Grant Agreement No.: 226479

SafeLand

Living with landslide risk in Europe: Assessment, effects of global change, and risk management strategies

7th Framework Programme
Cooperation Theme 6 Environment (including climate change)
Sub-Activity 6.1.3 Natural Hazards

Deliverable D6.1

Validation form and monograph of monitored sites and case studies

Work Package 6

Deliverable/Work Package Leader: SGI-MI/ICG Revision: 5

April 2012

Rev.	Deliverable Responsible	Controlled by	Date
0	SGI-MI	ICG	July 31st, 2009
1	SGI-MI	ICG	Nov 27th, 2009
2	SGI-MI	ICG	Dec 9th, 2009
3	SGI-MI	ICG	July 9th, 2010
4	SGI-MI	ICG	Sep 24th, 2010
5	SGI-MI	ICG	Apr 1st, 2012

SUMMARY

This deliverable presents a collection of the case studies validation forms for monitored landslide sites, which were released by the Partners.
The following information were provided for each site:

a) A map representing the location of the slide (or the representative location in the case of multiple or regional case histories (see §2).
b) A table showing a summary of the relevant data for each site (see §3).
c) Statistics regarding movement classification, material type and occurrence of landslide (see §0).
d) A table listing all the case histories analysed within the Safeland project, together with the reference of the deliverables.

In Annex 1, all the validation forms are collected. This deliverable is distributed together with a Google Earth™ project which shows the location of each hotspot on satellite imagery.

Notes to Rev. 1

Additional validation forms issued after the previous release of Rev. 0 of this Deliverable were included (see the Summary Table on Pages 7-10).

Notes to Rev. 2

Inclusion of the Mannen site (new) and modification to the Åknes validation form.

Notes to Rev. 3

Inclusion of the seven new sites: Aalesund, Aberfan, Arvel, Fourvière, Frank, Namsos and Rissa.

Notes to Rev. 4

Introduction added, updated statistics and final editing.

Notes to Rev. 5

Added 6 new sites: Arno Basin, Grevena, Laval, Mas d'Avignonet, Nedre Romerike, Nocera Inferiore. A table listing all the case histories analysed in the Safeland deliverables was also included (see §5).

Note about contributors

The following organisations contributed to the work described in this deliverable:

Lead partner responsible for the deliverable:
Studio Geotecnico Italiano srl (SGI-MI)

Partner responsible for quality control:
International Centre for Geohazards (ICG)

CONTENTS

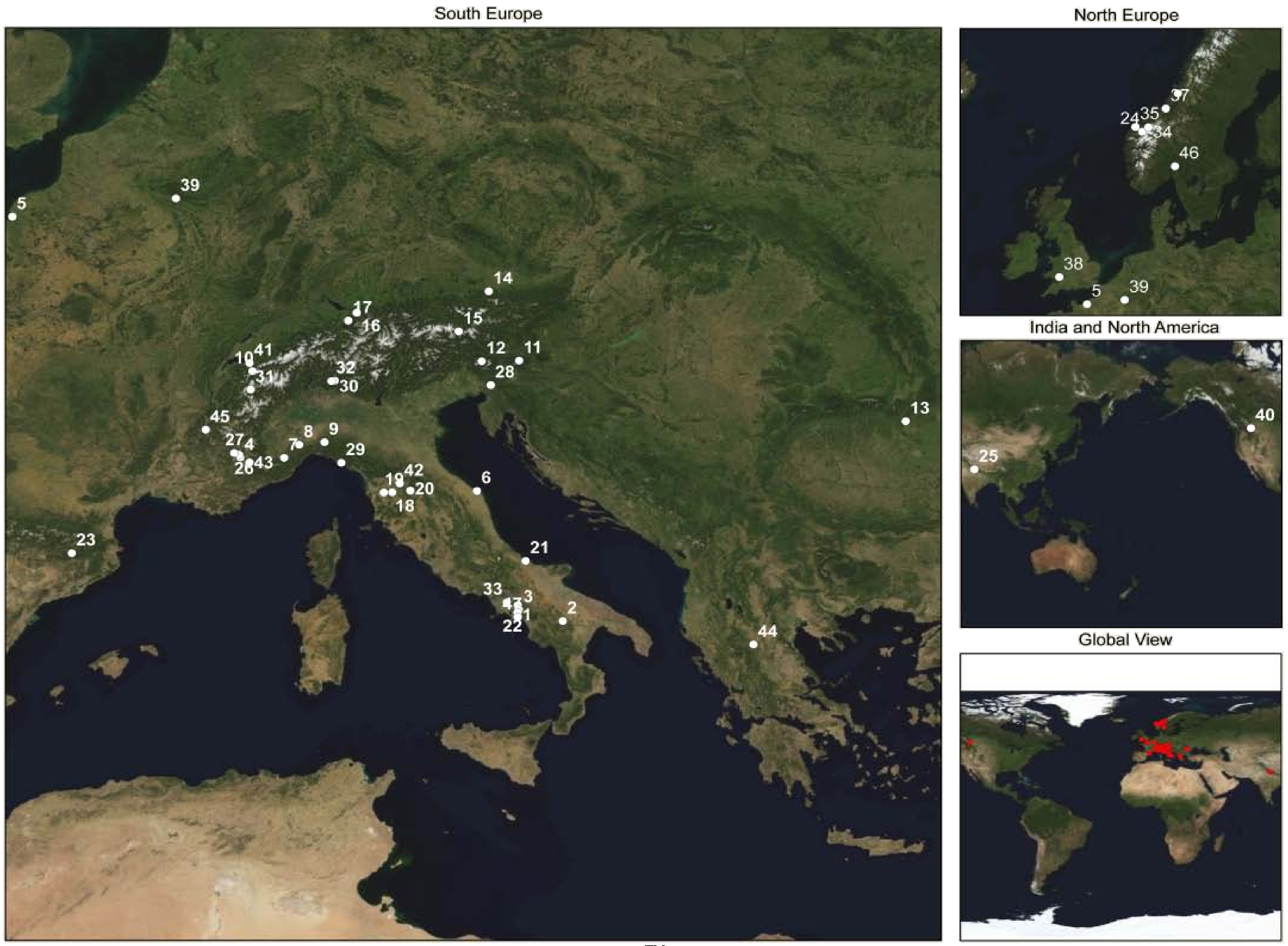
1 INTRODUCTION

The SafeLand Project has the following main objectives:
- To conduct quantitative analyses by means of analytical/numerical methods, and statistical and empirical models, and validation of predictions.
- The evaluation of effectiveness, at simulation level, of the landslide risk mitigation measures.
- Creation of landslide risk scenarios.
- The identification of priorities towards the integration of existing data with further information, to be partly or totally collected during the project, including actual/potential effects on built areas and infrastructures, and loss estimations, as well as social impacts.
- To provide background technical data for workshops intended for identification of most appropriate risk mitigation strategies.

Since the formulation stage of the SafeLand proposal, it was clear that different landslide types were to be considered, with different materials involved, slope movement, triggering factors, magnitude of the impacts (social, economics) etc.
During the first month of the Project a validation form was distributed among Partners asking them to give a summary of the main characteristics of known (and possibly representative) case histories (or “hotspots”). The SafeLand partners have provided data for 47 hotspots (see table of par. 3.), with a distribution among countries skewed toward the Italian territory, but covering almost the entire European territory (see map depicted in par. 2. and statistics of par. 4.).
The validation form issued to Partners was composed of four pages. The information collected comprised:
- References of the proposal Partner in order to facilitate the contacts with the potential users;
- The location of the landslide, including the geographic coordinates. From the beginning, the use of free mapping software as Google Earth™ was envisaged;
- The WP’s to which the case study propose could be applied.
- The main characteristic of the landslide, with particular reference to the triggering mechanism, movement classification, material (rock, debris etc.) and geometry (thickness, surface area, volume etc.). In the case of reactivated movements, the availability of historical data was considered as important.
- Topographic maps, aerial photos and satellite interferometry. Those data were very important since their availability made the case even more attractive for the Partners (i.e. for numerical modelling, mapping, etc.).
- Geotechnical, geological and meteorological/climate data. Also very important for the sake of the Project which is focused on climate changes;
- Availability of observational data, particularly useful to the WP’s devoted to monitoring and early warning systems identification.
- Information on mitigation strategies already envisaged or conceivable, social and economic impacts, losses.
- Few maps or images, generally useful for the user during the case selection phase.

The data form collected for the "hotspots", included in Annex 1, determined their representativeness vis-à-vis the project goals for each Partner. The application to a specific case history within the Safeland project is highlighted in Par. 5.
This deliverable is distributed together with a Google Earth™ project which shows the location of each hotspot on satellite imagery. The click of the user on a selected site icon pops up a window showing the landslide representative data for a “at a glance” view.

2 MAP OF THE COLLECTED SITES



ID	SITE
1	Cervinara
2	Masseria Marino
3	Monteforte Irpino
4	Super Sauze
5	Villerville - Cricqueboeuf
6	Ancona
7	Bagnaschino
8	Casella 1
9	Casella 2
10	La Frasse
11	Macesnik
12	Stože/Log pod Mangrtom
13	La Butoi
14	Gschliefgraben
15	Sonnblick
16	Sibratsgfäll/Rindberg
17	Laterns/Schnepfau
18	Pesa - Elsa
19	Val d'Era
20	Valdarno Superiore
21	Petacciato
22	Pizzo d'Alvano
23	Vallcebre
24	Åknes
25	Nainital
26	La Valette
27	Barcelonnette
28	Slano Blato
29	Castagnola
30	Bindo
31	Courmayeur
32	Fiumelatte - Varenna
33	Liri - Garigliano - Volturno
34	Mannen
35	Aalesund
36	Namsos
37	Rissa
38	Aberfan
39	Fourvière
40	Frank
41	Arvel
42	Arno Basin
43	Laval
44	Grevena
45	Mas d'Avignonet
46	Nedre Romerike
47	Nocera Inferiore

Base map and tool: Google Earth TM. Note: All sites are located in the annexed .kmz file.

3 LANDSLIDE CASE HISTORIES: SUMMARY TABLE

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	2	3	4	5				Spreads	Topples	Falls	Slide rotational	Slide translational	Flows	Complex	Rock	Debris	Earth	Other	First time	Recurrent	Reactivation		In Situ	Lab		
1	Cervinara	AMRA	X	X		X	X	Italy	Campania, Cervinara (AV)	Public						X					X	X			Rainfall	X	X	Yes: Suction and rainfall monitoring active since 2002 with data collected every 15 days.	July 2009
2	Masseria Marino	AMRA	X					Italy	Basilicata, Brindisi di Montagna (PZ)	Not Public							X			X				X	Rainfall and earthquake	X	X	No	July 2009
3	Monteforte Irpino	AMRA	X					Italy	Campania, Naples (NA)	Not Public						X			X			X			-	X	X	No	July 2009
4	Super Sauze	CNRS	X			X	X	France	S French Alps,	Public							X		X	X			X		Rainfall and snowmelt	X	X	Yes: Daily data transfer of displacements (dGPS) and meteo data; Web access at http://eost.u-strasbg.fr/omiv	Nov 2009
5	Villerville-Cricqueboeuf	CNRS	X			X	X	France	Lower Normandy coast	Public				X	X			X	X				X		Rainfall and sea erosion	X	X	Yes: Daily data transfer of displacements (dGPS) and meteo data; Web access at http://eost.u-strasbg.fr/omiv	July 2009
6	Ancona	CSG	X			X	X	Italy	Marche, Ancona (AN)	Not Public (on demand)							X				X			X	Rainfall and earthquake	X	X	Yes: Automatic Robotic station, geodetic GPS single and dual frequency: DMS-IU columns	July 2009
7	Bagnaschino	CSG	X			X	X	Italy	Piemonte, Torre Mondovì (CN)	Not Public (upon request)				X			X	X		X			X		Foot erosion on Paleoslide (D.G.P.V.)			Yes:Topographic and inclinometric	July 2009
8	Casella 1	CSG	X			X	X	Italy	Piemonte, Ponti (AL)	Not Public (upon request)					X		X	X						X	Rainfall			Envisaged.	July 2009
9	Casella 2	CSG	X			X	X	Italy	Piemonte, Casella Ligure (AL)	Not Public (upon request)				X	X		X	X		X				X	Rainfall			Envisaged.	July 2009
10	La Frasse	EPFL	X	X		X	X	Switzerla-nd	Between Sepey and Leysin	Public					X					X					Pore water pressure increase, GWL variations (cyclic effects), toe erosion	X	X	Yes: EWS: continuous laser (ROBOVEC); Monitoring: GPS, classical survey, photogrammetry, use of cadastral maps	July 2009

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	**2**	**3**	**4**	**5**				**Spreads**	**Topples**	**Falls**	**Slide rotational**	**Slide translational**	**Flows**	**Complex**	**Rock**	**Debris**	**Earth**	**Other**	**First time**	**Recurrent**	**Reactivation**		**In Situ**	**Lab**		
11	Macesnik	GeoZS				X		Slovenia	Near Solčava, N Slovenia	Not Public							X	X		X				X	Heavy rainfall, flooding of Savinja River	X	X	Yes: Geodetic measurements with laser distometer and reflectors	Nov 2009
12	Stože/Log pod Mangrtom	GeoZS				X		Slovenia	Stože/Log pod Mangrtom, NW Slovenia	Not Public				X		X	X	X	X	X		X			Heavy rainfall	X	X	Yes: Geodetic measurements with laser distometer and reflectors	Nov 2009
13	La Butoi	GIR					X	Romania	Prahova County, Telega	Public						X	X		X	X				X	Rainfall and anthropic activities		X	No	July 2009
14	Gschliefgraben	GSA	X	X		X	X	Austria	Traunsee, Upper Austria	Not Public (signature of agreement)			X	X	X	X				X			X	X	Increase of water pressure and rockfall		X	Yes, Envisaged: Permanent: automatic iclinometer, geoeletrics, TDR, piezometers, discharges in pipes and open channels, soil humidity, soil temperature, precipitation, air temperature, barometric pressure. Time lapse surveys:crack monitoring, dGPS, manual inclinometer measurements.	July 2009
15	Sonnblick	GSA	X	X		X		Austria	Sonnblick, Rauris	Not Public (signature of agreement)			X					X					X	X	Permafrost melting			Yes; Envisaged: geolectric monitoring, seismic monitoring, temperature monitoring in borehole	July 2009
16	Sibratsgfäll Rindberg	GSA	X	X		X	X	Austria	Sibratsgfäll, Vorarlberg	Not Public (signature of agreement)			X	X	X	X			X	X			X	X	Increase of water pressure, rainfall		X	Yes: Permanent: automatic inclinometer (DMS), geoeletrics, TDR, discharge in pipes and open channel, soil humidity, soil temperature, precipitation air temperature, barometric pressure. Time lapse surveys: Dgps, manual inclinometric measurements.	July 2009
17	Laterns Schnepfau	GSA	X	X		X	X	Austria	Sibratsgfäll, Vorarlberg	Not Public (signature of agreement)				X	X	X			X	X			X	X	Increase of water pressure, rainfall		X	No	July 2009
18	Pesa-Elsa	SGI	X	X		X	X	Italy	Tuscany (Poppiano,Ribaldaccio, Ortimino,Casalino, Gambassi terme, Lucarno, Certlado, Marcialla)	Public with some restrictions			X	X	X				X	X		X	X	X	Increase of water pressure, decrease of resistant strength by erosion or antrophic activity	X	X	Yes: Inclinometers.	July 2009

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	2	3	4	5				Spreads	Topples	Falls	Slide rotational	Slide translational	Flows	Complex	Rock	Debris	Earth	Other	First time	Recurrent	Reactivation		In Situ	Lab		
19	Val d'Era	SGI	X	X		X	X	Italy	Tuscany (Palaia, Toiano, Volterra)	Public with some restrictions			X	X	X			X	X	X		X	X	X	Increase of water pressure, decrease of resistant strength by erosion or antrophic activity	X	X	<u>Yes</u>: Inclinometers.	July 2009
20	Valdarno Superiore	SGI	X	X		X	X	Italy	Tuscany (Tosi, Carbonile, Modine, Ricasoli, I Pozzi, Poggilupi)	Public with some restrictions			X	X	X			X	X	X		X	X	X	Increase of water pressure, decrease of resistant strength by erosion or antrophic activity	X	X	<u>Yes</u>: inclinometers.	July 2009
21	Petacciato	SGI	X			X	X	Italy	Molise, Petacciato (CB)	Not Public (authorization requested)							X			X			X		Variation of water pressure following snowmelt and/or exceptional weather conditions	X	X	<u>Yes</u>: Inclinometer array, piezometers (sporadic monitoring)	July 2009
22	Pizzo d'Alvano	UNISA	X	X		X	X	Italy	Campania, Pizzo d'Alvano (AV)	Public						X	X		X	X		X			Rainfall	X	X	<u>Yes</u>: early warning system based on rainfall thresholds	July 2009
23	Vallcebre	UPC	X			X		Spain	Vallcebre	-					X					X			X		Rainfall and creek erosion	X	X	<u>Yes</u>: Wire exensometers, GPS	July 2009
24	Åknes	ICG				X	X	Norway	Åknes, Stranda, Møre og Romsdal	Public							X	X				X			Degradation of strength, increased water pressure, earthquake	X	X	<u>Yes</u>: very complete. See validation form.	Dec 2009
25	Nainital	ICG					X	India	Hill station in Kumaun Himalaya in Utterakhand State	Not Public							X	X					X		Rainfall and water	X	X	<u>Envisaged</u>: SAR Interferometry	July 2009

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	2	3	4	5				Spreads	Topples	Falls	Slide rotational	Slide translational	Flows	Complex	Rock	Debris	Earth	Other	First time	Recurrent	Reactivation		In Situ	Lab		
26	La Valette	CNRS	X			X	X	France	S French Alps, Department of Alpes de Hautes Provence	Public							X		X	X			X		Rainfall and snowmelt	X	X	Yes: Daily transfer of displacements (DGPS) and meteo data; Web access at http.//eost.u-trasbg.fr/omiv; EWs by RTM	Nov 2009
27	Barcelonnette	CNRS	X	X		X	X	France	S French Alps, Department of Alpes de Hautes Provence	Public			X	X	X	X	X	X	X	X		X	X	X	Rainfall, snowmelt and earthquake	X	X	Yes: Daily transfer of displacements (DGPS) and meteo data; Web access at http.//eost.u-trasbg.fr/omiv; EWs by RTM	Nov 2009
28	Slano Blato	GeoZS				X		Slovenia	Lokavec, near Ajdovščina, SW Slovenia	Not Public					X	X			X	X				X	Heavy rainfall (in the year 2000)	X	X	Yes: Geodetic measurements in the upper part of the landslide	Nov 2009
29	Castagnola	UNIFI				X		Italy	Liguria, Framura (La Spezia)	Public				X						X			X		Rainfall, increased water pressure		X	Yes: Current monitoring from 2007 (clinometers, crackmeters, inclinometers, rain gauge station). Data on website 24h/24. Past monitoring: inclinometers measurement from April 2001-2002, crackmeters measurements from April 2001-2002	Nov 2009
30	Bindo	UNIMIB	X			X	X	Italy	Lombardia, Cortenova	Not Public							X		X								X	Yes: GPS measurements, Satellite PS-SAR measurements (1992-2008), GB-InSAR measurements (2002-2005), Borehole inclinometer, TDR and Piezometers measurements.	Nov 2009
31	Courmayeur	UNIMIB				X		Italy	Valle d'Aosta, Courmayeur, M. de la Saxe	Not Public							X	X								X	X	Yes: ED distance measurements, GPS measurements, GB-InSAR measurements (since 2009), Borehole inclinometer and Piezometers measurements (since 2009).	Nov 2009
32	Fiumelatte-Varenna	UNIMIB		X			X	Italy	Lombardia, Fiumelatte - Varenna	Not Public		X	X					X										No	Nov 2009
33	Liri-Garigliano-Volturno	UNISA		X		X		Italy	Central Southern Italy	Public	X			X	X	X	X		X	X			X	X	Groundwater fluctuations, anthropic activity			No	Nov 2009
34	Mannen	ICG				X	X	Norway		Public							X	X					X		Rainfall, snowmelt, permafrost melting			Yes: Estabilished November-Dicember 2009 (extensometers, tiltmeters, single laser, ground-based radar).	Dec 2009

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	2	3	4	5				Spreads	Topples	Falls	Slide rotational	Slide translational	Flows	Complex	Rock	Debris	Earth	Other	First time	Recurrent	Reactivation		In Situ	Lab		
35	Ålesund	UNIL	X				X	Norway	Møre and Romsdal	Not Public					X			X				X			Engineering works (slope cutting)	X	X	No	July 2010
36	Namsos	UNIL	X				X	Norway	Trøndelag	Public						X					X	X			Engineering works (blasting)	X		No	July 2010
37	Rissa	UNIL	X				X	Norway	Trøndelag	Public						X					X	X			Buildiding works (head charge with excavation material)	X	X	No	July 2010
38	Aberfan	UNIL	X					United Kingdom	Wales,Aberfan	Not Public						X				X	X	X						Envisaged: Back-analysis with aerial photographs	July 2010
39	Foruvière	UNIL	X					France	Lyon, Fourvière hill	Public						X				X	X	X			Intense rainfall, pore pressure, old drainage system (badly maintained)			No	July 2010
40	Frank	UNIL	X					Canada	Near Blairmore, South West Alberta	Not Public			X			X		X				X			Complex wedges and planar dip slope (stability worsened by mining activity)	X		Yes: Acoustic and micro-seismic, GPS, extensometers, laser distance-meter, photogrammetry and meteorological stations	July 2010
41	Arvel	UNIL	X					Switzer-land	Arvel Quarry, Villeneuve	Not Public		?	X					X					X		Favorable slope and discontinuiy sets (stability worsened by quarry)			Yes: Ground-Based InSAR, Terrestrial Laser Scanning, (acoustic and micro-seismic)	July 2010
42	Arno Basin	UNIFI	X	X	X	X	X	Italy	Arno Basin, Tuscany	Public	X	X	X	X	X	X	X	X	X	X		X	X	X	Increased water pressure, erosion or anthropic activity	X	X	Yes: extensometers, inclinometers, piezometers, permanent scatterers, rain gauges	April 2012
43	Laval	CNRS	X					France	S French Alps, Department of Alpes de Haute Provence	Public					X				X	X		X			Rainfall	X	X	No	April 2012

ID	Site	Proposing partner	Suitable for WP's (*)					Country	Location	Access to data	Movement type							Material				Type of Occurrence			Triggering mechanism	Geotechnical data		Monitoring and/or early warning systems	Updating
			1	2	3	4	5				Spreads	Topples	Falls	Slide rotational	Slide translational	Flows	Complex	Rock	Debris	Earth	Other	First time	Recurrent	Reactivation		In Situ	Lab		
44	Grevena	AUTH		X				Greece	NW Greece, broader area of Grevena city	Not Public			X	X	X			X		X		X	X	X	Earthquake, rainfall, erosion, anthropic activities	X	X	No	April 2012
45	Mas d'Avignonet	CNRS	X					France	Central French Alps, Department of Isere, 40km S of Grenoble	Public				X						X			X		Rainfall, snowmelt	X	X	Yes: Daily data transfer of displacement (Dgps), Hydrology and meteo data. Web access to http://omiv.osug.fr	April 2012
46	Nedre Romerike	ICG	X		X			Norway	Akershus county, municipalities of Fet, Gjerdrum, Nannestad, Rælingen, Skedsmo, Sørum, Ullensaker.	Not Public				X	X					X		X			Rainfall, snowmelt, anthropic activity, erosion			No	April 2012
47	Nocera Inferiore	UNISA	X	X		X	X	Italy	Campania	Not Public						X	X		X	X		X			Rainfall	X	X	Yes	April 2012

(*) Notes: As suggested by proposing Partners

4 STATISTICS

Some statistics of data were performed with reference to:

- Movement types (Fig. 1): few sites are characterized by a simple movement; most of the cases are reported as complex.
- Materials (Fig 2): all the materials are represented; for several cases, more than one material class is involved.
- Type of occurrence (Fig. 3): the landslide cases are distributed uniformly among the three different types of occurrence (first time, reactivation, recurrent).
- Location (Fig. 4): the distribution among countries is particularly skewed toward Italy, which is characterised by the greatest number of case in its territory.

