Where are all the climate change games? Locating digital games' response to climate change

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ABSTRACT

The burgeoning genre of climate fiction, or "cli-fi," in literature and the arts has begun to attract both scholarly and popular attention. It has been described as "potentially [having] crucial contributions to make toward full understanding of the multiple, accelerating environmental challenges facing the world today" (Buell). Implicitly, these works confront the current orthodoxy about where exactly the issue of climate change sits in domains of knowledge. As Jordan notes: "climate change as 'nature" not culture is still largely perceived as a problem for the sciences alongside planning, policy, and geography" (Jordan 8). In this paper we ask where is, or alternatively what could climate fiction look like within the field of digital games? Even a passing familiarity with the cultural output of the mainstream game industry reveals the startling omission of the issue – with very few games telling stories that engage with climate change and the unfolding ecological crisis (Abraham "Videogame Visions"). Finding a relative dearth of explicit engagement, this paper offers an alternative engagement with climate change in games by focussing on the underlying ideas, conceptions and narratives of human-environment relationships that have been a part of games since their earliest incarnations. We argue that it is possible to read games for particular conceptualisations of human relationships to nature, and offer a description of four highly prevalent "modes" of human-environment engagement. We describe and analyse these relationships for their participation in or challenge to the same issues and problems that undergird the current ecological crisis, such as enlightenment narratives of human mastery and dominion over the earth.

KEYWORDS

Videogames, environmentalism, climate change, ecology, sustainability

Introduction

In 2013 American public broadcaster NPR ran a story titled "So Hot Right Now: Has Climate Change Created a New Literary Genre?" (Evancie). The report discussed the emergence of a genre in contemporary literature, which eschews the far-flung scenarios of much science fiction in favour of the all-too-real experiences of an already changing climate. The genre begins to bring an everyday, experiential dimension to the mounting evidence that we are living in a changed climate, and mirrors developments in both climate journalism and the field of climate communication which, with the help of maturing climate science itself, is more and more frequently able to attribute extreme weather events today to the emissions of the past. Elizabeth Kolbert, environmental reporter for *The New Yorker*, provides a number of examples of this work, in one such story describing measurements of glacial melt rates in Greenland and fish-kills in arctic regions, culminating in the observation that

> the warming that's being locked in today won't be fully felt until today's toddlers reach middle age. In effect, we are living in the climate of the past, but already we've determined the climate's future. (Kolbert)

The consensus in much of this type of reporting is that something is needed to bring the future we are "locking in" into the present – and climate fiction, NPR's story argues, is beginning to do this work – leading with the example of Nathaniel Rich's *Odds Against Tomorrow* which features an image of a drowned Manhattan on the cover and climate consequences as an essential narrative focus of the novel. In a case of life imitating art, early releases of the book began arriving only days after Hurricane Sandy inundated Manhattan. Speaking with scholars and novelists about the emergence of this new genre, dubbed "cli-fi," the report concludes that while "sci-fi usually takes place in a dystopian future, cli-fi happens in a dystopian present" (Evancie).

The academics and authors featured in the NPR story all focus on a critical element of the problem facing climate change activists: the significant remaining resistance to the acceptance that climate change is occurring. This dovetails with a growing awareness that existing methods of public dissemination of science (via information and awareness raising and the like) are failing to overcome ideological resistance and other barriers to action. (Fielding et al.; Wilson; Dickinson et al; Gammelgaard Ballantyne). As a result, many of the researchers and authors in the NPR story explain their wish to persuade people via more emotional or narrative-driven means. NPR quotes Judith Curry, professor and chair of Georgia Institute of Technology's School of Earth and Atmospheric Sciences, who notes:

> "You know, scientists and other people are trying to get their message across about various aspects of the climate change issue … and it seems like fiction is an untapped way of doing this – a way of smuggling some serious topics into the

consciousness" of readers who may not be following the science. (Evancie)

Deborah Jordan's study of Australian cli-fi makes several salient contributions to our understanding of the role the literary genre is beginning to play in responding to the climate crisis in a diversified way. She argues that science and technology have monopolised the discourse around climate change, which has been kept "in the technological sphere; a problem for science and policy makers. Missing is the human connection." (Jordan 7) She critiques the deeply flawed nature/culture split to explain why "climate change as 'nature' not culture is still largely perceived as a problem for the sciences alongside planning, policy, and geography" (Jordan 8). Climate fiction is poised to intervene in cultural and discursive constructions of climate, as well as a host of related environmental issues that the technocratic "facts and figures" approach to the issue is unlikely to touch. Jordan collates a list of dozens of recent and historical Australian literary works that speak to the current climate crisis in one way or another – from George Turner's 1987 *The Sea and Summer* to more contemporary works like Alexis Wright's 2006 novel *Carpentaria*. In an important move that informs the current paper's approach, she then expands her reading list beyond explicit engagements with climate change to encompass a broader range of ecologically sensitised work, summarising their contributions and perspectives, thereby unearthing a history of climate and environmental engagement within Australian literary arts. A growing body of research now supports the view that climate change is much more complicated than an approach that simply presenting "the facts" admits, and involves ideological and other intractable resistances that are not able to be simply won over by factual persuasion (Berglez & Olausson; Dirikx & Gelders; Fielding et. al.; Wilson; Lewandowski et al.; Gammelgaard Ballantyne). Within this diversified context, creative work thus stands to make a significant contribution along quite different lines.

