Grant Agreement No. 783169
U-Geohaz – "Geohazard impact assessment for urban areas"

Deliverable D3.1: User requirements

A deliverable of WP3: Early Warning System for Volcanic Activity

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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)	
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	x

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EXECUTIVE SUMMARY

The activities defined and performed in the Activity 3.1 named “Identification of user needs” are reported in this document, which represents the first official deliverable of WP2 “Early Warning System for Volcanic Activity”.

The main goal of this activity is to describe the needs from the involved CPA (Canarian Civil Protection) to improve volcanic early warning management activities. This task benefit from the previous collaboration of IGN-CNIG with the Spanish and Canarian CPA in the framework of the SAFETY project (*ECHO/SUB/2015/718679/Prev02/718679*), were specific needs for volcanic hazard prevention in urban areas were determined. User needs have been defined considering Sendai Framework for Disaster Risk Reduction 2015–2030, identifying the most efficient and effective way to integrate U-Geohaz products and services into the CPA prevention mechanisms. These User Needs will be converted into Requirements for effective product and service developments.

To define the needs, the results of two activities are taken as input:

- The review of international and EU strategies and Directives;

- The analysis of the existing natural risks prevention procedures of the CPAs involved in the project.

The result of this deliverable is the list of user requirements, useful to support civil protection authorities in increasing knowledge and ability to manage and reduce the volcanic risk.

It is worth to underline that the user requirements are defined in the first stage of the project , and plays the role of starting point and guidance for the development of the products. However, there will be a continuous updating during the progresses of the project thanks to the close collaboration among users, scientists and technological partners during the next phase of the project.

REFERENCE DOCUMENTS

N°	Title
RD1	DoW U-Geohaz

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1 INTRODUCTION

Damages and fatalities caused by geohazards have considerably increased in Europe during the last decades; urban pressure has led more people to live in flood plains, around seismically active areas and in zones prone to landslides. A lack of regulatory mechanisms in many countries to face geohazards within the ambit of urban planning, as well as poor prevention products and services, have increased the risk and exacerbated the effects of natural disasters. Geohazards in Spain cause significant economic and social losses. Every year, nearly 25 people are killed while economic losses exceed 0.23% of GDP. Indirect economic costs are not evaluated, but they can be very important. Geohazards are contemplated in the Spanish legislation within the ambits of the land regulations and the civil protection management, both in hands of the 17 autonomous communities of the country. The result is a large heterogeneity in approaches to geohazard mapping and different regional velocities about how to integrate efficiently geoscience knowledge into the land-use, urban development policies and natural risks prevention procedures. On a larger scale, Europe shows a similar situation to the Spanish one, with heterogeneous policies across borders and a lack of common methodological guides to elaborate geohazard maps. In this sense, it is essential to understand that geohazards are an international problem that requires collaboration and mutual understanding guided by collective EU policy.

The need to improve efforts for the development of prevention products and services is part of an innovative approach to shift from “disaster management” to “disaster risk management”. In this context, the U-Geohaz project activities have to be well positioned within the context of the European and international initiatives related to risk prevention and management, namely the EU civil protection mechanism and its legislation and the recently adopted Sendai Framework for Disaster Risk Reduction 2015-2030. In fact, the Sendai framework will aim to prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increasing the preparedness for response and recovery, and thus strengthening resilience.

In addition, some directives have to be considered in order to identify the most efficient and effective way to integrate U-Geohaz products and services into the CPA prevention mechanisms. For example, one of the goal of U-Geohaz is the development of cartographic products to support activities of risk evaluation; for this type of product the INSPIRE Directive is valid and already operative in EU Member States. INSPIRE sets up a framework of data, technology, policies, standards, and human resources, necessary to facilitate the sharing and using of spatial information. However, the success of the INSPIRE implementation will greatly depend upon the mobilization of the communities (as EuroGeoSurveys) to make the best use of this framework to develop their own infrastructure to serve the users’ needs, possibly in partnership with other communities. The contribution to the maintenance of the implementing rules will permit to adopt this major piece of legislation to the evolution of the needs and of the technologies.

2 VOLCANIC HAZARD MANAGEMENT IN SPAIN

The Spanish National Civil Protection service is a complex system where the assistance and overcoming of emergencies are assigned to several Bodies and operative structures. In particular, the responsibility related to the volcanic risk management and decision-making is shared between National and Canary Island (Autonomic) authorities, depending on the phase and situation of the declared emergency. Different emergency plans can be activated, from local to national level, depending on the increasing volcanic risk and situation. IGN declares the scientific alert with its own data or evaluating the available data from other institutions through the Scientific Committee of the corresponding Emergency Plan. The Volcanic Alert Level is established and changed by the Ministry or by requirement from the National Government in the Region or the Director of the Emergency Plan (National or Regional).

