Saving the Planet One Game at A Time

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ABSTRACT
Several scholars suggest that games offer playful ways to think about environmental problems and their solutions. Drawing on postcolonial and decolonial studies, environmental humanities, ecofeminism, and ecogames studies, this paper explores some of the ways in which games can theoretically raise awareness of the ecological crisis and of the need for a quick paradigm shift. It also identifies game elements that theoretically risk reinforcing false beliefs about climate change, masking its root causes, perpetuating the outdated nature-culture dualism, or feeding a blind faith in technological solutions.

Keywords
ecogames; climate change; ecological awareness; postcolonial studies; environmental humanities

INTRODUCTION
The environmental crisis prompts different reactions among populations: while some people get involved in protests or social actions, others feel powerless or paralyzed by eco-anxiety.[2] Some refuse to believe that humanity is facing an imminent threat, while others remain indifferent to the long-term consequences of climate change on future generations. In this context, it seems important to find innovative ways to sensitize the most skeptical segments of the population and to restore people's confidence in their ability to turn things around.

Several scholars suggest that games offer playful means to tackle environmental problems and to think about their solutions (Backe 2017; Chang 2019, Farca *et al.* 2020). While serious or educational games dealing with ecology rarely succeed in engaging a broad audience (Abraham and Jayemanne 2017, 76), the entertainment game industry releases every year an increasing number of climate fictions that cover topics such as biotechnological threats, natural disasters, and survival in a post-apocalyptic world. According to Hans-Joachim Backe (2017, 42-43), even games that involve embodying an animal, hunting an animal, or caring for an animal can lead to reflections on anthropocentrism and species conservation.

The idea that mainstream games designed for entertainment can be vectors of social and environmental change is appealing. However, it would be naive to believe that all games dealing with environmental topics have an equal potential to raise ecological awareness. Therefore, we need to ask ourselves what elements can make a game particularly suitable for ecocriticism and what elements can jeopardize their environmentalist message?

Proceedings of DiGRA 2023

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Drawing on postcolonial and decolonial studies, environmental humanities, ecofeminism, and ecogame studies, this paper explores some of the ways in which games can theoretically raise awareness of the ecological crisis and the paradigm shift needed to overcome it. It also identifies game elements that theoretically risk reinforcing false beliefs about climate change, masking its root causes, perpetuating the outdated nature-culture dualism, or feeding a blind faith in technological solutions. Several examples are provided throughout the paper to illustrate game elements that theoretically favor or hinder ecological awareness on the representational and procedural levels. These examples are drawn from our analyses of eight video and board games chosen for their focus on current environmental challenges even if their primary goal remains entertainment.[3] The conclusion, however, highlights the limits of our theoretical assumptions and the need for reception studies in order to test them.

GAME ELEMENTS THAT THEORETICALLY FAVOR ECOLOGICAL AWARENESS

Even though games that are not explicitly dealing with environmental problems might raise awareness about the ecological crisis –by depicting a devastated environment for instance–, some aspects of a game might favor ecological awareness.

An eco-centric perspective

According to Benjamin Abraham and Darshana Jayemanne (2017, 76), games that revolve around an "eco-centric" perspective can help players to move away from the anthropocentric point of view that often leads to condescension towards animals and nature.

This might involve adopting a "non-human" perspective, as in *Stray* (Annapurna Interactive, 2022), where the players embody a cat trapped in a dome-city in ruins, devoid of human beings, or as in *Abzû* (Giant Squid, 2016), where (spoiler alert) they play a robot who tries to revitalize a devastated aquatic world. The philosophical simulation game *Everything* (O'reilly, 2017) also provides a good example of an eco-centric perspective, as it invites the players to successively embody a multitude of animals, objects or systems (from bacteria to bears, from tree forests to school buses). Almost a thousand metamorphoses are possible in this game, except the embodiment of human beings. The game therefore allows the players to temporarily bypass their usual range of perceptions to put themselves in the "shoes" of non-humans. At the procedural level, these alternative perspectives free the player from typical human objectives that are harmful for the environment such as building an empire, expending a territory, exploiting resources or accumulating wealth.

However, non-human avatars do not necessarily escape anthropomorphism. Since the avatar in *Abzû* has a human appearance, the game does not escape the tendency of humans to create robots in their own image. Even though the cat in *Stray* does not behave as a human, it is coupled to a drone in which a human consciousness was uploaded, in order to facilitate its communication with anthropomorphic robots and with the player.

