D3.4 MAPS OF THE SEVERELY VULNERABLE POPULATIONS

Project acronym: BuildERS

Project title: Building European Communities' Resilience and Social Capital

Call: H2020-SU-SEC-2018-2019-2020/H2020-SU-SEC-2018

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Executive Summary

D3.4 “Maps of the Severely Vulnerable Populations” is a demonstrator (DEM) type of public software (OTHER) deliverable. D3.4 consists of two parts: 1) the software tools and this document to describe the tools and 2) the storyline for the video that will present the use of the maps and it is available in https://buildersproject.eu/media.

The tools are prepared in the BuildERS project to extract information on hazards from websites used in the BuildERS WP3 for visualization at user-selected platform, like ArcGIS, QGis or Google Earth. In this demonstrator we used ArcGis platform. This visualization can be used by first responders, or secondary emergency response actors, such as the Salvation Army, as background where they can add the location of severely vulnerable populations from Task 3.3 Full-blown survey.

These tools can be used in a more general way, to increase local knowledge and preparedness to hazard incidences before and during hazard occurrences. With user selected query parameters, the end user can have a tailored view of historical and ongoing hazards, on the area of interest, and at the moment needed.

The tools are implemented as python scripts. Guides for installation and utilisation with examples are presented in this document.

The storyline of the video presents how the above-mentioned data is shown in the case of Italy.

This deliverable answers from its side to the first Objective (OB1) of the BuildERS project’s original plan: *Provide understanding of and analysis on how especially the most vulnerable segments of population exposed to disasters and threats understand risks, prepare for them and behave individually and collectively in crises in different social and cultural contexts.* This deliverable makes visible the locations where natural and man-made disasters collected in Task 3.1 occur in different parts of Europe and expose various groups of people to their harmful consequences

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List of Acronyms

API	Application programming inteface
ArcGIS	A name of a GIS provided by ESRI company
BuildERS	Building European Communities Resilience and Social Capital project
CEMS	Copernicus Emergency Mapping Service
D	Deliverable
EMSR	Emergency Management Service Rapid mapping
ESRI	Environmental SystemsResearch Institute, Inc
ESA	European Space Agency
GDAL	Geosspatial Data Abstraction Library
GIS	Geographical Information System
JSON	JavaScript Object Notation
KML	Keyhole Markup Language
NGO	Non-governmental organisation
QGIS	Free and Open Source software for GIS, before QuantumGIS
USGS	Unites States Geological Survey
WP	Work Package

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1. Introduction

One aim of WP3 in the BuildERS project was to locate areas where people may be affected by significant man-made or natural risks. This was done in Task 3.1, where information on European hazard cases was collected from global and European websites, media and local databases and knowledge. ArcGis and Google Earth platforms were used to combine these data into integrated maps and tables on hazard cases, their discharge areas, and human and economic impacts. About 200 hazards in European countries during 2015 - 2019 were identified severe with significant human losses (mortality, injured or evacuated).

Population density maps and socio-economic maps were added to the hazard maps to identify regions with high intensity of hazards, and simultaneously with high density of socio-economically disadvantaged residents, with a higher risk of becoming vulnerable in hazard situation. Deliverable 3.1 describe these tasks and the resulting tables and maps on severe hazards.

The inventory of hazards exposed the problem that the information on hazards is split in tens or hundreds of websites. The feedback of the practitioners in the hazard domain also pinpointed, that the problem is not lack of hazard information, since there are a lot of systems and information available in several websites, but how to use and combine them. There is a need for integration of information from the websites to increase their usefulness for practitioners.

Followingly, for the purposes of deliverable D3.4 “Maps of the severely vulnerable populations” the process of the hazard inventory was automatized. Tools were developed to extract hazard information from the websites, with user defined query parameters and at user defined moment, to combine into one visualization. The visualization acts as background to add people with a high risk of becoming vulnerable from Task 3.3 “Full-blown survey” for further analysis.

In the following chapters 2 – 4 we present the tools, their installation and their utilization with examples.

To demonstrate how these scripts can be used, we will finally prepare a short video recording visualizing how the maps create new knowledge and support stakeholders in disaster management. The storyline for the video is presented in Chapter 5, and the final video will be available on the BuildERS project websites.

2. Tools

Two tools, or Python[1] scripts, were developed to extract hazard cases with discharge areas from hazard websites. Currently these two websites are the Copernicus Emergency Management Service’s Rapid Mapping Activations feed of European Space Agency (ESA) and EU (https://emergency.copernicus.eu/mapping/) and the Earthquake database from the United States Geology Survey - USGS (https://earthquake.usgs.gov/). These two covers most of the hazards in the European area. Besides, the development of the tools for the extreme weather database is ongoing.

The tools zip file `Builders_python_scripts.zip` contains the following files:

[1] Python is a scripting and also programming language for working with large datasets and data science projects.

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1. description of the Python scripts (also in this document)

   ```
   Builders_python_scripts.docx
   ```

2. Fiona and GDAL package installation[2]

   ```
   Fiona-1.8.18-cp36-cp36m-win_amd64.whl
   GDAL-3.1.4-cp36-cp36m-win_amd64.whl
   ```

3. Python scripts for Style generation and hazard extraction from USGS and Copernicus Emergency Mapping Service (CEMS) websites

   ```
   generate_style.py
   parse_emsr.py
   parse_usgs.py
   ```

4. Python libraries installed

   ```
   requirements.txt
   ```

3. BuildERS Python scripts Installation

The scripts were built and tested with Python 3.6.3. The requirements.txt file shows the installed python libraries. Fiona and GDAL were installed on Windows from wheel packages Fiona-1.8.13-cp36-cp36m-win_amd64.whl and GDAL-3.0.4-cp36-cp36m-win_amd64.whl.

