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Case Study

Impact of Cement Factory on the Soil: A Case Study of a Lusaka Cement Plant

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SUMMARY

The aim of this study was to investigate on the impact of Cement on soil a case study of Lusaka Cement Plant. The cement plant is found in Lusaka Province, Zambia. The researcher used an experimental research design and a systematic sampling method was employed. Five soil samples were tested. Soil has been a source of wealth for humans for infinite years and it continues so at present. Both mineral and organic amendments have been applied to soil to slow down its progressive impoverishment. This study assessed the level of contamination of the soil by calcium, magnesium, potassium, sodium, copper, chromium, cadmium, cobalt, nickel and zinc and the spatial distribution of these heavy metals around a cement factory. A total of 11 soil samples were collected from closest to the cement plant to furthest to help in analyzing the pH values, EC as well as the levels of chemical elements of the above-mentioned elements. The laboratory tests were conducted and the results well given as the project showed. Samples 1 and 2 were the closest to the plant within cement factory.

The soil chemical properties showed that, cement dust made the soil alkaline in nature, with pH increasing and EC decreasing as distance from the plant increased while both EC and pH for sample three which was furthest within the cement plant having the highest values with pH (11.4) and EC (6.7). The study found that as the distance from the cement mill increased, the chemical element level increased except for Copper, Chromium and Codmium while Cobalt and Nickel were constant. Sample three however, had the highest values for chemical elements except Cobalt and Nickel which were constant as earlier mentioned. The soil texture around the Cement plant is loamy sand. The results for pH were as follows 6.6 for sample 1 and 6.7 for sample 2. Both sample 1 and 2 were medium acidic. Sample 1 had a value of 0.33 mg/kg of Codmium whilst sample 2 had a value of 0.40 mg/kg which are both less than the maximum permissible levels in soils which is 3 but can conclude that there is a measure of contamination as compared to samples 10 and 11 which were furthest from the plant. The level of Cobalt was constant and the same as the rest of the soil samples (< 0.01). Samples 1 & 2 also had the same level of Chromium which is 0.9 mg/kg while in Copper sample 1 was slightly lower than sample 2 with a difference of 0.3 (16.4 - 16.1 = 0.3) and just like in Cobalt, samples 1 & 2 have the same value of Nickel (< 0.01). Calcium for sample 1 was 35.2 mg/kg while sample 2 was 40.4 mg/kg and was increasing with distance which was the case with Magnesium as well with sample 1 as 10.0 mg/kg and sample 2 as 12.5 mg/kg. Potassium was lower the closer to the cement plant and increased with distance with sample 1 having a value of 3.2 and sample 2 having 3.8 and lastly Sodium was also increasing the further you move away from the plant with sample 1 with 9.6 mg/kg and sample 2 with 12.2 mg/kg. Sample 10 & 11 were the furthest outside the cement plant premises and the results clearly indicate that both are alkaline in nature with the same value of 8.4 mg/kg. Both sample 10 & 11 had a value of 0.01 mg/kg for Codmium which were the lowest of all the tested samples while they both had < 0.01 as the value of Cobalt and they had 0.01 mg/kg as the value of Chromium. The concentration for copper in sample 10 and 11 were 5.2 mg/kg and 2.3 mg/kg respectively. In the case of Calcium, the values were sample 10 with 52.8 mg/kg and sample 11 with a value 53.0 mg/kg and sample 3 having the highest concentration. Magnesium increased with distance as sample 10 had 15.3 mg/kg while sample 11 had 16.8 mg/kg meanwhile in potassium the values were 5.5 mg/kg and 5.6 mg/kg respectively while sodium had 14.5 mg/kg for sample 10 and 15.4 mg/kg for sample 11. Lastly, the researcher discovered that none of the chemical elements exceeded the permissible levels of chemicals in soil given by the world health organization. This means that the Cement plant premises are within the regulated standard of chemical levels. When the samples were graphed with the permissible standards of WHO it shows that the samples were below the threshold of the world health Organisation.

The recommendations are that the cement plant should continue minimizing chemical levels within and around their premises by maintaining their current production strategies. From these findings, it is highly recommended that environmental auditing of the cement production line be carried out frequently to reduce the release of pollutants. It is also important that remediation activities be carried out on the soil to reduce the levels of chemical elements that are in excess to avert potential ecological disasters [1-3].

KEYWORDS: Cement plant; Chemical elements; Soil pollution; Chemical levels; Contamination

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