# FUNGI AS POTENTIAL TOOL FOR POLLUTED PORT SEDIMENT REMEDIATION

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# Guidelines for the sustainable treatment of dredged sediments in the Marittimo area

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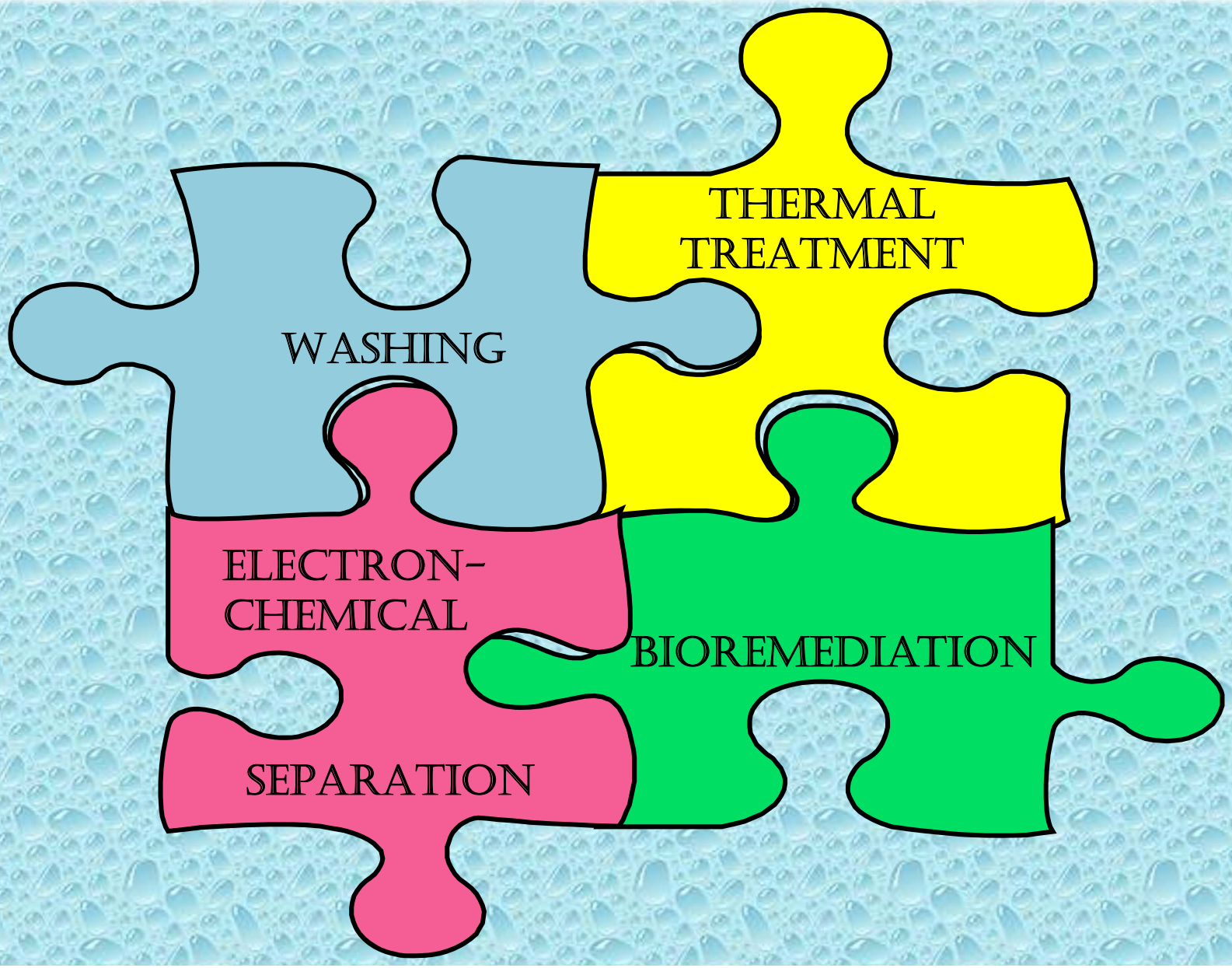
# INTRODUCTION: CONTAMINATION OF MARINE SEDIMENT

