

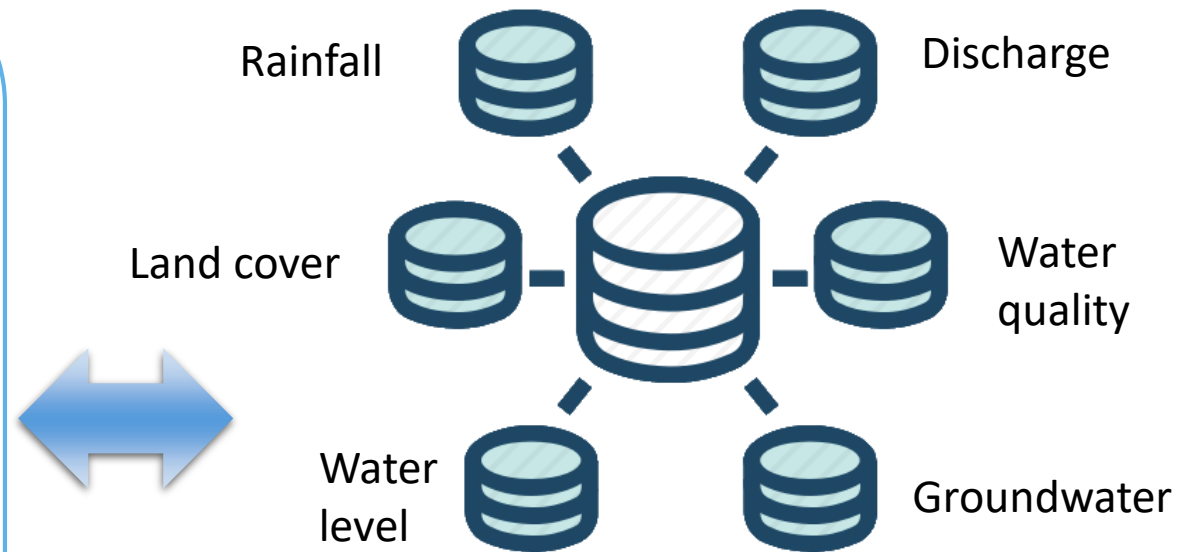
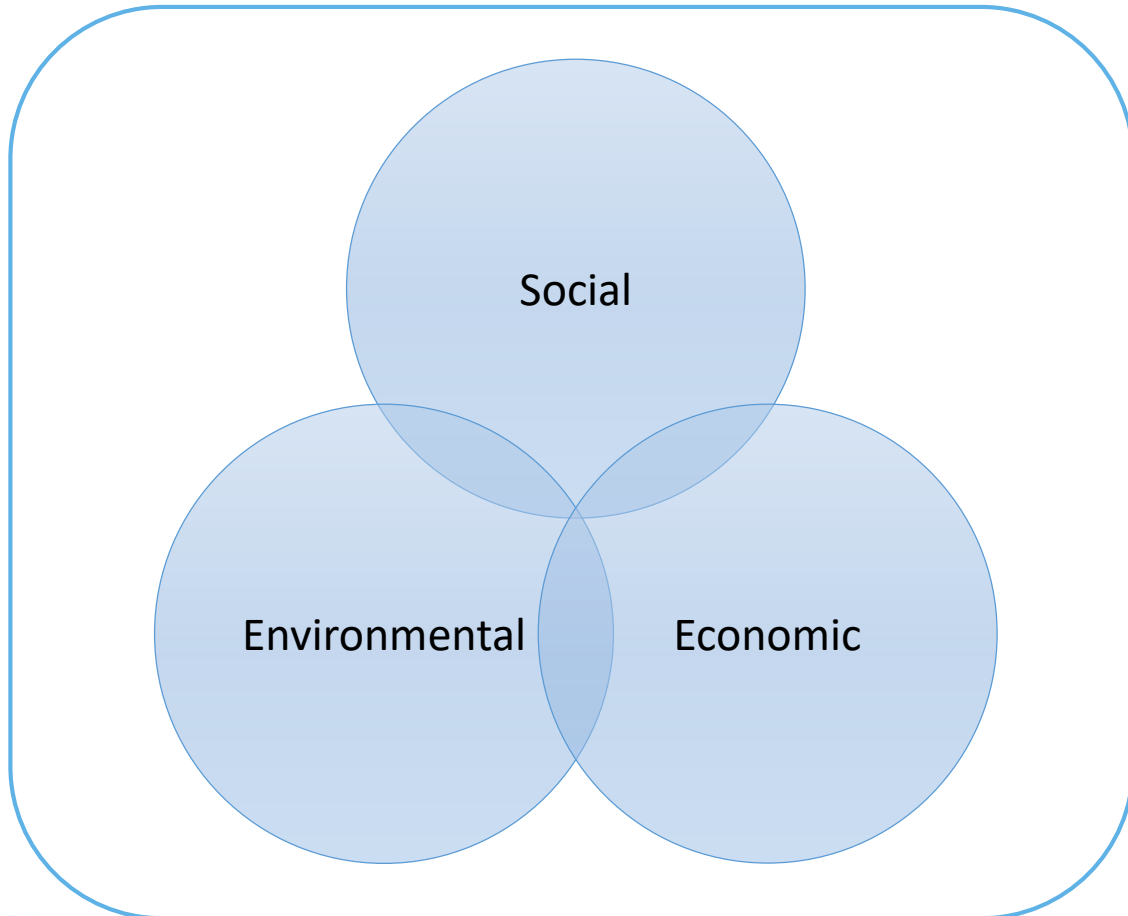
Validation of Expert and Citizen Science-based Smartphone Discharge Data