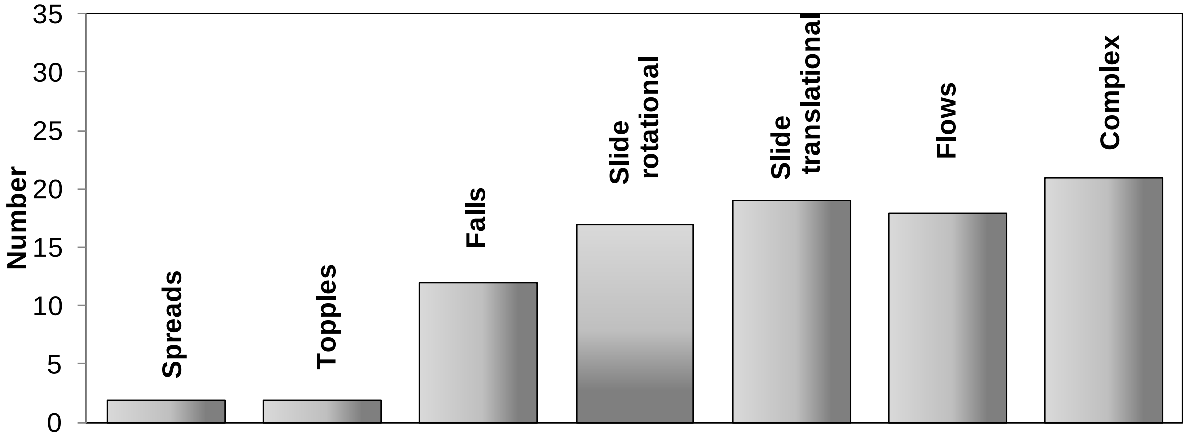


Figure 1: Movement classification

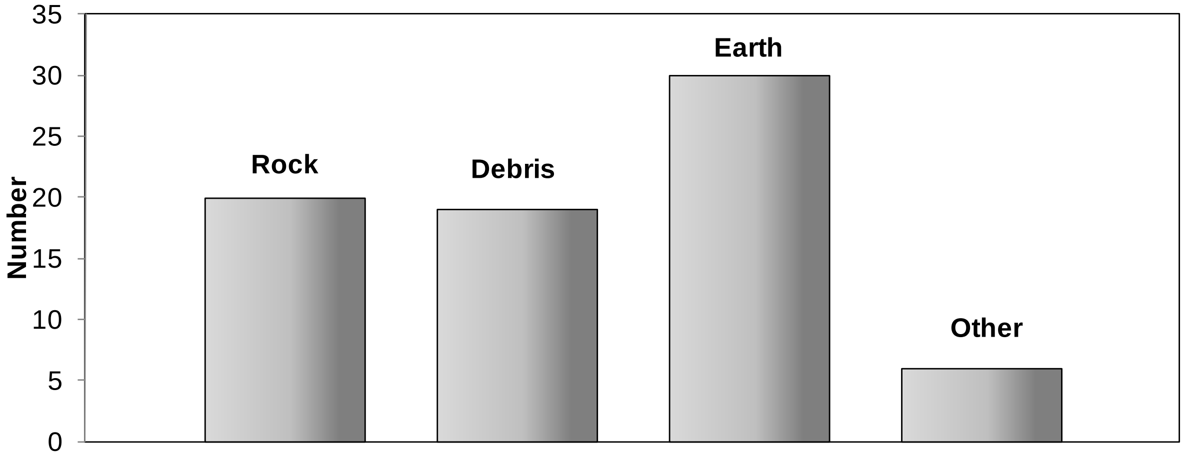


Figure 2: Material type

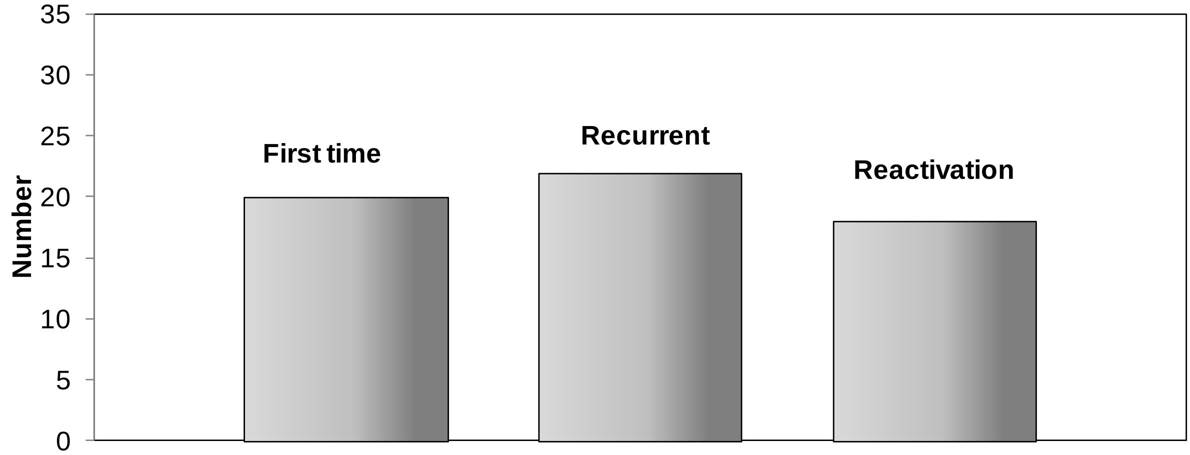


Figure 3: Type of occurence

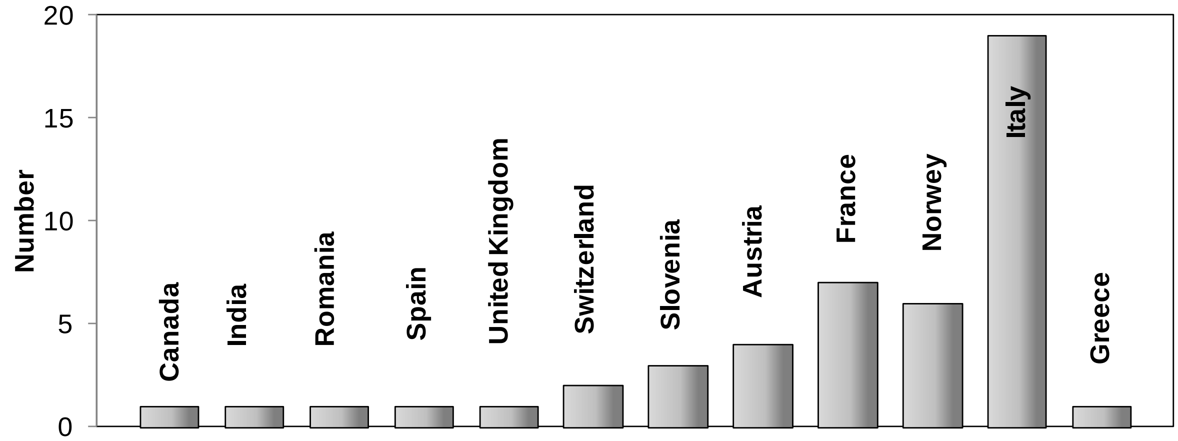


Figure 4: Location of case histories

5 LIST OF CASE STUDIES USED IN SAFELAND DELIVERABLES

The sites for which the validation form is provided in Annex 1 are highlighted in yellow.

Deliverable	Study site	Location	Partner	Contribution
D1.1 -D4.2	Ischia Island (Vezzi mountain)	Campania region, Southern Italy	UNIMIB	AMRA
D1.1	Avellino	Campania region, Southern Italy	UNIMIB	AMRA
D1.1 -D1.2 -D1.3 -D4.2	Cervinara	Campania region, Southern Italy	UNIMIB	AMRA
D1.1 -D1.2 -D1.3 -D1.4 -D1.5 -D1.6 -D2.1 -D3.3 -D3.4 -D3.6 -D3.8	Pizzo d'Alvano (Sarno, Quindici, Siano and Bracigliano)	Campania region, Southern Italy	UNIMIB	AMRA
D1.1	Trièves Plateau	Grenoble, French Alps	UNIMIB	CNRS
D1.1 -D1.5 -D2.7 -D2.8 -D3.3 -D3.4 -D3.6 -D3.8 -D3.9 -D4.3 -D4.5 -D4.6 -D5.3 -D7.4	Barcelonnette Basin	Barcelonette, Southern French Alps	UNIMIB	CNRS
D1.1 -D1.3 -D4.1 -D.4.3 -D4.8	Super Sauze landslide	Barcelonette, Southern French Alps	UNIMIB	CNRS
D1.1 -D4.6	Ruinon rockslide (Valfurva)	Upper Valtellina, Central Italian Alps	UNIMIB	UNIMIB
D1.1 -D5.1	Campo Vallemaggia landslide	Canton Ticino (Swiss Alps)	UNIMIB	UNIMIB
D1.1.	Spriana landslide	Valtellina, Italian Central Alps	UNIMIB	UNIMIB
D.1.1 - D.1.2 - D.1.3 - D3.6 - D4.1 - D4.5 - D4.6	Vallcebre landslide	Eastern Pyrenees, Barcelona	UNIMIB	UPC
D1.1.	Vajont landslide	Northern Italy	UNIMIB	SGI-MI
D1.1.	Civita di Bagnoregio	Central Italy	UNIMIB	SGI-MI
D1.1.	Calitri landsliade	Irpinia, Italy	UNIMIB	UNIMIB
D1.1.	Corniglio Landslide	Appenines region, Italy	UNIMIB	UNIMIB
D1.1.	Berard rock glacier	Southern Alps, France	UNIMIB	ETHZ
D1.1.	Turtmanntal	Canton Valais, Switzerland	UNIMIB	ETHZ
D1.1.	Vallèe du Durnand	Switzerland	UNIMIB	ETHZ
D1.1.	Val Pola landslide	Northern Italy	UNIMIB	ETHZ
D1.1.	Ritigraben Torrent	Canotn Valais, Switzerlans	UNIMIB	ETHZ
D1.1.	Randa rockslide	Mattertal, Switzerland	UNIMIB	ETHZ
D1.1.	Mt. Watles sackung	Val Venosta, Central ALPS, Italy	UNIMIB	SGI-MI

Deliverable	Study site	Location	Partner	Contribution
D1.1.	Stava valley	Trento, Northern Italy	UNIMIB	SGI-MI
D1.1 - D1.6	Rissa landslide	Lake Botnen, Norway	AMRA	AMRA
D1.2 - D2.11 - D5.3 - D5.7	Nocera Inferiore	Campiania region, Southern Italy	AMRA	UNISA
D1.2	Sila Grande	Calabria, Southern Italy	AMRA	AMRA
D1.2	Fosso St. Martino slide	Abruzzo region, Italy	AMRA	AMRA
D1.2	Torrente Miscano earthflow	Campania region, Southern Italy	AMRA	AMRA
D1.2 -D1.3	Grüben	Canton Wallis, Switzerland	AMRA	ETHZ
D1.2 -D1.3	Rüdlingen	Canton , Schaffhausen, Switzerland	AMRA	ETHZ
D1.2	Valdarno Basin	Central Italy	AMRA	AMRA
D1.2	Portalet landslide	Central Spanish Pyrenees	AMRA	FUNAB
D1.2 -D1.3 -D1.5	La Frasse landslide	Canton of Vaud, Switzerland	AMRA	ETHZ
D1.2	Potenza slide	Southern Italy	AMRA	AMRA
D1.3	Monteforte Irpino	Avella mountains, Southern Italy	ETHZ-CNRS	AMRA
D1.3	Laval landslide	Draix Catchment, South French Alps	ETHZ-CNRS	CNRS
D1.3	Tössegg	Canton Zürich, Switzerland	ETHZ-CNRS	ETHZ
D1.3	Orvieto slide	Central Italy	ETHZ-CNRS	AMRA
D1.3	Santa Barbara slide (open coal mine)	Upper Valdarno basin, Tuscany Region. Italy	ETHZ-CNRS	AMRA
D1.2 -D1.3	Basento Valley - Masseria Marino	Basento Valley -Southern Italy	ETHZ-CNRS	AMRA
D1.3	Torrente Miscano	Southern Italy	ETHZ-CNRS	AMRA
D1.5 -D3.3 -D3.4 - D3.8 -D3.9	Nedre Romerike area	South-eastern Norway	ICG	ICG
D1.5	Satriano	Calabria, Southern Italy	ICG	AMRA
D1.5	Verzino	Calabria, Southern Italy	ICG	AMRA
D1.5	Norangselva catchment	Western Norway	ICG	ICG
D1.6	Fuorviere slide	Lyon, France	ICG	BRGM
D1.6	Fully slide	Fully, Switzeralnd	ICG	EPFL
D1.6	Lutzenberg slide	Lutzenberg, Northeastern Switzerland	ICG	EPFL
D1.6	Aberfan slide	South Wales	ICG	ICG

Deliverable	Study site	Location	Partner	Contribution
D1.6 - D.1.7	Arvel slide	Switzerland	ICG	UNIL
D1.6 - D.1.7	Frank slide	Turtle Mountain, Canada	ICG	UNIL
D1.6	Aalesund rockslide	Aalesund, Norway	ICG	ICG
D1.6	Eterpas	Valais, Switzeraland	ICG	EPFL
D1.6	Namsos	Trondelag, Norway	ICG	ICG
D1.6	Menton	Alpes.Maritimes, France	ICG	BRGM
D1.7	Sasso Bisolo rockfall avalanche	Italy	FUNAB	UNIMIB
D1.7	Luseney rock avalanche	Aosta Valley, Northwest Italy	FUNAB	FUNAM
D1.7 - D.1.9	Thurwieset rock avalanche	Upper Valtellina, Central Italy	FUNAB	UNIMIB
D2.1 - D2.7 - D4.1 - D4.5	Basin of Liri Garigliano and Volturno rivers	Southern Italy	UPC	UNISA
D2.1 - D4.1 -D4.3	Basin of Arno River	Central Italy	UPC	UNIFI
D2.1	Po River Basin	Northern Italy	UPC	UNIMIB
D2.1	Val Trompia	Lombardy region, Northern Italy	UPC	UNIMIB
D2.1	Alto Adriatico Basin	Northern Italy	UPC	UNIMIB
D2.1	Masarè village	Allenghe, Northern Italy	UPC	UNIMIB
D2.2a -D4.1 - D4.3 - D4.5	Wenchuan earthquake	Longmensshan region, China	ITC	ITC
D2.2b	Sher-ka-Danda landsliade	Nainital, India	ITG	IIT
D2.2b -D4.3	Darjeeling Himalaya.	India	ICG	IIT-Roorkee
D2.4 -D3.6 -D4.1 - D4.5 -D4.6 -D4.8 -5.1	Aknes rock slide	Norway	UPC	ICG
D2.4	Marano slide	Italy	UPC	UNIFI-UNIMIB
D2.5 -D2.10	Glen Ogle	Scotland	AUTH	TRL
D2.5 -D2.10	Rest and be Thankful	Scotland	AUTH	TRL
D2.5	Seoul to Chuncheon National Road 46	Korea	AUTH	TRL
D2.7a	San Pietro	Guarano, Cosenza Province, Southern Italy	AUTH-ICG	UNISA
D2.7a -D2.7b	Grevena city	Greece	AUTH-ICG	AUTH
D2.7b	Skien	Norway	AUTH-ICG	ICG
D2.7b	Stranda	Norway	AUTH-ICG	ICG

Deliverable	Study site	Location	Partner	Contribution
D2.8	La Pobla de Lillet	Spanish Eastern Pyrenees.	UPC	UPC
D2.8	Nilgiri	India	UPC	ITC
D2.11	Castellammare di Stabia	Naples, Italy	UPC	AMRA
D2.11 -D4.6	Ancona	Italy	UPC	UNIFI
D2.11	Sola D'Andorra	Andorra	UPC	UPC
D2.11	Fiumelatte	Varenna. Italy	UPC	UNIMIB
D3.3 -D3.4 -D3.6	Telega	Prahova County, Romania	CMCC	CMCC
D3.6 -D5.3	Faucon catchment	Barcelonette, Southern French	BRGM	CNRS
D4.1 -D4.3 -D4.5	Messina landlslide	Italy	UNIL	ITC
D4.1	Val Canaria	Ticino Swiss Alps	UNIL	UNIL
D4.1	Valfurva and Valdisotto area	Italy	UNIL	UNIFI
D4.1	Trondheim Harbour	Norway	UNIL	ICG
D4.1	Buvika site	Norway	UNIL	ICG
D4.1	Valoria landslide	Northern Apennines, Italy	UNIL	ICG
D4.1	Finneidfjord landlside	Norway	UNIL	ICG
D4.1	Tessina landslide	Italy	UNIL	JRC
D4.1 -D4.3	The Flemish Ardennes	Belgium	UNIL	JRC
D4.1	Carbonille landlslide	Tuscany, Italy	UNIL	UNIFI
D4.1	Rindberg / Sibratsgfäll landslide	Austria	UNIL	GSA
D4.1 -D4.5 -D4.6 -4.8	Bagnaschino landslide	Cuneo, Piedmont. Italy	UNIL	CSG
D4.2	Pistoia, Prato and Lucca provinces (N Appenines)	Tuscany, Italy	CMCC	CMCC
D4.3 -D4.5 -4.6	La Valette mudslide	Barcelonette, Southern French Alps	CNRS	ITC
D4.3	Bois-Noir landslide	Southern French Alps	CNRS	ITC
D4.3 -D4.5 -4.6	Gschliefgraben landslide	Austria	CNRS	GSA
D4.3 -D4.5 -4.6	Villerville-Cricqueboeuf landslide	Normandy, France	CNRS	CNRS
D4.5	Avignonet	France	UNIFI	CNRS

Deliverable	Study site	Location	Partner	Contribution
D4.5	Rindberg and Sibratsgfäll	Vorarlberg, Austria	UNIFI	GSA
D4.5	Schnepfau	Vorarlberg, Austria	UNIFI	GSA
D4.5 -D4.6	Castagnola	Italy	UNIFI	UNIFI
D4.5	Sunndalsøra	Møre og Romsdal, Norway	UNIFI	NGU
D4.5	Stoze/Log pod Mangrtom	Julian Alps, Slovenia	UNIFI	GSA
D4.5	Aurland fjord	Norway	UNIFI	NGU
D4.6	Ampflwang – Hausruck	Austria	GSA	GSA
D4.6	Casella site	Piedmont Region, Italy	GSA	CSG
D4.6	Bindo rockslide	Cortenov, Italy	GSA	UNIMIB
D4.6	Jettan	Nordness, Norway	GSA	NGU
D4.6 -D4.8	Mannen	Norway	GSA	NGU
D4.6	Rosano	Piedmont Region, Italy	GSA	CSG
D4.6	Sonnblick & Mölltaler Glacier	Austria	GSA	GSA
D4.8	Mölltaler Glacier	Austria	ICG	GSA
D.5.1	Petacciato Landslide	Italy	SGI-MI	SGI-MI
D.5.1	Toggenburg rock slope	Canton of St. Gallen, Switzerland	SGI-MI	SGI-MI
D.5.1	Pontresina check dam	Canton of Graubünden in Switzerland	SGI-MI	SGI-MI
D.5.1	Arschella Ost Sedrun landslide	Switzerland	SGI-MI	SGI-MI
D.5.1	Falli-Hölli landlside	Fribourg, Switzerland	SGI-MI	SGI-MI
D.5.1	Stratoni Village	Greece	SGI-MI	SGI-MI

ANNEX 1: Validation forms

01 CERVINARA FLOWSLIDE (1/4)

Proposing partner:	AMRA S.c.ar.l. (3)		
Person(s) in charge for the data management:	Name:	Luciano Picarelli	
	email address:	luciano.picarelli@amracenter.it	
	Fax No.	+39 081 7685144	

Country:	ITALY	Location:	Cervinara (AV), Campania
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E. 14.6458° N. 41.0067°	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	AMRA
Owner contact data:	Luciano Picarelli
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☒Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	Inhabitants, public administrators, civil protecion autorities

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☐ Earth ☒ Other (specify): pyroclastic granular soils
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall-induced landslides		
Average velocity:	few m/s		
Further notes:			

01 CERVINARA FLOWSLIDE (2/4)

Landslide geometry:	Thickness	(m)	1.0 – 2.5
	Surface*	(m^2)	25000
	Volume	(m^3)	31000
Run-out:	Height	(m)	from 700m to 300m asl
	Distance	(m)	2000

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:25000 – 1:5000	Year(s): 2000
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: orthophoto after the 1999 landslide	

Geology and geomorphology:	☒ Yes ☐ No	Geological and geomorphological studies and maps done after the 1999 event.
Geophysics:	☐ Yes ☒ No	
Geotechnical data:	Site: ☒ Yes ☐ No	Hand-made pits and dug, about 20 DL030 penetrometer tests
	Lab: ☒ Yes ☐ No	1. A number of triaxial tests for determination of soil mechanical properties in both saturated and unsaturated conditions: drained and undrained triaxial tests, Suction Controlled Triaxial Test on natural and reconstituted specimens of volcanic and weathered ashes; 2. Determination of hydraulic characteristics of ashes and pumices in both saturated and unsaturated conditions through permeability tests and determination of soil water retention curves; 3. Flume Tests on small scale slopes in homogeneous and layered deposits of pyroclastic materials (both ashes and pumices) subjected to artificial rainfall; 4. Determination of physical properties of pyroclastic materials.
Groundwater:	☒ Yes ☐ No	Suction measurements by jet-fill tensiometers

Rainfall data	☒ Yes ☐ No	Hourly and daily rainfall data
Temperature data	☐ Yes ☒ No	
Humidity data	☐ Yes ☒ No	
Earthquake strong motion data	☐ Yes ☒ No	

01 CERVINARA FLOWSLIDE (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	Suction and rainfall monitoring is active since 2002 with data collection about every 15 days. Presently, automatic devices are installed with a hourly collected data frequency.