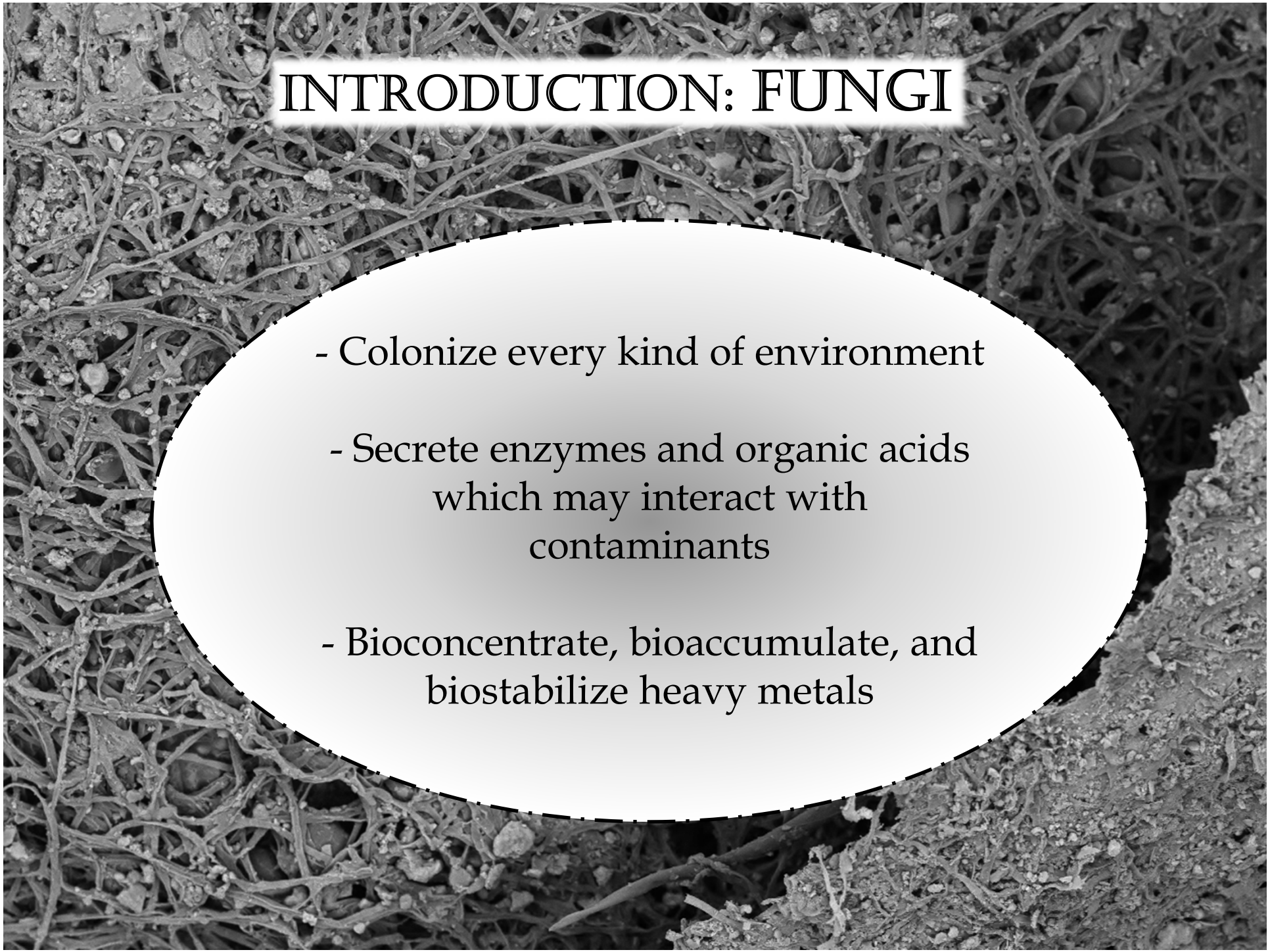
one of the most actual and global scale environmental problems

