



LANDSLIDE RISK ASSESSMENT MODEL FOR DISASTER PREVENTION AND MITIGATION (LANDSLIDE)

Co-financed by the EU



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The pilot phase is ongoing and all project partners are busy in testing the Landslide Hazard Assessment Model and Software. This phase is crucial as it will determine the level of functionality and usability of the software for the involved pilot areas. Therefore, civil protection staff are now testing, checking the different tools available including the hazard maps, in order to fully understand its use, the functions and the different outcomes of the software.

An online Training Platform (read more on page 2) has been developed to facilitate learning and use of the software. The Training Platform contains 3 different training courses (modules): Module 1 about the underlying model, adaptation processes, data required and parameters; Module 2 about how to use the software, interpretation of the outcomes (maps, etc.), online/offline functions, etc., and Module 3 will, once completed, contain different examples and good practices for how to involve different target sectors and stakeholders outside the Civil Protection system in risk prevention.

The partners responsible for the test areas have carried out training sessions with civil protection staff and local stakeholders, to test both the software and the training platform, to be able to learn about the use, and to be able to adjust and fine tune the software application and training content. You can read more about these initial test experiences on page 6.

The pilot phase will continue until the end of the project. In parallel to the pilot phase, partners have launched the third and last action phase, where they, on the one hand will set up 'Local cross sector risk prevention platforms', and on the other, implement a series of awareness raising events, so-called 'Prevention Days'. The aim of the Local cross-sector risk prevention platforms is to involve the different key actors of the local target sectors concerned, to deliver risk maps and to integrate risk considerations into their respective policies, plans and activities. The aim of the Prevention Days is to involve private actors and individuals concerned in risk prevention and/or self-protection.

This last phase is crucial in working towards a sustainable approach to risk prevention/reduction, i.e. both cross-sectors and by involving different levels, including the individual.

Enjoy reading!

*Pierluigi Maponi
Project Coordinator*

“The LANDSLIDE project investigates practical methods for the evaluation of the landslide hazard level from daily weather data, and proposes a new approach for the assessment of a medium-long term index taking into account the effects of climate change”.

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News and Upcoming Events:

Save the date: Final Conference of the Landslide Project in Patras, Greece – 10 th November 2016!

For more information check out the LANDSLIDE project website at:

www.landslideproject.eu



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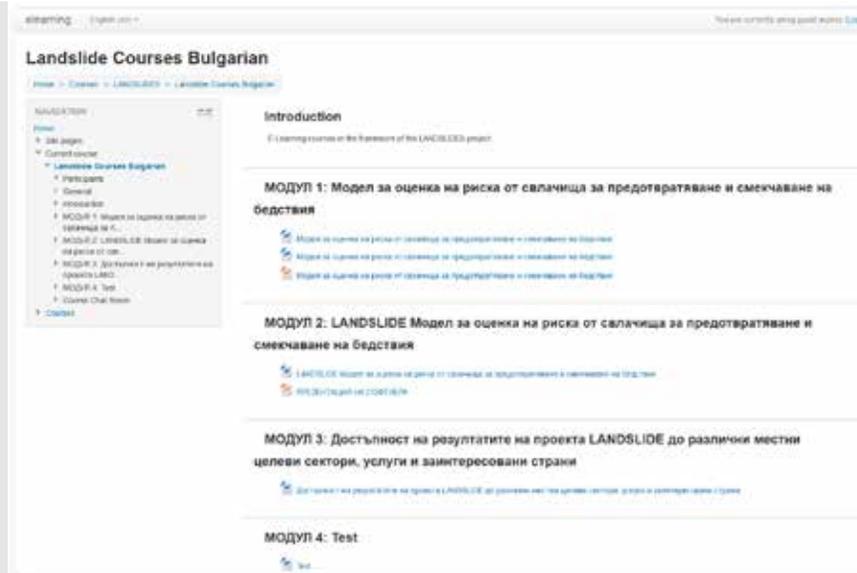


