Routledge
Taylor & Francis Group

Journal of Architectural Education

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rjae20

A New Ecological Contract

Tools to See Otherwise

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To cite this article: Linda Schilling Cuellar & Fernando Portal Carrasco (2024) A New Ecological Contract, Journal of Architectural Education, 78:2, 286-302, DOI: 10.1080/10464883.2024.2381429

To link to this article: https://doi.org/10.1080/10464883.2024.2381429

Published online: 09 Oct 2024.

A New Ecological Contract
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Figure 1. The video game scene depicts the stranding of an auxiliary platform for the positioning of intake and discharge pipelines belonging to a desalination plant in Playa Amarilla beach right next to a RAMSAR site, and explores different positions communities are faced with when dealing with the situation. Still from video gameplay developed by students Ángeles Aguilar, Liceth Calvo, and Iorana Marcelo, titled *Worlds* (Alternative Endings 2023).

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A New Ecological Contract is a pedagogical framework for design studios that focus on sites of *socioenvironmental conflict*. Through *ecocritical video game design*, students engage with situated impacts of large-scale climate issues by working through images of environmental impact assessment reports and baseline studies as archives of landscape transformation. This framework pursued two objectives: first, to awaken a critical and spatial political imagination in the context of a four-year constitutional referendum process that challenged the basis of the Chilean economy and its relationship to the environment from which it derives its riches, and second, to present students with a case for using their representational abilities to engage with situated impacts of large scale climate issues by going through *environmental impact assessment* reports' images and baselines studies approaching a design brief *otherwise*.

Keywords: game engines, environmental impact assessments, socioenvironmental conflicts, otherwise, ecocritical

Introduction

"Neoliberalism was born in Chile, and here it will die," read banners in numerous protests that flooded the streets of Santiago and other major cities around Chile after the uprising of October 19, 2019.[1] What followed an initial student act of civil disobedience—skipping transit fare at a subway station—catalyzed a popular revolt that quickly turned to a broader public demand for systemic change that called for a constitutional referendum in response to savage, dictatorship-era market economic policies.[2] Impoverished public education, failing pension systems, and environmental concerns were the result of an economy heavily reliant on extractivism and became topics of conversation across all walks of society.[3] These critiques of the Chilean economic model are an example of what political scientist Thea Riofrancos calls "new resource radicalisms" or a transformation in the ideological orientation of resource policy coinciding with broader disputes over the political-economic model.[4]

The uprising turned into a four-year process aimed at drafting a new constitution for the country. The first attempt in 2022 was led by a democratically elected Constitutional Assembly of ordinary people with no political party affiliation, while the second one in 2023 was led by an Expert Commission—appointed by political parties—and amended by an elected Constitutional Council. Neither of the two constitutional drafts produced passed the popular vote, putting an end to an unprecedented moment in Chilean history. The first constitutional draft was characterized by the definition of new attitudes towards long-felt public concerns, namely the rights of nature and outstanding debts to communities on the margins of extraction sites, which merits a an entire scholarly inquiry of its own.[5] Whereas the second constitutional draft "dialed down" environmental rights, in order to secure property rights and extractivist practices.[6] With this first draft, and for the first time, the term "environmental liability/legacy" was present in our nation's founding document. The constitutional proposal recognized intergenerational solidarity, environmental justice, and fair climate action. The proposal for an Office for the Defense of Nature established the state's responsibility to "promote awareness and education on environmental and nature rights."[7] If approved, this would have opened possibilities for what Professor Leslie Green (Director of Environmental Humanities South at the University of Cape Town) calls an environmental public: an environmentally minded collective that actively participates and consciously engages in the making of the environments they inhabit.[8] The nurturing of this new attitude is seen as essential for political science scholars like David Carruthers, who argues that Chilean society lacks civic participation beyond elections, priding itself in being depoliticized—seen as rational and level-headed—but ultimately excluded from politics and power in favor of individual consumerism and market-driven solutions.[9] The world saw it as a forward-looking constitutional proposal tackling the climate crisis head-on, and the role designers could have played in this new environmental awareness and education scenario will remain unknown.[10] Chileans voted against the first constitutional draft in a September 2022 referendum, and against the second draft in December 2023. It was within this context that the design studio discussed here exercised political imagination, amid the discussions held by both constitutional processes and their polarized political debate and media coverage.