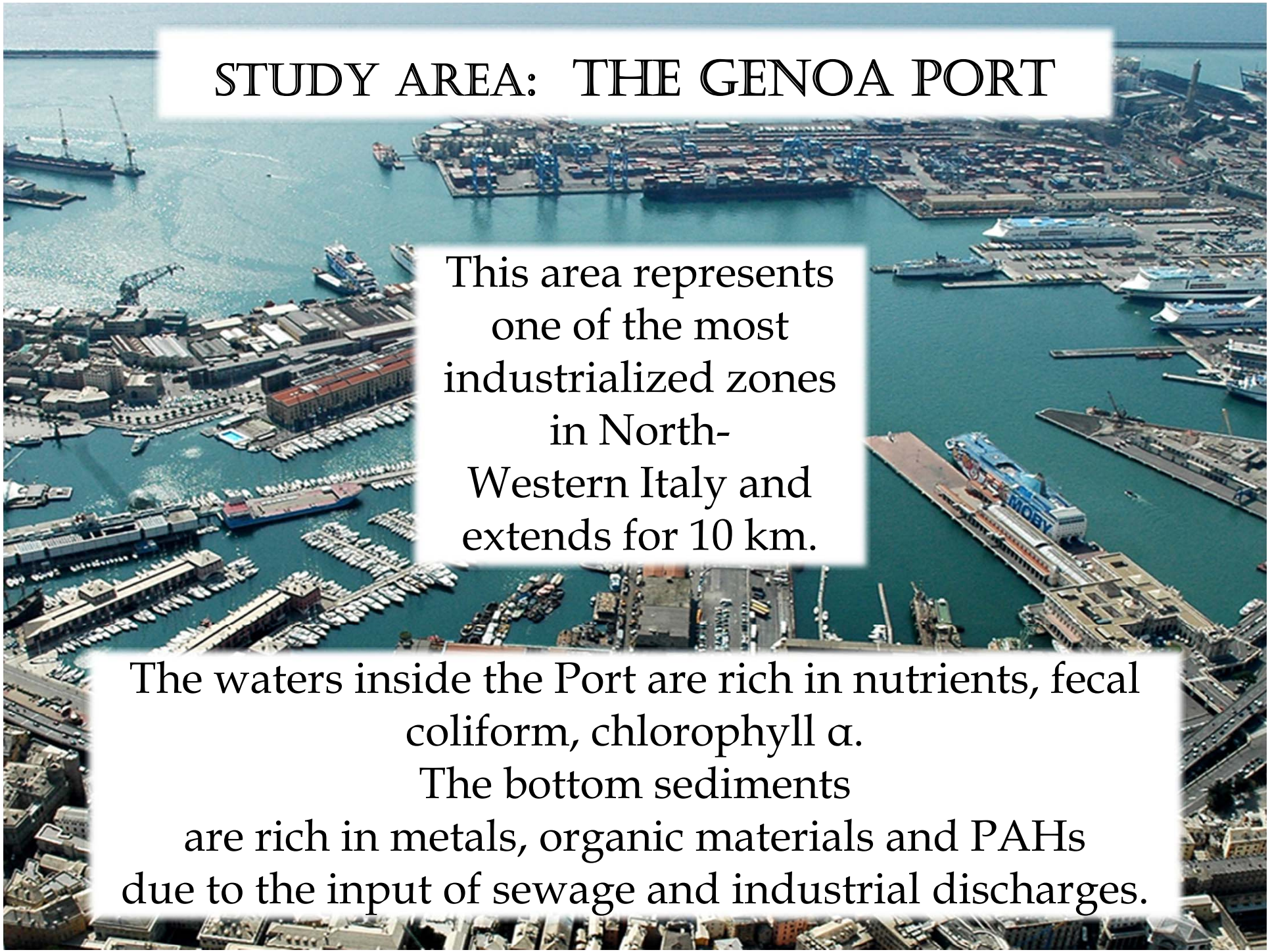
need of periodical dredging activities for the maintenance of the navigational depth in ports and waterways

huge volumes of contaminated sediments which need to be properly handled due their load of inorganic and organic substances

