# Games for the Planet: Analysis of environmental games for reinforcing pro-environmental behaviour

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## ABSTRACT

Millennials and Generation Z are the most environmentally conscious generations, but a positive attitude does not always translate to environmental actions. A possible solution could be environmental games that promote conscious behavior. This study is analyzing five environmental games and investigating the opinion of both generations on environmental games. The results show that both generations are open to trying environmental games and willing to pay for them if the profit goes to a specific environmental issue. The potential of environmental games is not explored, and this study could be an excellent basis for future academic research and business implications.

## 1. Introduction

In 2019 the influential magazine Guardian decided to use "climate emergency" or "climate crisis" instead of "climate change." Editors and journalists of the magazine believed that climate change is no longer considered to reflect the overall situation's seriousness accurately. Ice melting, the rise of the sea level, ozone, Amazon Fire, and single-use plastics are just some of the words closely connected to the phenomenon of the climate crisis.

When it comes to pro environmental behavior consumer behaviour is driven by the paradox often coined as 'attitude-behaviour gap' (Han, Seo & Ko, 2017; Niinimäki, 2010). Attitude-behaviour gap or intention-behaviour gap is defined as a gap that occurs when individuals' values or attitudes do not correlate to their actions.

The PAT formula. I=P×A×T (commonly pronounced "eye-pat") is a formula, describing the factors that cause environmental degradation. In this formula, I stands for impact; P stands for Population; Astands for Affluence (or amount consumed); T stands for Technology. This formula is crucial as it demonstrates that to make a real change for our planet, we need to change our consumer behavior.

How can the young generations be well-informed and, most importantly, engage with pro-environmental behaviours? A possible answer can be gamification, that is, the application of game design principles. It is hypothesised in this paper that games can promote environmentally conscious behaviour.

For answering this question, we will be analysing the top 5 environmental games focusing on the different elements from visual identity to communication styles. After the analysis is completed, the games would be presented to Millennials and Generation Z through online survey to understand better

why they would engage with such games and if the awareness level for the environmental games is high.

The research could serve as a guide for creating novel games and investigate which elements would encourage younger generations to engage with environmental games that could eventually lead to pro-environmental behaviour.

## 2. Literature revie

In recent years, climate change has become one of the most significant challenges the world has to face, meaning threats to life, ecosystems, health and wellbeing, states The World Health Organization (2020) along with the latest IPCC report (2020). Besides the extreme weather conditions that we globally experience, climate change started to have diverse impacts on the society as well. In the last few years, a significant number of studies has begun to concentrate on the ever-growing impacts that climate change makes on our mental health (Hrabok & Delorme & Agapont, 2020). Such new phenomena as ecological grief and climate anxiety occurred and strengthened, meaning that some people are living in fear and worrying about their lives on a daily basis because of the unforeseen consequences of environmental degradation. This could also influence their willingness on such demographical questions as establishing a family.

Another important aspect when we come to talk about the issue of climate change is the generational perspective. Results are quite diverse on which generation seem to be the most concerned about environmental degradation. Some state that despite the fact that younger generations are in a good position to adapt sustainable behaviours – for example, they use social media platforms well to gain and spread information –, they are far less committed to do real action compared to the older age-groups (Fielding & Head, 2012). The main reason behind this could be that climate change is usually not perceived as a personally relevant issue, it feels quite distant both in time and space. However, the appearance of such famous environmental icons as the Swedish climate activist, Greta Thunberg is, does lead to changes on the youth's attitude to get involved more into the question. The results of a recently conducted survey that was conducted in 23 European countries with 22 thousand participants, shows that climate change ranked first over other social problems (poverty, racism, sexism etc.) (EEA, 2020). The same report introduces the phenomenon of 'thunbergig" meaning that environmental consciousness has become a crucial aspect in finding the best partner or mate.

Despite of this openness and growing involvement of the youth, it still remains an unanswered question how to reinforce pro-environmental behaviour so that it will lead to concrete and sustainable action. From a generational aspect, two age groups need to be introduced: The Millennial generation and Generation Z. The Millennials involve people who were born between 1980-1995, whereas those who were born after 1995 (in Hungary) belong to Generation Z. The dates usually vary on regions or continents. Members of the Millennials are close to be leaders in the near future, that is why it is utterly important to educate them on sustainable behaviours. Generation Z is usually referred as digital natives, as they grew up in the era of the Internet and new technologies. Several studies show, that these young adults spend most of their time in front of the screen and use these technologies for work, communication, entertainment, gaining primary information and for playing games (Székely, 2020). Today, environmental and climate activists are using the full suite of social media platforms to collect

followers and Generation Z is quite active in this process (Cox, 2013:189). New ways of climate communication are required to be found in order to increase the engagement of public.

In fact, in the digital age, not only social media means a powerful tool. Digital and online games are also effective devices to reach a large number of people. Needless to say, that the concept of playing games is as old as humanity itself. Based on the very idea – that is to say the love of games – was the concept of "gamification" constructed. By gamification we mean an approach to "inspire, motivate and change behaviour through a certain play or gameful experience" (Rajanen&Rajanen, 2019:245). Gamification techniques are already in use in education and the workfield. It has been proven that it could improve both the motivation and engagement towards performance.

In the last few years, game designers in cooperation with large environmental organizations such as WWF, Greenpeace and UNESCO started to implement the issue of climate change into board games, digital games and online games as well. The aim of this was to raise the players' awareness, make them feel that their decision could change the future. On this way, the so far psychological distance issue of climate change becomes near (Dulic et al. 2011:228).

Environmental games belong to the so called "serious games" category. The purpose of a serious game is more than entertainment, it aims to educate the players on a certain problem. They can relate, besides the climate change issue, to a wide range of fields: healthcare, politics, military etc.