Adopting an eco-centric perspective does not necessarily mean excluding humans from the narrative; it can consist in putting in perspective their place within the ecosystems or acknowledging their interdependence with non-humans.

Interconnections between humans and non-humans

According to Jason W. Moore, one root cause of the ecological crisis is the Western philosophical conception of Nature (with a capital "N") as a wild space that existed apart from humans before being gradually exploited by capitalist societies (Abraham and Jayemanne 2017, 76). While capitalism is indeed an exploitative system, nature

includes humans rather than preceding them: "to be human means to be human-in-nature, with no separation, and neither coming 'before' or taking precedence over the other" (Abraham and Jayemanne 2017, 85).

One way of challenging the tendency to separate humans from nature is to illustrate the interconnections and transcorporeal relations between humans, animals, plants, organic matter and inorganic matter. As Gaard (2019, 175) explains, "We are born and come into being through relationships, and these relationships are not only human-to-human but also human to more-than-human, including relations with other animals, plants, waterbodies, rocks, soils, and seasons." After all, we are all made of the same stuff.

According to Abraham and Jayemanne (2017, 86), showing relationships through which humans and nature affect each other (what Moore calls oikeios) can help players understand that humans are not apart from nature. In *Abzû*, for instance, the simultaneous disappearance of humans and plants in the ocean shows that humans need non-humans to exist, and that the fate of humanity is directly related to the fate of nature.

Porous boundaries between humans and technologies

Another way of challenging the nature/culture divide, on which most Western thinking relies, is to illustrate the porous boundaries between humans and technologies, as does Haraway (1991) in her "Cyborg Manifesto". In this canonic text, she argues that most humans are, to some extent, human/machine hybrids, if only because they are kept alive or altered with prothesis, pharmaceutics and medical procedures. Machine therefore became part of human identities, and should be embraced instead of feared.

The avatar in *Abzû* is a good illustration of the cyborg, in so far as it is a robot with an ecological conscience and with empathy towards the great white shark when it gets electrocuted. An ambiguity therefore persists throughout the game about its status: conscious or not, living or not, human or non-human, woman or man. Moreover, this game does not equate nature with "purity" and "beauty," on the one hand, and technology with "corruption" and "destruction," on the other hand. The game overcomes the nature/culture dualism because it tells the story of a technology that destroys another technology to restore nature.

Anthropogenic causes of climate changes

Many scholars in environmental humanities, as well as in postcolonial and decolonial studies (Ferdinand 2019; Ghosh 2016; Klein 2014), identify capitalism and colonialism quests for perpetual growth as the root causes of environmental problems. Yet, these systems are rarely put into question. According to Frédéric Lordon (2021), the media and cultural institutions openly discuss climate emergency as long as it does not question our socioeconomic systems. As for defenders of petrocapitalism, they encourage environmental activism as long as it does not go against their economic interests. However, explains Serge Latouche (2019), only a struggle against "the idolatry of growth, productivism, consumerism and the market economy" can make the "re-enchantment of the world" possible.

Similarly, very few games directly criticize these systems or address the subversive idea of degrowth. Postapocalyptic games, for example, tend to dismiss the anthropogenic causes of environmental problems by articulating their story around rare natural disasters or biotechnological accidents. In the multiplayer online game *Eco* (Strange Loop Games, 2018), the threat to humanity is a meteor that is about to crash on the planet. As Chang (2019, 189) explains, narratives that convey the idea of a fate imposed on humans by external forces beyond their control do not highlight human responsibility for environmental problems.

One way of avoiding such a pitfall is to depict large biogeographical units (tropical forest, tundra, grassland, desert, etc.) not only as natural biomes, with specific vegetation, climate, and geology, but also as "anthropogenic biomes" or "anthromes," characterized by the transformations they have undergone as a result of human activity (2019, 7-8). The game *Planet Zoo* (Frontier Development plc, 2019), for instance, highlights the impact of the zoo's visitors on the cleanliness of the site by encouraging the players to collect their rubbish. To make the zoo profitable, the players have to educate visitors about anthropogenic causes of environmental problems such as deforestation, overexploitation, animal poaching, population fragmentation, etc. with pedagogical panels, interactive stations and "animal talks." Moreover, the players can consult a "zoopedia" that provides information about each species, but also about the impact that human activity and pollution have on them. Reading this information is, however, optional, since this knowledge is not mandatory to progress in the game.