# INTRODUCTION: CONTAMINATION OF MARINE SEDIMENT AND REMEDIATION STRATEGIES




INTRODUCTION: FUNGI
- Colonize every kind of environment
- Secrete enzymes and organic acids which may interact with contaminants
- Bioconcentrate, bioaccumulate, and biostabilize heavy metals

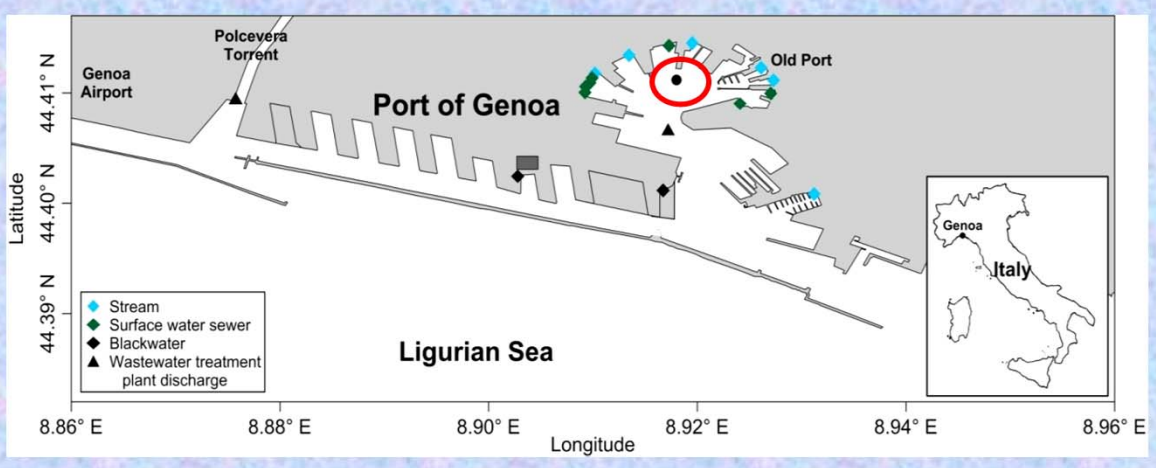



# STUDY AREA: THE GENOA PORT

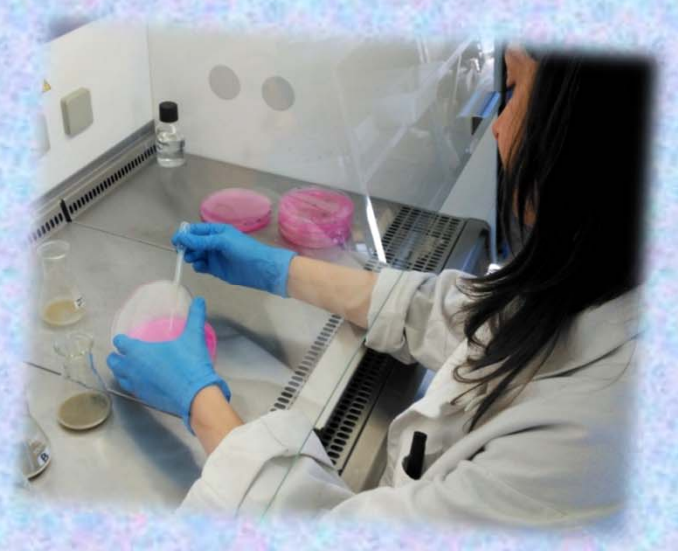
This area represents one of the most industrialized zones in North-Western Italy and extends for 10 km.

