Co-designing Citizen Social Science for Collective Action

#5.3

Open Source Digital Platform

QPR: ¿Qué Pasa, Riachuelo?, a citizen social science tool to promote Environmental Justice in Matanza-Riachuelo Basin

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List of Abbreviations

ACUMAR: Matanza-Riachuelo Basin Authority

ADA: Provincial Authority of Water

CSS: Citizen Social Science

KC: Knowledge Coalition

QPR: ¿Qué pasa Riachuelo? (What's up Riachuelo)

RENABAP: National Registry of Popular Neighbourhoods

SINIA: Integrated System of Environmental Information

1. Executive Summary

CoAct (Co-designing Citizen Social Science for Collective Action) aims at co-designing concepts, methods and tools for citizen social science (CSS) around "wicked" global social issues. Four different research and innovation (R&I) actions organise the empirical work of CoAct.

This deliverable D5.3 "Open Source Digital Platform" describes ¿Qué Pasa, Riachuelo? (QPR) alpha version, which is the cornerstone of the research co-design activities in R&I Action #3 in the frame of CoAct WP5, coordinated by the National University of San Martin (UNSAM) and the Fundación Ambiente y Recursos Naturales (FARN). QPR is a geo-referenced website that presents several layers of information, which can be chosen to be visualised on cartographic maps. The information available in the platform is both public information from different sources and citizen-generated data shared by platform users about different socio-environmental themes.

R&I Action #3 aims at co-designing CSS tools to facilitate actions contributing towards Environmental Justice in the Matanza-Riachuelo river basin, where 6 million people live, many of them in vulnerable socio-environmental situations.

This report describes this platform's main characteristics, reflects on its process of co-creation and presents the expected uses and purposes.

Stakeholders who may benefit from QPR are different actors interested in transforming the basin towards environmental justice, particularly in relation to the platform current themes: **basin water quality**, **conservation of natural areas** and **resettlement and redevelopment plans**.

The platform was co-designed in 15 workshops organised by theme. 51 co-researchers participated in those workshops. The main purposes of the workshops were to collect impressions, potential uses and expectations regarding the digital platform and to discuss and improve of the data-collection tool for each theme.

In these workshops different stakeholders identify different potential uses. For this reason, we developed a landing page where four different users' profiles (community, research, education and policy) can identify the platform potential benefits and the type of data they could produce and access. This can be accessed at https://quepasariachuelo.farn.org.ar.

The platform organises existing information and enables opportunities for sharing experiences and can be accessed at: https://mapaqpr.farn.org.ar/. The platform is open source, published at GNU General Public License version 3, and its code can be found at https://github.com/farn21/platform-qpr.

This document is organised as follows: Section 2 presents an introduction to CoAct and the R&I Action #3 on Environmental Justice; Section 3 analyses the platform co-design process; Section 4 describes the platform characteristics and technology, Section 5 comments on how the Covid-19 pandemic affected the development of this delivery, Section 6 presents the future activities using the platform and Section 7 presents the conclusions.

2. Introduction

2.1 CoAct General Concept

CoAct is proposing a new understanding of CSS as participatory research co-designed and directly driven by citizen groups sharing a social concern (See Figure 1). CoAct proposes to face four "wicked" social global issues by engaging citizens in a vulnerable situation. The joint effort will result in the implementation of new or improved science-related policies and the advancement of the CSS approach with regards to its applicability in concrete fields or research.

Figure 1: Citizen Social Science in Action, with citizen groups who share a social concern as co-researchers and with the support of the Knowledge Coalition.

In all CoAct R&I Actions (Mental Health Care, Youth Employment; Environmental Justice and Gender Inclusion), citizens in a vulnerable situation are placed at the centre of the research and their role and dedication conceptually recognize them as co-researchers. In practice, in all the R&I Actions co-researchers participate in all stages of the research cycle. This requires developing strategies to sustain such participation.

2.2 R&I Action #3 on Environmental Justice: research context

The R&I Action #3 on Environmental Justice explores socio-environmental problems in the Matanza-Riachuelo river basin, in the Buenos Aires metropolitan area, with the aim of promoting transformative actions.

The Matanza-Riachuelo is a heavily contaminated 64 km long river. 6 million people live in the basin (15% of Argentinean population) and it is estimated that 1.8 million of them live in highly vulnerable conditions[1], in terms of housing and access to basic infrastructure. There are several socio-environmental problems related to:

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[1] See social vulnerability index built by ACUMAR (2018) p. 31.

i) *contamination* from production activities (mainly industrial but also agricultural); sewage effluents since 50% of population in the basin is not connected to sewage system (ACUMAR, 2020, p. 44) and open garbage dumps

ii) *social vulnerability* in terms of housing (around 800 people live in informal settlements and slums (ACUMAR, 2018, p.31) some of them built on garbage dumps), lack of access to safe water for 21 % of the basin population (ACUMAR, 2020, p.36), and poor access to health system, which exacerbate the social impact of contamination.

iii) *limited participation in sanitation policy:* the river marks the limit between Buenos Aires City and Buenos Aires Province, thus there are different political jurisdictions involved, often governed by different political parties: the City; the Province; the Municipalities (within the Province); and the Nation, that rules over water surface. In this context it is very complex to advance sanitation policies. In 2008 a new national authority on the basin was created to develop a sanitation plan. However, there was very limited citizen participation in its design and implementation.

Environmental justice is based on a fair treatment and participation and involvement of people affected by environmental issues in the development, implementation and application of environmental laws, regulations and policies (EPA, 2021). In the basin this is not guaranteed because there is a greater concentration of environmental dangers occurred in "territories of greater social relegation and on citizens with less political and economic power" Merlinsky (2013, p.31) and because there is very limited participation of people directly affected by contamination (Cané, 2021).

The CoAct R&I Action #3 goal is to promote CSS tools to advance transformative actions towards environmental justice. It is coordinated by teams from the National University of San Martin (UNSAM) and the non-governmental organisation Fundación Ambiente y Recursos Naturales (FARN). In particular, we organised several co-design activities to launch a digital platform that will organise public information and generate citizen-data to produce new knowledge and understandings about three different socio-environmental problems: water quality, conservation of natural areas, and the resettlement of families previously located in the basin towline path. For each of the themes the platform contributes to different

purposes, which were jointly defined with co-researchers. The common denominator is producing knowledge that could promote transformative actions by different parties.

The action is organised in five research stages and for all of them we sought participation of different stakeholders. In the preparation phase (stage 1, CoAct Task T5.1) we built the knowledge coalition network, with the participation of diverse stakeholders who guided and facilitated the various co-design activities that follow. In the research co-design stage (stage 2, CoAct Task T5.2) teams from FARN and UNSAM targeted various stakeholders including community actors to act as co-researchers. Primarily through virtual workshops the main aim of this stage was to co-define the research and innovation challenges we will embrace using a co-designed digital platform for citizen generated data in each of the three themes. The next stage are activities leading to the platform's continuous co-design and use (stage 3, CoAct Task T5.3). This is done through co-design and implementation workshops organised jointly with various types of stakeholders, but mostly community actors, who act as co-researchers. The platform development builds on FARN's previous experience with *¿Qué pasa Riachuelo?*, a geo-referenced platform for monitoring sanitation policies in the basin, which was active from 2011 until 2014. The following stage is to collectively analyse data produced in the platform (stage 4, CoAct Task T5.4) through several participatory activities and finally to identify some measures of transformation (stage 5, CoAct Task T5.5) that could become visible using data in the platform and to reflect on outputs and processes carried out throughout the R&I Action #3 that could be applied in the European context. In this deliverable we mainly focus on processes and outputs associated with T5.2 and T5.3.

2.3 R&I Action #3 participants

Several different types of stakeholders are involved in the R&I Action #3 such as learning organisations, policy makers, academic researchers, civil society organisations and others, as can be seen listed in Figure 2. During the various activities involved in the research cycle and tasks, they may adopt different roles. Three main roles have been identified for this R&I Action #3:

- KC members, who have an advisory and facilitation role for the different activities in the R&I Action #3,

- co-researchers, who participate in the co-design of the different stages of the research cycle, especially in the definition of socio-environmental challenges and the co-design of the digital platform

- data generators, who mostly participate in the stage of data collection using the digital platform

This diversity in profiles and roles implies that there are different factors that need to be contemplated to promote active participation in all the different stages and tasks.

