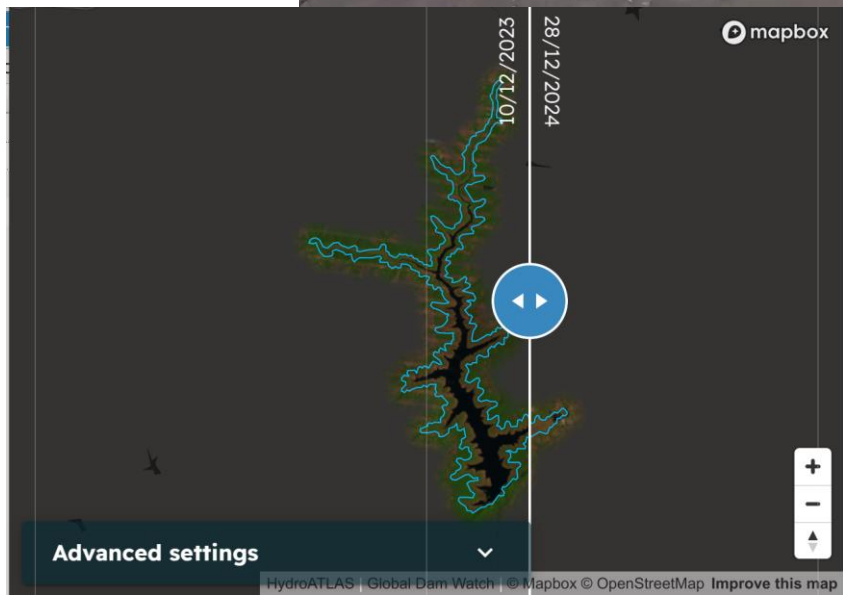
Reservoir monitoring (inc. from space)

Discharge estimation (inc. Data-Assimilation)

...and more

Source:
https://openrivercam.com





Source:
https://globalwaterwatch.earth

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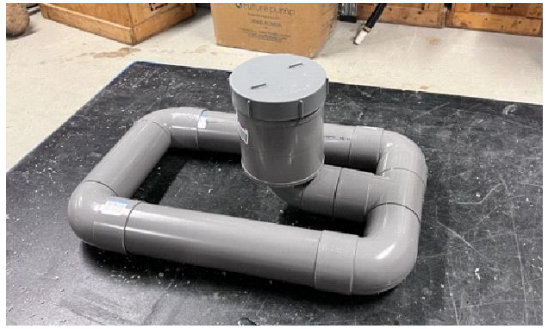
How does it work?

Wet bathymetry

- Floater (for river) or small boat (for lake / reservoir)
- Fish finder (+2 smartphones, one for depth tracking, one for location)
- GNSS equipment (+base station)



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How does it work?

Dry bathymetry

- Simple RGB drone
- Control points, or...
- Shoreline, or...
- RTK module (more $ but less man-hours)

