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The European marine observation and data network – geological data**Alan Stevenson**

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Abstract A brief report highlights the progress made during the 1st phase of the EMODnet–Geology Project (2009–2012). The project aims to bring together marine geological information from the European seas. All public available data on the sea-bed sediments, seafloor geology, geological boundaries and faults, rate of coastal erosion and sedimentation, geological events and event probabilities, seismic profiles; and minerals including aggregates, oil and gas have been compiled into the map layers at 1:1 million scale stored on the OneGeology-Europe portal (<http://www.onegeology-europe.org/home.html>). The project area covered the Baltic Sea, Greater North Sea and Celtic Sea; however, the EC have extended the geographical area of the programme to include, for example, the Mediterranean and Black seas, and have increased the resolution of compiled information to 1:250 000 scale.

Keywords • Marine observation • Data network • Geology • Environment • Sediment • European seas

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INTRODUCTION

A consortium consisting of the national geological survey organisations of the UK, Ireland, France, Belgium, The Netherlands, Germany, Denmark, Norway, Sweden, Finland, Estonia, Latvia, Poland, and the Nature Research Centre-Institute of Geology and Geography, Lithuania, are working to deliver the geological input to the European Commission's European Marine Observation and Data Network (further – EMODnet). The geological surveys of Europe provide an existing network (through the Association of European Geological Surveys – EuroGeoSurveys) that aims to deliver marine geological information solutions to decision makers in European government and industry, as well as providing baseline information for academic research. The EMODnet-Geology Project started in July 2009 and will end in the summer of 2012. In addition to geological information, EMODnet aims to bring together information from the European seas on hydrography, biology, chemistry, physical properties and habitat mapping. This article describes the progress made during this preparatory phase of EMODnet.

PROJECT OBJECTIVES

The EMODnet-Geology Project is compiling information held by the project partners and additional datasets that are publicly available. The outputs have been delivered through the Web using the multilingual OneGeology-Europe portal, which was developed in the OneGeology-Europe (IGE) project (<http://www.onegeology-europe.org/>). Existing metadata will continue to be stored on the EU-SEASED website, currently being developed and upgraded under the EC-funded GeoSeas project (<http://www.geo-seas.eu/>). The consortium is bringing together datasets according to the 'Preparatory Actions for European Marine Observation and Data Network Tendering Specification', namely all available sea-bed sediments including rate of accumulation or sedimentation; seafloor geology (including age, lithology and origin); geological boundaries and faults; rate of coastal erosion and sedimentation; geological events and event probabilities (including information on submarine landslides, volcanic activity, earthquake epicentres); seismic profiles; minerals (including aggregates, oil and gas). The areas covered are the Baltic Sea, Greater North Sea and Celtic Sea according to the boundaries shown in Figure 1.

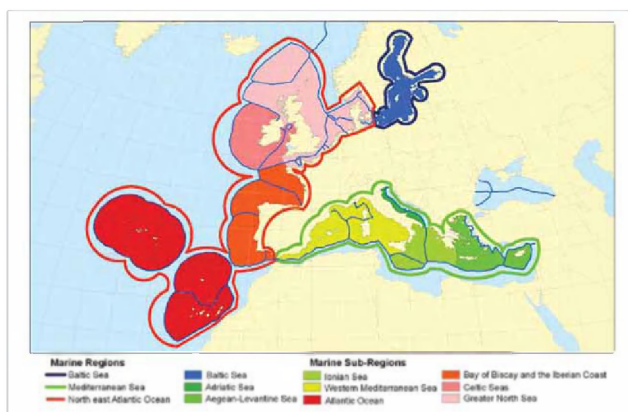


Fig. 1 Marine regions and sub-regions as defined by the Marine Strategy Framework Directive

