

The impact of open-pit mining in mountainous areas on eco-anxiety and future images of the place

Sergio Elías Uribe-Sierra^{a,d,*}, Lindsey Carte^b, Pablo Mansilla-Quñones^c,
Andrés Moreira-Muñoz^c

^a Laboratorio de Planificación Territorial, Facultad de Recursos Naturales, Universidad Católica de Temuco, Temuco, Chile

^b Universidad de la Frontera, Temuco, Chile

^c Instituto de Geografía, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

^d Departamento de Producción Económica, Universidad Autónoma Metropolitana-Xochimilco, Ciudad de México, México

ARTICLE INFO

Keywords:

Ecological anxiety
Extractivism
Place
Emotional geographies
Ecological mourning
Solastalgia
Socioenvironmental conflicts

ABSTRACT

The article analyzes how environmental pressures affect future images of a place and can produce ecoanxiety. We explore these themes via a qualitative study which included semi-structured interviews, observation, and document reviews. The study centered on the municipality of Putaendo, Chile, a region deeply impacted by environmental changes arising from climate change and agribusiness activities which is now facing the advance of an open-pit mining project. Our results show how transformations in the natural environment can affect individual and collective human well-being. The future image of the total destruction of a river by mining can generate ecoanxiety, expressed within the personal, family, and work levels, given the possible loss of land and water as resources for material sustenance and as an essential part of their identity. Ecoanxiety exposes local concerns over the ontological security associated with a sense of place which is under threat. In this way, ecoanxiety can be understood beyond the psychological impact linked with potential ecological changes. We also explore how expected landscape changes adversely affect the relations between people and their environment, activating organized responses to re-evaluate and protect the places which people care for via diverse cultural actions.

1. Introduction

A wealth of scientific evidence shows the impacts of climate change and the socioecological crisis generated by industrial development based upon unsustainable natural resource use. Pollution and the loss of species, ecosystems, and landscapes produce biophysical damages and alters the emotional state of people, leading to angst expressed in pain or sadness over the environmental devastation of beloved places (Albrecht, 2005; Pihkala, 2022; Manushevich et al., 2020; Eakin et al., 2019; Hayes and Poland, 2018).

While there is increasing evidence about worldwide environmental transformations, less is known about effects on emotional wellbeing. Recent studies have indicated the complex emotional reactions unleashed by environmental changes, including phenomena such as ecological mourning (Cunsolo and Ellis, 2018) and solastalgia (Albrecht et al., 2007; Galway et al., 2019; Phillips and Murphy, 2021; Moratis,

2020). To contribute to this body of literature, the present article examines the rise of ecoanxiety in a Chilean village facing a projected open-air mining pit. Ecoanxiety, characterized by uncertainty and fear in the face of environmental threats which can lead to future transformations (Comtesse et al., 2021), serves as a central focus point.

Although ecoanxiety can be linked with global environmental changes, the present study focuses on mining to place it under tension. Copper mining currently predominates with the open-pit technique which is the most economically profitable, but also more aggressive for nature because it demands more supplies (water and land surface) and generates more wastes (Mudd, 2010; Arboleda, 2017). In Latin America, cumulative knowledge about open-pit mines' environmental impact during operations has led to fears about future impacts for communities, contributing to conflicts around early-stages projects¹ (Bastidas-Orrego et al., 2018, 2021), particularly in places where the population has strong attachments to the earth and water sources.

* Corresponding author. Laboratorio de Planificación Territorial, Facultad de Recursos Naturales, Universidad Católica de Temuco, Temuco, Chile.

E-mail addresses: suribe@correo.xoc.uam.mx, suribe@uct.cl (S.E. Uribe-Sierra).

¹ Prospecting or exploration.

Communities perceive mining as environmentally devastating and with greater legal and political support by governments (Bastidas-Orrego et al., 2018, 2021), leading local populations to question discourses promoting a positive image of the activity as supporting development (Sánchez-Vázquez et al., 2016). Communities fear that mining operations can erode soil, contaminate the environment, damage health, change the landscape, and potentially reduce or eliminate access to water sources, leading to sociocultural impacts due to the lack of water for subsistence farming which is dependent on water and land for its survival (Sánchez-Vázquez et al., 2016; Uribe-Sierra et al., 2022; Singh et al., 2016). There is also fear about the risk of losing their properties and being relocated, losing control over their territory, and migrant workers disrupting their local tranquility and sociability with new customs (Sánchez-Vázquez et al., 2016).

Environmental conflicts linked with mining express something more than the dispute over natural resources, given the conflict between different ways of life and relating with nature, where local actors show their concern due to attachment to their communities and the immediate geographical surroundings defined as the identity of the place (Sánchez-Vázquez et al., 2016). Mining can represent an ecological threat due to the level of natural disruption it can cause, but it also poses sociocultural threats because environmental changes affect the material basis of social reproduction and the meanings attributed to the place. There is a threat to the earth and water enduring as fundamental means for material sustenance, and a threat to the sense of identity in the place, causing anxiety and concern about the future (Ramsay and Askland, 2022; Askland, 2018). Ontological security can be affected by the trauma represented by the risk of losing the sense of place, manifesting environmental unease to the extent that lived and imagined realities fall out of sync, given that ontological wellbeing is degraded and there is a growing sensation of alienation and a lack of control over identitarian locations (Askland and Bunn, 2018) like rivers or mountains.