The question for digital games, in this context, becomes rather clearer: are digital games doing – or could they be doing – anything similar to what cli-fi does in a literary context to contribute to our response to the ongoing climate crisis? What could artists working with digital games, as well as the mainstream games industry itself, be doing to encourage what Jordan calls an "eco-centric" perspective? How might games contribute (or already be contributing) to developing ecological awareness that "recognizes our interdependence with the non-human world, and our position within ecological systems that need to be maintained and protected for our future survival"? (Jordan 8). And in what ways does the state of climate change in games raise questions for scholarship and "serious games," that common point of contact between academic and game design worlds: "computer and video games present a rich limit case for the claims of environmental scholarship – a place where the natural and the digital collide and prompt careful reexamination of our assumptions about nature, realism, and the visual" (Chang 2013).

Where, in other words, are the cli-fi games? The extent of existing work is largely restricted to "edutainment" games – like NASA's "Climate Kids" series – which lack both the artistry and mainstream engagement sufficient to

make contributions to the public understanding of the issues wrapped up in our current climate challenge in the way that cli-fi does. Within the majority of commercial games, whether mainstream or independently developed, we find only a few examples of thematic or topical reference to climate change, which return to discuss later. This state of affairs mirrors the results of Jordan's study, which turns up only a dozen or so examples of explicit cli-fi works in Australian literature. However, central to her thesis is that when one expands and broadens the "definition of climate change novels to also include the causes of climate changes (industrialisation, colonisation, etc.) and some specific aspects of climate change (such as changes in land use, use of fossil fuels) as well as issues of society regulation and knowledge production, we find a very rich tradition indeed" (Jordan 77).

Following Jordan's gesture, and acknowledging the relative paucity of videogame examples of climate change engagements, we expand our focus to environmental or ecological representations in games more generally. Principally focussing on representations and conceptualisations of human-environmental relationships, this wider view reveals a similarly richer history as, in some respects, games always establish *some kind of* relationship to a limit or exterior, even if it is not explicitly conceptualised or designated as an "environment." We introduce four primary ecological models to describe how the environment has been figured within game designs – environment as backdrop, as resource, as antagonist, and as text. This is less a typology of exclusive categories than a heuristic to facilitate further analysis: many games use aspects of the four models at different times. We offer a brief description of these four common modes and critique their limitations with reference to ecocritical theory's rejection of the nature/culture divide. We argue that mainstream games, particularly those with aspirations to artistic expression or a sense of artistry in their design, would do well to attend to this aspect of their design and foreground these issues in greater detail. We finish with some observations and discussion of the problems facing game designers wishing to address climate change in their work.

Where are all the climate change games?

A small body of research has begun to examine digital games that address climate change in some manner. A 2011 survey of multiple forms of digital, board and card games that address climate change conducted by Reckien and Eisenack (266) found 52 games that in some way involved climate or climate change elements. They argue, based on their analysis of the games and the number found that climate change "games are not a niche product anymore" (Reckien and Eisenack 266). However, in spite of their conclusions and what at first seems an encouraging plenitude of games identified by the study, no account is offered of the prominence of these games within the wider sphere of gaming, with many examples languishing in the educational or "serious games" space, and thus having only limited reach and influence on wider games culture: "a substantial number of games are quite simple … and focus on the one-dimensional mediation of information and the reproduction of knowledge" (Reckien and Eisenack 257). This observation does not allow confidence that these games have the necessary depth to

engage the complexity and scale of the issue that is climate change, particularly in light of work like Anne Gammelgaard Ballantyne's which analyses contemporary communication theory and implications for climate change communication. Finding that "climate change communication simply does not fit into [the] traditional planning framework" offered by strategic communication approaches, she emphasises instead the importance of "the constitutive view of communication [that] defines communication as a social process that constitutes reality for the participants of that process" (340). In this way, we are guided to recognise in our communication a more complex relationship than simply that between a message and a receiver, which many of these simple games seem incapable of enabling.

