Radiological Health Effects from Uranium Deposits in Tanzania

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Introduction							
Objective: Using RESRAD-OFFISTE modelling software tool to estimate radiation dose and risk to the general public from uranium deposits in		Table 3: TEDE for Central Zone (SZ)					
		Total Effective Dose Equiva	alent (mSv/year)				
Tanzania		²²⁶ Ra	²³² Th	⁴⁰ K			
I ocation: Uranium denosits in Rahi district		0 5.5E-04	4.2E-05	5.3E-04			

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- > Target: knowing the TEDE received & cancer risk to people living around uranium deposits
- Method: Applying RESRAD-OFFSITE to estimate dose and risk to exposed people in Northern zone (NZ), Central zone (CZ) and Southern zone(SN) Procedures:
 - Sampling soils from different zones
 - \succ Calculating activity concentration of soil samples from different zones
- Factors: Activity concentration of Th-232, K-40 and U-238
- Final output: TEDE and cancer risk .

5.4E-04 4.2E-05 5.1E-04 5.3E-04 4.2E-05 3.9E-04 20 5.2E-04 4.2E-05 2.9E-04 30 5.0E-04 4.2E-05 2.2E-04 4.9E-04 4.2E-05 1.6E-04 40 9.1E-05 60 4.6E-04 4.2E-05 5.1E-05 4.4E-04 4.2E-05 80 4.1E-05 4.2E-05 100 2.8E-05

Fig.1. Excess cancer risk for all nuclides and components pathways for



Methods

- Soil Sampling: Soil samples frorn Northern zone, Central zone and Southern zone were randomly collected
- Sample analysis was conducted at the Laboratory of Tanzania Atomic Energy Commission (TAEC).
- Source term: The activity concentrations of Ra-226, Th-232 and K-40 were measured using (HPGe) detector

Surveyed Area	Maximum activity concentration (Bq/kg)						
	²²⁶ Ra	²³² Th	⁴⁰ K				
NZ	60.09±1.19	107.36±1.79	1,384.75±14.92				
CN	42.75±0.85	47.74±0.81	874.77±9.43				
SZ	69.38±1.38	132.11±2.25	706.67±7.64				
Results							

- > From table (1,2,3) the TEDE received to the public over 100 years in all the three zones is below the public dose limit of 1mSv/year recommended by ICRP and TAEC.
- > From figure (1,2,3), the Radon is major pathway to Excessive life cancer risk (ELCR) for Northern Zone (NZ) and
- Direct radiation from soil is a major pathway to Excessive life cancer risk
- (ELCR) for Central Zone (CZ) and Southern Zone (SZ).

Table 1: TEDE for Central Zone (NZ)



6.4E-03

6.4E-03

3.4E-05

3.4E-05

Fig. 2. Excess cancer risk for all nuclides and components pathways for Central Zone (CZ).



Fig. 3. Excess cancer risk for all nuclides and components pathways for Southern Zone (SZ). 1.0E-03



10		6.3E-03	3.4E-05	7.7E-04	20E-06						
20		6.1E-03	3.4E-05	5.7E-04	.00E-06						
30		5.9E-03	3.4E-05	4.3E-04	2.40E-06						
40		5.8E-03	3.4E-05	3.2E-04	.20E-06						
60		5.4E-03	3.4E-05	1.8E-04	00E+00		<u>A</u> .				
80		5.1E-03	3.4E-05	9.9E-05	0 20	40 6	50 Years	80	100	120	140
100		4.9E-04	3.4E-05	5.6E-05	Direct radiation Radon (waterbo	from soil (waterbo	ome)	Ingestio	n of Fish		
Table 2: TE	DE for Centr	al Zone (CZ)			Meat (waterborn & Soil ingestion (waterborn & Soil ingestion (w	ne) vaterborne) from soil (direct &	airborne)	Milk (wa Drinking	terborne) Water		
fear	Total Effect	ive Dose Equival	ent (mSv/year)		Radon (direct & Meat (direct & a	airborne) irborne)		🛟 Plant (di	irect & airborn ect & airborne	e))	
	226 D o	23	32 Th	40	★ Soil ingestion (d	irect & airborne)					
	22°Ra	20									
	3.4E-04	20	1.5E-05	6.5E-04		Conc	lusio	ns			
	3.4E-04 3.4E-04		1.5E-05 1.5E-05	6.5E-04 6.5E-04		Conc	lusio	ns			
1	 3.4E-04 3.4E-04 3.3E-04 		1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04	The TEDE received i	Conclose 1n	lusio	ns r and ro	don io o	dominont	
(1 2(3.4E-04 3.4E-04 3.3E-04 3.2E-04 		1.5E-05 1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04 3.6E-04	The TEDE received in the second se	Conc s below 1n	nSv/yea	ns ar and ra	don is a	dominant	t
(1 2 3	 3.4E-04 3.4E-04 3.3E-04 3.2E-04 3.1E-04 		1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04 3.6E-04 2.7E-04	The TEDE received i pathway contributing from the second secon	Conc s below 1n to excessiv	Iusio nSv/yea ve life to	ns ar and ra cancer	don is a risk(ELC	dominant CR) in NZ	t
1(2(3(4(3.4E-04 3.4E-04 3.3E-04 3.2E-04 3.1E-04 3.0E-04 		1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04 3.6E-04 2.7E-04 2.0E-04	The TEDE received is pathway contributing and direct radiation from the second seco	Conc s below 1n to excessiv om the soil	Iusio nSv/yea ve life to I in CZ a	ns ar and ra cancer and SZ	don is a risk(ELC	dominant CR) in NZ	t
1 2 3 4 6	 3.4E-04 3.4E-04 3.3E-04 3.2E-04 3.1E-04 3.0E-04 2.8E-04 		1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04 3.6E-04 2.7E-04 2.0E-04 1.1E-04	The TEDE received is pathway contributing and direct radiation from the second seco	Concl s below 1n to excessiv om the soil pported b	Iusio nSv/yea ve life to I in CZ a	ns ar and ra cancer and SZ Resea	don is a risk(ELC	dominant CR) in NZ	t
1 2 3 4 6 8	 3.4E-04 3.4E-04 3.3E-04 3.2E-04 3.1E-04 3.0E-04 2.8E-04 2.7E-04 		1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05 1.5E-05	6.5E-04 6.5E-04 4.9E-04 3.6E-04 2.7E-04 2.0E-04 1.1E-04 6.3E-05	 The TEDE received is pathway contributing and direct radiation from this research was sugnities of the second direct research was sugnities o	Conc s below 1n to excessive om the soil pported b ar Gradua	Iusio nSv/yea ve life to I in CZ a by 2020 ite Scho	ns ar and ra cancer and SZ Resea ool (KIN	don is a risk(ELC rch func JGS), R	dominant CR) in NZ	t

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