

GAMIFYING CLIMATE & CRISIS

Autonomous Territories

HADIN CHARBEL

The Bartlett School of Architecture, UCL / Pareid
h.charbel@ucl.ac.uk

DÉBORAH LÓPEZ

The Bartlett School of Architecture, UCL / Pareid
d.lobato@ucl.ac.uk

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ABSTRACT

Territories, including both land- and water-based, have long been considered as inert and thus subjected to human interests such as mining and fracking, often with little to no regard for both short and long-term consequences on the ecology. Despite these behaviors, humans have paradoxically deemed other kinds of territories to be more valuable, protecting them through legislative means for either their outstanding beauty, diverse ecology or other reasons determined to be worthy of protection. Still, with these efforts in place, there is the inherent issue that decisions affecting nature are being decided by humans based on manmade criteria and generally in their own interest. The recent introduction of nature as having rights derived from its own interest is perhaps the beginning of a paradigm shift at a larger and potentially global scale. If considered as an entity and imbued with agency, nature would rightly manage itself, towards self-determination, protecting itself while also engaging with us (as we do with it). What decisions might nature make, how might those decisions be carried out, and what legal recourse could enforce them? The following paper puts forward three case studies that examine territorial autonomy in their respective contexts, the ambition of which is to tease out new possibilities for what territorial autonomy might mean in the age of artificial intelligence, automation and ongoing capitalism.

1. INTRODUCTION

1.1 A COMMON EXAMPLE

Humans' relationship with nature has long been established as one of commodification. Lands and waters are territories that, despite possessing their own local ecologies comprised of habitats, geographies, geologies and resources, have been the subject of human acquisition, trades, exchanges, plundering, abuse, and in some cases the reverse (i.e., reforestation). Additionally, borders – both political and other humanmade kinds, such as dams – are superimposed human constructs that disregard pre-existing circumstances, exemplifying the dominance humans exert through a sense of ownership. One example can be seen in aerial photographs of the forest that spans the west of the Dominican Republic and the east of Haiti, where a non-physical border is made visible through the lush presence of greenery on one side and the disproportionate absence of trees on the other (Figure 1). The causes of why these territories are treated differently are beyond the scope of this paper; rather, the emphasis here is placed on the subjectivity with which territories of the same kind in the same location can be managed radically differently.



Figure 1:
Border between Haiti and the Dominican Republic. United Nations Environmental Program

1.2 THE RIGHTS OF NATURE

In 1972, Dr Christopher Stone published an essay entitled “Should Trees Have Standing? Towards Legal Rights for Natural Objects” (Stone 1972). In it, he utilizes the example of a stream of water to explain how rights are given to nature, through their ownership by humans. If Person A owns the portion of water located upstream and pollutes it (which they are entitled to do, as it is their property), there is no legal wrongdoing. However, once the polluted water reaches the location of Person B's territory downstream and affects that person's water, then there is a case for legal action. Yet, all legal actions are turned into an

economic equation meant to repair the damages caused by Person A to Person B. Stone aptly points out that in any such scenario and others of the like, “what does not weigh in the balance is the damage to the stream, its fish and turtles and ‘lower’ life. So long as the natural environment itself is rightless, these are not matters for judicial cognizance” (Stone 1972). This demonstrates that nature’s rights are contingent on a human proxy who, first, has ownership over it and, second, has an interest in taking action in response to events that “impair its quality”. In most examples provided throughout the essay, there is a continued relationship between rights and cost, suggesting that rights are inextricably linked to economics, or at the very least a notion of value, if they are to be given and upheld.

In a more recent instance, Ecuador has included the Rights of Nature in their constitution as of 2008, the first of inclusion of its kind. The opening reads: “We women and men, the sovereign people of Ecuador, recognizing our age-old roots, wrought by women and men from various peoples, celebrating nature, the Pacha Mama (Mother Earth), of which we are a part and which is vital to our existence, [...] hereby decide to build a new form of public coexistence, in diversity and in harmony with nature, to achieve the good way of living, the *sumak kawsay*” (Constitution of the Republic of Ecuador 2008). Other regions and/or nations have since either considered or have begun similar legislative procedures, pointing towards a new paradigm in nature’s participation, or at least representation, in discourse.

1.3 TWO CASES

In recent history, nature has acquired what we can loosely consider rights (or at least protection) through various methods for different reasons, each of which presents their own understanding of value.