More recently, Wu and Lee have performed a similar study of climate change games, finding that "a significant number of online climate change games exist as mini-games or simple simulations" and that "these are generally found on websites geared towards younger audiences" (414). Their survey does not attempt a complete accounting of the number of climate games, offering however approximately 13 examples of climate change games, concluding that they "are part of an entire genre of climate change games that offer powerful tools for education and engagement" (413). This is an encouraging development. Again, however, the influence and prominence of these games in global games culture is evidently limited, with many still educational or "serious games" and very few produced for commercial or popular consumption. The popularity and reach of many digital games shows that the form has far more potential for engaging audiences than is achieved by most "serious games."

Conversely, the notion of serious or educational games has arisen in response to a gaming industry and culture that is somewhat averse to socially or politically charged themes beyond warfare - particularly when compared to artistic fields such as literature or cinema. Any passing familiarity with what passes for the gaming mainstream would admit very few examples of cli-fi games. The two most relevant commercial games – *Fate of the World* and *Anno 2070* – have elsewhere been critiqued by Abraham (2015) for the simplicity and inefficacy of their "message" along similar lines to those mentioned already. So far this does not suggest a significant cultural or artistic trend similar to the "cli-fi" genre.

The examples above suggest a similar initial result to Jordan's review of Australian cli-fi, with very few explicit examples and even fewer achieving mainstream success. But as noted above, Jordan also argues that climate change is so pervasive an issue that it exceeds its own explicit thematisation, springing up in other less direct ways. Similarly, when we broaden the scope of our inquiry in a manner analogous to Jordan's, the picture of cli-fi in videogames changes quite considerably.

Four environmental models

What do we find if we follow Jordan's lead and expand our field of view beyond "climate change" as an explicit theme? In this light, the design of

environments comes to be a core element of game design: sub-disciplines such as level design, encounter design and system design among others are central to producing the environments in which contemporary games take place. Designed space is a key aspect of gaming, and each design has (implicit or explicit) ways of conceptualising the environment.

We argue that there are four broad models or ideal types (in the Weberian sense) for ecological relationships within digital games – four ways in which human players relate to the environments instantiated in digital games. None of our four suggested "modes" are perfect or "ideal," none being fully able to embody a perspective that avoids reproducing the same types of human-nature relationships that are so problematic and that underwrite the climate crisis (Moore; Plumwood). How to do this remains an open question for game design. Each mode is likely to be present to different degrees in the majority of games, and at any given moment a game can change from one to another depending on context – they are by no means necessarily exclusive, or even consistent within a given game. We do contend however that the four modes broadly cover the various ways in which videogame designs model the human-environment relation.

Mode 1: Environment as backdrop

The first of our four ecological models is the most obvious and self-explanatory. It is also perhaps the simplest. When games adopt an "environment as backdrop" approach, what consists of an "environment" here is either limited to a static or unchanging backdrop, or a smooth empty space in relation to which efficient movement takes place. Frequently this combines in the form of a flat 2D plane in front of which the action takes place. It embodies and reproduces the classic Western notion of the "environment" or "space" as an empty container, in the Cartesian tradition. In games this can give a sense that certain signifiers are present simply in a mode of "being-moved-past" (Jayemanne 2017) rather than as substantive entities in their own right.

Moore describes the contemporary thought tradition that this mirrors, describing the revolution in depiction and visualisation that came with Cartesian thought and the mind/body dualism: "In the new cartography, geography was cleansed of its troubling particularities and meanings. It became 'space as pure quantity.' It became abstract space – and therefore, abstract Nature" (Moore 72). Many other theorists have problematized this conceptualisation of space, often intimately tied to its visual representation, for instance Nicholas Mirzoeff in his work on visualisation and visuality. Likewise, Daniel Golding has critiqued the way the field of game studies has often deployed conceptions of space "from above," treating game space as "configurable" – a view that reproduces the seemingly complete, top-down, or strategic perspective of the designer – rather than "navigable" by an individual with a specific and embodied perspective. Arguing instead for a turn towards analysis "from below" he claims that "it is impossible to separate analysis of space from the analysis of its use" (Golding 124).

Golding gestures towards a Gibsonian perspective of the "affordance" – itself an ecological/relational perspective that implies both a living organism, with a distinct bodily experience, and a certain relation to object. Environment-as-background should be considered in relation not just to visual aspects (as in the foreground of a cinematic shot) but to possibilities for player activity. For instance, an emblematic example of this mode is the parallax-scrolling 2D environments of early 90s platformers – from *Commander Keen*, *Jazz Jackrabbit*, and *Abe's Odyssey*. Many of these games feature static backgrounds, in front of which the player and select interactive objects sit. Contemporary platformer games often still adopt this mode, with recent entries like *Limbo*, *Shadow Complex* and *Super Meat Boy* reproducing the clear distinction between the foreground space of action and the largely inert background. When the environment serves as the ground for the player to walk upon, or a screen in which the player passes in front of, the environment is operating in an "environment as backdrop" mode and for the vast majority of these examples, this is how these elements operate.