THE GEOLOGICAL INFORMATION

The project started by identifying relevant data held by the project partners and other national organisations, specifically the interpreted geological information, which involved a comprehensive audit and evaluation of national geological spatial datasets that can be compiled at 1:1 million scale in all partner countries. The main data sources were identified during the first three months of the project and have been subsequently incorporated into the map layers stored on the OneGeology-Europe portal. The map layers are complemented by metadata entries and data files for

their samples and cores, and all acoustic information (seismic records, sidescan sonar data etc) that are accessed through the EC-funded GeoSeas Project. GeoSeas is updating and increasing the range of marine geological and geophysical data established on the EU-SEASED metadatabases and making them available through the dedicated GeoSeas portal. The locations and metadata will be made available as part of the CDI Web Mapping Services (WMS) and Web Feature Services (WFS) services by which these can be added as an extra layer to the EMODnet-Geology portal. The locations and metadata of the samples and cores can then be added to the seamless sea-bed substrate (and other) 1:1 million map layers for the European seas.

THE SEA-BED SEDIMENT INFORMATION

One of the first map layers to be compiled was sea-bed sediment information. The information was harmonised by evaluating the different classification schemes used in each country, translating them to a uniform sediment scheme and then generalizing them to 1:1 million before combining into a single sea-bed sediment dataset (Fig. 2). The timeline in compiling and harmonising the sediment map was challenging, as the first version of the sea-bed substrate map was needed for the EUSeaMap project in January 2010; however, a draft map was delivered to this schedule. The data required was provided as ESRI shape files