Skellig Michael and “Puffin Island” (protected by ecology)

Off the southern Irish coast is the island of Skellig Michael (Figure 2). In addition to being added to the UNESCO World Heritage Site list in 1996 due to its unique evidence of extreme Christian monasticism, it also serves as a seasonal home for the migratory Atlantic Puffin, an endangered avian species. As such, it has since also been labelled a Special Protection Area and is protected as a nature reserve owned by the state. While visits to the island are permitted, they are constrained to 180 people per day, with restrictions to prevent disruption to the ecology. The puffin is also present in other areas, such as the island affectionately known as Puffin Island, which has also been classified as a Special Protection Area particularly because of its great cormorant colony of over 750 birds, over 10% of the national population, making it one of the largest colonies in the British Isles. Access to the island is by written permission from BirdWatch Ireland only; otherwise, it is

viewable by boat or distantly from the mainland. These two examples demonstrate how the presence of endangered species can extend beyond their immediate protection, limiting human disruption to existing ecologies.



Figure 2: Skellig Michael as seen from a boat.



Figure 3: Las Médulas, El Bierzo, Spain. Author: Yvon Fruneau, UNESCO

Las Médulas (protected by humanmade innovation)

In the northwestern region of Spain, a unique landscape formation known as Las Médulas was declared a UNESCO World Heritage Site in 1997 due to its ‘Outstanding Universal Value’ (Figure 3). Most would intuitively attribute its value to the unique geological features. However, upon closer reading we learn that it was an active Roman gold mine during the 1st century AD where an advanced hydraulic canal system was implemented to extract gold. After two centuries of mining, what was once a mountainous landscape was transformed into a devastated landscape, and what we see today is not a natural formation, but rather the scars of 200 years of exploitation. Still, the reason for its heritage status is not stated as being due to its perceived beauty, but rather because it satisfies the following UNESCO criteria (UNESCO 2019):

- (i): it represents a masterpiece of human creative genius;

- (ii): it exhibits an important interchange of human values;
- (iii): it bears a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;
- (iv): it is an outstanding example of a technological ensemble or landscape which illustrates a significant stage in human history.

Interestingly, one wonders if these criteria alone would have been sufficient if the landscape were not in some way aesthetically pleasing. An ironic observation following similar lines is that most of the photographs of Las Médulas are taken from a single direction to capture the exposed mountain faces, which reveal contemporary active mines in the background, raising questions about our current value system.

1.4 BORDERS, AUTOMATION AND GAMES

Not all human-defined borders are human made. In fact, many borders are defined by pre-existing geographical conditions. In the Italian Limes research project, the Austrian/Italian border is delineated by following the ridgeline of the glaciers in the Carnic Alps mountain range. Traditionally perceived as frozen and static, climate change has caused increasing fluctuations, bringing up the question of how to respond to something intended to be static that is, in fact, dynamic.

In the case of forestry and logging, trees are commonly planted and felled in a grid-like pattern, optimized for machinery, spacing between trees, and ease of management. The Terra-0 prototype asks what would happen if a forest could manage itself – that is to say plant, fell, and sell trees while taking into account its own health. What decisions would it make?

Looking to potentially preserve buildings that are scheduled to be demolished, often in alignment with public opinion, The Cunning of Cuteness observes that public opinion is often influenced by mediatization, representation, and aesthetics. By representing ugly buildings as “cute” inside a virtual platform and allowing users to take care of them through simple single-click actions (such as applying a band-aid, adding air-conditioning, etc.), a sense of affection and care can be generated between users and the virtual building, possibly transcending from the virtual sphere back into reality.

Seeking to overturn current assumptions about capitalism as being synonymous with progress and socialism with stagnation, the project AI Economist allows artificial intelligence to run a series of simulations based on different tax policies and then generate and test its own, ultimately resulting in a new solution that balances incentives and productivity with equitable taxation (Figure 4) (Zheng et al.).

When asked to define money during an interview, Ethereum founder

Vitalik Buterin defined it as a game. In essence, transactions are a kind of game, wherein exchanges of value are carried out between different parties in order to grow their own value (however they may define it). At a higher level, gamification can generally be understood as strategy making, generally towards a more focused objective. Through a set of rules, conditions and objectives, game-like interfaces and logics can be instrumentalized towards specific goals.