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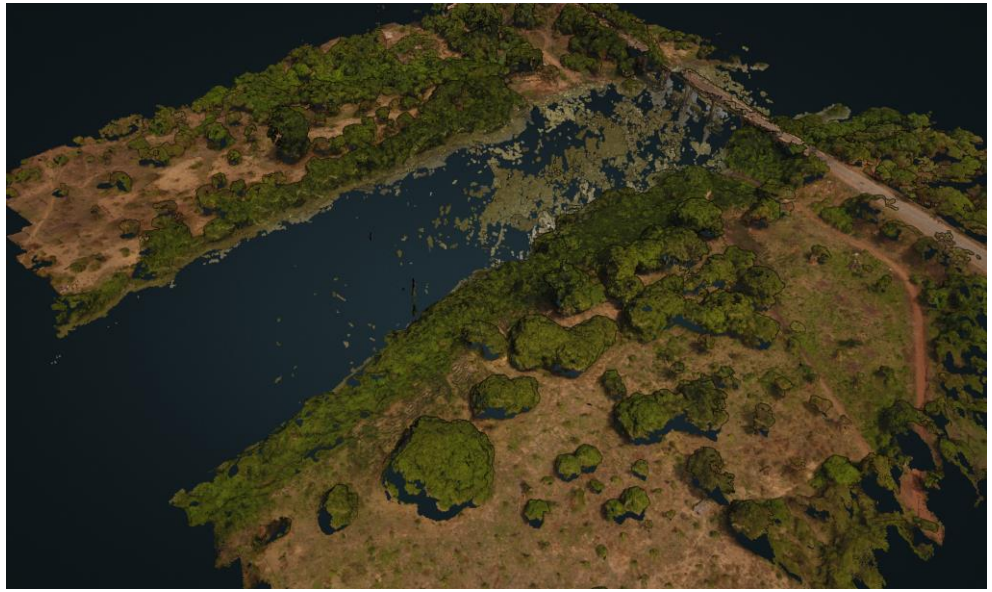
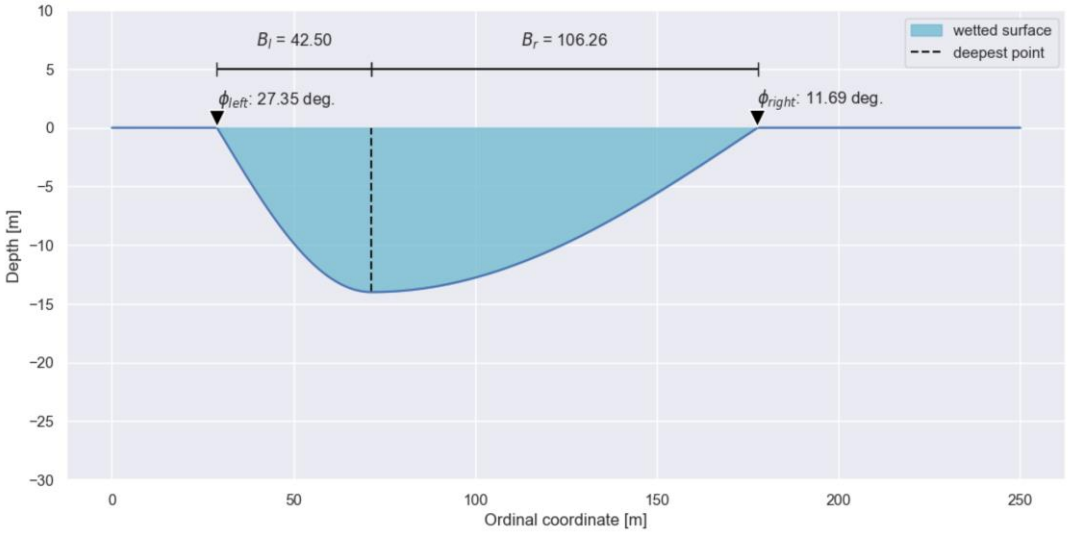
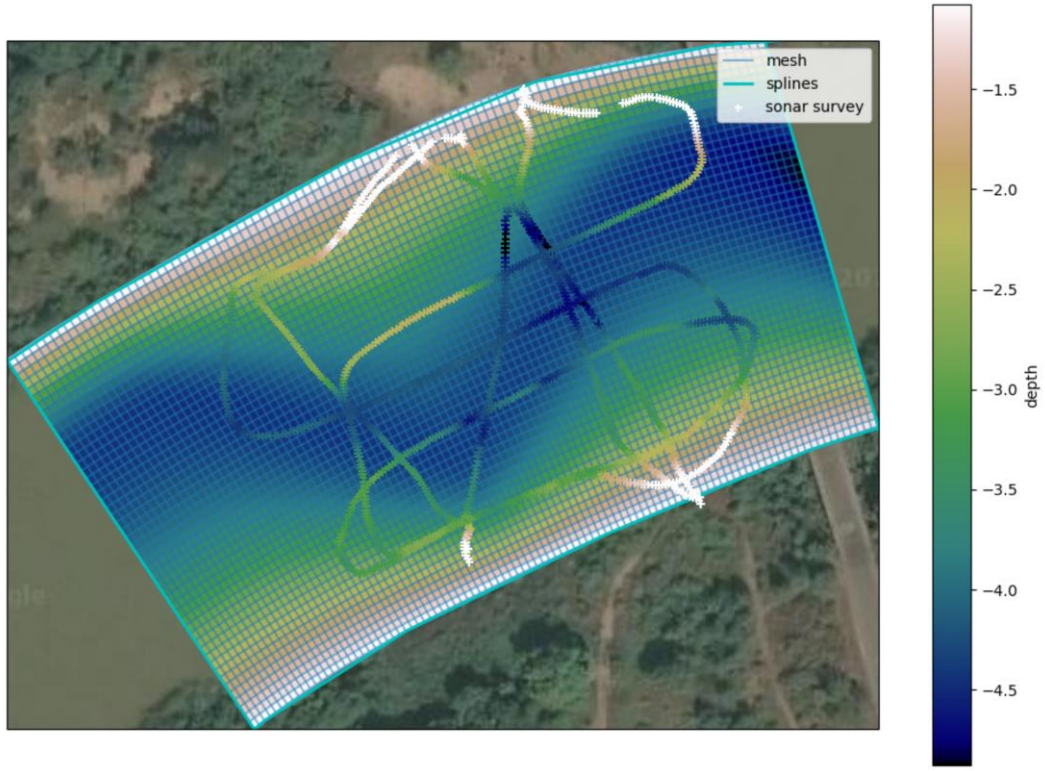
How does it work?