Elements at risk (specify): Human life, buildings, infrastructures, economical resources		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	5 people in 1999
Economic loss due to previous events:	☒ Yes ☐ No	Few millions of euros
Social consequences due to previous events	☒ Yes ☐ No	Homeless, interruption of economic activities, interruption of road lines.
Mitigation (already performed or envisaged):	☒ Yes ☐No	At the moment, only check-dams
Land planning already established for the case:	☐ Yes ☒ No	

Numerical modelling (already done)	☒ Yes ☐ No	Numerical modelling of infiltration and triggering stages with FEM and FDM models
Risk analyses already carried out	☐ Yes ☒ No	

01 CERVINARA FLOWSLIDE (4/4)

References (papers and other published material, www site), specify:	1. Olivares, L., and Picarelli, L., 2001. "*Susceptibility of loose pyroclastic soils to static liquefaction: Some preliminary data*." Proc., Symp. On Landslides, Causes, Impacts, and Countermeasures, Davos, VGE, Essen, 75–85. 2. Olivares, L., and Picarelli, L., 2003. "S*hallow flowslides triggered by intense rainfalls on natural slopes covered by loose unsaturated pyroclastic soils*." Geotechnique, 53-2, 283–288. 3. Olivares L., Picarelli L., Andreozzi L., Avolio B., Damiano E., Lampitiello S., 2002. "*Scenari di pericolosità di frana in terreni sciolti di natura piroclastica*" - AGI, XXI Convegno Nazionale di Geotecnica - L'Aquila. 4. L. Olivares, E. Damiano, L. Picarelli, 2003. "*Wetting and flume tests on a volcanic ash*" - International Conference on: Fast Slope Movements-Prediction and Prevention for Risk Mitigation - Naples. 5. L. Olivares, L. Andreozzi, E. Damiano, B. Avolio, L. Picarelli, 2003. "*Hydrologic response of a steep slope in unsaturated pyroclastic soils*" - International Conference on: Fast Slope Movements-Prediction and Prevention for Risk Mitigation - Naples. 6. Olivares L., Picarelli L., Andreozzi L., Damiano E., Lampitiello S., 2003. "*Meccanismi di innesco delle colate di fango in terreni piroclastici sciolti: il caso di Cervinara*" – Convivere con le frane: effetti su infrastrutture e insediamenti urbani. Strategie di intervento per la mitigazione del rischio – Hevelius ed. 7. Picarelli L., Olivares L., Andreozzi L., Damiano E., Lampitiello S., 2004. "*A research on rainfall-induced flowslides in unsaturated soils of pyroclastic origin*". Proc. Int. Symp. On Landslides, Rio de Janeiro. 8. Olivares L., Damiano E., 2004. "*Post-failure mechanics of landslides - Flowslides in pyroclastic soils*" Proc. Int. Symp. On Landslides, Rio de Janeiro. 9. Picarelli, L., Evangelista, A., Rolandi, G., Paone, A., Nicotera, M.V., Olivares, L., Scotto di Santolo, A., Lampitiello, S., and Rolandi, M., 2006. "M*echanical Properties of Pyroclastic Soils in Campania Region*," 2nd International Workshop on Characterisation and Engineering Properties of Natural Soils, Singapore, Vol. 1, pp. 2331–2384. 10. Olivares L., Damiano E., 2007. "*Post-failure mechanics of landslides - A laboratory investigation of flowslides in pyroclastic soils*" Journal of Geotechnical and Geoenvironmental Engineering ASCE, 133 (19): 51-62. 11. Picarelli L., Olivares L., Comegna L., Damiano E., 2007. "*Mechanical aspects of flow-like movements in granular and fine-grained soils*" Rock Mechanics and Rock Engineering, Vol. 41, 1, pp. 179-197 12. Olivares L., Tommasi P., 2008. "The role of suction and its changes on stability of steep slopes in unsaturated granular soils", Special Lecture, 10th Inter. Symp. On Landslides and Engineering Slopes, Xi'an, China, Vol. 1 13. Damiano E., Olivares L., 2009. "*The role of infiltration processes in steep slope stability of pyroclastic granular soils: laboratory and numerical investigatio*n". Accepted for publication on Natural Hazards. 14. Greco R., Guida A., Damiano E., Olivares L., 2009 "*Soil water content and suction monitoring in model slopes for shallow flowslides early warning applications*". Accepted for publication in Physics and Chemistry of the Earth, Elsevier.	
The case history has been considered in other research projects?	☒ Yes ☐ No	National projects financed by the Italian Ministry of Education (PRIN 2002; PRIN 2006)

General comments and pictures

02 MASSERIA MARINO MUDSLIDE (1/4)

Proposing partner:	AMRA scarl		
Person(s) in charge for the data management:	Name:	Gianfranco	Urciuoli
	email address:	gianurci@unina.it	
	Fax No.	++39 081 7683481	

Country:	Italy	Location:	Masseria Marino , Brindisi di Montagna (Potenza)
Scale:	☒Single slide ☐ Multiple ☐ Regional		
Reference geographical coordinates	E 15.9385° N 40.6344°	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	Dipartimento di Ingegneria Idraulica, Geotecnica ed Ambientale
Owner contact data	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): 1991-2004	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☒ Reactivation
Triggering mechanism	Masseria Marino landslide displays alternating phases of rest and reactivations; the primary cause of reactivation is rainfall, but experience shows that seismicity also plays an important role.		
Average velocity:	This mudslide displays different stages of movement characterized by very different displacement patterns and velocities. In the first stage (reactivation) the displacement rate ranges between very rapid and moderate (Cruden and Varnes1996), then it is decreasing, ranging from slow to extremely slow, until a complete stop (which can occur even tens or hundreds years after mudslide mobilization).		
Further notes:			

02 MASSERIA MARINO MUDSLIDE (2/4)

Landslide geometry:	Thickness (m)	5,5-11
	Surface* (m^2)	15000
	Volume (m^3)	-
Run-out:	Height (m)	-
	Distance (m)	-

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒Yes ☐ No	If yes, specify : - Topographic site map with location of situ instruments	Scale(s):	Year(s): -1991 -1997 -1999 -2003
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: - Brindisi di Montagna (PZ), Masseria Marino landslide; (1998).	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: - Photos of the site.	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: -Stratigraphic map
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): - Inclinometer tubes to measure the evolution of horizontal displacements (location maps availability); - Benchmarks to measure superficial displacements. (location maps availability).
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): - Classification test; - Triaxial tests on saturated samples (n° 85); - Direct shear tests on saturated samples (n° 30); - Oedometer tests on saturated samples; - Permeability test.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): - Casagrande and vibrating wire piezomiters to measure the water levels (location maps availability).

Rainfall data	☒ Yes ☐ No	If yes, specify: - Measurements collected by rain gauge installed insite; - Measurements collected by the meterological station *Vaglio di Lucania*.
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

02 MASSERIA MARINO MUDSLIDE (3/4)

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged		
	If yes or envisaged, specify (technique, frequency, web access etc.):		

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): -A simplified numerical analysis has been performed with the numerical code PLAXIS 2D(FEM).
Risk analyses already carried out	☐ Yes ☒No	If yes, specify:
References (papers and other published material, www site), specify:	1. Guerriero G. (1995). Modellazione sperimentale del comportamento meccanico di terreni in colata. *Tesi di Dottorato, Università degli Studi di Napoli Federico II.* 2. Comegna L. (2005). Proprietà e comportamento delle colate in argilla. *Tesi di Dottorato, Seconda Università degli Studi di Napoli*. 3. Picarelli L, Urciuoli G, Ramondini M, Comegna L (2005b) Main features of mudslides in tectonised highly fissured clay shales. Landslides 2(1):15–30. 4. Comegna L, Picarelli L, Urciuoli G (2007) The mechanics of mudslides as a cyclic undrained-drained process. Landslides 4:217-232	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: - MIUR: projects “PETIT-OSA” and “Franosità in Campania e introduzione di tecnologie avanzate per la stabilizzazione dei pendii”.

02 MASSERIA MARINO MUDSLIDE (4/4)

General comments and pictures:

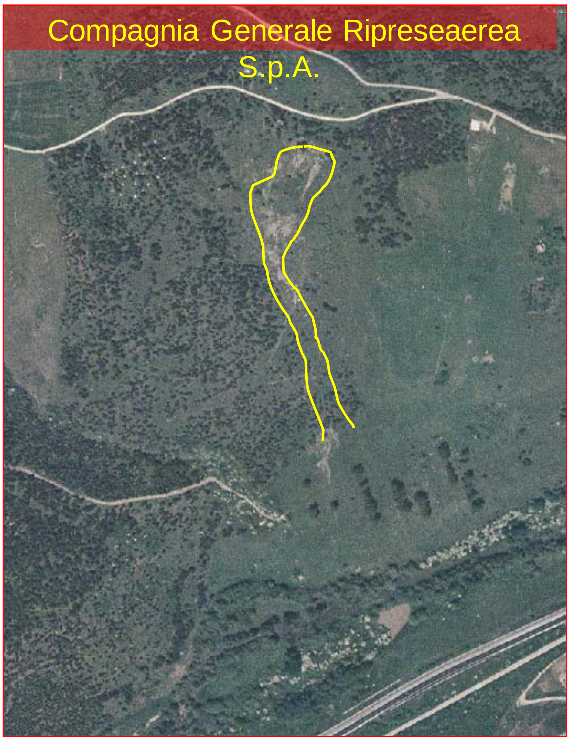


Figure1: Aerial photo of Masseria Marino landslide

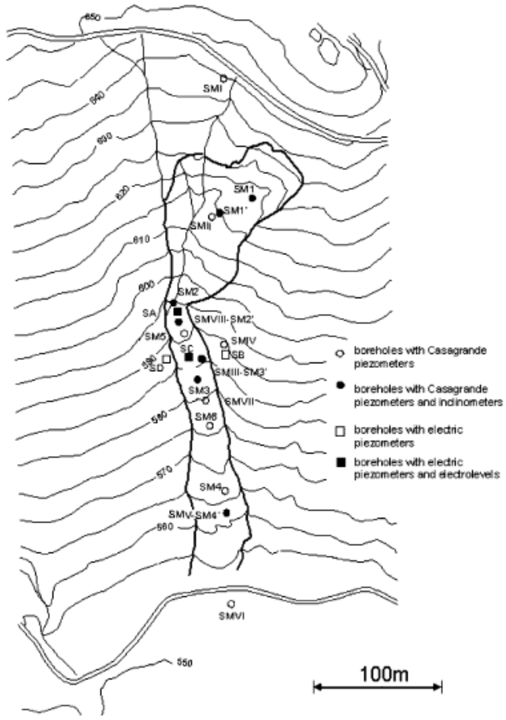


Figure2: Masseria Marino: location of instruments

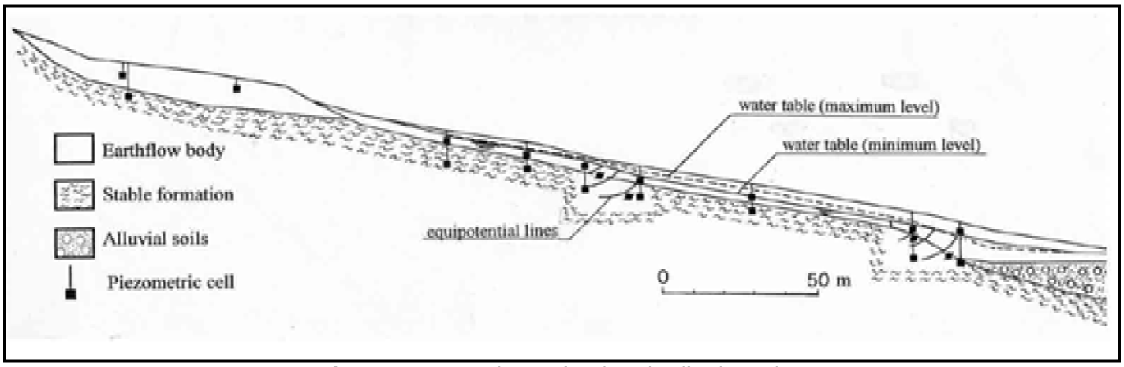


Figure3: Masseria Marino longitudinal section

03 MONTEFORTE IRPINO INSTRUMENTED SLOPE (1/3)

Proposing partner:	AMRA scarl		
Person(s) in charge for the data management:	Name:	Gianfranco	Urciuoli
	email address:	gianurci@unina.it	
	Fax No.	++39 081 7683481	

Country:	Italy	Location:	Naples
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 14.6767° N 40.8986°	Google Earth™ km file submitted with this form:	☐ Yes ☐ No

Data owner:	Dipartimento di Ingegneria Idraulica, Geotecnica ed Ambientale	
Owner contact data		
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested):	
Stakeholders:	(specify if they are interested in becoming end users of the project)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☐ Yes ☒ No (slide prone)	If yes, potential for future sliding?	☐ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): 2006-2008	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism			
Average velocity:			
Further notes:			

03 MONTEFORTE IRPINO INSTRUMENTED SLOPE (2/3)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify:	Scale(s):	Year(s): 2006
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: Naples, Somma Vesuvio and Monteforte Irpino; 2006	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Photos of the site and of the instrumentations installed; Map's site	

Geology and geomorphology:	☒ Yes ☐ No		If yes, specify: -Geologic map -Stratigraphic map -Slope map -Pyroclastic cover map
Geophysics:	☐ Yes ☒ No		If yes, specify:
Geotechnical data:	Site: ☒ Yes	☐ No	If yes, specify (type of test, location maps availability etc.): - Tensiometers to measure the suction - TimeDomainReflectometry to measure the volumetric water content
	Lab: ☒ Yes	☐ No	If yes, specify (type and number of test, material tested): - triaxial tests on saturated samples(n° 69) - triaxial tests on unsaturated samples(n° 11) - Direct shear tests on saturated samples(n° 14) - Direct shear tests on unsaturated samples(n° 19) - Oedometer tests on unsaturated samples(n° 11) - Evaporation test (n° 37) - Permeability test (n° 24) - Pressure Plate test (n° 31)
Groundwater:	☒ Yes ☐ No		If yes, specify (piezometers, suction etc.): - Piezometers

Rainfall data	☒ Yes ☐ No	If yes, specify: - Measurements collected by the Monteforte Rain gauge(2006-2008) - Measurements collected by the meterological station installed in site
Temperature data	☒ Yes ☐ No	If yes, specify: - Measurements collected by the meterological station installed in site

03 MONTEFORTE IRPINO INSTRUMENTED SLOPE (3/3)

Humidity data	☒ Yes ☐ No	If yes, specify: - Measurements collected by the meterological station installed in site
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):		

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Numerical analyses in static conditions done by: - Hydrus 1D (FEM) - Vadose (GEO STUDIO) 2D (FEM) - ICFEP(Imperial College Finite Element Method) 2D (FEM)
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	-Mechanical properties of unsaturated pyroclastic soils affected by fast landslide phenomena - Field investigation on triggering mechanisms of fast landslides in unsaturated pyroclastic soils	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: PRIN (2006/2008)

04 SUPER SAUZE (1/4)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Jean-Philippe Malet	
	email address:	jeanphilippe.malet@eost.u-strasbg.fr	
	Fax No.	+33 3 902 401 25	

Country:	France	Location:	South French Alps, Department of Alpes-de-Hautes-Provence, 100 km North of Nizza
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 6.6726° N 44.3420°	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	CNRS
Owner contact data :	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Aerial orthorectified photographs 1956 – 2008 (before failure and after failure) On-site displacement monitoring 1991-2009 (on-going) On-site hydrology monitoring 1997-2009 (on-going) On-site seismic monitoring 2004-2009 (on-going)	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation

04 SUPER SAUZE (2/4)

Triggering mechanism	Rainfall & snowmelt
Average velocity:	0.01 – 0.05 m.day-1 / in acceleration, velocities up to 0.4-0.5 m.day-1 have been observed. Several events of fluidization (triggering of rapid mudflows) have been observed in 1997, 1999, 2000, 2006, 2008.
Further notes:	The landslide is part of the French Observatory of Gravitational Processes (OMIV) – Website: http://eost.u-strasbg.fr/omiv

Landslide geometry:	Thickness	(m)	20
	Surface*	(m^2)	120.000
	Volume	(m^3)	750.000
Run-out:	Height	(m)	20
	Distance	(m)	800

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: - 7 DEMs over period 1956 – 1995; Resolution = 5 m; Accuracy = 3 m - 1 airbone photogrammetry DEM (2001). Resolution =2 m; Accuracy = 1 m - 2 airborne Lidar DEMs (2007, 2009); Resolution = 1 m; Accuracy = 20 cm - 2 airborne UAV photogrammetry DEMs (2006, 2008); Resolution = 1 m; Accuracy = 30 cm	

Aerial, satellite images:	☒ Yes ☐ No	If yes, specify coverage and date: - Aerial airborne orthophotographs (1956, 72, 78, 82, 88, 95, 2000, 2004, 2007) - Aerial UAV orthophotographs (2001, 2006, 2007, 2008) - VHR satellite image (SPOT5 – 2.5m, 2002, 2004, 2007, 2008 / Ikonos, 2006)
Satellite interferometry:	☐ Yes ☒ No	If yes, specify type (technique), scale and date:
Pictures of the area of interest	☒ Yes ☐ No	Terrestrial picture taken daily in front of the landslide since June 2007 (on-going)

Geology and geomorphology:	☒ Yes ☐ No	- Geomorphological map (1995, 1999, 2001, 2008) - Geological map
Geophysics:	☒ Yes ☐ No	- Ca. 25 ERT (electrical resistivity tomography) cross-sections - Ca. 10 active seismic tomographies - 10 electro-magnetism tomographies - Passive seismic monitoring - DTS–Distributed Thermal Sensing by optic fiber (200 m)

04 SUPER SAUZE **(3/4)**

Geotechnical data:	Site: ☒ Yes ☐ No	- 150 Dynamic Penetration Tests - 30 vane shear tests - 5 dilatation tests in boreholes - Several permeability tests (under pressure) - 3 inclinometers (1997) – Now broken
	Lab: ☒ Yes ☐ No	- Physical identification (grain size, Atterberg, density, etc.) - Triaxial tests (drained, undrained) - Oedometer tests - Ring shear tests - Rheometrical tests (cone-plane, plate-plate geometry)
Groundwater:	☒ Yes ☐ No	- 5 piezometers with continuous monitoring (1997 – ongoing) - suction and soil moisture monitoring (1997-2002) - soil temperature

