INSOP, COMMON FORUM, ARAGORN workshop on threshold values for soil contaminants

INSOP|COMMON FORUM|ARAGORN workshop

3 October|Online

The session will start in few minutes

- **Should you, at any point, lose your connection**, you will be able to re join the meeting by using the same link and password
- Kindly keep your microphone **mute**
- **To take the floor, please use the RAISE YOUR HAND function**. The moderator will take note of the order of discussion
- If you have comments or questions, please use the CHAT function
- Please make sure that your name below the image box indicates:

  YOUR COUNTRY/YOUR NAME

Meeting Agenda

12:00-12:05	Opening	Natalia Rodriguez Eugenio *FAO GSP*
12:05-12:20	National threshold values collected by INSOP members	Sergejus Ustinov *FAO GSP*
12:20-12:35	ARAGORN Horizon project and its work in threshold values compilation	Nathalie Briels *Arche Consulting*
12:35-12:50	A comparison of concepts for establishing soil threshold values – common denominators and differences in Europe	Dietmar Müller-Grabherr *COMMON FORUM on Contaminated Land in Europe*
12:50-13:05	National threshold values and their application in the Russian Federation	Ivan Semenkov *Moscow State University*
13:05-13:20	National threshold values and their application in China	Deyi Hou *INSOP Vice-Chair*
13:20-13:55	Open discussion: - Identification of further countries with/without soil pollution threshold values - INSOP Roadmap for building the database and developing a Global Soil Pollution Threshold Values Technical Report	
12:55-14:00	Conclusion	Ravi Naidu *INSOP Chair*

Governance

Ravi Naidu

INSOP Chair

Sergejus Ustinov

INSOP coordinator

Deyi Hou

INSOP Vice-Chair

Assessment WG

Helen Karasali

Monitoring WG

Claudia E Lima de Silva

Remediation WG

Scott D. Warner

Fang Wang

Food Safety WG

David O'Connor

Promoting s ble so agement for

Assessment WG Priority 1

- Advocate for the development of global harmonized methods including SOPs to identify and measure soil pollutants

➢Pesticide residue in the soil

Food and Agriculture Organization of the United Nations

INTERNATIONAL NETWORK ON SOIL POLLUTION

ACTION PLAN

PRIORITIES OF THE ASSESSMENT WORKING GROUP ON SOIL POLLUTION

OCTOBER 2023 VERSION

PRIORITY 1

Advocate for the development of global harmonized methods, including standard operating procedures (SOPs) to identify and measure soil pollutants

OUTCOME

Soil laboratories are well-informed about the harmonized SOPs for soil pollutants and their usage

KEY PERFORMANCE INDICATORS

LONG TERM	SHORT TO MEDIUM TERM
By 2025, 80% of soil laboratories working with the GSP will be aware of how to use the harmonized SOPs for measuring soil pollutants in the laboratory	At least one soil laboratory working with the GSP from each region is involved in the development of harmonized SOPs

KEY ACTIVITIES

- Liaise and work in partnership with the GLOSOLAN;
- Analyze the available protocols for soil pollutants;
- Develop SOPs for pollutants of concern, such as bioavailable heavy metals, obsolete pesticides and Highly Hazardous Pesticides (HHP); and
- Facilitate cooperation among soil laboratories in the use and implementation of soil pollutants SOPs through webinars and workshops on in-person training.

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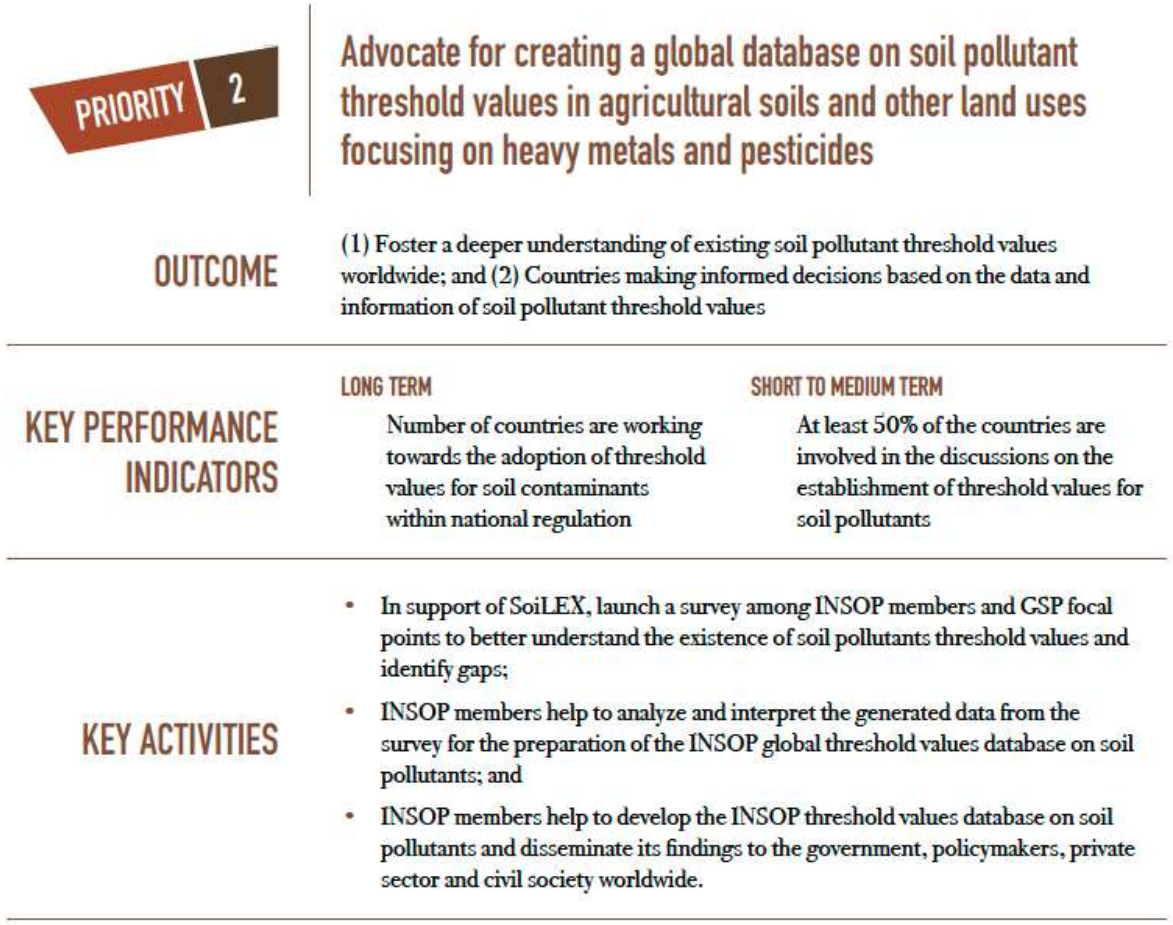
Assessment WG Priority 2

- Advocate for creating a global database on soil pollutant threshold values in agricultural soils and other land uses focusing on heavy metals and pesticides

➢ Better understand the existing threshold values and identify gaps

➢ Database and a Global Technical report on threshold values



PRIORITY 2

Advocate for creating a global database on soil pollutant threshold values in agricultural soils and other land uses focusing on heavy metals and pesticides

OUTCOME

(1) Foster a deeper understanding of existing soil pollutant threshold values worldwide; and (2) Countries making informed decisions based on the data and information of soil pollutant threshold values

KEY PERFORMANCE INDICATORS

LONG TERM	SHORT TO MEDIUM TERM
Number of countries are working towards the adoption of threshold values for soil contaminants within national regulation	At least 50% of the countries are involved in the discussions on the establishment of threshold values for soil pollutants

KEY ACTIVITIES

- In support of SoilLEX, launch a survey among INSOP members and GSP focal points to better understand the existence of soil pollutants threshold values and identify gaps;
- INSOP members help to analyze and interpret the generated data from the survey for the preparation of the INSOP global threshold values database on soil pollutants; and
- INSOP members help to develop the INSOP threshold values database on soil pollutants and disseminate its findings to the government, policymakers, private sector and civil society worldwide.

Promotin

Definition

Soil guideline values

Screening values

Soil standards

Action values

Target values

Trigger values

Intervention values

Acceptable concentrations

Regulatory guidance values (RGVs)

Threshold values

Clean-up values

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INSOP definition

- **Screening values**

➢Values above which additional investigation/risk assessment is required to determine whether a risk is acceptable

- **Intervention values**:

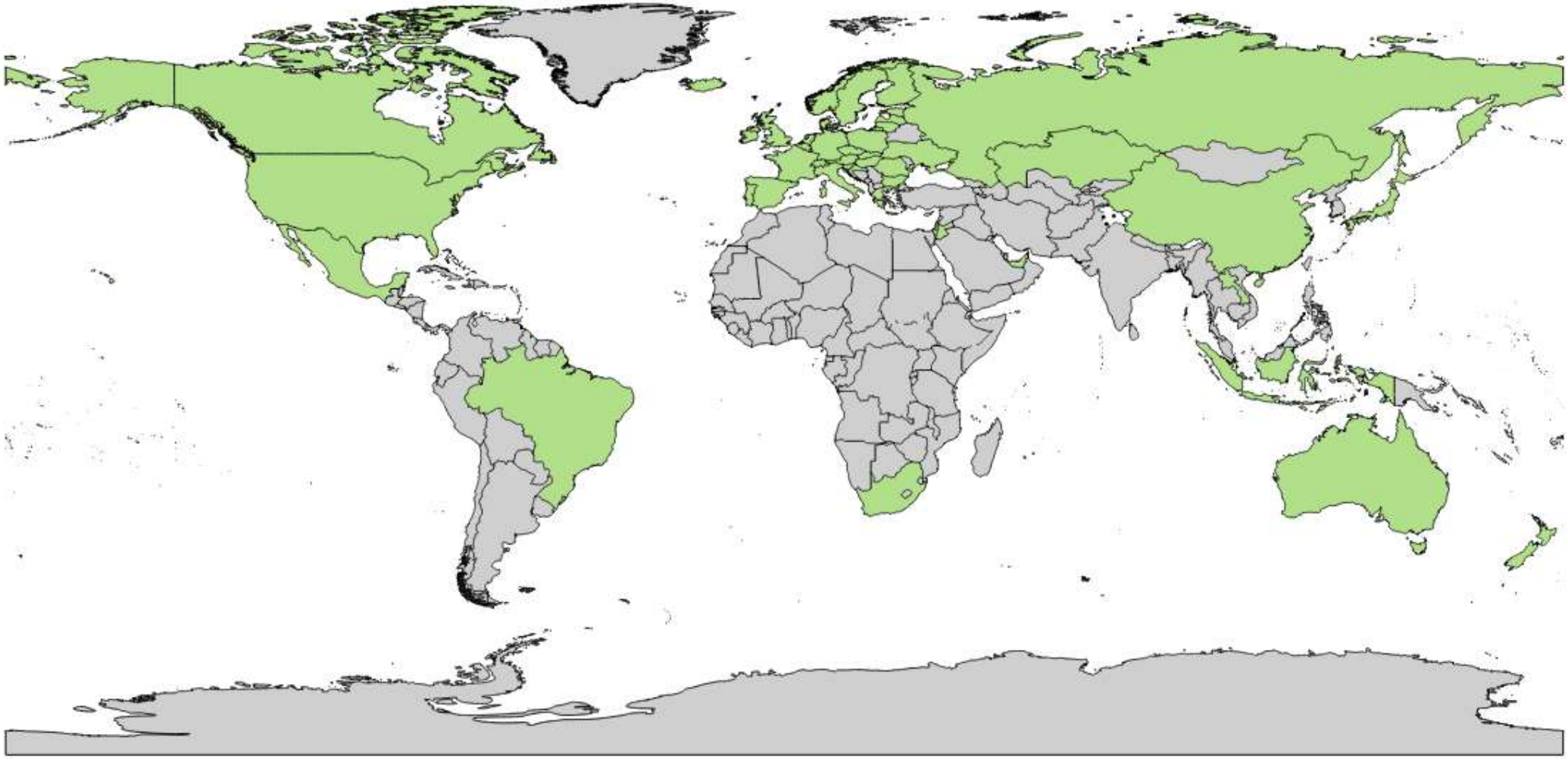
➢Values above which remediation or risk management actions are required; represent an unacceptable risk and require certain remediation/risk management action.

INSOP threshold values compilation

- Focuses on different land uses, such as residential, industrial, agricultural
- Focuses on the INSOP priority contaminants: Heavy metals(lloids) and pesticides

Name of Country:				Threshold Values for different land use types					
				Note: based on exposure scenarios where residents, often children, are the most sensitive receptors		Note: based on exposure scenarios where workers (adults) are the most sensitive receptors		Note: based on agricultural plant growth and uptake	
Type of Pollutants	**Constituents of Concern**	**Units**	**Country**	**Residential land use**		**Industrial land use**		**Agricultural land use**	
				Screening value	**Intervention value**	**Screening value**	**Intervention value**	**Screening value**	**Intervention value**
Heavy metals	Arsenic (As)	mg/kg							
	Cadmium (Cd)	mg/kg							
	Antimony (Sb)	mg/kg							
	Copper (Cu)	mg/kg							
	Chromium (Cr) (IV)	mg/kg							
	Cobalt (Co)	mg/kg							
	Mercury (Hg)	mg/kg							
	Lead (Pb)	mg/kg							
	Nickel (Ni)	mg/kg							
	Thallium (Tl)	mg/kg							
	Vanadium (V)	mg/kg							
	Beryllium (Be)	mg/kg							
	Selenium (Se)	mg/kg							

Contributing countries



GLOBAL SOIL PARTNERSHIP

Contributing partners

INTERNATIONAL NETWORK ON SOIL POLLUTION

CHANNELLING COLLECTIVE ACTION TOWARDS ZERO POLLUTION

COMMON FORUM

aragorn

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INSOP contributing members

Region	Country	INSOP member
Europe and Eurasia	Czechia	Sarka Polakova
	Denmark	Xenia Trier
	Germany	Annegret Biegel-Engler
	Greece	Elen Karasali
	France	Tiphaine Lucas
	Israel	Ellen Graber
	Italy	Paola Grenni Elena Leide Chiara Cassinari
	the Netherlands	Illona van der Koref
	Poland	Agnieszka Klimkowicz-Pawlas
	Russian Federation	Ivan Semenkov
	Switzerland	Mathieu Renaud
	Ukraine	Dmytro Semenov
	United Kingdom of Great Britain and Northern Ireland	Ian Martin

INSOP contributing members

Region	Country	INSOP member
Asia and the Pacific	Australia	Ayanka Wijayawardena
	the People's Republic of China	Deyi Hou
	Japan	Tetsuo Yasutaka
	The Lao People’s Democratic Republic	Xaysatith Souliyavongsa
	Pakistan	Amanullah Amanullah
	Viet Nam	Tống Quốc Nghị

Region	Country	INSOP member
Africa	South Africa	Ivan Semenkov

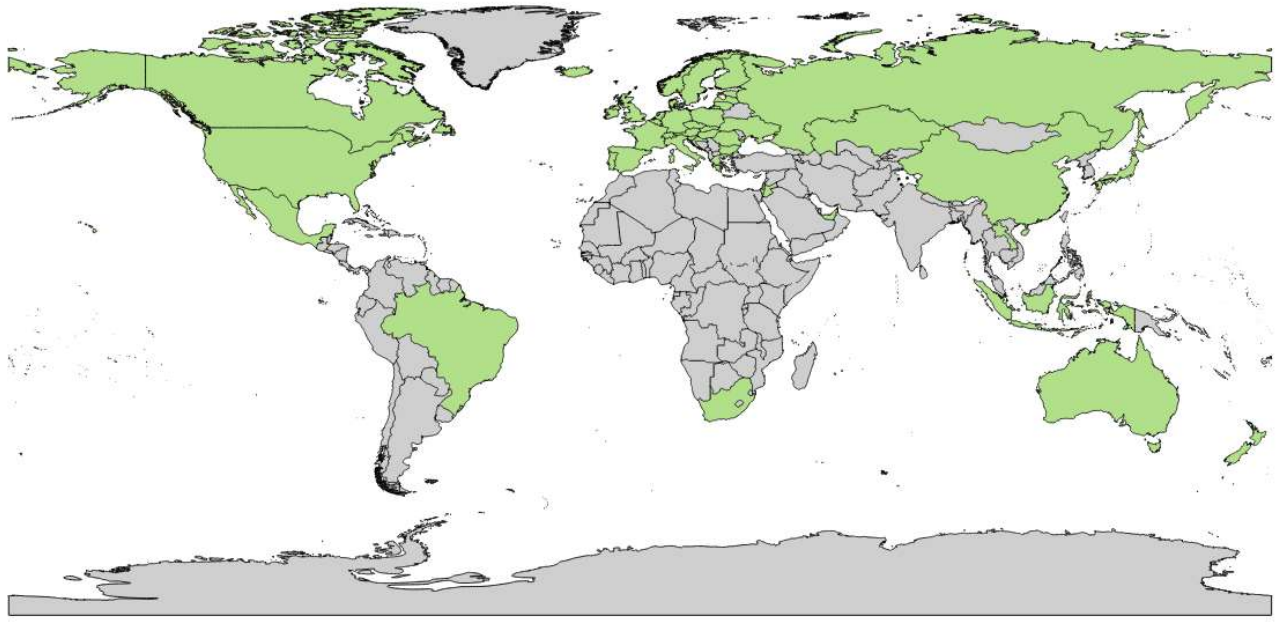
INSOP contributing members

Region	Country	INSOP member
Latin America and the Caribbean	Brazil	Ekos Brasil
	Mexico	Lenin Medina-Orozco

Region	Country	INSOP member
Near East and North Africa	Jordan	Nabeel Bani Hani
	United Arab Emirates	Bayan Mahmoud Athamneh

Next steps

- Identification of further countries with/without soil pollution threshold values:



- South Korea
- India
- Argentina
- Islamic Republic of Iran (the)
- Peru
- Algeria
- Malaysia

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Next steps

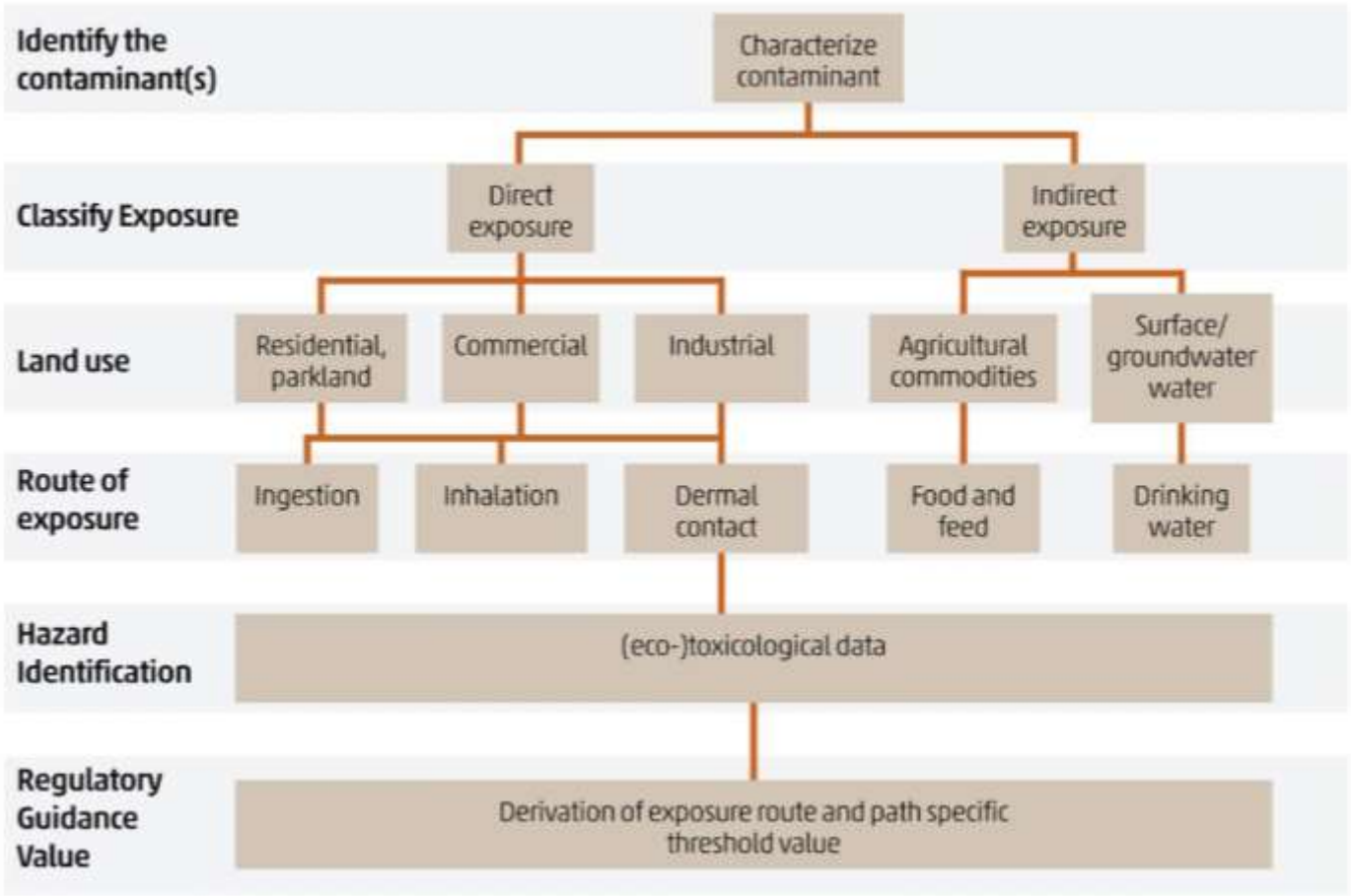
- Understand and describe the differences in the approaches used for derivation of threshold values

➢How did the threshold values been derived?