The activities leading to the platform co-design involved mainly community actors and learning organisations in the role of co-researchers. However, civil society and policy actors who are part of our knowledge coalition network also contributed in guiding and facilitating some of those activities.
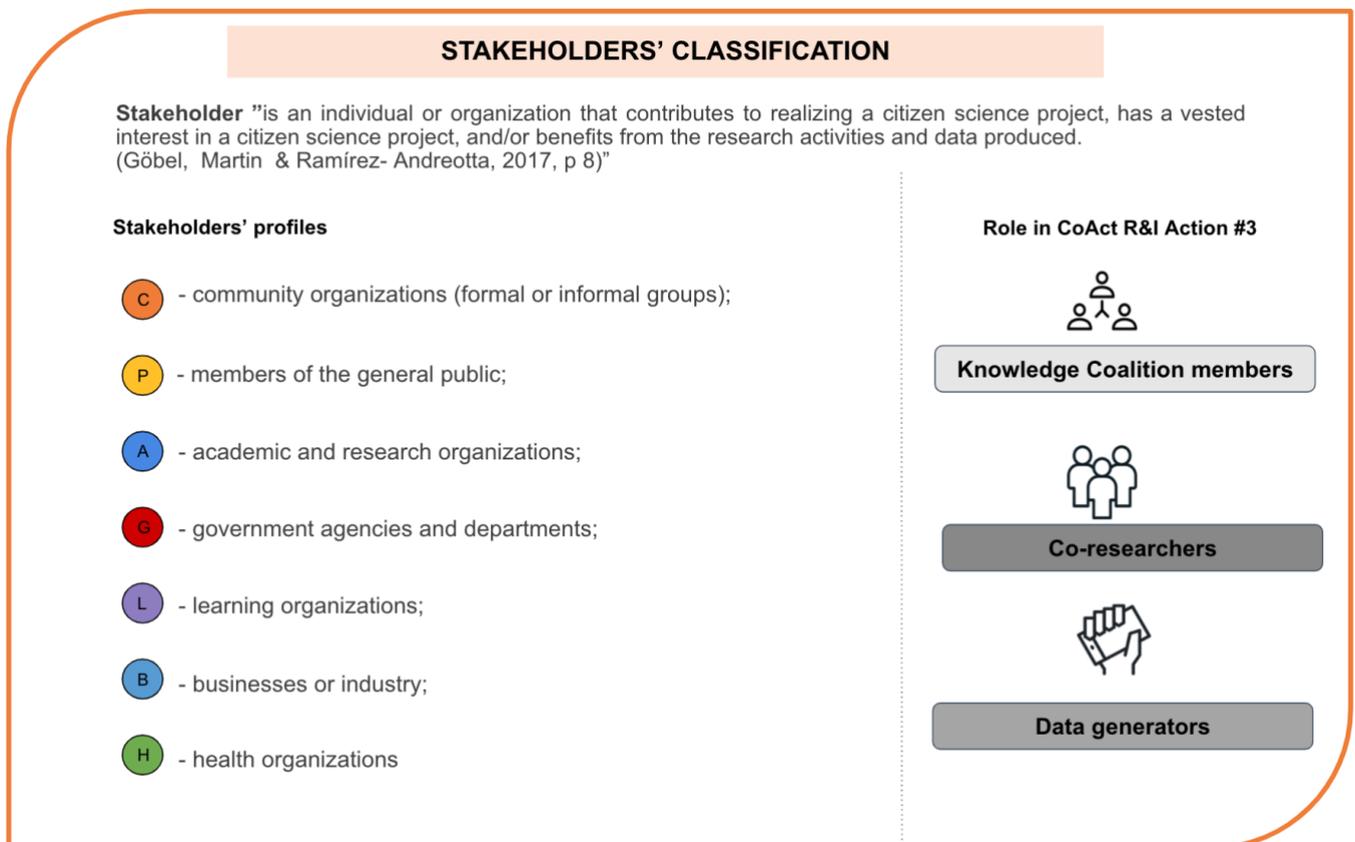
Figure 2: Stakeholder groups and their role in the R&I Action #3 on Environmental Justice, adapted from Arza et al. (2021)

2.4 R&I Action #3 digital output: QPR

We leaned on FARN's previous experience with QPR which stands for Qué pasa Riachuelo? (What's up Riachuelo?), which was a platform for monitoring sanitation policies in the basin active during the 2011-2014 period. The platform granted access to public information and increased the visibility of some socio-environmental problems and the extent to which they were addressed by sanitation authorities.

Our R&I Action #3 involves rebuilding QPR using a CSS approach. Through co-design workshops we incorporated different perspectives and viewpoints from the basin communities, scientists, and public authorities.

We worked primarily on three themes. During activities carried out in the context of T5.1 of the project we collected perceptions and understandings about main socio-environmental problems in the basin and the potential of CSS tools and methods to contribute in addressing solutions. Based on this and with further discussion in a recognition workshop which marked the beginning of task T5.2, we decided to begin working with three issues:

- **Basin water quality:** the basin is contaminated by industrial waste, liquid effluents, dangerous residues, clandestine dumps and collapsed landfills. A CSS approach is desirable not just to share, create and discuss water quality indicators, but also to highlight the importance of the river as a bio-cultural resource. In this theme we work especially with learning organisations.

- **Conservation of natural areas:** in the upper side of the basin there are wetlands and green areas which are important for the basin's biological and cultural patrimony. These create important ecosystemic benefits and allow social interaction and recreation, contributing to the population's wellbeing. However, these areas are currently threatened by industrialisation and urbanisation activities. Thus, a CSS approach is very relevant to share information and promote participation to contribute to the conservation of these areas.

- **Resettlement and redevelopment plans:** some people in the basin currently live in areas where they are exposed to environmental risks and housing infrastructure problems. These affected

people are included in urban development and redevelopment plans. A CSS approach is key in this theme because sharing information and participation are needed to find integral solutions.

3. Platform co-design activities

3.1. Research and platform co-design

The R&I Action #3 on Environmental Justice is organised in five main tasks as can be seen in Figure 3. The main inputs for the deliverable D5.3 were activities performed in the context of T5.2 and T5.3 of R&I Action #3, which are summarised in Table 1. Activities included in "T5.2 Research co-design through participatory methodologies" were largely based on virtual workshops with various stakeholders including community actors. The main goal was to co-define the research and innovation challenges we will embrace using a co-designed digital platform for citizen generated data. In turn, "T5.3 Conducting open research using Citizen-generated Data" pursued the goal of co-designing an open-source platform to produce citizen-driven data and to promote its use. Virtual workshops and on-site activities were carried out for this task. They were largely organised by theme (resettlements, water quality and conservation of natural areas) although we also organised activities to promote the use of the platform in general. Various types of stakeholders, but mostly community actors and learning organisations, participated in their role as co-researchers.
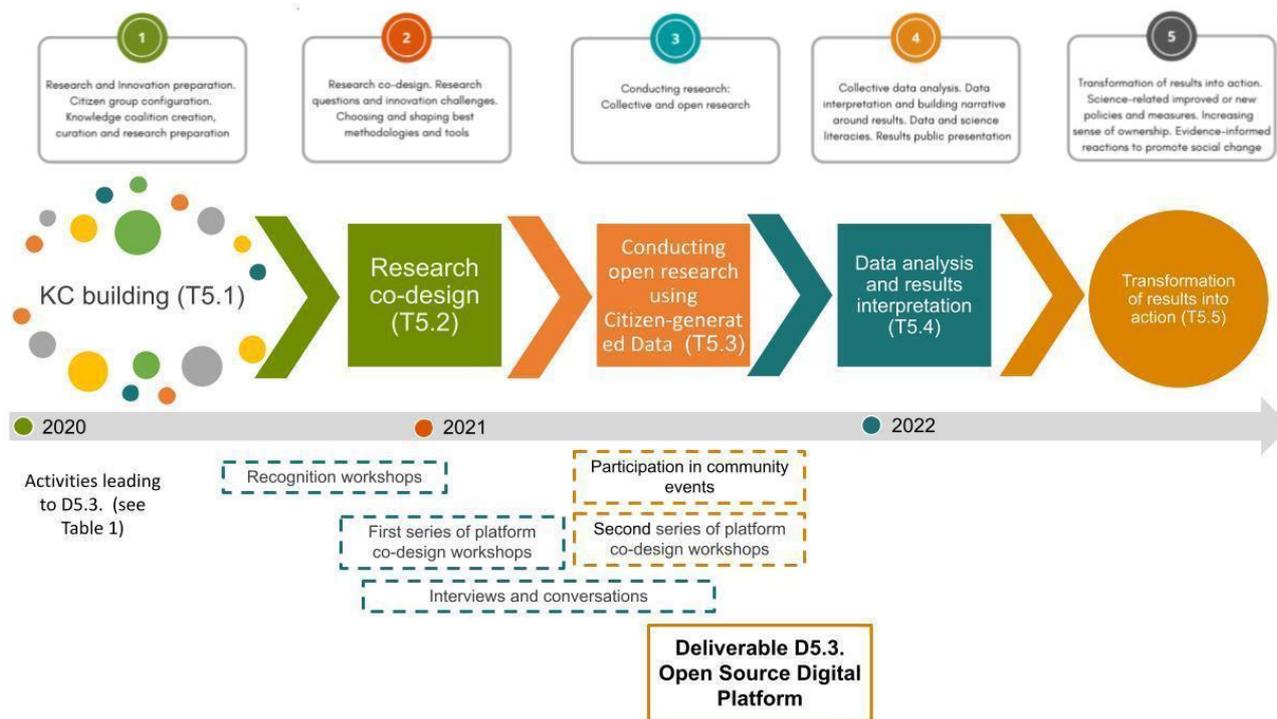
Figure 3: CoAct Research Cycle in the R&I Action #3 on Environmental Justice, adapted from Arza et al. (2021).

