



Soil

- > In Switzerland the amount of plastics entering the soil is much higher than that in the water and air. Because plastics hardly decompose, remaining there for a long period.
- > It can be assumed that microplastics can be found in soils across Switzerland.
- > The most significant sources of plastics in the soil are tyre abrasion, littering and compost from biowaste contaminated with plastics.

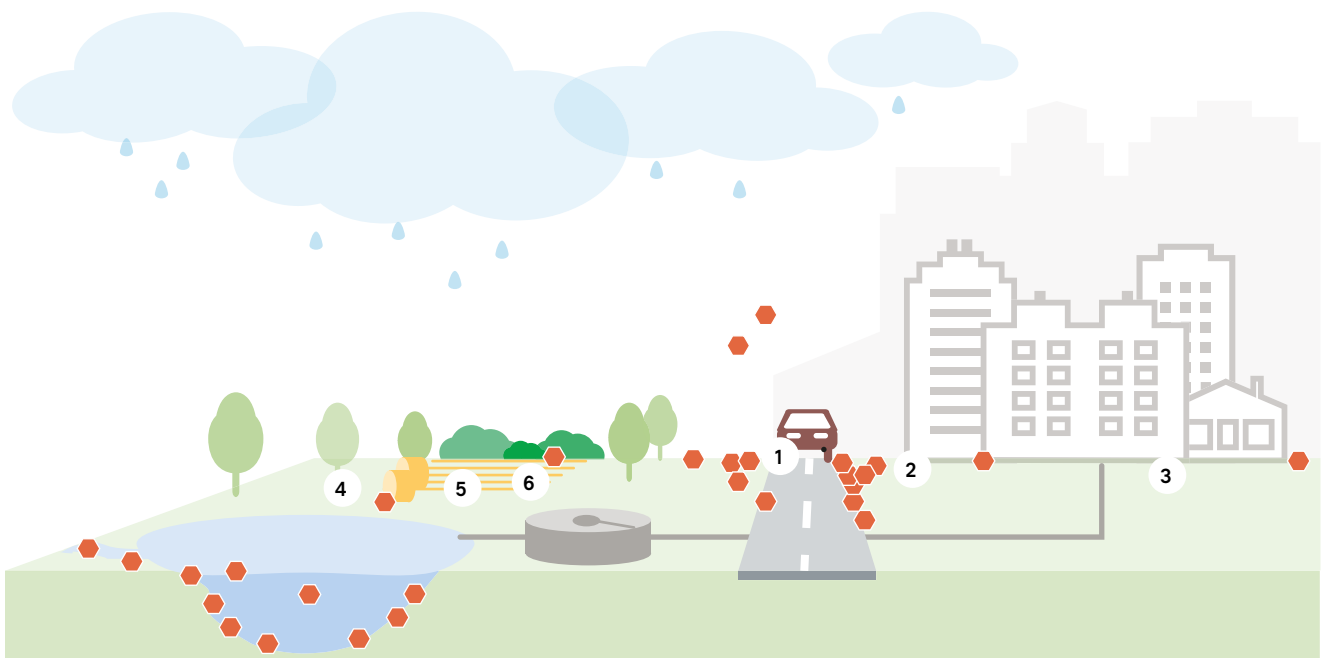
How plastics enter the soil

Firstly, plastics reach the surface of soil or penetrate soil directly, e.g. as a result of littering, the decomposition of plastic films from agriculture or the construction industry or the application of compost or digestate contaminated with plastics on agricultural land (see “Plastics in bio-waste collections” factsheet). However, indirect input such as rainwater which washes contaminants from roads into soils is also important. Furthermore, plastics can be carried over short or long distances by winds or waters before entering the soil.

A model calculation¹ of the seven most used types of plastic in Switzerland estimates the annual input of plastics on and into the soil at around 4,400 tonnes (macro) and around 600 tonnes (micro). In addition, according to a follow-up study², around 6,000 tonnes of tyre abrasion particles are introduced into the road embankments and 300 tonnes onto other soil every year. Plastic input into soil far exceeds that into watercourses (see “Rivers and lakes” factsheet).

Important sources of plastics in soil

1. **Roads:** tyre abrasion, but also other sources such as abrasion of road markings; 2. **Littering;** 3. **Other plastics that are improperly disposed of** (e.g. plastic bags in compost collections); 4. **Application of compost and digestate contaminated with plastics;** 5. **Fragments of plastic materials** (e.g. plastic films from the construction industry or agriculture); 6. **Plastic films which become weathered and are ploughed under.**



Behaviour and impact of plastics in soil

Once in the soil, plastics are essentially immobile and degrade slowly into microplastics. Because they are hardly decomposed, according to estimates, plastics will remain in the soil for up to several centuries and accumulate.

Plastics may harm living organisms, e.g. by damaging the gastrointestinal tract or through poisoning. Declining growth rates and inflammations of the intestine caused by microplastics have been documented in earthworms. The effects on soil-dwelling organisms measured to date have, however, been conducted under laboratory conditions rather than under environmental conditions, since it is still difficult to measure plastic levels in soil. Whether the levels of plastic in soil have an adverse impact on animals and whether the type of plastic has an influence still need to be researched. In addition, research needs to

be conducted into whether microplastics are absorbed by plants, including crop plants, the effect that microplastics have on plants and soil fertility and whether people can absorb microplastics by consuming crop plants (see *"Humans and animals" factsheet*).

Possible measures to reduce plastic pollution

There are already measures in place which reduce the level of plastic entering the soil (e.g. street cleaning). The application of effluent sludge as fertiliser is prohibited in Switzerland, so this does not constitute a pathway. Furthermore, since 2016 more stringent limits have applied to plastic contamination in compost and digestate. Plastic waste should also be disposed of in an environmentally friendly manner and should not be left to lie around. In some cases, however, it is difficult to reduce it and action has to be taken at source. The key measures are:

Sources and pathways for soil	Measures to reduce input
Littering on and into soil	<ul style="list-style-type: none"> • Dispose of litter properly • Combat littering actively • Clean public spaces
Abrasion of brakes, tyres and road markings	<ul style="list-style-type: none"> • Use low-abrasion brake pads, tyres and road markings • Lightweight cars, correct tyre pressure, narrow tyres, regenerative braking • Drive smoothly (avoiding stop-and-go)
Collected biowaste contaminated with plastics	<ul style="list-style-type: none"> • Improve quality of biowaste collection (e.g. better sorting) • No plastic waste intentionally or inadvertently disposed of in biowaste for collection, including not using allegedly degradable plastic bags
Plastic films being ploughed under in agriculture	<ul style="list-style-type: none"> • Do not plough agricultural films under • Encourage recycling of plastic films • Care should also be taken with allegedly degradable agricultural films

1 Press release Empa, 12.07.2019: Model calculation of plastics in Switzerland

2 Press release Empa, 14.11.2019: Model calculation of tyre abrasion in Switzerland

Further information

- FOEN information for specialists on littering (in German, French and Italian)
- FOEN information for specialists on transport policy and spatial planning (in German, French and Italian)