

NORM WASTE MANAGEMENT: IMPACT ON RESIDENTS SURROUNDING A LANDFILL

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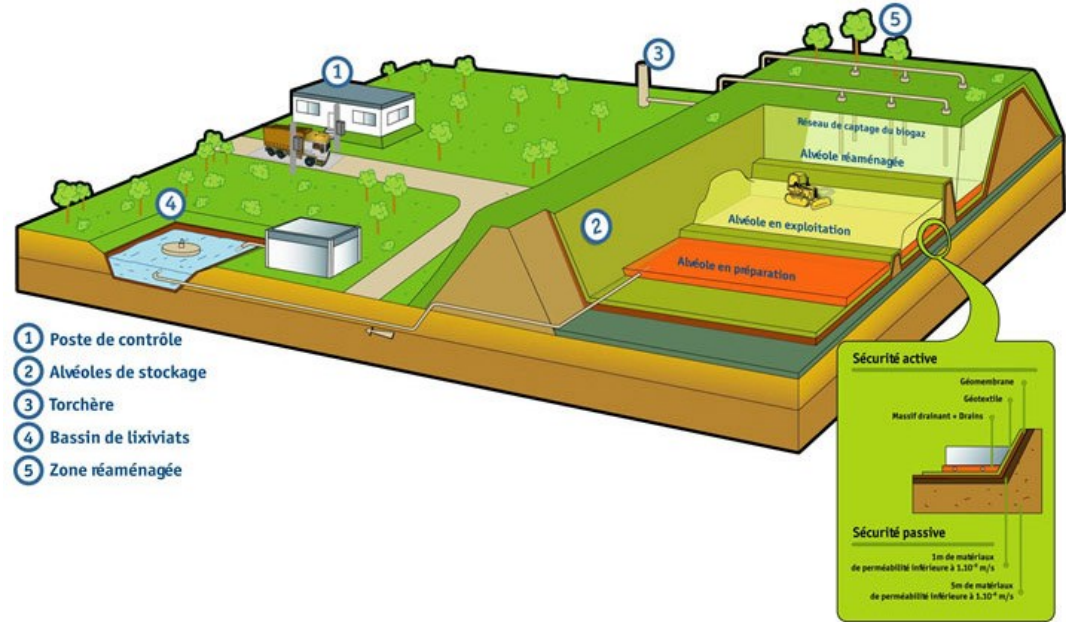
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Content

- Context in France
- Type of waste
- Exposure scenarios
- Exposure pathways
- Results
- Conclusions



