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Katherine Mollenhauer, Cala del Río, Javiera Rodríguez, Karen Silva, and Vanessa Rugiero

Faced with the climate crisis scenario, it is urgent to take action for local, sustainable and resilient community development, such as the collaboration of multiple actors from civil society and the private and public sectors. In that regard, public environmental information on environmental management and the performance of the mining industry is key to reducing socio-environmental conflicts and supporting decision-making, especially for citizens who are on constant alert in the face of the climate crisis.

Recognising this problem, a multidisciplinary research team from the Pontifical Catholic University of Chile developed the Environmental Observatory (EO), an environmental management information system pilot focused on mining projects in two regions of Chile. The purpose of the EO is to improve access to information for resilient community action to respond to environmental crisis contexts and avoid the generation of environmental conflicts due to lack of information, lack of transparency in environmental management processes and distrust associated with the control of the mining industry. Today, access to this kind of information in Chile has weaknesses linked to the institutional dispersion of data, asymmetries of access to information by different actors and the scarce consideration of the capacities, needs and expectations of each type of actor involved in a territory's environmental management.

The wicked problems approach, visual thinking, sense-making, and sense-sharing processes to make tacit knowledge explicit are key processes that break down the problem into components, enabling their understanding and integrating them into a solution proposal. Based on this, it is possible to involve and allow citizens to take part in the governance of processes from a strategic and political perspective, moving towards a new understanding of participation. Applying the systemic design methodological approach, researchers address the complexity of citizens' relationship with information, allowing users to become active and not only informed about environmental management activities in the territory, reducing socio-environmental conflicts.

This paper discusses the contribution of systems-oriented design as a relevant methodology to address the process of problem framing, need-finding, ideation, prototyping, testing and iteration in complex projects, where the EO acts as an example. It is concluded that the contribution of SOD was present in (a) the modelling of the complexity of the problem, incorporating the vision of each actor of the system, (b) the internal articulation of the multidisciplinary team of researchers to reach a single interdisciplinary result—the EO platform, and (c) the synthesis of new knowledge that allows the creation of a transdisciplinary methodological strategy.

KEYWORDS: systemic design, public environmental information, empowered citizenship, resilience, interdiscipline, sustainable development.

RSD TOPICS: Socioecological Design, Cases & Practice

Introduction

Access to public environmental management information in Chile has weaknesses related to the institutional dispersion of data asymmetries in access to information by different actors. These barriers have been especially sensitive for the mining industry, an activity with the highest investment contribution to the country and important socio-environmental conflicts. It is urgent to take action for sustainable and resilient local community development, including the collaboration of multiple actors from civil

society and private and public sectors. Making this information understandable for different actors through the generation of indicators in an appropriate and understandable language is key to reducing the gaps in access to public information on environmental management and the performance of the mining industry, reducing socio-environmental conflicts and supporting decision making, especially for citizens who are on permanent alert in the face of the climate crisis.

Recognising this problem, a multidisciplinary research team with members from geography, design, social sciences, urban studies, engineering and computer sciences developed the Environmental Observatory (EO) to pilot an environmental management information system focused on mining projects developed in Chile, specifically in the communes of Puchuncaví and Los Andes in the Valparaíso Region, and in the communes of San José de Maipo and Alhué in the Metropolitan Region. The purpose of the EO is to improve access to information for resilient community action to respond to environmental crisis contexts and avoid the generation of environmental conflicts due to lack of information, lack of transparency in environmental management processes and distrust associated with the control of the mining industry. This pilot focuses on capturing and integrating information dispersed and compartmentalised in four public services that manage environmental information: the Ministry of the Environment, the Environmental Evaluation Service, the Environmental Superintendency and the Second Environmental Court.

However, this alone is not enough. The capacities, needs and expectations of each type of actor involved in environmental management must be considered as part of the research and definition of requirements, especially those of the communities living in the territory. The researchers asked themselves how to improve citizen participation in the governance of environmental management processes from a strategic and political perspective to reduce socio-environmental conflicts. The authors posit that incorporating the systemic design perspective (Sevaldson, 2022) in the process of designing the indicators and the EO platform would allow a better understanding of the agendas of the various actors and how they require the information to be designed in order to be understood. The objective of this project is to improve the process of information understanding by users so that they become active agents and not only informed about environmental management activities in the territory. The

methodological strategy used is the Systems Oriented Design, which allows us to decompose the problem into components, understand them, solve them and integrate them again in the solution proposal. The method considers visual thinking, the wicked problems approach, and the capacity of sense-making and sense-sharing to make tacit knowledge explicit. This not only integrates the knowledge of civil society but also the experience and knowledge of the different disciplines involved in the team of researchers leading the project. Both integration efforts are aimed at creating a new way of thinking about citizen participation in environmental management.

Theoretical Framework

The need for change in the Chilean participatory processes within environmental management

Participation and legitimacy in environmental management are key to building resilient communities. Citizen participation in the environmental impact assessment process should be based on equal opportunities, mutual learning, and accessible and transparent information. However, with respect to participatory processes in the field of environmental management, one aspect to take into account is the delay of participation, an element that has been criticised by Lostarnau et al. (2011), Sepúlveda and Villarroel (2012); Rojas et al. (2003) and De La Maza (2001), because it takes place when a series of key decisions have already been made. According to the authors above, this fact has limited not only the understanding of the impacts by the communities but also their influence on environmental improvements, mitigation and compensatory actions. In this regard, the concept of environmental conflict, defined by White et al. (2009) as an expression of behaviour in which "one party is perceived as taking action at the expense of the interests of the other" (Bennet et al., 2001 in White et al., 2009:242), takes on a relevant role. Moreover, this expression of behaviour takes the form of organised public opposition, which uses various types of collective action.

The traditional model in which participation in environmental management has been developed has been focused on the development of instances in which the aim is to inform citizens and respond to their concerns, but from a perspective or line of thought that Richardson and Razzaque (2006) called rational elitism, which treats environmental

policy as a complex and technical field that requires specialised knowledge from experts. In Chile, this complexity is compounded by the fact that information is distributed in more than ten information systems: (1) the National Environmental Information System (SINIA); (2) the Pollutant Release and Transfer Register (PRTR); (3) the National Air Quality Information System (SINCA); (4) the Strategic Environmental Assessment Platform (SEA); (5) the online environment (Bergamini et al, 2023).

