Game Makers against the Climate Apocalypse

Corporate Sustainability, Local Action, and Planetary Care in Game Development

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Depleting planetary resources, environmental collapse, and the threat of a climate apocalypse are increasingly popular in video games. Game makers often introduce these eco-themes through bottom-up processes, using game narratives, mechanics, and design to convey ecological messages, shift cultural values, and promote social change. Paradoxically, even green-themed games contribute to environmental harm due to extensive global value chains, precarious labour conditions, and resource-intensive technologies. Drawing on the practical expertise of industry practitioners, this research critically examines the socio-material and environmental implications of game production at the intersection of extractivist logic, market demands, and sustainability frameworks.

The paper explores complementary strategies of corporate and grassroots efforts to fight the climate apocalypse within the game industry. Corporate initiatives often require quantified metrics and financial incentives, yet the lack of standardised emissions data and industry-wide standards complicates meaningful sustainability transitions. In contrast, bottom-up initiatives adopt a care-driven approach that prioritises both planetary and human well-being. Their local strategies address planetary entanglements and extend beyond ecological concerns to challenge dominant industry norms of competition and burnout. These collaborative, action-oriented sustainability efforts reveal the potential to inspire change, drive a green transition, and envision more sustainable futures for the game industry.

This research is part of the Horizon Europe project STRATEGIES – Sustainable Transition for Europe's Game Industries, collaborating with European studios and NGOs to explore the knowledge, skills, and challenges shaping green game-making, fostering a critical discussion on sustainability in game development.

Keywords: Green Game, Game Design, Game Production, Digital Materiality, Sustainability

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Making Games in the Age of Climate Crisis

Figure 1: Climate March in Riders Republic (Ubisoft Annecy, 2021), by Ubisoft Annecy.

The world is burning - or at least forests were, as wildfires raged across France in the summer of 2022. Meanwhile, players of *Riders Republic* (Ubisoft Annecy, 2021) engaged in reforestation efforts and planted new virtual trees over the course of two weeks. The *Rebirth* event culminated in an online climate march, where players dressed in green t-shirts equipped with megaphones, drums, and banners in support of environmental action (see figure 1). This temporary activation was conceptualised in 2021 during a *Green Game Jam* (Sandifer, 2022; Fizek, 2024) organised by the *Playing for the Planet Alliance*, a UN initiative advocating for the use of games as a medium to encourage environmental engagement and awareness of climate change.

As global warming accelerates, extreme weather events such as floods, hurricanes, and wildfires affect an increasing amount of people – including game studios and game developers. While climate disasters intensify in many regions worldwide, they also appear more frequently in video games. *Ubisoft Entertainment* and the *Playing for the Planet Alliance* emphasise that delivering positive messages is something players are increasingly expecting (Sandifer, 2022; Fizek et al, 2023), particularly as climate change continues to rank among the world's most pressing challenges (Open Society Foundation, 2023, p. 28). This reflects a growing recognition of games' ability to convey ecological messages and their potential to shift cultural values among players.

The rise of genres like *Solarpunk* and *Frostpunk*, the increasing number of city-building games addressing ecological and climate issues, and the prevalence of post-apocalyptic landscapes in ruins indicate the gaming industry's engagement with climate discourse. There is no widely established definition for categorising such games yet. Terms like *climate games, eco games, green games, games for change*, and *impact games* each emphasise different dimensions of the intersection between gaming and environmental awareness. *Climate games* align closely with the literary genre of climate fiction, or *cli-fi* (Abraham & Jayemanne, 2017), while *eco games* (De Beke et al., 2024) suggest a broader scope, positioning these games within *eco-media* or

green popular culture (Chang & Parham, 2017). Some of these games are produced as educational or serious games – designed to offer "more than entertainment" (Ritterfeld, Cody, & Vorderer, 2009). But the climate apocalypse is also increasingly present in entertainment-first titles, often employing more subtle forms of narrative, landscape design, gameplay, graphics, or mechanics to address ecological issues, create impact, or allow players to forge new relationships with nature (Fizek, 2024).