Within this context, A New Ecological Contract: Tools to See Otherwise was developed as a pedagogical framework to echo students' concerns about the complicit nature of the architectural discipline in the systemic issues raised by the constitutional referendum process. A key aspect of the project was to explore and critique the language behind images of economic progress and star-architect projects in sites of socioenvironmental conflict. Their primary archive were the public records of Environmental Impact Assessments (EIAs), and their primary tool, to help to deconstruct preconceived notions of nature, were game engines. The objective was to equip students with the skills to critically see the

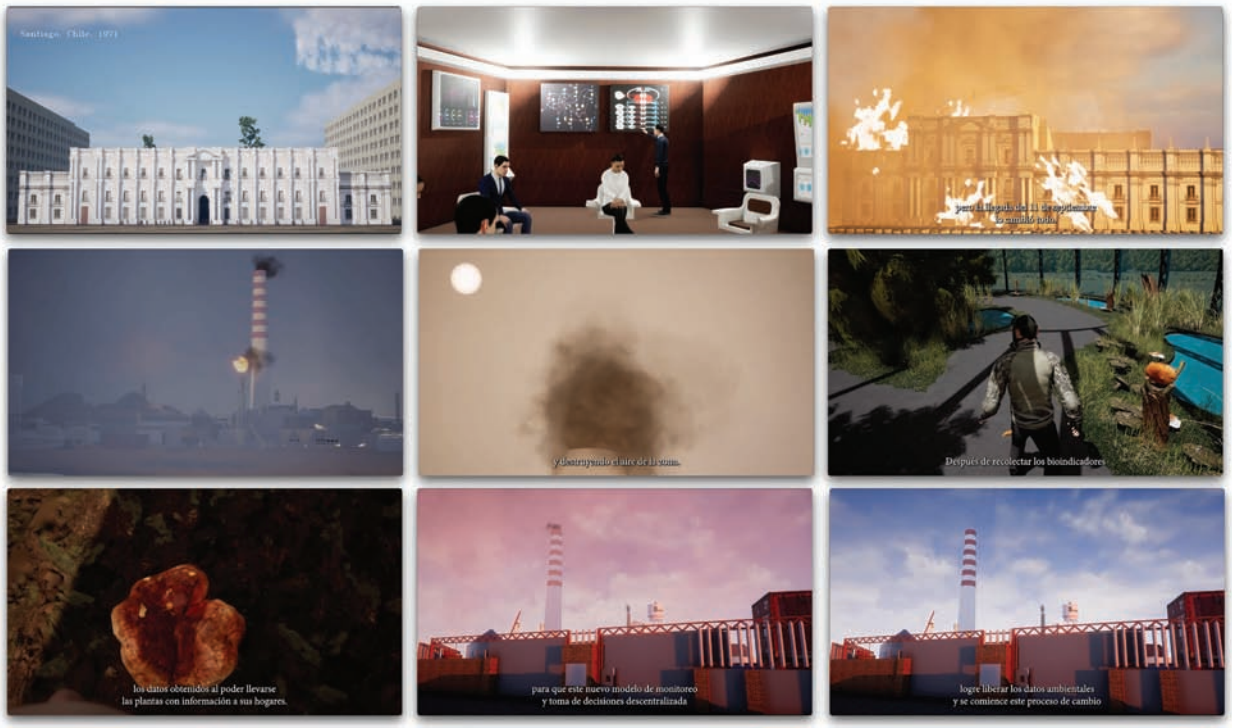


Figure 2. The video game scene depicts the Ventanas Industrial Park on Quintero beach and explores what collective and decentralized environmental monitoring inspired by the socialist cybersin project developed by Salvador Allende could mean for the people of Quintero. Still from video gameplay developed by students Valentina Gaete, Felipe Figueroa, and Nafis Salgado, titled *Seed to Cloud* (Alternative Endings 2023).

dramatic changes in the Chilean landscape through the images present in EIAs, to use video game platforms to merge different sources of information in a nontraditional research output in order to reach large audiences, and to explore new environmental aesthetics that might ignite political imagination during a key transitional moment in Chile. A New Ecological Contract borrows and refashions Michael Serres' concept of the Natural Contract to emphasize a new collective agreement on how we establish relationships with our nonhuman surroundings and explore new modeling tools to liberate design exercises from established forms of architectural drawings tied to canonical project inquiries. We wanted to see, and show, the built environment otherwise.[11]

Three undergraduate architecture design studios were taught using this framework at the School of Architecture at Universidad de Las Américas (UDLA) in Santiago de Chile, this studio had the support of Núcleo Lenguaje y Creación (NLC), an interdisciplinary research center at the Faculty for Architecture, Animation, Design and Construction (FAADC). The design studios included the following: What Happens When the Mine Closes? (2021),[12] Landscape Ledgers (2022),[13] and Alternative Endings (2023).[14] Each of them addressed climate justice by—respectively—speculating on future economies in sites of environmental liabilities created by a copper mine; confronting architectural discourse in areas of socioenvironmental conflict by exploring the potential archive for design studies enclosed in EIAs; and designing science-based future scenarios driven by the climate crisis. By exploring the real time rendering capabilities of game engines such as Unity and Unreal, students conducted research and design exercises within video games to test the medium's possibilities and potentials to explore architectural representations otherwise and what a just transition would look like for communities at these sites, and in this specific Chilean context.