After installing Python the following procedure should install all the required libraries on the Windows platform:

1. Create Python virtual environment and activate it
   ```
   virtualenv venv
   venv\Scripts\activate
   ```

2. Install Fiona and GDAL
   ```
   pip install Fiona-1.8.18-cp36-cp36m-win_amd64.whl GDAL-3.1.4-cp36-cp36m-win_amd64.whl
   ```

3. Install the rest of the libraries
   ```
   pip install -r requirements.txt
   ```

When using the scripts activate the virtual environment first

```
venv\Scripts\activate
python parse_emsr.py ...
```

[2] GDAL is a translator library for raster and vector geospatial data formats that is released under an X/MIT style. It is Open Source License by the Open Source Geospatial Foundation. Fiona is GDAL's neat and nimble vector API for Python programmers.

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4. BuildERS Python Scripts User guide with examples

4.1 Copernicus Emergency Management Service Rapid Mapping Activations

The Python script parse_emsr.py can be used to generate a Keyhole Markup Language (KML[3]) and ESRI Shapefile representations from the data available at feed https://emergency.copernicus.eu/mapping/activations-rapid/feed. The command line parameters of the script are shown below.

```
usage: python parse_emsr.py [-h] outputFolder outputKMLFile outputShapefile

Script to generate KML and shapefile representation from EMSR feed at
https://emergency.copernicus.eu/mapping/activations-rapid/feed

positional arguments:
  outputFolder     Output folder
  outputKMLFile    Output KML file name
  outputShapefile  Output shapefile name

optional arguments:
  -h, --help       show this help message and exit
```

The script retrieves all the input data from the feed and generates the KML and ESRI Shapefile versions in the defined output folder. The output folder is created if it does not exist. The output KML file can be zipped and renamed to .kmz to reduce disk space. Google Earth opens both KML and KMZ files. An example of the generated KML on Google Earth is shown below in Figure 1.

[3] Keyhole Markup Language (KML) is an XML-based format for storing geographic data and associated content and is an official Open Geospatial Consortium (OGC) standard and can be used to view in a number of free applications, including Google Earth and ArcGIS Explorer.

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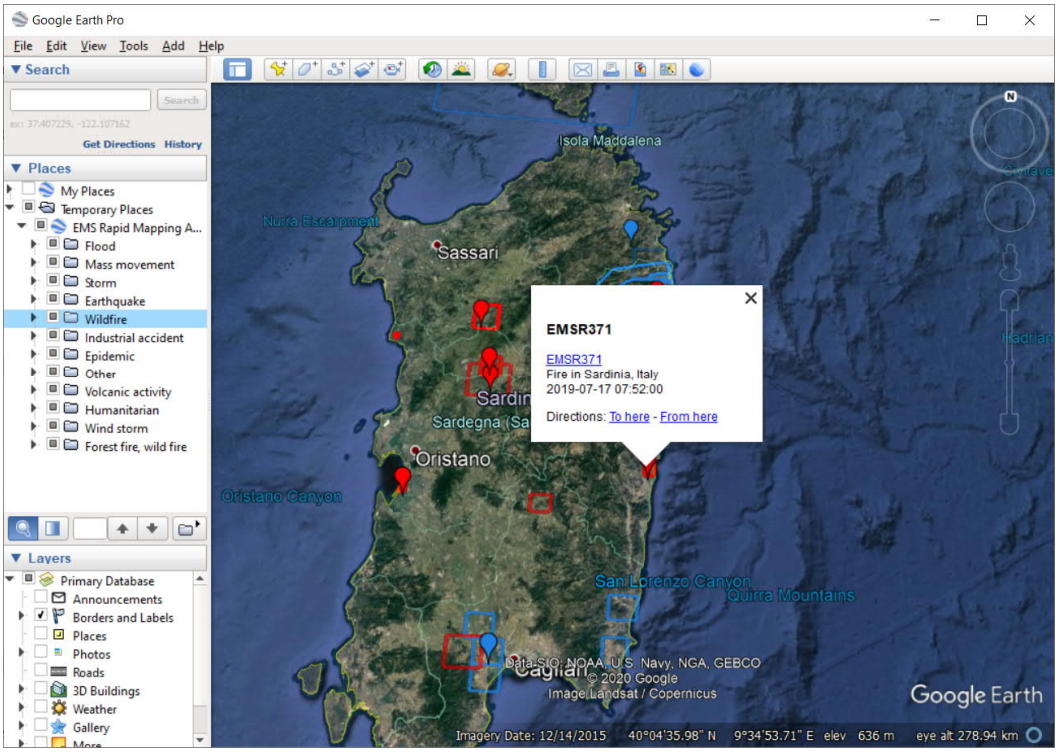

Figure 1 Screenshot from Google Earth showing EMSR data

Figure 2 presents a screenshot from QGIS (formely Quantum GIS[4]) showing Copernicus EMSR (Emergency Management Service Rapid mapping) shapefile data together with coastline data.