Other games hold humans' greed responsible for environmental problems. In *Alba: A Wildlife Adventure* (Ustwo, 2020), a Mediterranean wildlife sanctuary only threatened by the visitors' trash, by pesticides, and also by the imminent construction of a fancy hotel. In *Abzû*, the frescoes depicted on the walls of flooded temples show that the inhabitants of a vanished civilization once lived in harmony with the ocean until they developed a technology that allowed them to exploit its energy more efficiently, which in turn disturbed its delicate balance and caused their civilization's downfall. These murals imply that the mass extinction of living creatures in the ocean and the civilization demise was caused by the overexploitation of the ocean and the subjection of technologies to an imperative of growth. A similar example can be found in the adventure video game *Yonder: The Cloud Catcher Chronicles* (Prideful Sloth, 2017), wherein the protagonist's parents created a cloud of pollution accross the island of Gemea by hacking a technology called "Cloud Catcher" and overexploiting the healing properties of the "Celestial Cloud." Since that time, no more children are born on the island.

Accurate replication of ecosystems

According to Chang (2019, 15), games that replicate ecosystems, natural processes, or life cycles, on the representational or procedural level, such as *SimEarth* (1990) and *SimLife* (1992), can concretize information that seems abstract and threats that seem distant. In doing so, they can help avoid apathy (if I live in North America, why should I care about what is happening in the South Pole?). To replicate ecosystems, game environments can reflect the specificity of a region – its sounds, weather, and species density, distribution, and interrelationships–, instead of showing stereotypical landscapes that represent any region (2019, 22).

The game *Abzû*, for instance, recreates the rich ecosystem of the Indian Ocean that one rarely gets the chance to see with their own eyes. Its art director, Matt Nava, often spoke about the care his team took in modeling and animating the marine flora and fauna in the game environment (Haske 2016). He even went scuba diving several times to get a better feel of the shapes, colors, and movements of this ocean's creatures. Rather than using images from digital banks that cannot reflect the biodiversity of this rich ecosystem, artists drew each creature by hand and animated them using artificial intelligence.

The board game *CO_2: Second Chance* (Vital Larceda, 2018) does exactly the opposite: depicting continents as interchangeable by randomizing the natural resources available on each of them at the start of every game. This game, however, reproduce socioeconomic systems in a way that help to understand the complex interlocking of industry, science and economy when it comes to energy production. Indeed, players

have to acquire scientific knowledge and to negotiate on the carbon market before building renewable energy power plants.

Because of video games' ability to replicate ecosystems on a smaller scale, Chang (2019, 11) compares them to "mesocosms," which are bounded and partially enclosed places, outdoor or under a greenhouse, where experiments are conducted to bridge the gap between the laboratory and the physical world. Mesocosms provide more natural research conditions than a highly controlled laboratory while helping to avoid some obstacles of highly unpredictable experiments in nature. Like mesocosms, games can be "mini-ecosystems" that only replicate some aspects of natural ecosystems but still have scientific value (2019, 19-20). They can be faithful to certain details of reality and accurate to scientific facts without necessarily aiming for verisimilitude (2019, 120-123). After all, simplification can be useful to highlight patterns. The evolution of the game's environment, of its trees, plants, and animals through the seasons and years is therefore more important than photorealism. So is the accuracy of the genetic models and of the relationships between different species (2019, 48).

The game *Yonder* provides a good example of a mesocosm since it takes place on an island with eight distinct biomes, such as tropical beaches or snowy mountains. As times passes in the game, the seasons change. The game also features a dynamic weather system and a day-night cycle. In *Alba*, a wildlife sanctuary reproduces the Mediterranean ecosystem. The animal species in this sanctuary are specific to that ecosystem and have realistic relationships with each other. Moreover, the players are encouraged to consult a logbook that provides accurate information about their name, sounds, and habitat.