Public environmental information can improve industry performance, reduce environmental conflicts (Calveras & Ganuza, 2015; Silva, 2021) and foster informed citizenship (Banas, 2010; Creighton, 2005; Richardson & Razzaque, 2006; Silva, 2021). Encouraging informed citizenship is directly related to resilience, as proposed by Graveline and Germain (2022), who provided a series of definitions on that concept, emphasising learning capacity as a process that allows people to learn together, support experimentation and increase the potential for innovation (social and technological) (Jeans et al., 2016). Similarly, Norris et al. (2008), in addressing the concept of community resilience, mention that it arises from a set of adaptive capacities comprising economic development, social capital, community competence, and information and communication. These capacities provide a strategy for disaster preparedness and allow knowing and quantifying the impacts to advance towards the development of adaptation and mitigation policies (Bergamini et al., 2023).

These adaptive capacities feedback and strengthen each other, enabling communities to respond to the scientific evidence-based impacts of changing environmental conditions (Adger et al., 2001; Downing, 2003 in Tompkins and Adger, 2003) in line with the proposals of the Intergovernmental Panel on Climate Change (IPCC, 2018) related to, for example, desertification, land degradation and food insecurity. Accordingly, climate change adaptation and mitigation depend on the context and capacities of the community. They require an adequate design of public policies, institutions, and governance that contribute to increasing community resilience and fostering commitment and collaboration among all actors. Information and communication are vital in preventing environmental problems, especially because people need accurate information on environmental status, risks and recommendations, as well as the ability to act quickly on evidence. Studies show that determining what people know about the environment is essential for community sustainability (Abdul-Wahab, 2008; Wang et al.,

2016). However, it is important to note that transparency and disclosure of environmental information alone do not have the desired impact. The public may have access to information but still be unable to understand the content. It is necessary to rethink the technical language of the information to make it understandable to all stakeholders.

Although Chilean legislation has advanced significantly in terms of the right of access to environmental information, with a Transparency Law (Law No. 20,285) and mechanisms for citizen participation (Law No. 20,600), there is still a long way to go in terms of access to information, especially in aspects related to atmospheric pollution, contamination and water management, key aspects for the protection of people's health and the environment. Furthermore, as mentioned earlier, the current mechanisms for citizen participation do not promote dialogue and understanding between the parties involved in a socio-environmental conflict. In some cases, these conflicts end up in court, bringing the projects to trial. In this context, Law No. 20,600, to which Chile has been a party since 2022, is particularly relevant. It seeks to achieve the implementation of the rights of access indicated in Principle 10 of the Rio Declaration, whose objective is to guarantee the full and effective implementation of the rights of access to environmental information, public participation in environmental decision-making processes and access to justice in environmental matters. Finally, and from the point of view of access to justice in environmental matters, the procedural norms impose on civil society the duty to prove the environmental non-compliance of companies in the territory.

Addressing complexity led by design

The current climate crisis scenario is, without a doubt, very complex, involving multiple stakeholders and affecting all forms of life on Earth. Problems like this are not limited; they do not have only one solution and need the involvement of a range of knowledge to be addressed. The design process has tackled these inherently indeterminate situations, known within the discipline as wicked problems, acquiring a new role in the multidisciplinary industry and opening the discussion on design methodologies and how they can be adopted by other disciplines.

However, how can we identify or understand complex contexts? Scott Page (2009) defines landscapes of greater indeterminacy (Rittel, 1967 cited in Buchanan, 1992, p.15)

as those in constant movement, like the waves of the sea. In these, the aim of transformation is permanently oscillating with the movement of the landscape itself, so time becomes key when intervening and making an impact. This definition differs from other problems where the need for change is evident (Single peaked landscapes) or where you have more than one, and exploration will easily show you the best one (Rugged landscapes).

Birger Sevaldson establishes that increased complexity or, like Page establishes the oscillating nature of moving landscapes, is driven by higher information density and wider contexts and applications for design, introducing the "need for adaptability, flexibility, as well as interdisciplinary and transdisciplinary collaboration" (Sevaldson, 2022, p.5). However, since the early 1970s, the concepts around the transgression of disciplinarity have been confused (Gonzalez, 2019, p.60). Opening disciplinary proceedings to multidisciplinarity allows different backgrounds to integrate a team; however, "as long as its methodology remains disciplinary in nature, the results will be a sum of its parts" (Gonzalez, 2019, p.62). Sevaldson implies that complex problems need to go further from multidisciplinarity to interdisciplinarity through methodology, where problems are analysed systematically, and research requires the coordination of disciplinary approaches integrated into one (Gonzalez, 2019, p.62). Moreover, if possible, going as far as transdisciplinarity, where there is a deep knowledge reorganisation, where the team strives for the creation of "another way of thinking, not just another thought" (Gonzalez, 2019, p.65).

Understanding the complexity of issues like the one addressed in the following case study is best done from a systemic perspective, analysing the multiple variables that affect them in order to achieve preferable (Simon, 1969) sustainable and equitable outcomes. But as the contexts are everchanging, so should the perspectives that analyse them. In multidisciplinary teams, having representatives of each area of knowledge is key to developing solutions that are able to address all angles of the complexity of an issue. This creates an opportunity for interdisciplinary collaboration, integrating knowledge and methods from other disciplines to create a common response (Groth et al., 2020). In this context, design has the opportunity to generate models and methods that lead the internal and external articulation of the project, aiming for transdisciplinarity, the creation of "unity of intellectual frameworks beyond

disciplinary perspectives" (Jensenius, 2016, cited in Groth et al., 2020, p.329) that can guide the project. "Interdisciplinary, transdisciplinary, and cross-disciplinary work is a natural consequence of the complexity addressed in SOD. We are frequently dealing with unfamiliar realms, and learning becomes a continuous and integrated part of the SOD practice" (Sevaldson, 2022, p.348). Therefore, sense-making and sense-sharing (Sevaldson, 2022) as SOD-led processes will help define a "general working principle—for a team, that defines the value to be transmitted to users" (Culagovski & Del Rio, 2022, p. 160).

