

**VIRTUAL LANDSCAPE AND GREEN GAME JAM IN FIGHTING THE ENVIRONMENTAL CRISIS****Received on:** March 28, 2024**Passed on:** September 19, 2024License: *Rubian Diego Andrade<sup>1</sup>*

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**ABSTRACT:** Changes in natural landscapes represent global concerns. Considering the popularity of video games as a form of leisure, it is intriguing to explore whether virtual landscapes can promote environmental awareness. This study aimed to analyze the strategies adopted in the 10 video games awarded at Green Game Jam 2023, as tools for addressing environmental challenges. The qualitative study was conducted through exploratory and documentary research, focusing on the plots, virtual landscapes, meanings, and representations in these games. The data, analyzed descriptively using multimodal content analysis, show that participating companies adapted the plots, landscapes, and characters to encourage pro-environmental strategies, highlighting the significant potential of video games in addressing environmental challenges.

**KEYWORDS:** Landscape. Video games. Leisure.

## **PAISAGEM VIRTUAL E OS GREEN GAME JAM NO ENFRENTAMENTO À CRISE AMBIENTAL**

**RESUMO:** Alterações nas paisagens naturais representam preocupações mundiais. Considerando o interesse pelos *videogames* no contexto do lazer, torna-se instigante compreender se paisagens virtuais representam subsídios na sensibilização ambiental. Esse estudo objetivou analisar as estratégias adotadas nos 10 *videogames* premiados no *Green Game Jam* 2023, como coadjuvantes no enfrentamento aos desafios ambientais. O estudo qualitativo foi desenvolvido por meio de pesquisas exploratória e documental, tomando como foco os enredos, paisagens virtuais, significados e representações nesses *games*. Os dados analisados descritivamente por análise de conteúdo multimodal apontam que as empresas participantes adequaram os enredos, as paisagens e os personagens dos *games* para estimular estratégias pró-ambientais, evidenciam os *videogames* como potencial significativo no enfrentamento aos desafios ambientais.

**PALAVRAS-CHAVE:** Paisagem. *Videogames*. Lazer.

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## Introduction

The contemporary notion of landscape reveals that it goes beyond the simple idea of scenery, being seen as a set of numerous and diverse elements, which make up, in a heterogeneous and singular way, this context. In this sense, landscapes also present variety in spaces, in the time scales of occurrence of ecological processes, as well as in the systems of integrated elements, which trigger this broader notion, associated with landscape ecology (TURNER, 2005). This system, therefore, is composed of several connected elements, which promote the overcoming of the restricted idea of landscape, merely as a setting. This expanded perspective of landscape ecology includes elements focused on geographic, biological, ecological, economic, and even cultural aspects, which are part of the landscape's behavior.

Thus, landscape ecology serves as a synthetic nexus for the reciprocal interactions among these aspects, accounting for both biotic and abiotic processes. Within this framework, it considers both natural ecosystems and those managed by humans, embracing their heterogeneity to elucidate how they dialectically influence and are influenced by disturbances - often mediated or caused by human activity (Cushman, 2023). Humanity's pursuit of improved living standards hinges on ceaselessly developing strategies to counter the finite nature of the natural resources essential for life on Earth. Amid ongoing disruptions to contemporary ecosystems - primarily driven by human actions - the need for decisive interventions and effective measures is increasingly urgent, aimed at enhancing quality of life and ensuring its preservation.

It is in this sense that all sectors of society have focused on implementing initiatives to reinvigorate ecological awareness -emphasizing the importance of human attitudes and behaviors that respect the planet. Promoting environmental awareness is

no simple task and, according to Mukhammadjonovna (2023), should be encouraged from an early age to prevent unbalanced situations later on. Raising environmental awareness involves an evaluative and purposeful process of reflection on reality, aimed at promoting the rational regulation of behavior through emotional, personality, self-control, and ethical aspects.

According to this same author, the origin of the rational and responsible regulation of individual ecological behavior is directly associated with culture in its broad sense, permeating both already established environmental education actions at the formal level of education, as well as in the non-formal sphere, involving leisure. The author also highlights that the main challenge is finding integrated strategies to overcome indifference towards the finiteness of nature.

Environmental education represents a systematic and continuous process already underway, which has sought to develop and improve the ecological concept, especially in a school context. However, these actions still appear to be incipient or rudimentary, given the worsening problems associated with global warming and climate change, with irreparable environmental crises. Thus, it becomes urgent to seek innovative ways, combined with actions already underway in the school context, that can be effective and combine efforts, in order to increase environmental awareness (Shermukhammadov, 2022). Thinking from this perspective, the field of leisure also represents a fruitful space for education and production of knowledge related to environmental awareness (Terezani et al., 2013; Silva et al., 2022).