Video Game Design as an Otherwise Method

Exploring video game as method relies on the parallel resource-management video games have with the "undeveloped land" paradigm pervasive to the architectural discipline. Both see nature as an unlimited resource, one which, as resource-management video games like *Minecraft* is bountiful and a subject of development, baring no scar of extraction. In *Games as Environmental Text*, video game scholar Alenda Chang presents video games as platforms to explore ecocritical concerns that expand text-based precedents by allowing the player to *inhabit* scenes instead of being a reader captured by words on a page.[15] Video games allow users to process different inputs simultaneously instead of the sequentiality of the written record: A re-mediation of a mediated record of impacts that offers a visuality for the relational damage not evident in the impact assessment report.

The student/player can attune as a player and calibrate as a designer the atmospheres engendered by environmental controversies that expand the understanding of what's at stake, which is easily lost in text-based media. In this light, the studio framework positioned game engines as a tool for students to synthesize and explore relational aspects of data present in EIAs for chosen socioenvironmental conflicts.[16] These reports, comprised of impact assessments and baselines, became the primary consultative archive when trying to understand landscape transformations in places where human (and nonhuman) rights to an unpolluted environment are at stake. The aim was to connect the design discipline to spatial issues beyond traditional architectural briefs and expose the agency designers may have when setting up such operations or working in and around these sites.

Students initially conducted situated research on climate justice issues through the EIA archives, on contested sites (usually due to corporate resource extractivism) that foregrounded problematic encounters between two disparate 'modes of mattering.'[17] These different ways of worlding (or mattering) in the same space—for example, mining operations and subsistence farming—became the starting point from which students explored video game design as a method to reflect on environmental issues and designers' agency by 1) challenging the environments these game engines set as default, and 2) by exploring multiscalar and nonhierarchical narratives of change through the real-time rendering these game engines enable. When faced with the task of video game design, students had to make decisions regarding gameplay and gamespace, with each decision related to the audience that designer was working "for."

Gameplay or the Student/player

In designing for gameplay (how a game is navigated and ultimately played), students developed simple interactions to allow for the gamespace to be a center of attention. They steered away from the usual in-game resource management approach that deploys nature as an infinite resource to fulfill expansionist tasks, instead focusing on walking and meandering through familiar places as a human or nonhuman playable character observing their surroundings and/or encountering disparate ways of being. Student work developed the following, as examples: an abandoned platform for the positioning of desalination plant pipelines in a small coastal town that disrupted the upkeep of benthonic management areas in Los Vilos Bay (Figure 1) by Ángeles Aguilar, Liceth Calvo, and Iorana Marcelo, titled *Worlds*, or the Industrial Park in Ventanas, a site of environmental controversies in another coastal town that has been prominently featured in local media (Figure 2) by Valentina Gaete, Felipe Figueroa, and Nafis Salgado, titled *Seed to Cloud*.

In opposition to developer proclivities inherent in resource-management games where game success is measured by accumulating, here there is *no* game success. The end goal for both the student and the player—which are one and the same—*is* the journey. This proved to be a challenge at first. Students were keen to mimic gameplay scenarios that followed the resource-management approach. Introducing case studies like the 2017 video game *Everything* challenged these assumptions, which was key when setting up narrative and interaction design.[18] This role also challenged students to decide from which perspective to model gamespace. In *Distant Eyes* (Figure 3), by Nayeli Arce, Christopher Bustamante, and Carlos Pohl, the journey is designed to be played from the perspective of an automated surveillance system of a remotely monitored mining operation. Drones, surveillance cameras, and screens from the monitoring floor of a building in Santiago's business district are repurposed to allow citizens in the city to watch in real time a future closing process of an open pit mine and the subsequent ecological succession triggered in the absence of extraction. In this case, the player moves in and out of two sites, the mine and surveillance floor, through the lenses and screens of automated surveillance. With surveilling systems coopted for monitoring mine closing processes, how can we deal with watching thousands of hours of data? Can regular people become data brokers in participatory monitoring processes? In *Worlds* (Figure 4) by Ángeles Aguilar, Liceth Calvo, and Iorana Marcelo, the player gets to travel through underwater landscapes to see how coastal ecologies were impacted by sea floor dredging caused by a jack-up platform for the positioning of intake and discharge pipelines of a desalination plant washing up at Playa Amarilla beach. The design of such a journey gave students the chance to craft visualizations not typically encountered in images produced by media outlets that covered the accident, nor offered by the company's investor newsletter.[19] Could the stranded platform be hacked for other, potentially useful purposes?

Making decisions on gameplay perspectives helped students to explore multiscale and nonhierarchical navigation to see and understand the relational damage evident in the EIAs and, importantly, to reflect on design possibilities for climate justice that decenter human subjects.

