

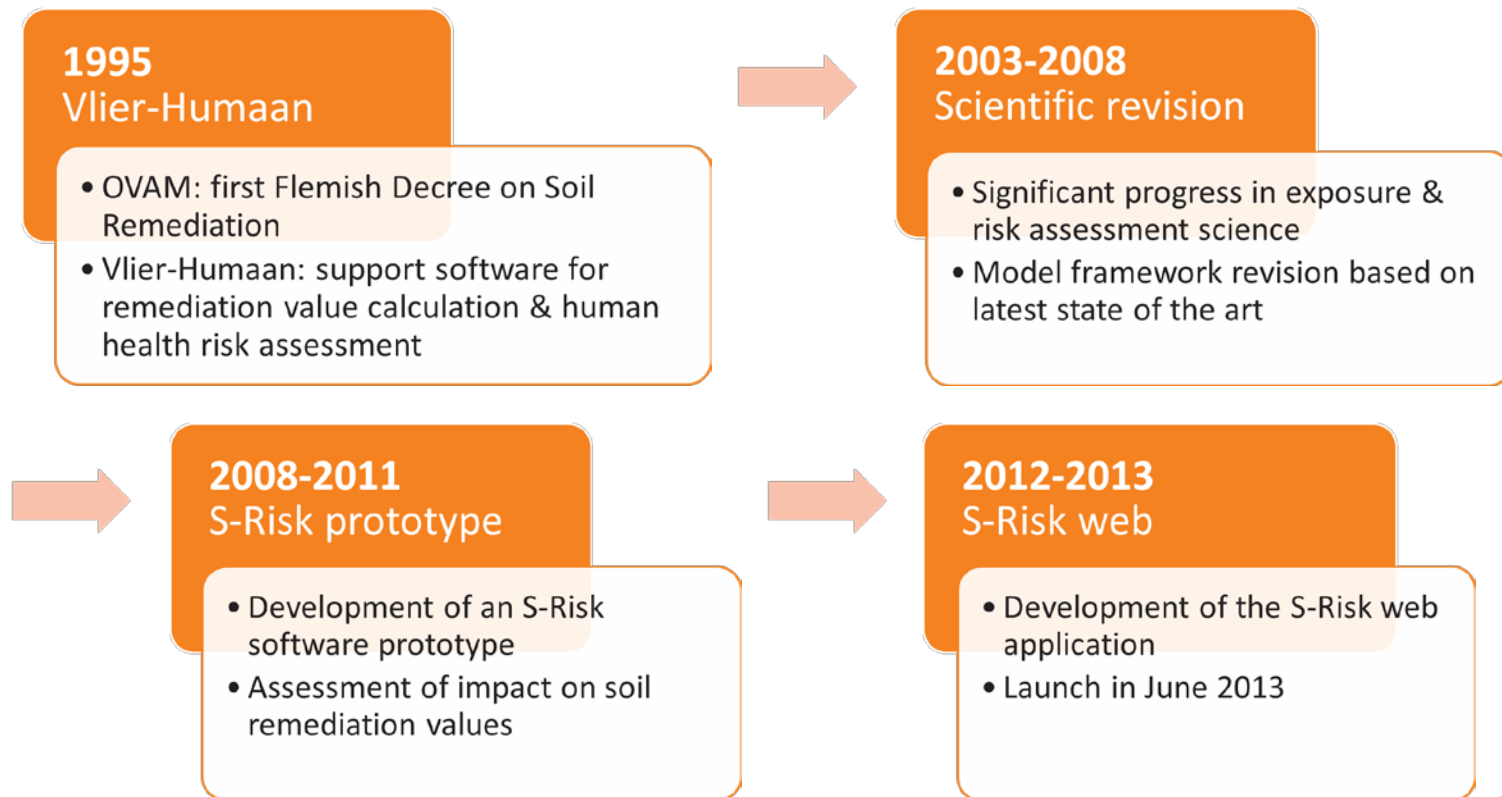


# S-Risk – A flexible model for human health risk assessment at contaminated sites

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# Background

## Soil remediation policy & modelling health risks in Flanders (Belgium)

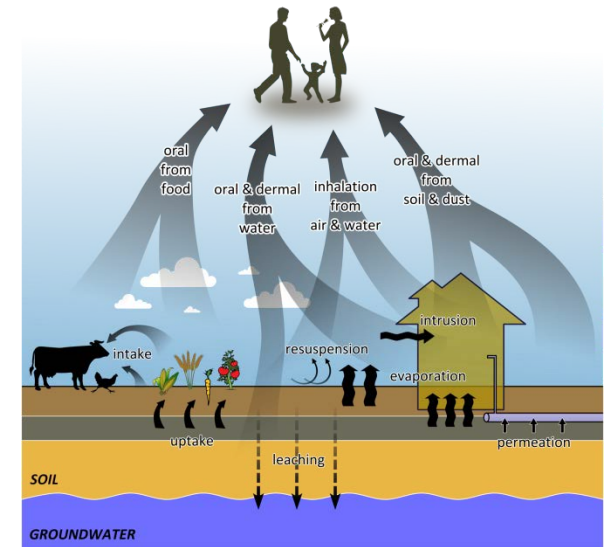


# Model description

- » S-Risk can be used for the calculation of
  - » Screening values (generic or site-specific)
  - » Human health risks

- » 4 main modules

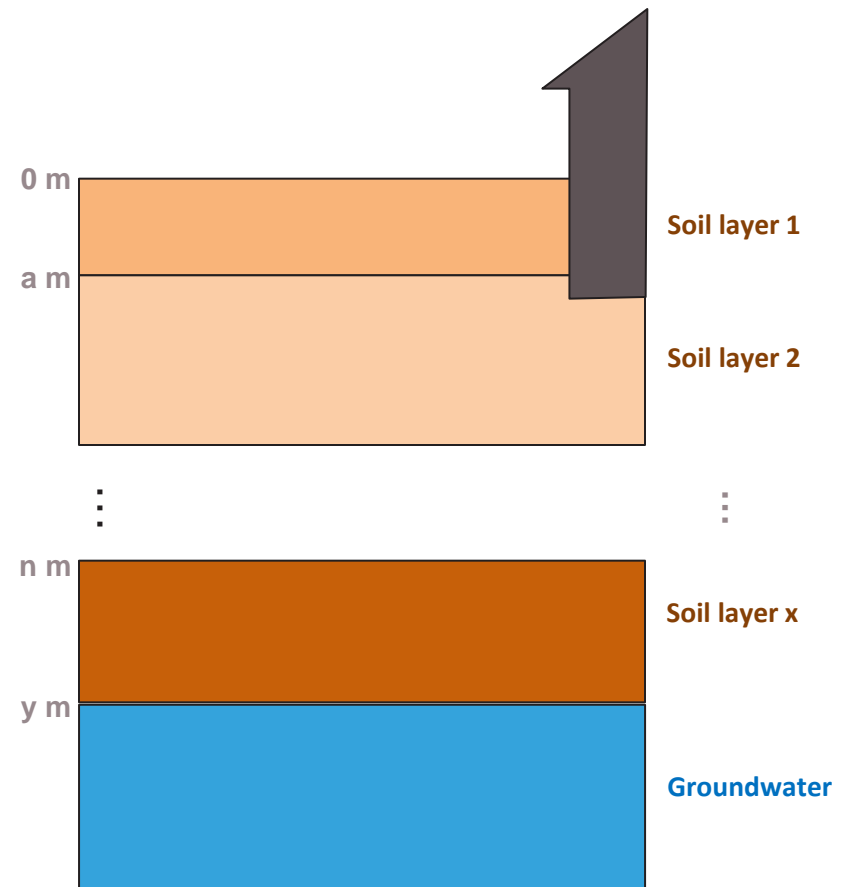
1. Chemical distribution in soil & groundwater
2. Transfer soil/groundwater → other environmental/biological media
3. Human exposure
4. Human health risks



# Model description – module 1

## Chemical distribution in soil & groundwater

- » Each soil layer → chemical distribution
    - » Solid phase
    - » Water phase
    - » Gas phase
  - » Groundwater → chemical distribution
    - » Water phase
    - » Gas phase
- At boundary between groundwater layer & unsaturated zone  
(assumption: equilibrium partitioning)