Paradoxically, green-themed games often simultaneously contribute to environmental harm and the destruction of the planet (Abraham, 2022). Games rely on global value chains, precarious labour, resource-intensive technology production, and planetary resource consumption (Abraham, 2022; Gordon, 2019, 2020). In *Digital Games After Climate Change* (2022), Ben Abraham estimates the total energy consumption of the gaming industry based on limited reports and later refines his calculations, concluding that the industry likely produced around 16 million tons of CO_2 emissions in 2023 (Abraham, 2024). Additionally, games depend on hardware and software infrastructures, which require components sourced through long and complex supply chains, including rare earth and minerals, often extracted in mining processes that harm both people and the planet (Gordon, 2019; Abraham, 2022, p. 179).

> "A truly ecological game can only be one that is aware of its existence as part of the material world, the harms it causes to a range of humans, plants, animals and the planet, and takes active steps to eliminate them.", concludes Abraham (2022, p. 84).

Our current research in the *Europe Horizon* project *STRATEGIES* is dedicated to fostering such a *Sustainable Transition for Europe's Game Industries.* The collaborative research project with an interdisciplinary team of fifteen partners throughout Europe explores strategies for (1) creating green-themed games and (2) developing games in more sustainable ways. The authors of this paper empirically investigate the role of game makers, as they are at the heart of production processes with significant environmental and social impacts. Moreover, many sustainability initiatives in the industry emerge from grassroots efforts and bottom-up movements led by game creators seeking to effect change in their workplaces. As such, game studios represent a dual research interest: they are both sites where key decisions about games are made and spaces where local sustainability initiatives originate.

This paper examines the challenges of making game production more sustainable, critically tracing the complex entanglements of game development value chains and their socio-material and environmental effects. Analysing both top-down corporate strategies and bottom-up grassroots initiatives, the paper discusses two complementary approaches to sustainability: Quantified corporate measures and bottom-up practices of planetary care. To understand the possibilities and challenges of a transition toward greener practices, we highlight the strategies that empower game makers to take action and explore possible pathways for a more sustainable game industry.

Corporate Battles Against Climate Change

The threads of an ecological apocalypse are global, as phenomena like climate change and digital infrastructures transcend predefined boundaries (Blake & Gilman, 2024). Emissions and pollution are not just chemical problems confined to national borders – they are social and biological issues with far-reaching consequences (Liboiron, 2021). The sustainability challenges in gaming stem from systemic issues of digital production cycles, which necessitate coordinated global solutions through policies, regulations and industry standards. There are no industry standards for the gaming industry to evaluate or compare the environmental or social

harm caused, and reports from corporations are still rare and fragmented (Abraham, 2024). As a result, the carbon footprint of the gaming industry remains largely an approximation, with no definitive global figure capturing the full scale of gaming-related energy consumption. Abraham mourns the absence of a "scary big number" (Abraham, 2024) that could create a sense of urgency and serve as a wake-up call for the industry.

Existing efforts within the game industry are setting goals to align with global sustainability commitments, such as the *Paris Agreement's* 2015 net-zero goals. Reducing carbon emissions has become a pressing priority to mitigate global warming. However, identifying concrete pathways for emissions reduction within computing technologies, particularly gaming, remains a significant challenge. The framework for measuring and evaluating emissions is the *Greenhouse Gas Protocol*, which categorises emissions into three scopes. *Scope 1* emissions stem directly from an organisation's burning of fossil fuels, which is not happening much in game studios. *Scope 2* emissions are those generated by someone else burning fossil fuels, primarily electricity providers. For the gaming industry, this is where it starts to get tricky, as electricity usage is not limited to local studios. All the emissions in a game's value chain, from production to distribution and consumption, are considered *Scope 3 emissions* – and this is where the majority of the gaming industry's carbon footprint originates.

