



# Contaminated Soil in Gardens

How to avoid the harmful effects

## EUROPEAN HEALTH21 TARGET 11 HEALTHIER LIVING

By the year 2015, people across society should have adopted healthier patterns of living  
(Adopted by the WHO Regional Committee for Europe at its forty-eighth session, Copenhagen, September 1998)

### Abstract

In many cities, gardens are located on old, abandoned landfills and dumping sites. Cities have expanded by filling up spaces around the city with garbage, rubble and earth. The places where old landfills were have often become gardens where citizens can get away and enjoy the open air away from the noise and racket of cities. Normal garbage and rubble in landfills do not present a problem, however industrial and chemical waste can present a health hazard, especially when concentrations of contaminants are above acceptable limits. Some special precautions are proposed in this booklet so that the potential ill effects of contaminated soil can be avoided.

### Keywords

SOIL POLLUTANTS  
RISK MANAGEMENT  
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## The soil is contaminated – what then?



There are many garden sites located on old, abandoned landfills and dumping sites. If your garden is located on one of them, you have probably found old pottery and other waste frequently when you dig in your garden.

This is the situation in many cities. Cities have expanded by filling up spaces around the city with garbage, rubble and earth. The places where old landfills were often become gardens. This is where citizens can get away and enjoy the open air away from the noise and racket of cities.

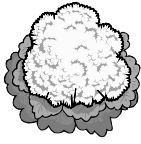
Fortunately many of these gardens still exist, and thousands of garden owners have a pleasant place of refuge. This is unique for large cities and something that should be protected. Normal garbage and rubble in landfills do not present a big problem. Neither is the soil that has been transported away from excavation sites. It is the industrial and chemical waste that gives problems.

Nowadays we know much more about soil contamination in gardens located on abandoned landfills. Some environmental protection agencies have tested soil and found concentrations of contaminants far above what should be in soil.

Some special precautions are proposed, because not enough is known about the long-term effects, especially, because we are subjected to pollutants from many sources. We do not know what the risk is of being in contact with contaminated soil over a long period of time either by working in the garden or eating fruits and vegetables grown in contaminated soil.

Therefore some simple advice is provided in this brochure. If followed, the potential ill effects of contaminated soil can be avoided.

## What is in the ground under us?



Ground can be contaminated by landfills, gasworks or other polluting activities that existed previously.

Some landfills date back to the 1800s. Waste in these dumps was usually spread randomly and this means that some places are very contaminated and others less so.

Dumped industrial waste used to contain heavy metals as well as petroleum and tars. The oil has usually disintegrated so generally only small amounts of oil in the soil are found.

Tars decompose very slowly and are still found in soil after many years. Tars have been found in many allotment gardens. Heavy metals – among these lead and cadmium – do not disintegrate and so remain in the soil. Therefore these contaminants do not disappear.

Contaminants have been found both on the surface and down to half a meter deep. Soil is not stationary and is mixed when you dig. This means, that even though you put compost on top of the soil, it is likely that the topsoil will become contaminated.



## How harmful substances may affect the body

- **Lead** is particularly harmful to the brain and nervous system, and children are especially vulnerable. Abnormally high blood levels of lead have been found in children who have been exposed to their parents work clothes (parents that, for example, work in industrial factories where lead is used). We consume some lead through the food we normally eat. Furthermore, soil close to roads with heavy traffic is contaminated with lead. Experiments have shown a relationship between increased levels of lead in the blood and reduced intellectual development.

- **Cadmium** can cause kidney damage and damage to lung and bone tissue. Cadmium is most likely to accumulate in vegetables. We do get some cadmium through the food we eat, and smoking contributes to accumulation of cadmium in the body. Smokers have twice as much cadmium in their bodies compared to nonsmokers.
- **Tars** can harm the skin in the form of irritation, rashes, sensitivity and skin cancer. The harmful effects were originally documented in chimney sweeps who were exposed to soot daily.

**People may be exposed to these substances if their gardens are contaminated and they:**

- consume soil or dust
- have direct skin contact with soil if they get soil on their hands and feet
- eat vegetables grown in contaminated soil

## How to reduce the risk



Nobody can completely avoid pollution. Many contaminants in soils are found in other places in our surroundings for example in

food, cigarette smoke, paint, textiles, plastics and in the air.

Science has enabled us to better analyse substances that damage health and determine whether sickness or other ill effects are due to contaminants. Often it is not possible to predict the effect that small doses of contaminants substances may have on people over time.

It is therefore advisable to be careful when handling contaminated soil, especially with small children because they often get soil on their hands and in their mouths. Fruit and vegetables may also pose a problem if they are not washed or peeled before eating.

Exactly how contaminants are absorbed into the body is not clear but we do know they can be absorbed, some more so than others. If possible, vegetables should be grown in uncontaminated soil. It is important to emphasize that children should not eat vegetables grown in contaminated soil since they are more vulnerable.

**Following the guidelines in this booklet will help reduce the risks in the long run.**

The predominant contaminants found in gardens built on old dump sites are lead, cadmium and

tars. Damage caused by these substances is known largely from accidents and carelessness with these contaminants, for example poor working conditions in the past.