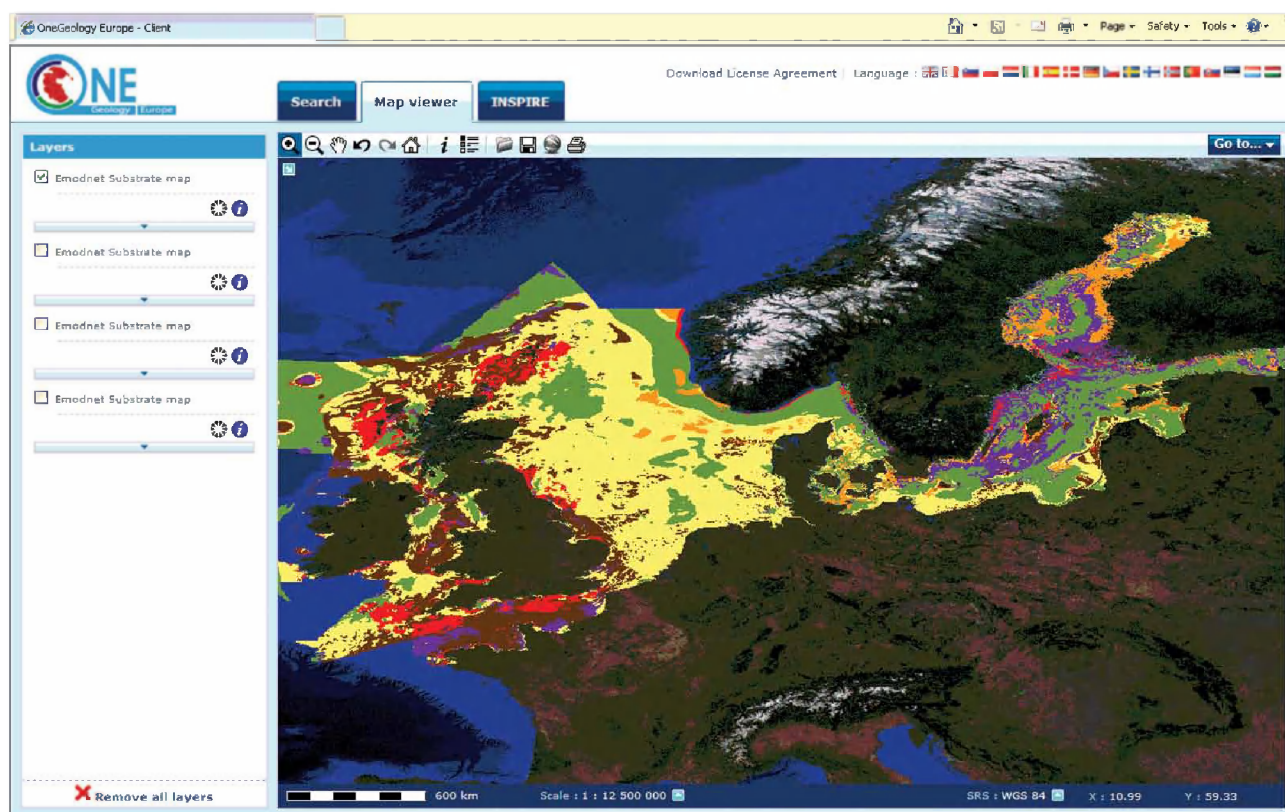


Fig. 2 Sea-bed substrate map of the EMODnet-Geology study area as shown in the OneGeology-Europe portal

showing polygon features, and all maps were provided in the WGS84 geographical coordinate system. The coastline used in the project GIS is from the VLIZ (2010) Maritime Boundaries Geodatabase, version 5. Available online at <http://www.vliz.be/vmdcdata/marbound>.

Due to the challenging timeline, the substrate reclassification scheme is simplified and provides an estimate of the substrate from the uppermost 30 cm of the sediment column. The BALANCE approach was adapted to reclassification due to its simplicity and transparency (Al-Hamdani *et al.* 2007). The approach is based on surface material (that is sometimes predicted). It was decided to include four substrate classes on the basis of the modified Folk triangle (mud to sandy mud; sand to muddy sand; coarse sediment; mixed sediment) and take into account three additional classes (boulder, till/diamiction, bedrock) (Fig. 3). The aim was to compile one sea-bed substrate map that includes all seven classes.

OTHER DATASETS

Sea-bed geology. The harmonised dataset of the offshore areas of the 1:5 Million International Geological Map of Europe and Adjacent Areas (Asch 2005) was implemented as a Web Mapping Service (WMS). In order to make the data interoperable with the onshore data from the eContent Plus project “OneGeology-Europe” (1G-E), the 1G-E vocabulary developed in agreement of 20 European Geological Surveys was implemented. This enables comparison and use of both onshore and offshore geological data of Northern Europe using the same geological terms, definitions and classifications and the sharing of data with the EMODnet and OneGeology communities and global users.

Coastal behaviour. The project completed the compilation of data on coastline migration. A GIS layer based on the EUROSION database on coastal erosion and sedimentation has been supplemented and updated by the partners.