Attempts to evaluate these indirect emissions reveal a complex web of dependencies in game development, production and hardware value chains. In their report *Untangling the carbon complexities of the games Industry* (2023), the *Playing for the Planet Alliance* sketched out the steps of game production (figure 2). It includes game development tools like game engines (Pérez, 2024), the hardware used in development and gameplay, like computers, consoles, and other devices (Gordon, 2019, 2020), distribution and publishing processes, and digital networks (Marsden, 2020) such as cloud gaming (Aslan, 2020; Hu, 2015), which rely on energy-intensive data centres. While research shows that all these elements contribute significantly to global emissions, their exact impact is difficult to track and quantify. Regulatory mechanisms, such as the European Union's emerging *Energy and Carbon Sustainability Reporting* (ECSR), increase legislative pressure for climate neutrality. In the future, it seeks to hold industries accountable by tracing their value chains and measuring their environmental impact. Meanwhile, non-profit organisations like the *Sustainable Games Alliance* (SGA), founded in 2024, started to develop industry standards that enable measurements and comparisons. As straightforward as the task of calculation may seem, it faces numerous challenges, especially on a global scale (Pasek et al., 2023), and many game studios struggle to implement such measures due to their dependence on external infrastructures beyond their direct control.

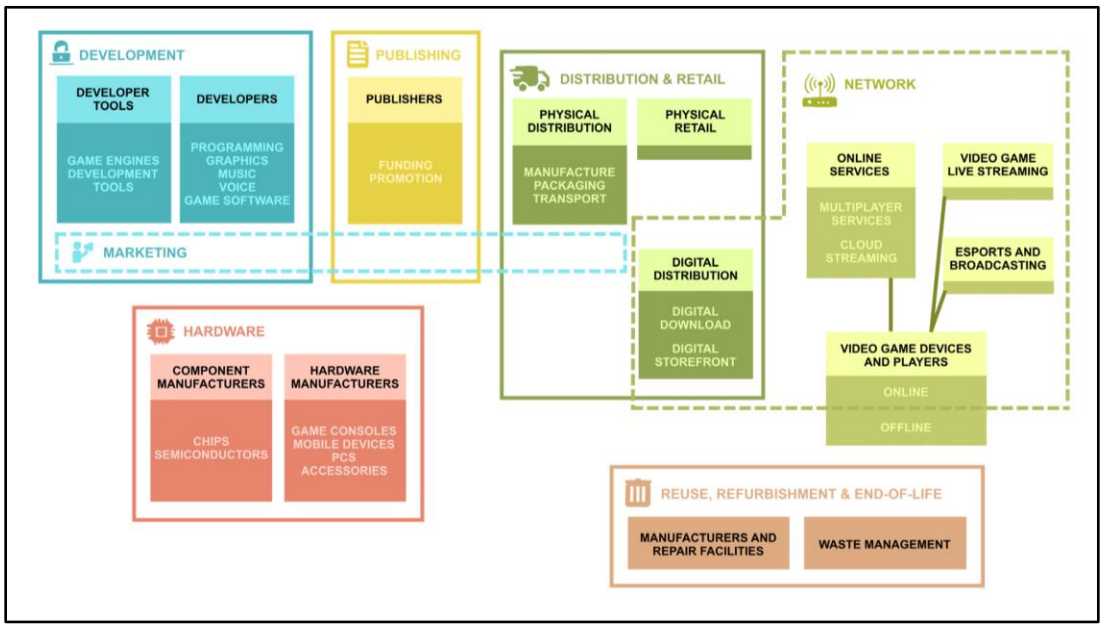

Figure 2: Gaming Value Chain as depicted in the Playing for the Planet report (Anderson et al., 2023, p. 17), by Melissa Eichhorn.

