



RAISE: Rasing environmental knowledge & awareness through an innovative virtual environment



Del-01-PR1: Scenarios

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Short Description	Creation of game scenarios of the 3D Virtual World Learning Environment. These scenarios were created based on the desktop survey executed during the Work Package 2. The scenarios provide adequate detail to the developers to create what the project experts have envisioned but also leave room for creativity and alternative games.
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Executive Summary

The project focused on enhancing environmental awareness through a series of game-based scenarios within a 3D Virtual World Learning Environment, blending education content with creative gameplay. Developed collaboratively by experts, these scenarios aim to immerse learners in environmental challenges, promoting understanding and engagement.

Central to the project's success was the creation of the virtual environment, where learners navigated through interactive scenarios to explore real-world environmental issues. The environment was designed to be intuitive, ensuring ease of use for a broad audience. The project involved ten scenarios that offered learners insights into environmental conservation and anxiety reduction related to environmental issues.

The virtual world's development and the scenarios therein demonstrated the project's innovative approach to combining technology and pedagogy, making environmental education more engaging and impactful.

In conclusion, the project set a precedent for using virtual worlds in educational contexts, proving that gamified learning can effectively raise awareness and prompt action towards environmental sustainability.





List of abbreviations

3DVWLE	3-Dimentional Virtual World Learning Environment
UPAT	University of Patras
ISMAI	University of Maia
UPatras	University of Patras (Greece)
AEDAS	Agrupamento de Escolas D. Afonso Sanches (Portugal)
Manin	Liceo Gimnasio Statale Daniele Manin
PR	Project Results
PM	Project Management





Introduction

1.1 Background

Raising environmental awareness through education is a crucial endeavour, especially when directed at young children. This early intervention is significant because the habits, values, and knowledge acquired during childhood lay the foundation for future attitudes and actions (Ballantyne & Packer, 2005). As the world grapples with unprecedented environmental challenges, there is a pressing need to equip the younger generation with the understanding and skills necessary to protect and sustain our planet (Barr, 2003).

Educational strategies must evolve to meet the demands of the modern world. In this context, the proposition to develop a 3D virtual world learning environment is both innovative and timely (Shepherd & Stirling, 2013). By immersing young learners in interactive, simulated environments, they can explore and engage with ecological scenarios that mirror real-world situations. This experiential learning can foster a deeper connection with environmental issues, encouraging empathy and a sense of responsibility towards nature (Dede, 2009).

A 3D virtual world offers a dynamic space where complex concepts can be simplified and visualized, making them more accessible and relatable to children. It can simulate the impact of human actions on the environment, allowing students to witness the consequences of their choices in a controlled, safe setting (Wals, 2011). This immediate feedback is an effective way to instil sustainable practices. Moreover, a virtual learning environment can transcend geographical and physical limitations, bringing diverse ecosystems and global issues to the doorstep of every classroom. This universal access to quality environmental education can democratize learning and ensure that every child, regardless of background, can become an informed steward of the environment (Monroe & Krasny, 2015).

In essence, a 3D virtual world dedicated to environmental learning aligns with the educational imperative to nurture informed, conscious, and proactive global citizens. It is an investment in the future—a future where the seeds of environmental stewardship sown in the minds of young learners blossom into the actions that will shape a sustainable and equitable world for all (Jensen & Schnack, 1997). Additionally, there is also a need for schools and/or other school educational institutions to develop systems that fosters the environmental education of young children as it will create future adults with green skills and competencies that will reflect finally to the society. (Kim & Castelli, 2020)





1.2 Gamification for Environmental Education

Gamification has emerged as a transformative approach in various domains, including environmental education, due to its ability to enhance engagement, motivation, and behaviour change. Gamification utilizes elements traditionally found in games – such as point scoring, competition, and rules of play – to motivate and enhance user experience in non-game contexts (Deterding et al., 2011).

In the context of environmental awareness, gamification can play a pivotal role. By integrating game mechanics into learning activities, educators can captivate children's attention and make complex environmental issues more accessible and engaging (Hamari, Koivisto & Sarsa, 2014). Gamification taps into the natural human instincts for competition, achievement, and collaboration, which can drive young learners to engage more deeply with environmental content and foster long-term behaviour change toward sustainability (Seaborn & Fels, 2015).

The effectiveness of gamification in educational settings has been supported by various studies demonstrating its positive impact on learning outcomes. (Mekler et al., 2014) For example, research suggests that gamification can improve student motivation, focus and retention of information, which are essential components in the transformative learning process necessary for environmental stewardship (Sailer et al., 2017).

Furthermore, gamified learning experiences can provide immediate feedback and rewards, crucial for reinforcing knowledge acquisition and encouraging the application of learned behaviours in real-world settings (Ratinho & Martins, 2023). By simulating environmental scenarios, students can witness the outcomes of their action, promoting an understanding of cause and effect that is vital for environmental decision-making. In terms of the social aspect of gamification, when applied to multiplayer settings, can also foster a sense of community and peer support, which is especially beneficial for young students, as a way to communicate and play with other children towards a common goal. (Ouariachi et al., 2020)

In summary, the integration of gamification into environmental education can enhance the learning experience, making it more interactive, enjoyable, and impactful. The potential of gamified approaches to foster environmental consciousness and address the challenges that the world is facing through an innovative pathway for educational programs, warranting further exploration and integration into curricula. (Wolf, 2020)





1.3 The RAISE project

RAISE is an innovative Erasmus+ funded initiative that stands for Raising environmental knowledge & awareness through an innovative virtual environment. This pioneering project is designed to enhance environmental consciousness among students through an immersive and state-of-the-art platform – a 3D virtual world. The core objective of RAISE is to empower individuals with the knowledge and capabilities necessary to navigate and address environmental challenges effectively.

The project seeks to construct a gamified environment that enables users to experience and interact with realistic environmental scenarios. By doing so, RAISE aims to instil a comprehensive understanding of ecological issues and promote active engagement in sustainable practices. The 3D virtual world developed by RAISE project team will serve as a fertile ground for users to develop and practice strategies to manage and mitigate environmental issues, fostering a generation of environmentally conscious and proactive individuals. (Xenos et al., 2019) Through this innovative virtual realm, RAISE is set to transform environmental education, making it more relatable, engaging, and impactful for its users.





2 Designing RAISE – Creation of virtual world scenarios

RAISE is a forward-thinking initiative that utilises gamification and serious games to instigate change and enhance the environmental awareness of school students. This project employs state-of-the-art technologies not just for entertainment but to foster cognitive development, enrich knowledge, and raise awareness about the pressing environmental issues of our time. As a specific genre of game-based learning, RAISE employs virtual world games, which are defined by their immersive, interactive environments.

Taking cues from the widespread popularity of open-source platforms such as “Second Life”, RAISE leverages immersive virtual world environments to address the educational needs of today’s youth. These virtual worlds enable students to embody avatars, interact within various settings, and gain a sense of empowerment and self-efficacy. Far from passive learning, RAISE’s virtual world promises engaging and innovative experiences that facilitate the acquisition of new skills and behaviours in a stigma-free and safe space. The cornerstone of RAISE is the creation of an Open 3D virtual world learning environment that simulates contemporary environmental problems. This world allows students to engage in gamified activities that mirror real-life ecological challenges, fostering an understanding of the issues and promoting active problem-solving. The gamified activities are embedded within scenarios that offer exposure to environmental issues, guiding students to develop positive coping mechanisms and environmental stewardship. (Xenos et al., 2009)

An integral part of RAISE’s mission is to deliver a comprehensive overview of environmental issues that young students should recognize and understand. To identify these issues and reveal areas of knowledge deficiency, a desktop survey was conducted. This survey helped pinpoint both well-understood concepts and those less known, which informed the development of the virtual world’s scenarios. RAISE aims to:

- Develop gamified scenarios that reflect real-world environmental challenges faced in society.
- Craft a virtual world that serves as an educational platform for environmental learning.
- Provide tools for students to enhance their knowledge of environmental issues

By focusing on the unique dynamics of the school environment and student experiences, RAISE created tailored scenarios that operationalize the educational needs of young





students in relation to environmental issues. These scenarios guide the development of the 3D virtual world, ensuring it is an effective tool for raising environmental awareness among school students

2.1 Virtual World Requirements

RAISE incorporates a state-of-the-art 3D Virtual World, akin to the immersive environment seen in platforms like “Second Life”. This advanced virtual realm is a multi-user space, featuring diverse 3D environments of varying sizes, accessible to users through a variety of clients using multiple protocols. Access to the RAISE 3D Virtual World is free and facilitated by a specialized virtual viewer, a standalone application outside the traditional web browser.

The technical requirements for the RAISE Educational 3D Virtual World ensure a broad accessibility and smooth user experience:

- A Dual-core CPU with SSE2 support.
- A NVidia or ATI/AMD graphics chip.
- A minimum of 2GB RAM.

The supported operating systems include:

- Windows XP or newer.
- Ubuntu Linux 10.04 or newer.
- Mac OS X 10.6 or newer.

In the RAISE 3D Virtual World, the focus is on fostering an interactive and collaborative learning environment. Users can create and customize their 3D avatars, reflecting their personal creativity and envisioned appearance. These avatars can interact with the virtual world’s elements, including various places, objects, and other avatars. This interaction encourages exploration and engagement within the virtual realm, thereby enhancing the learning experience.

Movement within this virtual space is dynamic and user-friendly, allowing avatars to walk, run, fly, teleport to specific coordinates, and interact with scripted objects, enriching the educational experience through diverse modes of exploration and interaction.

In RAISE, the 3D Virtual World is leveraged as an educational tool rather than a platform for private conversations or voice communications. It’s designed to immerse users in a





range of environmental scenarios, each crafted to raise awareness and understanding of key environmental issues faced in today's society. By simulating these real-world challenges in a controlled and interactive virtual environment, RAISE aims to enhance environmental literacy and foster proactive approaches to environmental stewardship among school students. (Rustamova, 2023)

2.2 Essential Steps and Responsibilities in Scenario Development

The RAISE project, focusing on raising environmental awareness among young school students through a 3D virtual learning environment, required a multifaceted approach in the development of its game scenarios. This development was a collaborative effort, bringing together a diverse group of experts:

1. **Environmental Scientists:** These experts, specialising in areas like climate change, biodiversity, and sustainable practices, played a crucial role. They ensured that the scenarios were scientifically accurate and relevant to current environmental issues.
2. **Computer Scientists and Game Developers:** Their expertise in creating engaging 3D virtual environments, gamification elements, and interactive designs was vital. They transformed complex environmental concepts into accessible and engaging learning experiences for little children.
3. **Educators and Environment Experts:** Understanding how children learn and process information, these professionals provided insights into creating age-appropriate educational content. Their guidance helped tailor the scenarios to be both informative and both suitable for little children.
4. **Students and Professors:** This group offered a fresh perspective on effective environmental education strategies, contributing ideas for making learning both fun and impactful.

The scenario development process included several key tasks and activities:

- **Research Survey:** A survey was conducted in order to pinpoint the deficiencies of school students aged between 10-15 years old and get a holistic view of will be developed in the virtual world by focusing the results of the research survey as understanding the starting level of knowledge, attitudes, and behaviours regarding environmental issues among the student population is essential. This





assessment helped us to identify specific areas where knowledge is lacking or misconceptions exist, allowing for targeted educational interventions.

- **Result Analysis:** A Result Analysis was created to structure the results and key findings from the research survey and get an understanding the specific gaps of students' understanding of environmental topics, such as waste management, conservation practices, and the impact of human activities on climate change. Recognising these gaps in the first step in developing tailored educational content that addresses these areas effectively is crucial and should not be overseen. The insights gained from the survey analysis directly inform the creation of scenarios within the 3D VWLE . By understanding the student's current knowledge level and emotional responses to environmental issues, the project team can design interactive scenarios that are both engaging and educational, ensuring that the virtual environment is relevant and effective in promoting environmental awareness.
- **Collaborative Design:** A concerted effort was made to ensure that the scenarios were deeply rooted in environmental science while also being pedagogically sound. This involved designing interactive elements such as virtual ecosystems, challenges, and tasks that were both educational and appealing to children.
- **Insight and Data Collection:** Understanding the target audience – children – was crucial. This involved qualitative research to tap into children's environmental awareness, interests, and learning deficiencies. Feedback from educators and students was instrumental in shaping the scenarios.

As a result of this comprehensive and collaborative process, the RAISE project successfully developed a series of interactive and educational scenarios within the 3D virtual world. These scenarios are designed not only to educate children about environmental issues but also to inspire them to be proactive in environmental conservation. The virtual world of RAISE offers a dynamic platform where children can explore, learn, and develop a deeper understanding of the environment around them. The project stands as a testament to the power of collaborative, interdisciplinary efforts in creating impactful educational tools.





2.2.1 Assessment and Investigation of Student Needs and Requirements

Desktop survey

In the RAISE project, we conducted a comprehensive desktop survey with school students to inform the development of our Virtual World for environmental education. This survey was crucial to ensure the educational content and gamification within the virtual environment were based on the actual learning needs and environmental understanding of the target audience. Before this survey, we prepared a detailed guide for a quantitative approach to capture the environmental awareness, knowledge gaps, and preferences of school-age students within 3 different countries – Greece, Italy and Portugal. The survey strategy included a series of questions covering a wide range of environmental topics and students' attitudes towards conservation and sustainability. This approach allowed us to gather data directly from the students, providing us with valuable insights into their environmental knowledge and attitudes, which were essential for developing engaging and informative scenarios in the Virtual World.

Participants

The participants in the survey conducted for the RAISE project were a diverse group of 347 school students. This included 232 female students (66.9%), 114 male students (32.9%), and 1 identifying as other (0.3%). The students hailed from three countries: Portugal with 135 participants, Greece with 61, and Italy with 151. Their ages ranged from 9 to 19 years, with the majority falling in the 14-15 age bracket. The participants represented various school years, from the 5th to the 11th grade, with a notable concentration in the 10th grade. This varied demographic composition provided a comprehensive insight into the environmental awareness and educational needs of young students across different regions and age groups.

Results

The survey conducted for the RAISE project yielded significant results, indicating a high level of engagement and participation from the students. They provided valuable feedback on various environmental topics, reflecting their awareness and concerns about climate change and sustainability. The nature of the survey, focusing on targeted questions about environmental issues, allowed students to express their viewpoints on crucial matters such as waste management, conservation, and pollution. Their responses offered deep insights into their understanding of environmental challenges and their attitudes towards sustainable practices. This feedback is essential for tailoring the RAISE





project's virtual world to effectively educate and motivate young students about environmental stewardship.

The result analysis from the RAISE project survey clearly identified gaps in environmental knowledge and awareness among students, pointing to specific areas for improvement in educational approaches. It was evident that students had a varying degree of understanding of fundamental environmental issues, with some lacking basic knowledge of recycling processes and sustainable practices. The findings also revealed significant disparities based on geography and gender, suggesting that educational content might need to be customised to address these differences effectively. Moreover, the survey underscored a need to enhance student engagement in environmental behaviours, as many expressed concern about climate change but did not consistently practice sustainability in daily life. This feedback is crucial for the RAISE project as it aims to develop a virtual world that not only educates but also actively engages students in environmental stewardship, encouraging them to translate their knowledge into action.

Key Findings

1. Waste Management

The survey revealed a significant interest and learning gap among students regarding waste management. Many students were unaware of the intricacies of waste segregation, disposal, and its environmental impact. For instance, when asked about items that cannot be recycled, a significant number (61.1%) incorrectly identified used paper napkins as recyclable. This misunderstanding underscores a broader lack of awareness about proper waste segregation and its environmental implications.

This find led to the development of scenarios like “Lost Something in Waste” and “Green Champions”, aiming to educate students on responsible waste practices, the importance of recycling, and the broader concept of a circular economy. These scenarios aim to correct misconceptions, educate students on the environmental impact of waste, and promote responsible waste practices. By integrating these topics into the virtual world, we aim to transform theoretical knowledge into practical, everyday actions, fostering environmentally conscious behaviour among students.

2. Renewable Energy

The RAISE desktop survey revealed a strong interest among students in renewable energy sources, particularly in how wind and solar power operate and their advantages over





conventional energy sources. A key insight emerged from a question about renewable energy awareness, where a significant majority of students (over 90%) demonstrated knowledge of solar and wind energy, indicating a keen interest in these areas.

To address this interest, the “Wind Farm Station” was conceptualised. This scenario provides an interactive experience where students can explore the mechanics of wind turbines, understand the process of generating wind energy, observe how a wind farm station really operates and comprehend the benefits and challenges associated with this renewable energy source. The scenarios designed to be immersive and informative, offering hands-on learning that goes beyond theoretical knowledge. It seeks to inspire students to support and advocate for renewable energy initiatives, reflecting their burgeoning interest in sustainable energy solutions.

The high level of interest in renewable energy among students underscores the importance of incorporating such topics into educational platforms. By providing interactive and engaging scenarios like “Wind Farm Station”, the RAISE project aims to harness the interest to foster a deeper understanding of renewable energy and its critical role in tackling environmental challenges. This scenario is just one example of how the RAISE project is leveraging the power of virtual worlds to transform environmental education, making it more relevant, engaging, and impactful for today’s students.

3. Recycling

The survey results highlighted a significant interest and knowledge gap in recycling among students. Notably, when asked about recycling practices, many students were aware of the basic concept but lacked a deeper understanding of effective recycling methods. For instance, a large proportion of students incorrectly identified certain materials as recyclable or non-recyclable, reflecting a common confusion about what can and cannot be processed through recycling programs.

To address this gap, the project developed scenarios focused on recycling, such as interactive modules where students sort waste correctly and learn about the recycling process, like “Lost something in waste” or “Green champions”. These scenarios are designed to provide practical knowledge about recycling, helping students understand the importance of proper waste sorting and the environmental benefits of recycling. The goal is to instil a habit of recycling in students, emphasizing that their actions can have a significant impact on environmental conservation. This experiential learning approach





seeks to create a lasting impact on students, inspiring them to adopt a lifestyle that prioritizes environmental health.

4. Carbon Footprint of Everyday Activities

The survey results from the RAISE project revealed a significant gap in students' understanding of the carbon footprint of their daily activities. Many students were not aware of how their everyday choices, such as transportation methods, energy consumption, and food preferences, contribute to their personal carbon footprint. For example, when asked about activities that increase carbon dioxide levels in the atmosphere, a substantial number of students did not recognize the full range of contributors, such as the impact of consuming energy from fossil fuels or the environmental cost of certain modes of transportation. To address this gap, the "Carbon Heroes" scenario was developed. This scenario is an interactive, engaging platform where students can learn about the environmental impact of common activities. It aims to make them aware of how their daily choices, like the type of transportation they use, the products they buy, and their household energy consumption, contribute to their carbon footprint. By simulating real-life decisions and their environmental outcomes, this scenario helps students understand the concept of carbon footprint in a tangible way.

This scenario also includes challenges and rewards for adopting more sustainable practices, encouraging students to think critically about their daily actions and how they can reduce their carbon footprint. The ultimate goal is to foster a deeper understanding of environmental responsibility and to empower students to make choices that are more sustainable. By integrating this knowledge into their daily lives, students can become active participants in combating climate change. Through the "Carbon Heroes" scenario, the RAISE project is addressing a crucial educational need, highlighting the importance of individual actions in the broader context of environmental conservation. This approach not only educates students but also inspires them to be part of the solution to environmental challenges.

5. Environmental Impact of Factories

The desktop survey revealed also a critical gap in students' awareness regarding the environmental impact of industrial activities. A significant number of students (over 60%) expressed concern about the detrimental effect of factories on the environment, yet many lacked a detailed understanding of specific pollutants and their consequences.





This finding led to the creation of the “Polluting Factory” scenario. In this scenario, students navigate a virtual environment impacted by factory pollution, learning about the effect of industrial pollutants, the importance of environmental regulations in mitigating these effects and the true impact of different appliances to the factory production reduces significantly the pollution of the environment. The scenario is rich with real-time simulations of polluted landscapes, interactive elements illustrating the processes of pollution, and role-playing activities where students make decisions to control or reduce industrial pollution.

Based on the survey findings, it's clear that students' concerns about industrial pollution are a call to action for more comprehensive environmental education. The "Polluting Factory" scenario, therefore, is not just an educational tool; it's a response to a crucial need for greater awareness and understanding among young learners about industrial environmental impacts. By bringing these issues to life through interactive simulations, the scenario addresses this educational gap, aiming to cultivate a generation of environmentally conscious individuals. It underscores the importance of equipping students with knowledge and critical thinking skills to address environmental challenges, emphasizing the role they can play in advocating for sustainable practices and policy changes. This approach reflects a commitment to not only inform but also empower students to make a positive impact on their world.

6. Eco-Friendly Technologies in Urban Environments

Finally, the desktop survey indicated a profound interest among students in cutting-edge, eco-friendly technologies in urban environments. A notable 75% of respondents expressed a desire to learn more about sustainable urban development, particularly in the areas of energy conservation, waste management, and green living spaces. This keen interest was further echoed in specific responses where students asked about technologies like solar panels, smart waste management systems, and green building practices.

To address this enthusiasm, the “Visiting a Green Town” scenario was developed. This scenario is a virtual exploration of a modern, eco-friendly urban area, designed to be both educational and inspiring. Students navigate through a city equipped with the latest sustainable technologies, like solar panels roofs or electric buses, learning how these innovations contribute to environmental conservation and improved urban living. They interact with elements like solar-powered building, efficient public transport systems, and community gardens, understanding their roles in creating sustainable cities.