Systems oriented design as a methodological strategy for complex work with communities

Systems oriented design (SOD) emerges as a methodological approach that allows making systemic design operational in complex contexts. This methodology alludes to the systematic analysis of methods and strategies for conducting studies and applied research projects (Jones, 2014). SOD is based on three fundamental principles regarding systems thinking:

- Systems thinking is an approach to approaching a project from its complexity and providing solutions to complex problems (Ackoff, 1974; Espinosa et al., 2008; DeTombe, 2015a,b).
- Systems thinking generates a space to adopt a holistic vision to approach the project (Clegg, 2000; Cardenas et al., 2010; Blizzard & Klotz, 2012; Forlizzi, 2012; Jones, 2014).
- Systems thinking allows for the incorporation of multiple perspectives and visions of the ecosystems that make up the project (Da Costa, Diehl and Snelders, 2019).

According to Sevaldson (2022), the implementation of the SOD methodology considers different steps oriented to the understanding of the system, the elaboration of the design process and the implementation of the solution. First, problem framing is considered, which allows for establishing the project boundaries, along with the actors, components and relationships that are involved in the project development. Secondly, the system analysis addresses the holistic understanding of the ecosystem in which the solution will be implemented. In addition, the data collection and analysis that allows

observing how the variables and interactions influence the behaviour of the system is addressed, in addition to identifying those points of influence with which the applied research project will work. Finally, design intervention development takes place, which allows us to devise the preferred scenario and the creation of value of the design project under development in relation to the effect it will generate on the context. In parallel and constantly, the need for knowledge sharing and design education is raised in order to conceive the discipline of design as an articulator within the interdisciplinary team and between them and the actors involved in the project.

For the development of the stages above, SOD contemplates multidisciplinary collaboration and user participation, valuing the process of co-creation between the internal team and the actors involved in the system (De Smedt & Borch, 2022). In this way, the inclusion of designers and non-designers in the development of the projects is not only necessary but also beneficial for the final result (Sevaldson, 2022). As part of the process, the aim is to work on the ability to discover, record, understand and design with the interconnections between entities, rather than with entities themselves, through analysing the system and its interrelated connections.

The Environmental Observatory as a case study

The case study corresponds to the applied research project "Observatorio Ambiental de Proyectos Mineros."[1] The project aimed to integrate information on the environmental impact of the mining industry in Chile into a single public access platform, providing access to useful, integrated, understandable, manageable, comparable and interoperable public information. As a result, a pilot environmental management information system focused on mining projects in the Valparaiso and Metropolitan Region was created, Allowing us to capture and integrate information from the Chilean public platforms and reduce access gaps to it through the generation of indicators that can be understandable by citizens (civil society), and public and private agents.

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[1] www.observatorioambientaluc.cl

The project's methodological process is based on the co-creation approach, which considers five stages (Figure 1). Several of them were carried out in the context of a pandemic (COVID-19), so the co-creative process was performed—to a large extent—remotely through the Miro platform.
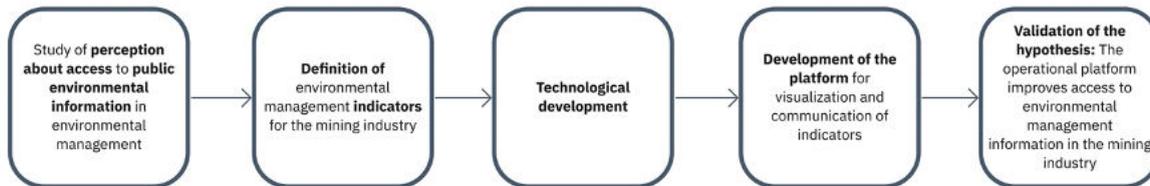
Figure 1: Stages for the EO platform construction.

Given the complexity of the environmental management process on which the EO platform is inserted, the multiplicity of actors, the multidisciplinary nature of the research team and the interdisciplinary nature of the final result were approached from the perspective of systemic design (Sevaldson, 2022), contemplating the interrelationships given in the context to be intervened. In this way, we proceeded from a perspective linked to wicked problems and the development of sensibility for systems, where visual thinking allows the creation of a common sense for the tuning of the internal team and potential users. In addition, the tacit knowledge coming from key informants and actors was contemplated for the understanding of the system and its specific needs.

In order to understand systemically the environmental management context in which the EO platform would be inserted, the technique associated with SOD was used— gigamapping. Gigamaps are visual tools that allow mapping the system through multiple layers and scales (Sevaldson, 2022) with the objective of investigating the existing relationships between categories and establishing the boundaries of the system addressed by the applied research project. In that line, for the formulation of the project and the implementation of the mentioned stages (Figure 1), a problem-framing process was carried out that contributed to establishing the system boundaries to identify its actors and existing relationships on which the components of the system solution (EO platform) would be inserted.

Likewise, the methodology associated with each stage of the project was visualised (Figure 1), which made it possible to establish the limits of the research and the planning of the design intervention. The result allowed the alignment of expectations and possibilities among the EO team, in addition to establishing the flow and traceability of the activities to be developed. This was repeated when discussing the problem framing and methodological strategy (Figures 2 and 3).

Based on the formulation of the problem and the available tacit knowledge, we sought to investigate the needs, expectations, and desires of the users associated with the EO platform. For this purpose, a need-finding process focused on reviewing information and the participation of each type of user was carried out. The purpose of this process was the system analysis and data collection associated with the review of information and the environmental management of mining projects. This process consisted of semi-structured interviews and need-finding workshops with users.

The objective of the interviews was to inquire into the context of the information search to understand what factors influence the interaction with the available information sources (Figure 4).