Figure 4: The AI Economist uses reinforcement learning and economic simulation to find an optimized tax policy to maximize both productivity and equality.

2. METHODS

If nature’s rights are often contingent on an economic factor or some other analogy for value, how can such factors be integrated when exploring ideas of autonomy? Additionally, if each territory has its own specific circumstances related to climate, ecology, resources, beauty, how might one approach designing for the specifics whilst providing a general blueprint? Seeking to engage with questions of nature’s autonomy, a methodology is developed that intertwines ideas of legislation, economics, user interaction, and speculation mediated through video game engines (Figure 5).

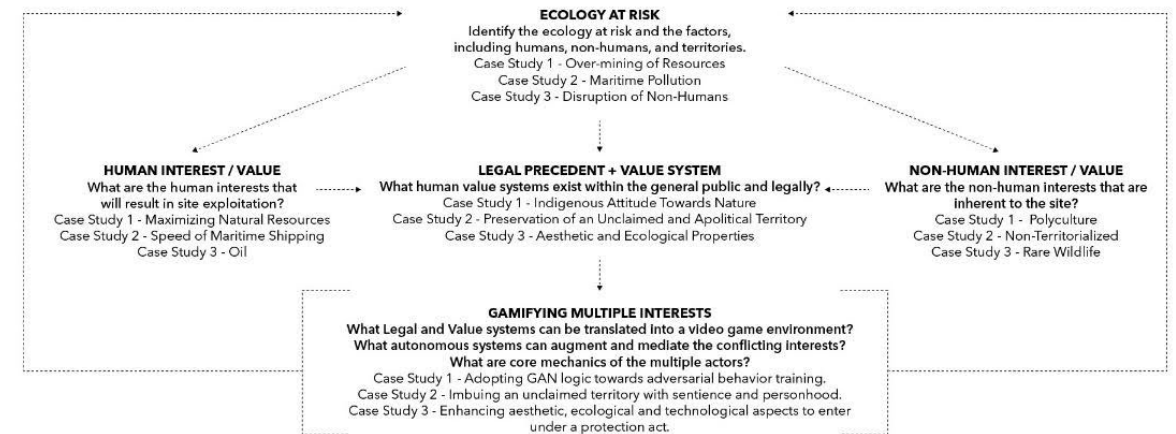


Figure 5: Methodological diagram

2.1 CASE STUDY 1 – ALASKA

Scenario. Alaska’s economy has always depended on natural resources, and tremendous wealth has been produced from fur, gold, copper, fish, and oil (Leask et al. 2006). With the idea of tremendous wealth come practices that put profit ahead of all other factors. Overfishing has impacted the current ecology, as has overmining, while climate change has also influenced migratory patterns, and habitats have been destroyed due to coastal and streamside development. The Alaska department of fish and game’s sport and commercial fishing

regulations contain hundreds of pages that specify how, where, and when fish may be caught, how many fish may be retained, [...] and despite fishing providing more jobs than any other industry, oil generates much more money, making any fight an unevenly matched one (Heacox 2018). Additionally, Alaska's population is 19% indigenous, the largest proportion in the United States, and their traditions retain a direct connection with the land, including past and present stewardship of Alaska's lands and waters.

Strategy. It is unrealistic to presume that mining will come to a halt when it generates the vast majority of the state's income. In parallel, while borders are generally seen as something fixed, the natural world does not acknowledge such impositions, suggesting that borders, access to land, and land leases should be something dynamic and adaptive, able to be updated in real time in response to variables such as climate change and migratory patterns. If the question at hand is about nature's autonomy and a realistic middle term between ecological conservation and resource extraction, then such factors ought to be at the core of the self-governing system. Can gamification help negotiate between indigenous knowledge and the logics of capitalism?