Not all elements of painted backdrop or scenery are entirely scenic, to be sure – and there are many moments where these background elements become interactive. When the player enters a doorway in *Abe's Odyssey* that element is no longer acting as a "backdrop," and these active screen elements disproportionately receive player (and scholarly) attention, with much of the remainder of the "space" or "backdrop" relegated to the category of "aesthetics," "art style" and often considered "non-essential." Noting the "environment as backdrop" mode, however, brings these elements into greater focus, as well as highlighting the Western human/nature dualism which is being reproduced by such a "foreground/background" distinction.

Occasionally the environment-as-backdrop mode breaks down, or is transformed. In Disney's original PlayStation game *Hercules*, at one point the player faces an obstacle they cannot jump over. Up until that point, the player has only travelled in a left/right direction, and needs to travel instead *into* what was previously the background. The idea of travelling *into the background* is a fairly radical one when stuck within this mode – one of this paper's authors became "stuck" on this section, unable to consider what to do about this insurmountable obstacle because it was difficult to even consider that it might even be possible for the background to be actively entered. Getting "stuck" because the environment does not reveal a necessary passage shades into our third environmental mode which is "environment as antagonist" – or something to be overcome, and it is by no means limited to 2D games. A similar example in a 3D game occurred in one of *Final Fantasy VII*'s early Midgar Slums levels, which features a top-down view of a pile of rubble – again stumping one of us as a young player, not being able to comprehend the active role played by what he considered a "background element" – a coloured plank which allows the player to traverse a raised ledge. The discovery of how to progress past this blockage became entirely accidental with the environment, formerly simply "background," suddenly rendered an active space for agency and movement, permitting passage.

While many of the examples above are from earlier eras of gaming, the environment-as-background is present in all games insofar as they are finite in scale. Even contemporary 3D "open world" games, which sport massive worlds (such as *Horizon: Zero Dawn* or *The Witcher 3: The Wild Hunt*), have outer bounds or limits such as an arbitrary point beyond which players cannot move or a "skybox" which gives the impression of meteorological phenomena but actually sits on top of the game world like a cloche. Furthermore, the idea of a "background" is complicated by the strategies by which videogames create the experience of space: often, environments consist of hollow surfaces intended to give the impression of substantive objects and environs. In a large urban sprawl such as that modelled by *Grand Theft Auto V*, for example, the majority of the action takes place on the streets. Very few buildings can actually be entered: instead, they function as a "background" to the game's primary focus on vehicular movement.

Mode 2: Environment as resource

The second of our heuristic lenses is "environment as resource" and it covers an even more varied conceptual terrain. This is the environment as something to be exploited. Games deploy this relationship whenever they utilize extractive or collecting mechanics for the sake of development, deployment or creation. Resource management has been a frequent element of games since their inception, and "resource" here is taken in the broadest sense. A resource in a game can be anything that is required or drawn upon within the broader schemata of the gameplay and mechanics.

The raw materials needed to build military units in a strategy game are one such "resource." In the real-time strategy game *StarCraft*, each military unit costs a certain amount of an abundant resource (minerals) and a rarer resource (gas). The amount that appear on a given map is typically pre-determined, and crucially limited so that a game cannot go on indefinitely. In this way, it's tempting to think that when the resources of a given gamespace or map are "limited," then an important dynamic of real-world environments (i.e. their capacity for depletion and exhaustion) is being reproduced through the game design. While this is the case, other aspects of this mode contravene this otherwise useful environmental interpretation. For instance, it ignores or overlooks the entirely instrumental relationship that these "resources" have for the (human) player.

Minerals and "Vespene gas" stand in for and variously limit or enable the development and deployment of a military force, necessary for winning the game. The resources themselves have a fixed relationship and place within the resource "economy" – 50 minerals for a worker, who mines a small batch of minerals at a certain rate, allowing for the production of more workers and other units in a geometric, and crucially *economic* sequence. And this connection is the key – whenever environment as resource is present, almost inevitably it is harnessed for and in the context of some kind of economy. In *StarCraft*, the cost of a given unit is always pre-determined (50 for a Terran marine; 100 for a Protoss zealot, and so on) and the raw materials are smoothly and economically transformed into the unit,

preserving their status as "resource" through transformation from raw material to active unit.