Gamespace as a Mode of Inquiry

Each studio offering of the course approached the gamespace as an opportunity to challenge preconceived notions of nature by being intentional about what assets populate the game scene. For our studios, gamescape design became a critical mode of inquiry for underrepresented Latin American environments in video games, which, besides a few notable exceptions, remains largely unimaged in this media form.[20] This lack of representation became evident in the aestheticized asset packages available for download from video game engine platforms like Unity and Unreal, which fail to grasp the nuances of the Chilean landscape, as they are mostly designed for the global North. Our studios sought to avoid cliché

Figure 3. The video game scene is played from the perspective of automated surveillance systems of a remotely monitored mining operation. Drones, surveillance cameras, and screens from the monitoring floor of a building in Santiago are repurposed to allow citizens to watch in real time the closing process of an open pit mine and the ecological succession triggered in the absence of extraction. Still from video gameplay developed by students Nayeli Arce, Christopher Bustamante, and Carlos Pohl, titled *Distant Eyes* (Alternative Endings 2023).

landscapes and generic scenes from prepackaged assets but instead pursued modeling environmental realism, going as far as to insist on large terrain models to convey the scale of the environments for each case study. This made game navigation exhausting and challenging with difficult playability. Subsequently, for all design studios, students modeled terrain using available satellite images, calibrated atmospheric settings to resemble specific Chilean latitudes, and modeled building assets after their real counterparts with the help of openly available construction documents or reference images found online. The goal, along with challenging prepackaged notions of nature, was to create site-specific scenes in the likeness of real environments that showcased places as they are: a playable image that deployed not a snapshot but a story of socioenvironmental conflict (Figure 5).

Each video game scene exceeds what it tries to represent by placing in the same virtual space as many references as it can hold. An annotated virtual landscape relevant to the student's research and to the matter of concern at hand.[21] In *Lake Panguipulli Sewage Discharge and the Theater* (Figure 6) by Christian Araneda and *Lake Maihue and the Hydroelectric Station that Never Got Built* (Figure 7) by Pamela Bustamante, these annotations are seen throughout the gamespace, juxtaposing information enclosed in EIAs or a built project architect's discourse with the landscapes it references to evidence the distance between one and the other. In another still from *Lake Panguipulli Sewage Discharge and the Theater* (Figure 8), the annotation quotes the architect's built project description, tacitly positing a critique of the preconceived notions of pristine lake waters by making visible the projected sewage discharge in the same lake a few meters away. In seeing gamespace as a mode of inquiry, students were challenged to make visible the relational nature between the impacts of extractive activities —architecture included— and the landscapes where such activities take place. In the work by Kevin Colimil, Joan Chamorro, and Yennifer Quintana (Figure 9) students explored the implications of a decommissioned tailing dam after a mine closes, a type of infrastructure required for ore mining with multiple externalities that engineering sciences problematically conceive as a contained problem without the possibility of cross-contamination beyond that which is by design.[22]

Each studio's game design focus changed during the What Happens When the Mine Closes? studio in 2021. Video game scenes were devoted to modeling post-extractive future scenarios based on future local economies of environmental reparations surrounding landscape-altering environmental liabilities from a copper mine set to close in 2037. Holly Jean Buck's text *After Geoengineering: Climate Tragedy, Repair and Restoration*

Figure 4. The video game scene develops underwater perspectives to show how coastal ecologies were impacted by the sea floor dragging caused by the jack-up platform washing up at Playa Amarilla beach. Still from video gameplay developed by students [Redacted for peer review process 6] Ángeles Aguilar, Liceth Calvo, and Iorana Marcelo, titled *Worlds* (Alternative Endings 2023).

