

## A System of Hierarchical Monitoring Methods for assessing changes in the biological and physical state of intertidal areas – (HIMOM)

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### Objectives

The proper management of coastal environments requires appropriate and informed policy directives and the necessary combination of tools to carry out the requirements of these directives. Such a toolbox must include an accurate, efficient and cost effective system of monitoring methods. HIMOM provides a system of Hierarchical Monitoring Methods (HMM) to determine system change within tidal flat areas. By enabling the end users to interactively work online through the internet based application iMAP, they can also estimate the costs of implementing monitoring strategies of differing complexities. The main objectives of HIMOM are:

- European wide assessment of biological and physical dynamics of selected intertidal estuaries using remote sensing and ground measurement
- Providing coastal managers and end-users with a system of hierarchical monitoring methods (HMM)
- Demonstration of the application of the HMM concept in co-operation with concerned monitoring agencies in local experiments

### Results

A practical handbook for carrying out monitoring of intertidal areas with recipes for sampling techniques and measurement methods as well as data analysis has been compiled. Links between the protocols shall be organised in a toolbox, ready to be used by the End Users. The HMM system, that is reflected in above mentioned toolbox, involves 34 validated and tested protocols for ground sampling, primary production, remote sensing and data management.

Field measurements are carried out every 2 – 3 months over 3 years in 4 different test sites spread over Europe. These seasonal measurements in each test site are performed in order to detect and compare changes throughout the years. In the scope of an intercalibration campaign different instruments and sampling as well as measurement methods were adjusted. During a simultaneous field campaign in all test sites, the vertical migration of microphytobenthos within a tidal cycle was analysed.

Spectral reflectances, which are measured regularly as standard parameter within the HMM, links the in-situ measurements with remote sensing data such as CASI or Landsat images. Methods like NDVI, linear spectral unmixing or supervised classification are used in order to

retrieve sediment classifications and assessment of microphytobenthos in different scales. Landsat images of the estuaries of each test site have been classified and compiled to the HIMOM Estuary Atlas.

**Potential exploitation by end users**

The link to End Users is performed on the one hand through the HIMOM toolbox and on the other hand through the HIMOM iMap, which is designed as an interactive tool for making geoinformation available via the internet.

The HIMOM toolbox will include all protocols of sampling and measurement methods which contain to different levels. This provides the End User with a hierarchical suite of activities that are tailored to the specific needs of the End User. A socio-economic implication of change on management practise has been investigated and socio-economic benefits and related cost-benefit analysis will be presented to interest groups and decision makers.

The main purpose of the iMap is to allow end users to visualise and interpret this data immediately and together with other data sets including easy data up- and download. Visual interpretation and queries on all (spatial and non-spatial) data is possible, as well as presenting data in graphical form such as for example time series or reflectance spectra measured at different measurement points.

All preliminary results of HIMOM have been presented to a group of End Users and Stakeholders in order to discuss the scientific achievements with the practical experiments of the End Users and to develop a system that fits to their requirements.