## 3. Method

Academic research can be approached from many different angles. Traditionally, research methodology is divided into qualitative and quantitative (Bhati, Hoyt, & Huffman, 2014). Some questions can only be answered on the grounds of quantitative research, while others require qualitative data (Ponterotto, 2006). To understand better the current market and the general opinion of Millennials and Generation Z on environmental games, the study combined both qualitative and quantitative methods. The qualitative method consisted of the content analysis of 5 environmental games, while the quantitative research included an international online survey. The original study had a focus group of 15 members of both generations. Questions used during the focus group interviews were modified into survey questions to get more representative results and compare the focus group results with a larger sample.

### 3.1.  Content analysis

The content analysis aims to compare five environmental games that are targeting Millennials, and Generation Z. Games were compared based on the theme of the game, google play ratings, the role of the player, and most importantly, communication and visual representation.

Games were chosen based on the following criteria:

- All the games had to be maximum five years old
- All the games had to be free
- They had to be mobile-friendly both for the Android and iOS operative system
- They had to be created by a credible organization, either an NGO or university
- They had to target Millennials and Generation Z

All the listed criteria were essential to ensure that the study analyzes only the most relevant games for both generations. Video games have been around for decades and as technology continues to improve, so do video games. Therefore, it was critical to choose the most recent environmental games, and the study draw excluded all the games coming after 2016.

The study decided only to include so-called free-to-play games as they make the experience of gaming more accessible. It is more likely to give something a try if it is free, as it eliminates the risk factor in potentially paying for something you might not like. The more players try the game, the more likely they are to recommend it to friends, keep playing it and even get into it long term, which is essential for the games that promote pro-environmental behavior.

According to the latest NDP Group report (2020), mobile is the most popular platform in the video game industry. It is widespread across all age groups, and its strength comes from accessibility, availability, and a wide range of offers. Statista (2021) shows that the leading smartphone vendors are Samsung, Apple, and Huawei. Combined, the three technology companies account for about half of all smartphone shipments worldwide. Therefore, it was crucial to include mobile-friendly games that support an Android operative system and include iOS that is only used on Apple devices, as those games have the potential to reach a wider audience. An important factor was the credibility of the game maker.

Environmental issues are well known today, but it is essential to get credible, and fact-checked information. Therefore, to ensure the credibility of the game, the study checked the organizations behind the creation. Only the most well-known organizations that tackle or research environmental issues were selected.

Finally, as the study focuses on Millennials and Generation Z, the games that target younger and older audiences were excluded.


### 3.2.   Sample

Based on the criteria mentioned above the following environmental games were chosen:


**Morphy! (2016)**

*Platforms:* iOS, Android, Web

Morphy! is a game starring Morphy, an alien who has crash-landed on an unknown planet and needs to find his missing crew members.

The aim of the game is to teach the fundamentals of animal adaptation. Players need to scan and obtain animal traits that can then be added to Morphy's abilities, which will help him navigate better in the unknown environment. Players learn more about specific wildlife behaviors, endangered species, and how they apply different traits in the real world.

The game was developed by the Smithsonian Science Education Center and Filament Games.

## WWF Free Rivers (2018)

WWF Free Rivers is an augmented reality game that offers learners the ability to observe and interact with five diverse river habitats.

The aim of the game is to teach how ecosystems depend on healthy, flowing rivers.

World Wildlife Foundation's game teaches players how different actions can affect the flow and the health of the river and through interactions with the people and wildlife that inhabit it.

## Ice Flows (2016)

*Platforms:* iOS, Android, Web

Ice Flows is a scientific simulation game that focuses on the impact of climate change on the Antarctic Ice Sheet. Players are responsible for controlling the size of the ice sheet and help the penguins get to their destination.

The game combines fieldwork and computer modeling to investigate the correlation between the atmosphere, the ocean and the ice sheet in this region. Scientists use these simulation models to understand how the ice behaves and to make projections for future.

The game was funded by the Natural Environment Research Council (NERC) as part of a project that investigates the future of Weddell Sea Region of Antarctica and what kind of impact could the changes in ice sheet have on global sea-level.

## Bleached Az (2019)

*Platforms:* iOS and Android

Bleached Az is a mobile arcade game based on the 2008 Aussie cartoon, Beached Az. The game uses humor to promote ocean health awareness and motivate players to contribute to environmental conservation.

The aim of the game is to save the hopeless coral from the dangers of plastic pollution and overfishing. 20% of the revenue from ads goes to the Carbon Neutral 'Plant-a-Tree' Program.

## World Rescue (2017)

*Platforms:* iOS and Android

World Rescue is inspired by the Sustainable Development Goals of the United Nations.

The game is set in Kenya, Norway, Brazil, India, and China, where players meet five young heroes and help them solve global problems such as displacement, disease, deforestation, drought, and pollution.

World Rescue was created for the first international Gaming Challenge organized by UNESCO Mahatma Gandhi Institute of Education for Peace (MGIEP). The game was chosen as the winning game design document.

### 3.3. The codebook

The games were analyzed based on the following criteria. The first division was based on the theme of the game. The study included games that cover different environmental issues, from water management to ecological education. The theme of the game was defined based on the central problem a player needs to solve or the primary lesson the game is trying to convey. For example, Morphy! does not try to solve an environmental issue, but the purpose of the game is to learn more about different animals and their traits. Therefore the theme of the game was coded as wildlife education. On the other hand, players in Bleached Az must save corals from a wide range of ocean-related issues. Therefore the theme was coded as Ocean pollution.

The second criteria were Google ratings on the Google play store. Having a positive grade is essential for several reasons. An excellent rating and positive reviews can impress a potential user. According to the Apptentive (2017) report, 59 % of users usually or always check ratings before downloading a new app. Finally, the more positive reviews and grades your application has, the more visible it is on the Google Play store, which is an important aspect for the competitive environment such as mobile games.

