

Indigenous Community-Based Approaches to Environmental Justice Through Citizen Science

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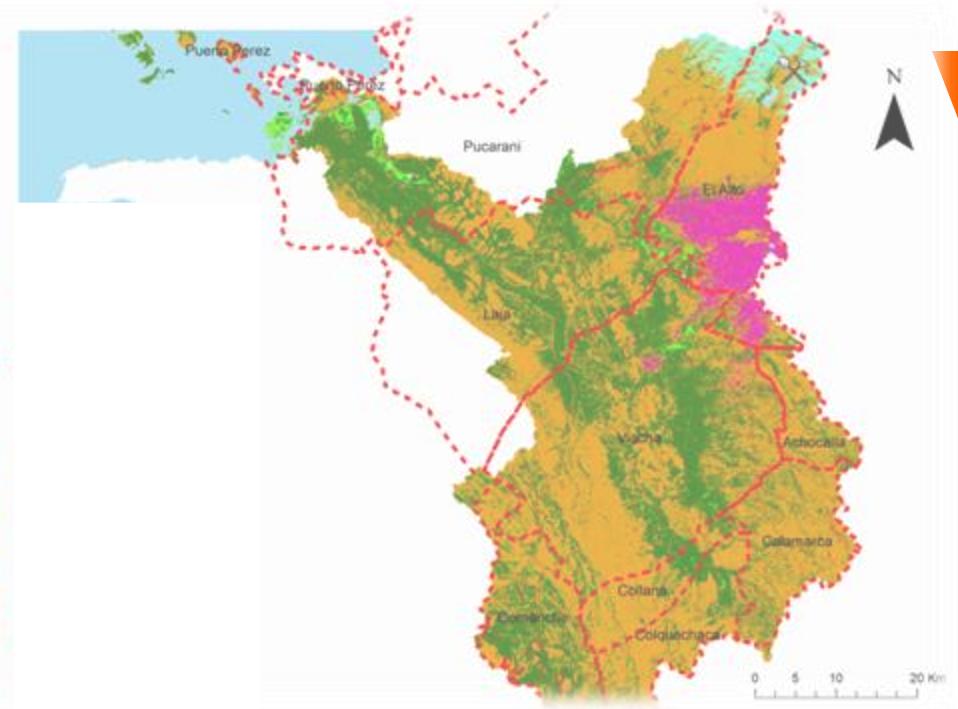
Oct 21th, 2025

Research question

How can citizen science water quality monitoring contribute