Based on the results of the interviews, five questions were defined on which the instrument for the need-finding workshop was designed. The objective was to integrate the users' experiences into the decision-making process of the research team. The questions used for the workshop were associated with

- What type of environmental information are you interested in knowing about the mining industry?
- Why do you need this environmental information about the mining industry?
- Where do you go to look for environmental information about the mining industry?
- What facilitator/hindering factor have you faced in accessing and using environmental information about the mining industry?
- What motivations do you have to look for environmental information about the mining industry?
- What is your motivation to look for environmental information about the mining industry?
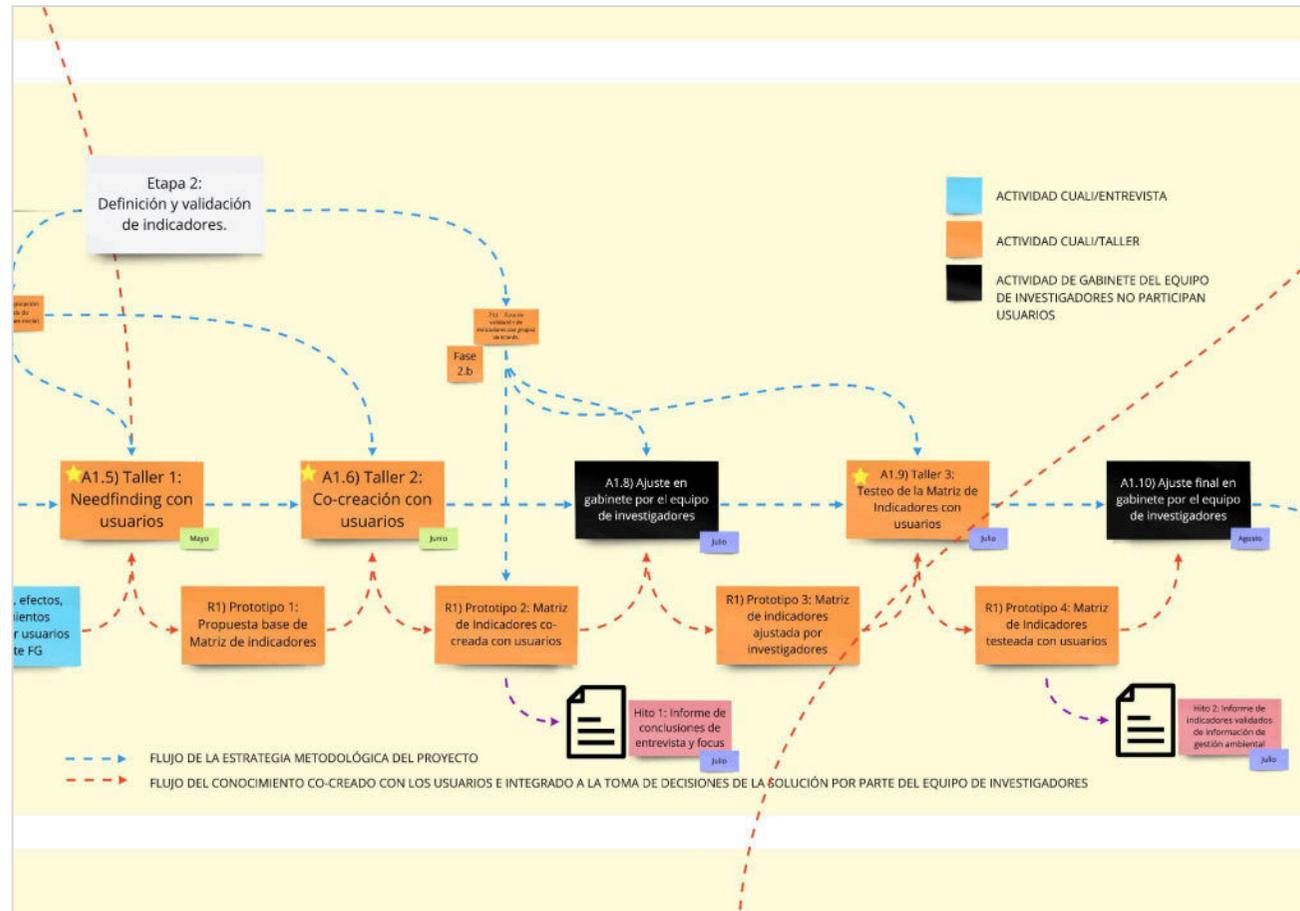
Figure 2: Problem Framing Gigamapping. Source: Mollenhauer et al. (2023).

Figure 3a: Methodological strategy Gigamapping, Source: Mollenhauer et al. (2023)

