HYDR4U

Sustainable Small-Scale Hydropower in Central Asia

hydrosolutions

Accountability & Transparency through Water-Energy-Food Nexus Accounting in Central Asia

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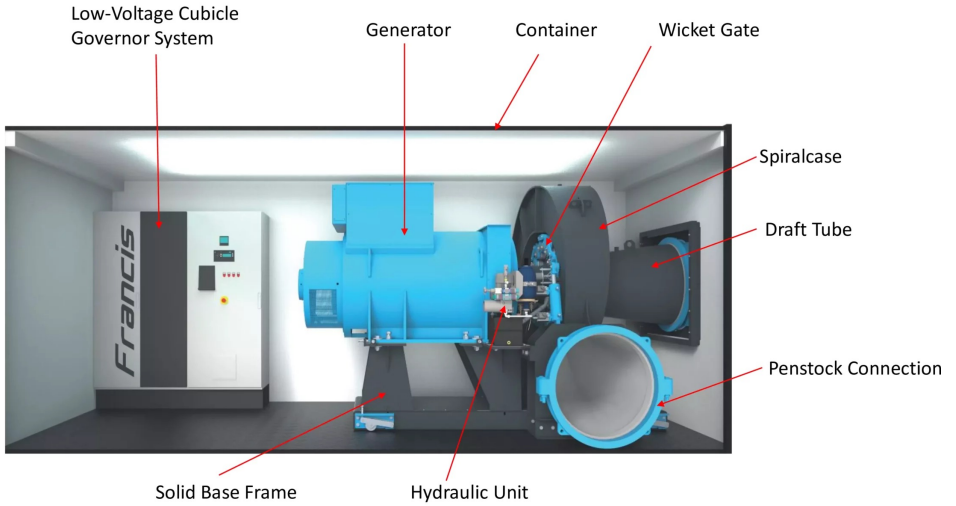
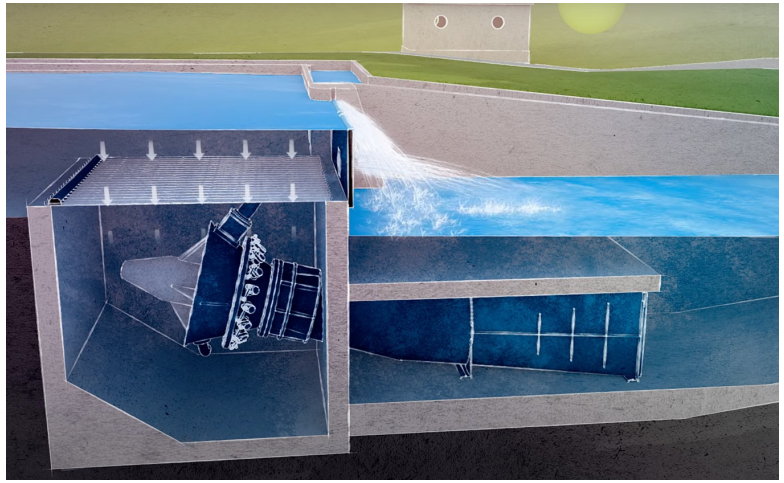
H2020 Hydro4U Project

- Hydro4U aims at demonstrating European small hydropower equipment and technologies in Central Asia thus contributing to a sustainable and climate-resilient future for the region.
- Installation of two demo plants. 500 kW low-head eco-friendly run-of-river plant (Hydro Shaft Power Solution) & 2 MW medium-head plant (Francis Container Power Solutions)
- HSPS in Atbashy River, Naryn Catchment (KYG) and FCPS in Shakhimardan enclave (UZB)





Source www.hydro4u.eu

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Central Asia Regional Characterization

- Large endorheic river basins of southern Central Asia are shared by AFG, KAZ, KYG, UZB, TJK and TKM
- Area 1.5 mio. km^2, approx.
- Climate characteristics: 45% arid, 25% semi-arid, 19% sub-humid, 11% humid
- Population 100 mio., approx.
- > 90% of available runoff used in irrigation on 85’000 km^2