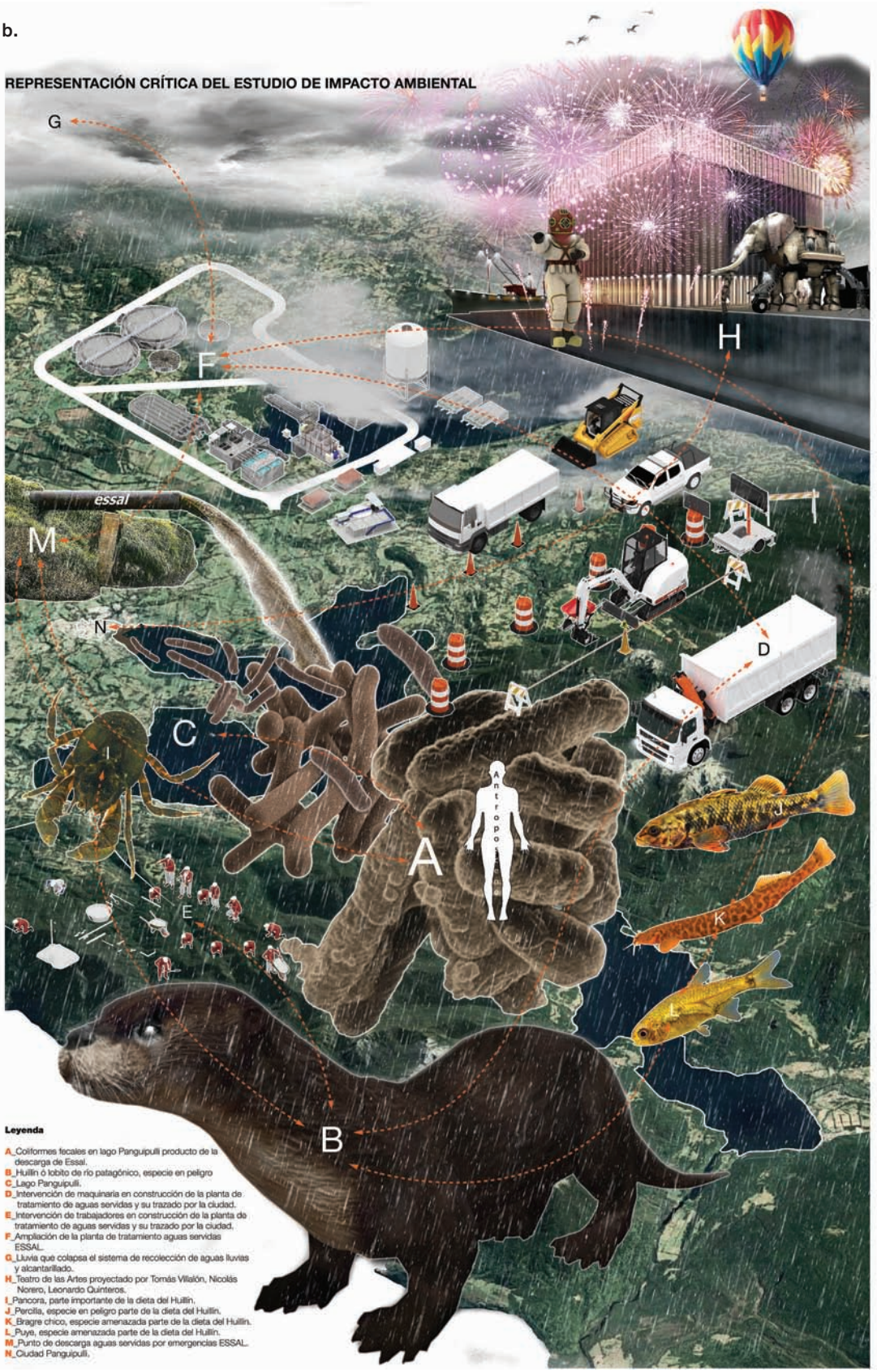
served as a reference for students to consider what local future economies might look like in a landscape modified by copper mining.[23] It helped to counter initial approaches that tried to frame these matters as problems with known solutions—there are no quick engineering fixes—by reframing these as processes of change that designers must engage with. In the case of Landscape Ledgers (2022), video games showcased areas where socioenvironmental conflict and famous Chilean architecture meet. Juxtaposing imagery present in architectural renderings that exploit signs of architecture-driven cultural capital through the likes of hot air balloons and lively gatherings in impossible assemblages (Figure 10) against socioenvironmental conflicts present in supposedly pristine nature vistas, ultimately emphasizing the distance between the disciplinary discourse and issues affecting society today. Finally, in Alternative Endings (2023) students developed processes and science-based future scenarios based on current extractive economic trends throughout the country. They avoided overemotional conservation responses in favor of narrative plots centered around nonhuman stories via scenes that navigated socioenvironmental conflicts from perspectives and camera angles that challenged who the player/protagonist is and what an alternative ending might look like. In *Never Been Only Human,* students designed an aesthetic for the Office for the Defense of Nature as outlined in the Chilean first constitutional draft from 2022. They took on the challenge of imagining how water would testify on behalf of itself when humans trespass established water levels and quality thresholds in the Maipo watershed. The gameplay takes the player through the journey of a drop of water at different watershed moments proposing sensing fields with distinct characteristics related to solid or liquid water matter states (Figure 11 and 12). In *Raparquía* (Figure 13) students imagined a decolonial future for Easter Island after sea level rise and the abolition of nation-states.

Worlding through Gaming

As a medium for architectural representation, video games can be understood to be a novel technical category of visual depiction. They can become an *architectural* representation beyond the techniques that allowed for the gestural drawing or the heliography of photographs but within the family of the image/signal, a new statistical storage format that enables other types of thought to be possible.[24] These potential possible thoughts align with the open-ended speculative practice that currently uses such real-time rendering game engines, such as Liam Young and PAREID. Artist Alice Bucknell is another example, using this software in architectural teaching to expand our understanding of a world in nonlinear or geologic time, raising overlooked perspectives, imagining worlds through the many entangled presents of our current climate crisis.[25] If, as John May argues, the historical present gave architecture drawings their subject, speculative futures gave video games their script for architectural representation, nesting within their nonlinear multiscalar narrative possibilities the chance to explore and reflect on the built environment otherwise. This emphasis on the otherwise, especially when guiding students through

Figure 5. A board comprised of three sections: a) an analysis of different software images present in an environmental impact assessment report for a sewage treatment plant in Panguipulli, which allowed to reflect on the different modeling software used to represent construction and operations impact on the environment; b) a collage depicting different human and nonhuman actors involved in the socioenvironmental conflict and their disparate participation on the socioenvironmental issue at hand; c) a bibliography of video game assets and plugins downloaded and built for *Lake Panguipulli Sewage Discharge and the Theater* by student Christian Araneda (Landscape Ledgers studio 2022).

b.


