The overuse of soil, for example by intensive agricultural practices, causes soil erosion, desertification and deterioration, and makes the soil inaccessible to future generations as a resource. One possible way to reverse these negative effects is by increasing the organic carbon and nitrogen stocks of thesoil with organic amendments such as sewage sludge; this has been recommended as one possible method of sludge utilization by the European Directive on Sewage Sludge (86/278/EEC) (SSD). However, as the endproduct of wastewater purification processes, sewage sludge contains large amounts of toxic substances (xenobiotics), including those that are not subject to any regulation; these substances include a range of organic compounds such as polychlorinated dibenzo-*p*-dioxins and furans (PCDDs/Fs), antibacterial personal care products, such as triclosan - commonly used in toothpaste, shampoos, soaps; and pharmaceuticals like antibiotics. Hence in recent years, the use of sewage sludge has become a major safety concern for its potential risk to the environment and human health.

There are also growing calls to revise the SSD to include antibiotic resistance genes as emerging contaminants frequently present in the sewage sludge. Many researchers have demonstrated that wastewater purification processes have resulted in an increase in the number of antibacterial resistance (antibiotic resistance bacteria and genes) due to the presence of a mixture of antibiotics and a range of bacterial consortia in the activated sludge. It was also demonstrated that sewage sludge has a greater effect on the level of antibiotic resistance released to the environment than effluent wastewater. This difference has been attributed the fact that antibiotics resistance bacteria and genes removed from influent wastewater are transferred to the sludge. Consequently, sewage sludge, which is considered to be the main contributor of the antibiotics resistance released to the environment, is currently the subject of special research attention.

In addition, the use of sewage sludge leads to changes in the soil microbiome. One of the key features of microorganisms is their quick response to disturbances and changes in the environment, including impurities introduced into it. Therefore, the characteristics of microorganism communities can be used as a biological indicator for assessing the state of soil fertilized with sewage sludge.

Considering the above, our focus is to determine the impact of the agricultural application of sewage sludge on the soil contamination with sludge-originated antibiotics and organic toxic compounds (PCDDs/Fs, triclosan), and on genetic and taxonomic changes of soil microbiota with a special emphasis to antibiotic resistance.

In particular the proposed project is aimed at elucidating the effects of sewage sludge and its toxic substances on soil contamination and the dissemination of antibiotic resistance. The simultaneous analysis of the biodegradation rate of studied xenobiotics under different environmental conditions will determine the persistence of the compounds in soil and will contribute to the design of future nature-based solutions (biodegradation, bioaugmentation, biostimulation) aimed at allowing their safe and quick removal from the contaminated soils. A measurable effect of the project will be the degree of holistic knowledge obtained about the impact of agricultural use of sewage sludge by an interdisciplinary approach consistent with the Europen Soil Charter (1972) that postulates the rational use and preservation of soils, achieved through scientific, interdisciplinary research.