

Military hazardous waste and contaminated brown fields

Military action does not only destroy lives, but beyond this pollutes society and the environment. Due to the chemical and physical activity of the weapons certain risks for soil, water, air, plants, animals and human health arises. Weapons include – apart from the lethal impact by firing with it – two main health risks: (1) heavy metals, mostly lead, from the cartridges (2) chemical substances used as explosive and as gunpowder in ammunition, mostly nitroamine complexes.

a) trails of intoxication

There exist two trails into the human body (1) direct and (2) indirect.

Toxic waste can be absorbed by primary sources, which is called direct. This means any intoxication by primary particles and chemical complexes through air (breathing) and water (drinking). Exposition to any dump site for military waste, proximity to sites with heavy fighting and military vehicles will bring small particles to the air and there to the lungs and to some extent to the stomach and the whole digestion system. This is especially the kind of source of coarse material like cartridges and shells and of course fragments of it. Over time these materials become smaller due to rusting and fragmentation. In general, the smaller the particle, the easier it is to be absorbed in the human body. Another type is the distribution of very fine material like the ones from the source of ammunition propellants for small arms, grenades and bombs in an area. These propellants contain as well a toxic agent, nitroamines. The most common know is black powder or gunpowder. There are also some other nitroamine complexes used in rockets, grenades and bombs, but unfold practically the same destructive impact in the body. The trail into the digestion system by drinking water freighted with these materials is of course clear.

The second trail is indirect. Plants absorb toxic wastes from water and soil and animals from water and plants and from air. By eating plants, animals, milk or honey these toxic materials unfold their impact into the body via the digestion system.

b) Medical risks

An intoxication of heavy metals leads to severe diseases. Some parts to practically the whole body can be affected by malfunctioning in organs (e.g. the kidney, liver, lung), the brain, muscles, joint and bones. Heavy metal intoxications are also supported by heavy pains and may lead to cancer. One common disease is jaundice or icterus (skin and/or eyes turn to a yellowish color), which indicates a malfunctioning of the liver, but may also point to another disease like hepatitis A to C or cancer. Analysis of heavy metal intoxication can only be done in laboratories, but also some hints can be found like the malfunctioning and swelling. Analysis requires an urine sample. But before taking the sample the intoxicated person has to take a special drug, like chelation agents. Heavy metals enrich themselves in the body in an irreversible reaction – under common conditions in the body. Infusing of chelation agents releases them into the blood and finally the urine, which makes it possible to analyze them in a laboratory. This procedure is expensive.

Any heavy metal intoxication must be treated by

- (1) to immediately stop any further exposition to contaminated water, soil, air and food.
- (2) medical analysis

(3) medical treatment to remove the toxic particles from the body

Nitroamine complexes will also affect organs and will lead to cancer. Their treatment is much more complex.

1. Methods of exploration

a) awareness creation

hazardous waste is a topic ordinary people hardly heard about. The pollution of soil, water and air cannot be seen properly by the eyes, only by microscopes and even there only skilled people can distinguish these materials from others. The second scheme is to analyze the chemical functioning. But even this is much more complex for ordinary people.

For this reason awareness of the impacts of toxic wastes has to be created, which should include:

- Information about health risks and common diseases, especially for elderly and children
- Information about risks for plants and animals and for the consumption by the people
- Information on safety measures in dealing with military hazardous waste (gloves, dust mask, in some very rare cases an insulated suit)
- Information on the pollution trails from soil and water to plants, animals and human beings
- Information on local monitoring measures
- and if necessary, information about the remedies for landscape and human beings (keep in mind: in case of heavy metal pollution it will take more than half a year to show an improvement in the body, for complete remedy it will take several years)

b) collection of data (registration, exploration and assessment)

local population and military persons are quite useful witness to trace the sites of military action

- creation of a data base with all known areas where military weapons had been used and of all waste dumps containing weapons, scrap material and ammunition

Database should include, if possible

- Kind of weapon (small arms, grenades, bombs, military vehicle)
- Amount
- Size of the field (in square meter or any other appropriate scale)
- Age (of a dump site or of battle field)
- Whether it's a battle field or a dump site (in case of dump site, other materials can be included)

These data should eventually show the most polluted areas

- creation of a map of these data (e.g. by using FreeGIS, QuantumGIS → see data base functions there)

- additional maps of
 - Soil
 - Topography (for water runoff, when it's raining, and wind blow)
 - Surface water
 - Ground water
 - Vegetation
 - Agricultural Use
 - Housing
- match the maps to explore (1) the most polluted areas, (2) feasibility of dislocation by wind, water and erosion and (3) the risks of exposition for animals and humans.

c) local monitoring

these measures can be done by the local population as a precaution measure to judge the current condition and how it changes over time (20, 30 to much more years)

- Monitoring of vegetation:
 - Any place without any vegetation anymore
 - Any place with complete different vegetation especially with metallophyte plants of the arid regions in the Middle East and Turkey
- Monitoring of water
 - Dead Animals
 - Scarcer or no more plants
 - Loss of aquatic ecology (plants, animals, especially small animals like the larva of flies and frogs/tadpoles)
 - Change in water color
- monitoring of smells

d) exploration of hazardous wastes

these measures can only be done in a laboratory

- by using the data from b) create a data base and map of suspected polluted areas and sites
- analysis of water and soil in situ
- analyses of water and soil ex situ (in case of dislocation of particles)
- analysis of blood and urine (but only if a special drug is used, most commonly chelation agents, which are expensive)