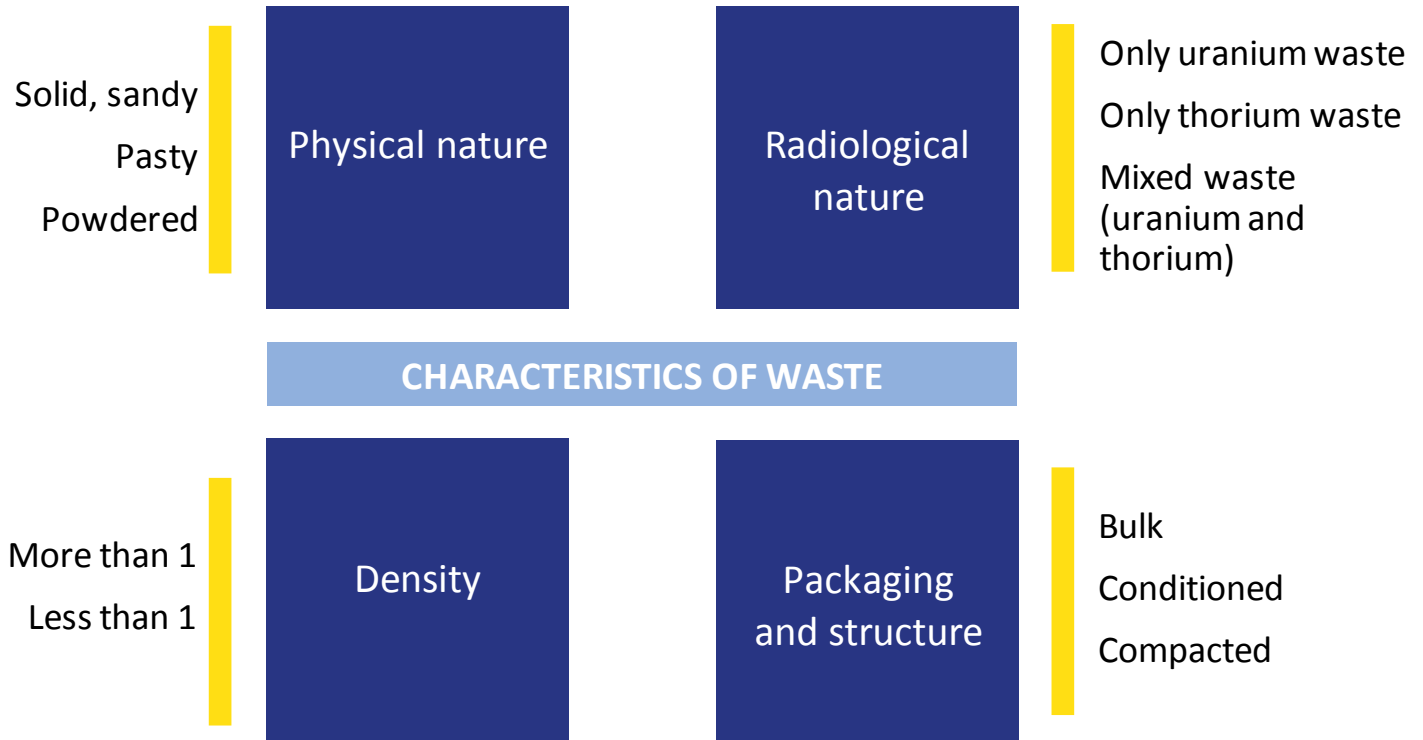
French context

[TRANSPOSITION OF THE EUROPEAN DIRECTIVE 2013/59/EURATOM

- Update the regulation of the management of waste from industries involving NORM
- A graded approach

	Inert waste landfill	Non-hazardous waste landfill	Hazardous waste landfill	Radioactive waste storage
NORM < 1 Bq/g	X	X	X	X
1 Bq/g < NORM < 20 Bq/g		X (with radiological survey)	X (with radiological survey)	X
NORM > 20 Bq/g				X

Types of waste containing NORM



Choice of term-sources

RICH-URANIUM WASTE

Activity concentration:

20 Bq/g U238

0 Bq/g Th232

10 Bq/g K40

Secular equilibrium

Pasty waste (d=1.6)/
powdered waste (d=1)

RICH-THORIUM WASTE

Activity concentration:

0 Bq/g U238

20 Bq/g Th232

10 Bq/g K40

Secular equilibrium

Pasty waste (d=1.6)/
powdered waste (d=1)

MIXED WASTE

Activity concentration:

20 Bq/g U238

20 Bq/g Th232

10 Bq/g K40

Secular equilibrium

Pasty waste (d=1.6)/
powdered waste (d=1)

Dispersion hypotheses

[ACTIVITY CONCENTRATIONS IN THE DIFFERENT ENVIRONMENTAL COMPARTMENTS

Atmospheric compartment (air)

- Dusty cloud from the landfill
 - Activity concentration of waste
 - Dust levels
 - » Pasty waste, compacted waste: 0.01 mg/m^3
 - » Powdered waste: 1 mg/m^3

Soil (due to deposition)

- Activity concentration of dusty cloud above the soil
- Soil density: 1600 kg/m^3

Watercourse

- Activity of the leachate: RP 122 (part II) approach
- Volume of the leachate: RP 122 (part II) approach $\rightarrow 2,000 \text{ m}^3$
- Dilution factor in the watercourse : 10

Exposure scenarios

OPERATING PHASE

- Scenario 1: Residents surrounding the landfill
 - Walkers at the edge of the site
- Scenario 2: Users of watercourse into which leachate is discharged
 - Consumption of drinking water
 - Vegetable garden watering



These two scenarios can be independent of each other or complementary

POST-CLOSURE PHASE

- Residents settled on the closed landfill (human intrusion) exposed to contaminated soil and contaminated groundwater
 - Outdoor activities on contaminated soil
 - Use of groundwater (consumption and watering of a vegetable garden)