The Landslide Training Platform and Training Modules

Training Platform

The LANDSLIDE Training Platform for project training purposes is hosted in: <http://elearning-landslides.net>. It is based on Moodle toolbox that allows flexibility, ease in use and dynamic tailor made customization. All partners' languages can be selected, through an option that changes the language in all menus. Three courses (training modules) have been created for all languages using the developed training material and translation in partners' languages where needed. There is also an option for a chat room where interaction between the trainers and the platform supporting team will be established. As training in landslides is dynamic and the most suitable courses depend on the target group and the objectives, the platform can easy create new courses and modules using additional material, such as presentations, videos, infographics, etc. The initial definition of courses is indicative to describe the complexity of the landslides prevention approach. Cross sector influence courses can be added, as well as material for training local teams in landslide risk prone areas, to identify initial phenomena and evaluate them. The Platform can exploit the potential of various training approaches and produce courses suitable for different target groups in different cases. Log in is open as all partners experiment with it and as direct or indirect training events have been scheduled for early autumn.

The initial training events differ in synthesis of audience from civil protection personnel to mayors, public servants, researchers, engineers and representatives of public work construction companies. The first evaluation and outcomes underlines the close link between courses, training material and courses' target groups and the need to enrich the e-training platform, overcoming the definition and content of initial courses. Preliminary use of the Platform did not reveal any hidden problems, still as training content and structure will be updated, the Platform functionalities can change. Optical training means, practical guides, check lists, and best practices / lessons learned / things to avoid from past landslide cases elsewhere, are necessary to attract attention and be beneficial. The following training events will revise the user needs and e-platform functional specifications in a way that will optimize results.





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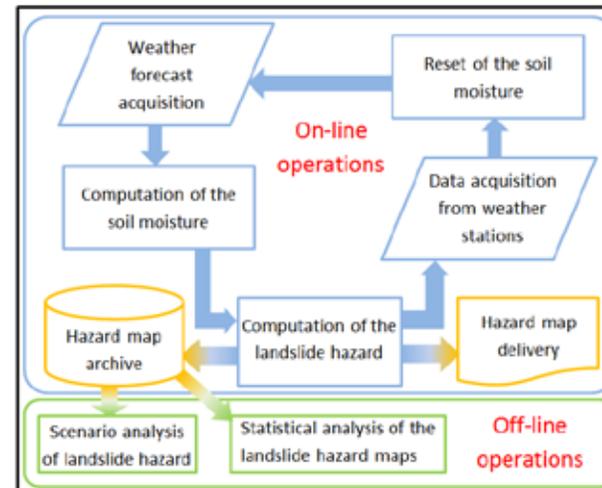
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The general outline of the Landslide Hazard Assessment Model and Software which can be found in the Training Platform

Computer information system



Remarks:

- On-line operations are performed automatically
- Off-line operations must be explicitly required

Daily work of the software (online operations):

1. At the beginning of the day, it acquires the weather forecast for the next 24 hours;
2. It computes the soil moisture for the next 24 hours on the base of weather forecast data;
3. It computes 4 landslide hazard maps (1 map every 6 hours);
4. It waits for the end of the day;
5. It gets the data measured by the weather stations on the territory;
6. It computes the soil moisture at the end of the present day on the base of weather stations data.

Other services (off-line operations):

- a. Statistical analysis of the landslide hazard maps: the user can obtain the cumulative landslide hazard map on time periods of a week, a month, a year.
- b. Scenario analysis of the landslide hazard: the user can obtain the evolution of the current landslide hazard by providing a scenario for future weather data.

Training module 1

The first module contains material to learn about the Landslide model, the development process, the logics behind the model and its functioning.

A glance of what you can learn in training module 1:

The LANDSLIDE project combines the models for the dynamics of soil moisture and for the slope stability analysis in order to obtain a quantitative evaluation of landslide hazard from weather conditions. In particular, the dynamics of the soil moisture is described by Richard's equation, that is a physical model depending on several geomorphological parameters of the region under study. The evaluation of landslide hazard consists of computing the Safety Factor, given by the ratio between the forces that prevent the slope from failing and those that bring the slope to collapse (depending on the soil water content obtained by the solution of the soil moisture model). In particular, LANDSLIDE project considers the infinity slope model to compute the safety factor: this model provides quantitative hazard maps for the evaluation of the landslide hazard in large scale.



