CAUSES OF SOIL POLLUTION

AAUE1003 SOIL POLLUTION
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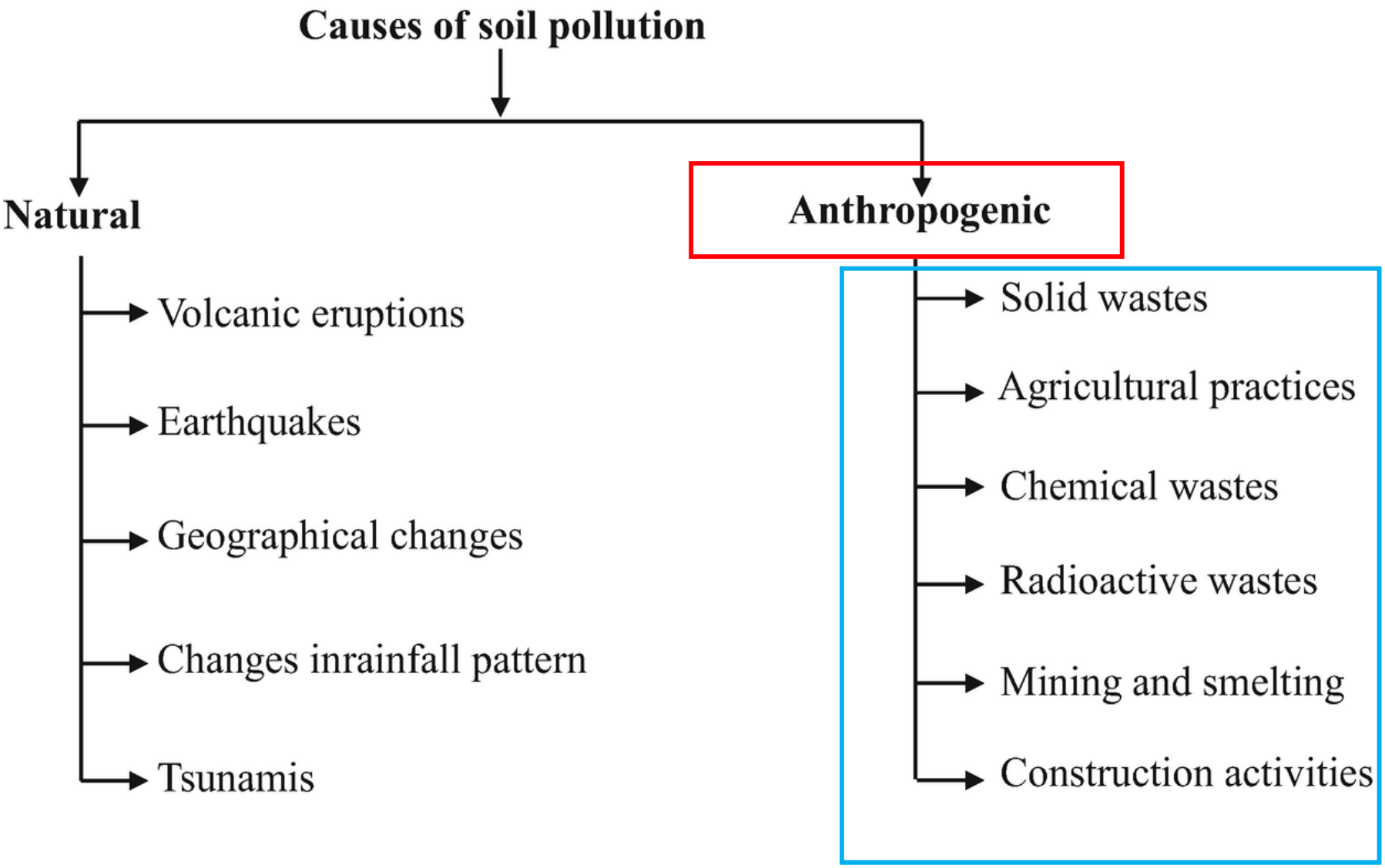
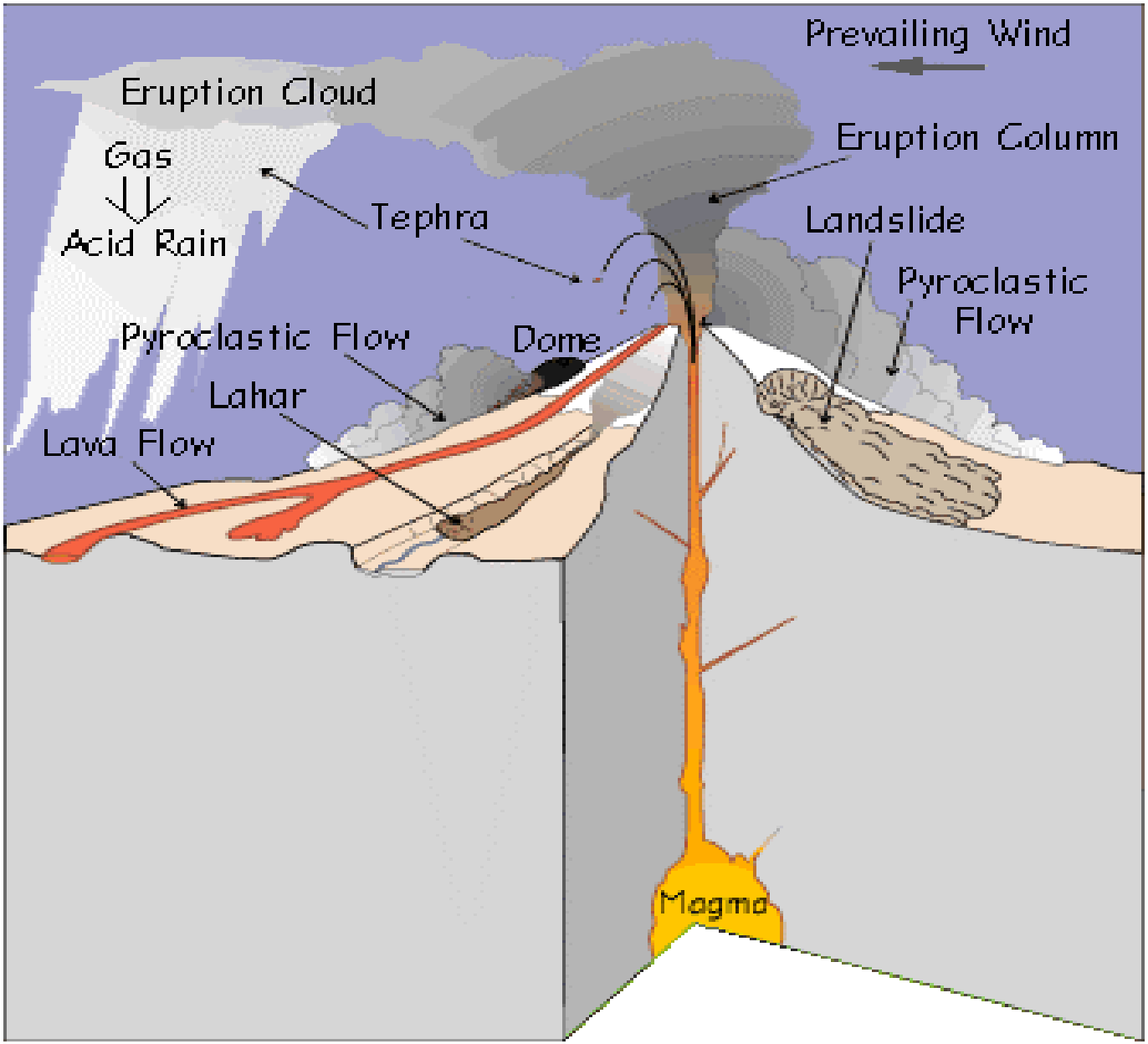