There were three types of activities carried out in the context of those tasks:

- Recognition workshops and platform co-design workshops: we first organised a "recognition workshop" in October 2020 with a variety of stakeholders to collectively discuss the research and innovation challenges and to identify what information was considered useful and for what purposes (item #1 in Table 1). In addition, we also run two "recognition workshops" with several community libraries to explore their interest and potential in disseminating the platform in their territorial networks (items #3 and #4 in Table 1). We then organised several smaller-size platform co-design workshops, most of which were theme-specific and came in two series. In the first series we collected suggestions, potential uses and expectations regarding the digital platform (items #2 and #6 in Table 1). In the second series we presented the platform progress and explored specific platform functions by navigating the prototype and/or discussed further uses offline (items #5, #7, #8 and #9 in Table 1). Community actors were the most prominent participants acting as co-researchers in all these platform co-design workshops. For the water

quality theme, a community library coordinated most of the activities side by side with UNSAM team. General outcomes of these activities are discussed below in this section.

- Interviews and conversations: in relation to T5.2 and T5.3 we organised several exchanges between June and December 2021. These included interactions with four researchers and extensionists working on the different themes to obtain feedback on data collection tools included in the platform and conversations with 12 actors participating in territorial organisations working on environmental issues in the basin, to promote the use of the platform and to better identify strategies for platform dissemination. Relevant outcomes for the deliverable D5.3 are mentioned in the thematic sections that follow.

- Participation in activities and events organized by the community: we also participated in four activities organised by community organisations in the basin to expand our territorial network, to test the platform in the field and to disseminate our R&I Action #3 activities. Table 2 briefly describes the activities and our goals for participation.

Activity #	Main goal / themes	Date	Stakeholders' profiles who participated	Outcomes	# People reached
#1. Research co-design workshop. One, virtual	Recognition. Understanding perceptions of the potential of CSS tools for Environmental Justice / All themes	October 2020	C A G	Availability and use of public sources of information. Identification of platform potential purposes Building the KC	22
#2. Platform co-design workshops Three, virtual	First-series platform co-design: potential uses and expectations / resettlements and conservation	April, June and August 2021	C G	Impressions, suggestions, potential uses and expectations regarding the digital platform.	13

	of natural areas themes.				
#3. Workshop with community libraries. One, virtual	Recognition. Presenting CoAct and expanding territorial reach / All themes	May 2021	L C G	Expanding the KC. Planning future co-design workshop	10
#4. Workshop with libraries and cultural centers. One, virtual	Recognition.Presenting CoAct and discussing potential uses of the platform and expectations / All themes.	June 2021	L C	Expanding the KC Impressions, suggestions, potential uses and expectations regarding the digital platform.	9
#5. Platform co-design workshops. Three, virtual	Second-series platform co-design: exploring specific functions and reflecting on the information circuit / resettlements and conservation of natural areas themes.	August to October 2021	C G L	Feedback on the specific functions related to resettlements and natural areas. Potential uses (two workshops). Identification of actors, actions and type of data involved in the information cycle for the theme on conservation of natural areas (one workshop). Testing the reporting function.	11
#6. Platform co-design workshops. Two virtual	First-series platform co-design: potential uses and expectations / water quality theme	September 2021	L C	Discussing CSS concepts and their role for water quality. Impressions, suggestions, potential uses, purposes and expectations regarding the digital platform. Identification of additional actors interested in the platform, actions to involve them and	6

				potential uses of the platform.	
#7. Platform co-design workshops. Three, virtual Two, onsite	Second-series platform co-design: reviewing and testing data collection tool and field guide / water quality theme	October - November 2021	L C	Discussion and improvement of the platform reporting content and field guide for water quality. Identification and mapping of observation spots. Testing of reporting functions of the platform through onsite activities. Reflection on the project and platform's development.	18
#8. Platform co-design workshops. One, onsite	Second-series platform co-design: testing platforms functions and the form/ conservation of natural areas theme	November 2021	L C	Discussion on the potential uses of the platform and the reporting content. Testing platform functions through onsite activities at the natural area.	10
#9. Platform co-design workshops. One, onsite	Second-series platform co-design: testing functions / resettlement theme	December 2021	L C	Discussion on the platform potential uses and reporting content Testing the platform functions.	7

Table 1: Main activities organised by CoAct R&I Action #3 in the context of Tasks T5.2 and T5.3 from October 2020 to December 2021 which contributed towards the co-creation of the D5.3. Open Source Platform.

Activity	Date	Stakeholders' profiles who participated	Activity description and CoAct participation goal	# People reached (approximate numbers)

#1 Seven astronomy online workshops organised by community library	Fortnightly from 27/08/21 to 12/11/21		The community library has held an astronomy workshop as a science communication activity for the last decades. It covers cosmology and relativistic quantum theory. During the Covid-19 restrictions, this workshop has switched to a virtual modality. By participating in this activity for a period of time, we aimed at strengthening links with groups and organisations from local communities.	+20
#2 Cycling event organised by community organizations	16/10/21		A local organization organized an event to raise awareness on the importance of implementing a biocorridor in the area. We aimed at i. strengthening links with groups and organisations from local communities. ii. identifying potential uses of the platform on the sites of interest.	+30
#3 Event at a natural area organised by community organizations	06/11/21		A local organization organized an event to raise awareness on the importance of guaranteeing protection for a natural area.	+30

			We aimed at i. strengthening links with groups and organisations from local communities. ii. presenting CoAct project and the platform's purposes. iii. identifying potential issues in using the platform on the sites of interest.	
#4 Participatory planning workshops	27/11/2021	C A G H L	A local organization organized a workshop to co-design a biocorridor at a sub-basin. The main objective was to build a common diagnosis and perspective for the participative planification process. We aimed at i. strengthening links with groups and organisations from local communities. ii. presenting CoAct project. Continuing to collaborate with the network	+20

Table 2: Other activities organised by territorial organisations in which CoAct R&I Action #3 team participated to spread the platform in the context of T5.3 in October-November 2021

During the recognition workshops we identified public sources of information relevant for the different themes that were used by various stakeholders. By doing so, several problems in the availability and accessibility of information became evident. In this context, we discussed potential uses of the platform,

obstacles and expectations. As a result, the general aim for the platform which at the time of drafting the R&I Action #3 scope had been expressed as "to share and create new knowledge on citizens understanding of socio-environmental problems and their practical experiences in dealing with them" became more specifically defined as: to **share experiences** of the actions carried out by communities living in the basin; to **organise** the available public information; to **collectively produce** new information to facilitate interaction and actions for transformation.

In asynchronous work FARN and CENIT's teams continued working with these general purposes in mind, to better adapt them for each theme and to identify the public datasets to be included in the platform. We nurtured our work with conversations with different stakeholders and outcomes from recognition workshops.

In the case of conservation of natural areas and resettlements and redevelopment plans, an operationalisation was carried out to start translating abstract concepts into measurable variables (Lazarsfeld, 1984). In the case of water quality an expert in hydrology with previous experience in participatory research, who was part of the knowledge coalition, was involved in the conversations. Through these activities the main dimensions for data generation were defined and we used them to create a questionnaire to be included in the platform prototype. The prototype opened up the dialogue with co-researches during platform co-design workshops (first and second series) and together discussed the adequacy and relevance and suggested modifications to the questionnaires, as it is explained in more detail in the following sections.

3.2. Platform co-design for basin water quality theme

In the project the potential of the citizen generated data was identified for the recording of the superficial and observational aspects of the river's bodies of water throughout the basin, to complement the official datasets that register different parameters through laboratory analysed samples and sensors. During recognition workshops, especially with community libraries, the education community and children in particular were located at the core of a strategy aiming at producing and discussing knowledge about the

river. This was seen as a key aspect to promote the valorisation of the river as a bio-cultural resource. As a consequence, and considering the recent approval of the National Law on Environmental Education - to be applied in the schooling system as well as other informal education spheres-, we focused on education settings as key users for the platform in this theme.

We first organised two workshops with community libraries located in the basin (#3 and #4 in Table 1). Community libraries are autonomous organisations managed by local actors and funded through different sources, including subsidies from the State. One of these libraries, with a long trajectory in scientific communication and environmental education, stood out as a key partner to conduct co-design activities. Their representatives not only manifested their commitment towards environmental education during recognition workshops but also were familiar with participatory knowledge production.

3.2.1. Co-design workshops: participants; goals and activities

We conducted seven co-design workshops, five virtual and two on-site. Each of them lasted between 2.5 and 3 hours. Meetings were held fortnightly with several conversations in-between to discuss the perceptions on each meeting's results. The library representatives provide their point of view on how the co-design process contributed to the library and community's purposes. The first two workshops (#6 in Table 1) belong to the first-series in our platform co-design (to discuss platform purposes, impressions, perceptions and expectations regarding uses) and the last five (#7 in Table 1) were of the second-series, to actually navigate the platform and to test its functions.

Participants

Virtual workshops were run with six members of the library, including the two representatives of the Directive Commission with whom the UNSAM team held regular calls to define the workshop's activities. The other four participants were members of the library and regular attendees to its different activities. Later on, in the on-site workshops 19 people in total participated, including the former 6 plus 8 other library members, 2 teenagers who were neighbours attending local schools, linked to the adults that were present and who contributed with their vision, and 3 people from a teachers' training institution.