Furthermore, in an engaging twist, students are presented with challenges such as designing their own eco-friendly spaces, managing a city's waste recycling system, or planning a sustainable public transportation network. These activities are not only informative but also encourage students to think critically about urban planning and its environmental impact. By the end of the scenario, students have a comprehensive understanding of how eco-friendly technologies can transform urban areas. The goal is to inspire them to become advocates for sustainable urban development and to consider how they can contribute to creating greener, more sustainable communities in their own lives.

7. Attitudes

The survey results from the RAISE project shed light on a trend among student concerning their attitudes toward environmental sustainability. While there's a demonstrated positive inclination towards adopting environmentally friendly practices such as recycling, energy conservation, water preservation, and supporting local food sources, a discernible gap emerges in their active participation in environmental group and initiatives. This discrepancy between attitude and action warrants a deeper exploration to understand its implications and explore potential solutions, so the survey highlighted a significant gap in students' active engagement with environmental groups and initiatives. This gap suggests that while students are theoretically supportive of environmental conservation, this support does not consistently translate into practical involvement or activism. Several factors could contribute to this gap:

1. **Lack of Awareness or Access:** Students may not be aware of existing environmental groups or initiatives within their community or school or may feel that they do not have access to these groups.
2. **Perceived Barriers to Participation:** There could be perceived barriers to involvement, such as time constraints, lack of encouragement from peers or educators, or the belief that individual efforts are too small to make a difference.
3. **Motivational Gaps:** While students may agree with the principles of environmental conservation, they might lack the motivation of immediate incentives to participate actively in related activities or groups.
4. **Emotional and Psychological Factors:** Feelings of anxiety, hopelessness, or overwhelm in the face of global environmental issues might deter students from engaging in what they perceive as a challenge.





So, addressing the gap between students' positive environmental attitudes and their active participation in environmental groups and initiatives is a complex challenge that requires innovative solutions. One of the promising approaches the RAISE project will adopt to its scenarios involves incorporating real-time and critical thinking minigames into the educational scenarios provided within the virtual learning environment. This strategy is designed to bridge the theoretical support for environmental conservation with practical involvement, tackling the identified barriers in several impactful ways.

So, the RAISE project's incorporation of real-time and critical thinking mini-games into its educational scenarios represents a forward-thinking approach to environmental education. By directly addressing the gap between positive attitudes and active participation, these mini games play a crucial role in transforming theoretical support into actionable behaviors. Through this innovative strategy, the project aims to cultivate a generation of students who are not only aware of environmental issues but are also equipped and motivated to take part in solving them. This approach has the potential to make a significant impact on the future of environmental conservation efforts, fostering a culture of active participation and stewardship among young learners.

2.3 Developing a Scenario Rationale

The RAISE project's central aim is to engage students in environmental education and awareness through an immersive, gamified virtual world. This innovative approach leverages 3D virtual worlds to craft interactive and educational environments, where students can safely explore and confront various environmental issues in a fictional yet impactful setting. The project began with an in-depth analysis of environmental problems, drawing on a wealth of resources including scholarly literature, expert knowledge from project partners, and comprehensive diagnostic assessments like semi-structured interviews.

To capture student interest and facilitate a deeper understanding of environmental challenges, the RAISE team developed a series of carefully crafted scenarios. Each scenario corresponds to a specific environmental issue, ranging from pollution and waste management to renewable energy and conservation. These scenarios are not mere simulations; they are enriched with role-play activities that allow students to experience and respond to environmental issues firsthand. In each scenario, students encounter non-Player Characters (NPCs) who are grappling with similar environmental challenges and will guide the student through the narrative of each scenario. This design allows students





to project themselves into the situation, empathizing with the NPCs and, by extension, understanding the real-world implications of these issues. As students navigate these scenarios, they are not only observers but active participants, taking on the role of helpers who guide the NPCs — and, metaphorically, themselves — towards overcoming environmental challenges.

The RAISE project's virtual environment is replete with educational cues and strategies. Essential knowledge about environmental issues and sustainability practices is seamlessly integrated into the virtual world. These educational elements are playfully embedded throughout the environment, encouraging exploration and discovery. The information is presented in simple, accessible formats, often accompanied by supporting literature, to ensure that students can easily grasp complex environmental concepts. Moreover, the educational content is strategically placed throughout the environment, designed to spark curiosity and encourage self-directed learning.

This immersive, scenario-based approach signifies a bold reimagining of environmental education. The RAISE project not only aims to inform but to transform, cultivating a generation of students who are not just aware of environmental issues but are empowered to take meaningful action. Through this innovative blend of technology, narrative, and interactivity, the RAISE project offers a blueprint for the future of environmental education, one where learning transcends the classroom, inspiring students to become active participants in crafting a more sustainable, environmentally conscious world.

The goal of the RAISE project is to create a virtual space that resonates with students on both an educational and emotional level. By blending gamification with environmental education, the project seeks to inspire a new generation of environmentally conscious individuals. (Ahmadi, Noorani & Hosseini, 2023) It aims to empower students with the knowledge and skills necessary to tackle environmental issues, fostering a sense of responsibility and urgency towards environmental stewardship and sustainability. Through this innovative approach, the RAISE project exemplifies how technology and education can converge to create impactful learning experiences. It stands as a model for how virtual environments can be harnessed for educational purposes, particularly in fostering awareness and action in critical areas such as environmental conservation.





2.4 Environmental Rationale

Despite the groundswell of gamified approaches to a range of issues, there remains a dearth of evidence for its effectiveness. Recent research has begun to emphasise how gamification can encourage environmental behaviours and contribute to environmental sustainability issues. Du, Ke and Wagner pinpointed that the gamification design elements like autonomy support, visibility of achievement, competition, and interactivity can satisfy users' demands for green effectiveness, enjoyment, and social gain, thereby predicting users' intention to continue utilising gamified information systems for pro-environmental behaviours. More specifically, they concluded that gamification is considered an effective alternative to promote the adoption of pro-environmental behaviours within organisations, supporting the creation of a culture that benefits both the economy and society. So, a scenario must outline a gamified experience which is linked to students' experiences of everyday life (particularly around the school area), whilst also providing opportunities for learning and skill development which is informed by an evidence-based and environmentally informed approach to raise environmental awareness. These activities and experiences in turn, must be specifically tailored to the technological requirements of the 3D virtual world, such as the use of NPCs, interactions between the avatar and other players, interactions between the avatar and objects in the environment, mobility of the avatar around the environment, etc.

Developing an environmental rationale for the 3D virtual world is fundamental step in the development of the scenarios- this helped to guide the development of the overarching game concept and the structure of the game. Rooting the game within an evidence-based approach to environmental education is vital, as it fosters a sense of environmental caution to future adults that will eventually returns its gain to tomorrows society.

Several studies have illuminated the roles of gamification and virtual environments in educational settings, underlining the necessity for learning experiences that are both engaging and immersive. For instance, research and experimental implementations such as the "3DUPB" campus have showcased the benefits of designing virtual worlds as learning environments. These platforms, by integrating gamification elements, significantly boost student motivation and the effectiveness of learning evaluation. Similarly, the fusion of virtual reality and gamification for teaching fundamental concepts in computer hardware to software engineering students has proven that such innovative educational 3D virtual worlds can complement traditional teaching methods, thereby enhancing learning outcomes and student engagement. Furthermore, the application of gamification and virtual reality-enhanced learning in university





engineering and architecture classes, utilizing tools like Sketchfab, Unity, and Oculus Rift VR, has been shown to heighten student motivation and engagement significantly. This approach not only facilitates the creation of immersive worlds for architectural designs but also demonstrates the effectiveness of gamification within educational contexts. Collectively, these studies advocate for the potential of gamified virtual environments to cultivate engaging, immersive, and effective learning experiences aimed at fostering environmental awareness and sustainability. They emphasize the criticality of crafting educational scenarios that resonate with real-life experiences and are supported by the technological affordances appropriate for 3D virtual worlds, ultimately gearing future generations towards a positive contribution to environmental sustainability.

2.5 Technological Rationale

In the context of the RAISE project, the use of 3D virtual world technology is predicated on creating a highly immersive, interactive learning environment. This approach aligns with research suggesting that virtual worlds offer significant engagement and immersion potential (Onyesolu & Eze, 2009; Bredl et al., 2015). Key elements contributing to this immersive experience include:

1. **Avatars:** The creation and customization of avatars, as discussed by Michel, Helmick, & Mayron (2011), play a pivotal role in enhancing the user's sense of presence and immersion in the virtual environment.
2. **Social Interaction:** The RAISE virtual world facilitates interaction between users, augmenting immersion. This social dynamic, highlighted by Bredl et al. (2015), is essential for creating a collaborative and realistic learning atmosphere.
3. **Technical Quality and Realism:** The RAISE project emphasizes high-quality graphics and realistic environmental simulations. According to Childs (2010) and de Freitas et al. (2009), these aspects are crucial for a believable and engaging virtual experience.

Additionally, immersion is influenced by the user's willingness to engage, as noted by Kanamgotov et al. (2012). This factor is particularly relevant for the RAISE project, where the success of environmental education hinges on the students' engagement levels. The RAISE project's integration of these elements aims to provide an experience that mirrors real-world environmental interactions and challenges. This immersive quality is vital for ensuring that students are not only educated about environmental issues but also feel motivated to actively participate in and advocate for sustainable practices.





Further enriching the RAISE project's technological rationale is the incorporation of adaptive learning techniques, which personalize the educational experience. Adaptive learning systems, as explored in studies by Xie, Chu, Hwang, and Wang (2019), can adjust the difficulty level and presentation of content based on individual student performance and preferences. This personalized approach ensures that each student's learning journey is tailored to their unique needs and abilities, thereby maximizing engagement and effectiveness. The integration of adaptive learning in the RAISE project's virtual world further enhances its educational value, making it a dynamic tool for fostering environmental awareness and action among a diverse student population.

2.6 Pedagogical rationale

In the RAISE project, the pedagogical rationale is centered around utilizing gamification to enhance student engagement in environmental education. This approach aligns with the Critical-Dialectic Paradigm (Fragkaki & Lionarakis, 2011), extending beyond mere understanding of environmental issues to fostering critical consciousness and action for personal and societal transformation. The project draws from Constructivism and Social Constructivism, emphasizing that knowledge and understanding develop through meaningful interactions with the virtual environment and other participants. In RAISE, virtual scenarios are crafted to be realistic and relevant to students' experiences, facilitating active learning and critical reflection.

Furthermore, the integration of Critical Constructivism emphasizes the social dimensions of environmental education, fostering community building and collaborative learning. This approach is designed to enhance students' social engagement and cooperative skills through real-time communication in the virtual world. By enabling students to interact, discuss, and solve environmental challenges together, RAISE aims to cultivate a strong sense of community and shared responsibility. This interactive environment encourages students to exchange ideas, offer mutual support, and collaboratively develop solutions, enhancing their understanding and commitment to environmental stewardship. The project's focus on social interaction not only enriches the learning experience but also aligns with the goal of fostering a collaborative and environmentally conscious community.

Recent publications further enrich the pedagogical rationale of the RAISE project, underscoring the significance of gamification in environmental education. Ouariachi, Li, and Elving (2020) identified pro-environmental gamification platforms like SaveOhno and





JouleBug as best practices for educational purposes, highlighting the importance of elements such as meaning, ownership, and social influence in engaging users in pro-environmental behavioural change. Similarly, Mahmud, Husnin, and Tuan Soh (2020) found that teaching presence in online gamification significantly impacts sustainability learning and self-determination, driving student participation in gamified activities. These insights complement the RAISE project's objectives by providing empirical evidence on the effectiveness of gamification in promoting environmental education and engagement.

Pedagogically, the RAISE project follows an Inquiry-based learning approach (EBL, 2012; Dostál, 2015), where students independently explore environmental situations, engaging in critical reflections on their actions and the impact of societal factors. Social learning is emphasized, helping students realize the commonality of environmental concerns (Bandura, 1971). Active Learning (Settles, 2010) is fundamental, with gamification (Sebastian et al., 2011) and structured empathetic activities in the virtual world. This educational strategy enables students to approach environmental issues both objectively and personally, making the virtual situations convenient and redemptive for their learning experience.

Overall, the RAISE project's pedagogical approach meticulously integrates epistemology, theory, pedagogy, and methodology to provide a qualitative, safe, and engaging virtual environment for environmental education.

2.7 3D Virtual World Gaming Rationale

In the RAISE project, the development of a 3D virtual world is grounded in the evolving perception of gaming as a beneficial educational tool. This approach aligns with research underscoring the positive aspects of gaming, such as educational enhancement (Aguilera & Mendiz, 2003), promotion of collaboration, socialization (Garvey, 1971), and development of critical thinking (Ellington & Percival, 1977). Games have been recognized for their ability to boost motivation and foster skills like problem-solving, strategic planning, and logical reasoning.

The RAISE project's 3D virtual world is designed to immerse students in environmental scenarios, promoting understanding and action on sustainability issues. It utilizes specific scenarios, akin to those in educational games like "Civilization IV" for geography and strategy, or "Sims" for social simulation, to engage students in learning about





environmental challenges. These scenarios are crafted to stimulate observation, critical thinking, and decision-making skills within an environmental context. Recent advancements in 3D Virtual Worlds offer unique opportunities for applications beyond leisure, extending into education and training. The RAISE project capitalizes on these technologies to move beyond traditional educational methods, focusing instead on experiential learning through action, cooperation, and problem-solving in a virtual environment.

Recent studies further substantiate the use of 3D virtual worlds in education, highlighting their potential to foster immersive learning experiences. For example, 3D virtual environments are recognized for their capacity to enable active learning, learning by doing, and knowledge construction through social interaction, which are crucial in the educational domain (Rapanotti et al., 2012; Dickey, 2005). Moreover, the pedagogical implications of using 3D virtual worlds for synchronous distance education reveal that Active Worlds, a popular 3D virtual world, supports constructivist learning environments and facilitates pedagogical approaches such as inquiry-based learning, highlighting the versatility and effectiveness of 3D virtual worlds in enhancing educational outcomes (Dickey, 2005).

An essential aspect of 3D Virtual Worlds in education is immersion. This sense of "being there," along with interaction with virtual objects, can significantly enhance student engagement and understanding of complex concepts (Dickey, 2005; Frisbee, 2007). The RAISE project leverages this immersion to provide students with experiences that deepen their understanding of environmental issues and encourage active participation in sustainability efforts.

Supporting this immersive learning experience, numerous studies have demonstrated the effectiveness of experiential learning in virtual worlds across various scientific domains (Maratou et al., 2015; Ntokas et al., 2015; Xenos et al., 2017). In line with these findings, the RAISE project's 3D virtual world includes scenarios where students explore and address environmental challenges, fostering a deeper understanding and proactive attitude towards environmental wellbeing. Thus, the RAISE project's use of a 3D virtual world is a deliberate choice to harness the educational potential of gaming and virtual reality technologies, providing an innovative platform for environmental education and engagement.





3. The RAISE 3D Virtual World – Environmental Education Scenarios

Integrating environmental, pedagogical, and technological insights, the RAISE project team, with input from experts, developed a suite of scenarios for its 3D virtual world. This overarching strategy guides the virtual world's design, focusing on key environmental challenges, activities that encourage sustainable practices, and skills or knowledge to be gained through game-based experiences. The RAISE scenarios aim to engage students in environmental education through a gamified, 3D virtual environment, promoting awareness and positive action toward environmental issues. The goal is to create an immersive learning experience that educates students about real-world environmental challenges and empowers them with the tools to address these issues effectively.

3.1 Implementing Environmental Education in the RAISE 3D Virtual World

In the RAISE project, the primary goal within the 3D virtual world is to engage player in environmental challenges relevant to their experiences. The scenarios, developed based on collaborative input, involve gamified elements that educate players about environmental issues. Players interact within the virtual world, aiding non-player characters (NPCs) who are facing various environmental challenges. These interactions are designed to provide insights into environmental impacts and sustainable practices. The presence of a virtual guide or coach offers additional support and guidance, helping players recognize the significance of their actions on the environment and learn effective strategies for promoting sustainability. This immersive experience aims to equip students with knowledge and skills for addressing real-world environmental concerns.

3.2 Game-based elements

In the RAISE project's 3D virtual world, game-based elements are key to delivering an engaging and educational experience. Each scenario is designed with the mission to impart a specific environmental learning goal, enhancing players' understanding by the scenario's end. The primary objectives include grasping the concept of an environmental problem, learning methods to mitigate its effects, recognizing how these issues affect daily life, and fostering a realization that everyone is both part of the problem and the solution.





To achieve these educational goals, the game incorporates various gaming design techniques. Scenarios are enriched with quizzes, image correspondence games, text fill minigames, and real-life inspired activities like shooting waste into the correct recycling bin, represented by a basketball hoop. This interactive approach ensures that learning about environmental issues is not only informative but also enjoyable. Additionally, the game features a trophy room, which serves to track players' progress. This space highlights completed scenarios and suggests future ones to undertake, offering players a clear view of what they have learned and what remains to be explored. This feature enhances the sense of accomplishment and helps in reinforcing the educational context experienced in each scenario.

The scenarios within the RAISE 3D virtual world are listed in Table 1: List of Scenarios. Each scenario is also available in Appendix 2.

Table 1: List of scenarios

Sequence	Scenario	Aims/Skills gained
Tutorial room	Learning the 3D virtual world environment	- Players learn how to interact with the 3D virtual world environment
Scenario 1	Green champions	- Knowhow to segregate paper, plastic, metal and organic waste. - Identify and recognize the benefits that recycling programmes means for the health and sustainability of the planets
Scenario 2	Walk in the forest	- Characterize species of different forest ecosystems - Identify the human activities that can be developed in the forest - Identify threats and risks to the forest
Scenario 3	Lost in waste	- Collecting and transportation of the waste - The technologies are used in each of these treatments (sorting and baling, composting)





Scenario 4	Polluting Factory	- Students will have familiarized themselves with the concept of industrial pollution - Students will also develop strategies to enhance their knowledge about industrial pollution and waste. - They will be able to come up with strategies to cope with the problem of industrial pollution
Scenario 5	Carbon Champions	- Provide information about the importance of our carbon footprint in relation to our planet - Help students realize that their everyday habits can affect the planet - Encourage students to make changes in their lifestyle and everyday habits in order to help the environment
Scenario 6	Visiting a Green Town	- Acquire knowledge about the environment and the role of electric buses in promoting sustainability - Acquire knowledge about the role evergreens in protecting the environment. - Be equipped with strategies to cope with environmental challenges, particularly in the context of renewable energy integration and overcoming barriers to its adoption
Scenario 7	Eco-Farm Explorer	- Learn about the role of biogas energy in promoting sustainability - Understand the fundamental principles of organic farming - Identify the different types of bees
Scenario 8	Wind Turbine Challenge	- Understand the fundamental principles of wind energy, including how wind turbine's function.





Scenario 9		- Enhance the knowledge about environmental issues related to wind energy - Learn about the environment and the role of wind energy in promoting sustainability
	Water treasure	- Identify water pollutants - Learn about the consequences of water pollution - Adopt behaviours to minimize water costs
Scenario 10	House eco-explorer	- Develop players' ability to critically assess the environmental impact of common items found in a house or yard - Encourage players to make informed decisions about sustainability practices by understanding the long-term effects of their choices

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Appendices

1. Appendix 1: Desktop Research Survey

Portugal Research Protocol – Desktop Research Guidelines & Protocol

As part of the RAISE project, ISMAI University conducted a desktop research survey with school students from 3 different countries (Greece, Italy, and Portugal). This study helped us to ensure the gamified approach will be informed by the experiences, needs and opinions of its target audience. This document provides a guide to the development and implementation of a qualitative approach to capture the experiences, needs and preferences of school student and environmentalist professional maximize the work quality. Research study with these key stakeholders has been conducted and will provide a platform for learning and generating ideas for the development of the Virtual World

Method overview

Desktop Research survey allowed us to gain insights into the opinions, knowledge and experiences of the participants in relation to their experiences of environmental issues, specifically those aspects which are most crucial depending the severity and the trend of the modern era and how a virtual world/gamified approach may be suited to those issues. The multiregional and Pan-European character of this survey allowed us to create shared data and get a holistic view.

Aim

To capture the voice and preferences of school's student by carrying out a desktop research survey, in which several environmental questions were provided to the students. This information will provide learning and to generate ideas for the creation of Serious game scenarios for the RAISE project

Requirements

The inclusion requirements for the students that will participate in the survey are the following:

1. Male and female students who are actively registered as students at Manin, AEDAS and Arsakeio for example.
2. Willing to contribute to the survey.
3. Ages between 10-15
4. Parents approve the participation in the survey





Planning

1. Survey Design:

Objective: Define the purpose of the survey clearly to ensure that the questions are aligned with the goals of creating an educational online game.

- **Target Audience:** School Students aged 10-15 years old
- **Questionnaire Sections:** The survey is divided into three main section (A: Knowledge, B: Attitudes, C: Behaviour) to gather comprehensive data on students' environmental knowledge, attitudes towards environmental issues, and their environmentally friendly behaviours.
- **Question Types:** Use a mix of multiple-choice questions, check-all-that-apply, and Likert scale question to capture a wide range of responses.
- **Language and Clarity:** Ensure questions are clearly written and age-appropriate for the target audience to avoid misunderstandings

2. Pre-testing

Test the survey with a small group of students to identify any confusing questions or technical issues. (computer availability, internet connection and etc.). Gather feedback on the clarity of questions, the time required to complete the survey, and any technical difficulties encountered. Finally, refine and adjust the survey based on feedback to improve clarity and ease of completion.

