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Participatory Monitoring

Foregrounding Sustenance Practices as a New Environmental Public

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This essay explores the relationship between extraction activities and the subsistence economies they impact to advocate for the emergence of a new political category—what Lesley Green refers to as environmental public. With a Chilean copper mine as a case study, this essay recognizes sustenance practices (such as farming, herding, and fishing) as material witnesses that register environmental change in and around extraction sites. With a recent update to national legislation—to comply with the Escazú Agreement—it is possible to posit sustenance practices as essential for the now mandatory participatory monitoring of environmental change within these sites. This could center these sustenance practices and bring them forward from the fringes of economic development. Reviewing environmental impact assessment reports as records of landscape transactions, and conducting fieldwork around the mines' operational landscapes, reveals how the copper industry neglects to register the relational damage done by extractive activities. With an upcoming project phase to extend the copper mine's operations, this essay considers how spatial disciplines might learn from and assist in supporting monitoring activities for this new environmental public.

Keywords: extraction activities, environmental public, sustenance practices, material witnesses, participatory monitoring, environmental impact assessment

Introduction

In Chile, recent changes to an environmental protocol present an opportunity to transform the relationship between extractive activities and the lands and communities they impact.[1] Following adoption of the United Nations 2030 Agenda for Sustainable Development, Latin American member states negotiated the Regional Agreement on Access to Information, Public Participation, and Justice in Environmental Matters, or what is better known as the Escazú Agreement. This agreement originates from Principle 10 of the 1992 Rio Declaration on Environment and Development, which establishes that "Environmental issues are best handled with participation of all concerned citizens, at the relevant level."[2] The Escazú Agreement sets regional standards for Latin American and Caribbean countries, foregrounding South-South cooperation for the right to a healthy environment, with particular attention given to vulnerable people and communities.[3] The agreement became enforceable to all signing parties in 2021 but, after initially championing the cause, Chile's right-wing and industry-oriented government of the late Sebastián Piñera opted out, believing that stricter environmental regulatory frameworks would disincentivize investment.[4]

It wasn't until the 2023 administration of Gabriel Boric (a young president who rose to candidacy after the October 2019 uprisings with a social and environmental agenda) that Chile became a signatory to the Escazú Agreement. This adoption required the country to update its national legal frameworks to meet the standards set by the agreement. In 2023, the Environmental Evaluation Service, in collaboration with the Ministry of the Environment, amended the Regulation of the Environmental Impact Assessment System (SEIA) to align with the Climate Change Framework Law and the Escazú Agreement. Supreme Decree No. 30 of 2023 (DS 30/2023), which enacts this amendment, took effect on February 1, 2024. As a result, all projects entering the system after this date must comply with the new requirements.

One of these new requirements presents a unique opportunity for design disciplines to support what

anthropologist and Environmental Humanities scholar Lesley Green calls an "environmental public" or the people who hold rights to a particular landscape.[5] Before February 1, public involvement in projects with significant environmental impact was restricted to the initial stages of an Environmental Impact Assessment (EIA) submission. Citizen Participation was further limited to a sixty-business-day period, during which they could raise questions about the project through in-person or online submissions. Following the implementation of DS 30/2023, citizens are allowed to be involved throughout the lifespan of a project via Participatory Monitoring. This new timeframe for public participation requires project owners (such as mining companies) to incorporate impacted communities into ongoing monitoring through information sharing, reports, data collection, training, coordination of field visits and other activities that track the project's development in all its phases.[6]

Given the extended duration of projects requiring EIAs and the ongoing need for monitoring, Participatory Monitoring activities will require involvement from communities that practice subsistence farming and gathering in and around the operational landscapes where extraction activities take place. Communities such as farmers, herders and fishermen have intimate territorial knowledge and can be witnesses to the environmental impacts caused by—in this case—mining. Their accounts of changes in fish stock available or the flow patterns of rivers give a description of environmental distress that expands the scope, both in space and time, of the impacts that an EIA process currently registers. Sustenance practices in places like Chile's copper-rich Choapa Valley in the Coquimbo region are forced to contend with environmental stresses from nearby extraction operations, and their outputs provide evidence of environmental change. In this sense, these fishing, foraging and herding practices are potential mechanisms of participatory monitoring under the new environmental mandate introduced with Chile's signing of the Escazú Agreement.

Architecture, as a discipline concerned with shaping the public realm, can play a valuable role in facilitating the emergence and sustainment of an "environmental public" comprised of sustenance practices communities through dedicated spaces for Participatory Monitoring, while also helping to mobilize resistance against such damage. Scholars from different fields have recognized the importance of local environmental knowledge production. In researching cultures of assembly, Architect Markus Miessen emphasizes the importance of spaces for local knowledge production, community building and embedded political decision-making in the context of the socioecological transition.[7] Science and Technology Studies scholar Noortje Marres suggests a role for the design of events and architecture in the articulation of public controversies or "issue formation."[8] In extraction sites, "issue formation" or the delineation of situations that come to matter is critical as environmental controversies precipitate a need for democratic engagement, and such engagement can take place in public spaces. Seeing sustenance practices as a medium to access the burden and unexplored relationships extraction operations place on livelihoods follows what Geographer Andrew Barry suggests: that the discourse on environmental problems has been dominated by a focus on the development of models within enclosed laboratories, rather than the unbounded spaces of depleted forests or contaminated mines, where a researcher can attune to the obligations these environmental problems generate.[9]

Resistance to *extractivismo* has a complex history that, as political scholar Thea Riofrancos highlights, has taken many forms—beginning with localized struggles in Indigenous territories, advancing to the nationalization of natural resources, and culminating in the current opposition to all forms of extraction.[10] Through this research, I suggest that designers should play a role in implementing new policies aimed at increasing public participation in environmental matters as is afforded by the Escazú Agreement. Increasing such participation can help us create new forms of resistance that complement, yet are distinct from, the long tradition of organizing against extractive industries within Latin America. This essay brings together research from across sources and methods, including fieldwork in Chile`s Choapa Valley and specifically the operational areas of Los Pelambres copper mine; semistructured interviews with locals and subject matter experts in the town of Los Vilos, Salamanca and Caimanes; and analysis of the online archives and proceedings of the Chilean Environmental Impact Assessment System (SEIA).