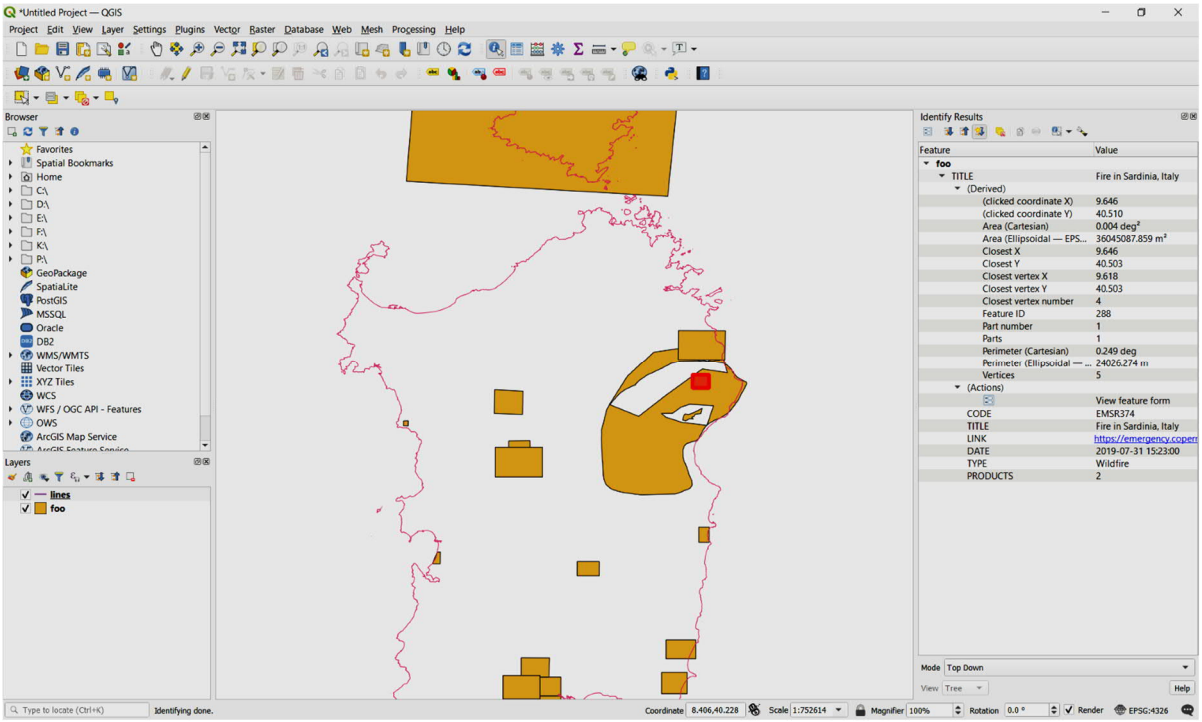

Figure 2 Screenshot from QGIS showing EMSR shapefile data together with coastline data

[4] QCIS is a free and open source Geographic Information System which can be used to visualize, manage, edit, analyse data, and compose printable maps.

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4.2 USGS Earthquakes

The Python script parse_usgs.py can be used to create a KML representation from JavaScript Object Notation (JSON) data downloaded from USGS query API. The script is built and tested with Python 3.6.3. The command line parameters of the script are shown below.

```
usage: python parse_usgs.py [-h] inputJSONFile outputKMLFile

Script to generate KML representation from a JSON data file downloaded from
USGS query API, e.g. response to
https://earthquake.usgs.gov/fdsnws/event/1/query.geojson?starttime=2012-01-01
00:00:00&endtime=2020-12-10 23:59:59&minmagnitude=4&maxdepth=0.2&orderby=time

positional arguments:
  inputJSONFile  Input JSON file
  outputKMLFile  Output KML file

optional arguments:
  -h, --help     show this help message and exit
```

The JSON data must first be downloaded manually from the USGS site using a query in web browser. The query syntax is

https://earthquake.usgs.gov/fdsnws/event/1/query.geojson?
starttime=2012-01-01%2000%3A00%3A00&
endtime=2020-12-10%2023%3A59%3A59&
maxlatitude=85&
minlatitude=25&
maxlongitude=60&
minlongitude=-25&
minmagnitude=4&
orderby=time

The query must be all on one row without spaces; here it is split to rows for clarity. The parts that should be adjusted are shown in **bold**. The latitude and longitude constraints can be omitted if data for the whole world is requested. The resulting data should be saved to a .json file for processing with the script. An example of the generated KML on Google Earth is shown below.

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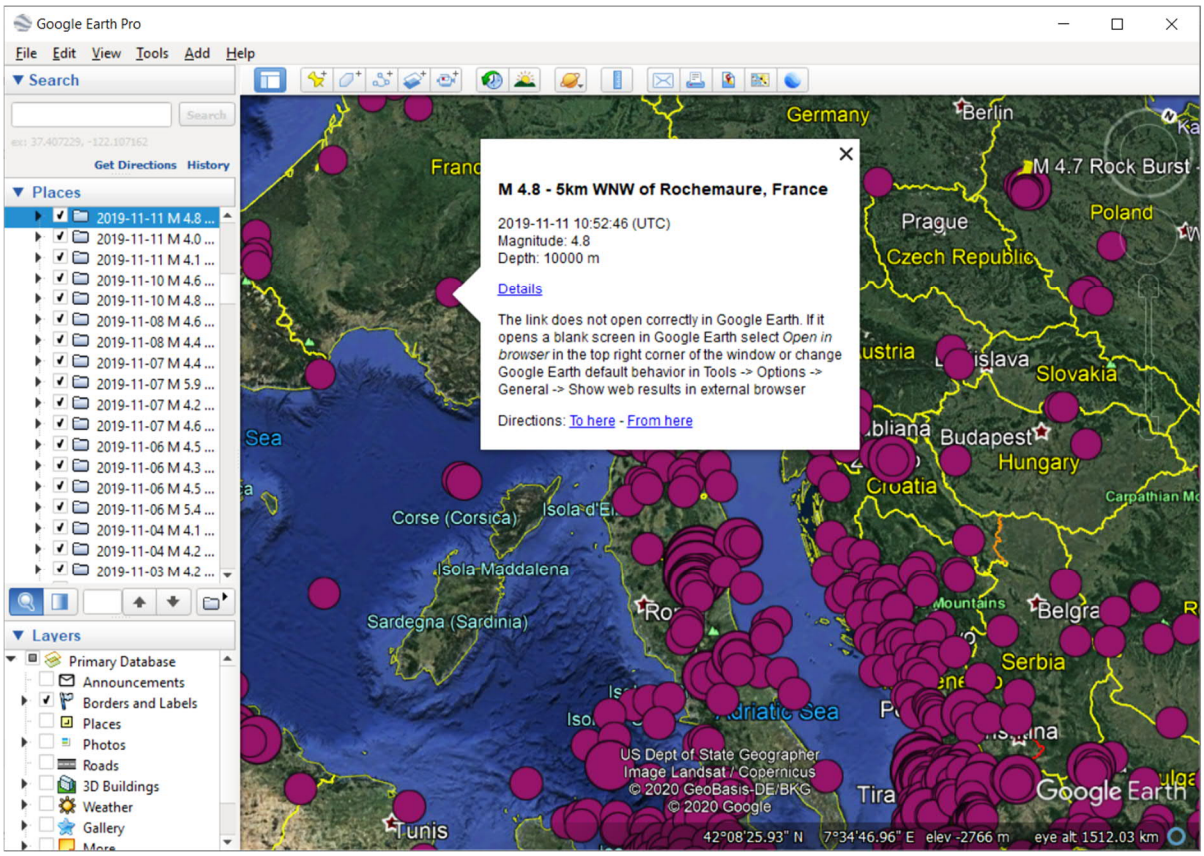

Figure 3 Screenshot from Google Earth showing USGS data.