➢Have all major pathways of human exposure been taken into account?

Next steps

- Assist countries to derive their own national/regional threshold values based on the GSP/FAO conceptual model that considers all the fundamental parameters for deriving threshold values



Rationale for deriving soil threshold values, includes consideration of the type and concentration of the pollutants concerned, detailed examination of the possible exposure routes and hazard identification considering compound specific toxicological data. Source: FAO and UNEP, 2021

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ARAGORN Horizon project and its work in threshold values compilation

Nathalie Briels & Stijn Van Hees

ARCHE Consulting

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The European Union

INSOP workshop, 3rd of October 2024

ARAGORN project

Achieving Remediation And GOverning Restoration of contaminated soils Now

- Horizon Europe project
- October 2023 – 2027
- EU Mission: « A Soil Deal for Europe »

Funded by
The European Union

The consortium

Project coordinator

WPLs

Other partners

Funded by
The European Union

ARAGORN project

Main objectives:

- **Map** contaminated sites in Europe
- Evaluate **remediation- and immobilization techniques**
- Investigate **resilience and ecological restoration** after remediation
- Develop a **risk assessment framework** for stakeholders
    - Guidelines including socio-economic analysis and remediation options

Avoid regrettable remediation

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STV compilation

- Risk assessment framework for EU stakeholders
- Analytical chemistry methods

EU policy: **Directive on Soil Monitoring and Resilience**

INSOP

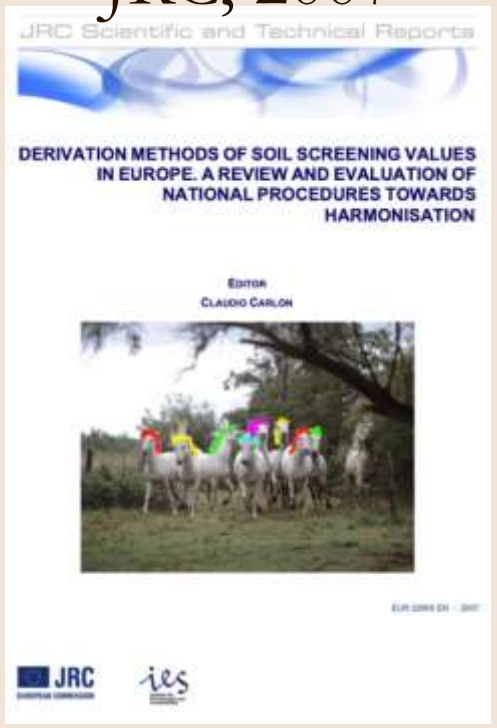
- Preventing duplicative efforts
- Data sharing
- Working towards a comprehensive global database & report
- Provide insights from a European perspective

EU soil threshold compilation

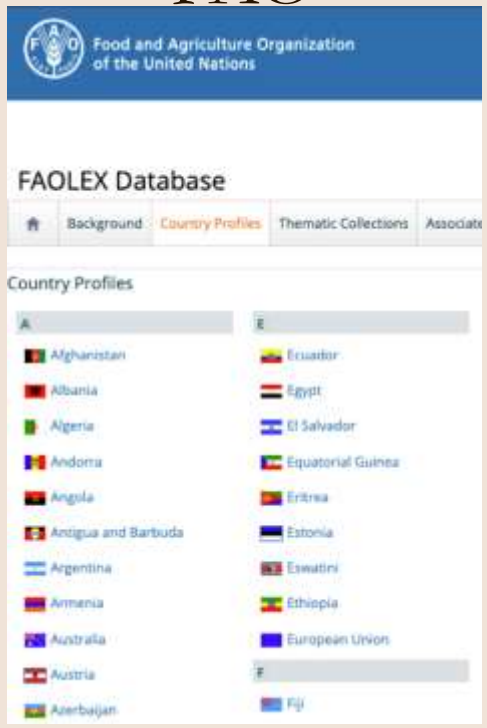
Sources & previous work

EEA, 2023

JRC, 2007



FAO



THE HERACLES FRAMEWORK
HUMAN AND ECOLOGICAL RISK ASSESSMENT FOR CONTAMINATED LAND IN EUROPEAN MEMBER STATES
Towards the development of common references

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EU soil threshold compilation

Validation

! Note

Derivation methods out of scope of the risk assessment framework for stakeholders

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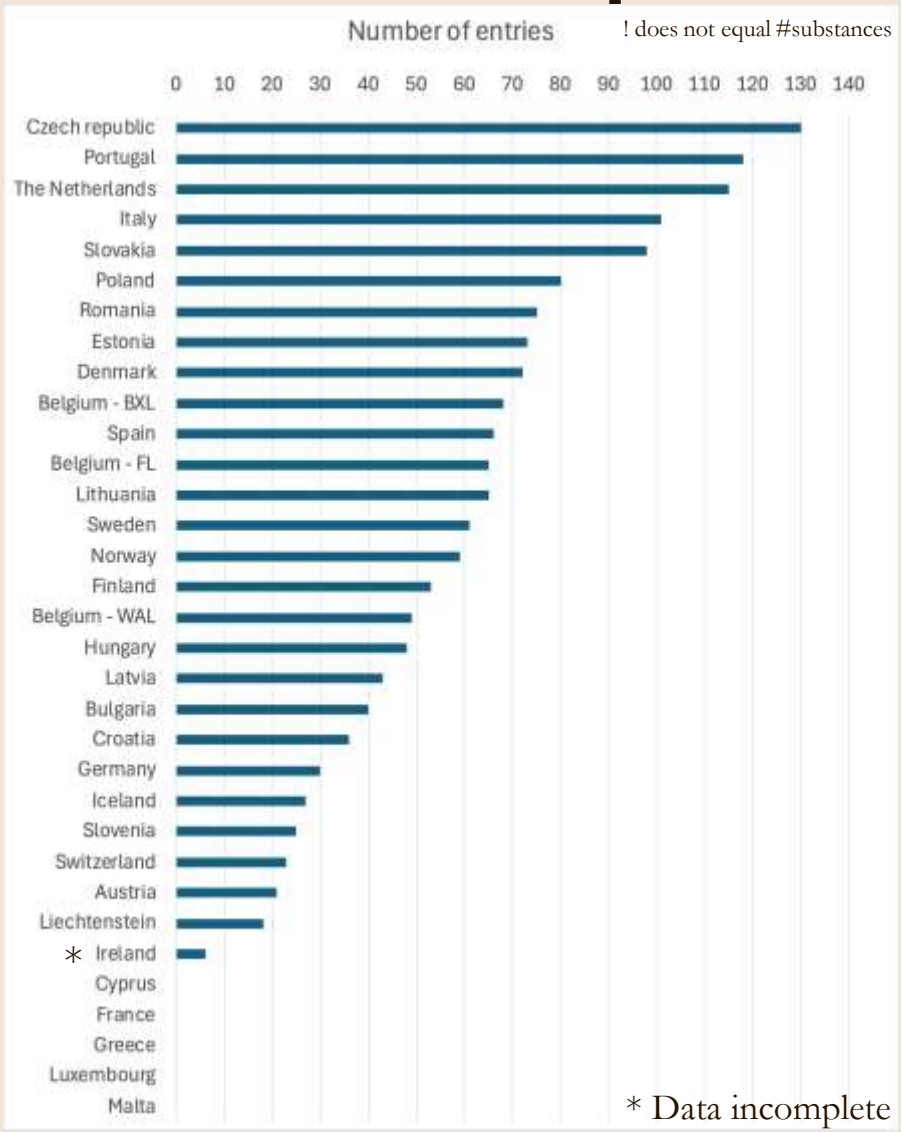
STVs in Europe



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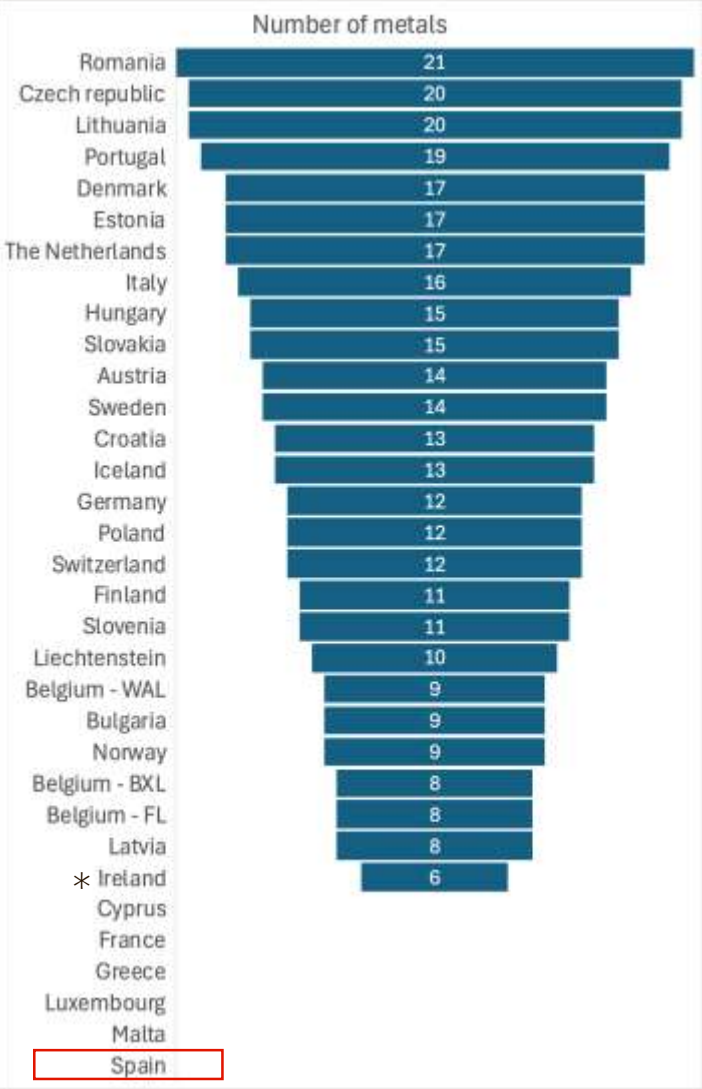
Metals and metalloids



*Data incomplete

Cd
Cu
Hg
Ni
Pb
Zn

Spain

The responsibilty for the development of STVs for metals is transferred to the autonomous regions.