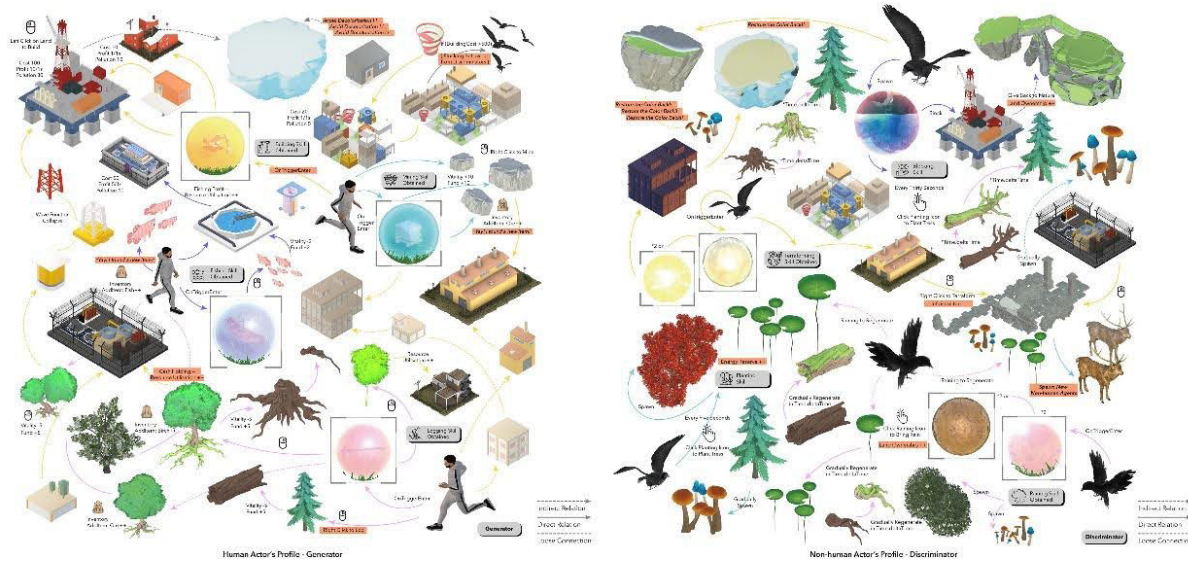


Figure 6: Actor profiles and game mechanics with Generator (left) and Discriminator (right)

Gamification. The proposal is based on an adversarial setup between a Generator (profiteering developer) and a Discriminator (natural emissary) (Figure 6). Players can play as either character, and one's objective is diametrically opposed to the other's. The Generator's task is to mine as many resources as possible, including the felling of trees and fishing of salmon. Meanwhile, the Discriminator's task is to monitor the health of the ecology and actively limit the amount of resources extracted. Machine learning agents are also trained in parallel simulations in order to augment the knowledge database, iterating through different initial conditions and target outcomes

(Figure 7). Finally, a digital twin is produced to encode and update the territories' status at various scales over time (Figure 7). The game enables a simplified version of user behavior to be enacted, which is representative of actions that could be executed in the real world (Figure 8). The speculation is that with a sentient system and the ability to dynamically update the data set, an autonomous system can make informed decisions about how much of what resource should be taken and when, mediating between common capitalistic tendencies and indigenous methods.