Software (all free and open source)

- OpenDroneMap (for dry-bed)
- ORProfile (for interpretation of alluvial streams, conveyance / wetted profile)
- QGIS for integration and presentation







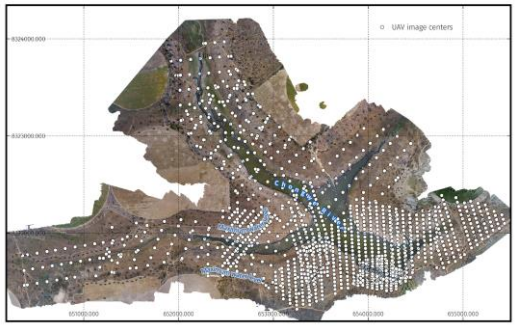
How does it work?

Procedure

- Set up **base station** (GNSS)
- **Dry:** flight planning
- **Wet:** survey planning (equally spaced lines / contours)
- Perform flights / bathymetry tracks / control points / lines
- Office work: make wet bathymetry / dry bathymetry
- Merge

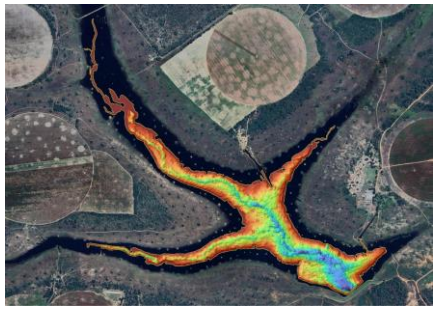
Control points/lines

Wet survey

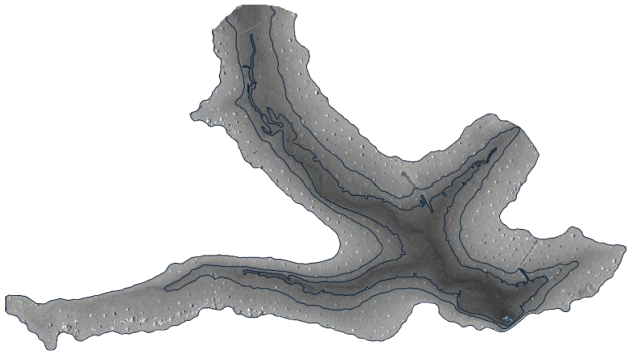


Dry survey

Dry bathymetry



Wet bathymetry



Ray reservoir Zambia

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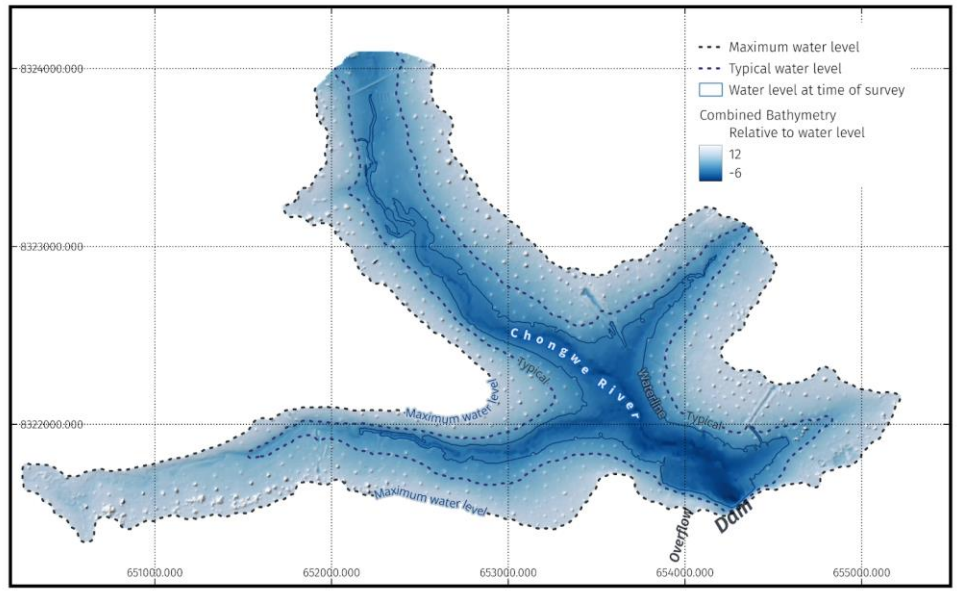
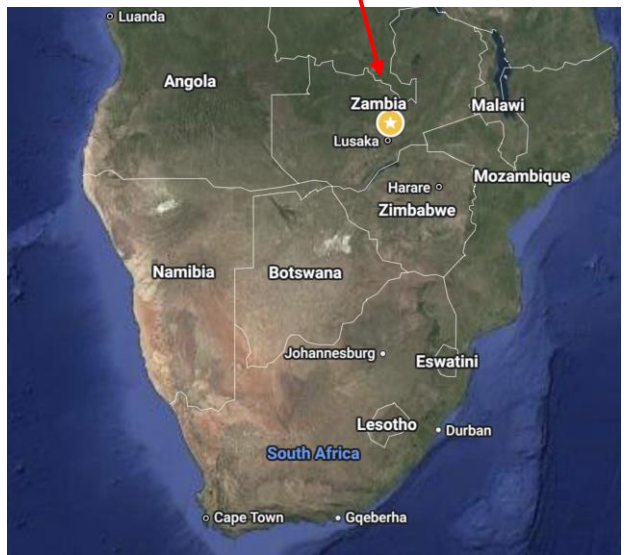
Products for use cases

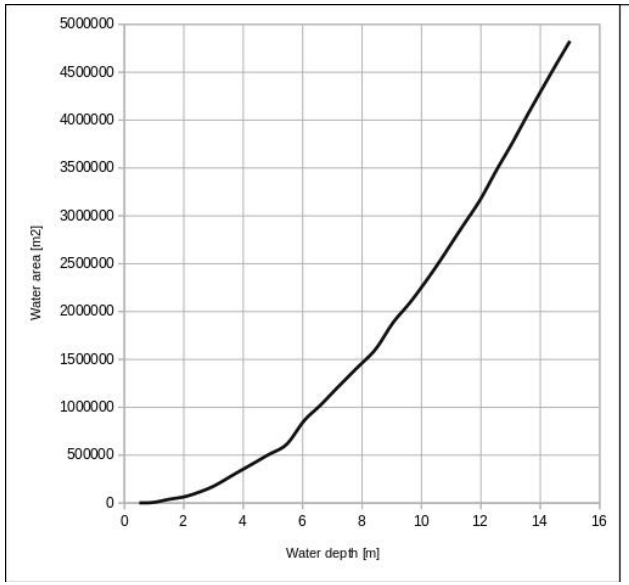
Demonstration case: Ray reservoir – Zambia (~5 days surveying)