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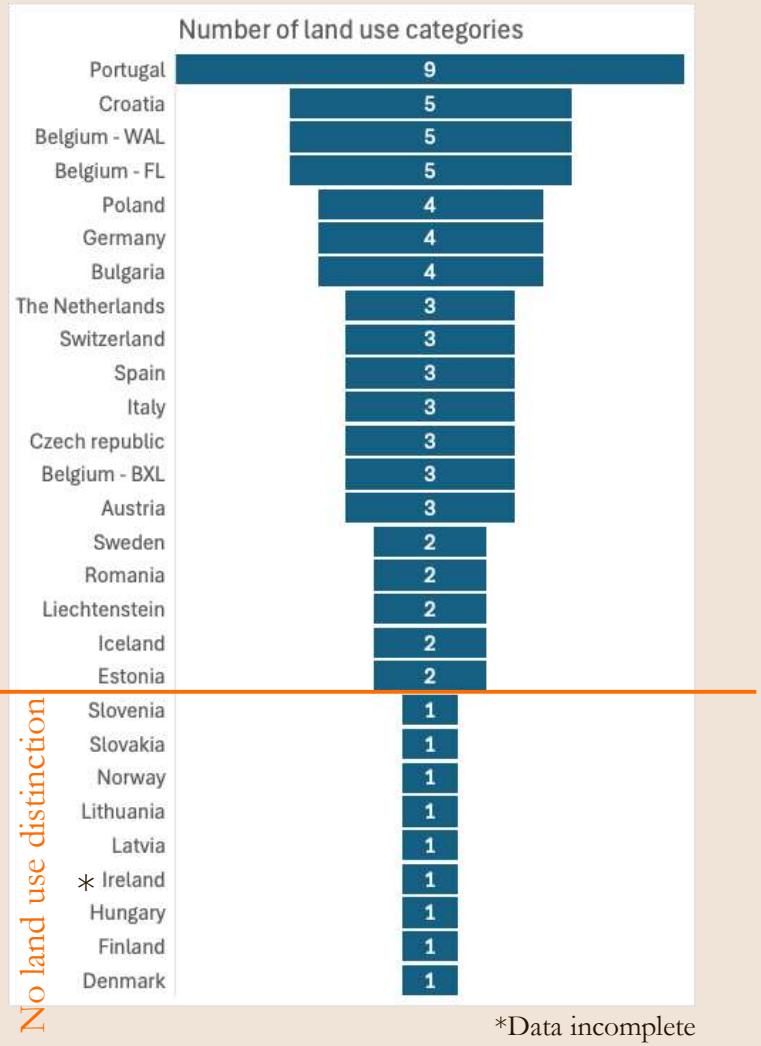
Land use



*Data incomplete

Most common:

- Industrial
- Recreational
- Residential
- Agricultural
- Nature
- Children's playground

Very specific:

- With or without use of subterranean water
- Distance <30m from a surface water body

Very vague:

- "Special zones"
- Sensitive / less-sensitive

Related to protection goal

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Other approaches

Germany

Distinction between the **soil-human** pathway and **soil-crop** pathway

Tiered approach

1. Acceptable value
2. Warning value
3. Action value

9 countries

Corrections for soil characteristics:

pH, clay, TOC, water permeability

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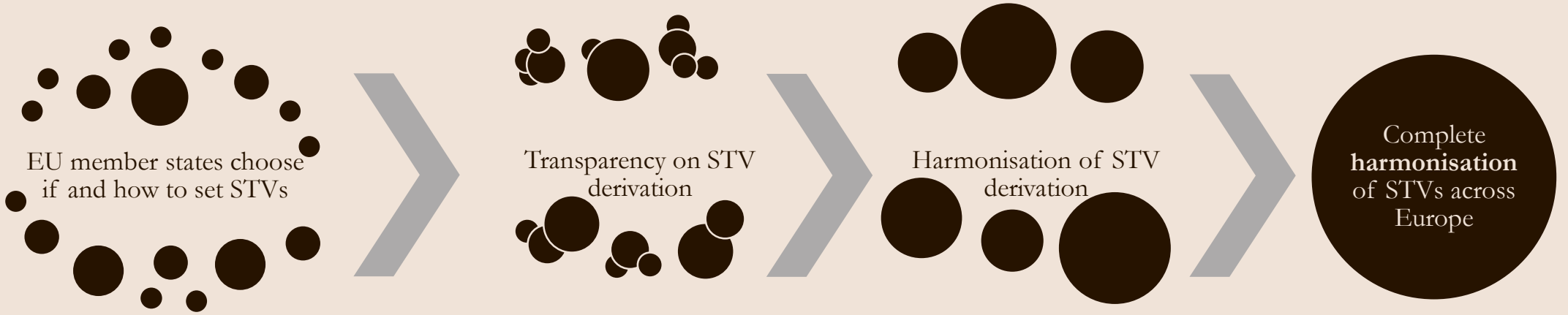
Towards a degree of harmonization

EU policy: Directive on Soil Monitoring and Resilience



Current situation

How to implement this?

Repository with national STVs that is kept up to date?

European soil quality standards analogous to the WFD?

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Thank you for your attention

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www.aragorn-horizon.eu

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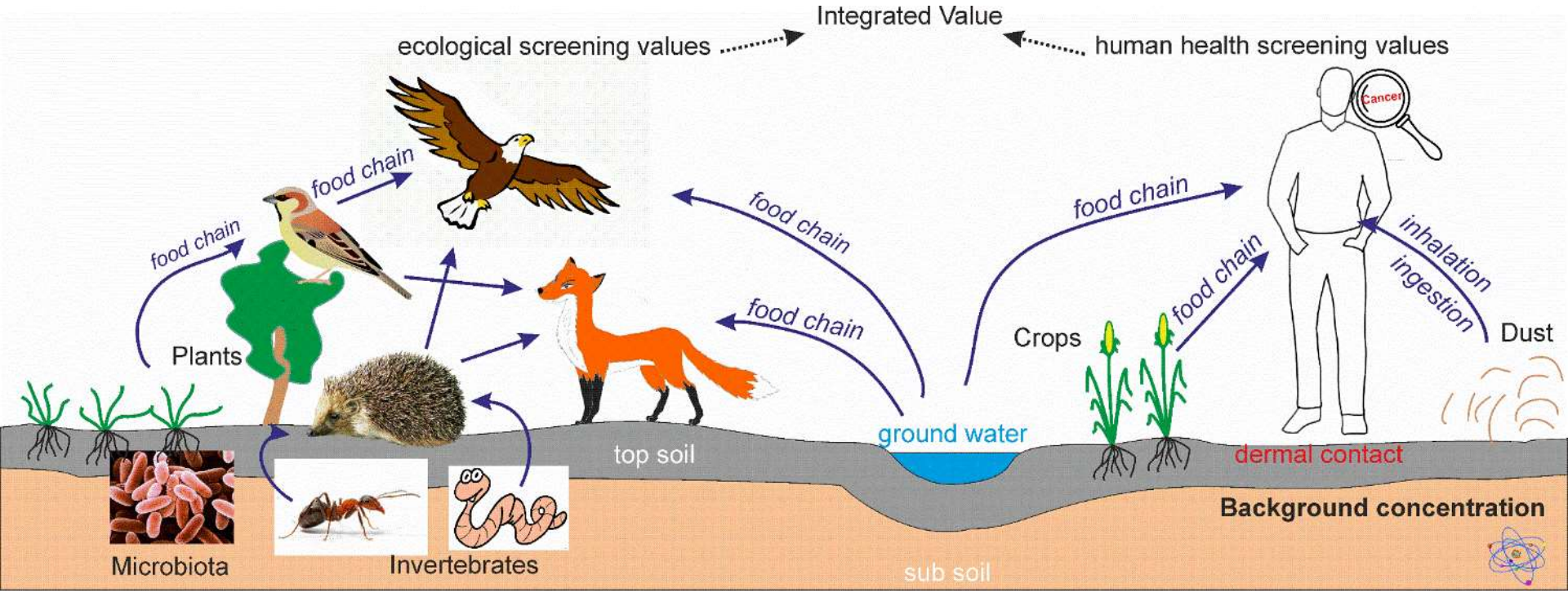
National threshold values and their application in the Russian Federation



Canadian Council for Ministers for the Environment. Canadian Environmental Quality Guidelines. 2018. http://st-ts.ccme.ca/en/index.html

Ivan Semenkov

Lomonosov Moscow State University

2024

Principals for establishing soil threshold values

Country	End point					Risk assessment		Scientific basis					
								local background		versatility		reassessment	diet
	ecosystem	human	plants	water	air indoor /outdoor	negative effects	cancer	auxiliary	necessary	soil specific	local risk		
China	?	+	+	?	?	?	?	+	?	+	?	?	?
SAR	–	+	–	+	–	+	+	+	–	–	–	–	+
Australia	+	+	+	–	–	+	–	+	+	–	+	+	+
New Zeeland	+	+	+	?	?	+	+	+	–	–	+	–	+
Netherlands	+	+	+	+	+	+	+	+	–	–	+	+	+
Russia	+	+	+	+	+	–	–	+	–	+	–	+	+
USA	+	+	+	+	+	+	+	+	–	–	+	+	+
Germany	–	+	+	+	–	+	+	–	–	–	+	–	+
Canada	+	+	+	+	+	+	+	+	–	–	+	+	+
Finland	+	+	+	+	+	+	+	–	+	–	+	–	+
Sweden	+	+	+	+	+	+	+	+	–	–	+	–	+
Czech Republic	+	+	+	–	+	+	+	–	+	+	–	–	–