Rainfall data	☒ Yes ☐ No	- 3 raingauges around the study site (2 km)
Temperature data	☒ Yes ☐ No	- meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Humidity data	☒ Yes ☐ No	- meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Earthquake strong motion data	☒ Yes ☐ No	- seismic station at Jausiers (7 km from the landslide) - seismic station on the landslide in July 2009

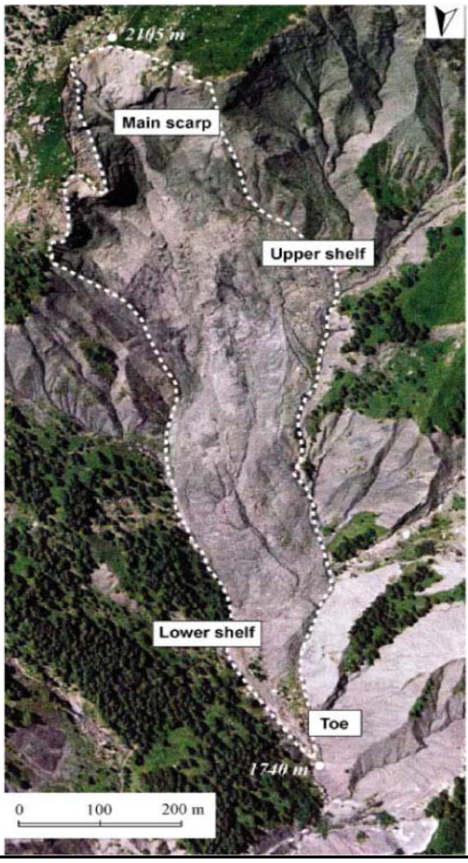
Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	- Daily data transfer of displacements (dGPS) & meteo data - Web access at the OMIV Website (http://eost.u-strasbg.fr/omiv)

Elements at risk (specify): - road and bridges 3 km downstream of the landslide - Ca. 20 buildings on the torrential cone of Sauze 3 km downstream of the landslide - Uphill, system to capture water for alimentation of the wtare reservoir of the city of Enchastrayes		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	Non structural – Monitoring system
Land planning already established for the case:	☒ Yes ☐ No	PPR (French Risk Maps)

04 SUPER SAUZE (4/4)

Numerical modelling (already done)	☒ Yes ☐ No	- Several analytical models (model for slow displacements, model for fluidization, models for mudflow behavior, hydrological model; - Static modeling of safety factors; - FEM modeling (Flac / GefDyn / Abaqus); - Physical modeling (inclined plane).
Risk analyses already carried out	☒ Yes ☐ No	Semi-quantitative risk analysis of the Sauze torrential cone (possibility of a debris flow attaining the cone)
References (papers and other published material, www site), specify:	See: http://eost.u-strasbg.fr/omiv/Publications_super_sauze.html	
The case history has been considered in other research projects?	☒ Yes ☐ No	- EC FP3 TESLEC, EC FP4 NEWTECH, EC FP5 ALARM, EC FP6 MOUNTAIN RISKS - French funding: PNRH, ACI MOTE, ACI SAMOA, ACI GACH2C, ECCO ECOU-PREF, ANR TRIGGERLAND, ANR SISCA

General comments and pictures:
For a detailed description of the study site, the main research questions and the knowledge of the site, see: http://eost.u-strasbg.fr/omiv/Super_Sauze_intro.html
Photo:



05 VILLERVILLE - CRICQUEBOEUF (1/4)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Olivier Maquaire	
	email address:	Olivier.maquaire@unicaen.fr	
	Fax No.	+ 33 2 315 663 86	

Country:	FRANCE	Location:	Lower Normandy coast, Departement of Calvados, 200 km West of Paris		
Scale:	☒ Single slide		☐ Multiple		☐ Regional
Reference geographical coordinates	E 0.1283° N 49.4011°		Google Earth™ kml file submitted with this form:	☐ Yes ☐ No	

Data owner:	CNRS / University of Caen Basse-Normandy	
Owner contact data:		
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):	
Stakeholders:	DIREN (Direction Régionale de l'Environnement de Basse-Normandie) - They are already end-users of the project (a letter of intent has been send at the proposal stage)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)		If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Aerial orthorectified photographs 1956–2006 (before failure and after) On-site displacement monitoring 1985-2009 (on-going) On-site hydrology monitoring 1985-2009 (on-going)		
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex		Material:	☒ Rock (marls) ☒ Debris ☐ Earth ☐ Other (specify):
			Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall & sea erosion			
Average velocity:	0.10 – 0.50m.yr^{-1}. After the first-time failure in 1982, three major accelerations (crisis) have been observed in 1988, 1995 & 2001			
Further notes:				

05 VILLERVILLE - CRICQUEBOEUF (2/4)

Landslide geometry:	Thickness (m)	15-20
	Surface* (m^2)	400000 & 170000
	Volume (m^3)	6000000 & 2500000
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒Yes ☐ No	If yes, specify :	Scale(s): 1:25000	Year(s): 1992
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: - 1 DEM BDAlti Resolution = 50 m; Accuracy = 1 m - 1 DEM of 1970s; Resolution = 2 m; Accuracy = 50 cm	
Aerial, satellite images:		☒ Yes ☐ No	- Aerial airborne orthophotographs (1955, 1972, 1979, 1984, 1994, 2000, 2002, 2006) - VHR satellite image (SPOT5 – 2.5m, 1987,1993 / Ikonos, 2005)	
Satellite interferometry:		☐ Yes ☒No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒Yes ☐ No	Information's about landscape evolution, land-use changing and disappeared buildings. Historical pictures for several years (*i.e.* postcards, …)	

Geology and geomorphology:	☒ Yes ☐ No	Geological map (1:50 000) Geomorphological map (1: 5 000) 1985 & 2009
Geophysics:	☒ Yes ☐ No	- 12 ERT (electrical resistivity tomography) cross-sections - 5 GPR (Ground penetrating radar) cross-sections
Geotechnical data:	Site: ☒ Yes ☐ No	- Pumping tests (Lefranc) - 3 inclinometers (1987) – Now broken - 5 inclinometers (2004)
	Lab: ☒ Yes ☐ No	- Physicla identification (grain size, Atterberg, density, etc) - Triaxial tests (drained, undrained) - Oedometer tests - Ring shear tests
Groundwater:	☒Yes ☐ No	- 10 piezometers & wells with punctual monitoring (2007 – ongoing) - 4 piezometers with continuous monitoring (from 1985 to 1988) - 4 piezometers with continuous monitoring (2007 – ongoing) - 3 interstitial cells in different depth - soil temperature

Rainfall data	☒ Yes No	- Meteofrance data since 1949 - 1 raingauge on study site (2007 – on going)
Temperature data	☒Yes ☐ No	- 2 temperature sensors in the soil and 1outside
Humidity data	☐Yes ☒No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒No	If yes, specify (Eqk. name, Magnitude, Date etc.):

05 VILLERVILLE - CRICQUEBOEUF (3/4)

Monitoring and/or early warning systems:	☒Yes	☐ No	☐ Envisaged
	- Daily data transfer of displacements (dGPS) & meteo data - Web access at the OMIV Website (http://eost.u-strasbg.fr/omiv)		

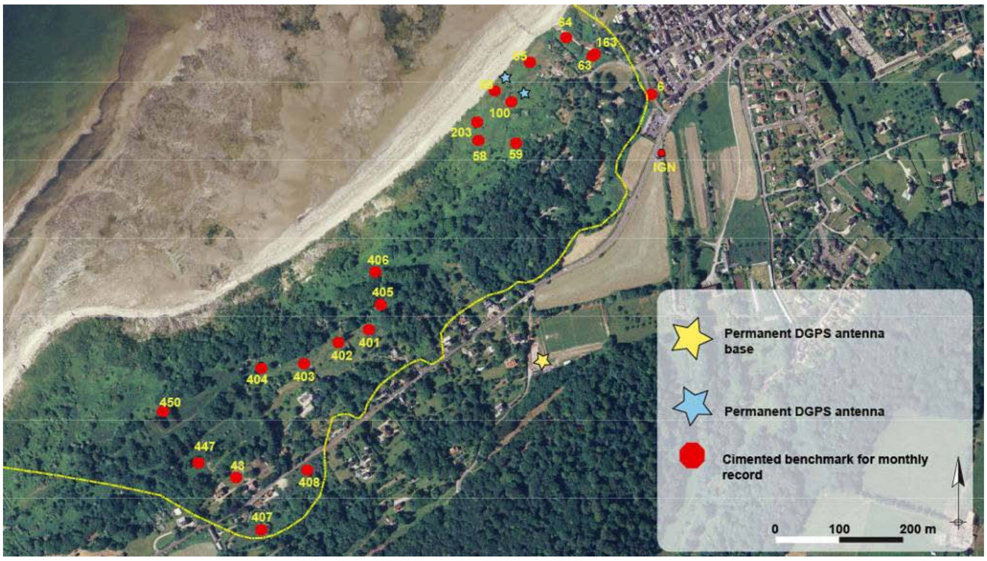
Elements at risk (specify): Physical vulnerability database (building, infrastructures…) Social and economical vulnerability evaluation and degree exposition		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Several millions of euros (not already calculated!) - 30 houses destroyed & damaged, - 1 camping destroyed, - major road damaged in several points, - indirect losses with the decrease of the attendance and several shops closures
Social consequences due to previous events	☒ Yes ☐ No	- losses of local people, - local tourist activities decrease. - decreasing of the price of the buildings
Mitigation (already performed or envisaged):	☒ Yes ☐ No	- Drainage & sea fence are envisaged
Land planning already established for the case:	☒ Yes ☐ No	PPR Risk map (Plan de Prévention des Risques)

Numerical modelling (already done)	☒ Yes ☐ No	- Analytical model (model for slow displacements) - Static modeling of safety factors - FEM modeling (Flac)
Risk analyses already carried out	☐ Yes ☒ No	
References (papers and other published material, www site), specify:	See: http://eost.u-strasbg.fr/omiv/Publications_villerville.html	
The case history has been considered in other research projects?	☒ Yes ☐ No	ANR SISCA

05 VILLERVILLE - CRICQUEBOEUF (4/4)

General comments and pictures :
For a detailed description of the study site, the main research questions and the knowledge of the site, see: http://eost.u-strasbg.fr/omiv/Villerville_intro.html

Aerial view to the West on the Villerville-Cricqueboeuf landslides (1988)



Displacement monitoring system of Villerville landslide

06 ANCONA (1/3)

Proposing partner:	CSG		
Person(s) in charge for the data management:	Name:	Mario Lovisolo	
	email address:	mario.lovisolo@csgsrl.eu	
	Fax No.	+39 0144 745914	

Country:	ITALY	Location:	Ancona
Scale:	☐ Single slide ☒ Multiple ☐ Regional		
Reference geographical coordinates	E13.4731 N43.6022	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	Ancona Monitoring Centre – Ancona Municipality	
Owner contact data):	Stefano Cardellini	
Owner is end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested):on demand	
Stakeholders:	Comune di Ancona	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	December 1982	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☐ Debris ☐ Earth ☒ Other (specify): layers OC clay+sand
		Type of occurrence	☐ First time ☐ Recurrent ☒ Reactivation
Triggering mechanism	Rain, seismic event		
Average velocity:	Actually 2 mm/y		
Further notes:			

06 ANCONA (2/3)

Landslide geometry:	Thickness (m)	Max 75-100-120 m
	Surface* (m^2)	2.2 104 m²
	Volume (m^3)	180 Mm³
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000	Year(s):
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: ortophoto 1:5000	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: 4 surveys, starting date 1992	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Image of the disaster (1982): 3 industries, 2 hospitals, private buildings, 1 national road, 1 national railway.	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: 1:5000
Geophysics:	☒ Yes ☐ No	If yes, specify: airborn, shallow seismic reflection
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): 50 corings (30 inclinometer pipes + 20 piezometer pipes)
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): various
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): N°20 piezometers

Rainfall data	☒ Yes ☐ No	If yes, specify: 1 climatic station
Temperature data	☒ Yes ☐ No	If yes, specify: outside + inside ground
Humidity data	☒ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): 1690, 30october 1930, 25 january 1972

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): N° 7 Automatic Robotic station N° 26 geodetic GPS single frequency N° 26 geodetic GPS dual frequency N° 3 DMS-IU columns placed up to 95 m bgl (1 value/minute)

06 ANCONA (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	v☐ Yes ☐ No	If yes, specify: 500 people lost their jog, 1582 peolple moved to hotels during event and families leaving in 60 buildings are still waiting for a risk reduction
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): drainage systems (wells + trenches), retaining walls, early warning system (2008-2009)
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify: under deployment

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Papers, remediation projects (no data available on the WEB)	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures:

07 BAGNASCHINO (1/4)

Proposing partner:	CSG (18)		
Person(s) in charge for the data management:	Name:	Mario Lovisolo	
	email address:	mario.lovisolo@csgsrl.eu	
	Fax No.	+39 0144 745914	

Country:	Italy	Location:	Torre Mondovì (CN)
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 7.9335 N 44.3358	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No

Data owner:	Provincia di Cuneo
Owner contact data :	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (data available after request)
Stakeholders:	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes☐ No	If yes, specify (including time span): 1994 ÷ 2009	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒Recurrent ☐ Reactivation
Triggering mechanism	foot erosion on paleoslide (d.g.p.v.)		
Average velocity:	Last 6 months (period November 2008 - may 2009) cumulative displacement (4 main events) = 60 cm		
Further notes:			

07 BAGNASCHINO (2/4)

Landslide geometry:	Thickness (m)	50 ÷ 60
	Surface* (m^2)	45.000
	Volume (m^3)	3.000.000
Run-out:	Height (m)	45
	Distance (m)	?

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000	Year(s): 2007
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☒Yes ☐ No	Aerial 1994, Satellite: Google Earth	
Satellite interferometry:		☐ Yes ☒No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	Last reactivation	

Geology and geomorphology:	☒Yes ☐ No	On studing geology and geomorfology
Geophysics:	☒Yes ☐ No	Seismic and geoeletric surveys
Geotechnical data:	Site: ☐ Yes ☒No	If yes, specify (type of test, location maps availability etc.): under development
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒Yes ☐ No	Two level : 1) 19 m (freatic) 2) 63 m (on pressure)

Rainfall data	☒Yes ☐ No	Record from 30th April 2008
Temperature data	☒ Yes ☐ No	Record from 30th April 2008
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): **Topografic** since 17th October 2006 to 28 th november 2008 Inclinometric since 10 th October 2008		

07 BAGNASCHINO **(3/4)**

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify:
Economic loss due to previous events:	☒Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes☐ No	If yes, describe (structural/non-structural): Non structural; deep drainage and monitoring (inclinometric- rainfall – topographic – satellite etc..)
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

07 BAGNASCHINO **(4/4)**

General comments and pictures:

08 CASELLA 1 (1/3)

Proposing partner:	CSG (18)		
Person(s) in charge for the data management:	Name:	Mario Lovisolo	
	email address:	mario.lovisolo@csgsrl.eu	
	Fax No.	+39 0144 745914	

Country:	Italy	Location:	Casella Ligure (AL)
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 8.3650 N 44.6211	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No

Data owner:	Comune di Ponti (AL)	
Owner contact data :		
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (data available upon request)	
Stakeholders:	Provincia di Alessandria. Regione Piemonte, might be interested becoming end-user	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes☐ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐Recurrent ☒ Reactivation
Triggering mechanism	precipitacion		
Average velocity:			
Further notes:			

08 CASELLA 1 (2/3)

Landslide geometry:	Thickness (m)	15-50
	Surface* (m^2)	1.600.000
	Volume (m^3)	24 Mm³
Run-out:	Height (m)	
	Distance (m)	?

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000 – 1:10000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 1:5000	
Aerial, satellite images:		☒Yes ☐ No	Aerial 1994, 2000 Satellite: Google Earth	
Satellite interferometry:		☒ Yes ☐No	If yes, specify type (technique), scale and date: ARPA Piemonte dataset	
Pictures of the area of interest		☒ Yes ☐ No		

Geology and geomorphology:	☒Yes ☐ No	
Geophysics:	☒Yes ☐ No	
Geotechnical data:	Site: ☐ Yes ☒No	If yes, specify (type of test, location maps availability etc.): under development
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒Yes ☐ No	Spring along fractures

Rainfall data	☒Yes ☐ No	Regional climatic station
Temperature data	☒ Yes ☐ No	Regional climatic station
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

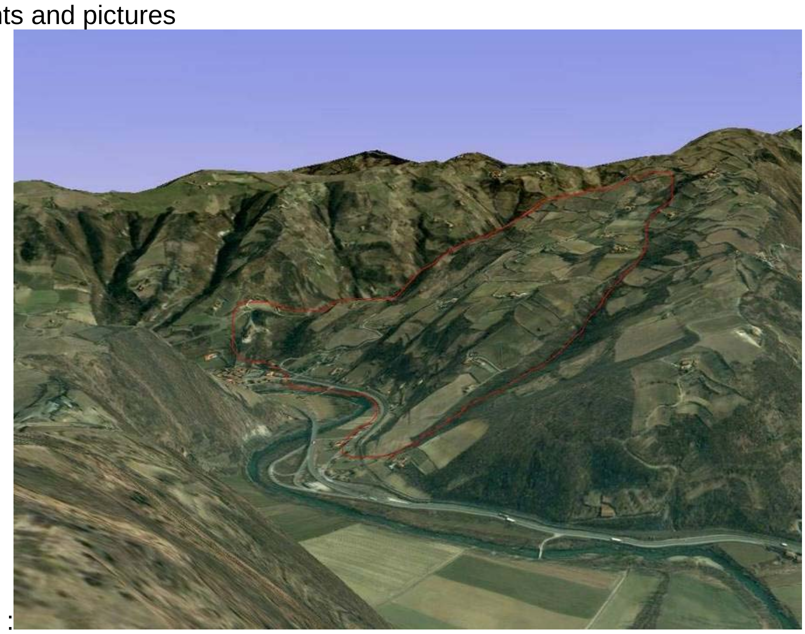
Monitoring and/or early warning systems:	☐Yes ☐ No ☒ Envisaged
	If yes, specify:

08 CASELLA 1 (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify:
Economic loss due to previous events:	☒Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures



:

09 CASELLA 2 (1/3)

Proposing partner:	CSG (18)		
Person(s) in charge for the data management:	Name:	Mario Lovisolo	
	email address:	mario.lovisolo@csgsrl.eu	
	Fax No.	+39 0144 745914	

Country:	Italy	Location:	Cabella Ligure (AL)
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 9.0956 N 44.67778	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No

Data owner:	Comune di Casella Ligure (AL)
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (data available after request)
Stakeholders:	Provincia di Alessandria. Regione Piemonte, might be interested becoming end-user

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes☐ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐Recurrent ☒ Reactivation
Triggering mechanism	precipitacion		
Average velocity:			
Further notes:			

09 CASELLA 2 **(2/3)**

Landslide geometry:	Thickness	(m)	30-50
	Surface*	(m^2)	1.200.000
	Volume	(m^3)	40 Mm³
Run-out:	Height	(m)	
	Distance	(m)	?