to advancing environmental justice in Indigenous communities?



Case Study





Case Study Katari River Basin

Largest populated RB in Bolivia (1.3 million people)

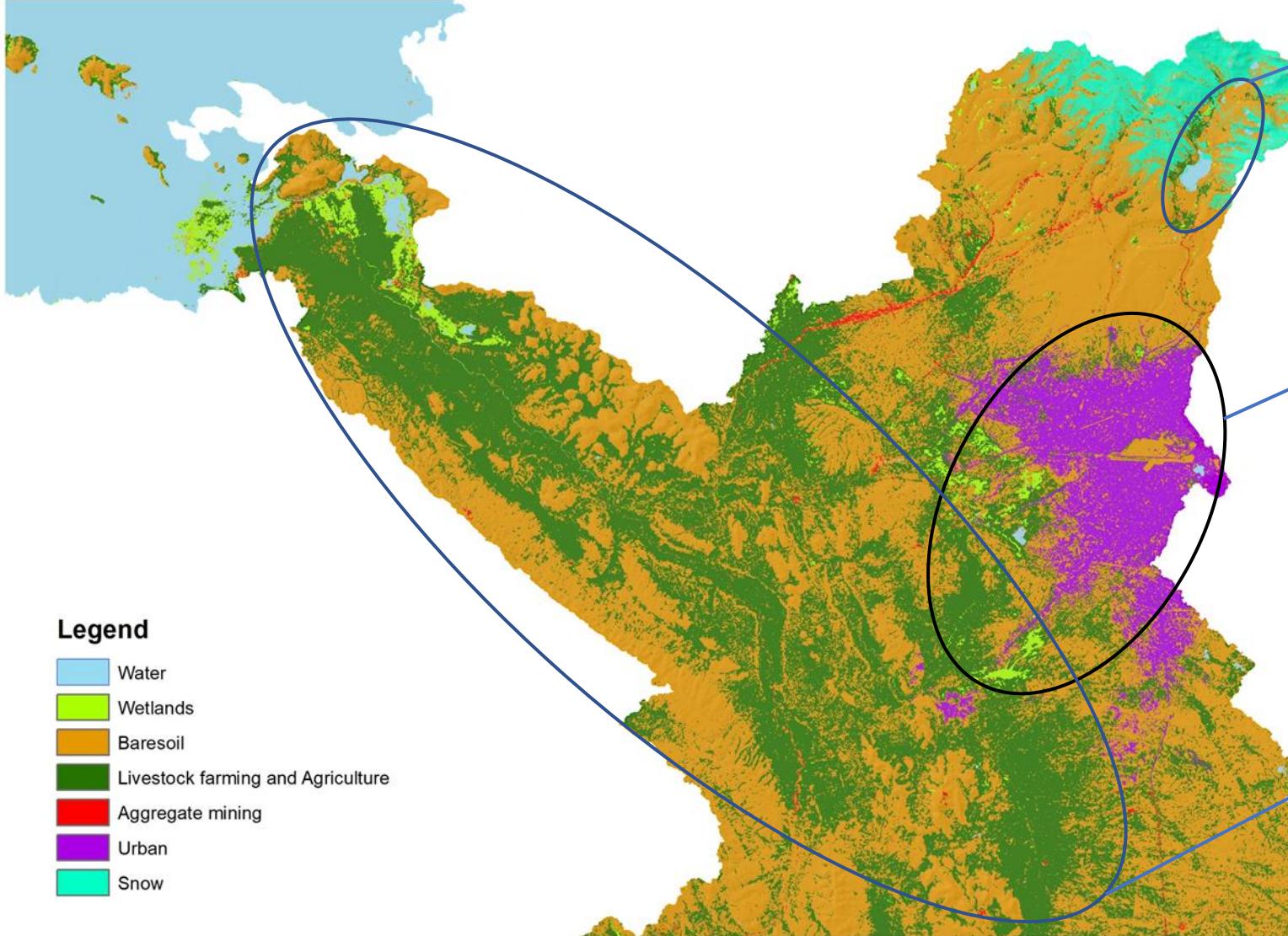
Discharge over Titicaca lake:
highest navigable lake in the world

