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U-Geohaz – "Geohazard impact
assessment for urban areas"

Deliverable D4.4: Rockfall Information System (RIS) design

A deliverable of WP 4 (Activity 4.3): Rockfall Information System "RIS"

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Lead contractor for this deliverable: IGME

Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the Consortium (including the Commission Services)	x
CO	Confidential, only for members of the Consortium (including the Commission Services)	
TN	Technical Note, not a deliverable, only internal for members of the Consortium	

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EXECUTIVE SUMMARY

The actions defined and performed in the Activity 4.3 "Rockfall Information System "RIS" are described in this document, which represents the third deliverable of WP4 "Tools and methods to support Early Warning System for Rockfalls".

The main goal of the Activity 4.3 is to collect and update the necessary input data to support U-Geohaz products related to rockfall hazard. This system will increase the knowledge of rockfall prone urban areas, promoting risk assessments and better risk management in urban areas and increasing their resilience. The RIS will gather updated information on rockfall events, Geographic data, Soil Data, Vegetation Data, Climate data and Resilience Data (Source data, Rainfall thresholds). The implementation of the RIS will involve not only the CPAs but also the related organizations that account for the different necessary input data.

At the end of the project, a final demonstration of RIS will be done in one of the Canary island test site. The outcome of this task will be essential for the training of the U-Geohaz products in the WP5.

REFERENCE DOCUMENTS

N°	Title
RD1	DoW Part B
D4.1	User requirements

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1 INTRODUCTION

This document is the first deliverable of the Activity 4.3 "Rockfall Information System "RIS". The purpose is define the structure of a database able to collect and store the available thematic and ancillary information necessary to evaluate rockfall hazard.

The activity 4.3 will have the following objectives:

- To collect and organize high-quality digital cartography developed in compliance with U-Geohaz project requirements.

- To define the basic principles and standards that should be applied in the processes that involve digital cartographic information, both in the generation of new products, as well as in the update/modification.

- To develop a nomenclature for standardization of the cartographic data necessary for supporting rockfalls product.

- To include metadata file for supporting U-Geohaz products, that are mandatory in the Data Specification on Natural Risk Zones- Technical Guidelines that establish the practical implementation of these data according to INSPIRE Directive.

The quality of the products will be determined by the capacity to meet the needs required by the final users. The following parameters will be taken into account in order to estimate the quality of the products:

- Geometric accuracy: the data, including in RIS, will avoid errors in the spatial position of the objects.

- Completion: data will be complete and a detailed information about each file will be included in the general data form.

- Consistency: data will be compliance with the graphic rules: the non-existence of repeated points, polygons will be closed; line connections will be verified, etc.

- Temporal accuracy: degree of the relevance and temporary validity of the data will be defined.

2 ROCKFALL INFORMATION SYSTEM (RIS)

2.1 Type of data

Geodatabase can be an effective solution to store data and model for disaster risk assessment and spatial planning. Geodatabase enables the integration, management, storage and analysis of several different source and type of thematic information. Geodatabase has a comprehensive information model for representing, managing of data and model. In this sense, two main graphics structures will be considered in the Rockfall Information System (RIS): raster and vector. In the raster structure, the graphics information is stored in a geo-referenced matrix system, organized in rows and columns, and with a value associated to each cell. For vector

structure (i.e., shapefile), the graphic elements are represented by three basic geometric entities: points, lines and polygons.