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000 – 1:10000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 1:5000	
Aerial, satellite images:		☒Yes ☐ No	Aerial 1994, 2000 Satellite: Google Earth	
Satellite interferometry:		☒ Yes ☐No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No		

Geology and geomorphology:	☒Yes ☐ No	
Geophysics:	☒Yes ☐ No	
Geotechnical data:	Site: ☐ Yes ☒No	If yes, specify (type of test, location maps availability etc.): under development
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒Yes ☐ No	

Rainfall data	☒Yes ☐ No	Regional climatic station
Temperature data	☒ Yes ☐ No	Regional climatic station
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☐Yes	☐ No	☒ Envisaged

09 CASELLA 2 (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify:
Economic loss due to previous events:	☒Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures:

10 LA FRASSE (1/4)

Proposing partner:	Laboratoire de Mécanique des Sols (LMS), Ecole Polytechnique Fédérale de Lausanne (EPFL)		
Person(s) in charge for the data management:	Name:	Hervé Peron John Eichenberger	
	email address:	Herve.peron@epfl.ch john.eichenberger@epfl.ch	
	Fax No.	+41-21-693 41 53	

Country:	Switzerland	Location:	Between Sepey and Leysin
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E07.0235 N46.2116	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Canton of Vaud, SESA: service des eaux, sols et assainissement
Owner contact data:	Claude-Alain Davoli 1014 Lausanne
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): 1768-2009	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Pore water pressure increase/ GWL variations (cyclic effects), toe erosion (before mitigation measures were taken at the toe of the slope)		
Average velocity:	10-15cm/y in the upper part; 20-60cm/y in the lower part		
Further notes:	Variational displacement rate in the lower and upper part		

10 LA FRASSE (2/4)

Landslide geometry:	Thickness (m)	80m (upper part); 20-40m (lower part)
	Surface* (m^2)	$2*10^6$ (2km * 0.5-1km)
	Volume (m^3)	$42*10^6 – 73*10^6$
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:25'000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: DEM 25	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: Aerial photographs: 1957, 1969, 1974, 1980, 1982	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:
Geophysics:	☒ Yes ☐ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Geological caracterisation
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Classical geot. Caracterisation, oedometer, drained and undrained triaxial tests
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): piezometers

Rainfall data	☒ Yes ☐ No	If yes, specify: Pluviometrical data
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): EWS: continuous laser (ROBOVEC) Monitoring: GPS, classical survey, photogrammetry, use of cadastral maps

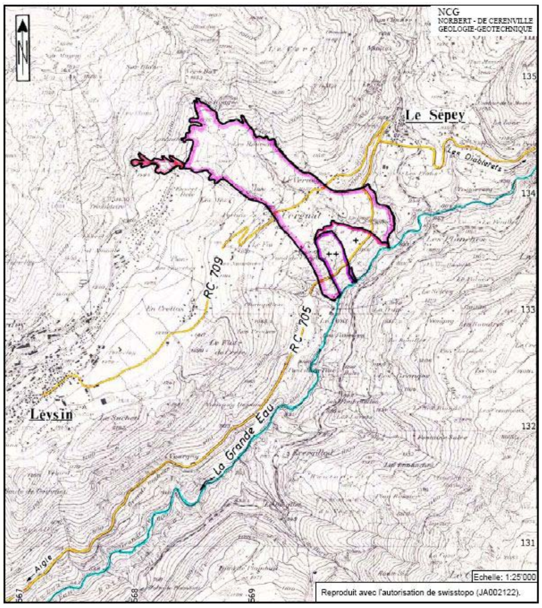
10 LA FRASSE (3/4)

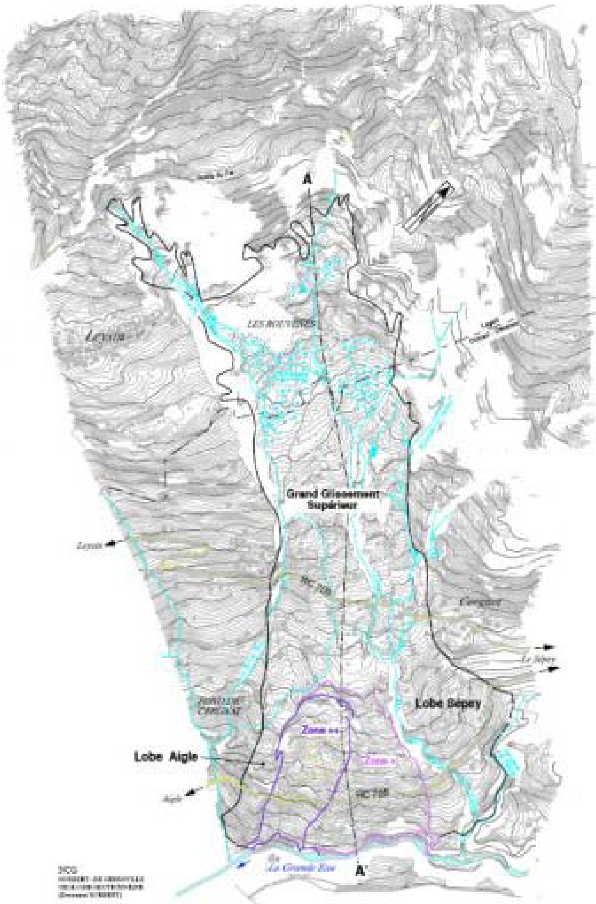
Elements at risk: Cantonal roads, chalets, hydroelectric plant remotely at risk (at the toe, downstream of the “Grande Eaux”		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Pumping, drainage shaft (725m length), anchorage of the main cantonal road, retaining wall at the toe, river deviation
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify: Only agricultural zone

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): FEM static
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Association technique Norbert, De Cérenville Géotechnique + EPFL pour l'étude du glissement de La Frasse, 2004. Glissement de La Frasse, modélisation et étude de faisabilité
References (papers and other published material, www site), specify:	1. Bonnard, Ch., 1984. Determination of slow landslide activity by multidisciplinary measurements techniques. In: International Symposium on Field Measurements in Geomechancis, Zürich, Balkema, 1:619-638 2. Commend, S., Geiser, F. and Tacher L., 2004. 3D numerical modeling of a landslide in Switzerland. In: Proceedings of the International Symposium on Numerical Models in Geomechanics NUMOG IX, Ottawa, pp 595-601 3. Laloui, L., Tacher, L., Moreni, M. and Bonnard, Ch., 2004. Hydro-mechanical modelling of crises of large landslides: application to the La Frasse landslide. In: Proceedings of the IX Symposium on Landslides, Rio de Janeiro, Balkema, pp 1103-1110 4. Lugeon, M., Patschoud E. and Rothpletz, F., 1922. Rapport d'expertise sur le glissement des Frasses, Etat de Vaud, Département des Travaux Publics, Service des Routes. 5. Noverraz, F. and Bonnard, Ch., 1990. Technical note on the visit of the La Frasse landslide. In: Proceedings of the Vth International Symposium on Landslides, Lausanne, Balkema, 3:1549-1554 6. Prina, E., Bonnard, Ch. and Vulliet, L, 2004. Vulnerability and risk assessment of a mountain road crossing landslides. Rivista Italiana Geotecnica XXXVIII(2).67-79 7. Soldini, M., Philippossian, F., Grosjean, G., Decoppet, P.A. and Davoli, C.A., 2009. Forages drainants à La Frasse. Tracés, 6: 10-15 8. Tacher L., Bonnard, Ch., Laloui, L. and Parriaux, A, 2005. Modelling the behaviour of a large landslide with repsect to hydrogeological and geomechanical parameter heterogeneity. Landslides, 2:3-24 http://www.vd.ch/fr/themes/environnement/eau/rivieres/la-frasse/	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: DUTI, PNR31

10 LA FRASSE (4/4)

General comments and pictures:





From http://www.vd.ch/fr/themes/environnement/eau/rivieres/la-frasse/

11 MACESNIK (1/4)

Proposing partner:	GeoZS		
Person(s) in charge for the data management:	Name:	Magda Čarman	
	email address:	Magda.carman@geo-zs.si	
	Fax No.	+ 386 28 09 753	

Country:	Slovenia	Location:	near Solčava, N Slovenia	
Scale:	☒ Single slide	☐ Multiple	☐ Regional	
Reference geographical coordinates	E 14.6842° N 46.4351°	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No	

Data owner:	Ministry of the Enviromental and Spatial Planning of the Republic Slovenia
Owner contact data:	Ervin.vivoda@gov.si
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested): Data are (formaly) public, but possible with no access.
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): around year 1895 (115 years ago)	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☒ Reactivation active slide represents only small part of a much larger fossil slide.
Triggering mechanism	heavy rainfall, flooding of Savinja River		
Average velocity:	In 1990's: 25cm/day; early in 2005, after 3 deep trenches and two reinforced shafts were done: 1cm/day		
Further notes:	Active landslide lies within the fossil landslide, which thickness is up to 50 m and 350m wide with total estimated volume 8-10 million m^3		

11 MACESNIK (2/4)

Landslide geometry: Active landslide	Thickness (m)	It's depth is not constant; average 10-15m, at the toe is 30m
	Surface* (m^2)	250.000
	Volume (m^3)	2.000.000
Run-out:	Height (m)	
	Distance (m)	

*For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000	Year(s): 1993-1999
Digital Elevation Model	☒ Yes ☐ No	If yes, specify: Grid ASCII	Resolution and accuracy: DMV5 Accuracy: 1m on open spaces 3m on covered spaces	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: 1:5.000 DOF (aerial) Satellite images not available	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: mapping: geology, hydrology, engineering geology.
Geophysics:	☒ Yes ☐ No	If yes, specify: Sesmic refraction, vertical electrical sounding (VES), electrical tomography (ERT)
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): 28 boreholes equiped with inclinometer casings, one extensiometer, SPT – during drilling maps – availability?
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Standard lab. tests on soils: water content, unit weight, plastic limit, plasticity index, shrinkage limit, shear strenght. On rock specimens: uniaxal rock strenght, point load test. No data, how much tests were done.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 28 boreholes equiped as piezometres water permeability tests

Rainfall data	☒ Yes ☐ No	If yes, specify: Local precepitations, measured at rainfall gauging station at Solčava.
Temperature data	☒ Yes ☐ No	If yes, specify: measured at rainfall gauging station at Solčava.
Humidity data	☒ Yes ☐ No	If yes, specify: measured at rainfall gauging station at Solčava.

11 MACESNIK (3/4)

Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): - official seismic hazard map of Slovenia for the earthquakes period of 500 years - new seismic hazard map of Slovenia – map of design acceleration of ground

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): geodetic measurements with laser distometer and reflectors

Elements at risk (specify): human lives, buildings, infrastructure		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Damage on cultivated land, destroyed state road: estimated 0'5mio€
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: The landslide threats a few residental and farm houses, and panoramic road; it's only 1km away from the village Solčava and Savinja River.
Mitigation (already performed or envisaged):	☐ Yes ☐ No	If yes, describe (structural/non-structural): already performed: surface drainage works final solution: plans have been made to build a combination of subsurface drainage works (deep drains) with retaining works (vertical concrete shafts)
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: The National Spatial Plan for the case is in preparing with new regulations about land planning and land use.

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Plaxis-3D (fem)
Risk analyses already carried out	☐ Yes ☐ No	If yes, specify:
References (papers and other published material, www site), specify:	1. Mikoš, M., Fazarinc, R., Pulko, B., Petkovšek, A., Majes, B.: Stepwise mitigation of the Macesnik landslide, Slovenia. Natural Hazards and Earth System Sciences, 5, 947-958, 2005. 2. Majes, Bojan, Zigman, F., Fazarinc, Rok, Mikoš, Matjaž, Robas, Alenka, Petkovšek, Ana. Investigations and mitigation of the Macesnik landslide in Slovenia. V: Abstracts of the Contributions of the European Geosciences Union General Assembly 2004 : Nice, France, 25-30 April 2004, (Geophysical Research Abstracts, Vol. 6). Katlenburg-Lindau: EGU, 2004. 3. Zorn, M., Komac, B.: Recent mass movements in Slovenia. Slovenia – a geographical owerview. 73-80, 2004. 4. Other papers – only in Slovene language.	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: National research programme P2-180-0792: "Hydrotechnics, Hydraulics, and Geotechnics".

11 MACESNIK (4/4)

General comments and pictures:

12 STOŽE/ LOG POD MANGRTOM (1/4)

Proposing partner:	GeoZS		
Person(s) in charge for the data management:	Name:	Magda Čarman	
	email address:	Magda.carman@geo-zs.si	
	Fax No.	+ 386 28 09 753	

Country:	Slovenia	Location:	Stože / Log pod Mangrtom, NW Slovenia
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	N 46.4208 E 13.6067	Google Earth™ kml file submitted with this form:	☒ Yes: area is showv ☐ No

Data owner:	Ministry of the Enviromental and Spatial Planning of the Republic Slovenia
Owner contact data:	Ervin.vivoda@gov.si
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested): Data are (formaly) public, but possible with no access.
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span): Some prehistorical indices.	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☒ Complex	Material:	☒ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Heavy rainfall		
Average velocity:	10 m/s in steep and narrow channel of the Predelica Torrent, between 3 and 5 m/s in more open and flat velley of the Koritnica river		
Further notes:			

12 STOŽE/ LOG POD MANGRTOM (2/4)

Landslide geometry:	Thickness (m)	up to 10m, locally even 50m
	Surface* (m^2)	250.000
	Volume (m^3)	2,5 milion m^3
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5.000	Year(s): 1993-1999
Digital Elevation Model	☒ Yes ☐ No	If yes, specify: Grid ASCII	Resolution and accuracy: DMV5 Accuracy: 1m on open spaces 3m on covered spaces	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: 1:5.000 DOF (aerial) Satellite images not available.	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: First event – slide, debris flow. Mitigation.	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: geology, engeenering geology, hydrogeology mapping
Geophysics:	☒ Yes ☐ No	If yes, specify: Groud seismometry, ground radar
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.):SPT
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Standard lab. tests on soils: water content, unit weight, gradation, porosity, liquid limit, plastic limit, plasticizy index, shear strenght No data, how much tests were done.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 3 boreholes equiped as piezometres

Rainfall data	☒ Yes ☐ No	If yes, specify: two automatic weather stations; water content in snow cover is observed in 3 locations
Temperature data	☒ Yes ☐ No	If yes, specify: two automatic weather stations;
Humidity data	☒ Yes ☐ No	If yes, specify: two automatic weather stations;
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): - official seismic hazard map of Slovenia for the earthquakes period of 500 years - new seismic hazard map of Slovenia – map of design acceleration of ground

12 STOŽE/ LOG POD MANGRTOM (3/4)

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): geodetic measurements with laser distometer and reflectors		

Elements at risk (specify): human lives, buildings, infrastructure		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: 7
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Aprox. 15.620.000,00 €
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: Destroyed several houses and outbildings – residents had to move temporarily.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Non-structural: 18.000.000,00 €
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: The National Spatial Plan for the case is in preparing with new regulations about land planning and land use

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): FEM - Plaxis
Risk analyses already carried out	☐ Yes ☐ No	If yes, specify: One and two-dimensional modelling of selected debris flows of known magnitudes and different viscosities were applied. For the determination of risk area, the existing and the possible new infrastructures were taken into account, and the risk area was divided into 3 zones.
References (papers and other published material, www site), specify:	1. Mikoš, M., Četina, M., Brilly, M.: Hydrologic conditions responsible for triggering the Stže landslide, Slovenia. Engineering Geology 73 (2004), 193-213 2. Majes, Bojan, Petkovšek, Ana, Logar, Janko. Landslide Stože-consequences and feasibility of corrective measures = Rutschung Stože, Konsequenzen und Machbarkeit korrigierender Maßnahmen. V: *Tagungsband der 12. Donau-Europäischen Konferenz, Passau, 27.-28.Mai 2002* 3. Zorn, M., Komac, B.: Recent mass movements in Slovenia. Slovenia – a geographical owerview. 73-80, 2004. 4. Other papers – only in Slovene language	
The case history has been considered in other research projects?	☐ Yes ☐ No	If yes, specify the project name and use of data:

12 STOŽE/ LOG POD MANGRTOM (4/4)

General comments and pictures:

Upper part:

In the valley, Village Log pod Mangrtom after debris flows:

13 LA BUTOI (1/3)

Proposing partner:	GIR		
Person(s) in charge for the data management:	Name:	Raluca – Mihaela Maftei	
	email address:	mafteir@yahoo.com	
	Fax No.	+40 (0) 21 318 13 26	

Country:	ROMANIA	Location:	Prahova County, Telega
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 25.7849 N 45.1339	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	GIR	
Owner contact data		
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):	
Stakeholders:	Inhabitants. Local, regional and national Romanian authorities	

Case study is suitable for:	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's: WP7 (Dissemination of Project results)

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No		
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☒ Reactivation
Triggering mechanism	Complex deep seated landslide with annual reactivations in clayey superficial deposits and salt formations triggered by rainfall and anthropic activities.		
Average velocity:			
Further notes:			

13 LA BUTOI (2/3)

Landslide geometry:	Thickness	(m)	0.5 – 20
	Surface*	(m^2)	129000
	Volume	(m^3)	
Run-out:	Height	(m)	From 450 to 560
	Distance	(m)	430

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:50,000, 1:25,000	Year(s): 1972, 1976
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution: 2.0m per pixel	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: 2001, 2002	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	Photographs taken since 2000 until present.	

Geology and geomorphology:	☒ Yes ☐ No	Geological, geomorpholgical and hydrogeological studies and maps
Geophysics:	☒ Yes ☐ No	Seismic refraction prospects performed in 2005 on 1.5 km seismic profile, using 150 seismic waves and 700 seisomgrams on solid memory; geo - electrical investigations from 2000 until 2008
Geotechnical data:	Site: ☐ Yes ☒ No	
	Lab: ☒ Yes ☐ No	Tests for physical and mechanical properties: critical shear stress, granulometry, apparent density, humidity, porosity, saturation degree
Groundwater:	☐ Yes ☐ No	

Rainfall data	☐ Yes ☒ No	
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged

13 LA BUTOI (3/3)

Elements at risk (specify): people, facilities (buildings, infrastructures), economical activities, environment.		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	
Economic loss due to previous events:	☒ Yes ☐ No	Unestimated
Social consequences due to previous events	☒ Yes ☐ No	Destroyed buildings, unfunctional infrastructure, interruption of economic activities
Mitigation (already performed or envisaged):	☒ Yes ☐ No	Structural works: battlements, breastwork
Land planning already established for the case:	☐ Yes ☒ No	

Numerical modelling (already done)	☐ Yes ☒ No	
Risk analyses already carried out	☐ Yes ☒ No	
References (papers and other published material, www site), specify:	1. Paraschivescu C., Nicolae Maria, Răducu Magdalena (1973), Studii geologice privind alunecările de teren din zona Câmpina, Provița, Gura Beliei, Vârfuri, Runcu, Malu cu Flori, Câmpulung, jud. Prahova, Dâmbovița şi Argeş. Perimetrele: Vârfuri, Sotânga şi Telega – Buştenari, Arhiva I.G.R., Bucureşti 2. Maftei Raluca et al. (2001), Elaboration of landslide hazard assessment map using geological and geophysical analysis – Application in the eastern part of the Muntenia Subcarpathians, Romania, Symposium on Environmental Geology for Urban Development and Regional Planning. Federal Institute for Geosciences and Natural resources (BGR), Hannover, Germany (Z. Angew. Geol. 4/2000, 35 – 41) 3. Grandjean G., Bitri A., Pennetier C., Maftei Raluca, Meric O., Malet (2004), Caracterisation structurale et hydrique des glissements de terrain, AGAP, Holland 4. Cristea P., Cristian Cristina, Manj V., Nițică C. (2005), Seismic researches on landslides in Wallachian Subcarpathians, Revue Roumaine de Geophysique, Tome 49, Ed. Academiei Române 5. Maftei Raluca et al. (2006) Structural characterization of landslides with a multidisciplinary approach (geophysical tests), Telega village (Prahova County) – case study, Anuarul Institutului Geologic al României, Bucureşti	
The case history has been considered in other research projects?	☒ Yes ☐ No	1998 – 2000, Studiul alunecărilor de teren pe teritoriul județului Prahova 2004, Grant NATO – STI EST CLG 980166, Structural characterization of landslides with a multidisciplinary approach 2003 – 2004, Caracterizarea structurală a alunecărilor de teren printr-o abordare multidisciplinară, contract 30/2003 MedC, Program CORINT 2008 – 2011, Integrated system of data collection Technologies for mapping soil properties – DIGISOIL – ENV 2007-211523

The proposed area is situated in Telega village, 5 km from Câmpina town, on the left bank of the Telega Valley. Here, landslides are very extended, with catastrophic effects in some places, particulary in „La Butoi" area (Telega Spa and the main road were seriously affected). During the years researches (seismic tests, geomorphological, geo-electrical and geotechnical investigations) were performed in order to provide data that can be used to develop mitigation strategies, methodologies and procedures to analyse the landslides susceptibility, hazard and risk.
We must emphasize the importance of the „La Butoi" site as a test area, due to its relevance as out of use exploitation site (salt) affected by instability phenomena, highly frequent situation met in the Subcarpathians, were the density of population reaches the maximum values.

14 GSCHLIEFGRABEN (1/4)

Proposing partner:	Geological Survey of Austria		
Person(s) in charge for the data management:	Name:	Robert Supper	Ivo Baron
	email address:	Robert.supper@geologie.ac.at	Ivo.baron@geologie.ac.at
	Fax No.	+4317125674 56	

Country:	Austria	Location:	Traunsee, Upper Austria
Scale:	☐ Single slide ☒ Multiple ☐ Regional		
Reference geographical coordinates	E 13.81401° N 47.8857°	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Torrent and Avalanche Control of Upper Austria
Owner contact data :	Gasperl Wolfgang [Wolfgang.Gasperl@die-wildbach.at] Tel. +43 732771348 12 mob. +43 664 2867283
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes
Confidentiality/ Access to data	☒ Not Public, for SafeLand partners guaranteed upon signature of agreement
Stakeholders:	Torrent and Avalanche Control of Upper Austria; County Government of Upper Austria; Commune of Gmunden - yes

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify):6,7

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	since 1660; large scale events in 1660, 1734, 1884, 1891,1910, 1920, 1947, 1955, 1987; historical and chronical analysis performed	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Hydraulic pressure, rockfall		
Average velocity:	Max. velocity: 4.7m/day; currently 2-4 cm / month		
Further notes:			

14 GSCHLIEFGRABEN (2/4)

Landslide geometry:	Thickness (m)	Variable, av. 17m
	Surface*	3.2 km2
	Volume (m^3)	3.8 million
Run-out:	Height (m)	20
	Distance (m)	2500

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:2000	Year(s): 2009
Digital Elevation Model	☒ Yes ☐ No 5 Laser scans + 4 echo sounding of subaquatic alluvial cone (01,02,05,12-2008)	If yes, specify:	Resolution and accuracy: Laser scan: 5* 04.2007-09.2008; 1m cell size, resolution 20 cm horizontal, 15 cm vertical	
Aerial images:		☒ Yes ☐ No	3 times (2003 (before recent event), 2005 (?), 2008 (2 times), 2009)	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	Webcam-video of movement event, airborne photos, airborne video,...	