Planet Zoo is another good example as it encourages players to recreate biomes faithfully: the natural elements of the grassland, tropical forest, desert, tundra, taiga, and temperate forest have to be adequately replicated in the enclosures to fulfill the animals' needs and to build a profitable zoo. For example, animals from the temperate forest are not happy with plants from the desert and with too much heat. The giraffes need a heating system if the zoo is located in a region where it gets cold, and the penguins require a certain level of water to be able to swim. The predation, symbiosis or competition relations between species are accurately depicted in the game: the giraffe can cohabit with the zebra, but if the antelopes are placed in the same pen as the crocodiles, they are rapidly eaten. The relationships between animals from the same species are also portrayed with rigor. For example, African Savanna elephants usually live in groups of 3 to 15 with only one male. When the player does not respect these conditions, the elephants are unhappy. If two animals from the same family reproduce, there are consequences on the immunity and the fertility of their offspring. Moreover, the animals from the same species are distinct from one another: their genome determines their appearance, but also their longevity, size, immunity and fertility rate.

In *Abzû*, meditating on statues allows the player to observe the marine fauna, to learn the names of different species and to better understand their relationships. Witnessing predation during a meditation session even unlocks the "Foodchain" trophy. A problem of verisimilitude can, however, be found in *Abzû*'s Easter egg. In the game's final chapter, the player who decides to explore the surroundings of the main pyramid can discover an ice floe where it is possible to walk alongside penguins and to wake up a sleeping polar bear. This floe is, however, a caricatural and inaccurate representation of the Arctic's ecosystem, insofar as polar bears do not coexist with penguins, which only live in the South Pole.

In some games, the parameters of the replicated environment are only accessible to the players via statistics that favor detachment instead of emotional responses. In *Eco*, for

instance, the topography, climate, animal presence, soil fertility, etc. are abstract variables to monitor and whose understanding outside of the game is yet to be proven. In the board game *Solutions* (Big Talk inc., 2022), climate changes are reduced to only one abstract parameter: the level of CO_2. The practical consequences of climate change on humans and animals are not addressed. However, the many ways human activity impacts the level of CO_2 in the atmosphere is explained on the Solutions cards and the Event cards, while the snowball effect of a CO_2 increase is illustrated by the Feedback Loop cards.

Player's agency

In his article "Against Procedurality," Miguel Sicart (2011) argues that games can only have an impact on players' beliefs and behaviors if they allow for a diverse range of actions that can lead to critical reflection. Drawing on Sicart, Backe (2017) suggests that games can foster ecological awareness by forcing players into ethical dilemmas or asking them to pursue a goal that goes against their values. One way to boost players' agency is to give them the ability to act on the game's events or to interact in meaningful ways with the flora and fauna of the game environment instead of simply navigating in a static backdrop. This is possible when actionable elements are not limited to power ups, to keys that unlock doors, or to objects that can be destroyed during battles (Chang 2019, 15, 190). According to Chang, the avatar's ability to improve a disastrous situation can encourage players to ask themselves how they can contribute to the fight against climate change and can help them to overcome paralysis (what difference could I make anyway?). Unlike many environmental discourses, which tend to adopt a fatalistic tone, failure and loss often give way to success in video games, and this helps to restore hope rather than encourage fatalism (2019, 12).

Towards the end of *Abzû*, for instance, the player character acquires the power to revitalize the marine environment by dismantling the technological devices that caused its degradation. In *Alba*, the young girl avatar has the power to rescue animals that are stuck in rubbish or to save the animals from pesticides poisoning with a healing kit. She can also exert her agency by collecting as many signatures as possible for a petition against the construction of a hotel that will destroy the sanctuary.

The video game *Everything*, however, provides a counter-example by showing that players' lack of agency can lead to the humble realization of their small and contingent place in the universe (also encouraged by the narrator's invitation to return to their initial place at the end of the game). Indeed, *Everything*'s game world continues to evolve even when the players stop interacting. This is why the description of the game indicates that the acceptable number of players is between 0 and 1.

Change of scale

According to Chang (2019, 71), games that show natural environments from different spatial or temporal scales (micro or macro) can help players to visualize far-away or long-term consequences of some variables on the environment. She provides the examples of the video games *flOw* (Thatgamecompany, 2007), which submerges players in a world of aquatic micro-organisms, and *Spore* (EA, 2008), which allows players to zoom in/out of planets' environment and takes them through five stages of evolution: the formation of cellular organisms, the birth of creatures, the development of tribes, the establishment of civilizations, and the conquest of space. As its creator Will Wright explains, *Spore* allows to visualize in minutes the long-term consequences of increasing a variable such as the carbon dioxide level and to act on those consequences by making procedural changes; something that is impossible to do in the non-game world (2019, 85-86).

