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GEOCHEMICAL STUDIES ON SOIL PROFILES, GROUND WATER AND THEIR ENVIRONMENTAL IMPACTS AROUND THE INDUSTRIAL AREA OF KAFR ELZAYAAT, NILE DELTA, EGYPT

by

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The present study is devoted for the Nile Delta soils and ground water around the industrial area of Kafr Elzayaat about 25 km WNW of Tanta. The study area including the city of Kafr Elzayaat and surroundings is in general an intensively cultivated farm land. This intensive cultivation goes hand in hand with intensive application of fertilizer and pesticide. Kafr Elzayaat is a famous industrial city. There are many industrial plants in the city with different production aims. The main industrial plants are fertilizer, pesticide and chemical industries which lie directly or close to the River Nile which serves as drain for their untreated waste water. Around the city there are many brick kilns which use(d) the fertile Delta soil for brick production, and release big amounts of unfiltrated smoke into the atmosphere.

The aim of this study is to evaluate possible environmental hazards and ground water impacts using granulometric, mineralogical and chemical analyses of soil and ground water samples. For further identification of pollution, other advanced methods such as AAS-GF, IC and spectrophotometry were applied.

With especial reference to circumstances around the study area, such as climate, land and water use, demography and industry, sixteen soil profile localities were selected using a random sampling raster method to check out a possible soil contamination and if the soil has a protection (puffer) function in protecting the shallow ground water aquifer.

Samples were collected from 14 soil profiles, at depths of 0.05 m, 0.3 m and 1 m. Grain size analysis was done to define the nomenclature of samples. Soil in the study area is generally of clayey silt type. X-ray analysis of samples revealed that these sediments are composed of quartz, plagioclase, alkali feldspar, calcite, ankerite/dolomite, Fe-oxides and clay minerals. The clay minerals are mainly smectite, kaolinite and chlorite. The clay fraction is composed mainly of smectite with few amounts of kaolinite and chlorite. Their assemblages are similar to other parts of the Nile Delta.

Three major and eight , environmentally relevant, trace elements were measured by XRF to define their bulk concentrations in soil samples. The detected element concentrations were compared with international soil standards to define polluted samples and possible pollution source(s). The elements Co and Zn lay under the maximum tolerable concentration in international soils and Mn content is generally low. High Cu and Ni values could be of urban and industrial origin, high Cr and V of industrial origin and high P of industrial and agricultural sources. Soils in the study area are fine-textured, highly alkaline, have medium OC and very high EC.

Soil samples were leached with water to define the water-soluble substances which could migrate into the shallow aquifer. High concentrations of Co, Cr, Fe, V, Ni and Cu in elution were determined. They could be a subject of wash-out under lower soil pH conditions. Chloride, nitrate and phosphate decrease with increasing depth, which could mean that they are not subject of wash-out.

Ground water samples were analysed to determine their suitability for drinking, and if there is a relation between element concentration in soil, in elution and in ground water. The ground water quality in the study area is generally good, except for the elements Fe, Mn, and Hg and $KMnO_4$-index which could be due to soil leaching by polluted irrigation water or from other point sources, such as cesspools, in the study area.