2.1 Administrative framework

The Basic Civil Protection Norm was approved by Royal Decree 407/1992 of 24 April. It establishes that emergencies related to volcanic risk were ruled by Special Plans which must be approved according to corresponding Basic Directive.

Basic Directive for Civil Protection Management for Volcanic Risk was published on 21 February 1996 (BOE 4 March 1996). Here two levels of planning were stablished, national and autonomic, and a minimum number of functions were defined for both of them.

Eighteen years later, on 1 July 2010 The Special Plan for Volcanic Risk Emergencies in the Canary Islands of Civil Protection was approved by Royal Decree. It is the fundamental document to manage volcanic crisis in Spain, provided that they are not declared national emergencies.

In case the volcanic emergency is considered a national one it applies the National Plan for Volcanic Risk of Civil Protection (30 January 2013, BOE 11 February 2013)

2.2 Spanish Civil Protection System

The Spanish Civil Protection and Emergency General Directory is a public service aimed to study and prevent collective high risk, disasters and public calamity situations that can suppose a risk for the citizens, as well as to protect the citizens and their properties when those situations arise.

The main **functions** include:

- Preparation of civil protection plans at national level or those whose competence will be assigned by the existing legal regulations.
- Preparation and management of exercises and simulations in the framework of the aforementioned plans.
- Development of studies related to risk analysis and preventive pilot projects to back up emergency and disaster prevention plan.

- Preparation and broadcast of warnings to civil protection organizations and, where appropriate, to citizens.
- Management of subsidies and aid set aside to meet needs derived from disasters or catastrophes and preparation of the corresponding regulations.
- Theoretical and practical training in the management of risks and emergencies, including the training of managers and personnel of the services and organizations involved in emergency actions, particularly fire and rescue services, health services and law enforcement authorities.
- Carrying out studies and information programs for the citizenship, promoting the self-protection of citizens and corporations and promoting social participation in activities of civil protection and emergencies and education programs for prevention in schools.
- Coordination of relations with the different Civil Protection Delegations and Sub-Delegations of Government and with the Regional Bodies and Local Administrations with competences in civil protection activities, as well as, the organization and maintenance of the Secretary of the Civil Protection National Commission, of its Permanent Commission and of its technical commission and working groups.
- Maintenance of technical relations with equivalent organizations from other countries, especially from the European Union, Mediterranean and Latin America.
- Request the intervention of the Military Emergency Unit in accordance with the Protocols on action that are set out for this.

The main **objectives** are**:**

a) To inform and prepare citizens through the self-protection.
b) To constitute an organization bringing together all public and private entities for the rescue of people and their goods, in cases of calamities or disasters.
c) Coordinated and effective intervention in situations of serious risk, catastrophe or public calamity.

The General Directorate acts mainly on various fields: floods, earthquakes, volcanoes, chemical plants, nuclear power plants and dangerous goods transport, and its basic functions in these fields are:

- Precautions: To analyse the assumptions of risk, its causes and effects, as well as the areas that might be affected (Risk Inventory).
- Prevention: To take the necessary measures to avoid or to reduce the hazards situations, with the means available.
- Planning: To develop emergency plans, and action lines to deal with serious risk situations, catastrophe or public calamity.
- Intervention: To coordinate and to direct the intervention of civil protection components for people and properties protection and rescue.
- Rehabilitation: To attend the relevant institutional bodies in planning and measures implementation to restore the essentials public services, socioeconomic and environmental conditions, essential to normalize the lives of the affected communities.

2.3 Canary Civil Protection System

The Canary Islands Protection system (CDPC) is under the responsibility of the Directorate General of Security and Emergency, which belongs to the Ministry of Territorial Policy, Sustainability and Security of the regional government of the Canary Islands. Its main competences are: (1) security; (2) coordination of local polices; (3) Emergencies, Civil Protection and Marine Rescue; (4) potentially dangerous animals; (5) training. The 112 emergency coordination service alerts from specific emergencies, and evaluates and coordinates the necessary response.

Regional government in the Canary Islands is organized in nine different sections, called Consejerías, one of which is Land Policy, Sustainability and Security. One task area of this Consejería is the Environmental Policy, through which a General Management of Security and Emergencies is competent in the civil defence through a Civil Protection and Emergency Management Service.