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The Landslide Training Platform and Training Modules

Training Module 2

The web-based LANDSLIDE system has been uploaded in operational mode since May 2016. The system capabilities are designed to have all Geographic Information Systems (GIS) basic tools needed for the work of layers and resulting map operations. Entering to the system can be done by two ways either through the dedicated web-page - <http://93.123.110.111/landslide>, or through the LANDSLIDE project web-site – www.landslideproject.eu, by entering in the TOOLS menu as shown in figure 1a.



Figure 1a: Entering to the system web-site



Figure 1b: Initial screen of the LANDSLIDE system

The main screen of the system consists of general GIS tools panel and map of Europe with appointed layers where every test site is located. Managing between the embedded functionalities is made in a user friendly manner where a single click of the mouse provide all tool functionalities. The meteorological data and landslide hazard maps calculated on daily base can be seen when someone navigates himself to the location of interest and explores a bit the GIS functionalities from the main horizontal panel available for the users placed above the Europe map of the main screen (see figure 1b).

The output layers which the users can see are depth maps and hazard maps which has been calculated on daily basis every six hours and produce the probably of land movement according to the water content in the soil. Based on this statistical information for past days is also embedded as functionality historical data analysis which can give option for registered users to download layers. By usage of appropriate desktop application these layers can be further analyzed and processed in order for the local authorities to get as much corresponding information for their test area as possible.



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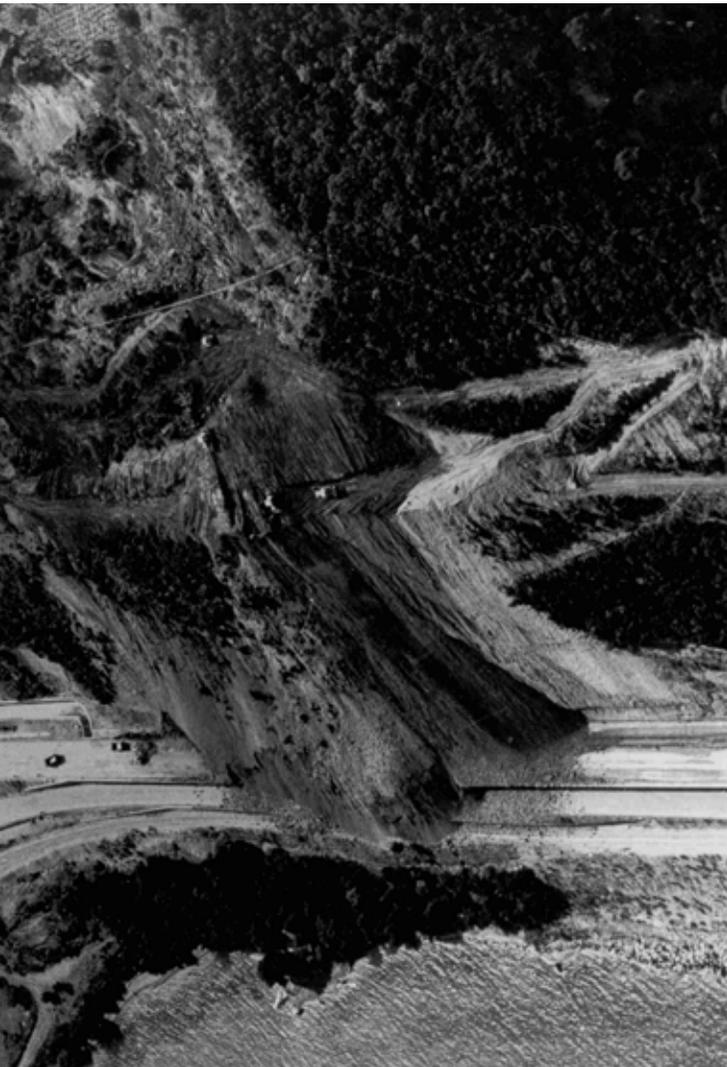
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The Landslide Training Platform and Training Modules