REPRESENTACIÓN CRÍTICA DEL ESTUDIO DE IMPACTO AMBIENTAL
G
F
H
essal
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A
Antropo
E
J
K
L
B
Leyenda
A_Coliformes fecales en lago Panguipulli producto de la descarga de Essal.
B_Huillín ó lobito de río patagónico, especie en peligro
C_Lago Panguipulli.
D_Intervención de maquinaria en construcción de la planta de tratamiento de aguas servidas y su trazado por la ciudad.
E_Intervención de trabajadores en construcción de la planta de tratamiento de aguas servidas y su trazado por la ciudad.
F_Ampliación de la planta de tratamiento aguas servidas ESSAL.
G_Lluvia que colapsa el sistema de recolección de aguas lluvias y alcantarillado.
H_Teatro de las Artes proyectado por Tomás Villalón, Nicolás Norero, Leonardo Quinteros.
I_Pancora, parte importante de la dieta del Huillín.
J_Percilla, especie en peligro parte de la dieta del Huillín.
K_Bragre chico, especie amenazada parte de la dieta del Huillín.
L_Puye, especie amenazada parte de la dieta del Huillín.
M_Punto de descarga aguas servidas por emergencias ESSAL.
N_Ciudad Panguipulli.

Figure 6 (Above). Annotations are seen throughout the game design. Stills from video gameplay *Lake Panguipulli Sewage Discharge and the Theater* by student Christian Araneda (Landscape Ledgers studio 2022).

Figure 7 (Below). Annotations are seen throughout the game design. Stills from video gameplay *Lake Maihue and the Hydroelectric Station that Never Got Built* by student Pamela Bustamante (Landscape Ledgers studio 2022).

Figure 8. Two stills from video gameplay *Lake Panguipulli Sewage Discharge and the Theater* that highlight a conceptual distance between an architectural description by the built projects' architect and the socioenvironmental conflicts taking place on the same project site by student Christian Araneda (Landscape Ledgers studio 2022).

Figure 9 (Above). Reforestation strategy for the top of the soil of tailing dam Quillayes. Students speculated about different future economies around ecological reparations, reflecting on the material legacy of environmental liabilities, such as a copper tailing dam in this case, and the time it would take for local workers to complete and care for this new landscape. The mines` EIA and Closure Plans submitted to authorities, and available for public consultation, were the main archive consulted by the studio. Work by students Kevin Colimil, Joan Chamorro, and Yennifer Quintana (What Happens When the Mine Closes? studio 2021).

Figure 10 (Below). Still from video gameplay *Lake Panguipulli Sewage Discharge and the Theater* depicting in the same scene the Lake Theater project—and all the elements present in widely advertised project renders—juxtaposed with Lake Panguipulli setting subject to environmental degradation due to raw sewage discharges on what the architects call calm waters. Posing the question: What are the discourses that validate Chilean architecture? Work by student Christian Araneda (Landscape Ledgers studio 2022).

Figure 11,12. Stills from the video gameplay *Never Been Only Human* shows an aesthetic to the Office for the Defense of Nature as outlined in the Chilean first constitutional draft of 2022. It takes on the challenge of imagining how water would testify on behalf of itself when humans trespass established water levels and quality thresholds. The gameplay takes the player through the journey of a drop of water at different watershed moments. It proposes sensing fields with distinct characteristics related to solid or liquid water matter states. Work by students Pamela Bustamante, Catherine Medina, and Christian Araneda, titled *Never Been Only Human* (Alternative Endings 2023).