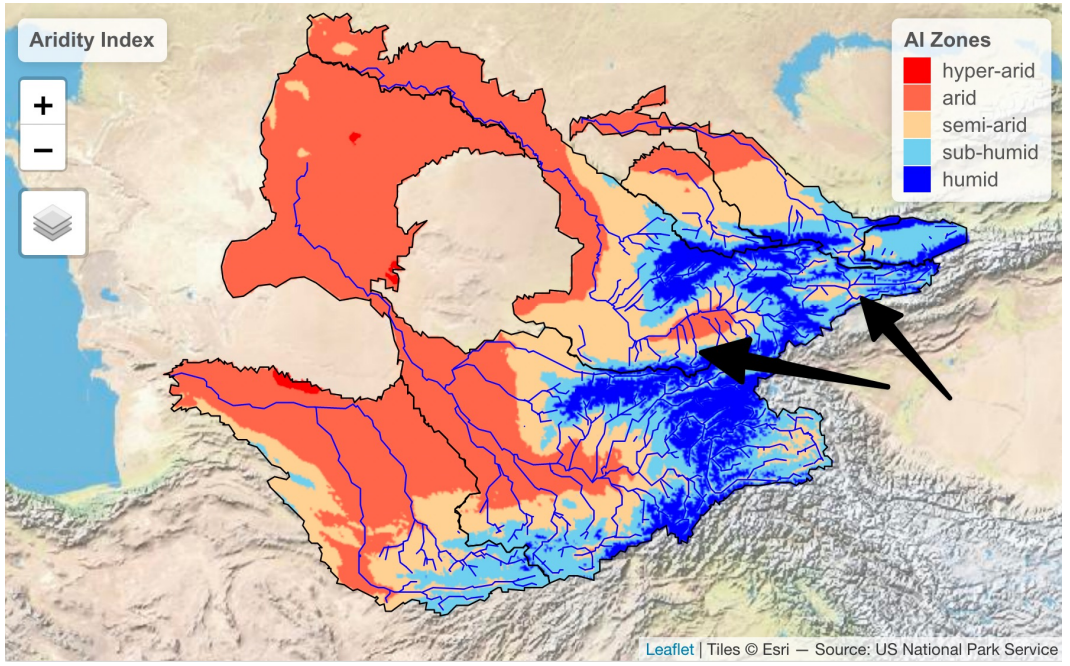

Figure 1 The aridity index over the large river basins in semi-arid Central Asia. River basins are from HydroSheds, climatology data is from CHELSA High-Res. Climate Data and aridity index class definition is from Ponce, 2000 ($0 < \phi < 0.75$ = humid, $0.75 < \phi < 2$ = sub-humid, $2 < \phi < 5$ = semi-arid, $5 < \phi < 12$ = arid, $\phi > 12$ = hyper-arid).

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WEF Nexus in Central Asia

- Figure shows flow of water-related information at regional & national levels between organizations. It reflects the nexus.
- Precise water monitoring & accounting remains a challenge as traditional monitoring throughout the region.

