

# GENOMIC INSTRUMENTS FOR THE SELECTION OF USEFUL MICROORGANISMS IN BIOREMEDIATION PROCESSES AND DECONSTRUCTION OF COMPLEX MATRICES

**Innovations and Benefits** - The bioremediation is a promising, versatile and effective remediation technology based on the exploiting of particular microorganism metabolism and their enzymes to biodegrade a wide range of contaminants. Moreover, these organisms are often able to deconstruct complex matrices that have chemical characteristics similar to those of the pollutants on which they act. They can therefore also be used to obtain high added value compounds from recalcitrant substrates such as, for example, lignin, in the bio-refinery perspective. Meta-genomic and proteomic approaches, allow us to decode the taxonomic complexity of the species present in a site and to identify the arsenal of genes, proteins and enzymes used in the detoxification and deconstruction processes.

**Use** - Biological remediation through the use of micro-organisms of fungal (mycoremediation) and bacterial origin and, for an alternative eco-compatible, sustainable and economic management of polluted environmental matrices. Selection of enzymatic functions effective both in the decontamination of polluted matrices and in the deconstruction of complex matrices, in order to make simple molecular compounds available, which are useful for the synthesis of bio-products.

**Applications and ongoing Activities** - Integrated monitoring of "multi-omics" through metagenomic and proteomic approaches for the characterization of the microbial complexity of highly polluted areas, characterized by the presence of PAHs, PCBs and heavy metals. Isolation, identification and characterization of microorganisms of fungal origin, with a high detoxifying power. Identification of genes, proteins and enzymes involved in the processes of decontamination and deconstruction of complex matrices.