Training Module 3

The main expected results of the LANDSLIDE project are the landslide hazard maps, indicating the probability that a potentially landslide occurs in a given time period and in a given area. In particular, the computation of the hazard map is not influenced by the presence of man or the infrastructures, so the landslide hazard does not consider any reference to the size and the intensity of the phenomenon. One of the objectives of the LANDSLIDE project is to enhance knowledge and skills related to landslides risk management of a multi-stakeholder target group, which plays an important role in reducing landslide impacts through various cross-sectorial issues involving social, technical, legal, financial, environmental and administrative considerations.

Training module 3 will contain different good practices for how to involve local target sectors, stakeholders and risk groups concerned in prevention and risk reduction activities. Also, different partner experiences from relevant project activities i.e. the setting up of 'local cross-sector risk prevention platforms' and the carrying out 'Prevention Days', will also make up training module 3.





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Patras training event in the premises of the Region of Western Greece premises, organised by NOA, with 40 participants. Vice Governor, Mayors of landslide risk prone municipalities, public servants, engineers, constructors, researchers were among the audience, representing almost all landslide interested target groups.

Partners initial test experiences: Software and Training Platform

National Observatory of Athens

The 1st training event in Greece took place in the city of Patras on the 21st June 2016. It was co-organized by the National Observatory of Athens and the Region of Western Greece. The audience of 60 people consisted of engineers, technical offices members, civil servants, mayors, researchers and volunteers. Presentations were made by Dr. Georgios Drakatos, describing the activities of the LANDSLIDE project, Mr. Evangelos Katsaros who presented the software and the training platform, and Prof. Nikolaos Sabatakakis, presenting the pilot case of “Panagopoula” landslide. Presentations were followed by a Q & A session on project outputs, and key questions were raised that must be answered by the project:

- Training modules are too theoretic for people with heavy duties and not enough time
- Need for optical means of learning (presentations, videos, pictures, schemes, case studies, visualized lessons learnt / things to avoid) that will ‘translate’ theoretical concepts into easy to understand concepts and practical to use guides
- More time is needed to evaluate the platform as its use seems easy, still it is directly linked with training material
- Only easy to use material need to be translated in national language
- User guide is friendly and easy to use. A video that would show use in simple steps could also be useful
- It is not clear what is the time period referring to hazard assessment maps / alerts produced by the system. Can it be considered as an early warning system that will guide civil protection people in next steps to be taken (prioritization of activities)?
- What is the percentage of false alarm in the notifications provided by the system? Which are the restrictions in model use (which factors that can cause landslide are not fully considered by the model)?
- How easily and under what conditions (geological data/ studies, maps, meteo stations...=>cost & time) can it be replicated in other areas under landslide risk?
- Available maps in each area can be uploaded in the web based application?
- Is the software free to use? Where it would be installed after project end? Who/how can update it?
- What are the other measures that can support the use of the software? For example: trained people at local level to check through visual inspections precursor phenomena of landslides and evaluate them. Or use of satellite measurements to verify landslides risk
- What are the next steps after model validation in pilot areas? Next steps / proposals
- Need for Real Life Event Simulating Examples: After extended heavy rain many requests arrive at Regional Offices to check in situ possibility for landslides. Can the software (for the areas covered) evaluate how serious those requests are in order to use limited personnel and means in the area really in risk for landslide?



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Partners initial test experiences: Software and Training Platform

Marche Region

During some weeks in mid-June, after having translated the principal documents related to the content and characteristics of the Landslide WEB application, the personnel of the Marche Region have tested the training platform and the software model.

The pilot area selected for the test and implementation of the LANDSLIDE model in the Marche region is a hydrographic basin of 11,69 km² located in the mid part of the Esino River basin (i.e. in the central part of the territory of the Province of Ancona).

Inside of the chosen basin there is an important provincial road that was several times damaged and interrupted by an important active landslide (the more recent movement occurred in the last year).

