

EMRAS II Working Group 1

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Justin Smith



Centre for Radiation, Chemical and Environmental Hazards
formerly the National Radiological Protection Board

Scenario A (v2)

Releases to the marine environment – results using PC-CREAM 08

Exposure pathway	Dose Sv/y		
	Co-60	Cs-137	Sr-90
Internal dose rate from sediments	-	-	-
External dose rate from sediments	4.62E-05	5.78E-06	1.55E-07
Internal dose rate from fish	4.00E-07	2.20E-06	1.10E-07
Internal dose rate from crustaceans	1.94E-06	3.22E-07	5.33E-08
Internal dose rate from mollusca	4.42E-07	1.46E-07	1.21E-08
Total dose rate	4.90E-05	8.45E-06	3.30E-07

Scenario A (v2)

Comments on marine assessment

- Possible inconsistency in use of filtered or unfiltered water concentrations between participants.
- I used $1 \cdot 10^{-5} \text{ t m}^{-2} \text{ y}^{-1}$ and should be $1 \cdot 10^{-4} \text{ t m}^{-2} \text{ y}^{-1}$ (i.e. $1 \cdot 10^{-5} \text{ t m}^{-3} \text{ y}^{-1}$) but this only has small impact on bed sediment concentrations of a few percent.
- K_d (Bq t^{-1} per Bq m^{-3})
 - $\text{Co} = 2 \cdot 10^5$, $\text{Sr} = 1 \cdot 10^3$, $\text{Cs} = 3 \cdot 10^3$ for coastal regions
- C_f (Bq t^{-1} per Bq m^{-3})
 - $\text{Co} = 1 \cdot 10^3$, $\text{Sr} = 2$, $\text{Cs} = 1 \cdot 10^2$ for fish
 - $\text{Co} = 1 \cdot 10^4$, $\text{Sr} = 2$, $\text{Cs} = 3 \cdot 10^1$ for crustaceans
 - $\text{Co} = 5 \cdot 10^3$, $\text{Sr} = 1$, $\text{Cs} = 3 \cdot 10^1$ for molluscs
- PC-CREAM assumes instant dilution of marine discharges into a large volume.

Scenario A (v2)

Releases to atmosphere – results using PC-CREAM 08

Exposure pathway	Dose Sv/y			
	Co-60	Cs-137	I-131	Kr-85
Internal dose rate from inhalation	4.96E-06	2.28E-06	3.65E-06	0
External dose rate from air immersion (cloudshine)	3.56E-08	1.80E-09	5.50E-09	2.82E-10
External dose rate from groundshine	1.35E-04	1.07E-04	3.95E-06	0
Internal dose rate from ingestion of green vegetables	5.56E-07	2.31E-06	1.25E-05	0
Internal dose rate from ingestion of root vegetables	2.78E-08	7.08E-06	7.93E-06	0
Internal dose rate from ingestion of domestic fruits	2.50E-08	9.06E-07	1.28E-06	0
Internal dose rate from ingestion of cow produce (milk)	4.36E-06	8.86E-06	4.10E-05	0
Internal dose rate from ingestion of cow produce (beef)	3.37E-06	6.09E-06	1.81E-06	0
Internal dose rate from ingestion of sheep produce	3.19E-08	7.42E-07	1.29E-07	0
External dose rate from direct radiation	4.00E-06	4.00E-06	4.00E-06	4.00E-06
Total dose rate	1.52E-04	1.39E-04	7.63E-05	4.00E-06

Scenario A (v2)

Comments on atmospheric assessment

- I used adult inhalation dose coefficient for Co-60 of $1 \cdot 10^{-8}$ (not $3.1 \cdot 10^{-8}$) Sv Bq⁻¹
- Depth of top mixed soil layer 0.3 m not 0.1 m
- Transfer parameter for radionuclide uptake in crops from soil was in terms of wet mass plant to dry mass soil
- For translocation used fixed parameter values for semi-mobile or mobile
- Differences in dose from ingestion of some terrestrial foods could be further investigated by comparison of deposition rates.
- Transfer parameter from air immersion to human dose for Kr-85 $\sim 2.82 \cdot 10^{-10} / 7.24 \cdot 10^{-2} = 4 \cdot 10^{-9}$ Sv y⁻¹ per Bq m⁻³

Scenario B

Defining the representative person

- Information required
 - The discharge
 - Discharge routes
 - Discharged radionuclides
 - Exposure pathways
 - Habit surveys
 - Age groups
 - Ingestion rates
 - Inhalation rates
 - Location
 - Occupancies
 - Dwellings

Scenario B

Defining the representative person

- The previous data would be reviewed to identify potential candidates for critical groups/representative person. A full set of exposure pathways would be considered for
 - Those most exposed to atmospheric discharge
 - Consider high consumers of terrestrial foods
 - Individuals spending a lot of time outdoors close to the site
 - Those most exposed to marine discharge
 - Consider high consumers of marine foods
 - Individuals spending a lot of time outdoors along the coast
 - Those most exposed to combined discharges
 - Habits are such that summed exposure from atmospheric and aquatic discharges may be significant

Scenario B

Defining the representative person

- Review of habit data may indicate that a single group represents two or more of the previous categories
- Review of habit data may indicate that supplementary data are required eg make assumptions about locations (eg 0.5 km and 5 km), use data from distributions based on national habit surveys, the 'Top-Two' approach may be used.
- Dose assessments carried out for the selected groups to identify critical group/representative person.

Scenario B

- So it is likely that dose assessments would be done for very similar groups to those identified by EA (see below) and the worst case group would be selected for the critical group/representative person.

1. Atmospheric pathway exposure groups	
	Green vegetable consumers
	Root vegetable consumers
	Domestic fruit consumers
	Milk consumers
	Sheep meat consumers
	Occupants for plume pathways (inner area)
2. Aquatic pathway exposure groups	
	Sea fish consumers
	Crustacean consumers
	Mollusc consumers
	Occupants for exposure - Sediment