DIAGNOSING THE URUSSANGA RIVER

A Citizen Science Analysis of Water Quality and Land Use in Southern Santa Catarina.

Study by Students of
EMEF Alaíde Tabalipa | Içara, SC

THE INVESTIGATION AT A GLANCE

CRITICAL STATUS

THE PROBLEM

The Urussanga River Basin (BHRU) faces a double crisis: water scarcity and critical quality degradation driven by historical **Acid Mine Drainage (DAM)**.

Bright Cyan (A0DESFF)
Vivid Green (9T6FF68)

THE MISSION

To diagnose physical/chemical **water conditions** and map **Permanent Preservation Areas (APP)** using **GLOBE Citizen Science** protocols.

Latitude: 35°55'39"
Longitude: 376°9'09"

THE METHOD

Field data collection across 6 strategic points (Içara to Jaguaruna) using **hydrology lab kits** and the **GLOBE Land Cover (LULC) app**.

KEY FINDINGS

- Confirmed **acidic pH levels** (DAM impact).
- **Extreme salinity intrusion** at the **estuary**.
- **Urbanization** accelerating **bank erosion**.

A RIVER UNDER SIEGE

THE INDUSTRIAL LEGACY

Acid Mine Drainage (DAM)

Historical liability from 1930s coal mining.

Pyrite oxidation releases **Sulfuric Acid** + **Heavy Metals** (Fe, Al, Mn, Zn).

Waters frequently **pH < 3.0.**

MODERN PRESSURE

Anthropogenic Stressors

Untreated domestic effluents.

Rice cultivation (Rizicultura) runoff.

Cattle ranching & **Urban Sprawl.**

RESULT: A chemically stressed ecosystem.

Analysis confirms cumulative environmental degradation.

Latitude: 35T'S3'99"
Longitude: 376'T9'09"

BRIDGING THE DATA GAP

The GLOBE Observer Methodology

HYDROLOGY

Lab kits measuring:

- pH & Dissolved Oxygen
- Electrical Conductivity
- Nitrates & Transparency

ATMOSPHERE & SOIL

Contextual data:

- Soil pH & Moisture
- Air Temperature
- Humidity

LAND COVER (LULC)

Mapping the banks:

- Vegetation vs. Urbanization
- Satellite validation

Goal: Validating student-led science for River Basin Committee management plans.