Figure 3b: Fragment of the Methodological strategy Gigamapping, Source: Mollenhauer et al. (2023)
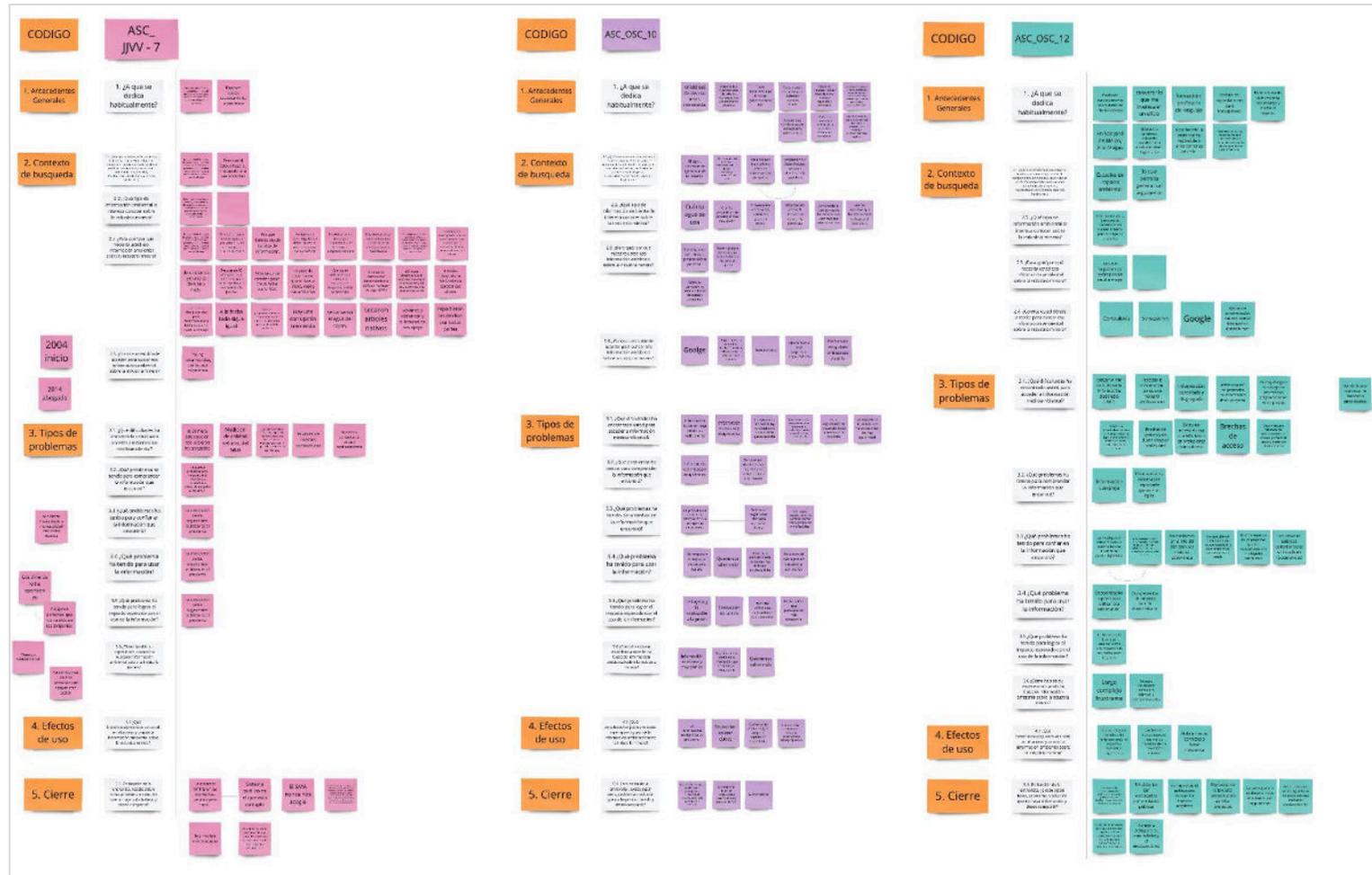
Figure 4a: Fragment of the analysis process for semi-structured interviews. Source: Mollenhauer et al. (2023)
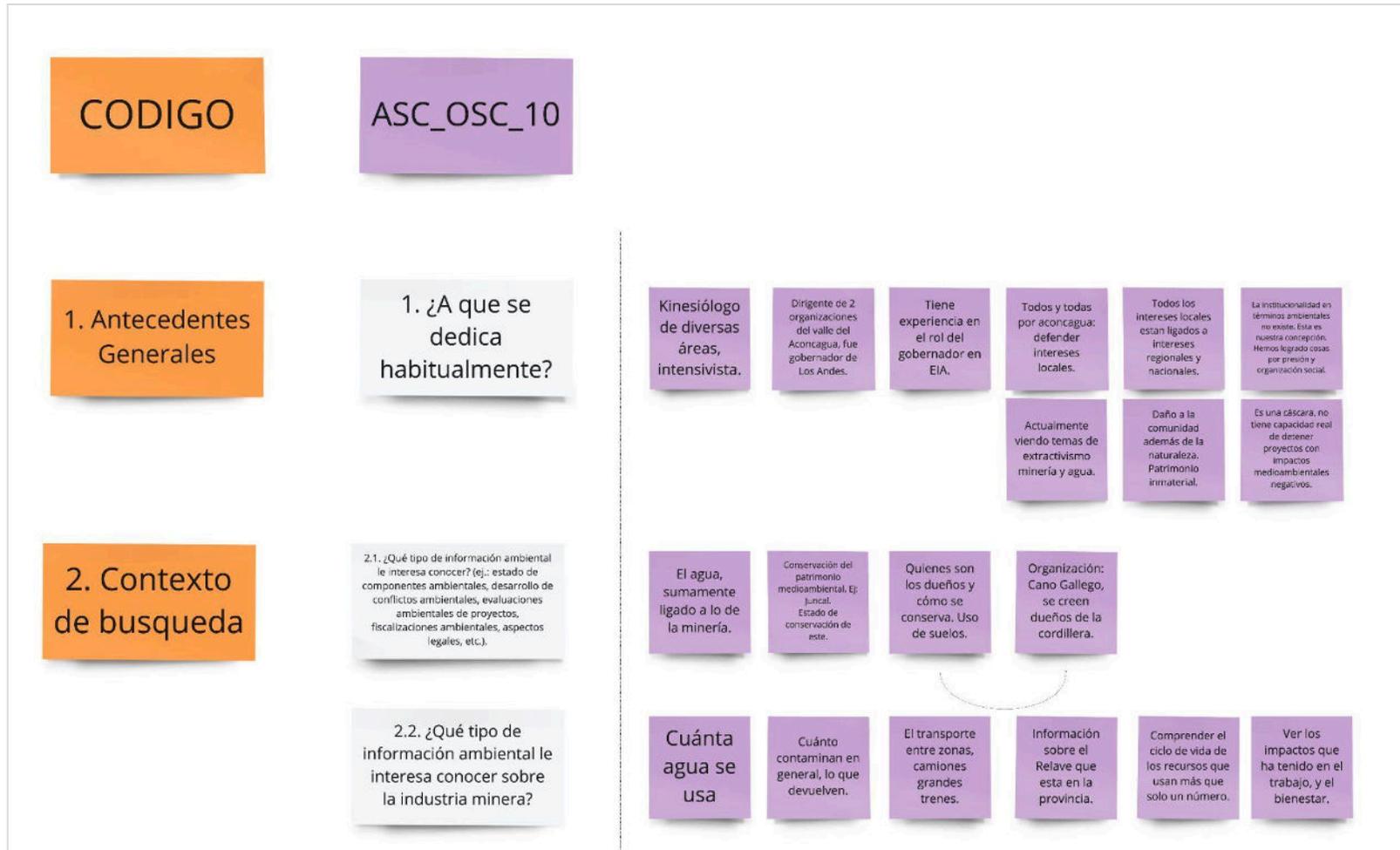
Figure 4b: Fragment of the analysis process for semi-structured interviews. Source: Mollenhauer et al. (2023)

Figure 5a: System analysis of responses from the need-finding workshop.
Source: Mollenhauer et al. (2023).

Figure 5b: System analysis of responses from the need-finding workshop.
Source: Mollenhauer et al. (2023).

Results

Although the project's purpose is to generate indicators that provide relevant information on climate change mitigation and adaptation, the use of systems-oriented design favoured greater involvement and commitment of stakeholders in environmental management.

The application of visual thinking and the wicked problems approach, as well as the ability of sense-making and sense-sharing to make tacit knowledge explicit, were key when processing the results of the user workshops.