Geology and geomorphology:	☒ Yes ☐ No	Detailed geological and geomorphological mapping performed, GIS layers soon available; 13 core drillings up to 170m depth; mapping of crack development;
Geophysics:	☒ Yes ☐ No	Seismics, sea-seismics, geoelectrics, borehole geophysics, airborne geophysics (magnetic, electromagnetic, gamma spectroscopy, passive microwave soil humidity)
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): shear parameters, permeability
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Piezometers, tracer experiments, water conductivity mapping

Rainfall data	☒ Yes ☐ No	If yes, specify:perticipation
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☒ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	Next permanent station (normal type, not strong motion): Molln (distance 30 km), data so far not analysed

14 GSCHLIEFGRABEN (3/4)

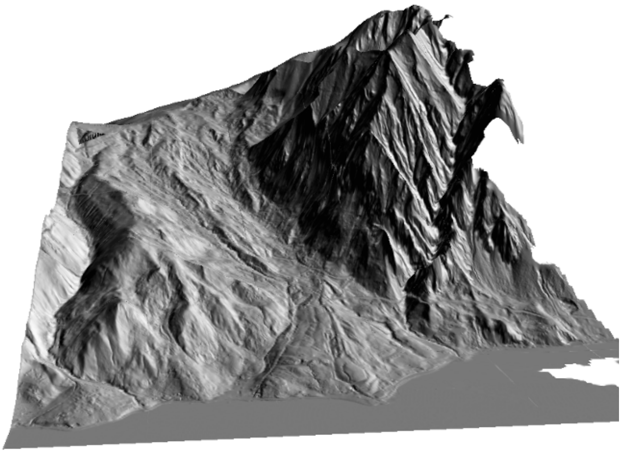
Monitoring and/or early warning systems:	☒ Yes ☐ No ☒ Envisaged
	Permanent: Automatic inclinometer (DMS), geoelectrics (resistivity, SP), TDR, piezometers at different levels in seperate drillings, discharge in pipes and open channels, soil humidity, soil temperature, precipitation, air temperature, barometric pressure, **Time lapse surveys**: crack monitoring (triangular, profile surveys), dGPS (93 fixed points, daily-3 times/week; since May 2009 once a week; total 7000 single measurements up to now), manual inclinometric measurements (13 holes up to 170 m depth)

Elements at risk (specify): 74 objects within red hazard zone, threat to local infrastructure (main road, water-, electricity- and communication conduits), threat of flood wave in case of abrupt submerging of the debris fan into the lake Traunsee		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	2007 event: 13 Mill. € for mitigation measures, estimated economic loss without measures: 30 Mill.€
Social consequences due to previous events	☒ Yes ☐ No	Several; for the 2007 event: 55 houses had to be evacuated
Mitigation (already performed or envisaged):	☒ Yes ☐ No	Recently: **drainage works** (220 pumping wells in 3 lines to slow down movement front to secure buildings, 10000 m of drainage trenches inside slide -> 10000 t of water removed per day), 160000m3 of **slide material removed**,etc. Envisaged: monitoring and early warning system, reforestation
Land planning already established for the case:	☒ Yes ☐ No	1974 first hazard zone map; 1978 first legally binding land use plan (construction stop)

Numerical modelling (already done)	☒ Yes ☐ No	master thesis Di Monte, 2008: finite difference FLAC2D (http://www.ub.tuwien.ac.at/dipl/2008/AC05039307.pdf)
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☒ Yes ☐ No	Integrated geophysical studies of Alpine inhomogeneous mass movements - Site Gschliefgraben " (project performed before event, Austrian Academy of Science ISDR program), data available, project finalized 2007.

14 GSCHLIEFGRABEN (4/4)

Additionally a media (mainly newspapers) documentation was performed since 11.2007, which up to now includes approx. 380 digital articles



15 SONNBLICK (1/3)

Proposing partner:	Geological Survey of Austria		
Person(s) in charge for the data management:	Name:	Robert Supper	Ivo Baron
	email address:	Robert.supper@geologie.ac.at	Ivo.baron@geologie.ac.at
	Fax No.	+4317125674 56	

Country:	Austria	Location:	Sonnblick, Rauris
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 12.95 N 47.05	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Geological Survey of Austria / Sonnblickverein / Zentralanstalt für Meteorologie und Geodynamik	
Owner contact data:	s.a. / Michael Staudinger, Freisaalweg 16 ; A-5020 Salzburg, Austria; tel +43(0)662 626301-24, staudinger@zamg.ac.at; www.zamg.ac.at	
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ?
Confidentiality/ Access to data	☒ Not Public, for SafeLand partners guaranteed upon signature of agreement	
Stakeholders:	Sonnblickverein	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify):6,7

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No		
Movement type:	☒ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Permafrost melting		
Average velocity:			
Further notes:			

15 SONNBLICK (2/3)

Landslide geometry:	Thickness (m)	
	Surface*	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:50000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	?	
Aerial images:		☒ Yes ☐ No	?	
Satellite interferometry:		☐ Yes ☒ No		
Pictures of the area of interest		☒ Yes ☐ No		

Geology and geomorphology:	☒ Yes ☐ No	
Geophysics:	☒ Yes ☐ No	Borehole geophysics, geoelectrics, seismics, GPR
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☐ No	
Groundwater:	☐ Yes ☐ No	

Rainfall data	☒ Yes ☐ No	If yes, specify:
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☒ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	

Monitoring and/or early warning systems:	☒ Yes ☐ No ☒ Envisaged
	geoelectric monitoring, seismic monitoring, temperature monitoring in borehole

15 SONNBLICK (3/3)

Elements at risk (specify): Sonnblick observatory, the highest observatory of Austria at an altitude of 3106 m		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	2007 event: 13 Mill. € for mitigation measures, estimated economic loss without measures: 30 Mill.€
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, specify:
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	http://www.sonnblick.net/portal/component/option,com_frontpage/Itemid,1/lang,de/ http://www.sonnblick.net/portal/images/stories/gba/permafrost_sonnblick.pdf 1. Supper, R.; Römer, A.; Avian, M.; Kellerer-Pirklbauer , A. Geoelectrical measurements for permafrost monitoring at the Hoher Sonnblick, Salzburg, Austria, Geophysical Research Abstracts, 2007.	
The case history has been considered in other research projects?	☒ Yes ☐ No	http://www.sonnblick.net/portal/content/view/118/277/lang,de/ http:/www.sonnblick.net/portal/content/view/117/277/lang,de/

It is the only permafrost monitoring site, GBA will perform geoelectrical permafrost monitoring within WP4.3 as pre-study and test area for possible geoelectrical monitoring of Aknes test site

16 SIBRATSGFÄLL / RINDBERG (1/4)

Proposing partner:	Geological Survey of Austria		
Person(s) in charge for the data management:	Name:	Robert Supper	Ivo Baron
	email address:	Robert.supper@geologie.ac.at	Ivo.baron@geologie.ac.at
	Fax No.	+4317125674 56	

Country:	Austria	Location:	Sibratsgfäll, Vorarlberg		
Scale:	☐ Single slide	☒ Multiple	☐ Regional		
Reference geographical coordinates	E 10.0177 N 47.4398	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No		

Data owner:	Torrent and Avalanche Control of Vorarlberg	
Owner contact data:	DI Margarete Wöhrer-Alge, Rheinstrasse 32/4, A-6900 BREGENZ Tel.: +43(0)5574 - 74995 - 416 Fax.: +43(0)5574 - 74995 - 6 Mob.: +43(0)664 - 5729590 e-mail: margarete.woehrer@die-wildbach.at	
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes
Confidentiality/ Access to data	☒ Not Public, for SafeLand partners guaranteed upon signature of agreement	
Stakeholders:	Torrent and Avalanche Control; Commune of Sibratsgfäll - yes	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify):6,7

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No		
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Hydraulic pressure, rainfall		
Average velocity:	Max. velocity: 4 m/day; currently 2-4 (Sibratsgfäll), 6 (Rindberg) cm / year		
Further notes:	There are 2 different sliding areas: Rindberg: activated in 1999, catastrophic event; Sibratsgfäll town area: continuously sliding		

16 SIBRATSGFÄLL / RINDBERG (2/4)

Landslide geometry:	Thickness (m)	Variable, max. 40-50m
	Surface*	1.4 km2
	Volume (m^3)	70 million
Run-out:	Height (m)	?
	Distance (m)	2500

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:2000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Details will follow	
Aerial images:		☒ Yes ☐ No	several times, Details will follow	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No		

Geology and geomorphology:	☒ Yes ☐ No	Detailed geological and geomorphological mapping performed, GIS layers available; core drillings up to 70m depth; further details will follow
Geophysics:	☒ Yes ☐ No	Seismics, geoelectrics, borehole geophysics, airborne geophysics (2000 + 2009; magnetic, electromagnetic, gamma spectroscopy, passive microwave soil humidity), electromagnetig, hydrophysical logs, ground gamma ray
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): further details will follow
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Piezometers, tracer experiments, water conductivity mapping; o-18 monitoring for one year, inflow, outflow, snow thickness, geochemical analysis

Rainfall data	☒ Yes ☐ No	If yes, specify: perticipation
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☒ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	

16 SIBRATSGFÄLL / RINDBERG (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged	
	Permanent: Automatic inclinometer (DMS), geoelectrics (resistivity, SP; 2002-2006), TDR, , discharge in pipes and open channels, soil humidity, soil temperature, precipitation, air temperature, barometric pressure, **Time lapse surveys**: dGPS, manual inclinometric measurements	

Elements at risk (specify): further details will follow		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	further details will follow
Social consequences due to previous events	☒ Yes ☐ No	further details will follow
Mitigation (already performed or envisaged):	☒ Yes ☐ No	further details will follow
Land planning already established for the case:	☒ Yes ☐ No	further details will follow

Numerical modelling (already done)	☒ Yes ☐ No	finite difference FLAC2D
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Several, further details will follow; e.g. 1. Supper, R.; Ahl, A. ; Römer, A.; Jochum, B.; Bieber, G.: A complex geo-scientific strategy for landslide hazard mitigation – from airborne mapping to ground monitoring, Advances in Geosciences, 14, 1-6, 2008. 2. Supper, R., Römer, A., Bieber, G., Jaritz, W., Wöhrer-alge, G.: An inter-disciplinary strategy for landslide structure investigation and monitoring. – Conference Proceedings, Vol.2, Interpraevent, p. 251-259, Dornbirn. 3. Supper R., Römer A., Bieber G., Jaritz W., Wöhrer-Alge M.: An interdisciplinary approach to landslide hazard Assessment and monitoring, Extended Abstracts, Interpraevent, p. 408-409, Dornbirn. 4. Jaritz W., Supper R., Wöhrer-Alge M.: A strategy for landslide risk mitigation – the landslide of Sibratsgfäll / Austria, Extended Abstracts, Interpraevent, p. 198-199, Dornbirn. 5. Jaritz W., Supper R., Wöhrer-Alge M.: Beurteilung geogener Gefahren im Hinblick auf eine Risikominderung in der Gde. Sibratsgfäll (Österreich), Conference Proceedings, Vol.2, Interpraevent, p. 171-182, Dornbirn.	
The case history has been considered in other research projects?	☒ Yes ☐ No	further details will follow

16 SIBRATSGFÄLL / RINDBERG (4/4)

General comments and pictures:

Classification: DEEP SEATED LANDSLIDE

Geological Survey of Austria

17 LATERNS/SCHNEPFAU (1/3)

Proposing partner:	Geological Survey of Austria		
Person(s) in charge for the data management:	Name:	Robert Supper	Ivo Baron
	email address:	Robert.supper@geologie.ac.at	Ivo.baron@geologie.ac.at
	Fax No.	+4317125674 56	

Country:	Austria	Location:	Sibratsgfäll, Vorarlberg
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	Laterns: N 47.2763 E 9.7777 Schnefpau: N 47.3516 E 9.9452	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Torrent and Avalanche Control of Vorarlberg
Owner contact data:	DI Margarete Wöhrer-Alge, Rheinstrasse 32/4, A-6900 BREGENZ Tel.: +43(0)5574 - 74995 - 416 Fax.: +43(0)5574 - 74995 - 6 Mob.: +43(0)664 - 5729590 e-mail: margarete.woehrer@die-wildbach.at
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes
Confidentiality/ Access to data	☒ Not Public, for SafeLand partners guaranteed upon signature of agreement
Stakeholders:	Torrent and Avalanche Control; Commune of Sibratsgfäll - yes

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify):6,7

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No		
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Hydraulic pressure, rainfall		
Average velocity:	Further details will follow		
Further notes:	In 1999 and 2005 several shallow landslides were triggered by heavy rainfall event		

17 LATERNS/SCHNEPFAU (2/3)

Landslide geometry:	Thickness (m)	
	Surface*	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Details will follow	
Aerial images:		☒ Yes ☐ No	several times, Details will follow	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No		

Geology and geomorphology:	☒ Yes ☐ No	Further details will follow
Geophysics:	☒ Yes ☐ No	Further details will follow
Geotechnical data:	Site: ☐ Yes ☒ No	
	Lab: ☒ Yes ☐ No	Further details will follow
Groundwater:	☒ Yes ☐ No	Further details will follow

Rainfall data	☒ Yes ☐ No	If yes, specify: Further details will follow
Temperature data	☒ Yes ☐ No	If yes, specify: Further details will follow
Humidity data	☒ Yes ☒ No	If yes, specify: Further details will follow
Earthquake strong motion data	☐ Yes ☒ No	Further details will follow

Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged

17 LATERNS/SCHNEPFAU (3/3)

Elements at risk (specify): further details will follow		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	further details will follow
Social consequences due to previous events	☒ Yes ☐ No	further details will follow
Mitigation (already performed or envisaged):	☒ Yes ☐ No	further details will follow
Land planning already established for the case:	☒ Yes ☐ No	further details will follow

Numerical modelling (already done)	☐ Yes ☒ No	
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☐ Yes ☒ No	

These sites will be test areas for the application of airborne geophysics, measurements financed on GBA projects

18 PESA – ELSA (1/3)

Proposing partner:	SGI		
Person(s) in charge for the data management:	Name:	Alberto Callerio	Marcello Brugioni Lorenzo Sulli
	email address:	a.callerio@studiogeotecnico.it	m.brugioni@adbarno.it l.sulli@adbarno.it
	Fax No	055 26743250	055 26743250

Country:	Italy	Location:	Tuscany (Central Italy. 533km^2 Regional area with 8 detailed sites. Poppiano, Ribaldaccio, Ortimino, Casalino, Gambassi terem, Lucardo , Certlado e Marcialla.
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 11.0371 N 43.5700 See attached PDF	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	Autorità di bacino del Fiume Arno and Regione Toscana
Owner contact data :	b.mazzanti@adbarno.it per Autorità di bacino Fiume Arno
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) with some restrictions ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): First documented event: 1988-2009	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Mainly:increase of internal water pressure, decrease of resistant strength by erosion or anthropic activity		
Average velocity:	Mainly:Low or very low (max 2/3 cm for years)		
Further notes:			

18 PESA – ELSA **(2/3)**

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	-
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1/2000-1/25000	Year(s): 1998-2007
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy:10x10m; +/+ 1m	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:whole area 1998/2000	
Satellite interferometry:		☒Yes ☐ No	If yes, specify type (technique), scale and date:Permanent scatteres 1992-2002 and (partially) 2002-2007	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:1:25000 scale and some greater
Geophysics:	☒ Yes ☐ No	If yes, specify:Seismic data of Modine site
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): data of 8 sites
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 14 piezometers in Casalino, 3 piez. in Ortimino

Rainfall data	☒ Yes ☐ No	If yes, specify:
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☐Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Inclinometers (almost 21 in Casalino e Ortimino sites, all good) , data to verify about other sites.

18 PESA – ELSA (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: SLAM for the Casalino site, project with Regione Toscana for Ortimino site.

General comments and pictures:

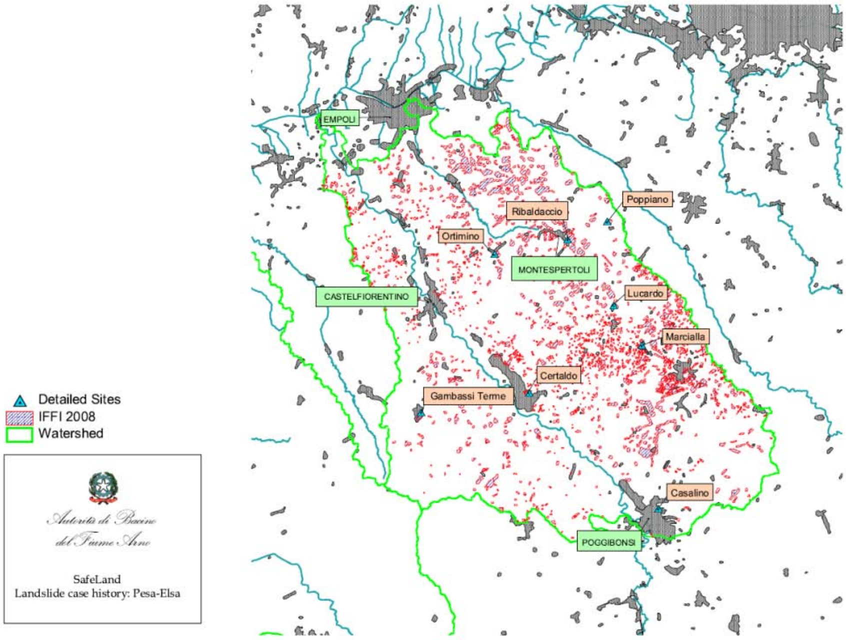


Figure 1: Geographic location of the studied area.

19 VAL D'ERA (1/3)

Proposing partner:	SGI		
Person(s) in charge for the data management:	Name:	Alberto Callerio	Marcello Brugioni Lorenzo Sulli
	email address:	a.callerio@studiogeotecnico.it	m.brugioni@adbarno.it l.sulli@adbarno.it
	Fax No	+39 025691845	+39 055 26743250

Country:	Italy	Location:	Tuscany (Central Italy. 481 km^2 Regional area with 3 detailed sites. Palaia, Toiano, Volterra.
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 10.79545° N 43.5692 See attached PDF	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	Autorità di bacino del Fiume Arno and Regione Toscana
Owner contact data:	b.mazzanti@adbarno.it per Autorità di bacino Fiume Arno
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) with some restrictions ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): early '800-2009	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Mainly:increase of internal water pressure, decrease of resistant strength by erosion or anthropic activity		
Average velocity:	Mainly:Low or very low (max 2/3 cm for years)		
Further notes:			

19 VAL D'ERA (2/3)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	-
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1/2000-1/25000	Year(s): 1998-2007
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy:10x10m; +/+ 1m. Lidar 1x1m DTM and DSM coming soon (validation by Regione Toscana in progress)	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:whole area 1998/2000	
Satellite interferometry:		☒Yes ☐ No	If yes, specify type (technique), scale and date:Permanent scatteres 1992-2002 and (partially) 2002-2007	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:1:25000 scale and some greater
Geophysics:	☒ Yes ☐ No	If yes, specify:Seismic data of Toiano and Volterra sites
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): data of 3 sites
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 3 piezometers in Volterra, 2 piez. in Toiano (from starting date to 2009)

Rainfall data	☒ Yes ☐ No	If yes, specify:
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☐Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Inclinometers 6 in Toiano 2 in Volterra (start data from end 2009).

19 VAL D'ERA (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Project with Regione Toscana for Volterra and Toiano sites.

General comments and pictures:

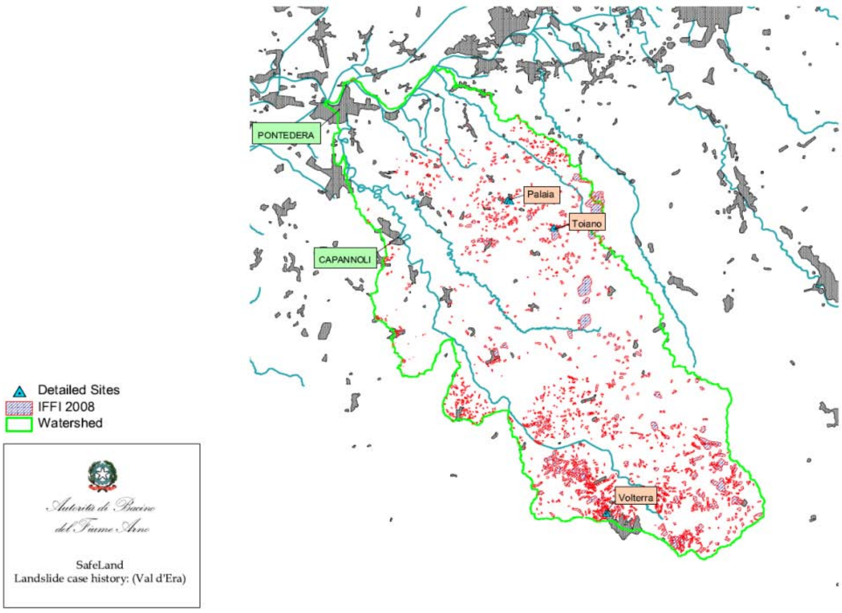


Figure 1: Geographic location of the studied area.

20 VALDARNO SUPERIORE (1/3)

Proposing partner:	SGI		
Person(s) in charge for the data management:	Name:	Alberto Callerio	Marcello Brugioni Lorenzo Sulli
	email address:	a.callerio@studiogeotecnico.it	m.brugioni@adbarno.it l.sulli@adbarno.it
	Fax No	+39 025691845	+39 055 26743250

Country:	Italy	Location:	Tuscany (Central Italy. 739 km^2 Regional area with 6 detailed sites. Tosi, Carbonile, Modine, Ricasoli, I Pozzi, Poggilupi..		
Scale:	☐ Single slide		☒ Multiple	☐ Regional	
Reference geographical coordinates	E 11.5611 ° N 43.6108° See attached PDF		Google Earth™ kml file submitted with this form:	☐ Yes ☐ No	

Data owner:	Autorità di bacino del Fiume Arno and Regione Toscana
Owner contact data :	b.mazzanti@adbarno.it per Autorità di bacino Fiume Arno
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) with some restrictions ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): early 1986-2009	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Mainly:increase of internal water pressure, decrease of resistant strength by erosion or anthropic activity		
Average velocity:	Mainly:Low or very low (max 2/3 cm for years)		
Further notes:			

20 VALDARNO SUPERIORE (2/3)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	-
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1/2000-1/25000	Year(s): 1998-2007
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy:10x10m; +/+ 1m. Lidar 1x1m DTM and DSM coming soon (validation by Regione Toscana in progress)	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:whole area 1998/2000	
Satellite interferometry:		☒Yes ☐ No	If yes, specify type (technique), scale and date:Permanent scatteres 1992-2002 and (partially) 2002-2007	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:1:25000 scale and some greater
Geophysics:	☒ Yes ☐ No	If yes, specify:Seismic data of Modine site
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): data of 6 sites
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested):
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): almost 2 piezometers in Modine, data to verify about other sites.

