SIBYL

(SeIsmic monitoring and vulnera**B**ilit**Y** framework for civi**L** protection)

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Deliverable DE1: Training materials for the use of the developed framework and tools

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SUMMARY

The ultimate goal of the SIBYL project was that the developed tools and framework will be employed by CP authorities and other interested parties. Therefore, it is necessary to have a body of training material that will allow non-specialists to learn and be able to make use of them within a reasonable length of time. It is the purpose of this deliverable therefore to outline the material that has been produced (much of it already presented in the form of the guidelines that make up a number of deliverables) for just this matter.

1. INTRODUCTION

The SIBYL project set out to develop an operational framework for Civil Protection (CP) authorities to rapidly and cost-effectively assess the seismic vulnerability of the built environment. However, it was also an aim of the project to develop the tools and framework in such a way that they could be easily employed by non-specialists within the Civil Protection (CP) community, and other relevant parties.

The main sources of material are the guidelines that have been produced during the project. In addition, material that will allow an interested practitioner some training in the use of the REM (Remote Environmental Monitoring) tools has been made available.

2. TRAINING MATERIAL

2.1 Deliverables and guidelines

The following are the deliverables that are guidelines for the various components of the SIBYL project.

- DB1: Guidelines for the remote-sensing assessment methodology
  The aim of this document was to guide and assist a non-specialist in the collection, processing and interpretation of remote sensing data within the context of exposure and vulnerability assessment. It discussed the developed software tools, in terms of both their installation and actual usage. An important feature is the use of Free and Open Source Software (FOSS), for example, the QGIS[1] open source geographical information system. This allows those parties who may not have access to more sophisticated commercial software the ability to make use of such tools developed within SIBYL, a fundamental aim of the project.

- DB3: Guidelines of the mobile mapping system and remote rapid visual screening
  The purpose of this document was to outline the use of the REM (Rapid Environmental Mapping) system which was expanded upon within SIBYL. It is made up of two parts, an Omni-directional camera system (GFZ-MOMA – MObile Mapping system) and a system for analysing the acquired images, the RRVS (Rapid Remove Visual Survey). The document outlines the procedure for undertaking surveys with such a camera system (calling upon the guidelines in DB1), data collection, analysis and documentation.

- DC1: Guidelines for the building assessment procedure and short-term monitoring
  These guidelines are made within the context of four levels of knowledge about a building's vulnerability, KL0 (very limited knowledge), KL1 (limited knowledge), KL2 (normal knowledge), and KL3 (full knowledge). The document sets out the main steps for a building's seismic assessment, namely data collection, and structural modelling. The required data and possible sources are outlined, long with various analysis methods,

[1] https://www.qgis.org/en/site/

such as structural modelling and modal analysis. A case study (the Faculty of Philosophy building in Thessaloniki) is included.

- DC2: Guidelines for undertaking site-effect surveys
  Methodologies for site assessments are outlined in this deliverable. The material covered includes the various methods that may be used for the analysis of recordings, namely the Spatial AutoCorellation (SPAC) and Horizontal to Vertical Ratio (HVSR) methods. The Multi-Parameter WIreless SEnsing system was also outlined, including the real-time software included, and finally some practical issues related to undertaking such a survey.

- DC3: Documentation for the developed software tools
  This document outlines the use of the excel spreadsheet based tool developed by TU-BERLIN based on the simplified integral structural model (SISM) approach. Details are given as to how to make use of the tool, what data is required, how to analysis the results and what its limitations are.

- DC4: Reports on the case studies
  While not strictly a guideline, this document outlines the procedures undertaken as part of the field activities during the project. It covers the fieldwork in Thessaloniki, Cologne and l'Aquila, and includes different means of gathering data (*in situ* structural measurements, recording of ambient vibrations, site assessments) and the different analysis methods.

- DD1: Guidelines for the assessment of time-variant seismic risk of monitored single structures
  These guidelines are for the time-dependent vulnerability assessment of structures, making use of performance-based earthquake engineering (PBEE).