Over the past few decades, various commitments have been made by various social actors, operating at individual, national and transnational levels, to discuss ways to minimize environmental problems. Through educational and sociopolitical actions

and the establishment of pro-environmental social movements, scholars in the field of leisure have intensified their assertions regarding the potential of leisure in the processes of environmental awareness and sensitization, connecting the bodily experiences arising from involvement in the cultural contents of leisure with local and even global pro-environmental actions (Mansfield; Wheaton, 2023).

Positive interactions are already known, in the sense of environmental awareness, when human approximation with environments involving nature and the diversity of constituent elements of these natural landscapes takes place, in leisure experiences, as evidenced by Figueiredo and Schwartz (2013), Pereira and Armbrust (2023), Finardi and Ulasowicz (2023), among other scholars. However, when focusing on other environments and landscapes that are equally conducive to experiences in the leisure context, such as experiences developed in the virtual environment, involving video games and esports, for example, these relationships with aspects of environmental awareness are not always so clear (Weinhardt, 2019), but they already represent potential to be studied.

When outlining the constitutive dimensions of analyses focusing on the potential of video games in environmental activism processes, Amadori (2023) highlights that there are already campaign networks for the creation of gaming ecosystems, capable of triggering the initial potential of this relationship. Other equally important initiatives also highlight new trajectories of intersection between the world of video games and ecological activism, experienced in the context of leisure, such as the actions of the Playing for the Planet Alliance, the United Nations, and video game production companies and esports participants who support the notion of sports modalities loaded with meaning, beyond the activity manifested bodily (Weinhardt, 2019).

The video game industry is experiencing constant growth and, according to Pimentel (2023), there were around 2.7 billion gamers worldwide in 2021, of which 405 million were subscribers to YouTube channels and followers of the main gaming influencers. In Brazil, as Pimentel (2023) explains, the video game industry already showed an average growth of 30% per year in 2018 and the country was ranked thirteenth among the largest consumers of games in the world, based on one active smartphone per inhabitant. Based on this data, one can see the potential of video games, the focus of this study, as a high-impact media, both from an economic and sociocultural point of view (Matumoto; Gonçalves-Segundo, 2023). These media therefore represent important tools for triggering attitudes and values, as well as new, potentially sensitizing meanings.

This growing and attractive audience for video games has generated interest among environmental activists and game developers in instilling messages addressing issues related to the threats to the planet, due to the climate crisis. Thus, some video game development companies, committed to incorporating environmental themes into their products, were willing to create ecologically themed plots and dystopian landscapes, manifesting the threats to life on earth, which would encourage reflection and pro-environmental behavior, based on the evidence that, from virtual stimuli integrated into games, one can significantly impact behaviors in the real world (Patterson; Barratt, 2019).

Based on these optimistic premises regarding people's identification with video games, one of the actions adopted worldwide refers to the proposal of the United Nations Environment Programme (UNEP), which launched the initiative aimed at the Playing for the Planet Alliance in 2019. This Alliance reinvigorates a partnership with

the video game industry, with a view to promoting and valuing video games as potential resources in tackling the climate and environmental crises (Patterson; Barratt, 2019). This initiative, involving the Play for the Planet Alliance, aims to tackle environmental challenges through technology and creativity. This alliance seeks to promote the interactive entertainment industry's initiatives regarding sustainability issues, encouraging protagonism and the evolution of the adoption of best practices, with the collaboration of national and international organizations, in a collective effort to benefit the ecosystem.

Within the action proposals of this Alliance, the innovative organization of the Green Game Jam emerged, which represents an annual competition, with the participation of game companies, who are challenged to integrate, in their games, activation proposals related to the knowledge and confrontation of climate change and other environmental problems. These motivations can be embedded in plots, landscapes, messages, and characters, to highlight the environmental challenges to be faced and encourage assertive decision-making. These games aim to implement ecological principles in already established games, with the aim of bringing together an active audience of millions of users around the world, offering inspiration so that they take the lead in actions that can benefit the planet. In addition to games aimed at defending this environmental discourse, this action also encourages other initiatives, such as planting thousands of trees and improving other strategies that support the global environmental agenda.

The video games participating in the Green Game Jam cover several categories of games, to cater to different audiences and genres of participants, containing various types of messages to be assimilated. This project is annual and also involves raising

funds to support wildlife protection actions in various locations around the world, such as the Amazon or the Himalayas. The use of the word Jam, in this initiative, represents a reference to the jam session style, in music, in which there is an informal meeting of musicians, in which the audience is also invited to improvise. In this sense, the game jam makes this allusion, inviting developers to create a prototype product design, adding new ideas to the field of the video game industry.

