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Beyond transparency: assessing access to environmental information in Chile and the ability of providers and users to comprehend it

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Abstract: This paper evaluates environmental information accessibility in Chile, aiming to identify gaps to enhance public management and citizen participation. The paper opens with a theoretical, practical and legal reference framework for information accessibility. This is followed by the main body of research comprising interviews with representatives from public authorities providing environmental information and with users of that information. An analysis of the results is then presented, followed by the discussion and conclusions emerging from the research work. This article identifies a number of information systems that provide data to measure progress and setbacks in environmental conditions and in public and private environmental management. However, access to information is failing to achieve its democratic objective. Although there are some benefits from the disclosure of environmental information, an overall lack of governance for information systems creates a series of obstacles that prevent the public from actively participating in environmental issues.

Keywords: environmental information; information systems; environment; access to information; Chile.

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1 Introduction

Access to information is both a right and a fundamental tool in building citizenship and consolidating democratic systems since it fosters public participation and stimulates citizen involvement in public affairs (Botero Marino, 2012; Fuenmayor, 2004). Information dissemination strengthens the participation of non-state actors in creating and implementing public policies, enabling society and non-state bodies to take informed decisions and judgments about matters that affect their immediate environment. Unlike other resources, information weakens the command and control system and the associated hierarchies because accessibility of information facilitates extra-governmental entities exercising influence on decision-making processes (Banas, 2010). In this sense, information accessibility is a factor that determines progress in contemporary society and a strategic axis for the 'common good' (Gauchi Risso, 2012).

The right to access environmental information is increasingly recognised and regulated based on democratic ideals of government transparency and accountability, enabling all individuals to request and receive information (Zuluaga, 2017). Taking the above into account, information and communication technologies (ICT) have become

powerful tools for the implementation of the right to access information, as they have facilitated access (Banas, 2010).

In Chile, in recent years, access to environmental information has improved considerably thanks to the legislation and regulations put in place over the last two decades (Aguilar, 2021; Ministerio del Medio Ambiente, 2020), as well as global developments in technology, which provide increasingly complete and accurate information on environmental conditions in the country (Agenda País, 2022; Senado, 2022).

According to Manfredi-Sánchez (2017), the transparency and access to information has three epistemological levels. The first refers to constitutional issues linked to individual rights that enable access to information; the second involves information management, which relates to political perspectives and governance determining access to results, statistics and data; and the third relates to citizenship, where organised and systematised information is capable of creating knowledge.

In this context, the research presented in this paper addresses accessibility to environmental information, focusing on the third epistemological level identified by Manfredi-Sánchez (2017), where it is acknowledged that, as long as the citizenship is informed, the quality of public opinion improves, the ability to understand and decide with greater freedom increases, and critical thinking is stimulated.

This research aims to identify knowledge gaps arising from the accessibility of environmental information, by analysing interviews with representatives from public authorities that provide environmental information and users or potential users (recipients) of this, in order to provide an assessment that serves to improve public management and citizen participation in this field. It should be noted that there is little research on this subject in Latin America generally and especially in Chile.

The hypothesis of this research is that in Chile, this third epistemological level is the most poorly-developed, as equitable access to information does not necessarily achieve the desired impact. The public may have access, but the process to access the information can be complicated and counter-intuitive and the information difficult to interpret. Therefore, access does not always translate into an informed citizenship. People not only need information available, but also organised, systematised, and understandable.

According to Arts et al. (2015), there are two barriers to online environmental information from public authorities: liability (regarding consistency and quality of the provided information) and interpretation. Most studies developed to date focus on the first aspect (data consistency and quality) rather than on how the information is presented to the public and how they can interpret it. In this context, this research considers it of greater relevance to develop further understanding of this second aspect.

This paper provides a conceptual framework for environmental information accessibility, first in a global context and then specifically in Chile. This is followed by the main body of research comprising semi-structured interviews with public environmental information providers and current and potential users. Results and discussion are then presented in the same section so that the relevance of the results is more clearly delineated, and finally, the conclusions emerging from the research work.

2 Conceptual framework

2.1 International legal regimes related to the right of access to environmental information and its benefits

The Rio Declaration, adopted at the United Nations Conference on Environment and Development in 1992, proclaims in its tenth principle that environmental issues are best handled with the participation of all concerned citizens (Naciones Unidas, 1992). To this end, states must facilitate and encourage public awareness and participation by making environmental information widely available, so that the public can: be informed about the state of the environment and any impacts upon it; express well-founded opinions; and participate effectively in decision-making processes, with the ultimate goal of protecting the environment and preventing environmental damage (Herrera Espinoza et al., 2013; Whittaker, 2017).