The third criteria were communication style. The communication was divided into two parts. First, we checked if games contained only educational facts, facts on environmental issues, or contained solutions and advices on how we should tackle different environmental issues. Traditionally, when it comes to the environmental communication the strategy was to provide lay audiences with information-based appeals to trigger pro-environmental concern and behavior. More recent studies have demonstrated the insufficiency of purely informational communication strategies (Whitmarsh, O'Neill, & Lorenzoni, 2011) when it comes to environmental issues. Action-related knowledge, meaning communication that offers which behavioral options and possible courses of action (Kaiser & Fuhrer, 2003, p. 601), may be a more vital determinant of pro-environmental behavior than knowledge about the causes of environmental problems. (Smith-Sebasto & Fortner, 1994). Therefore, games that contained information-based communication were simply coded as facts, while the games that included action-based communication were coded as a solution. The second part was the game's tone, which was divided into positive, negative, and natural. The tone represents the communication style. The negative style represents a catastrophic image of the current status of our environment, while the positive style emphasizes that there is still time to change.

The following criteria were visuals. Visuals were divided into simple and complex. It is because simpler animation is more mobile-friendly as it contains less details, why complex visuals might be overwhelming for a consumer, which could lead to giving up on the game. WWF Free Rivers is an augmented reality game that contains complex visuals, while Bleached Az is a mobile arcade game with simple visuals.

Lastly, the characters were divided into role-playing and decision-maker. We defined role-playing has players assuming the roles of characters in a fictional setting (Grouling, 2010). An example of Morphy the player is the one that embodies Morphy, a lost alien, while in the Bleached Az, the main charters are the corals, and you are decision-makers, the one who needs to protect them from the ocean pollution. Role-playing is a typical tactic used in games to make players more engaged with the story.

### 3.4. Survey

Besides content analyses, an international survey was conducted to examine the familiarity of Millennials and Generation Z with environmental games, willingness to play, and willingness to pay for such games. The survey consisted of 82 participants. 52,3 percent of Generation Z, 47,7 percent of Millenilas, from which we had 54,5 percent of female participants and 45,5 percent of male participants. The goal was to have a balanced number for both sex and generations. Participants were primarily Europeans (more than 70%), but we obtained answers also from North America, South America, Asia, and Africa. The survey was spread in several Facebook and Reddit groups that consist of Millennials and Generation Z to obtain participants.

Survey was divided into five parts. The first part was dealing with general information such as generation, sex, country. The second part was dedicated to environment. Participants had to express through Likert scale their concerns about the environmental issues in general and concrete environmental issues such as air pollution, plastic waste, and others. The next part was dedicated to games, how much time they spend in front of the screen, how often they play any games, and are they familiar with the concept of environmental games. In the fourth part we presented 5 environmental games that were analysed in terms of description and visuals. The explanation for the games was directly taken from the Google Play store, and they had to indicate how likely is that they would try a presented game. The visuals were also taken from the Google Play store as we wanted to achieve the scenario as if they would go to the Google Store and scroll through the available games. The last part was dedicated to a willingness to pay. Are they willing to pay in general, and are they willing to pay if the profit of the games goes to a good cause, such in the case of Bleached Az.

## 4. Results

*Content analysis*

The following table summarizes the results of the content analysis.

| Content analysis | Morphy! | WWF Free Rivers | Ice Flows | Bleached Az | World Rescue |
|---|---|---|---|---|---|
| Theme | Wildlife Education | Ecological Education | Climate Change | Ocean Pollution | Global Management |
| Organization | Smithsonian | World Wildlife Foundation | NERC | Carbon Neutral | UNESCO |
| Rating | 4,5 | 4 | 4,6 | 4,9 | 4,5 |
| Communication | Facts Neutral | Facts Negative | Facts Neutral | Facts + Solution Positive | Facts + Solution Positive |
| Visuals | Simple | Complex | Simple | Simple | Complex |
| Characters | Role Playing | Decision Maker | Role Playing | Decision Maker | Role Playing |

The table displays themes, organizations behind the game, Google ratings, communication style, visuals, and characters. From the table, we can see that the highest ratings on Google are given to the Bleached Az, while the lowest score goes to the WWF Free Rivers. The reason for the lowest score could be answered by communication style, visuals, and characters. The WWF Free Rivers uses Facts and Negative communication style to talk about Ecological Education. The visuals are too complex for the mobile devices as it uses augmented reality, which leads to frustrations of the plays, which could be also seen in the comments on Google Play as customers experienced the app crashing. Another point is that you are not the main charter of the game but rather a decision maker, leading to less engagement. On the other hand, Bleached Az uses positive communication style, presents both facts and solution and it is easy to use as the animation is very simple. When it comes to the character, you are again a decision maker, but this game has a unique selling proposition that is humor. It is the only game out of 5 that uses humor to talk about the environmental issues, making it enjoyable, entertaining, and leading to longer play and a bigger number of users. Users left comments such as it is unique, hilarious, informative, and fun. It was interesting to see that only 2 games containedaction-based communication, one of the main aspects of enforcing pro-environmental behavior.
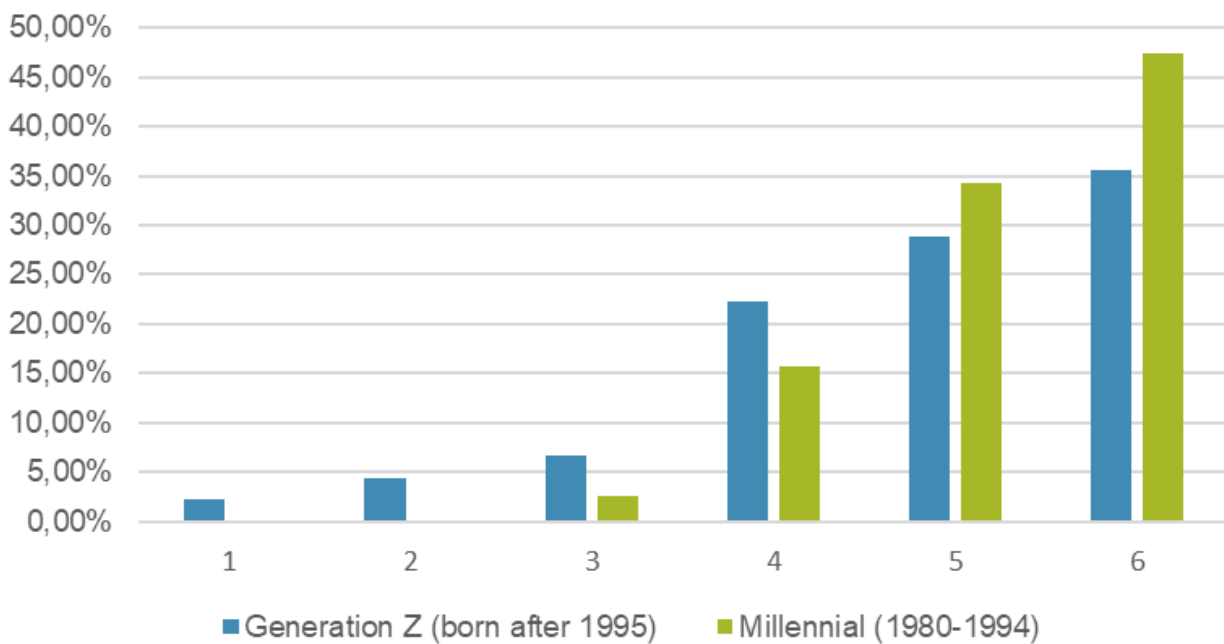
*Online survey*