The waters inside the Port are rich in nutrients, fecal coliform, chlorophyll α.
The bottom sediments
are rich in metals, organic materials and PAHs
due to the input of sewage and industrial discharges.

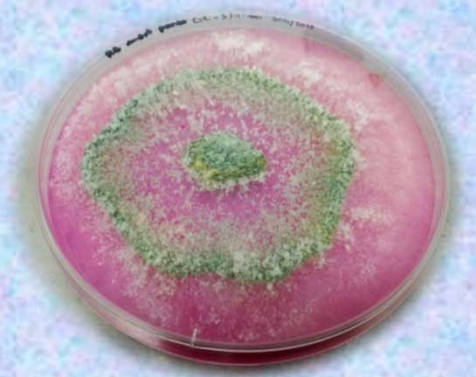
# MATERIALS AND METHODS: SAMPLING AND SEDIMENT CHARACTERIZATION

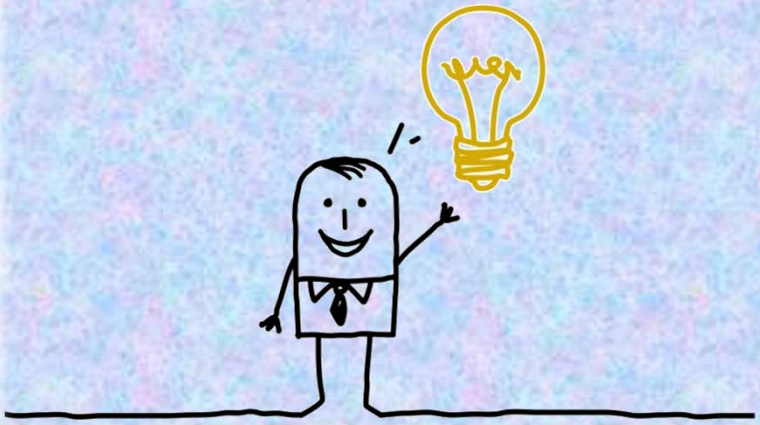



- heavy metals
- organic inorganic fraction
- grain-size
- fungal characterization



# MATERIALS AND METHODS: PILOT MYCOLOGICAL ACTIVITY



# RESULTS & DISCUSSION

*Aspergillus*, *Penicillium*, and *Trichoderma* are the most common genera in the original sediment and 773 colonies forming units (CFUs) were counted

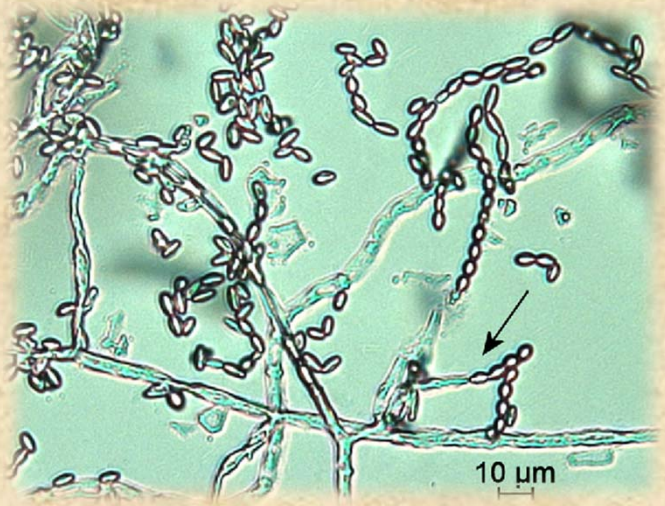
| Parameters | Values |
|---|---|
| Organic fraction (%) | 3 |
| Inorganic fraction (%) | 97 |
| Al (mg $kg^{-1}$) | 6800 ± 579 |
| Fe (mg $kg^{-1}$) | 15000 ± 1129 |
| Cu (mg $kg^{-1}$) | 15 ± 3 |
| Zn (mg $kg^{-1}$) | 62 ± 11 |
| Ni (mg $kg^{-1}$) | 31 ± 6 |
| Fine fraction (%) | 13 |
| Coarse fraction (%) | 87 |