As highlighted by Pernisa Júnior and Moreno (2023), virtual and metaverse resources, with the immersive possibilities provided by the languages of artificial intelligence and virtual and augmented realities, are increasingly being used as tools to catalyze sustainability. With this, researchers are realizing that immersive and interactive landscapes, provided by these technological resources, can represent a support for making people reflect and understand, clearly, the environmental challenges in the world, promoting a sense of urgency for protagonism in facing these challenges. This type of initiative is extremely important to encourage other actions of the same magnitude. Thus, considering the intense evolution of technological resources and the great impact and interest in video games in the context of leisure, it becomes intriguing to highlight and understand the subsidies inserted in this Green Game Jam action, in the dissemination of environmental awareness. Therefore, this study aimed to identify and disseminate the strategies adopted in the video games awarded at the Green Game Jam 2023, offering supporting actions in facing environmental challenges.

## **Method**

The study was qualitative in nature and was developed through the combination of exploratory research and documentary analysis. Exploratory research helps to

understand the different nuances that characterize the universe researched, as highlighted by Howard and Henderson (2023). Research involving document analysis highlights the contribution of documents already prepared, which may refer to written texts, or even content from virtual environment resources, such as videos, websites, or other forms of material disseminated in different ways. In this sense, data from the information contained on the Green Game Jam website were taken into consideration, focusing on the 10 video games from the respective companies awarded in this initiative (Playing Four The Planet, 2023).

As an inclusion criterion, the 10 placed in the competition were taken into consideration for analysis, which contained a description of the strategies listed in the game proposal, available on the Green Game Jam 2023 website. Furthermore, to obtain more information about the description of the games, other websites were researched, complementing the information necessary to carry out the analysis. The exploratory research was carried out from September to December 2023, with the preparation of the list of games participating in the study and the search for their descriptions. Applying the inclusion criteria, 10 games were listed, which comprised the intentional sample participating in the study.

The documentary analysis adopted in the study represents a way of examining and understanding the most significant condensed information, which is expressed in different types of documents, whether written, oral, visual or in the virtual environment (Lima Junior et al., 2021). This analysis was carried out with the aim of identifying and appreciating details of the elements that defined the games. To help elucidate the meanings obtained through documentary analysis, the multimodal content analysis technique was performed, in the view of Serafini and Reid (2023). This technique is an

update of Bardin's (2011) proposal, now taking into account information expressed through digital technological resources.

According to the authors, this contemporary technique allows the identification of several variables related, specifically, to forms of digital communication, which are multimodal. Therefore, detailed aspects of the messages inserted in the games can be learned. To this end, three categories of analysis were established a priori, referring to: 1- categorization of games, 2- narratives, 3- expressive coherence and representations, in order to highlight the semiotic potential contained in games. The results were compared with studies already produced in the literature and promote reflections, which can deepen the production in the area.

## Results and Discussion

The analyzed data, which aimed to explore the potential of video games from the Green Game Jam as a strategy for addressing the environmental crisis, reveal various resources for maximizing games' role in raising awareness about nature and the environment. For a clearer understanding of the study, Table 1 below lists the analyzed video games along with their key details.

**Table 1:** Description of video games and details of the games analyzed in the study

NAME OF THE GAME	GAME TYPE	CHARACTERS	NARRATIVE	OBJECTIVE OF THE GAME
<i>June's Journey</i> ( <i>June's Journey</i> <i>June's Journey</i> <i>Wildlife Week</i>	Hidden object puzzle adventure game	Detective June Parker	The landscapes are based on the Himalayan mountains, and with the idea of wildlife, helping to bring players closer to the regions where endangered animals live, such as the snow leopard. The island created in this case is covered in snow and mountains. There are also other snow animals to be found in this game, not limited to the Snow	500,000 objects to be collected and when this number is reached, by the total number of players during the Green Games week, there will be a donation of 100,000 dollars, by the company producing <i>June's Journey</i> to the NGO Snow Leopard Trust that works to preserve the species.