In this section, the survey results are presented which show the extent of concern and interest of the two generations, the willingness on trying out environmental games and the motivating factors regarding paying for a certain game.

We were interested in what extend the participants are concerned about the environment in general. It turns out from the results that the vast majority of the participants are extremely concerned. However, surprisingly, from a generational perspective the Millennial generation is more affected by the question than Generation Z which proves the diversity of previous results when the generational aspect is integrated.
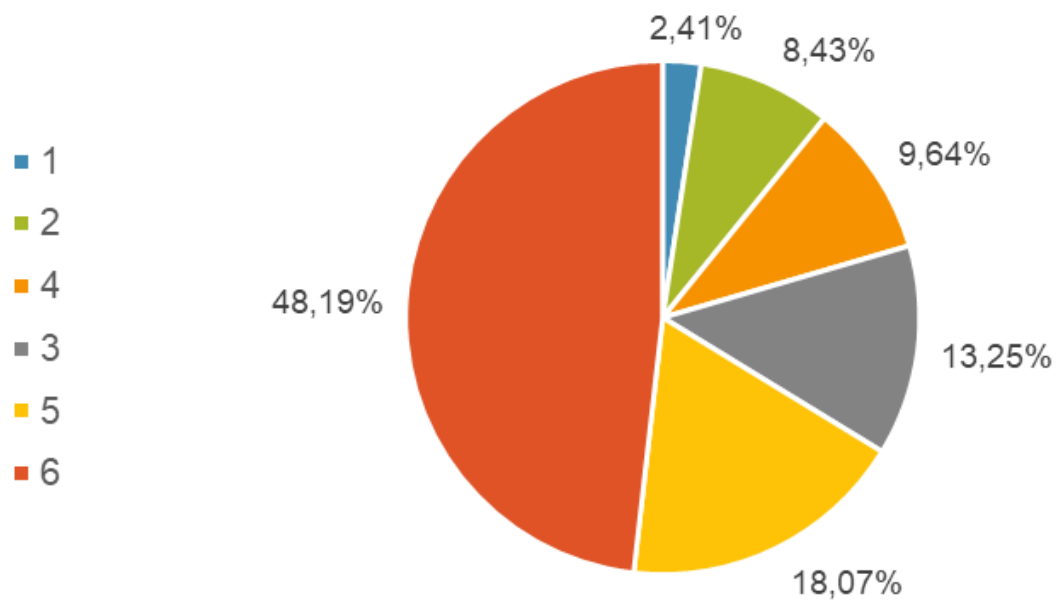
Considering a specific environmental problem, for example chemicals and pesticides, water shortage and water pollution, nuclear waste, climate change, genetically modified foods and air pollution, the results are quite concurrent. Independently on which