Mesopotamia Environmental Journal
ISSN 2410-2598
Journal homepage http//:www.bumej.com

DOI: http://dx.doi.org/10.31759/mej.2019.5.2.0060

Study of natural radioactivity of soil and noise levels in some industrial sites in Hillah city, Iraq

Ali T. Mekhalif , Mahammed Ebraheem Al-defiery , Ahmed R. Kehawish and Nawfal A. Salih

Environmental and research studies center, University of Babylon ,Hilla,Iraq.

Corresponding author:aliasar62@yahoo.com

To cite this article:

Mekhalif A. T. Al-defiery M. E. Kehawish A. R..Salih N. A. Study of natural radioactivity of soil and noise levels in the industrial sites in Hillah city..*Mesop. environ. j.*, 2019, Vol. 5, No.2, pp. 52-60

Received date: 23/6/2019 Accepted date: 11/8/2019 Published date:15/12/2019

Abstract

The levels of natural radioactivity and noise at a number of locations in industrial area of Hillah city have been measured. The measurements were done by using tow devices: Alert (Inspector 33290), Noise meter (NM 104), for several days (December of 2017), during day-time from 9 am.-12 am. With respect to measure the radioactivity, there are three repetitions per location test were taken. Moreover the distance between the device and measured material was (30 cm). The results show that all the values of natural radioactivity are within the permissible limits, where the highest averages for radioactivity rats is (0.0095 µSv/hr) registered at the house of worship, likewise the lowest value is (0.005µSv/hr) recorded near of Al Wa'illy school. On the other hand the averages of noise levels at entire locations are significantly elevated, where the highest values recorded at the interior of industrial area (2.7 dB), and the lowest averages at the interior of industrial area (64.9 dB) was registered at the Bazar area.

Keywords: Natural radioactivity, noise level, industrial area, ccommunity noise, annual dose.

Introduction

Knowledge of natural radionuclides concentration levels in soil and their distributionin the environment is of considerable interest in numerous fields of science. Natural radionuclides in soil are responsible for the background radiation exposure to the population [1]. The natural radionuclides such as (^{238}U, ^{232}Th, ^{40}K) significantly contribute to total dose from natural sources [2]. The radiation to which the human population is exposed comes from many various sources, some of these sources are natural; others are the result from human activities. The radiation from natural sources include cosmic radiation, external radiation from radionuclides in earth's crust and internal radiation from radionuclides inhaled or ingested and retained in the body [3]. The exposure of the population to natural radioactivity has been estimated by the UNSCEAR, which concluded an effective average annual dose equivalent to 2.4 msv/ year per person [4]. The adverse effects are in correlation with the quantity of absorbed energy, the penetrating power of the radiation, the duration of the exposure, as well as with the reproduction rate of the cells of a certain tissue [5]. In addition, the activity of a particular radioactive material is described by the constant decay rate and the half-life [6]. The interactions between radionuclide and the soil include physical (reversible) sorption governed by the uncompensated charges on the surface of the soil particles, nevertheless the chemical (mainly irreversible) sorption through high affinity, specific interactions and the establishment of covalent bonds [7,8]. Even though the radioactive contamination of the environment is relatively rare, it requires a great attention because of extreme degrading effects of ionizing radiation on living tissues [9]. Noise is an unwanted sound. 'Sound which is disagreeable, discordant or which interferes with the reception of wanted sound becomes noise [10]. Community noise' is one of the most common pollutants. It is defined by the World Health Organization (WHO) as noise emitted from all sources except noise at the industrial workplace. Community noise includes the primary sources of road, rail and air traffic, industries, construction and public works and the neighbourhood' [11]. The environmental stressor and nuisance, no auditory effects of noise, can be defined as 'all those effects on health and well-being which are caused by exposure to noise with the exclusion of effects on the hearing organ and the effects which are due to the masking of auditory information exposure to continuous noise of 85–90 dBA, [12]. Generally the noise disturbs activities and communication causing annoyance, which may lead to stress responses, then symptoms and possibly illness [13]. There is, as yet, no consensus on a model for measuring total annoyance from multiple noise sources. Adverse health effects appear to be related to total noise exposure from all sources rather than the noise from any single source [14]. Noise has been identified as one of the main environmental stressors that have adverse psychological and physiological influences on human health, including discomfort, cardiovascular and metabolic diseases, sleep disorders, hearing loss and tinnitus, birth outcomes, and cognitive impairments [15]. Recently many studies have attempted to expand the noise sources to include traffic noise from roads and railways as well [16,17]. There are a continuous concern with noise and its impact on humans, many studies deal with the effects of noise , Dalton and Boehm [18] investigates the effects of noise on health and performance, while Keppler,et al. [19] mentioned that introduction humans to unnecessary noise can effects the corti which lead to hearing loss induced by noise.

