International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 4 Issue 12, December 2017 | ISSN: 2394-4404

# A Study On Soil Pollution Of Kolaghat Thermal Power Project Of West Bengal In India

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***Abstract:** The objective of this study is to evaluate the soil pollution status in the salt field area of Kolaghat thermal power (KTPP), West Bengal using different analytical techniques. The Kolaghat Thermal Power Plant (KTPP) is placed on the right bank of the river Rupnarayan in Purba Medinipur, West Bengal. This power project was started during the sixth plan period (1980-85) with only one 210 MW unit. The KTPP includes about 900 acres of land out of which 871.89 acres lie in the Panskura-II block and the rest in the Sahid Matangini block, Tamluk. Although the plant has a number of facilities, the lack of treatment of the fly ash exited from this plant has been detrimental to the productivity and quality of the main marketable crops of the surrounding area and is also liable for some changes in the land use pattern. The present paper is prepared to investigate all these in detail.*



## I. INTRODUCTION

Soil pollution is one of the threats to the living creature of the Earth. Soil radioactive pollution is due to presence of radioactive materials or elements in soil that emit radiation, thus they are not stable and get transformed into other radioactive or non-radioactive materials. Many radioactive elements are naturally present in the environment. Most of them are used in nuclear power plants, and as basic components of nuclear weapons. Kolaghat, West Bengal is a place of thermal power. It is not only the place of air pollution, but also the soil.The village Borodangi is situated about 4 km away from Kolaghat Railway station and 4 km north of Kolaghat Thermal Power Station. The village's economy has been mainly created on agriculture. Thus, it is our primary duty to bring back the pollution free soil in Kolaghat. This study is a suitable step in the direction.

## II. SAMPLE COLLECTION AND PREPARATION

Soil samples were collected at different locations of salt field area of Kolaghat, West Bengal. The samples were collected at a depth of 5– 10 cm. At the gathering points, after eliminating the top cover, plants and stones, about 2 kg of soil samples were collected and packed in pre-cleaned airtight plastic bags, labelled and transported to the laboratory, pulverized and made to pass through a 2-mm mesh sieve. The samples were air-dried stored in pre-cleaned plastic containers for determination of pH and electrical conductivity.

To determine the concentration of radionuclides, 500–600 g soil samples were dried in an oven at 105 °C for 24 h to obtain the constant dry weight and then were transferred into airtight PVC containers of uniform size to its total height to avoid distribution of the gamma radiation-emitting decay products. The samples were sealed and kept for 28 days to let radon and its short-lived children to reach radioactive equilibrium before measurement using a gamma-spectrometry system.

*SOIL TEXTURE MEASUREMENTS:* The soil texture (ash, sand, silt, clay) was confirmed by hand feel method. A tiny amount of soil sample was taken in hand and enough water added to make a sphere. This sphere was stimulated between thumb and forefinger to determine the feel characteristics of ash, sand, slit and clay. The feel features for ash, sand, slit and clay were determined, smooth and sticky respectively. The soil ball was strapped between thumb and forefinger to make a ribbon. The longer the ribbon, the more is the clay content in the soil. The ruler was used to extent the length of the ribbon and the data were verified.

*SOIL PH MEASUREMENTS:* The pH meter was calibrated using pH 7 buffer solution. Then the meter was accustomed with known pH of buffer solutions 4.1 and 9.1. 21 g of soil was weighed and moved into 100 ml beaker. 40 ml dis-tilled water was added and stirred well with a glass rod. This could stand for half an hour with recurrent stirring. The electrode was absorbed in soil water suspension and the pH value was dogged from the automatic display of the pH meter.

*MULTIVARIATE STATISTICAL ANALYSIS:* The relationship between radioactive variables and physicochemical possessions of soil samples were strong-minded using Multivariate statistical analysis. The correlation analysis was used to explore the correlation between various binding fractions of physicochemical properties and radioactive variables. Multivariate statistical analysis such principal component analysis (PCA) and Cluster analysis (CA) are performed.

