Abstract

Radioactive and non-radioactive elements have been present in our environment since the evolution of the earth. Their concentrations vary from region to region depending on the geological formation and geochemistry of these elements. Anthropogenic activities and human interferences besides natural activities like volcanic eruption and earthquakes however, have the potential to disperse elements in the environment and alter their levels over the natural background. Hence it is important to study the distribution of radionuclides and other trace elements in environmental matrices at times.

Human exposure to radioactive/non-radioactive elements may occur via different routes. The main exposure routes are inhalation of air, ingestion of food, drinking water and other matter such as soil, and dermal exposure. Monitoring of radionuclides and other elements in living human environment therefore, is helpful in making it sure that their levels do not go beyond permissible limits in living human environment and predicting any possibility of accumulation in particular environmental matrix, get transported and enter the food chain.

In the present thesis work, environmental monitoring studies comprising of indoor and outdoor radioactivity levels and trace elemental levels (in groundwater) in the environment of the south-western Punjab, India have been carried out to assess radiation and chemical doses to the inhabitants for health risk assessment. The thesis is divided into seven chapters.

A brief layout of the content of the chapters is as follow:

Chapter 1st deals with introduction to general literature related to environmental monitoring including introduction to radioactive and trace elements, their origin, general levels in environment and health implication to human. Terms and units used in Radiological Risk Assessment have been discussed. Chapter takes detailed note of epidemiological studies carried out worldwide concerning health-effects of radioactive exposure. Chapter concludes with introduction to study region, studies carried in the recent past in and adjoining areas and brief account of aims and objectives of the thesis work.

2nd chapter deals with description and principle of the instrumentation used in the present thesis work. Chapter introduces the reader with the four major sections of experimental techniques: Radon measurement techniques, Uranium measurement techniques, Heavy metal analysis techniques and Gamma spectrometric technique. Principles of the techniques, block diagrams of the instruments and structural diagrams of the (detector) materials have been given wherever desired.

The results of uranium analysis in water and soil samples from south-western Punjab using Laser Flourimetry and fission track technique are reported in the 3rd chapter of this thesis. In the wake of significantly higher values of uranium contents found in the subsurface water of this region, radiological risk magnitudes and Chemical Toxicity risks in terms of Average Daily Dose (ADD) due to obtained uranium values in water samples have been calculated and discussed.

In the 4th chapter, distribution of chemical elements of health concern and physico-chemical parameters viz. TDS, pH etc has been discussed in drinking water samples. Chemical doses (Average Daily Doses) and non-carcinogenic hazard coefficients have been calculated and discussed for the obtained concentrations of important elements in water samples.

5th chapter comprises of radiometric analysis of soil samples using gamma-ray spectrometry to estimate natural radiation background levels for the study region. In this chapter, Air-Absorbed and Effective Dose Rates have been calculated and given for obtained radium (^{226}Ra), Thorium (^{232}Th) and potassium (^{40}K) concentrations in soil samples, discussed and compared with global values.

6th chapter is a detailed investigation of radon concentrations in the region for health risk assessment. Study comprises of estimating indoor radon levels of the dwellings, soil-gas radon, water-dissolved radon and surface radon exhalation rates for the study region. Inhalation annual doses due to indoor radon concentrations and ingestion doses due to water-dissolved radon have been calculated and discussed in this chapter.

Thesis concludes with overall conclusions and future perspectives of the work, in the 7th chapter.