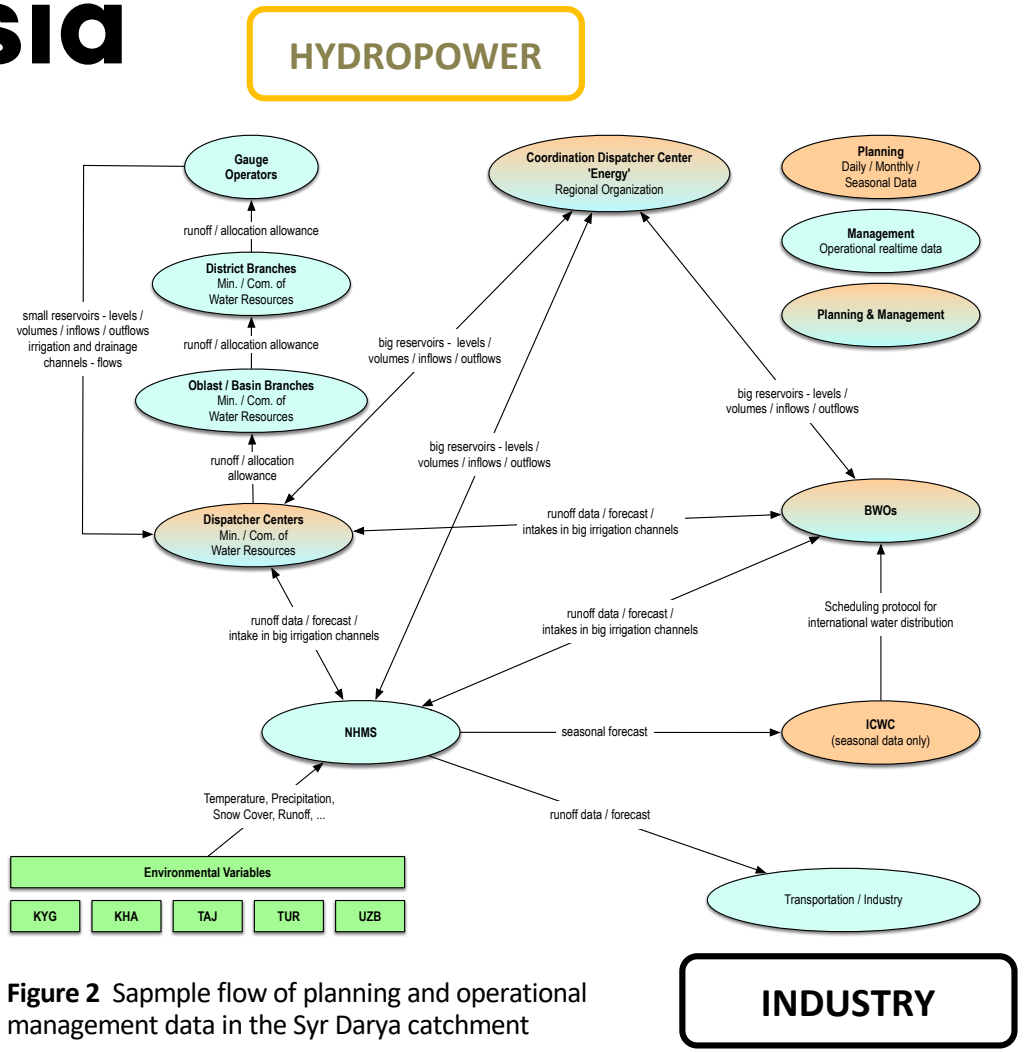

Figure 2 Sapmple flow of planning and operational management data in the Syr Darya catchment

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Remote Sensing for Agriculture & Irrigation Performance Monitoring

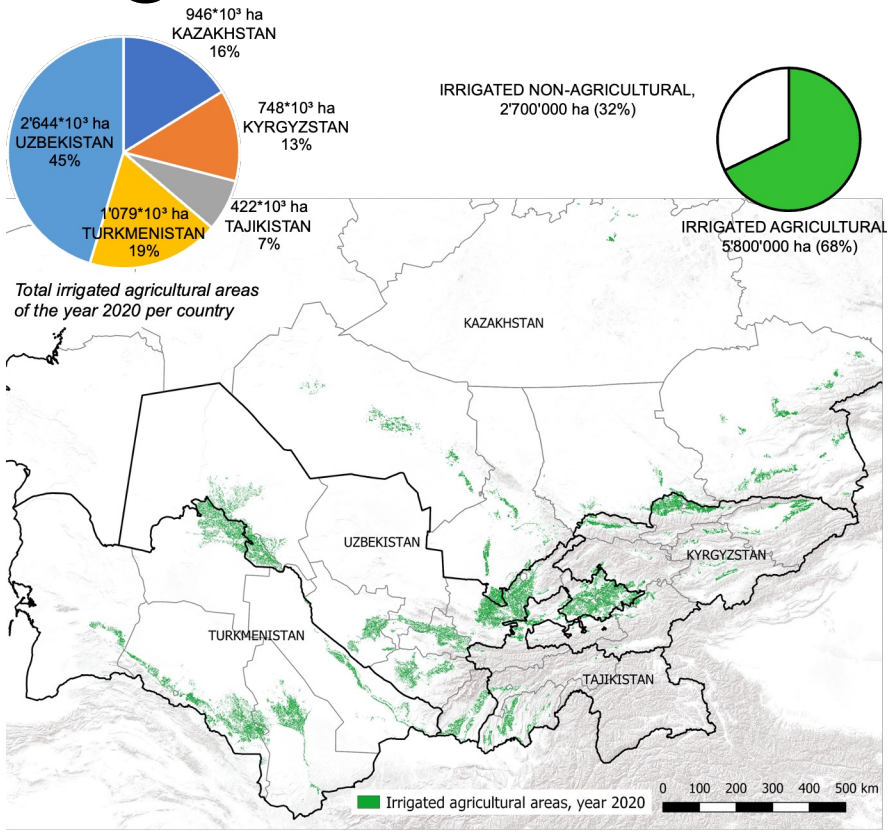

Figure 3 Mapping of irrigated areas (Sentinel-2 and Landsat, 30 m resolution, see Ragettli et al., 2018) between 2016 – 2020. Map of 2020 shown. Urban gardens account for one third of total irrigated area.