10th iEMSs Conference 2020

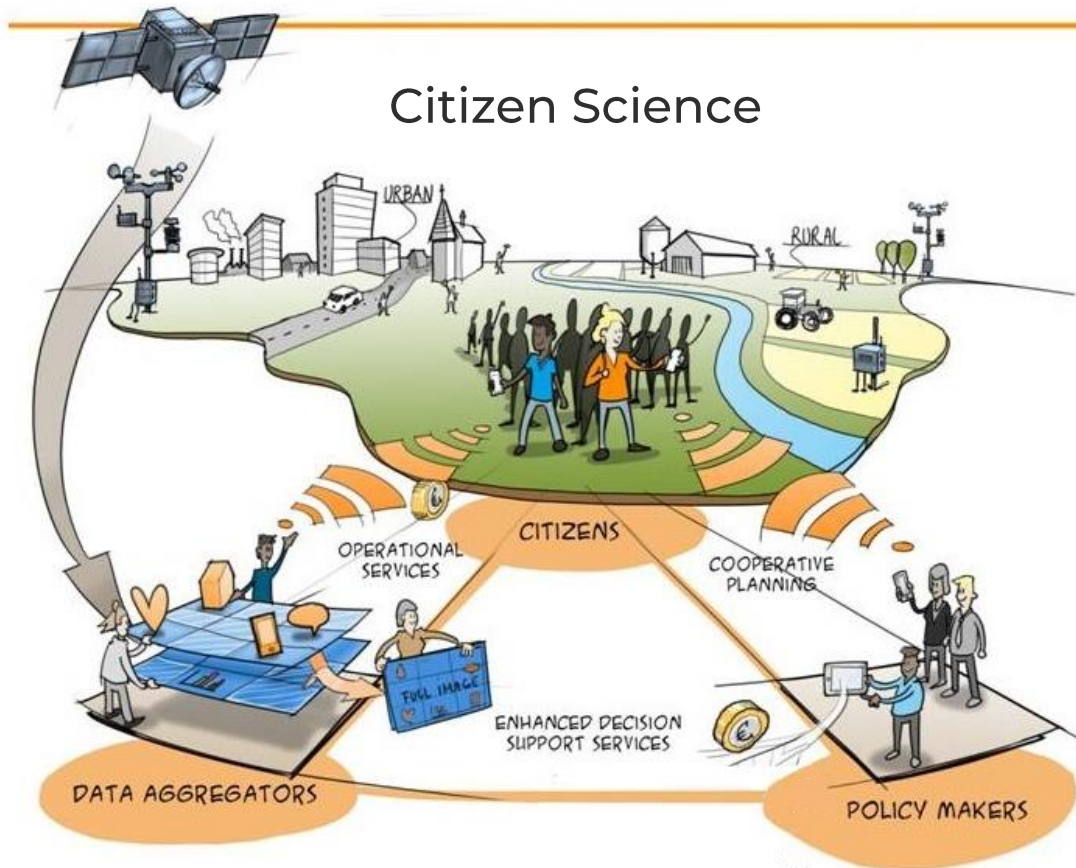
Raed Fehri, Patrick Bogaert, Slaheddine Khelifi, and Marnik Vanclooster

16-09-2020

Water resources management strategies



Data gaps, unavailability & poor quality!



Citizen Science (CS) is a complex process built on civic engagement into science, environmental monitoring, and capacity building.

- A promising source of information and data
- Cost-effective and useful in providing early warnings
- Increases awareness and empowers people
- However, CS data not (yet) used widely for official environmental monitoring and reporting

Water situation In Tunisia

- Water-related data unavailability is still an issue
- Existing monitoring networks are not spatially dense
- Rainfall and discharge databases suffer from data gaps and incomplete timeseries

Bases for citizens science ?