Causes of soil pollution
Natural
Volcanic eruptions
Earthquakes
Geographical changes
Changes inrainfall pattern
Tsunamis
Anthropogenic
Solid wastes
Agricultural practices
Chemical wastes
Radioactive wastes
Mining and smelting
Construction activities

VOLCANIC POLLUTION



LAVA CONTAINS MANY HEAVY METALS!

GLOWING LAVA FIELD IN THE TWILIGHT "After several days waiting for good flying weather, I got my OK and went on the helicopter. I was incredibly lucky to have both a spectacular pink sunset and a new, red-hot lava formation in the foreground. I must have driven the helicopter pilot crazy going over this segment again and again, but in the end, I got what I wanted!" says Erez about this stunning photo. Photo/Erez Marom

SO_4 and CO_2 EMISSIONS DUE TO VOLCANOS

EARTHQUAKE (tsunami) POLLUTION

‘’..About 1m tons of debris was still lingering in the Pacific Ocean four years after a magnitude 9.0 earthquake – the most powerful ever recorded in Japan – set off a series of massive tsunami waves that devastated a wide swath of Honshu’s Pacific coastline and killed nearly 20,000 people…”

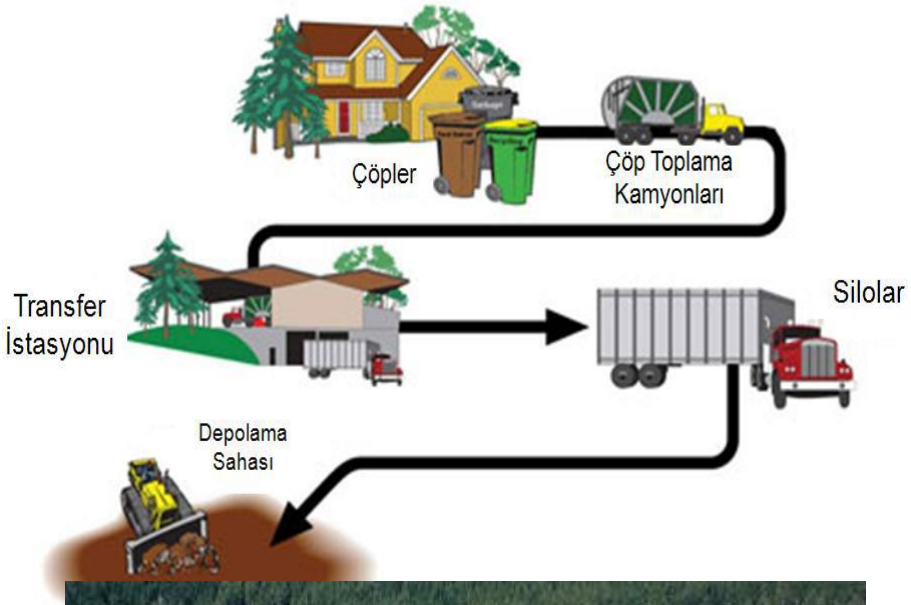
SOLID WASTES

Unwanted solid materials (i.e. garbage, paper, plastics and other synthetic materials, metals, and wood). They are generated in public places such as factories, companies, hotels and schools.