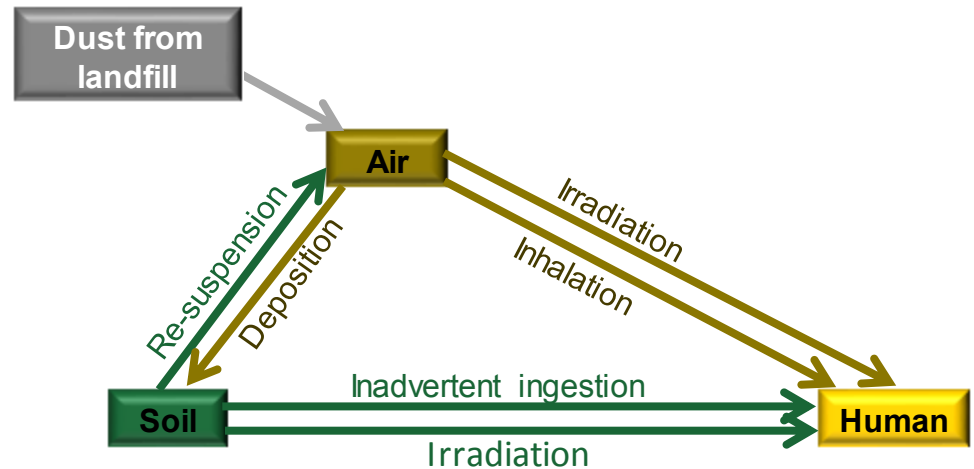


This scenario takes place 300 years after the closure

Exposure pathways and parameters

[OPERATING PHASE – SCENARIO 1

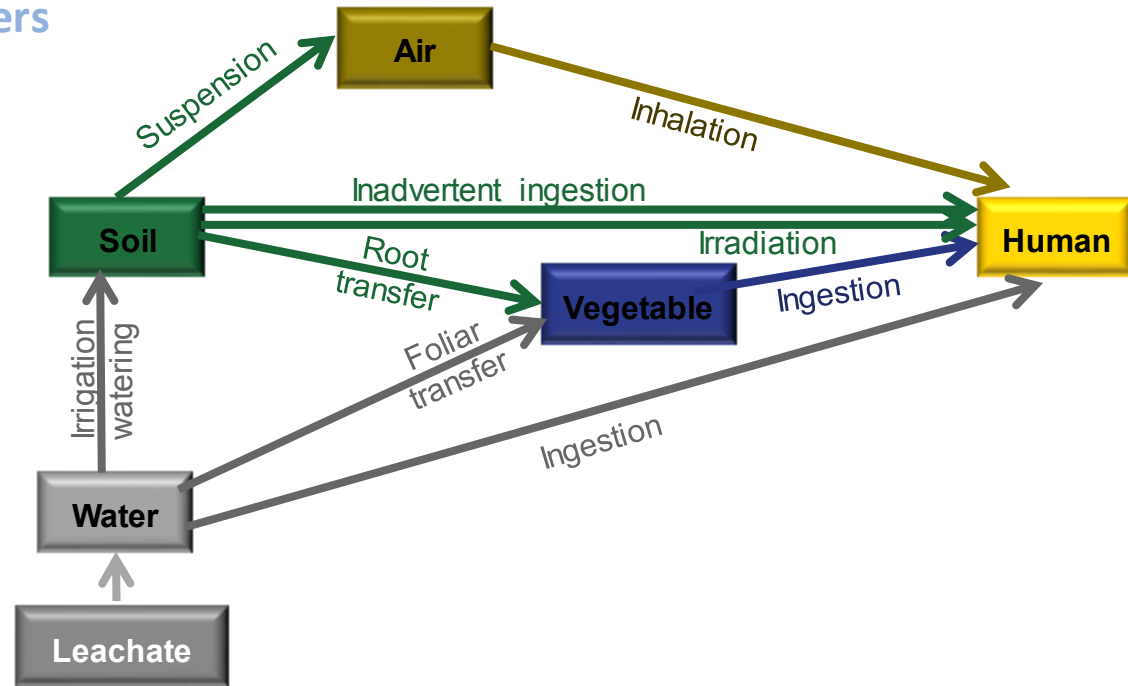
- External exposure (irradiation)
 - Activity concentration in air and in soil
- Internal exposure by inhalation of dust
 - Activity concentration in air and in soil
 - Re-suspension rate
 - Breathing flow rate depending on the age classes
 - Annual exposure time
- Internal exposure by ingestion of contaminated soil
 - Activity concentration in soil
 - Annual quantity ingested by inadvertence depending on the age classes