The Infrastructures of Copper Extraction

The Los Pelambres copper mine in Chile is a large-scale operation owned by Antofagasta Minerals, which began extraction in the early 2000s. The mine extracts copper ore from the Los Pelambres-El Pachón mineral cluster, a resource shared with Argentina and located high in the Andes.[11] The open-pit mine is a huge void, blasted with explosives to extract mineral ore from solid rock. Los Pelambres' operational areas, seen in Figure 1, have restricted access and the mine's remote location means that both mine employees and residents never see the open pit itself; instead, they experience it indirectly. They might notice traces of it in the everyday particulate matter drifting from a tailings dam, in strategically placed signage alerting that nearby pipelines carry copper concentrate, or in the eerie sight of a eucalyptus plantation where no other vegetation grows as tall or as green. Without these clues, the mine largely remains unseen by the untrained eye. As Figure 2 shows, the mine becomes visible to locals through the proximity of poles

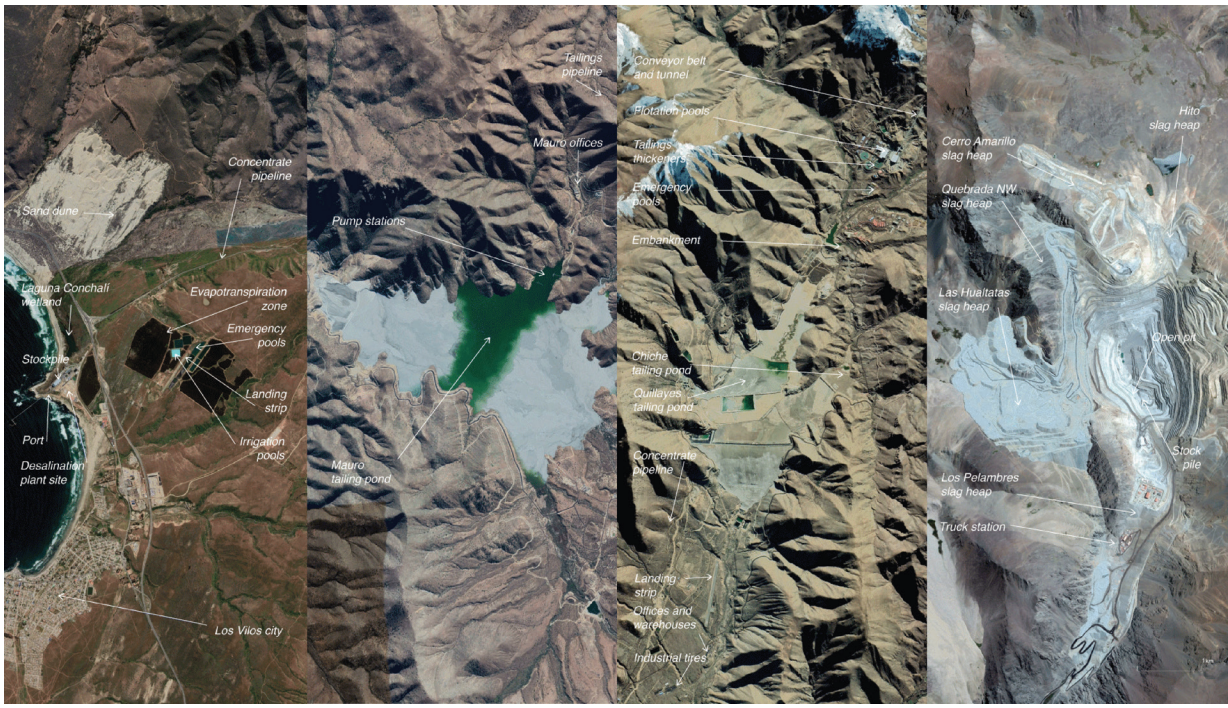


Figure 1. Mine operational areas. From right to left: the open pit in the Andes, Chacay industrial facilities, the El Mauro tailings dam, Puerto Chungo, and the Evapotranspiration Zone in Los Vilos. Images from Google Earth.

and pipelines to houses, sidewalks, roads and the ocean shoreline.

At four sites at different altitudes along the transect from the Andes to the Pacific Ocean, we find mining waste from the well-known slag and tailings dam, to lesser-known infrastructures that deal with waste like a eucalyptus plantation or a desalination plant, engineered solutions to dispose of—or store in perpetuity—the damaging by-products of copper mining. From east to west, beginning in the Andes, slag mountains of blasted rock form around the open pit, shifting the imagined territorial demarcation between Chile and Argentina. In the valley, a 230-meter dam wall holds tons of tailings (a sludge by-product from the grinding and flotation processes that separate copper from ore) occasionally releasing dried particulate matter and depositing a thin veil of dust on rooftops and cars in the nearby town of Caimanes. This reminds everyone that the mine is responsible for the dust—the same mine that has dried up the valley and whose dam threatens the town's existence with every earthquake felt in the area.[12] On the coast next to the Puerto Chungo port facilities, where vessels ship copper concentrate to refineries elsewhere, sits a 140-hectare eucalyptus plantation. This plantation assists in the extraction process by utilizing the trees' evapotranspiration abilities to return water from copper concentrate back to the environment—a co-opted nature-based solution for disposing of industrial water (which is not permitted in naturally occurring bodies of water). Lastly, a desalination plant reverses the water cycle by removing salt from ocean water via reverse osmosis to supply the mine operations in the mountains with noncontinental water, creating uncertainty among local fishermen about the impact that brine disposal will have on coastal marine ecologies.[13]