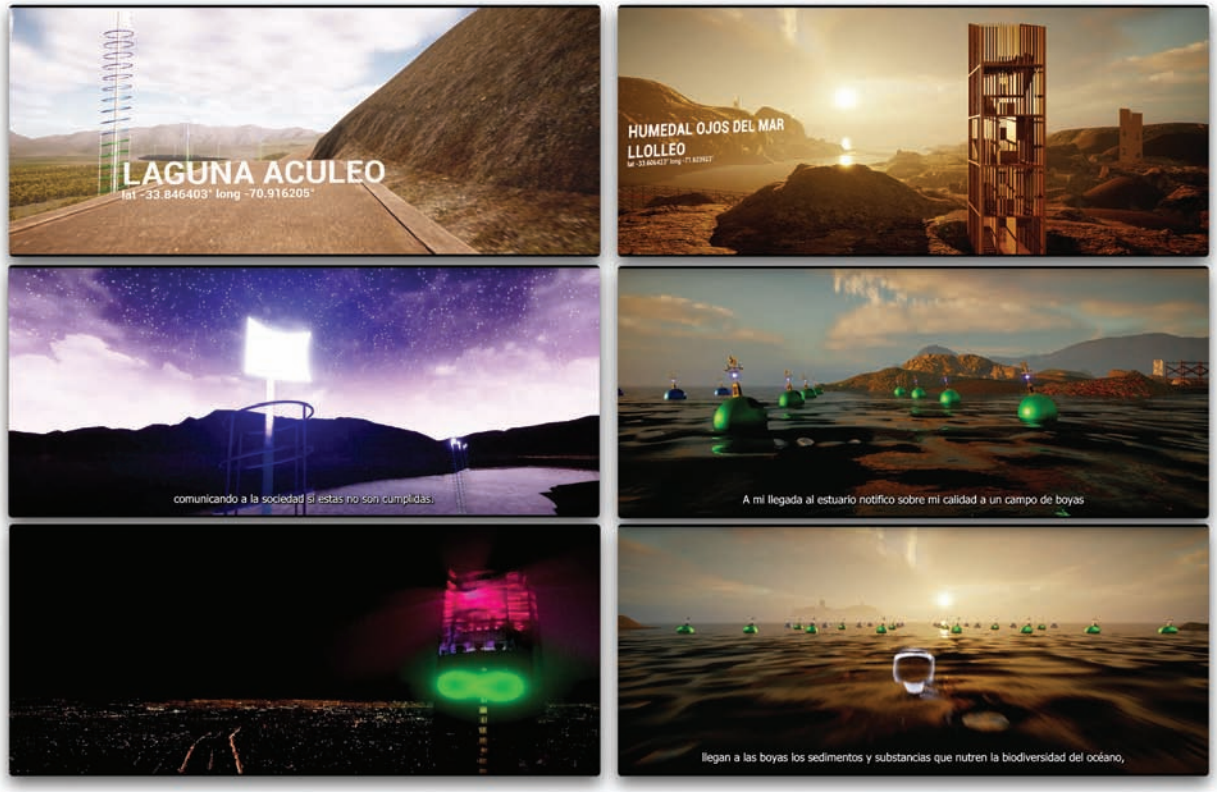
LAGUNA ACULEO
lat -33.846403° long -70.916205°
HUMEDAL OJOS DEL MAR
LLOLLEO
comunicando a la sociedad si estas no son cumplidas.
A mi llegada al estuario notifico sobre mi calidad a un campo de boyas
llegan a las boyas los sedimentos y substancias que nutren la biodiversidad del océano,

Figure 13. Stills from the video gameplay *Raparquía*, which imagines what if, in a future after sea level rise projections, Easter Island reconfigures its urban form differently than how the Chilean state has imposed on them. Work by students Kevin Araya, Juan Pablo Vergara, and Anson Soto, titled *Raparquía* (Alternative Endings 2023).

gamespace design, works through Spivak's worlding definition as a Western-centered exercise that denies the Third World their own worldings, narratives, and representations.[26] Our pedagogical framework identified video games as an opportunity to work on worlding from the perspective of *South American* narratives and environmental controversies, claiming the format away from Anglo-American academia. Each studio searched for attuning the student/player to the power of both human and non-human agency. The real time rendering capabilities allowed students to explore game engines as representational tools and as narrative devices. Each student team was a protoenvironmental public that engaged in issue formation by exploring, in each video game scene, the social-technical arrangements that facilitate the emergence of socioenvironmental conflicts rather than deploying design as problem-solving.[27] As architecture students, their already-developed modeling skills lend themselves to crafting digital worlds that carry their research and political stances forward, and for multiple entry points to complex narratives that are decidedly nonlinear and multiscalar by nature. Some challenges related to final deliverables arose towards the end of each studio. These had to do with presenting these types of projects beyond the classroom itself: gameplay videos and animations that convey a sense of how a game is played are directed narratives that refuse the open-ended navigation that video games allow. Students had to design their game simultaneously for the gameplay video *and* for playing the video game as such at desk crits. In the long run, this deliverable formality constituted a pedagogical dissonance that must be considered using real-time rendering game modeling engines in the classroom or requiring gameplay videos as deliverables without a platform to host video games for remote play.

By approaching video game design as a method, the pedagogical framework of New Ecological Contract: Tools to See Otherwise exercised how representational tools allow one to explore and learn differently (Figure 14). If students had been presented with the premise of thinking through drawing, these design studios posited worlding through gaming to see situations anew: not as problems to solve but as issues with which to establish long-term engagements as designers and through which a new political subject, an environmental public, could emerge. To foster this new political subject the studio framework strove for exploring with students their spatio-political imagination, inviting them to see how design can operate in service of issue formation and therefore for a continuous definition of environmental controversies and its many unknown consequences, for the scale of changes these controversies create has not been seen before. A worlding exercise that defied the meaning behind concepts that attach to architecture such as development and looked into narratives of futures centered in

Figure 14. Image from the end-of-term show. Students from the Alternative Endings studio share their work by playing video game scenes built on science-based speculations for new climate futures with fellow students and other studio teachers. Galpón, Barrio Franklin, Universidad de Las Américas, Santiago, 2023.

stories other than those of social responsibility and remediations that accompany the extractive-industry discourse.