3. Distribution

Choose an appropriate online survey tool that is accessible and easy to use for the target audience. Collaborate with school in multiple countries (at least 3) to reach a diverse student population. It is preferable that the group is comprised of participants who differ in gender, experience level and etc. Secure permissions and support from educational institutions to distribute the survey. Clearly communicate the purpose of the survey to students, teachers, and parent to ensure understanding and encourage participation.

4. Data Collection

Gather the students in specific school program hours in a class where you can distribute and gather the data effectively. Ensure that the data collection takes place simultaneously for the participants. Each session regardless the student





population should last approximately 1 hour. If you have multiple sessions let a 30-minute break to ensure that the data have collected.

5. Data Analysis

Analyse the data to identify patterns, trends, and gaps in students' environmental knowledge, attitudes, and behaviours. Extract key insights that will inform the development of the 3D VWLE, focusing on areas where students show interest, lack knowledge, or demonstrating strong environmental behaviours.

6. Reporting and Action

Compile a comprehensive report summarising the findings, including graphs, charts, and narrative explanations. Use the survey findings to guide the content, design, and educational objectives of the 3D VWLE. Finally, make sure that the survey findings with participating schools and students as appropriate, emphasising how their input will contribute to the game's development.

7. Ethical Considerations

Ensure the survey is inclusive and non-discriminatory, providing equal opportunity for participation regardless of race, gender, socioeconomic status, disability, or any other characteristic. This might involve offering the survey in multiple languages or formats to accommodate different needs.





Conducting the Desktop Research Survey

Introduction:

Try to bring you target audience to the context setting at first:

“We are initiating this survey as a pivotal component of our development of the 3D Virtual World Learning Environment. This effort is directed toward the creation and dissemination of an interactive online game designed to enhance environmental awareness among students. Your insights are crucial in this developmental phase, offering valuable perspectives on environmental issues and potential digital solutions”

General Guidelines:

- **Appreciation:** Begin by expressing sincere thanks to respondents for their participation, emphasising the value of their time and input.
- **Duration and Cooperation:** Inform participants that the survey is expected to take approximately 45-55 minutes to complete. Request their attention and honesty throughout the questionnaire.
- **Confidentiality Assurance:** Highlight the anonymous nature of the survey, reassuring participants that their responses will be treated with the utmost confidentiality and used solely for research purposes. “Your responses will be anonymised, ensuring no personal identifiers are included in our analysis or reports. We are committed to maintaining the highest standards of privacy and data protection”
- **Survey Instructions:** Offer clear instructions on how to complete the survey, including the selection of options in multiple-choice questions and the scale for rating questions. “Please read each question carefully and select the answer the best reflects your opinion or knowledge. There are no right or wrong answers; we are interested in your honest perspectives.”
- **Importance of Complete Responses:** Stress the importance of answering all questions, even those where the respondent may be unsure. “Your complete responses, even to items where you might feel uncertain, are invaluable to us. They provide a comprehensive view of the diver thoughts and experiences related to environmental education and awareness.”





Ethical and Practical Considerations

- Voluntary Participation: Emphasise the voluntary nature of the survey participation.
- Parental Consent: As our target audience are students aged 10-15 years make sure to have parental consent.
- Feedback and Results: Offer participants the option to receive a summary of the survey findings if they are interested.





Desktop Research Survey

Student identification:

Age:

Gender:

Country:

School year: (Options 5th 6th 7th 8th 9th 10th)

1. How do you feel, when you think about climate change? (Choose all you feel)

- a) Fear
- b) Sadness
- c) Anxious
- d) Guilty
- e) Hopelessness
- f) Powerless
- g) Anger
- h) Worry
- i) Powerful
- j) Optimistic
- k) Hopeful
- l) Indifferent

A - Knowledge

(choose only one answer)

Waste and recycle:

A1. Name the materials which correspond to the green, blue and yellow recycling bins

(Different colours in Portugal, Greece and Italy)

- a) Plastic, glass and paper
- b) Glass, paper and plastic
- c) Paper, glass and plastic (or a photograph with the items in order)
- d) I don't know

A2. What is the 5 R's policy?

- a) Refuse, Reduce, Reuse, Repurpose, Recycle
- b) Repair, Reduce, Reuse, Rot, Recycle
- c) Refuse, Reduce, Reuse, Rot, Recycle
- d) I don't know

A3. Which item cannot be recycled?





- a) Bottle cap
- b) Used newspaper
- c) Used paper napkin
- d) Used plastic bucket
- e) I don't know

Conserve water:

A4. According to the UN (United Nations) what is the average daily consumption of water per person (counting hygiene and drinking)?

- a) 50 l/day
- b) 200 l/day
- c) 110l/day
- d) 150 l/day
- e) I don't know

A5. Water is an important resource for maintaining the ecosystem and life. A human being can go without eating food for 1 to 2 months, but without drinking can only go:

- a) 3 to 7 days
- b) 1 day
- c) 30 days
- d) I don't know

A6. What is the percentage of potable water on earth?

- a) 20%
- b) 3%
- c) less than 1%
- d) I don't know

Pollution

A7. Which material decomposes most quickly in nature?

- a) paper
- b) fabric cloth
- c) metal
- d) wood
- e) I don't know

A8. Which of these materials takes the longest to decompose in nature?

- a) A soft drink can
- b) food scraps
- c) disposable nappy





- d) glass
- e) I don't know

CO₂/greenhouse gases

A9. What is the greenhouse effect?

- a) Certain gases in the atmosphere trap heat (infrared radiation) and warm the earth.
- b) The sun is emitting more energy in recent years.
- c) Certain gases in the atmosphere that protect us from ultraviolet radiation.
- d) I don't know

A10. Which activities are the largest contributors of greenhouse gases?

- a. Deforestation
- b. Electricity generation
- c. Industry
- d. Transportation
- e. Agriculture
- f. I don't know

A11. Carbon dioxide (CO₂) is:

- a. Caused by human activities (industry and transports)
- b. Caused by forest fires
- c. Released by volcanoes
- d. All of the above
- e. I don't know

A12. Which of the following gases does not contribute to the greenhouse effect?

- a. Carbon dioxide
- b. Nitrogen
- c. Water vapor
- d. Methane
- e. I don't know

A13. Fires release carbon stored in plants and contribute to the greenhouse effect.

- a) True
- b) False
- c) I don't know

A14. The earth's plants have absorbed carbon dioxide that humans released into the atmosphere over the past few decades by approximately:

- a. 25%
- b. 50%
- c. 75%





- d. 100%
- e. I don't know

Climate Change

A15. The risk of soil desertification, of arid and semi-arid areas, is more serious in Southern Europe (Portugal, Spain, Italy and Greece) than in Northern Europe

- a) True
- b) false
- c) I don't know

A16. One consequence of climate change is the increase of forest fires.

- a) True
- b) False
- c) I don't know

A17. What are the consequences of the ascent of the middle sea level?

- a) coastal erosion
- b) under water coastal towns
- c) worsen freshwater quality
- d) all of the above
- e) I don't know

Biodiversity

A18. Desertification leads to loss of biodiversity (fewer plants and animals)

- a) true
- b) false
- c) I don't know

A19. Wildfires affect biodiversity.

- a) True
- b) False
- c) I don't know

Sustainable Agriculture

A20. Ladybugs can replace the use of chemical insecticides in agriculture.

- a) True
- b) False
- c) I don't know

A21. Which kind of agriculture is more sustainable?

- a) intensive subsistence agriculture
- b) organic agriculture





- c) commercial agriculture
- d) I don't know

Save energy:

A22. Which renewable energy sources do you know? (Choose all you know)

- a) Solar energy
- b) Wind energy
- c) Geothermal energy
- d) Hydropower
- e) Biomass energy
- f) Ocean energy
- g) I don't know

B - Attitudes

Conserve water:

B1. What uses the least amount of water?

- a) Doing the dishes by hand
- b) Doing the dishes in the dishwasher
- c) I don't know

B2. Which of these is not sustainable?

- a) Washing the car with a bucket
- b) Re-using rainwater
- c) Dumping cooking oil down the drain.
- d) I don't know

Save energy:

B3. What can we do to save electricity?

- a) Take a long bath
- b) Leave the fridge door open
- c) Turn off the light when leaving a room
- d) I don't know

B4. Which one of these increases the level of carbon dioxide in our atmosphere?

- a) Cutting down trees
- b) Traveling by plane
- c) Producing energy with fossil fuels
- d) All of the above
- e) I don't know





5-point Likert scale: (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.

Support local food:

B51. I think that growing our own fruits and vegetables is a great way to support sustainable agriculture and reduce your carbon footprint.

B52. I think that plant a garden can help support local ecosystems.

Join a local environmental group:

B53. Joining a group can be a great way to make a positive impact and meet like-minded people.

B54. I think it is important to speak up and advocate for environmental issues

B55. I think it is important to choose products from companies that prioritize sustainability and environmental protection

Conserve water:

B56. I think it is OK that each one of us uses as much water as we want.

C – Behaviour-

5-point Likert scale: (1) Never; (2) Rarely; (3) Sometimes; (4) Always; (5) Often.

Reduce, reuse, and recycle:

C1. I reduce my waste by using reusable water bottles and lunch containers

C2. I recycle my waste

C3. I encourage my friends and family to reduce their consumption of single-use plastics

C4. I encourage my friends and family to recycle.

C5. I avoid products with excessive packaging.

Save energy:

C6. I turn off lights and electronics when not in use

C7. I encourage others turn off lights and electronics when not in use

C8. I encourage my friends and family to switch to energy-efficient light bulbs and appliances.

C9. My family tries to use renewable energy sources

Conserve water:

C10. I turn off the faucet when brushing my teeth.

C11. I take shorter showers.

C12. I fix or ask others to fix any leaky faucets.

C13. In my house we store rainwater for uses that do not require drinking water

Support local food:

C14. I get involved in activities related to gardening and growing fruit and vegetables.





C15. I do my shopping in local stores.

Join a local environmental group:

C16. I collaborate in an environmental group that works to protect the environment and promote sustainability.

C17. I get involved with nature conservation organisations, supporting their efforts through donations or volunteering.

C18. I try to consume unprocessed food as much as possible.

CO2/greenhouse gases

C19. I use to walk, bike, take public transportation.

C20. When I go to school, I share the car with friends or neighbours.

C21. I buy or encourage my family to buy environmentally-friendly products (such as recycled paper and non-toxic cleaning products).

Advocate for change:

C22. I have already taken part in a protest action in defence of the environment.

C23. I publish posts in my social media about environmental causes.

C24. I participate in environmental projects at my school.





Consent Form

 (School Logo) Erasmus+	Funded by Erasmus+ Programme of the EU Key Activity 2 - Cooperation for Innovation and the exchange of good practices KA202 - Strategic Partnerships for school education	
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RAISE: Raising environmental knowledge & awareness through an innovative virtual environment

(Chief Scientific Officer)
(Name)
(Address)
(Telephone)
(Email)

PARENTAL CONSENT FOR PARTICIPATION IN A RESEARCH PROGRAMME

I, the undersigned as the parent/guardian of the student of the (school name) of (school city) are invited to give your permission to your son/daughter to participate in a research study related to the RAISE project and to participate in the study as his/her parents. Before you decide, it is important to understand why the research is being done and what it will involve. Please read the following information carefully. If there is anything that is not clear or if you need more information, ask the principal investigator listed in this document.

1. Presentation of the RAISE project

The motivation for this project lies in the growing need to spread environmental awareness and knowledge as expressed in the European Green Deal, where the role of education and training in the transition to more sustainable future is central, as well as in the Sustainable Development Goals (SDGs) where there is an explicit target. Moreover, as Europe has embarked on the path of energy transition, in the field of environmental and climate policies, citizens should feel included. Thus, aiming to develop knowledge, awareness and inevitable attitudes and values by learning and exercising their responsibilities, both at school and in their community.

For this reason, (school name) and the Department of Computer Engineering & Informatics of University of Patras cooperate with other European schools and universities and participate in the RAISE programme funded by the Erasmus+ programme of the European Union. The participating countries are Portugal, Greece and Italy. The RAISE project is designed to address the need to implement integrated and effective vocational guidance services and methodologies in educational environment. The methodology to be followed focuses on the use of technology to enhance environmental awareness, proposing an online digital platform around which the activities will be structured. We expect that the approach through the RAISE project will make environmental and sustainability education more attractive, motivating and useful, as it empowers and engages young people in developing themselves and thus has a greater chance of generating a positive in the short, medium and long term.





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2. Participation in the test phase

Your son/daughter as a participating student will participate in a number of modules (max. 6) which will take place within the school curriculum and will be distributed during the school year, depending on the internal organisation of the schools and the school's curriculum.

Each module will have a duration of approximately 1 teaching hour and will be implemented and coordinated by 2 teachers from the school participating in the programme.

During each module your son/daughter will be asked to participate or perform one or more activities and interact with the RAISE platform, as the platform is an important part of the project's innovative approach to guidance and because its measurements on the use and user experience will be a crucial part of the European Commission's evaluation of the project.

We invite your child to participate in the RAISE project, which includes a series of educational activities implemented within a virtual world. This initiative, funded through the Erasmus+ program, is designed to enhance self-awareness and interpersonal understanding among students. Your child will have the opportunity to engage in interactive exercises that help them explore various aspects of their personalities and how they relate to others. These activities are structured to provide feedback and validation from peers and educators, which are essential for personal development. The virtual environment used for these activities offers a dynamic and attractive setting where students can experience different scenarios that require varied skills. This approach makes the learning process more engaging and closely aligned with modern educational needs. By signing this consent form, you authorize your child's participation in this innovative educational survey, which is crucial for the successful implementation of the RAISE project. We appreciate your support and look forward to helping your child navigate this exciting learning experience.

As participating parents, you are invited to support your child's engagement in the RAISE project, an Erasmus+ funded initiative that employs a virtual world to educate students about environmental sustainability. Your role will be encouraging your child and providing feedback through the project's platform and social media. This will enhance their understanding of environmental issues through interactive activities designed to engage and educate. By signing this consent form, you authorize your child to participate and contribute to this innovative approach to environmental education.

3. Confidentiality

All data collected during your son/daughter's participation in the study will be treated with the utmost care and confidentiality and in accordance with Articles 13 and 14 of the EU General Data Protection Regulation n. 679/2016. Only the school staff involved in the activities and the scientific project leader will have access to the data. In any case, the data will only be used for purposes related to the project, its evaluation and the dissemination of results.

It is important to know that under no circumstances will your son/daughter's data or your own data be shared in a way that can be linked to your son/daughter or to your person.

You may at any time exercise your rights to the controller in accordance with Articles 15 to 22 of the aforementioned EU Regulation 679/2016, including the right of access to your son/daughter or your data, the right to rectify, update, complete or delete data that is inaccurate, incomplete or collected in conditions that are not in accordance with the law, and the right to object on legitimate grounds to its processing. These rights may be exercised by sending a request with a subject-matter: "Privacy Rights" to the following e-mail address:





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4. Contact Details

If at any time you have questions about this study, or if your son/daughter or you experience any side effects as a result of participating in this study, you can contact the principal contact person of RAISE project whose contact details are provided on the front page. If you have questions about your rights as a research participant or if problems arise that you do not feel you can discuss with the main contact person please contact the school contact for the project.

5. Voluntary participation

Your son/daughter's or your participation in this study is completely voluntary. It is up to you to decide whether or not to allow your son/daughter to participate in this study or to take part in this study. If you decide to approve your son/daughter's participation or to take part in this study, you will be asked to sign a consent form (see below). Once you have signed the consent form, your son/daughter or you are free to refuse to answer any or all of the questions or to withdraw from the study at any time and without giving a reason. Withdrawal from the study will have no consequences for your son/daughter or for you.

(Contact Person) (Email of contact person)	Michalis Xenos Professor xenos@ceid.upatras.gr
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PARENTAL/GUARDIAN CONSENT

We read and understood the information provided about our son/daughter's and our own participation in the RAISE programme and had the opportunity to ask questions. We understand that our son/daughter's and our participation is voluntary and that we may withdraw at any time, without giving a reason, at no cost and without consequence. We understand that research data, without personally identifiable information (not linked to us), may be shared with others. We understand that we will be given a copy of this consent form. We consent to our son/daughters's participation in this study and voluntarily agree to participate in this study.

Signature of parent/guardian

Date

Signature of the Chief Scientific Officer _____ Date _____





2. Appendix 2: The RAISE Suit of Scenarios

Scenario 1 – Green Champions

Partner name and country: AEDAS, Portugal

Educational content embedded

The educational goal of this scenario is to teach students how to recycle and sort waste correctly and also present ways to reduce the consumption of products that have a lot of packaging.

The contents to be included in this scenario contemplate the waste recycling/segregation process. Students are expected to know in which recycling bin they have to place each waste item by choosing the green, blue, yellow or brown container according to the UE directive.

Setting description

The scenario is set at a school, after a students' party and the sport facilities are piled with waste. Students arrive at the field for a play or run due to the amount of litter on the floor. The PE teacher decides to play a game where students must know/learn how to sort and recycle waste. The school sports facility can be the basketball field outdoors.

Introduction

In a rapidly advancing world, where progress and development often seem synonymous with consumption, the importance of recycling cannot be overstated. Recycling stands as a beacon of hope, offering a tangible solution to the environmental challenges posed by excessive waste generation and resource depletion. If you learn how to recycle, you will help to minimize the amount of waste sent to landfills and incinerators. You should prioritise recycling as a means to conserve valuable resources and reduce the environmental impact of waste disposal. Let's see if you know how to segregate waste properly!

The teacher tells the students that they have to clean the floor before the classes start. Each student will play the game in turns. There will be 4 different basketball hoops: a





green, a yellow, a blue and a brown one. There will be 3 items of each type of waste spread around the field floor:

- 3 items made of plastic or metal waste (for example: a coke can, a bag of potato chips and a carton of milk);
- 3 items of paper waste (a paper cup for hot drinks, a paper cup for cold drinks and a popcorn pack);
- 3 different items made of glass (a candy jar, a soda bottle and a yogurt cup);
- 3 items of organic waste (a banana peel, an apple core and a cookie).

Characters/Players description

In this scenario there will be a student/player that will try to clean up the sports field. The Physical Education (PE) teacher will also act as a referee. There will be a timer to start, pause and finish the game. The PE will give feedback every time a player misplace a waste item. There will be a speech bubble for each correction or recommendation or a video pop-up window.

Game mechanisms

The Physical Education teacher will explain the rules to the player, providing a short explanation about the different types of waste and the reasons to separate the items correctly. The player has to pick up each waste item scattered around the room and decide which waste bin it belongs to. If the waste item is correctly placed, a success message pops up, encouraging the player and providing a fun fact related to recycling that type of waste, in a speech bubble. If the player misplaces a waste item, the PE steps in to give him a second chance. He provides a error message. If the player correctly places the waste on the second try, a congratulations message pops up. The game finishes once all waste items have been picked up from the floor and sorted, regardless of whether they've all been correctly segregated. The player will accumulate more or less points according to the number of trials for sorting the waste items and putting it in the right waste bin. Should a user incorrectly sort a waste item into the wrong bin, they are directed to an external online resource, preferable an informative video from an educational source, which provides further guidance and information on proper waste segregation. As suggested, the videos can encourage further exploration and learning about waste segregation. The player will have to introduce all the 3 waste items in the right basket hoop/container, for example:





- Put the candy jar in the green basketball hoop.

The player has to introduce 3 waste items in the right container. At the end he is supposed to place 12 items correctly to achieve the maximum score. It would be appropriate to have a timer and the student should be able to pause the game in order to have time to think. The game is over once all waste items have been picked up from the floor and sorted, regardless of whether they've all been placed correctly.

Script

The player goes to the basketball court and when he arrives there, he finds a lot of waste items scattered all over the floor, due to a party that took place at school the day before. The student/player that arrives at the court belongs to the Eco-school's programme and wants to start playing basketball, but he can't. The player starts talking to the PE teacher that is already there to clean up and prepare for the class.

Dialogue:

PE teacher: "Hello (name of student) ready for a mini-game? Head to the basketball court and sort waste into hoops: blue for paper, green for glass, yellow for metal, grey for organic. Aim the garbage at the right hoop for a recycling challenge. It's fun and educational. Let's get recycling and make our school cleaner!"

The game informs that the user:

Minigame: Now, it's time to play the mini-game! Head over to the basketball court and start sorting the waste. Good luck!

The user should go to the basketball court to continue the scenario narrative. The game starts and the player has to pick up each waste item scattered around the field and decide which bin it belongs to.

If the player is correct, there will be a pop-up window with a motivational message such as "Great, that's it!" or "you know how to segregate waste" or just "Brilliant".

Every time the player makes a mistake and/or has to watch a video, the timer stops during the pause. At the first mistake, the PE steps in to give the player a second chance. He provides a detailed description of the waste item and gives the player a clue about its appropriate disposal.

Educational material



Description of the waste item segregation:

Paper /blue container:



When disposing of a paper waste item, you should place it in a designated recycling bin or container which is typically blue or marked with a recycling symbol. If your local recycling programme accepts paper products, you can usually include items such as newspaper, cardboard, office paper and paper packaging in the recycling bin. Be sure to remove any non-paper materials like plastic or metal before placing it in the recycling bin, as contamination can hinder the recycling process.

Plastic/yellow container:



When disposing of a plastic item, you should place it in a designated recycling bin or container which is typically yellow or marked with a recycling symbol. If your local recycling programme accepts plastic products, you can usually include single-use plastics, plastic containers, plastic packaging, plastic water bottles, among other items.

Make sure that you, whenever possible, reduce your consumption of single-use plastics and replace them with reusable alternatives. This helps minimize plastic waste in the first place.