Obscuring Planetary Destruction

Efforts towards more sustainable game-making are difficult because they mix two complex systems: planetary well-being and game development value chains. These gaming value chains are embedded within broader computer technology and production trends in late capitalism. Games, like other digital technologies, are sometimes considered immaterial products. The planetary costs of gaming are not immediately visible – they are abstract and spread out across different locations, timelines, and actors. Digital industries often obscure rather than eliminate environmental and social costs by shifting degradation and resource extraction to other regions (Parrique et al., 2019, p. 22). Resource extraction and electronic waste disposal are unevenly distributed, disproportionately impacting the Global South (Gordon, 2019). The invisibility of global value chains is linked to an intransparent semiconductor industry and is closely tied to the historical chip miniaturisation process. Early computers were massive machines occupying entire rooms, but the introduction of microprocessors allowed engineers to fit computers into ever smaller and sleeker cases, concealing the hardware components (Simon, 2007, p. 180). This transformation led to the idea of the "invisible computer" (Norman, 1998, vii), shifting consumer attention entirely toward the pixel images displayed on screens. The materiality of digital devices became easily overlooked, and the material blackboxing of computers marked a shift in public perception. Bruno Latour described this process of *mental blackboxing*: "When a machine runs efficiently, when a matter of fact is settled, one needs to focus only on its inputs and outputs and not on its internal complexity" (Latour, 1999, p. 304). This blackboxing effect makes digital practices – including gaming – appear immaterial, epistemically separating the digital from social and planetary consequences. This illusion of dematerialisation, which allows the disassociation of a production process from environmental impacts, was described as the process of *decoupling* by Parrique et al. (2019). To decouple the economy from natural resources obscures how economic activities remain rooted in extractivist logic (Cubitt, 2016). In contrast, Parrique et al. (2019, p. 20) argue that global GDP remains tightly linked to resource extraction, and the demand for natural resources has reached unprecedented levels. The gaming industry is no exception, as its infrastructure depends on finite planetary resources.

Our analysis of different frameworks for sustainability, like the commonly used three-pillar framework of *social, environmental and economic sustainability*, the *Economy, Ecology, Equity (EEE),* and *Environmental, Social, and Governance (ESG*), reveal a common trait: All rest on liberal economic conceptions, proposing economic growth as a necessary condition for humanity's well-being. Originally, the concept of sustainability served as a counterpoint to economic development when it emerged in response to the depletion of forest resources in 17th and 18th-century Europe (Purvis, Mao & Robinson, 2018). The term has since been reframed to align with capitalist growth imperatives in the latter half of the 20th century (Purvis, Mao & Robinson, 2018). Currently, many frameworks for corporate sustainability are shaped by ideas of *Green Growth* that have been dominating policy-making in Europe and worldwide since the 1980s (Purvis, Mao & Robinson, 2018). However, critics continue to point out that continuous economic growth is fundamentally incompatible with ecological and social sustainability and fails to resolve social inequalities but often exacerbates them (Seers, 1969; Boos Hefti & Sigg, 2024). Like the three-pillar model that fails to address the asymmetric relations between economic growth and environmental and social well-being and does not explain how economic growth should translate to more effective protection of the ecosystems and a fairer distribution of wealth worldwide (Purvis, Mao & Robinson, 2018).

Similarly, ESG funds risk becoming a form of institutionalised greenwashing and can be used as a tool for legitimising harmful business-as-usual practices under the guise of sustainability (Boos, Hefti & Sigg, 2024). Reports such as *Profit over Planet* (Boos, Hefti & Sigg, 2024) warned that most sustainable funds barely shift capital towards sustainable economic activities. "The prioritisation of financial interests over the long-term preservation of the environment starkly contradicts the climate and biodiversity goals to which most asset managers publicly commit." (Boos, Hefti & Sigg, 2024, p. 4). With no obligation or requirements, current sustainability measures in the gaming industry are voluntary undertakings and based on self-reporting. While the three biggest console producers, Sony, Nintendo and Microsoft, have been working on a Self-Regulatory Initiative (SRI), these voluntary reports lack industry-wide standards, remain partial in scope, and often shift responsibility onto consumers or small-scale studios, deflecting attention from systemic dependencies on big tech infrastructures. Thus, self-reporting remains questionable as a viable measure, and Greenpeace International asserts that "self-regulation by financial actors has proven to be ineffective, allowing banks and asset managers to greenwash in broad daylight" (Greenpeace International, 2021).

Such case studies of greenwashing illustrate a fundamental friction of many sustainability measures, a contradiction that reflects a broader issue: the same economic logic that separates production from its material consequences is expected to resolve the very crises it contributes to. Moreover, frameworks for sustainability rely on quantified evaluation, where extensive data is required to facilitate decision-making and possible implementation (Archer, 2024). Mathew Archer (2024) criticised this need for commensurability, where numerical evidence becomes a prerequisite for action. He argues that the demand for metrics can delay necessary interventions, preventing the transformation of processes for which plausible evidence for change is already available. The result is a friction between top-down metrics-driven governance and the need for transformative ecological action. This tension – between the need for accurate quantification and the urgency of action – leads back to the role of grassroots initiatives and local actors, who engage in a different approach to driving sustainability efforts from within the industry.

