

## Coastal mapping: surveys and products in Europe

6th IHO EU meeting, coastal mapping: surveys and products in Europe 1 / n Amsterdam - 25 June 2014

### Needs for high resolution coastal mapping

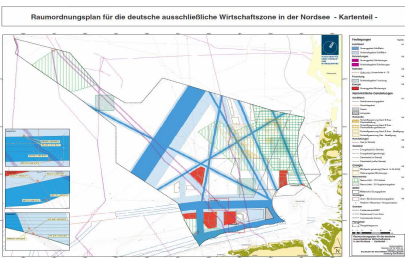
**Blue growth : Marine spatial planning**  
com(2013) 133, 12 March 2013




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### Needs for high resolution coastal mapping

**Blue growth : Marine spatial planning**



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### Needs for high resolution coastal mapping

**Climate change : erosion**  
SWD (2013) 133, 16 April 2013, climate change in coastal regions



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### Needs for high resolution coastal mapping

**Climate change : marine submersion**

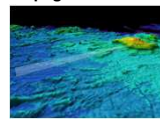
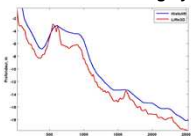
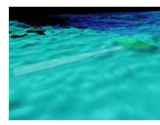
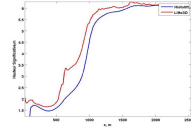


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### Needs for high resolution coastal mapping

**Climate change : marine submersion**

Propagation of waves towards the coast highly depends on seafloor profile

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### Experience gained and national programmes

**Italy**

Coastal Mapping using Bathymetric Lidar and Hyperspectral sensor in 100Km2 is not hampered by the (in) accessibility of a site, which is often a problem in coastal areas. Covering large surfaces in a short time in order to study vegetation patterns and morphology along coastal zones

The strategy of combining high and very high resolution spectral measurements in a multisensory and multi resolution analysis includes different way of data fusion to assimilate spectral and spatial variability in complex coastal mapping.

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### Experience gained and national programmes

**EROSION DEPOSITION**

**SEDIMENTARY STRUCTURES**

**SEAGRASS**

**Unconsolidated**

**MIXED SEA FLOOR**

Morphology and surface rugosity in seafloor Typologies classification

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### Experience gained and national programmes

#### SEABED HABITAT MAPPING

The sandy beach of S' Agostino represents the sandy southern edge of seagrass meadow. At lower bathymetries high cover percent of benthic seagrass and seaweeds are measured

**SEAGRASS**

**SEAWEED**

**SAND**

**ACCURACY - 3m/-6m**

**SEAFLOOR PROPERTIES**  
Unconsolidated  
Consolidated

**SEABED PROPERTIES**  
Seagrass  
Seaweeds  
Sands  
Organogenic  
Rocky

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### Experience gained and national programmes

**MEAN  $\Phi$**  Run 07

**PIROXEN** Run 07

**Legend**  
Classification of Watersheds  
Sediment grain  
Sediment texture  
Sediment type  
Sediment class

**Legend**  
Piroxeno

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### Experience gained and national programmes

**STRUCTURED VEGETATION (mostly trees)**

**UNSTRUCTURED (mostly herbaceous and shrub)**

**SAND**

**MIXED SUBSTRATES (roof, asphalt)**

"Structured vegetation", considering the extensive presence of Junipers and Pines overlay morphological complexity as well as the larger dimension and stability of dunes moving from north to south. "Mixed substrates" and "Sand and herbaceous" vary from pure sandy pixel to buildings, gardens, fences, private houses, pools, etc.

Vegetation Type	Color
Structured (Pines)	Green
Structured (Juniper)	Yellow
Unstructured (Herbaceous)	Blue
Unstructured (Shrub)	Red
Sand	White
Mixed Substrates	Grey

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### Experience gained and national programmes

**MEVES** over pass on 12/05/2009 and field validation sampling with turbidimeter measurements of TSM. Image analysis of water quality with BOMBER (Giardino et al., 2012)

**SMA** results combined with LIDAR classification on the base of reflectance and depth values provides a 3D view of lake bed that validated and refined hyperspectral mixture models of macrophytes and reeds.

**Image analysis of lake bed properties with Spectral Mixture Models**

**Phragmitetum**

**Dead roots of retreating Phragmitetum**

**Surface and submerged macrophytes Charium and Potamatum**

Vegetation Type	Color
Phragmitetum	Green
Dead roots of retreating Phragmitetum	Red
Surface and submerged macrophytes Charium and Potamatum	Blue

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### Previous experience in Sweden

Comparison of areas, approximately 1000 x 750 m, depth 2,5 - 11 m

Multibeam, 1x1 m grid. Plenty of stones in the area.

LIDAR (Hawkeye II), 5x5 m grid. In general the same image of the seafloor. However no stones/objects. Some gaps where the LIDAR system couldn't survey the seafloor.