While various studies have been done about mining and its impacts (Chávez et al., 2023; Zanetta-Colombo et al., 2022; Uribe Sierra and Panez Pinto, 2022; Uribe-Sierra et al., 2023), there are fewer studies concerning emotional responses in places threatened by early-stage projects. The present article aims to contribute to this discussion and analyze how environmental pressures affect the future image of the place and can produce ecoanxiety.

The study took place in the Putaendo Valley, a location within the Andes Range in the Valparaíso Region of Chile. The main economic activity is traditionally agriculture, depending on water from the Putaendo River, which is fed by the Rocín River and Chalaco Slough. Other activities include small-scale herding and transhumance in the mountains between Chile and Argentina (Baraona et al., 1961), along with the presence of large-scale agribusiness (Palmisano, 2020).

However, a close relation has been developed between the land and the river as a form of sustenance, but also as part of the cultural identity of the place due to the material, symbolic, and affective practices constructed over years by many generations (Cataldo, 2019). It is very common to hear local talk about the symbolic appropriation of the Putaendo River, but sensations of environmental angst currently prevail due to modifications to the river associated with climate change and interventions to create a reservoir which could supply enough water for agribusiness demand (Cataldo, 2019; Palmisano et al., 2022).

The zone is also facing a dispute with Andes Copper, a Canadian company, in relation with the installation of the Vizcachitas open-pit copper mine (Palmisano, 2020). The project is in its initial phase, and would be located in the Rocín River basin. For local residents, it poses a major threat due to its potential effects on this tributary, which could lead to the disappearance of the Putaendo River given the alterations which the latter has already faced (Cataldo, 2019). In Putaendo, although environmental impacts have not yet occurred, sensations of ecoanxiety arise over the fear that mining operations can cause socio-environmental transformations which could affect rivers, subsistence methods, and the future image of the place.

By continuing along these lines, we contribute to the debate about the concept of ecoanxiety as a socioenvironmental phenomenon. We also broaden the examination of the impacts of extractivism on daily life and the intimate experiences of individuals (Berman-Arévalo and Ojeda, 2020; Aparicio, 2017). In the field of geography and political ecology, there is an emerging focus on the everyday and intimate scale of emotions, since recognizing the importance of this scale reveals an environment of experience which could otherwise go unperceived (Sultana, 2015). Emotional geographies propose a reevaluation of subjectivity to explore the intersection of emotions and space, elucidating affective relations and the practices which tie human beings to the places which they love (Nogué, 2015; Sultana, 2011).

2. Emotional responses to environmental changes: solastalgia and ecoanxiety

Recent years have seen various studies about emotional responses to environmental changes (Albrecht et al., 2007; Galway et al., 2019; Phillips and Murphy, 2021; Moratis, 2020; Warsini et al., 2014; Askland and Bunn, 2018), with the concept of solastalgia standing out as an explanation for the pain felt by people who recognize that the place where they live is under immediate threat and attack (Albrecht, 2005). Solastalgia manifests as an attack on the sense of place itself, in damage to the sense of belonging and identity for a particular place, and in a feeling of angst or psychological desolation over its transformation (Albrecht, 2005). The sensation of losing a sense of place happens with the transformation of beloved environments due to multiple natural or artificial factors such as climate change, droughts, floods, fires, war, terrorism, logging, mining, or institutional changes (Albrecht, 2005).

Solastalgia explains the loss of material sustenance for people due to environmental impacts and the disintegration of cultural ties with the earth (Albrecht, 2005). Therefore, solastalgia as an expression of angst based upon a place is not only about environmental change as a biophysical transformation, but about the nexus between biophysical, social, and ontological levels, which is intertwined with power relations and the autonomy to interpret the past and the imagination of the future (Askland and Bunn, 2018). Solastalgia extends to the system of relations which generate a stable sense of place, transcending the solely environmental plane and passing into the sociocultural plane to the extent that the ontological security of people is affected (Askland and Bunn, 2018). While psychological trauma which affects mental health can occur, it is also important to pay attention to how landscape changes affect the relation between the natural environment and people, meanings, connections, and the way in which we maintain ourselves in a place and organize our subjectivities in relation to that place (Askland and Bunn, 2018).

Solastalgia is a very present-centered concept which concerns the senses of people who live in environmentally affected environments (Albrecht, 2005; Askland and Bunn, 2018). It is also connected with the future, since people who experience this sensation can seek to create things or participate in collective actions which can provide consolation (Albrecht, 2005).

However, given the rising intensity of the climate crisis and the unsustainable use of natural resources, environmental changes can be more intense in the future. The threat from this can cause an emotional response of anxiety (Boluda-Verdú et al., 2022). In this study, we intend to differentiate ecoanxiety as a type of emotional pain due to immediate changes in the natural environment, and anxiety as the expression of fear or concern in the face of future environmental changes.