4.3 Python installation notes

The scripts were built and tested with Python 3.6.3. The requirements.txt file shows the installed python libraries. Fiona and GDAL were installed on Windows from wheel packages Fiona-1.8.13-cp36-cp36m-win_amd64.whl and GDAL-3.0.4-cp36-cp36m-win_amd64.whl. After installing Python the following procedure should install all the required libraries om Windows platform:

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3. Install the rest of the libraries

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pip install -r requirements.txt
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When using the scripts activate the virtual environment first

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5. Combining WP3 survey results to hazard maps

5.1 Material for demonstrator

The purpose of the WP3 survey was to explore how vulnerable people cope in extreme events, what resources are available to them for coping, what are the immediate and long-term consequences of those extreme events, and what deficiencies might exist in the care provided to these individuals in European regions. The survey focused mainly on the COVID-19 pandemic situation, but also other kinds of disasters were considered. The survey data included respondents from thirteen countries: Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Portugal, and Spain.

In the BuildERS demonstrator, we use data from Italy. Survey questions regarding received support during the pandemic situation and the information sources during the pandemic situation can give valuable information on the needs of vulnerable people in extreme events.

Suitable survey questions are:

1) What was the most important support from your relative?
2) What was the most important support from your neighbour, colleague?
3) What was the most important support from your friend?
4) What was the most important support from the other organisation?
5) What have been the two most important sources of information for you on the pandemic?
6) I trust the information that the government of this country provides on the ways of avoiding Covid-19 infection. Answers based on a Likert-Scale from 1-5 (Strongly disagree - strongly agree).

The questions 1-3 provide an indicator of respondent's **social** resilience. The question 4 provides an inverse indicator of missing support from social services responsible for authorities or relief organisations (**vulnerability** indicator). The questions 5-6 focus on the used information source, which provides an indicator of the quality of received information and the trust on it (**vulnerability** indicator).

We suggest that information on the most important (forms of) support and the most important sources of information in hazard situations should be scrutinized to enable regional level actors to be better prepared for disasters also from the point of vulnerable individuals. Information could be collected locally, for instance, in big cities which can assist in building diagrams. It is important that the collection of information is done in an ethical acceptable way and that privacy and data protection needs are ensured. With this kind of information, regional and local level actors are able to better provide necessary help for vulnerable people and provide reachable sources of information/communication in hazards for them.

6. Demonstrator

The final demonstrator for public will be a video recording that will be available on the BuildERS website (https://buildersproject.eu/media). The demonstrator tells how the data from Italy can be, and was, collected during the BuildERS project, to support disaster managers and charity organisations to arrange their work in disasters.

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The maps presented in the demonstrator are prepared and shown by Mr Lauri Seitsonen (VTT), the reader is Mrs Laura Wendling (VTT) and the video was edited by Mr Toni Lusikka (VTT). The final demonstrator video is available in the project website: https://buildersproject.eu/media.

6.1 Data used in the demonstrator

For the demonstrator we made some restrictions regarding the intensive of the hazards, and thus earthquakes with intensity under 5 degree on the Richter scale are not presented in it. As mentioned before, the data for the demonstrator is received from two main data bases: the Copernicus Emergency Management Service's Rapid Mapping Activations feed of European Space Agency (ESA) and EU, and the Earthquake database from the United States Geology Survey – USGS. Note, that magnitude estimates for a given earthquake data may differ from the data received from other earthquake data reporting agencies due to differences in methodology, data availability, and inherent uncertainties in seismic data[5].

In addition to hazard data bases we used the GDP (gross domestic product) data retrieved from ArcGIS online datasets and the Italian open data set for age structure of the population is retrieved from https://www.tuttitalia.it/statistiche/indici-demografici-struttura-popolazione/.

The blue text in the story describes the selected hazards. All the hazards that were available in the Copernicus Emergency Management Service are not presented in the video due to the short recording time. For example, only 3-4 storms and floods are available from the cases shown in the table 1 below. The map presented later in Fig 4 provides a view to all hazards described in the story line. In the demonstration, these hazard types will be presented separately.

Table 1 Areas affected by heavy rain and the impacts of weather hazards in Italy 2015-2019.

Time	Area	Impacts
September 2015	Liguria Region, Emilia Romagna Region EMSR138 / Polygon 109	Severe floods and landslides occurred in the province of Piacenza. Hundreds people were evacuated from the areas alongside the rivers Nure and Trebbia. At least three people died in the floods. https://emergency.copernicus.eu/mapping/list-of-components/EMSR138
October 2015	Campania Region Provinces of Benevento and Caserta	Intense rains caused severe floods and landslides in the Calore river basin of the Campania Region. A lot of people were exposed to floods and damage occurred in several areas, in particular to the transportation network. Capua and other villages along the Volturno river were exposed to flood hazards.
November 2016	North West of Italy, Piemonte and Liguria EMSR192 / Polygon 86	Heavy rainfalls inflicted floods, in particular flooding of the river Po. https://emergency.copernicus.eu/mapping/list-of-components/EMSR192
September 2017	Tuscany Region, the Municipalities of Livorno and Rosignano EMSR238 / Polygon 73	Flooding due to severe rains resulted in casualties and damage to private home, infrastructure and community assets. https://emergency.copernicus.eu/mapping/list-of-components/EMSR238

[5] https://www.usgs.gov/faqs/why-do-usgs-earthquake-magnitudes-differ-those-published-other-agencies?qt-news_science_products=0#qt-news_science_products