			Leopard, which is the main target.	
<i>Boom Beach (Turtle Division)</i>	Combat, strategy and action game	Dr. T., Sergeant Brick, Colonel Gearheart and combat players who are the commanders	Defeat the Droid Turtle, a mechanical creation of the villain Dr. T, to save endangered sea turtles that have been captured.	Raise awareness of the need for wildlife conservation through sea turtles, contributing to research and conservation of the species.
<i>Love &amp; Pies (Toads in Trouble)</i>	Matching game	Amelia, her friends and the harlequin frogs.	Players join the characters to preserve an endangered species of frog in a landscape that is in contact with nature and scenes that represent the Amazon rainforest.	The power of community work is evoked when the local community comes together to build conservation sanctuaries for harlequin frogs. In this process, characters and players learn about ecology, renewable agriculture and sustainability.
<i>Pac-Man (Play for the Himalayas)</i>	Arcadian	Pac-Man and ghosts (mobile characters), snow leopard (fixed character)	Mazes with 20 levels based on the graphics of the classic game, composed of themes and graphics related to the habitat of the Himalayan region.	To demonstrate the importance of wildlife conservation in the Himalayan region, with a focus on protecting snow leopards.
<i>My Talking Angela 2 (Flower Power)</i>	Virtual pet game	Angela the Kitten	Angela the kitten is involved in related activities, such as taking care of her garden and planting different flowers and actions to preserve the environment.	Focus on environmental awareness, addressing issues related to the environment in a subtle and playful way.
<i>Wildlife Special (QuizDuel)</i>	Multiplayer Trivia	There are no characters, but rather thematic questions about the Himalayan region.	Questions and answers about aspects of the Himalayan region and its impact on the snow leopard species.	Raising awareness of the snow leopard and its habitats devastated by the impacts of climate change.
<i>Mountain Journey event (Ruzzle)</i>	Challenge	Player opponents - endangered characters from the Himalayas (golden takin, Tibetan fox, Tibetan wolf, Himalayan brown bear, with a focus on the snow leopard).	Find as many words as you can in the shortest time possible	Raising awareness of endangered animals in the Himalayan region.
<i>Brainy's Himalayan Quest (Word Brain)</i>	Puzzles	Words that are formed from letters from above to form words at the bottom of the screen.	Discover the word in question and punctuate it with a representation of the paws of Himalayan animals, with an emphasis on the snow leopard.	Raising awareness of endangered animals present in the Himalayan region.
<i>Snow Leopard Event (Word Domination)</i>	Crossword style	Words to complete with snow leopard themes	Players collect snow leopard paws for rewards	Raise awareness about the environmental problem of the extinction of the snow leopard.
<i>Tray Racers (Toad Mode Update)</i>	Racing game	Adorable creatures, whose appearance can be changed by the player, such as weird haircuts and	Each race takes place in a randomly generated park, with distinct landscapes, dangers, creatures and surprises in post-apocalyptic biomes, as	Convey a positive outlook on the apocalypse, so that after the world ends, these adorable and playful creatures have found a more sustainable way to

		accessories, or even have their board customized, for example.	bizarre as they are beautiful. It features environments like sand dunes, springy cactus forests, crazy deserts, sustainable villages, with creatures like adorable insects and herds of giant camels.	live together in harmony with nature, in healthy environments, celebrating ecology, kindness, and community.
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**Source:** Prepared by the authors (2023).

The analysis categories listed in the study were created to help understand the various nuances present in award-winning video games, namely: 1- categorization of video games, addressing the type of classification of games, in adventure, action, or others; 2- narratives, focusing on the predominance of plot themes and 3- expressive coherence and representations, bringing to light aspects related to scenarios and landscapes, highlighting destructive or beautiful elements, in addition to animal or other types of characters present in the plot and gender relations, or other possible social representations present.

Focusing on the original game June's Journey, one can see that this is a detective game, therefore, the goal is to find objects and store them on the island, where the searches take place. In terms of technological resources, it's quite appealing, sparking interest in noticing the differences between the landscape and the desired objects on the screen. It's even suitable for children, thanks to its intuitive abilities and easy identification of objects in the game environment. However, as there are many objects to be found, the game can become tiring, as some players report (Google Play, 2024). Despite this, the game contains music that helps maintain concentration when searching for objects, and June is the main character, who does the searching, valuing the female protagonism in the plot.

Gonçalves and Azambuja (2021) emphasize that electronic games are very much part of the leisure sphere in contemporary society. However, despite the recreational and

educational potential of these games, inappropriate ways of using them can lead to addiction, when the player loses control over the time they play, causing harm to relationships, routines and responsibilities. In the case of June's Journey, although the game instigates aspects related to the virtual landscape of an island, it can also lead to possible addiction, since it is a long game, due to the fact that its objective is to conquer many objects. June's Journey, to participate in the Green Game Jam, received some changes, with environmental appeals, transforming its setting into an island with characteristics of the Himalayas, to help in the preservation of snow animals, as the region is affected by illegal hunting, destruction of the original habitat and pollution. The intention was to raise awareness about the preservation of the snow leopard, an animal in extinction in the region, and of great beauty, due to its light coat (white and gray).

In this version of the game, there is a clear call for the preservation of these animals and their defense, and the company producing the game, during Green Game Week, the event to present the games, promised to donate 100 thousand dollars if players managed to find 500 thousand animals. This can be an interesting challenge to achieve the goal of preserving animals, but on the other hand, if this target is not reached, it can become a frustration and a lack of specific support, in financial terms, for the Non-Governmental Organization (NGO) protecting this region. There is still no information available on whether the target was reached, or whether the amount of 100 thousand dollars was donated.

Calisto, Barbosa and Silva (2010) argue that electronic games can be strategies for transforming a passive attitude into individual responsibility towards the environment. In this sense, June's Journey can encourage changes in player behavior

with regard to sustainability. Aesthetically, the game evokes the idea of a landscape reminiscent of a wild natural environment (a warning given in the invitation to players). It's a setting unlike other islands where the game takes place. The characterization of the Himalayas helps in this perception of where snow leopards live. The existence of other snow animals, such as foxes, yaks, bears, among others, helps to acclimate the player to the virtual Himalayan landscape. There is an emphasis on preserving nature, and this is demonstrated by the partnership with the NGO Snow Leonard Trust, which helps to care for a 200km<sup>2</sup> region, carrying out research, tracking animals and generating other actions with the local population, for sustainability. The snow leopard is also chosen due to its great beauty, making it the largest predator in the region, weighing around 80 kg.