Also consider reusing plastic items, when possible, to reduce waste. For example, you can use plastic containers for storage, refill plastic water bottles, or repurpose plastic bags.

Please look for recycling symbols, such as the recycling arrows with a number inside, usually found on the plastic item. If it's recyclable, rinse it clean of any residue and place it in your recycling bin. Common recyclable plastics include PET (#1), HDPE (#2), and LDPE

(#4). If the plastic item is hazardous waste, such as certain electronics or chemicals contained in plastic containers, follow your local regulations for hazardous waste disposal. Do not dispose of hazardous plastics in regular trash or recycling bins.

Metal/yellow container:



When disposing of a metal waste item, it's important to follow local waste disposal guidelines and consider recycling options. Before disposing of the metal item, consider if it can be reused or repurposed. Sometimes, items can be repaired or refurbished rather than discarded.

If the metal item is recyclable (e.g., aluminum, steel, copper), consider recycling it. If the metal item contains hazardous materials, such as chemicals or batteries, it should not be placed in regular metal recycling bins. Instead, take it to a designated hazardous waste disposal facility.

Some larger metal items, like appliances or automotive parts, can be taken to metal scrap yards. These facilities often pay for scrap metal, so you may even make some money by recycling.

Glass/green container:



When disposing of a glass waste item, it's important to follow recycling guidelines and

local regulations. Typically, glass waste should be placed in a designated recycling bin or container specifically designated for glass recycling. This could be a green or blue bin or a separate glass recycling container provided by your local waste management or recycling program.

Here's a short description of where to place a glass waste item:

First, rinse out the glass container to remove any remaining food or liquid residues.

Only then, place the clean glass item in the appropriate recycling bin or container. Ensure that it is empty and not contaminated with non-recyclable materials.

Organic/brown container:



When disposing of organic waste items, it's important to follow proper guidelines. Here's a brief description of where to place organic waste items:

Compost Bin or Pile: organic waste, such as fruit and vegetable scraps, coffee grounds, eggshells, and yard debris like leaves and grass clippings, should be placed in a designated compost bin or pile. Make sure the composting area is well-aerated and balanced with a mix of green (nitrogen-rich) and brown (carbon-rich) materials for efficient decomposition.

Indoor Compost Container: for kitchen scraps, consider using a small container with a lid to collect organic waste indoors. Empty this container into your larger outdoor compost bin or pile regularly to avoid odors and pests.

Municipal Composting Programme: some cities offer curbside pickup or drop-off locations for organic waste like food scraps and yard waste. Check with your local waste management authorities to see if this service is available in your area.



Worm Bin (Vermicomposting): if you have limited outdoor space, consider setting up a worm bin indoors or on a balcony. Worms can efficiently break down organic materials into nutrient-rich vermicompost.

Avoid Landfills: Do not place organic waste in regular trash bins that go to landfills. Organic matter in landfills generates methane, a potent greenhouse gas

When the user has correctly placed all the garbage to the correct hoop then a congratulations message is popped up:

Minigame: Congratulations! You've successfully matched all the garbage to the right hoops in the basketball minigame. Your amazing recycling skills have made a big difference. Great job in keeping our environment clean and learning the importance of proper waste sorting!





Scenario 2 – Walk in the forest

Partner name and country: ISMAI, Portugal

Educational content embedded

We could have educational contents that are related to the processes and activities related with forest ecosystems, such as:

- Characterize species of different forest ecosystems (animals and plants)
- Characterize ecosystem services provided by forests
- The importance of the forest for human activities and human-forest dynamics.
- The activities that can be developed in the forest
- Threats and risks to the forest
- New approaches and innovations

These educational contents allow players to:

- Understand the importance of biodiversity and the risks that threaten it
- Understand the importance of ecosystem benefits
- Understand the relationship between biotic and abiotic systems in an ecosystem

Understanding the importance of trees for:

- food security
 - water production
 - securing slopes
 - reproduction of other animals
 - the carbon cycle
 - water cycle
 - securing biodiversity
 - human health
 - climate
- Identify professions related to the forest
 - Identify species living in the forest
 - Distinguish between forest and tree monoculture
 - Identify economic and social activities linked to the forest
 - Understanding the role of trees and forests in history (in symbols, stories, events, culture)
 - Identify the major current threats to the forest





Understand the attitudes and behaviors appropriate to the interaction of humans with the forest

Setting description

The game takes place in a forest where the player goes for a walk. The player comes into contact with landscapes with different characteristics (proximity to a river, residential area, production forest, mountain forest) and with other visitors and residents.

The different landscapes are:

Forest

River bank

Characters/Players description

This is a single player game.

The game is supported by several people who provide information about plants, animals and processes that can be found in a forest area.

These main characters are:

A shepherd

A forest ranger

Animals and plants can also provide information and tips

Game mechanisms

The player interacts with the different characters he meets along the way. This interaction involves:

- questions and answers
- free information and advice
- quiz
- mini-games





The player will interact with the characters who will give them information about the species, the activities, and the objectives to achieve.

For each character the player has an exploration activity or a mini game.

Script

The student goes for a walk in the forest and will collect as much information as possible that will give them the behavior and attitude of a forest defender.

To do this they need to identify plant types, animal species, and understand the dynamics and interactions of a forest environment.

On this discovery walk, they will have the help of several characters that they meet along the way, who provide information and pose challenges.

Introduction: Explore a forest in search for content towards your school project. Learn about forests and their relationship with humans.

On the way they meet a forest ranger.

Ranger: Hello there! Where are you going, friend?

Player: Hello! I'm going for a walk in the forest. I'm trying to learn new things as part of a school project.

Ranger: That sounds interesting! I can help you get to know the forest better. Do you know that this is a protected area that still maintains the Mediterranean forest biome?

Player: What is the Mediterranean forest?

Ranger: Well, the Mediterranean forest is an ecosystem rich in biodiversity, adapted to the climatic conditions and characteristics of the region. It is characterized by a great diversity of flora and fauna that coexists with relationships between them.

Ranger: Here's some of the more important plants and herbs. Try to solve the minigame next to me, by correlating the plants with their names.

Lavenders are small evergreen shrubs with gray-green hoary linear leaves. The purple flowers are sparsely arranged on spikes at the tips of long bare stalks and produce small





nutlet fruits.

Thyme is a small low-growing shrub. The stems are somewhat woody and bear simple leaves that are oval to linear and arranged oppositely.

Laurus nobilis is a pyramidal, aromatic, evergreen tree or large shrub that grows to as much as 18m tall.

Ficus carica is a gynodioecious, deciduous tree or large shrub that grows up to 7 to 10 m tall, with a smooth white bark.

Game: Present a list of names and a list of pictures of plants and place each name on the correct picture (10 points). (trial and error)

Thyme (*Thymus vulgaris*)

Lavender (*Lavandula angustifolia*)

Laurel (*Laurus nobilis*)

Fig tree (*Ficus carica*)

Player: Thanks for teaching me a little about local plants.

Ranger: No problem, friend. Let's move on a little further. The path opens up into a riverbank.

The player and the ranger continue walking and arrive near a riverbank.

Player: I saw something moving in the lake. What kind of fish live here?

Ranger: Well, there are animal and plant species, which are a characteristic of this particular ecosystem that exist near rivers and streams and are called riparian. Try to identify some of them.

Game Title: "River Wildlife Challenge" (8 points)

Instructions:

Read the description of each animal living near rivers.

Guess the name of the animal based on the given clues.

Choose the correct answer from the multiple-choice options.

Keep track of your score and have fun!





Let's get started!

1. This animal is a large, semi-aquatic mammal known for building dams and lodges with sticks and branches.

- a) Beaver
- b) Deer
- c) Wolf

2. This reptile is often found sunning itself on logs or rocks near the river and can swim gracefully underwater.

- a) Turtle
- b) Frog
- c) Lizard

3. With its long, curved bill and webbed feet, this bird catches fish in the river and builds nests on trees near the water.

- a) Heron
- b) Owl
- c) Peacock

4. This amphibian has a smooth, slimy skin and spends its life both in water and on land, returning to the river to breed.

- a) Salamander
- b) Snail
- c) Butterfly

5. Known for their impressive jumps upstream during spawning season, these fish are a popular target for fishermen.





- a) Trout
- b) Shark
- c) Octopus

6. This bird, with its colorful plumage and melodious song, can often be spotted near rivers and streams.

- a) Kingfisher
- b) Sparrow
- c) Pigeon

7. With its sleek body and webbed feet, this semi-aquatic mammal is an excellent swimmer and diver.

- a) Otter
- b) Fox
- c) Rabbit

8. This insect, often found near rivers, spends most of its life as a nymph underwater before transforming into a flying adult.

- a) Dragonfly
- b) Ant
- c) Butterfly

Answers (is it possible to display a image with the right answer?):

- 1. Beaver
- 2. Turtle
- 3. Heron





4. Salamander
5. Trout
6. Kingfisher
7. Otter
8. Dragonfly

Player: This forest is marvelous. Are all forests like this?

Forest ranger: Forests adapt to the conditions of each location. Unfortunately, the interaction between the forest and humans is not always mutually beneficial. Have a look at these examples:

Positive and negative examples of human interaction with the forest (display a photo relating to each example)

9. Positive example: Amazon rainforests provide essential ecosystem services such as global climate regulation, oxygen production and maintenance of biodiversity. In addition, local communities depend on these forests for their livelihoods, through fishing, fruit gathering and medicinal plants.



10. Negative example: Uncontrolled logging in the Amazon Rainforest results in deforestation, leading to loss of habitat for numerous animal and plant species, contributing to climate change and jeopardizing the ecosystem services provided by the forest.





Player: I see. Humans seem to take advantage of the forest's resources, with utter disregard for the forest itself and the ecosystem as a whole.

Forest ranger: You are right. Ecosystems play a very important role for humans and the other species that share planet Earth with us. These benefits or services are irreplaceable.

Ranger: Hey, did you know that there are plants in the forest that have medicinal properties? Here's a few:

Lavender (*Lavandula* spp.): Lavender is well-known for its calming properties and is often used in aromatherapy and herbal remedies for relaxation and stress relief.

Rosemary (*Rosmarinus officinalis*): Rosemary has antioxidant properties and is used in traditional medicine for improving digestion and as a memory enhancer.

Thyme (*Thymus vulgaris*): Thyme is known for its antibacterial and antifungal properties. It is used in natural remedies for respiratory ailments and as a culinary herb.

Player: Wow. I didn't know plants and herbs could be so useful, even in medicine.

Ranger: I'm glad you found the information interesting. Let's keep walking down the path.

The player continues walking with the ranger. On the way they meet a shepherd who takes his sheep into the forest. The player and the forest ranger talk to him.

Ranger: Hello there!

Player: Greetings! Where are you taking your sheep?

Shepherd: Hello you both! I'm taking my herd to the meadow through the forest.

Player: Do they eat plants on the way?

Shepherd: Well, they eat the plants that are on the ground and the foliage from the





branches of the trees that are lower down, helping protect the forest from fires.

Player: And are there many fires in this area?

Shepherd: More and more, due to climate change, lack of tree diversity, and lack of rain. The type of trees also matters, some burn more easily than others, and a low diversity in species doesn't help much either.

Ranger: Yes, that's right. A monoculture tree forest is characterized by intensive planting of a single tree species on large tracts of land.

Player: So, what can we do to help protect the forest from fires?

Ranger: First, remember that forest protection is everyone's responsibility. Every minor action can make a major difference in preventing fires and preserving these valuable ecosystems.

Player: I think I've got all I need for my school project. I learned a lot about the forest and why we should protect it. Thank you both.





Scenario 3 – Lost in waste

Partner name and country: ISMAI, Portugal

Educational content embedded

We could have educational contents that are related to the processes and activities of recycling waste, such as:

- Segregation practices for waste at home or school
- Collecting and transportation of the waste
- Different destinations to which waste is transported depending on its characteristics.
- The technologies that are used in each of these treatments (sorting and baling, composting).
- Use of the separated and treated waste as raw material for other products.
- Introduction to the concept of circular economy

These educational contents allow players to:

- Understand where the waste generated is sent to and what destinations it is given.
- Understand in a simple way the different technologies and biological solutions for treating the waste generated at home and at school.
- become aware of the importance of their actions to saving the planet's resources and motivate them to make more conscious decisions.
- It includes some applications and solutions in the circular economy area.

As they go through the various stages, players receive information via cards, photographs, or explanations from the characters.

Setting description

The game takes place in an integrated waste treatment plant. Each treatment system has its own section (sorting, composting, in addition to the laboratory of the circular economy researcher/scientist).

The sorting plant includes an unloading bay for lorries, a magnetic capture system for metallic materials, a manual plastic separation line, a compacting and baling machine, a storage area for segregated materials.





The scientist's laboratory has several items to explain which waste was used for its production and why this solution is important.

Characters/Players description

This is a single player game.

The game is supported by several technicians who provide information about technologies and processes of waste treatment and help the player to look for the lost item.

These main characters are:

Manager

Technician in charge of incineration plant

Researcher in the circular economy field (scientist)

Game mechanisms

The player will interact with the manager who will give them information about the technologies and the objectives to achieve.

For each technology the player has an exploration activity or a minigame.

When the student has passed through all the sections and performed all the required activities, they find the item they are looking for.

Script

The player will interact with the technicians who will give them information about the technologies and the objectives to achieve.

For each technology (per building) the player has an exploration activity or a mini-game.

To pass to the next building, the player must answer a quiz and guarantee a minimum score that allows him/her to obtain the entrance key.

When you have passed through all the buildings and performed all the proposed activities, the player finds the item he/she is looking for.





Player: Hello! I was wondering whether you could help me find my tablet. It seems to have been accidentally thrown away in the trash.

Manager: Hello. If it came with the plastic or the paper waste, it's possibly in the sorting station. Let's go there.

Player: What is this?

Manager: The waste placed in the paper, plastic and glass recycling bins is brought here by the garbage collection trucks you see on the street.

Manager: Glass does not need any prior treatment and can be sent directly to the companies that recycle it.

Player: How do you recycle glass?

Manager: It's separated by colour using special equipment. Then it is sent to a furnace to be melted and used to produce new packaging. Glass can be recycled countless times, with no loss of quality.

Game Title: Glass Recycling Factory Quiz

Instructions: Read each question carefully and select the best answer from the choices provided. At the end of the quiz, you will receive your score and learn interesting facts about glass recycling. Let's get started!

1. What is the main benefit of recycling glass? a) Reducing water consumption b) Saving energy and raw materials c) Producing cleaner air d) Supporting local businesses
2. Which of the following is the most common example of glass waste that can be recycled? a) Empty glass bottles b) Broken windows c) Light bulbs d) Styrofoam cups
3. What is the first step in the glass recycling process? a) Cleaning and crushing the glass b) Collecting glass waste c) Transporting glass to the recycling factory d) Sorting glass by color
4. What color of glass can be recycled the most? a) Clear (transparent) glass b) Green glass c) Brown (amber) glass d) All colors are equally recyclable





5. What can recycled glass be used for? a) Making new glass bottles and jars b) Creating beautiful glass artwork c) Producing panels for buildings d) All of the above
6. True or False: Glass can be recycled indefinitely without losing its quality or purity.
7. True or False: We cannot add cups, glasses, mirrors and lamps to packaging glass for recycling because the melting temperature is different and the glass produced is not homogeneous.
8. How does recycling one glass bottle save energy compared to making a new one from raw materials? a) Saves 10% energy b) Saves 20% energy c) Saves 50% energy d) Saves 90% energy
9. What is other alternative to a sustainable use of glass jars, besides recycling? a) They are sent to a landfill b) They are repurposed into new glass items c) They are melted and recycled into other materials d) They are cleaned and reused
10. How does glass recycling help the environment? a) Reducing greenhouse gas emissions b) Saving natural resources like sand and soda ash c) Preventing pollution and littering d) All of the above

Solution: 1B, 2A, 3B, 4D, 5A, 6T, 7T, 8C, 9D, 10D

Player: Very interesting.

Manager: Let's find your laptop. It was probably taken to the segregation plant. This is where the waste from the plastic and paper bins is brought.

Manager: Preparing the paper is simple and involves separating the cardboard from the thinner paper and checking that it is not mixed with other materials. Then it is just compacted and packaged in bales. [\(present the photos of the process\)](#)





Truck discharging paper and Card for recycling



Paper press



cardboard bales



paper bales



Manager: Plastic, on the other hand, has a more complicated process and goes through several types of equipment.

Manager: Waste treatment plants use various technologies for segregating plastic from the mixed waste to facilitate proper recycling and waste management.

Manager: Discover some of the common technologies for segregating plastic in waste treatment plants include by associating each photo of the equipment with each description. Click on one to select it and then click on the correct slot to place it.

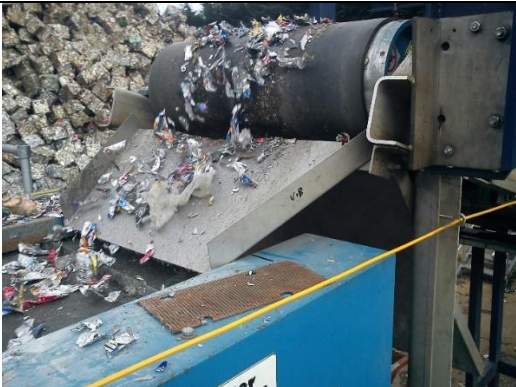
Game: Associate the photo of the equipment with each description ([solutions presented in blue](#))

1. **Mechanical Sorting:** Mechanical sorting involves the use of conveyor belts, screens, and separators to separate plastic from other materials based on their size, shape, and density. This process can separate larger plastic items from the rest of the waste.
2. **Magnetic Separation:** Magnetic separators are used to remove ferrous metals from the waste stream. While not directly related to plastic segregation, this step can help in removing metal components attached to plastic items.
3. **Optical Sorting:** Optical sorting systems use sensors and cameras to detect different types of plastics based on their optical properties, such as color and transparency. The system then directs jets of air or mechanical arms to sort the plastics accordingly.
4. **Handpicking and Manual Sorting:** In some waste treatment plants, manual sorting by trained workers is still employed to segregate plastics that automated systems might have difficulty identifying.

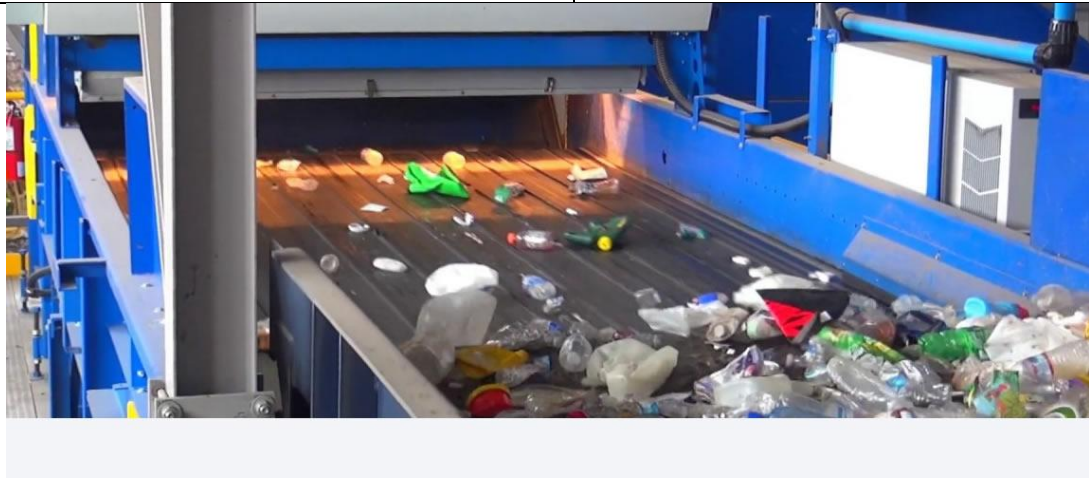




Handpicking and Manual Sorting



Magnetic Separation



Optical Sorting



Mechanical sorting

Manager: It's important to note that the effectiveness of each technology depends on factors such as the level of contamination in the waste stream, the type of plastic polymers present, and the overall waste composition.

Manager: This is why we use a combination of these technologies to achieve optimal plastic segregation and increase recycling efficiency.

Manager: After an appropriate segregation the plastic is bailed like this, and it is ready for other uses. ([photo showing plastic bailed by type below](#))



Manager: As you can see, this way of treating plastics prevents them from accumulating on land or reaching the sea. We all know how serious the problems of plastic in the sea are. ([show the following photos](#))





Manager: Let's move on. Did anyone find a laptop?

Worker: Yes. Someone took it to the office next to the composting plant.

Player: Great! What is a composting plant?

Manager: Come and see. Composting facilities are designed to process organic materials, which are biodegradable and can break down naturally over time.

Manager: These materials provide the necessary nutrients and organic matter for the composting process and may include yard waste, food waste, cardboard, agricultural residues and other organic materials.

Manager: Green and brown materials in composting are categories of organic waste that are used to create a balanced compost mix.

Manager: Each category plays a specific role in the composting process, contributing different nutrients and textures.

Manager: We have to be careful! There are some things that can't be processed in a composting facility. Tricky things like plastic, metal, and glass don't like to join the compost party.

Manager: They can't break down like organic materials, so we keep them out. Try sorting the materials on the table into the three bins. The red bin is for the removed materials.

Game: Compost Sorting Challenge: In the composting facility, the player must sort the collected materials into the right compost bins, separating green and brown materials to create the perfect compost mix. There is a third bin for the materials that must be removed.

Bins: green, brown, and red

Materials (solution):

Green Materials (fruit, leaf from a plant, kitchen scraps, vegetable trimmings, coffee grounds, freshly cut grass, flowers).