FROM ESPLANADA TO THE SEA

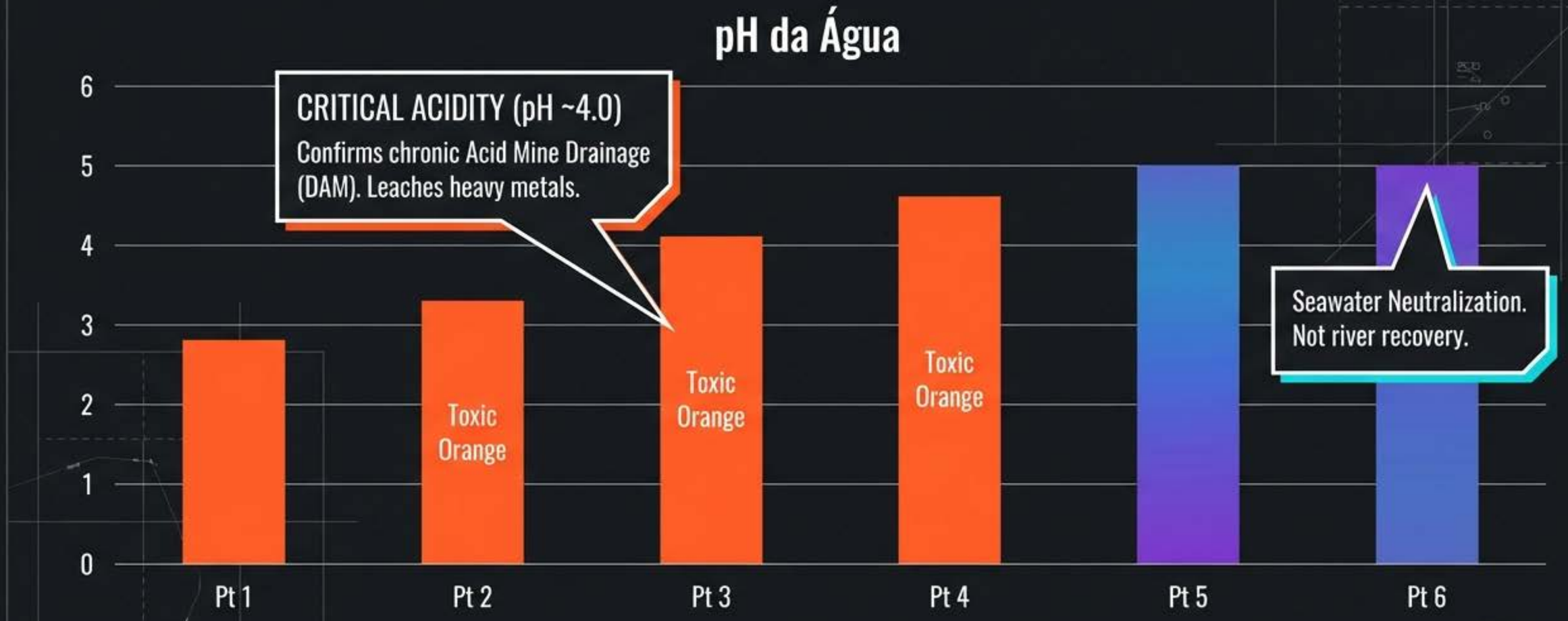
OBSERVED ENVIRONMENTAL PARAMETERS

Parameter	Reference Range	Inland Points 1-2	Mid-River Points 3-4	Estuary Points 5-6
pH	6.0 - 9.0	4.0 - 4.5	4.0 - 4.5	5.5 - 6.0
Conductivity (µS/cm)	600 - 1800	1235 - 2822	1350	22,000 - 38,000
Dissolved Oxygen (mg/L)	> 5.0	7.0 - 7.3	7.3 - 7.5	7.5 - 7.8
Transparency (cm)	30 - 65	33 - 35	38 - 42	45 - 46
Nitrate (mg/L)	< 10	0.3	0.25	> 0.25

Data collected by EMEF Alaíde Tabalipa students (2025).