In this way, ecoanxiety is a response which people can have in the face of environmental change threats, where although they may not yet have materialized, their latency generates unease and alters daily routine. Most studies on this concept explore how concern for future changes in natural environments can cause mental maladies including insomnia, traumas, mourning, and distancing (Ogunbode et al., 2022; Pihkala, 2022). Other studies consider how ecoanxiety activates defense

responses in the population via environmental activism (Pihkala, 2020; Kurth and Pihkala, 2022; Ojala et al., 2021). This is a challenge, because if successful coping mechanisms are not developed, mental health tends to deteriorate, since individuals perceive their efforts as insufficient to mitigate environmental problems (Boluda-Verdú et al., 2022).

Although there are various emotions linked to ecoanxiety, including fear, stress, sadness, guilt, self-blame, rage, frustration, impotence, and despair (Boluda-Verdú et al., 2022; Kurth and Pihkala, 2022; Ágoston et al., 2022; Gunasiri et al., 2022; Pihkala, 2021), the study of this concept remains limited. There is no exploration of how ecoanxiety caused by threatened future landscape changes can damage identity with a place and collective, individual, and human wellbeing. The present study aims to advance in this regard and explore how ecological threats generate anxiety over fear of changes in water and land use which can affect material sustenance patterns, but also images of the future and the sense of place in people.

3. Deepening the spatial dimension of eco-anxiety: emotional geographies and places

Emotional geographies study the spatiality of emotion, feelings, and affect (Nogué, 2009, 2015) and explore the relations between individuals and places (Pile, 2010). The place evokes emotions, and people project emotions about the place (Luna and Valverde, 2015). This takes place intersubjectively, since emotions can be individual and collective (Davidson et al., 2005). This framework lets us understand the struggles and concerns of people in socioenvironmental conflicts, capturing their emotions derived from their experiences and the context where they live (Sultana, 2011). Studying emotional geographies implies a political and ethical commitment, requiring sensitivity from the researcher (Sharp, 2009) in order to understand how people perceive and face threats to their most beloved places (Bailey and Osborne, 2020; Della Porta and Diani, 1999).

The concept of place arose in geographical thinking in the 1970s as a critique of spatial science within human geography (Cresswell, 2009). Humanists proposed that place implies a search for meaning through experiences, perceptions, interpretations, sensations, and the memories of people (Tuan, 1977; Gregory et al., 2009; Ramírez and López Levi, 2015). In other words, it integrates the relation between individuals, their social position, and their specific spatial location, which creates meaning and generates attachment (Tuan, 1974). Subjectivity is relevant, and the meaning derived from a place is influenced by emotions and individual representations (Ramírez and López Levi, 2015). A significant site is one which combines location and meaning, without any limitation to specific scales (Cresswell, 2009). The latter defines the position and point in space, while the former refers to the meanings, emotions, and sentiments based on individual or collective experiences, with attributes including materiality, significance, practices, and experiences (Cresswell, 2009). Places are produced via individual and collective action over time as a sociocultural construction linked with the practice and ontology of the individual, their *habitus*, and their sense of themselves (Askland, 2018). Changes in any of these areas are accompanied by political struggles and inequalities which can lead to experiences of loss and disempowerment (Askland, 2018).

4. Materials and methods

The present study uses a phenomenological focus, approaching the topic of anxiety from a qualitative and interpretive perspective. The methodology is based upon geonarratives of attachment to places by residents (Quintero-Weir et al., 2023; Kwan and Ding, 2008; Yuan, 2020; Quintana-Muñoz, 2022). According to Bell et al. (2015), this focus allows us to identify individual relations with places and how experiences are affected by the socioecological pressures of climate change and resource extraction.

We carried out 13 semi-structured interviews with local authorities

and key people during August 2022, working together with key informants from socioenvironmental organizations, and subsequently using a snowball sampling focus. We used recommendations of new participants who belonged to socioenvironmental organizations or local authorities. The number of interviewees fulfills the objectives laid out during qualitative data gathering. Interviews were centered on understanding participants' experiences with visible environmental changes and socioenvironmental threats from mining, helping us identify emotional responses to these phenomena. Informed consent formats approved by an ethics commission were used, along with pseudonyms to protect respondents' identity, apart from the mayor, who is a public figure.

During the interviews, we used maps of the municipality of Putaendo and a 3D printed model as additional materials, which let participants point to the maps and model the most appreciated places which are under threat by socioecological pressures to motivate participation by people. Interview data content analysis was done using Atlas. ti software.

The number of interviews may be a limitation for the article, so we also used qualitative data gathered in field notes via observation, along with a review of academic documents, technical reports, and press stories to further contextualize the localized responses and present a broader communitarian argument.

5. Background: environmental transformations in putaendo

Putaendo is a small community located in the Valparaíso Region, Chile (Fig. 1), with a population of 16,754 inhabitants, of which 60% reside in rural areas (Instituto Nacional de Estadística [INE], 2017). The local economy has traditionally relied on agriculture, livestock, forestry, and fishing, with 54% of registered workers engaged in these sectors in 2017 (Biblioteca del Congreso Nacional de Chile, 2021, [BCN], 2021). However, the area faces significant socio-environmental challenges, including recurrent droughts and agro-industrial monoculture, which have led to changes in land use and water, desertification, and the emergence of socio-environmental conflicts (Palmisano, 2023; Bolados, 2016; Panes-Pinto et al., 2018; Uribe-Sierra et al., 2022).