Planet Zoo is another good example of games in which the time scale can be changed to favor visualization. With the default settings, fifteen minutes of gameplay correspond to one year. The players can, however, slow down the flow of time by choosing the mode "in real time" or making time run out two or five times faster. Slowing down the time helps to realize how long some processes take (it takes 25 years before a Seychelles giant tortoise can reproduce). Speeding up the time, for its part, allows players to better visualize the life cycles of animals.

According to Chang (2019, 71), the players' omniscient view and ability to change scale can lead to an increased sense of power over nature, but it can also bring about the humble realization of their insignificance in the earth's ecosystems and in the vast cosmos.

Strategies to arouse emotions and affects

In their detailed analysis of *The Legend of Zelda: Breath of the Wild* (Nintendo, 2017) and the gameplay experiences that it provides, Gerald Farca, Alexander Lehner and Victor Navarro-Remesal (2020, 6-7) illustrate how affects[4] and emotions are involved in what they call "regenerative play;" an experience that they describe as a resensitization to the beauty of nature. While moments of serenity help players to feel affection for living creatures and to feel responsible for their well-being, moments of danger arouse their survival instincts and lead to physical reactions such as fear. Farca and his colleagues also emphasize the importance of a specific affect that Daniel Vella (2015) calls, after Immanuel Kant, the "ludic sublime," which is a mix of amazement, curiosity and terror caused by a game system's opacity and the player's incapacity to fully grasp it. According to them, the sublime can also be aroused by a huge and majestic game environment in which players feel relatively small and insignificant, such as the one in *Breath of the Wild*. Experimenting this affect can potentially change their perception of their place in their ecosystem.

Similarly, in *Abzû*, actions such as riding on the back of sea turtles or swimming among fish to make them twirl are not meaningful in terms of gameplay –they do not contribute to achieving the game's goals or transforming the narrative–, but they allow players to establish a stronger affective connection with the sea creatures and to feel concerned about their well-being. *Planet Zoo* also favors emotional attachment since players can witness the birth, growth and death of their animals. In this game, moments of danger constantly interrupt the peaceful gameplay: when a red warning tells the player that an animal's well-being is compromised, the player has to act swiftly to prevent this animal from dying or from leaving the zoo.

ELEMENTS THAT HINDER A GAME'S ECOCRITICAL POTENTIAL

Emphasis on technological solutions

Many games that tackle environmental issues propose technological solutions. The board game *CO_2: Second Chance*, for instance, tasks the player with limiting rise of carbon particles per million before it reaches a catastrophic level, by replacing power plants based on fossil fuel, like coal and oil, with power plants based on renewable energy, such as wind, solar energy or hydroelectricity. Insisting on technological solutions to solve the ecological crisis can, however, blind players to the fundamental role played by capitalist imperatives and to degrowth as a possible solution.

Indeed, a smart use of technologies might not be sufficient to urgently address the devastating consequences of climate mutation. In her book *This Changes Everything: Capitalism vs. Climate*, Naomi Klein (2014, 223) explains that carbon sensors, biomass, sulfate diffusers, space mirrors that can block sunrays, ocean fertilizers that can help to capture CO_2, and other untested and high-risk technological solutions

overshadow the socioeconomic root causes of climate change. In fact, these proposed remedies risk being worse than the disease, because they double down on "exactly the kind of reckless, short-term thinking that got us into this mess" (2014, 50). "The solution to pollution is certainly not more pollution," explains Klein (2014, 241). It "is not to fix the world, it is to fix ourselves." According to Amitav Ghosh (2016, 147, 154), the "blind faith" in geoengineering is problematic because it does not help to overthrow the dominant paradigm of perpetual growth.

Instead of questioning the rhetoric of constant growth in the capitalistic market, *CO_2: Second Chance* requires players to engage in this endless growth fallacy and to exploit natural resources with little to no consideration for the effects of the power plants on the ecosystems. In the board game *Solutions*, only eight Solution cards on a total of 76 suggest sociocultural changes such as empowering smallholder, plant-rich diets, health and education, walkable cities, indigenous forest tenured, community action, telepresence, and climate education. All other Solutions cards insist on technological solutions such as feeding cows with seaweed instead of eating less beef and dairy, or using hybrid vehicules instead of taking public transportation. Most proposed solutions already exist instead of being imagined as it is the case in many climate fictions. However, their cost and inaccessibility for some countries are not mentionned.