This Service is also responsible of the Centre for Emergency and Security Coordination, CECOES 1-1-2, and the Emergency and Rescue Group (GES). CECOES 1-1-2 is a public service that no only gives the adequate response to any emergency call that happens in the Canary Islands, but also knows about all emergency means and resources in every moment for its implementation in any emergence situation that could take place in real time. CECOPIN and CECOPAL have the same functions at insular and local levels, respectively.

On the other hand, GES is an action group in charge of search and rescue missions for regional government. GES have the corresponding human and material resources to achieve their goals, including five helicopters based in different islands, and it is aimed to give a quick response to every unexpected situation that could take place in the autonomous community.

Besides, we can consider that civil service works, in the case of the Canary Islands, in four different stages: local, insular, regional and state governments and each of them manage their own civil defence services.

Due to the volcanic origin of the Canary Islands, one of the basic pillars in the forecast of geological hazards is PEVOLCA, the Special Plan for Volcanic Emergency. This plan provides an inventory of means and resources, both human and materials, and lays down action protocols to apply in the case that a volcanic or a geological risk come true.

The declaration for a volcanic emergency usually comes from the National IGN, the institution in charge of volcanic surveillance in Spain. Here, we must consider that volcanic crisis came preceded by announcing phenomena, as earthquakes, subterranean noises or land deformations. In the case of volcanic unrest, the Scientific Committee of PEVOLCA Plan decides the level and origin of the volcanic activity informing to the Plan Director that can activate the Plan.

PEVOLCA contemplates the following **situations**:

- Pre-alarm situation. Green light

- Alarm situation. Yellow light
- Maximum alarm situation. Orange light
- Emergency. Red light

The PEVOLCA Director, according to the information provided by the Technical Director can activate different **emergency operational levels**:

Levels 0 and 1, insular level

This level corresponds to a situation in which, even existing a volcanic activity, occurs without important risks for people, infrastructures or environment.

Level 2, regional level

Level 2 reflects an increase of the level of risk of the situation, with strong impact and serious hazard for the population. Scientific Committee will be constantly in contact with Plan's Direction, with the aim of informing any change or increase of the volcanic activity. In this level, forest fires or ash fall can occur and interfere with electricity, communications, forcing roofs to collapse, polluting the water, etc. This stage implies informing the population about recommendations and planned actions; this phase can last from a few days up to some weeks or months. The PEVOLCA emergency level 2 implies that emergency will be managed by regional authorities; the coordination of the whole actions linked with the Plan will correspond to CECOES 1-1-2, if required.

***Level 3,* state level**

The establishment of an emergency in level 3 implies the existence of an extremely high hazard situation, affecting large areas where the life of people can not be guaranteed with the resources foretold in the Plan. In this level, high energetic or explosive eruptions can be expected or the situation can be difficult to forecast. Therefore, it implies to pay attention to zones larger than those expected in a usual eruptive episode. Scientific Committee will be in permanent communication with Plan's Direction. In this level, emergency will be managed according with that established in the State Plan.2.2.2.1 Rockfall and Landlides Hazards in the Canary Islands

In Canary Islands, according to historical data and morphology of the terrain, with steep slopes present in some enclaves of it, different types of risk dynamics slopes (rockfalls, landslides, collapses) are given, being the rains the main cause of almost all rockfalls and landslides occurring inside the islands. Historically, we have documented a number of gravitational giant landslides in the geologic history of the islands, which have generated tsunamis and mega-tsunamis (with waves over 30 meters high). These giant landslides are caused by the rapid growth of large volcanic edifices of the islands causing serious imbalances. When a volcano has grown so much that exceeds the critical level of stability, form a critical system, in which any additional process (trigger), as a new intrusion, an eruption, an earthquake or saturation of the soil, can cause the collapse part of the volcano. Thus, the balance is restored and the building can continue to grow.

There are studies that support that have occurred at least 10 historical events corresponding to large landslides into the sea in the Canary Islands, which have generated mega-tsunamis. The most representative are:

- Tenerife. Caldera de Las Canadas (several slides: Icod), the valleys of El Palmar, La Orotava, Güimar and northern arc of Anaga.
- El Hierro. El Golfo, El Julan and Las Playas.
- La Palma. Aridane Valley.
- Fuerteventura. The arc of Jandía.
- Gran Canaria. The arc of Andén Verde.

In addition, there is also evidence that there have been a special type of landslides, consisting in a landslide and mudslide mixture. Although the volume of materials displaced is much lower than the previous, its origin is mainly due to the saturation of the ground. Regarding collapses, corresponding Canary Islands to volcanic terrain, there are areas where ground collapses occur; they are associated with volcanic tubes. The volcanic tubes are not easily identifiable, using as criteria the lava flow type and age. The largest number of volcanic tubes of the Canaries are in fluid cast of "pahoehoe" type of recent ages (younger than 100,000 years).