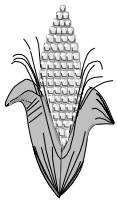
Increased levels of illness have not been observed in people living on contaminated land. But this does not rule out the possibility of ill effects, which may be undetectable using current analytical methods. The impact from contaminated soil can be difficult to separate from other types of pollution or contaminants that we are exposed to in our daily lives.

There is evidence from a few surveys that small children, living on contaminated land, can have small amounts of harmful substances in their bodies, probably because they put soil in their mouths when playing outside.

Environment and health officials have established soil quality criteria including an upper limit for how much contamination is permissible in soil. These limits are established with a certain safety margin, from the knowledge of how much soil children eat, how much they acquire in other ways and how much of the contaminants can be tolerated.

Soil contamination levels in some areas which are located on old dumping sites far exceed accepted limits. In these areas, assessments need to be carried out to find out what should be done to prevent possible harm.

## The best way to garden



Vegetables can be grown in raised beds with clean soil.

Raised beds can be built with uncontaminated soil or vegetables can be grown in plant pots or bags of clean soil.

A raised bed is in principle a wooden frame, filled with about half a meter of soil. To avoid the new clean soil becoming contaminated with the underlying soil, a special net should be placed at the bottom of the raised bed. This special net allows both rainwater and worms through.

In the rest of the garden soil should be covered (see below). This helps to prevent spreading contaminated soil and dust and reduces the risk of children getting soil on their hands and feet.

Grass can be grown or tiles laid where foot traffic is heavy in order to cover contaminated garden soil. Flower beds can be planted with plants which cover exposed soil or the soil can be covered with mulching, compost, bark, etc, particularly if children play in the garden.





***Can I still eat fruit and berries from my garden?***

Yes, but peel fruits and wash berries, and do not let children eat unpeeled or unwashed fruit.

***Do I really have to peel my new potatoes?***

No, not if they are grown in a raised bed.

***Can I move plants to the raised beds?***

No, keep the uncontaminated soil separate from the contaminated. Only grow vegetables in the raised beds. Ornamental plants do just as well in the contaminated soil.

***Can I still compost?***

Yes, you can make compost out of garden refuse from the raised beds and from sorted kitchen waste.

## Questions and answers



***Should I wear gloves, when I work the raised beds?***

No, you don't have to, but it is a good idea to always wear gloves when you work in the garden.

***What do I do, when my gloves are wet and soiled?***

Change them. It is a good idea to have several pairs in use.

If you have cuts or sores, be especially attentive to avoiding any direct contact with soil.



## How to avoid contact with soil



Gloves should always be used in order to avoid direct contact with soil. Take care that gloves are fully intact, dry and clean – otherwise they do not offer much protection for hands.

Soil should be thoroughly shaken off clothes and footwear, so that contaminated soil is not taken inside the home.

Hands should be washed thoroughly, when finished.

## How to avoid bringing soil inside the home



If soil is covered with grass, tiles, flower beds, etc., most of the risk of bringing soil into the home is eliminated. This saves a lot of extra cleaning.

A doormat or brush for footwear should be placed at the door and shoes removed before coming inside.

Hands should always be washed after garden work.



## Questions and answers



### ***Is dust indoors a problem?***

Yes, because the dust also contains contaminating substances from the soil. This is why soil should be removed from clothes and footwear before coming inside.

### ***What about carpets?***

Carpet and rugs gather dust, so a floor that can be washed is better. Otherwise vacuum carpets regularly.

### ***What do I do, if my dog takes soil in?***

Sweep it up or vacuum, before it spreads too much.

If you cover the soil in your flower beds, you can reduce the risk of a dog taking soil inside.

### ***Can children go barefoot?***

Yes, but keep them on the grass and tiles, so that they are not exposed to the soil.

### ***Can children help with the garden work?***

Yes, but only work with the raised beds, where the soil is uncontaminated.

### ***May children eat vegetables, fruits and berries from the garden?***

Yes, but only those grown in uncontaminated soil. If you have old fruit trees and berry bushes, you ought to avoid that children eat these fruits and berries.

### ***What do I do if my child has eaten soil?***

Nothing, except wash the child's mouth thoroughly. There is unlikely to be any acute adverse health effect.

## How to take special precautions with children



Children are especially vulnerable to contaminants. In part, because their bodies cannot tolerate as much, and partially because of increased exposure when playing in the garden.

Most small children get soil in their mouths. This is natural for children; they examine things by putting them in their mouth. Some children also like to eat soil.

Instead of letting children play in parts of the garden where they may be at increased risk, make a sand box for them with a solid bottom and change the sand regularly, around once a year. Teach the older children that they should not play with soil – for example, it is not a very good idea to make mud cakes, even though it is fun.

Children should get into the habit of washing their hands often especially before eating and when they come in from the garden. Children should be supervised when playing in gardens where there is contaminated soil.

All public places should be safe, so that it is unlikely to come in contact with contaminated soils.

## **Acknowledgements**

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**Follow these five simple precautions so that you can avoid ill effects.**



**Organize your garden, so that there is no exposed contaminated soil.**

**Only grow vegetables in uncontaminated soil.**

**Avoid coming in direct contact with contaminated soil.**

**Keep things clean and tidy both inside and out.**

**Keep an eye on children, so that they don't play with contaminated soil.**

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