generation one belongs to or where he/she lives, the majority of people regard air and water pollution, and climate change as the most important environmental problems their country faces. A possible explanation for this tendency could be that almost all of these things can be experienced in our everyday life. The quality of air and water influence or health to a large extent, whereas a majority of people also recognize change in the weather conditions: extremely hot summers, tepid winters and frequently alternating weather fronts. At the same time, climate change is the most popular topic in the worldwide mainstream media over the loss of biodiversity or waste collection. It certainly has a strong influence on what people think to be important.
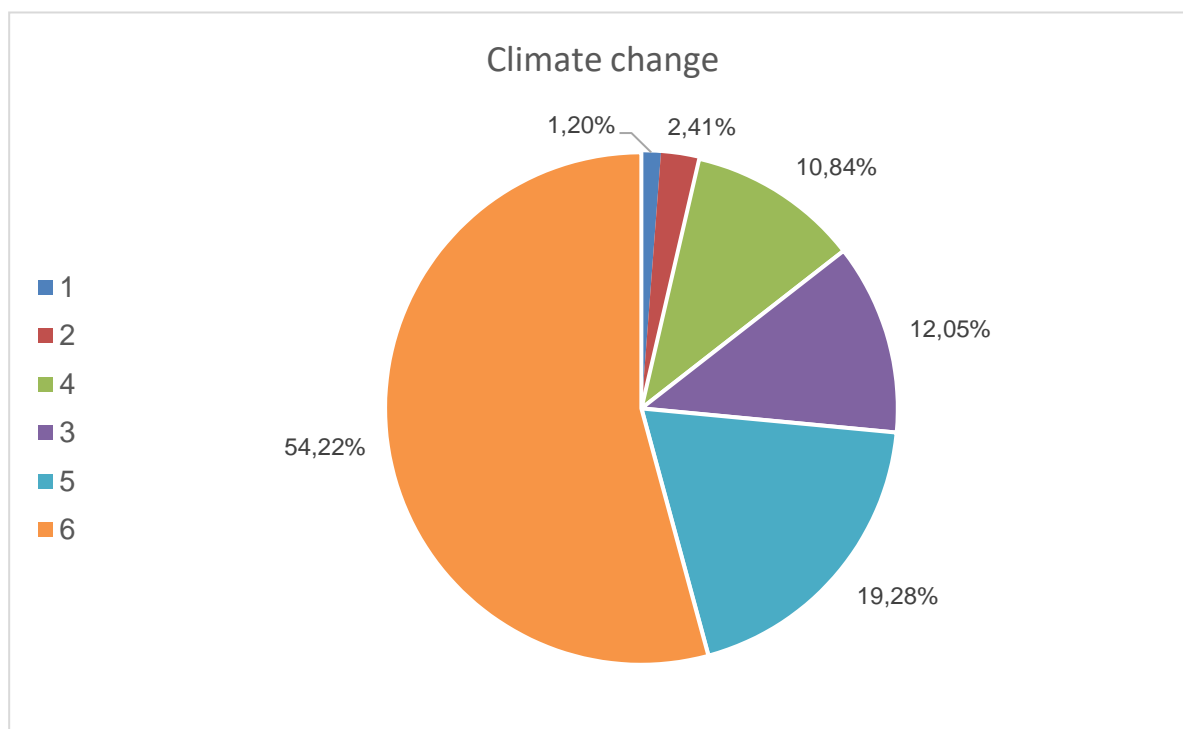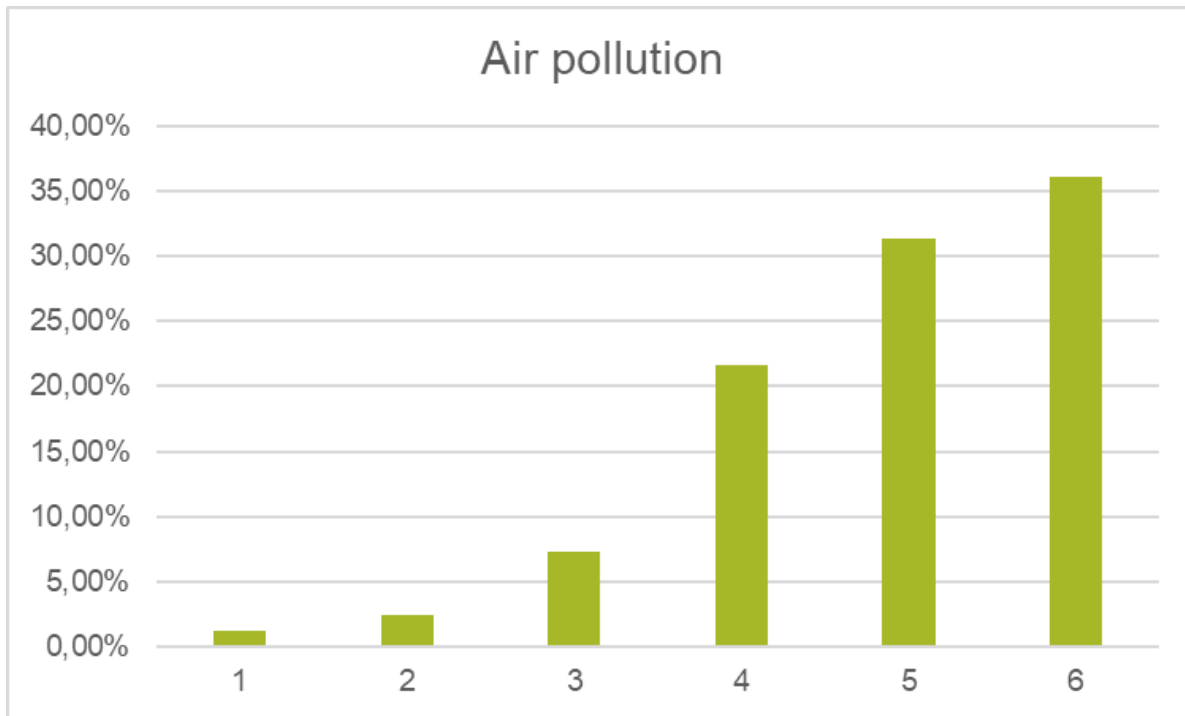
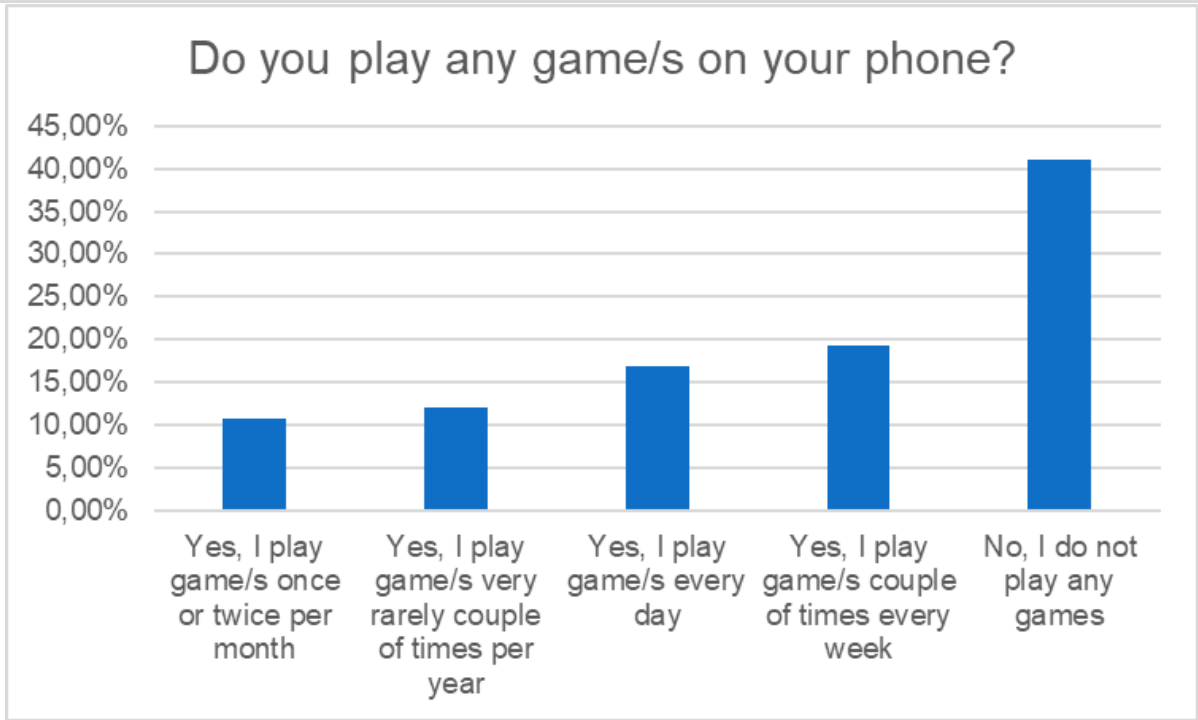## Generally speaking, how concerned are you about environmental issues?