In the case of rockfall emergency, when a rockfall event hits one of the islands, the 112 collects the alert from the citizens. From this alert, an approximate geolocation (± 500 m) is provided to the insular government. Civil Department from insular government are in charge of the reparation of the damage and the municipality ensures the emergency assistance to the population if necessary. Road maintenance services and reparation works are carried out by private companies supporting the insular Civil Department.

2.4 Prevention activities and procedures for geological risk

2.4.1 National School of Civil Protection

Most of the prevention activities for geological risk are carried out by the National School of Civil Protection. The National School of Civil Protection, established by Royal Decree 901/1990, 13th of June, is a body of the Directorate General of Civil Protection and Emergencies that plays, in accordance with the established in the Royal Decree 1181/2008 of the 11th of July, the following functions:

- To train theoretical and practically the staff of the different services and organizations involved in people and goods protection in emergency case.
- To serve as a technicians and specialists forum in the matters related to the risks and emergencies management.
- To promote the development of the prevention social culture and the citizen self-protection.

From a strategic point of view, the National School of Civil Protection mission is to implement training policies approved by the responsible of the civil protection national system in order to train and maintain in its members' the level of competence required in their role, within a training public system for national civil protection. In order to delimit the National School action field, it is

understood that human resources that form the civil protection national system are made up of all professionals and/or volunteers who operate from their respective organizations for citizen protection in catastrophic events. The training public system for civil protection has as a mission to train and maintain the professional skills that these people need to play their role effectively. However, initial training for professionals should be the responsibility of each organization, although the training public system of civil protection should homogenise it; the volunteers training should be planned, programmed and delivered by the mentioned public system, as well as the training devoted to the updating of those ones. The National School of Civil Protection mission, within training public system for civil protection, is given strategies to structure the National School activities and these are: To lead cooperatively the national public system of training, so that the effort developed by all training centres for civil protection is coordinated and aimed at common objectives previously established.

2.4.2 Canary Islands Government Tests and Simulations

The Canary Islands Government organizes different simulations in order to test and to verify the capability and the level of preparation for emergency response. That is, the efficiency with which the different organizations involved carry out their actions. Its aim is to check:

- Functioning and effectiveness of warning systems for the population and communications.
- Time of response from Action Groups and for the application of protective measures.
- Operation (in fictitious conditions) of Action Groups and a first evaluation of its effectiveness.

However, there are points that can not be tested by tests, such as the ability of the organization to cope with unforeseen events. Tests start from a predetermined emergency, and check the internal and functional mechanisms of the Plan. The Director of PEVOLCA (Volcanic Emergency Plan) shall propose an annual plan of simulacra, while an official of the Directorate General of Security and Emergencies will coordinate exercises in different islands gather along the year the maximum possible diversity of experiences.

In 2014, during the Congress in Transnational Cooperation in Security and Emergency (EMERNET), the Canary Islands Government organized simulations of an eruption and earthquake, with a series of practical exercises in emergency, to study action measures in event of an earthquake-volcanic phenomenon, with an earthquake of magnitude 5.1, 2 kilometres deep. The first part of the exercise took place with the convening of the PEVOLCA Scientific Committee, which analysed the likely scenarios and assumptions where there is a risk-volcanic earthquake on the island of Tenerife. Once these assumptions, the Direction Committee met to consider which possible measures in Civil Protection had to be taken before a possible volcanic eruption. Plans for an evacuation were made, including escape routes, possible failures of electrical and telephone supplies were addressed, possible shelters where located, and roadblock, incidents in air traffic, communication plan, etc. were foreseen. In these meetings were present technical and scientific personnel from Azores, Cape Verde, Madeira, the UK and Italy, which also acted as observers, in addition to those from state government, Canary Islands (regional) Government, Cabildo de Tenerife (insular government) and the municipalities affected. The occurrence of an

earthquake of 5.1 that hit the Candelaria area, causing structural collapse and subsequent rescue of people trapped in Punta Larga quarry was simulated. In addition, a dangerous goods accident caused by the explosion of a fuel tank due to the earthquake, and the evacuation of a school were simulated. After receiving the call alerting at the CECOES 1-1-2 (emergency phone number room), and once he analyzed the situation, the. Advanced Command Post moved to the area, and the Crisis Room that commands the PEVOLCA was activated. Both they were also activated the Emergency Plan for Tenerife Island (depending on the insular government) as the Municipal Emergency Plan for Candelaria (the municipality involved in the drill).