*Aspergillus melleus* Yukawa

*Penicillium brevicompactum* Dierckx

*Penicillium citrinum* Thom

*Trichoderma virens* (J.H. Mill., Giddens & A.A. Foster) Arx




*Paecilomyces maximus* C. Ram

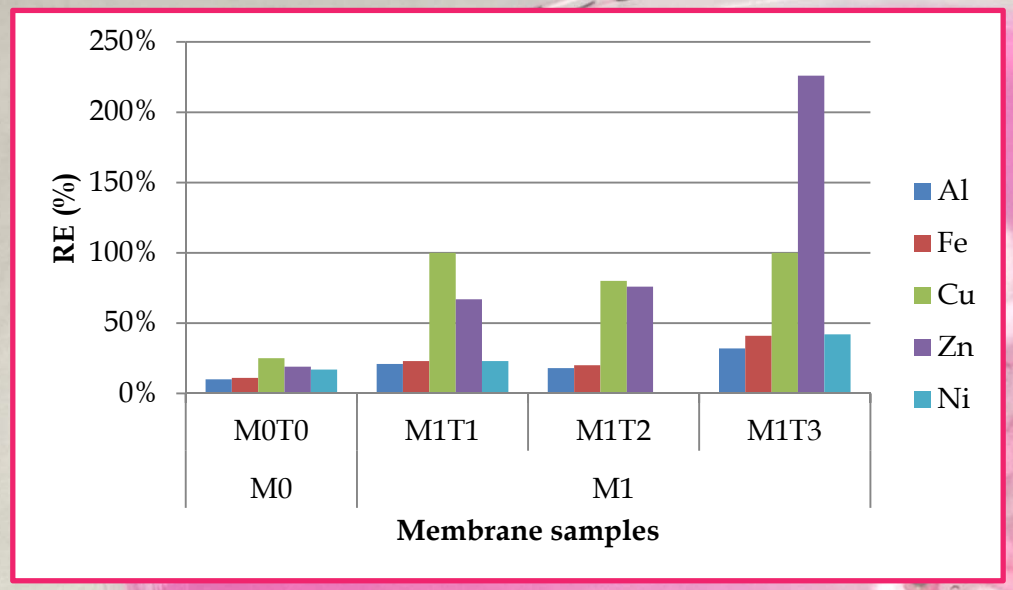
*Penicillium expansum* Link

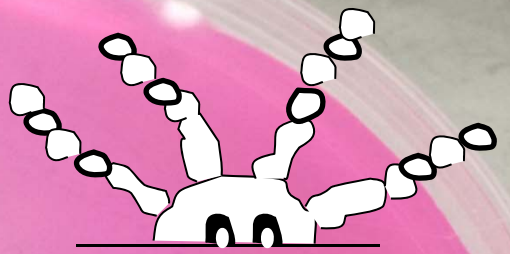
# RESULTS & DISCUSSION

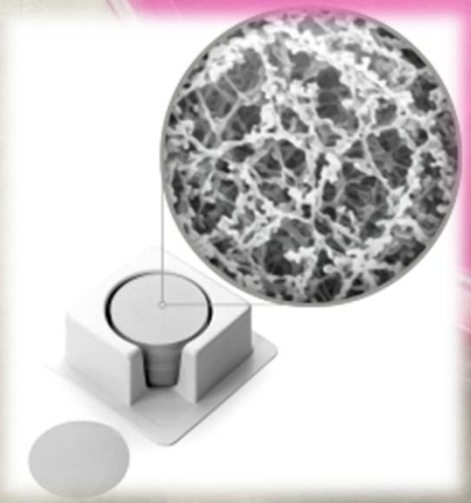
| | M0T0 | M1T1 | M1T2 | M1T3 | D1T1 | D1T2 | D1T3 |
|---|---|---|---|---|---|---|---|
| Al | 10 | 21 | 18 | 32 | 11 | 8 | 22 |
| Fe | 11 | 23 | 20 | 41 | 12 | 9 | 30 |
| **Cu** | 25 | 100 | 80 | 100 | 75 | 55 | 75 |
| **Zn** | 19 | 67 | 76 | 226 | 48 | 57 | 207 |
| Ni | 17 | 23 | 13 | 42 | 2 | 4 | 25 |

