D6.4 Report

Data Management and Best Practices towards EU wide Data Harmonisation- The PEARL Experience

This project has received funding from the European Union´s Seventh Framework Programme for Research, Technological Development and Demonstration under Grant Agreement N° 603663 for the research project PEARL (Preparing for Extreme And Rare events in coastal regions).

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Flood Risk related Data Management and Best Practices towards EU wide Data Harmonisation- The PEARL Experience

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Disclaimer

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Summary

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1 Introduction

As the models and methods to be developed in PEARL require high amount of different data types and formats such as geo data, time series or narratives which have to be exchanged between the models, efficient data management is the key to the timely delivery of the intermediate results and their efficient processing along the project workflow.

This report outlines the PEARL experience regarding the data management and infrastructure. It encompasses the two main components: Metadata Catalogue and the Data Management Procedures.

The Metadata Catalogues (MDC) has been developed and implemented in order to support the coordinated data management practice from the initial project phase. For its development we considered the existing EU initiatives and Directives for management of data infrastructure (e.g. 2007/2/EC- INSPIRE) as well as the experience and data infrastructure developed within previous projects, in particular the German national project KLIMZUG- Nord, where OGS standards complied data services and data management have been developed.

A coordinated Data Management has been pursued from the intitial project stage and continuously supported the activities in the case study areas when implementing the PEARL methods and tools.

2 Key Data Management Regulations

In order to develop a data management plan, PEARL referenced the key relevant Directives and regulations at the EU level. The key Directive ad for the PEARL activities 2007/2/EC- INSPIRE) which is dedicated [to create a European Union spatial data infrastructure for the purposes of EU environmental policies and policies or activities which may have an impact on the environment.]

Following the INSPIRE vision the data are to be collected once and maintained at the level where this can be done most effectively. The Directive also emphasises the importance of the seamless combination of data from different sources, demanding their interoperability (Van den Broucke, 2014).

This vision is in line with the requirements on data management in PEARL. For the implementation of the PEARL holistic framework it is necessary to use and combine data of different type and from different sources, which are to be used by different partners to apply their models. Also, those models can be deployed in a sequential order, requiring seamless transfer of data between them.

INSPIRE delivers general rules to establish an infrastructure for spatial information in Europe for the purposes of Community environmental policies and policies or activities which may have an impact on the environment.

Table 1 Data Interoperability Components (Van den Broucke, 2014).

(A) INSPIRE Principles	(B) Terminology	(C) Reference model
(D) Rules for application Schemas and feature catalogues	(E) Spatial and temporal aspects	(F) Multi-lingual text and cultural adaptibility
(G) Coordinate refe-rencing and units model	(H) Object referencing modelling	(I) Identifier Management
(J) Data transformation	(K) Portrayal model	(L) Registers and registries
(M) Metadata	(N) Maintenance	(O) Quality
(P) Data Transfer	(Q) Consistency between data	(R) Multiple representations
(S) Data capturing	(T) Conformance	

An important aspect addressed by the INSPIRE is the creation, storage and maintenance of metadata. According to Article 5(1) of INSPIRE Directive 2007/2/EC, Member States shall ensure that metadata are created for the spatial data sets and services. INSPIRE provides the regulation and the technical guidelines for the management of metadata.

3 Data Management in PEARL

3.1 Overview

PEARL approached data management following the key activities:

1. Development, deployment and maintenance of the Metadata catalogue
2. Definition and monitoring of the procedures for data collection, deployment and storage

3.2 Metadata Catalogue

The Meta Data Catalogues (MDC) has been developed and implemented in order to support the coordinated data management practice from the initial project phase.

For its development the following steps have been undertaken:

I) Metadata online survey

II) Metadata platform development

III) Establishment of the platform

PEARL Metadata Catalogue is implemented as the web portal, based on “ESRI Geoportal”. A geoportal is a gateway to web-based geospatial resources, enabling users to discover, view and access geospatial information and services made available by their providing organizations. Data providers can use the geoportal to make their geo-spatial resources discoverable, viewable, and accessible to other PEARL project partners. The MDC has been designed in order to provide the efficient support and overview of the available and required data throughout the project and in this way support the coordinated actions in the PEARL case study areas. The catalogues is maintained and improved during the duration of PEARL and where required beyond the project lifetime.

The following metadata standards are supported:

- FGDC
- Dublin Core
- North American Profile (Data)
- North American Profile (Services)
- GEMINI (Data)
- GEMINI (Services)
- ISO 19115 (Data)
- ISO 19119 (Services)
- ISO 19115-2 (Imagery and Gridded Data)