In this simulation participated: the Firefighters from Tenerife; AEA (volunteers association); UME (a military unit specialized in emergencies); Red Cross; SUC (emergency sanitary aid); GES (regional search and rescue service); Guardia Civil (police), Candelaria municipality; Civil Protection from La Laguna (a neighbour municipality); Canary Islands Police; Cabildo Insular de Tenerife (insular government); Civil Protection from Azores; Civil Protection from Cape Verde; and Consejería Ministry of Education of the Government of the Canary Islands. In 2015 was held in Lanzarote an emergency drill produced because of a volcanic eruption. It was planned during the First International Conference on Volcanic Emergencies and in the framework of the Transnational Cooperation Programme Madeira-Azores-Canary Bomber 2.0 of the European Union. The drill was organized by the Consortium of Security and Emergency of Lanzarote, the Consortium for Firefight of Tenerife, the Civil Protection organizations of Madeira and Cape Verde, Bomber 2.0, the MAC 2007-2013 program for Transnational Cooperation and the European Union through the ERDF Community program. The drill included the evacuation of Ye village, and the establishment of a crisis cabinet.

3 USER REQUIREMENTS FOR WP2 PRODUCTS

U-Geohaz project aims to set up useful products for Civil Protection user community at EU level (operating at different administrative and organizational levels, from local to continental). In this context, a further effort has been done to define a list of realistic user need for WP2 products that allow them to be integrated also in a different national context.

For each WP2 product, a series of specific user needs are established in order to cope with main needs of CPAs that represent the users of the project.

The establishment of user requirements have been based mainly on:

- Analysis of U-Geohaz DOW.
- Interaction between U-geohaz partners.

- User requirements from SAFETY project.
- Existing prevention procedures of CPA.
- Key contribution of the involved CPAs.

A specific coding scheme has been adopted to number uniquely the U-Geohaz user needs. This is a lesson learned from several other EU projects developed with similar purposes (e.g. SAFETY). Each single need is coded adopting the following labelling scheme:

WPX_DC_Y

where:

- X is the number of WP
- DC is the deliverable code (e.g. 1.4 or 1.3.2)
- Y is the progressive number of the requirement

WORK PACKAGE 2: TOOLS AND METHODS TO SUPPORT EARLY WARNING SYSTEM FOR VOLCANIC ACTIVITY			
Activity 2.3 Deformation Activity Maps			
Short Description	**Product**	**ID Requirement**	**User Requirements**
The main goal of this activity will be mapping ground deformation during a time interval over Tenerife, La Palma and El Hierro islands using InSAR techniques. Within this action, open-source software tools to generate the products will be provided.	Displacement Map (DIM)	WP2_2.3.2_1	U-Geohaz shall provide DIM in raster format.
	Displacement Map (DIM)	WP2_2.3.2_2	U-Geohaz shall provide DIM with a description of data source used.
	Displacement Map (DIM)	WP2_2.3.2_3	U-Geohaz shall provide DIM with an evaluation of the quality and uncertainty of the map.
	Displacement Map (DIM)	WP2_2.3.2_4	U-Geohaz shall provide DIM at the best scale and resolution possible considering the input data.
	Displacement Map (DIM)	WP2_2.3.2_5	U-Geohaz shall provide DIM at the highest possible temporal frequency
	Displacement Map (DIM)	WP2_2.3.2_6	U-Geohaz shall provide DIM according to INSPIRE directive (see Annex A)

	Displacement Map (DIM)	WP2_2.3.2_7	U-Geohaz shall provide DIM results in a specific layout ready to be printed for field activities (see Annex B)
	Deformation Activity Maps (DAM)	WP2_2.3.2_8	U-Geohaz shall provide DAM in vector and raster format.
.	Deformation Activity Maps (DAM)	WP2_2.3.2_9	U-Geohaz shall provide DAM with a description of data source used.
	Deformation Activity Maps (DAM)	WP2_2.3.2_10	U-Geohaz shall provide DAM with an evaluation of the quality and uncertainty of the map.
	Deformation Activity Maps (DAM)	WP2_2.3.2_11	U-Geohaz shall provide DAM at the best scale and resolution possible considering the input data.
	Deformation Activity Maps (DAM)	WP2_2.3.2_12	U-Geohaz shall provide DAM at the highest possible temporal frequency

