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Mini Review

Environmental Pollution in Sri Lanka

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Abstract: Sri Lanka, as a developing country during the last two decades, has faced a lot of environmental changes. These changes have affected the country's economy, agriculture, and society. Primarily the causes of environmental pollution are industrialization, urbanization, population growth, transportation, and deforestation. This is a big issue that affects both developed and developing countries. Furthermore, these issues affect not only humans but also trees, plants, and animals. Sri Lanka confronted many environmental problems, including water pollution, air pollution, solid waste, deforestation, and biodiversity loss. This paper investigates the environmental issues in Sri Lanka and provides insight into the challenges and effects of Environmental Pollution in Sri Lanka.

Index Terms: Bio-Diversity, Deforestation, Euro Trophic, Industrialization, Urbanization

1. INTRODUCTION

This paper aims to investigate the environmental issues in Sri Lanka. It provides insight into the challenges and effects of environmental pollution. Its affects not only humans but also trees, plants, and animals. Sri Lanka faces several ecological problems, including water pollution, air pollution, solid waste, and biodiversity loss. Primarily the cases of environmental pollution are industrialization, urbanization, population growth, transportation, and deforestation. Those are significant issues that affect both developing and developed countries. As a developing country, during the last two decades, Sri Lanka has faced a lot of environmental changes because of environmental pollution in various ways. These changes have affected the country's economy, agriculture, and society.

2. ENVIRONMENTAL POLLUTION IN SRI LANKA

2.1 Water pollution

Water pollution is the contamination of a stream, river, lake, ocean, or other body of water, which depletes water quality and makes it toxic to the environment and humans.

Last year we experienced a cargo ship ***Express Pearl*** carrying chemicals catching fire off the coast of Sri Lanka. For several days it was burning off on the Sri Lanka coast. The thick dark smoke from the burning ship could be seen for miles. They're not only the aquatic environment but also the entire ecosystem, including the atmosphere, which is polluted. Varies types of hazardous chemicals had leaked into the seawater. It threatened the survival of marine life in several ways. Additionally, according to the MEPA reports, three containers of plastic pellets were on board the ship. Some amount of that tiny plastic pellets washed up on the local beach nearby. The most dangerous chemicals on board the ship were Nitric acid, NaOH, Copper & Lead. It is impossible to quantify how much this

harmful chemical pollutes the ocean [1]. Water pollution is rampant in the industrial areas of Biyagama, Koggala, and Katunayake in Sri Lanka. Because large-scale factories discharge wastewater without proper mechanisms. GN divisions Mabima West, North & South Pattiwala located in the Biyagama divisional secretariat are good examples of this. The Pattiwala canal that flows through these areas is the primary source of livelihood for the people living here. But the Sapugaskanda oil refinery and gas filling plant are discharging their effluent into this Pattiwala canal. As a result, the oil and grease levels in the water have exceeded the standard. So, the water in the Pattiwala canal has become unfit for consumption [2].

Petroleum refinery effluents contain toxic compounds, including polycyclic aromatic hydrocarbons. Because of these toxins, the fish caught near the petroleum refinery show abnormalities compared to other average fish [3].

Improper use of agrochemicals, construction of canals, and deforestation are the leading causes of the destruction of the riverine aquatic ecosystem. As a result, sedimentary conditions, eutrophication, and excessive growth of aquatic weeds are occurring, which are our country's main threads of marine life. Improper land usage and illegal constructions directly affect the soil erosion conditions in the upper reaches of the major rivers in Sri Lanka. A study conducted by NEDECO (1979) in the Peradeniya area has revealed that the Mahaweli river carries 0.5 million tons of sediments annually. Considering the quality of river water in Sri Lanka, the quality of the upper reaches water samples is high. As the river recedes, water quality declines rapidly. The Mahaweli River’s upper catchment has many annual crop fields and tea plantations. When the river flows down, the water quality changes rapidly due to the mixing of chemicals used for cultivation and misuse of land [4].

