EcoBlue - Recycle The River Trash

An Educational Game

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ABSTRACT

A serious game to ensure more people know about recycling rubbish. It teaches people how to identify and recycle trash flowing down a river. As rubbish passes, players must place it in the appropriate recycle bins. When players level up, it results in the river running faster. Rubbish piles up, and the game ends when it gets to a specific limit. In front of the river, people do activities such as cycling, which blocks up the view, so sometimes the player cannot see the river items (when levels get harder). If players get a fish by accident, points are deducted. Randomly, People will be throwing things into the river, and players can click on the person to stop them from throwing rubbish into the river and increase their reputation. Different structures such as farmland, household drainage and factory are present near the river and either affect or are affected by the river's pollution level. Children may cause the bin position to be changed; players must keep that in mind. At the end of every level, the rubbish collector collects the rubbish and says "THANKS!".

1 Introduction

Video Games capture a wide variety of audiences, with more than 2.5 billion gamers worldwide. That's a third of the world's population. Seventy-two per cent of the gamers are age 18 or older, with an average gamer being 34 years old. These demographics show us that games are not only for teens though teens and vicenarians love them. Thus, when appropriately used, video games could prove a potent tool in educating and bringing world reforms.

1.1 What are Serious Games?

The term 'Serious Games' has developed because people wanted to distinguish between games for fun and entertainment to games that had a serious outcome, such as giving a social message or learning. A serious game from a learning perspective is a game that allows people to learn. Many people think that serious games originated in 2000 with the Serious Game initiative. If we go back in time to the 1970s, a man named Clarke C. Abt released a book called Serious Games. It even goes back way further. Games can give us non-linear experiences. We don't always have to go in order. We can think about the strategy differently. We can think about elements differently. All these things are benefits of playing serious games.

1.2 How Serious is River Pollution Around the World?

Indonesia's Citarum River, which is relied upon by almost 19 million people, has been choked with chemicals and rubbish due to decades of pollution. Wastewater is introduced into the stream by about 3000 industries residing near the river. Residents have nowhere to dispose of trash, so they either burn it or throw it into the river. In 2013 Asian Development Bank found out that faecal coliform bacteria levels had shot through the roof, crossing 5,000 times the mandatory limits. Lead levels have become more than 1,000 times the US Environmental Protection Agency drinking water standard. Levels of other heavy metals such as Al, Fe and Mn are above the international average. People are suffering from dermatitis, contact rashes, intestinal problems, delays in child development, renal failure, chronic bronchitis, and a significant incidence of tumours. Contaminants are also ingested via the food, mainly rice, irrigated with water from factories and villages or the Citarum and its tributaries, affecting residents and nearby animal life.



Figure 1: The Citarum river near the village of Bojongsoang in Bandung, West Java, Indonesia

The mismanagement of plastic disposal has caused the chaotic spread of plastics in the environment and eventually led to the fragmentation of this substance into smaller particles, turning it into microplastics (MPs) that pollute the environment. Microplastics have been found in river water, sediments, ponds, and milkfish (Chanos chanos) downstream of the Citarum River. Based on the shapes, the microplastics found in the samples could be categorized into five types: a fragment, fibre, film, monofilament, and foam. The fragment was the most dominant shape of microplastics in both water and sediment samples. The most dominant polymers in the microplastics were polyethylene (PE) and polypropylene (PP).

Antibiotic and metal resistance in sediments from the Ganges and Yamuna Rivers in India and streams in the River Tyne catchment were quantified by a collaborative effort of Newcastle University and the Indian Institute of Technology, Delhi. Their results showed that metal pollution also affected resident bacteria, with Firmicutes and Bacteroidetes being the most abundant species at sites with high metal pollution. These bacteria are common in metal-contaminated environments and are known to carry metal resistance genes (MRGs) and antibiotic resistance genes (ARGs) in groups in "gene cassettes", which causes antibiotic resistance.

The study showed that specific metal combinations that promote the most potent bacterial responses were a combination of Cobalt with Nickel or with Zinc and Cadmium.

