



De la Wallonie
d'hier, nous
créons celle
de demain

Harmonization of human health risk assessment in Belgium (S-RISK) Questions about risk management

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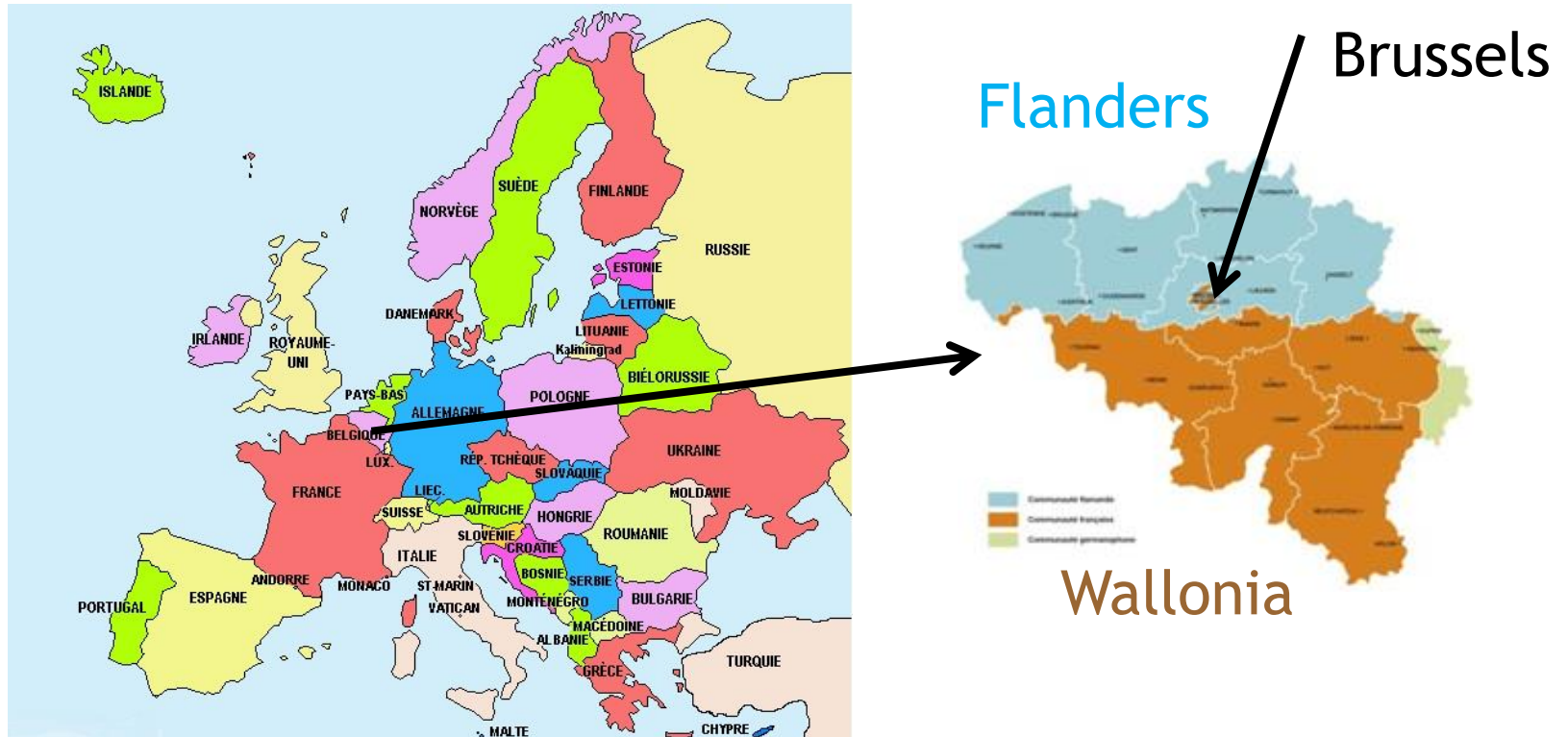


3. Questions about risk management with the new Soil Guideline Values (SGV)



1. Harmonization of human health risk assessment in Belgium

Belgium : 3 regions -> 3 soil regulations



Brussels, Flanders and Wallonia → same S-RISK model since 2016-2017

1. Soil legislation in Wallonia

GRER : Guide for risk assessment

Generic values
= legal values
(VR, VS, VI)

Tier 2 : site
specific
assessment
(S-RISK)

Tier 1 :
comparison with
 VS_H , VS_N , VS_E

VS_H : Soil
Guideline
Value (S-RISK)

2. Risk assessment model : S-RISK

A working group implemented by the Ministry of the Environment in Wallonia since 2015 with :



☐ Ministry of the Environment in Wallonia



☐ ISSeP : Walloon public institute in charge of risk assessment, air quality,... → **in charge of the implementation of the new methodology, writing of the technical guidance, calculation of SGV**



☐ SPAQuE : Public company in charge of the remediation of orphan sites for the Walloon Government

SPAQuE

2. Risk assessment model : S-RISK

S-RISK model : the « *recommended or reference* » model developed by VITO (2013) for Human Health Risk Assessment

2 existing versions : *S-RISK FL/BRX* and *S-RISK WAL*

What's new with S-RISK WAL (compared to RISC-HUMAN) ?

