Integrated Sediment Management System (ISMS) at a physiographic unit scale, an application in Versilia littoral (Tuscany, Italy)

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Introduction: The article deals with the build-up of a large scale integrated system for sediment management (ISMS) on a sandy coast. In particular ISMS have to consider the evolution of the coastline and its sediment budget in order to establish which actions are well suited with the morphological equilibrium of the coast within the optimal use of natural resource [1]. The recent development of ICZM studies [2], has shown that the environmental impact on the coast in terms of pollution and sediment management have to be considered at a physiographic unit scale. Through the understanding of sediment dynamics it is possible to define the necessary actions to sustain the long term stability of sediment budget [3].The aim of the present work is to show the importance of setting up short and long term management actions.

Methods:
The Integrated sediment management system is built on a hierarchical approach: the following parameters are considered of relevance:
- water and sediment discharge of rivers [4];
- reservoir's storage capacity;
- long shore transport [5];
- siltation rate (m^3/y) of ports [2];
- capital dredging and maintenance of coastal structures[2];
- periodic bathymetric surveys [2];
- sea bed mapping and classification [2];
- search and characterization of off shore deposits along the continental shelf to be used for beach nourishment;
- pollutant contents for emerged-beaches and seabed sediments.

The proposed checklist should be considered to define every sediment management actions within the entire physiographic unit. If all these data are collected, it will be possible to plan the actions to be taken, at first to re-establish the sediment balance along the coast and then to optimize the future dredging-nourishment interventions.

Results:
For the apuo Versilian Physiographic Unit the parameter checklist has been filled up with data from different sources. The different management options applied within the physiographic unit highlight different solutions and management options (i.e. dredging, nourishment, offshore/inland disposal, variation of river discharge) that usually laid hidden by the different data source leading to a main conclusion [2]: the bottom-up decision making process contrasts with the long term and large scale management of littoral sediments within the physiographic units.

Discussion:
The results from this work give the basis for the actions that the Authorities need to plan both for overall shoreline management and harbor development. This kind of studies is also necessary for the planning of harbor layout variations compatibly with sedimentary circulation within the sand sharing system. The state-of-the-art design criteria include the analysis of the influence that a coastal structure can have on the littoral drift, studying if and how the coastal sediments could by-pass the structures. The choosing of the sediment management options is much more complicated in presence of pollution. Also for this reason, it has to be said that what is missing to make the proposed management strategy with ISMS a winning option is the definition of the normative frame reference, that should consider all the state-of-the-art results.

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