Regarding the diversity of the participants, around half of them had a teaching background, there was a gender balance and the age spectrum was also quite broad, covering from teenagers to the elderly.

Goals

The main goals of the activities were to discuss impressions, suggestions, potential uses in the local setting, purposes and expectations regarding the digital platform. These goals were present in all workshops. More specifically, in the first-series we also aimed at discussing the concept of CSS and how it relates to other participatory experiences of co-researchers. In the second series we aimed at validating and adapting the platform's reporting questionnaire and functions for water quality, to test the platform functions and usability (both desktop and mobile websites). As by-products we also aimed at developing the field guide's content and to plan a follow-up schedule and content for platform dissemination.

Activities

During the five virtual workshops the main activities included collective discussions, usually initiated by a presentation and proposal by the UNSAM team or the two representatives of the library.

The first workshop was used to present the CSS concepts. It was initiated through a Mentimeter wordcloud, with the co-researchers expressing their thoughts about the Matanza-Riachuelo river basin. Many words were related to the process and outcomes of contamination but also to their disappointment regarding the potential for transformation. As a consequence of this result, the library representatives suggested an activity for the next workshop that would promote empathic engagement. The workshop was centred around expressing perceptions about the importance of water quality. Several day-to-day representations associated to the past and present habits came up as relevant. We also discuss the platforms' purposes on this theme.

The second-series of workshops was initiated with the third session, which addressed the platform prototype presentation. A hydrology expert, who is part of the knowledge coalition, also participated. He answered questions regarding the theme asked by researchers and co-researchers. We also discussed the content of the water quality reporting form, and the platform's main functionalities (map, layers of public datasets, report function display and themes visualisation). The fourth session was named

collective mapping for community activation and we identified what would be potential points for registration using the platform and how to further disseminate it among other actors. In the last virtual session, we conducted a "reporting simulation": we further discussed the form's structure and content, the circuit of information and the co-researchers' experience of taking photographs and observing the environment in terms of their appreciation of the river. This triggered a renewed interest and reduced their pessimism regarding transformation of the basin. Consistent with these ideas the co-researchers pointed to the importance of including in the platform the possibility of reporting the perceptions about the environment, and to explicitly recognise the value of continuous monitoring by tracking previous contributions.

In the sixth workshop (the first on-site) we selected the reporting spots and defined itineraries. In smaller groups, co-researchers discussed paper copies of the field guides and the data-collection questionnaire. They marked things that needed further clarification and discussed potential additions to the report form. The final workshop (second on-site) we used the platform in two different itineraries, identified bugs and discussed issues for improvements. We also video recorded the co-researcher both using the platform and defining it for dissemination purposes.

3.2.2. Co-design workshops: outcomes

As a result of the described activities, we identified two main **uses** for the platform. First, as a result of the co-researchers background and the originally identified purpose of linking the platform with environmental education, it was identified as a valuable **resource for pedagogical settings**: teachers of different subjects could implement curricular activities in interdisciplinary projects and develop materials with the children or teenagers using the platform as a tool for both collecting and consulting information.

Additionally, throughout both series of workshops the discussions regarding the relevance of the river as well as the produced changes in the co-researchers' perceptions of it led to the identification of the platform's use as a **community building tool**. The possibility of using it for raising awareness about contamination and the biocultural relevance of the Matanza-Riachuelo river was identified by co-researchers both in terms of potential results for other stakeholders' involvement (linking retired centres

and social and sports clubs with families and young people through periodical monitoring activities) and as part of the activities that were conducted (and started to plan for the future) in the on-site workshops.

In terms of the platforms' functions and content, the co-researchers identified as relevant the possibility that the users can **follow up** their previous monitoring activities and compare information; that the platform allows uploading or sharing information related to water quality from other sources (such as biochemical analysis or other indicators), and that teachers or other actors connected to (formal or informal) **educational activities** can consult and share content.

There were several modifications suggested for some of the questions and options to answer included in the data-collection form. One of the more innovative requests was related to the possibility of including a section **to allow data generators to report their perceptions of the environment**, pointing to the relevance of the situated knowledge production.

For the guide they mainly suggested clarifications and the provision of examples in a more colloquial language and concluded that it will be useful to work in the preparation of more specific guides according to the educational levels. During the virtual workshops it was also suggested that both the platform and the Citizen Social Science concept should be introduced through informative audio-visual material to engage other actors.

3.3. Platform co-design for conservation of natural areas theme

For the natural areas theme we organised three virtual workshops and one on-site. Virtual workshops lasted around 2 hours. On-site workshop lasted 3.5 hours. The first one (activity #2 in Table 1) belonged to the first series of co-design workshops, with the main goal being to identify impressions, suggestions and to explore potential uses and expectations about the platform. In the next three (activities #5 and #8 in Table 1) we continued discussing the platform's uses and expectations but many activities were organised around the functionalities of the platform and issues that turned up when navigating. In all cases, workshops were organised by researchers from FARN and UNSAM. The activities were planned together with an external human-centred design expert who also facilitated all but one of them.

3.3.1. Co-design workshops: participants; goals and activities

Participants

While some co-researchers participated in all four workshops, others did so intermittently. In total there were 16 people participating: 12 of them belong to different community organisations or neighbour associations interested in protecting and preserving four different natural areas of the basin; 2 individual neighbours interested in preserving natural areas in other basin locations and 2 representatives from a community library of the basin.

Goals

The first workshop (virtual) aimed at collecting impressions, suggestions, potential uses and expectations regarding the digital platform. In the second workshop (virtual) we continued discussing expectations and potential uses but we also started exploring specific functionalities of the platform. The third workshop (virtual) aimed at continuing the discussion of potential uses and, in addition, at opening up a discussion about the information cycle, the process through which information/ data is validated and finally published on the platform. Finally, the fourth workshop (on-site) we aimed at revising the last version of the data-collection questionnaire and to test the platform from mobile phones in the actual natural area.

Activities

The first workshop was divided in three main parts: visualization of elements of the platform (map, documents, reports), visualization of the form with different types of reports and feedback on the workshop dynamics and new actors who could be invited in future workshops. The screen of the platform was shared and the map's functions and visualisation layers were explained. The facilitator explained the function of sharing experiences (i.e., making reports) and mentioned the specific topics to report on. The participants imagined specific scenarios in which they could use the report making function, which allowed us to better identify potential use cases.

The second workshop started by setting a trigger question to identify expectations associated with the imaginary of digital platforms for natural areas topics as tools for action and collective construction of knowledge. Afterwards, the participants were divided into two groups to explore the platform and the form. One participant of each group was assigned to share the screen and show the platform as navigating on it. We also include co-evaluation questions. Meanwhile, the facilitator asked relevant questions.

The third workshop was organised in three main parts: to collect participants' own descriptions about the platform; to discuss the information cycle -mainly regarding upload data; and to plan face to face encounters by asking about interests, activities and availability. This was the only workshop which was not facilitated by an external party.

The fourth workshop (the first time onsite) we navigated the platform with the mobile phones and tried to use the "sharing experience" function while taking a short tour around the natural area. Then, in smaller groups participants discussed the questionnaire for data collection. Finally, we planned future encounters and activities for the 2022 summer.

3.3.2 Co-design workshop: outcomes

Outcomes

Natural areas are vital for the sanitation of the basin. In the context of an important deficit of these natural areas the platform was seen as a collaborative tool that may connect different areas promoting a more systemic view of their social and environmental role in the basin. The platform was seen as a tool that may contribute to that end in three different ways: by sharing information; by accessing scattered information; by enabling interactions among different stakeholders who shared this common view, facilitating, therefore, their collective action.

Co-researchers were interested in **sharing information about the main characteristics of each natural area**; its biodiversity and the different threats that were present in different moments to anticipate risks (e.g., if there were too many users reporting accumulation of garbage there could be a risk of fire in that

area). The platform was mentioned several times as a tool for **visualizing the efforts to monitor and alert potential threats** or problems associated with the safeguarding of these natural spaces.

They were also interested in accessing **information about all natural areas in the basin**, both in terms of uses, threats and collective actions to defend them. In addition, they thought the platform could work as a repository of legal documents related to gaining protection for the area. Finally, co-researchers mentioned the relevance of visualising the **evolution of the systems of natural areas in the basin,** whether they grow or shrink, whether they increasingly became protected or not.

Another clear outcome of workshops was the need **to enhance the network of actors** interested in protecting different areas throughout the basin. Workshops were an opportunity in this regard since they gather people from different areas, but they expect the platform could strengthen this social and political goal, for example by developing a feature where current and future activities could be advertised by actors or organisations promoting the natural areas protection.

It was clear from workshops, nonetheless, that **different stakeholders may use the platform very differently**. While some may use it for educational purposes, to disseminate the importance of conservation, others were more interested in the production of knowledge regarding what worked or not in terms of gaining access to protection, or how these natural areas evolve and why in the basin. In turn, some users may be only interested in sharing pictures of their outings while others would like to use it as a tool for pushing for political transformation.