Likewise, the "health" of the player in the first person shooter genre can be considered a resource – one that typically presents a very strict barrier to the continuation of gameplay. When out of health (which may or may not regenerate on its own) without additional lives it is typically "game over." Similarly, running out of the resource with which to repel or defend oneself from hostile attack – bullets, mana, stamina, etc. – typically results in a similar situation, though often a less hard-failure condition. In this way, however, these resources become tied into the continuation of the game itself. The most recent *Doom* ties its health mechanic to defeating enemies, meaning that the location of threats and the means to continue the game are linked, effectively establishing a flow of player movement through the space. Once again, this presents the relation between human and environment in fairly instrumental terms, with certain things necessary to continue, and often in quite transparently "economic" ways. There is very little problematizing of the distinction between player and environment.

There are, however, ways that this distinction breaks down. More abstractly, in certain games the "resource" can be the mental resources of the player themselves – *StarCraft* itself taxes a player's attention, ability to multitask, and first-person shooters often require the player to manage a delicate balance between strategic high-level thought and instantaneous trained bodily reaction. From this perspective, the human player becomes yet another part of the resource system, and the distinction between human attention and in-game environmental resource begins to collapse (Ash; Apperley & Clemens). In any case, for the vast majority of games environmental resources exist within and serve an economic purpose.

Mode 3: Environment as antagonist

In some cases, however, elements of the environment become a resource for transforming that environment itself – explosive barrels that knock down walls, clear debris, or chop down trees. This points towards the third environmental mode: environment as antagonist. In this mode, the environment itself becomes an obstacle or an "antagonist" that resists the player. The notion of "beating" a game suggests this dynamic. Action/adventure games from the venerable *Prince of Persia* to the contemporary *Tomb Raider* and the *Uncharted* series often feature environmental obstacles and challenges for the player to navigate. These range from rugged cliff faces that must be scaled, to replications of dangerous human-made perils like sparking power cables, all of which are commonly positioned within the 3D space of the game as part of the environment. This perspective usefully suggests an acknowledgement that built environments are just as much "environments" as their "natural," pristine or wilderness counterparts – which are never anything of the sort anyway, as Morton (2010) argues.

Furthermore, there is also often a difficulty in making clear distinctions between animate elements (such as enemies – human, animal or monster) of

the game and more static formations such as aforementioned obstacles. In this sense, enemies are just as much part of the "environment" as the walls, floors and ceilings that demarcate the game space. In games which present the player a challenge to progress all elements participate to various degrees in an ecosystem of antagonism directed at the player. In games like *Dark Souls* this distinction becomes especially difficult to maintain, as the world itself is often just as dangerous as the actual "enemies" – with deadly traps and pitfalls to be navigated by the player. This perspective already hints at an ecological or eco-systemic perspective but there are other resonance within this tradition as well.

Mode 4: Environment as text

Finally, there is game environment as a "text," as in the common level design practice of "environmental storytelling." Such designs organize the play environment such that it suggests or conveys a narrative. The locations of certain items in *Dark Souls*, for example, is such that it is possible to reconstruct the story of how they came to be left there (as opposed to random "drops" or generic items without a history).

The environment-as-text can also be seen, in a more metaphorical sense, as underwriting the explosive popularity and range of survival/crafting games over the past decade (Abraham "Examining"). These games, which often feature destructible or deformable environments in order to facilitate resource gathering and crafting (in the process, deploying the second mode – environment as resource) also end up allowing as a byproduct the *creative* control of the environment. Kyle Bohunicky has described *Minecraft* as enabling a form of ecocriticism by bringing the environment into the sphere of the player's discursive construction: "Players" discourse consists of the rocks, trees, dirt, water and biological matter, and this discursive matter provides a set of symbols with which they can write shelter, tools and media" (222). Game engines built on voxel technology, allowing for greater levels of deformation and the kind of eco-writing that Bohunicky describes, enable the game to take on textual meaning – think of players logging on to an abandoned *Minecraft* server which features the remains of hours and hours of player work, like discovering a lost civilization.

This type of game is often considered highly-emergent and Sean Cubitt argues then that the concept of emergence, often lauded in games design, reveals something essential about ecological relationships. Quoting Lewontin (133), Cubitt writes:

> "Because organisms create their own environments we cannot characterise the environment except in the presence of the organism that it surrounds" (Lewontin 133). An ecological game is then one in which the act of externalising and objectifying the environment as other is broken down by insisting on the mutuality of production, the interaction of multiple users to produce an evolving rule-set.