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Time	Area	Impacts
October, 2018	Northern Italy. Friuli Venezia Giulia and Veneto Regions EMSR332 / Polygon 29	Heavy rains caused a rapid increase in water levels of Livenza, Piave, Tagliamento and Adige rivers (resulting in the highest level of warning). Many people were evacuated in both areas. https://emergency.copernicus.eu/mapping/list-of-components/EMSR332
October 2018	Southeastern part of Sicily.	The highest intensity of precipitation was recorded in Palagonia (Catania) with 240 mm of rain in a few hours.
May 2019	Central and northeastern regions of Italy Emilia-Romagna Region	Heavy rainfall with strong winds and hailstorms led to river bank overflows resulting in a great deal of damage. Rapidly increasing water levels of the Rivers of Savio, Montone, Ronco, Panaro, Secchia, Sillaro and Foglia, caused the highest alert level. The rivers Secchia (Modena), Savio (Cesena), Sillaro (Imola) and Montone (Forlì) rivers burst their banks.
November 2019	Northeaster Italy, Friuli Venezia Giulia and Veneto regions EMSR409 / Polygon 7	A deep cyclonic circulation lingered on the Italian peninsula causing a high tide in Venice, which reached a maximum value 187 cm and caused marine flooding and storm surge of many areas near the cities of Monfalcone, Grado and Trieste. https://emergency.copernicus.eu/mapping/list-of-components/EMSR409

One presented layer provides the GDP data retrieved from ArcGIS online datasets. It shows GDP in units of €/Year, and presented at NUTS 3 level[6] which is used for small regions for specific diagnoses.

In the text, there are few footnotes explaining which EMSR codes have been used from the Copernicus Emergency Management Service's Rapid Mapping Activations feeds from the discussed time span.

6.2 Storyline of the demonstrator

Storyteller:

The BuildERS project aims to improve the overall resilience of people, communities and all of society by focusing on the most vulnerable individuals, groups and communities. The acronym BuildERS stands for "Building European Communities' Resilience and Social Capital. Strengthening the social capital, risk awareness and preparedness of the most vulnerable people in our societies and communities will improve management of disaster events and minimise human mortality due to future natural disasters.

BuildERS has 17 partners from ten different countries including authorities, research institutions, academies, companies and NGOs. The project will come to an end in spring 2022. The project is funded by the European Commission's Horizon 2020 programme.

One task of the Builders project was to study how to combine data from public registers about things like different types of natural disasters, demographics, economic circumstances and operational

[6].NUTS levels describe on what spatial level the collected information is shown. NUTS 1 level stands for the major socio-economic regions, NUTS 2 denotes the basic regions for the application of regional policies and NUTS 3 what is used in this demonstrator, is used for small regions for specific diagnoses.

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locations of non-governmental humanitarian relief agencies into one map. This kind of information can help to plan new response activities and tools to manage the impacts of natural disasters.

This demonstrator will show how these maps can be collected in practice. The case country of this demonstration will be Italy, which is a partner country in the BuildERS project and one of the European countries most affected by natural disasters.

Our study has shown that people are vulnerable to natural disasters for many reasons. For example, elderly people (defined as those more than 65 years old), perceive bushfires as a significant threat due to limitations on mobility, small children without swimming skills are vulnerable to floods, and people without sufficient language skills may not understand guidelines related to emergency actions when disasters occur.

The first step is to show you the area that we are studying. We used an ArcGis platform to create this base map. The first step is to select the area we are studying."

Programme user opens the programme and selects Italy.

Storyteller:

Information about natural disasters has been derived from satellite images (ArcGis platforms) of sites of hazard occurrences. Disasters that meet pre-defined criteria have been selected in the demonstrator.

The disasters represented here are those that cause human fatalities, injuries and/or large-scale displacement, affect a large number of people, or inflict extensive and immediate damage to buildings, roads, telecommunication, health-care facilities or water supply lines. These include heat waves and other meteorological anomalies, hydrological disasters like flooding, and ground movements such as rockslides and avalanches. Most of these events are registered by the Copernicus emergency service, which we have used to gather these data.

The disasters represented here were gathered from the years 2015-2019.

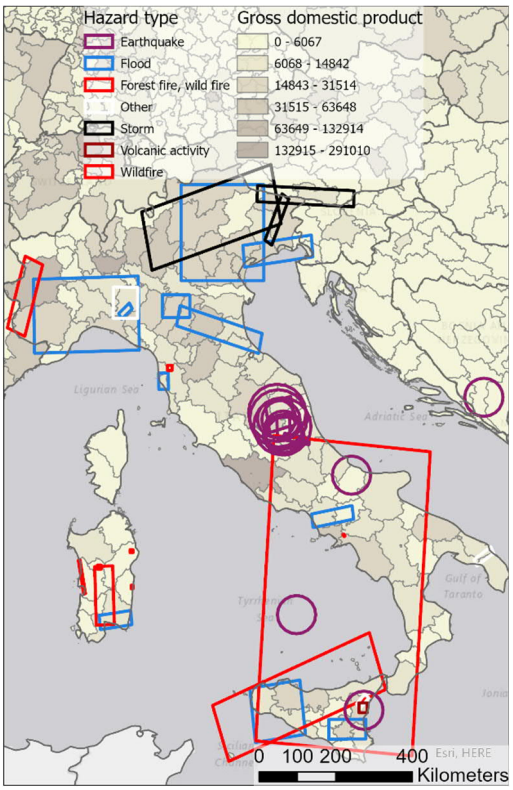

Figure 4 Hazards in Italy 2015-2019 from the Copernicus Emergency Management Service and the Earthquake database from the United States Geology Survey – USGS

Programme user adds the map of forest fires

Storyteller:

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Now you can see in the map the location of forest fires as red squares. Most of these have taken place in southern Italy, including many on the isle of Sardinia.

The year 2019 was very destructive in Italy, and especially in Sardinia with regard to fire hazards. In July 2019[7], several wildfires broke out in the northern-eastern part of Sardinia, near the town of Siniscola. The most damaging fire affected a large area of Mediterranean scrubland and several agricultural areas. Several houses and farms were evacuated in advance but still the fire destroyed some farms and killed the animals.