All these sites constitute or expand the notion of what Chilean legislation recognizes as an environmental liability, which typically only covers tailings deposit sites. Each site serves as a proxy for the mine's extraction activities and produces friction with sustenance practices that sustained people before the mine arrived. At each of these locations, there is no more copper (the copper has left through pipelines as concentrated liquid to be shipped away as a fine powder). Instead, the mine leaves behind by-products that pass as innocuous landscape features. As mine waste is dumped in the shape of hills, sustenance activities like transhumance (the seasonal movement of livestock between different ecological zones)—are silently rerouted. In and around the open pit, at an altitude of 3,600 meters above mean sea level (a.m.s.l), the transhumance of goat breeders from Coquimbo (Chile) into the high valleys of Calingasta (Argentina) is unique due to the integration and cross-border cooperation.[14] The mine has allowed breeders to pass through its open pit operational areas, accommodating the Chilean government's request.[15] The mine's constantly moving border has also created sovereignty problems for the state. In 2015 Glencore, the company that owns El Pachón, alerted authorities to the presence

Figure 2. Mine Infrastructure. Pipelines that run openly or beneath sidewalks in various towns along the Choapa Valley, March 2021. All images: Linda Schilling Cuellar unless otherwise indicated.

of the Los Pelambres Cerro Amarillo waste dump on the Argentinian side. The mine had unintentionally trespassed the territorial demarcation line between two countries due to a conflict in map interpretations and had dumped fifty tons of blasted rock on top of a *bofedal*—a high Andean wetland were many rivers start—exposing it to acid rock drainage, which is an acidic discharge from waste dump rock stockpiles.[16]

In the valley, at an altitude of 800 meters a.m.s.l, the construction of a tailings dam seen in Figure 3 entailed occupying with tailings El Mauro Valley in 2005, displacing families and burying Diaguita archaeological sites. The tailings dam also channeled and diverted the tributaries of the Choapa River, becoming a looming threat to the downstream town of Caimanes, which could be buried under tailings when the next big earthquake occurs and the wall collapses. As a result, river communities that rely on fishing and foraging, along with farmers, have had their sustenance practices disrupted by this landscape reconfiguration.

In the coastal town of Los Vilos, a series of mine facilities and industry-governed stewardship measures, such as a eucalyptus plantation and the fencing of the Laguna Conchalí wetland respectively, have led to the prohibition of all foraging and hunting activities. Practices that constitute part of the Vileños identity are viewed as backwards by mine supporters that belong to the educated Santiago elites. Remnants of subsistence economies predating the mine's arrival are considered hazardous because of the uncertain levels of toxicity that plants and small mammals may carry on their bodies. In 2004, the Laguna Conchalí wetland was designated a Ramsar site, an international recognition that grants protection to wetlands. The wetland is located on the land acquired by the mine to build Puerto Chungo operational facilities on the coast of Los Vilos. The purported aim of the Ramsar designation, which positioned the mining company as the wetland steward, was to exert control over decades-long foraging practices in a coastal lagoon with a high population density that could endanger a fragile ecosystem. Such a move signaled that local sustenance practices, and not the mine's impact at the catchment level, was the biggest threat to the wetland. This conservation effort alienated locals from their environment, granting the right to speak for nature to a company instead of the local community.

Now, locals-turned-visitors can enter the area via trails or learn about the wetland history by visiting the interpretation center Centro Andrónico Luksic Abaroa (CALA) beside Puerto Chungo`s facilities on the coast of Los Vilos that overlooks the lagoon with the mission to present "an industrial mining activity that is responsible towards environmental preservation and social development."[17] The prohibition of foraging and hunting in the designated Ramsar site extends to the 140-hectare eucalyptus plantation depicted in Figure 4. An informal settlement, strategically placed next to the plantation since 2021, has prompted mine authorities to consider building a wall around the plantation perimeter to deter these new neighbors from entering the area

Figure 3. El Mauro tailings dam. Drone footage from fieldwork conducted in March 2021.

to collect wood, which they use for heating and cooking due to the lack of formal utilities infrastructure.[18] The eucalyptus trees absorb chemicals carried by water from copper concentrate used to irrigate them, and the interaction between the combustion fumes from burning this wood and these chemicals remains unknown.

Despite these risks, as shown in Figure 5, these sustenance practices continue to be carried out by individuals and collectives throughout the valley, for whom the mine's promise of economic prosperity for the region, via either direct jobs or compensation, did not materialize. Subsistence economies have existed in these landscapes before and during mining operations and will continue to persist on these altered landscapes after the mine closes.[19] Such complex extraction ecologies need to be addressed beyond the usual for/against models. As sociologists Sebastián Ureta and Patricio Flores explore in their book *Worlds of Green and Grey,* practicing extraction differently, moving "beyond extractivism," can only start by thinking of extraction differently, that is, in some cases extraction ecologies establish relationships that happen *because of,* not *despite* the presence of mining waste.[20] The authors conducted fieldwork in Chile's central valley where a tailing dam feeds treated wastewater back to a creek, which in turn allows nearby landowners to cultivate plots of land. What they initially conceived as a destitute landscape was supported by complex interactions between infrastructures of extraction and sustenance practices. Considering extraction differently in this way requires recognizing the potential of sustenance practices to reveal unexamined relationships and entanglements with extraction, while inscribing them into Participatory Monitoring EIA processes.

From Baselines to Sustenance Baselining Practices

The Choapa Valley has been labeled a "sacrifice zone," a place where the right to a healthy environment is secondary to the state's prerogative to privilege mining activities and to weave large infrastructures into small towns and coastal cities.[21] This situation places locals on the frontlines of anthropogenic change on a geological scale. They feel uneasy, wondering what will happen to them in the event of an infrastructure failure. Locals serve as witnesses in the traditional sense, and in an expanded sense their practices fall under what researcher and artist Susan Schuppli describes as a "material witness," which for her is "an operative concept that considers the evidential role of matter in registering external events and in revealing the practices and procedures that enable such matter to bear witness."[22] Humans and nonhumans witness environmental changes over decades, and they can testify beyond ordinary extraction impact reports. In this context, locals' sustenance practices, which share the same space as the mine's activities, hold a witnessing and testimonial potential, demonstrating their capacity to be recognized by state officials as Participatory Monitoring practices.