2.2 Remote sensing analysis (REM_SatEx)

The REM Satellite Exposure (SatEx, see deliverable DB1) is a QGIS plugin. It is disseminated via the free and open software sharing platform github[2] and can be found under the website:

https://github.com/GFZ-Centre-for-Early-Warning/REM_satex_plugin

The code includes an html documentation which helps to get started with the plugin. Furthermore, we included a demo with a user guide, which provides step by step instructions for performing an analysis it can be found under the wiki section of the code repository[3]. In general using the plugin requires no specific expert knowledge. All the user requires is an installation of QGIS, the OrfeoToolbox[4] (both obtainable for OSGeo4W[5] on Windows or official package managers of Linux distributions), and the REM_SatEx plugin. The tool is intended to work with the free of charge satellite imagery acquired by the NASA Landsat[6] series of satellites. The satellite images can be obtained from the USGS Earth explorer platform[7].

Since this requires registering as a user on the platform, a minimal working example was included alongside the actual code in github. This working example includes all of the data required to run a single assessment and can be used for the purpose of training. It includes an example QGIS project file, which if loaded into QGIS loads all the required files from the provided data set as layers into QGIS (see Figure 1.

[2] https://github.com/
[3] https://github.com/GFZ-Centre-for-Early-Warning/REM_satex_plugin/wiki/User-Guide
[4] https://www.orfeo-toolbox.org/
[5] https://trac.osgeo.org/osgeo4w/
[6] https://landsat.gsfc.nasa.gov/
[7] https://earthexplorer.usgs.gov/