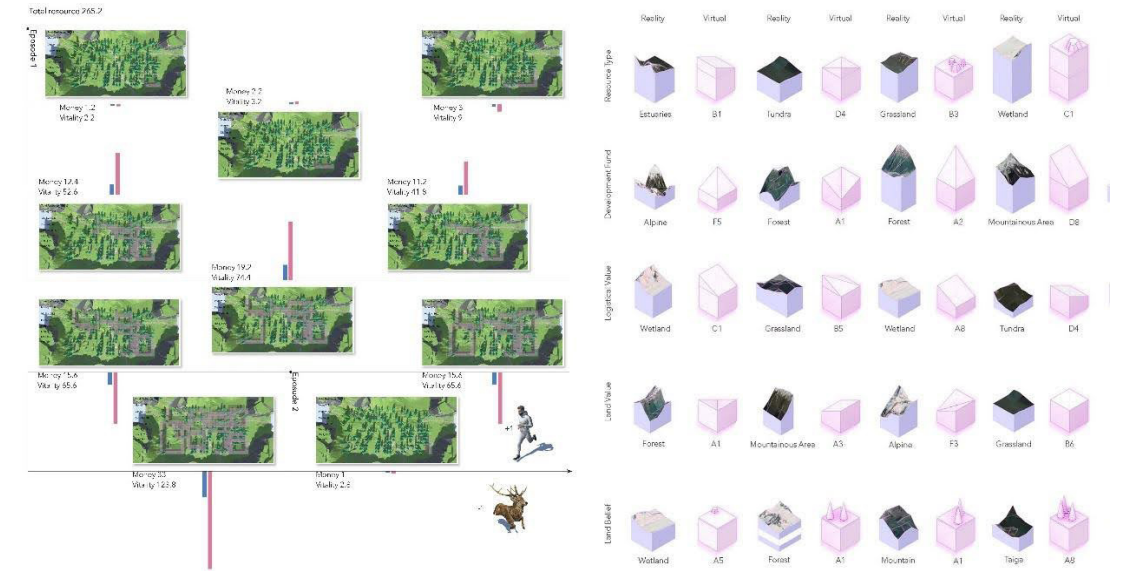


Figure 7: Machine learning agents for adversarial reinforcement learning (left). Digital twinning (right)

Figure 8: Different scenes from the video game

2.2 CASE STUDY 2 – THE ARCTIC EXCLUSIVE ECONOMIC ZONE (EEZ)

Scenario. The Arctic Circle is a highly trafficked region that provides short-route access between various nations and continents. Traditionally, traveling through certain areas closer to the North Pole could only be achieved during limited times of the year as the ice sheet would prevent access. With warming temperatures, the periods in which the sheet is thin and penetrable have lengthened, increasing access with the projection of increasing ship travel. In August 2014, for example, unusual ice conditions in the eastern central Arctic enabled the German cruise ship *Hanseatic* to reach a position of 85° 41' North, thus setting a new record for passenger ships (World Ocean Review).

An Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights regarding the exploration and use of marine resources, including energy production (DeRepentigny et al. 2020). The five countries surrounding the Arctic are limited to an EEZ that extends 200 nautical miles (370.4 km) from the coastline, a regulation set by the United Nations Convention on the Law of the Sea, the remainder of which is considered international waters belonging to no one, making it susceptible both to continued and increased future exploitation, as well as autonomy.

Strategy. Why not decide which ships pass and when? If they want to cross sooner, or repeatedly, why not charge them more? Why not divert routes or deny access to allow for ecological regeneration and health? A self-governing autonomous system could potentially mediate such decisions, keeping track of local marine wellbeing and earning the income required to support the infrastructure.

Gamification. The international waters within the Arctic Circle are voxelized, forming a 3D grid made up of various layers, allowing for constant monitoring and information to be collected. Any single or multiple voxels' bio-scores can be retrieved at any moment (Figure 9). The virtual model contains a simplified food chain and behaviors, various ships of different sizes with different degrees of pollution, and existing ports and typical routes travelled between them (Figure 10). An equation computes pollution, ecological health and money earned in order, the goal of which is to allow the territory to govern itself, maximizing profits while determining an acceptable amount of bio-damage in exchange. ML agents are again used to train a model to find optimum paths depending on the conditions to be satisfied. The system, in turn, can also block a ship from entering a particular voxel, thus forcing it to reroute (Figure 11). The game interface serves the dual function of monitoring and enabling shippers to devise new strategies, potentially reframing the current regime of logistics.