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### Comparison of point density an area of 40 x 40m, 4 - 5 m depth

Object, 1 km<sup>2</sup>

Multibeam, view from above      LIDAR (Chiroptera)      LIDAR (Hawkeye II)

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### Object detection LIDAR vs Multibeam

Rock: 5x5 m and 3 m high

Multibeam  
Mean depth: ca 6 m  
Shallowest point: 2,75 m

Rock: 3x3 m och 2,2 m high

LIDAR (Hawkeye II)  
Could not find any of the rocks found with the multibeam system.

Purple points from multibeam  
Grey points from Hawkeye II

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### Experience gained and national programmes

#### Norway

The Norwegian coast: 100 915 km, including 239 057 islands

- Continuous surveying programme for the coastal zone  
Equipment: multibeam on 3 launches
- A national multi disciplinary survey programme in preparation
- Utilized LIDAR several times in the period 1998-2006
- Running a LIDAR pilot project for high resolution integrated (sea and land) coastal zone surveying

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### Experience gained and national programmes

#### Germany

Integrated high resolution DTM (1m-Grid)

- Multi-sensor-survey
- combined terrestrial and seaground model
- Purposes:
  - coastal protection
  - Environment monitoring
  - Harbour construction

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### Experience gained and national programmes

#### France

Parties terrestres et maritimes produites ou programmées

Partie terrestre produite ou programmée

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### Experience gained and national programmes

#### Gestion des infrastructures portuaires (Toulon)

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### Experience gained and national programmes

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### Benefits of a joint programme

#### Harmonized description

Sedimentology: which normalization...

Bathymetry & elevation: which resolution, which vert ref

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### Benefits of a joint programme

#### Share the experience and the know-how

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### Benefits of a joint programme

#### Share the collection of data (devices, processing tools...)

Kartendarstellung Seewetter

Neben Wind- und Seegangsvorhersagekarten für den Bereich Nord- und Ostsee sowie Mittelmeer und Nordatlantik finden Sie hier auch eine Karte für aktuelle Wassertemperaturen.

Sign: Höhe von Windsee und Seegang (in cm) (Quelle: Toulon (Météo France))  
 Datum: 2014-06-25 10:00:00 (UTC+03:00)  
 UTM: 32 QUT 70 20 Jun 2014 00:19 00UTC+03:00  
 UTM: 32 QUT 70 20 Jun 2014 00:19 00UTC+03:00  
 Wind und Seegangsvorhersagekarte

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### Design study

#### Geographic extension

Relevant area to Joint European Coastal Mapping Program

Deliverable: map of the relevant area

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### Design study

#### Areas at stake

**Deliverable: map of the sensitive areas**

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### Design study

#### Sharing gained experiences

Water column penetrating Marine LIDAR Surveys in Ireland

- 2003 - Survey of area of Malinbeg Bay for GSI - Eloy Yachting Company
- 2002 - Clew Bay - Initial trial for the Geological Survey of Ireland (GSI)
- 2003 - Clew Bay - Completion of the Clew Bay Survey for GSI
- 2006 - Barinny Bay, Dromore Bay, South Galway Bay
- 2008 - Malinbeg Bay survey for GSI / County Donegal
- 2008 - BLOM survey for GSI of Donegal Sligo Carrigrohane Bays
- 2008 - TEKSA survey of Donegal Sligo Carrigrohane Bays
- 2010 - Polystyren survey for GSI of Belle Isle, Killybegs, Sligo, Sully/Gahway Bays

**Deliverable: feedback of experiences**

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### Design study

#### Survey strategy

Taking into account various types of surveys, MBES, Lidar, SDB  
And their performances, depending on  
-water turbidity, sea states, weather conditions...

**Deliverable: surveying scheme**

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### Design study

#### Product specification

Taking into account various types of surveys, MBES, Lidar, SDB  
And their performances

**Deliverable: product specification**

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### Design study

#### Preexisting data & products

**Deliverable: map of the compliant existing data**

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### Design study

#### Common vertical reference

Source: NSHC TWG (2010)

NSHC Tidal Working Group work of 2010

MSL vs ellipsoid: diff. <0.5 m.    LAT vs ellipsoid: diff. <0.5 m.    CD vs ellipsoid: diff. <0.8 m.

**Deliverable: evaluation of cost and time for establishing a common vertical reference surface**

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**Design study** **Resurveying strategy**

**Deliverable: resurvey strategy, depending on sedimentology, waves and streams.**

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**Design study** **Implementation policy**

**Take into account**  
 -prerogatives of Member States (priority areas) & funding  
 -funding by European regional development fund, EMFF, « climate change funds »...?

**Deliverable: description of a scheme of governance**

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**Design study** **Overall result**

**To be able to**  
 Specify a programme on an appropriate area  
 Covering several Member States coastline  
 To be carried out in a sensible time scale  
 At a cost to be sensibly estimated  
 Gathering funding by Member States and European funds  
 Delivering harmonized products

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**Design study** **Time scale**

**Specification of design study : September 2014**  
**Proposal by HOs November 2014**  
**To begin January 2015**  
**To be lasting 18 months**

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**Thank you for your attention**

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