The first test activity was conducted only by the staff involved in the project. It was preferred not to involve external people or any stakeholder before identifying possible errors, or weaknesses of the system.

We found the e-learning platform, though still uncomplete, easy to understand and to use. The modules are quite various, with files in .pdf and .ppt format, and are of very high scientific level (for example Module 1, concerning the mathematical model with a simplifier power point, focusing on the same argument that can give the principal concepts about what the module wants to transfer).

Our training mainly consisted of a test of the different characteristics of the Landslide software, with the translated user guide, to better understand the different buttons and functionalities, and to see if it can be useful and clear to other users not directly involved in the project.

Commands are quite clear, but we found some inaccuracies.

During this phase we suggested some improvements to upgrade the system.

In the last part of the system development we think that we should focus on the following points:

- 1) The ancillary layers are actually too simplified; and the outputs on the web application could be only used for qualitative evaluations; it would be very useful to improve the topographic information of the system to easily recognise the areas where hazard index is higher.
- 2) The present colours of the hazard index map are connected with the Safety Factor but we think that the qualitative scale of hazard associated with the numeric values is not actually very appropriate and could be modified.

In fact a value of safety factor more than 3 indicates, with a sufficient confidence, a stable slope so we can suggest for the hazard index map only three intervals (and colours): high risk (safety factor < 1), medium risk (1 < safety factor < 3) and low risk (safety factor > 3)

3) As a consequence of the mathematical model used for the calculation of the safety factor (indefinite slope) the model tends to understate the safety factor value at the slope feet (where the slope ends). We should introduce this concept in the user manual.

Finally, we think that the software requires an important test phase in the next months for validating the outputs, and it will be very crucial to compare the hazard index maps with field surveys and to follow the evolution of the historical data.



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Partners initial test experiences: Software and Training Platform



Bulgaria
On the 21 June 2016, three training modules were held in the Regional Administration Smolyan on how to use the online platform and software developed in the Landslide project.

The training was attended by 10 representatives of Civil Protection, members of the project team, the geologist who had prepared the report, analysis of drilling activities and a representative of the municipality of Smolyan – 16 participants in total.

The Deputy Regional Governor opened the training meeting. The 3 developed modules for the introduction to the online platform, software and manual use, were presented. It was demonstrated how to use different

buttons for work directly in real time through an Internet connection.

The ability to use online platform publications of educational materials in Bulgarian, was demonstrated to the participants.

(<http://elearning-landslides.ne>)



After the presentations, participants checked their knowledge by completing tests sent to us by the Lead Partner.

This was followed by an intensive discussions on the quality of training materials, the usefulness of the developed model, the complexity of the software and the possibilities of using the online platform. The Director of the Regional Directorate “Fire Safety and Civil Protection” - Mr. Simeon Tsarvulanov summed up the discussion and gave the following proposals:

1. The system should be able to show not only the graphical information (maps), but also indicators of specific meteorological stations for certain dates or periods. This could be used for other hazards like fires, floods, earthquakes, etc.
 2. The system should be certified in order to have legal value to various authorities, including the judiciary.
- The meeting was attended by media representatives who covered the activity in 7 publications.





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Partners initial test experiences: Software and Training Platform

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Bielsko-Biala District

On the 7 July a training session took place in the building of the District Office in Bielsko-Biala, during which the stakeholders could become acquainted with the landslide risk assessment model as well as with the LANDSLIDE software.

The training session started at 10:00 am and it was attended by 14 people. The participants of the training were the representatives of the following institutions:

- Kozy Commune Office - The construction bureau;
- Forestry management of Bielsko District;
- District Office in Bielsko-Biala - Crisis Management Department, Department of Civil Engineering and the Department of Environmental Protection, Agriculture and Forestry.

The employees of the institutions mentioned above are essentially interested in the monitoring activities and in the location of landslide areas. Precisely for this reason they were selected as the group of the most relevant stakeholders interested in the practical application of the developed LANDSLIDE model and software.