Later in 2019[8] more wildfires struck different parts of Sardinia and burned about 700 hectares of Mediterranean scrubland, pine woodlands or agricultural lands.

In September 2019[9], a forest fire endangered the municipality of Sarno, in the area of Monte Saretto. The fire spread to the mountains behind the town of Sarno and for this reason, almost 200 people were evacuated. Over 90% of the Sarno pine forest was damaged by this fire.

Programme user adds the map of floods and storms

Storyteller:

Floods are presented in blue squares. They have taken place mostly in the northern part of Italy, near the Alpen area. Black squares represent storms, which also have occurred in the northern part of the study area.

Let's zoom in on a few of these areas. Here we see the Liguria region of northern Italy highlighted.

Programme user highlights first case

The Liguria and Emilia Romagna regions were affected by severe floods and landslides in September 2015. Hundreds of people were evacuated from areas along the rivers Nure and Trebbia, and at least three fatalities were recorded[10].

Programme user highlights second case

Just over one year later, in November 2016[11], heavy rainfall induced flooding in the north-west of Italy, specifically the Piemonte and Ligura regions, including flooding of the River Po. Heavy rains have caused riverine flooding in other areas of northern Italy, for example, in the Friuli Venezia Giulia and Veneto regions heavy rainfalls in October 2018[12] resulted in rapidly rising river levels, the highest level of warning, and the evacuation of many people in both areas.

Programme user highlights third case

[7] EMSR 374
[8] EMSR 377 and 401
[9] EMS 394
[10] EMSR 138
[11] EMSR 192
[12] EMSR 409

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In November 2019[13] these same two regions - Friuli Venezia Giulia and Veneto – experienced extreme high tides, resulting in coastal flooding, and storm surge affected many areas near the cities of Monfalcone, Grado and Trieste.

Programme user adds the map of earthquakes and volcanic activity

Storyteller:

Earthquakes are derived from two services: USGS and Copernicus. Earthquake data shown as purple circles are from the USGS, while the purple polygons represent earthquake data from the Copernicus Emergency Management service. The small maroon square – seen here within a purple circle - shows volcanic activity in Sicilia, representing the eruption of Mount Etna.

At the end of 2018[14] the Etna volcano in Sicily had a sudden eruption close to its main crater at 3 300 meters altitude. The activity was mainly explosions as well as emissions of lava from several eruptive fissures starting from the base of the New South East Crater. The eruption was followed by an earthquake of magnitude 4.8 degrees on the Richter scale which hit the same region.

In August 2016[15], an earthquake occurred in the center of Italy affecting a very large territory including several regions (Lazio, Abruzzo, Umbria) and municipalities. After the main shock of moment magnitude 6.2, several smaller tremors occurred in the area, inflicting casualties and structural damages. This August 2016 earthquake in central Italy killed 299 people and injured nearly 400. The earthquake was felt across the region, including the city of Rome, where the metro system and many schools were evacuated.

In October of the same year[16] (2016), two new earthquakes of magnitude 5.5 and 6.1, respectively, rocked central Italy with the epicenter close to the same area suffering from the deadly August quake. Several earthquakes of magnitude greater than 5 occurred in four regions of Central Italy - Lazio, Umbria, Abruzzo and Marche - within a short time period in 2016.

Later, in January 2017[17] four additional earthquakes with magnitude over five, occurred in the areas near to those previously affected, in particular the Abruzzo Region. The last event arrived after exceptional heavy snowfall, which caused an avalanche on Abruzzo's Gran Sasso Mountain that killed 29 people.

The location of the operation positions of non-governmental humanitarian relief agencies include information about the Salvation Army's operational positions. The Salvation Army is one of the BuildERS project partners. This agency is usually among the first ones after the official rescue organisations to arrive to help victims following a natural disaster. These places are shown as green small areas in the map.

Programme user adds the background map of SAL's premises

[13] EMSR 332
[14] EMSR 336
[15] EMSR 177
[16] EMSR 190
[17] EMSR 194

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Storyteller:

In Italy, there are almost 60 different volunteer organizations providing support during emergencies. The Salvation Army alone have churches or shelter in over 20 different locations. The churches and shelters of the Salvation Army are located in in Rome, Turin, Naples, Torre Pellice, Bobbio Pellice, Firenze, Forio, Ariano Irpino, Lentini, Castelvetrano, Catania, and Atena Lucata. In addition, there are churches in Limitone, Potenza, Braide, Brienza and a shelter in Florence

In the case of the Abruzzo earthquake, it is possible that some of the recipients of Salvation Army disaster relief services relocated to Rome from Abruzzo after destructive earthquakes damaged the Abruzzo region. If this is the case, this cohort may report experience from encountering severely dangerous disaster and they may need extra psychosocial help from society including government and the charity organizations.

Programme user adds the map of GDP

Storyteller:

The GDP layer includes data retrieved from ArcGIS online datasets, showing GDP in units of €/Year, and presented at the level of small territorial units.

The GDP layer indicates the socio-economic strata of people affected by disaster impacts and partially informs the level of disaster relief required.

This map presents each area's respective economic wealth derived from statistics on the Gross Domestic Product (GDP) per capita. As we can see here, the forest fires have occurred mostly in areas with lower GDP, and the floods in the areas with the relatively greater GDP.

As shown here, the areas affected by fires belong to the lowest or second lowest GDP categories (< € 18 432 euros/Y). The Abruzzo area belongs to the third GDP category, € 14 843 – 31 514 euros/Y. Floods are common in northern areas of Italy where the GDP is relatively greater than in southern part of the country, with GDP in the flood-affected northern parts of Italy varying from 14 843 to 63 648 euros/Y.