largest fresh lake in South America

the most important water resource in the Andes region.

Environmental Driving Forces

Driving forces



1 Mining

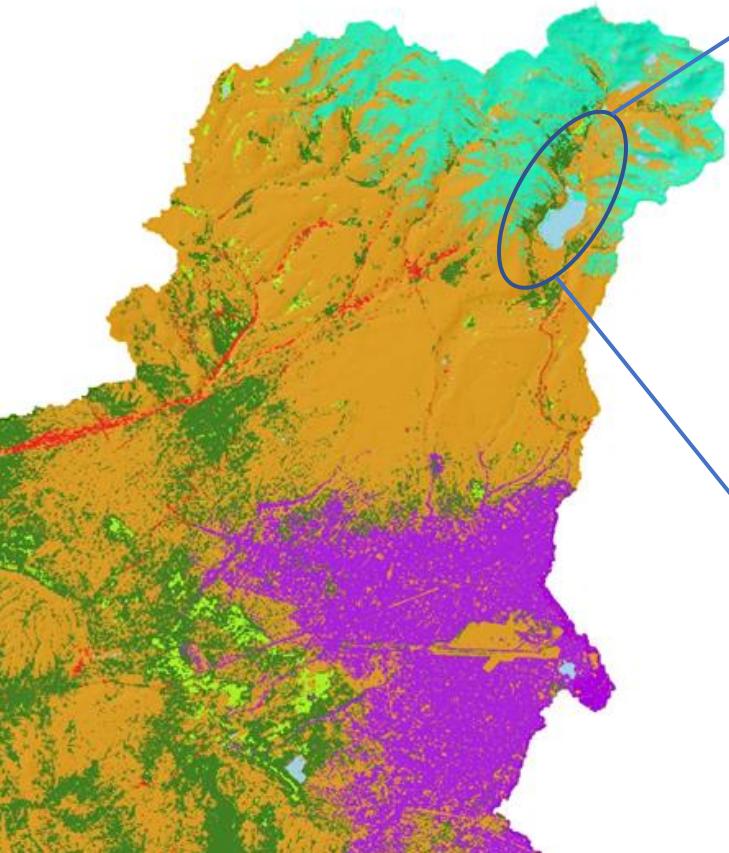


2 Urban and Industrial



3 Farming and Agriculture

1 Mining Region/Pressures



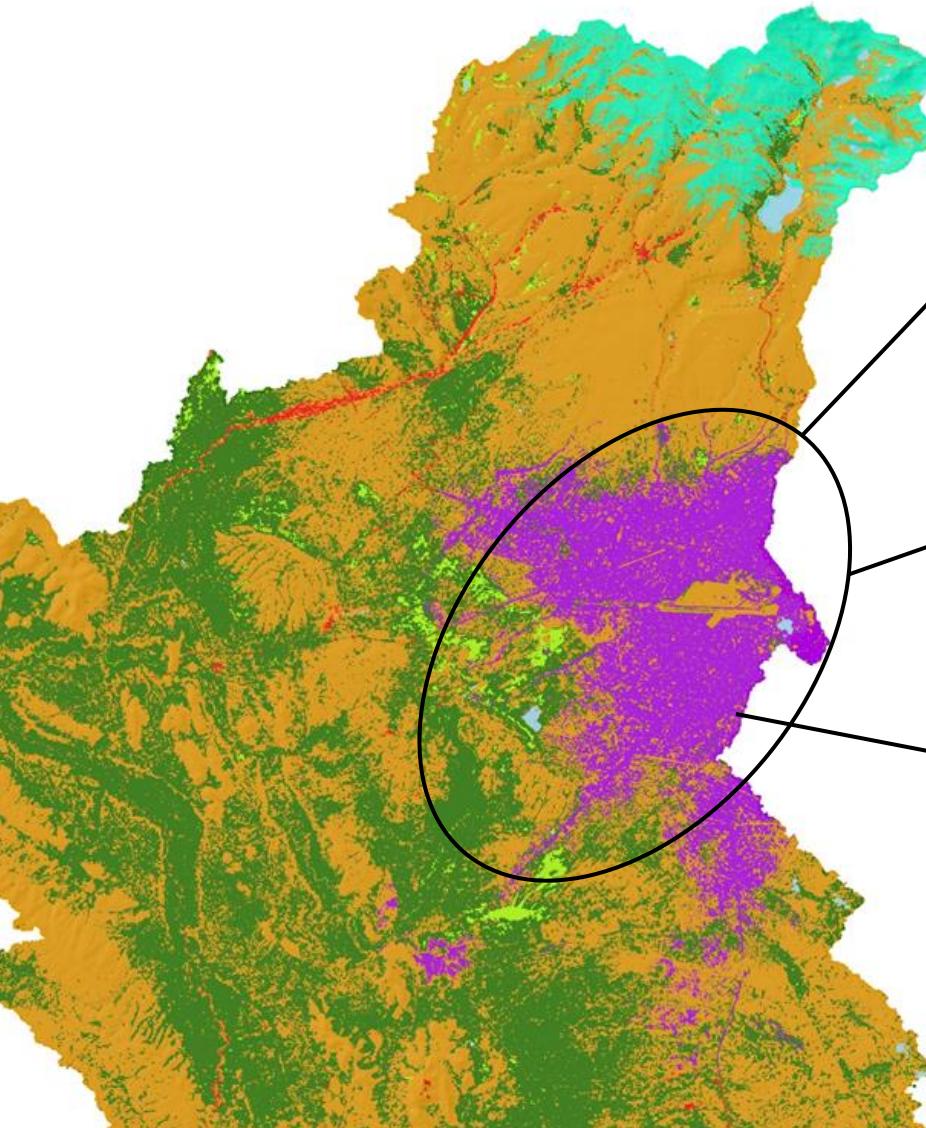
*2,000,000 m³ Mine waste
Acid Mine Drainage*