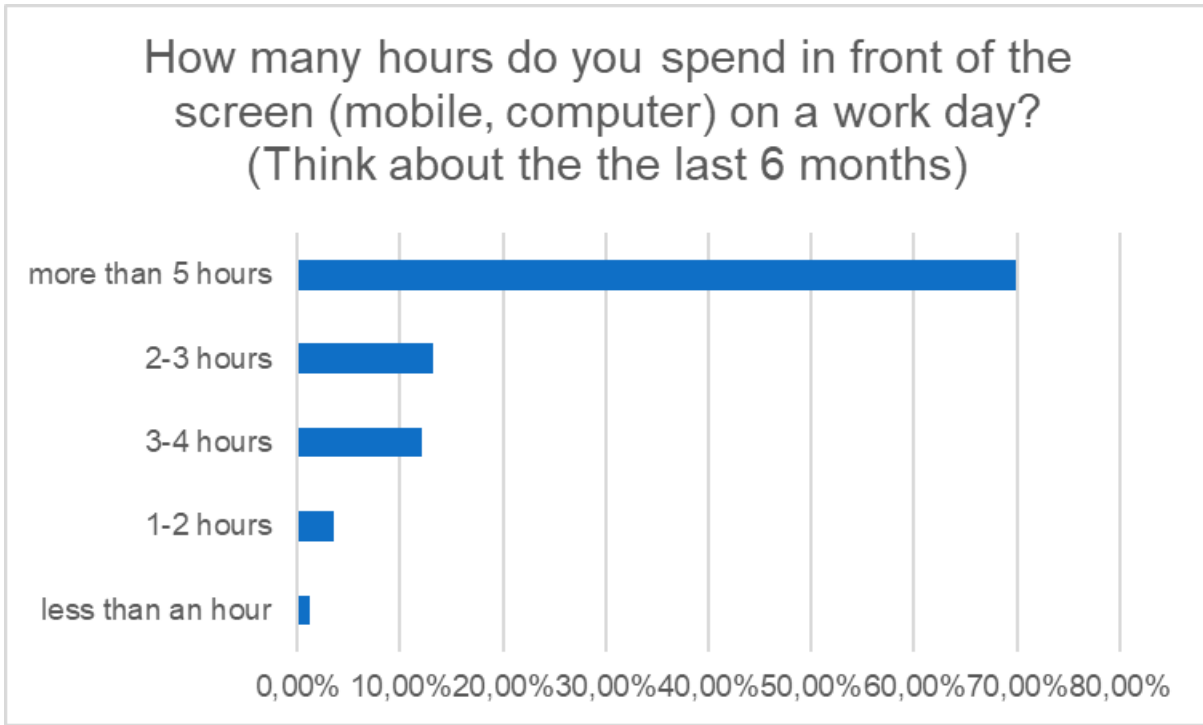Generation Z (born after 1995)    Millennial (1980-1994)

## Water shortage and water pollution



2,41%    8,43%

9,64%

13,25%

48,19%

18,07%

- 1
- 2
- 4
- 3
- 5
- 6

## Air pollution

(Bar chart titled "Air pollution" with values for categories 1 through 6)

- 1: ~1,00%
- 2: ~2,50%
- 3: ~7,50%
- 4: ~21,50%
- 5: ~31,00%
- 6: ~36,00%

## Climate change

(Pie chart titled "Climate change")

- 1: 1,20%
- 2: 2,41%
- 4: 10,84%
- 3: 12,05%
- 5: 19,28%
- 6: 54,22%

Taking into account media consumption patterns and time, spent in front of the screen, it turns out that the vast majority – 70% – spent more than five hours in front of the screen on a work day in the last six months. More than half of them play a game or more games on his/her devices either once or twice a week or every day, nevertheless, the remaining 40% of them do not play any games on his/her device at all.