Programme user adds the map of population age

Storyteller:

As you have seen from this demonstration, Italy is one of the European countries which has suffered most from the natural hazards during the study period 2015 - 2019. The age distribution of the populations affected by natural hazards influences the need for disaster relief. As shown in this map for example, in the northern parts of Italy particularly affected by flooding, the proportion of the population over the age of 65 is more than 23%, and along the Ionian Sea coast this proportion is even higher, with 28% of residents over the age of 65. This is notably different from the areas of southern Italy significantly affected by fires, where the proportion of the population greater than 65 years old is less than 23%. Information like this helps local and regional governments and other authorities to plan response activities. For example, in this case the elderly population in northern Italy will likely need more help during floods, but happily they part is not so big in the areas were rampant fires take place.

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Programme user adds the map of homeless

Storyteller:

In this map, you can see relative values of homeless people in Italy in different regions. Data has been gathered from the Statistics report and web pages of Istat Statistics[18] and it covers the year 2014. The highest values of homeless people are in Lombardia and Lazio regions varying between 0.101% to 0.200% of the total number of residents. The second highest values (from 0.076% to 0.100%) are in Emilia-Romagna and Toscana regions and in Sicilia. In the Piemonte region between 0.051% to 0.075% of all residents are homeless. Campania region has the lowest value of homelessness varying between 0.001% to 0.050% according to statistics. There are more than ten regions from where the number of homeless people was not available. These regions are marked as white in the map.

Homelessness in Italy is geographical. *Specifically, about 56% of all reported homeless people live in the northern part of the country. Of all northern cities and cities across Italy, Milan has the highest amount of homeless people but Rome and Palermo report the highest number of homeless people in their respective regions.[19]*

According to recent studies, ***middle-aged people and migrants are most at risk for homelessness in Italy.*** *Half of all homeless people are between the ages of 35 and 54. Further, Migrants make up 58% of people facing homelessness in Italy. Migrants often experience stigmatization and discrimination which leaves them in a more vulnerable situation that creates a higher risk of becoming homeless. Even though there is data available for the bigger Italian cities that describe how many of the homeless are migrants, we decided to not include that data in this report to prevent stigmatization and potential misuse of the data/this report.[19]*

Figure 5 Homeless people in Italy in regions in year 2014 from Istat Statistics

[18] https://www.istat.it/it/files/2015/12/Persone_senza_dimora.pdf and https://www.tuttitalia.it/statistiche/popolazione-andamento-demografico/
[19] https://borgenproject.org/homelessness-in-italy-2/?nowprocket=1

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Programme user adds the map of resident foreigners

Storyteller:

In this map, you can see resident foreign population in different regions. Data has been collected from the web pages of Istat Statistics[20] and it describes the situation in the beginning of year 2021. The highest amount of foreign population is in northern and western regions. In Lombardia, there are more than one million foreign residents, that is over 1 142 000 foreigners. In Piemonte, Veneto, Emilia-Romagna, Toscana and Lazio regions, the number of foreigners varies between 257 054 and 625 572. In Campania and Sicilia, there are foreigners from 140 479 to 257 053. The lowest number of foreigners are in Molise and Basilicata regions and in Sardegna.

Foreign population should be taken into account when planning activities of disaster management and preparedness, especially when the number of foreigners in a region is high. Foreigners may not be familiar with typical hazards in a region, cannot observe signs of danger or they may not know how to act or get help. They may not understand public warnings or guidance from authorities or other organisations offering help. This may be due to language issue, they do not understand the language, or they do not know where to find information.

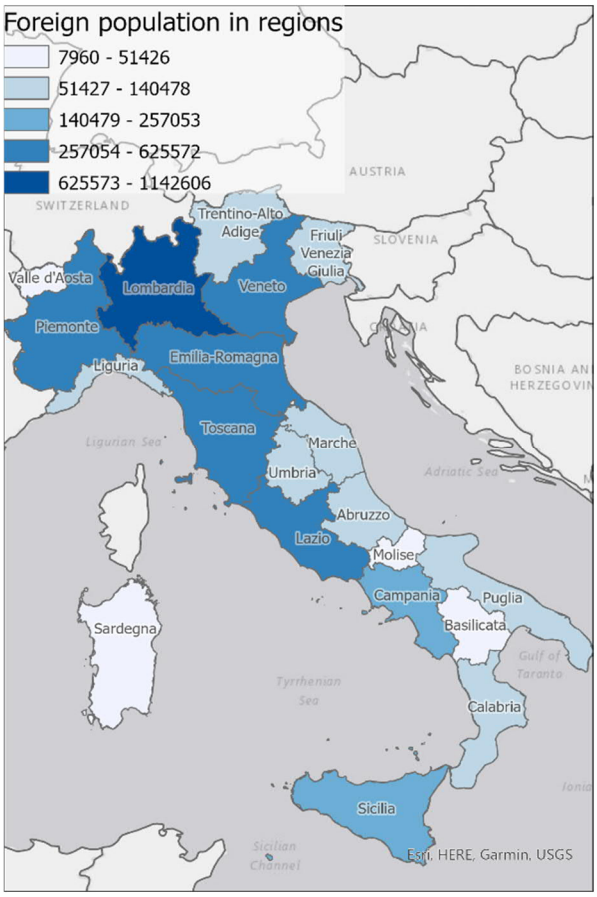

Figure 6 Foreign population in regions in year 2021 from Istat Statistics

We hope that you enjoyed this demonstration of how different types of data can support disaster preparedness and community resilience. These types of maps can be produced for different parts of Europe and can help both governmental and non-governmental organizations to prepare in advance to address the prevailing natural hazards in the local area, for example, by arranging shelters and response equipment, and by advance planning of rescue activities. The links to the maps and other

[20] http://dati.istat.it/viewhtml.aspx?il=blank&vh=0000&vf=0&vcq=1100&graph=0&view-metadata=1&lang=en&QueryId=19103&metadata=DCIS_POPSTRRES1 and http://dati.istat.it/?lang=en&SubSessionId=7587d8c5-f694-4fa2-8703-366a22a7ab5c#

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background information is shared with the European Salvation Army and available for use by authorities and others involved in natural disaster preparedness and response activities.