Game Makers against the Climate Apocalypse

While top-down strategies for sustainability focus on quantifiable solutions, bottom-up initiatives for green game development have not received much academic attention yet. An increasing number of game developers and collectives advocate for a greener industry. Our research traces and observes particularly grassroots green gaming initiatives, such as the *IGDA Climate Special Interest Group (SIG)*. Founded in 2019 by concerned game developers, the IGDA Climate SIG has grown into one of the most active communities in the advocacy for a greener industry.

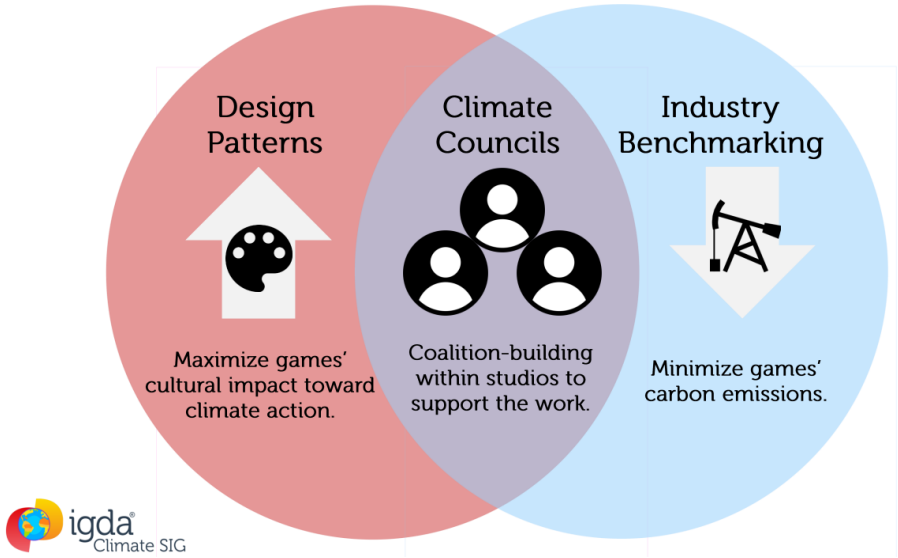

Figure 3: The three workstreams of the IGDA Climate SIG, by IGDA Climate SIG (2025).

The group is divided into three primary workstreams (figure 3): *Industry Benchmarking* focuses on quantified approaches, which are necessary for developers in larger studios to make a case for corporate transformation. The discussions in this workstream point to the remarkable fact that industry benchmarking, regulations and policies do not oppose grassroots efforts but can be used as leverage to advocate for more systemic change.

The *Design Patterns* workstream leverages the unique expertise of game makers – their ability to address ecological issues through interactive experiences. Rather than simply creating games about climate change, the IGDA Climate SIG advocates for a more intentional approach, emphasising the impact a game should have. Since the climate crisis affects everything, they propose that every game can be connected to it, but not every game can do so in the same way. To support this approach, a team of developers, researchers, and activists created the *Environmental Game Design Playbook* (Whittle et al., 2022), an extensive resource for game designers. More recently, its methodologies have been further expanded into the evolving website *Green Game Design* (IGDA Climate SIG, 2025), officially launched in March 2025. The site features a curated collection of *Games* with environmental themes, alongside *Design Theories* linked to specific *Use Cases* demonstrating their application. The examples range from depicting fossil fuel companies as villains in *Sonic the Hedgehog* 2 (1992) to *Terra Nil* (2023), a reverse city-builder that challenges techno-solutionism by requiring players to dismantle and recycle all technology used in the process of terraforming lush ecosystems (Alfred 2022).