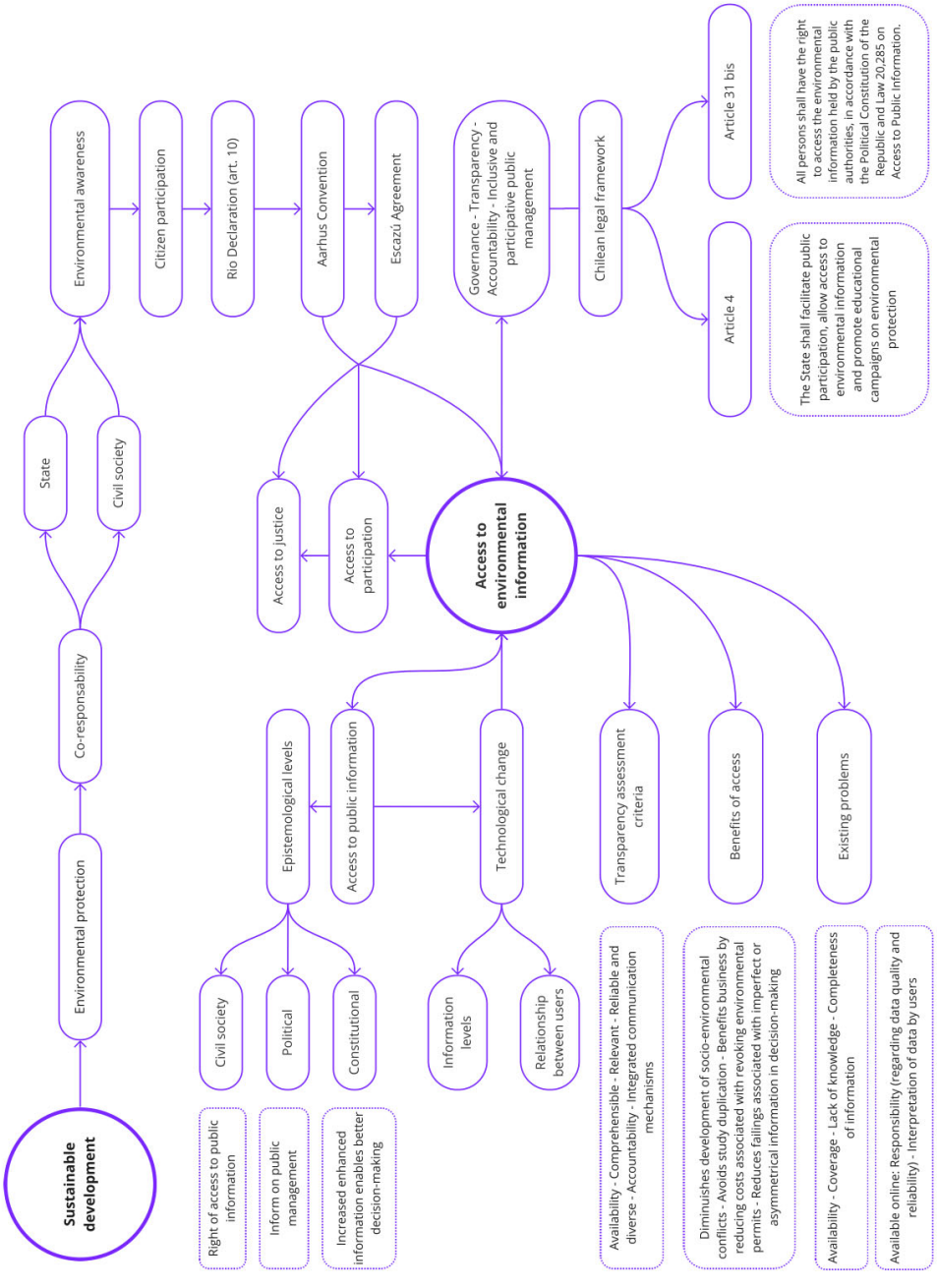
In Europe and Central Asia, Principle 10 of the Rio Declaration was implemented in 1998 with the Aarhus Convention that deals with the public's rights of access to information, public participation and justice in environmental matters (UNECE, 1998). The Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (the Escazú Agreement), inspired by the Aarhus Convention, was adopted in 2018. Both of these instruments recognise the interrelationship between sustainable development, public participation, transparency, legal certainty and environmental protection (Jiménez Guanipa, 2020). The UNECE and CEPAL thereby acknowledge that access means not only making information on environmental issues available, but also to make known and help understand the negative impacts on the environment and people's health, in addition to environmental management instruments (Naciones Unidas, 2018).

Due to the above, the disclosure of environmental information is essential to promote understanding, increase environmental awareness, and thus encourage citizens to participate in environmental management actively (Chen and Cho, 2019; Pan et al., 2022). According to Yu and Jin (2022), it was possible to establish that environmental awareness increases significantly among citizens due to the wide disclosure of environmental information.

In this sense, environmental awareness, understood as a cognitive construct indicating people's attention, concern or sensitivity to an endangered environment (Aminrad et al., 2013) is a crucial factor influencing the protection of the environment (Arlt et al., 2011; Sudarmadi et al., 2001; Sypsas et al., 2013; Tam and Chan, 2018) and facilitates the implementation of public policies in this matter (Yu and Jin, 2022). Therefore, successful public participation in environmental issues depends on the level of environmental awareness, so all efforts to increase this bring about more sustainable development (Wang et al., 2016).

According to Creighton (2005) and Richardson and Razzaque (2006), access to environmental information is part of the process of citizen participation in public policy, within the framework of what is called the 'continuum of participation'. In this sense, access to environmental information facilitates public participation in administrative and judicial processes, helps promote more rational and informed decision-making and encourages transparent and responsible decision-making (Richardson and Razzaque, 2006). Therefore, access to environmental information and public participation can be considered as interdependent rights (Aguilar, 2020).

Figure 1 Theoretical and legal dimensions of access to information (see online version for colours)



Source: Developed by author

Vera (2015) states that public access to environmental information discourages the development of socio-environmental conflicts, avoids research duplication, benefits private companies to the extent that it reduces costs of revocation of environmental permits, and reduces failures in decision-making arising from information errors and asymmetries. Environmental economics literature (e.g., see Cohen and Santhakumar, 2007) indicates that symmetry of information-sharing between parties provides inputs for actions as follows:

- Affected community: an informed community will have a perceived risk of the polluting activity that is closer to reality, demanding action by the authorities and the company that better achieves the social optimum.
- Company: by providing information on its environmental performance, the company could, for example, improve the future performance of both existing industrial units and future projects. For example (Cohen and Santhakumar, 2007), there is evidence that information disclosure can facilitate the internalisation of external factors connected to their commercial activities.

A recent study by Hervé (2021), after reviewing the constitutions of 30 different countries, concludes there to be eight issues relevant to environmental matters, one of which is the 'right of access' that includes aspects of participation, information and justice.

2.2 Environmental information in Chile

In Chile, progress in the access to environmental information has been evident since Law 20417 came into force leading to the creation of the Environment Ministry, the Environmental Assessment Service and the Environment Superintendency (Ley 20417 Crea El Ministerio De Medio Ambiente, El Servicio De Evaluación Ambiental Y La Superintendencia Del Medio Ambiente, 2010). This law stipulates that access to environmental information held by public authorities is both a right and a mechanism to promote public participation in decision-making. It complements Law 20285 on Access to Public Information (Ley 20285 Sobre Acceso A La Información Pública, 2008), which indicates that all information in the possession of state authorities is public and can therefore be requested by any person as a legal right.