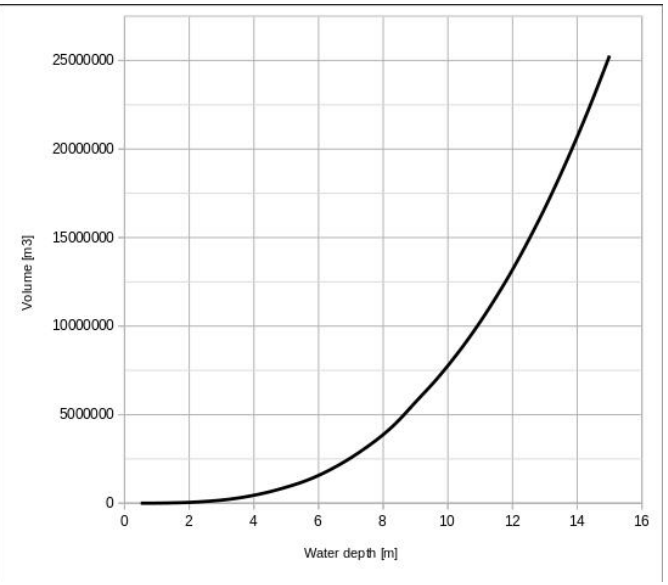
- Maps
- Hypsometry (stage – area / stage – volume)
- Time series (if combined with water level or area observations)

~ 3 km









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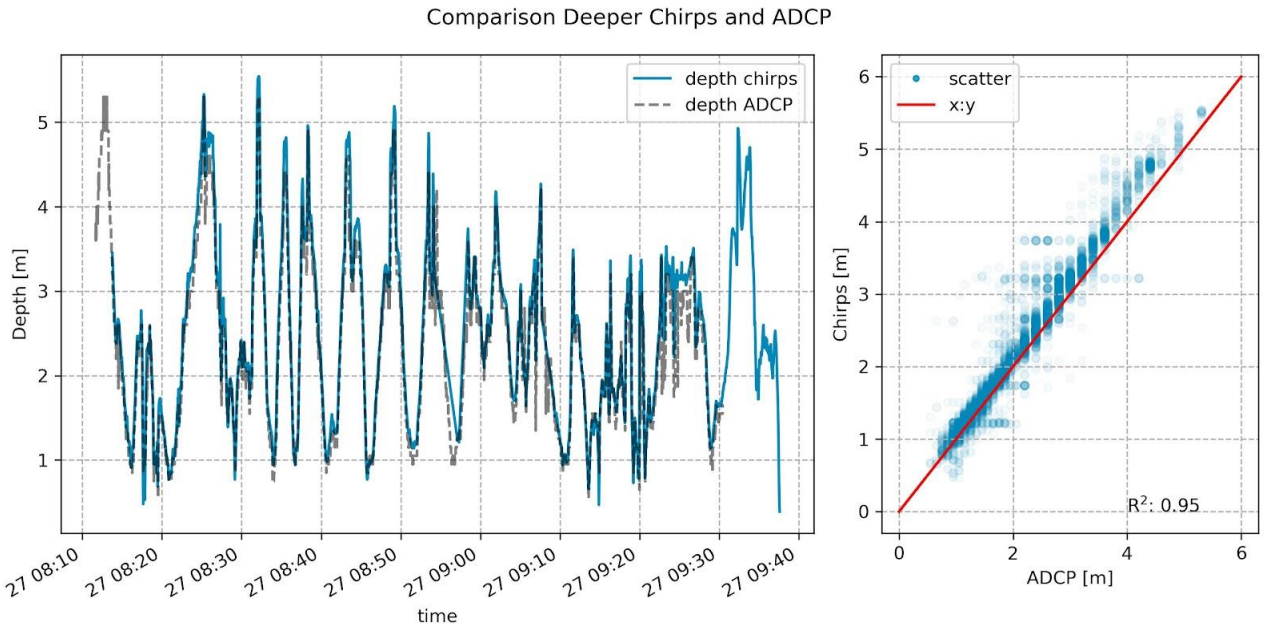

Validation

- ADCP tracks
- Difference less than 20cm, explainable by bottom-track resolution of ADCP (also 20cm)