Examining the Green Game Design website closely, it becomes clear that the focus extends beyond merely integrating sustainability into game mechanics and narratives. Alongside use cases like *Eco-Roleplay, Solarpunk* and *Building a Sustainable City* appear suggestions for *CO_2 labels for games*, Implementing a *Power-saving Mode* and *Cleaning Up Your Data Storage* P*olicy*. The ecological implications of gaming are not separated from the game design but are presented as an integral aspect of it. Suggestions for a green game design address both the upstream impacts of platforms and devices and the downstream emissions generated by players. It is a proposal for a game design that recouples the game-making process with all potential sites of impact. It is a collection of strategies, use cases, and goals, not intended for implementation in a single game but instead presenting a vast repertoire that emphasises how every game can contribute in some way.

However, their vision for green game design extends beyond in-game features. The Climate SIG website includes bold proposals such as *Put Down Your Tools,* which encourages developers to pause production and participate in climate protests, and *Identify with Activists*, which advocates for engagement with local climate initiatives. This broad approach to green game-making is also reflected in their community activities that go beyond game-making discussions, encompassing efforts like reducing travel footprints and vivid discussions on gardening strategies. The overlap of design patterns and industry benchmarking in climate councils exemplifies how community activities are at the centre of the climate SIGs activities:

> "We are an open community that seeks to build a safe and inclusive space for game industry professionals concerned about climate change. **Community care is the lifeblood of our SIG culture.** [...] We are also directly redefining our industry's culture of competition and burnout." (IGDA Climate SIG, 2025, emp. in Orig.)

This philosophy culminates in their proposal for a *Green Studio Culture*, which they consider the "upstream of studio policies" (IGDA Climate SIG, 2025). It seeks to establish a greener game industry, starting with a work environment that gives more consideration to the well-being of people and the planet. Starting with their situated position as game makers, they map out every possible action, expanding outward to reconnect all direct and indirect consequences of a single design decision. In contrast to corporate sustainability strategies, the climate SIG emphasises that becoming active does not require numerical evidence, but they collect plausible evidence as a basis for action. Moreover, the efforts for ecological sustainability are recoupled with work cultures. This is crucial because game-making is a passion-driven creative industry that often comes with precarious work conditions, where time constraints, job insecurity, and production pressures come at significant costs for the people involved (O'Donnell, 2014). Thus, the IGDA Climate SIG's attempt to establish a culture of sustainability contrasts with prevalent industry logic and suggests profound transformations of game production processes.

Battling Eco-Anxiety with Planetary Care

> We can't make games if our homes and offices are flooded, on fire, or aren't built to insulate us from extreme heat.
>
> We can't play, download, or stream our games if our power grids are disrupted by challenges for which they weren't prepared.
>
> We can't sell our games if players are dealing with severe weather, food shortages, and limited access to clean water.
>
> We won't care about reserving the next cutting-edge game or next-gen console if we only have the energy to focus on keeping ourselves and our families safe. (IGDA Climate SIG, 2025)

By framing climate change as an existential threat to game development itself, the IGDA Climate SIG underscores the urgency of action. Their grassroots efforts make a clear case: climate change is not an abstract issue; it directly impacts every aspect of life, including gaming. The SIG does not position sustainability as an external obligation but as an intrinsic responsibility rooted in an ethos of care for the planet and its people. These practices of care for a sustainable gaming industry often do not start with game development itself; instead, they emerge from a broader ethical and ecological disposition that extends across different areas of life – including the workplace. This ethos of care is reflected in the simple yet profound concern expressed by members of the IGDA climate SIG: the desire to "save the world". For many of its members, this concern is deeply personal, shaped by lived experiences and what some members call eco-anxiety, the emotional distress caused by witnessing environmental destruction and facing an uncertain future. Such a shared sense of catastrophe can be a powerful catalyst for collective action (Chakrabarty, 2009). The Climate SIG embodies this ethos in its slogan: "You are not alone. Climate change concerns all of us." (IGDA Climate SIG, 2025).