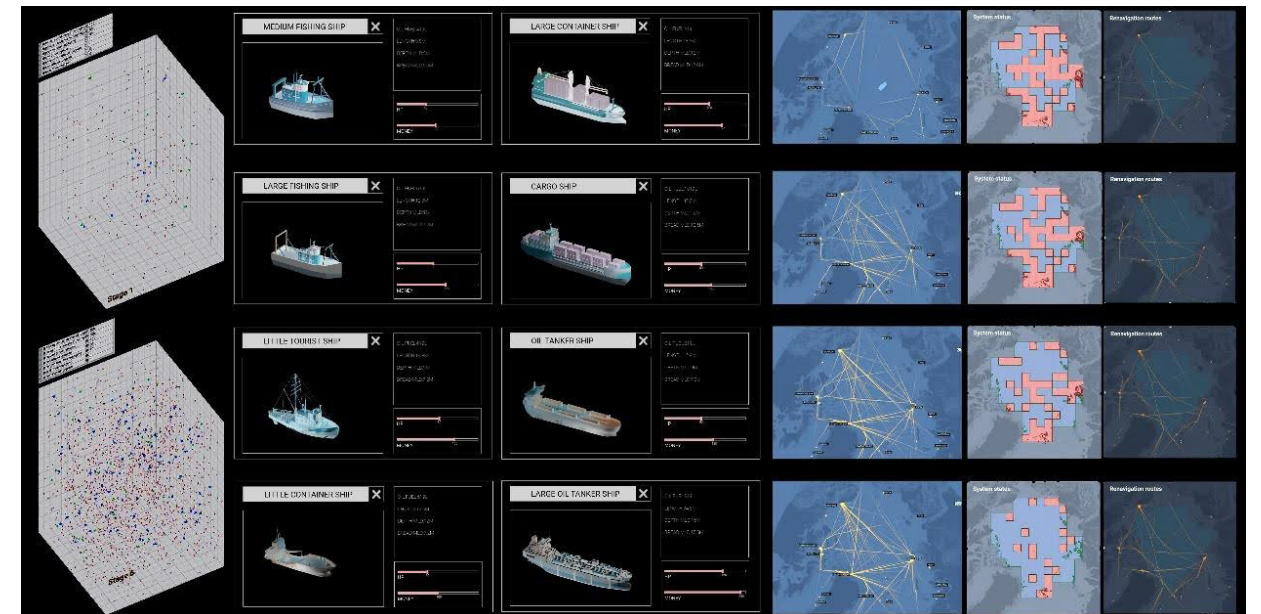
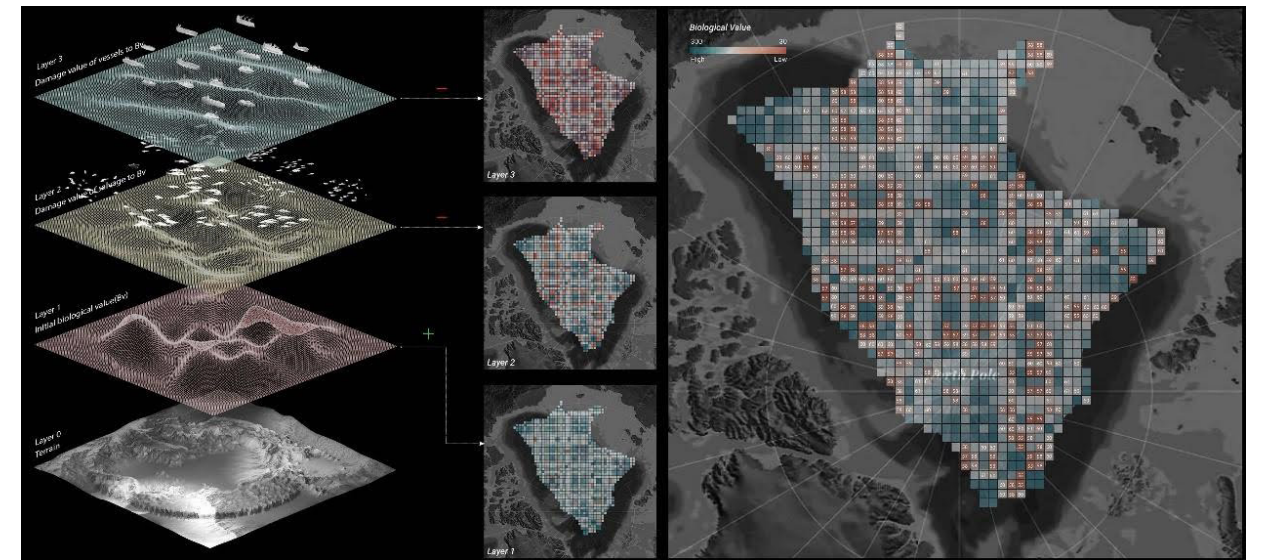


Figure 9: The three defining layers for determining the bio-score

Figure 10: Food chain simulation (left). Various ship sizes and statistics (middle). Existing ship routes and rerouted ship routes according to ecological damage (right)

2.3 CASE STUDY 3 - TESHEKPUK LAKE

Scenario. Teshekpuk Lake is the largest lake in Alaska and considered one of the most productive, diverse, and sensitive wetland ecosystems in the entire Arctic, while also serving as a rich resource for indigenous residents for harvesting fish and wildlife. Despite this, the area currently has no official protection and is under threat on two fronts. On the one hand, it is subject to continued interest by oil companies, with the Willow Project having been granted drilling rights by the Bureau of Land Management (BLM) and other governing bodies in 2023 (U.S. Department of the Interior Bureau of Land Management, 2023). On the other hand, warming temperatures have led to an increase in sea ice melting and consequent saltwater contamination. Despite its relevance from both ecological and indigenous perspectives, most of

the world's population is unaware of the lake and its circumstances.