Biodegradable wastes can be decomposed naturally is (plant and animal residues and leftover food)

Non-biodegradable wastes cannot be broken down naturally and ruin the natural nutrient and water cycles if contaminated and accumulated in the nature

Municipal waste disposal in landfills and incineration are the two most common systems used in waste management…

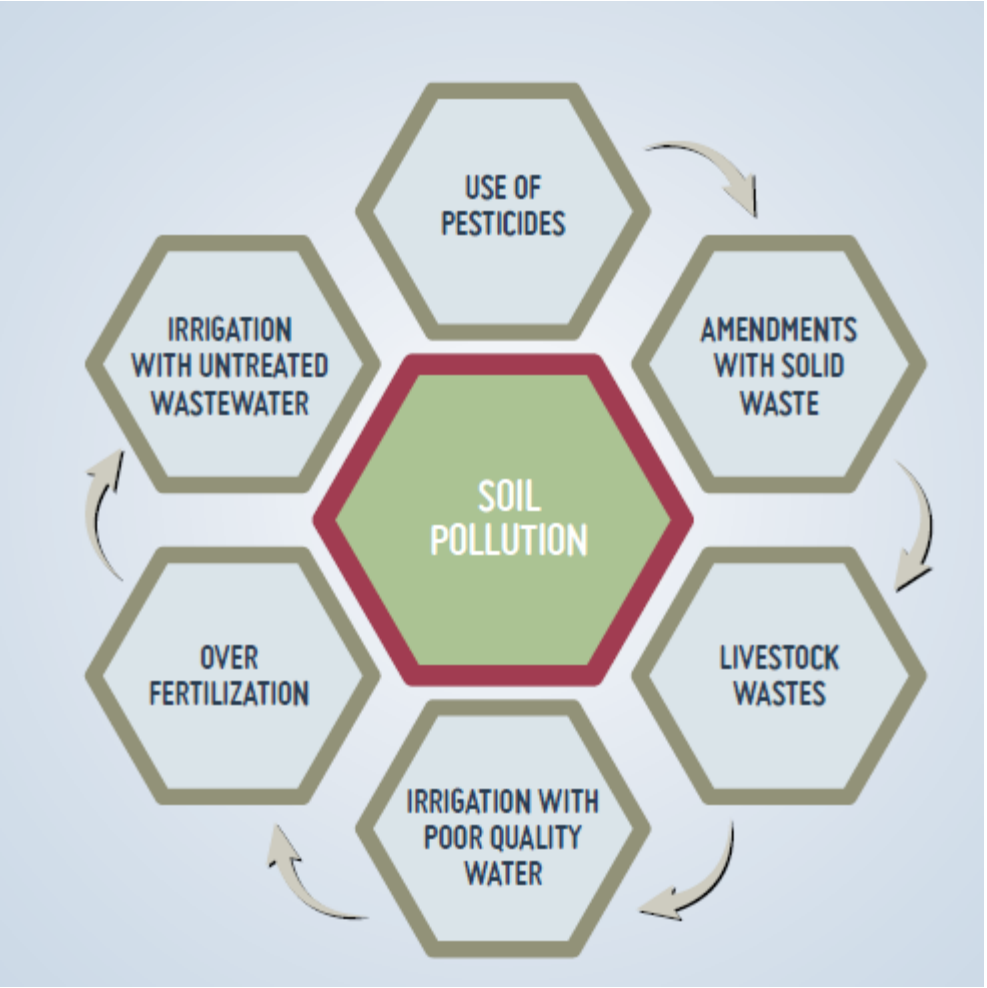


Many pollutants, such as heavy metals, polyaromatic hydrocarbons, pharmaceutical compounds, personal care products accumulate in the surrounding soil environments, either directly from landfill leachates that may be polluting soil and under groundwater, or by ash fallout from incinerating plants.