There is an exceptional case of water pollution in the candy district. On 30 and 29/09/2008, a group who drank the water from the Dunumadalawa and Rosmith reservoirs in Kandy contracted diarrheal. Investigations into the source of the disease revealed that the drinking water contained a biological toxin produced by a dinoflagellate species, *pyridinium aciculiferum*. Water samples from both reservoirs contained up to 75%-100% toxic species. Also, the water at Rosmith reservoir's boundaries had turned red. Freshwater systems considered eutrophic if the prosperous revel in freshwater is greater than 30 micrograms per liter. Once the pools return to this state, unwanted toxic algae will grow. When discovered the origins of all this, revealed that river water pollution caused all these conditions by animal waste. Polluted the river water was due to the discharge of sewage from animal farms in Kandy into these reservoirs [5].

2.2 Air pollution

Air pollution is one of the most severe environmental threats, affecting everyone: humans, animals, crops, cities, forests, aquatic ecosystems, etc.

Air pollution is caused by 69% of the household and 17 % of the industrial sectors in Sri Lanka. Other stationary sources include power generation and open burning of domestic and industrial waste. The mobile sources, as well as the transportation sector, are the root causes.12.5 % of air pollution, the combustion of commercial energy, is the primary source of air pollution in Sri Lanka. The transportation sector is the most polluting to the environment. Except for Sulphur dioxide, emissions from other sectors are relatively low. Carbon monoxide is the culprit. The most severe polluter, the industrial sector, accounts for nearly half of total SO2 emissions. (Sulphur dioxide.) According to World Health Organization guidelines, Sri Lanka's air quality is moderately unsafe; the most recent data show the country's annual mean concentration of PM2.5 is 11 g/m3, exceeding the recommended maximum of 10 g/m3. Vehicle emissions, waste burning, the agricultural industry, and petroleum refining can all impact air quality in Sri Lanka. According to available data, Colombo may experience high levels of air pollution.

2.3 Solid waste pollution

Solid waste includes e-medical waste, electronic and electrical waste, domestic solid waste, and various types of solid sewage, including disposable plastics and polythene. Sri Lanka collects about 7000 metric tons of solid waste per day, of which the western province separates about 60%.

One person typically produces between 0.4-1.0 kg of solid waste daily. But only about half of these are collected [6]. In 2008 the central environmental authority launched a "PILISARU PROJECT" targeting pollution-free Sri Lanka by 2018. But due to the failure and instability of the public administration, they were paralyzed. And as a result of that, coastal areas, rivers, lakes, canals, waterways, Bloemandal, Kolonnawa-Meethotamulla, and the wetland Muthurajawela and Kandy Gohagoda sides become plastic dumping areas. Today a massive mountain of garbage built in Sri Lanka has become a tragedy [7].

Until 2009, the Colombo municipal council disposed of solid waste in the Bloomingdale area of Colombo 13. Due to a legal dispute with the authorities, built the garbage mountain without any control. On 08/09/2009, Bloomingdales erupted due to the accumulation of methane gas in the garbage dump. Then, from time to time, the mount collapsed, burying dozens of homes. Finally, per an order from the Supreme Court dated 29 march 2009, the dumping of solid garbage in the Bloomingdale area in Colombo 13. After that, the city of Colombo was filled with artificially created waste dumps with no place to dump the solid garbage collected all over the city. Only then will trash be dumped in the Kolonnawa area. The solid waste collected from the Colombo MC began to accumulate in the Kolonnawa 13th area, spread over 21 acres and became a waste division.

A waterway connects the Kelani River to Kolonnawa via the Kittampahuwa canal. During the rainy season, the flood situation appears, and solid waste is added to the trenches. The most talked-about recent incident due to solid waste is the Meethotamulla Kolonnawa landside in April 2017. Which caused more than 26 casualties, and about 145 houses went wrong. Today the Meethotamulla landfill is about 380m long. Once upon a time, there was a paddy field called Pottuwila for the livelihood of the villagers of Kolonnawa. But today, the nonperishable solid waste collected in the Colombo MC is overflowing with electronic waste, plastics, polyethylene, etc. [8].

