Glaciers and ice sheets cover ca. 10% of Earth surface. They represent 70% of global freshwater reservoirs and are also extreme biomes, where well adapted organisms flourish and interact with the surrounding environment. Because of climate change and the related cryosphere decline, glaciers constitute potentially important natural hazards as main contributors to sea level rise, but also as responsible for ice collapse from mountain slopes toward inhabited areas. Moreover, glaciers are economically important as sources for hydroelectric power production and as essential sources of water in many mountainous regions of Earth. Recent studies show that glaciers may be the source of other threats, e.g. the release into the environment of anthropogenic and natural radionuclides. Indeed, glaciers were recognized as repositories for such substances. Because of ice melting, radionuclides and other contaminants stored in glaciers may be transported to downstream ecosystems and be accumulated in biota, with further consequences along the trophic chain. The common occurrence of radioactive elements in the environment is related to both natural and anthropogenic factors. The artificial radionuclides released in the environment due to human activities (^{137}Cs, ^{238,239,240}Pu, ^{241}Am) are produced through nuclear fission and neutron activation processes. Most of their release was related with atmospheric nuclear weapon testing, nuclear reactor accidents and failures of nuclear-powered satellites. The recent Fukushima nuclear power plant accident showed that the uncontrolled release of radionuclides is still now a real and present threat. Relatively small but constant releases of radioactive elements are also associated with reprocessing of spent nuclear fuel. Studies of anthropogenic radionuclides in the environment have entered a new era with the renaissance of nuclear energy and the associated fuel reprocessing. This scenario is of relevant concern in relation to national security and with respect to nuclear non-proliferation. The presence of these artificial radionuclides in the environment is harmful for man and for the ecosystems because it contributes to the dose of ionising radiation received by organisms. Furthermore some of the most common radionuclides are also toxic in relation to their chemical behaviour (plutonium and americium).

The other contaminant group that is recognized as a pollutant of cryosphere are heavy metals. Heavy metals are natural elements of Earth crust. Since the beginning of the industrial era (from~1850) loading of metals to the environment due to human activities have increased nearly 10 times, however emission of heavy metals increased substantially after World War II and is still increasing in some countries (Asian sector). The main anthropogenic heavy metal sources include industry, mining, agriculture, fuel burning, waste disposal and transportation. Heavy metals pollute locally but can be also transported globally by air mass circulation, rivers, oceanic currents etc. Heavy metal pollution has been found in Asian and European glaciers and even in remote Arctic and Antarctic areas**.** At the time of melting, glaciers introduce metals to streams and can pollute underlying vegetation and humans when serve aa a drinking water source.

A characteristic feature of mountain glaciers are cryoconite – accumulations of dust deposited on glacier surfaces. Being darker than ice the cryoconite melt down into glacier ice creating cryoconite holes filled with water in summer. Only recently their ability to accumulate radionuclide has been recognized. This ability is related to the highly adsorbing extracellular polymeric substances and other substances excreted by cyanobacteria – the most common living components of cryoconite. The role of these substances is to bind toxic elements outside cyanobacteria cells. The cryoconite aggregates held together by these substances can survive even tens of years on glacier surfaces acquiring during that time airborne radionuclides and heavy metals up to very high levels. The project aims at determination of radionuclide levels (^{137}Cs, $^{238,239+240}$Pu, ^{241}Am, ^{207}Bi, ^{210}Pb, ^{226}Ra, ^{232}Th and ^{40}K) and heavy metals (Hg, Pb, Cd, As, Cu, Zn, Cr, Ni, Fe, Al) in cryoconite samples collected from 25 glaciers from all the world (Alaska, Siveria, Altai, Qilian shan, Tienshan, Pamir, Himalayas, Arctic, Greenland, Norway, Patagonia and Antarctic). Analysis of so many different samples from different places will allow to study the correlations between glaciers, atmospheric contamination and melting on a global scale. The realization of the project will also allow for a better understanding of transport processes between glacier and peri-glacial environments. This is particularly important since intensive melting due to climate change will expose new areas that will be later inhabited by flora and fauna. And it is commonly known that high concentrations of radionuclides and metals may pose ecotoxicological effects to the local ecosystem.