	Deformation Activity Maps (DAM)	WP2_2.3.2_13	U-Geohaz shall provide DAM according to INSPIRE directive
	Deformation Activity Maps (DAM)	WP2_2.3.2_14	U-Geohaz shall provide DAM results in a specific layout ready to be printed for field activities (see Annex B)
	Software tools to produce the 6-day maps and user manual	WP2_2.3.3_1	U-Geohaz shall provide a free prototype software for DIM and DAM generation compatible with common operating systems (Windows, MacOS or GNU/Linux)
	Software tools to produce the 6-day maps and user manual	WP2_2.3.3_2	U-Geohaz shall provide guidelines for software tools use
	Software tools to produce the 6-day maps and user manual	WP2_2.3.3_3	U-Geohaz shall foreseen practical training sessions about the use of software tools

WORK PACKAGE 2: TOOLS AND METHODS TO SUPPORT EARLY WARNING SYSTEM FOR VOLCANIC ACTIVITY			
Activity 2.4 Volcanic Early Warning (VEW) System implementation			
Short Description	**Product**	**ID Requirement**	**User Requirements**
The main goal of this activity will be the integration of DIM and DAM with other deformation data (GPS, tiltmeters) in order to reinforce the early warning system of volcanic activity aimed at CPAs .	VEW-Displacement Map (VEW-DIM)	WP2_2.4_1	U-Geohaz shall provide VEW-DIM in raster format.
	VEW-Displacement Map (VEW-DIM)	WP2_2.4_2	U-Geohaz shall provide VEW-DIM with a description of data source used.
	VEW-Displacement Map (VEW-DIM)	WP2_2.4_3	U-Geohaz shall provide VEW-DIM with an evaluation of the quality and uncertainty of the map.
	VEW-Displacement Map (VEW-DIM)	WP2_2.4_4	U-Geohaz shall provide VEW-DIM at the best scale and resolution possible considering the input data.
	VEW-Displacement Map (VEW-DIM)	WP2_2.4_5	U-Geohaz shall provide VEW-DIM at the highest possible temporal frequency

	VEW-Displacement Map (VEW-DIM)	WP2_2.4_6	U-Geohaz shall provide VEW-DIM according to INSPIRE directive (see Annex A)
	VEW-Displacement Map (VEW-DIM)	WP2_2.4_7	U-Geohaz shall provide VEW-DIM results in a specific layout ready to be printed for field activities (see Annex B)
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4_8	U-Geohaz shall provide VEW-DAM in vector and raster format.
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4_9	U-Geohaz shall provide VEW-DAM with a description of data source used.
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4_10	U-Geohaz shall provide VEW-DAM with an evaluation of the quality and uncertainty of the map.
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4_11	U-Geohaz shall provide VEW-DAM at the best scale and resolution possible considering the input data.

	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4_12	U-Geohaz shall provide VEW-DAM at the highest possible temporal frequency
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4._13	U-Geohaz shall provide VEW-DAM according to INSPIRE directive (see Annex A)
	VEW-Deformation Activity Maps (VEW-DAM)	WP2_2.4._14	U-Geohaz shall provide VEW-DAM results in a specific layout ready to be printed for field activities (see Annex B)

4. **ANNEX A**

U-Geohaz project is focused on monitoring geohazard-associated ground deformations specifically addressed to urban areas and critical infraestuctures. Several work packages consider the production of different kind of maps to assess the potential of geohazard activity. Analysing INSPIRE directive these products can be included in **Natural Risk Zones** theme of Annex III.

Data Specification on Natural Risk Zones- Technical Guidelines stablish the practical implementation of these data according to INSPIRE Directive. This document stablish:

- Data content and structure
- Reference System, units of measure and grids
- Data quality
- Data-level metadata
- Delivery
- Data capture
- Portrayal