- Increase of young population
- Many NGOs are active and contribute to several domains including environment and water
- Growth of smartphone and internet culture across the country

The beginning



- In October 2018, we launched the Together4Water project
- The first Citizen Science initiative in the country, to be tested in Medjez El Beb region of the Medjerda catchment

Objectives

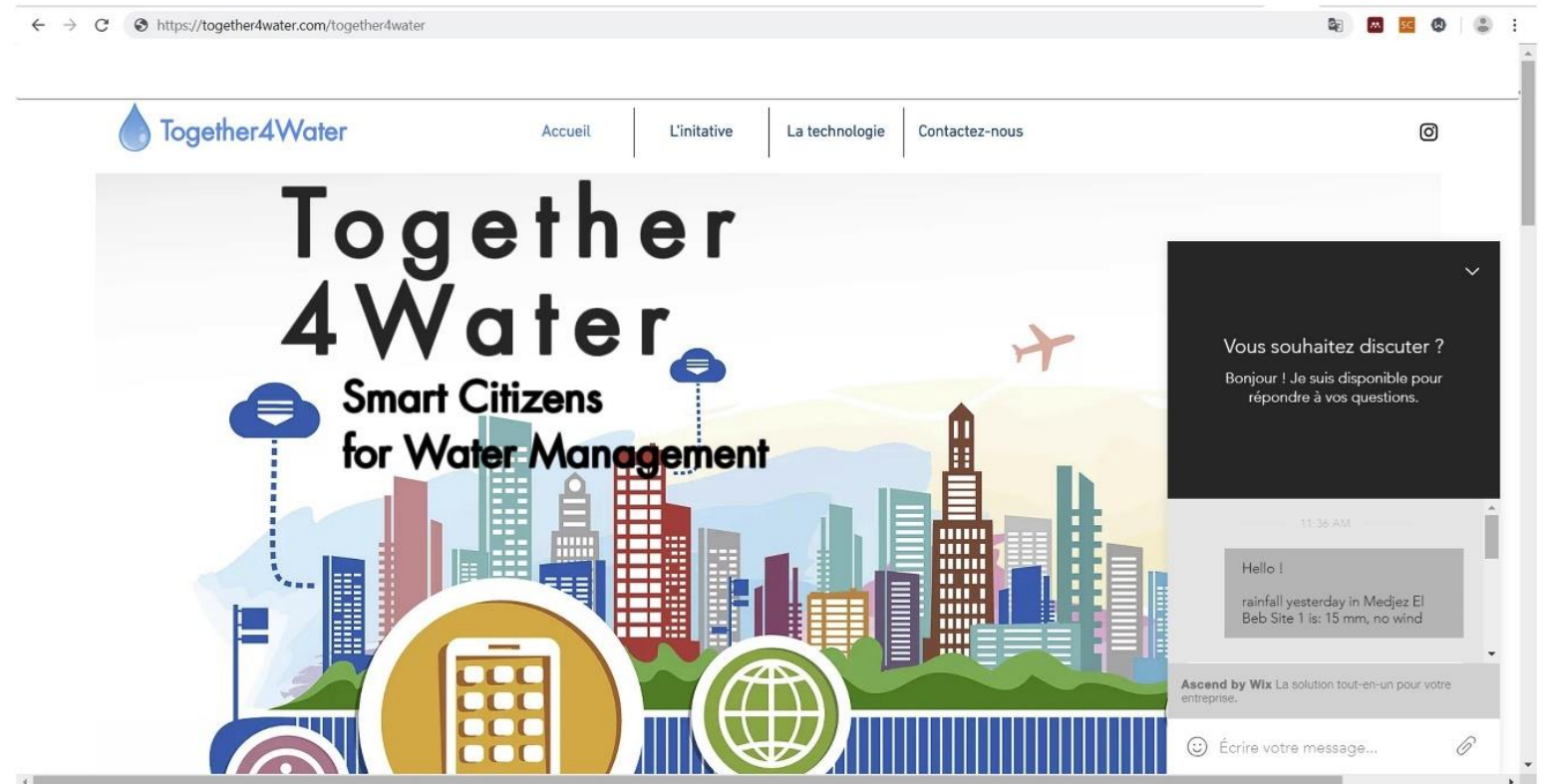
- Bringing everyday citizens into science through environmental monitoring
- Contribute to the existing local water databases: Rainfall, Water Quality and Discharge
- Capacity building of local communities and scope for a larger scale implementation