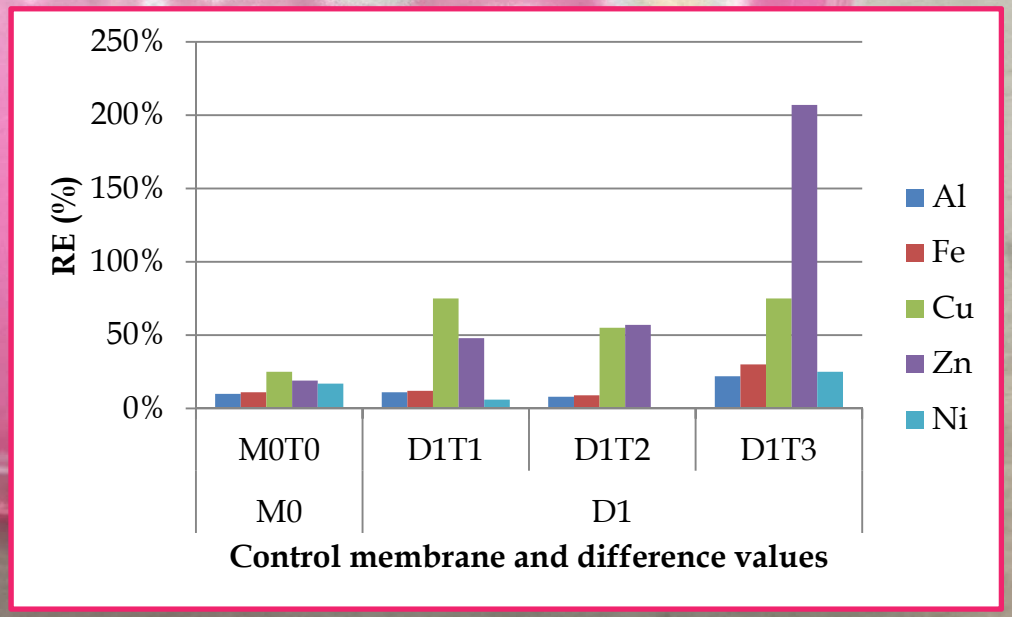
Recovery efficiency (RE, in %) values of the most abundant metals (Al, Fe, Cu, Zn, Ni), calculated as the ratio between the metals content in the membrane and the initial metals content in the sediment.

# RESULTS & DISCUSSION





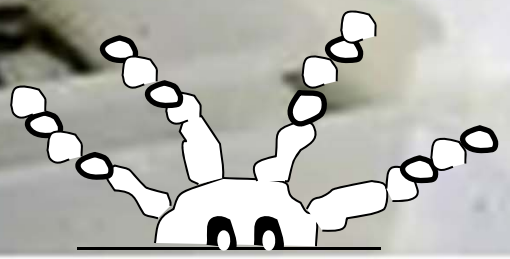


# CONCLUSION

Native microfungi may be an innovative bio-remediation tool for contaminated port sediment.

The fungal-membrane protocol allowed to increase the membrane recovery efficiency of metals.

This represents the firt step of a novel biotechnology able to remediate *in situ* port sediment.

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