Rainfall data	☒ Yes ☐ No	If yes, specify:
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☐Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Inclinometers . Almost 28 in Carbonile, Ricasoli, Modine and I Pozzi site, some not yet good. Data to verify about other sites.

20 VALDARNO SUPERIORE (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒No	If yes, specify:
References (papers and other published material, www site), specify:		
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Slam for Carbonile site, Project with Regione Toscana for Modine site.

General comments and pictures :

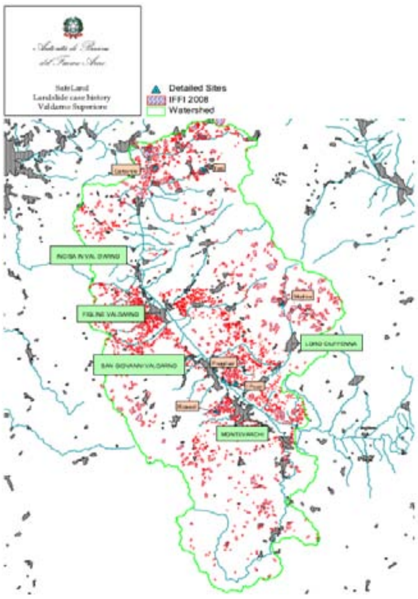


Figure 1: Geographic location of the studied area.

21 PETACCIATO (1/4)

Proposing partner:	SGI		
Person(s) in charge for the data management:	Name:	Alberto Callerio	Manuela Davì
	email address:	a.callerio@studiogeotecnico.it	m.davi@studiogeotecnico.it
	Fax No.	+39025691845	+39025691845

Country:	Italy	Location:	Petacciato (CB)
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 14.8690° N 42.0231°	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No

Data owner:	Autostrade per l'Italia Spa, Regione Molise.	
Owner contact data:		
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested): The data are partially public. For those not public, the authorisation has been requested to the owner, as an extension to the one obtained within the Lessloss project.	
Stakeholders:	Autostrade per l'Italia SpA, Regione Molise, Ferrovie dello Stato SpA	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): First documented event: 1906 Recent: 2009	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Significant variation of groundwater pressures following snowmelt and/or exceptional weather conditions		
Average velocity:			
Further notes:			

21 PETACCIATO (2/4)

Landslide geometry:	Thickness (m)	From 5-10 to 80-90m
	Surface* (m^2)	10.150.000
	Volume (m^3)	-
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 40m	

Aerial, satellite images:	☐ Yes ☐ No	If yes, specify coverage and date: to be verified with owner
Satellite interferometry:	☐ Yes ☐ No	If yes, specify type (technique), scale and date: to be verified with owner
Pictures of the area of interest	☒ Yes ☐ No	If yes, specify: several pictures of affected area

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Several studies (see references).
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Boreholes, piezometers, CPT, permeability.
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): oedometers, triaxial, direct shear, ring shear.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): piezometers and sporadic monitoring.

Rainfall data	☒ Yes ☐ No	If yes, specify: Few data, to be gathered from the Termoli climatic station
Temperature data	☒ Yes ☐ No	If yes, specify: Few data, to be gathered from the Termoli climatic station
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	The closest existing SM analogue recordings were obtained during the two Basso Molise strong shocks of 31.10 and 1.11.2002 at the accelerograph stations of Lesina, Sannicandro and San Severo, located in the North of the Puglia region (PGA = 66.2 , 60.7, and 42.4 cm/s**2, respectively)

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Incinometer array, piezometers (sporadic monitoring).		

21 PETACCIATO (3/4)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: A quantification is not available at this time. However, the landslide has a major impact on the infrastructures running at its foot (Motorway A14, National highway Railway line)
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Stabilization measures (pile, anchors, piers – 20-30m depth – scarce results), vulnerability of lifelines reduction, by means of a by pass earth work structure (design level).
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: PAI (Hydrological Arrangement Plan of the Molise region)

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify: Static, dynamic FEM modeling (LessLoss project, SGI)
Risk analyses already carried out	☐ Yes ☐ No	If yes, specify:
References (papers and other published material, www site), specify:	- Studio Geotecnico Italiano, The Petacciato Landslide, Geological and Geotechnical Data, LessLoss FP6 Project, March 15th, 2007 - Gori, U. and Mezzabotta, M., 1995. Sul cinematismo della frana costiera dell'abitato di Petacciato (CB), Geol. Appl. Idrogeol XXX, pp.659-675 (in Italian). - Melidoro, G., Mezzabotta, M., Monitoraggio ultrasecolare delle deformazioni gravitative costiere adriatiche. Int. Conf. "Prevention of Hydrogeological Hazard: the Role of Scientific Research", CNR, 5th-7th November 1996, Alba (Italy), vol. 1, pp.343-356. (In Italian) - Santaloia, F., Cotecchia, V., Monterisi, L., Geologica evolution and landslide mechanism along the central Adriatic coastal slopes, in Advances in Geotechnical Engineering: The Skempton Conference, 2004, Tomas Telford London. - Guerricchio A., Melidoro G., and Simeone V., Le grandi frane di Petacciato sul versante costiero adriatico (Molise). Mem, Soc. Geol. It., 51, 607-623 (In Italian). - Cotecchia F., Santaloia F., "La frana di Petacciato: geologia dell'area e storia degli eventi franosi", Internal SGI-MI Report, 2006 (in Italian). - Cotecchia F., Santaloia F., Bottiglieri O., Monterisi L. Landslides in stiff clay slopes along the Adriatic coast (Central Italy). Proc. of the 10th International Symposium On Landslides And Engineered Slopes, June 30/July 4 2008, Xi'an, China. - Cotecchia V. e Melidoro G., Studi, rilevamenti dell'area in frana – Indagini e orientamenti progettuali: Relazione generale. Technical report. Regione Molise - Dipartimento per la Protezione Civile del Ministero degli Interni, 2002 (in Italian).	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: In the Lessloss project, the site of Petacciato has been analysed and results carried out in terms of losses to infrastructures.

21 PETACCIATO (4/4)

General comments and pictures:

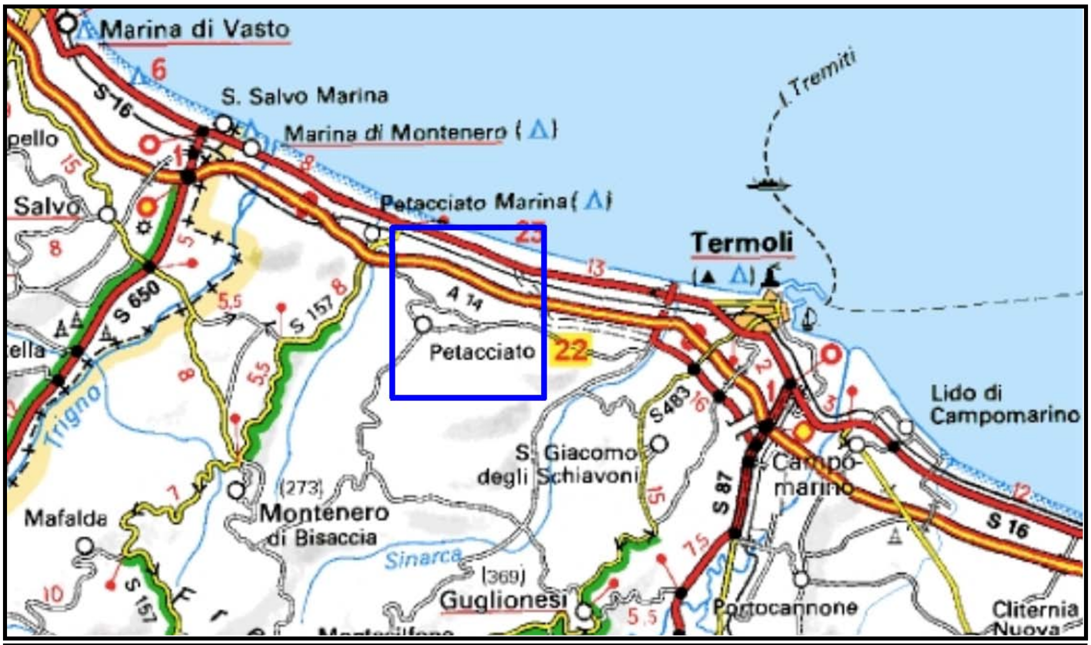


Figure 1: Geographic location of the studied area.

Figure 2: “Vaccareggia”, crack on the road at the slide top boundary.

22 PIZZO D'ALVANO (1/4)

Proposing partner:	UNISA (14)		
Person(s) in charge for the data management:	Name:	Leonardo Cascini and Giuseppe Sorbino	
	email address:	l.cascini@unisa.it; g.sorbino@unisa.it	
	Fax No.	+39 089 964231	

Country:	ITALY	Location:	Campania
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E 14.6342° N 40.8341	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	UNISA
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	Inhabitants. Local, regional and national Italian Authorities (they might be interested in becoming end users of the project).

Case study is suitable for:	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's: WP7 (Dissemination of Project results)

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	A historical database on rainfall-induced fast slope movements of the flow type occuring in the area has a time span from the year 1625 to nowadays	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall-induced shallow landslides of the flow type in pyroclastic soils for which six different triggering mechanisms have been detected on the basis of the predisposing and triggering factors, as well as of the corresponding landslide source areas.		
Average velocity:	The average velocity in correspondence of the urbanized areas located at the toe of the slopes is about 10-15 m/s (maximum back-calculated velocity of about 20 m/s)		
Further notes:			

22 PIZZO D'ALVANO (2/4)

Landslide geometry:	Thickness (m)	0.5 – 5.0
	Surface* (m^2)	800000
	Volume (m^3)	2.0×10^6
Run-out:	Height (m)	From 100 to 800
	Distance (m)	From 250 to 3500

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:25,000, 1:5,000	Year(s): 2000
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution: 2.0m per pixel	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	Ortho-photographs taken immediately after the last catastrophic event of May 1998	

Geology and geomorphology:	☒ Yes ☐ No	Geological, geomorpholgical and hydrogeological studies and maps
Geophysics:	☒ Yes ☐ No	seismic refraction prospects performed along more than 300 shallow pits
Geotechnical data:	Site: ☒ Yes ☐ No	Hand-dug shafts, Standard Penetration tests The type and location of in-situ investigations are reported in a GIS.
	Lab: ☒ Yes ☐ No	≈ 450 tests for physical properties; ≈ 330 tests for strength properties in saturated and unsaturated conditions; ≈ 50 tests for hydraulic properties in saturated and unsaturated conditions; ≈ 40 tests for compressibility properties in saturated and unsaturated conditions
Groundwater:	☒ Yes ☐ No	Suction measurements from November 1999 up to now

Rainfall data	☒ Yes ☐ No	Hourly and daily rainfall data
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	An early warning system based on rainfall thresholds is currently operating for alerting the population		

22 PIZZO D'ALVANO (3/4)

Elements at risk (specify): people, facilities (buildings, infrastructures), economical activities, environment.		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	40 in 1640; 159 in 1998
Economic loss due to previous events:	☒ Yes ☐ No	About 500 Ml € for the event in 1998
Social consequences due to previous events	☒ Yes ☐ No	Homeless, interruption of economic activities, constraints in land-use.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	Mitigation structural works: lined channels, check dams and storage basins
Land planning already established for the case:	☒ Yes ☐ No	New regulations about land-use.
Numerical modelling (already done)	☒ Yes ☐ No	Numerical modeling of triggering and propagation stages with analytical and FEM models
Risk analyses already carried out	☒ Yes ☐ No	Susceptibilty analyses with the aid of heuristic methods at 1:5,000 scale.

References (papers and other published material, www site), specify:

1. Cascini L., Guida D., Nocera N., Romanzi G., Sorbino G. (2000) – A preliminary model for landslides of May 1998 in Campania Region. Special Lecture in Proc. of the Second Intern. Symp. on "Geotechnics of Hard Soils and Soft Rocks", Vol. 3, pp. 1623 – 1649. ISBN 90 5809 021 3
2. Cascini L., Sorbino G. (2002) - Soil suction measurements over large areas: a case study. Proc. of 3rd Intern. Conf. on Unsaturated Soils (UNSAT 2002), Recife, Brazil, Vol. 2, pp. 829 – 834. ISBN: 90-5809-371-9.
3. Sorbino G., Foresta V. (2002) – Unsaturated hydraulic characteristics of pyroclastic soils. Proc. of 3rd Intern. Conf. on Unsaturated Soils (UNSAT 2002), Recife, Brazil, Vol. 1, pp. 405 – 410. ISBN: 90-5809-371-9.
4. Cascini L., Ferlisi S. (2003) - Occurrence and consequences of flowslides: a case study. Proc. of the International Conference on "Fast Slope Movements – Prediction and Prevention for Risk Mitigation". Pàtron Editore, Bologna. Vol. I, pp. 85 - 92. ISBN: 88-555-2699-5
5. Cascini L., Sorbino G., Cuomo S. (2003) - Modelling of flowslide triggering in pyroclastic soil. Proc. of the International Conference on "Fast Slope Movements – Prediction and Prevention for Risk Mitigation". Pàtron Editore, Bologna. Vol. I, 93 - 100. ISBN: 88-555-2699-5
6. Cascini L., Sorbino G. (2003) – The contribution of soil suction measurements to the analysis of flowslides triggering. Invited Lecture, Proc. of the Int. Workshop "Flows 2003 - Occurrence and Mechanisms of Flows in Natural Slopes and Earthfill". Sorrento, May 14-16, Pàtron Editore, Bologna, pp. 77-85. ISBN: 88-555-2747-9
7. Cascini L. (2004) – The flowslides of May 1998 in the Campania region, Italy: the scientific emergency management. Italian Geotechnical Journal, Anno XXXVIII, n. 2, pp. 11-44. ISSN: 0557-1405
8. Bilotta E., Cascini L., Foresta V., Sorbino G. (2005) – Geotechnical characterization of pyroclastic soils involved in huge flowslides. Geotechnical and Geological Engineering, 23, pp. 365-402. ISSN: 0960-3182
9. Cascini L. (2005) – La gestione scientifica dell'emergenza idrogeologica del maggio 1998 nella Regione Campania. Rubbettino Ed., pp. 278. ISBN: 88-498-0964-6
10. Cascini L., Guida D., Sorbino G. (2005) – Il Presidio Territoriale. Una esperienza sul campo. Rubbettino Ed., pp. 130. ISBN: 88-498-0962-X
11. Cascini L., Guida D., Sorbino G., Lanzara R. (2005) – Il Sistema Informativo del Presidio Territoriale. Rubbettino Ed., pp. 99. ISBN: 88-498-0963-8
12. Cascini L., Cuomo S., Sorbino G. (2005) – Flow-like mass movements in pyroclastic soils: remarks on the modelling of triggering mechanisms. Italian Geotechnical Journal, n. 4, pp. 11-31. ISSN: 0557-1405

22 PIZZO D'ALVANO (4/4)

	13. Cascini L., Bonnard Ch., Corominas J., Jibson R., Montero-Olarte J. (2005). – Landslide hazard and risk zoning for urban planning and development. – State of the Art report. Proc. of International Conference on Landslide Risk Management, Hungr, Fell, Couture & Eberhardt (eds), pp. 199-235, ISBN: 041538043X 14. Cascini L. (2005) – Risk assessment of fast landslide–From theory to practice. General Report. Proc. Int. Conference on "Fast Slope Movements – Prediction and Prevention for Risk Mitigation". Patron Ed., 2, pp. 33-52. ISBN: 88-555-2833-5 15. Sorbino G. (2005) - Numerical modelling of soil suction measurements in pyroclastic soils. Proc. of Advanced Experimental Unsaturated Soil Mechanics, pp. 541-547. ISBN: 0415383374. 16. Sorbino G., Sica C., Cascini L., Cuomo S. (2007) - On the forecasting of flowslides triggering areas using physically based models. Proc. of 1st North American Landslide Conference (Vail, Colorado). Editors: V.R. Schuster, R.L. Schuster, A.K. Turner. AEG Publication n. 23. ISBN 978-0-975-4295-3-2. (su CD-ROM). 17. Cascini L., Cuomo S., Guida D. (2008) - Typical source areas of May 1998 flow-like mass movements in the Campania region, Southern Italy. Engineering Geology, 96 (3), p.107-125. DOI: 10.1016/j.enggeo.2007.10.003 18. Cascini L., Cuomo S., Pastor M. (2008) – The role played by mountain tracks on rainfall-induced shallow landslides: a case study. Proc. of the iEMSs Fourth Biennial Meeting: International Congress on Environmental Modelling and Software (iEMSs 2008). 7-10 July 2008, Barcelona, Spain. M. Sànchez-Marrè, J. Béjar, J. Comas, A.E. Rizzoli, G. Guariso (eds.). ISBN: 978-84-7653-074-0, pp. 1484 – 1491. 19. Cascini L., Cuomo S., Pastor M., Fernández-Merodo J.A. (2008) – Geomechanical modelling of triggering mechanisms for rainfall-induced triangular shallow landslides of the flow-type. Proceedings of the iEMSs Fourth Biennial Meeting: International Congress on Environmental Modelling and Software (iEMSs 2008). 7-10 July 2008, Barcelona, Spain. M. Sànchez-Marrè, J. Béjar, J. Comas, A.E. Rizzoli, G. Guariso (eds.). ISBN: 978-84-7653-074-0, pp. 1516 – 1523. 20. Cascini L., Ferlisi S., Vitolo E. (2008) – Individual and societal risk owing to landslides in the Campania region (southern Italy). Georisk, 2(3), pp. 125-140. DOI: 10.1080/17499510802291310 21. Cascini L., Cuomo S., Ferlisi S., Sorbino G. (2009) - Detection of mechanisms for destructive landslides in Campania region – southern Italy. Proc. of the workshop on "Rainfall-induced landslides: mechanisms, monitoring techniques and nowcasting models for early warning systems". Naples, 8-10 June 2009, NAPOLI, vol. 1, pp. 43-51, ISBN: 978-88-89972-12-0. 22. Pastor M., Haddad B., Sorbino G., Cuomo S., Drempetic V. (2009) - A depth integrated, coupled SPH model for flow-like landslides and related phenomena. Int. J. for Num. and Anal. Meth. in Geomechanics, vol. 33; pp. 143-172. ISSN: 0363-9061. 23. Cascini L., Cuomo S., Pastor M., Sorbino G. (in press). Modelling of rainfall-induced shallow landslides of the flow-type. Journal of Geot. and Geoenv. Eng. (ASCE), ISSN: 1090-0241.	
The case history has been considered in other research projects?	☒ Yes ☐ No	The case history has been considered in national projects financed by the Italian Ministry of Education (FARB 1999-2008; CERIUS, 2001; PRIN 2007)

The proposed area has an extension of about 60 km^2 and it is located within a territory of about 1400 km^2 of the Campania region where the societal risk is proved to be one of the highest in Europe (Cascini et al., 2008). The data provided by UNISA for this area can be profitably used for applying and testing advanced procedures and methodologies aimed to the analysis of landslide susceptibility, hazard and risk. Once identified the best procedures, they could be applied in the remaining portion of the territory at landslide risk for which similar comprehensive data are not available yet. Considering that the mechanical behaviour of the involved pyroclastic soils does not sensibly differ from other coarse grain deposits largely diffused on mountain regions of Europe and affected by shallow landslides, the selected procedures for the Campania region could also be extended to different geo-environmental European contexts. Finally, the presence of some mitigation works in the proposed area could allow carrying out a QRA in order to assess the residual landslide risk and provide the effectiveness of the existing mitigation works with the aid of costs/benefits analyses. This can allow the possible adoption of the same mitigation options for other sites in Europe.

23 VALLCEBRE (1/3)

Proposing partner:	2 - UPC		
Person(s) in charge for the data management:	Name:	Jordi Corominas	
	email address:	Jordi.corominas@upc.edu	
	Fax No.	+(34).93.401.7251	

Country:	Spain	Location:	Vallcebre
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 1.8333 N 42.2000	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	UPC	
Owner contact data:	Jordi Corominas	
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):	
Stakeholders:		

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): 1996- present	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall and probably, torrent erosion		
Average velocity:	mm/week (maximum velocity cm/day)		
Further notes:	It may experience acceleration surges		

23 VALLCEBRE (2/3)

Landslide geometry:	Thickness (m)	Three units: 15, 30, >40
	Surface* (m^2)	800,000
	Volume (m^3)	25 Mm^3
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5,000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 15x15m	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: Several years	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: DInSAR with corner reflectors since 2006	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: included in this document	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:
Geophysics:	☒ Yes ☐ No	If yes, specify: Electrical soundings (VES)
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Hydraulic test
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Shear tests (peak, residual), identification
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Open piezometers, casagrande piezometers

Rainfall data	☒ Yes ☐ No	If yes, specify: hourly data
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Wire exensometer, GPS

23 VALLCEBRE (3/3)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Road repair and cracks in buildings
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify: Small consequences
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Static
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	1. Corominas, J.; Moya, J.; Lloret, A; Gili, J.A.; Angeli, M.G. & Pasuto, A.. 2000. Measurement of landslide displacements using a wire extensometer. Engineering Geology, 55: 149 - 166 2. Corominas, J., Moya, J., Ledesma, A., Lloret, A. & Gili, J.A. 2005. Prediction of ground displacements and velocities from groundwater level changes at the Vallcebre landslide (Eastern Pyrenees, Spain). Landslides 2: p. 83 - 96. 3. Gili, J.A.; Corominas, J. and Rius, J. 2000. Using Global Positioning Techniques in landslide monitoring. Engineering Geology, 55: 167-192	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: NEWTECH (5th UE Framework) Mountain Risks – Marie Curie network

General comments and pictures:

24 ÅKNES (1/4)

Proposing partner:	International Centre for Geohazards (ICG) / Åknes/Tafjord Early Warning		
Person(s) in charge for the data management:	Name:	Lars Harald Blikra (1)	Tore Bergeng (2)
	email address:	lhb@aknes.no	tb@aknes.no
	Fax No.		