GLOBE

THE ACID TEST: CONFIRMING MINE DRAINAGE

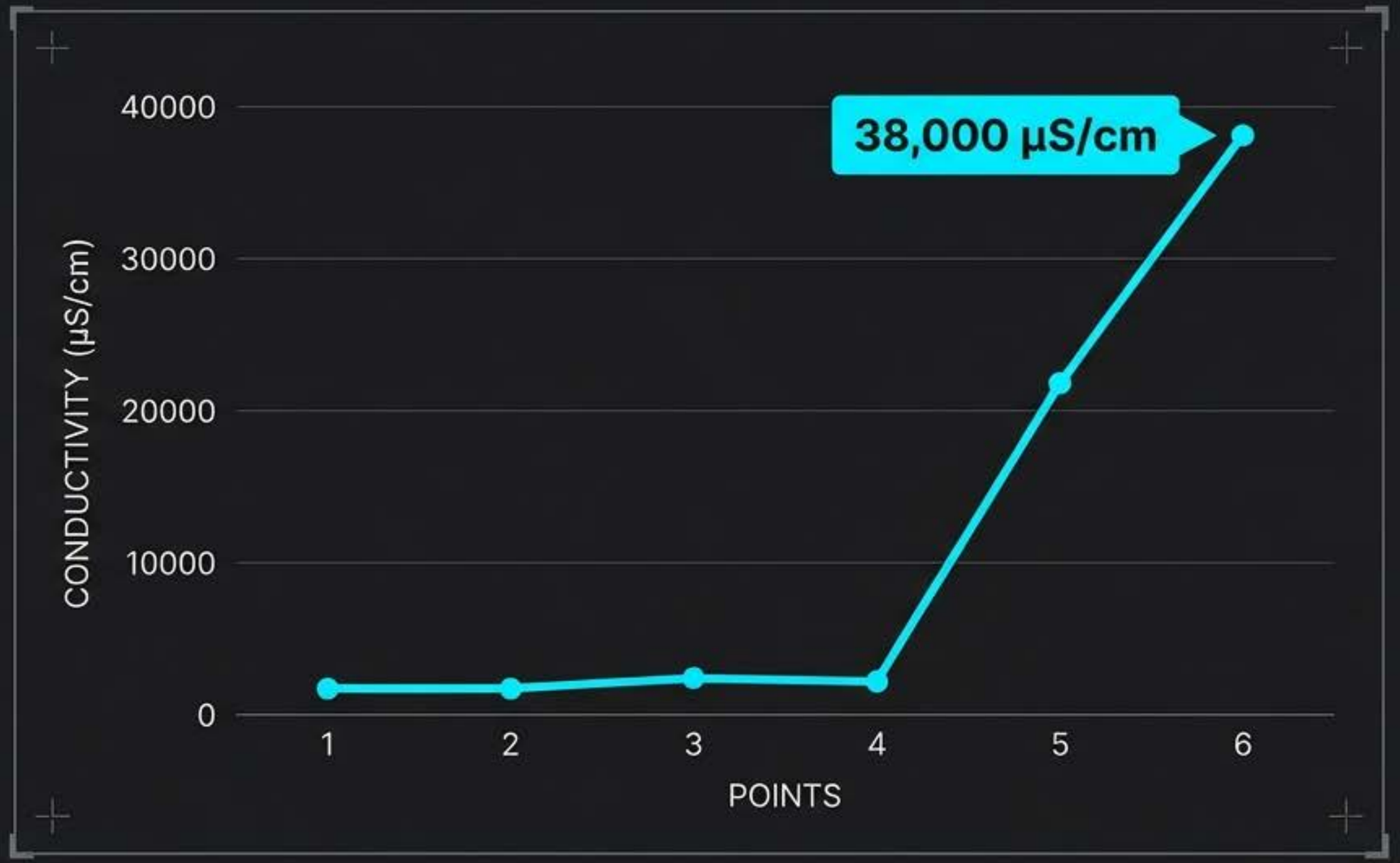


Data Source: Globe Brasil

Globe BRASIL

THE ESTUARY EFFECT: CONDUCTIVITY SPIKES

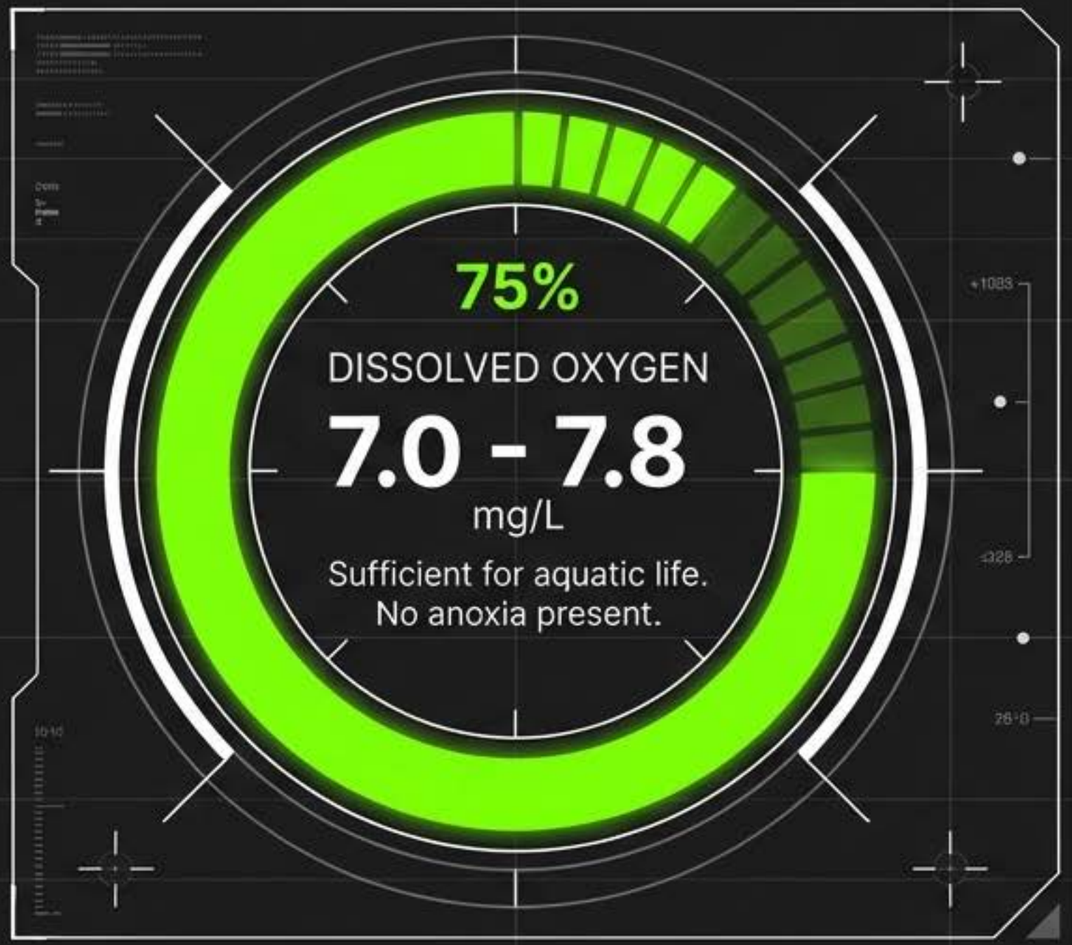
Upstream (Pts 1-4): Stable freshwater levels.
Estuary (Pts 5-6): Massive tidal intrusion of saltwater alters geochemical balance, masking acidity but increasing ionic stress.