Step-by-step citizen science approach

1

Online Platform

- ✓ Informative
- ✓ User-friendly
- ✓ Communication-oriented



Step-by-step citizen science approach

2

Field preparation

- ✓ Sites selection
- ✓ Accessibility & Security check
- ✓ Bathymetry



Step-by-step citizen science approach

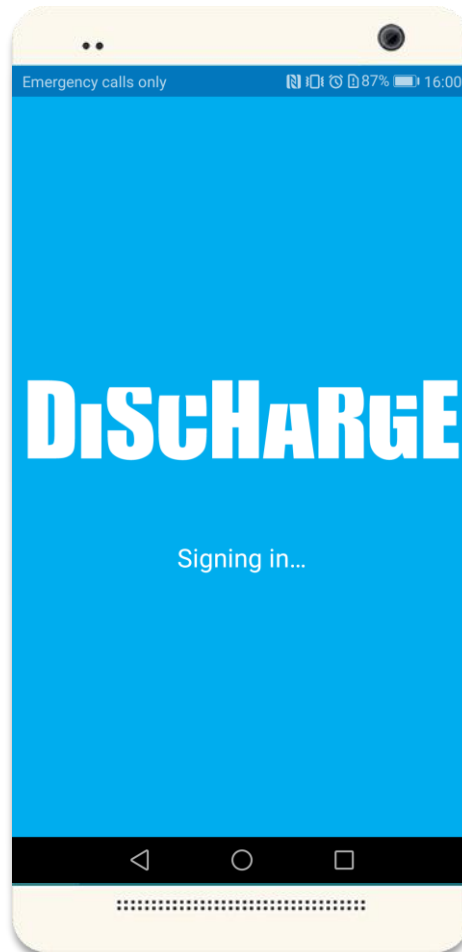
3

Field training

- ✓ Measurement tool
- ✓ Data transmission
- ✓ Environmental knowledge



Discharge app Setup



Available for free
on Play Store or on
www.discharge.ch



Disto s910

Discharge app Setup

New site

Measurements trend chart

No measurements for site

Cross-section & Markers



SETUP

No cross-section defined

EDIT CROSS-SECTION

No markers defined

EDIT MARKERS

Roughness* Required

720p

1080p

Video resolution

Manning-Strickler Roughness Coefficients

For stationary, regular discharges after expression of:

$$v = k_{st} * r_{hy}^{2/3} * I_E^{1/2}$$

v =bulk velocity, r_{hy} =hydraulic radius, I_E =hydraulic gradient line.

Roughness coefficients k_{st} : $k_{st}[m^{1/3}/s]$

Natural streams

River with "solid" bed, without irregularities	40
River bed with plants stuff	30-35
Riverbed with rocks and irregularities	30
Riverbed with a lot of mobilized rocks	28
Wild river with rocks, size of a head	20-28

Earth channels

Solid material smooth

OK

Set up Cross-section & Markers

INPUT PREVIEW

z [m]

y [m]

profile

shoreline

markers

shoreline fit

shoreline points

x [m]

y [m]