In Putaendo, the shift towards modernized agriculture decreased the significance of primary activities in the local economy between 1992 and 2017 (Uribe-Sierra et al., 2022). The ongoing drought and water scarcity have further impacted subsistence agriculture and livestock, resulting in livestock population decline and farmers leasing land (Palmisano, 2020, 2023). To adapt, the population has turned to rural ecotourism as an alternative economic activity, offering mountain experiences and outdoor ecological-focused activities. The mayor estimates that goat livestock have gone from 35,000 in 1990 to 12,000 or 15,000 by 2022, less than half the prior number. Where local residents used to drive cattle to the hills, they now drive people to enjoy the mountains and great outdoors.

In 2007, the Andes Copper company from Canada acquired the Vizcachitas deposit with the intention of establishing an open-pit copper mine. The proposed mine would be situated along the Rocín River, the primary tributary of the Putaendo River, which serves as a crucial water source for domestic use by the local population. This development created a division within the community, since the location of the mine and its promised employment opportunities clashed with the social and economic reality of Putaendo, which is heavily reliant on agriculture and subsisting on river water. Andes Copper positioned itself as an economic alternative for the community, pledging to create 5000 jobs during the construction phase (2023–2025) and 1300 direct jobs, along with 3000 indirect jobs, during the operational stage (commencing in 2025) (Minera Vizcachitas, n.d.). However, there is no mention of how much of the local population will be hired, and national experience shows that more people are hired from outside the community for open-pit mines, which has led to negative cultural changes (Thodes Miranda, 2016).

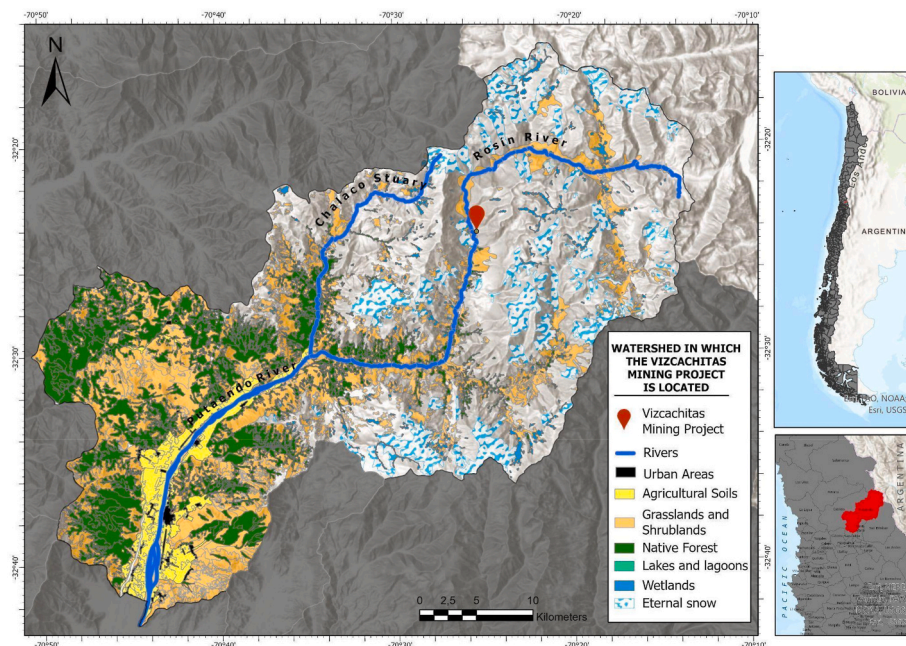


Fig. 1. Location and characteristics of Putaendo.

The company has presented the undertaking as one of the most important large-scale projects in the country for new mining sites, unlike the national trend where mining development is based on expanding existing sites. Nevertheless, this project poses a significant threat that could exacerbate the environmental impacts resulting from drought and agribusiness, leading to a socio-environmental conflict between the company and local organizations in Putaendo.

Mining in Chile is governed by the Mining Code of 1980, which has historically favored exploitation and left communities' interests aside (Cataldo, 2019). In 2008, the Andes Copper company requested a prospecting permit via the Vizcachitas Mine Prospecting initiative, which was presented via an Environmental Impact Declaration (EID) given to the Regional Environmental Commission (REC) for the Valparaíso Region, obtaining a negative initial result. Despite rejection for an unfavorable environmental rating, probes were still carried out, regardless of the determination by the REC (Gilbert, 2020).

In 2015 the company began another unauthorized probing campaign, and was sanctioned by the REC and the General Water Directorate (Palmisano et al., 2022). Requests for further probe permits were approved in 2021, but rejected in 2022 (Labbé, 2020), particularly due to environmental impacts which these works could pose to the Andean mountain cat (*Leopardus jacobita*) in the zone, which is an endangered native species.

