Citizen Science Communication Strategies
in *Urban Water* and *Freshwater Ecosystem* Projects

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Building Knowledge Together: Citizen Science, Communication, and Trust
Symposium at the Museum für Naturkunde Berlin, 5-6. October 2026



2 ecosystems … Urban Water and Freshwater Ecosystem
2 digital resources … URBAnWat3r and 2QUA
1 question ..

how can *communication* become *participation*?

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Theory

Science communication means mediating between **scientific knowledge** and **everyday experience**.

From **information transmission** to **participation and shared meaning-making**.

Burns, O'Connor & Stocklmayer (2003); Lewenstein (2003); Bucchi & Trench (2008); Wynne (1992)

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Theory

DEFICIT MODEL

Science → public;
Factual information;
Public as receiver;

Limitations:
reduces the science–society relationship to a knowledge gap and tends to overlook context, trust and local knowledge.

Burns, O'Connor & Stocklmayer (2003); Lewenstein (2003); Bucchi & Trench (2008); Wynne (1992)

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Theory

PARTICIPATORY MODEL

Science ↔ society;
Dialogue and contextualisation;
Public as active agent.

Conceptual shift:
meaning is constructed through scientific knowledge, experiences, values and sociocultural contexts.

Burns, O'Connor & Stocklmayer (2003); Lewenstein (2003); Bucchi & Trench (2008); Wynne (1992)

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Theory

CITIZEN SCIENCE

Participation is no longer only a communication goal;
It becomes part of knowledge production.

Citizens can *observe*, *collect data*, *interpret phenomena*, and *influence decisions*.

Santana et al. (2022), Roche et al. (2020), Santos et al. (2025)

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Citizen Science Communication Strategies | URBAnWat3r and 2QUA | 2025-2027

UNDERSTAND

scientific literacy

DIALOGUE

contextualisation

PARTICIPATE

active engagement

CO-PRODUCE

shared knowledge

Engagement

direct integration in the process

Capacity building

literacy and autonomy

Interactions

formal and informal formats

Accessibility

accessible languages and resources

Santana et al. (2022), Roche et al. (2020), Santos et al. (2025)

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COGNITIVE PRINCIPLES

Framed as a mediator of environmental literacy

Dual Coding

Information can be represented through verbal and non-verbal systems; combining words and images supports meaning-making (Paivio, 1971, 1986)

Multimedia Learning

Combining narration with images, using fewer unnecessary elements, can facilitate understanding and reduce cognitive load (Mayer, 2001/2002).

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Bringing *storytelling* and *multimedia* together to promote **environmental literacy**.

HIGHLIGHT	abstract environmental processes
NARRATE	problem → consequences → solutions
SITUATE	everyday life and place
ENGAGE	exploration and participation

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Trust

CITIZEN SCIENCE

FROM

Science → Citizens

information
awareness
behaviour change

TOWARDS

Science ↔ Citizens

dialogue
participation/co-creation
shared knowledge

Key framing: communication as part of knowledge co-production.

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two projects, two water challenges

