

# **PFAS in Soil –** Comparative Study of Strategies for Management of PFAS in Soil

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*PFAS Management Strategies in the United States, European Union and  
Australia*

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# Agenda

## Introduction:

- PFAS in soil in Denmark –  
What are the challenges?

## Comparative study:

- How are other countries handling PFAS in soil

## Conclusion:

- 13 ideas on how to handle PFAS contamination in soil





# **PFAS in soil in Denmark**

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## **What are the challenges?**

# Situation in Denmark

- LOW QUALITY CRITERIAS FOR PFAS4 ARE CHALLENGING
- THE SOIL QUALITY CRITERIA DO NOT PROTECT GROUNDWATER
- A DIFFUSE LEVEL OF PFAS IN SOIL IS ESPECTED (BUT IT IS NOT YET INVESTIGATED)
- THERE ARE NO FACILITIES TO HANDLE OR REMEDIATE PFAS IN SOIL ON A LARGER SCALE
- CONSTRUCTION PROJECTS STOP IF PFAS IS DETECTED IN THE SOIL

	PFAS22	PFAS4
Soil Quality Criteria	0,4 mg/kg	0,01 mg/kg
Groundwater Quality Criteria	100 ng/l	2 ng/l





# Comparative study

How are other countries handling PFAS  
in soil?

# Comparative Study

CARRIED OUT BY WSP DENMARK IN  
COOPERATION WITH THE MUNICIPALITY OF  
ROSKILDE.

FUNDED AND PUBLISHED BY DANISH EPA.

CARRIED OUT JAN-APRIL 2024

SURVEY OF LITTERATURE FROM OTHER  
COUNTRIES, EG REPORTS, WEBPAGES.



## PFAS I JORD International screening af andre landes praksis for håndtering af jord med PFAS

LINK TO REPORT:  
[PFAS i jord \(mst.dk\)](https://mst.dk)

## **Comparative Study**

**THE PURPOSE OF THE PROJECT WAS TO CONDUCT A COMPARATIVE STUDY OF HOW OTHER COUNTRIES ARE HANDLING PFAS IN SOIL.**

**THE PROJECT EXPLORED OTHER COUNTRIES CONCEPTS FOR SOIL QUALITY CRITERIAS AND THEIR STRATEGIES FOR MANAGING PFAS IN SOIL.**

**BASED ON THIS INFORMATION, THE PROJECT HAS DERIVED 13 IDEAS FOR MANAGING PFAS IN SOIL IN DENMARK.**

# Countries

	Flandern	Netherland	Germany	Sweden	Norway	Australia	Canada	United States	Schwitzerland	Italy
Soil Quality Criteria for PFAS	X	X	X	X	X	X	X	X	X	X
Strategi and guidance for handling of soil with PFAS	X	X	X			X				

Finland has conducted survey of PFAS in soil and England has made soil screening values



# All countries face a huge PFAS Challenge

## How to balance the risk of PFAS?



- **ELIMINATING AND AVOIDING PFAS**
- **LANDFILLING OF SOIL SHOULD BE AVOIDED.**

**REUSE OF SOIL WITH PFAS MUST NOT LEAD TO AN UNACCEPTABLE RISK TO HUMAN HEALTH AND ENVIRONMENT**

**PFAS HAS BEEN WIDE SPREAD IN THE ENVIRONMENT.**

**A HIGH DEGREE OF LEACHIBILITY FROM SOIL TO GROUNDWATER / SURFACE WATER.**

# Soil quality criterias – Frameworks

DIFFICULT TO COMPARE BETWEEN COUNTRIES

MANY EXPOSURE PATHWAYS.

- SOIL CONTACT, LIVESTOCK AND PLANT UPTAKE, GROUNDWATER, SURFACE WATER, ECOSYSTEMS
- IN DENMARK SOIL QUALITY CRITERIAS ARE BASED ONLY SOIL CONTACT.

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	Jordkontakt	Optag I fødevarer	Grundvand	Overfladevand	Økosystemer
Flandern	X		X	X	X
Nederlandene	X				X
Tyskland			X		
Sverige	X	X	X	X	X
Norge	X		X	X	X
Australien	X	X			X
Canada	X	X	X	X	X
USA	X	X	X		

# Reuse of soil with PFAS - Frameworks

WHAT TO DO,

WHEN PFAS POTENTIALLY CAN BE FOUND EVERYWHERE.



**WE NEED A SOIL QUALITY CRITERIA FOR FREE USE**

**A NO RISC VALUE (NORWAY)**

**A VALUE FOR THE FREE USE OF SOILS (FLANDERN, NETHERLAND)**

**REUSE OF SOIL WITHIN SPECIFIC AREAS**

**A SOIL QUALITY MAP (NETHERLAND)**

**LEACHING TEST INSTEAD OF SOIL SAMPLES?**

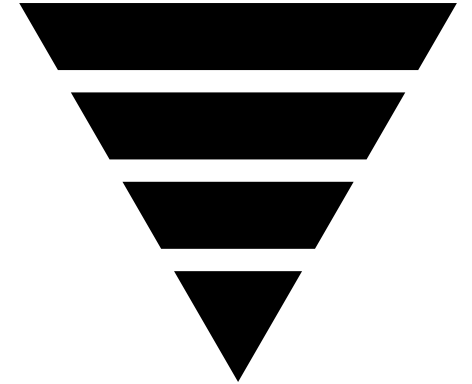
**USE OF LEACHING TEST TO EVALUATE POSSIBILITIES OF REUSE (GERMANY)**

# How to treat PFAS in soil?

## AUSTRALIA – MANAGEMENT PLAN

### HIERARCHY FOR PFAS TREATMENT

1. SEPARATION, TREATMENT AND DESTRUCTION
2. ON-SITE ENCAPSULATION
3. OFF-SITE REMOVAL TO A SPECIFIC LANDFILL  
CELL



DECISION TREE FOR REUSE OF PFAS IN SOIL (AUSTRALIA)

LANDFILLING ON SPECIAL DESIGNED LANDFILL (NORWAY)

**Conclusion:  
13 ideas on how to handle PFAS  
contamination in soil**





## 7 ideas targeting soil quality criteria for PFAS

Inclusion of multiple exposure pathways in the soil quality criteria

Inclusion of the soil's protective level into the soil quality criteria

Establishment of a reference value for PFAS in soil where there is no risk

Determination of a level for diffuse PFAS contamination in soil

Differentiated soil quality criteria based on land use

Use of PFOA-equivalents in soil quality criteria

Development of a soil quality criterion for the sum of PFAS

## 6 ideas targeting handling of PFAS in soil

**Action plan for PFAS in soil**

**Use of Leaching test**

**Soil quality maps of PFAS**

**Guidelines for temporary storage**

**Guidelines for reuse**

**Design of special units at landfills for PFAS contaminated soil**

**Exchanging  
knowledge  
between  
countries helps  
us move  
forward!**

**Thank you for  
your attention!**

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