Materials and Methods

Measurement of noise levels:

In this study was measured the noise pollution levels by using noise meter (NM 104) Fig.(1) at several locations into the industrial area in Hillah city for several days of December 2018, during day-time from 9 am. - 12 am.

Measurement of soil radioactivity levels:

The soil positions were randomly selected within industrial area at Hillah city, Iraq. with a maximum temperature of (26℃). Three repetitions per location test, moreover the distance between the device and measured material was (30 cm). The adapted measuring unit is sievert (Sv) as 1Sv = 1 joul / kg. and the measurements were done by using (Radiation Alert) device Fig.2.

Fig.1 Noise meter (NM104)

Fig.2 Radiation Alert

Study Area

The study was accomplished over the city of Hillah precisely at the northern part which is known as the industrial district as shown in Fig(3). The city located at 32° 29' N,44°26'E [20]. In addition study area ranges up to (27-34) meter above the mean sea level [21], and possess a population of 1.065927 during 2018 [22].

Fig. 3 The map of study area

Results and Discussions

This research carried out over the city of Hillah in December of 2018. The level averages of both soil radioactivity and noise was measured at several locations into an industrial area which located at the northern part of Hillah city. In order to ensure the measurement's accuracy, number of observations was taken at each of site. Table (1) illustrates the level averages of noise at study area, as is evident all the values of noise are within the permissible limits. The highest value was (75.5 dB) registered at (near the house of worship), while the lowest value was (64.9 dB) registered at the (bazar area). Fig.(4)displays the scheme for averages of noise level at all measured sites at study area, generally there is a marked convergence among the values of measured sites. The numbers from (1- 6) on X-axes denote to the measurement sites, as lasted in Table (1).

Table (2) demonstrates the radioactivity measurements for surface layer of soil in study area at numerous random sites. The measurements have been done by using (33290 Radiation Alert Inspector, which made in U.S.A, and the fixed distance between the device and soil is about 30cm. The results showed that all values are within the allowable limitations and the highest value of radioactivity was (0.015 µSv/hr) registered at the (bazar area), nevertheless the lowest value is (0.004 µSv/hr) registered at the internal of (industrial area). Fig.(5) illustrates the measured values of radioactivity at different positions in study area, also the numbers from (1-6) on X-axes donate to the measured locations as lasted in Table (2). As is evident there is a marked variation among the soil radioactivity magnitudes at the measured sites.

Conclusions

It is important to determine background noise and soil radioactivity levels in order to estimate the health impacts. Several sites have been chosen to measure the noise and soil radioactivity levelswithin industrial area at Hillah city during December 2018. The results demonstrated thatall the measured values for noise and soil radioactivity levels are within the permissible limitations whichadapted by WHO.