## III. RESULTS AND DISCUSSIONS

*SOIL TEXTURE ANALYSIS:* Soil texture controls the rate at which water drains through a drenched soil; Water transfers more easily through sandy soils than it does through clayey soils. Clay soils have a greater water holding capacity than sandy soils. Once field volume is reached, soil texture also influences how much water is available to the plant. Texture refers to the size of the particles such as sand, silt, and clay. The percentage (%) of clay content is the best predictor for documentation of organic carbon. Higher clay content reduces the seepage of water, thereby reducing the possible salinization in soils.

*SOIL PH ANALYSIS:* The pH in soil is a portion of hydrogen ion activity in the soil solution. Generally, pH lesser than 7 indicate acidic nature and pH N7 indicate alkaline nature of the soil. The alkalinity in soils is determined by different sources, in natural system it is exaggerated by mineralogy, climate and weathering and may vary according to the local geology.

*NATURAL RADIO ACTIVITY CONCENTRATION IN SOILS:* The ranks of uranium, thorium and potassium vary over a wide range in the surface soil, which depends on local geology, soil parameters and other influencing factors. The gritty radionuclides concentrations of soil samples are given. It is marked that of 7 samples, in 4 soil samples less than below detectable limit of $^{238}$U was observed and activity concentration of $^{238}$U is lesser than world average value (35 Bq kg$^{-1}$). Likewise, except 2 locations, the got results for $^{232}$Th have higher values of activity concentrations, when compared with worldwide average value (30 Bq kg$^{-1}$ for $^{232}$Th) of this radionuclide in the soil.

*RADIATION DOSE RATE ($D_R$):* To assess any radiological hazard, the exposure to radiation arising from radionuclides present in soil can be determined in terms of many parameters. A direct linking between radioactivity concentrations of natural radionuclides and their exposure is recognized as the absorbed dose rate in the air at 1 m above the ground surface.

*CORRELATION COEFFICIENT ANALYSIS:* Correlation analysis (CA) was recycled to determine the correlations between any two binding fractions of variables. The goal of CA is to quantify the strength of the connection between the variables. This is the most commonly used technique for investigating the relationship be-tween two quantitative variables. To quantify the strength of the relationship, we can calculate the correlation coefficient. Its numerical value ranges from +1.0 to −1.0.

*CLUSTER ANALYSIS:* Cluster analysis (CA) is one of the multivariate methods used to identify and classify groups with comparable characters in a new group of observations. Each reflection in a cluster is like most others in the same cluster. Similarity, is a measure of distance between clusters relative to the largest distance between any two individual variables. Zero distance means the clusters are 100% similar in their sample measurements, whereas the cluster areas are as disparate as the least similar region means similarity of 0%. Cluster analysis was carried out through axes to identify similar characteristics among natural radioisotopes and physicochemical properties in soils.

## IV. CONCLUSION

Variations in Landuse and its impact Borodangi village has been fronting a severe problem due to “fly-ash” originating from the “Kolaghat Thermal Power Station” that has an opposing impact on agricultural production, especially the production of flower like tuberose which is the major marketable crop of the study area. These have induced a change in land use character. There is a considerable change in flower farming where there is almost 70% decline in area associated to the 1975-76 situations. It clearly indicates the level of impact of fly ash on the flower cultivation. The vegetation shield has also reduced to 10% with the growth of settlements. A certain section of land under flower farming is now devoted to paddy cultivation. By this, the cultivated land has increased approximately by 5% during a period of more than 30 years. Thus, it is evident that there is extensive growth of settlements and fallow land. The growth in unplanted land may be due to failure in flower cultivation. Some of this land becomes waste land as it could not be used for any fruitful activities. A good number of growers were engaged in flower cultivation as this was a lucrative occupation and they were assured of their market demand for different flowers in different seasons. As the problem of fly ash started to adversely affect the production of the flowers particularly tuberose, the farmers were then compelled to shift to other flower initially but in course of time it has been found that the cultivation was not so profitable as in the case of tuberose or rose. As a result, many small farmers have sold their lands to big land owners and changed their occupation from farming to jobs in the unorganised sector. It has been originated that out of 17 share cropper families at least 10 families have changed their occupation to daily labourers. At least seven farmer families in this village are now in difficult situation and they are also planning to sell their lands on which they used to produce various types of flowers. There is also land poverty found in some portion of the agricultural field where the fly ash deposit gradually encroaching into agricultural land and thereby making it less creative.

ISSN: 2394-4404

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