3.4. Platform co-design for resettlement and redevelopment plans theme

In this theme we have organised three virtual workshops and one on-site in two different neighbourhoods. In one of them the resettlement process was ongoing -and for some families already completed (neighbourhood 1 (N1)). The other was legally subject to relocation but the process has not started yet (neighbourhood (N2)) and most inhabitants stand up for a redevelopment plan. Workshops lasted between 1.5 and 2 hours. In terms of our project plan and the type of activities that we organised,

two of them belong to the first series (Activity #2 of Table 1) while the other two belong to the second series (Activities #5 and #9 of Table 1). In all cases, workshops were organised by researchers from FARN and UNSAM. The activities were planned together with an external human-centred design expert, who also facilitated all virtual workshops.

3.4.1. Co-design workshops: participants, goals and activities

Participants

In total there were 16 people participating: 3 of them were Inhabitants of N1 and 10 were inhabitant of N2; there was 1 representative from the public defence bodies from Buenos Aires Autonomous City for N1; and 2 representatives of civil society organizations in N2.

Goals

The aim was, first, to expand the territorial collaborative networks for the platform-codesign, to collect impressions, suggestions and expectations on the digital platform and to explore platform potential uses on this theme. Second, to go deeper in the definition of potential uses and to test and obtain feedback on the specific functions working on the platform prototype. Goals had to be adapted to the particular conditions of the time and places. Digital connectivity is poor in most areas of these neighbourhoods. Most participants connect using their mobile phones.

Activities

The workshop dynamic was guided in a question and answer format. While in the virtual workshops the platform was navigated by the facilitator who shared the screen (N1) or reproduced short videos showing the platforms main functionalities (N2), in the onsite workshop participants navigated the platform themselves (only N2). In N1 the facilitator showed the platform's functionalities (in N1) and guided a discussion about who, why and for what may use the platform, trust issues and reliability regarding the information to be available in the platform. Participants put forward this discussion in terms of the legitimacy of users. This implied focussing on the data validation cycle and on which actors that may upload contents to the platform. In the other case, the discussion on potential uses and contents lead to

reflection on how the platform could help to disseminate collective action and individual claims that neighbours had already made through institutionalized channels, so that these actions could have a greater impact.

3.4.2 Co-design workshop: outcomes

Resettlement processes and redevelopment plans are controversial and affect communities' lives in multiple aspects, exposing populations in vulnerable conditions to new risks. Therefore, the platform was seen by neighbours affected by these policies as an asset **to make their problems** during the process **more visible**. Moreover, they also perceived the platform as a tool that could be used to **monitor the advancement of the sanitation plan** and the urban policy in three ways: to appraise public policy compliance, to share information on the works and infrastructure plans for the area, and to report issues that may be useful for the public defence officers to have some updates on the situation in the neighbourhood.

Urban development and resettlement policies need to guarantee people's access to information during the whole process. In this sense, the platform could contribute **to make public information more accessible**- information is scattered and difficult to understand. Commitments agreed in neighbourhood work-tables could also be shared through the platform.

Another critical aspect in the process is community participation. The neighbourhoods work-tables are the formal institutionalized scenery to guarantee this right but co-researchers recognize the importance of community mobilization. Thus, most involved neighbours mentioned they would like **to share their experience of collective action and organization**, their claims and legal actions that are still unsolved and their achievements as well.

Co-researchers were also interested in **sharing information about what is usually "not shown"**, i.e. the positive aspects of community life in these neighbourhoods and other aspects that are part of their territorial identity. They thought the platform could be used to share information about **community activities and projects** in order to promote interaction and further actions towards transformation.

During the workshops participants have also identified **obstacles** for fostering the use of the platform in the neighbourhoods. In the first place, **poor connectivity** in these areas was seen as an actual barrier. In the second place, participants raised an issue on the **actual impacts** of using the platform, i.e., how could their reports in the platform actually lead to an improvement in their living conditions. In this regard participants manifest their scepticism and disappointments related to the authorities' failed promises. Moreover, in both neighbourhoods the existence of basic needs that should be urgently addressed is usually a priority among neighbours that makes it difficult to discuss long term strategies or actions that do not have a direct and immediate result.

Another aspect that the workshops shed light on were participants' concerns about t**he legitimacy of any data provider** and how to guarantee the reliability of shared information. We have also identified that some neighbours that work for the local government or for enterprises that cause pollution, are afraid of losing their jobs or other reprisals if they complained or took legal actions to fight for their rights. This reinforces the need to take special care of **sensitive data safety**.

The workshops also enabled us to learn about the information **sources and communication channels neighbours** had used during the whole process. It was evident that despite having similar aspects, each resettlement process has a particular development in each neighbourhood and that is the reason why it is important to enable each community to share their own vision.

4. QPR Digital Platform

4.1 Context: previous versions of QPR

In 2010 FARN and other civil society organisations initiated the project QPR Qué pasa Riachuelo? and in 2011 they launched the geo-referenced platform that enabled open access to data related to the ACUMAR's Sanitation Plan. The final expected outcome was that communities could monitor these activities' execution and influence public policies in their territory.

In a second stage, QPR published citizen-generated data, which was a very innovative move. QPR became one of the first citizen-driven platforms in the country. The new section, "Social Monitoring'', established active mechanisms to control and watchdog the Sanitation Plan's execution. This section included a new feature: a form that could be completed anonymously by citizens. This form gathered information that was then uploaded and published as a "story" (a neighbourhood alert taken by FARN to request further information on the matter to the competent authority) or as an "action" (an activity carried out by the community), whose responses were also published. "Social Monitoring'' section also included a "News" subsection that displayed a social survey on the presence of the issues associated with the basin in the media. For more information on the case, please see Fressoli and Arza (2016) and Mira (2016).

Although FARN organised workshops and other activities within the community to foster platform use, spontaneous participation was rather low. Firstly, neighbours from the basin did not perceive the platform as a tool to solve their problems and eventually lost interest in reporting any situation as there were no concrete responses carried-out by ACUMAR. Secondly, neighbours feared reprisals by powerful groups with conflicting interests (e.g., industries dumping waste). Thirdly, the wide digital and technology gap in the affected communities limited the platform's use to the FARN workshops.

The QPR's dependency on workshops to feed its database weakened its community impact. As soon as the project ran out of funds to sustain the workshops, the generation of systematic information could not be further guaranteed. Funding was also needed for the cross-reference validation done by FARN's own staff on the citizen information about breaches to existing regulation and on the follow-up with national authorities on the different issues raised on the platform. The platform stopped being active in 2014.

Overall, QPR's main success was to push ACUMAR to grant access to information related to the Sanitation Plan, to systematize existing data and to make it visible. This was a central claim from communities seeking solutions to long-lasting socio environmental problems. In fact, ACUMAR ended-up developing its own geo-referenced tool showing information on socio-environmental basin's problems, among other issues. However, the goal to foster citizen-generated data remained unfulfilled.

The mentioned experiences made it clear that a new version of QPR had to be re-conceptualized to become a tool that could be uptaken by citizens. This goal not only aims at increasing the amount of citizen-generated data but also to build a sustainable platform that might become more independent from resources raised by leading organisations.

4.2 General description

Based on the previous experience UNSAM and FARN initiated the development process of a new version of the platform: ¿Qué pasa, Riachuelo? (QPR). Both organisations agreed to keep the name QPR because it is well known by many actors interested in the sanitation of the basin. Unlike QPR 2011-2014 we adopted a citizen social science approach to guide the development activities.

The alpha version works on three themes: water quality, conservation of natural areas and resettlement processes. The platform is conceived as dynamic open-source technology which can be upgraded in future versions to modify some features of the data-collection tools, to cover new themes, or to improve visualization functions. It is owned by FARN. The participation of UNSAM, CoAct Consortium and EU funding is acknowledged in the *about us* section (see Figure 4). It is a geo-referenced site that presents several layers of information, which can be chosen to be visualised on two types of cartographic maps: a satellite (heavier) or a street (lighter) map. These layers of information are both, public information and citizen-generated data.

We expect the platform to be used by different users' profiles, including educators, researchers, community actors and public policy actors. They could find different benefits in using the platform as identified during the platform co-design activities (see Figure 5). All in all, the platform could become a tool to build community networks related to the environmental justice problems of the basin who may then ideate actions to promote transformation.

Figure 4: QPR (alpha version) main page, about section

WHAT CAN QPR BE USED FOR?