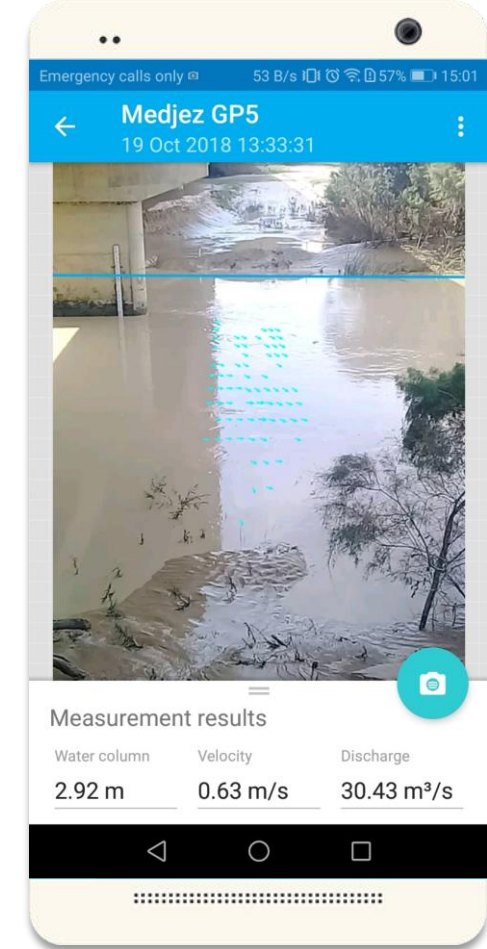
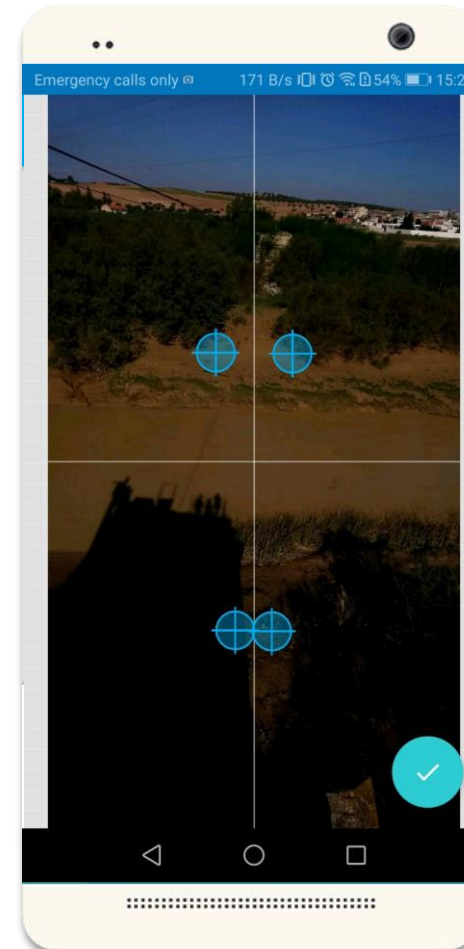
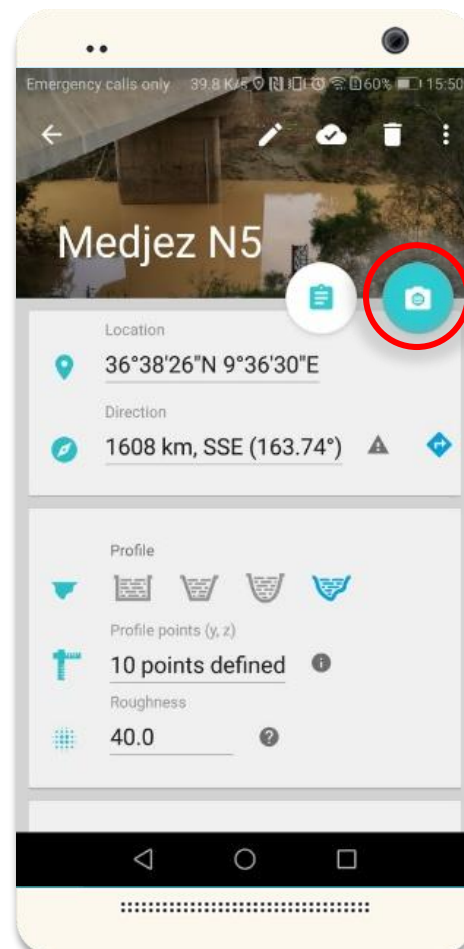
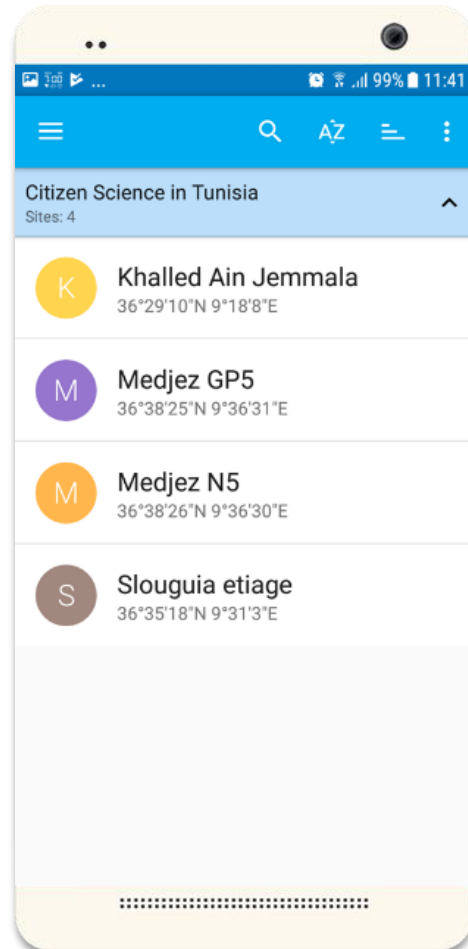
z [m]