Strategy. The presence of a diverse and rich ecology has not proved enough to warrant unconditional protection. Reaching out to a wider audience and gaining public support through a form of aesthetic activism could potentially alter the lake's current status. There are countless places in the world that most have never visited, but which have become permanently imprinted on the public imagination, either visually or as an idea, such as the Phi Phi Islands in Thailand where *The Beach* was filmed, the salt flats in Bolivia, the Grand Canyon in the western United States, or Niagara Falls on the Canadian/United States border, to name a few. There are a few iconic images that come to mind for each of these, and often one that is the most known, the quintessential image: strategic views are framed and repeatedly retaken and published, reinforcing the image, beauty, and awe of each place. A strategy of terraforming and mediatization could potentially render the lake ecologically resilient to changing environmental conditions, while increasing global visibility.

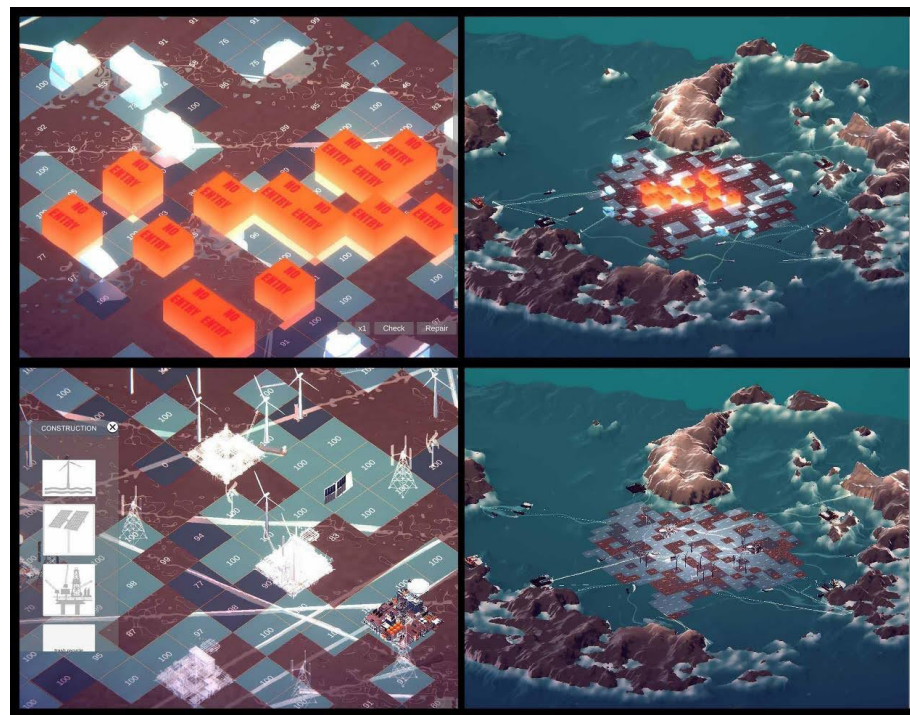


Figure 11: Game interface showing the confluence of the voxelized territory and the autonomous system: accessible and blocked zones (top-left), shipping routes and rerouting (top-right), autonomously managed infrastructures (bottom-left, bottom-right)

Gamification. A dataset of the world's protected landscapes and unique features is created. The ones that bear a close resemblance to the potential of the site, either formally or with regard to color, are used as the basis for a style GAN, generating a series of pictorial options (Figure 12). The options are then presented to the public through social media, where A/B testing and eye gaze tracking are used to determine which version of the lake is preferred, and which areas of it specifically. Then, a feasibility study is recreated in a virtual environment, simulating a food chain to test for ecological continuity (Figure 13).

Figure 12: Landscape dataset (left). Potential site identification (middle). Style GAN transfer onto potential site from 2D to 3D (right)



Once the selected landscape has passed the aforementioned criteria, it is released to the public as a walkable virtual environment, inviting virtual tourists to wander the site and take virtual photos. The archive and data help to determine which areas are best suited for feature enhancement, the quintessential image (Figure 14). Engaging users both passively and actively, new forms of territorial gardening that collapse aesthetic and ecological performance could minimize or potentially outweigh current extractive practices in favor of a different kind of value.