Semenkov I.N., Koroleva T.V. 2019. Eurasian Soil Science. https://doi.org/10.1134/S1064229319100107

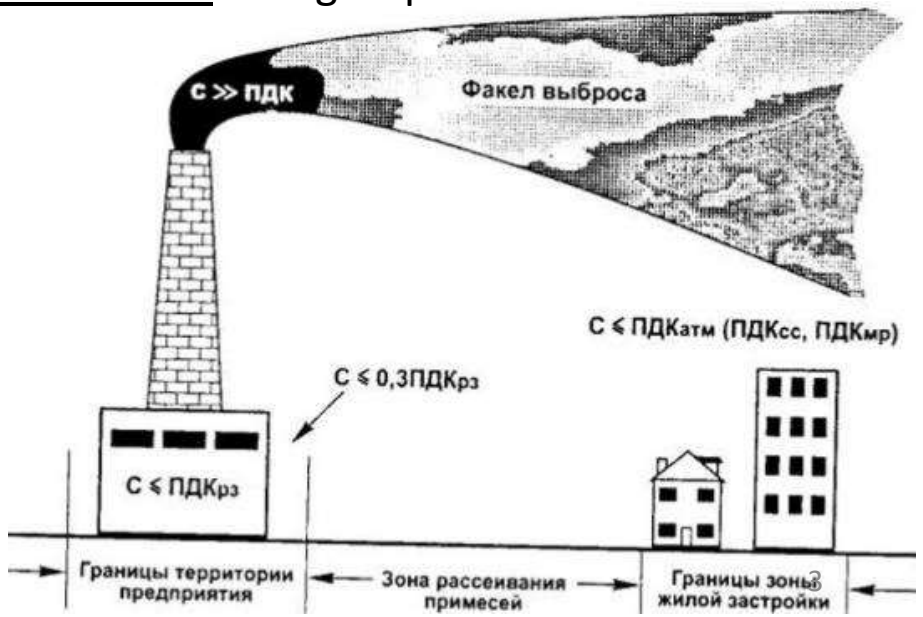
Russian (Soviet) permissible concentrations for soils (since 1980)

1. Maximal permissible concentration (MPC) is an **experimentally validated value***.
Four indicators of harmfulness:
-*ecological* – ability of soil to self-purification and biological activity
-*translocation to plants* – safe level in agricultural plants
-*translocation to surface water* – safe level in surface water
-*translocation to air* - safe level in atmospheric air

The lowest one is MPC

*Preliminary analysis: consideration of production, already available MPCs in air and water and approved detection methods

2. Estimated permissible concentration is a **calculated value** for 3 groups of soils:
-sandy and sandy-loamy soils;
-loamy and clayey acidic soils;
-loamy and clayey near-neutral soils.



GN 2.1.7.2041-06; GN 2.1.7.2511-09; SanPiN 1.2.3685-21

Regulatory development

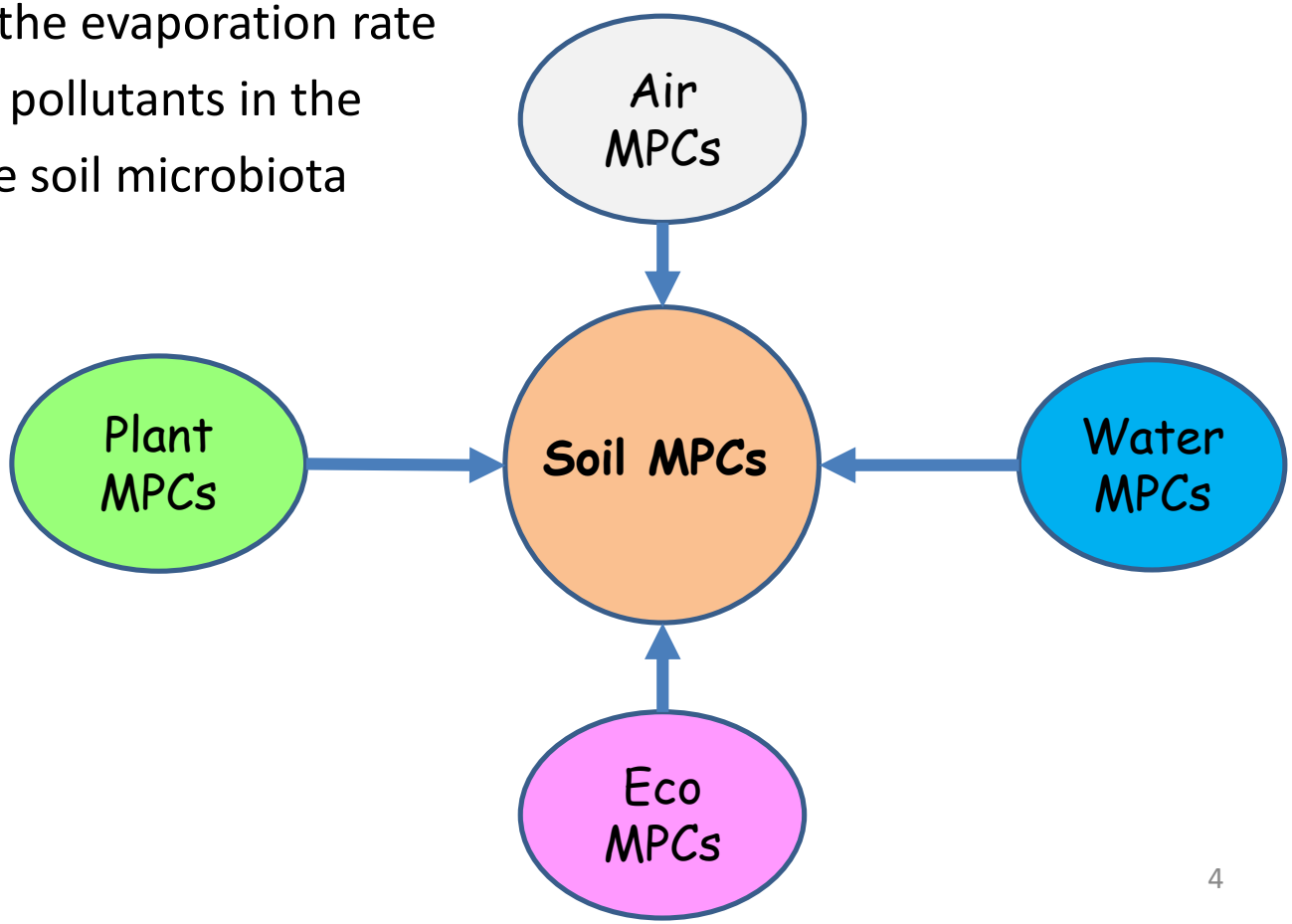
1. Study of the substance stability and mobility in the environments
2. Identifying the most sensitive component:

2.1. MPC_{plants}: Pot and field experiments with plants

2.2. MPC_{water}: Experiments with filtration units or columns

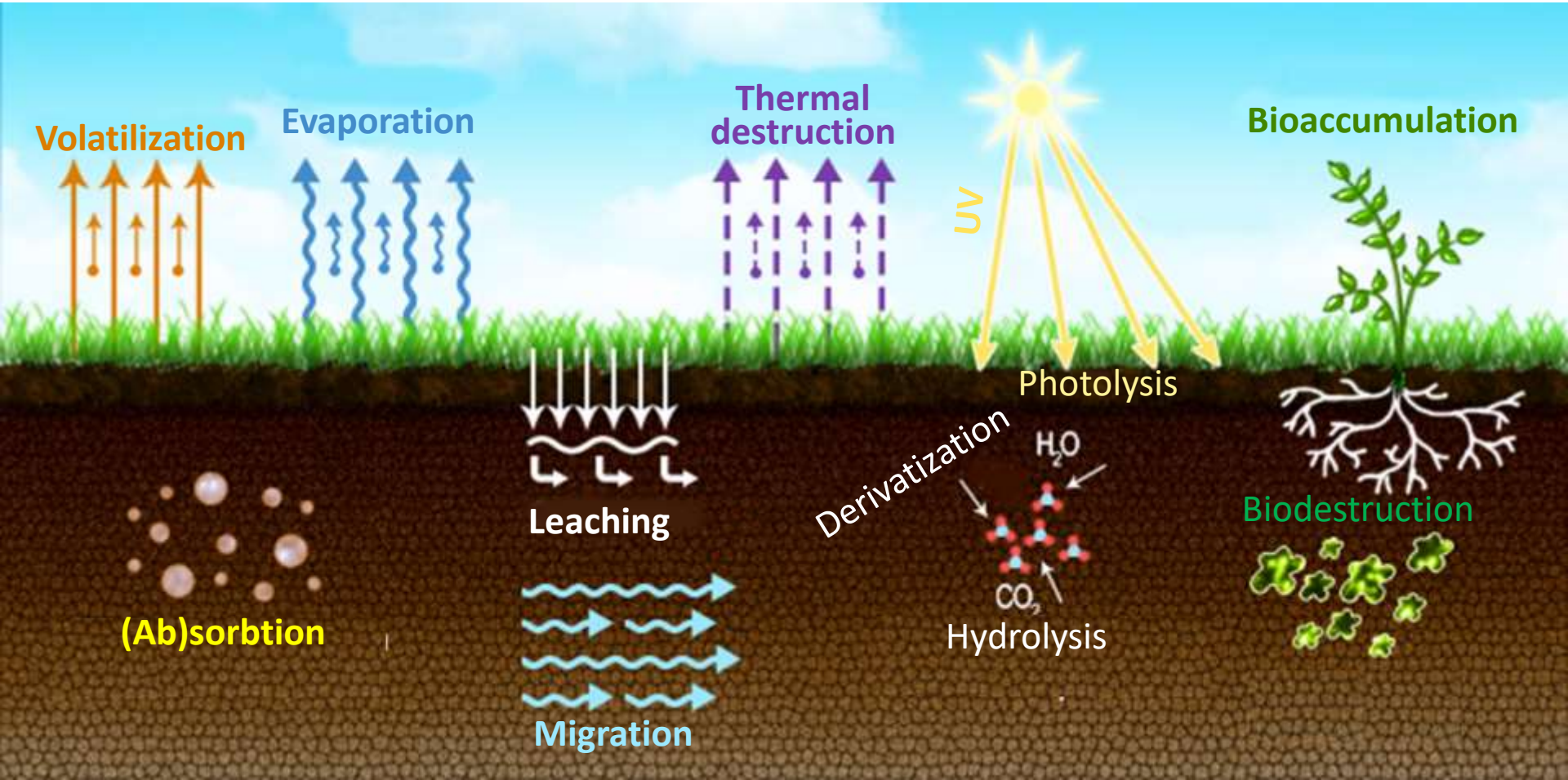
2.3. MPC_{air}: Evaluation of the evaporation rate