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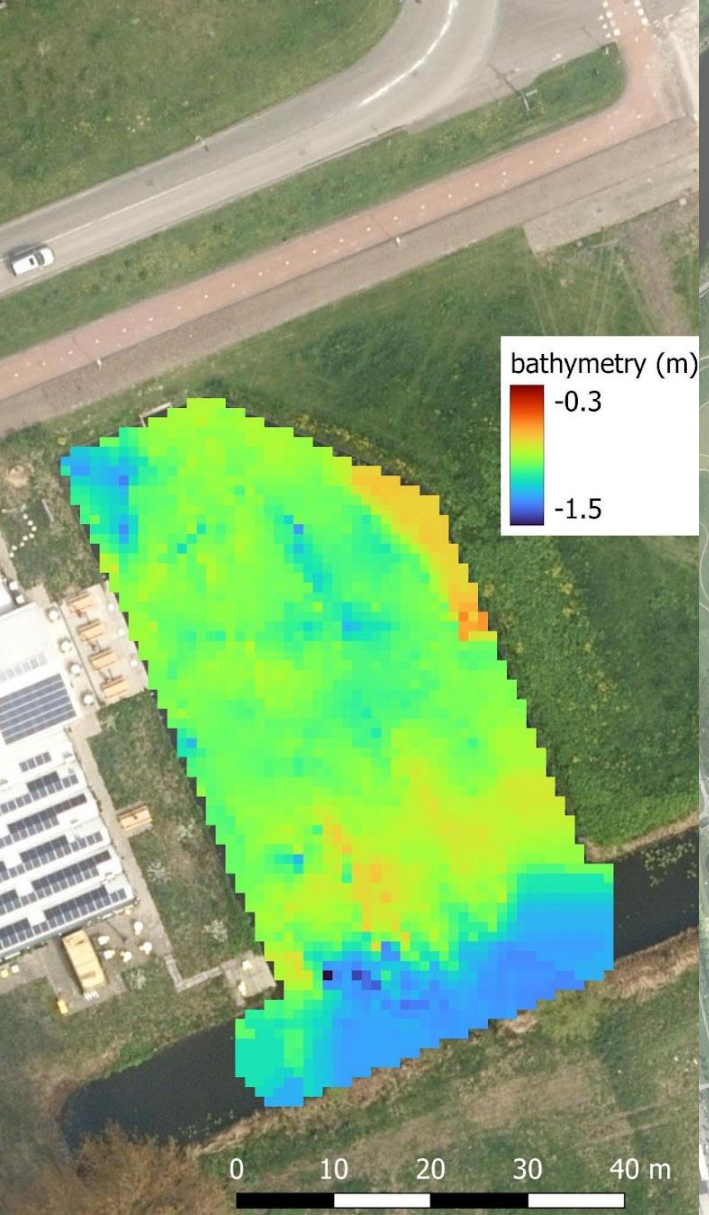