We will use point features when the shape and the dimensions of the entities will be too small to be represented, on a certain scale, as lines or polygons. Lines elements, one dimension, are arc features with nodes at the beginning and end of each part. The intersections of lines are located in a node. Polygons are two-dimensional objects that represent confined areas. These elements are stored in layers or graphics files, linear, and polygonal. All shapefiles (point, linear or polygon) have associated an attributes table, where the information is detailed for each single element. This information can be stored in a database useful and functional for consulting, searching and analysing, the geographic information.
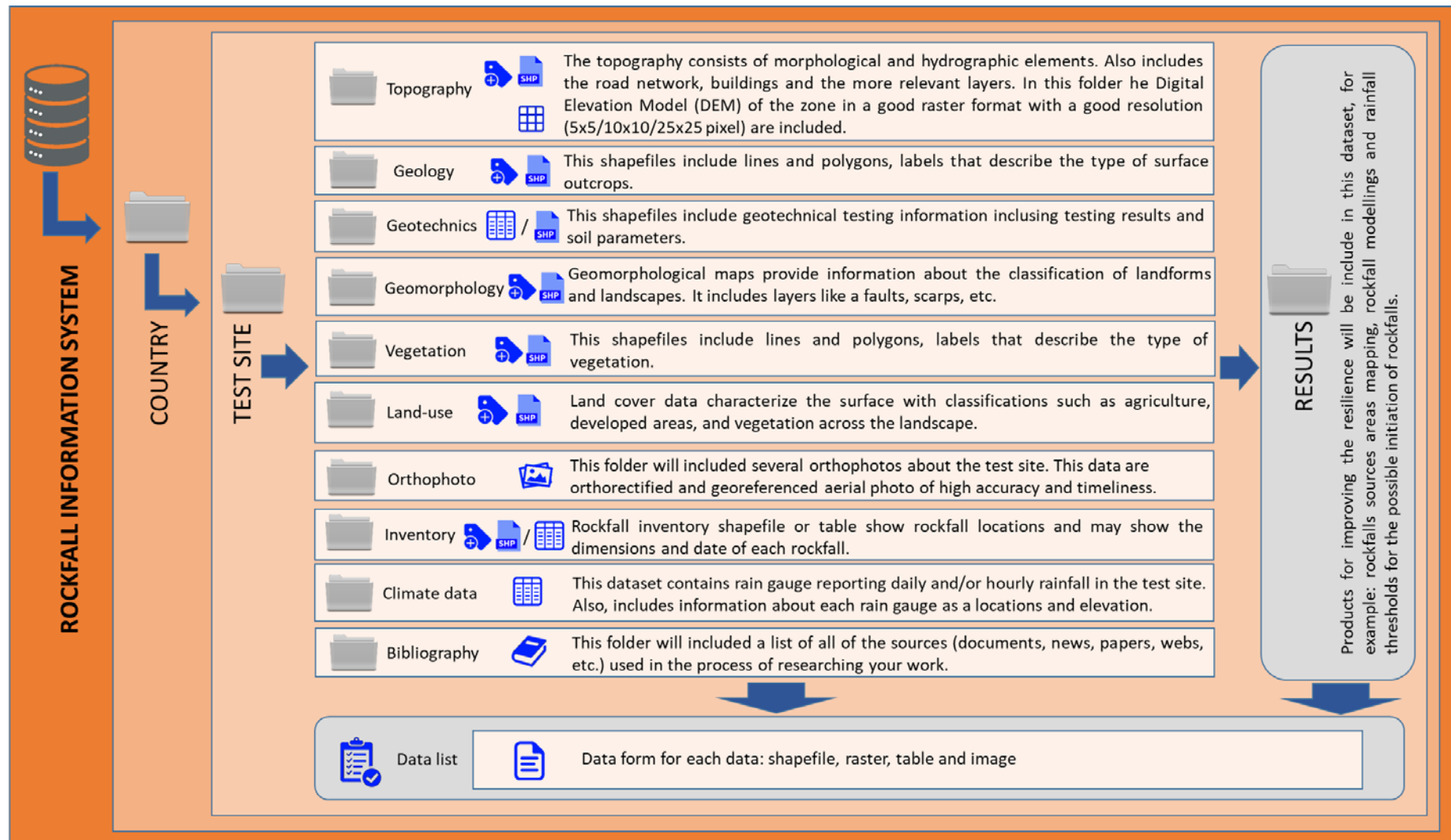
In addition, RIS will include other types of information like tables, images or word/pdf documents.

2.2 Format

Cartography in vector format will be prepared as shapefile to be incorporated directly into the RIS database. The raster information will be delivered as TIFF / TFW, ESRI Grid or ECW.