Article 10 of Law 20285 states that, "access to information includes the right to access information contained in acts, resolutions, minutes, files, contracts and agreements, as well as all information gathered and prepared through public funding, regardless of content, format and medium, save for legal exceptions". In turn, the right of access to information belonging to state authorities laid down in Law 20285 recognises, in Article 11, the principle of facilitation, whereby 'the mechanisms and procedures for access to public authority information must facilitate the exercise of this right and exclude any demand or requirement that may obstruct or prevent it'.

Law 19300, which was modified by Law 20417, states in Article 4 that "It is the duty of the State to facilitate public participation, allow access to environmental information and promote educational campaigns aimed at protecting the environment". Additionally, Article 31 bis indicates that "Every person has the right to access information of an environmental nature in the possession of the public authorities, in accordance with the provisions of the Political Constitution of the Republic and Law 20285 on Access to

Public Information". In this same Article, environmental information is defined as all information in written, visual, sound or electronic media or any other material form on:

a The state of the elements of the environment, such as air and atmosphere, water, soil, landscape, protected areas, biological diversity and its components, including genetically modified organisms; and the interaction between these different elements.

b Factors, such as substances, energy, noise, radiation or waste, including radioactive waste, emissions, effluents and all substances released into the environment that affect or may affect the elements of the environment indicated in section a.

c Administrative action related to environmental matters, or that affect or may affect the elements and factors mentioned in sections a and b, and the measures, policies, regulations, plans and programmes upon which such action is based.

d Environmental legislation compliance reports.

e Economic and social analyses, as well as other studies used in decision-making for administrative action and its fundaments, indicated in section c.

f People's health and safety, living conditions and cultural assets, when these are or may be affected by the state of the elements of the environment mentioned in section a or by any of the factors and measures indicated in sections b and c.

g All other information related to the environment or to the elements, components or concepts defined in Article 2 of the Law.

It should be emphasised that, in the aforementioned legal bodies, only people's right of access to environmental information is guaranteed, since the State must ensure that all its information is made public. However, there is no legal guarantee to ensure that information is comprehensible and correctly interpreted.

The Escazú Agreement, ratified by Chile in May 2022, states in Article 6 on information generation and dissemination that each country shall guarantee, to the extent possible within available resources, that the competent authorities generate, collect, publicise and disseminate environmental information relevant to their functions in a systematic, proactive, timely, regular, accessible and comprehensible manner (Naciones Unidas, 2018).

The main platforms for accessing environmental information in Chile are currently:

- The Environment Ministry through the National Environmental Information System (*Sistema Nacional de Información Ambiental*) (https://sinia.mma.gob.cl/); the Pollutant Release and Transfer Register (*Registro de Emisiones y Transferencias de Contaminantes*) (https://retc.mma.gob.cl/); the National Air Quality Information System (*Sistema de Información Nacional de Calidad del Aire*) (https://sinca.mma.gob.cl/); and the Strategic Environmental Assessment Platform (*Plataforma de Evaluación Ambiental Estratégica*) (https://eae.mma.gob.cl/).
- The Environmental Assessment Service (*Servicio de Evaluación Ambiental*), which manages the online Environmental Impact Assessment System (SEIA or *Sistema de Evaluación de Impacto Ambiental*) (https://www.sea.gob.cl/) and the Baseline

Information System (*Sistema de Información de líneas de base*) for projects submitted to the SEIA (https://sig.sea.gob.cl/mapadeproyectos/).

- The Environment Superintendency through the National Environmental Control Information System (*Sistema Nacional de Información de Fiscalización Ambiental*) (https://snifa.sma.gob.cl/).
- The legal case records in the country's three environmental courts [First Environmental Court (https://www.1ta.cl/), Second Environmental Court (https://tribunalambiental.cl/) and Third Environmental Court (https://3ta.cl/)].

There are also other sectoral platforms of various State bodies that provide environmental information.

In 2013, the Environment Ministry published the 'First Report on the State of the Environment', an annual document established in Law 19300, which seeks to disseminate existing information so that anyone can find out about the development of the country's environmental issues and the state of its environmental heritage so as to be able to identify opportunities and challenges for environmental management. In turn, the report also aims to identify shortcomings and gaps in environmental information (Ministerio del Medio Ambiente, 2013). Eight reports have been submitted to date (2013, 2015, 2017, 2018, 2019, 2021, 2022, 2023). The latest report lists some 250 environmental indicators (Ministerio del Medio Ambiente, 2023).

These tools have made it possible to publicise information on the state of the elements of the environment (atmosphere, soil and water), including trends and levels of degradation, as well as on public and private sector environmental management.

Chile's efforts to improve and promote access to environmental information are internationally recognised, as stated in the second and third Environmental Performance Reviews carried out by the OECD and the Economic Commission for Latin America and the Caribbean (ECLAC) in 2016 and 2024, respectively. However, problems exist regarding information availability, coverage, lack of knowledge and completeness (OCDE and CEPAL, 2016), information asymmetry between the project owners and the citizens (OCDE and CEPAL, 2024) while information fragmentation and dispersion further hinder access (Yáñez et al., 2005). In turn, one of the main environmental problems in Chile is the lack of information for better decision-making, which is a public sector management issue. In this context, in the face of water scarcity, the imperative to establish a centralised information system that meticulously manages both the quantity and quality of water becomes clear (OCDE and CEPAL, 2024), paralleling the urgent need for a deeper scientific understanding of Chilean biota to combat the loss of biodiversity including their information deliver, and a robust compilation of reliable referential data concerning soil resources and their environmental quality, which together represent critical fronts for advancing environmental management and sustainability (Bergamini et al., 2017).

Figure 1 presents a conceptual summary of the theoretical and legal dimensions of access to public information for environmental management.

3 Methodology

A perception survey was conducted through interviews with representatives[1] from public bodies providing environmental information and actual or potential information users to identify gaps in environmental information in Chile. In the context of this project, the interviews are an instance of qualitative research. In the study of environmental phenomena, which is the focus of this research, this approach opens possibilities to engage with topics that cannot be explored through quantitative analysis (Kanazawa, 2018).