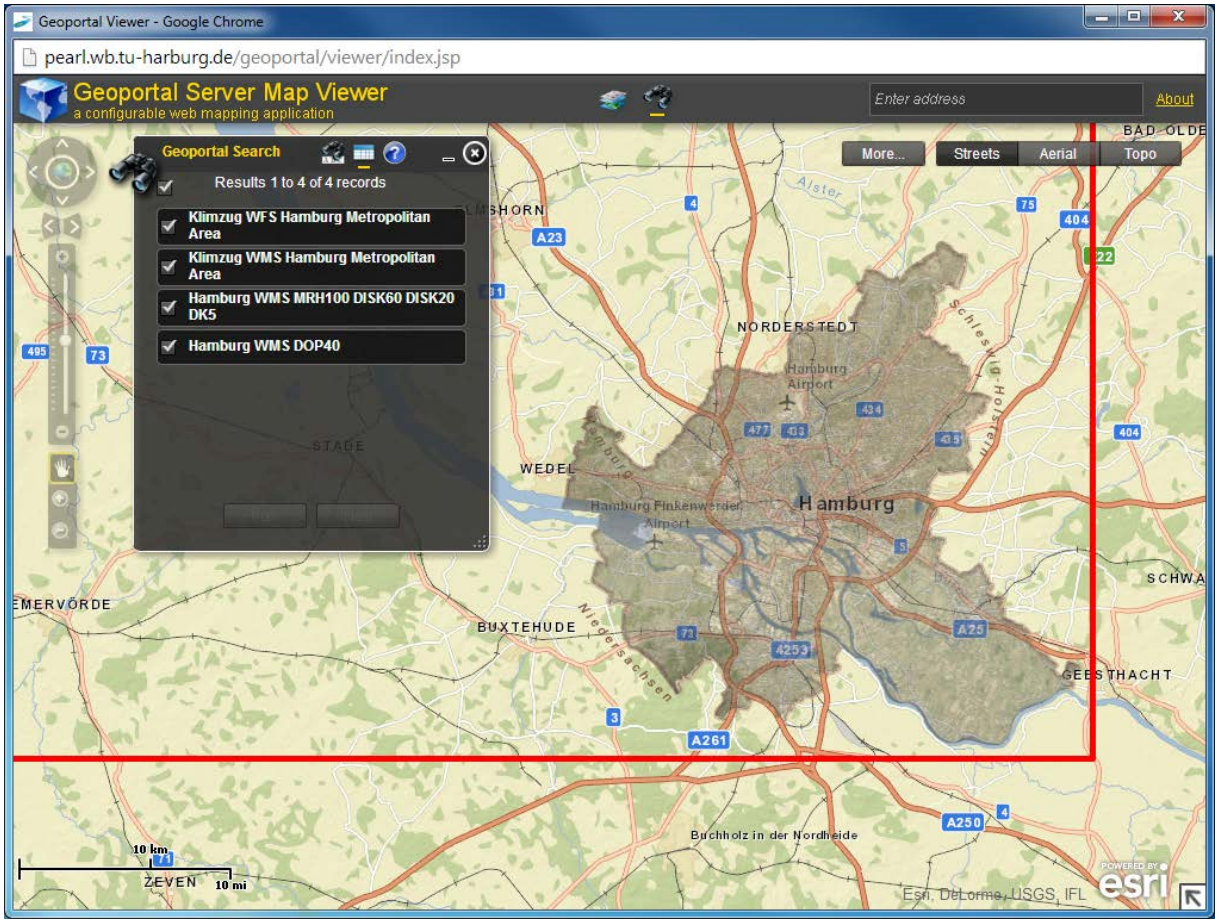

Figure 1: Live preview of Hamburg Web Map Service Layers

3.3 System Infrastrcuture

The developed MDC supports rather flexible data management as the ‘metadata i.e. the data about data’ is centrally stored, which ‘*points or* create links to the data sources or data providers, which can be stored on any external server. It enables the partners to store data on their own servers and follow their own access policies and still enables the coordinated data management and case study activities through the centralised metadata repository (MDC).

During the project meeting in Hamburg in January 22-24, 2014 it has been agreed to follow the decentralised data management policy, whwere each responsible case study partner is in charge of the data for the study area of interest, but the links to the data and the type of their avaiability (full, with restrictions etc) are stored in the MDC and as such available to the modellers (WP1-5 parnters). The recommended system infrastructure which is to be implemented for PEARL is illustrated in Figure 6.