2.3 «RIS» diagram

The following diagram shows the structure of the Rockfall Information System (RIS). The first information lever will consider the country where the data is collected, since of the RIS will be implemented in different European areas, in the framework of the collaboration between the partners of the U-Geohaz Consortium. In addition, RIS will be used in the training activities of work package 5. The second information level will define the study area where the information is available and where the rockfall hazard will be carried out. Finally, considering all relevant data for rockfall hazard analysis, each test site is structured in 10 folders containing the following information: topography, geology, geotechnics, geomorphology, vegetation, land-use, orthophoto, inventory, climate data, and bibliography. Additionally, a data list will be included where all files will be described. For each file, a data form will be available with specific information, as date, type of data, attributes, etc.

ROCKFALL INFORMATION SYSTEM

COUNTRY

TEST SITE

Topography — The topography consists of morphological and hydrographic elements. Also includes the road network, buildings and the more relevant layers. In this folder he Digital Elevation Model (DEM) of the zone in a good raster format with a good resolution (5x5/10x10/25x25 pixel) are included.

Geology — This shapefiles include lines and polygons, labels that describe the type of surface outcrops.

Geotechnics — This shapefiles include geotechnical testing information inclusing testing results and soil parameters.

Geomorphology — Geomorphological maps provide information about the classification of landforms and landscapes. It includes layers like a faults, scarps, etc.

Vegetation — This shapefiles include lines and polygons, labels that describe the type of vegetation.

Land-use — Land cover data characterize the surface with classifications such as agriculture, developed areas, and vegetation across the landscape.

Orthophoto — This folder will included several orthophotos about the test site. This data are orthorectified and georeferenced aerial photo of high accuracy and timeliness.

Inventory — Rockfall inventory shapefile or table show rockfall locations and may show the dimensions and date of each rockfall.

Climate data — This dataset contains rain gauge reporting daily and/or hourly rainfall in the test site. Also, includes information about each rain gauge as a locations and elevation.

Bibliography — This folder will included a list of all of the sources (documents, news, papers, webs, etc.) used in the process of researching your work.

Data list — Data form for each data: shapefile, raster, table and image

RESULTS — Products for improving the resilience will be include in this dataset, for example: rockfalls sources areas mapping, rockfall modellings and rainfall thresholds for the possible initiation of rockfalls.

Data list for cartographic layers, alphanumeric tables, orthophotos, and maps services.

ID	Type	Name	Description	Update	Person responsible

ID.: Numeric ID of Raster, shapefile, table, orthophoto and Map service, data. Code XX-Y-Z where XX is the number of the folder for the test site (i.e., Topography is 01, and Inventory is 08), Y is the progressive number of the data and Z is the number of version

Type: (R) Raster; (S) Shapefile; (T) Table; (O) Orthophoto; (M) Map service;

Name: 2.4 Nomenclature

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Data form for shapefile or raster

Graphics structures (shapefile or raster)

ID	*See Data list*

Name	*See Nomenclature section*
Classification	*Topography, Geology, Inventory, Vegetation, Land-use*
Description	
Type of data	*Points, Lines, Polygons, Raster, …*
Scale/Resolution	*1:25000/ 5x5 meter pixel*
Metadata file	

Date	*01/01/2018*	Entry Date	*15/06/2018*	Update	*31/12/2018*
Version					

Dissemination Level	*Public, Restricted to a specific group, Confidential*

Fields (Attribute)

Name	Description

URL/ website	

Data form for tables or orthophoto

Tables	
ID	*See Data list*

Name	*See Nomenclature section*
Classification	*Topography, Geology, Inventory, Vegetation, Land-use*
Description	
Metadata file	

Date	*01/01/2018*	Entry Date	*31/01/2018*	Update	*31/12/2019*
Version		*v02*			

Dissemination Level	*Public, Restricted to a specific group, Confidential*

Fields (Attribute)

Name	Description

URL/ website	

2.4 Nomenclature

Once the structure of the RIS will be defined, the nomenclature of the files will be established facilitating access to information not only for the U-Geohaz Consortium but also for the organizations that request the data (i.e., CPAs, Geological surveys). A specific coding scheme will be adopted to name the information stored in the RIS. This is a lesson learned from other EU projects developed with similar purposes (e.g., SAFETY, LAMPRE, PANGEO). Every single data is coded as follows:

Vector information

In case of shapefile files, the nomenclature will be:

<CC>_<TTT>_<NAME>_ <NN>			
Country code	Test site code	Descriptive name	version
ES	TNF	Source_areas	03
IT	VAO	Vegetation	00

where:

- Country code (CC): a standard ISO 3166-1 alpha-2 defined for most of the countries and dependent areas in the world by two-letters.