Brown Materials (dried leaves, straw, small twigs, shredded paper (like non-glossy newspaper), and even some cardboard.

Materials to remove (red bin): bin, glass bottle, plastic bag, fork, lamp





Manager: Once we gather all organic materials, we mix them together in the composting facility. We give them some air to breathe and a little water. Just like plants need water, our compost pile needs some moisture, but not too much.

Manager: We also give it some air by turning or mixing it with a shovel. This helps the composting ingredients breathe and the microorganisms do their job.

Manager: They turn them into something special called compost.

Player: I never imagined that the materials we separate would be treated in this way. What happens then?

Manager: Let's take a look at our test lab. You'll like it.

Scientist: Hello, do you want to see what we do here?

Scientist: These innovative products demonstrate the power of recycling and upcycling, transforming waste materials into valuable and functional items, reducing the environmental impact, and promoting a circular economy.

Manager: We hope you enjoyed the tour. We have something for you here.

Player: My laptop! Thank you!

Manager: Don't forget to recycle. Now you know why it's important.





Scenario 4 – Polluting Factory

Partner name and country: Arsakeio, Greece

Educational content embedded

The contents to be embedded in this scenario will be the pollution of the environment by a factory.

Setting description

The students of RAISE school are on a field trip near their school with their teacher. They are having fun. Suddenly, they realize that something is not right. They realize that their surroundings do not look good. The environment is polluted. The trees look sick, the grass is brown instead of green, the nearby lake is dirty and the flowers are dying. The students understand that something is wrong. They gradually realize the intensity of the problem.

Characters/Players description

The students (two students, one student is the playable character-for the purpose of this scenario we will call him/her /PLAYER but in the game the character will be named by the player-and Mark, his friend/the other student)

the teacher

the head of the factory

the environmental police

factory workers

local people

Game mechanisms

Exploration: the students will explore the environment by being able to see before and after pictures which show the destruction of specific areas





Make positive changes after negotiating with the head of the factory → the environment gradually changes → rewards → visible impact on plants and wildlife

Script

(Student and Teacher are on the field trip. They are exploring nature and admiring their surroundings. The Teacher shows them some beautiful, colorful flowers)

Teacher: Look, children. The flowers are beautiful.

[A notecard appears with two possible answers for the player:

1. Answer 1: Yes, they are.
2. Answer 2: But something feels wrong.

Depending on what the player chose, the reaction is:

Player: Yes, they are. OR But something feels wrong

Mark: Oh no.

(Mark points at some flowers that are dying)

Mark: What's wrong with them?

Player: Something is killing them!

[The player can click on the flowers and a video appears with the pollution from the



factory → <https://youtu.be/OS-jdL-CIRk> from Guardian News Youtube Channel @guardiannews]

(The Player, Mark and the Teacher walk a bit further and they find a lake. The lake is dirty and the fish in it are dead.)

Mark: Poor fish! They are all dead!

Player: Look at how dirty this lake is! It must have been beautiful once.

[The Player clicks on the lake and sees a photo of how it was before the pollution]



Teacher: Children, look around you. The trees are all dead!

(The children look around them and realize that the trees are brown and have no leaves)

Mark: What is causing all this?

Player: Look up there! I can see smoke!

Teacher: Look children! The factory! This has been causing everything!

[A notecard appears]

1. Option 1A: Go to the factory
2. Option 1B: Do nothing and return to the school.

If the player chooses “Option 1A” they are transported to the factory. If the player chooses “Option 1B”, Mark tells him “Do nothing? Hm, this doesn’t sound like a good



idea. Let's go to the factory and check it out!"

(They are transported to the factory. Outside of the factory they meet a local).

Teacher: Hello.

Local: Hello.

Player: Can you tell us what happened here?

Local: The factory has been destroying the environment ever since it opened.

Mark: Oh no! How serious is this problem?

Local: Environmental pollution is both a local and universal problem. You can see its local implications here, but here are some universal facts as well:

[A notecard appears with a Quiz about general environmental facts]

1. According to NASA, how much is the sea level expected to rise by the year 2050?
A. 15 to 20 centimetres B. 20 to 25 centimetres C. 25 to 30 centimetres D. 30 to 35 centimetres
2. How much of the Amazon rainforest was cut down from 1988 to 2022? A.
200,000km² B. 375,000km² C. 425,000km² D. 450,000 km²
3. Which of these is not a renewable form of energy? A. Natural gas B. Wind C. Solar
D. Geothermal
4. How do people celebrate World Environment Day? A. Street parades B. Tree
planting C. Organised clean-up events D. All of the above
5. How much plastic is there in the world? A. 750 million tonnes B. 8.3 billion tonnes
C. 10 billion tonnes D. 12.4 billion tonnes
6. Which year was the hottest ever year on record? A. 1996
B. 2008 C. 2016 D. 2021
7. Recycling an aluminium can uses what percentage of the energy used to create it?
A. 1% B. 5% C. 20% D. 50%

Answers: 1. C, 2. D, 3. A, 4. D, 5. B, 6. B, 7. B

Player: Oh no! This is a serious problem indeed! We must do something!

[A notecard appears with two options:

1. Option 1: Go inside the factory and ask the teacher and Mark to bring help.
2. Option 2: Go back to the school and ignore the problem.





If the Player chooses Option 2, a red screen appears with a message that says “Ignoring the problem will only make it worse! Are you sure this is what you want to do? Think again...” and the two options appear again. If the Player chooses Option 2 again, can we suggest that he “lost” the game? Game over?

When the player chooses Option 1, he says:]

Player: I will go inside the factory! You two stay behind and bring help. I’m sure I will need it.

Teacher: Go! I will call the environmental police for extra help!

Mark: I will go back to the school and tell everyone!

(The player goes inside the factory. The Teacher does not follow them. The Environmental Police will appear later.)

Factory worker: Who are you?

Player: I am a student. We were on a field trip with our school and we noticed the pollution from your factory.

Factory worker: What pollution? There is no pollution.

Player: The trees and the flowers are dying. The lake is dirty. The fish are dead.

Factory worker: Please don’t shout! It’s not my fault! It’s not our fault! This is our job.

Player: Do something!

Factory worker: I can’t! We can’t! We are just workers. We will lose our jobs. Go to the head of the factory.

(The player goes to the head of the factory. Setting: his office)

Head of the factory: Who are you? Why are you here?

Player: I am a student. Your factory is destroying the environment. You must stop!

Head of the factory: No! If we stop the factory, we will lose money!

Player: But the environment!

Head of the factory: Money is more important!





(Suddenly the environmental police arrive)

Head of the factory: Oh no! It's you again!

Environmental Police: You must change your practices, otherwise we will shut down your factory.

Head of the factory: Impossible!

Player: No, nothing is impossible. If I were the head of the factory, If I were making all the decisions, things would be better.

Head of the factory: Oh, you think it's so easy? Then, be my guest...

[A screen appears. Now the Player has to make choices for the factory]

CARD 1: Shows the question

"The factory will start recycling its waste instead of simply dumping it into the lake. This will cost more."

The player must choose

"YES" or "NO"

CARD 2: Shows the question

"The factory will start working with exclusively eco-friendly partners. This means that some previous collaborations will cease to exist."

The player must choose

"YES" or "NO"

CARD 3: Shows the question

"The factory must update its machinery and equipment to new, up-to-day equipment that is eco-friendly. This will admittedly cost more, but will adhere to EU eco-friendly regulations."

The player must choose

"YES" or "NO"

CARD 4: Shows the question





“Hire expert environmentalists to help make sure that the factory functions properly and respects the environment.”

The player must choose

“YES” or “NO”

If the player chooses more “YES” answers, the screen will show a congratulatory message saying “Congratulations! Your factory is greener!” If the player chooses more “NO” answers, the screen will go red and will show the message “Try again! Think green!”

[END OF GAME]

Player: It’s not difficult to decide to be green. If you take the first steps, the rewards will be instant.

Head of the factory: What do you mean?

Player: First of all, the local community will thank you. The flowers and trees will be green again.

Environmental Police: The lake will be clean. The fish will stop dying.

Player: You can even advertise your green factory on social media. Everybody wins!

Head of the factory: What happens if we don’t change anything?

Environmental Police: Then, things get worse.

[To illustrate this, a screen appears with photos of the outcomes of the environment completely destroyed. No more flowers or trees, the lake is full of toxic waste, the sky is polluted and the fields are full of trash.]





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Head of the factory: Oh no! This is awful! We must change things now that we still have time! Thank you RAISE school!

At the end of the game a notecard appear which provides the players with some a link to United Nations Environment Programme (UNEP) in order to conduct their own research about the problem of factory pollution/environmental pollution:

<https://www.unep.org>



Scenario 5 – Carbon Champions

Partner name and country: Arsakeio, Greece

Educational content embedded

Students learn about their carbon footprint and practical ways to reduce it.

Setting description

The game is set in an everyday environment, it begins in a household.

Characters/Players description

The main character is (the student), and a Green superhero that will guide the student throughout the scenario narrative

Game mechanisms

There is a carbon calculator which calculates carbon emissions according to the player's choices. It can be a footprint that fills up with points, following the main player's decisions. There is also a short quiz that tests students' knowledge about carbon footprint and why it matters.

At the quiz minigames if a user makes a mistake, then he should receive immediate feedback.

Script

The main player has a goal of keeping their carbon footprint to a minimum, or even trying to become carbon neutral (more challenging). Players play individually.

The game follows the main player who makes a number of decisions and choices: determining where they live (e.g. flat, two-story house), what they eat (meat meals, vegetarian), their means of transport, how they decide to heat or cool their homes, how much water they use in everyday tasks (washing, watering, etc), what they buy when they go shopping, how much electricity they consume (if they turn on/off appliances and the light).





All these choices affect the game and calculate the character's carbon footprint. If they get more points than those determined to reach their carbon neutral goal, then a thermostat/sound alarm can become red/go off to notify them that they need to make changes in their lifestyle. They can then go back and make changes or proceed by being very careful. If they manage to keep their emissions to the desired level, they become Carbon Heroes!

Detailed script:

There is a short introduction by an avatar who can look like a “green” superhero:

Green Superhero: Welcome to Carbon Heroes! Every action has a carbon footprint: your food, gadgets, clothes, even you! This game helps you reduce your footprint in daily life and realize the impact it has on our planet and environment.

Green Superhero: But, first, let's take a short quiz to check what you may already know about carbon footprint and why it matters. (with pictures)

QUIZ QUESTIONS

1. Why does too much carbon dioxide in the atmosphere cause climate change?





- a. It cools down our planet.
- b. It blocks out UV rays.
- c. It traps heat and warms up our planet.
- d. It lets sunlight escape.

2. According to the Paris Climate Agreement, humans should limit the global temperature rise well below:



- a. 2degrees Celsius
- b. 3 degrees Celsius
- c. 4 degrees Celsius
- d. 5 degrees Celsius

3. What is the name used to describe the total set of carbon emissions (or greenhouse gases) caused by an individual?





- a. Carbon cycle
- b. Carbon handprint
- c. Carbon footprint
- d. Carbon summary

4. Why should you be concerned with the size of your carbon footprint?



- a. Sometimes its hard to find shoes that are the right size.
- b. If we don't decrease greenhouse gas emissions Earth will continue to cool.
- c. Greenhouse gases are becoming scarce in Earth's atmosphere.
- d. Increases in greenhouse gases in the atmosphere are contributing to global climate change.

5. Which of these choices in transportation produces less greenhouse gas than the others?





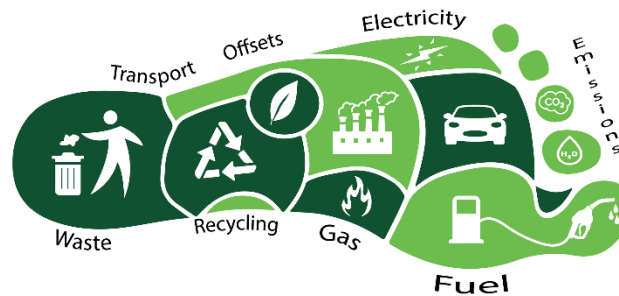
- a. Walking
- b. Riding a bus
- c. Riding a car
- d. Taking a train

6. Which of the following foods takes the least energy to produce?



- a. meat
- b. fresh vegetables
- c. bread
- d. cereal

7. What is the main human activity that adds to an individual's carbon footprint?



- a. Respiration and growth
- b. Usage of fossil fuels for energy
- c. Usage of alternative energies (solar, wind, etc)
- d. Photosynthesis by plants

8. Reducing your carbon footprint requires:



- a. Carefully thinking about every step encompassed in your routine.
- b. Shifts in diet and consumption habits.
- c. Adopting a cleaner lifestyle – both for you and the planet.
- d. All of the above.

KEY TO QUIZ: 1. C, 2. A, 3. C, 4. D, 5. A, 6. B, 7. B, 8. D

Pop up window: **Congratulations on completing the quiz!** (feedback on results, depending on the number of correct answers given)

Now, let's play a game and see what you can change in your everyday habits that can help reduce your carbon emissions footprint and protect the planet!

The user should enter the house in order to proceed to the scenario narrative.

Philosophy behind the game: Reducing your climate impact doesn't require dramatic changes to your lifestyle, like selling your car or becoming a vegetarian. Even small changes to your daily routine can have a big impact on your carbon footprint! Let's go!



Now, let's walk through a hypothetical normal weekday.

It's a normal weekday at home (Student avatar is at home, wakes up and goes to the kitchen to prepare breakfast). A window pops up:

1. What kind of breakfast do you usually have (earlier or later in the day)?

Possible options:

- a. a glass of milk
- b. a glass of juice
- c. a bowl of cereal
- d. fresh fruit
- e. a doughnut (or another packed snack, such as biscuits, croissants, etc)
- f. bacon and eggs
- g. bread with butter and honey or jam

Carbon calculator measurements for each option:

- a. 352 gCO₂e - Rating B: Low carbon footprint
- b. 257 gCO₂e - Rating B: Low carbon footprint
- c. 108 gCO₂e - Rating B: Low carbon footprint
- d. 100 gCO₂e – Rating A: Very low carbon footprint

e. 493 gCO₂e – Rating E: Very High Carbon footprint – Carbon hero explains: Did you know your food could actually be the biggest source of carbon in your daily life? Pre-packaged and processed food generate large amounts of greenhouse gases because of a long and complicated food cycle that involves production, processing, transportation, storage and waste. Try opting for locally produced food, fresh fruit and vegetables to minimize your carbon footprint. They are healthy options, too!

f. 767 gCO₂e - Rating E: Very High Carbon footprint - Did you know your food could actually be the biggest source of carbon in your daily life? According to scientists, the production of animal-based food is causing twice the pollution of producing plant-based foods. The raising and culling of animals, especially beef, for food is far worse for the climate than





growing and processing fruits and vegetables. What you can do: you don't have to give up on meat, but you can minimize its consumption to less times per week and make sure you also minimize waste.

g. 250 gCO₂e - Rating B: Low carbon footprint

The player can select multiple options. Each option will add up to a carbon footprint 'thermometer'. When selecting a particular option, a small window pops up next to the 'thermometer' informing the student about the carbon rating of each option together with some brief explanation or information.

2. After eating breakfast, Avatar prepares schoolbag and needs to go to school.

A window pops up: **Time to go! How do you go to school? (Assuming school is approx. 3 km away).**

Possible options: walk, drive, bus, ride a bike

Carbon calculator measurements for each option (for approx. a 3 km distance):

Walk – Very low carbon rating - approx. 39 gCO₂e. Walking is one of the lowest-carbon ways to go from one place to another. This comes with many other benefits such as lower local air pollution and better health!

Drive – Very High Carbon rating - approx. 196 gCO₂e per passenger. If we have to drive, putting more people in the car reduces the impact of driving! Car-sharing also helps to reduce local air pollution and congestion.

Bus – High carbon rating - approx. 105 gCO₂e - Compared with driving alone, taking public transportation reduces CO₂ emissions by 45%, decreasing pollutants in the atmosphere and improving air quality.

Bike – very low carbon rating - approx. 17 gCO₂e – Great choice! Choosing a bike over a car just once a day reduces your average carbon emissions from transportation by 67%! It's great exercise, too!





Again, the player's choices add up to the carbon thermometer. Each choice is accompanied by a carbon rating and a short explanation.

When the breakfast minigame ends then:

The student arrives at home and sits with a parent/sibling in a living room to watch a TV show. They complain that it's very hot/ cold (depending on the season chosen at the beginning).

Window pop-up: **How do you suggest cooling down / warming up?**

Possible options: Cooling Down:

- a. Turning on the air-conditioner
- b. opening the windows
- c. close the curtains
- d. using a ceiling/box fan

Carbon calculator measurements for each option:

a. Air-conditioner – Very High Carbon Rating – 380 gCO₂e per day - Air conditioning is a major contributor to climate change. AC units are making global warming worse: Because they use a large amount of energy, electricity production is increased, which emits more carbon dioxide into the atmosphere. Find alternative ways to cool down your home!

b. Opening the windows: Very low carbon rating – Great choice and not harmful to the environment!

c. Closing the curtains: Very low carbon rating – Great choice and not harmful to the environment!





d. Using a box or a ceiling fan – Low carbon rating - 2 gCO₂e - Ceiling fans are far more environmentally friendly than air-conditioning and help the air circulate in the room!

Possible options: Warming up:

- a. Using warmer clothes and blankets
- b. Insulating the room from air drafts and opening the curtains to let the sun in.
- c. Using a traditional central heating system
- d. Using a portable heater

Carbon calculator measurements for each option:

A. Using warmer clothes and blankets: Very low carbon rating – Great choice! Dress in layers in cold weather to insulate your body and regulate your body temperature.

B. Insulating the room from air drafts and opening the curtains to let the sun in. Very low carbon rating – Great choice! Let the sunlight fill your home with natural warmth. Locate the windows that get the most direct sunlight and open up the curtains while the sun is out. You can also seal any gaps surrounding your doors and windows to prevent cold from entering the house and seal off unused rooms to help keep the rest of your home warmer.

C. Using a traditional central heating system: Very high carbon rating - Heating technologies impact the environment on a huge scale. Most of modern buildings' furnaces or boilers run on fossil fuels such as natural gas and oil; as a result, heating and hot water account for about 42 percent of a city's total greenhouse gas emissions. To avert the catastrophic impacts of climate change, we must reduce our carbon emissions by opting for alternative ways to heat our homes.



D. Using a portable heater: Medium carbon rating – Portable electric heaters do not generate harmful greenhouse emissions but still electricity generation can still put a lot of CO₂s into the atmosphere. What you can do: you can set your heater's thermostat to a setting that works for you - it doesn't always have to be on full blast. This will mean that the heater will reach a stable temperature and only generate what's needed to maintain it.

At the end of the game, students get the chance to see a summary of their carbon footprint with feedback and comments about how they did, what impact their choices had on the environment and what they can do, if necessary, to reduce their carbon emissions. They can get a certificate of achievement / of a Carbon Hero if they managed to keep their emissions at a 'green' level.

The green hero avatar can also provide them with more information and a link to a video about how they can reduce their carbon footprint.

[How to Lower Your Carbon Footprint — Green Mountain Energy - YouTube](#)



How to Lower Your Carbon Footprint – Green Mountain Energy



Scenario 6 – Visiting a Green Town

Partner name and country: Manin, Italy

Educational content embedded

Information about different ways to save energy: electric buses, solar panels, bike sharing. Information about how to create green sustainable areas. This information could be provided through pushbuttons near the different objects of the area. Pressing the button the young people are sent to the site where they will find the information they need

Setting description

The activity will take place in a residential area of a modern green town with a park skirted by a street with green houses.

Characters/Players description

The uncle of the main character

Game mechanisms

Exploration and observation of the area. And steadily the user is guided throughout the area and click the corresponding area to continue the scenario. For image corresponding minigame is the user doesn't pass the given threshold then he will repeat the minigame by highlighting the wrong answers and he will repeat the minigame. The user can leave the area whenever he wants

Script

The user visits their uncle, who lives in a green area of a town and who is keen on the environment. He decides to take them around and show them the different ways in which we can protect the environment in a town. He will do this through challenges which will give them points. The person who earns more points will get a wonderful prize: a bicycle.





Uncle: Welcome to our green city! I've an idea: let's walk & learn how to protect our planet? I'll teach you something, and I've prepared some games for you. Each game gives points. Person 1: Wonderful idea. I am ready, and you?

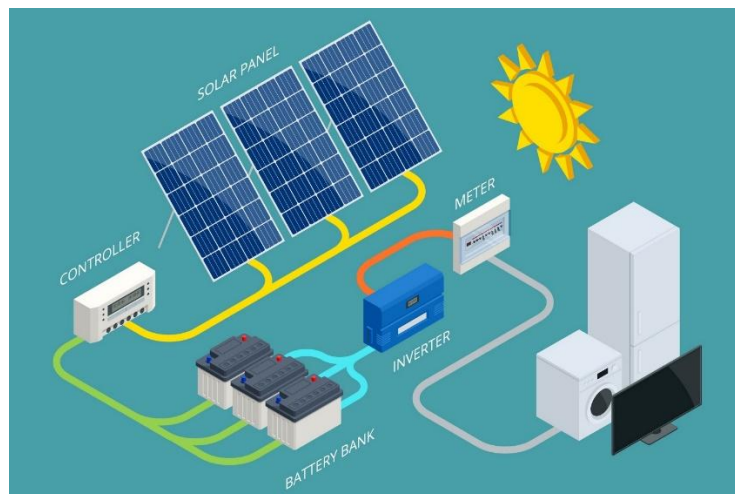
Student: Great idea. I'm ready. Don't know much about environment but I want to learn

Uncle: Ok, let's start our tour. As you can see, on the roof of our house we have solar panels. Check this banner and then click to the solar panels to continue the scenario.