The arrival of Andes Copper in Putaendo was widely considered a socioecological threat. Although there are people who favor the project, the majority has indicated their rejection for it via various actions which gave rise to a conflict beginning in 2011 (OCMAL, 2023) but which became more intense in 2015. This has included information campaign, mass marches for life (2015, 2016, and 2021), legal actions, and multiple artistic expressions accompanied by local socioenvironmental organizations (Palmisano et al., 2022).

There have also been concerts in the public square of the city, neighborhood recitals, itinerant plays in schools, and performances involving attractive theatrical techniques such as the drama of a child who can no longer go to play in the river because the river has lost its flow (Cataldo, 2019; Palmisano, 2020). In the cultural artistic organization, "Vizcacha Capucha", local artists also perform interpretations of a fable through stories with pedagogical aims and ecological content that promote critical reflection on the sociometabolic damages of

open-pit mining, in order to promote resistance action (Barrera, 2020).

One important aspect is that in the face of the ecological threat from the mine, a new appreciation for the natural wealth of the place emerged, which also helped with defense actions. According to the mayor, there used to be a strategic deficit in public management, with little value given to the territory, which led to a perceived vacuum. However, since 2016, both the former and current administration have actively promoted recognition of the most valuable natural and cultural sites of Putaendo.

This may be due to the phenomenon mentioned by Carlo, a young environmentalist, for whom the uncertainty around the arrival of Vizcachitas is even greater than the effects of climate change and agribusiness. In his words:

"Most people here saw the drought and the water shortage as a sign to adapt and have different behaviors that are environmentally friendly to deal with the situation. There's lots of people who move from monocropping to ecological farming, and even though it took them about three years, they succeeded, made themselves resilient, and changed their mentality in a context of scarcity. So the drought isn't too severe, because we can fight it by adapting to it".

This story indicates that there is greater fear of open-pit mining than of other environmental change factors, as it is considered an activity which can cause irreversible impacts similar to those seen in the northern part of the country. National documentation on the topic shows a common pattern of emerging disputes over water, pollution, health damage, and landscape changes (Bolados, 2016; Arboleda, 2017; Romero and Opazo, 2019).

The speed of environmental changes from open-pit mining can be reflected and perceived more quickly than impacts from other activities or phenomena. Concern over landscape changes can thus awaken appreciation for the territory and bring a reappraisal, which has also been useful for community struggles against mining. Unlike other cases, the local authorities support anti-mining initiatives, since their election arises from participation in local territorial defense groups, which has meant that the municipal government has led resistance actions to link civil society efforts with town authority.

During community expeditions the local people identified over a hundred rock glaciers in the mountain range, showcasing the rich

biodiversity of wetlands and endemic flora and fauna, including the Andean cat. Efforts were also made to revalue significant sites, such as preserving the memory of the historic route of the *Ejército Libertador de Chile*, which played a pivotal role in making Putaendo the first community freed from Spanish colonial rule in the country during the War of Independence over 200 years ago. Other important locations containing archaeological remains, petroglyphs scattered across various hills, and the *Corrales de Chalaco* have also been given renewed recognition.

Another valued site is the *Los Patos* Sector, which serves as a public bathing area during the summer season. However, this site, along with the Putaendo River, faces problems due to the damming of the Rocín River, the main tributary of the Putaendo River. Residents' stories indicated that they made deeper sections in the Putaendo River to go spend time in during hot periods, and that even with the flow reduction people continue to go enjoy the place. However, the mine project could be the end of the Putaendo River, leading to the disappearance of this water source as a source of sustenance for the population and as a space for recreation and emotions.

The hills in Putaendo also hold significant natural and cultural value. The hills have historically been important for cattle ranching, but they have also become essential for ecotourism activities. Mining activity by Andes Copper has restricted access to the hills, though, which impacts local economic practices. Concerns have been raised about how mining will deepen the precariousness of subsistence agriculture and cattle ranching in the area due to the presence of the mine. Along with physical changes, such as those resulting from mining operations, the current access limitations affect the local community and their economic activities, images of the future of the place, and their sense of identity within it, as they lose power over these sites.

In this sense, there is uncertainty not only over the fear of affecting the means of subsistence due to mining activity, but also the destruction of local identity associated with the natural environment and high-value sites which can cause anxiety. According to Palmisano (2020), the response from farmers, muleteers, herders, and drivers was the construction of some collective alternatives, including: 1) Declaration of National Heritage, and eventually, a World Heritage Site designation, for the route taken by the Liberating Army over the Andes; 2) Nature Sanctuary Declaration, for peri-glacier sectors (like Las Launas); and 3) Creation of an Andean Park, to protect flora and fauna.

6. Emotional responses to environmental changes in putaendo

The qualitative data gathered from Putaendo residents clearly show they perceive mining as a threat, which has various dimensions and evokes a series of emotions. Specifically, we explore the potential ecological, social, and cultural impacts of mining and the fears that it can lead to the loss of high value sites and their traditional means for living connected to the natural environment. Across this section, we go into further depth about how socioenvironmental pressures have generated emotional responses in the local population.

6.1. Constructing the threat of mining: fear of additional ecological loss

One crucial aspect of eco-anxiety is the fear of potential future ecological damage. This fear is often heightened by past experiences. The residents of Putaendo have already witnessed significant environmental transformations driven, in part, by extractive activities in the agro-export industry and climate change. This history provides a basis for their concerns regarding the potential impacts of new extractive projects in the area.