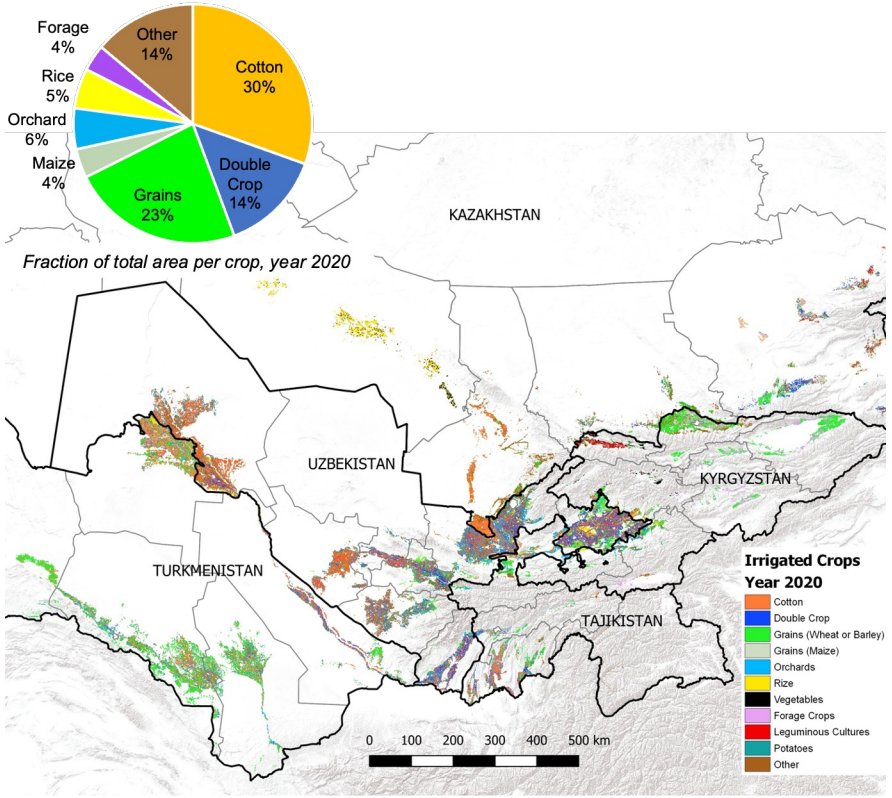

Figure 4 Crop dissagregated areas (Sentinel-1 and Sentinel-2, 30 m resolution, approach using unsupervised and semi-supervised learning steps, Ragettli et al. 2021) between 2016 – 2020. Map of 2020 shown.

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Detailed Scheme-Level Diagnostics

Diagnostics of

- irrigation efficiency
- identification of water deficit areas
- unofficial scheme extensions

Allows for improved irrigation scheduling, the prioritization of investments, and monitoring of irrigation compliance.