Table 1 Area and analysis variable by participant group

Area	*Variable*	
	Public authorities providing information	*Information users*
Information provided and future projection	Type of information provided	N/A
	Sources generating information	
	Updating information	
	New information of interest to be provided	
Users of information provided	Main users of information	N/A
	User information sources	
	Interests and objectives of users when accessing information	
Information of interest to users	N/A	Information source of users
		Types of information sought
		Interests and objectives of receiving the information provided
Quality of information	Strengths of information provided	Strengths of information provided
	Weaknesses of information provided	Weaknesses of information provided
	Whether the information provided is adequate and complete	Whether the information provided adequate and complete
	Reliability of information	Reliability of information
Accessibility of information	Well-ordered, comprehensible and manageable information	Well-ordered, comprehensible and manageable information
	Inclusive information	N/A
	Use of information technology	N/A
	Ease of access to information	Ease of access to information
Effects of use of information	Benefits of use of information	Benefits of use of information
	Public participation	N/A
	N/A	Use of information

Source: Author's own

The central aspects of qualitative research are: identification of the issue, literature and theory review and venturing into the field of study itself (Hernández Sampieri et al., 2010). The process also involves selecting a limited number of cases for intensive study that enable the researchers to characterise processes, mechanisms and belief systems (Kanazawa, 2018).

Semi-structured interviews have been chosen as an approach in this study, since they are based on planned questions that can be adjusted to the context of each interviewee 'to motivate the interlocutor, clarify terms, identify ambiguities and reduce formalisms' (Díaz-Bravo et al., 2013).

The interview design needed to take into account: practical aspects (maintain participant attention and motivation), ethical aspects (consequences of talking about certain topics for the participant[2]) (Hasan, 2023) and theoretical aspects (information necessary to fully comprehend the phenomenon being studied) (Hernández Sampieri et al., 2010).

The interviews were structured into six different areas that researchers were seeking to investigate by subsequently analysing responses to contrast opinions between the two groups of participants. Table 1 summarises the methodological structure used to create the interview schedule.

The study comprised 31 interviews, a sample size in line with that recommended for qualitative research (Hernández Sampieri et al., 2010). Since it is difficult to determine the number of people to interview in a qualitative study, the strategy was to adjust to a theoretical sampling, with new interviews no longer held once people ceased to produce new information, i.e., when the saturation point was reached.

Non-probability qualitative sampling was used to seek representativeness, but not in the population or statistical sense. Participants were selected through the representation of a collective, where everyone is a node of relationships, i.e., they are not a single individual but several at the same time, and their perspective includes that of others (Canales Cerón, 2006). This selection is drawn from a sample of experts and a sample of typical subjects:

- A sample of experts who, for the purposes of this study, are representatives of public authorities providing environmental information. These are key public authority actors responsible for providing information on the public service within which they work. Group interviews were sometimes used with information providers if a public body chose to include professionals from different units to provide more complete and detailed information.

  Representatives of 15 information systems or units providing environmental public information were interviewed from this group:

  Representatives from 15 systems or units providing public environmental information were interviewed. In this way, the research, focused on public environmental information, succeeded in engaging with the main information providers, excluding other less involved units such as the Ministry of Health, the Ministry of Transport, and others.

- Sample of typical users or receivers of information, including presidents or members of neighbourhood associations, environmental committees and members of the general public. The study focused on actors living in the El Quisco district.[3] Sixteen individuals were interviewed in total.

Due to the epidemiological context of COVID-19 and the imposed restrictions on human contact, the interviews were carried out by telematics and telephone (according to interviewee preference) with a maximum duration of one hour. This method has been used in other similar experiences (Longhurst, 2016).

The completed interviews were transcribed for analysis, supported by Atlas.ti software. As stated by Hernández-Sampieri et al. (2010), data analysis is not standard in qualitative research since each study requires its own analysis scheme or choreography. Content analysis will be carried out and matrices (heat maps) constructed to enable the findings to be explained quantitatively and qualitatively.

Table 2 Public bodies interviewed as information providers

Public body	*Information system/unit providing information*	*Characteristics*
Environment Ministry	National Environmental Information System (SINIA)	Provides environmental information for Chile, including studies, maps, indicators and statistics.
	National Air Quality Information System (SINCA)	Provides country-wide air quality information, to gradually improve the knowledge, surveillance and management of the quality of the air we breathe.
	Pollutant Release and Transfer Register (RETC)	Catalogue or database of information on releases and transfers of potentially harmful chemical substances into the environment.
	Strategic Environmental Assessment (EAE)	Electronic information system intended for consultation and monitoring of Strategic Environmental Assessment procedures for: policies, plans, land use planning instruments and coastal zoning, amongst other uses. Background information and administrative action and annexes that are part of the assessment procedure are presented for each case.
Environmental Assessment Service	Environmental Impact Assessment System (SEIA)	System managing environmental assessment of projects according to current regulations. It promotes and facilitates public participation in project assessments. The system's technological process aims to establish common criteria to evaluate each type of project to ensure environmental protection is efficient and effective. It reports to the Environmental Assessment Service (SEA).
Environment Superintendency (SMA)	National Environmental Monitoring and Enforcement System (SNIFA)	Provides information to the public about the SMA's monitoring and enforcement processes from a land use perspective, together with public authority reports, judgments and resolutions relating to environmental issues. It also provides access to public records on environmental instruments and disciplinary measures.
Environmental Court, Valdivia	Legal Case Management System	System with details of online processing of legal cases in Valdivia's Third Environmental Court.