WILD STORING

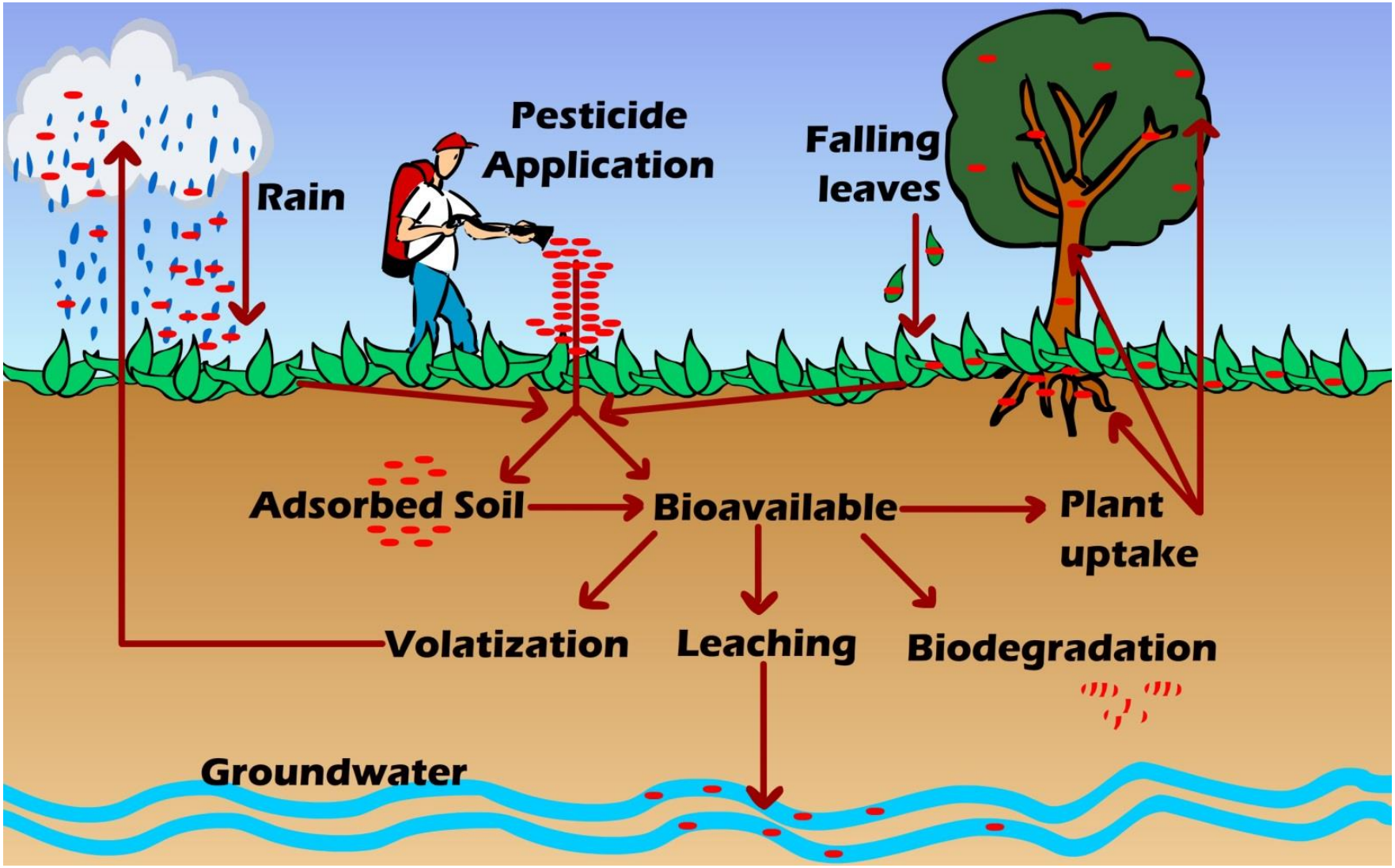
AGRICULTURAL PRACTICES

Agricultural wastes are produced as a result of various agricultural activities including cattle and poultry manure applications, fertilization, irrigation

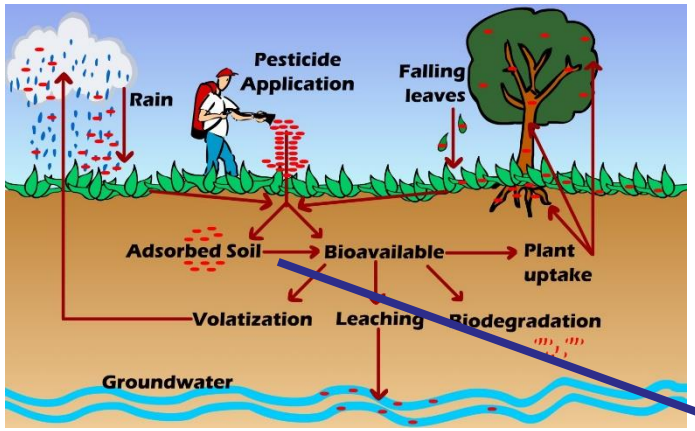


Rodríguez-Eugenio N, McLaughlin M, Pennock D (2018) Soil Pollution: a hidden reality.