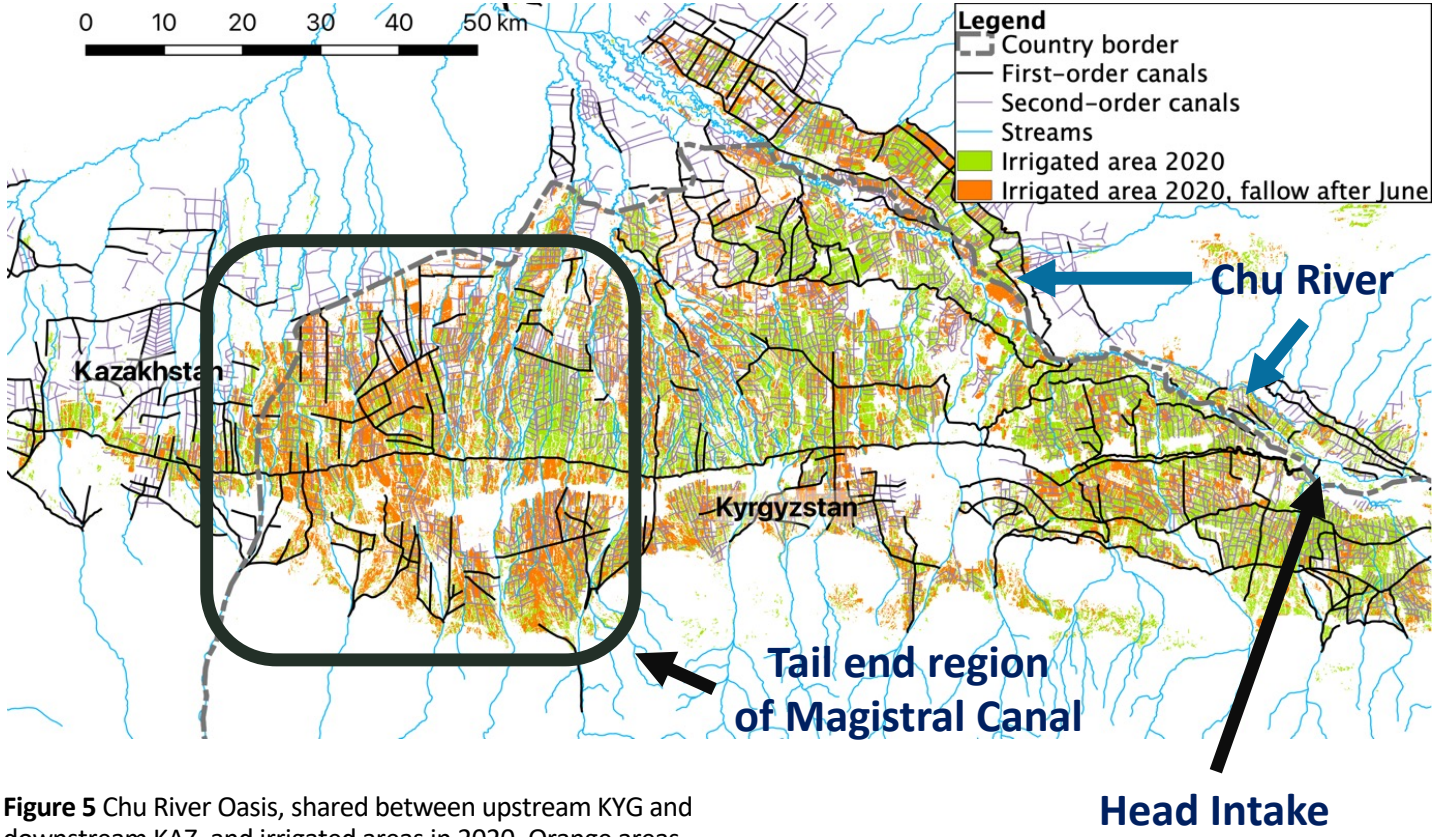

Figure 5 Chu River Oasis, shared between upstream KYG and downstream KAZ, and irrigated areas in 2020. Orange areas are fallow after June.