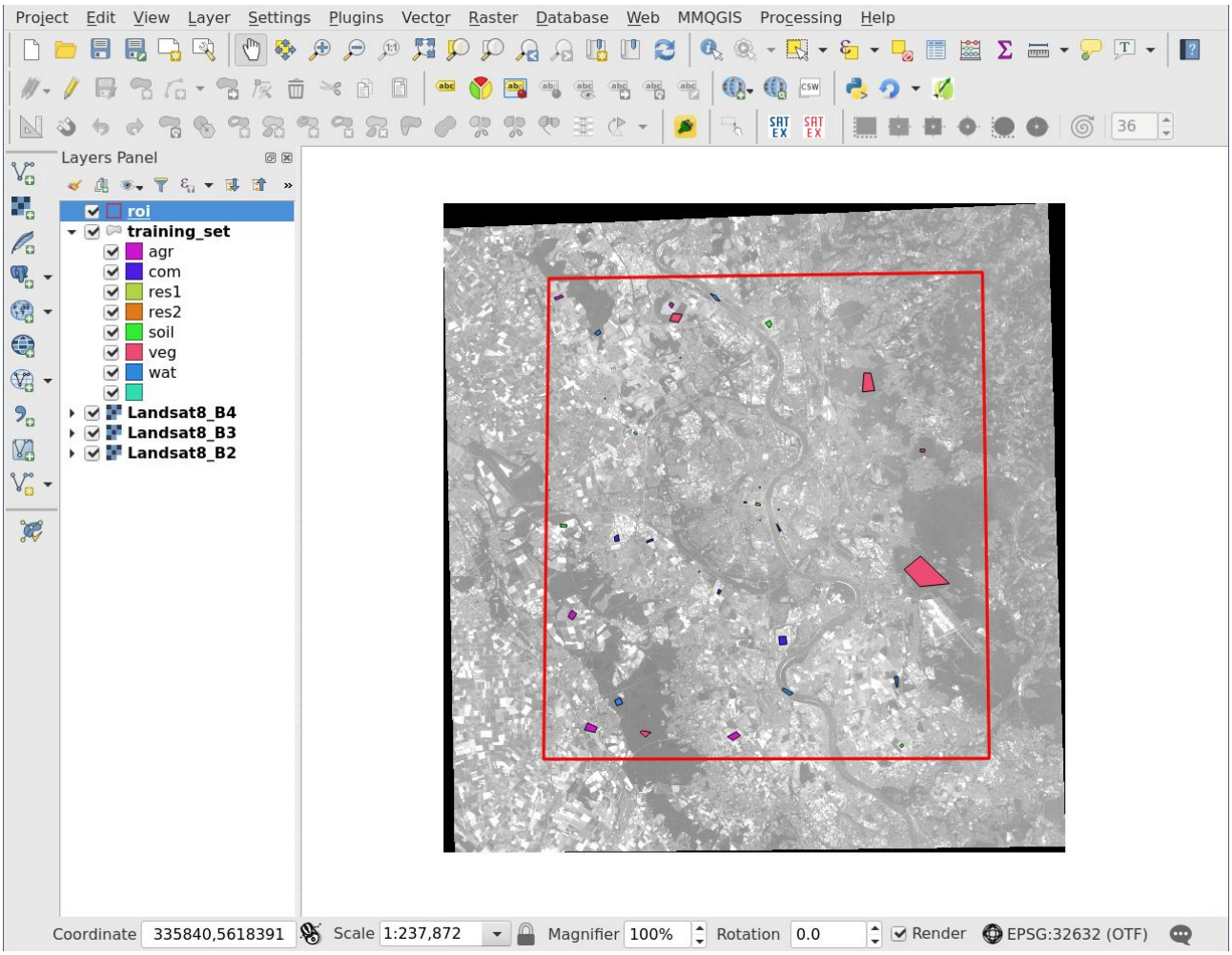

Figure 1 Dataset provided with the code repository

These include a subset of a Landsat 8 scene of Cologne in 2015, in the form of three raster files with the file extension *.TIF corresponding to the spectral bands red, green and blue. Since usually a single band of a Landsat 8 scene is around 100MB in size, they have been spatially cropped to a size of about 10MB. Furthermore, the data set includes a vector file with the region of interest in the form of a rectangle which describes the spatial extent of the classification results that will be created. The final ingredient for the analysis and loaded as a layer in the system is an example training set with ground truth information with different land-use class examples in the region of interest. Following the instructions as given in the guide provided to the user yields a layerstacked satellite scene as shown in Figure 2.

Finally, after following all the steps, the user is presented with the resulting classification that should look like shown in Figure 3.