FATES of PEST RESIDUES IN NATURE

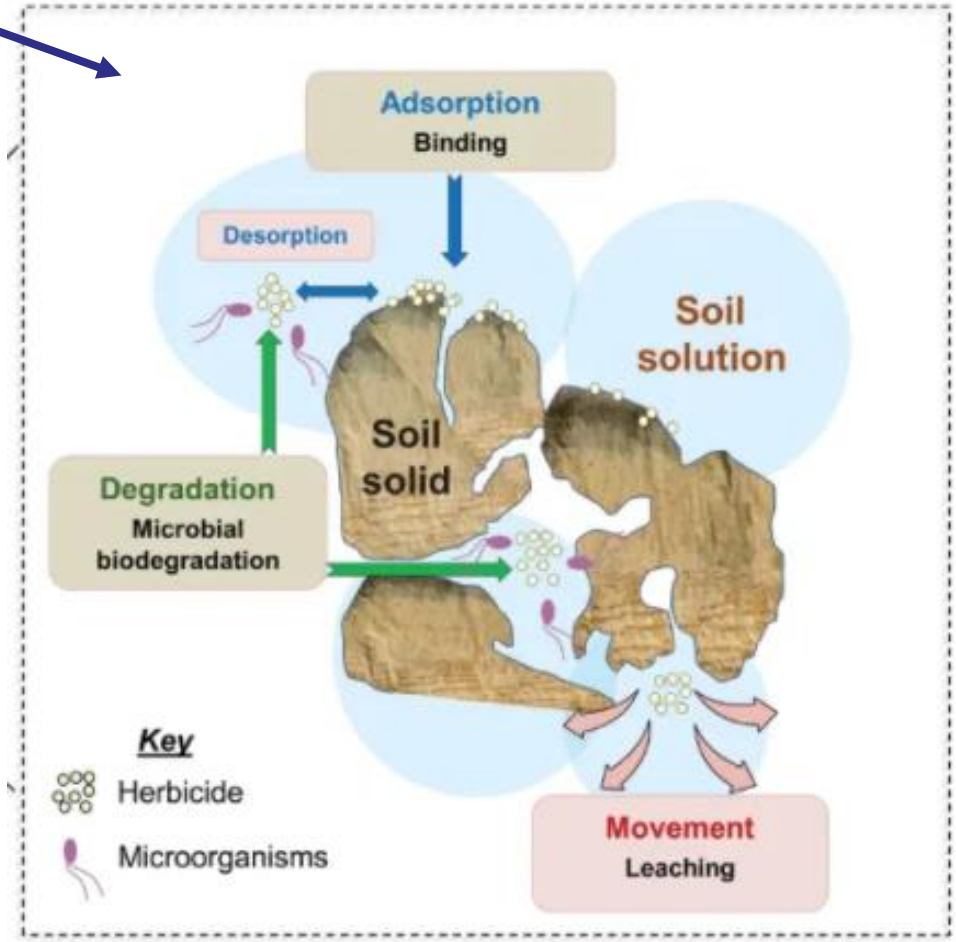


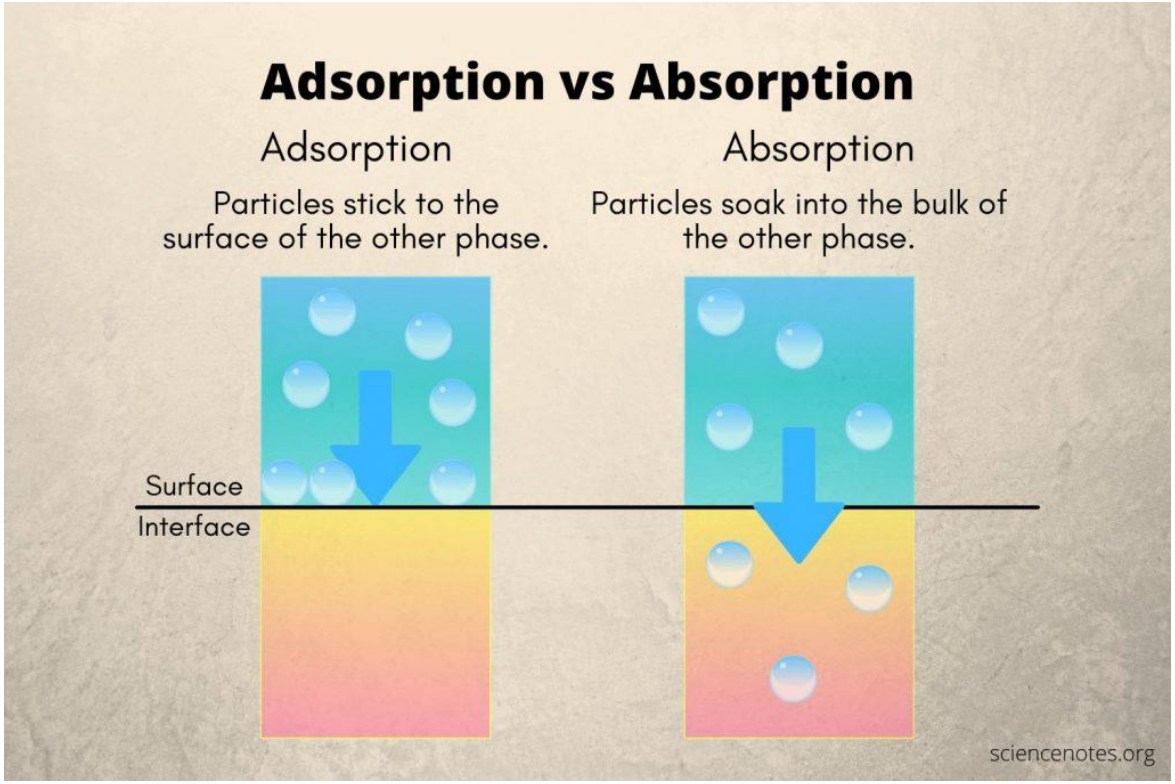
FATES of PEST RESIDUES IN SOIL



- Pest residues can be captured by soil surface (**adsorption**) and released back to soil solution (**desorption**)