1.3 River Cleaning Initiatives

#TeamSeas is a global campaign being led by famous YouTubers Mark (Rober), Jimmy (MrBeast) and Campaign Director Matt Fitzgerald (@fitz350) to raise $30M to remove 30M pounds of plastic and trash from the ocean, rivers and beaches. They have collaborated with The Ocean Cleanup and have developed technologies for river pollution called Interceptors, which have removed over 2 million pounds. It is solar-powered and can collect trash autonomously.

Canal & River Trust is a UK-based charity that looks after and brings 2,000 miles of waterways to life because they believe that life is better by water. They work with volunteers and communities across England and Wales to transform canals and rivers into spaces where local people want to spend time and feel better. They have started an initiative called #PlasticChallenge. They believe, "If every time someone visited our canals and rivers they picked up and disposed of just one piece of plastic, there could be no plastic left within a year." They have a helpful guide for The Plastic Challenge, and It includes safety tips such as: Do not reach into the water to collect any plastics or litter. Always stay away from the water's edge; Always use gloves, or a litter picker, to pick up plastics and litter and cover any cuts and grazes before you start.

Thus the intricacies of the existing river problem and some of their implemented solutions are considered for gamification and exciting gameplay elements to make a safe, totally immersive and educative game.

The updated template, user manuals, samples, and required fonts, all are available at the URL <https://www.acm.org/publications/proceedings-template>. It contains said information for all three versions of MS Word (Windows and 2 versions of Mac). There are also separate links to the user guide, which can be referred to by the user. This URL also contains some useful video links, which describe how to add the template, structure the paper, and generate the layout, in different clips. **Display Formula with Number**

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Figure 1: Figure Caption and Image above the caption [In draft mode, Image will not appear on the screen]

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1.1 Heading Level 2

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1. In a Word 2010 document, insert a picture.
2. Right click on the inserted picture and select the **Format Picture** option.
3. Select the **Alt Txt** option from the left-side panel options.
4. In the "Title:" and "Description:" text boxes, type the text you want to represent the picture, and then click "Close".

Below are steps to place alt-txt value in **MS Word 2013/2016**. To add alternative text to a picture in Word 2013/2016, follow these steps:

1. In a Word 2013/2016 document, insert a picture.
2. Right click on the inserted picture and select the **Format Picture** option.
3. In the settings at the right side of the window, click on the "Layout & Properties" icon (3rd option).
4. Expand **Alt Txt** option.
5. In the "Title:" and "Description:" text boxes, type the text you want to represent the picture, and then click "Close".

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ACKNOWLEDGMENTS

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REFERENCES

[1] Victor Yanev. 2022. Video Game Demographics - Who Plays Games in 2022. (May 2022). Retrieved May 30, 2022 from https://techjury.net/blog/video-game-demographics/#gref

[2] Carl Kapp, 2019. What Are Serious Games?. Video. (19 August 2019). Retrieved May 27, 2022 from https://youtu.be/JmG3fdptY\_k

[3] Sonia Gupta, David W. Graham, T.R. Sreekrishnan, Shaikh Ziauddin Ahammad. 2022. Effects of heavy metals pollution on the co-selection of metal and antibiotic resistance in urban rivers in UK and India. *Environmental Pollution* 306, 1, Article 119326 (April 2022), 11 pages. DOI: https://doi.org/10.1016/j.envpol.2022.119326

[4] Andrea Carrubba. 2020. Rotten river: life on one of the world's most polluted waterways – photo essay. (November 2022). Retrieved May 31, 2022 from https://www.theguardian.com/global-development/2020/nov/02/rotten-river-life-on-one-of-the-worlds-most-polluted-waterways-photo-essay

[5] Sembiring, E., Fareza, A.A., Suendo, V. et al. The Presence of Microplastics in Water, Sediment, and Milkfish (Chanos chanos) at the Downstream Area of Citarum River, Indonesia. *Water Air Soil Pollut*ion 231, 355 (July 2020), 231-355. DOI: https://doi.org/10.1007/s11270-020-04710-y

[6] Team Seas. 2022. #TEAMSEAS. Retrieved from https://teamseas.org/

[7] Canal & River Trust. 2022. Join our #PlasticChallenge. Retrieved from https://canalrivertrust.org.uk/news-and-views/features/plastic-and-litter-in-our-canals