Even though the draft constitution of 2022 did not materialize, the studio space operated as an Office for the Defense of Nature where political discussions brought to the table a critique of the intensification of resource extraction by hegemonic economies of the Global North and explored what lies ahead of these "new resource radicalisms"[28] stances in Chile (anti-extractivism and radical resource nationalism), for resources are of a finite nature and design discussions need to account for how to live with the damage already done.

Acknowledgments

Tutors for each studio were as follows: What Happens When the Mine Closes? (2021), Linda Schilling; Landscape Ledgers (2022), Linda Schilling; Climate Frictions (2023), Deborah López Lobato and Hadin Charbel (Pareid), Linda Schilling, Serena Dambrosio, Nicolás Díaz, Jaime San Martín, and teaching assistant Emilio Romero.

In 2022, Universidad de Las Américas Research grants awarded the proposal *Territories in Conflict: A Counter-narrative of National Architecture in Areas of Socioenvironmental Conflict* funding for the creation of a repository of case studies currently under development. The repository will serve as an archive for future urban design architecture studios as the ones taught under the framework *New Ecological Contract: Tools to See Otherwise.*

Notes

1 Joselyne Contreras Cerda and Jorge Saavedra Utman, "Editorial: Abuse and Disobedience: Chile's October and the End of Neoliberalism," *Social Identities* 27:5 (2021): 517–20, doi:10.1080/13504630.2021.1931094.

2 A group of Chilean students pursued graduate studies in economics under Milton Friedman at the University of Chicago. Known as the Chicago Boys, they presented Pinochet with an economic reform program named "the brick," alluding to the material's robust thickness—its "building block" capacity as an economic metaphor for Chilean society. Pinochet's economic reforms were embedded in the 1980 dictatorship constitution: they brought prosperity for elites who monetized Chilean natural resources, and access to the banking system to many middle-class families who benefitted from the credit scheme set up by banks and retailers. The Chilean miracle was seen as a beacon of hope by its troubled neighbors and the world in the early nineties. For an in-depth analysis of this process from a global perspective see David Harvey, *A Brief History of Neoliberalism* (Oxford: Oxford University Press, 2005). For an oral account of the implementation of these economic reforms, see Carola Fuentes' documentary *Chicago Boys* (La Ventana Producciones, 2015).

3 Maite Berasaluce et al., "Social-Environmental Conflicts in Chile: Is There Any Potential for an Ecological Constitution?" *Sustainability* 13:22 (2021): 12701. https://doi.org/10.3390/su132212701.

4 Thea N. Riofrancos, *Resource Radicals: From Petro-Nationalism to Post-Extractivism in Ecuador,* Radical Américas (Durham London: Duke University Press, 2020).

5 The first constitutional draft stated the rights of nature in Chapter 3. See Convención Constitucional, *Propuesta Constitución Política de la República de Chile* (Santiago de Chile, 2022). Available at https://en.wikipedia.org/wiki/2022_proposed_Political_Constitution_of_the_Republic_of_Chile.

6 The second constitutional draft included minor and much-contested environmental rights. For a discussion on these proposals see Cathy Schneider and Sofía Williamson-García, "Chile's New Constitutional Process Shifts to the Right," *NACLA,* February 15, 2023, https://nacla.org/chiles-new-constitutional-process-shifts-right, and Francisco Parra Galaz, "Chile's Second Attempt at a New Constitution Dials Down Green Ambitions," *Dialogue Earth,* July 6, 2023, https://dialogue.earth/en/climate/373051-chiles-second-attempt-at-a-new-constitution-dials-down-green-ambitions/.

7 The first draft defined the Office for the Defense of Nature as: "An autonomous body, with legal personality and own assets [that] will have as its function the promotion and protection of the rights of nature and the environmental rights assured in this Constitution, in the international environmental treaties ratified and in force in Chile, against the acts or omissions of the State Administration bodies and private entities."

8 Leslie 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.

9 David Carruthers, "Environmental Politics in Chile: Legacies of Dictatorship and Democracy," *Third World Quarterly* 22:3 (June 2001): 343–58, https://doi.org/10.1080/01436590120061642.

10 Somini Sengupta, "Chile Writes a New Constitution, Confronting Climate Change Head On," *The New York Times,* December 28, 2021.

11 The Latin American epistemological concept of otherwise or *"un paradigma otro"* is a perspective where the modern/colonial project starts its erasures from 1492 onwards, with a deliberate resistance of the European centering of the Enlightenment and Industrial Revolution. For an in-depth discussion on the topic see Arturo Escobar, "Worlds and Knowledges Otherwise: The Latin American Modernity/Coloniality Research Program," *Cultural Studies* 21:2–3

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13 For studio brief and student work see https://repositorioarquitecturaudla.cargo.site/Landscape-Ledgers. Studio taught by Linda Schilling.

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