Educational material

The amount of sunlight that strikes the earth's surface in an hour and a half is enough to handle the entire world's energy consumption for a full year. Solar technologies convert sunlight into electrical energy either through photovoltaic (PV) panels or through mirrors that concentrate solar radiation. This energy can be used to generate electricity or be stored in batteries or thermal storage.

When the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electrical field in the cell, causing electricity to flow.



Then the user clicks to the solar panels located to the roof of the home and he must complete the following quiz.





Now try and do the following True/False quiz

The greater the sunlight, the more electricity is charged

solar batteries charge more slowly when there is less sunlight

When your home or appliances need electricity, the electricity leaves the solar battery and enters an inverter

With solar storage, you can take advantage of bright, sunny days when there's plenty of electricity to go around.

The electricity which is stored can't be used on a cloudy day.

Uncle: Well, done! Now, can you see that bus in the road? It is an electric bus. Our municipality has decided to eliminate all the fossil fuel-powered buses and they have invested money on an electric bus fleet. Click the bus to continue the scenario.

The user must locate the bus and click on it to proceed to the scenario narrative.

There are many types of advantages to this choice:

ENVIRONMENTAL BENEFITS

COMMUNITY AND SOCIAL BENEFITS

ECONOMIC BENEFITS

I'll give you a list of benefits. Try and put them under the right heading:

- 1) electric buses require less maintenance and have a **longer life cycle**
- 2) electric buses have fewer components
- 3) Passengers enjoy a comfortable ride, thanks to pneumatic suspension technology
- 4) energy costs can fall even more with new electric bus deposits, which thanks to smart charging can cut electricity consumption by 40%.
- 5) Electric buses have zero tailpipe emissions
- 6) electric buses have **lower fuel costs**
- 7) Electric buses silently glide through urban avenues, maintaining **lower noise levels** both inside and out.
- 8) Electric buses help fight climate change.





When the user successfully complete the quiz then:

Uncle: Town has many cycle lanes encouraging citizens to bike instead of drive. See the bike docking station there? Bikes are secured in docks, unlocked with an app or ride code via a keypad on each dock. It's very convenient and beneficial. Click the bike station to continue the scenario.

Then the user walks down the street to reach the park and they notice cycle station where he clicks on it and the scenario narrative proceeds as following:

Uncle: You can find cycle lanes throughout the town to give citizens the possibility to leave their cars at home. And over there you can also see a bike docking station. The bicycles are locked into the docks and must be unlocked using an app or ride code. Each dock contains a keypad where ride codes can be entered. This is very convenient and has lots of advantages. Your next game is a fill-in the gaps text. **Try and do it! It is about the advantages of cycle lanes and bike sharing: (12 points)**

For the _____ setting, bike lanes can offer many benefits to the _____. More and more cities are seeking ways to cut down on congestion while also improving the _____, and these cities are turning to the bicycle.

Dedicated bike lanes create a solution that not only offers _____ to cyclists, but they also standardize some of the city cyclists' behaviors. This means that vehicles and _____ won't have to guess how the bikers will navigate the road or sidewalk.

The addition of bike lanes helps to improve traffic flow because it gives bikers a place in the roadway. No longer do city bicyclists need to _____ cars or people and vice versa, but they can carry on at a steady speed.

The addition of bike lanes creates a feeling of safety for many people who would bike if they felt that it was an _____ option. Not only does biking cut down on _____ use, but it also offers _____ the added _____ of exercise. For example, a two-mile bike ride can _____ about 100 calories, and this type of cycling can decrease the _____ of diabetes, depression, dementia, cardiovascular disease, cancer, and high blood pressure.

SAFETY, URBAN, BENEFIT, CHANCES, SAFE, COMMUNITY, PEDESTRIANS, ENVIRONMENT, DODGE, FUEL, COMMUTERS, BURN.

When the user successfully completes the minigame then:





Uncle: Congratulations! Now, can you see? There are a lot of evergreens in this park. They are very useful for the environment. They are plants that have green leaves all year round.

EDUCATIONAL MATERIAL

These are the advantages of evergreens:

1. When cold air prevents pollutants from escaping the atmosphere, they're the only trees that continue to purify our air.
2. Evergreens are as close to maintenance-free as you can get. Their ability to retain moisture is near the top of the list of other trees.
3. Evergreens provide homes and shelter for many birds and wildlife. Nests are safe from predators and weather, and the many branches give plenty of birds and small animals a home.
4. The foliage and seeds provide food for flora and fauna and can protect birds and wildlife from freezing weather.

Now try and match the names of the most famous evergreens to the pictures (5 points):

- a) LARCH
- b) PINE TREE
- c) SPRUCE
- d) FIR
- e) CYPRESS

1.



2.





When the user completes successfully the minigame go as following:

Uncle: Now we have come to the end of our tour.

6. *Student: I appreciated it very much. From now on I'll try to be more environmentally friendly, because I have become more aware about how to protect the Earth. Thank you, uncle. You know a lot about the environment!!*





Scenario 7 – Eco-Farm Explorer

Partner name and country: Manin, Italy

Educational content embedded

Short texts about the following topics:

Pesticides: substances used for destroying insects or other organisms harmful to cultivated plants or to animals.

Nitrate: a chemical that includes nitrogen and oxygen, often used as a fertilizer .

Leaching: (with reference to a soluble chemical or mineral) draining away from soil, ash, or similar material by the action of percolating liquid, especially rainwater.

Nitrogen-fixing: nitrogen fixation refers to the chemical processes by which atmospheric nitrogen is assimilated into organic compounds, especially by certain microorganisms as part of the nitrogen cycle.

cover crops: crops grown for the protection and enrichment of the soil.

Ionizing radiation: it is a form of energy that acts by removing electrons from atoms and molecules of materials that include air, water, and living tissue.

Pest: a destructive insect or other animal that attacks crops, food, livestock, etc.



Pollen: a fine powdery substance, typically yellow, consisting of microscopic grains discharged from the male part of a flower or from a male cone. Each grain contains a male gamete that can fertilize the female ovule, to which pollen is transported by the wind, insects, or other animals.



Miticides: substances or preparations for killing mites. A mite is a minute arachnid which has four pairs of legs when adult, related to the ticks. Many kinds live in the soil and a number are parasitic on plants or animals.

Anaerobic digestion: Anaerobic digestion is a process through which bacteria break down organic matter—such as animal manure, wastewater biosolids, and food wastes—in the absence of oxygen. Anaerobic digestion for biogas production takes place in a sealed vessel called a reactor, which is designed and constructed in various shapes and sizes specific to the site and feedstock conditions.

Manure: animal dung used for fertilizing land.



Slurry: a semi-liquid mixture, typically of fine particles of manure, cement, or coal suspended in water.

Hydrogen sulfite: Hydrogen sulfide (also known as H₂S, sewer gas, swamp gas, stink damp, and sour damp) is a colorless gas known for its pungent "rotten egg" odor at low concentrations. It is extremely flammable and highly toxic.

Landfill: A landfill site, also known as a tip, dump, rubbish dump, garbage dump, or dumping ground, is a site for the disposal of waste materials.





Digestate: it is the material remaining after the anaerobic digestion of a biodegradable feedstock.



Breed: to keep animals for the purpose of producing young animals in a controlled way.
Amino-acids: a simple organic compound containing both a carboxyl (—COOH) and an amino (—NH_2) group. Although over 500 amino acids exist in nature, by far the most important are the alpha-amino acids, from which proteins are composed.

Suckling animals: infant or young animals that are still taking milk from the mother.

Cowshed: a farm building in which cattle are kept when not at pasture, or in which they are milked.



Livestock: animals such as cows, sheep, etc. that are kept or traded as a source of income.



Setting description

The activity will take place on a farm. For the setting issues we think about a farm near the town of Cremona. There could be: a field (or some fields), a cowshed, a biogas plant, a beehive

Characters/Players description

The main character is a user who visits his grandfather who is a farmer. The user meets different workers of the farm (honey producer, farmers who deal with organic plantations for the production of organic food, milkers, an environmental engineer who has projected biomass plants for the production of green energy for different uses, i.e. district heating...)

Game mechanisms

Exploration and observation of the area, dialogues with specific questions of the user to the different characters met during the visit, who give him/her multiple-choice options or ask him to reorder sentences. If he manages to answer all the questions, he/she will be able to leave the farm (mechanism of the escape room).

The corresponding game minigame will be corresponding a specific text to a specific text. If user cannot pass the threshold set then the only the wrong images will be reset keeping the right ones. At the several quizzes instant feedback will be given to the student if the answer was correct or right and he will repeat the same question.

Script

Student avatar has to carry out research for his science teacher on how organic farms work.

He meets his grandfather at his organic farm:

Grandfather: hello darling. Welcome to RAISE organic Farm. Are you ready to learn more about biogas plants and organic productions?

Grandchild: Yes, I am willing to learn more about all that has to do with organic productions and biogas plants.

Grandfather: Great! Come with me. We will now meet a farmer who will tell you how organic farming works.





Grandchild: wow! I can't wait

Farmer: Hi (name of the avatar)..... How are you?

Grandchild: Fine thanks. I am curious to learn all the secrets of organic farming.

Farmer: it is a sustainable agricultural system that uses ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops. Modern organic farming was developed as a response to the environmental harm caused by the use of chemical pesticides and synthetic fertilizers in conventional agriculture, and it has numerous ecological benefits.

Do the following game: cross the disadvantages and tick the advantages of organic farming:

Grandchild: Ok I'll do that.

1. It uses fewer pesticides
2. There are higher food costs for consumers
3. It reduces soil erosion.
4. It decreases nitrate leaching into groundwater and surface water
5. There are lower yields
6. It recycles animal wastes back into the farm.

Farmer: Producing organically means respecting the rules on organic farming. These rules are designed based on general and specific principles to promote environmental protection, maintain the biodiversity of Europe and build consumer trust in organic products.

What is forbidden (F) and what is encouraged (E) according to you?

1. Use of GMOs
2. Crop rotation
3. Use of ionizing radiation
4. Use of hormones
5. Cultivation of nitrogen-fixing plants
6. Cultivation of green manure crops to restore the fertility of the soil
7. Natural immunological defense of animals
8. Techniques encouraging natural pest control

If the result is 5 correct answers or more go on. If not try again





Grandfather: Well, done. Now let's go to the apiary. You will meet a beekeeper.

Grandchild: wonderful

Beekeeper: hello

Grandchild: Hello!

Beekeeper: Welcome to my apiary. Here we produce organic honey. Organic honey is produced from the pollen of organically grown plants, and without chemical miticides to treat the bees. Buying organic honey ensures that you avoid contact with pesticides that may be sprayed on or near the plants visited by honeybees.

First of all, let's learn something about all the parts of an apiary and its inhabitants. Try and match the words to the pictures.

1. Worker bee
2. Chewing bee
3. Honeycomb
4. Queen bee
5. Drone
6. Beehive





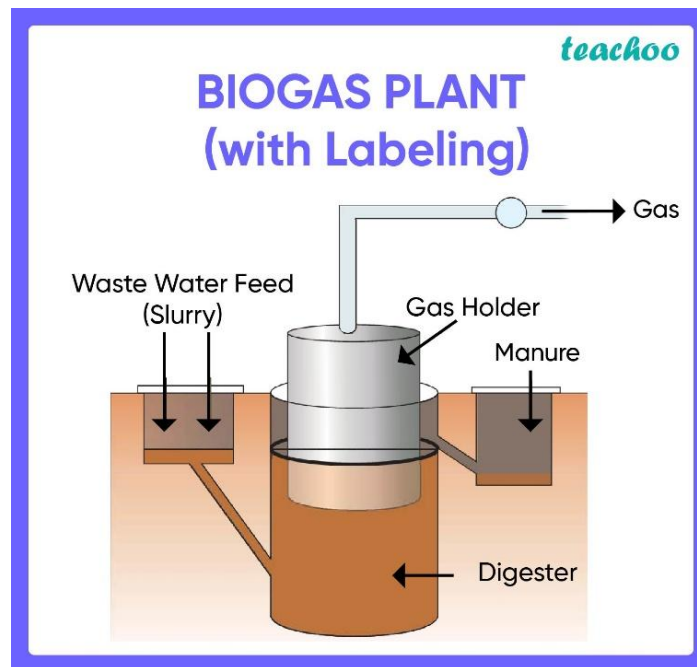
Well, done. Now I'm going to tell you something about how honey is produced. Try and put the sentences in the correct order!

Grandfather: Now you'll meet an engineer who planned our biogas plant

Grandchild: Great!

Engineer: Hi (avatar's name) Here is our biogas plant. Biogas plants rely on anaerobic digestion, a fermentation process in which waste is digested by microbes to produce methane gas (biogas). The waste can be converted into biofertilizer and spread directly onto fields, or the biogas itself can be used interchangeably with natural gas or fuel. Now I'll show how it works:





Put the steps in the right order

The fermentation process

The substrates are heated to various temperatures inside the fermenter, and a series of microorganisms start breaking down the organic matter in the absence of light and oxygen.

Eliminating impurities

The biogas goes through a cleanup process, in which water, hydrogen sulfide, and impurities are removed to produce biomethane that can further be used to generate energy and heat. The biogas is permanently monitored to ensure the quality of the final product.

Producing biogas

As a result of the fermentation, biogas with methane as the main ingredient is produced inside the fermenters. At this stage of the process, the gas includes, besides methane and carbon dioxide, water and hydrogen sulfide—which is one of the main reasons containers should be made in steel.



Pre-treatment and filling the digester

Multiple types of organic matter, called substrates, go into the digester. Some substrates can be liquid manure, renewable raw materials (such as corn or grass), or waste produced by the food industry.

Pulling out the residues

After fermentation, the residues called digestate are pulled out of the tank to be used as environment-friendly, high-quality fertilizer. This way, the biogas production process becomes a zero-waste system of eliminating garbage from landfills while providing a solution for better crops at the same time.

If you made more than two mistakes, try again

Engineer: Biogas could be particularly useful in rural or poorer areas due to the low cost of setup and the availability of waste materials. Almost any organic waste can be used in the process, though factors such as pH and temperature affect the gas production. It is a zero-emissions process.

Grandchild: Thank you very much. This was very interesting!

Grandfather: Now let's go to the cowshed. There is much more to learn about animal welfare on our farm.

Grandchild: ok, let's go

Livestock farmer: Welcome to our cowshed. Here we breed 500 milk cows. It is a very big livestock. If we wish to market our products as organic, we have to fulfil specific conditions including respect for animal welfare and feeding animals in accordance with their nutritional needs since we have to protect the animals' health and environment. Most importantly we must ensure that organically farmed animals are kept separate from non-organic.

As I said there are rules on livestock. Decide what is forbidden (F) and what is encouraged (E):

- 1) Cloning animals
- 2) 100% organic feed
- 3) Natural method of reproduction





- 4) Growth promoters and synthetic amino-acids
- 5) Feed obtained from the farm where the animals are kept
- 6) Hormones and similar substances
- 7) Immunological veterinary medicines
- 8) Access to open air or grazing areas
- 9) Feeding suckling animals with natural, preferably maternal milk.
- 10) Trained personnel

Grandfather: Well, done boy. Now there is a final quiz to assess what you actually learnt from this tour. I hope you have become aware of the benefits an organic farm can bring to our environment.





Scenario 8 – Wind Turbine Challenge

Partner name and country: UPatras, Greece

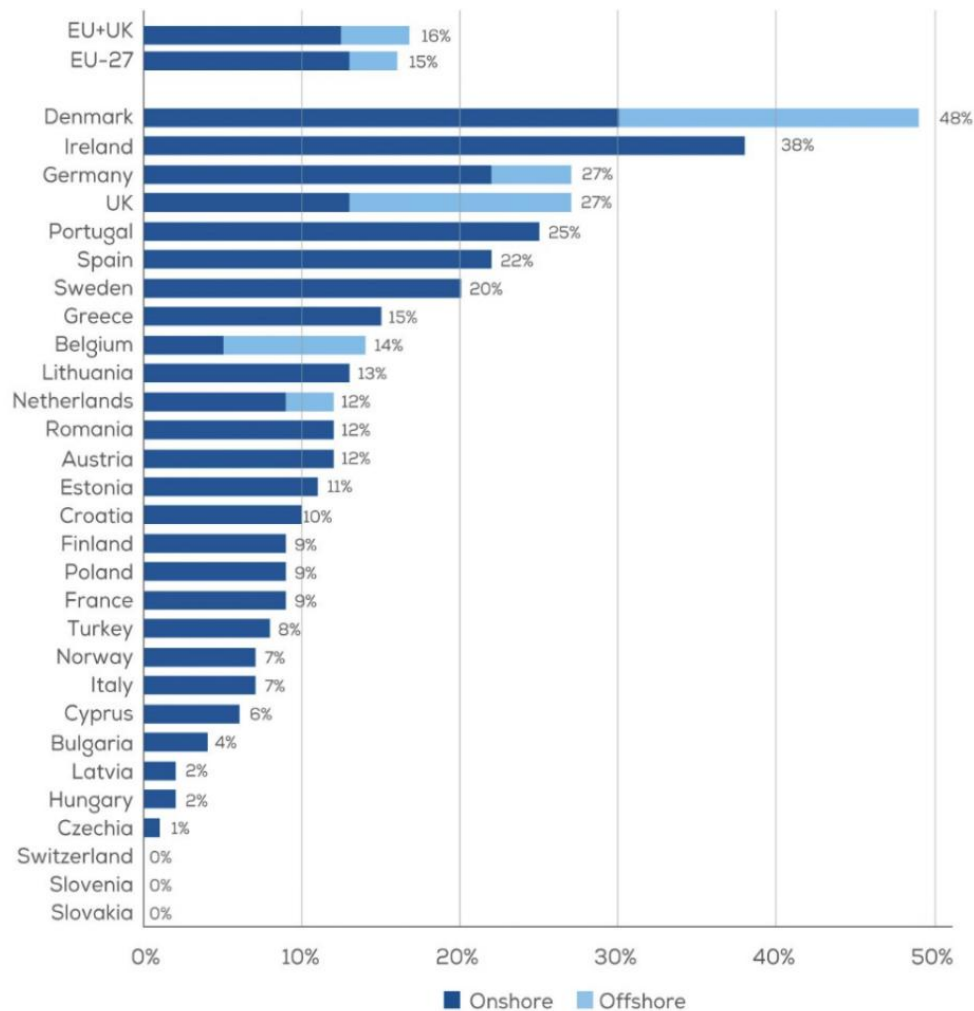
Educational content embedded

The primary educational goal of this game scenario is to introduce students to the concept of wind energy production. Key educational content includes:

- **Wind Energy Basics:** The game starts with an introduction to wind energy, explaining its status as a renewable, clean source of power and its significance for achieving energy sustainability. It also describes the basic functioning of wind turbines, which convert wind's kinetic energy into electricity.
- **Wind Farm Management:** The game progresses to a practical, hands-on task – the Wind Farm Challenge- that simulates the process of setting up a wind farm. The challenge introduces students to a variety of practical considerations, such as environmental factors, and budget management, among other.
- **Wind Energy Quiz and Reflection:** Towards the end of the game, students take part in a wind energy quiz that helps reinforce the knowledge they've gained throughout the game. The game also encourages reflection by asking students to explain the rationale behind their decisions during the Wind Farm Challenge and to consider the impact of these decisions on the environment.
- **Interactive Learning:** The scenario effectively uses a combination of interactive gameplay, dialogue-based learning, visual aids, and quizzes to facilitate an engaging and comprehensive learning experience.

Moreover 4 images should be inserted to the scenario with several fun facts about the wind energy.

