

R&D Project for a sustainable management of shoreline and sea floor in Emilia-Romagna region.

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Introduction: To dredge and to move sediments is needed to preserve navigability and to defend the beach from erosion (also by subsidence). Managing large amounts of sediments, often contaminated, is an important environmental issue. The sediments should be a resource also if they are considered as waste. The legal framework (national and european directives) for management of sediments isn't complete at the moment. The criterions as thresholds, kind of analysis, reuse options, better remediation technologies available, etc. are needed to provide Administrators of improved knowledge for sediment management.

The project had developed by ARPA Emilia-Romagna with a team consisting of public authorities, academic and industrial research and international links.

The main objectives are: a complete characterisation (physical, chemical, microbiological and ecotoxicological) of sediments in Ravenna harbour, Emilia-Romagna shoreline and Sacca di Goro, to develop, at a pilot scale, treatment technologies for the sediments to be dredged from Ravenna harbour, to assess environmental impact due to sealines, to provide stakeholders of a support decision tool about reuse of sediments to be dredged or moved.

In particular the project is organized in three subprojects:

1. Studies for the remediation and reuse of contaminated sediments dredged from Ravenna harbour
2. Assessment environmental impact of sealines and sediment monitoring
3. Investigation on Emilia-Romagna shoreline

Methods: The sampling activities are made with vibro corer, gravity corer, orange-peel grab, Van Veen grab, box corer.

Chemical analysis in dry matter with extraction and XRF method, leaching test (UNI EN 12457-2, UNI 14429, NEN 7343, NEN 7341, NEN 7345, DIN 38414 S-4).

Physical analysis (granulometry) with laser and rule Stokes method, Eco-toxicity (*Vibrio fisheri*, *Daphnia magna*, *Selenastrum capricornutum*, *Ceriodaphnia dubia*, *Brachionus plicatilis*, *Acartia tonsa*, *Dicentrarchus labrax*).

Treatment technologies: phosphatation, calcination, liming, solvent extraction, soil washing, landfarming.



Fig. 1: Location of sediments investigated in Emilia-Romagna region (red line and circle).

Results: The main results are: an assessment of contaminants and their 3D distribution, a classification of sediments according to grain size distribution, an evaluation of treatment efficacy and an assessment to assess suitability of sediments to different reuse options, a protocols for sediments reuse, a proposal for the attribution of local limits values and background values of metals in regional shoreline, a database containing data collecting since last 10 years from regional coast, an evaluation of benthic ecosystem along the sealines, a relation between contamination and source of contamination considering the rivers, the traffic of ships and the sealines, health and ecological state of the sea basin.

Discussion: The project team is constituted of: Regione Emilia-Romagna (I), Provincia e Comune di Ravenna (I), Autorità Portuale di Ravenna (I), ENI S.p.A-R&M (I), ISMAR-CNR (I), University of Bologna (I), University of Bremen (D), University of Roma (I), Conseil General du Var (F).

References: [1] G.Bortone, L.Palumbo et al (2006) *Sediment and Dredged Material Treatment*; [2] M. Preti et al (2002) *Stato del litorale emiliano-romagnolo dell'anno 2000*; . [3] Regione Emilia-Romagna et al (2005) *Linee guida per la gestione integrata delle zone costiere (GIZC)*.