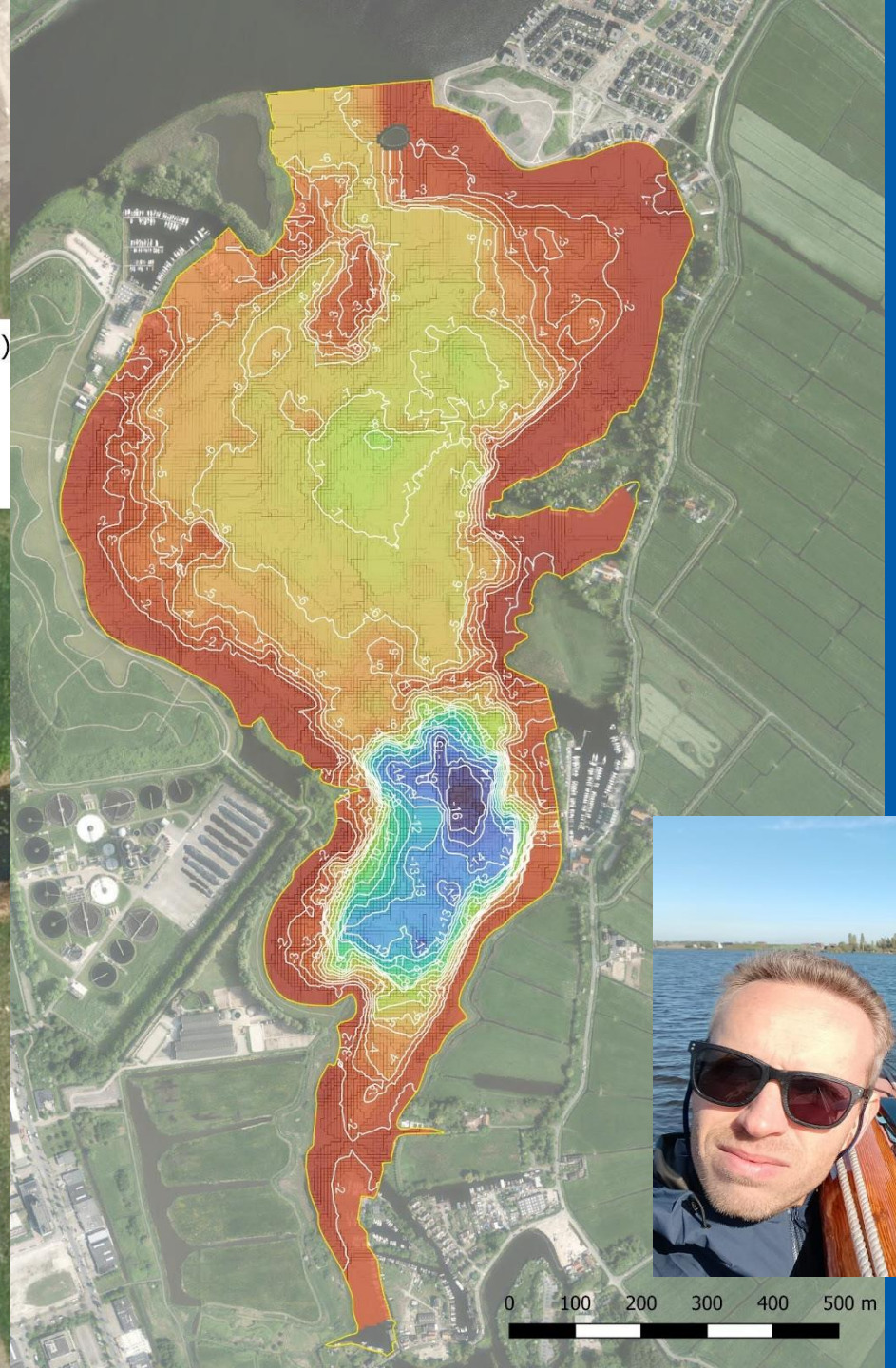

Using the tools

- Small pond
- Mooie Nel

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Item	Unit cost	nr	Total cost
Tripod	$150.00	1	$150.00
fish finder	$400.00	2	$800.00
fish finder clamp	$70.00	1	$70.00
GNSS sets + XLR radio	$853.00	2	$1,706.00
20Ah power banks	$20.00	2	$40.00
Android phone	$150.00	2	$300.00
Boat	$2,500.00	1	$2,500.00
2.5Pk engine	$1,000.00	1	$1,000.00
Drone DJI Mavic 3	$2,000.00	2	$4,000.00
Extra batteries	$165.00	5	$825.00
Small generator (on petrol)	$150.00	1	$150.00
SD card	$20.00	1	$20.00
Landing pad	$10.00	1	$10.00
Several cables+spares (USB-C, OTG)	$100.00	1	$100.00
Total costs			**$11,671.00**

Local affordability

- Investment costs **< 12,000 US$** including spare materials
- Only wet? Only **about 3,000 US$**
- Incidental costs per survey, 2-5 km^2 reservoir: ~10,000 US$
  - Personnel
  - Equipment / boat / vehicle hire
  - Travel
- With experience and scaling incidental costs will go down to **$3,000 - 5,000** per survey

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Status, way forward

- Affordable local service is possible
- The quality of results is (very) high
- Loose software components, integration would make things easier (QGIS plugin?)
- Paper in the making
- First possible client: World Bank Zambia

Discussion

- Costs of materials and TCOO is very low, but...
- ...integrated bathymetry surveying requires **significant new skills**
- Potential for several end users beyond NHMSs (hydropower, irrigation, IFIs)

Offer as a service by **local entrepreneur**?

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Thank you.

Further reading:
on hardware design and set up + hookup guide
https://www.linkedin.com/pulse/local-affordable-bathymetry-service-hardware-rainbow-sensing-ki5te/?trackingId=avySRNVW3sj7Q9PaCyNafw%3D%3D

Full survey experience
https://www.linkedin.com/pulse/local-teams-global-impact-bathymetry-as-a-service-zambia-myj7e/?trackingId=tQnrmmzAKZdtou86uzriLg%3D%3D

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