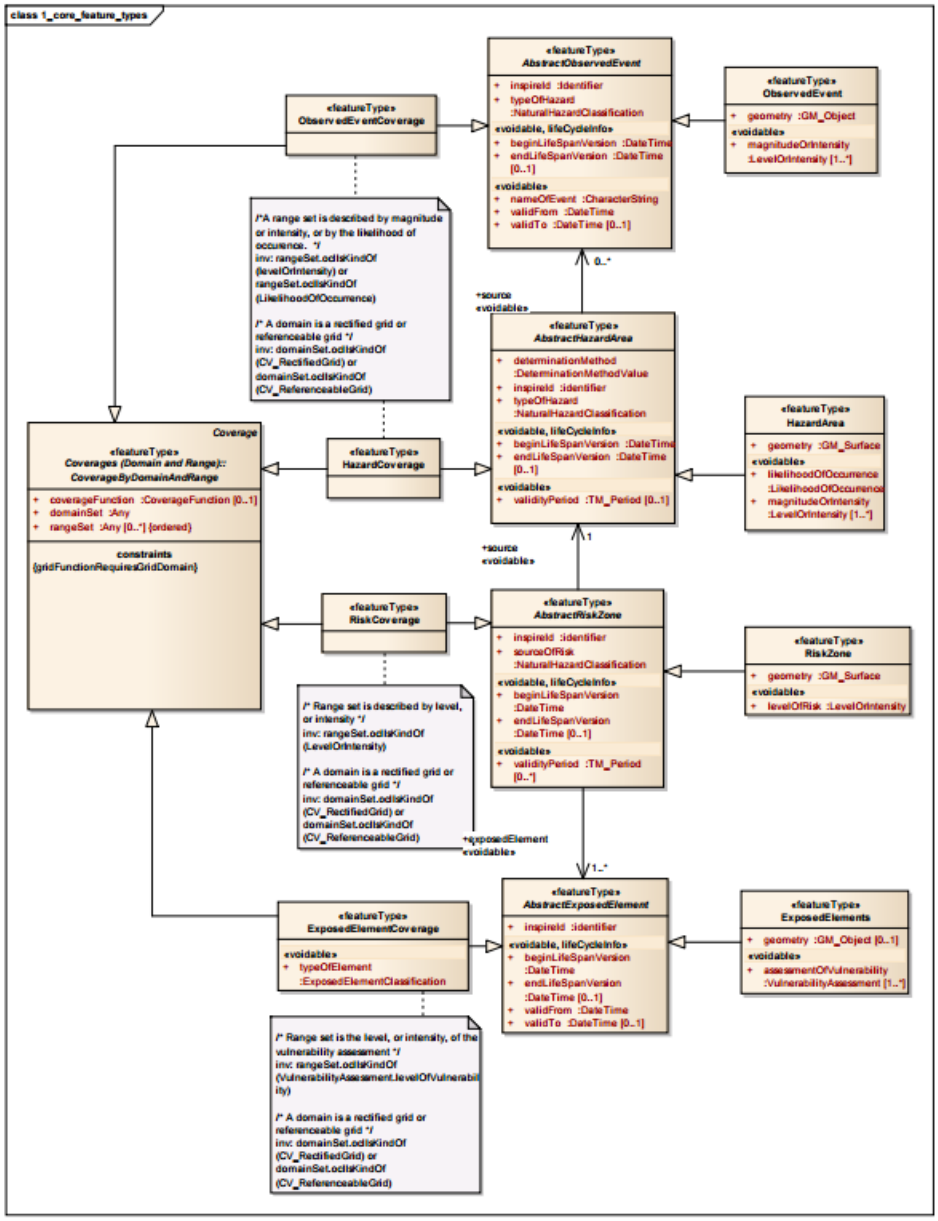

Figure 1: Overview of NaturalRisksZones application schema

5. ANNEX B

The purpose of this annex is to provide a reference scheme for the graphical return of the U-Geohaz products. The scheme is inspired by the outputs obtained at the end of the SAFETY project and based on the maps currently delivered by the Copernicus EMS service (http://www.copernicus.eu/main/services).

Delivering a map in a standardized raster format is extremely useful for end users, especially for Civil Protection actors, because of the possibility of having available a printable and ready-to-use product.

In Figure 2 a layout proposal for U-Geohaz product is reported. This schema is composed of different sections containing different levels of information. The content of every section is explained below.