GLOBE BRASIL

Data Source: GLOBE

BIOLOGICAL HEALTH & ORGANIC LOAD



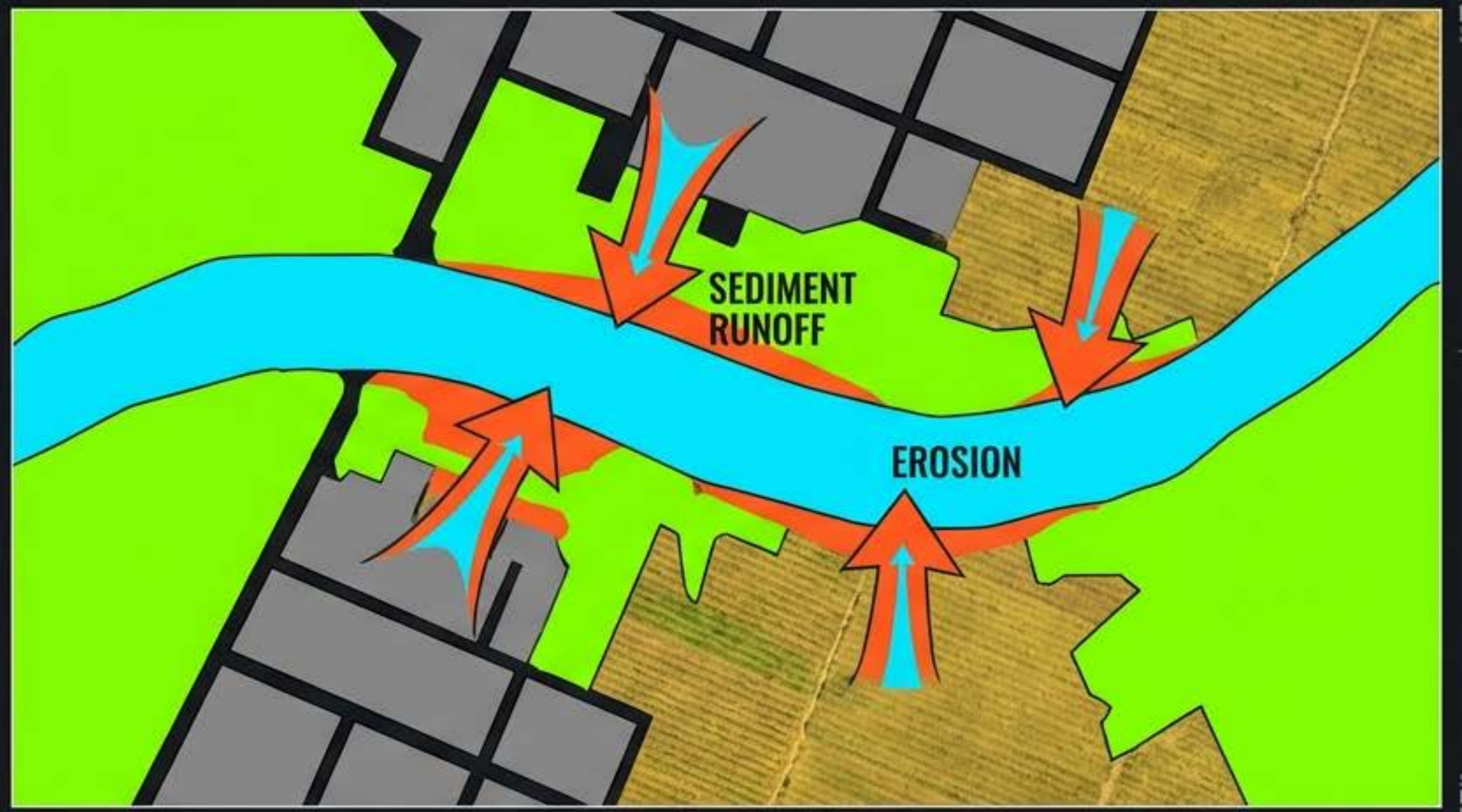
The river can breathe, but it is being fed a toxic diet.

Globe Brasil

Data Source: Globe Brasil (2025)

LAND USE: THE EROSION ENGINE

- Loss of **Riparian Forest** (Mata Ciliar)
- Expansion of **Pasture** & **Rice** Cultivation
- **Clay Extraction** on banks
- **Result:** Physical bank **degradation** & **Sedimentation**



satellite view

Globe Brasil

Data Source: Globe Brasil (2025)

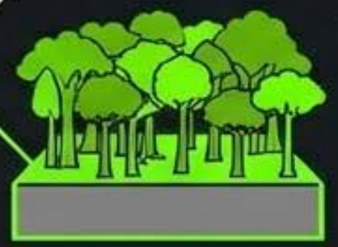
THE COOLING POWER OF PRESERVATION

TEMP_DELTA

21°C Inter

Preserved Areas (Pts 3 & 4)

Dense vegetation moderates microclimate.



MICROCLIMATE_MOD

27°C Inter

Exposed Areas

Lack of canopy leads to higher air and soil temperatures.

SOIL CONTEXT

pH: **4.5** ACIDITY: **HIGH**

Bank soil pH measured at **4.5 (Acidic)**. This acidity contributes to the leaching of materials into the river during rain events.

Globe Brasil

Data Source: Globe Brasil (2025)

SYNTHESIS: A RIVER IN DISTRESS

CHEMICAL POLLUTION

Fingerprint of Coal Mining (DAM) validated. Low pH facilitates heavy metal toxicity.

PHYSICAL VULNERABILITY

Land use (cattle/mining) is stripping banks, accelerating erosion.

ESTUARINE COMPLEXITY

Battleground between acid mine water and saline ocean water.

RIVER_ANALYSIS_SYNTH

"The river faces a double threat: chronic acidity from the past and erosive pressure from the present."

Globe Brasil

Data Source: Globe Brasil (2025)

THE POWER OF CITIZEN SCIENCE

Can student projects support river basin management?

YES.