- a better vapour intrusion model (VOLASOIL)
- calculation of exposure intake by age groups instead of only 2 targets : adult/child
- specific soil texture from soil data in Wallonia (organic matter content, clay content,...)
- updating of soil ingestion rate (a very sensitive parameter for the soil ingestion pathway)
- updating of the most relevant toxicity data thanks to INERIS (2010-2011) and AWAC (Public Agency for Air in Wallonia)



New Soil Guideline Values VS_H (for the protection of human health)



Calculation of Soil Guideline Value (SGV)

- Step 1 : Data collection and Conceptual exposure model

➡ Backward mode : concentration in soil = Cleanup level

- Step 2 : Toxicity assessment

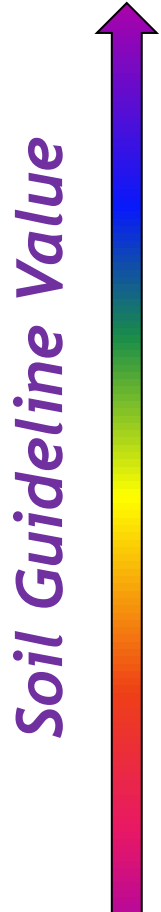
➡ Chemical-specific parameters, Toxicity values or Reference doses

- Step 3 : Exposure assessment

➡ S-RISK model, generic soil, 5 generic land-uses

- Step 4 : Risk characterization

➡ Acceptable risk : Hazard Index = 1 et Cancer Risk = 10^{-5}



3. Risk management : question when... new SGV < natural background level



New toxicity data for Arsenic and Lead



→ new SGV < natural background level in soil

→ unacceptable risk everywhere in Wallonia



→ what to do ?



3. Risk management : new toxicity data for Lead (EFSA)

New toxicity data for Lead were established by EFSA in 2010 and are based on a new approach : the Benchmark Dose approach

EFSA (2009) « Use of the Benchmark Dose approach in risk assessment »

EFSA (2010) « Scientific opinion on lead in food »



And also French documents :

ANSES (2012) « Récentes évolutions méthodologiques de la Benchmark Dose »

ANSES (2013) « Expositions au plomb : effets sur la santé associés à des plombémies inférieures à 100 µg/L - Avis de l'ANSES - Rapport d'expertise collective »

HCSP (High Council for Public Health) (2014) : Intervention Threshold = 50 µg/L instead of 100 µg/L previously

Critical reference point	Neurodevelopmental effects in children	Cardiovascular effects in adults	Renal effects in adults
Endpoint	IQ score	Systolic Blood Pressure (SBP)	Chronic Kidney Disease (CKD)
Data	Continuous data	Continuous data	Quantal data
Observed change : BMR	BMR = 1 % = decrease of 1 IQ point	BMR = 1 % = increase of 1,2 mmHg (per year) Backgrd = 120 mmHg	BMR = 10 % = prevalence of CKD = 10 %
BMDL	BMDL ₀₁ = 12 µg/L	BMDL ₀₁ = 36 µg/L (blood) BMDL ₀₁ = 8,1 µg/g (tibia bone)	BMDL ₁₀ = 15 µg/L
Health effect	+ 4,5 % in the risk of failure to graduate from high school - 2 % later productivity at work	+ 3,1 % pop. treated for hypertension + 2,4 % mortality from myocardial infarction + 2,6 % mortality from cerebral stroke	



3. Risk management : new toxicity data for Lead (EFSA)

EFSA (2010) « Scientific opinion on lead in food »

Critical reference point	Neurodevelopmental effects in children	Cardiovascular effects in adults	Renal effects in adults
BMDL	BMDL ₀₁ = 12 µg/L	BMDL ₀₁ = 36 µg/L	BMDL ₁₀ = 15 µg/L
Intake value derived from the BMDL	0,5 µg/kg.j	1,5 µg/kg.j	0,63 µg/kg.j

Models : IEUBK (EPA) - Carlisle and Wade

3. Risk management : Additivity



cadmium, lead,
benzene, toluene,
benzo(a)pyrene,
trichloroethene



arsenic, lead,
benzene,
naphthalene

Interactions between all the substances in the human body :

- **Additivity** : $[X + Y] = [X] + [Y]$
- Synergism, potentiation : $[X + Y] > [X] + [Y]$
- Antagonism, inhibition, masking : $[X + Y] < [X] + [Y]$



More information -> (ATSDR, 2004) + (EPA, 1986)