ISSN 2410-2598

Table (1): The noise levels in several sites in industrial area

Locations	Noise level (dB)
Bazar area	**62.7**
	75
	57
Highway area	**67**
	73.9
	78
Interior of industrial area	**77.8**
	88.9
	59.1
	61.1
	63.4
	72.1
	87.3
	71.7
First area of old block	**66**
	71.3
	79
Near of Al Waelly school	**76.7**
	69.3
Near the House of Worship.	**70.4**
	81

Table 2: The radioactivity levels in some soils in industrial area

Soil position	Radioactivity Levels µSv/hr
Bazar area	**0.009**
	0.005
	0.006
Highway area	**0.010**
	0.009
	0.006
Interior of industrial area	**0.004**
	0.012
	0.005
	0.012
	0.006
	0.007
	0.013
	0.009
First area of old block	**0.008**
	0.008
	0.006
Near of Al Waelly school	**0.005**
	0.005
Near the House of Worship.	**0.009**
	0.010

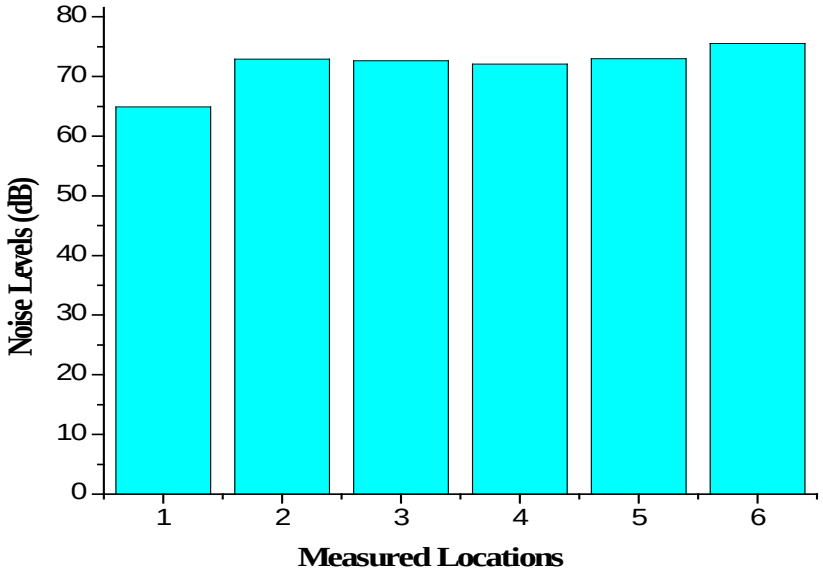

Fig.4 The averages of noise level at different sites in study area.

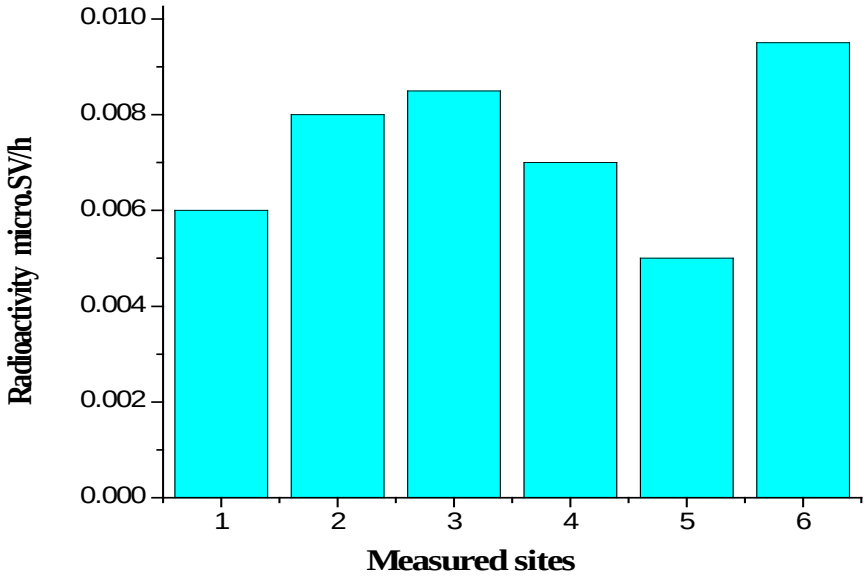

Fig.5 The averages of radioactivity level at different sites in study area.