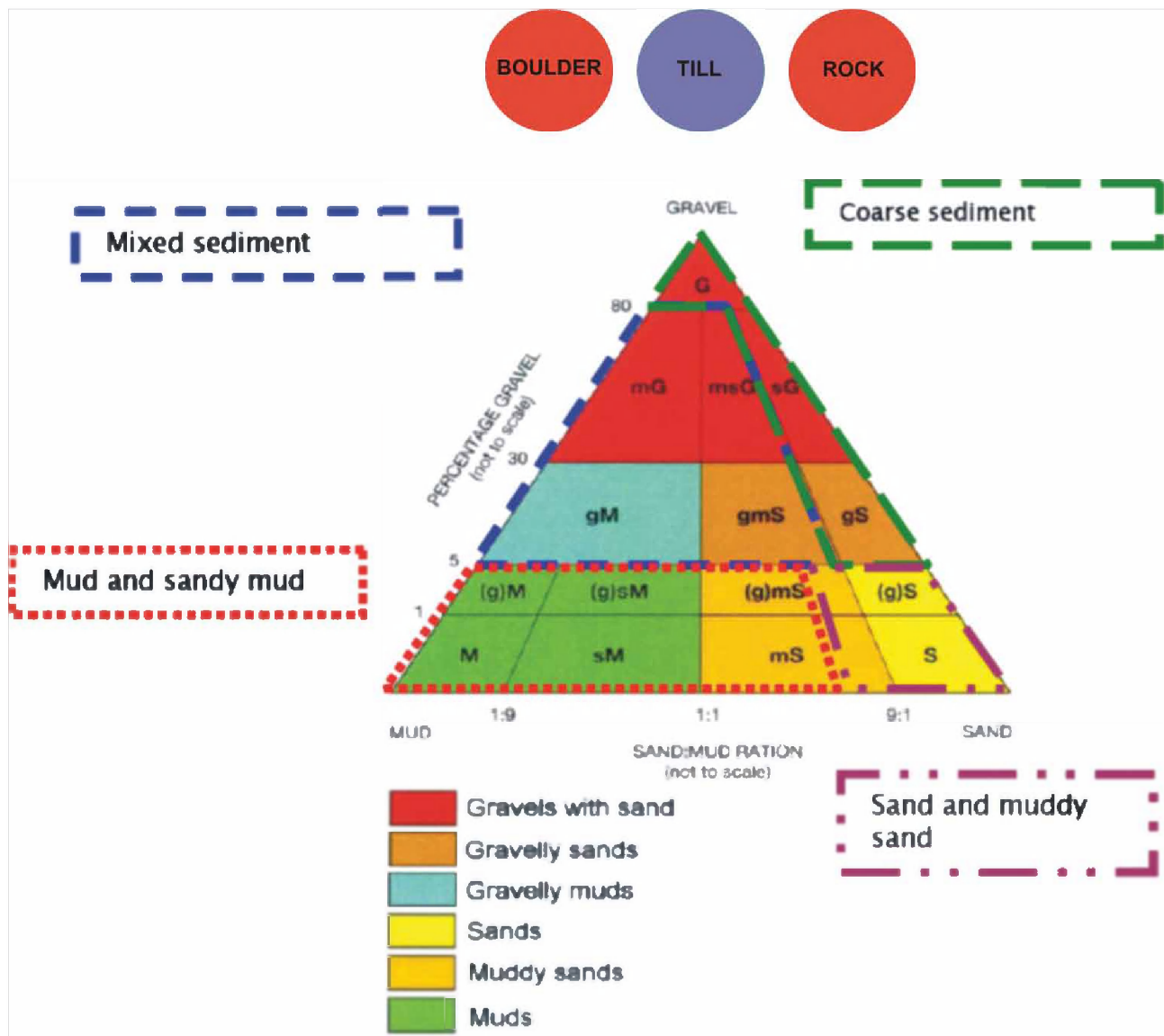


Fig. 3 The modified Folk classification system

Geological events and probabilities. Submarine landslide and earthquake information was derived from the EU-funded COSTA (Continental Slope Stability) project. The European-Mediterranean Seismological Centre (EMSC) run a portal service, <http://www.seismicportal.eu/jetspeed/portal/> with associated web services. The EMSC data, including its event catalogue, are available in the EMODnet-Geology portal through these standard web services.

Minerals. Maps have been compiled showing areas of minerals (including aggregates, oil and gas, and metalliferous minerals) in the regional seas based on information available to the project partners, including publicly-available information (published scientific papers etc.).

Compilation of these various has highlighted data gaps and deficiencies, for example the low-resolution data on which many of the national geological interpretations are based. Examples of high-resolution datasets using the latest acquisition and imaging techniques are being included in selected areas of the sub-regional seas under investigation to demonstrate the possibilities that long-term national sea-bed mapping strategies could deliver to the benefit of individual countries and the European Union. These examples can provide incentives to national funding agencies to adopt a strategy for high-resolution mapping, which would strengthen the European research area and underpin all public and commercial activities in the marine environment.

THE NEXT PHASE OF EMODNET

The current phase of EMODnet ends in 2012. The European Commission issued the invitation to tender for the full EMODnet project, with a closing date of September 2012. For the geological component of the project, the EC have extended the geographical area of the programme to include, for example, the Mediterranean and Black seas and have increased the resolution of compiled information to 1:250,000 scale.

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