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 is relied upon by millions, but decades of pollution have choked it with chemicals and rubbish. About 3000 industries discharge their wastewater into the stream, affecting almost 19 million people who live along the river. The levels of faecal coliform bacteria are more than 5,000 times mandatory limits, according to the findings of the Asian Development Bank in 2013. Lead levels are more than 1,000 times the US Environmental Protection Agency drinking water standard and levels of other heavy metals such as aluminium, iron and manganese are above the international average. Those living along the river have nowhere to dispose of rubbish, so they either burn it or throw it into the river. Many people suffer from dermatitis, contact rashes, and intestinal problems, but also from delays in child development, renal failure, chronic bronchitis and a significant incidence of tumours. People and their animals also ingest contaminants through their food, mostly rice, which is irrigated with water from factories and villages or from the Citarum and its tributaries.



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) in the downstream Citarum River. Based on the shapes, the microplastics found in the samples could be categorized into five types, which are 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 found in the microplastics were polyethylene (PE) and polypropylene (PP).

Research by Newcastle University and the Indian Institute of Technology, Delhi quantified antibiotic and metal resistance in sediments from the Ganges and Yamuna Rivers in India and streams in the River Tyne catchment. The 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 shows that specific metal combinations that promote the most potent bacterial responses are Cobalt plus Nickel and the combination of Cobalt, Zinc and Cadmium.

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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3. Select the **Alt Txt** option from the left-side panel options.
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3. In the settings at the right side of the window, click on the "Layout & Properties" icon (3rd option).
4. Expand **Alt Txt** option.
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