BACK

CANCEL

FINISH

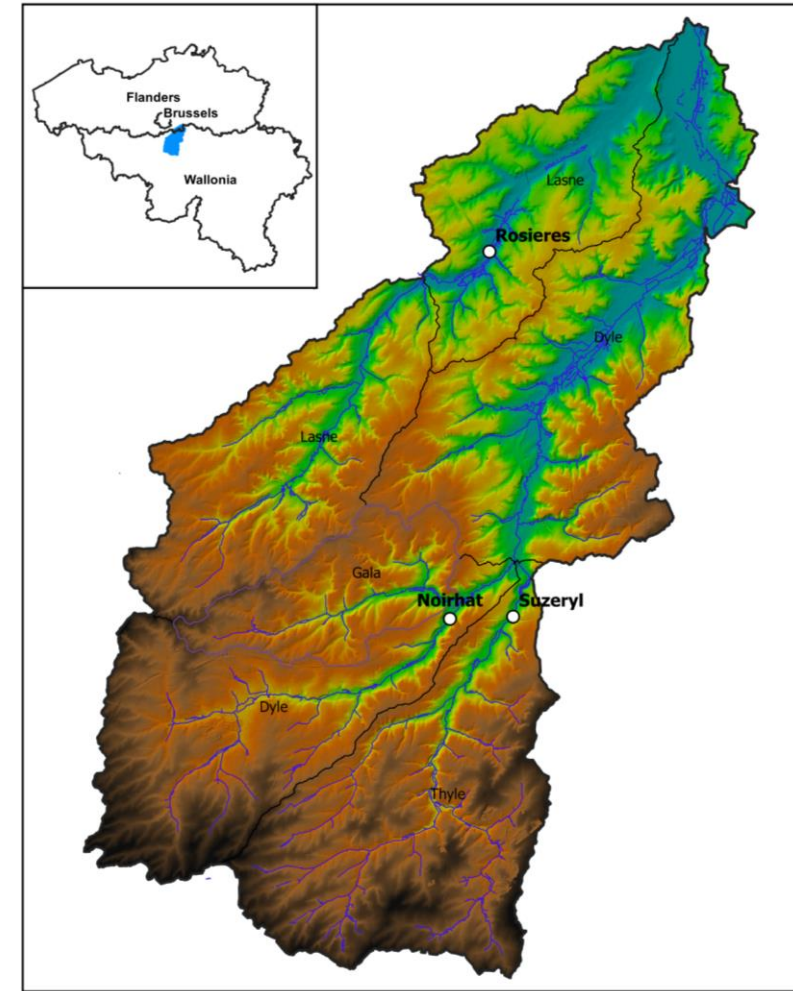
Discharge measurement



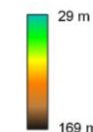
Expert user measurements

Belgium

- 3 sites were selected: Noirhat, Rosières, and Suzeryl.
- Measurement period: 3 months
- Official daily measurements are delivered by Aqualim project.



0 1 2 km

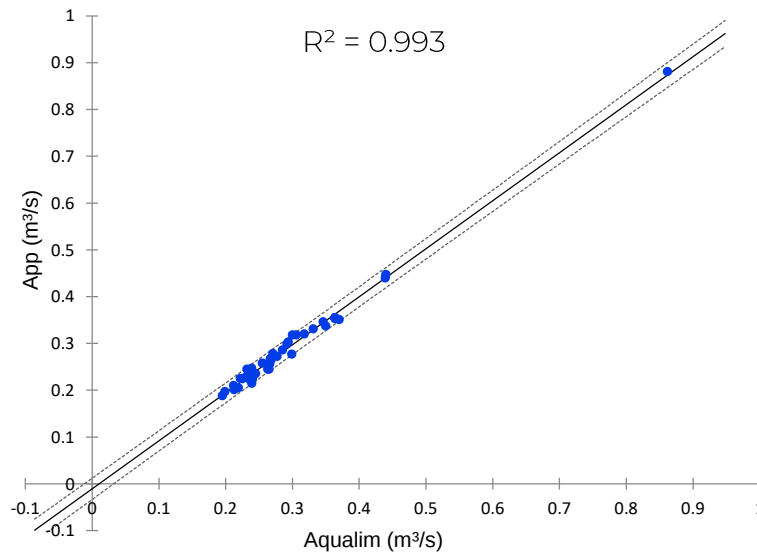


Legend

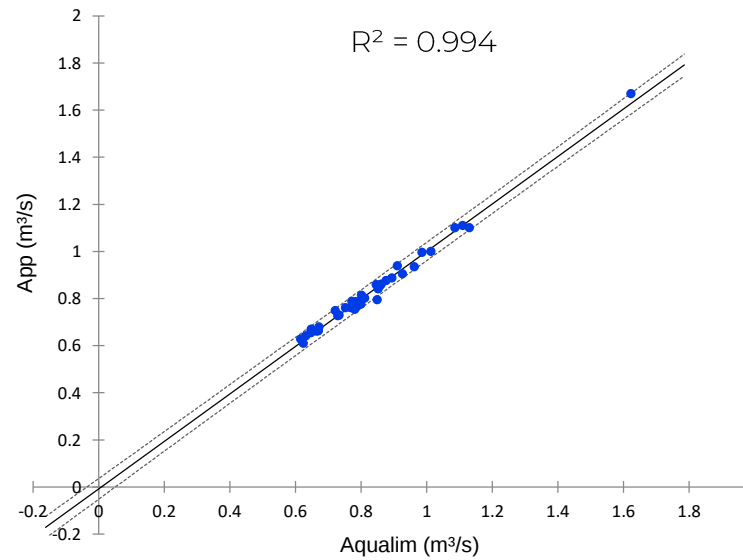
- Catchments
- Discharge Stations
- Rivers