In environmental science, baselines are a benchmark to measure degradations against; they serve as

Figure 4. Evapotranspiration Zone. Drone footage from fieldwork conducted in March 2021.

a type of certainty for determining mitigation strategies or compensation plans for affected parties. Baselines vary in scope and format, ranging from individual material samples to the assembly of large datasets. They can include species population counts at a proposed project site, or ice core records that track global climate changes. Baselines are an integral part of Environmental Impact Assessments and represent the initial stage of any permitting process submitted to the Environmental Impact Assessments System (SEIA). In Chile, the state delegates this production of environmental knowledge to private consultants who develop these baselines. [23] Since the 1973–1990 Pinochet dictatorship, the state has stopped investing in knowledge about its own territory, transferring that responsibility to privatized knowledge markets, which underscores the prevailing belief in the Chilean economy: markets know best.[24] Since private consultants develop these baselines, data is proprietary, inaccessible to communities (unless a project owner submits an EIA to the SEIA), making data aggregation into public and shared baselines impossible.

Baselines do not account for relational damage—the harm inflicted on the connections between entities affected by the mine's daily operations—or the environmental stress caused by mitigation measures approved by the company and state regulatory bodies. For example, relocating or replacing tree species in El Mauro Valley impacts pollinators or soil bacteria; the underwater brine plume impacts larvae carried by the Pacific Ocean's upwelling currents off the ecologically diverse coast of Los Vilos; the sulfates accumulated in 140 hectares of tree plantation pose dangers for those harvesting and burning it for heating or cooking.[25] These considerations are all examples of relational damage and, if ever acknowledged by consultants, they are dismissed as negligible and remain unexplored.

The EIA presents nature as a passive background against which species of vegetation and animals live. Anticolonial author Aimé Césaire identified this itemization or 'thingification' of nature as a colonial project that renders a world composed of subjects and objects, neglecting to understand entities in relation to each other.[26] When accounting for ecosystem disturbances during a desalination plant construction phase, the EIA document listed all species present in a specific area as objects to be captured and relocated elsewhere away from the mine activities and subsequently monitored for success indicator compliance. Instead of seeing species as participants in relational processes modified by extraction, this modernist subject-object framing changes the order of factors disregarding outcomes.

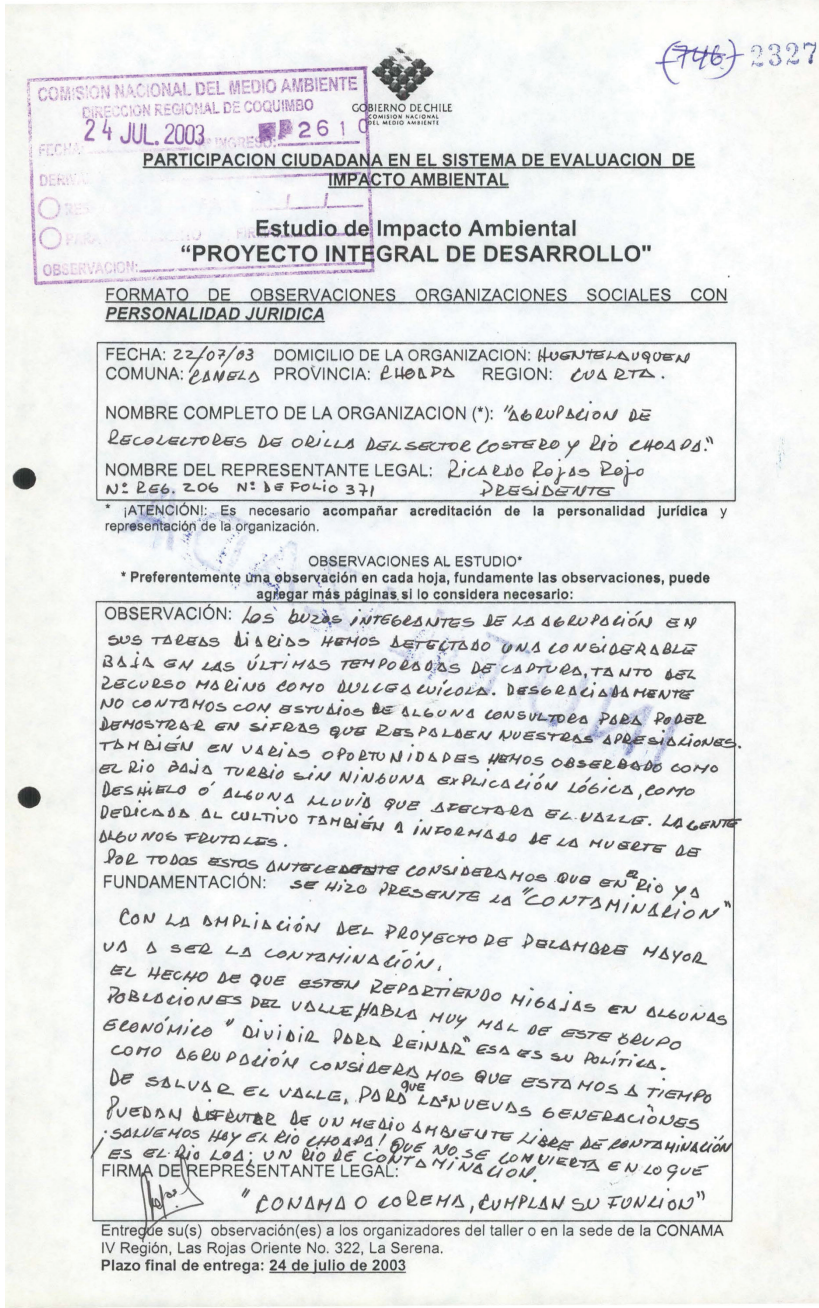
Sebastián Ureta argues that in contrast to the use of "baselines," which he equates to a snapshot, adopting "baselining practices" could introduce new approaches to data collection that account for accumulating damage over time. Currently, baselines act as a *tabula rasa*, starting anew with a new project phase normalizing a preexisting ecologically degraded landscape.[27] For example, when the mine submitted an EIA to obtain permission to place intake pipelines for the Los Vilos bay

Figure 5. (Top) Sustenance Practices. Goat herding next to a highway connecting to the Los Pelambres mine facilities, April 2024. (Bottom) Residents of Los Vilos fishing at the municipal dock for the day's catch, March 2021.

desalination plant, the visual disturbance on the ocean horizon caused by the construction phases was deemed of low importance because the horizon had already been altered by the mine's facilities from previous projects.