The same cannot be said of *Abzû*, since its avatar is an intelligent robot capable of storing energy to invigorate nature and of destroying the devices that suck the life out of the ocean. The fact that the avatar is a robot seeking to restore nature, however, has the merit of discouraging players from adopting a technophobic point of view. Indeed, it sends the message that technologies are neither fundamentally good nor bad; it is their subjugation to the economic imperatives of growth that makes them complicit in the Earth's overexploitation. The game nonetheless raises the possibility of fighting fire with fire by suggesting that a wise use of technologies can contribute to the protection of the planet.

The cat adventure video game *Stray*, on the other hand, provides a good example of geoengineering failure. At some point in the game, the player learns that before humans vanished, they bioengineered a bacteria that could eat rubbish to help with waste management in the dome-city. The bacteria, however, mutated, invaded the city, and started to eat "much more" than just rubbish. This technological solution therefore clearly failed to fulfill its purpose.

Idealization and erasure

Idealization and erasure are rhetorical techniques that can theoretically dilute the critical potential of a game. As Chang (2019, 146) explains, many farming simulators such as *Farmville* (Zynga, 2009) idealize labor that involves a direct relation with nature and avoid showing its problematic aspects, such as waste and labor exploitation.

A similar problem can be found in the game *Planet Zoo*, which idealizes the life that animals have in a zoo and do not account for their lower reproduction rate in captivity. Because selling animals provides money and conservation points in the game, their reproduction rate is in fact much higher than in reality, to the point that their habitat quickly becomes overcrowded. For its part, *Abzû*'s Easter egg on the ice floe is a missed opportunity to show that the Arctic is already experimenting the devastating effects of global warming (Baccaro and Deschamps 2021). In this context, and because the polar bear is the ultimate symbol of climate emergency (Palmer 2009, 588), the peaceful scenery depicted on the ice floe seems particularly odd.

Orientalism and speciesism

Another pitfall to avoid when it comes to eco-friendly games is orientalism, that is the contemptuous portrayal of the East from a Western imperialist and colonialist perspective (Saïd, 1979). Some might argue that the murals in *Abzû* convey Orientalist representations of a once glorious civilization whose tragic fate only serves to enlighten the West on the mistakes that should not be repeated. As Malcom Ferdinand suggests, the criticism of our planet destruction must remain "intimately tied to the criticisms of the colonial and postcolonial domination and to the demands of equality" (our translation, Ferdinand 2019, 34).

Some games hardly avoid speciesism, that is the belief in a hierarchy between species and in the superiority of humans over animals (Ryder 1975, 16). In *Abzû*, for instance, players are encouraged to explore the underwater environment to find "hidden pools" from which they can resurrect sea creatures that are extinct or endangered in the off-game world. While the ability to revive sea creatures can help players to realize how fragile the underwater ecosystem is, it also carries the risk to let players believe that the avatar is superior to them. The challenges offered in the second half of the game, however, prevent this belief from crystallizing, as the player character also becomes vulnerable.

The same cannot be said for *Planet Zoo*. Considering that it is a zoo management game, humans are necessarily depicted as superior to the animals. Indeed, they exert power over them and control their fate by buying them, selling them, managing their fertility rate with contraception, or returning them to nature. Furthermore, there is a hierarchy among the animals based on characteristic such as their species, genetic, age, etc., which influence their resale price and the number of "conservation points" that can be made when they are returned to nature. Releasing a lion into the wild, for example, is more advantageous for the player than releasing a flamingo.

Exploitation of natural resources

Players' success is often based on their exploitation of natural resources, especially in real-time strategy games where each military unit costs an abundant number of resources and minerals. As Chang (2019, 23) explains, the extraction, collection, and use of natural resources for enrichment or progression purposes, however, replicates the instrumental relationships between humans and nature at the origin of environmental problems. While the scarcity of certain resources may help players to understand that they are limited in the off-game world, the fact remains that players must establish an instrumental relational with them.