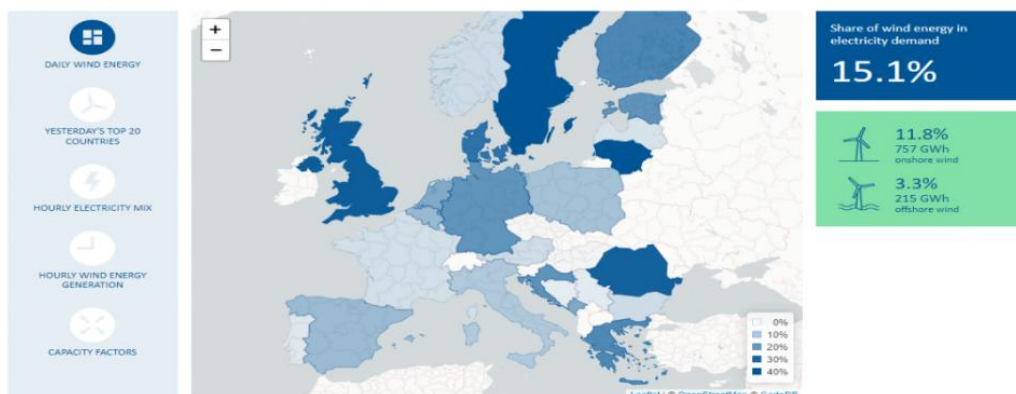


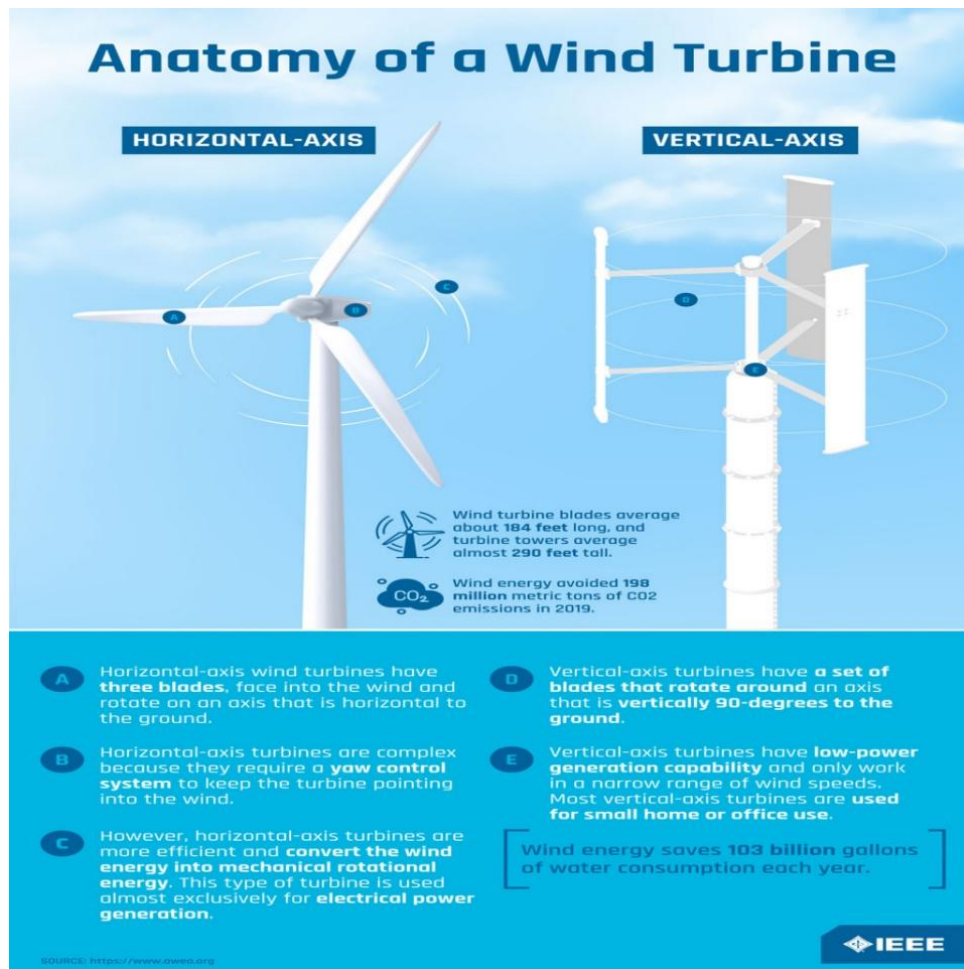


Wind EUROPE WIND POWER
NUMBERS
DAILY

Currently displaying data from 1 October 2023

How much wind was in Europe's electricity yesterday?





Setting description

This game scenario will take place on a wind farm and then on the wind farm station. Regarding the wind farm station building, it's important to have offices, chairs, 2D visualization of the wind farm display, computers, office equipment at the offices or general office equipment.

Characters/Players description

It will be a single player game. The NPCs are:

- Wind farm expert manager named Nick
- Turbine technician named John
- Turbine engineer named Andreas
- Environmental analyst named Maria



Game mechanisms

The user will interact with the Wind farm expert manager in order to start the game.

The player will be redirect to the wind farm in order to place the wind turbines to the appropriate locations trying not to harm the environment.

If the user accumulates enough points, then he is redirect back to the wind farm station offices in order to do a quiz to finalize the scenario.

Script

(Student Avatar and Wind farm expert manager at the wind farm station entrance)

Student avatar arrives at wind farm station and Nick is at his office working, the student can approach Nick and the following conversation takes place:

Student: Good morning, Nick! How are you?

Nick: Welcome to RAISE wind farm! Are you here to learn more about wind energy?

Student:

1. Option 1: "Yes, I'm here to learn about wind energy and how it works."
2. Option 2: Go away not saying anything

If the student selects the first option, continue the dialogue otherwise do nothing.

Option 1:

Nick: "Great! Wind energy is a clean and renewable source of power that comes from the movement of air, which can then be used to power our homes. Would you like to join our challenge to test your knowledge and learn more about wind turbines?"

Student:

1. Option 1A: "Yes, I'd love to join the Wind Farm Challenge"

When the user selects the Option 1A then he is redirect to a wind farm where he can 5 wind turbines and the goal is to place these 5 wind turbines to the 15 wind turbines bases with the most efficient and sustainable way within the environmental constraints

Game Setup:

We provide the student a virtual plot of land for their wind farm, along with ,





environmental factors, and wind turbines. The game will have will end when user puts all wind turbines to wind turbines bases for the student to plan and build their wind farm.

Gameplay:

Student must consider the following:

- Environmental factors:
 - Wind speed and consistency: A location with consistent and strong winds is critical for efficient energy production.
 - Land availability and topography: The area should have enough space for turbines and support infrastructure.
 - Environmental impact: Consider potential effects on local wildlife, such as birds, as well as on vegetation and ecosystems.
 - Access to the electrical grid: The development of a wind farm depends to the efficient energy distribution.

Scoring: The points are awarded based on the total energy output of the wind farm. Bonus points will be awarded for minimizing environmental impact and including additional sustainable features.

If the user doesn't pass a given threshold, then he must repeat the placing of the wind turbines otherwise the minigame ends. Then the user can redirect by clicking the exit box where he will be redirected to the Wind Farm Station and finalize the scenario with a given quiz

Then a Quiz will pop up about the wind energy, the quiz will be:

Title: Wind Energy Quiz for Students

1. What is wind energy? a) Energy from the sun b) Energy from moving water c) Energy from moving air d) Energy from the ground
2. What do wind turbines mainly use to generate electricity? a) Solar panels b) Water wheels c) Kinetic energy from the wind d) Heat from the Earth's core
3. Which of the following is a common type of wind turbine? a) Horizontal-axis wind turbine b) Solar wind turbine c) Geothermal wind turbine d) Wave wind turbine
4. What is one major benefit of using wind energy? a) It produces greenhouse gas emissions b) It is a nonrenewable resource c) It is a clean and renewable energy source d) It requires large amounts of water to operate
5. Which of the following is a disadvantage of wind energy? a) High initial investment cost b) Produces harmful emissions c) Requires constant sunlight d) Contributes to global warming
6. What is the term used to describe the area where a group of wind turbines is





- installed? a) Solar farm b) Wind farm c) Hydroelectric farm d) Geothermal farm
7. Which of the following factors affects the efficiency of a wind turbine? a) Wind speed b) Water temperature c) Solar radiation d) Ground conductivity
 8. What is an advantage of offshore wind farms compared to onshore wind farms? a) Lower installation costs b) More stable wind conditions c) Less impact on local wildlife d) Reduced noise pollution
 9. You are designing a wind farm and need to consider the environmental impact. One important aspect is minimizing the disruption to wildlife habitats. Which action should you take to achieve this goal? a) Place wind turbines at the edge of the terrain. b) Position wind turbines near water bodies to attract wildlife. c) Ensure wind turbines are positioned within the central region of the terrain. d) Install wind turbines in densely populated areas.
 10. What is one potential environmental concern related to wind turbines? a) They contribute to deforestation b) They can cause noise pollution c) They deplete natural resources d) They release harmful pollutants into the air

Answers: 1c, 2c, 3a, 4c, 5a, 6b, 7a, 8b, 9c, 10b

After that a notecard will pop up saying:

“We hope you had fun and learned more about wind energy. In order to make a shift towards a greener future we have to be educated about the capabilities of the renewable sources of energy.”

Finally, the user will return to the scenario room.





Scenario 9 – Water treasure

Partner name and country: AEDAS, Portugal

Educational content embedded

The education goal of this scenario is to teach students about:

- The importance of water
- Identify the challenges regarding water management.
- Water pollutants
- Human activities that consume more water
- Consequences of water pollution
- Determine the water footprint
- Adopt behaviors to minimize water costs.
- Know eco curiosities.

Setting description

The scenario will take place along a river. It may be the river Po, the longest in Italy, which flows very near the town of Cremona (or the Ave River, that flows into Atlantic Ocean in Vila do Conde). The activity begins at the source of the river (the Alps/Cabreira mountains) and ends at its mouth. The class is going on a field trip to the river Po (or Ave). Students plan to do various outdoor and river activities. When they arrive at the source of the river and start walking along the water until they reach its mouth, they are faced with a polluted river and dirty banks. The pollution is such that the students are unable to carry out some of the outdoor activities they had planned. They are upset by the situation and decide to take action.

Characters/Players description

The main character is a student/player. It start on the source and finishes at the mouth of the river.

Game mechanisms





Exploration and observation of landscape and/or polluted areas, dialogues with specific questions of the students to the different characters they met during the trip and related answers. During the trip, students are expected to answer some questionnaires (multiple choice or other) and/or play minigames (i.e., we give the students some photos and they guess the environmental problem it illustrates).

Script

The students stop at several checkpoints along the river and meet inhabitants in different areas or towns along the river, or people who have professions connected with the river (i.e., fisherman, engineer responsible for a hydroelectric power plan, an environmentalist and a farmer). They discuss about environmental problems caused by the lack of water (i.e., glacier retreat at the source, the difficult operation of the hydroelectric power plants, lack of water for irrigation, navigation difficulties, sea water which goes back at the mouth...) or other human activities (different kinds of pollution).

1. At the first checkpoint, they establish a dialogue with an **environmentalist** who is at the source of the river to determine the reason why the glacier has retreated.

The students gather around him, and the environmentalist asks them:

Please answer this multiple-choice quiz:

1.1. What is one of the primary factors that contributes to the retreat of glaciers?

- a) Increased snowfall
- b) Decreased global temperatures
- c) **Human activities, such as industrial emissions**
- d) Expansion of polar ice caps

If students answer correctly, a pop-up window will congratulate them or the environmentalist will compliment them, proceeding with the dialogue, afterwards.





1.2. What is the term for the process by which glaciers lose more ice through melting and calving than they gain through snow accumulation?

- a) Glacier advance
- b) Glacier recession
- c) Glacier equilibrium
- d) Glacier mass balance**

1.3. Which of the following is a natural cause of glacier retreat?

- a) Volcanic eruptions**
- b) Forest preservation
- c) Decreased solar radiation
- d) Carbon dioxide emissions

1.4. How do higher temperatures contribute to glacier retreat?

- a) They increase snow accumulation.
- b) They cause glaciers to advance.
- c) They accelerate glacier melting.**
- d) They have no impact on glaciers.





1.5. What is the term for the process where pieces of ice break off from the glacier and fall into the ocean, contributing to glacier retreat?

- a) Sublimation
- b) Ablation
- c) Calving**
- d) Accumulation

The students answer and if they get it right, they move on, and the river gets cleaner.

2. Next, at the second check point, they meet a **fisherman** that is complaining about the lack of water and fish because the water is polluted.

First, there is a video about the possible reasons why the level of water has decreased. Then, students answer a **quiz** about the lack of fish. As they get right answers, the river gets cleaner, and they can continue hiking down the river.

Dialogue: The fisherman asks the students:

2.1. What are common reasons for a decrease in the water level of the river Po?

- a) Excessive rainfall and flooding
- b) Glacial meltwater input
- c) Dams and water diversions**
- d) High tides and storm surges





2.2. Which of the following actions contribute to reducing an individual's water footprint?

- a) Increase meat consumption
- b) Using inefficient irrigation techniques in agriculture.
- c) Reduce domestic water waste**
- d) Increase the production of water-intensive consumer goods

2.3. During a prolonged drought, which human activity is most likely to impact the river Po's water level?

- a) Construction of new reservoirs
- b) Reduced industrial water usage
- c) Strict water conservation measures
- d) Increased irrigation for agriculture**

2.4. What is the primary natural factor responsible for variations in the river Po's water level throughout the year?

- a) Ocean currents
- b) Solar radiation
- c) Seasonal precipitation patterns**
- d) Volcanic activity

2.5. Why does the number of fish diminish in a polluted river?





- a) Increased sunlight penetration
- b) Improved water quality
- c) Reduced oxygen levels**
- d) Enhanced food availability

2.6. What is a common consequence of pollution on aquatic ecosystems?

- a) Increased fish populations
- b) Balanced pH levels
- c) Algae blooms**
- d) Reduced sedimentation

2.7 How does pollution typically affect the reproductive abilities of fish?

- a) Enhances their breeding behaviour
- b) Boosts egg survival rates
- c) Reduces fertility and hatching success**
- d) Increases the number of offspring

2.8 What role do toxins in polluted water play in fish population decline?

- a) Stimulate fish growth
- b) Act as natural fish repellents
- c) Impair fish immune systems and cause diseases**
- d) Encourage predator-prey relationships





2.9 In a polluted river, what impact does nutrient runoff have on fish populations?

- a) It provides essential nutrients for fish growth
- b) It has no effect on fish populations
- c) It can lead to oxygen depletion and fish kills**
- d) It increases fish resistance to pollution

3. As they descend, they stop at the third checkpoint for a break and find a **farmer** by the bank of the river. They start talking about the human activities that consume more water. The fisherman

asks the students:

3.1 Which of the following human activities is the largest consumer of freshwater globally?

- a) Household use
- b) Agriculture**
- c) Industrial processes
- d) Energy production

3.2 What percentage of global freshwater withdrawals is typically used for agricultural purposes?





- a) 10%
- b) 25%
- c) 50%
- d) 70%**

3.3 Which industry often consumes significant amounts of water for cooling and other processes?

- a) Textile manufacturing
- b) Information technology
- c) Automobile production
- d) Pharmaceutical manufacturing**

3.4 In urban areas, what is one of the main contributors to residential water consumption?

- a) Showering
- b) Washing dishes
- c) Flushing toilets
- d) Watering lawns**

3.5 Which of the following energy sources requires the most water for its production?





- a) Nuclear power
- b) Natural gas**
- c) Solar power
- d) Wind power

3.6 What is the water footprint?

- a) The amount of water you drink in a day.
- b) The amount of water you use for washing dishes.
- c) The total volume of water used directly and indirectly to support your lifestyle.**
- d) The amount of water you save in a water tank.

3.7 What can you do to reduce your water footprint related to clothing?

- a) Buy new clothes frequently.
- b) Choose clothing made from water-intensive crops like cotton.
- c) Purchase second-hand clothing.**
- d) Never wash your clothes.

3.8 Which of the following contributes the most to a typical person's water footprint?

- a) Showering and bathing.





- b) Flushing the toilet.
- c) Washing dishes.
- d) Dietary choices and food consumption.**

3.9 How can you reduce your water footprint related to food consumption?

- a) Eat more meat and dairy products.
- b) Choose locally sourced and seasonal foods.**
- c) Consume bottled water instead of tap water.
- d) Take longer showers.

If they got the right answers, they can have their picnic and move on hiking.

4. They stop at the hydroelectric dam and find the **engineer** responsible for the structure. He/she explains the students how the central works and the importance of water to maintain human activities.

- a) Do you know how you can save water in your daily activities?

Students are asked to select the images that correspond to appropriate actions to save water.

At the end of the game, they have to play a mini game about environmental problems in order to be able to go to the beach and have some fun at the mouth of the river.

Mini game about environmental problems. Students have to look at a set of images and





match them with the correct environmental problem each image refers to.



1. Melting ice caps

Source : <https://www.flickr.com/photos/137585906@N04/39283097431>



2. Air pollution

Source : <https://earth.org/effects-of-air-pollution-on-the-environment/>



3. Marine litter

Source : <https://www.flickr.com/photos/snemann2/38948653872>



4. Deforestation

Source : <https://www.publicdomainpictures.net/en/view-image.php?image=296125&picture=deforestation>



5. Water insecurity

Source : <https://smartwatermagazine.com/news/american-society-nutrition/food-insecurity-and-water-insecurity-go-hand-hand-study-finds>



6. Biodiversity loss

Source : <https://www.flickr.com/photos/felton-nyc/51549394578>



7. Intensive agriculture

Source: <https://www.fian.org/en/press-release/article/a-just-transition-to-agroecology-3176>



8. Plastic pollution

Source : <https://ndla.no/subject:d1fe9d0a-a54d-49db-a4c2-fd5463a7c9e7/topic:a2f5aaa0-ab52-49d5-aabf-e7ffeac47fa2/topic:ee45a439-5633-4074-9629-f84e1dd9ef02/topic:f1b53365-36e1-43b8-b8bf-0c79f2141b82/resource:f721bdda-545f-48fa-adc9-290e05b571d4>



9. Fast fashion pollution

Source : <https://earth.org/fast-fashions-detrimental-effect-on-the-environment/>



10. Global warming

Source : <https://www.cespafrica.com/climate-change-explained/>



11. Food insecurity

Source : <https://theconversation.com/hunger-is-increasing-worldwide-but-women-bear-the-brunt-of-food-insecurity-188906>



12. Food waste

Source : <https://wastewise.be/2022/07/new-model-for-urban-food-waste-collection-breaking-down-barriers-with-kat-heinrich/>



Scenario 10 – House eco-explorer

Partner name and country: UPatras, Greece

Educational content embedded

The educational content related to various items that can be found inside a house or in the house yard, that can be eco-friendly or non-eco-friendly is:

- **Armchair:** This armchair is more than just a comfortable spot to unwind. Crafted using sustainably-sourced materials and environmentally-friendly processes, it offers relaxation while taking care of our planet. Its production prioritizes a reduced carbon footprint, blending the comforts of home with the essential goal of environmental preservation.
- **Bicycles:** Bicycles are an environmentally friendly mode of transportation. They produce no emissions, require no fuel, and reduce the need for cars, which can decrease traffic congestion and pollution. Furthermore, manufacturing a bicycle has a much smaller carbon footprint compared to cars. Riding a bike also promotes physical health and well-being.
- **Bookcase:** A bookcase, primarily crafted from wood, serves as a repository for numerous books, each made from paper that originates from trees. While the intent behind a bookcase—to preserve knowledge and culture—is commendable, its environmental impact can't be overlooked. The production of books necessitates the felling of trees for paper, combined with the energy and resources used in printing, binding, and transportation. A fully stocked bookcase might, indirectly, represent a significant number of trees. While digital alternatives are emerging, traditional bookcases and books can have a notable footprint on the environment.
- **Candle:** A balcony candle, designed to spread a gentle glow and cozy ambiance, is not just beautiful to look at but also kind to our planet. Crafted from eco-friendly materials, it burns cleanly without releasing harmful substances into the air. This means you can enjoy your candlelit moments knowing you're using a product that supports sustainable practices and cares for the environment. Its eco-conscious nature reminds us that we can have delightful experiences while still making earth-friendly choices.
- **Ceiling fan:** A balcony candle, designed to spread a gentle glow and cozy ambiance, is not just beautiful to look at but also kind to our planet. Crafted from eco-friendly materials, it burns cleanly without releasing harmful substances into the air. This means you can enjoy your candlelit moments knowing you're using a product that supports sustainable practices and cares for the environment. Its





eco-conscious nature reminds us that we can have delightful experiences while still making earth-friendly choices.

- **Chemical fertilizer:** Chemical fertilizers are mixtures that farmers and gardeners use to feed their plants, ensuring they grow strong and yield a lot. However, there's a catch. When used excessively, these fertilizers can wash away with rain or irrigation, finding their way into streams, rivers, and eventually, our oceans. This can cause a problem called "eutrophication," where water bodies get overloaded with nutrients, leading to excessive algae growth. When the algae die, they consume a lot of oxygen in the water, which can harm fish and other aquatic life.
- **Cigarettes:** Cigarettes are slender rolls of tobacco wrapped in paper, commonly ignited for smoking. While they might offer momentary relaxation for some, they come with serious health risks and environmental concerns. Their production, consumption, and disposal lead to deforestation, pollution, and littering, posing challenges to both human health and the planet's wellbeing.
- **Coal:** Coal is a black rock mainly composed of carbon, used as a fuel source. While it played a significant role in the industrial revolution and powered our world for decades, it comes with a heavy environmental cost. When we burn coal, it releases a mix of harmful gases, like carbon dioxide, which contributes to global warming, and sulphur dioxide, which can lead to acid rain. Moreover, mining for coal often leads to deforestation, habitat loss, and water pollution.
- **Coat hanger:** The aluminium coat hanger is a durable and lightweight tool used for hanging clothes and ensuring they maintain their shape. Made from aluminium, a highly abundant and recyclable metal, this hanger boasts a shiny appearance and resistance to rust. Aluminium production does have environmental impacts due to energy consumption and mining processes, but once produced, the metal can be recycled infinitely without loss of quality. When disposing of an aluminium coat hanger, it's essential to recycle it to ensure that its environmental footprint is minimized and to support the circular economy of metal products.
- **Coca Cola can:** A Coca-Cola can is a cylindrical aluminium container that holds the globally popular carbonated soft drink, Coca-Cola. While its sleek design and portability make it a favourite for many, its environmental implications are significant. The mining of bauxite for aluminium production can result in habitat destruction and water pollution. Additionally, while aluminium is recyclable, many cans unfortunately end up in landfills or as litter, adding to environmental concerns.
- **Couch:** This couch offers a blend of comfort and eco-friendliness. Made from sustainably-sourced materials and crafted with environmentally-friendly processes, it not only serves as a cozy spot to relax but also supports a healthier planet. Its production has a reduced carbon footprint, ensuring that your home





remains a haven without compromising the environment.