How many hours do you spend in front of the screen (mobile, computer) on a work day? (Think about the the last 6 months)
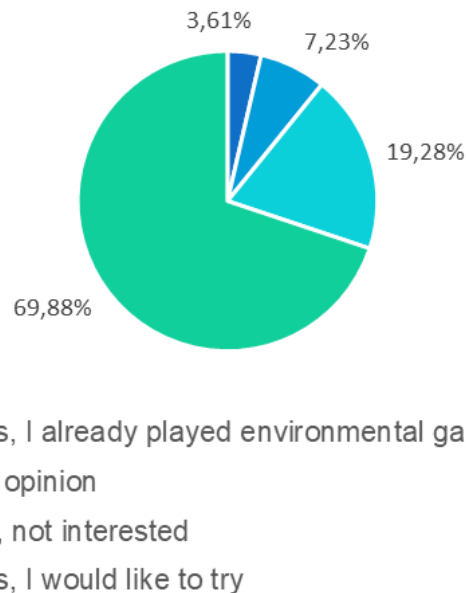


Do you play any game/s on your phone?

Despite of the popularity of digital and online games, most of the participants never heard about the concept of environmental games. It suggests that the marketing of such games are quite weak, even if lot of them are designed by world known green organisations.

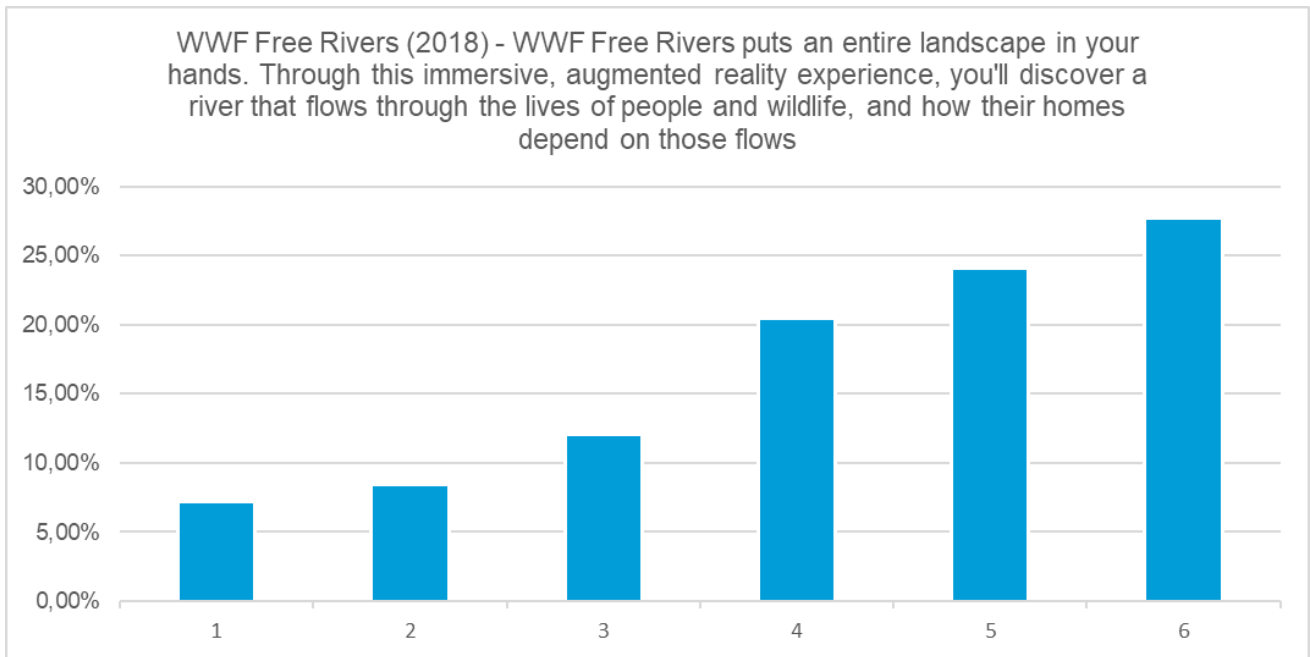**"Are you familiar with the concept of environmentl games?"**

■ No ■ Yes
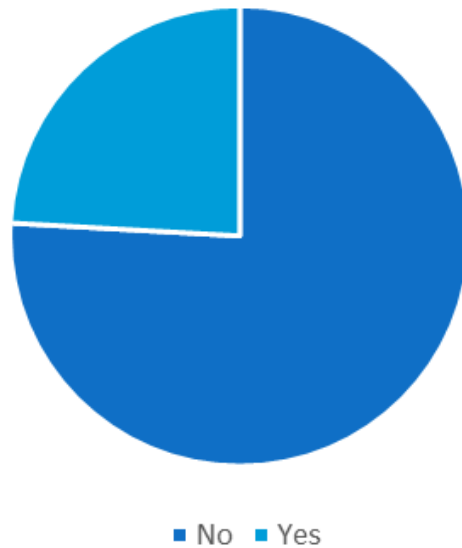
From the aspect of willingness to try out an environmental game, almost 70% of the respondents answered that he/she would give a chance for a game.