2.4. MPC_{eco}: Treatment of pollutants in the Petri dishes (control of the soil microbiota and microbial activity)



Regulatory development

- Experiments in thermostats under different air humidity & temperature, soil organic matter content and acidity e.g., in Chernozems, Albeluvisols etc.
- For trace elements, it is more relevant to assess mobility and the degree of transformation



1. Evaluation of from soil to plant translocation in control conditions

1.1 Preliminary pot experiments in Petri dishes

Modelling the maximum translocation of the substance from soil to plants in a short period of time:

-growing of agricultural products on a model substrate

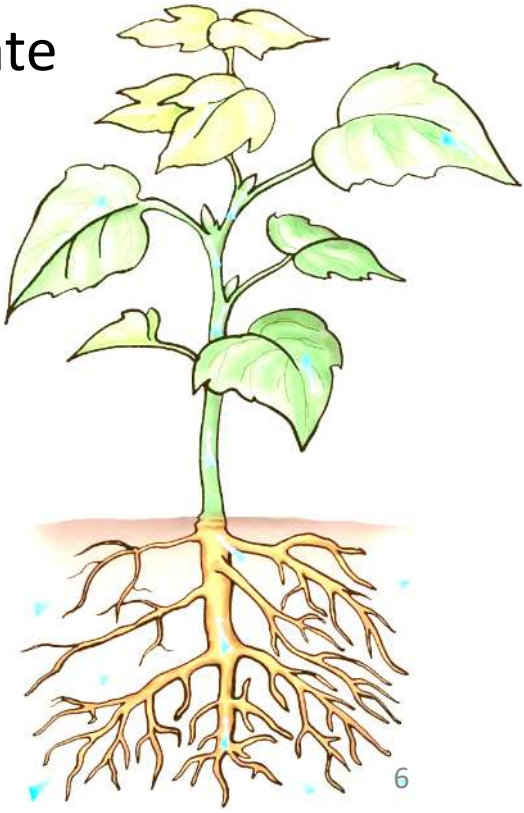
-germination bio-tests on the sand

1.2 Field experiments

Justification of the permissible level of substance

in soil, providing a safe level for human health

in agricultural plants.



1.1. Preliminary pot experiments in Petri dishes

- **The model substrate:**

- medium-grained quarry sand Ø <2 mm
- sampled from a depth of at least 3 m
- free of organic and mineral inclusions
-SOM=0%. CEC 1.5 mmol/100 g
-PM_{10}≤12%. $PM_{50\text{-}250}$=55%
-treatment with Pryanishnikov's mixture(g/kg):

0.24 NH_4NO_3 + 0.172 $CaHPO_4$ + 0.6 $MgSO_4$ + 0.344 $CaO{\times}2H_2O$ + 0.16 KCl + 0.025 $FeCl_3$

- **Plant germination test** (wheat,barley,oats,peas,cucumbers,white mustard)

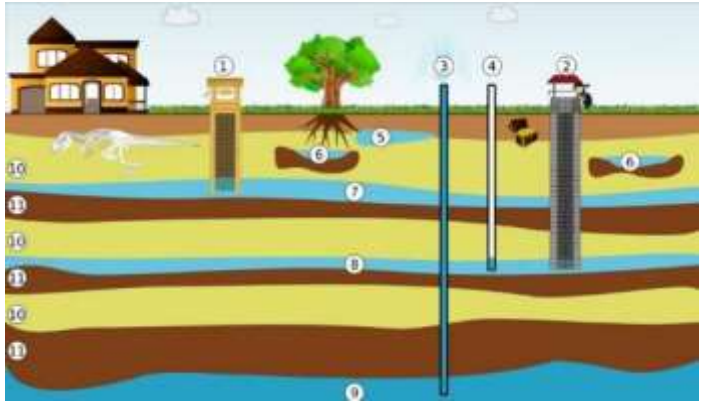
1.2. Field experiments

- **Plant species**: i. accumulators and widely represented in the diet (wheat, potatoes, carrot, beetroot, radish, peas, leafy vegetables)
- **For pesticides**: only target plants and crops that are grown after treatment
- **Calculation for marketable products**




2. Evaluation of from soil to surface water translocation in control conditions

- Filtration units or columns
- Soil layers: 0–25, 25–50, 50–75, 75–100 cm
- Duration of the experiment is 3 months
- 600 mm of water - average annual precipitation rate for the middle part of the USSR (for irrigated soils - irrigation rate)
- 20–25 ml every 5 days with a 2-day break
- Determination of substance content in every 100 ml of filtrate



3. Evaluation of from soil to air translocation in control conditions

Only for substances and their derivatives which concentration or pressure of saturated vapours in the surface air layer (T=20-50˚C) is greater than the maximal permissible concentration in atmospheric air

- If the saturated vapour pressure is known, it is calculated for temperatures of 20 and 50°C
- If the data are not available, experiment at moisture range 0–100% and temperature 20–50°C
- 0–20 cm topsoil layer

4. Ecological threshold value

Accounting for:

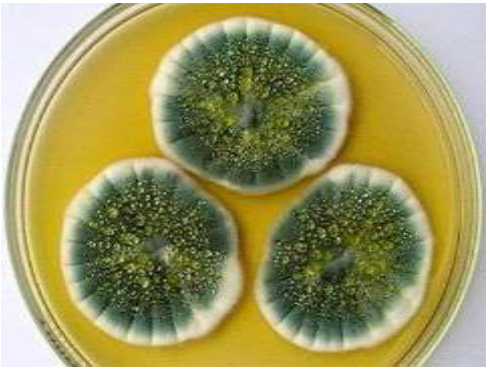
- changes in the intensity of biochemical processes:
  ammonification, nitrification and decomposition of C-containing substances
- the number of cultivated microorganisms

Stages:

4.1. preliminary screening studies

4.2. main studies.



4.1. Preliminary screening studies

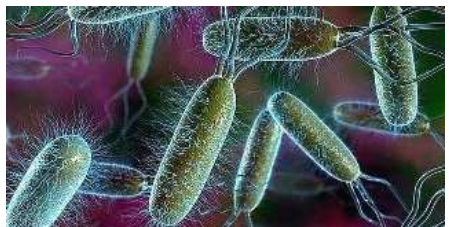
- Aqueous solution of the substance
- 3 – 5 varieties of *Escherichia coli*
- Suppression by at least 50% relative to the control
- Selection of the most sensitive microorganisms (actinomycetes, fungi, spore bacteria, etc.) for the main experiment.

4.2. The main experiment

- Control of microbiological indicators (dynamics of saprophytic bacteria, *Escherichia coli*, etc.) and biochemical (protease, cellulase, respiration (according to CO_2 level), NH_4^+ and NO_3^- content in 3, 7, 10, 14, 20, 30 days and further every 14 days.
- + additional indicators depending on the substance
- Any reliable changes in at least 2 indicators for:

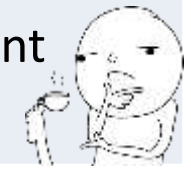
-biochemical indices >25% relative to control for >7 days

-microbiological parameters >50%



Permissible concentrations (PCs) in Russian soils (total content)

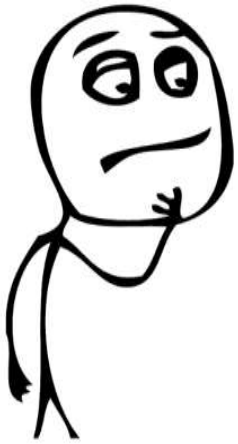
Element	MPCs, mg/kg	Estimated PCs, mg/kg			The most sensitive end point
		sandy	loamy		
			pH_{KCl}<5,5	pH_{KCl}> 5,5	
As	2	2	5	10	–
Cd	–	0,5	1	2	–
Cr^{6+}	0,05	–	–	–	soil microbiota
Cu	–	33	66	132	–
Hg	2,1	–	–	–	plants
Mn	1500	–	–	–	soil microbiota
Ni	–	20	40	80	–
Pb	32	32	65	130	–
S	160	–	–	–	soil microbiota
Sb	4,5	–	–	–	water
V	150	–	–	–	soil microbiota
Zn	–	55	110	220	–
V+Mn	100+1000	–	–	–	soil microbiota
Hg+Pb	20+1	–	–	–	plants

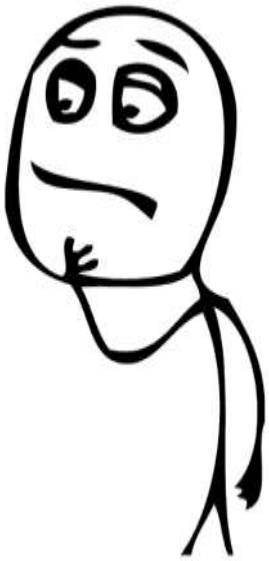


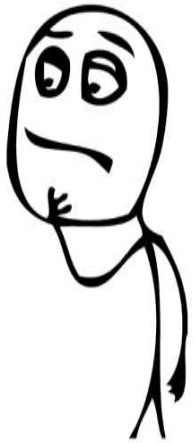
SanPiN 1.2.3685-21

Permissible concentrations (PCs) in Russian soils (mobile fraction), mg/kg

Element	PCs	Solvent	Soils
Co	5,0	AAc	all
Mn	700	0,1n H_2SO_4	Chernozems
	300	0,1n H_2SO_4	Albeluvisols, pH 4,0
	400	0,1n H_2SO_4	Albeluvisols, pH 5,1 – 5,9
	500	0,1n H_2SO_4	Albeluvisols, pH > 5,9
	140	AAc	Chernozems
	60	AAc	Albeluvisols, pH 4,0
	80	AAc	Albeluvisols, pH 5,1 – 5,9
	100	AAc	Albeluvisols, pH > 5,9
Cu	3,0	AAc	all
Ni	4,0	AAc	all
Pb	6,0	AAc	all
F	2,8	0,006n HCl (pH_{soil}<6,6) or 0,03n K_2SO_4 (pH_{soil}>6,5)	all
Cr^{3+}	6,0	AAc	all
Zn	23,0	AAc	all