We argue that such an approach of a grassroots initiative reflects a notion of more-than-human care that acknowledges the relation between living and non-living beings. (Puig de la Bellacasa, 2011) Moreover, it opens up an interesting perspective on strategies for a green transition. In contrast to traditional sustainability approaches, care foregrounds relationality, responsibility, and ethical accountability in technoscientific practices (Staffa, 2021). It does not refer to caregiving in a conventional sense but points towards "an attentive and power-critical commitment for the wellbeing of our world" (Staffa, 2021, p. 48). Care-driven approaches to sustainability focus on the interdependencies of different human and non-human beings on the planet, encouraging to rethink what is part of green game-making. It proposes an approach against the climate apocalypse that is not based on a checklist of sustainable indicators but establishes a practice of care that acknowledges the relation between the local and the global. Estrid Sørensen et al. (2025) propose adopting a planetary thinking approach that begins with situated practices and traces their extended relations beyond the local. This concept helps us to analyse how local practices address global challenges by starting with specific acts of care and expanding outward, recoupling them with planetary impacts. The perspective on planetary care thus provides a way to understand how sustainability efforts in game development, even if they begin with small, local actions, address global dependencies and contribute to broader systemic transformations.

Conclusion: Local Strategies Against a Global Apocalypse

A persistent challenge in sustainability research remains a "knowing-doing gap" (Pfeffer and Sutton, 2000) or "intention-action gap" (Goossens et al., 2017), where awareness of environmental crisis does not necessarily translate to concrete actions. In the context of sustainable game-making, a major challenge is the difficulty of addressing globally distributed effects with local practices and of translating planetary problems into actionable local strategies. Our ongoing research explores the motivations driving game makers to become active, the challenges they face in implementation, and the solutions they develop. Through ethnographic fieldwork, interviews, and surveys, we examine current practices, investigating what it takes – in terms of resources, tools, networks, and knowledge – to engage in practices of care for people and the planet.

The initial findings presented in this paper indicate that addressing sustainability issues in an industry with global value chains requires systemic change. However, current regulations and corporate sustainability measurements often prioritise profitability, and hesitant steps can fail to drive substantial transformation. Top-down strategies tend to require quantifiable evidence

and financial justification before committing to sustainability initiatives. Our findings suggest that the lack of comprehensive global data and industry standards for the game industry can delay meaningful action. Industry standards are an urgent prerequisite for comparability and accountability, and initiatives such as the Sustainable Games Alliance deserve sustained political and financial backing.

It is essential to recognise that metrics and local actions are not mutually exclusive. Metrics and regulations can also be powerful tools for grassroots initiatives, providing leverage within corporate decision-making to foster more sustainable studio cultures and advocate for industry-wide change. At the same time, metrics are useless without meaningful implementation, and local actions should not have to wait for global metrics. Bottom-up initiatives like the IGDA Climate SIG enact an alternative pathway to green game-making. They promote an action-first approach, for which credible plausibility, rather than exact metrics, is sufficient to implement a plan of action. This is particularly relevant as 90% of European game studios are micro and small enterprises (ISFE & EGDF, 2022), many of which take practical steps without requiring extensive data-driven justification. Donna Haraway (1988) argues that we must start with specific, situated perspectives to make sense of the larger picture. Similarly, grassroots initiatives tackling climate collapse emphasise localised, issue-specific interventions rather than waiting for top-down solutions. These movements drive a green transition and inspire change by prioritising well-being and direct action over financial incentives and quantification.

Many of these bottom-up efforts remain invisible, either because companies choose not to make them public or because overt environmental branding is perceived as a liability for investment. In the face of a looming ecological apocalypse, researching these local strategies for planetary care offers promising insights. Documenting and amplifying such practices can inspire further practical action and help envision and enact more sustainable futures for the game industry. For developers, especially those in micro and indie studios, the repertoire of action can help to take proactive steps towards sustainability, leveraging their care for people and the planet and their creativity to drive impactful change. Education and training in sustainable game development should also be embedded in curricula (Fizek et al., 2023), ensuring that future professionals are equipped to confront ecological challenges through their craft.

To enable and support these local efforts, policymakers could not only establish binding reporting standards but also provide incentives for voluntary action, while ensuring that small studios are not overburdened by administrative demands. To strengthen the transitions, industry leaders should integrate sustainability into their core operations and commit to transparency, while collaborating with grassroots actors and employees who care, to draw on their expertise and creativity to implement new measures. Aligning top-down accountability with bottom-up innovation is essential if the industry is to move beyond performative measures toward meaningful ecological responsibility.

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