USES

ACTIONS IDENTIFIED DURING CO-DESIGN WORKSHOPS

Educational
- to plan educational outings to observe water bodies and sinkholes of the Matanza-Riachuelo basin.
- to design interdisciplinary projects
- to design syllabus aligned to the National Environmental Education Law

Research
- to gather information during fieldwork
- to analyse community visions on the QPR themes
- to display data from various public sources in one single place
- to learn how to use citizen science tools

Community
- to create alerts and to identify natural areas that need protection
- to create networks among actors with similar interests
- to access information on the socio-environmental situation of the Matanza-Riachuelo basin
- to make visible several community experiences and problems that affect them
- to monitor public policies

Governmental
- to learn about community visions concerning water quality, the processes of protecting natural areas, and about the resettlement of neighborhoods, shanty towns and settlements previously located in the basin
- to access to geo-referenced information generated by citizens and public sources
- to integrate different sources of public information

Figure 5: What can QPR be used for? Uses and actions identified in platform co-design workshops

4.3 How can QPR be used?

To better inform potential users and to share other material directly related to the platform (e.g., field guides for data collection) we created a landing page whose URL is https://quepasariachuelo.farn.org.ar (see Figure 6). Users could select one or more profiles and they will read information about what QPR can be used for as presented in Figure 5. This information is to promote the use by different participants. Complementary information and project outputs will be shared in this landing page such as field guides, data sheets with information about different natural areas and other data.
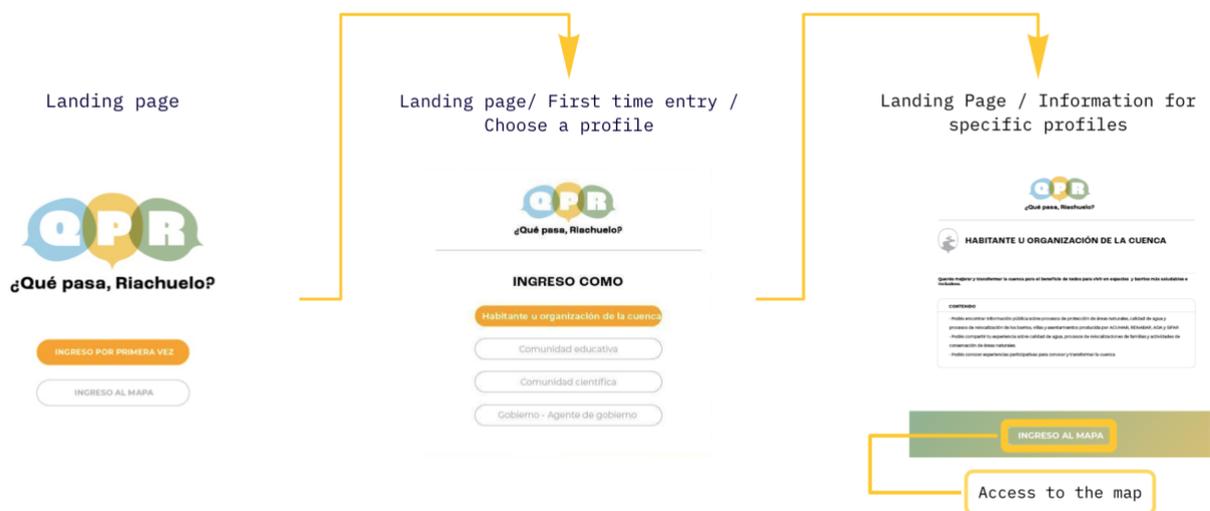
Figure 6: Landing page: to enter QPR (alpha version) by choosing one profile, accessing information about uses and entering the map

From the landing page, users can access the map, which can also be accessed directly at https://mapaqpr.farn.org.ar/. Figure 7 shows different options when navigating QPR alpha version.
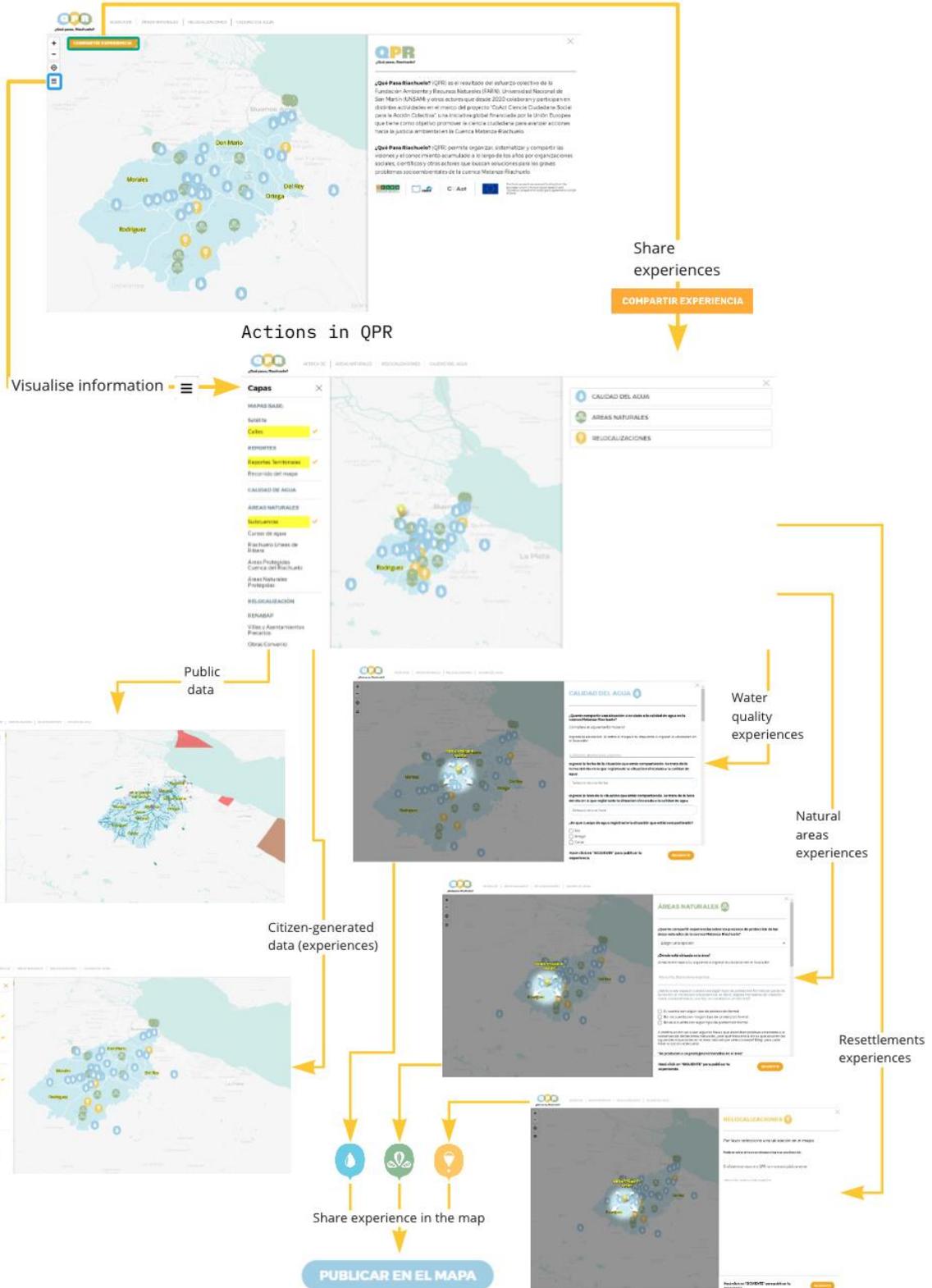
Main Page / About Section

Share
experiences

COMPARTIR EXPERIENCIA

Actions in QPR

Visualise information

Water
quality
experiences

Public
data

Natural
areas
experiences

Citizen-generated
data (experiences)

Resettlements
experiences

Share experience in the map

PUBLICAR EN EL MAPA

Figure 7: Options to navigate QPR (alpha version)

When entering the map users can either visualise public information and the citizen-generated data by pressing the "layers" button (*Capas*, in Spanish) or they could generate data by pressing the "to share experience" button (*Compartir Experiencia*, in Spanish). If they decide to visualise they could see public information relevant or the reports generated by citizens in the three themes. The public information available in the alpha version of the platform is the following:

- Hydrographic sub-basins within the Matanza-Riachuelo basin. Source: ACUMAR
- Water courses of the Matanza-Riachuelo basin. Source: ACUMAR
- Hydrographic sub-basins of Buenos Aires Province. Source: Provincial Authority of Water (ADA, from its acronym in Spanish)
- Protected areas in the Matanza-Riachuelo basin. Source: ACUMAR
- Protected areas in Buenos Aires Province. Source: Integrated System of Environmental Information (SINIA, from its acronym in Spanish)
- Popular neighbourhoods registered in the country: Source: National Registry of Popular Neighborhoods (RENABAP for its acronym in Spanish)
- Shantytowns and "informal" settlements of the Matanza-Riachuelo basin. Source ACUMAR[2]
- New buildings for social houses associated with the resettlement process in Matanza-Riachuelo basin. Source ACUMAR
- Works tables for citizen participation in the resettlement process in Matanza-Riachuelo basin. Source ACUMAR

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[2]ACUMARs dataset of shanty towns and precarious settlements in the basin includes all neighbourhoods included in an agreement of 2010 (Convenio Marco para el cumplimiento del plan de urbanización de villas y asentamientos precarios en riesgo ambiental de la Cuenca Matanza Riachuelo) in which authorities from the different jurisdictions commit themselves to provide housing solutions for all inhabitants exposed to environmental risk. According to this agreement most exposed populations were going to be resettled in new areas and dwellings. In some neighbourhood resettlement processes include the whole population, while in other cases only some families were selected for resettlement.

If users decide to share experience, they choose one of the three themes and they will need to agree with our data protection policy which is shown as a pop-up message. In the following sections we describe in more detail the instrument to collect data for each theme and the potential uses of the collected data.