different contexts → common communication needs

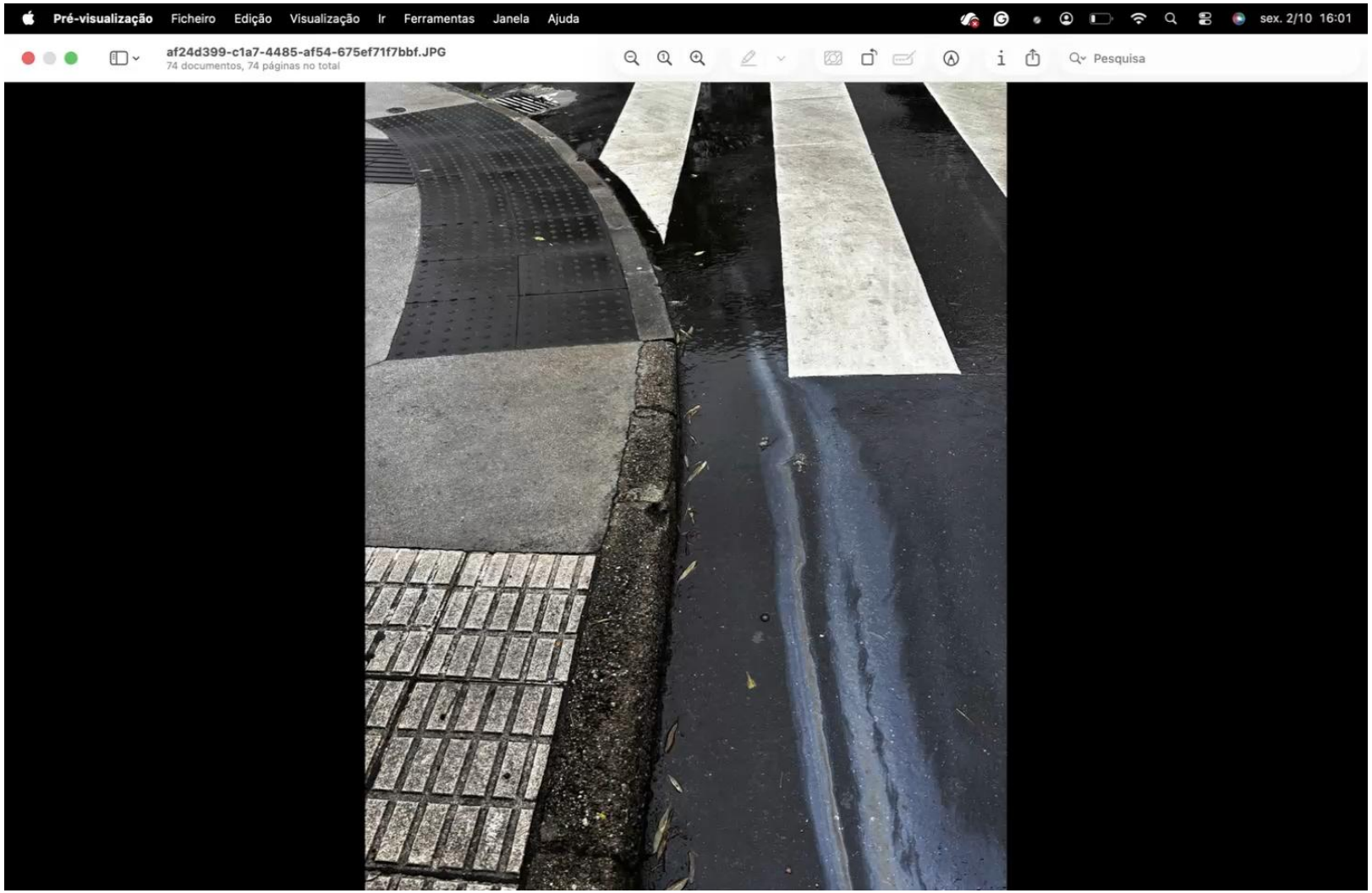
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URBAN WATƎR

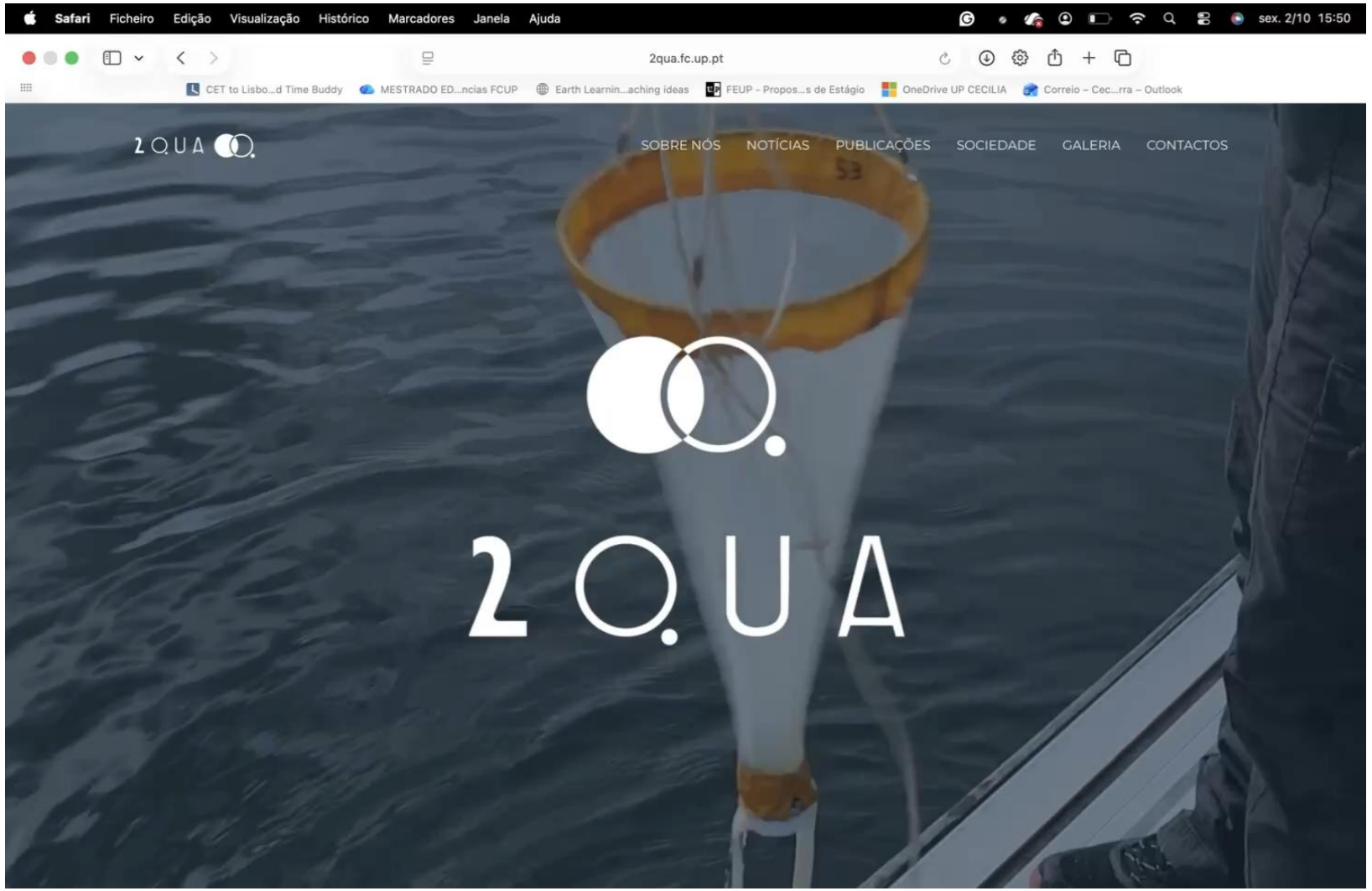
Urbanisation
↓
Stormwater management
↓
Aquatic biodiversity