Milluni Dam
Second Largest Dam
10M m³



2 Urban Industrial/Pressures



20,000,000 m³/Year

*Un/ineffectively
treated urban WW
discharged*



Over 4000 productive activities
Clandestine Industrial Discharges



800 Tn/Year
Urban – industrial
Solid Waste

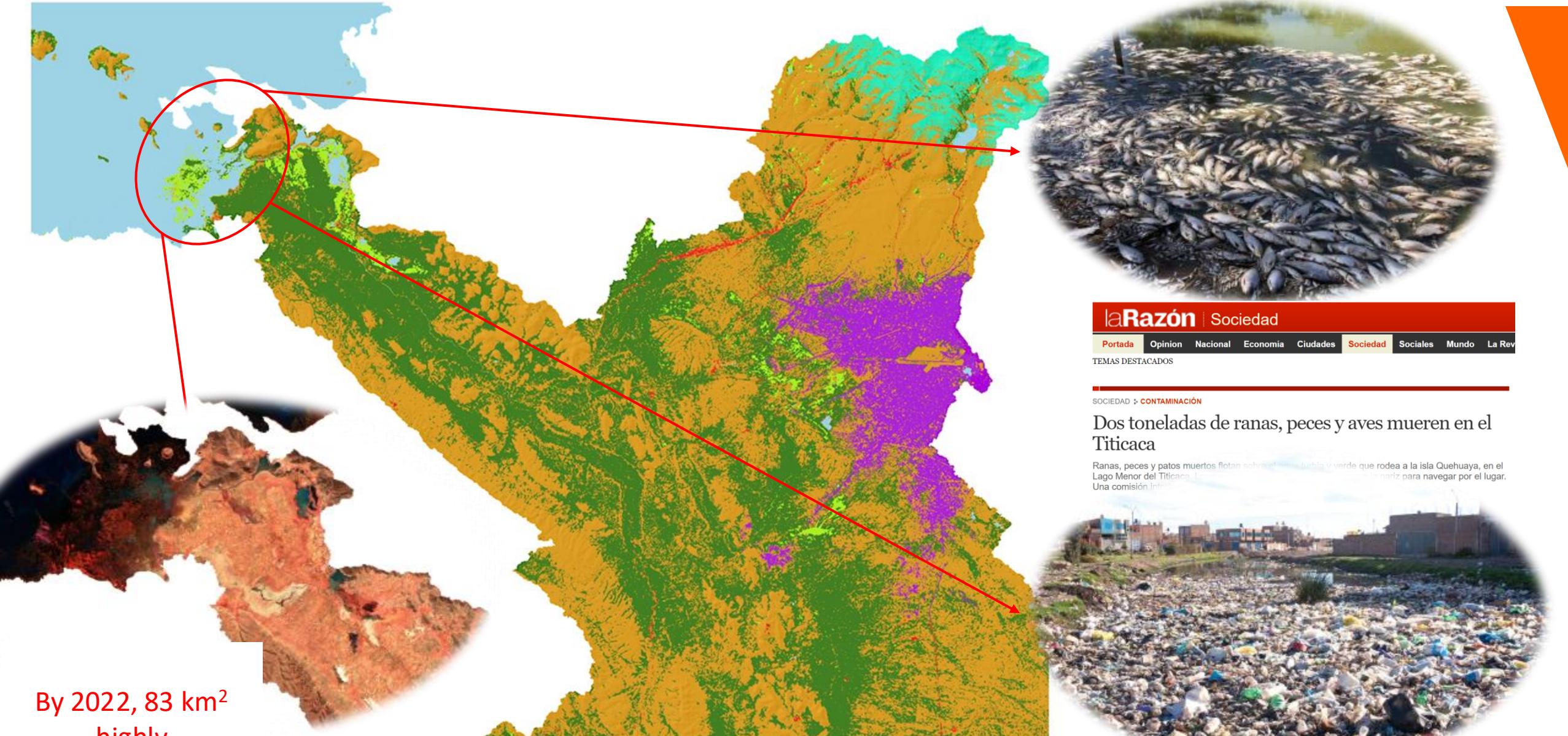


Case Study Katari River Basin

“Katari River is the major source Lake Titicaca’s contamination which consist of industrial and organic discharges ”

“....We might have to initiate another war for the contamination”

Martín Chávez, Pucanani’s Mayor 2015



laRazón | Sociedad

Portada Opinión Nacional Economía Ciudades Sociedad Sociales Mundo La Rev

TEMAS DESTACADOS

SOCIEDAD > CONTAMINACIÓN

Dos toneladas de ranas, peces y aves mueren en el Titicaca

Ranas, peces y patos muertos flotan sobre el agua turbia y verde que rodea a la isla Quehuaya, en el Lago Menor del Titicaca. Una comisión internacional de expertos recomienda la mariz para navegar por el lugar.