- **Fanta can:** A Fanta can is a cylindrical aluminium vessel containing Fanta, a fruit-flavoured carbonated drink enjoyed worldwide. Its bright and colourful design reflects the zest of its contents. However, the environmental cost of producing such cans is worth noting. Bauxite mining, essential for aluminium extraction, can lead to ecological damage and water contamination. Though aluminium is recyclable, many of these cans do not find their way to recycling centers and instead contribute to landfill waste or become environmental litter.
- **Fireplace:** A fireplace is an architectural structure built into homes and spaces to burn wood or other fuels, radiating warmth into the surrounding area. While it offers a cozy ambiance and can be a heat source, the combustion process releases smoke and particulates into the air. This can contribute to indoor and outdoor air pollution, making it essential to use them responsibly and ensure proper ventilation.
- **Garden:** A garden act as an oasis, especially in urban areas, providing space for city dwellers to grow their own vegetables and flowers. While plants absorb carbon dioxide and release oxygen, making our air cleaner, gardens also serve as natural coolers, absorbing sunlight and providing shade.
- **Glass bottle:** A glass water bottle is a durable vessel crafted from a blend of sand, soda ash, and limestone, which are heated to create a clear or coloured transparent material. Glass bottles are often favoured for their absence of chemicals that might leach into the contents, ensuring a pure taste. Environmentally, glass has an edge over some materials as it is fully recyclable without loss of quality. However, the production of glass does have an energy footprint, primarily due to the high temperatures needed in its formation. Reusing glass bottles can significantly offset this footprint, making them a sustainable choice when used long-term.
- **High-Tech Fridge:** The High-Tech fridge is not just a showcase of the latest technology but also a testament to how innovation can harmonize with eco-friendliness. Designed to be energy-efficient, it consumes significantly less power compared to traditional models. This not only results in reduced electricity bills but also a smaller carbon footprint. So, while our food stays fresh and delicious, our planet benefits too!
- **Houseplant:** Houseplants are environmentally friendly additions to any space. They help purify indoor air by absorbing toxins and releasing fresh oxygen. Additionally, they require minimal resources and can even increase humidity, benefiting both people and the environment. Their ability to reduce indoor pollutants makes them an eco-friendly choice for interior decoration.
- **Incandescent light bulb:** Incandescent light bulbs, also known as traditional bulbs, operate by passing electricity through a wire filament until it becomes hot enough to glow. While they have been widely used for over a century, they are not very





- energy-efficient compared to newer lighting technologies. Most of the energy they consume is wasted as heat rather than light. This inefficiency can lead to higher electricity bills and increased carbon emissions if the energy source is non-renewable. For eco-conscious choices, alternatives like LED bulbs are recommended as they use significantly less energy and last longer.
- **Jars:** Small jars are versatile containers commonly used for jams, jellies, and various other delicacies. Made mainly of glass, these jars offer an eco-benefit: they can be reused multiple times for different purposes, from storing foods to being part of craft projects or handy organizers. Glass, unlike some plastics, doesn't give off harmful substances, keeping your food safe. The main environmental concern is the energy required to produce these jars. However, by reusing them, you can spread out that energy cost over many uses, making them a greener choice. s
 - **LED light bulb:** LED light bulbs use light-emitting diodes to produce light. They are a significant advancement over traditional incandescent bulbs. Not only do they consume up to 90% less energy, but they also have a much longer lifespan, often lasting 15-25 times longer. This means fewer replacements, reduced waste, and substantial energy savings over time. From an environmental standpoint, switching to LED bulbs is a great way to reduce energy consumption and decrease the carbon footprint of a household or establishment.
 - **Lawnmower:** Lawnmowers, especially gas-powered ones, release emissions that can be harmful to the environment. They also contribute to noise pollution. Electric mowers are a bit friendlier but still require energy which might come from non-renewable sources. It's better to opt for manual push mowers or natural lawn management methods for an eco-friendlier approach.
 - **Leaf blower:** Leaf blowers are handy tools that make the task of cleaning yards, driveways, and sidewalks much easier by blowing away leaves and other debris. While they save time and effort, gas-powered versions can have a downside for the environment. They emit pollutants that contribute to air pollution, and their loud noise can be disruptive to both humans and animals in the vicinity. Moreover, when we blow leaves away, we're removing a natural source of organic material that, if left to decompose, could enrich our soils.
 - **Mug:** A regular mug, often made from ceramic or glass, is designed for multiple uses. Unlike disposable cups that are thrown away after one use, a ceramic or glass mug can be used over and over again. This means fewer items go to the landfill, and less waste is produced. By using a regular mug, you're directly helping to reduce the amount of trash and waste in our environment. It's a simple, yet effective way to be more eco-friendly in daily life.
 - **Oil barrels:** Oil barrels are mainly used to hold and move oil from one place to another. Now, while the barrel itself is just a container, what's inside - the oil - is used for energy, like driving cars or flying planes, it releases dangerous substances called greenhouse gases into the air, which isn't good for our planet. In fact, these





gases are one of the big reasons for the hotter summers and weird weather we're seeing. Plus, sometimes, mistakes happen, and oil spills into the ocean, harming sea life and birds.

- **Organic fertilizer:** Organic fertilizer is a type of soil amendment made from natural materials like composted plants or animal manure. Unlike chemical fertilizers, which can contain synthetic substances, organic fertilizers provide essential nutrients to plants in a slow and steady manner. When applied appropriately, they can improve soil health, promote strong plant growth, and reduce the risk of soil and water pollution. They also play a role in sustainable farming, helping to maintain the balance of the ecosystem and fostering a healthy environment.
- **Oven:** The oven, especially older models, has always been the heart of the kitchen. They often rely on gas or wood for heating, which isn't too friendly for our planet. These ovens can emit more greenhouse gases and consume more energy compared to modern, efficient ovens. They lack the precise controls and eco-friendly features that newer models boast. For our Earth's sake, it's always good to think about using more energy-efficient alternatives when we can.
- **Painting:** Paintings, especially when created using traditional, non-environmentally friendly paints, can have a hidden environmental cost. These paints often contain chemicals and heavy metals that, when manufactured and eventually discarded, can harm the environment. The residues can contaminate soil, waterways, and pose risks to aquatic life.
- **Paper bag:** A paper bag is a biodegradable and compostable container, primarily crafted from wood pulp which is sourced from trees. These bags have risen in popularity as an environmentally friendlier alternative to plastic bags. When produced from sustainably managed forests, their environmental impact can be relatively low. While the production of paper bags requires water and energy, their ability to break down naturally in the environment reduces the risk of long-term pollution. However, reusing and recycling paper bags, or opting for cloth bags, can further minimize ecological footprints.
- **Plastic chair:** When you think of a plastic chair, you might picture a simple, lightweight seat that can withstand rain, sun, and even being tossed around at backyard parties. However, behind its practical design lies an environmental challenge. These chairs are made from plastic, which takes a really long time to break down in nature. So, that chair you sit on for a few hours during summer barbecues? It could linger in our environment for centuries. Plus, the making of plastic releases some not-so-nice chemicals.
- **Plastic water bottle:** A plastic water bottle is a convenient, portable vessel typically made from polyethylene terephthalate (PET). It's designed for single-use to carry and dispense water. However, its environmental impact is concerning. Producing these bottles consumes fossil fuels, and after use, they often contribute to the growing global plastic waste crisis. While they can be recycled, a significant





- number end up in landfills or polluting oceans, where they take hundreds of years to degrade and can harm marine life.
- **Plates:** Plates are essential tableware items present in virtually every home and dining venue around the globe. Most plates are manufactured from ceramics like porcelain or stoneware, but they can also originate from materials such as glass, metal, plastic, or wood. A notable advantage of plates, especially those made of durable materials, is their potential for reuse over many years, supporting a sustainable and environmentally-conscious lifestyle. Proper care and handling can further extend their lifespan, underlining the principle of reusing over disposing and diminishing the necessity for frequent replacements.
 - **Radiator:** A radiator is a heating device designed to warm spaces. This particular model utilizes fossil fuels as its energy source. While effective in providing warmth, burning fossil fuels releases carbon dioxide and other greenhouse gases into the atmosphere, contributing to global warming and air pollution. Using such radiators regularly may have a negative impact on the environment.
 - **Recycle bins:** A recycle bin is a special container where we place materials like paper, plastic, metal, and glass, keeping them separate from regular trash. Instead of these materials ending up in landfills or being burned, they get a new lease on life. By recycling, we not only reduce the amount of waste but also save energy, reduce pollution, and conserve natural resources. Remember, every item you put into a recycle bin is a step towards a cleaner and healthier planet for all of us!
 - **Solar panel:** Solar panels are like big, flat screens that catch sunlight and magically convert it into electricity. This is super cool for a couple of reasons. First, we have a LOT of sunlight, and it's free. Secondly, by using the sun's energy, we're not burning dirty fuels like coal or oil, which create pollution and harm our planet. Now, making these solar panels does take some energy and resources, but once they're up and running, they can keep on producing clean energy for many, many years. It's like giving Earth a little break from all the smoke and gases we usually send into the air!
 - **Steam BBQ:** A gas BBQ is a popular outdoor cooking device that uses propane or natural gas as its heat source. Environmentally speaking, while it's a cleaner-burning option compared to charcoal grills, it still relies on fossil fuels. The extraction and transportation of these fuels can harm our planet. While enjoying the convenience of a gas BBQ, it's essential to be aware of the carbon footprint of such devices.
 - **Swimming pool:** Swimming pools are areas filled with water, allowing us to swim, play, or just chill on a hot day. While they offer great fun and exercise, there's a hidden side we should be aware of. Pools consume a lot of water and often rely on chemicals to keep the water clean, which can harm the environment when drained off. The energy used to pump and warm the water can also be significant.
 - **Synthetic carpet:** Synthetic carpets, often made from materials like nylon,





polyester, or polypropylene, are popular due to their durability and affordability. However, their production involves the use of petroleum-based products and can result in significant greenhouse gas emissions. Moreover, these carpets can off-gas volatile organic compounds (VOCs) into indoor spaces, affecting air quality and potentially causing health concerns.

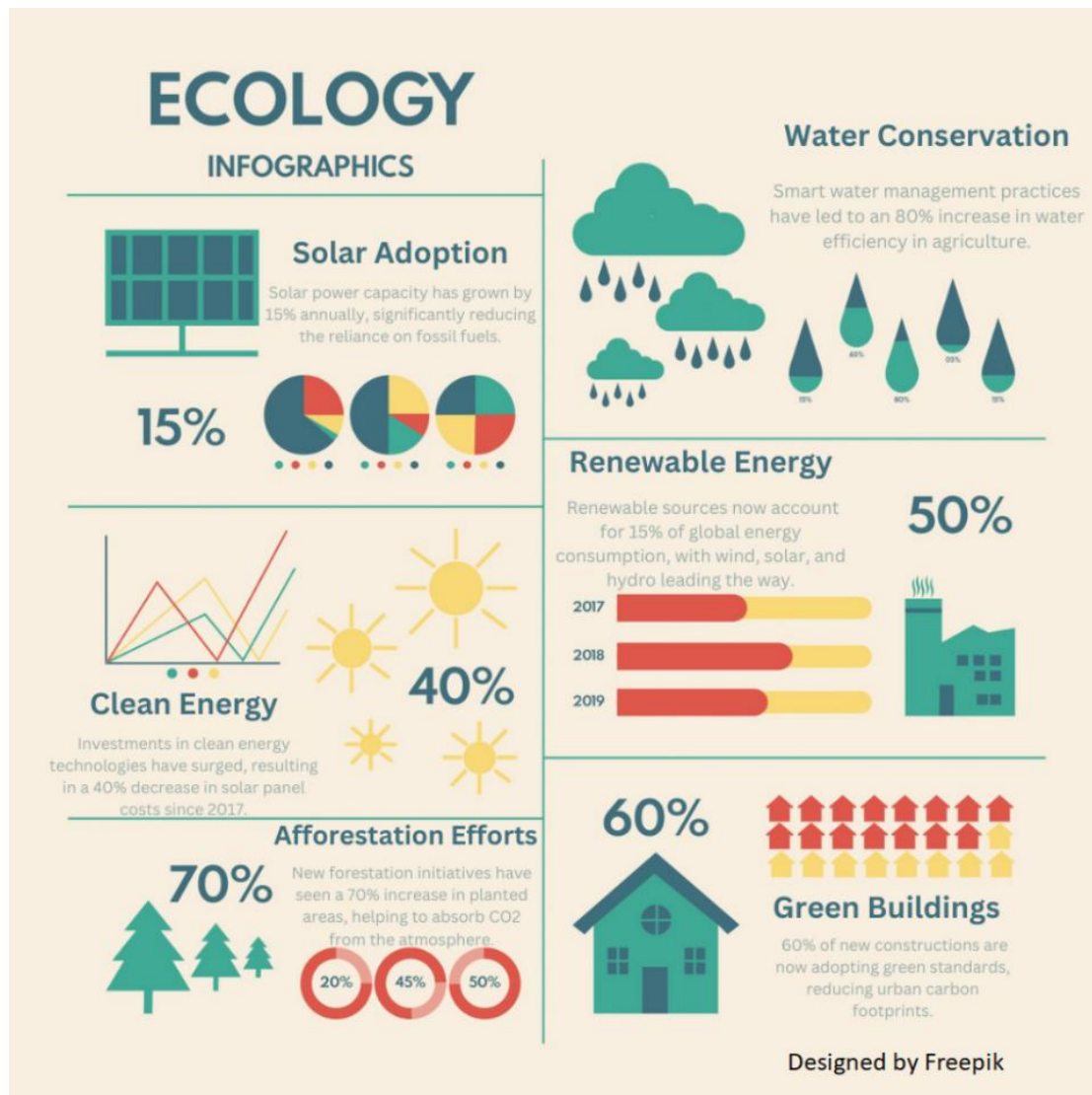
- **TV:** The TV, has long been a staple in homes around the world, providing entertainment, news, and education. It's a device that receives and displays broadcast signals, streaming content, and more on its screen while emitting sound from its built-in speakers. As technology has advanced, TVs have transformed from large, heavy boxes to slim, high-definition flat screens, often equipped with smart capabilities. However, like many electronics, the production, use, and disposal of TVs come with environmental implications. Their manufacturing involves the use of precious metals and other resources, and discarded TVs can contribute to electronic waste
- **Thermostat:** A thermostat is like the brain behind your home's heating and cooling systems. It tells your heater or air conditioner when to switch on and off, based on the temperature you set. But here's the exciting part for our planet: modern thermostats, especially the smart ones, can learn your patterns, understand when you're home or away, and adjust the temperature accordingly. This smart tech means less wasted energy, which is great news for the environment!
- **Water Collector:** A water collector, often known as a rainwater harvesting system, is a brilliant way to harness nature's gift: rain. When it rains, instead of letting the water just flow away, this system captures it, typically from rooftops, directing it into a storage tank. Once collected, this water can be used for watering plants, flushing toilets, and even washing cars. Using a water collector helps us rely less on treated municipal water, which is not only good for our pockets but also for our planet. It promotes sustainable living by conserving precious water resources and reducing energy consumption linked to water treatment and distribution.

These educational facts can help players understand the impact of their choices on the environment and motivate them to make more eco-conscious decisions.

After clicking each item, the player can read information about each item, or receive a card with this information.

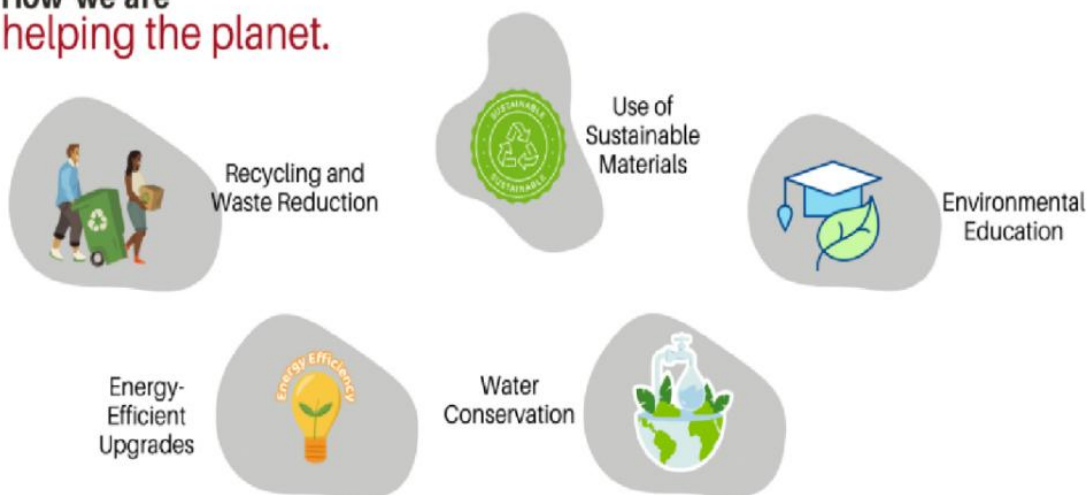
Moreover, around the room we have included several images with fun facts corresponding environment







How we are helping the planet.





Setting description

A house with a few rooms and a back yard. The house has the following items:

Environmentally friendly items:



- Armchair
- Bicycle
- Candle
- Coat hanger
- Couch
- Glass bottle
- Recycling bins
- Compost bins
- Energy-efficient light bulbs
- Reusable water bottles
- Cloth shopping bags
- Mug
- Solar panels
- Rain barrels for collecting rainwater
- Non-toxic cleaning products
- Plant-based or biodegradable materials for furniture or décor
- High-Tech Fridge
- House Plant
- Jars
- Thermostat
- LED light bulb
- Organic fertilizer
- Plates
- Water collector

Non-environmentally friendly items:

- Bookcase
- Cigarettes
- Coal
- Coca cola can
- Fireplace
- Garden
- Oven
- Painting
- Incandescent light bulb
- Single-use plastic water bottles
- Styrofoam cups or plates
- Non-recyclable packaging
- Incandescent light bulbs





- Chemical pesticides or fertilizers
- Products made from endangered species
- Non-renewable energy sources like oil or coal
- Products made with synthetic materials like polyester or nylon
- Electronics that are not Energy Star certified
- Lawnmower
- Swimming pool
- Steam BBQ
- Synthetic carpet
- TV
- Radiator
- Plastic Chair
- Plastic Water Bottle
- Leaf blower

Characters/Players description

This is a multiplayer game, where at least 3 players work together to explore a virtual house and identify environmentally friendly and non-environmentally friendly items.

The players first enter inside the game space and when all players have selected a role from the Central Selection Scenario room. After that no more players can join the game.

Each player has selected one of the following distinct roles;

One Player is the "Non-Environmentally Friendly Spotter". Their role is to identify non-environmentally friendly items in each room and the yard. They wear a red cloth to distinguish their role.

One Player is the "Eco-Friendly Spotter". Their role is to identify environmentally friendly items in each room and the yard. They wear a green cloth to distinguish their role.

One or more Players are the "Eco-Educator". Their role is to click on the items identified by Players 1 and 2 to provide additional educational content about each item.

Game mechanisms

The game starts when every role has selected a role in the Scenario Selection role room and also the game has a reset button if the players want to reset and start all over again.

The roles are selected in the start by the players.

At every correct or wrong decision, the score is showed.





In the start of the game when the players enter the scenario, they should get the following description:

Welcome to the House Eco-Explorer adventure!

In the House Eco-Explorer game, the mechanisms are designed to encourage teamwork and learning. When an Eco-Friendly Spotter or Non-Environmentally Friendly Spotter correctly identifies an item, the team earn three points. However, if a Spotter makes a mistake and identifies an item incorrectly, the team loses one point.

The Eco-Educator plays a crucial role in providing additional educational content. They can click on an item for free the first time, receiving a short description. However, if they choose to provide more detailed information, it will cost them one point.

The game starts with an initial score of 10. The game ends if the team score is over 30 or below 0 or when all items in the room are selected.

Please note that if any player decides to leave the scenario prematurely, the entire scenario will conclude, and the remaining players will be automatically teleported back to the scenario room

So, the team starts with 10 points and they have a goal to reach 30 points to win.

The game must offer ways for the team to communicate (chat or voice).

The items will become semi-invisible when selected signaling that this item has been selected. For example, the 1st time the "Eco-Educator" clicks on an item they receive the item's name, the 2nd time the "Eco-Educator" clicks on an item they receive a short educational content about the item that could be a hint of how to use it, the 3rd time the "Eco-Educator" clicks on an item they receive the detailed educational content. When the "Eco-Friendly Spotter" or the "Non-Environmentally Friendly Spotter" click on an item they are informed about their choice (correct or incorrect accordingly) and the entire team receive the full educational content, while the item is locked and cannot be selected until the game is finished.

Script

The players must communicate with each other to share information about the items they find and decide if they need further information about each item.





Every item can be clicked by each player, but the idea is that before the "Eco-Friendly Spotter" or the "Non-Environmentally Friendly Spotter" select something, the team will discuss in detail about what this item is and how they will proceed.

The "Eco-Educator" can click on each item for free for the first time and they will receive just the name of this item. Then, if needed, the "Eco-Educator" can provide additional educational content about each item but using this feature costs one point. After each selection the "Eco-Educator" receives more educational content, and this feature can be used up to 3 times.

Each correct identification made by "Eco-Friendly Spotter" or the "Non-Environmentally Friendly Spotter" earns the players three points.

Each incorrect identification made by Player 1 or Player 2 deducts 3 points from the players and makes the item non-selectable.

Educational Content:

As Eco-Educator clicks on each item, the game displays additional educational content about the item, such as facts about its environmental impact, how it can be recycled or reused, and alternatives that are more environmentally friendly.

The educational content can also include tips on how to make more eco-conscious choices in everyday life.

Winning Conditions:

The players win the game if they accumulate enough points to reach a predetermined score.

The players lose the game if they run out of points before reaching the predetermined score.





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