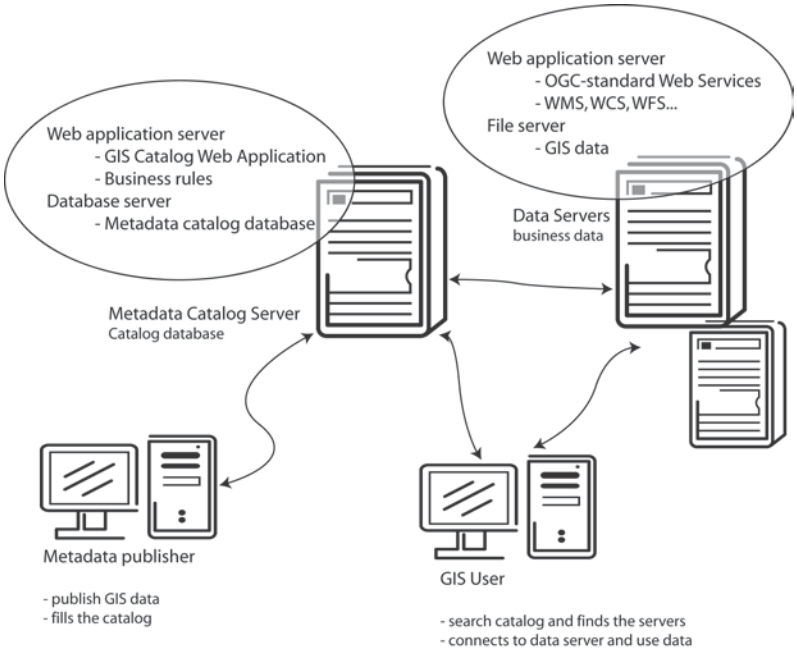

Figure 2 Suggested information system deployment structure

3.4 Data

As the models and tools develop within PEARL are different in their nature (e.g. hazard vs. vulnerability models), different types of data was needed for their operation. Tables 2 and 3 illustrate the variety of data that are being used in PEARL:

Table 2 Available data used for research activities in German case study area (Elbe Estuary)

No.	Data type	Brief description
1.	Bathymetry	Bathymetric data of the Lower Elbe (2006, 2010) Resolution: 1m x 1m Bathymetric of the Elbe from Geesthacht to Neu Darchau (2016) resolution: 1x1m
2.	DEM	DEM of the Metropolitan area of Hamburg, Schleswig-Holstein and Lower Saxony (1 m x 1 m)
3.	Discharge	Time series of discharges for Neu Darchau (Source: Portal Tideelbe)
4.	Water level	Time series of water level for several gauges along the Lower Elbe and the North Sea, time series of BSH water level forecasts and time series of measured storm surge events
5.	Rain fall	Time series of rain fall data for several gauges
6.	Wind data	Wind field data from superior climate models (regional Climate Model Cosmo-CLM forced by Echam 5)
7.	Historic nautical charts	Historic nautical charts including historic bathymetric conditions of the Lower Elbe (1930)
8.	Flood protection infrastructure	Data on recent and historic flood protection infrastructure including the last 2000 years
9.	Census data	Population data
10.	Land use data	Recent land use data and data from previous projects
11.	Cadastral data	Recent cadastral data and data from previous projects

12.	Company data	Data on companies for the city of Hamburg (recent and from previous projects)
13.	Building data	Building data (floor plans, design descriptions, etc.)
14	Evacuation process	Evacuation plans, information of the evacuation process, collecting points and refuges etc.
15.	Direct / indirect damages	Direct / indirect damages for different land use categories and economic sectors (project XtremRisK)
16.	Damage functions	Damage functions for residential buildings, infrastructure and commercial objects
17.	Flood maps	Existing flood maps for comparative purposes
18.	Historic Documents	Available historic documents, books, maps relevant for the Desk FORIN methodology
19.	Interviews with the key stakeholders	The expert knowledge and experience obtained in a direct communication with the key stakeholders within the LAAs and beyond

Table 3 Available data used for research activities in Italian case study area (Genoa)

No.	Type of data	Brief description
1.	Rainfall	Time series of rainfall; Format: ASCII, xlsx; Resolution: 10 min
2.	Discharge	Time series of discharge; Format: ASCII, xlsx; Resolution: 10 min
3.	Flood prone area	Shape files of flood prone area; Return period: 50 yrs, 200 yrs, 500 yrs
4.	Digital elevation model	Digital elevation model; Format: ASCII, grid file; Resolution: 5m
5.	River profile sections	River profile sections; Format: CAD, xlsx
6.	Observed data	Observed data (rainfall, discharge) of Nov. 4th, 2011
7.	Census	Census data from 2011, Format: Shape file, xlsx
8.	Cartografia Tecnica Comunale	Format: CAD; Scales: 1:2000, 1:1000

The procedure for data collection, its storage and updating has been agreed upon at the 1st. Project Committee Meeting in January 2014 and has regularly been discussed and when necessary updated.

4 Lessons learned and Recommendations

Although in PEARL a number of sophisticated models have been developed and deployed, requiring a number of different data types (e.g. geo data, time series), which should also be operated following the PEARL modelling chains (such as the hazard assessment chain as described in the report D2.1), the scale of the integration and collaboration between the partners was rather bilateral, which considerably reduced the need for an extensive data management in the case study areas. In order to derive the plausible lessons learned and recommendations for the data harmonisation a higher level of integration and interconnection of the models and tools is needed.

The use of the Metadata catalogue is often seen as a burden and additional work, rather than a help. In order to enhance the usability of the Metadata catalogue, the team members and model developers should from an early stage start using and referring to the catalogue, keeping it as the only communication tools about the data. Metadata Catalogue will be kept available for all partners after the project lifetime, however, without updating and maintaining it, its usability will be become rather limited.

The decentralised data management is the only possible way to pursue the modelling work between different parties considering strict requirements on data privacy and accessibility of the relevant institutions and data owners. In the future the data policies and requirements on the data security will be increasingly considered, which will have an impact on the data management and possibly its efficiency.

References

EC (2007) Directive 2007/2/EC establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

Danny Vandenbroucke (2014): INTRODUCTION TO INSPIRE, available at: https://www.geo-train.eu/modules/introduction_inspire/pdf/introduction_inspire.pdf