If sustenance practices were viewed as baselining activities, marginalized communities would have agency to participate in discussions dominated by project owners, private consultants and the state. The public has typically entered debates only through the framework established by the Citizen Participation process to express grievances; beyond that, they have little influence on decisions regarding their environment. It is possible to glean how local people reported environmental degradation in the mine's first EIA submission. In the consolidated file of 3,346 pages available for download on the SEIA platform, comments submitted by concerned citizens offer a window into the collective concerns in 2003.[28] In one-page forms written by hand, people from the Canela Municipality advise about unusual turbid waters without the presence of heavy rains or snow breaks, as well as the diminished presence of shrimps and silversides in the Choapa River since the mine started operations in 2000 with soil prospecting and subsequent construction phases of industrial facilities like El Mauro tailings dam. In one of the comments, as seen in Figure 6, the then-president of the Coastal and Choapa River Shoreline Collectors Association expresses general frustration at having observed these changes that were affecting their livelihoods but felt overlooked because they did not have access to hire consultants to conduct studies to validate their claims, the only epistemic framework valid in the eyes of the state.

Can the sustenance practices of fishermen and others be an entryway to material evidence of damage yet to be acknowledged? Understanding the impact of extractive activities involves searching for relational damage and paying sustained attention to learn how to ask questions regarding



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COMISION NACIONAL DEL MEDIO AMBIENTE
DIRECCION REGIONAL DE COQUIMBO
GOBIERNO DE CHILE
COMISION NACIONAL DEL MEDIO AMBIENTE
24 JUL. 2003 2610

PARTICIPACION CIUDADANA EN EL SISTEMA DE EVALUACION DE IMPACTO AMBIENTAL

Estudio de Impacto Ambiental
"PROYECTO INTEGRAL DE DESARROLLO"

FORMATO DE OBSERVACIONES ORGANIZACIONES SOCIALES CON *PERSONALIDAD JURIDICA*

FECHA: 22/07/03 DOMICILIO DE LA ORGANIZACION: HUENTELAUQUEN
COMUNA: CANELA PROVINCIA: CHOAPA REGION: CUARTA.

NOMBRE COMPLETO DE LA ORGANIZACION (*): "AGRUPACION DE RECOLECTORES DE ORILLA DEL SECTOR COSTERO Y RIO CHOAPA."

NOMBRE DEL REPRESENTANTE LEGAL: Ricardo Rojas Rojo
Nº REG. 206 Nº DE FOLIO 371 PRESIDENTE

* ¡ATENCIÓN!: Es necesario acompañar acreditación de la personalidad jurídica y representación de la organización.

OBSERVACIONES AL ESTUDIO*
* Preferentemente una observación en cada hoja, fundamente las observaciones, puede agregar más páginas si lo considera necesario:

OBSERVACIÓN: LOS BUZOS INTEGRANTES DE LA AGRUPACIÓN EN SUS TAREAS DIARIAS HEMOS DETECTADO UNA CONSIDERABLE BAJA EN LAS ÚLTIMAS TEMPORADAS DE CAPTURA, TANTO DEL RECURSO MARINO COMO DULCEACUÍCOLA. DESGRACIADAMENTE NO CONTAMOS CON ESTUDIOS DE ALGUNA CONSULTORA PARA PODER DEMOSTRAR EN CIFRAS QUE RESPALDEN NUESTRAS APRESIACIONES. TAMBIÉN EN VARIAS OPORTUNIDADES HEMOS OBSERVADO COMO EL RIO BAJA TURBIO SIN NINGUNA EXPLICACIÓN LÓGICA, COMO DESHIELO Ó ALGUNA LLUVIA QUE AFECTARA EL VALLE. LA GENTE DEDICADA AL CULTIVO TAMBIÉN A INFORMADO DE LA MUERTE DE ALGUNOS FRUTALES.
POR TODOS ESTOS ANTECEDENTES CONSIDERAMOS QUE EN RIO YA
FUNDAMENTACIÓN: SE HIZO PRESENTE LA "CONTAMINACION"
CON LA AMPLIACIÓN DEL PROYECTO DE PELAMBRES MAYOR VA A SER LA CONTAMINACIÓN.
EL HECHO DE QUE ESTEN REPARTIENDO MIGAJAS EN ALGUNAS POBLACIONES DEL VALLE HABLA MUY MAL DE ESTE GRUPO ECONÓMICO " DIVIDIR PARA REINAR" ESA ES SU POLÍTICA.
COMO AGRUPACIÓN CONSIDERAMOS QUE ESTAMOS A TIEMPO DE SALVAR EL VALLE, PARA QUE LAS NUEVAS GENERACIONES PUEDAN DISFRUTAR DE UN MEDIO AMBIENTE LIBRE DE CONTAMINACIÓN
¡SALVEMOS HOY EL RIO CHOAPA! QUE NO SE CONVIERTA EN LO QUE ES EL RIO LOA: UN RIO DE CONTAMINACION.
FIRMA DEL REPRESENTANTE LEGAL:
"CONAMA O COREMA, CUMPLAN SU FUNCION"

Entregue su(s) observación(es) a los organizadores del taller o en la sede de la CONAMA IV Región, Las Rojas Oriente No. 322, La Serena.
Plazo final de entrega: 24 de julio de 2003

Figure 6. Citizen Participation comment. A one-page comment submission by the Coastal and Choapa River Shoreline Collectors Association legal representative filed on 22/07/2003. Translation:

Name of Organization: Agrupación de Recolectores de Orilla del Sector Costero y Río Chopa (Coastal and Choapa River Shoreline Collectors Association)
Observation: The divers who are members of the group in their daily tasks have detected a considerable drop in the last seasons of capture, both marine and fresh aquaculture resource. Unfortunately, we do not have studies from any consulting firm to be able to demonstrate in figures that support our assessment. We have also observed on several occasions how the river flows down turbid, without any logical explanation such as thawing or any rain that affected the valley. People dedicated to farming have also reported the death of some fruit trees.