If we agree with this, we find that the environment-as-text mode, present in many games that utilize emergence, can be found in an incunabular form in many games – and is closest to approaching an ecological sensibility. Cubitt emphasizes the co-creation of both player and space, and the survival-crafting genre may be the best example yet of this dynamic, with players fashioning in great detail their environments. However, the extent to which players themselves are *also* refashioned according to ecological imperatives is typically quite limited: often simply by the imperatives of survival itself.

Human-environmental relationships behind the climate crisis

While such a brief review can only be representative and not exhaustive, the heuristic of four environmental models does indicate a conceptual approach to the problem of climate change games. In all four design modes, the environment is largely *subject to* the activity of more lively entities that inhabit it: either an index of their movement (background) or subject to their extractive (resource), militarist (antagonist) or cognitive (text) gameplay. As we know, however, in the form of climate change, our environment is anything but a neutral mediator of action: it is more than a box in which things occur.

How are we to conceptualise this broadening of the climate problem and how it does, or could, appear in games? At the outset, it should be noted that the preponderance of post-apocalyptic or dystopian scenarios behind climate change tropes and imagery also holds in games, and that the predilection to disaster is more pronounced in gaming's relatively limited generic palette. Innumerable space marines and fantasy heroes have quested to deal with some perilous meteorological entity or world-threatening unintended consequence of technology. But these game plots tend to misrecognise or displace the *anthropogenic* element of climate change onto otherworldly or far-future actors. Our analysis seeks to preserve anthropogenesis by incorporating work that crucially rethinks the nature-culture dichotomy.

Jason W. Moore is one of a growing number of scholars who have begun to reconceptualise the many intersecting and overlapping ecological crises facing the world, and his work is useful here. He has argued that a major contributor and guarantor of our current situation has been a certain Western philosophical and conceptual orientation towards both the very question of what it means to be human, and what this conception implies about Nature itself (with an emphatically capital N). Nature with a capital-N is "out there," a wild, untouched or untamed space of non-humanness which has been enclosed, harnessed and drawn upon as part of the long process of the emergence of capitalism. For Moore, much of the thinking around our current predicament is inflected with what he calls a type of "green arithmetic." This can also be described as a form of Cartesian dualism, assuming that if we just "add nature" back to whatever our current ways of thinking are that we will achieve a total and sufficient perspective.

Moore is of course not the first to critique either this type of Cartesianism (*cf.* Grosz) or the green arithmetic perspective. Thinkers as diverse as Bruno

Latour, Donna Haraway, Val Plumwood, Timothy Morton and others have provided their own critiques and formulations of this same deeply flawed dimension of much Western thinking. One of Moore's productive insights stems from taking the view that "capitalism is not an economic system; it is not a social system; it is *a way of organizing nature*" (2). And by nature, he takes pains to emphasise, this includes humans as well – as to be human means to be *human-in-nature*, with no separation, and neither coming "before" or taking precedence over the other.

Bruno Latour's extensive body of work on the scientific construction of "facts" (which, if successful, become "naturalised" and often lose their sense of contingency and connection to the experimental and institutional conditions that helped establish them) has similarly observed that it is impossible for anything to be more or less "natural" than anything else. The process of "construction" happens at all levels and is participated in by both human and nonhuman entities. This becomes extremely important to conceptualising climate change and gaming's place within it. Moore reminds us that the view of humans as separate from nature "is directly implicated in the colossal violence, inequality, and oppression of the modern world; and that the view of Nature as external is a fundamental condition of capital accumulation." (2) Moore uses the term "*oikeios* [which] names the relation through which humans act – and are acted upon by the whole of nature – in our environment-making" (Moore 4). There are practical consequences to this shift in perspective:

> The most elementary forms of differentiation … unfold as bundles of human and extra-human natures, interweaving biophysical and symbolic natures at every scale. The relations of class, race, and gender unfold through the *oikeios*; they are irreducible to the aggregation of their so-called social and ecological dimensions. (Moore 9)

In other words, there is always *more* than whatever we get when we add "humans" and "nature" together – there is an excess, a remainder that escapes and isn't captured by this operation. Depending on our disciplinary perspective we could call this "history" or "contingency" or perhaps even "agency" (to take a Latourian approach). Moore, like Cubitt earlier, likes to describe it as reciprocal relationships of co-fashioning – impossible to recognise from the perspective of modernity and the nature/society binary. What this suggests for our analysis of cli-fi games is that a fruitful line of inquiry may be to consider the history of games' engagements with the western conception of a human/nature binary. Looking at the field of games from this perspective it becomes clear there is a much longer and richer tradition of engagement than would be suggested by the current dearth of cli-fi games.