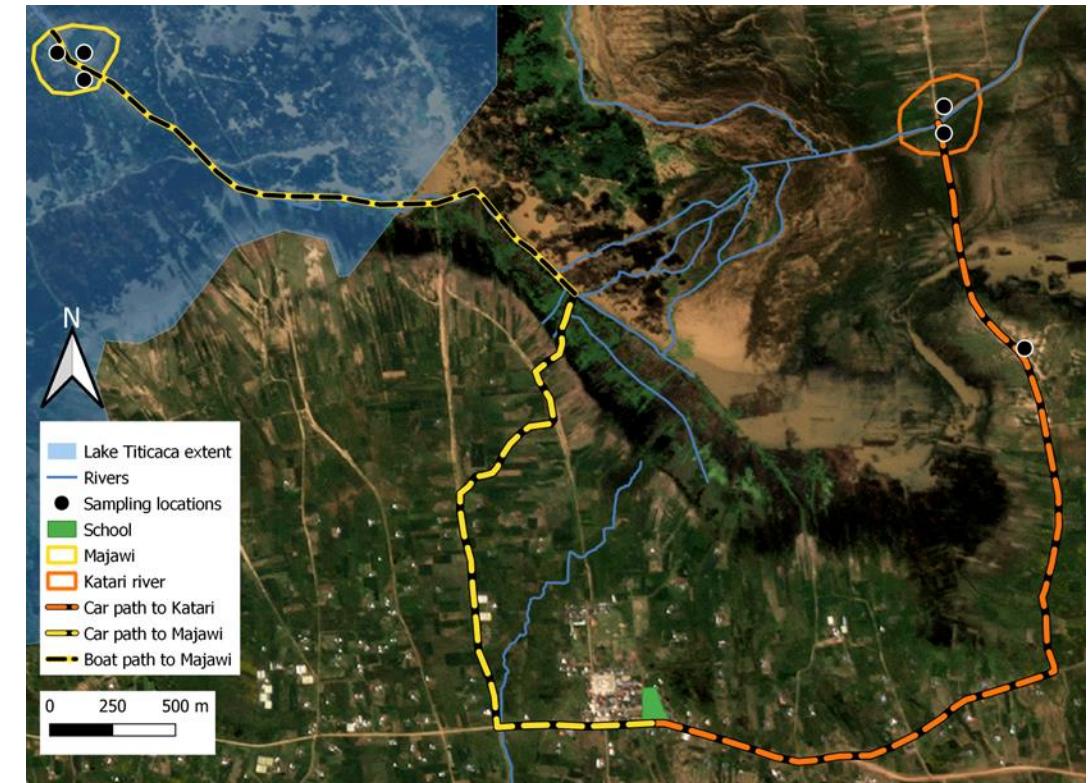




October 2021 – Ministry of Water and Environment cleaning campaign

Research design

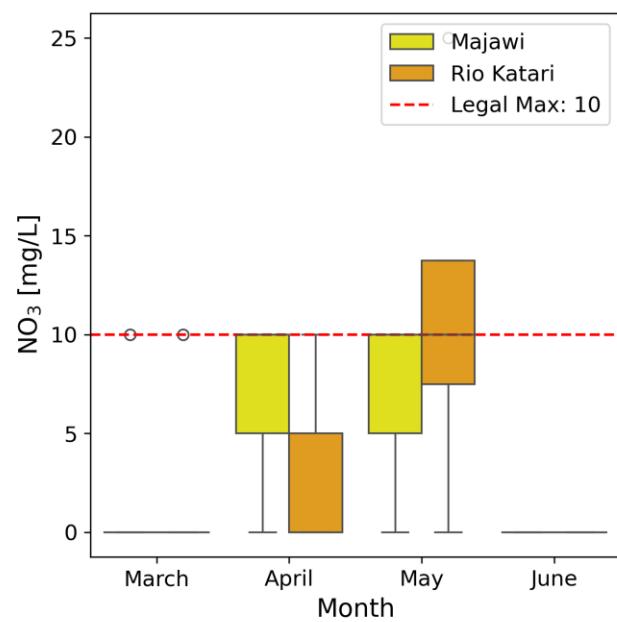
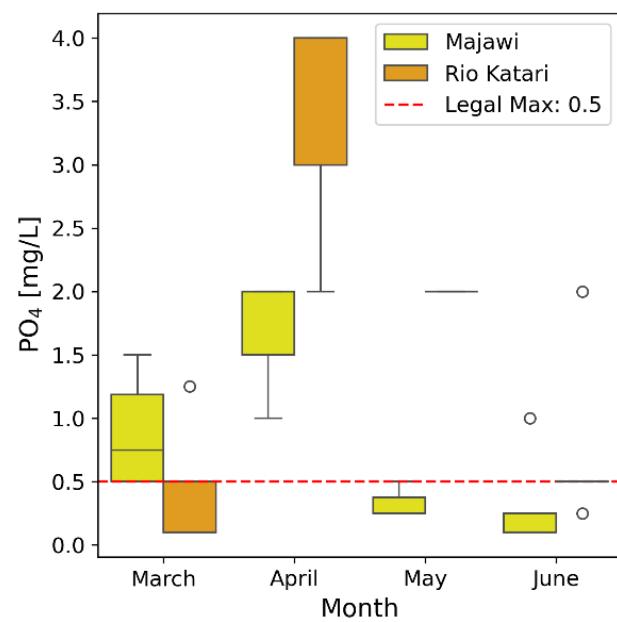
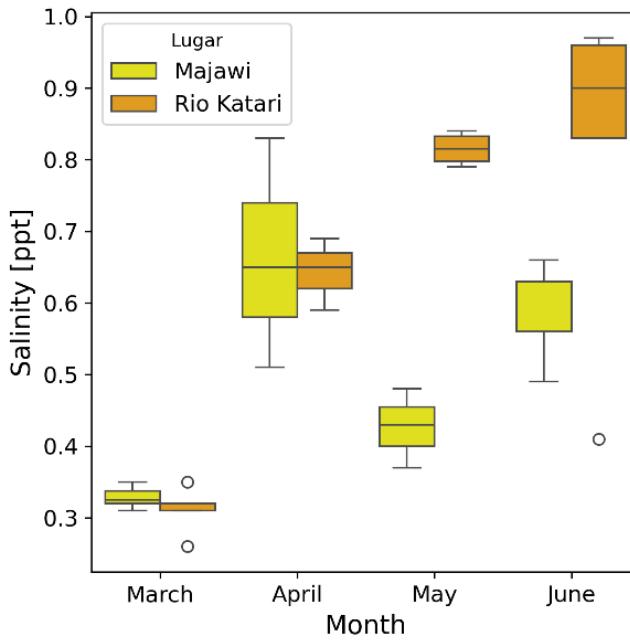
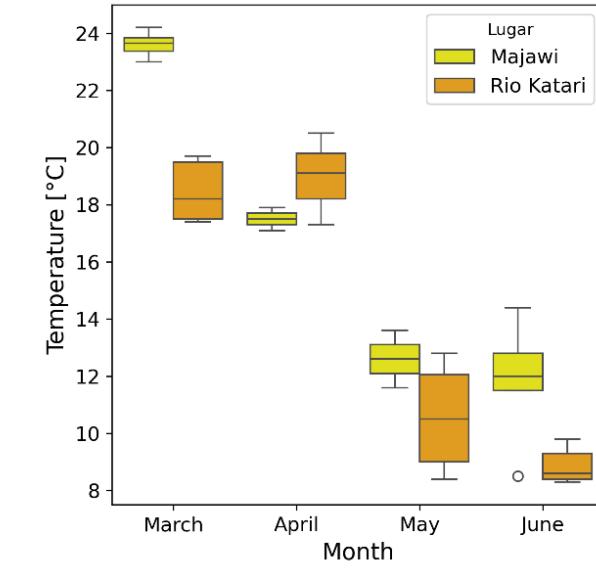