- **Leaching** is the movement of plant nutritions and also pollutants (prest residues) through deep soil layers and underground water, causing underground water pollution in most cases
- Microbes living in soil can eat pest residues completely or change their chemical structure into harmless / less harmful / very harmful compounds (**microbial biodegradation**)
- Pest residues can move in soil using **soil solution** (soil water)





Soil sorption mechanisms

CHEMICAL WASTES

Chemical wastes are made from harmful chemicals. Soil contamination due to chemical wastes may occur during their transport, landfill and disposal activities.

chemical wastes dumped in the nature

Chemical Waste Disposal Guideline

Innocuous aqueous waste

- **Acid** (pH<4)
- **Alkali** (pH>10)
- Harmless soluble inorganic salt
- Alcohol containing salt
- Hypochlorite solution
- Fine (tlc grade) silica and alumina

These chemicals should be washed down with excess water.

Organic Solvent

- **Chlorinated**

Example: DCM, Chloroform, Chlorobenzene etc.

- **Non-Cholronated**

Example: THF, ethyl acetate, hexane, toluene, methanol, etc.

Red List

- Compounds with transitional metals
- Biocides
- Cyanides
- Mineral oils and hydrocarbons
- Poisonous organosilicon compounds
- Metal phosphides
- Phosphorus element
- Fluorides and nitrites.

Solid Waste

- Lightly contaminated

Example: Gloves, empty vials/centrifuge .

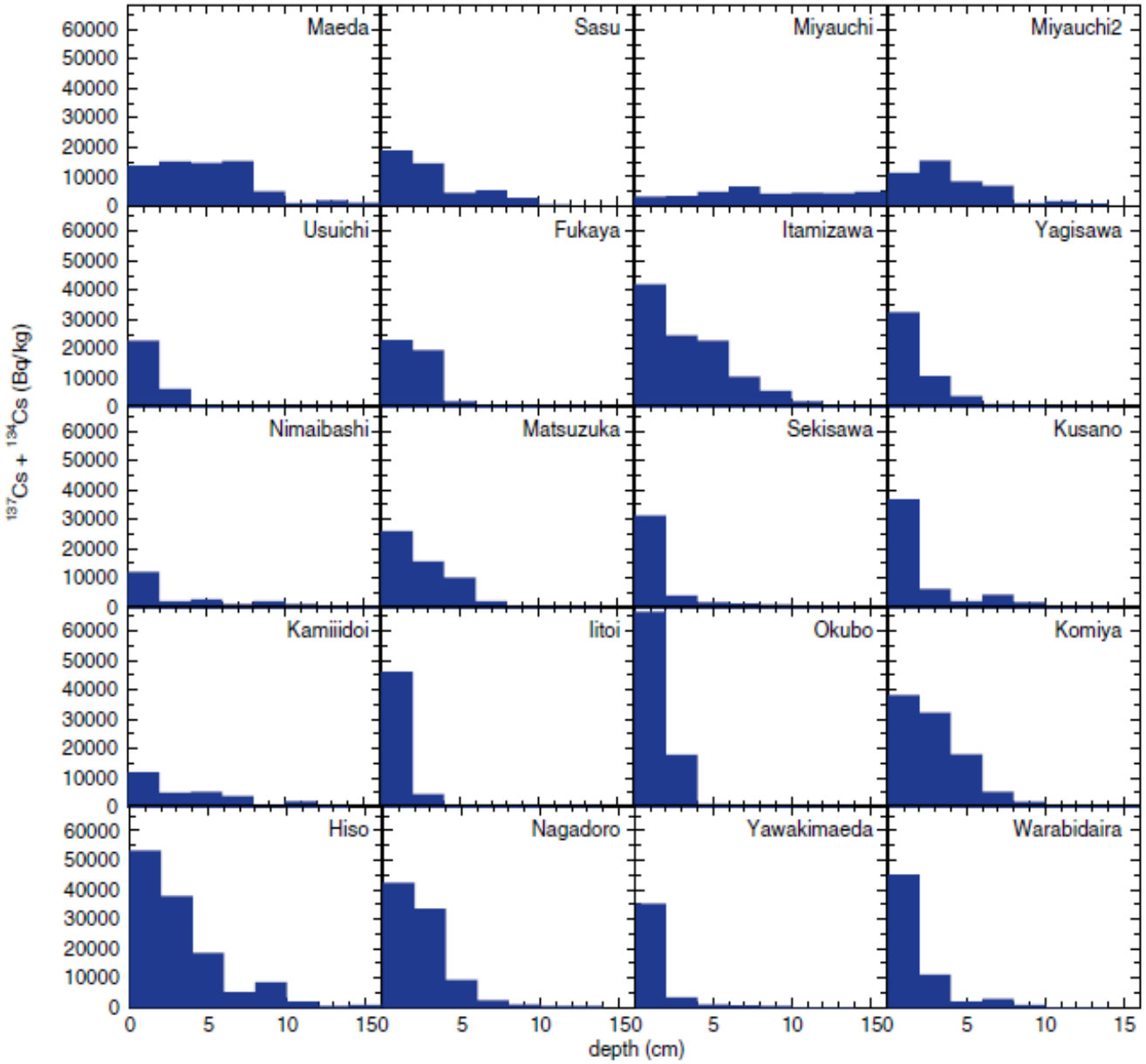
Broken Glassware

Broken glassware are usually collected in plastic-lined cardboard boxes for landfilling. Due to contamination, they are usually not suitable for recycling.