Stakeholders: schools, municipalities, water management, community groups



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Reservoirs
↓
Biodiversity
↓
Ecological sustainability

Stakeholders: teachers, students, policymakers, local communities.

https://2qua.fc.up.pt

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two projects, two water challenges

different contexts → common question

How can digital resources support meaningful participation?

Cecília Guerra[1], Luísa Cardoso[2], Tiago Paralta[3], Bruno B. Castro[4], Sara C. Antunes[5]

OUR APPROACH

Design-based research methodology

an iterative, evidence-informed process for developing two digital resources.

RESOURCE	→	INTERACTION	→	FEEDBACK	→	CO-DESIGN	→	ITERATION
concrete artefact		use / explore		needs / gaps		adapt		improve

This makes the resource both an
OUTPUT and a **SPACE FOR PARTICIPATION**.

(Design-Based Research Collective, 2003)

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OUR APPROACH

Design-based research methodology

an iterative, evidence-informed process for developing two digital resources.

01 · ANALYSE → 02 · DESIGN → 03 · PROTOTYPE → 04 · EVALUATE & REFINE

Context & literature → Design requirements → Digital prototypes → User feedback & iteration

OUTPUT: Two evidence-informed digital resources

(Design-Based Research Collective, 2003)

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OUR APPROACH

Participants		
CODE	PROFILE & BACKGROUND	EVALUATION FOCUS
P1-P2	Researcher · Biology / Aquatic Ecology	Scientific accuracy
P3–P4	Multimedia Students · Interaction Design / UX	Usability, navigation & interface
P5–P6	Science Communication & Education Students	Clarity, narrative & pedagogy

Ethics approval: FCUP Ethics Committee · Proc. CE2026/p650492 · 10 April 2026

(Design-Based Research Collective, 2003)

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URBAnWat3r: making urban water visible



WHAT IT DOES

Makes invisible water processes visible
Connects everyday urban practices with ecological consequences