Source: Author's own

Table 2 Public bodies interviewed as information providers (continued)

Public body	*Information system/unit providing information*	*Characteristics*
National Institute of Statistics	Environmental statistics	A significant number of basic environmental variables that can be consulted either as chronological series according to area or expected causal factor, or as statistical tables from the Annual Environment Report.
Undersecretariat of Regional and Administrative Development (SUBDERE)	National Environmental Information System (SINIM)	Information system with national coverage for all 345 municipalities in the country, which collects, organises and processes scattered local-municipal level information for different areas and makes it available to the public.
	Support Unit for Regional Decentralisation and Strengthening of Regional Governments	Demographic load capacity studies for Easter Island and Juan Fernández.
Ministry of Economy, Development and Tourism	National Tourism Service (SERNATUR), national statistics	Publications compiling statistical information on tourism developed over limited periods, including study references and all statistical material related to tourism.
	National Tourism Service (SERNATUR), tourism development and environmental assessment	Seeks to strengthen the development and sustainable management of tourism through participation in management of sector-level environmental assessment instruments. Its participation in the Environmental Impact Assessment System and in Strategic Environmental Assessments is particularly relevant.
El Quisco Municipality	Environment Department	Seeks to protect and manage the local environment.
	Land Use Planning Department	Creates the municipality's policies, plans, programmes and development projects.
Chilean Navy	Directemar Coastline Environment Observation Programme (POAL)	The Office of Maritime Affairs and Merchant Marines is a high-level body in the Chilean Navy. This Chilean public service contributes to maritime development by overseeing compliance with current laws and international agreements to: provide maritime security; protect human life at sea, in fluvial and lacustrine zones; preserve the aquatic environment and natural marine resources; carry out maritime policing; and monitor and regulate activities within the maritime sphere of its jurisdiction.

Source: Author's own

In general terms, the results of interventions by both groups of actors can be seen in Table 3, with the largest number of responses concentrated within the group of information providers (58.6%).

The responses provided by the public bodies providing information are mainly concentrated in the areas of 'users of the information provided' (19.9%), 'accessibility of information' (13.9%) and 'information provided and future projection' (11.3%).

For information users, the most discussed areas of analysis were 'information of interest to users' (15.9%), 'quality of information' (9.3%) and 'effects of use of information' (8.7%).

Results will be presented by area, starting with a quantitative concentration analysis of interviewees' responses or interventions (heat map) to identify the main interests and concerns around the different issues. These can then be analysed qualitatively. Finally in the same results, the discussion is made.

Table 3 Concentration of responses by area of analysis

Area	*% area*	
	Public authorities providing information	*Information users*
Information provided and future projection	11.33%	0%*
Users of information provided	19.88%	0%*
Information of interest to users	0%*	15.9%
Quality of information	10.34%	9.34%
Accessibility of information	13.92%	7.36%
Effects of use of information	3.18%	8.75%
Total	58.65%	41.35%

Note: Data with * belong to areas not discussed in the group analysis interviews.

Source: Author's own

4 Results and discussion

The research results are analysed and discussed in an organised manner across six dimensions. Each dimension offers a comprehensive look at the different facets of how environmental information is shared, understood, and applied, providing insights into both the strengths and areas for improvement in current practices.

4.1 Information provided and future projection

Since only public bodies providing information were consulted, responses are concentrated in this group (see Table 4), specifically in the variables 'updating information' (49%) and 'sources providing information' (37%).

Respondents agreed that keeping information updated was a crucial point, acknowledging problems in timing and continuity in collecting information. The following quote exemplifies this situation: 'In Chile information often exists, but it is based on studies, … it does not allow for a systemic or temporal analysis, so the issue gets a bit hidden or the possibility of getting relevant and interesting statistical data is lost'.[4] According to the information providers, this happens because

> "Citizens think that the information we have is like the count of COVID patients, where we give a daily report. So, in waste information, which is information we are asked for a lot, we publish the information from the previous year at the end of this year. For example, the waste report for 2020 will be presented in December 2021. So, people ask us for the 2021 report. They believe that the garbage truck picks up the trash and the data immediately arrives at the ministry, so they want day-to-day information. It's not for all variables because information is not generated just for the sake of it but for a public policy objective."[5]

On the other hand, some information providers recognised the advantages of systems with automatic information updates:

> "Information is published on the website as soon as it arrives. For example, in the case of monitoring environmental rating resolutions, we have more than 100,000 company reports. The moment a company uploads their reports onto our platform it is automatically available – there are no obstacles or censorship in that sense – the public can see the report that the company submits as soon as we receive it."[6]

The main sources of information identified were regulatory reports (essentially from companies subject to reporting obligations), municipalities and cross-sector public services, i.e., bodies specialised in specific areas and coordinated by the Environment Ministry.

Table 4 Heat map for 'information provided and future projection'

Variable	*% area*	
	Public authorities providing information	*Information users*
Updating information	49%	0%
Sources generating information	37%	0%
Type of information provided	5%	0%
New information of interest to be provided	9%	0%
Total	*100%*	*0%*
Main ideas mentioned	Information is outdated.	N/A
	Progress in automation.	
	Cross-sector nature of information.	
	Recognised sources are regulatory reports, cross-sector public bodies and municipalities	

Source: Author's own

Respondents emphasised the importance of access to information as fundamental for public participation and democratic systems, like what Botero Marino (2012) and Fuenmayor (2004) suggest, who mention that the right of citizens to access public information is crucial for transparency and accountability and for the common good, as highlighted by Gauchi Risso (2012).

The results indicate that, although there is significant access to environmental information, as well as an adequate update speed, the expectation is that it should be more instantaneous. Furthermore, while the sources generating information and the type

of information provided are essential, the updating of information and the introduction of new information of interest are crucial for maintaining public engagement and relevance (Aguilar, 2020).

The review of legislation shows that, although access to information is guaranteed, the reliance on regulatory reports and cross-sector information sources highlights the need for a more systematic approach to data collection and dissemination to enhance the public's understanding and engagement with environmental issues (Arts et al., 2015; Wang et al., 2016).

4.2 Users of information provided

As in the previous area, there are only responses from public bodies providing information (see Table 5) since only they were consulted. The most mentioned variables in this area were 'interests and objectives of users' (55%), and 'main users of information' (31%).

Table 5 Heat map for 'users of information provided'

Variable	*% area*	
	Public authorities providing information	*Information users*
Interests and objectives of users when accessing information	55%	0%
Main users of information	31%	0%
User information sources	14%	0%
Total	*100%*	*0%*
Main ideas mentioned	Demand for information on environmental compliance, complaints, environmental impact assessments and environmental education. Main users of environmental information: general public and public services.	N/A

Source: Author's own

Within the variable 'interests and objectives of users', the public bodies providing information indicate that users are mainly interested in industry environmental compliance issues, complaints, environmental assessments, and environmental education.