The training session started with a short presentation of characteristics of both the project and the model. The main objectives, the milestones and future planning foreseen in the framework of the project activities were discussed with the adequate due diligence. Then each participant was acquainted with the training platform and everybody was given a chance to work on it. None of the participants reported any difficulties while using the platform. Together they noted that it is designed in a simple, clear way and that it is understandable for everyone. The next stage of training session was the actual work with the software. Each participant was given an opportunity to use the webpage individually, testing thus menus and options. Thanks to the fact that the training participants became previously familiar with the model's manual, they had already gained knowledge about the possible functions as well as the icons of the main menu. In addition, it was found that the selected icons of the software are intuitive therefore in most cases the user is able to figure out what their function is.

The final stage of the meeting was an exchange of peer evaluations and conclusions in reference to the presented material. The participants found the software a very useful tool for people dealing with landslides. At the same time they reported the demand for creation of a language insert into the software at some later time, which would greatly facilitate the use of the model. In addition, it was proposed that information/warning should be sent, to the e-mail addresses given when creating the account, whenever in the monitored area a significant risk of earth movements occurs.



Training session –
Bielsko-Biala District, Poland
7 June 2016



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Steering Committee and Transnational Exchange & Peer Review Meeting in Poland

The 4th SC-meeting of the Landslide project took place in Szczyrk in Poland on the 27 and 28 June 2016. The meeting was hosted by the project partner Bielsko-Biala District.

On the first day, an exchange and peer review meeting took place, among partners, invited guests and European experts. The objective of the meeting was to start evaluate and exchange activities undertaken by the partners with regards to the use of the Landslide Hazard Assessment Software, and the online Training Platform developed to facilitate its use. Another aim was also to discuss and exchange good practices among partners, guest and experts regarding cross-sector and multi-level involvement of local stakeholders in risk prevention. Presentations, discussion and exchange around these topics were made both to share experience and to discuss how to further progress project work.



Study visit to the Polish test site, area of the former quarry in Kozy, Poland – 27 June 2016

Opening session with press and media at the Landslide 'Transnational exchange & peer review meeting' 27 June 2016, Szczyrk, Bieslko-Biala District, Poland

On the second day the **SC-meeting among** SC-members took place to monitor and follow up ongoing activities as well as to plan and organise upcoming activities to be launched and in particular: the 'Cross-sector risk prevention platforms' and 'Prevention Days', to be implemented in each local territory; the project publications, and; the **Final Conference** of the Landslide project that will take place in **Patras in Greece on the 10 November 2016** .

A **study visit** was carried out in the afternoon of the 27th June to visit the Polish test site, located in the area of the former quarry in Kozy, situated in the Small Beskind mountain range. The area of the quarry, selected as test zone in the project, has been considered to be in danger of further movements judging by the results of physicochemical studies of the material gathered in the dump. It has been found that the major part of the slope is in a state close to an equilibrium border and even small changes in the distribution of stresses, caused for example by weather conditions, may lead to the development of landslide processes. In addition, the area is also frequently visited by tourists for the landscape and the panoramic view from the higher level of the quarry towards the Silesian foothills and the Oświęcim Valley.



Landslide Team standing at the higher level of the quarry, enjoying the beautiful view



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Networking with the RECALL project

An important activity in the Landslide project is to network with other relevant actors outside the project partnership with the aim to commonly disseminate project outcomes and to create possible synergies. Networking activities with the RECALL project is undertaken and RECALL will also participate in the final conference of the Landslide project in Patras on November the 10th.