# Model description – modules 2 & 3

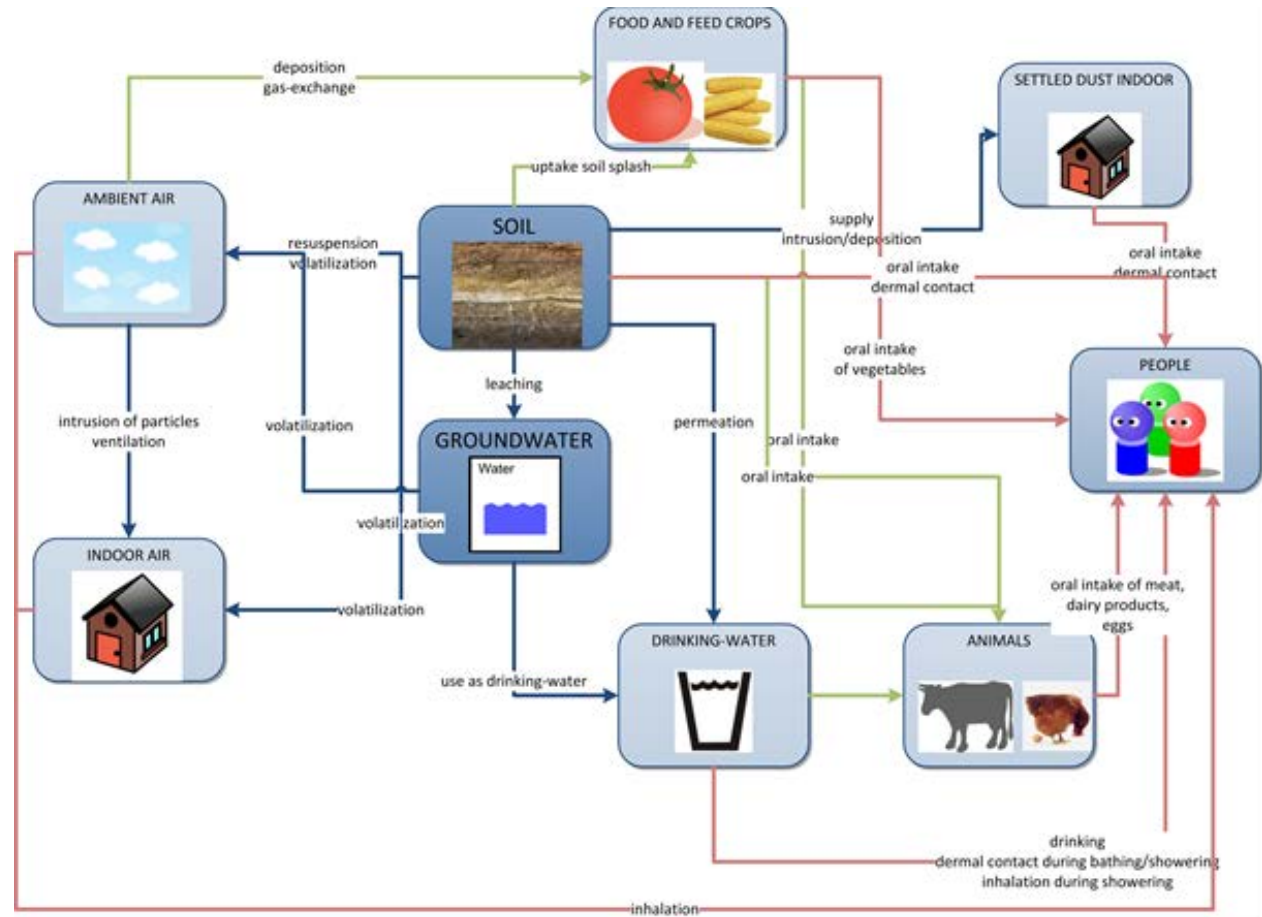
## Transfer & exposure

Soil/groundwater

Other env. media

Biological media

People (1-70 y.)