Ecological and Environmental Games

When the climate crisis is conceptualised as entangled with, even underwritten by the broader ecological crisis of *oikeios* – of reciprocal human

participation and entanglement within the process of environment-making – we can begin to examine the underlying issues behind the phenomenon of climate change, and are simultaneously able to exhume a longer tradition within both games and game studies. Like the more explicit climate games, the question of how games can contribute to ecological or environmental issues often also occurs within a "serious games" or "games 4 change" framework, however, and this approach has been critiqued in recent years on a variety of grounds ranging from the ideological (Pedercini; Abraham "Videogame Visions") to its questionable efficacy in achieving social or cultural change, and especially in these games' ability to engender critical reflection and learning (Tyack & Wyeth).

A common feature of the literature around the application of games to the ends of player education and reflection is a kind of optimistic "openness" – with a perennial focus on "potential" effects with little attempt to substantiate or guarantee actual learning outcomes. A brief look at this body of literature reflects this: Tim Cross discusses "AgVenture: A Farming Strategy Computer Game" and its use in undergraduate teaching, with the strongest evidence presented for efficacy resting on its ability to "enliven the presentation of economic principles" and with students "appear[ing] able to use the information presented in making their decisions" (Cross 106). Stewart, et al. present a case study of using a computer game to similarly present agricultural and business issues around farming systems in a fun way and their conclusions about efficacy rest upon self-reported responses from players; there is no attempt at comparing the pedagogical effectiveness of this method with any other form of assessment. Gonzales, et al. wish to combine the success of social media games (such as *Farmville*) and the educational function played by "land-use simulations," arguing that the success of the former "*suggests* that radically new possibilities exist" (Gonzales et al. 20, emphasis ours) for combination with the latter.

Lee et al. describe a "real-world action game for climate change education" with "pilot tests *suggest[ing]* that gameplay helped players realize the importance of their personal actions, with reports of new behaviors and an increased desire to educate others on the website and beyond" (Lee, et al. 362); Bell-Gawne notes "there is hopeful evidence" in her review of a game attempting to teach environmental policy. Smith and Sanchez describe social games' potential for learning, claiming they "may turn out to be power learning tools" (Smith and Sanchez 73). Kelly and Nardi have argued for games' potential to engage players with themes of sustainability and environmentalism, simulating scenarios of scarcity (Kelly and Nardi). Not least of all, Jane McGonigal's book *Reality is Broken*, as well as much of her work in this oeuvre, takes the view that the world can be changed by and through gaming, and has received sustained criticism for its overly panglossian outlook (Bogost).

Scholarship also exists outside the games for change mode, with games receiving significant attention from scholars working in an ecocritical mode. Kyle Bohunicky's work describing the "ecocomposition" involved in the game *Minecraft*, which involves the player making transformational inscriptions on the landscape itself, has already been mentioned. Alenda

Chang similarly has focussed on environmental issues and their intersection with digital games, asking the question "why must games replicate the same kind of costly obliviousness we see every day in the nonvirtual world – the refusal to acknowledge or even attempt to understand our role in climate change, environmental degradation, and species loss"? (Chang 61). Jason Bainbridge has traced the ecological themes inherent in the Pokemon series, observing that series creator Satoshi Tajiri's stated love of collecting insects as a child, an experience which has deeply guided the series' focus since its inception. Matt Barton has argued for more detail in the environmental simulations of weather in games, arguing that greater verisimilitude will allow games to tackle issues like global warming. He asks, "how can games acknowledge the threat of global warming when game characters fail to take notice of a torrential downpour on their heads?" (Barton).

There is a more critical question that underlies this body of work and could guide future scholarship: that is, how do we conceptualise the human-nature relationships in games? This would entail asking questions about the medium-specificity of videogames and the environmental costs of gaming (Dyer-Witheford and de Peuter) – but also, more narrowly, about how players and other mobile entities are *innervated* within game worlds, and how those worlds affect and are affected in return. Useful contributions to these questions have been made by Alex Galloway who draws our attention to the following distinction: "if photographs are images, and films are moving images, then *videogames are actions*" (Galloway 2). Similarly, Brendan Keogh, Thomas Apperley and others have usefully argued for the body of the gamer as a critical site or contributor to how meaning is created in and through game play. Apperley describes the body of the player as "embroiled in a vital imbroglio of feedback between their body and the software and hardware of the videogame" (Apperley 1). Videogame play is thus fundamentally ecosystemic, incorporating multiple actors within a cybernetic circuit (Dovey & Kennedy; Jayemanne). In addition to semiotic and conceptual concerns, then, it is important to consider how games incorporate and structure player activity within the game world and in which ways these challenge or recapitulate the four environmental modes.