References

[1] El-Aydarous A., "Gamma Radioactivity levels and their corresponding external exposure of some soil samples from katief governorate", Saudi Arabia. Global journal of Environmental Research,**1-2:**49-53. 2007

[2]Karahan G. and Bayulken A., "Assessment of gamma dose rates around Istanbul (Turkey)". Journal of Environmental Radioactivity, 47213-221. 2000

[3] Gür, F. Baba, A. and Kumru, M.N.," Assessment of the radiological impact of Soil in Izmir", International Earth Science Colloquium on the Agean Region, Izmir, 2001
Turkey, 89-98.

[4] UNSCEAR "Report to general assembly" 1981, UN.

[5] Chen, M. et al., "Field demonstration of in situ immobilization of soil Pb using PAmendments", Advances in Environmental Research. Elsevier, 8(1), pp. 93–102.2003

[6]IAEA, S. G., "Terminology used in nuclear safety and radiation protection" 2007

[7] Sposito, G., "The chemistry of soils. Oxford university press".2008

[8]Tan, K. H. "Principles of soil chemistry". CRC press. 2010,

[9]Barbosa Jr, F. et al., "A critical review of biomarkers used for monitoring human exposure to lead: advantages, limitations, and future needs", Environmental health pers pectives. National Institute of Environmental Health Sciences, 13(12), pp. 1669-1674. 2005

[10] W.H.O, 1990, "Indoor Environment: Health Aspects of air quality, thermal environment, light and noise", World Health Organization, Geneva.

[11] Cantrell, RW., "The Effects of Noise Exposure", AGARD Conference Proceedings No. 171, Effects of Long Duration Noise Exposure on Hearing and Health, NATO.1975

[12] Job, R. F. S., "The influence of subjective reactions to noise on health effects of the noise", Environment International. Elsevier, 22(1), pp. 93–104.1996

[13] Stansfeld, S. A. and Matheson, M. P., "Noise pollution: non-auditory effects on health", British medical bulletin. Oxford University Press, 68(1), pp. 243–257.2003

[14] Goines, L. and Hagler, L., "Noise pollution: a modern plague", Southern Medical Journal-Birmingham Alabama-. Southern Medical Association, 100(3), p. 287. 2007

[15]Guski, R.; Schreckenberg, D.; Schuemer, R., Who environmental noise guidelines for the European region: A systematic review on environmental noise and annoyance. Int. J . Environ. Res. Public Health, 14, 1539. [CrossRef] [PubMed] .2017

[16] Oiamo, T.H.; Luginaah, I.N.; Baxter, J., Cumulative effects of noise and odour annoyances on environmental and health related quality of life. Soc. Sci. Med. 146, 191–203. 2015

[17]Sørensen, M.; Hvidberg, M.; Hoffmann, B.; Andersen, Z.J.; Nordsborg, R.B.; Lillelund, K.G.; Jakobsen, J.; Tjønneland, A.; Overvad, K.; Raaschou-Nielsen, O., Exposure to road traffic and railway noise and associations with blood pressure and self-reported hype- rtension: A cohort study. Environ. Health, 10, 92. 2011

[18] Dalton, B. H. and Boehm, D. G., "Effects of noise and music on human and task performance": a systematic review occupational ergonomics. Vol. 7, pp: 143-152.2007

.

[19] Keppler, H., Hearing in young adults. Part II: "The effects of recreational noise exposure". Noise and Health. Vol. 17, No. 78. Pp: 245-252. 2015

[20]Ali. J.Al-Jahashi, S.M.S thesis: “Heat Island at Hillah city University of Al-Qadisiyah”, College of Arts, department of Geography, Pp 9. 2007

[21] Amiera M. Ali, , PH.D thesis “Efficiency of spatial distribution for public education services in the city of Hillah”. Baghdad University, College of education for women Dep.of Geography pp 27. 2013

[22] Central Censes Bureou, Directorate count of Babylon, 2014.