- Test site code (TTT): three letter representing the test site where the data is available.

- Descriptive name (NAME): one or two words which clearly describes what the layer represents or its products, is known as a descriptive name. Use the English language.

- Version (NN): a progressive number that indicates changes in the data.

Raster information

In case of raster files, the nomenclature will be:

<CC>_<TTT>_<NAME>_<YY>			
Country code	Test site code	Descriptive name	Year
ES	GCN	MDE	09
IT	VAO	SLOPE	17

where:

- Country code (CC): a standard ISO 3166-1 alpha-2 defined for most of the countries and dependent areas in the world by two-letters.

- Test site code (TTT): three letters representing the test site where the data is available.

- Descriptive name (NAME): one or two words which clearly describes what the layer represents or its products are, is known as a descriptive name. Use the English language.

- Year (YYY): due the temporal relevance, a code for different years.

Tables

In case of tables, the nomenclature will be:

<CC>_<TTT>_<NAME>_<YY>_ <NN>				
Country code	Test site code	Descriptive name	Year	Version
ES	TNF	Rockfall_events	12	01
IT	VAO	Rainfall_gauge	16	00

where:

- Country code (CC): a standard ISO 3166-1 alpha-2 defined for most of the countries and dependent areas in the world by two-letters.

- Tet site code (TTT): three letter representing the test site where the data is available.

- Descriptive name (NAME): One or two words which clearly describes what the table represents or its records are, is known as a descriptive name. Use the English language.

- Year (YYY): due to the temporal relevance, a code for different years.

- Version (NN): a progressive number that indicates changes in the table.

Orthophotos

In case of orthophoto files, the nomenclature will be:

<CC>_<TTT>_<NAME>_<NN>			
Country code	Test site code	Descriptive name	year
ES	GCN	PNOA_ANNUAL	98
IT	VAO	PTP	05

where:

- Country code (CC): a standard ISO 3166-1 alpha-2 defined for most of the countries and dependent areas in the world by two-letters.

- Tet site code (TTT): three letter representing the test site where the data is available.

- Descriptive name (NAME): one or two words which clearly describes what the layer represents or its products are, is known as a descriptive name. Use the English language.

- Year (YYY): due to temporal relevance, a code for different years.

Documents

In case of documents (word, pdt, etc.), the nomenclature will be:

<CC>_<TTT>_<AUT>_<TITLE>			
Country code	Test site code	Author	Title of the document
ES	TNF	Sarro_et_al	A methodology for assessing rockfall hazard within the ambit of Civil Protection: The Safety project.
IT	VAO	Maccaferri	5,000 kJ rockfall barrier (Bespoke) Arvier (Valle D'Aosta)

where:

- Country code (CC): a standard ISO 3166-1 alpha-2 defined for most of the countries and dependent areas in the world by two-letters.

- Tet site code (TTT): three letter reperesenting the test site where the data is available.

- Author (AUT): the name of the author or institution, responsible for the document.

- Title of the document (TITLE): the complete document title.

2.5 Metadata

All geographic information of the RIS, both graphics and alphanumeric, will be properly documented according to the standard of metadata. They are defined as "data on data". This documentation on Geographic information is a necessary work for optimal management and exploitation of the data. It is essential for the data exchange and should be common for all potential users. We will apply metadata standards that provide the structure for describing digital geographic data. The partner responsible for each product will be responsible for the generation of the corresponding metadata. The metadata file (.XML) will comply with the nomenclature of the layer / table / orthophoto to which it refers. Finally, this metadata of the U-Geohaz product will be Inspire-compliant.

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