Basis: Based on all these antecedents, we consider that the river is already contaminated. With the expansion of the Pelambres project the contamination will be even greater. The fact that they are handing out crumbs in some towns in the valley speaks very badly of this economic group, "divide and conquer" that is their policy. As a group we believe that we are in time to save the valley, so that the new generations can enjoy an environment free of pollution, let's save the Chopa River today! Let it not become what the Loa River is: a river of contamination. CONAMA or COREMA should fulfill their role.

Archive available for download at: https://seia.sea.gob.cl/expediente/expedientesEvaluacion.php?id_expediente=328&idExpediente=328.

unexplored relationships. Therefore, it seems essential to turn to record-keeping practices, such as sustenance activities, that embody generations of experience living with/from these landscapes. The Federación de Pescadores y Mariscadores (Federation of Fishermen and Shellfish Harvesters) in Los Vilos operates a small hatchery to support twelve shellfish-based communities in the area, overseeing twenty-one benthic resource exploitation and management areas. The hatchery is maintained alongside an archive of taxidermied local sea mammals and fish, intended for educational purposes to inspire school children who may enter the same line of work as seen in Figure 7. Mining activities' impacts on local marine ecologies can be gathered from the fluctuations present in the hatching numbers needed at each of these management areas. The records the hatchery keeps can be read in tandem with EIAs for the mine's different project phases, an assemblage of different sources seeking to understand relational damage.

The Cooperativa Campesina Apícola Choapa (Choapa Beekeeping Cooperative), founded by twenty-two beekeepers, has a community

Figure 7. Los Vilos Hatchery. Top: Hatchery's propagation tank facilities. Below: Hatchery`s main public building which exhibits archival material for educational purposes.

extraction plant located in the town of Caimanes. Beekeepers find pride in their honey produced in a transition valley between the desert areas of the north and the green valleys in Chile`s Central Region. At the same time, Caimanes is located downstream of El Mauro, the third largest tailing dam in the world. The honey produced by small apiculture farms in Choapa and extracted at the Caimanes plant can provide both qualitative and quantitative information on the environmental impacts of extraction.[29]

These practices constitute an unofficial archive of change; their spatial distribution and materiality allow for monitoring the environment for pollution as subtle and elusive as atmospheric contamination fluxes over space and time. They engage daily with matter that senses the adverse effects of extraction activities and do not cease when a project owner submits an EIA, or the state lacks staff traveling from Santiago to remote areas for routine inspections. This daily on-the-ground engagement opens the possibility to compose collective baselines with different degrees of resolution regarding who is involved in the data collection. This might include remote sensing, aerial photographs or hatchery records of declining fish populations in local bays.

If sustenance baselining practices were considered essential to Participatory Monitoring because of their long-term documentation of events related to extraction—evident in their comment submission during the Citizen Participation process, and their own logs like those hatchery reports— they would differ significantly from current citizen science research projects. In such projects, individuals often lack a direct relationship with the land and instead serve as extensions of scientists' eyes and ears, supporting initiatives that rely on sustained funding for prolonged data collection.[30] Thus suggesting that people farming, herding and fishing near the mine could contribute to Participatory Monitoring is to imagine them with a seat at the table where these practices could hold equal standing in shaping environmental issues alongside state regulatory bodies and private companies. This group has the potential to define issues that neither the state nor companies have the capacity—or incentive—to acknowledge, a public which can emerge through designing dedicated spaces for such Participatory Monitoring.

A New Political Category Through Design

The term "environmental public" was coined by environmental humanities scholar Lesley Green to identify a social identity different from "stakeholder," which includes various groups united by environmental concerns but overlooks the differences in social capital, which give some "stakeholders" a stronger platform to have their demands heard than others. Her fieldwork is in South Africa, where the government denied Rastafarians access to natural reserves but granted access to others seen as more qualified in environmental management and conservation science, reasserting

Figure 8. Citizen Participation activity. Visual documentation of an open house event (Project Exhibition). During this event, procedures and timelines for submitting relevant observations were explained to the community. Additionally, the project's works, activities, impacts and mitigation measures, among other details, were also explained. It took place October 13, 2021, at Club Deportivo Caimanes as part of the Citizen Participation process for the Operational Adaptation Project in 2021. Available at https://infofirma.sea.gob.cl/DocumentosSEA/MostrarDocumento?docId=8d/8a/7499bc0142768cd1b560acb8270fe2ec8716.

a racially influenced authority within public spaces.[31] Through this research, Green defines this new political category as those who are rightsholders to a particular landscape by virtue of their sustained engagement with it. Postcolonial cultural studies and environmental humanities researcher Shela Sheikh further expands on the definition of environmental public to include both human and nonhuman actors in the configuration of the public. In Sheikh's definition, the environmental public serves as witnesses to an ongoing process that involves the simultaneous registration of experiences and representation of environmental degradation that has involved subjugation of certain "subjects."[32]

Bringing together these perspectives, I propose considering an environmental public as human and nonhuman participants in an environmental controversy that engage as witnesses and contribute, through their baselining practices, to the understanding and definition of relational damage. Expanding this definition allows us to elevate sustenance practices and consider them as vantage points to look *from* to witness the relational damage of mining. Given the importance of supporting this dialogue with physical space, what type of spatial social-technical arrangements, ranging from Information and Communication Technologies (ICT) to architecture to the design of events, might facilitate public involvement as suggested by Marres, and in turn assist the act of Participatory Monitoring?[33] By recognizing the spatial and temporal knowledge that local communities demonstrate through sustenance practices—knowledge that spans both the past and the future, beyond the limited timeframe of extraction—design disciplines can support these practices as a form of record-keeping akin to baseline activities.