A concrete example of these concerns is the construction of a dam that has reduced residents' water access. In an attempt to address the historical water deficit in Putaendo, the construction of the Chacrilas reservoir was proposed in 1990. This reservoir involved damming the Rocín and Putaendo rivers, leading to decreased water access. Water resource distribution has also been unequal, favoring large

agribusinesses at local residents' expense (Páñez-Pinto et al., 2018).

Qualitative data reveals that the damming has led to a significant decrease in forested areas, with once-abundant species like *peumos* (*Cryptocarya alba*), *espinos* (*Acacia caven*), and *quillay* (*Quillaja saponaria*)² barely surviving. Another study noted a staggering decline of 99.88% in forest land use between 1997 and 2017 in Putaendo, while areas without vegetation and urban-industrial areas grew by 14.86% and 47.94%, respectively, highlighting the severe desertification occurring in the area (Uribe-Sierra et al., 2022).

Another example is the loss of land previously dedicated to subsistence cattle ranching, which was appropriated by a large transnational cattle ranching company. In the mid-1980s, the transnational company Tongoy acquired land through public auction for speculative purposes, resulting in the loss of ownership of the mountain range for the cattle herders and breeders and undermined this traditional economic practice in the area (Palmisano, 2020, 2023). Land and water use changes and the subsequent environmental changes have generated sensations of angst in people, affecting their material and affective relations with the place.

Part of the ecoanxiety which Putaendo residents faced is rooted in feelings of sadness and nostalgia for the loss of places and landscapes with a profound meaning for them and their communities. For instance, Fernando, a farmer and muleskinner, lamented the loss of the Putaendo river due to dam construction, as it was an important place for him:

"It feels really nostalgic to walk up to the river and see miles and miles of it with no water at all, and all the plants and trees gone. The whole place is just gone, you know? There used to be families and stories, folks having a good time by the river, but now there's nothing. When you go up to the mountains, you realize the desert has come all the way to us. We used to have snow that stayed forever, but that hasn't happened in a long time."

For Carmen, a teacher at the local primary and secondary school, not seeing the river gave her a similar sensation: *"It's really sad. It's one of the places I miss the most"*. These testimonies clearly show the strong affective and identitarian link between the participants and the Putaendo River, highlighting the pain caused by its transformation and manifesting sensations of solastalgia for the changes suffered by the place they miss.

This connects with the sensations of anxiety over the fear that mining can damage the Rocín and Putaendo Rivers, completely losing all access possibilities. Ariel, a psychologist and environmentalist, expressed that the Vizcachitas mine being set up on the Rocín River *"could kill or destroy the river [Rocín and Putaendo] because of contamination and what open-pit mining means in general."* Echoing this sentiment, Fernando commented that this type of mining represents *"a huge threat because these companies exploit the minerals and once they're done, they leave, leaving the entire area without water, dry, sick, and very poor."*

The participants are very conscious of the negative ecological impacts associated with open-pit mining, including exhaustion of water resource and landscape changes, which could keep them from enjoying what remains of the Putaendo River as it may disappear if the mine opens. Soil erosion, pollution, and impacts on the mountain can also aggravate the problems for some subsistence activities such as transhumance and herding, since according to the respondents many breeders have had to move southwards due to the drought. In this way, we can observe concern over the gradual loss of power over these places and the fear that in the future, they may be completely disempowered due to the mining project.

Bianca, an actress and environmentalist, briefly shared her background to mention that she had already lived in mining-affected territories in the Coquimbo, Copiapó, and Antofagasta regions, where the environmental damage is visible to the naked eye. She arrived in Putaendo in 2014, hoping to settle in a mining-free place, but as she put

² For a more detailed study of the local flora, see Cádiz-Véliz et al. (2023).

it, “After five months, our land was under construction when we were told about a neighborhood council meeting for the installation of a mining company. For me, it was a big ‘no,’ like, I didn’t sign up for dealing with this monster.”

Bianca explained that the whole process has been “*torturous because, honestly, it hasn’t been pleasant to realize that you have to fight against this monster ... It’s really hard to fight these companies with all their economic, social, political, and international support ... from big investors.*”

This testimony reveals the impotent feeling of struggling under unequal conditions and the emotional problems which arise within environments of socioenvironmental conflict against mining. It is a lengthy and enervating struggle, and the term “torturous” used in this narrative reflects the psychological exhaustion arising from the menace of mining, given the experience from regions which are environmentally affected by the activity and the actions taken to face this challenge; the path forward remains unclear.

It has become a daily battle to the extent that life and both family and individual plans are suspended in order to face the problem on a full-time basis. However, the story also shows how concerns over mining advances within their new home activated intentions to participate in resistance actions.

6.2. Fear of losing traditional trades

The study participants understand that the installation of an open-pit mine in their area, which already suffers from severe drought problems, will complicate the situation further by impacting the Putaendo River, which serves as the main source of water for domestic use. This indicates that without suitable conditions, traditional peasant practices are being abandoned or replaced by livelihoods in commerce, services, or informal sectors, which in turn affects the very identity of the local land workers who have a strong bond with the land.