In terms of raising awareness about nature conservation, it is understood that identifying this animal is an important factor, as many people (especially children) have probably never seen it, as it is a rare animal and from a region far from that of most players. The emphasis on and proximity to the Himalayan landscape also helps in recognizing the habitat, including images of large mountains, which form the highest peaks on the planet. In this sense, it also helps you learn a little more about the planet. The game's beautiful images are an extra attraction to keep players glued to the screen.

Rosa and Gonçalves (2023) point out that the rewilding strategy, that is, restoring ecosystems with minimal human interference, generating natural regeneration of the site, is the best way to conserve nature, especially in cases of endangered animals. Therefore, the effective support that Wooga, the game's creator, offers to the NGO Snow Leonard Trust, can help in the maintenance of snow leopards. However, it must be verified whether the promised amount actually reached its destination.

When analyzing the Boom Beach game “Turtle Division”, it is clear that this is a combat, strategy and action game. These are the oldest types of games, in terms of classification from the perspective of their content. They are easy to understand, easy to operate and the stories are objective, according to Pimentel (2023), as can be seen in the game in question. The game has a narrative based on the objective of saving endangered sea turtles, which have been captured. The game aims to raise awareness about the need for wildlife conservation, considering sea turtles. This approach shows that this need for preservation is occurring due to environmental and climate issues.

In this sense, Arendt, Schwenter and Owens (2023), when carrying out a study with a species of sea turtle, observed that climate change is considered a threat to the population of these animals and that some interventions, although they cannot change the climate factor, can help these animals, enhancing their adaptation to these changes. Given this reality, using games like these, in the leisure sphere, can allow the player, while having fun, to acquire knowledge about awareness and preservation of this and other marine animals.

Santos and Coelho (2023) argue that games from this perspective can stimulate critical thinking about environmental issues, providing learning to deal with the consequences of one's actions and helping to develop an active stance towards developing solutions to environmental problems. These authors also state that games like this can be pedagogical tools that raise players' awareness about climate change, the importance of managing natural resources and conserving biodiversity. The Boom Beach game “Turtle Division” offers another attraction for players, which is the possibility of winning/acquiring Turtle Trophies, as a reward for each victory, some of which are free and others are paid. Part of this resource, as well as voluntary donations,

are directed to a sea turtle preservation institution in Panama, the Sea Turtle Conservancy, contributing to research and conservation of the species.

Similar to what is proposed in this Panama project, in Brazil, there is the Tamar Project Foundation, which, since the 1980s, has been operating on the Brazilian coast (in 23 different locations), with the mission of recovering and monitoring sea turtles, through the development of research and conservation. The project demonstrates potential, given all the achievements made since its creation, such as the recovery of compromised populations, the protection of species, the expansion of scientific knowledge, awareness and sensitization of the population and pedagogical education (Fundação Projeto Tamar, 2024), as evidenced in several scientific publications (Araújo; Silva; Melotti, 2021; Domingos; Silva, 2020; Suassuna, 2004). The game takes place in an interface that contains a virtual landscape, representing the natural environment (beaches, islands, combat fields) and the Droid Turtle, a kind of giant, mechanical, technological and unnatural turtle, where experiments take place with turtles of different species, which were captured. It can be seen that the game seems to make an analogy about the use of technologies, their benefits and challenges, since the method used in the game scenario (by Dr. T.) does not work and threatens the lives of the turtles.

Santos and Coelho (2023) defend the idea that games characterized by this technological guise can represent an excellent learning strategy. However, the economic model proposed by society must be transformed, to encourage the production of games with more sustainable consumption and production, opening space for a more reflective environmental vision. According to the authors, these transformations will only occur if there is an investment in political and social formation (which can occur through

games). This way, citizens and players would be ready to face today's environmental and ecological challenges.

The Love & Pie Game: *Toads in Trouble* is a matching kind of game. According to the plot, players join the characters of Amélia, her friends and the harlequin frogs, to preserve an endangered species of frog, in a virtual landscape, which addresses nature, with scenarios representing the Amazon Rainforest. Throughout the game, the power of community work is highlighted as the local community comes together to build conservation sanctuaries for harlequin frogs. In this process, characters and players learn about ecology, renewable agriculture and sustainability. After the success of the original game Love & Pies, the developer Trailmix released a version titled Love & Pies in 2023 to promote the Green Game Jam: *Toads in Trouble*. In this version, the producer kept the same formula as the original game (matching game), considering that, for the genre, Love & Pies was revolutionary, earning the producer another award, Best Puzzle Game at The TIGA Games Industry Awards 2023 (Tiga, 2023), in addition to a good evaluation from specialized critics (Saravanan, 2021; Tuerlings, 2022).