The perception of one information provider stands out: "the transparency law has been a really important milestone, … people are more empowered now in knowing their rights in this regard and they ask for information, that's very clear, … people ask more specific things now, users are more prepared, they do not ask things as if they had no idea".[7] Although the transparency law allows ordinary citizens to request information, there are other types of actors. 'Regarding our information, the range of users is very broad, including from my area, in environmental matters, all these actors, companies submitting to the environmental impact assessment system, consultants, and productive companies requiring this type of sought-after information to present their projects. Obviously, all tourism service providers and municipalities as well'.[8]

The main users are individuals from the general public, as well as public service officials.

Regarding legal procedures to access environmental information, Chilean legislation establishes several mechanisms, such as the National Environmental Information System (SINIA) and the Registry of Emissions and Transfers of Pollutants (RETC). However, users report difficulties in accessing information due to the dispersion of data and the use of technical terminology.

Respondents emphasised that the range of users includes not only ordinary citizens but also companies, consultants, and public service officials, reflecting a broad spectrum of interests and objectives (Zuluaga, 2017). This aligns with the notion that transparency and access to information is crucial for holding governments accountable and ensuring that various stakeholders can participate effectively in environmental governance.

4.3 Information of interest to users

This area, unlike the previous ones, is aimed at information users (see Table 6). The responses fit mainly into the variable 'information source of users' (43%) and 'types of information sought' (26%).

Table 6 Heat map for 'information of interest to users'

Variable	*% area*	
	Public authorities providing information	*Information users*
Interests and objectives of receiving the information provided	0%	20%
Information source of users	0%	43%
Types of information sought	0%	26%
Total	*0%*	*100%*
Main ideas mentioned	N/A	Main sources of information: Google, social networks and municipality. Information of interest to users is partially available. It is possible to access information related to environmental management activities. Information on the state of the environment, linked mainly to the state of the immediate surroundings of interested parties, is less accessible.

Source: Author's own

User information is generally accessed through the Google search engine, through which various web pages can be reached. Social networks are the second most common source, followed by the municipality in third place, through direct consultation with the relevant officials.

Analysis of the information that users or potential users want to access, shows that, in general, this information is available and accessible through services and internet platforms. The most frequently mentioned types of information were: public and/or

private environmental management; project and training applications; and laws, regulations and statutes. However, there are other areas that are not covered or not communicated as desired, such as: potential health impacts caused by local environmental conditions; the state of the local flora, fauna and ecosystems and their protection; good environmental practices and outstanding projects; environmental activities (meetings, talks, etc.); academic research relating to the environment; and environmental conflicts.

The study's findings indicate that users primarily rely on non-official sources such as Google and social networks to access environmental information. This reliance on general internet searches and social media highlights a gap in the visibility and accessibility of official environmental data sources. Users prefer these platforms for their convenience and broader range of information, suggesting that official channels need to enhance their online presence and user-friendliness to compete with more popular information sources.

In this context, the relevance of the information provided is critical. Respondents emphasised the importance of having access to comprehensive and updated environmental data, but also pointed out that the information needs to be presented in a way that is easily understandable and relevant to their specific needs (Agenda País, 2022). This reflects the need for tailored information that addresses the local context and specific concerns of users. Developing specific educational programs to accompany the dissemination of environmental information and simplifying access procedures would make information more intuitive and accessible, thereby strengthening citizen participation in environmental management (Fuenmayor, 2004; Banas, 2010).

Furthermore, while information on environmental management and regulations is accessible, users find it challenging to locate specific data on local environmental impacts and health-related information. This underscores the need for official sources to not only provide comprehensive data but also ensure it is easily discoverable and presented in a manner that addresses the immediate concerns of the public. Improving the accessibility and clarity of information on official platforms could reduce the public's dependence on non-official sources and improve overall engagement with environmental issues (Herrera Espinoza et al., 2013; Aguilar, 2020). The reliance on user-friendly platforms would enhance both accessibility and engagement, highlighting the critical role of contextually relevant information.

4.4 Quality of information

Information providers and users had a similar number of responses on the quality of information (both close to 50%, see Table 7). However, the former mainly discussed 'strengths of information' in terms of the quality of the information (20%) and then 'whether the information is adequate and complete' (18%), while the latter focused the discussion on 'reliability of information' (20%) and 'whether the information is adequate and complete' (16%), which is interesting in terms of the different realities that were revealed.

For public bodies providing information, the strengths mainly relate to the automation of information (i.e., the information is captured and delivered to users) and the transparency of the service since it is not manipulated or interpreted by the providers. Providers demonstrated a more critical view on whether information was adequate and

complete, highlighting: a lack of environmental statistics; a lack of reference standards to comprehend the information and its environmental impacts; outdated information systems; lack of systemic and temporal analysis; and information not available for all territories (e.g., monitoring stations).

Broadly speaking, the user opinions on the quality of the information provided are negative, alluding to a mistrust of public information and private companies, incomplete information, censorship of information, outdated information and information not consistent with the local reality.

Table 7 Heat map for 'quality of information'

Variable	*% area*	
	Public authorities providing information	*Information users*
Strengths of information provided	20%	0%
Weaknesses of information provided	14%	11%
Whether the information provided is adequate and complete	18%	16%
Reliability of information	0%	20%
Total	*53%*	*47%*
Main ideas mentioned	The main strengths of environmental information is the automation and transparency of the service.	Low levels of trust in public and private information.
	The information is incomplete or inadequate since it lacks environmental statistics, standards, systemic analyses and updating.	Lack of information.
		Information does not reflect local reality.

Source: Author's own

In terms of reliability, regulatory action is considered trustworthy, but there is little trust in data provided by public authorities and especially by private industry. One user stated, "I am left with doubts about the information, especially when it comes to information on the consequences of industrial activity, water production facilities or solar panels".[9] Likewise, within the variable 'Whether information is adequate and complete', another user mentions that

> "through the formal channels, one trusts a bit more, but as we were saying, they also censor the information quite a bit. They give general outlines about a place, but they don't tell you much about wetlands, which are largely unknown, or about environmental projects that can greatly damage landscapes. That kind of information is not available."[10]

In summary, the public bodies providing information are aware that it is incomplete or inadequate, but they do not recognise users' perception of the reliability of the environmental information to be a key point.