Expert user measurements

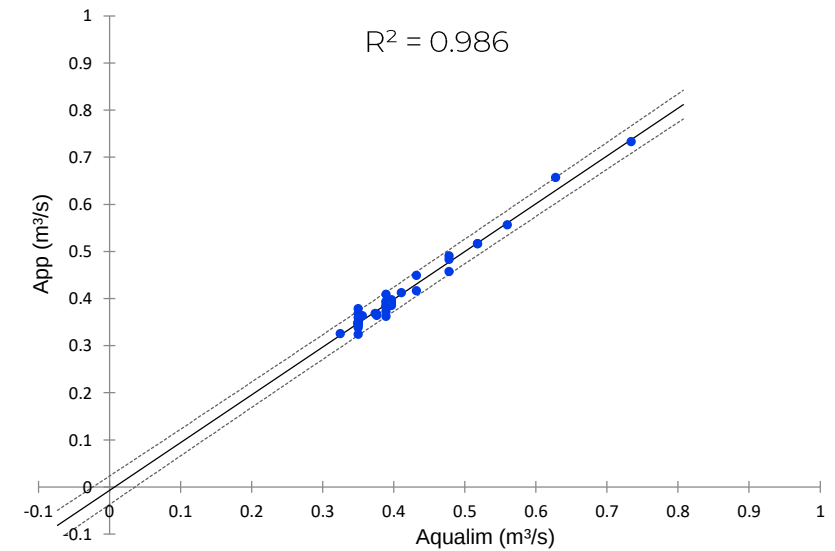
Noirhat



Rosières



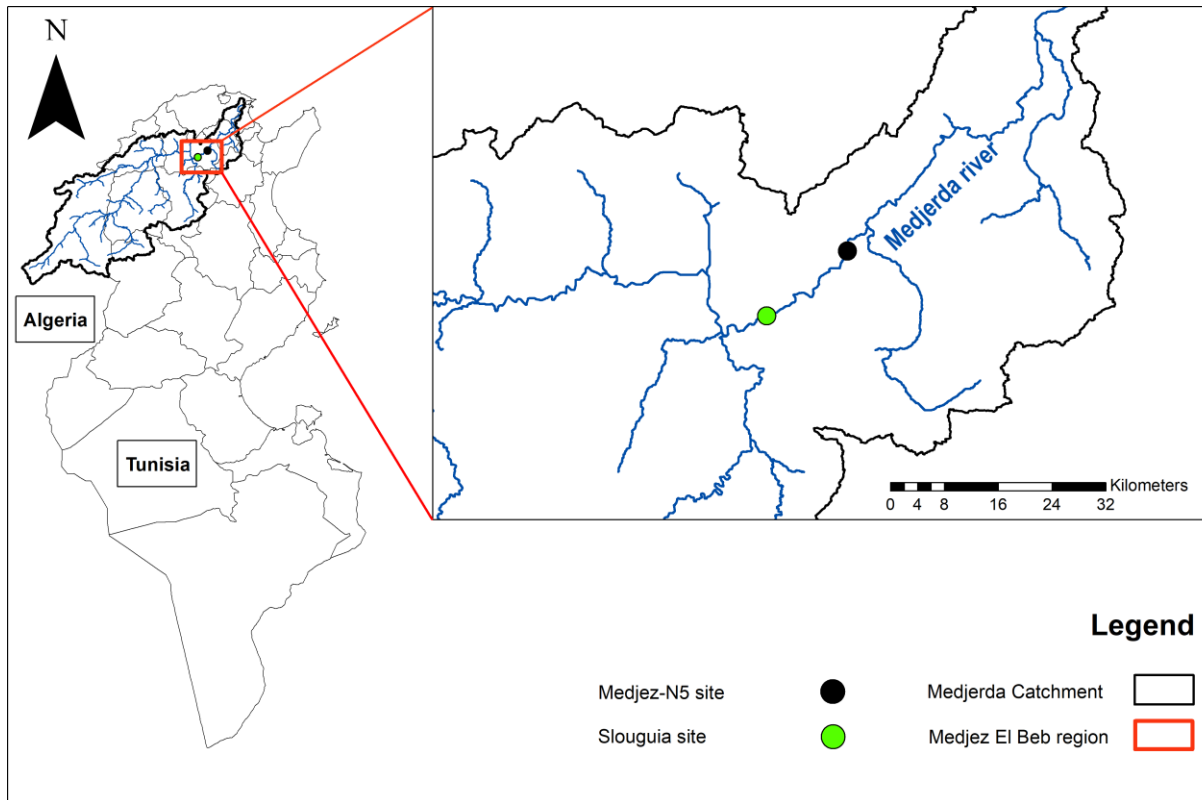
Suzeryl



Outcome

- Strong agreement between the expert user measurements and Aqualim observations.