Unlike the original version, where the aim was to restore Amélia's (main character) family's cafeteria, which had been mysteriously burned down, in this special version, players, as a reward for fusions (combinations of objects), can decorate the harlequin frog sanctuaries. For Tuerlings (2022) Love & Pies offers a gaming experience beyond a matching game. For the author, the game's graphics and art are bold and redefine the genre. In addition to the attractive visual and aesthetic aspects, the narrative leads to a deeply immersive experience for the player. In this way, the high quality graphics, the attractive and educational plot, the theme under the interface of the virtual landscape of nature and the active community participation, made Love & Pies:

Toads in Trouble was among the highlights, winning the Google's Choice category of the Green Game Jam 2023, based on the criteria of innovation, impact and education (Playing For The Planet, 2023a).

When analyzing the Pac-Man game, from the company Midway, in the version participating in the Green Game Jam, it is clear that the game was developed with the aim of raising awareness and increasing consciousness about the importance of preserving wildlife, focusing especially on the protection of snow leopards in the Himalayan region. The plot of the game Pac-Man Play for the Himalayas highlights the relevance of the central figure of snow leopards, an endangered species, fundamental to the biodiversity of the Himalayan region (Shrestha; Kindlmann, 2020). Players embark on a journey through a regional adventure map, navigating mazes and collecting cards to complete a themed album that addresses the survival of snow leopards. The Pac-Man character begins his exploration of the Himalayas, traversing an exclusive maze map, with 20 levels and three bonus mazes, all based on the graphics of the classic game. In this context, participants have the opportunity to understand the importance of wildlife conservation, with a focus on the protection of snow leopards, which are represented in all stages of the game, remaining fixed on the screen. Within the game, players have access to summary information about the situation of snow leopards and can also visit official social media channels to learn more about this endangered animal (Playing For The Planet, 2023b). The game's graphics do not directly depict the local landscapes, but rather create a virtual landscape containing a variety of mazes, with elements typical of the Himalayan region, such as mountainous habitats and the area's characteristic climate. These elements are represented in the paths the character takes as he seeks to collect the edible tablets.

Furthermore, as a way to promote environmental awareness and activism in a fun and playful way, players have the opportunity to make donations to an organization dedicated to the preservation of these animals and their habitat, the Snow Leopard Trust (Playing For The Planet, 2023b). According to Alexander et al. (2023), by the year 2023, there were a total of 621 affiliated individuals, representing 31 organizations and 74 projects in 11 countries, which highlights the relevance of the topic for society. The author reveals that research carried out by the Snow Leopard Trust group, with the aim of increasing scientific and social engagement, consists of approximately 1,569 publications, demonstrating that interactive experiences, such as games, not only provide entertainment, but also help raise awareness about urgent environmental issues. The numbers presented by Alexander et al. (2023) suggest that by engaging in Pac-Man Play for the Himalayas, players become part of a community dedicated to wildlife preservation and conserving the beauty of the Himalayan natural landscape, which includes the snow leopard. The game makes access to information and learning easier, constituting an effective engagement tool.

The game My Talking Angela 2 is developed by the Slovenian video game company Outfit7. This game, with the Flower Power version, is a virtual pet game, which features the main character, the kitten Angela, who is extremely dedicated to preserving the environment and, because of this, gets involved in related activities, such as taking care of her garden and planting various flowers. These gardening activities make the game My Talking Angela 2 a type of activity focused on environmental awareness, addressing issues related to the environment in a subtle and playful way. In the game's dynamics, players develop environmentally friendly practices, such as recycling, saving water, and reducing energy consumption, within the game's virtual

landscape, composed of interactive elements present in the game. Furthermore, the game addresses the importance of collection and targeted disposal according to the type of waste material and enables participation in environmental conservation simulations (Playing For The Planet, 2023c). By incorporating these environmental elements, the game not only entertains players but also promotes awareness and positive behavior towards the environment.

The visuals of the game My Talking Angela 2 are made up of several scenarios, in which the kitten Angela acts inside and outside the house, constituting a graphic of vibrant colors, and immersive scenarios, with a focus on the game's environmental narrative. From Angela's colorful garden, filled with a variety of exotic flowers and plants, to modern urban settings, as well as picturesque natural locations like sunny beaches or lush forests, players have a wide range of environments to explore. Each scenario features items that seek to raise environmental awareness in an immersive way, providing a stimulating experience for players to explore, while interacting with Angela the kitten and carrying out various activities. This way the game was developed contributes to creating a healthy and attractive environment for the entire ecosystem, with the game's main focus being the importance of the role of bees in pollination and the subsistence of life in nature. According to Ellis (2022), bees play a fundamental role in the ecosystem and in the preservation of plant species. The interdependence between the environment and bee pollination is crucial for other species, which depend on specific plants (Andrews, 2022). The graphics presented by the game correspond to scenarios directed at the environment, in which the kitten needs to take care of her plants, her garden, watering them so that the bees come and carry out their pollination.