Ariel expressed his dismay, saying, “*It’s really sad to see the empty fields ... It’s heartbreaking to lose that local production.*”

Mauricio Quiroga stated that incorporating the Putaendo and Rocín basins into mining activity could affect local economic development, which depends on agriculture, tourism and cultural heritage: *in that same perspective, it seems fundamental to us that a municipality should not incorporate a new [stressor] to the already-scarce water resources, such as large-scale copper mining (Putaendo Resiste, 2020).* This is shared by Héctor Fuentes, founder of the socio-environmental organization “Coordinadora 3 Ríos”, who said that if the drought has already caused labor precariousness, “*mining will be the nail in the coffin*” (Cable a Tierra, 2020).

Carmen also shares the “*fear of traditional trades being lost*”. She emphasizes the risks faced by cattle herders, breeders, saddlers, and wicker weavers, as mining activity may alter the spatial dynamics of the area, forcing them to adapt to new rhythms and work patterns. Fernando feels that this situation disrupts the continuity of the *medias lunas de campo* (stone corrals used for livestock work). He explains that as the cattle population decreases and livestock loses its significance, these stone corrals, like the Corrales de Chalaco, lose their purpose. The *medias lunas de campo* were not only functional, but also served as a joyful celebration for families where practices and important affective ties were forged for generations.

6.3. Uncertainty in the face of potential changes in daily life

According to Esmeralda, an anthropologist and school teacher, the problem of open-pit mining in Putaendo has created a constant state of uncertainty. People try to carry on with their lives while knowing that the threat looms, aware that it has the potential to transform the natural environment, identity, and social reality which they know, cherish, and defend. In the face of this uncertainty, a range of emotions are experienced. Esmeralda shared her own struggles with negative emotions that arise due to the advancing mining, and how they interfere with her

habits and daily routine.

“I feel depressed and even think about leaving Putaendo because of the mining situation. It affects my sleep, my work motivation, and morale. It’s disheartening to see that despite the potential for productive activities, the reality seems to be heading in the opposite direction, detrimental to both individuals and the social and natural environment. It makes me question what I can do. Initially, it makes me feel sluggish, but then I push myself to fulfill my various roles—work, activism, motherhood, citizenship—striving to give my best in each because I believe it’s possible. I entered this loop of studying, educating myself, and working on things, not knowing what the outcome will be. Eventually, as I engage in more political and concrete actions, I realize how challenging it truly is. It generates frustration, anger, stress—so many things.”

The experience of Esmeralda highlights the association of fear and anxiety with not knowing how Putaendo will change after the arrival of mining. In particular, the influx of outsiders causes concern for some. Carlo noted, “*The fear that Putaendo won’t be the same generates anxiety ... having to interact with people who are completely different from what we’re used to.*” Armando, an independent artisanal miner, pointed out, “*It’s a fact that there’s fear that, with the arrival of people from outside, the town could undergo changes. Given the current situation, it’s going to be terrible, and we won’t be able to live peacefully in this town.*”

The primary concern revolves around the arrival of individuals who do not share the values of the current residents of Putaendo, bringing negative influences or not intending to settle down. Gerardo, a young environmentalist, expresses the fear that an influx of transient population could disrupt the current sense of security in Putaendo, saying, “*People from different cultures or with different tranquility standards may disturb what we cherish—walking down the street with peace and quiet, without disturbances.*”

The participants also expressed concerns about the future lives of the younger generations. Carlo reflected that:

“we’re also worried about the generations that come after us. When I see my nephews and nieces, it saddens me to think that they won’t get to experience the same Putaendo that shaped me into the person I am. It’s disheartening ‘cause they’ll come across different folks with their own ways and teachings.”

Esmeralda echoed this sentiment, saying,

“What affects me the most is my daughter. The other day, she had a nightmare and said, ‘Mom, I dreamt that they took away all our water, and we had to move to the south.’ Thinking about what will happen to future generations overwhelms me with anxiety and unease. They will face constant battles, struggles, resistance, stress, and uncertainty.”

Gerardo has reached a point of resignation, stating, “*I feel like I’ve moved past sadness and now I’m desperate, on the verge of accepting reality as it is and trying to overcome anxiety. I understand that this is the reality, and I shouldn’t harbor false illusions, but rather attempt to accept it.*” Safety is a crucial and fundamental aspect of the participants’ way of life.

7. Conclusions

The article analyzed how the pressure from potential future environmental changes in land and water use can generate ecoanxiety in people. The case study was a useful reference point to illustrate how open-pit mining advances threatens the material subsistence which depends on the natural environment, due to possible changes in the landscape including rivers and mountains, at the same time that it menaces the future image and sense of place which the local population has, activating a sense of ecoanxiety with motivations to abandon their home if the Putaendo River disappears.

In Chile, as in Ecuador (Sánchez-Vázquez et al., 2016) and México (Bastidas-Orrego et al., 2018, 2021) the advance of open-pit mining projects in their early stages within places where there is no mining

tradition due to the prior absence of this activity, and the strong symbolic ties which have been built with land and water, generate fears that projects will change landscapes, erode the soil, exhaust resources, and reduce access to water sources for domestic and recreational use.