The ecological zone balance has been completely upset due to the unwise decision taken by the authorities to dump garbage in the Muthurajawela area, which is a wetland and a sanctuary under the fauna and flora ordinance. That is a susceptible ecological zone. It is a large-scale dumping in the refuge in Kotikawatta and several other places. Colombo MC is disposing of waste in the Delathura, Uswetakeiyawa, and Bopitiya areas in the Muthurajawela sanctuary in violation of environmental regulations. This is a RAMSAR wetland and a crucial point in terms of biodiversity. The landfill near Kotikawatta was initially 04 acres, but now it has expanded to 26 acres. The waste collected in this area comes from the Kolonnawa MC and the Biyagama industrial zone [8]. The ecological zone balance has been completely upset due to the unwise decision taken by the authorities to dump garbage in the Muthurajawela area which is a wetland as well as a sanctuary under the fauna and flora ordinance. That is a very sensitive ecological zone. It is a large-scale dumping in kotikawatta and several other places in the sanctuary. Colombo MC is disposing of waste in Delathura, Uswetakeiyawa, and Bopitiya areas in Muthurajawela sanctuary in violation of environmental regulations. This is a RAMSAR wetland and a crucial point in terms of biodiversity. The landfill near kotikawatta was initially 04 acres in extent but now it has expanded to 26 acres. The waste collected in this area comes

from the Kolonnawa MC and the Biyagama industrial zone [8].

3. EFFECTS OF THE ENVIRONMENTAL POLLUTION

3.1 Water Pollution

Water pollution has a significant impact on biodiversity. The BOD value of water has increased due to water pollution. Water cycle changes and climate change due to water pollution have also occurred from time to time in Sri Lanka (changes in the rain cycle). Also, with global warming and rising sea level, the island is likely to be at risk of tsunamis in the future, which significantly impacts a small island like Sri Lanka. The recent increase in the number of people suffering from kidney failure in Sri Lanka is due to increase water hardness. People, especially those engaged in agriculture, are more prone to kidney [9] [10].

Table 1 Comparison with recommended standards of tolerance limits for discharge of effluent for inland surface waters by the Central Environmental Authority (CEA), Sri Lanka (National Environmental (Protection and Quality) Regulations 2008)

Table 1. Annual average values of pollutants

Constituents	Average at GS1 location[a]	Average at GS4 location[a]	Background Values	CEA
pH	8.12	8.16	6.89	6 - 8.5
BOD_5	1,096	528	6	30
COD	13,248	1,425	15	250
TSS	1,730	126	35	50
Alkalinity	8,890	2,589	577	-
Ammonia-Nitrogen	1,113	330	1.4	50
Nitrate-Nitrogen	128	32	0.6	-
Phosphate	107	54	2.1	5
Zinc	1.15	0.30	0.002	5
Cadmium	0.04	0.01	ND	0.1
Nickel	0.33	0.11	ND	3
Chromium	0.13	0.09	ND	0.1
Copper	0.22	0.07	0.001	3
Lead	0.18	0.14	ND	0.1

Results in mg/L, unless pH, conductivity mS/cm
ND: Detected values
[a]: Annual Average Values

Due to fermentable organic materials with high protein concentrations, leachate may include ammonium-N. . The results for ammonia-N showed a wide range of 6-4,095 mg/L. After the study period, there were noticeably high amounts (about 3,000 mg/L) and significant rainfall (100–150 mm as of October 2012). Ammonia increase during the last period may have resulted from the stabilization of anaerobic digestion since ammonia is a byproduct of anaerobic protein degradation. According to

Table 1, the phosphate levels varied significantly across large ranges and frequently exceeded the country's regulations of 2 mg/L for wastewater discharge to inland waters. Similar to nitrate, phosphate also abruptly increased after sampling, which was accompanied by intense rainfall. This might be a result of increased nutrient leaching from newly dumped trash at the site during the first precipitation, followed by the diluting effects of rainfall.