The company Mag Interactiv, in partnership with the Playing for the Planet platform, developed four games in 2023, which were selected as highlights on environmental issues, namely: *Wildlife Special (QuizDuel)*, *Mountain Journey event (Ruzzle)*, *Brainy's Himalayan Quest (Word Brain)*, *Snow Leopard Event (Word Domination)* (Playing For The Planet, 2023d). Wildlife Special (QuizDuel) is a real-time multiplayer trivia game where players can play with friends, family, or random opponents online. Participants can showcase their knowledge by answering quickly and accurately, creating a fun and challenging experience. The competition generally involves answering multiple-choice questions covering a variety of topics, such as history, geography, pop culture, and science (Riehl; Hamlin, 2012).

These types of games, as they encompass a wide variety of topics within a given theme, are effective in promoting environmental awareness by including issues related to nature preservation and the importance of protecting endangered species, as is the case with the current Wildlife Special (QuizDuel) game, which focused this issue on the snow leopard and its habitats, devastated by the impacts of climate change. By implementing these tactics, trivia games can not only provide players with entertainment, but also educate and motivate them to take action in favor of environmental conservation. In the case of this game, as it is a question and answer game, it does not have any visual aspects nor does it contain graphics.

The second game, the Mountain Journey event (Ruzzle), specifically based on Ruzzle, is a game that focuses on intellectual challenge, in which the player needs to find as many words as they can, in the shortest time possible (Enache; Friberg; Wiklander, 2023). In this sense, in order to reach an audience that is engaged with environmental themes, this version of the game was created, called Mountain Journey

Event, in which the player's opponents were represented by characters such as endangered animals of the Himalayas, golden takin, Tibetan fox, Tibetan wolf, Himalayan brown bear, with a focus on the snow leopard. This cause is important and requires attention, Shrestha et al. (2022) demonstrate, in a review study, explaining how illegal hunting, wildlife trade and habitat loss and fragmentation in the Himalayan region have contributed, over time, to the species becoming extinct. The game contains several scenes, one of which contains visual graphics, with simple virtual landscapes, derived from platform games, in which animals compete with players in a word hunt.

The third game, Brainy's Himalayan Quest (Word Brain) or specifically, Word Brain, is a puzzle game, in which the player must solve the puzzle, already in the initial phase of the game, using the nine letters at the top, to form words at the bottom of the screen. In this version developed for environmental awareness, the game is predominantly composed of discovering the word in question and, upon succeeding, the player gains points, represented by the paws of Himalayan animals, with emphasis on the snow leopard (Enache; Friberg; Wiklander, 2023). The game contains scenes without visual graphics of landscapes, only background, with a predominantly blue color.

The fourth game, the puzzle-style Snow Leopard Event (Word Domination), offers a crossword collection mode where players collect snow leopard paws for exclusive rewards by forming words related to the theme. This focus on this animal is analyzed in the study by McCarthy, Mallon and Schwartz (2023), in which the authors analyze that these initiatives are important resources to minimize the extinction of this animal. This game also does not contain scenes with elaborate visual graphics and landscapes. In this way, it provides players with a way to raise awareness about such a

real and necessary environmental problem, focused on the extinction of the snow leopard.

The game *Tray Racers* offers a critical reflection on climate crises and changes in natural landscapes, as it contemplates the post-apocalyptic scenario, although it also offers a positive vision of this post-end of the world. However, it is precisely through the appeal for harmony with nature in the post-apocalyptic period that the game presents itself as an interesting strategy, contributing so that players, while having fun in a leisure activity, having contact with animals of different species and in different virtual landscapes, can, perhaps, reflect on how much they could live this panorama in the present moment, before this apocalypse actually arrives, and what their contributions could be, valuing sustainability. In line with the educational premise of this game, scholars argue that the approach of active, innovative methodologies that correspond to the expectations of today's society, including gamification (Oliveira et al., 2023), as well as experiences linked to different cultural leisure contents, such as virtual content, can represent a differentiated and effective strategy for environmental awareness, meeting local actions, with possible global repercussions, which represents a significant principle of Environmental Education (Mansfield; Wheaton, 2023).

As already highlighted by Pernisa Júnior and Moreno (2023), the important contributions of the evolution of technological resources and the metaverse can already be noted, from the perspective of assisting the teaching and learning process, with regard to environmental awareness. The increasing immersion and interactivity afforded by these resources amplify reflections, as is the case with the aspects addressed in the *Tray Racers* game, specifically related to emerging environmental challenges and their protagonism, to contribute to possible solutions. Likewise, it is important to highlight

that the aforementioned game encompasses another admirable concept related to Environmental Education, which is the aspect of community, collectivity and cooperation, which effectively contribute to changes and solutions in favor of the environment.