Citizens' measurements



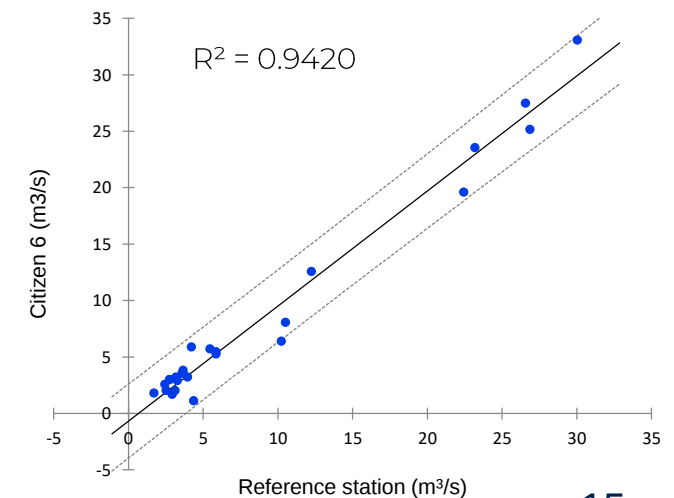
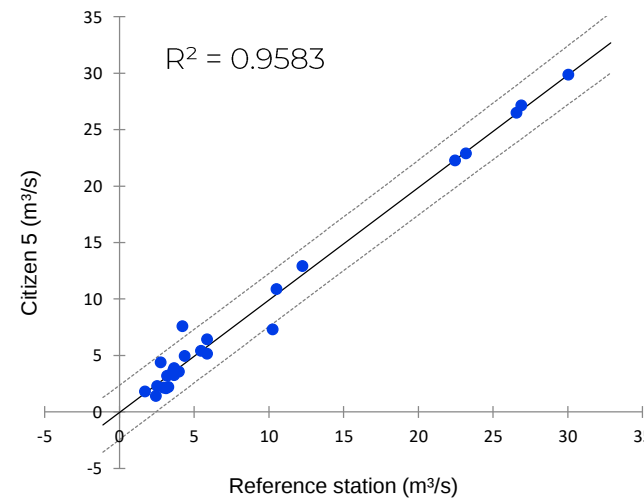
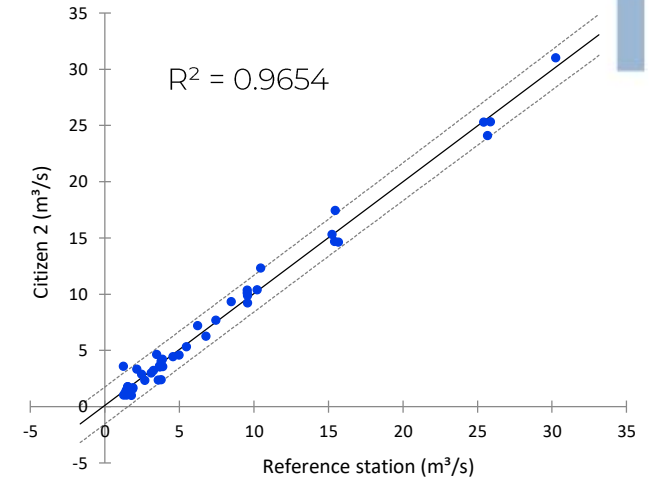
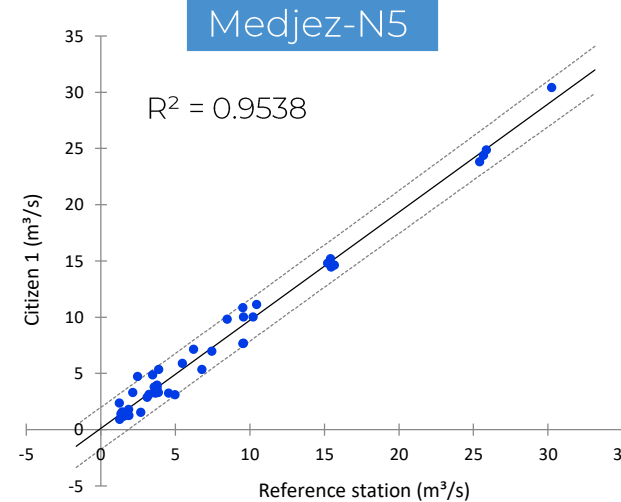
Tunisia

- The Medjerda: the most important river in Tunisia.
- Two sites were selected in Medjez El Beb region: Medjez-N5 and Slouguia.
- Official daily measurements are delivered by the Ministry of Agriculture.

Citizens' measurements

Outcomes

- Strong agreement between citizens data and official observations in low to medium discharge events
- Events $> 35 \text{ m}^3/\text{s}$ (4 events) were inconsistent mainly because of the initial sites setup (cross-section and markers locations)



Slouguia

Conclusions

- The Together4Water first citizen science campaign in Tunisia was successful at both scientific and social levels.
- The step-by-step citizens engagement approach showed promising results in motivating citizens in the Medjez El Bebb region.
- Discharge data collection using the “Discharge App” provided reliable outcomes that can be useful to complement the existing databases.
- The “Discharge app” showed slightly better performance with the expert user than with the trained citizens.

Outlook

- Scope aim at including more volunteers and a larger number of monitoring sites in other regions of the Medjerda catchment.
- Include non-trained citizens into the monitoring campaign to assess the quality of their measurements compared to the outcomes of the trained volunteers.
- An uncertainty/sensitivity analysis is required in order to assess the sources of errors related to the “Discharge app” measurements.



Thank you ...