In *Abzû*, players are encouraged to collect seashells but the narrative of the game does not direct them towards relentless accumulation. In *Eco*, on the other hand, animals and plants are objects to be exploited and transformed in tradable resources. Even if they must be used responsibly and with parsimony, they solely exist to produce the material for the tools and machines that might prevent the meteor from hitting the planet. Moreover, the colonization of untouched territories is inevitable in *Eco*: before being able to build anything, the players must "claim land." Similarly, in *Planet Zoo*, animals are instrumentalized to make money. The zoo therefore fulfills an imperative of growth, productivism and consumerism. To win the game in *Yonder*, players have to fish, hunt, and raise animals on a farm with a high level of productivity. Moreover, the farm is serviced by unpaid workers who were baited with food.

CONCLUSION

In conclusion, it is not sufficient for a game to address environmental topics in order to provoke a change in thinking, attitudes and behavior. Based on postcolonial and decolonial studies, environmental humanities, ecofeminism and ecogame studies, many

elements can favor their capacity to raise ecological awareness, such as: adopting an eco-centric perspective rather than an anthropocentric point of view; showing the interrelations between humans and non-humans, challenging the nature/culture dualism by illustrating the porous boundaries between humans and technologies; pinpointing the anthropogenic causes of the ecological crisis –especially capitalism and colonialism–; replicating ecosystems accurately without aiming for verisimilitude, giving players agency; allowing a change of scale that facilitates the visualization of far-fetched or long-term consequences and; using strategies that arouse emotions and affects.

Several pitfalls can also be avoided when it comes to creating ecoconscious games, such as focusing on technological solutions and geoengineering rather than degrowth; idealizing the work that involves a direct relation with nature and masking its problematic elements; showing orientalism and speciesism; and basing the players' success on the exploitation of natural resources.

Even if a game mobilizes many elements that favor ecological awareness and avoid pitfalls that hinder environmentalist messages, there is no guarantee that players will actualize its ecocritical potential. In their reception study of *Abzû*, based on the analysis of 2421 players' comments published on 14 platforms, Gabrielle Trépanier-Jobin, Maeva Charre-Tchang and Sylvie Largeaud-Ortega (upcoming) found out that only a minority of players discuss its environmental message and that none of them identify petrocapitalism's imperatives of perpetual growth as the main cause of the marine ecosystem devastation. Players are generally more concerned with the game's price, status, and similarity to other games than by its environmental message. While this makes another case against naive procedurality (Sicart 2011), it also raises the question of the context in which the game is played. Can the actualization of a game's ecocriticism be favored by a pedagogical context in which a facilitator such as a social worker or a teacher encourages discussions? At this point, it becomes clear that more reception studies on games with ecocritical potential should be conducted to better understand what elements and contexts favor ecological awareness.

ENDNOTES

[1] This paper presents the results of a research conducted by the reseach group Homo Ludens, based at Université du Québec à Montréal (Québec, Canada). It was led by Professor Gabrielle Trépanier-Jobin and co-written by, in alphabetical order: Maude Bonenfant, Laurie Briand, Simon Delorme, Maeva Charre-Tchang, Simon Dor, Pierre Gabriel Dumoulin, Daniela Fitiavanjanahary Landrys, Débora Krischke Leitão, Fabien Richert, Mathilde Savoie, Dorah Simon, Gabrielle Trépanier-Jobin, Julien Toulze, Amélie Vallière, Hugo Veillé and Elisa Vial. Gabrielle Trépanier-Jobin also edited the paper.

[2] Ecoanxiety is defined by the American Psychological Association as "a chronic fear of environmental doom" (Clayton et al., 2017, p. 68). Having experienced traumatic situations regarding climate change or natural disasters could lead to ecoanxiety, but it could also be triggered by secondary exposure to information about climate change and ecological catastrophes such as through the media and popular culture. (Clayton, 2020, p.3).

[3] *Abzû* (Giant Squid, 2016), *Planet Zoo* (Frontier Developements plc, 2019), *Yonder* (Prideful Sloth, 2017), *Co_2: second chance* (Vital Lacerda, 2018), *Solutions* (Levac-Levay, 2022), *Alba, a Wildlife Adventure* (Ustwo, 2020), *Everything* (O'reilly, 2017), *Eco* (Strange Loop Games, 2018).

[4] While emotions are discernible and identifiable feelings, affects are imprecise and diffuse emotional tones that cannot be fully grasped and have not yet been concretized

in language. Affects are transformational because they change the way we are in the world. Therefore, they have political implications and play an important role in the reorganization of social order, resistance, repression, and revolts (Massumi, *The Politics of Affect*, ix).

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