Exposure pathways and parameters

[OPERATING PHASE – SCENARIO 2

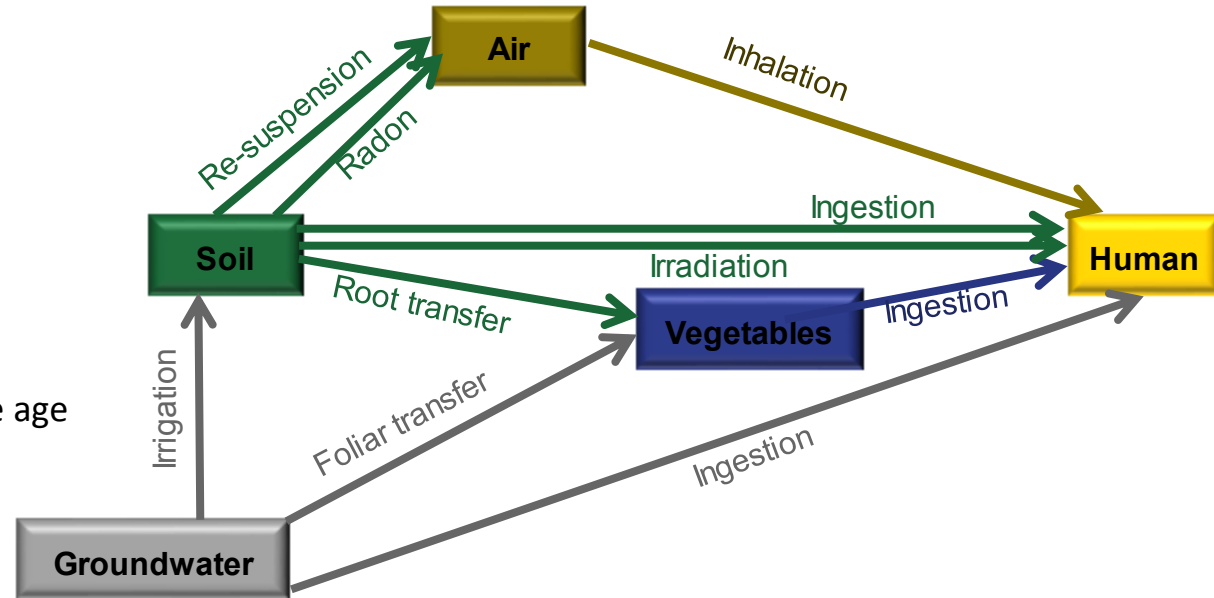
- External exposure (irradiation)
 - Activity concentration in soil
- Internal exposure by inhalation
 - Activity concentration in soil
 - Suspension rate
 - Breathing flow rate depending on the age classes
 - Annual exposure time
- Internal exposure by ingestion
 - Activity concentration in water and in soil
 - Annual intake of vegetables, soil and water depending on the age classes



Exposure pathways and parameters

[POST-CLOSURE PHASE

- External exposure (irradiation)
 - Activity concentration in soil (waste)
- Internal exposure by inhalation
 - Activity concentration in soil
 - Re-suspension rate
 - Breathing flow rate depending on the age classes
 - Radon exhalation from soil
 - Annual exposure time
- Internal exposure by ingestion
 - Activity concentration in water and in soil
 - Annual quantity ingested of vegetables, soil and water depending on the age classes



- Calculation tool
 - ResRad - OnSite
 - Parameters by default of the calculation tool

Results for mixed waste

OPERATING PHASE - SCENARIO 1

Pasty waste

Most exposed age class: 15 y

Effective dose: 0.01 mSv/an

Powdered waste

Most exposed age class: 15 y

Effective dose: 1.11 mSv/an

OPERATING PHASE – SCENARIO 2

Pasty waste

Most exposed age class: 1-2 y

Effective dose: 2.96 mSv/an

Powdered waste

Most exposed age class: 1-2 y

Effective dose: 2.96 mSv/an

POST-CLOSURE PHASE

Pasty waste

Most exposed age class: 15 y

Effective dose: 4.41 mSv/an

Radon exposure: 74 mSv/y

Powdered waste

Most exposed age class: 15 y

Effective dose: 4.41 mSv/an

Radon exposure: 74 mSv/y

Conclusions

- Landfill operators
 - Ensure that the radiological characteristics of the waste are respected
 - Put in place provisions to prevent or limit the dust levels and the leachage
- Authorities
 - Ensure that the radiological characteristics of the waste are respected
 - Ensure the specific provisions put in place by the landfill operators are relevant and sufficient
 - Put in place provisions to keep the memory of the history of the site

Be careful: the radiological risk is not the main issue

**THANK YOU FOR YOUR
ATTENTION**