SanPiN 1.2.3685-21

Chemical elements controlled in soils

Country	Total content		Mobile fraction	n
	metals	non-metals		
The Nitherlands	Ag, Ba, Be, Cd, Co, Cr, Cr^{3+}, Cr^{6+}, Cu, Hg, Mo, Ni, Pb, Sn, Te, Tl, *V*, Zn	As, Sb, Se	Cr	22
Canada	Ag, Ba, Be, Cd, Co, Cr, Cr^{6+}, Cu, Hg, Mo, Ni, Pb, Sn, Tl, U, *V*, Zn	As, B, Sb, Se	–	21
The USA	Ag, Al, Ba, Cd, Co, Cr^{3+}, Cr^{6+}, Cu, Fe, Hg, Li, **Mn**, Mo, Sn, Zr	As, Cl, F, I, Sb, Se	–	21
Australia	Ba, Be, Cd, Co, Cr^{3+}, Cr^{6+}, Cu, Hg, **Mn**, Mo, Ni, Pb, Sn, *V*, Zn	As, Sb	–	17
Czech	Be, Cd, Co, Cr, Cu, Hg, **Mn**, Ni, Pb, *V*, Zn, Tl	As	As, Cd, Cu, Ni, Pb, Tl, Zn	20
South Africa	Cd, Co, Cr^{3+}, Cr^{6+}, Cu, Hg, **Mn**, Ni, Pb, *V*, Zn	As, Cl, F	–	14
Russia	Cd, Cr^{6+}, Cu, Hg, **Mn**, Ni, Pb, *V*, Zn, ***Mn+V***, Hg+Pb	As, S, Sb	Co,Cr^{6+},Cu , F , **Mn**, Ni ,Pb, Zn	25
Finland	Cd, Co, Cr, Cu, Hg, Ni, Pb, *V*, Zn	As, Sb	–	11
Germany	Cd, Cr, Cu, Hg, Ni, Pb, Tl, Zn	As	As,Cd,Cu,Ni,Pb, Tl,Zn	16
China	Cd, Cr^{3+}, Cu, Hg, Ni, Pb, Zn	As	–	8
New Zeeland	Cd, Cr^{3+}, Cr^{6+}, Cu, Pb	As, B	–	7

Application in the Russian Federation

Specified to soils in:

-all settlements,

-agricultural lands,

-zones of sanitary protection of water supply sources,

-territories of resorts and several institutions.

Compliance is mandatory for citizens, individual entrepreneurs and legal entities.

Guarantee one health in case of control of the level of application or ingestion of substances into the soil.

Using:

-environmental impact assessment (As, Cd, Cu, Hg, Ni, Pb, Zn; 3,4- benzpyrene, TPHs in all kinds)

-reclamation of disturbed lands

-impacted lands of formal dump piles

SanPiN 1.2.3685-21

References

Legislative acts (in Russia; open access):

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Thank you for your attention!

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Food and Agriculture Organization of the United Nations

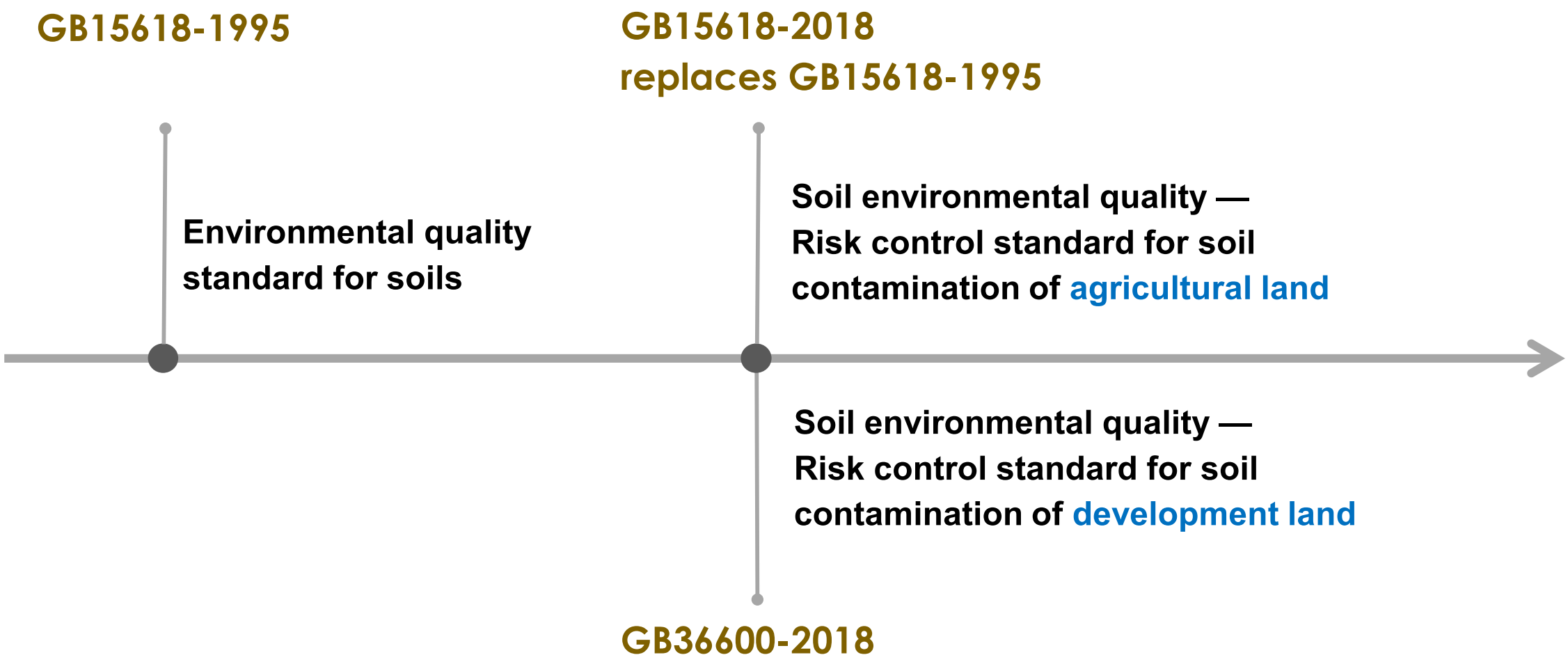
National threshold values and their application in China

Deyi Hou

October 3rd, 2024

INTERNATIONAL NETWORK ON SOIL POLLUTION
CHANNELLING COLLECTIVE ACTION TOWARDS ZERO POLLUTION

Development stages of national standard for soil contamination



Environmental quality standard for soils: GB15618-1995

UDC 631.4 : 006.83
Z 50

GB

中华人民共和国国家标准

GB 15618—1995

土 壤 环 境 质 量 标 准

Environmental quality standard for soils

1995-07-13发布　　1996-03-01实施

国家环境保护局
国家技术监督局　发布

Environmental Quality Standards (EQSs) for soils (GB15618-1995) in China were derived based on several factors:

- **Data on the soil background in China**
- **Data from soil ecological tests**
- **Data from geographically anomalous areas in China**
- **Information on soil standards or guidelines from abroad**

These EQSs set the maximum acceptable concentration of pollutants and relevant monitoring methods in the soil based on different soil functions/uses, protection targets and soil properties.

Source: Sun et al., 2019, Journal of Environmental Management

Environmental quality standard for soils: GB15618-1995

According to the soil application function and conservation objectives, three types of standard were set:

- **Type I is protective of soils in national nature reserves, centralized drinking water resources, tea plantations, pasture and other protected areas, and the goal is to basically maintain the natural background level.**
- **Type II is applicable to the soil in general farmland, land for growing vegetables, tea plantations, orchards, pasture etc., where the goal is to not cause harm and pollution to plants and the environment.**
- **Type III is applicable to woodland soil, and farmland soils near to high background soils of more pollutant capacity and mineral fields, where the goal is basically to not cause harm and pollution to plants and the environment.**

Environmental quality standard for soils: GB15618-1995

- **Soil Environmental Quality Standards**

Unit: mg/kg

Contamination			Type I	Type II			Type III
			Natural Background	pH<6.5	6.5<pH<7.5	pH>7.5	pH>6.5
Cadmium		≤	0.2	0.3	0.3	0.6	1
Mercury		≤	0.15	0.3	0.5	1	1.5
Arsenic	Paddy	≤	15	30	25	20	30
	Dry land	≤	15	40	30	25	40
Copper	Arable land	≤	35	50	100	100	400
	Orchard	≤	/	150	200	200	400
Lead		≤	35	250	300	350	500
Chromium	Paddy	≤	90	250	300	350	400
	Dry land	≤	90	150	200	250	300
Zinc		≤	100	200	250	300	500
Nickel		≤	40	40	50	60	200
Hexachlorocyclohexanes (HCHs)		≤	0.05		0.5		1
Dichlorodiphenyltrichloroethanes (DDTs)		≤	0.05		0.5		1

The switch from 1995 version to 2018 version

- GB15618-1995, which follows the framework of water and air quality standards, is insufficient for addressing the current needs of soil environmental management.
- In May 2016, the State Council issued the "Action Plan for Soil Pollution Prevention and Control", which urgently requires the revision of standards to meet the needs of soil pollution risk control.
- 20 years after the release of GB15618-1995, a new risk control standard for soil contamination of agricultural land (GB15618-2018), was issued in 22nd June 2018, to replace GB15618-1995 and to take effect on 1st August 2018
- Additionally, a risk control standard for soil contamination on development land (GB36600-2018) was issued and implemented simultaneously to safeguard human health and environmental security.