Recording ends

7. Conclusions

This document presents one of the tools developed in BuildERS project to show how different kinds of maps derived from public sources can be collected and used to provide broader figure about the state of common natural disasters, people's welfare and age in a specific region. From practitioners view the problem has not been the lack of hazard data, but rather integration of data from different websites to form the broader situation picture.

This deliverable answers from its side to the first Objective (OB1) of the BuildERS project's original plan: *Provide understanding of and analysis on how especially the most vulnerable segments of population exposed to disasters and threats understand risks, prepare for them and behave individually and collectively in crises in different social and cultural contexts.* This deliverable makes visible the locations where natural and man-made disasters collected in Task 3.1 occur in different parts of Europe and expose various groups of people to their harmful consequences.

Regarding the natural hazards in Europe, the Copernicus Emergency Management service provides and the USGS website on earthquakes. Copernicus bases on satellite and in situ observations, and it deliver near-real-time data on a global level which can also be used for local and regional needs. These two covers most of the European natural hazards.

In this study, the earthquake data was derived from USGS website due to the data accessibility. However, there are many other data sources to pick seismic data, such as Database of Individual Seismogenic Sources (INVG), International Seismic Center (ISC) and Seismic portal EMSC from European Plate Observing System EPOS, which could be connectable for this kind of use.

The storyline of the demonstrator will include the data collected from Italy regarding the hazards that took place in 2015-2019. The final demonstrator for public is available as a video recording in the project website: https://buildersproject.eu/media .

Based on the study in task 3.4, we recommend that data on homelessness should be studied in more detail, perhaps through the collection of statistics. Data should also be up-to-date. It is difficult to compare statistics from different countries, as measuring methods and criteria vary[21]. The results may also vary widely depending on which entity collects the data. The Nordic countries, for instance, have a broad definition of homelessness, which also include those living temporarily with relatives or friends. If more limited definition is used, only people staying outside such as rough sleepers, are included. Results also vary highly depending on whether, for example, refugees or immigrants are included.

[21] https://www.feantsaresearch.org/download/feantsa-studies_04-web2445115205382853398 1.pdf

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Comments from the BuildERS 3rd review regarding D3.4 and our responses

Reviewers' comment	Our response	Page
The D3.4 (closely related to demonstration tool showed during the review session) identifies hazardous areas related to different Hazards in different targeted countries, but it is not necessarily mapping severely vulnerable populations - as the deliverable's title proposes -.	The D3.4 demonstrates how hazard information from public websites and public information on density of socio-economically disadvantaged residents, that is vulnerable people in disasters, are combined into one map-based visualization.	p. 7
The accuracy of Table 1 (Pg.13) explains that "impacts" should be strengthened (e.g., A lot of people were exposed to floods and damage occurred in several areas, in particular to the transportation network. / Many people were evacuated in both areas, etc.). Impact measurement is critical to proceed with any further improved response, as the project pretends. Moreover, when the focus is on vulnerable people, the impact should be split, at least, in deaths and injuries (e.g. how many of them could be identified as vulnerable following Builders methodological framework?), and economic losses and assets/processes damage.	We agree with this. However, public information on disasters and their impacts vary and do not necessary provide enough detailed information. We have used information from Copernicus Emergency Management Service because it is publicly available database and highly reliable.	p. 14
With regard to the tool demonstrated, it is doubtful that the maps provided can help governmental organizations to get prepared for natural hazards in their area. Local Authorities access to hazard and impact data of higher quality and the tool does not provide new insights from it.	Information for the D3.4 was gathered from public websites, databases and registries. One important target group for the maps provided in the D3.4 is non-governmental humanitarian relief agencies, which usually provide aid right after the official rescue organisations. Their access to non-public hazard and impact data is highly uncertain.	p. 13 and p. 19
Considering the research outcomes delivered by the project in the resilience and vulnerability domain, this deliverable provides too a shallow analysis which fails to demonstrate the added value of the project outputs to the targeted domain. It could be counterproductive to propose it as an outcome of the project without revision.	We have revised the software based on the final reviewers' comment and added information layers on homeless and foreign population in regions. We have also suggested that information on primary support needs of homeless people and most important source of information for homeless people in disasters should be studied more detailed, and collect statistics. This kind of information we have not found in our studies. If data would be available, it will make it possible for regional level actors to get better prepared and offer	p. 13 and p. 20 and p. 21

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	necessary help and reachable ways of communication with vulnerable people in disasters.	
The tool should demonstrate how to make concrete use of the theoretical construct provided by the project, so as to deliver new insights on vulnerability, or otherwise providing a concrete example of analysis of the data gathered through the surveys able to provide novel distributions of vulnerable people.	The BuildERS project has suffered the COVID-19 impacts in many ways. One of the most significant harm has focused on the survey implementation. We have not been able to carry out the survey as originally planned and the final execution period has just ended (31.8.2021). Therefore, the final analysis results of the survey have not been available yet, and our suggestions for information layers and other observations are based on the preliminary results. Nevertheless, we see that the chosen indicators of vulnerability and information they express create new insights into vulnerability, vulnerable people and their needs.	p. 13
The data gathered does not create a competitive advantage and/or added value to other existing tools that local governments and civil protection mechanisms already have in place. And, most important; currently, they don't open possibilities to effectively unveil vulnerable people in these hazardous areas applying the methodological framework developed.	Layers, which have been chosen to the software and suggestion to collect information on primary support needs and most important source of information for homeless people in disasters offer new information on vulnerability. This data add value for organisations responsible for preparedness and response in disasters as well in their efforts to improve their operations.	p. 13
Recommendation: To introduce information layers about three (3) vulnerability indicators that could be derived from the methodological framework and the work already developed in case studies. It could provide real advances built upon the research already carried out.	We have revised the software based on the final reviewers' comment and added information layers on homeless and foreign population in regions. We have also suggested that information on primary support needs of homeless people and most important source of information for homeless people in disasters should be studied more detailed, and statistics should be collected. We have not found this kind of information in our studies. If data would be available, it will make it possible for regional level actors to get better prepared and offer necessary help and reachable ways of communication with vulnerable people in disasters.	p. 13

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