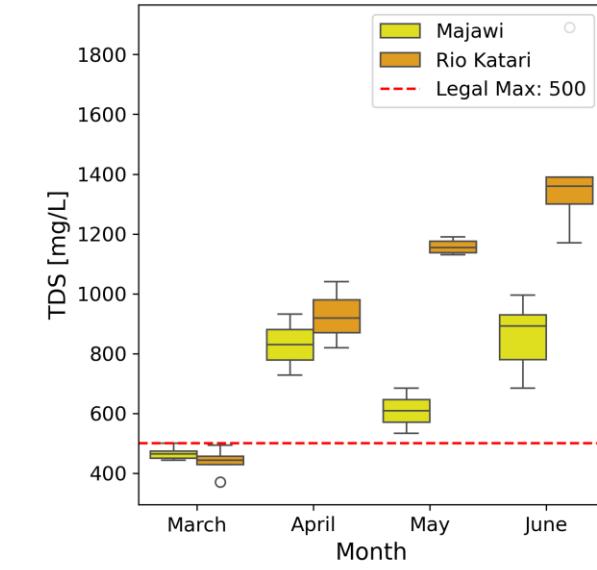
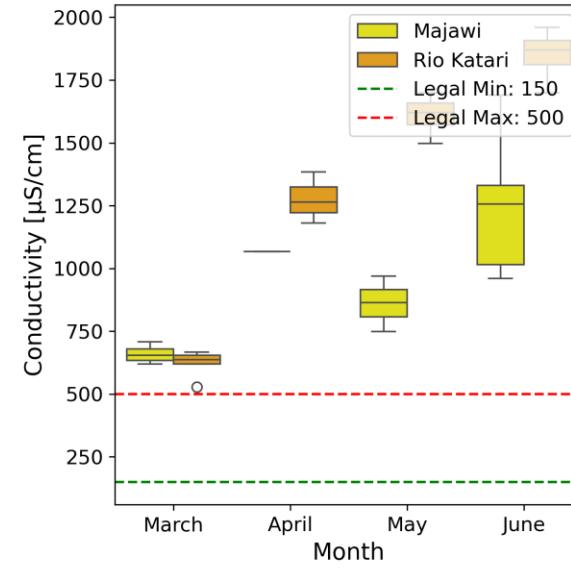
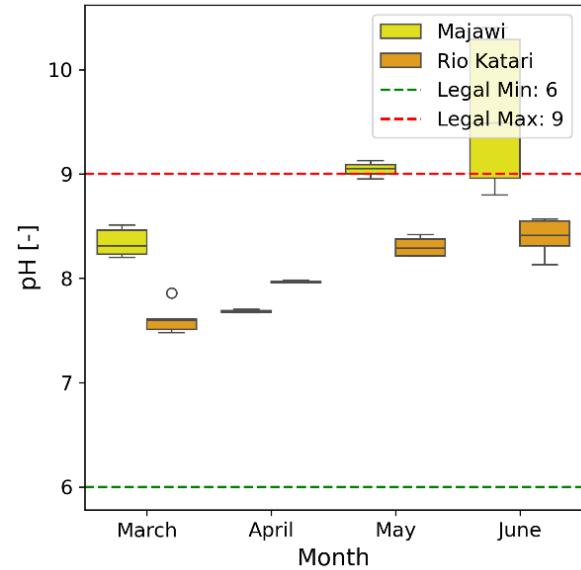
- WQ methods: Apera multiparameter, SERA, OASE strips, HydroColor app
- Monthly monitoring from March–June 2024
- Sites: Majawi and Katari River