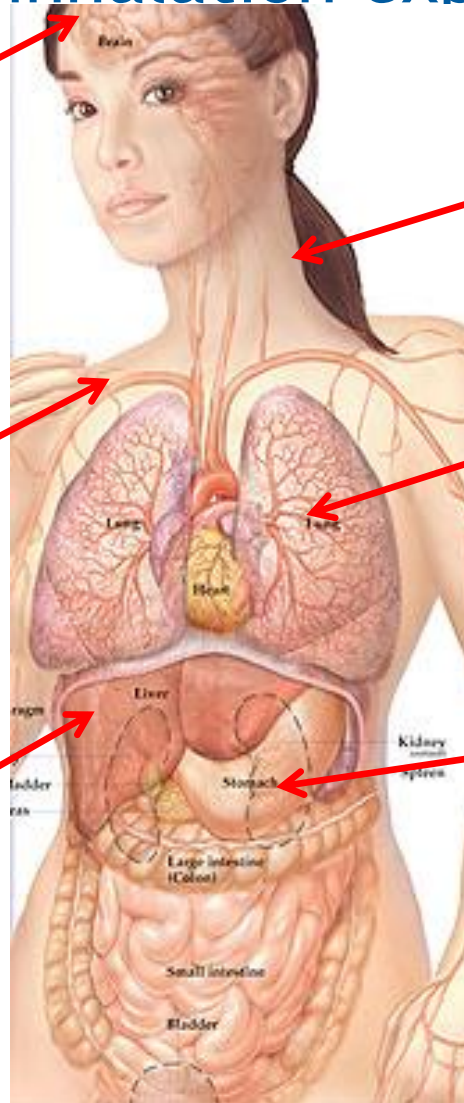
3. Risk management - Additivity

Target organ - inhalation exposure

CENTRAL NERVOUX SYSTEM : arsenic, cyanide, toluene, xylenes, styrene, Trichloroethylene, 111-TCA

BLOOD : lead, petroleum hydrocarbons, dichloromethane, cis12-DCE

LIVER : ethylbenzene, phenol, hydrocarbons, vinyl chloride, 12-DCA, trans12-DCE, PCE, 112-TCA



SKIN : arsenic

LUNG : arsenic, cuivre, nickel, zinc, xylènes, phénol, naphtalène, trans-12DCE, 112-TCA

KIDNEY : cadmium, mercury, ethylbenzene, phenol, MTBE, petroleum hydrocarbons, PCE

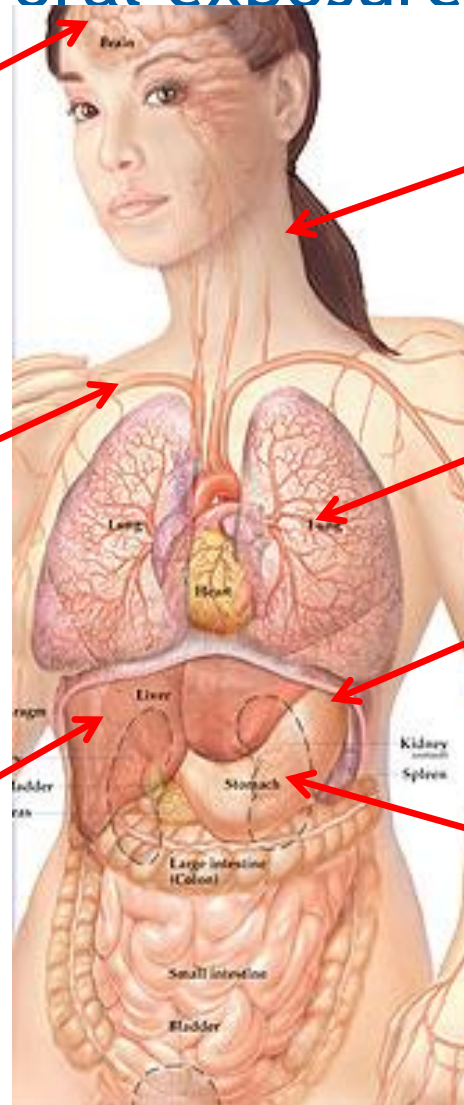
3. Risk management - Additivity

Target organ - oral exposure

CENTRAL NERVOUS SYSTEM : lead, free cyanide

BLOOD : arsenic, lead, zinc, MTBE, fluoranthene, fluorene, petroleum hydrocarbons, cis+trans-12DCE

LIVER : arsenic, ethylbenzene, toluene, acenaphthene, fluoranthene, phenanthrene, petroleum hydrocarbons, vinyl chloride, dichloromethane, PCE, chloroform, tetrachloromethane



SKIN

LUNG

RATE : arsenic

KIDNEY : cadmium, mercury, ethylbenzene, MTBE, B(ghi)P, fluoranthene, phenanthrene, pyrene, petroleum hydrocarbons

3. Risk management :

Other questions



- ❑ Comparison SGV to natural background level in soil
- ❑ Comparison SGV to diffuse background level in soil
- ❑ Risk additivity (mixture) : good agreement between SGV (VS_H) and detailed risk assessment
- ❑ Residential land-use including vegetable garden
- ❑ Link between environment and health : epidemiological survey, human biological monitoring
- ❑ Recommendations to owners of private garden where soil concentration > SGV for residential land-use
- ❑ A specific land-use : a building with commercial activities at the groundfloor and residential use at the other floors