The information obtained allowed the identification of:

- Types of information that the user needs or is interested in knowing
- Types of reasons for using the information by the user (Figure 6)
- Types of information sources that the user uses to obtain the information (Figure 7)
- Types of obstacles and facilitators that the user faces accessing the information
- Types of motivation the user has to search for and/or use the information (Figure 8 a&b).

The workshop results made it possible to systematise and map the information, emphasising the relationships and interconnections between the different actors and components involved in environmental management. In this way, multiple perspectives could be taken into consideration and work from all sides of the problem.

In parallel, the analysis of the results obtained in the need-finding was based on the 3C user mapping methodology, which, from the approach of communicology (Tolosa, 2008), seeks to understand people from the mental, affective and bodily (Soto et al., 2020). From a methodological and instrumental point of view, the "3C User" describes and analyses the user's identity through three key questions:

- What do you think, related to the user's beliefs and concerns?
- What do you love, related to the user's emotions, affections and commitments?
- What do you do, related to the user's activities, practices and rituals (Mollenhauer et al., 2019)?

The results obtained by using these systemic information processing tools were key for the subsequent design intervention development. They allowed the definition of the solution's components and requirements, together with the development, testing, validation, and implementation of the EO platform, both in the public and private sectors and the citizenry. This not only integrated the knowledge of civil society but also the experience and knowledge of the different disciplines that participated in the team of researchers that led the project.

Discussion

The EO platform, developed on an information ecology (Nardi & O'Day, 1999), poses a complex challenge since the potential users are different actors belonging to the public sector, the mining industry and civil society. Faced with the question of how to improve citizen participation in the governance of environmental management processes from a strategic and political perspective, the authors approach the challenge methodologically by incorporating the perspective of systemic design.

According to Sevaldson (2022), as a first point, it is possible to recognise in the EO project the system that is designed, that is, the EO platform as an environmental management information system focused on mining projects. This system integrates information and reduces gaps in users' access to it through the generation of indicators that can be understandable by civil society, public agents, and private agents.

Secondly, it is also possible to recognise the system for which it is designed (Sevaldson, 2022). That is, in an environmental management project guided by systemic design, the ecosystem of stakeholders in the project (Da Costa, Diehl and Snelders, 2019) is incorporated from the beginning of the design process. At the same time, the research team determines the variables so that the stakeholders interact with the information, and it can be understood, and their multiple visions and perspectives are integrated. This allows not only the improvement of the process of understanding the information by the users but also the making of them active agents and not only informed about the environmental management activities in the territory. In this way, it contributes to a new way of thinking about citizen participation while simultaneously creating a new way of building community resilience with and for the people and their territories.

Third, the system we are designing is recognised, i.e., the methodological system applied and composed of the disciplines involved in the project. A space of disciplinary breadth is generated so that the members of the research team, regardless of the discipline of origin, can adopt a holistic vision (Clegg, 2000; Cardenas et al., 2010; Blizzard & Klotz, 2012; Forlizzi, 2012; Jones, 2014) from which to propose novel solutions with innovation potential to complex problems (Ackoff, 1974; Espinosa et al., 2008; DeTombe 2015a,b). For this, the team decomposes the problem into components, understands them, solves them and integrates them again in the interdisciplinary solution proposal. Therefore, the EO platform and its components are an interdisciplinary synthesis of the internal articulation by the multidisciplinary team of researchers and the pooling of knowledge from each discipline expressed in a result (Groth et al., 2020). In this sense, Systems-Oriented Design, as a methodological strategy, goes ahead, operationalising an articulated way of moving beyond the disciplinary perspectives that guide the project, opening the way to a new transdisciplinary knowledge that can be applied in the participatory process with environmental management (Table1).
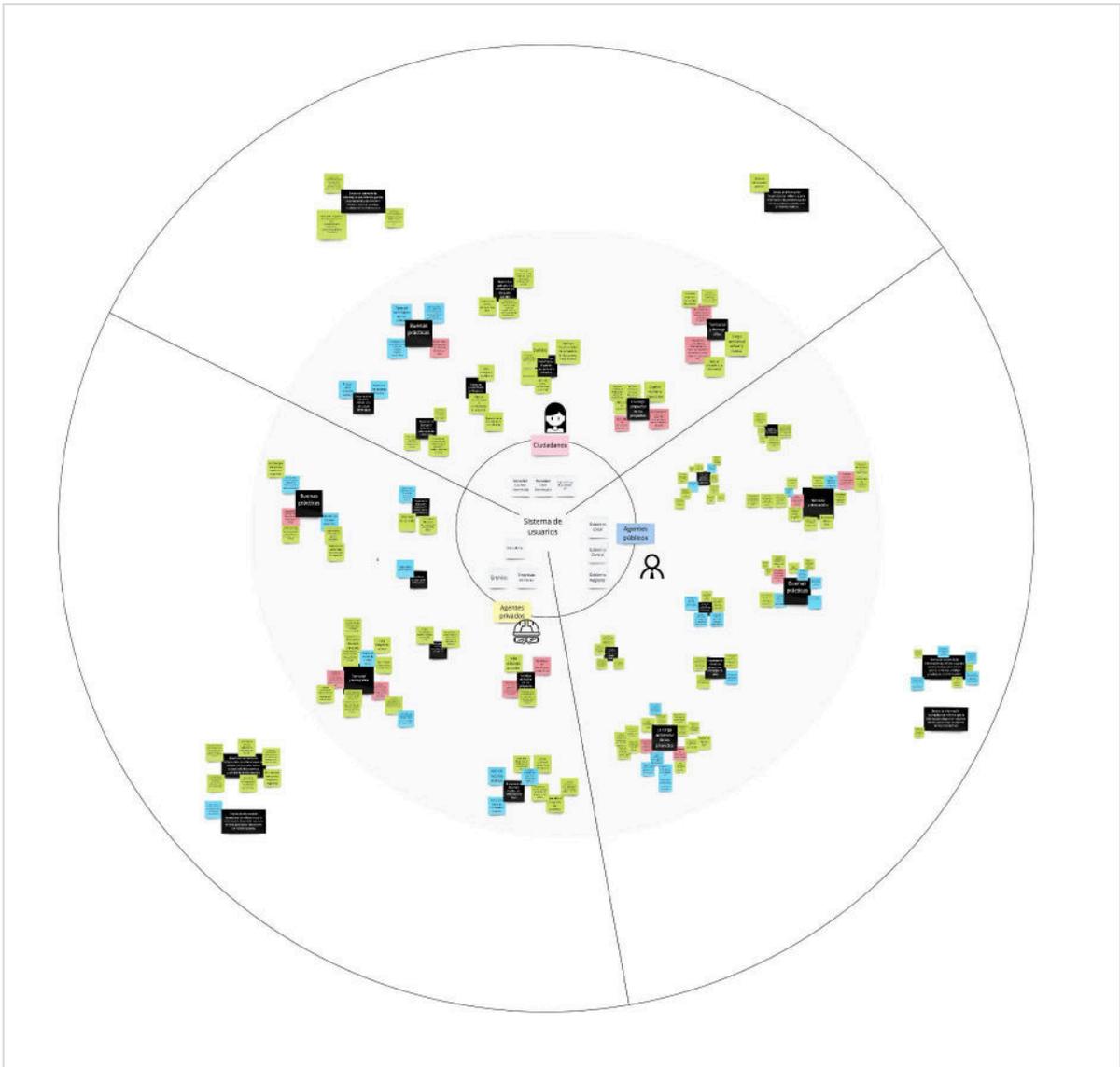
Figure 6a: Processing "Reasons for use of information by user".Source: Mollenhauer et al. (2023).