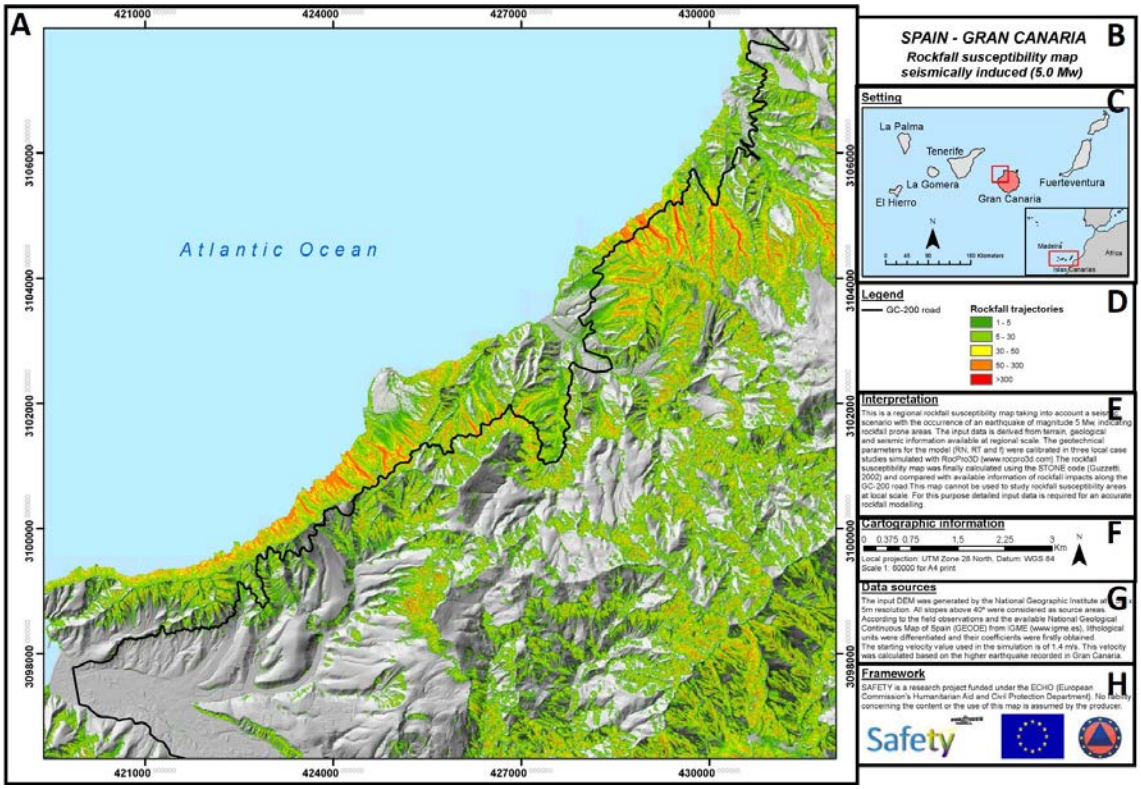

Figure 1 – Layout proposal for U-Geohaz products. The background image comes from one of the deliverables of the SAFETY project.

Section A: is the core of the layout and contains the results of an Action. Satellite images, aerial orthophotos, digital elevation models or shaded reliefs can be used as background image. The map must highlight political boundary (municipalities, regions, etc…), main roads and place names guaranteeing the readability of the map and depending on its scale. A reference grid has to be drawn outside the image border. The scale of the image has to be selected depending on the type of output and of the information to be deliver to the end users; images with different scale can be prepared.

Section B: is the name of the map and its location.

Section C: represents the geographical location of the site. Both national and regional geographical frameworks shall be shown.

Section D: is the legend of the map. The legend has to enable the identification of the general information described in Section A.

Section E: contains a brief interpretation of the map. In this section simple and effective information about what can be seen in the image have to be proposed. A small review about the main outcomes connected to this map can be added.

Section F: is the cartographic reference of the map. This section contains the scale bar and north direction referred to the image of Section A. Moreover, the reference cartographic system is shown.

Section G: describes the data source. In this section, the input data are briefly described.

Section H: describes the framework of the map. Simple information about U-Geohaz and the position of the product in the framework of the project are given. All the necessary logos can be added at the end of this section.

All the maps produced within U-Geohaz should be deliver in .pdf or in other standard image formats (.jpeg, .tiff, etc…).

REFERENCES

- *BOE Real Decreto 407/1992, de 24 abril, por el que se aprueba la Norma Básica de Protección Civil.*
- *BOE Resolución 21 febrero de 1996, de la Secretaría de Estado de Interior, disponiendo la publicación del acuerdo de Consejo de Ministros por el que se aprueba la directriz básica de Planificación de Protección Civil ante el Riesgo Volcánico*
- *BOC 41470 Decreto 73/2010, de 1 de julio, por el que se aprueba el Plan Especial de Protección Civil y Atención de Emergencia por riesgo volcánico en la Comunidad Autónoma de Canarias (PEVOLCA)*
- *BOE Resolución de 30 de enero de 2013, de la Subsecretaría, por la que se publica Acuerdo de Consejo de Ministros de 25 de enero de 201, por el que se aprueba el Plan Estatal de Protección Civil ante el Riesgo Volcánico.*
- INSPIRE Data Specification for the spatial data theme Natural Risk Zones. INSPIRE Thematic Working Group Natural Risk Zones. https://inspire.ec.europa.eu/id/document/tg/nz
- Sendai Framework for Disaster Risk Reduction 2015-2030 https://www.unisdr.org/we/inform/publications/43291