RADIOACTIVE WASTES (fallouts)

Fukushima Nuclear Power Plant Disaster, 2011

^{137}Cs distribution in soil…



- Accumulation of ^{137}Cs in surface soils of 19 prefectures

Mining and smelting Activities

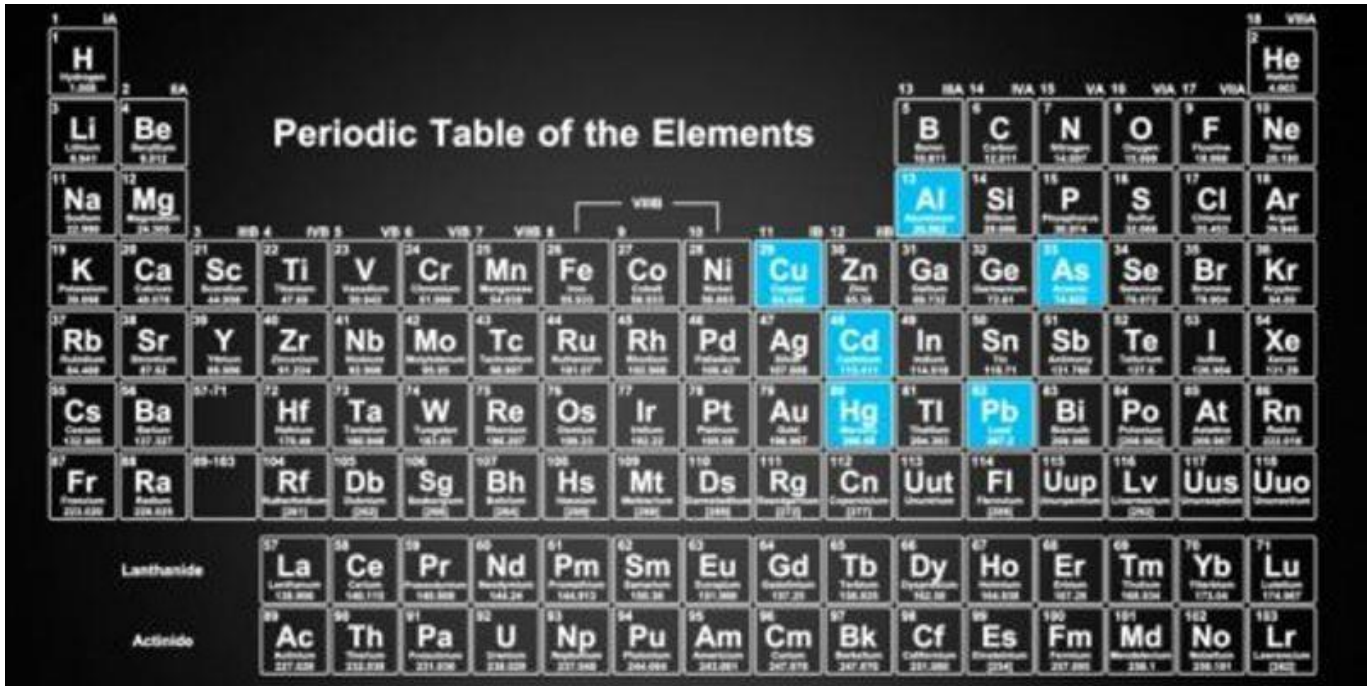
Bor / Serbia - July 13, 2019: Copper mine and smelting complex of Zijin Bor Copper in Bor, Eastern Serbia, one of the largest copper mines in Europe owned by Chinese mining company Zijin Mining Group

Mines and smelters produce large quantities of waste, usually deposited on land or into aquatic systems. The major consequence of these activities is **contaminations of** air, soil, river water and groundwater systems **by heavy metals such as Cd, Pb, Hg, Cr and As)**

Önemli ağır metallerin ekolojik sınıflaması (Davies,1980)

G: Gerekli
K: Kirletici

Element	Özgül Ağırlık g/cm^3	Bitki ve Hayvan için Gereklilik	Kirletici Olup Olmadığı
Ag (gümüş)	10.5	-	K
Cd (kadmiyum)	8.7	-	K
Cr (krom)	7.2	G	K
Co (kobalt)	8.9	G	K
Cu (bakır)	8.9	G	K
Fe (demir)	7.9	G	K
Hg (civa)	13.6	-	K
Mn (manganez)	7.4	G	-
Pb (kurşun)	11.3	-	K
Mo (molibden)	10.2	G	K
Ni (nikel)	8.9	G	K
Pt (platin)	21.5	-	-
Tl (talyum)	11.9	-	K
Sn (kalay)	7.3	-	K
U (uranyum)	19.1	G	K
V (vanadyum)	6.1	G	K
W (tungsten)	19.3	G	K
Zn (çinko)	7.1	G	K



The term **heavy metal** refers to any metallic chemical element that has a relatively high density and is **toxic** or poisonous at low concentrations. Examples of **heavy metals** include mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb).