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Web-based Solutions

CropMapper - Monitoring

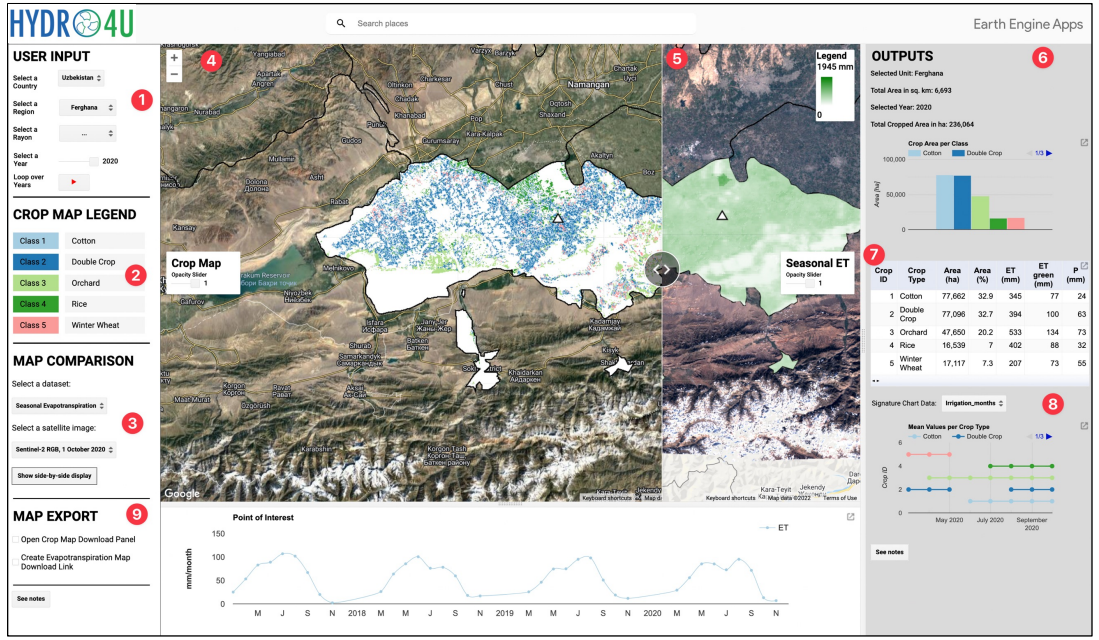

Figure 6 CropMapper Central Asia screenshot. Allows monitoring and water balance assessments for particular domains of interest that can be selected by users.

Count4D - Planning & Accounting

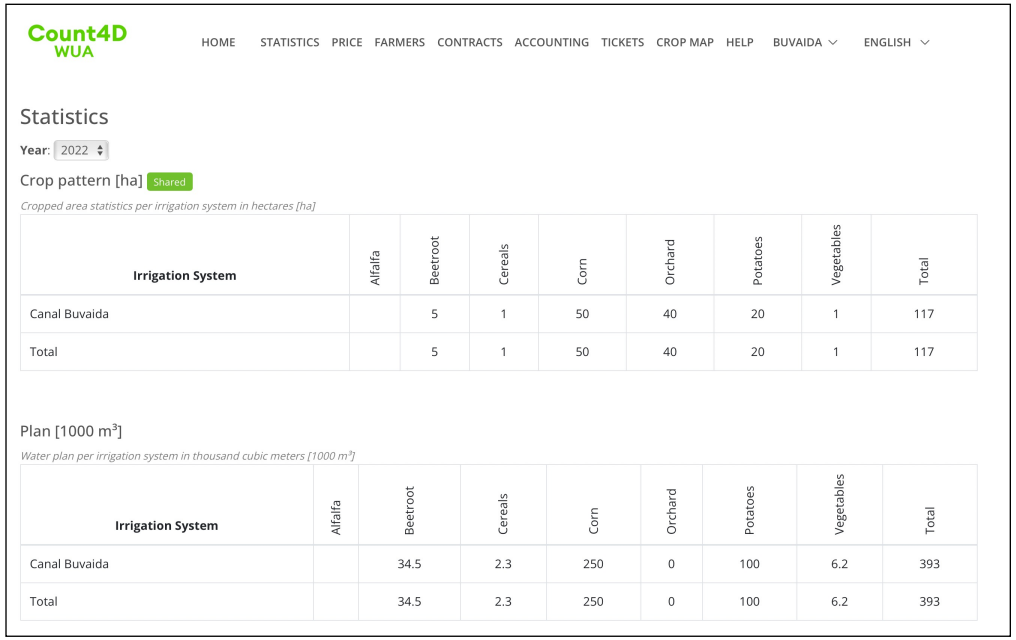

Figure 7 Screenshot of the Count4D tool. Pre-season water planning is possible on a supply system basis. Furthermore, it allows water user specific operational data to be acquired, managed and analyzed for overview statistics and water accounting, including a ticketing system for water supply fees.

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Conclusions

Opportunities

- Modern water monitoring methods provide cost-effective and scalable opportunties for accounting.
- No local hardware required except for computer connected to the internet.

Challenges

- Operationalization is a lengthy process as uptake is met with sceptisicm.
- Reasons include institutional intertia in agriculture with strong preference for status quo and lack of political will for modernization as well as, in some instances, hidden double accounting practices parallel to official ones.

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Thank you for your attention

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