The discussion about the quality of information focused mainly on public distrust regarding the origin and content of environmental information. Much of the public service information is prepared and delivered by those regulated, which leads users to

question the veracity of the data. This mistrust is supported by Arts et al. (2015), who emphasise that the presentation and consistency of information are crucial for its credibility. Furthermore, despite the abundance of raw data, the state makes little effort to generate environmental statistics or correlate data on causes and consequences based on statistical analysis or environmental monitoring, which is essential for informed decision-making and effective participation in environmental management (Wang et al., 2016). The lack of reference standards and the temporal scale of available information make it difficult for users to identify problems in their immediate environment or correlate data with their life experiences, such as lower flow levels in waterways, loss of biodiversity, and air quality over time (Arts et al., 2015; Wang et al., 2016).

Additionally, the review of legislation shows that although access to information is guaranteed, there is no clear mandate to educate the public about the content of this information. Aguilar (2020) suggests that it is essential to integrate educational components along with the dissemination of information to improve public policies and ensure a truly informed citizenry. Moreover, the reliance on regulatory reports and cross-sector information sources highlights the need for a more systematic approach to data collection and dissemination to enhance the public's understanding and engagement with environmental issues (Senado, 2022; Manfredi-Sánchez, 2017).

4.5 Accessibility of information

Results (Table 8) show there to be more responses from providers (65%) than from users (35%) regarding accessibility of information. The information providers mainly developed the variables 'inclusive information' (30%) and 'well-ordered, comprehensible and manageable information' (21%). Users only addressed the areas of 'ease of access to information' (18%) and 'well-ordered, comprehensible and manageable information' (17%).

Representatives from the public bodies that provide information recognised the benefits of making all environmental information public. They also acknowledged the need for public bodies to strive to make information comprehensible for all. To this end, they have: hired journalists to dissemination information; created explanatory videos and infographics; included maps; implemented information technologies; and tried to ensure information is always well-ordered and data well-structured, to ensure information inclusiveness. They also recognised the need for both primary or raw data and processed or analysed data.

From a more critical perspective, information providers recognised that information was compartmentalised in different ministries and public agencies and that there was little dialogue to address the problems relating to the digital and cultural divides between users that might impede them from searching for and using information. Exclusive use of digital information channels was seen to contradict the inclusiveness expected from access to information.

Within the variable of 'well-ordered, comprehensible and manageable information', the public authority representatives recognised the considerable use of environmental technical terminology in the dissemination of information. 'There is quite a lot of technical information and it may be quite difficult for some people to find it, but for others, such as people doing scientific research, the information is suitable and comprehensible'.[11]

Table 8 Heat map for 'accessibility of information'

Variable	*% area*	
	Public authorities providing information	*Information users*
Well-ordered, comprehensible and manageable information	21%	17%
Inclusive information	30%	0%
Use of information technology	12%	0%
Ease of access to information	3%	18%
Total	65%	35%
Main ideas mentioned	Inclusive information thanks to public authority efforts.	Use of technical terminology.
	Information compartmentalised in different public services.	Information difficult to comprehend.
	The digital and cultural divide is not addressed.	Information difficult to manage.
	Excessive use of technical terminology.	Poor dissemination.

Source: Author's own

In this context, the interviewees explained that the public bodies have small environmental teams who are unable to cover all the different requirements for information dissemination or to provide statistics. Moreover, some public bodies that handle environmental information do not have public data platforms.

Information users, in line with these criticisms raised by the public bodies providing information, also point out that, although the state has made significant progress in access to environmental information, difficulties still abound, such as the abundant use of technical language, the lack of visual resources to support information comprehension and the use of formats that are sometimes unfriendly for users (complex databases, shapefile files, kmz, etc.).

This issue is related to the digital and cultural gap experienced by some users. Interviewees identified that there has been little effort to address this problem, for example by: training community leaders; broadening the communication channels through which information is disseminated (television, schools, radio); and investigating users' experiences of the different platforms available.

In consequence, users mention making abundant use of non-official sources to access information (e.g., lawyers, public officials, social leaders and social networks). One user stated: "I feel it's not something difficult to access and in fact the people working with wetland issues, mostly lawyers, gave me the information".[12] In turn, a lack of awareness of the environmental information platforms was mentioned: "Like I told you, there's no specific place to go to where I can say 'Oh! Now, here I am going to find information'. There's no specific webpage where I can review or find the information".[13]

The main differences of opinion between information providers and users or potential users of environmental information are found in this area of analysis. Public bodies focused on the positive aspects of transparency laws and access to public information, highlighting their efforts to manage information, implement information technologies,

and employ design and journalism professionals to aid in dissemination. In contrast, users were less aware of these advancements, often citing a lack of knowledge about where to find information. They pointed out digital and educational gaps that hindered access and frequently relied on unofficial channels to obtain information, suggesting that public access to environmental information is not fully effective for the general public. Gauchi Risso (2012) emphasises that information accessibility is strategic for the common good, highlighting the importance of ensuring that information is not only available but also usable by all segments of the population. Banas (2010) also points out that the dissemination of information can weaken command and control systems by enabling extra-governmental entities to influence decision-making.

From a more critical perspective, information providers recognised that information was compartmentalised in different ministries and public agencies and that there was little dialogue to address the problems relating to the digital and cultural divides between users that might impede them from searching for and using information. Richardson and Razzaque (2006) suggest that effective public participation requires not only access to information but also its interpretation and practical use. Information users highlighted difficulties such as the abundant use of technical language, lack of visual resources to support comprehension, and user-unfriendly formats.

4.6 Effects of use of information

In this area the public bodies providing information offered fewer responses than users. The former placed special emphasis on 'benefits of use of information' (22%) followed by 'public participation' (5%) (see Table 9).

Information users discussed the variables 'Use of information' (57%) and 'Benefits of use of information' (17%) in greater depth.

Table 9 Heat map for 'effects of use of information'

Variable	*% area*	
	Public authorities providing information	*Information users*
Benefits of use of information	22%	17%
Public participation	5%	0%*
Use of information	0%**	57%
Total	*27%*	*73%*
Main ideas mentioned	Benefit: transparency for general public, accountability and promoting environmental education.	Environmental awareness, demand better environmental management.