Figure 6b: Processing "Reasons for use of information by user".Source: Mollenhauer et al. (2023).
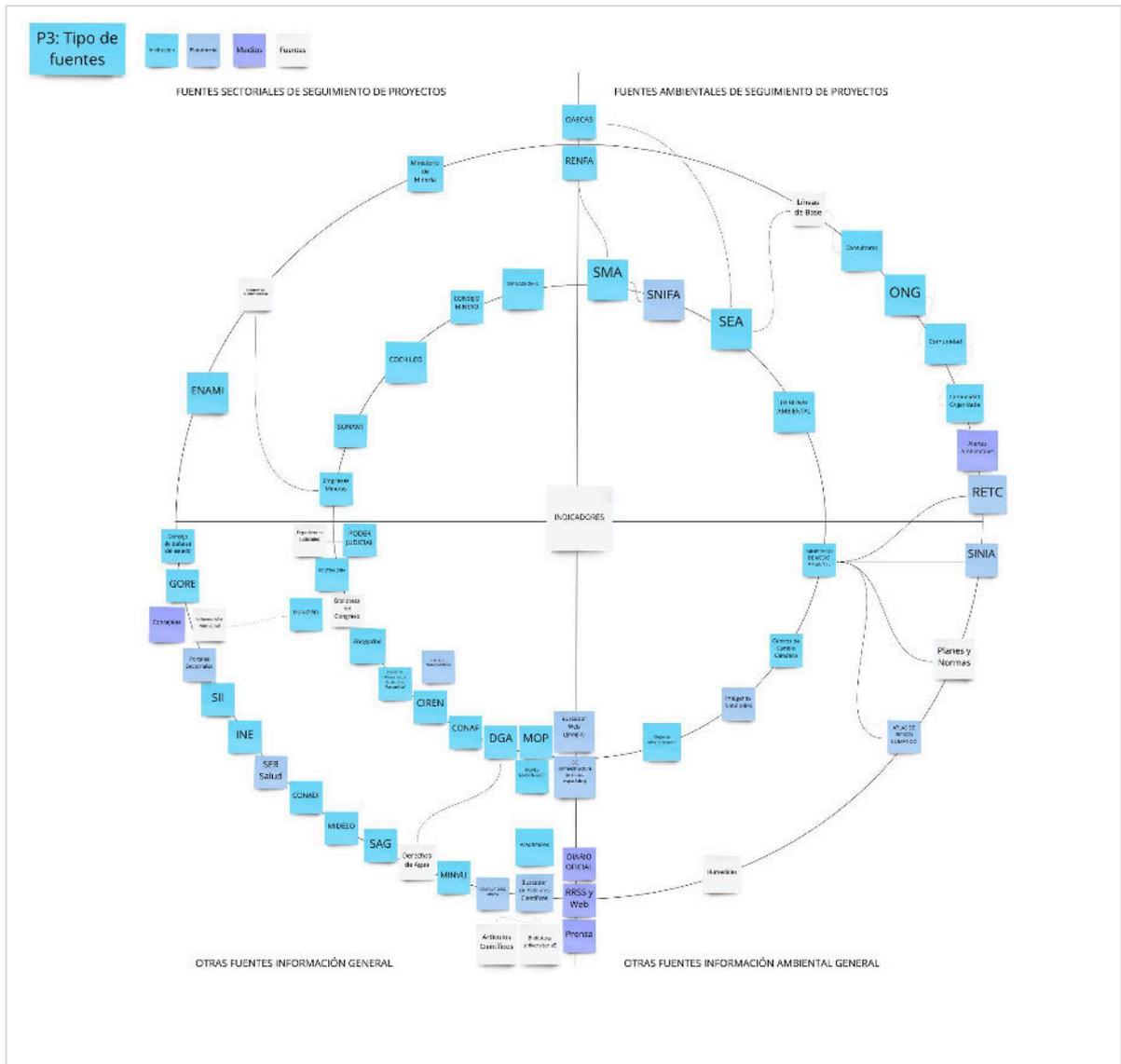
Figure 7a: Processing "Types of information sources".Source: Mollenhauer et al. (2023)
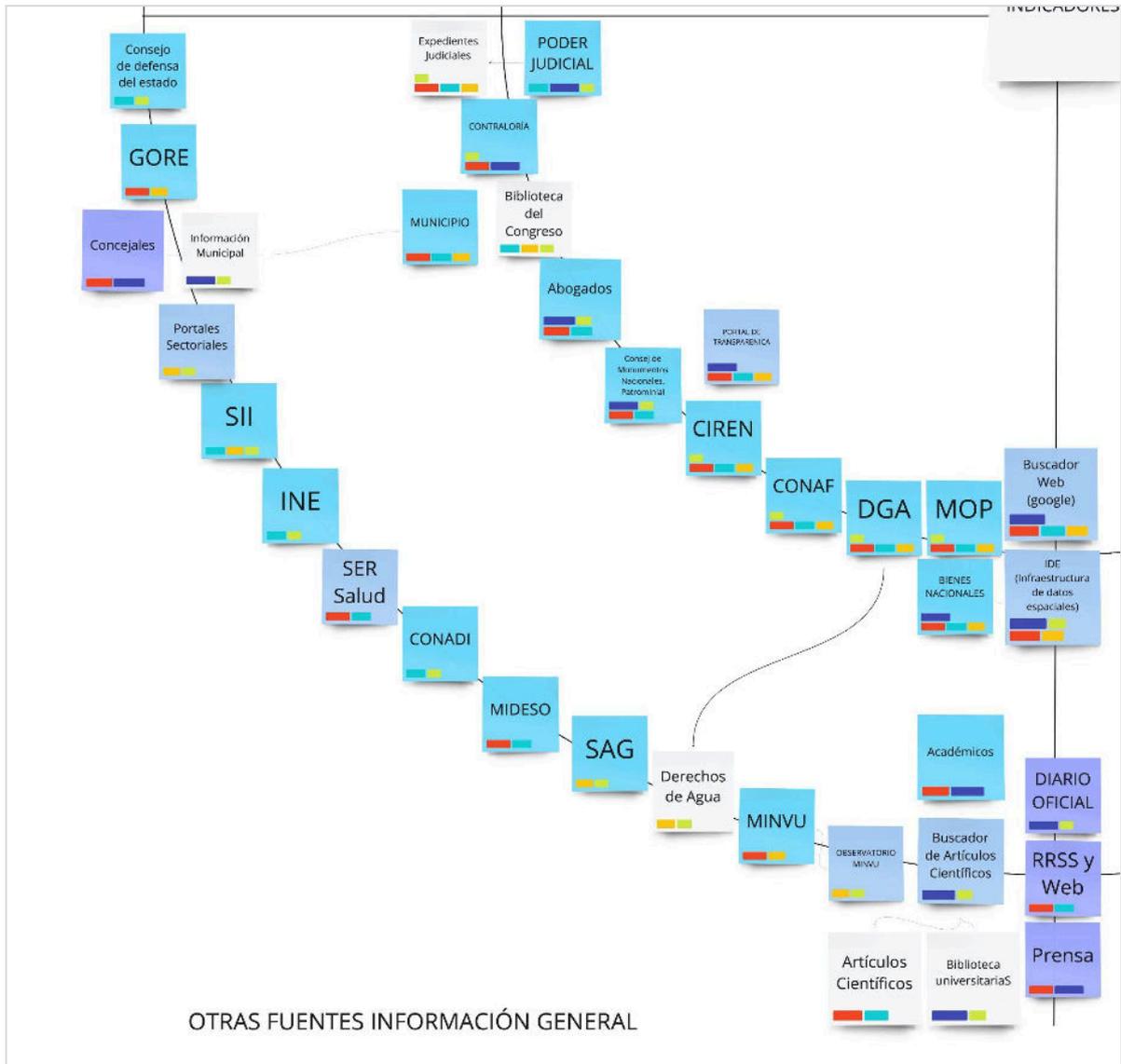
Figure 7b: Processing "Types of information sources".Source: Mollenhauer et al. (2023)