Currently, nowhere in Chilean environmental legislation are there guidelines for the spatial requirements where Citizen Participation activities occur. These activities serve as the sole reference for involving the public in an EIA process. These mandatory gatherings organized by a project owner usually take place in improvised forums in various public spaces, such as city squares, municipal gymnasiums or public buildings. These gatherings are arranged spatially like a science fair or a signature-collecting booth; their makeshift disposition complicates the building of public or collective challenges to a company's official narrative about an extractive project. As shown in Figure 8, a typical nine square metre marquee tent can accommodate only a few people at a time, disrupting any collective dissent that relies on strength in numbers. The spatial distribution restricts who can speak and the types of materials allowed to support arguments. These temporary configurations, which prevent all affected citizens from participating, influence the ability of communities to engage in environmental controversies by leaving crucial comments unheard, and therefore out of scope of an EIA. The traditional absence of spatial disciplines in discussions on socioenvironmental conflict deliberation, typically dominated by disciplines like sociology and anthropology, highlights the need to reflect on how environmental deliberation spaces directly influence community engagement and power dynamics. This perspective advances contemporary discourse by framing architecture not just as a backdrop for environmental politics but as an active agent in shaping political interactions and outcomes.

Moving Forward

The changes in Chilean environmental legislation seek to enhance transparency and comply with the Escazú Agreement. These changes also present an opportunity to assert the involvement of communities engaged in sustenance practices through Participatory Monitoring in environmental controversies, positioning them not just as any public, but as an "environmental public" alongside state and industry

actors. Case studies for Participatory Monitoring have been explored prior to the Escazú Agreement in Argentina, Bolivia, Perú and Panamá—mining countries like Chile.[34] However, the compared analysis of these cases does not address the role of design in articulating spaces for environmental monitoring or the importance of spatial arrangements that could facilitate the observation and sensing of environmental change that considers the testimonial capacities of matter or nonhuman entities.

The administrative act that enabled Los Pelambres copper extraction to begin on the Chilean side was the issuing of Resolución de Calificación Ambiental (Environmental Resolution) N°71 in October of 1997. This permit grants a project owner permission to carry out a proposed activity and marks the culmination of an EIA filing process that can't be contested. The new EIA regulations introducing Participatory Monitoring leave extraction open to contestations from the participating community involved in the monitoring. The mining company has introduced twenty-one projects to the SEIA in the past twenty-four years, with only five requiring mandatory Citizen Participation processes. Toward the end of 2024, it will file another EIA seeking permission to extend operations until 2051. Named EVU or Extensión de Vida *Útil* (Life Use Extension), the process must comply with the new regulations mandate of Participatory Monitoring. The EIA submission for the Los Pelambres EVU project will provide insight into how the mining company interprets the mandate for Participatory Monitoring.[35] This will be a first for the company and, if followed closely by designers committed to challenge this process, could set a precedent for involving sustenance practices in Participatory Monitoring.

Notes

1 EIAs were first introduced by the US in the early seventies to integrate environmental considerations into the development of projects with a significant impact on the environment.

2 Rio Declaration on Environment and Development, in the *Report of the United Nations Conference on Environment and Development*, UN Doc. A/CONF.151/26, vol. 1, August 12 1992.

3 Economic Commission for Latin America and the Caribbean (ECLAC), "Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America," United Nations Publication, 2023.

4 Chile had promoted the agreement since initial talks in 2014, but during Sebastián Piñera's second term in office the administration decided that the agreement added nothing new to national environmental laws, which already meet the goals of the treaty, and that the treaty's provisions could encroach on Chilean sovereignty. See https://nacla.org/news/2019/10/03/chile-climate-change-escaz%C3%BA.

5 Lesley Green, "Ecology, Race, and the Making of Environmental Publics: A Dialogue with Silent Spring in South Africa," *Resilience: A Journal of the Environmental Humanities* 1:2 (2014), https://doi.org/10.5250/resilience.1.2.002.

6 Chile, Ministerio del Medio Ambiente, "Aprueba Modificación Al Decreto Supremo N° 40, De 2012, Del Ministerio Del Medio Ambiente, Que Establece El Reglamento Del Sistema De Evaluación De Impacto Ambiental," Decreto 30, Aprobado el 1 febrero 2024, Artículo 1, https://www.bcn.cl/leychile/navegar/imprimir?idNorma=1200689&idVersion=2024-02-01.

7 Markus Miessen, ed., *Agonistic Assemblies: On the Spatial Politics of Horizontality* (London: Sternberg Press, 2024).

8 Noortje Marres, "The Issues Deserve More Credit: Pragmatist Contributions to the Study of Public Involvement in Controversy," *Social Studies of Science* 37:5 (October 2007): 759–80, https://doi.org/10.1177/0306312706077367.

9 Andrew Barry, "What Is an Environmental Problem?" *Theory, Culture & Society* 38:2 (March 2021): 93–117, https://doi.org/10.1177/0263276420958043.

10 For in-depth historical context on antiextractive organizing in Latin America, see Thea N. Riofrancos, *Resource Radicals: From Petro-Nationalism to Post-Extractivism in Ecuador*, Radical Américas (Durham; London: Duke University Press, 2020).

11 Opposite the Region of Coquimbo in Chile we find the San Juan Province on the Argentinian side, where mining has not developed at the scale of its Chilean counterpart due to an expansive pampa stretch that separates the Argentinian Andes from the Atlantic Ocean, making extraction and shipping much more expensive. On the other side, the Swiss Glencore owns the rights to extract from El Pachón.

12 For a window into the conflict between the town of Caimanes and the mine, see London Mining Network, *In the Valley of the Shadow of Death? A Report on Antofagasta Plc, Minera Los Pelambres and Caimanes*, London Mining Network, May 2017, https://londonminingnetwork.org/wp-content/uploads/2017/05/LMN-Caimanes-report-final-revised.pdf.

13 Argyris Panagopoulos and Katherine-Joanne Haralambous, "Environmental Impacts of Desalination and Brine Treatment—Challenges and Mitigation Measures," *Marine Pollution Bulletin* 161 (December 2020): 111773, https://doi.org/10.1016/j.marpolbul.2020.111773.

14 Mariano Alvarez, "Paradiplomacia e integración transfronteriza: las veranadas en los Altos Valles de Calingasta," *Si Somos Americanos* 21:2 (December 31, 2021): 70–93, https://doi.org/10.4067/S0719-09482021000200070.

15 Valeria Maino, *Trashumancia en el valle del Choapa* (Santiago, Chile: Minera Los Pelambres, 2015), https://bibliotecadigital.ciren.cl/handle/20.500.13082/31700.