Notes: *The 'public participation' variable was only consulted to the provider public bodies since it sought their opinion regarding whether or not the available information enabled public participation.
**The 'use of the information' variable was only brought to the information users since it sought to identify what uses this group of interviewees gave to that information.

Source: Author's own

In terms of the benefits, information providers mentioned that access to information is both a component to generate transparency with the public and a feasible mechanism to promote environmental education. One respondent stated, "We can deliver this information to the community, because that is our job to provide information and to teach environmental education and having this kind of information helps you generate material to deliver to the community".[14]

Other relevant aspects are linked to accountability, improving public policies with objective information, protecting the environment, promoting public participation, improving projects under assessment and demanding improvements in the environmental management of private companies. One participant mentioned that:

> "the aim is, above all, to increase participation, which is why the most frequent information users are the general public, which came as a surprise. So I think that one unforeseen effect of this law has been to increase participation. So, participation is being exercised or promoted not only when judicial disputes arise, but before that stage is reached."[15]

On the other hand, information users were mainly discussing the uses they give to the information. The main uses are to: generate awareness to protect the local environment; demand better environmental regulations; denounce transgressions; implement actions to improve environmental quality; identify critical points of action; and question authorities about environmental problems.

In this context, the use of information is seen as an input for education, but there is still a long way to go before such information can be delivered in a clear way. One user said, "I've searched for experiences of recycling in other districts, but all the information is very vague. The municipality provides transparency, but there are many obstacles to accessing information on what is happening, especially regarding experiences in other municipalities".[16]

These findings underscore the potential benefits of providing access to environmental information, such as increasing public transparency and promoting educational initiatives. However, the effectiveness of these benefits is limited by practical challenges, including the public's ability to effectively use the information for environmental protection and policy advocacy. The Aarhus Convention supports the idea that better access to information, awareness of environmental problems, and public participation in decision-making inherently favour environmental protection (Bermúdez, 2010). Nonetheless, the study reveals that public participation remains underutilised due to barriers in accessing and using the information effectively.

Moreover, despite the identified benefits, both information providers and users recognise the need for improved mechanisms to facilitate public participation. Richardson and Razzaque (2006) emphasise that access to information alone is insufficient; it must be coupled with opportunities for public engagement and practical application. Enhancing the clarity, accessibility, and contextual relevance of environmental information can empower users to take informed actions, thereby fostering greater environmental stewardship and compliance with regulations (Aguilar, 2021; Wang et al., 2016).

5 Conclusions

The proposed research hypothesis has been fulfilled. In Chile, the progress achieved by administrative law in terms of access to information is evident with the enactment of Law No. 20.285 on Access to Public Information (Bermúdez, 2010), and this has been confirmed in light of this investigation. The information provided by the various public services with environmental competence corresponds to all the information held by the State. This complies with the first two epistemological levels of access to information according to Manfredi-Sánchez (2017), that is, individual rights to access information and State information management relating to political perspectives and governance. In fact, there are several information systems with data to measure progress and setbacks in public and private environmental management.

The third epistemological pillar for access to information relates to citizenship. Public access to public environmental information is expected to generate knowledge, awareness, and thus participation in environmental guardianship and protection. However, this aspect is poorly developed in Chile, with access failing to fulfil its objective in the democratic exercise, as evidenced by the various gaps in information quality and accessibility described in the discussion.

The findings of this study have significant practical and theoretical implications. From a practical perspective, improving the accessibility and clarity of environmental information can enhance citizen participation in environmental management, promoting more informed and effective decision-making. Theoretically, this study contributes to the field of information access by highlighting the importance of not only providing data but also facilitating its interpretation and practical application, aligning with the theories of effective participation proposed by Richardson and Razzaque (2006).

It is important to note, for an adequate interpretation of the results, that while the sample of public officials and their interpretation may be representative, the sample of users corresponds to a single territory, which may introduce biases in the perception of the interviewees. This is something that can be expanded upon in the future.

In view of the results of this study, the following recommendations are proposed to advance key aspects:

- Generate more information and statistics to measure environmental and human health impacts, and register progress and setbacks through monitoring, generating new knowledge for informed decision-making and public policies for environmental protection.
- Address user distrust by improving transparency in the processes of information collection and review, as well as enhancing access channels to reduce intermediaries in the information delivery process.
- Improve the accessibility of information by including inclusivity and applying methodologies that focus on the general public as users, incorporating intuitive and responsive information visualisation systems with clear and processed information.
- Disseminate environmental information from the immediate context of people, ensuring that the information is relevant and easily understandable.

- Address the issue of environmental information dissemination to reduce access difficulties, promoting environmental education that accompanies the dissemination of information.

From an academic perspective, it is necessary to conduct additional studies that address public education and training to improve the understanding and use of environmental information. Further research is also recommended on how different digital platforms can be integrated to offer a more coherent and accessible user experience. The authors of this article are working on this in the applied research project 'Environmental Observatory of Minning Projects' (https://observatorioambientaluc.cl/), expecting to have results in the future.

Finally, it is important to mention that in Chile, the recently ratified Escazú Agreement may bring significant changes in this area, and this should be evaluated in the coming years. For now, the right of access to environmental information is limited to providing environmental information, barely addressing the issue of ensuring that information is comprehensible and easily accessible to all members of the general public.

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Notes

1 The officials in charge of information access at the institutions were contacted. On some occasions, the representatives chose to attend the interviews with their team of professionals, leading to a group interview.

2 This study has received ethical certification from the Pontifica Universidad Católica de Chile, ID Protocol: 200513022.

3 The sample of interviewees is drawn from El Quisco, a coastal district in the Chilean central zone in the Valparaíso Region, approximately 114 kilometres from the capital city, Santiago.

4 C-1-P.

5 C-6-P.

6 C-73-P.

7 C-95-P.

8 C-52-P.

9 C-37-U.

10 C-51-U.

11 C-15-P.

12 C-55-U.

13 C-54-U.

14 C-10-P.

15 C-281-P.

16 C-74-U.