# Model description – module 4

## Calculation of human health risks

- » Compare calculated exposures with toxicological reference values

Type of effect	Risk metric	Cut-off value (Fl. soil remed. Decree)
<b>Threshold</b>		
→ systemic	Highest $RI_{total}$	$RI = 1$
→ local	Highest RI (oral or inhalation)	$RI = 1$
<b>Non-threshold</b>		
→ systemic	$ExCR_{total}$ for lifetime exposure	$ExCR = 1 \times 10^{-5}$
→ local	ExCR (oral or inhalation) for lifetime exposure	$ExCR = 1 \times 10^{-5}$
<b>Pseudo-threshold</b>		
→ systemic	$pRI_{total}$ for lifetime exposure	$pRI = 1$
→ local	$pRI$ (oral or inhalation) for lifetime exposure	$pRI = 1$

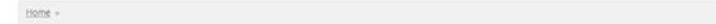
$RI$  = Risk Index (exposure / risk threshold)  
 $ExCR$  = Excess lifelong Cancer Risk (exposure \* unit risk)  
 $pRI$  = pseudo-Risk Index (exposure / risk threshold)

# Online web platform

- » S-Risk portal (<https://www.s-risk.be>)
  - » S-Risk application
  - » Information about releases & training events
  - » Documentation (manual, technical guidance & data sheets)
  - » Registration & demo licenses
  - » Helpdesk & FAQs



- » Today
  - » 65 registered users
  - » > 8700 simulations



## S-Risk license agreement updated

Submitted by s-risk on Wed, 05/13/2015 - 13:25

The S-Risk license agreement has been revised and updated, in order to make it more suitable with regard to the use of S-Risk in an interregional or international context. The new license agreement will be applicable to all new S-Risk licenses. For existing licensees, the old license agreement remains in effect.

These adjustments do not affect or change the S-Risk operational service in any way.

[Read more](#) | [s-risk.be](#)

## S-Risk updated to 1.1.3

Submitted by s-risk on Mon, 05/04/2015 - 10:02

Yesterday, S-Risk has been updated to version 1.1.3. This release resolves a number of issues with the new features introduced in 1.1.0 and some other minor adjustments.

More details can be found on our [Release notes](#) page.

[Read more](#) | [s-risk.be](#)

# Online web platform - overview

The screenshot displays the S-Risk web platform interface, which is used for managing simulations and configuring model inputs. The interface is divided into several main sections:

- Available Simulations:** A table listing various simulation runs with columns for Name, Label, Chemical, Application, Land use, and Last modified. The table includes entries like 'TineF', 'sris-175', and 'ortec\_ty1'.
- Simulation summary:** A section providing details for a selected simulation (TineF), including its name, label, description, chemical (DEHP), application type (Generic soil remediation value), region (Vlaanderen), and soil profile (Scenario soil layer).
- Model inputs & outputs:** A section for configuring model parameters, including a 'Switch to Tier 2' button, a 'Default land uses' dropdown menu, and checkboxes for 'Oral exposure route' (Intake via soil and dust, Intake via locally produced vegetables, Intake via locally produced meat and milk, Intake via locally produced eggs, Intake via groundwater or drinking water) and 'Inhalation exposure route' (Intake via outdoor air, Intake via indoor air, Intake via bathroom air). A 'Fraction of groundwater used as drinking water' input field is also present.



# Online web platform - scenarios

Model inputs & outputs

Scenario Chemical Soil Water Outdoor air Indoor air Plants Animals Concentrations Exposure Risk Concentration limits Results

Switch to Tier 2

Default land uses  
Agricultural

Agricultural  
Residential with vegetable garden  
Residential with garden  
Residential without garden  
Day recreation, outdoor sports  
Day recreation, indoor sports  
Holiday resort, mainly indoor  
Light industry  
Heavy industry

vegetables  
meat and milk  
eggs  
drinking water

Fraction of groundwater used as drinking water: 0

Dermal exposure route

- Absorption from soil and dust
- Absorption from water

Inhalation exposure route

- Intake via outdoor air
- Intake via indoor air
- Intake via bathroom air

# Online web platform - chemicals

Model inputs & outputs

Scenario **Chemical** Soil Water Outdoor air Indoor air Plants Animals Concentrations Exposure Risk Concentration limits Results Graph

Switch to Tier 1

Tetrachloroethene

Tetrachloroethene

General

Name: Tetrachloroethene  
CAS n°: 127-18-4  
 Organic  
 Dissociating  
Type: Base  
pKa:

