Review: *Digital Games After Climate Change*, by Benjamin J. Abraham. 2022. Palgrave Macmillan. xv + 254 pp.

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Game studies scholarship is increasingly considering questions of ecology and climate change, as evidenced by dedicated journal themes in recent years (Bohunicky & Bianchi, 2018; Chang & Parham, 2017). Benjamin Abraham, in an article co-authored with Darshana Jayemanne (2017), already posed the question "where are all the climate change games?" (p. 74), with the takeaway that the games industry has some yet untapped potential to engage with fictional themes corresponding to many dimensions of climate change. In *Digital Games After Climate Change*, Abraham pursues a wholly different approach—an inductive study of the carbon footprint of the videogames industry. Here, he renounces most of the scholarship focused on the pedagogical effect of games to change player behaviors for the better, favoring a focus on the sustainability of game production, distribution, and consumption. This argument makes up the focus of the first, mostly theoretical, part of the book, comprising of Chapter 2 and 3. Having established this change of focus and its motivations, Abraham turns to a preliminary collection of relevant data concerning games industry emissions, and this information makes up the remainder of the analysis, consisting of Chapter 4 to 7. In unpacking the contents of Abraham's work, I first consider his theoretical underpinnings in the early chapters, before delving into the more straightforward findings he provides in later chapters.

Chapter 1 serves as the introduction and contextualization of the work. Abraham commences by positioning the book in recent ecological thought, involving the ideas to reimagine all strands of civilization more ecologically—which is inferred to be inconsistent with capitalism's way of organizing nature as an external and exploitable entity (Moore, 2015). Abraham argues that despite the seemingly marginal carbon emissions of the games industry—0.04% of global emissions—the games industry should nonetheless be thoroughly committed to achieving carbon neutrality.

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Chapter 2 engages with the (ironically posed) question of how games can save the world, an idea popularized by game designer Jane McGonigal (2011). Abraham explicitly positions himself against such sentiments and ultimately renounces the suggestion of pedagogical effects of games identified by many scholars. He mainly relies on the argument that players are not homogeneous, and therefore do not respond similarly or reliably to games advocating ecological values—an argument that directly contrasts with the idea of persuasive games (Bogost, 2007). Still, Abraham does not completely disregard the aesthetics of games as a factor in co-constructing a more ecological world. He suggests that games can already experiment with ecological futurity by including the sustainable technologies of the near future within visual world design, thus subtly showing the appeal of such technologies.

Chapter 3 develops the debate on the pedagogical potentialities of videogames by suggesting a change of approach for ecologically motivated games. Rather than focusing on any potential to persuade players to live more ecologically, he argues scholars should study the material context of game production and distribution—a position inspired by and expanding on game studies' material turn (Apperley & Jayemanne, 2012). Abraham unpacks his argument further by redefining the very concept of the ecological game:

> The truly ecological game is already aware of its carbon emissions, has already reduced its carbon footprint, has already decoupled itself from the resource extractive aspects of the games industry. [It] no longer matters much whether or not a game can or does change a climate skeptic's mind. (p. 82)

Thus, Abraham calls for a seriously different approach to conducting ecological game studies scholarship, focusing on the material realities of emissions and environmental destruction implicit in the production of videogames, rather than on their presumed ability to convince players of ecological politics. In the rest of the book, Abraham delineates a series of preliminary data to initiate this new focus of study.

At this point, one may question whether Abraham's suggestion should be followed as radically as he suggests. Even if it is easily agreed upon that the games industry should neutralize emissions and environmental damage as soon as possible, the rebuttal of content-focused ecological politics seems too premature. While the games industry accounts for 0.04% of global emissions (Abraham states it emits as much as Slovenia with little more than 2 million inhabitants; p. 19), there are approximately 2.5-3.5 billion gameplayers around the world (Clement, 2022; Wijman, 2020), and they usually live in energy-intensive regions. As gameplayers evidently make up a huge portion of the global population, having games convince even a minor part of the gaming community to make sustainable adjustments in lifestyle could

produce a similar emission-reducing effect to the one envisioned through making the games industry carbon neutral. Therefore, Abraham's dismissal of games' pedagogical potential appears to neglect a meaningful, if challenging, area of potential ecological improvement.

Still, this less convincing claim is no detriment to the inductive research Abraham conducts in the following chapters, with Chapter 4 to 6 ordered from most to least urgent areas of emissions. Chapter 4 deals with the available numbers substantiating the 0.04% emission contribution of game development (the high end of estimates). Abraham studies employee numbers, offices, and equipment considerations, and provides preliminary emission statistics for AAA game studios (the opaqueness of whom makes the data barely retrievable). He also emphasizes promising developments in some mid-sized game development studios, which have already cultivated an ecological culture within their practice. As such, Abraham sketches a complicated and naturally incomplete, yet hopeful outlook on reducing emissions from the perspective of development.

Chapter 5 turns to the distribution of games. Basing his findings on a combination of marketing and accessible company data, Abraham deduces that the distribution of game discs is far from as sustainable as it could be, mostly due to the near-instantaneous release dates all around the globe that require more emissive air rather than sea transportation. His main argument is that the games industry should further digitize and eventually become fully digital, as the emissions of electricity will be relatively straightforwardly offset by the forthcoming developments of the renewable energy transition. This development would be less easily achievable if games continue to be physically shipped. However, Abraham is arguably too optimistic here regarding the renewable energy transition. In addition, Internet quality is not universally proficient enough (especially in the Global South) to facilitate an exclusively digital games industry.

Chapter 6 discusses the emissions involved in playing games. Here, Abraham considers both how energy could be more effectively saved during play, as well as how games can be designed to require less energy. He welcomes creative initiatives to embed sustainability figures in gameplay and pays attention to the increasing energy costs with every console generation. This leads Abraham to argue that the perpetual upscaling of consoles and their features must come to an end, and that a more constrained utilization of current technologies ("the last console generation") would produce creative challenges for developers that could potentially result in highly interesting games.

In Chapter 7, Abraham conducts an unorthodox inductive study of the (periodic) elements hidden in the PlayStation 4's advanced processing unit (APU) and connects these elements to their material origin in and around the surface of the Earth. Abraham traces the tiniest parts of the PlayStation 4's composition to the most environmentally destructive

practices of mining in the world. Providing a detailed overview of the harms associated with elements like nickel, palladium, and gold, this chapter deals with environmental issues in which the games industry is more covertly embedded in. As such, the direction of this chapter is both original and highly provocative for further research endeavors.

Notably, Abraham continually emphasizes the opaqueness of relevant data and the guesswork involved in providing most of the numbers for his research. His call for transparency shows that this first considerable mapping of the industry's sustainability requires further expansion and attention. While this task should primarily be taken up by the industry, game scholars can already expand on the preliminary data provided by Abraham. More generally speaking, Abraham argues that the games industry should cease to increase production scale and rather envision more creative applications of current-day hardware. As such, game scholars employing game analyses could identify aesthetic innovations in game design that inspire game developers to pioneer within, rather than beyond the current console generation. An aesthetic, rather than technological acceleration, is thus well-warranted to condition the ecological transition of the games industry.

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