3.2 Air pollution

Increased levels of toxic gases in the atmosphere can have long-term and short-term effects on various respiratory diseases and allergies. High levels of air pollution increase the risk of heart attack, shortness of breath, cough and breathing problems, and irritation of the eyes, nose, and throat. Humans and animals are exposed to several health problems, including congenital disabilities, reproductive failure, and disease due to air pollution. Air pollution in the Colombo district of Sri Lanka is very high. Last year in November, the Colombo district was shrouded in smoke due to air pollution caused by human activities. The toxic gases released from the combustion of fossil fuels mix with water vapors in the atmosphere, creating fog, smoke, and snow. These conditions frequently occur in the Colombo suburbs of Sri Lanka. Ozone depletion due to releasing toxic gases into the atmosphere makes it easier for the sun's harmful rays to reach the Earth's surface. And air pollution causes global warming. As a result, sea levels rise as their icebergs melt [11].

3.3 Solid Waste Pollution.

Wetlands, flood retention areas, watercourses, roadsides, and wildlife-protected areas have all been subjected to haphazard dumping of SW. Health concerns [stray dogs, mosquito and fly breeding grounds]. Loss of aesthetic values and scenic beauty. Water pollution [surface and ground water] results from leachate and run-off. Unavailability of suitable lands for waste disposal. Lack of commitment by all parties concerned. Lack of financial assistance. Weakness of collection system. Lack of public awareness. No proper collection system for recyclable waste. Paying the slightest attention to SW problems in the majority of Las. Lack of political will & conflicts in local-level level politics [12].

4. HOW TO MINIMIZE THE ENVIRONMENTAL POLLUTION?

4.1 How to Minimize Water Pollution

Generated into waste-free waste or to reduce the hazard level of garbage that has been properly treated for waste. When water is released from factories, and the primary thing we can do here is to dilute the wastewater allowed to be a network used, we purify it; that is, we carry out a water treatment process. Due to this, we have legalized the relevant contaminant levels in water treatment, and the remediation is done to keep the values below the maximum value. The table below shows the maximum number of contaminants that an industrial company in Sri Lanka should have when discharging wastewater into inland waterways.

Many countries have spent the maximum number of contaminants that should be present in our wastewater discharge or treatment. For example: Treating and separating heavy metals from

wastewater from metal factories and disposing of our wastewater. Proper preparation of sewage and other wastewater discharge systems can prevent water from mixing with clean water. Central Environmental Authority under the Environmental Ministry, the National Water Supply and Drainage Board, the Ministry of Agriculture and Environmental Health, and the Occupational Health unit under the Ministry of Health are the central institutions involved in wastewater management. Wastewater from industrial estates such as Katunayake and Biyagama is treated and discharged through centralized wastewater treatment plants. Lubricating effluent from vehicle service companies passes through sand filters and is treated and released by paddy. However, the use of secure wastewater in agriculture was not effectively endorsed by present regulations [13].

4.2 How to minimize air pollution:

In Sri Lanka Use, modern technology to drill for crude oil to minimize the release of methane into the air and stop the release of methane into the atmosphere by combustion. As a result, there is a high concentration of carbon dioxide in the air and Sulphur dioxide from the combustion of fossil fuels such as Sulphur. The pleasure we have in the air coming out of a coal power plant by burning a low percentage of coal can reduce the size of the waste. We can release the air in a way that does not harm the environment or reduce the level of contaminants, allowing the waste to be generated. Use refrigerators and air conditioners with inverter technology instead of the usual weed conditioners and refrigerators. Although there is a practical difficulty in minimizing animal control about carnivores, switching from a meat to a vegetarian diet can reduce the demand for animal feed in the above way. Excessive use of internal combustion engines also adds nitric oxide to the air. For example, discharge and purification of airborne Sulphur dioxide from the combustion chamber through the Lime liquid filter. The number of hydrocarbons used by internal combustion engines can be minimized [14].