Properties

M (g/mol):	1.658E2				
Ts (°C):	25				
S (mg/l):	1.5E2				
Tp (°C):	25				
P (Pa):	2.483E3				
Th (°C):	10				
H (Pa.m <sup>3</sup> /mol):	7.33E2				
Koc (dm <sup>3</sup> /kg):	2.64E2				
OR <input type="checkbox"/> Calculate Koc with QSAR formula of type:					
Kd (dm <sup>3</sup> /kg):					
OR <input type="checkbox"/> Calculate K <sub>d</sub> with formula: $\log(K_d) = A + B \cdot \log(CL) + C \cdot \log(\text{Conc}) + D \cdot \log(\text{CEC}) + E \cdot \log(\text{OM}) + F \cdot \text{pH-CaCl}_2$					
A = 0.0E0	B = 0.0E0	C = 0.0E0	D = 0.0E0	E = 0.0E0	F = 0.0E0
Kow:	5.495E2				
Koa:					
Dpe (m <sup>2</sup> /d):	7.7E-7				
Dpvc (m <sup>2</sup> /d):					
Da (m <sup>2</sup> /d):					
Dw (m <sup>2</sup> /d):					

# Online web platform – soil profile

Model inputs & outputs

Scenario Chemical **Soil** Water Outdoor air Indoor air Plants Animals Concentrations Exposure Risk Concentration limits Results Graph

Switch to Tier 1

Type: Standard heavy clay Add

Top of selected layer (m): 0

Standard clay  
Generic soil layer  
Standard heavy clay

Groundwater table depth (m): 3

Name: Standard clay

Properties

Organic matter (%):	1.7
pH-KCl:	5.7E0
Clay (%):	23.4
Soil air permeability Kv (m <sup>2</sup> ):	2.2E-14
Al content (mg/kg):	1.025E3
Fe content (mg/kg):	2.0E3
Ptot content (mg/kg):	1.25E3
Organic carbon:	0.01
θa (m <sup>3</sup> /m <sup>3</sup> ):	1.4E-1
θw (m <sup>3</sup> /m <sup>3</sup> ):	3.1E-1
θs (m <sup>3</sup> /m <sup>3</sup> ):	4.5E-1
ps (kg/m <sup>3</sup> ):	1.48E3
CEC (meq/100g):	1.85E1
θwcz (m <sup>3</sup> /m <sup>3</sup> ):	3.8E-1
Lcz (m):	7.0E-1

Customize Delete

# Online web platform - output

Model inputs & outputs

Scenario Chemical Soil Water Outdoor air Indoor air Plants Animals Concentrations Exposure Risk Concentration limits Results Graph

Last Calculation Time: 2015-02-05 11:17

Calculate risks & report results

PDF Excel CSV HTML

Include result summary

Include result details

## S-Risk report - lead\_recreational\_outdoor

Print

### Main results

Chemical	Highest RI	Highest ExCR	Highest pRI	Highest CI
Lead	(>1)	(>10 <sup>-5</sup> )	(>1)	1.121e+0 (Sheep meat CI)

Main results  
 Conceptual site model  
 Scenario  
 Soil profile & concentrations  
 Results per chemical  
 Lead  
 List of user-modified parameters