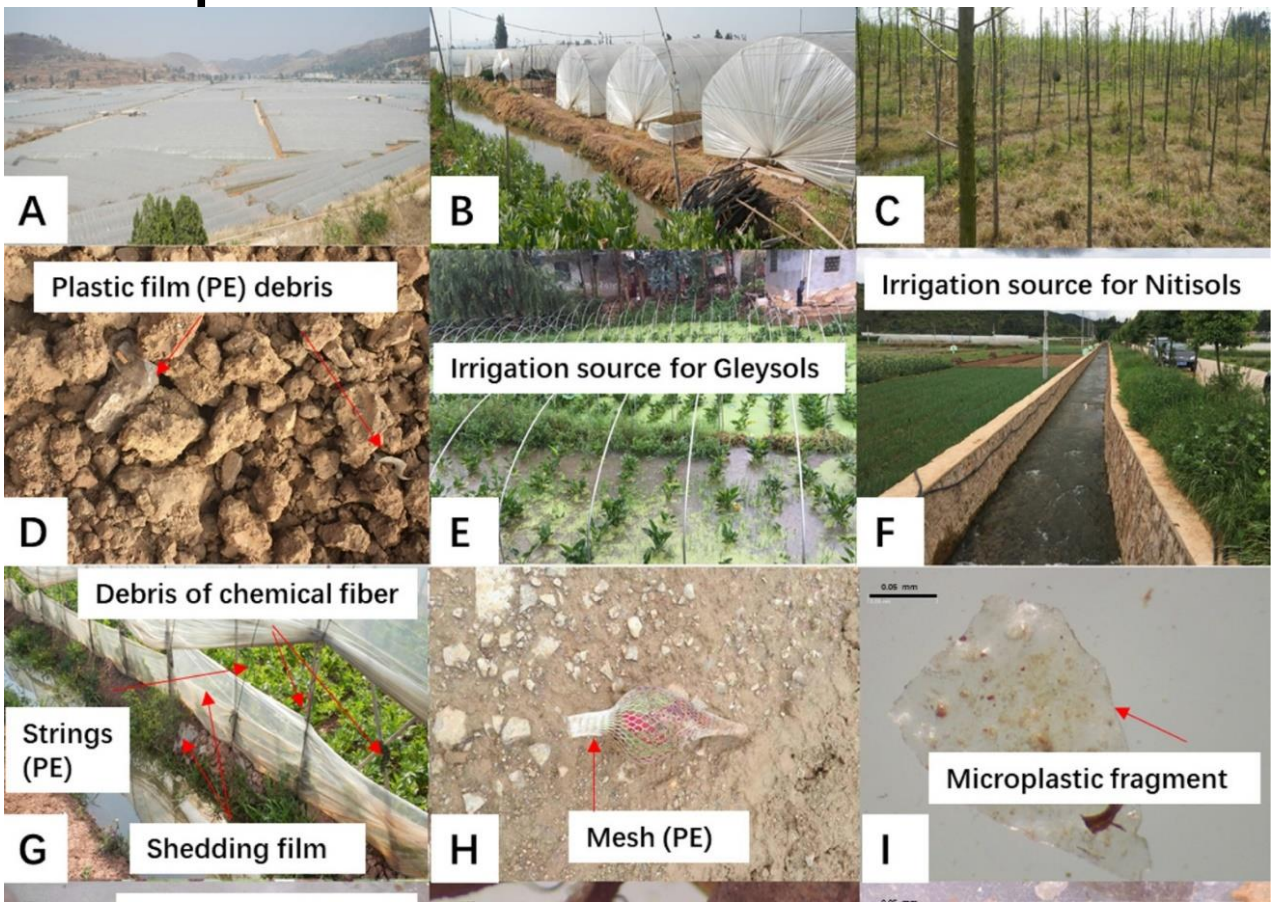
Itai-**itai** is a disease name given to the mass cadmium poisoning of Toyama Prefecture, Japan, starting around 1912. The term "**itai**-**itai** disease" was coined by locals for the severe pains (Japanese: 痛い **itai**) people with the condition felt in the spine and joints.

Construction Activities (soil sealing)

Soil sealing can be defined as the destruction or covering of **soils** by buildings, constructions and layers of completely or partly impermeable artificial material (asphalt, concrete, etc)

Microplastics in soil

- Sewage Sludge
- Waste water irrigation
- Mulching
- Composting
- Industrial emissions,
- Atmospheric deposition



Environment

Microplastics discovered near summit of Mount Everest

Scientists discovered microplastics at an altitude of more than 8,000m, the highest point they have been detected on Earth

Daisy Dunne Environment Correspondent | @daisydunnesci | 2 hours ago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