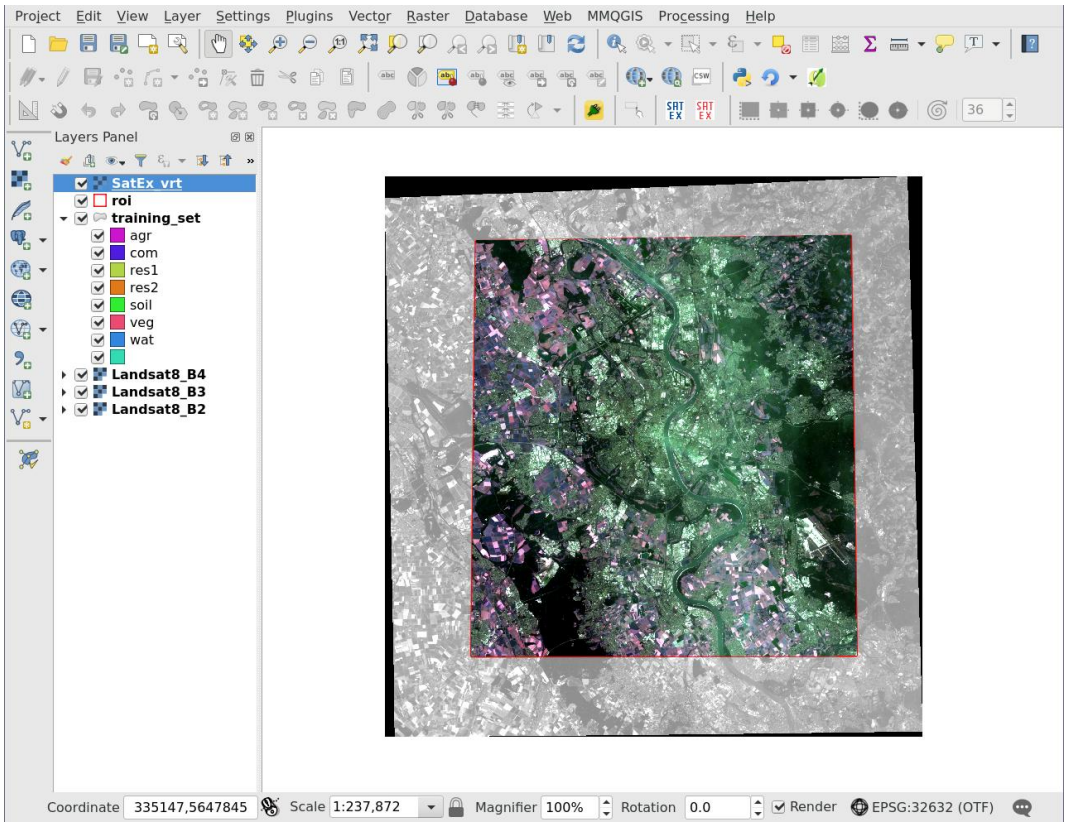

Figure 2 Layerstacked scene following the provided guidlines

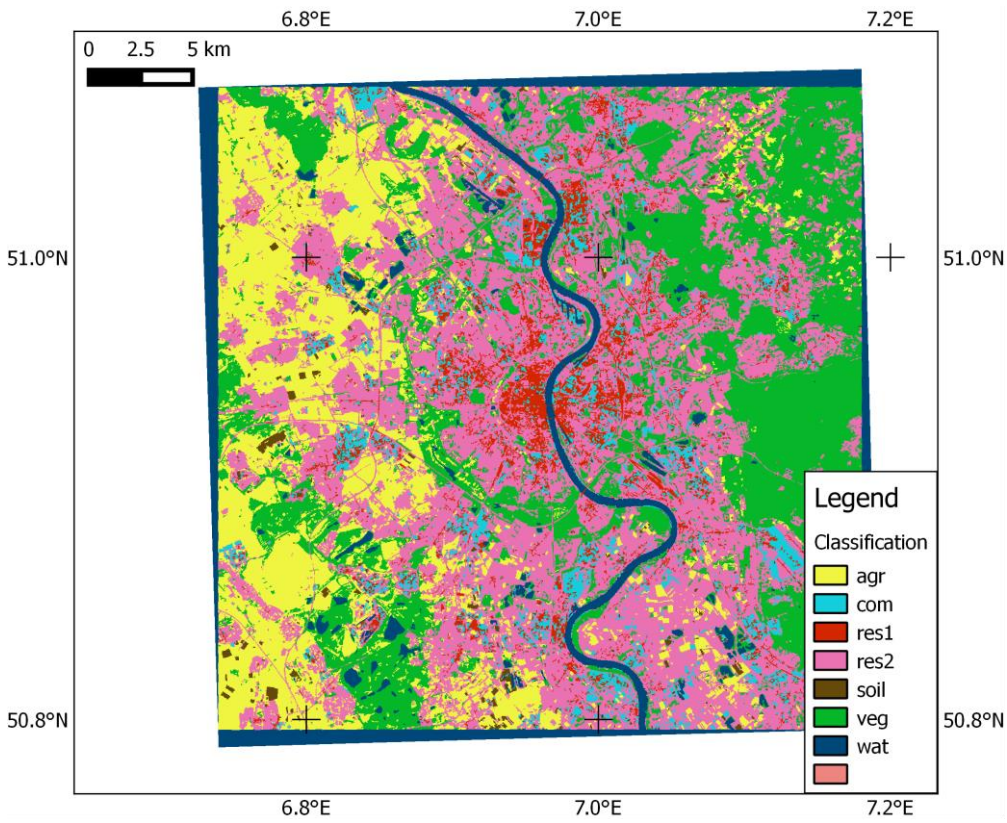

Figure 3 Resulting classification for Cologne

2.3 Remote Visual Screening

The RRVS (Rapid Remove Visual Screening, see deliverable DB3 and Figure 4) is a system for analysing the panoramic images acquired along the sampling route from REM Optimized Routing using the Omni-directional camera system, the GFZ-MOMA – MObile Mapping system.