**Would you be open to try any environmental games?**

3,61%
7,23%
19,28%
69,88%

■ Yes, I already played environmental game/s
■ No opinion
■ No, not interested
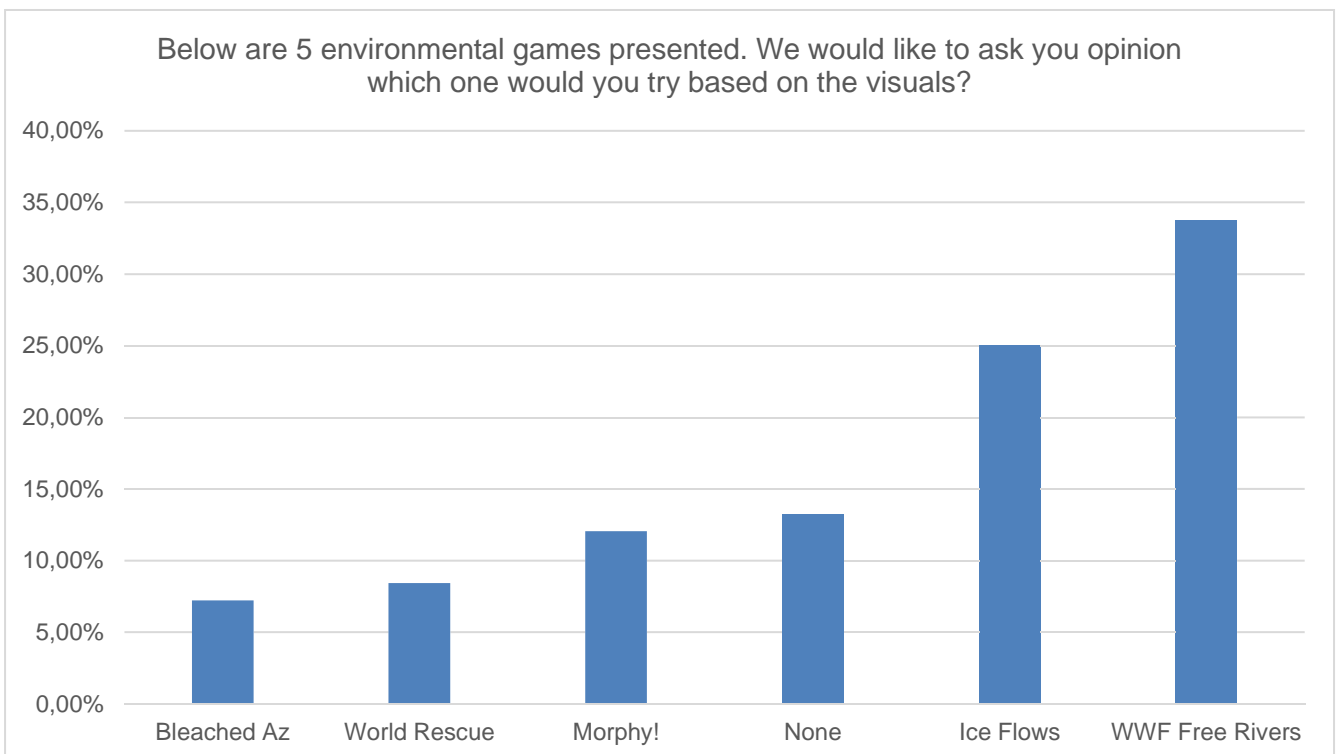■ Yes, I would like to try

The online survey contained questions relating to the Google description and visuals of each five games. The WWF Free Rivers (2018) was the most popular both by its description and visual characteristics.

WWF Free Rivers (2018) - WWF Free Rivers puts an entire landscape in your hands. Through this immersive, augmented reality experience, you'll discover a river that flows through the lives of people and wildlife, and how their homes depend on those flows

A possible explanation for this dominant popularity is based on two things, namely that even the title of the game contains the organisation (WWF) that invented the game itself so people have prior knowledge on what to expect. Also, the augmented reality experience, that the game offers is a strong buzzword.



Below are 5 environmental games presented. We would like to ask you opinion which one would you try based on the visuals?

The question of paying for an environmental game divides the participants into two groups, half of them would not pay for a game, whereas the other half show willingness to do so. None of them would pay more than 10 EUR for a game. This tendency changes, if it is about a very specific environmental problem. If giving money for a game would help to save endangered species (orangutan, panda,

elephant etc.) or improve the air quality, almost 60% of the responders would be willing to give 1-10 EUR.

## 5. Discussion and implications

One of the key findings is that users are not familiar with the concept of environmental games. This shows that this type of game is not popular or highly advertised and needs a better marketing strategy. It could also mean a lack of environmental games available for both generations. What is encouraging to see is that younger generations, Millennials, and Generation Z are willing to try them out. Still, they are also willing to pay for them, especially if a certain percentage of the profit goes into a good cause.

The research also confirms that younger generations are very much concerned with the environment, and as the survey shows, they do engage into gaming and spend a significant amount in front of the screen, which could mean that environmental games could be a good tool for education and entertainment of younger generations.

Additionally, this study contributes to the very limited number of papers on the topic of environmental games, and it can serve as a good starting point for future research.

Besides theoretical implications, this study also has practical implications. Based on the survey and the content analysis, we can see that the following features would make an engaging game:

We can see from the content analysis and from the reviews coming from Google Play that users prefer simple design as it is more mobile-friendly. It is crucial for the game to have action-based communication with a positive communication style to get users engaged, entertained, and educate them on important environmental issues. It is also important to communicate from the start what is the aim of the game as in some cases it was not clear from the beginning. As the survey demonstrated games should contribute to the concrete noble cause that effects participants. It is important to have a unique selling proposition as in Bleached Az, which uses humor, which makes it stand out from the competition on the market. Finally, a good description of the games is needed as we could see from the survey that Bleached Az did not have such a high result based on the visuals and narrative.

## 6. Limitations and future research

The study is an excellent basis for future research on environmental games. Unfortunately, not many studies focus on the concept of environmental games, even though there could be a great potential in using them to reinforce pro-environmental behavior.

The limitations of this study are, firstly, the size of the sample. The bigger size of the sample could point out additional trends but most importantly, if we are comparing the initial results obtained from the focus group that consisted of Europeans with the international survey, we can see that culture could play an important aspect when it comes to the results. Different regions have different environmental issues, which could influence their willingness to pay for a certain environmental issue. The closer the issue is to them, the more likely is that they would want to fix it.

When it comes to content analysis, this could be a good starting point. The new elements that need to be analyzed could be added, but future research could also extend on the numbers of games. It would be interesting to compare environmental games to other serious games that have an aim to educate

consumers besides entertainment. Possible research could compare environmental games that target different generations, in this case, children and adults.

Another issue when it comes to environmental games is the lack of longitudinal studies. The real question remains: Are environmental games eventually leading to pro-environmental behavior? Therefore an extensive longitudinal research is needed in order to demonstrate the potential of the environmental games.

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