According to the United Nations Brazil website (2024), tools involving virtual worlds offer unparalleled opportunities, which are impossible in other environments. The realistic and impactful experiences created in video games can affect and lead users to reflect on environmental actions. That's why the video games analyzed sought to invest effort, both in the types of characters, as well as in the themes and landscapes, to reveal the scenario of destruction and personal responsibilities in decision-making. These video games entering the Green Game Jam competition are adaptations of other well-known games, accepting the challenge of raising awareness about the environment and sustainability. As you can see, some themes are similar, as in the case of actions to save Himalayan snow leopards. As Ross (2024) highlights, both the perception and the feelings surrounding the choice of a video game are changing. One of the focuses of this change is the issue of taking sustainability into account in the production method of this media and in its consumption. Furthermore, the author also states that the project developed by the Playing for the Planet action represents a significant part of this change in feelings regarding the role of video games in social life.

Every time a new feature is developed, video games take it into account to enhance their messaging. In the view of Syafrudin et al. (2024), the exploration of innovations, such as the application of artificial intelligence in digital image processing, is increasingly constant. The authors also highlight the important role of the various applications of artificial intelligence resources in the dissemination of sustainability.

One of these possibilities is focused on the development of video games, in which developers challenge themselves to create attractive and innovative resources capable of potentially impacting consumers, seeking to engage with the world of sustainability. When reporting on the relationships between digital technology, video games and sustainability, Lakshmi (2024) embraces that practices involving sustainability must represent continuous processes, which must always be updated, as new challenges arise. In this sense, the author, in addition to reporting on sustainable ways of involving technology and the production of technological resources, also highlights that the rise of artificial intelligence has played an increasingly greater role in fostering transformations, including in video games, to keep up with new demands. Thus, the relevance of these resources is highlighted, from the perspective of promoting more interactivity, in favor of raising awareness about the urgency of action proposals for sustainability.

It can be seen that most games place emphasis on the destroyed virtual landscape, to attract attention, or on calls to save endangered species. When looking at the aspects involving the theme of nature, in different forms of expression, Vieira (2023) notes the success of the various resources that privilege the ambiguous game between reality and fiction, as is the case with some literary works and video games, which use a contemporary aesthetic, full of technological resources. For the author, however, one of the main concerns should be with ethics, much more than with aesthetics in the works. From this perspective, all strategies that can spark reflection and denunciations about the overwhelming processes of deterioration of nature are extremely pertinent. The video games analyzed, which are part of the Green Game Jam proposal, demonstrated great potential to be used as a supporting resource in school and

leisure contexts, to promote attractive strategies, aiming to develop positive attitudes and impact pro-environmental and sustainable actions.

## **Final Considerations**

Protecting and restoring the planet are global responsibilities that also depend on individual actions. Given the widespread popularity of video games in societies worldwide, it is increasingly important to harness their influence by disseminating environmental information and encouraging sustainable behaviors. This led the United Nations to launch the Green Game Jam competition, which supports game developers in creating motivational content that inspires proactive environmental action.

The study made it clear that video games have significant potential for addressing environmental challenges. The participating companies sought to adapt the plots, landscapes and characters of some already known games, to complement the social meanings of the strategies that lead to achieving global ecological objectives, emphasizing individual and group actions. Certainly, all these initiatives combined should act as catalysts for pro-environmental behavior in the future. Protecting and promoting the balance of animal and plant life and biodiversity in general is a very critical task, which involves different initiatives. The most important thing is to understand the value that each person has in this process, so that this objective can be achieved. In this sense, video games can represent important persuasion strategies for more conscious behavior in relation to the environment.

The virtual landscapes in video games captivate players, serving as compelling territories and settings for game narratives. Tied to the games' thematic appeals and characters, these landscapes are designed both to denounce environmental abuses

caused by human actions - prompting players to reflect deeply on their behavior - and to encourage affinity, decision-making, and proactive steps toward preservation to mitigate such impacts. However, beyond the virtual landscapes examined in this study, the urgency lies in humanity's relationship with natural landscapes. Without urgent, assertive actions to foster respect for the natural world, we risk a future where virtual landscapes are all we have left to experience and connect with.

A key limitation of this study is its focus solely on the 2023 edition of the Green Game Jam. Future research could incorporate additional variables by examining other editions of the competition. We recommend new studies that explore related initiatives, emphasizing the potential of education through leisure. These should highlight the role of video games and gamification strategies - particularly those featuring virtual landscapes - in fostering ecological awareness. All approaches to strengthening the link between leisure-based education and environmental goals warrant attention. The 2024 Green Game Jam should continue promoting video games that benefit the environment, while future studies adopt innovative strategies.

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