DATA GENERATION

Provided missing pH & EC data for the Urussanga River Basin Committee.

MAKING THE INVISIBLE VISIBLE

Exposed chemical dangers hidden from the community's naked eye.

EDUCATION

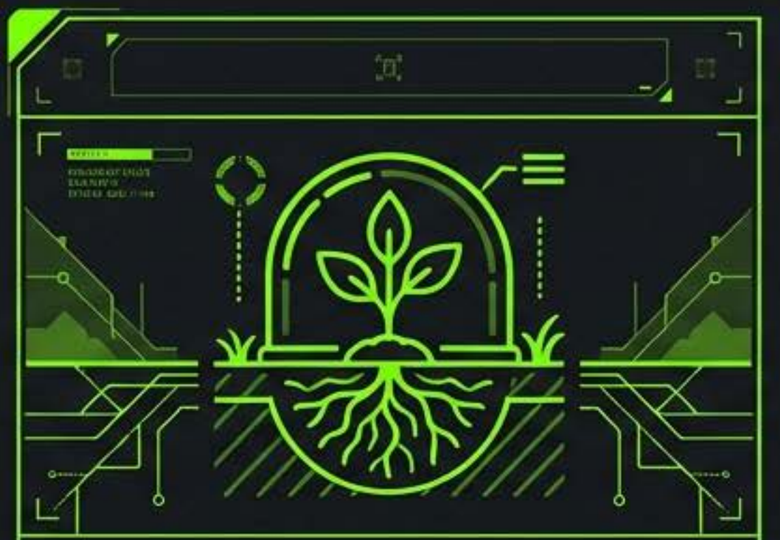
Transformed students from passive observers into active researchers.

Globe Brasil

TOWARD A MANAGED FUTURE

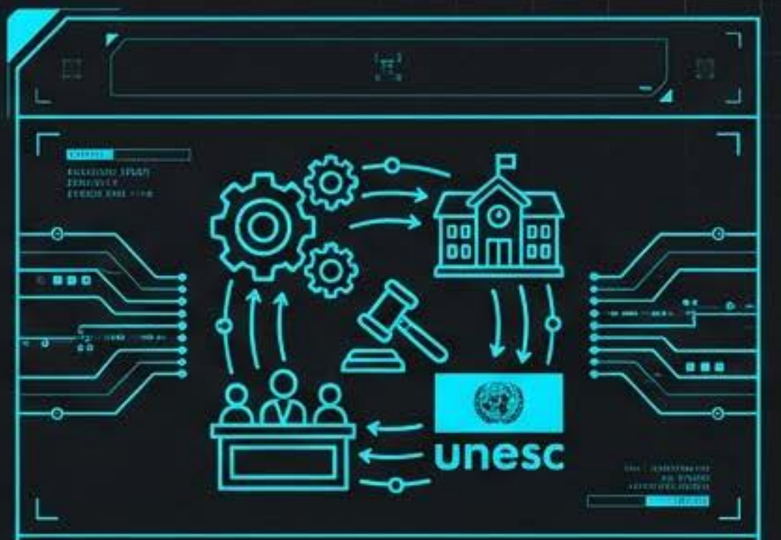
MONITOR

Continuous tracking of Acid Mine Drainage trends is essential.



RESTORE

Replanting Permanent Preservation Areas (APP) to halt erosion.



COLLABORATE

School (Science) + Committee (Policy) + UNESC (Support).

"Local data, global protocols, real impact."

Globe Brasil

CREDITS & REFERENCES

PROJECT TEAM

Authors: Alisson Porto de Jesus, Josué de Matos Idalino, Kayrine Soratto Teixeira, Maria Vitória Toretti Cardoso, Pedro Luiz de Souza.

Institution: EMEF Alaíde Tabalipa (Içara, SC).

Support: GLOBE Brasil, AEB, CNPq, UNESC.

KEY REFERENCES

Oliveira (2021) - Land Use.

Castilhos et al. (2007) - Acid Mine Drainage.

Albuquerque Junior et al. (2020) - Water Resources Plan.