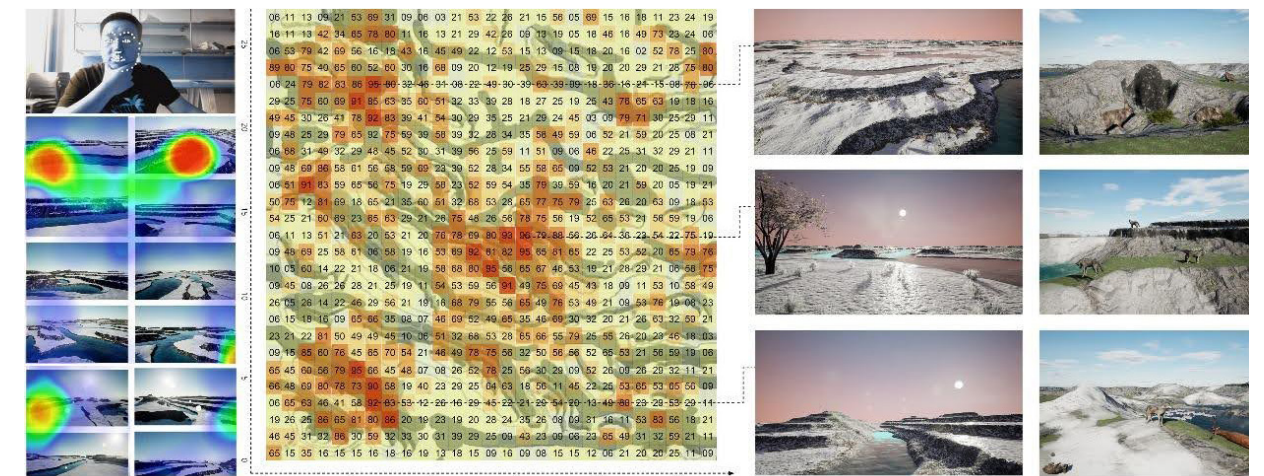
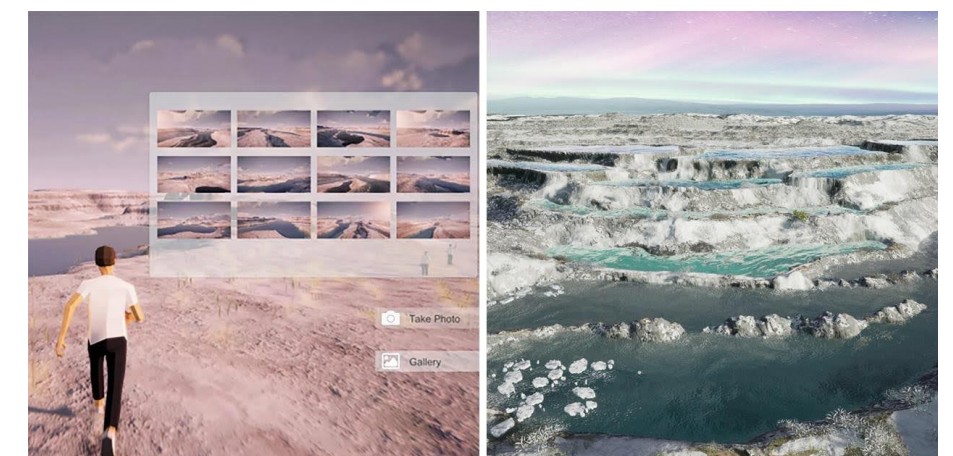


Figure 13: Eye gaze tracking (left). Geo-location and topographical site enhancement in 3D (middle). Food chain simulation (right)

Figure 14: Virtual tourist exploring the landscape and photographing sites of interest (left). Aesthetic and ecological enhancement of the selected site and the quintessential image (right)



3. CONCLUSION

This paper presents a combination of legal precedent, gaming technologies, and gaming strategies to negotiate and mediate pressing conflicts surrounding humans, non-humans, and territories. While speculative in nature, initial results point to the plausibility of such techniques as being able to potentially generate more equitable outcomes when negotiating human and non-human interests. Additionally, through the game interfaces and interactions, an additional level of empathy is built from the human perspective, pointing to the value of a well-designed aesthetic component to complement the gaming mechanics.

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