We can observe the fears of the local population regarding potential ecological impacts, which drive potential sociocultural changes since reduced water and mountain Access can affect material subsistence practices as well as local traditions like agriculture, herding, and transhumance. There is also concern about attachment to communities and the immediate geographical environment where identitarian, productive, and affective relations have been built across generations.

The potential social impacts linked with the arrival of migrant workers combine with concern over ecological impacts, since there is a risk of losing the everyday ways of life built over years, as has already happened in other parts of Chile such as Antofagasta (Thodes Miranda, 2016). This situation affects the ontological security of people (Askland and Bunn, 2018) since the image of the future of a place is altered, and ecoanxiety arises over people wondering how their home will be in biophysical, social, and cultural terms if mining operations began tomorrow.

The case study shows that ecoanxiety is tied with prior experiences of impotence and despoliation which have already generated environmental angst in the population due to losing beloved locations to climate change and agribusiness. This situation of anxiety over immediate environmental changes can be characterized as solastalgia, as long as the desired environment is directly attacked and transformed (Albrecht, 2005). However, a connection with the future is generated when people question their projection in their living spaces and the latent threats which can worsen existing environmental damages in the zone.

In Putaendo, people move from a state of solastalgia to a state of ecoanxiety because the existing environmental angst extends towards concern over the future of the place due to the threat from an open-air mining project. Their stories show how the wellbeing of the natural environment affects human wellbeing. The future image of the total destruction of a river by mining generates ecoanxiety which is expressed in the family, labor, and intimate levels, not only due to possibly losing the land and water as resources for material subsistence, but also as an essential part of their sense of identity in the place.

The sensation of anticipated environmental changes due to extractive activity affects routines and moods, raising concern over possible exacerbation of sociocultural and environmental damages in the zone. Concerns arise over how environmental degradation can damage the local economy, the community, and human welfare due to the risk of completely losing access and power over the places where a material and identitarian relation was built, and is now threatened.

We can also see a growing subjective reappraisal by the local population of the interaction between the space and their emotions, motivated by the risk posed by mining. This reactivated the evaluation of the natural environment in Putaendo via protecting beloved locations which involve affective relations and identitarian practices. According to Askland and Bunn (2018) change or threats to ontology, habitus, and the sense of place lead to disempowerment and inequalities, but also to responses and struggles to preserve the environment.

In this way, ecoanxiety can be understood beyond the psychological impact which leads to possible mental health deterioration associated with concern over potential ecological changes. It also explores how anticipated landscape changes harm the relation between people and their environment, activating organized responses to reappraise and protect the places which people love via legal and artistic actions.

Future studies will need to go into detail about ecoanxiety as a socioenvironmental phenomenon to broaden comprehension about how risks for the natural environment condition human, individual, and collective wellbeing. This is increasingly relevant in a global context heavily affected by the intensive use of natural resources for different productive activities, where mining is not the only thing which can create ecoanxiety since current environmental threats include other

phenomena which require analysis, including climate change.

Funding

This work was supported by the ANID FONDECYT POST-DOCTORADO 2022 PROJECT N° 3220496 and ANID ANILLOS ATE230072 "Climate Pluriverses: A decolonial perspective of geo-humanities for the design of alternative territories in contexts of climate change".

Declaration of conflicting interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Sergio Elías Uribe-Sierra: Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing. **Lindsey Carte:** Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Pablo Mansilla-Quinones:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Andrés Moreira-Muñoz:** Conceptualization, Funding acquisition, Validation, Writing – original draft.

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Sergio Elías Uribe Sierra. Economist from the Universidad Autónoma de Zacatecas, a Master's and Ph.D. in Rural Development from the Universidad Autónoma Metropolitana-Xochimilco. The main lines of research are mining extractivism, rural development and socio-environmental conflicts.

Lindsey Carte. PhD is on faculty at the Universidad de la Frontera in Chile. She researches the relationship between extractivism and rural change in Latin America.

Pablo Mansilla-Quinones. Associate Professor, Institute of Geography, Pontificia Universidad Católica de Valparaíso, Chile. He directs the Alternative Territories Group www.territoriosalternativos.cl. He specializes in Human Geography, Social Geography and Territorial Planning. He holds a Master's degree in Geography and a PhD in Human Geography from the Universidade Federal Fluminense, Brazil. His professional experience has been mainly focused on research on territory and social movements in Latin American perspective.

Andrés Moreira-Muñoz. Geographer and Ph.D in Natural Sciences University of Erlangen-Nürnberg, Germany. Specialist in Biogeography, Botanical Geography and Management of Protected Wildlife Areas and Biosphere Reserves. Author of 4 books and more than 80 articles and book chapters in the areas of Biogeography in the areas of Biogeography, Conservation and Physical Geography. Professor at the Pontificia Universidad Católica de Valparaíso, Institute of Geography. He directs the BIOGEOLOG.org Laboratory and the Anillos-Conicyt project "Geohumanities and Creative Biogeographies" (BIOGEOARTO). Creative Biogeographies" (BIOGEOARTO.CL).