4.3 How to Minimize Solid Waste Pollution:

It can be used for cooking, generating life from the restaurant, and domestic wastewater and waste food components. It is lowering the number of raw substances and energy used according to the product through changing the design of the product or converting the manufacturing technique, decreasing the quantity of manufacturing by extending the lifestyles of merchandise or enhancing repair and maintenance technology, reducing the amount of disposed waste through lowering the extent of waste or by selecting recyclable uncooked materials. Again and again, the use of products after washing or other suitable measures (reusable cups, returnable bottles, used apparel, and so on) [15]. Industrial solid waste, urban solid waste, and agricultural solid waste can be classified into three types. This solid waste contains decaying waste, plastic, glass, metal, hazardous chemicals, etc. The main problem for many municipal, local, and councils is the proper management of solid waste. Most of the decomposing wastes in the composition of urban solid wastes are called decomposing wastes, which are decomposed in a short period by the bacteria that live in the water and the problem. The earth's interior is dug like a large deep well, and a solid concrete lining of the wall is placed in the waste [16].

5. PROPOSALS TO MINIMIZE THE ENVIRONMENTAL POLLUTION

5.1 Proposals to Minimize Water Pollution in Sri Lanka

Improve sanitation by installing toilets and latrines that flush into a sewer or a secure enclosure. Education can help to promote good hygiene habits. Hand washing with soap and water can cut diarrheal cases by up to 35%. Install rainwater and storage systems to collect and store rainwater for drinking or recharging underground aquifers. Construct wells to extract groundwater from aquifers underground. To make drinking water safe, provide home water-treatment capability through filters, solar disinfection, or flocculants. To improve water quality, promote low-cost solutions such as chlorine tablets or plastic bottles that can be exposed to sunlight.

5.2 Proposals to Minimize Air Pollution in Sri Lanka

The government of Sri Lanka banned the importance of two-stroke petrol three-wheelers from 1st January 2008. To avoid the local assembly of two-stroke engines, the Sri Lankan government prohibited the import of complete engines, engine blocks, and cylinder heads after 2011. Sri Lanka is in the process of implementing the vehicle emission testing program on 15th July 2008. The ministry of environment and natural resources developed the emission standards; at that period, vehicle owners must secure an emission certificate because it is the requirement for the annual revenue license in Sri Lanka [17]. In 2002 the national quality on urban air quality management was inaugurated. Leaded gasoline was prohibited in June 2002. The diesel, which contains low Sulphur, was introduced in June 2003. In 2008, it banned the importation of two-stroke three-wheelers. The vehicle emission testing centre was established in 2008. In 1994, the permissible ambient air quality levels for selected air pollutants were enacted under the national environmental regulation. The world air quality guideline was published in 2005. The air quality standards for Sri Lanka, including standards for PM10 and PM2.5, were bought into force in August 2008 [18].

5.3 Proposals to Minimize Solid Waste Pollution in Sri Lanka.

It can be used for cooking, generating life from the restaurant, and domestic wastewater and waste food components. Lowering the number of raw substances and energy used according to the product through changing the design of the product or converting the manufacturing technique, decreasing the quantity of manufacturing by extending the lifestyles of merchandise or enhancing repair and maintenance technology, reducing the amount of disposed waste through lowering the extent of waste or by selecting recyclable uncooked materials. Again and again, the use of products after washing or other suitable measures (reusable cups, returnable bottles, used apparel, and so on.). Industrial solid waste, urban solid waste, and agricultural solid waste can be classified into three types. This solid waste contains a mixture of decaying waste, plastic, glass, metal, hazardous chemicals, etc. The main problem for many municipal councils, local councils, and councils is the proper management of solid waste. Most of the decomposing wastes in the composition of urban solid wastes are called decomposing wastes, which are decomposed in a short period of time by the bacteria that live in the water and the problem. The interior of the earth is dug like a large deep well, and a solid concrete lining of the wall is placed in the waste.

6. CONCLUSION

By now, Sri Lanka has faced so many environmental issues. Thereby so many problems have been created in various ways. Indeed, natural resources are destroyed by neglecting our future world. We cannot handle this situation if we can't decrease this scenario. We can see significant issues. In addition, we need to minimize this pollution because we don t know what situation we will face in the future. Then we will be ready to reduce pollutants, suggesting new proposals in the real sense of the word we need to maintain our environment.

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