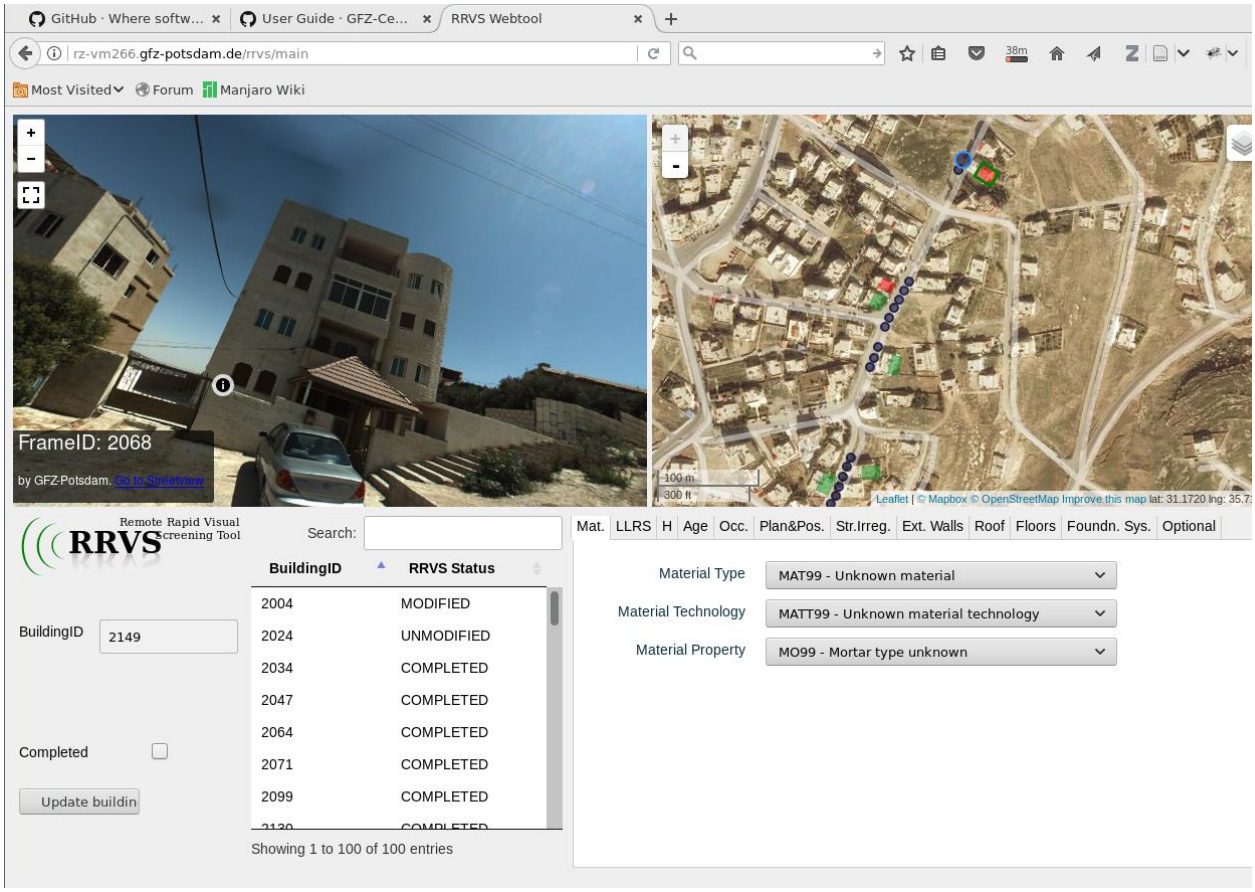

Figure 4 Screenshot of the RRVS tool

There is a User Guide provided on the github repository[8]. While using the RRVS platform requires no technical knowledge, the installation of the tool on a server requires advanced proficiency in system administration. Thus, in order to provide training possibilities to the endusers GFZ is hosting the RRVS system on a publicly accessible webserver:[9]

[8] https://github.com/GFZ-Centre-for-Early-Warning/REM_RRVS/wiki/User-Guide

[9] rz-vm266.gfz-potsdam.de/rrvs/.

For reasons of security and privacy, the system requires the user to provide login credentials. Upon making an e-mail request, any potential user who is interested in such training is provided credentials that can be used to access a training dataset on the system. This training dataset comprises images and buildings in Cologne. Among the buildings, some have already been screened so that the user can get an impression about how a fully screened building looks like and some are unmodified so the users can experience the screening procedure themselves. The classification is based on the GEM Taxonomy v2.0[10] and for each attribute and value specifiable via the system there exists a documentation on the GEM glossary.

[10] https://www.nexus.globalquakemodel.org/gem-building-taxonomy/overview/glossary

3. FINAL COMMENTS

This deliverable outlined the documents produced during the SIBYL project that serve as guidelines for interested CP practitioners. It also outlined some training material that may be exploited for learning about the satellite and in-situ image analysis tools.

Further information about the various tools and the framework as a whole may be found by contacting the following project participants.

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