Conclusion

Once we broaden our concern beyond a narrow focus on games thematically or narratively about climate change, and include games that are conceptually about the same issues at the root of the climate crisis, we find a different and quite expanded picture. The modes of human-environmental activity outlined above paint a rough picture of the space that artists and activists working with interactive games inevitably need to navigate and subvert.

As we have shown with our review of the existing modes of engagement with climate games, activists and advocates wishing to use games face a difficult task, risking falling into the same dynamic as the didactic or "serious games" which largely do not succeed at having the widespread transformative effects they aim for. Using this heuristic, it is possible to break down a particular climate change game design in terms of what elements serve in

which mode, and how they relate to player activity. For example, it could be argued that not enough climate change games are *climate justice games*: in assuming a unified human agency that acts to affect change, do many such games push aside questions of uneven development and environmental impact and effectively relegate large swathes of humanity to the environment-as-background? This is also a challenge to address modalities of Western power that serious games have been reluctant to touch: while *Papers, Please* is a critical darling that reflects on communist bureaucracy and border crossing, in light of the recent release of a draft report on climate change from 13 federal US agencies amongst fear of censorship by the executive (Friedman), perhaps a somewhat more straightforward sequel is called for.

Each of the four modes describes a particular way in which designers can and have posed the question of the environment in their work. However, each environmental mode also indicates a problem insofar as they are often static boundaries or frameworks for player action (its "possibility space," following Salen and Zimmerman) and aesthetic pleasure within a given game: none of these four modes really capture the potential of how the weird assemblages we call videogames can deal with the weird event we call climate change. The background may be unreachable; the resource extraction may be unproblematic and the economy oversimplified; the antagonists incapable of retreat or parley; the text uninspired. These static environmental modes are limits to the more general notion of exchange or co-fashioning of human and environment through complex and reciprocal relations we are suggesting would be the basis of a game that includes anthropogenic climate change.

One of the difficulties, then, in seeing these alternative pathways to environmental action in digital games is what Deborah Bird Rose described as the western "ego-centered view of the environment," which can roughly map onto the figure of the videogame "player" that organizes so much game design discourse and production. This view constrains and hampers both creators and players:

> The egocentric view of landscape, wherein one either sees oneself or one sees nothing at all, constitutes a kind of blindness; it closes off the evidence of what really is there. (Rose 18)

From this point of view, perhaps the most powerful "climate change games" are those that, far from explicitly adding a climate change theme over a traditional game design (and which perhaps uncritically take on board rhetorics of "realism" from the game industry), actively work to reconfigure our notion of the human-nature environment. Instead, as designer and digital media artist Darius Kazemi points out, the "flat ontology" of a game such as *Katamari Damacy* (and the more recent *Everything* by David O'Reilly), in which everything in a vast universe is capable of being rolled up into an ever-increasing sphere, escapes the four environmental modes by which videogames distinguish playful subjects within a world of mere "objects" of play. The difference between player and world is subordinated to "rollability" – a bizarre Spinozan substance that unites beings that otherwise seem wildly different.

These games reveal a mutuality between beings that exceeds their conceptualization as background, resource, antagonist or text, creating worlds in which both ego-centric player viewpoint and subject-object relations are radically opened, can be seen as the contemporary equivalent of Walter Benjamin's reading of the animation cinema of his own time: with its eccentric characters and talking animals, the "globe-spanning" Mickey Mouse is an image that is "radically challenging anthropocentric hierarchies" (Hansen; see also Leslie). To extend Benjamin's thought here: perhaps the salient question is less "where is the cli-fi literature of videogames" and more "What can cli-fi of all kinds learn from gaming's most interesting experiments with form?"

We began this piece with a discussion of the emerging trend within contemporary literary fiction that has been labelled "cli-fi" – climate fiction set in the almost-present, as a response to the increasingly obvious and in-your face nature of climate change. Given the size and scope of the contemporary digital games industry, we wondered "where are the cli-fi games?" finding very few within the mainstream. Instead, they exist largely in the silos of educational games, which while sometimes successful within institutional contexts can struggle to show cultural influence and impact of the likes of blockbuster games like *Call of Duty*. If cli-fi literature is an example of growing awareness and concern over climate change, as well as an argument for its increasing cultural centrality, then a missing cli-fi trend in digital games is indeed something of an indictment of the medium's relevance. But if games, in all their distinctiveness and peculiarity, instead have other more productive potential modes of engagement with the underlying causes of climate change, beyond the four sketched out here, then perhaps they will be poised to make a unique contribution after all to addressing what Amitav Ghosh has called "The Great Derangement": "humans of the future will surely understand … that only in one, very brief era … did a significant number of their kind believe that planets and asteroids are inert" (Ghosh 3).

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