16 See "The Glencore-Minera Los Pelambres conflict; A Case of Déjà Vu?" in London Mining Network, *In the Valley of the Shadow of Death?*", 11.

17 See Centro Andrónico Luksic Abaroa (CALA), "Nosotros," https://www.centrocala.cl/nosotros.

18 The informal settlement highlights a local housing crisis fueled by rising rent prices, as the mine's subcontractors accommodate their workers in rental properties once occupied by locals.

19 The mine's closing plans were initially set for 2037 but are now projected for 2051, thanks to new water sources provided by a new desalination plant inaugurated in 2024, which allows for the continued extraction of low-grade mineral ore. The need for new water sources arises from old ore deposits requiring more water to extract minerals, as well as the mega-drought affecting the area. See René D. Garreaud et al., "The Central Chile Mega Drought (2010–2018): A Climate Dynamics Perspective," *International Journal of Climatology* 40:1 (January 2020): 421–39, https://

doi.org/10.1002/joc.6219.

20 Sebastián Ureta and Patricio Flores, *Worlds of Gray and Green: Mineral Extraction as Ecological Practice*, Critical Environments Nature, Science, and Politics 11 (Oakland: University of California Press, 2022).

21 For an expanded genealogy of the term, tracing its history from its origins in 1970s livestock and land management to its adoption by global environmental justice movements in the 1990s, see Ryan Juskus, "Sacrifice Zones," *Environmental Humanities* 15:1 (March 1, 2023): 3–24, https://doi.org/10.1215/22011919-10216129.

22 Susan Schuppli, *Material Witness: Media, Forensics, Evidence*, Leonardo (Cambridge, MA: The MIT Press, 2020).

23 According to Chilean regulations the elements of the environment that a baseline should consider are: The physical environment, including, among others, the characterization and analysis of the aspects associated with the atmosphere (such as climate and meteorology, air quality, noise, luminosity, among others); to the lithosphere (such as geology, geomorphology, geomorphological risk areas, soil characterization, among others); the hydrosphere; glaciers, quality and quantity of water. Terrestrial ecosystems. Continental aquatic ecosystems. Marine ecosystems. Natural and artificial elements that make up the historical, archaeological, paleontological, religious and, in general, heritage that make up the cultural heritage, including the characterization of National Monuments. The landscape, including its visibility, quality and type. Protected areas and priority sites for conservation. The natural or cultural attractions and their interrelationships, which attract flows of visitors or tourists. The use of territory and its relationship with territorial planning. The human environment, including information and analysis of its geographical, demographic, anthropological, socioeconomic and basic social well-being dimensions. If there is a presence of human groups belonging to indigenous peoples, the uses and valuation of natural resources will be described with particular emphasis; their cultural practices; Organizational structure; appropriation of the environment; its cultural heritage; group identity; community rituals. Projects or activities that have a current Environmental Qualification Resolution, even when they are not operating.

24 Javiera Barandiarán, *Science and Environment in Chile: The Politics of Expert Advice in a Neoliberal Democracy* (The MIT Press, 2018), https://doi.org/10.7551/mitpress/11294.001.0001.

25 For an account of this case study from the perspective of water manipulation for extractive purposes and an account of the formation of this informal settlement, see for reference Linda Schilling Cuellar, "Unearthing and Reversing: Exhausting the Water Cycle," in *Architecture from Public to Commons*, 1st ed. (Routledge, 2023).

26 Aimé Césaire, "Discourse on Colonialism," in *Postcolonialism*, by Diana Brydon, 1st ed. (London: Routledge, 2022), 310–39, https://doi.org/10.4324/9781003101406-19.

27 Sebastián Ureta, Thomas Lekan and W. Graf Von Hardenberg, "Baselining Nature: An Introduction," *Environment and Planning E: Nature and Space* 3:1 (March 2020): 3–19, https://doi.org/10.1177/2514848619898092.

28 All available for download at https://seia.sea.gob.cl/expediente/expedientesEvaluacion.php?id_expediente=328&idExpediente=328.

29 Paton Vuong et al., "The Buzz about Honey-Based Biosurveys," *Npj Biodiversity* 3:1 (April 17, 2024): 8, https://doi.org/10.1038/s44185-024-00040-y.

30 Camilo Gouet Hiriart, Daniela Salazar Rodríguez, Wladimir Riquelme Maulén, Alejandra Rojo Almarza and Daniel Opazo Bunster, "The EXPLORA Model of Citizen Science at Schools: Design and Implementation in the Intercultural South of Chile," *Tapuya: Latin American Science, Technology and Society* 5:1 (December 31, 2022): 2117492, https://doi.org/10.1080/25729861.2022.2117492.

31 Green, "Ecology, Race, and the Making of Environmental Publics."

32 Shela Sheikh, "The Future of the Witness: Nature, Race and More-than-Human Environmental Publics," *Kronos* 44:1 (2018), https://doi.org/10.17159/2309-9585/2018/v44a9.

33 Marres, "The Issues Deserve More Credit."

34 See Claudio Pareja, Xavier André and Sarah Daitch, "Comités de Monitoreo Ambiental Participativo en Contextos Mineros: Lecciones a Partir de Nueves Estudios de Casos en Cuatro Países de Latinoamérica" (New York: Programa de las Naciones Unidas para el Desarrollo (PNUD), 2019); also Victoria Reyes-García et al., "Data Sovereignty in Community-Based Environmental Monitoring: Toward Equitable Environmental Data Governance," *BioScience* 72:8 (August 2, 2022): 714–17, https://doi.org/10.1093/biosci/biac048.

35 As of this essay's submission, the Environmental Evaluation Service (SEA) is still drafting guidelines on how project owners can involve citizens in Participatory Monitoring, following the publication of Decree 30 in the *Official Gazette* on February 1, 2024. Until August, the document for the Participatory Monitoring guidelines was included in the online list of documents under preparation but was taken down due to a postponed publication date for late 2024. To stay updated on the development of these guidelines, please visit https://www.sea.gob.cl/documentos-en-elaboracion.

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