Figure 8a: Processing "Motivation types".Source: Mollenhauer et al. (2023).

Figure 8b: Processing "Motivation types".Source: Mollenhauer et al. (2023).

Environmental Management Projects

	Traditional environmental management project	Environmental management project led by systemic design.
Which key concepts define the project?	Access to information.	Access and understanding of information.
What is the project's focus?	Focused on providing information to users	Focused on the interaction between users, contexts, variables and stakeholders.
Type or degree of User participation	Passive	Active
In what spaces does the community participate?	Identifying the environmental issues they consider to be most relevant	Building the problem and the solution, from problem identification to information design and visualisation.
What methods and techniques are used to work with the community?	Participatory methodologies are developed to raise community issues and interests.	Development of methodologies related to Sensibility-for-System, Tacit-Knowledge, Visual-thinking, Wicked-Problem, Sense Making/Sense Sharing
How is the research team organised?	Linear mode: The team with more knowledge in environmental management provides inputs for the team in charge of participation to develop the participatory processes.	Horizontal and collaborative mode: working teams with mutual feedback during the platform construction process.
What is the result in terms of knowledge?	Results are multidisciplinary with a technical approach	Outcome is transdisciplinary with focus on user understanding

Table 1: Comparative table for environmental management projects. Source: Own elaboration.

Conclusions

From the results, it can be concluded that the process developed has been able to address the problems related to access to public environmental management information, the institutional dispersion of data, as well as the asymmetry in the access to information by all stakeholders. The co-construction of environmental management indicators has made it possible to make more understandable data and information that were highly complex, given the characteristics of mining environmental management.

It has been the incorporation of the systemic design perspective that has allowed this co-construction, thus improving the process of understanding the information by the users, leaving aside the traditional model of traditional elitism linked to expert knowledge to transcend towards the delivery of a tool that provides a set of capabilities to know the environmental conditions and impacts, thus being able to contribute to the design of public policies that contribute to increasing community resilience.

It is not enough to improve access to information for a resilient community action that responds to environmental crisis contexts and avoids the generation of environmental conflicts due to lack of information, lack of transparency in environmental management processes and distrust associated with the mining industry control. Actions should also be aimed at addressing the requirements based on the capacities, needs and expectations expressed in the agendas of each type of actor involved in environmental management, especially those of the communities living in the territory.

The incorporation of systems-oriented design as a relevant methodology to address the environmental management process makes the mode, i.e., the methodology applied for the development of the Environmental Observatory of Mining Projects, itself a response to the building of community resilience to face environmental problems.

This is evidenced by the following characteristics present in the project's development.

> (i) The modelling of the complexity of the problem incorporating the vision of each actor in the system

> ii) The internal articulation of the multidisciplinary team of researchers to arrive at a single interdisciplinary result—the EO platform

iii) The synthesis of new knowledge that allows the proposal of a transdisciplinary methodological strategy that not only contributes to creating a new way of thinking about citizen participation but also a new way of making it happen

Finally, this improves the process of understanding the information the users and contributes to creating new transdisciplinary knowledge on how to build community resilience with and for the people and their territories.

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