Research design

- Mixed-methods approach
- 4 workshops (design, WQ training, Indigenous rights, results)
- 3 rounds of interviews
- 19 high school students trained as citizen scientists







Communal Aphtapi meal with parents of Chojasivi School students

Rights awareness workshop for parents of students at the town hall



“The government should take action, because in the end they are the leaders.”

—*Indigenous authority*

“We can’t really do anything — it’s up to the government to fix this.”

— *Community member*

"Before, we didn't know whether it was polluted or not — we just told by the color."

— *Chojasivi School student*





Emblem of the school in Chojasivi



Chojasivi School's main entrance

Civic morning assembly and school facilities, including the sports field



Prior and informed consent given by parents and final-year students at Chojasivi School



Prior informed consent granted by the Educational Council and school directors at Chojasivi School



Training and field activities on water quality monitoring with Chojasivi School students, supported by UCB environmental engineering students



“Now we know how polluted the water is. [...] We ourselves could explain the process.”

— *A female student from Chojasivi School*

“Before, even though we knew the water was polluted, we didn’t measure the level of contamination. Now we know how polluted it really is.”

— *A male student from Chojasivi School*

Workshop on legal rights, the rights of nature, and constitutional legal mechanisms, delivered to students and teachers from Chojasivi School at UCB by law students from UCB

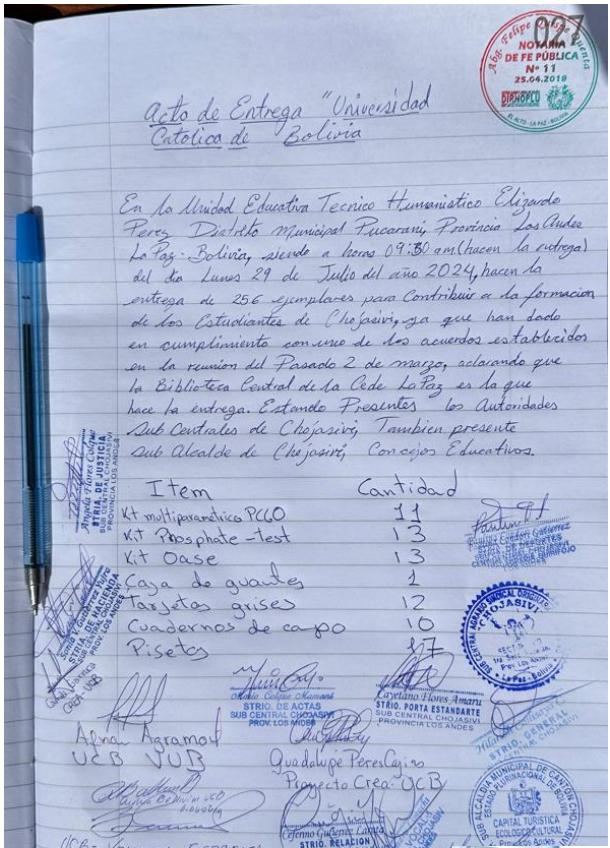


“Yes, as they explained to us, there are environmental rights, and also the right to have knowledge about these topics.”

— *A female student from Chojasivi School*

“Environmental rights allow us to protect the water and unite with other places where there are polluters, to defend the environment.”

— *A male student from Chojasivi School*



Sixty-four students from Chojasivi School and UCB signed the donation agreement and received citizen science equipment. The ceremony was attended by the school director, the head teacher, the principal of the Chojasivi School, the representative of the Indigenous authority, and researchers from VUB and UCB.



“We have to take care of the environment.”

— *Chojasivi School student*

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AXA
Research Fund



unesco
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POR LA SANTA SEDE
DESDE EL 2023



WATER AND CLIMATE
DEPARTMENT

vliruos

CUENCA
KATARI

Results

Youth Voices and Scientific Literacy

"Using the water testing kits ***made me feel like a real scientist***, and now I understand how to measure contamination levels" (290524_CS1).

"Seeing the data we collected ***gave me confidence to speak about water pollution*** in our community meetings" (290524_CS7)

Shift from passive observation to informed engagement



Results

Legal Awareness and Advocacy Barriers

"The contamination *comes from the city, but we are the ones suffering the consequences*" (290524_CS5).

"Companies polluting our water should be held accountable through stricter laws" (280824_GJ2_JEGF)

"I think everyone has the right to clean water, but *I don't know how to enforce it*" (290524_CS2).

- Increased environmental legal awareness
- Lack of instruments/processes to enact rights