### Conceptual site model

#### Scenario

Land use: Day recreation, outdoor sports\_TF

Based on: Day recreation, outdoor sports

Exposure routes

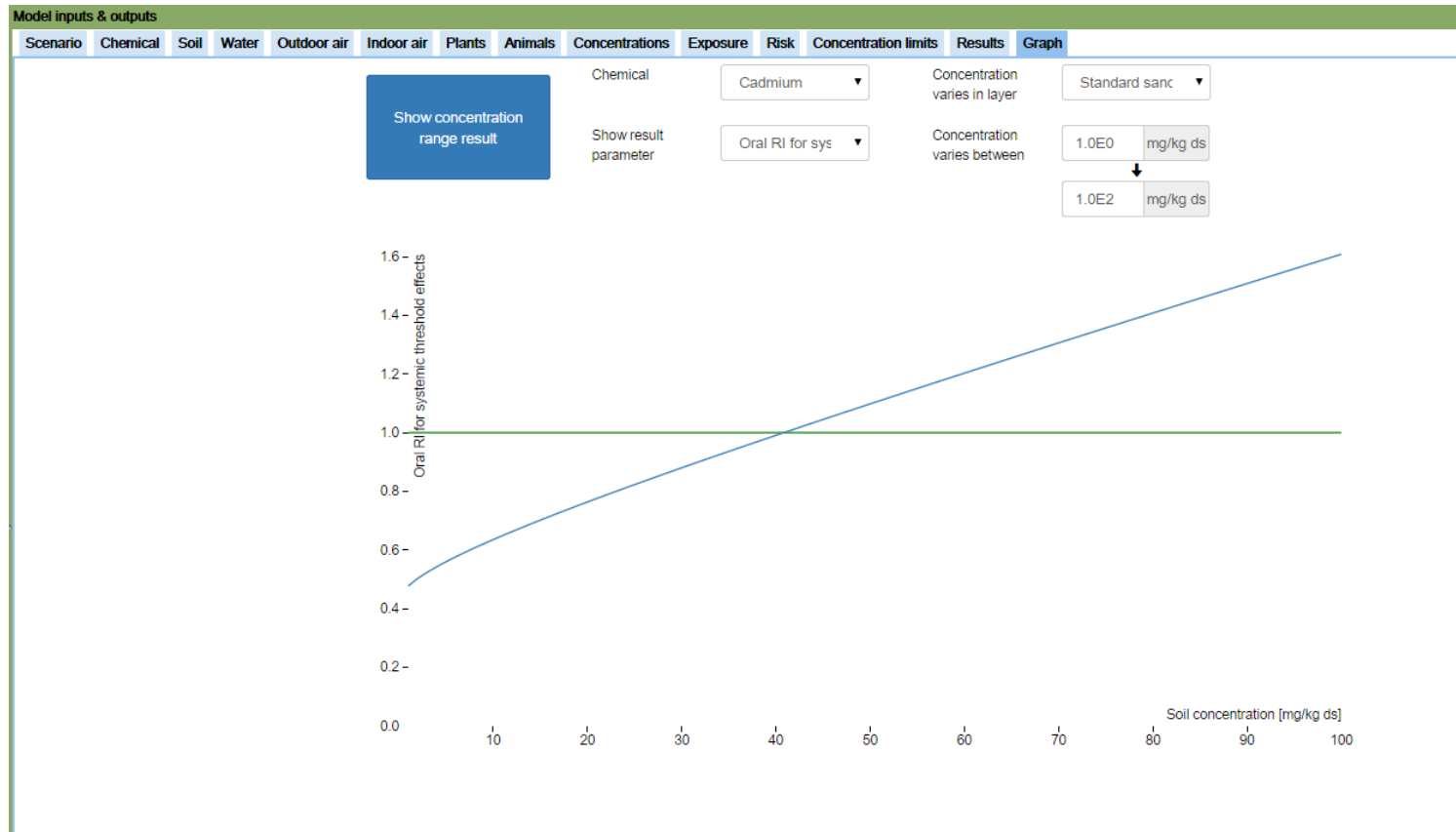
	Oral	Inhalation	Dermal
soil & settled dust		via outdoor air	via soil & settled dust
vegetables		via indoor air	via water (bath & shower)
via meat & milk			during showering
via eggs			
via water			

#### Soil profile & concentrations

Site characteristics

	Basement
Building type	
Floor thickness	m 0.1
Floor quality setting	Gaps and holes
Drinking water pipe depth	m 0.8
Length of the site	m 50.0

# Online web platform - output



# Future plans

## S-Risk Light

- » Same concept as current S-Risk Pro version, but
  - » Less modelling functionalities
  - » No helpdesk support
  
- » Will be developed upon sufficient user interest.  
Please contact us ([info@s-risk.be](mailto:info@s-risk.be)) if you are interested.

# Additional information

- » Model application, documentation, etc.
  - » web page: <https://www.s-risk.be>
- » Questions, demo license requests, etc.
  - » E-mail to helpdesk: [info@s-risk.be](mailto:info@s-risk.be)
  - » Talk to us:



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