www.recallproject.eu

RECALL project presentation

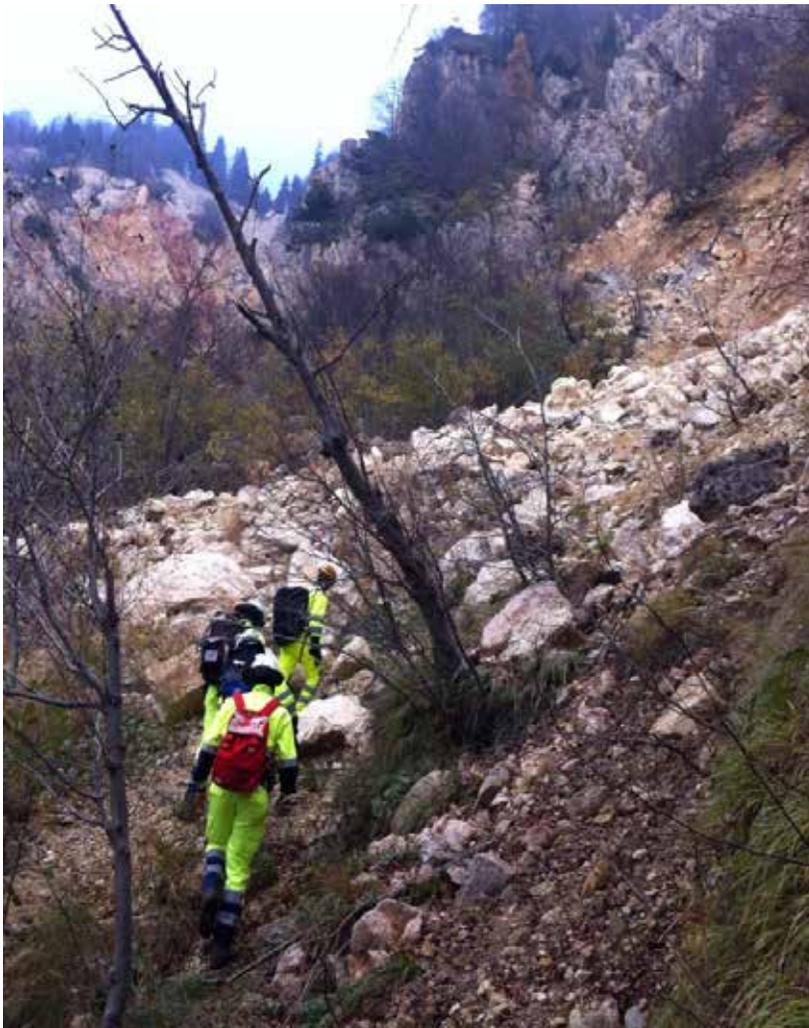


RECALL (Resilient European Communities Against Local Landslides) is a two-years project co-funded by the European Civil Protection Financial Instrument. Partners of the project are Province of Vicenza (IT) - Coordinator, Geological Survey of Slovenia (SLO),

Region of Western Macedonia (GR), University of Debrecen (HU) and Vukovar-Srijem County (HR). RECALL aims to take a step forward in risk prevention, moving to cost-benefits examination and efficient financial resources management and allocation, which is now a huge criticality in local communities destined to become a focal point in the upcoming years, in parallel with increasing scarcity of financial resources available at local level. The project will indeed lead to the development of an efficient and effective methodology for risk analysis, territorial monitoring, data collection, costs analysis for prevention measures and best budget allocation at local level within public territorial entities.

RECALL will test its outcomes in 4 Pilot Areas, by means of Local Cooperative Teams ad hoc created in each project Country:

1. Landslides Capellazzi and Cischele in municipality of Recoaro Terme (Italy) where two landslides in residential areas occurred. The local cooperative team will reconstruct current structures and monitoring surface creeping with remote sensing techniques.
2. Gymnasium Vukovar (Croatia) where there is a soil instability in the high school area. Local Cooperative team will drain water and will stabilize material under foundations.
3. Landslide Potoska Planina (Slovenia) where there is a landslide located above the densely populated settlement of Koroska Bela. Local Cooperative team will undertake a periodical monitoring with remote sensing techniques.
4. Vitsi Landslides and Vigla Rockfalls (Greece) where there are numerous rockfalls and landslides in the vicinity of Florina city. Local Cooperative team will install rockfall nets and barriers and will reconstruct the road.



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The Landslide Bulletin addresses project partners and project target groups.

It appears twice a year for the project duration in an email circulation.

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If you have any ideas or suggestions for the next edition, please let us know via:

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