Results

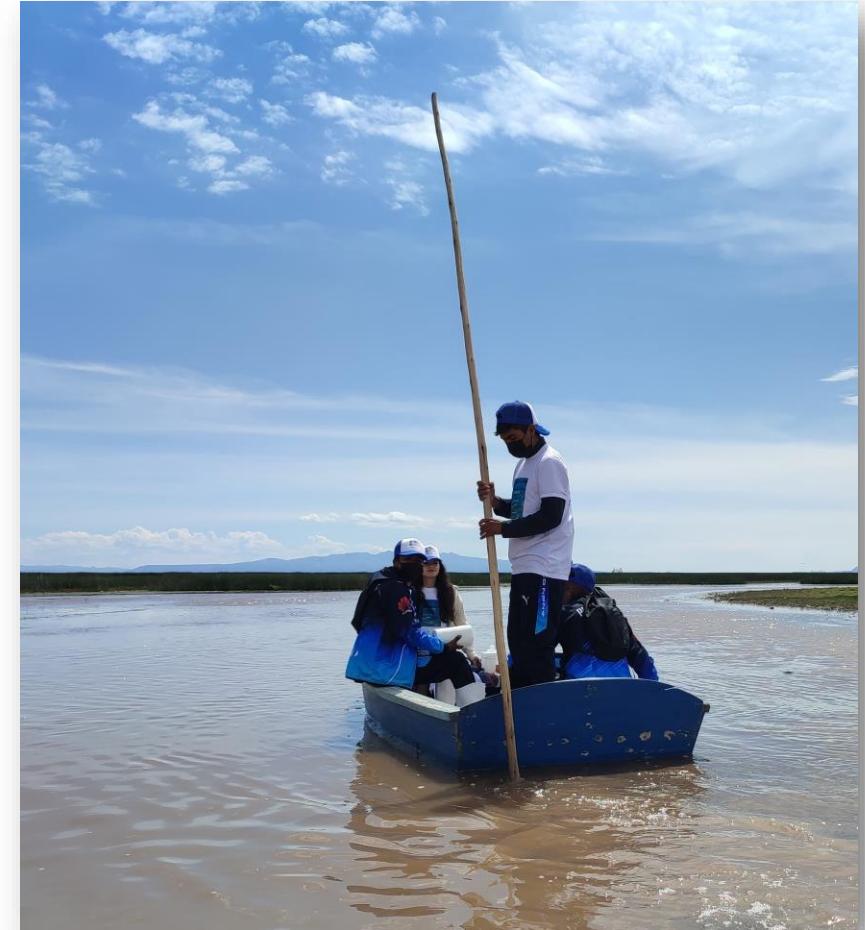
Intergenerational environmental Injustices

"Our **grandparents fished in these rivers**, but now there's nothing left due to pollution" (290524_CS2)

"The pollution started years ago, but **now we're the ones dealing with the consequences**" (290524_CS5)

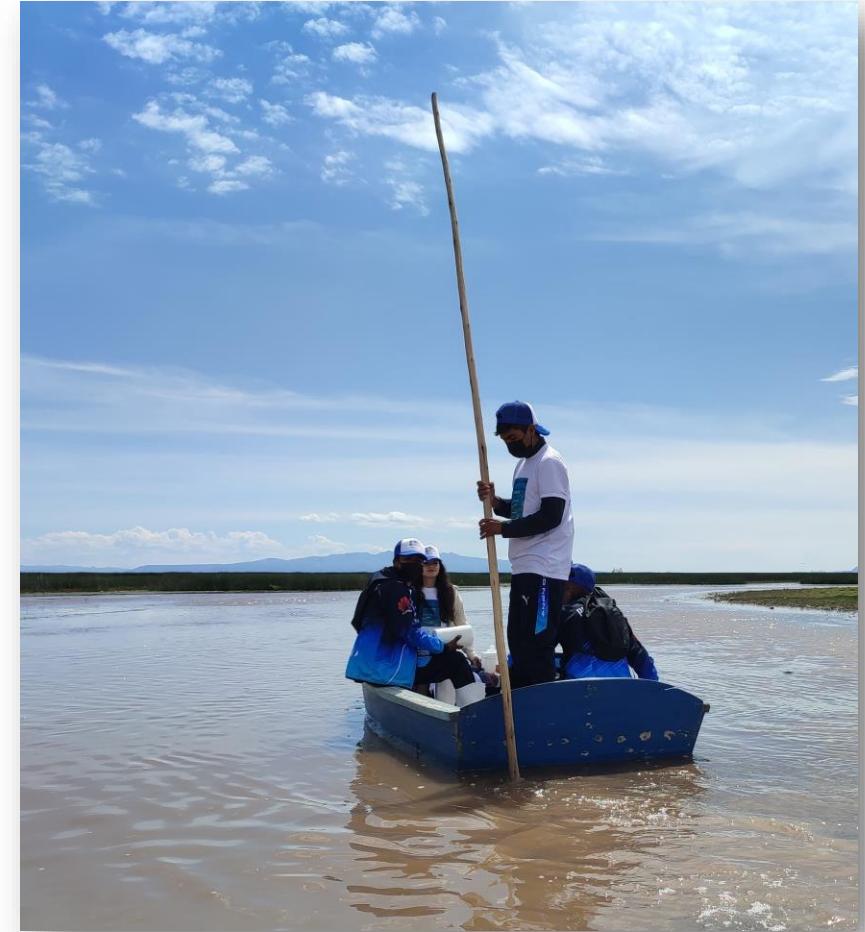
"Before, **there were fish, the water was clear, and we could drink from the river**. Now, it's toxic" (290524_CS2).

-Younger generations lack memory of a healthy river



Conclusions

- CS support environmental justice advocacy (active engagement in the project)
- Evidence document of environmental injustices
- Indigenous rights awareness, but **barriers** on how to enact environmental rights
- Environmental Intergenerational injustices unveiled
- Formal Recognition of community-generated data





Humble Waters
Documentary



Gracias

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(Hilarion Quispe)

"I believe that we should start from the sense of community, considering that the community is not only a human community, but the community is also made up of all the elements of nature, be they stars, animals, plants, the air we breathe, the sun, the coexistence that we have every day, that is the true community"