4.4 Citizen-data collection tool for the basin water quality

4.4.1. How does the questionnaire look like?

Co-researchers and data generators use this questionnaire to enter water quality data based on their observation of superficial Matanza-Riachuelo basin water system components, such as rivers, channels and streams, and sinks of the drainage system. Several sub-basins of the Matanza-Riachuelo basin are fully urbanized and therefore the natural surface drainage was totally transformed when building the drainage systems. Thus, current drainage system is dual, free in the surface and via pipes in the sub-surface. The sinks are the areas where these two systems connect. Therefore, by monitoring the sinks, in terms of colours, odours or accumulation of solid residues, one can understand different situations in relation to water quality.

The questionnaire gathers information on two main subjects: water quality and hydrometeorological situations as shown in Table 3 and Figure 8. The main forcing of the water dynamics in the basin is rain. For this reason, having a record of the previous rainfall situation in the area allows co-researchers to have an idea of what is expected in the water courses.

Water quality variables	Hydrometeorological variables
Turbidity	Water level at the current hydrological situation
Colour	Weather status in days prior to the report: rain, rain type and presence of wind
Presence of odour	
Presence of floating objects	

Presence of vegetation in the riverside and riverbed	
Presence of fauna	
Proximity to potential sources of contamination	

Table 3: Main categories in the water quality questionnaire

Figure 8: QPR (alpha version) Basin Water Quality data-collection tool (questionnaire)

Besides, co-researchers are asked to enter a location for the water body they are reporting on, to specify the water body type (river, channel, stream, and others) and to provide time and date details from the

registered event. Finally, co-researchers may upload pictures and documents as well as use the open field to enter additional information or any personal thoughts on the registered event.

4.4.2. What can this information be used for?

The dataset will make more visible the status of some variables that can be associated with the evaluation of the quality of surface water. Specifically, it is about providing data regarding the current and the preceding hydrometeorological situation at the reporting point and determining the state of the river or stream with respect to an easily observable classification relative to turbidity or odour, and the presence of vegetation, sources of contamination nearby, fauna or waste.

For the community: The population will be able to report the status of the basin with a wide spatial coverage, allowing to point out anomalous situations such as the occurrence of isolated discharges, strange spills, or the accumulation of waste on the margins and on the water. They could also share their personal understanding or experience of water quality and how it impacts their lives. In addition, by being involved in monitoring activities the population will better understand the dynamics of the basin

For policy makers: The evaluation of water quality parameters in a basin allows the creation of management tools that may be useful to establish the status of the water resource and to determine the efficiency of management programs. Monitoring variables associated with water quality allows characterizing pollution contributions from specific or unknown sources, which may support decision-making.

For scientific research: community participation in water quality monitoring, when complementing traditional measurement methods, enables the analysis of the temporal and spatial evolution of water quality parameters. Citizen-generated data tools significantly increase the spatial coverage of data and over time.

For education: the process of filling the questionnaire and reading the field guide during training outings open opportunities for teachers to introduce concepts regarding water quality to students and to explain what factors may explain the situation they are reporting.

4.5 Citizen-data collection tool for conservation of natural areas

4.5.1. How does the questionnaire look like?

The questionnaire gathers information on the protection processes of natural areas along the basin, focusing on the importance of formal recognition (laws and norms), the availability of management resources and regulation and the existence of collective action and social mobilization.

To better understand the probability of success in these processes, the questionnaire also includes information on the risks and hazards for protection and on the opportunities to promote protection actions based on these areas' values in terms of biodiversity, cultural patrimony and community uses and symbolic appropriation. Most frequent risks for protection detected by co-researchers are: fires, garbage dumping, illegal hunting or fishing, cutting down of trees and plants, weeding of native vegetation, proximity to industrial waste and sources of pollution, other incompatible uses of space that diminish the protected surface (these may be promoted by governmental actors, enterprises or other community members). About the opportunities, the questionnaire has a bio-cultural approach as it includes the presence of native flora and fauna, wetlands, cultural patrimony (such as historical or archaeological remains) and community members' activities and experiences in the area.

4.5.2. What can this information be used for?

For community: The inclusion of aspects related to norms, management resources, and social aspects such as collective action is also crucial for understanding the protection process. It is important to communicate and generate awareness on these areas' natural and cultural patrimony. Above all, neighbours and younger generations should know these areas, appreciate their value, use them in a sustainable way and defend them.

For policy makers: Having georeferenced data about several natural areas, particularly about their natural and cultural patrimony and about their threats, may be an important input for planning and implementing a bio-cultural corridor at a landscape scale. Information in the platform may help to connect and enhance these areas all along the basin. There is a deficit of green spaces in the basin. These

areas positively contribute towards sanitation of the basin, which is the target of the judicial order that guides policy decisions. At a smaller scale, identifying and geolocating some hazards may help to have a better diagnosis and improvement of mitigation and risk management policies.

For scientific research: Data in the platform may help to better understand both risks and opportunities of these natural areas to be protected by analysing the relationship between georeferenced data and the characteristics of these areas and their preservation status. Firstly, information about how the space nearby the area is used, about contested spaces in the area and about the proximity to sources of pollution and other threats, may help to better understand risks. It could also help to identify the most common impacts on these areas and the mitigation measures. Secondly, spatial analysis on the area's location may help to study its environmental importance at a larger scale that embraces the whole basin as a system. Thirdly, to recognise what areas according to communities should have some protection and find scientific arguments for supporting these processes.

4.6 Citizen-data collection tool for resettlement and redevelopment processes

4.6.1. How does the questionnaire look like?

The questionnaire gathers information on how people assess their own situation regarding the resettlement process, the multiple dimensions in which the resettlement or urban development policy may impact communities and relevant normative aspects to understand whether people rights are being respected.[3]

As already mentioned above there are people living in the basin that have been included in the resettlement plans because the national authorities considered they are subject to environmental risks. People affected by these processes may experience other risks related to the resettlement process itself.

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[3] According to UN guidelines (such as the Basic Principles and Guidelines on Development-based Evictions and Displacement, 2007), ACUMAR's protocol for the resettlement process recommend decision makers to act integrally, to provide information and to enable participation in the decision making process to guarantee people's rights (ACUMAR, 2017).

The questionnaire then includes information about a variety of aspects that are considered key by co-researchers when thinking about the resettlement or redevelopment process (e.g. access to health and education, adequate housing and access to public services, neighbourhoods public spaces maintenance, transportations and connectivity, employment, entrepreneurship and family economy, community relationships and organizations among others) including access to information about the policy process and their participation in them as well. There were also expressed interests in reporting information produced through work-tables as well as other action-oriented instances where community organizations are actively involved.

4.6.2. What can this information be used for?

For the community: Sharing information through the platform is a way to make their problems public and gain visibility for their collective actions. It is also a way to know what is going on in other communities from the basin.

For policy makers: public defence officers may use this information to have updates from the territory and identify emerging issues and social needs that may affect people's access to their rights. Neighbours may identify other pollution sources that are not being controlled by the sanitation plan, such as new industries and activities that generate different kinds of emissions that should be controlled by authorities.

For scientific research: citizen data may be used for contrasting public information on the advancement of the resettlement and housing policies. Alternative indicators may be built to understand people's risk perception, wellbeing appraisal and satisfaction level regarding the resettlement process, subjective aspects that are not usually addressed by official data. Georeferenced data may be related to information regarding different topics (health, economy, education, community relationships, etc.) and this may help to identify some regularities that need to be studied and addressed. Reports in the platform may also be an input for carrying out public policy analysis techniques, such as stakeholder's analysis, public policy evaluation and studies that focus on the implementation gap.

4.7 Technical Set-up of the Platform

4.7.1 Platform modules

QPR is a full stack solution for both navigating and building collaborative maps. It started as a fork from Mapseed.org, a community-driven map platform which started also as a fork from the Shareabouts[4] project (developed by OpenPlans).

QPR relies on two main components:

- QPR Platform (UI), a node application built with React, featuring Mapbox integration. It allows creating and editing maps through web forms that are configured as JSON objects and rendered by its own view engine.
- QPR API is a REST-API developed using Django and Python 2.7. This module powers QPR Platform by collecting and storing the information that users submit through the three forms.

Besides, it offers its own User Interface for allowing administrative tasks such as:

- Managing permissions grants for submitters and datasets;
- Managing user authentication. Authentication is performed via third-party social media services (Twitter, Facebook, and Google+ are currently supported);
- Managing (CRUD) user submissions.

QPR Platform is served as a static website using S3 storage server with Cloudfront CDN in AWS. QPR API on the other side is a dockerized Python application that runs as a web server in an EC2 Amazon Linux 2 environment, using nginx as the proxy in the host machine and gunicorn for serving the Django application on the container.

AWS cloud-computing is General Data Protection Regulation (GDPR) compliant and guarantees a high degree of cyber-security. Besides, in order to protect user's privacy, a post-processing function has been implemented to remove users' metadata from uploaded attachments and avoid storing it in the QPR database.

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[4] From https://github.com/openplans/shareabouts: Shareabouts is an online mapping tool to gather crowdsourced public input in a social and engaging process.

4.7.2 Technical specification

A detailed description on QPR technical specification may be found in the Table 4 below.