COMMUNICATION VALUE

Scientific evidence is translated into a short, accessible visual narrative

NEXT STEP

Use stakeholder interaction to test relevance, clarity and possible adaptations

URBAnWat3r: making urban water visible



2QUA: exploring freshwater biodiversity

An audiovisual communication resource

IMMERSIVE DIGITAL ENVIRONMENT: AGUIEIRA RESERVOIR

EXPLORE

Species, habitats and biodiversity in an interactive environment

CONNECT

Experiential learning and a more tangible relationship with the reservoir

TRANSPARENCY

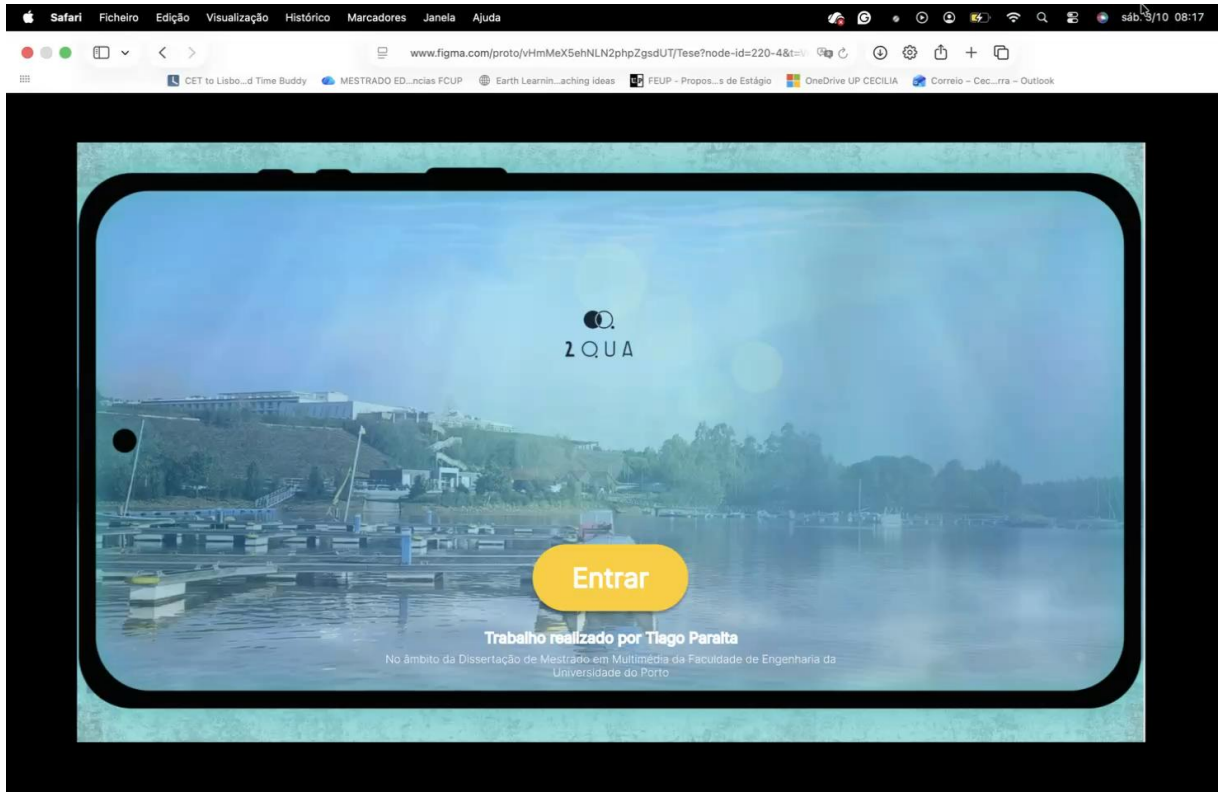
Open-access biodiversity datasets and visual materials

Figma

2QUA: exploring freshwater biodiversity

An audiovisual communication resource

IMMERSIVE DIGITAL ENVIRONMENT: AGUIEIRA RESERVOIR



https://www.figma.com/proto/vHmMeX5ehNLN2phpZgsdUT/Tese?node-id=220-4&t=Vpz1qufaNRCAzmVU-1&scaling=contain&content-scaling=fixed&page-id=220%3A3&starting-point-node-id=220%3A4



TWO DIGITAL FORMATS — ONE QUESTION: HOW CAN COMMUNICATION BECOME PARTICIPATION?

URBAnWat3r

Animated audiovisual narrative

WATCH → UNDERSTAND → REFLECT

2QUA

Immersive digital environment

EXPLORE → EXPERIENCE → CONNECT

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RELEVANCE

Local needs and experiences shape communication

OWNERSHIP

Stakeholders can shape what and how is communicated

TRANSPARENCY

Evidence, data and processes become more visible

RELATIONSHIP

Repeated interaction creates opportunities for mutual trust

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Participation and digitalisation can create…

Opportunities

- Local relevance
- Transparency
- Dialogue
- Shared ownership
- Environmental & sustainability literacy
- Long-term engagement

Challenges

- Digital accessibility
- Digital literacy
- Unequal participation
- Representation
- Expectations vs. actual influence
- Sustainability of engagement

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Opportunities ≠ Guarantees

The key question is not only
WHO participates, but
WHO can influence the resource and
WHAT changes as a result.

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COMMUNICATION IS PART OF PARTICIPATION

Not only communicating TO citizens, but WITH them

TRUST IS RELATIONAL

It can grow through open, responsive, and meaningful interaction

DIGITAL TOOLS ARE MEANS, NOT SOLUTIONS

Their value comes from accessibility, co-design, and participation.

Citizen science communication can become an infrastructure for knowledge co-creation.

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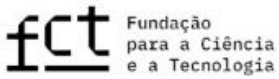
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URBAN WATER

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Thank you.
Obrigada.

Cecília Guerra and Sara C. Antunes

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