Standard for soil contamination of agricultural land: GB15618-2018

ICS 13.080
Z 64

GB

中华人民共和国国家标准

GB 15618—2018
代替 GB 15618—1995

土壤环境质量
农用地土壤污染风险管控标准
（试行）

Soil environmental quality
—Risk control standard for soil contamination of agricultural land

2018-06-22 发布　　2018-08-01 实施

生态环境部
国家市场监督管理总局　发布

Soil environmental quality — Risk control standard for soil contamination of agricultural land:

- This standard regulates the soil risk screening values and risk intervention values in agricultural land, and the requirements of monitoring, implementation and supervision.
- Exposure pathway considered: Ingestion of contaminated crops.

Agricultural land is classified into three types:

- Arable land (paddy, irrigated land, dry land)
- Garden (orchard, tea garden)
- Pasture (natural pasture and artificial pasture)
- In this standard, ‘others’ include all kinds of agricultural land except for paddy

Standard for soil contamination of agricultural land: GB15618-2018

Two sets of threshold values:

- **Risk screening value**

When the contaminant levels are equal to or below this value, the risk to the quality of agricultural products, crop growth, or soil ecological environment is considered low and generally negligible. However, if the contaminant levels exceed this value, there may be potential risks to the quality of agricultural products, crop growth, or the soil ecological environment. In such cases, it is necessary to enhance soil environment monitoring and agricultural product monitoring, and, in principle, implement safety utilization measures.

- **Risk intervention value**

When contaminant levels exceed this value, the risk of soil contamination is high, meaning that edible agricultural products do not meet quality and safety standards. In such cases, stringent control measures should be implemented as a matter of principle.

Standard for soil contamination of agricultural land: GB15618-2018

The determination of threshold values takes into account the following aspects:

• To protect the quality of agricultural products	Based on the dose-response relationships between soil contamination and crop bioaccumulation, from pot or field plot experiments, and from field survey data using species sensitivity distribution (SDD) methods.
• To protect crop growth	Based on the dose-response relationship between soil contamination and crop yield, a predictive model is established
• To protect soil microorganisms	Based on the dose-effect relationship between soil contamination and the number of soil microorganisms or the inhibition rate of biochemical indicators

Standard for soil contamination of agricultural land: GB15618-2018

- **Risk Screening Values for Soil Contamination of Agricultural Land (Basic Items)**

Unit: mg/kg

Number	Contamination		Risk screening values			
			pH≤5.5	5.5<pH≤6.5	6.5<pH≤7.5	pH>7.5
1	Cadmium	Paddy	0.3	0.4	0.6	0.8
		Others	0.3	0.3	0.3	0.6
2	Mercury	Paddy	0.5	0.5	0.6	1
		Others	1.3	1.8	2.4	3.4
3	Arsenic	Paddy	30	30	25	20
		Others	40	40	30	25
4	Lead	Paddy	80	100	140	240
		Others	70	90	120	170
5	Chromium	Paddy	250	250	300	350
		Others	150	150	200	200
6	Copper	Orchard	150	150	200	200
		Others	50	50	100	100
7	Nickel		60	70	100	190
8	Zinc		200	200	250	300

Standard for soil contamination of agricultural land: GB15618-2018

- **Risk Screening Values for Soil Contamination of Agricultural Land (Other Items)**

Unit: mg/kg

Number	Contamination	Risk screening values
1	Hexachlorocyclohexanes (HCHs)	0.1
2	Dichlorodiphenyltrichloroethanes (DDTs)	0.1
3	Benzo[a]pyrene	0.55

Standard for soil contamination of agricultural land: GB15618-2018

- **Risk Intervention Values for Soil Contamination of Agricultural Land**

Unit: mg/kg

Number	Contamination	Risk intervention values			
		pH≤5.5	5.5<pH≤6.5	6.5<pH≤7.5	pH>7.5
1	Cadmium	1.5	2.0	3.0	4.0
2	Mercury	2.0	2.5	4.0	6.0
3	Arsenic	200	150	120	100
4	Lead	400	500	700	1000
5	Chromium	800	850	1000	1300

Standard for soil contamination of development land: GB36600-2018

ICS
Z

GB

中华人民共和国国家标准

GB36600—2018

土壤环境质量
建设用地土壤污染风险管控标准
（试行）

Soil environmental quality
Risk control standard for soil contamination of development land

（发布稿）

2018-06-22 发布　　2018-08-01 实施

生　态　环　境　部
国家市场监督管理总局　　发布

Soil environmental quality —

Risk control standard for soil contamination of development land:

- **Issued in 22nd June 2018, took effect on 1st August 2018**
- **This standard regulates the soil risk screening values and risk intervention values for development land, and the requirements of monitoring, implementation and supervision.**

Standard for soil contamination of development land: GB36600-2018

Development land is divided into two categories (based on GB 50137).

Type I includes land used for:

- Residential
- Primary and secondary school
- Medical and health care
- Social welfare facility
- Community park or children's park

Type II includes land used for :

- Industrial
- Logistics and warehousing
- Commercial
- Utility
- Road and transportation facility
- Public management and public service
- Greenspaces and squares

Standard for soil contamination of development land: GB36600-2018

Two sets of threshold values:

Risk Screening Value:

- When contaminant levels are equal to or below this value, the risk to human health can be considered negligible. If the levels exceed this value, there may be potential risks to human health, and further detailed investigation and risk assessment should be conducted to determine the specific extent and level of contamination.

Risk Intervention Value:

- When contaminant levels exceed this value, there is usually an unacceptable risk to human health, and risk control or remediation measures should be implemented.

Standard for soil contamination of development land: GB36600-2018

Main exposure pathways considered:

- Oral ingestion of soil
- Skin contact with soil
- Inhalation of soil particulate matter
- Inhalation of gaseous pollutants from surficial soil in outdoor air
- Inhalation of gaseous pollutants from the subsoil soil in the outdoor air
- Inhalation of gaseous pollutants from the subsoil soil in the indoor air

Standard for soil contamination of development land: GB36600-2018

- **Risk Screening Values and Intervention Values for Soil Contamination of Development Land**

Unit: mg/kg

Number	Contamination	CAS Number	Screening Values		Intervention Values	
			Type I Land	Type II Land	Type I Land	Type II Land
Metal(loid)s						
1	Arsenic	7440-38-2	20	60	120	140
2	Cadmium	7440-43-9	20	65	47	172
3	Chromium (VI)	18540-29-9	3.0	5.7	30	78
4	Copper	7440-50-8	2000	18000	8000	36000
5	Lead	7439-92-1	400	800	800	2500
6	Mercury	7439-97-6	8	38	33	82
7	Nickel	7440-02-0	150	900	600	2000

Standard for soil contamination of development land: GB36600-2018

- **Risk Screening Values and Intervention Values for Soil Contamination of Development Land**

Unit: mg/kg

Number	Contamination	CAS Number	Screening Values		Intervention Values	
			Type I Land	Type II Land	Type I Land	Type II Land
VOCs						
8	tetrachloromethane	56-23-5	0.9	2.8	9	36
9	chloroform	67-66-3	0.3	0.9	5	10
10	chloromethane	74-87-3	12	37	21	120
11	1,1-dichloroethane	75-34-3	3	9	20	100
12	1,2-dichloroethane	107-06-2	0.52	5	6	21
13	1,1-dichloroethene	75-35-4	12	66	40	200
14	(Z)-1,2-dichloroethene	156-59-2	66	596	200	2000
15	(Z)-1,2-dichloroethene	156-60-5	10	54	31	163
16	dichloromethane	75-09-2	94	616	300	2000
17	1,2-dichloropropane	78-87-5	1	5	5	47
18	1,1,1,2-tetrachloroethane	630-20-6	2.6	10	26	100
19	1,1,2,2-tetrachloroethane	79-34-5	1.6	6.8	14	50
20	tetrachloroethylene	127-18-4	11	53	34	183

Standard for soil contamination of development land: GB36600-2018

- **Risk Screening Values and Intervention Values for Soil Contamination of Development Land**

Unit: mg/kg

Number	Contamination	CAS Number	Screening Values		Intervention Values	
			Type I Land	Type II Land	Type I Land	Type II Land
		VOCs				
21	1,1,1-trichloroethane	71-55-6	701	840	840	840
22	1,1,2-trichloroethane	79-00-5	0.6	2.8	5	15
23	1,1,2-trichloroethene	79-01-6	0.7	2.8	7	20
24	1,2,3-trichloropropane	96-18-4	0.05	0.5	0.5	5
25	chloroethene	75-01-4	0.12	0.43	1.2	4.3
26	benzene	71-43-2	1	4	10	40
27	chlorobenzene	108-90-7	68	270	200	1000
28	1,2-dichlorobenzene	95-50-1	560	560	560	560
29	1,4-dichlorobenzene	106-46-7	5.6	20	56	200
30	ethylbenzene	100-41-4	7.2	28	72	280
31	styrene	100-42-5	1290	1290	1290	1290
32	toluene	108-88-3	1200	1200	1200	1200
33	1,3-xylene +1,4-xylene	108-38-3,106-42-3	163	570	500	570
34	1,2-xylene	95-47-6	222	640	640	640

Standard for soil contamination of development land: GB36600-2018

- **Risk Screening Values and Intervention Values for Soil Contamination of Development Land**

Unit: mg/kg

Number	Contamination	CAS Number	Screening Values		Intervention Values	
			Type I Land	Type II Land	Type I Land	Type II Land
		SVOCs				
35	nitrobenzene	98-95-3	34	76	190	760
36	aniline	62-53-3	92	260	211	663
37	2-chlorophenol	95-57-8	250	2256	500	4500
38	benzo[a]anthracene	56-55-3	5.5	15	55	151
39	benzo[a]pyrene	50-32-8	0.55	1.5	5.5	15
40	benzo[b]fluoranthene	205-99-2	5.5	15	55	151
41	benzo[k]fluoranthene	207-08-9	55	151	550	1500
42	chrysene	218-01-9	490	1293	4900	12900
43	dibenz[a,h]anthracene	53-70-3	0.55	1.5	5.5	15
44	indeno[1,2,3-cd]pyrene	193-39-5	5.5	15	55	151
45	naphthalene	91-20-3	25	70	255	700

Take home message

1. GB15618-2018: Agricultural land; GB36600-2018: Development land

2. Two sets of thresholds for both standards: risk screening and risk intervention values

3. Exposure pathways considered in GB15618-2018: ingestion of contaminated crop

4. Exposure pathways considered in GB36600-2018: oral ingestion, skin contact, inhalation (including soil particles and gaseous contaminants)


Thank you!
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