Runtime	- QPR API runs on python and is implemented using Django Framework. - QPR Platform runs on Node.js and is built using its own design system made up of reusable React components.
Monitoring	- User action logs stored in the database and are visible from API admin panel (**native QPR API action logs**). - Application and requests logs are written in /var/log directory in the API server machine (**EC2 logging**). - **Cloud Trail** generates Amazon Auditory registers. - **Cloudwatch Alarms** configurations monitor health servers (network, disk and memory). - **Cloudfront logs** are saved in S3 to register API use.
Code back-up	On each release, a bundle that includes the codebase and its dependencies will be backed-up in a S3 storage unit in AWS.
Information for Tracking and Customizations	QPR uses cookies to provide a customized user experience on the site. This means that users' computers remember information of their last sessions. Users' browsers only share information in the cookie with the specific website that provides it, and no other website can request that information. Besides, QPR uses **Google Analytics** to gather information for analysis and to improve user experience and better align QPR's content and website's design with users' needs. To use this third-party analytic service, QPR's cookies collect and temporarily store certain information (mentioned below) that does not persist in the QPR database. - The domain users access our website from - Users computer's IP address - The date and time users accessed the site - Users' computer operating system - The browser used to access QPR site - The Universal Resource Locators (URLs) of the pages visited on QPR - The URL of the site users come from, if they click a link there that bring them to QPR
Database	Database contains user activity information and their submitted data. PostgreSQL 14.1 is running in a Docker container in EC2. A cron job runs daily to store database (**back-up**) snapshots in a separated S3 bucket.

Table 4: Technical specification of QPR platform

4.7.3 Code documentation and open-source license

The code of QPR is published under the GNU General Public License version 3 on platform-qpr repository (https://github.com/farn21/platform-qpr). This Github repository stays synchronized with its upstream, platform repository, from Mapseed. A README.md file gives instructions on how to install, configure, customize and deploy a new interactive map.

5. The Covid-19 pandemic and its impact on the deliverable

This deliverable is the result of tasks T5.2 Research co-design through participatory methodologies and T5.3 Conducting open research using Citizen-generated Data. The Covid-19 pandemic implied the adaptation of the original plans for both of these. The Covid Situation and the associated lock down restrictions affected the communities in the Matanza-Riachuelo-basin disproportionately more than in other parts of the country. The Buenos Aires metropolitan area had the highest infection rates in the country during 2020 and most of 2021 and consequently very restrictive lockdown measures. Housing conditions made social distance particularly complicated. Restrictions due to lockdown exacerbated economic emergencies in these communities.

Activities associated with T5.2 turned totally virtual as well as most of those associated with T5.3. This required participants to get access to digital infrastructure and to have some experience and/or training about how to interact virtually. This was challenging for all groups, and it became critical for those in most vulnerable conditions. In particular, the housing conditions of neighbours affected by resettlement policies and their socioeconomic situation, especially during Covid-19 times, were not optimal to carry out virtual activities. Co-researchers in the conservation of natural areas are in a better situation but they frequently faced emergencies that prevented them from participating at the last minute and when they connected, they used tablets or mobile phones, which were not ideal for the planned dynamics. All in all, this situation was not optimal to guarantee frequent interactions. In the water quality theme, the alliance

with a community library with experience in popular science and whose members (or some of them) had previous experience in digital participation in activities organised by the library contributed to guarantee a more systematic and stable participation.

The differences in the intensity and frequency of the interaction can be noted in the degree of progress regarding the data-collection tools embedded in the platform for the different themes. While in the water quality theme these tools have been better tested, for other themes there might still be room for some improvements with further usage. The possibility of continuous improvements is not unexpected since the platform was originally conceived as a dynamic tool that could be upgraded as needed.

6. Future activities with digital platform

In the R&I Action #3 future activities framed under the ongoing T5.3 Conducting open research using Citizen-generated Data and T5.4 Data analysis and results interpretation require the use of the platform that are mostly included within the ongoing.

We will promote the use of the platforms with two interlinked and consecutive purposes: first, to disseminate it and to promote data generation among specific communities and groups that will also allow for its grassroots uptake; and second, to facilitate the processes of analysing and generating interpretations of the data and developing strategies to activate the produced knowledge. We planned two types of workshops and associated activities.

Firstly, implementation workshops, some of which will be jointly organised with co-researchers. These workshops aimed at making the platform better known and at teaching/instructing about how to use it. We plan to link these workshops with other training and communication activities to promote participation and enhance the educational impact of the R&I action #3. We have already developed products to contribute to the dissemination such as a short video showing the platform development process (see Arza, et al 2021). We are currently developing some micro-videos based on interviews and other activities with co-researchers to engage other actors with the platform. These micro-videos will

showcase concrete community monitoring activities in the field, the co-researchers definitions and interpretations of the impact of a citizen social science project and what is the platform to them.

Secondly, to facilitate the processes of producing interpretations of the data and developing strategies to activate knowledge production activities. To that end two further larger-scale workshops involving other actors in the knowledge coalition are planned in the coming months.

i) a hackathon where software developers, researchers with different disciplinary backgrounds working on the platform issues and co-researchers will discuss options to improve visualisation features of the platform, with the aim of motivating commitment from different actors to further develop and use the platform.

ii) we will hold a policy workshop with different actors involved in sanitation actions, to better understand how to promote the use of citizen-driven data in policy making and implementation. The identification of potential obstacles, windows of opportunity in the policy processes and potential allies to engage with will contribute to the production of guides and general recommendations of steps to consider for linking citizen social science projects in general to public policy. These results will contribute to planning future activities of data collection and will be a relevant input for the activities associated with the identification of strategies to activate the knowledge produced through the platform.

With these inputs we will then proceed with the organisation of co-creation sessions for data interpretation and analysis with the aim of producing the last deliverable of our R&I action D5.4 "Policy brief on Environmental Justice".

7. Conclusions

The R&I Action #3 on Environmental Justice explores socio-environmental problems in the Matanza-Riachuelo river basin, in the Buenos Aires metropolitan area, with the aim of promoting transformative actions. The Matanza-Riachuelo is a heavily contaminated 64 km long river. 6 million people live in the

basin (15% of Argentinean population) and it is estimated that 1.8 million of them live in highly vulnerable conditions (as defined by ACUMAR (2018) p.31).

The R&I Action #3 goal is to promote citizen social science tools to advance transformative actions towards environmental justice. The main output is an open-source digital platform called ¿Qué pasa, Riachuelo? (QPR) whose alpha version is presented in this document. Tasks T5.2 Research co-design through participatory methodologies and T5.3 Conducting open research using Citizen-generated Data of the CoAct R&I Action #3 guided the activities leading to this output.

Stakeholders who may benefit from data-collection activities are different actors interested in transforming the basin towards environmental justice, particularly in relation to the platform current themes: **basin water quality**, **conservation of natural areas** and **resettlement and redevelopment plans**.

Participation of the affected community is the backbone connecting citizen social science with environmental justice approaches. In R&I Action #3 participation in the platform co-design was facilitated mainly through 15 workshops in which 51 co-researchers participated, mostly from community organisations. However, there were different types of actors involved such as learning organisations, public policy officials, academic researchers, and others as explained in section 2.3 in the different activities organised to co-design the research leading to the platform development, which were described in section 3. Besides the 51 co-researchers who participated in platform co-design workshops for the different themes, there were 37 additional actors who contributed to task T5.2 and T5.3 either participating in recognition workshops or in interviews and conversations. Some of them were key in facilitating interactions with co-researchers or providing insights for different activities. In addition, we also draw from the guidance of knowledge coalition actors who participated in activities organised as part of T5.1. Knowledge Coalition building. In total, there were 128 actors contributing in some way or another with R&I action #3.

The digital platform follows three main purposes: to share experiences of the actions carried out by communities living in the basin; to organise the scattered public information and to collectively produce new information to facilitate interactions and actions for transformation.

In the alpha version the platform organises existing information and enables opportunities for sharing experiences and can be accessed at: https://mapaqpr.farn.org.ar/. The platform is open source, published at GNU General Public License version 3, and its code can be found at https://github.com/farn21/platform-qpr.

It is a geo-referenced site that presents several layers of information, which can be chosen to be visualised on two types of cartographic maps: a satellite (heavier) or a street (lighter) map. The information available in the platform is both public information from different sources related to the three themes and the experiences shared by platform users.

Data collection tools to share experiences and observations are different for each theme. Three different questionnaires were co-design with different co-researchers groups in workshops organised by UNSAM and FARN, most of which were facilitated by an external party. In the case of basin water quality, an expert in hydrology also participated in the process. The potential uses of data in the platform were lengthy discussed in workshops, and in all themes uses for community, research and policy could be identified. In the basin water quality theme and to some extent in conservation of natural areas theme, educational uses were also identified. For this reason, a landing page was developed where four different users' profiles (community, research, education and policy) can identify the platform potential benefits and the type of data they could produce and access. This can be accessed at https://quepasariachuelo.farn.org.ar.

The platform has the potential to become an intermediary space for actors to ideate actions of transformation. They could access public information –currently scattered- in a single place together with citizen-generated data on three important themes for Environmental Justice.

In the upcoming months we will organise activities on two interlinked and consecutive purposes: first to disseminate the platform and to promote data production among specific communities and groups that will also allow for its grassroots uptake; and second, to facilitate the processes of producing interpretations of the data and developing strategies to activate the produced knowledge.

8. References

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