Country:	Norway	Location:	Åknes, Stranda, Møre og Romsdal, Norway
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 06.994739° N 62.178696°	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Åknes/Tafjord Early-warning Centre and some data at Geological Survey of Norway
Owner contact data:	Lars Harald Blikra (1), Tore Bergeng (1)
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access of generale data (e.g. Topograohy, geology, structural, borehole, hazard/risk etc.), detailed monitoring data accessible on request) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	The municipalities of Stranda, Norddal, Stordal, Ørskog, Sykkylven and Ålesund and Møre og Romsdal council district.

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☐ Yes ☒ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Photogrammetry based on aerial photos back to 1961. Rod extensometers from 1993 and onwards. Total station, GPS, etc. from 2004 and onwards.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Possible triggering by degradation of strength, increased water pressure and earthquake.		
Average velocity:	Up to 10 cm per year.		
Further notes:	Rock slides of volumes in the order of $10^5 m^3$ have occurred from the western flank of the unstable area in 1850 – 1900, 1940 and 1960.		

24 ÅKNES (2/4)

Landslide geometry:	Thickness (m)	Assumed max. 120m
	Surface* (m^2)	650,000
	Volume (m^3)	20- 52,000,000
Run-out:	Height (m)	Into the fjord
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify : LIDAR airplane and helicopter	Scale(s): 1:2000	Year(s): 2006
Digital Elevation Model	☒ Yes ☐ No	If yes, specify: LIDAR-helicopter	Resolution and accuracy: Res. 1 m, acc. 10 – 20 cm	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: Whole area, from 1961 and later.	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: InSAR, different resolution. Radarsat 2. 4 reflectors for detection (estabilished October 2005).	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Lots of pictures; overview and details.	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Structural and geological mapping has been carried out covering the whole area of interest.
Geophysics:	☒ Yes ☐ No	If yes, specify: At the surface: Ground penetrating radar, refraction seismic, 2D resistivity profiling, 3D seismics. Borehole logging: resistivity, P-wave and S-wave, porosity, gamma-ray, conductivity and temperature.
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Joint roughness coefficient, joint compressive strength, geological strength index, core logging (rock types, fracture frequency, type of fractures). Reported in journal articles and project reports.
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Basic friction angle (>216 tests), uniaxial compressive strength (54), Young's modulus (45), Poisson's ratio (45), Brazilian test (19), sound velocity (47), density (48), ring shear testing of fault rocks, triaxial testing of rock (15 tests) and gouge material (3 samples). Reported in journal articles and project reports.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Water level in 3 boreholes, piezometers in 3 boreholes, mapping of springs, tracer test in boreholes and springs. Reported in journal articles and project reports.

Rainfall data	☒ Yes ☐ No	If yes, specify: Weather station (air temperature, ground temperature, precipitation, snow-depth, wind speed, insolation, humidity).
Temperature data	☒ Yes ☐ No	If yes, specify: Weather station
Humidity data	☒ Yes ☐ No	If yes, specify: Weather station
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

24 ÅKNES (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged	
	If yes or envisaged, specify (technique, frequency, web access etc.): *Surface monitoring:* • Permanent GPS network with 8 antennas • Total station with 30 prisms • Ground-based radar with 8 reflectors • Ground-based radar yearly campaigns • Five rod extensometers • Surface crackmeters • Surface tiltmeters • Two single lasers • Eight 3-component geophones • Seismograph *Borehole monitoring:* • Three DMS systems, 50, 100 and 120 m active (inclinometers, pietzometers (2), digital compass and temperature sensors) *Climate station:* • Temperature • Precipitation • Two snow-depth sensors • Wind speed • Ground temperature • Insolation *Warning systems:* • Typhons • Automatic phone-warning systems	

Elements at risk (specify): Human lives, buildings and infrastructure due to the tsunami that may be caused by a rock avalanche.		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): An early warning system is implemented. Draining of the slope by tunnels and boreholes is under consideration.
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: Special bilding codes has been estabilished in 2009.

Numerical modelling (already done)	☒Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): *Stability:* Static; FEM, DEM and analytical. Dynamic; DEM. Num. mod of run-out/slide speed has also been carried out.
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Risks associated with different slide/ tsunami scenarios have been analysed.

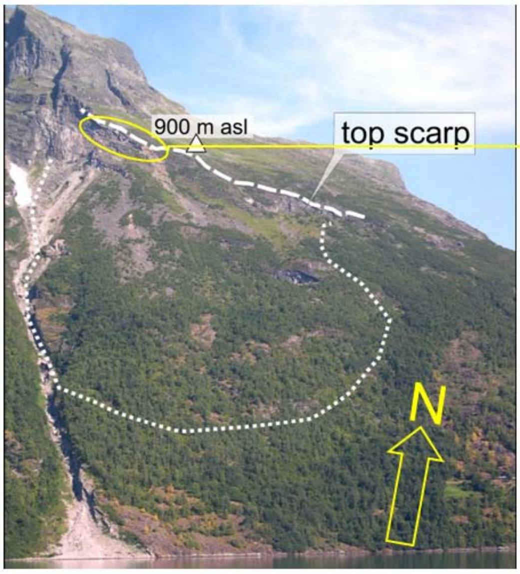
References (papers and other published material, www site), specify:	One selected paper on monitoring and early warning, also giving a brief overview on geology and movement pattern: Blikra LH (2008). The Åknes rockslide; monitoring, threshold values and early-warning. In: Chen Z, Zhang J, Li Z, Wu F, Ho K, editors. Landslides and Engineered Slopes. Proceedings of the Tenth International Symposium on Landslides and Engineered Slopes. Xi'an, China; 2008. p. 1089-1094. CRC Press. Taylor & Francis Group. A Balkema Book.

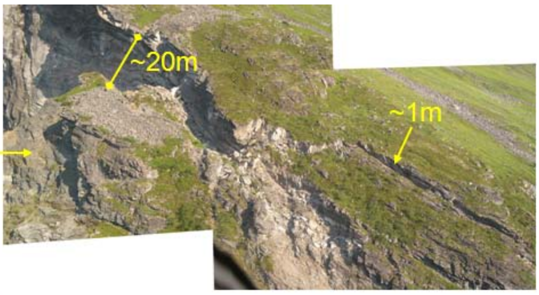
24 ÅKNES (4/4)

The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: A seires of different research projects. E.g. “Stability of rock slopes”, one of the projects run by International Geohazards, Oslo, Norway, and “Integral Risk Management of Natural Hazards”, EU-project completed in 2008.

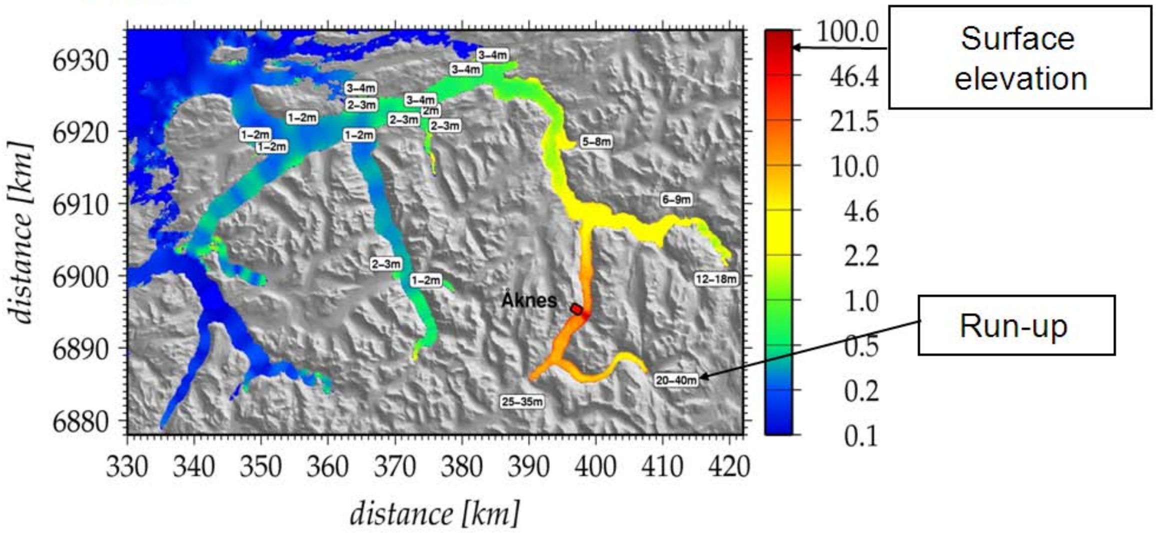
General comments and pictures:

The Åknes rock slope is probably one of the most investigated rock slopes in the world. The major part of the research and investigations for implementation of an early-warning system started in 2004. In addition to the rock-slope-related activities, a lot of work and research has been done on the tsunami-related topics.





Åknes: results from tsunami modelling – 35 mill. m³ entering the water at a speed of 70m/s



25 NAINITAL (1/4)

Proposing partner:	ICG		
Person(s) in charge for the data management:	Name:	Rajinder K. Bhasin	
	email address:	rkb@ngi.no	
	Fax No.	+47-22230448	

Country:	India	Location:	Hill station in Kumaun Himalaya in Utterakhand State
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	E79°26' – 79°28' N29°22' – 29°24'	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Indian Department of Science and Technology (DST)
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify whether authorization is already available/requested): No
Stakeholders:	Local Disaster Management Authority, DST, local businesses in tourist industry

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☐ Yes ☒ No (slide prone) Creep Movements observed	If yes, potential for future sliding?	☐ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span): Not systematic	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall and water induced		
Average velocity:	Probably a few cm every year in different areas		
Further notes:	Creep movement in the rock and unstable debris on top of in situ rock		

25 NAINITAL (2/4)

Landslide geometry:	Thickness	(m)	50 – 100 m
	Surface*	(m^2)	100,000
	Volume	(m^3)	5 million
Run-out:	Height	(m)	Lake underneath the slide
	Distance	(m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☐ Yes ☒ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Krol formation comprising of shales and phyllites
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Rock mass characterisation
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Unit weight, compressive strength
Groundwater:	☐ Yes ☐ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☐ Yes ☒ No	If yes, specify:
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): Probably available from existing earthquake hazard zonation maps

Monitoring and/or early warning systems:	☐ Yes ☐ No X Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Monitoring planned through SAR interferometry

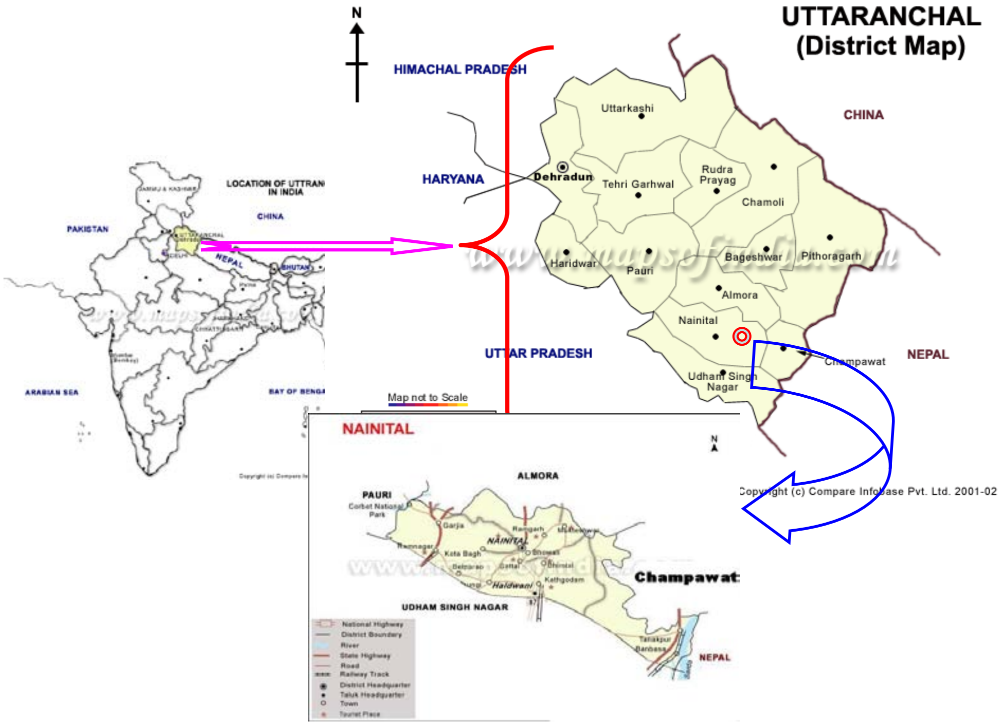
25 NAINITAL (3/4)

Elements at risk (specify): People residing on the slope		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: Not mentioned specifically in literature but have been informed by local community
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Not available. Regular housing and road repairs
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: People do not want to move from their local residences
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Limit equilibrium analysis
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Some local studies in the area financed by the Ministry of Science and Technology in New Delhi, India	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

25 NAINITAL **(4/4)**

General comments and pictures:



View of Sher–ka–danda Hill from Nainital Bus stand (Talli tal) showing extent of urbanisation

26 LA VALETTE (1/4)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Jean-Philippe Malet	
	email address:	jeanphilippe.malet@eost.u-strasbg.fr	
	Fax No.	+33 3 902 401 25	

Country:	France	Location:	South French Alps, Department of Alpes-de-Hautes-Provence, 100 km North of Nizza
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 6.639333 N 44.404333	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	CNRS
Owner contact data:	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage)
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Aerial orthorectified photographs 1982 – 2008 (before failure and after failure) On-site displacement monitoring 1988-2009 (on-going) On-site hydrology monitoring 1988-1994 / 2002-2009 (on-going)	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall and snowmelt		
Average velocity:	0.01 – 0.05 m.day-1 / in acceleration, velocities up to 0.4-0.5 m.day-1 have been observed. Several events of fluidization (triggering of rapid mudflows) have been observed in 1982, 1988, 1992.		
Further notes:	The landslide is part of the French Observatory of Gravitational Processes (OMIV) – Website: http://eost.u-strasbg.fr/omiv		

26 LA VALETTE (2/4)

Landslide geometry:	Thickness (m)	30
	Surface* (m^2)	500000
	Volume (m^3)	60000000
Run-out:	Height (m)	20
	Distance (m)	1250

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: - 6 DEMs over period 1982 – 2009; Resolution = 5 m; Accuracy = 3 m - 2 airborne Lidar DEMs (2007, 2009); Resolution = 1 m; Accuracy = 20 cm	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: - Aerial airborne orthophotographs (1982, 88, 95, 2000, 2004, 2007) - VHR satellite image (SPOT5 – 2.5m, 2002, 2004, 2007, 2008 / Ikonos, 2006)	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date: SAR Interferometry (ERS) TerraSarX (planned in SafeLand by BRGM)	
Pictures of the area of interest		☒ Yes ☐ No	Terrestrial picture taken daily in front of the landslide since June 2007 (on-going)	

Geology and geomorphology:	☒ Yes ☐ No	- Geomorphological map (1995, 1999, 2001, 2008) - Geological map
Geophysics:	☒ Yes ☐ No	- Ca. 10 ERT (electrical resistivity tomography) cross-sections - Ca. 10 active seismic tomographies
Geotechnical data:	Site: ☒ Yes ☐ No	- 3 boreholes - 10 dilatation tests in boreholes - Several permeability tests (under pressure) - 3 inclinometers (2007) – Now broken
	Lab: ☒ Yes ☐ No	- Physical identification (grain size, Atterberg, density, etc) - Triaxial tests (drained, undrained) - Oedometer tests - Ring shear tests - Rheometrical tests (cone-plane, plate-plate geometry)
Groundwater:	☒ Yes ☐ No	- 2 piezometers with continuous monitoring - soil temperature

Rainfall data	☒ Yes ☐ No	- 1 raingauge on the study site
Temperature data	☒ Yes ☐ No	- meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Humidity data	☒ Yes ☐ No	- meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Earthquake strong motion data	☒ Yes ☐ No	- seismic station at Jausiers (7 km from the landslide)

26 LA VALETTE (3/4)

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	- Daily data transfer of displacements (dGPS) & meteo data - Web access at the OMIV Website (http://eost.u-strasbg.fr/omiv) - EWs by RTM (infra red camera + optical camera + benchmark displacement + debris flow detection; automated linked to Prefecture Alpes-de-Haute-Provence)		

Elements at risk (specify): - road and bridges 1 km downstream of the landslide - road passing in the middle of the landslide (only access road to a small village) - ca. 150 buildings on the torrential cone of Valette torrent (St-Pons municipality) , ca 400 inhabitants		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in ca. 5 M €:
Social consequences due to previous events	☒ Yes ☐ No	Relocation of some inhabitants
Mitigation (already performed or envisaged):	☒ Yes ☐ No	Non structural – Monitoring systemStructural – Water drainage
Land planning already established for the case:	☒ Yes ☐ No	PPR (French Risk Maps)

Numerical modelling (already done)	☒ Yes ☐ No	- Several analytical models (model for slow displacements, model for fluidization, models for mudflow behavior, hydrological model - Static modeling of safety factors - FEM modeling (Flac / GefDyn / Abaqus) - Physical modeling (inclined plane)
Risk analyses already carried out	☒ Yes ☐ No	Semi-quantitative risk analysis of the La Valette torrential cone (possibility of a debris flow attaining the cone)
References (papers and other published material, www site), specify:	See: http://eost.u-strasbg.fr/omiv/Publications_la_valette.html	
The case history has been considered in other research projects?	☒ Yes ☐ No	- EC FP3 TESLEC, EC FP4 NEWTECH, EC FP5 ALARM, EC FP6 MOUNTAIN RISKS - French funding: PNRH, ACI MOTE, ACI SAMOA, ACI GACH2C, ECCO ECOU-PREF, ANR TRIGGERLAND, ANR SISCA

26 LA VALETTE (4/4)

General comments and pictures:
For a detailed description of the study site, the main research questions and the knowledge of the site, see: http://eost.u-strasbg.fr/omiv/La_valette_intro.html

Photo: 

27 BARCELONNETTE (1/5)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Jean-Philippe Malet	
	email address:	jeanphilippe.malet@eost.u-strasbg.fr	
	Fax No.	+33 3 902 401 25	

Country:	France	Location:	South French Alps, Department of Alpes-de-Hautes-Provence, 100 km North of Nizza
Scale:	☐ Single slide	☒ Multiple	☒ Regional
Reference geographical coordinates	NW corner: E 6°30.00 N 44°26.50 SE corner: E 6°52.35 N 44°19.30	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	CNRS	
Owner contact data :	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage) DREAL (Direction Regionale de l'Environnement, de l'Aménagement et du Logement)	
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):	
Stakeholders:	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage) DREAL (Direction Regionale de l'Environnement, de l'Aménagement et du Logement)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechnical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP2.3 Quantitative hazard assessment ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Event database (including damage) 1750 – 2009 (on going) Mitigation work database 1890 – 2009 (on going)	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☒ Flows ☒ Complex	Material:	☒ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Rainfall, snowmelt, seismic acceleration		

27 BARCELONNETTE (2/5)

Average velocity:	Variable according to the type of processes: - debris flows : up to 5 m.s-1 - shallow landslides and creep: cm.year-1 - large active mudslides: 0.01 – 0.05 m.day-1 / in acceleration, velocities up to 0.4-0.5 m.day-1 have been observed.
Further notes:	The Barcelonnette area is part of the French Observatory of Gravitational Processes (OMIV) – Website: http://eost.u-strasbg.fr/omiv

Landslide geometry:	Thickness	(m)	Very variable according to the type of process
	Surface*	(m^2)	Very variable according to the type of process
	Volume	(m^3)	Very variable according to the type of process
Run-out:	Height	(m)	Very variable according to the type of process
	Distance	(m)	Very variable according to the type of process
Barcelonnette Area – Area extension	Surface	(m^2)	300
Number of active mass movements	Nbr.		Ca. 150

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): TopoMap25 (1/25000) TopoMap10 (1/10000)	Year(s): 1998, 1945, 1899 1945, 1899
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: Digital Terrain Model (IFSAR product, 2 m grid) http://eost.u-strasbg.fr/omiv/Data/Data_Barcelonnette/DTM-Barcelo-10m.zip Digital Terrain Model (elevation lines, 10m grid) Digital Terrain Model (BD Alti, 50m grid)	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: - Aerial airborne orthophotographs (1948, 1956, 1974, 1982, 1988, 2000, 2004, 2008) - Landsat ETM (TM30m & P15m) (1984, 1988, 2000, 2004) - VHR satellite image (SPOT5 – 2.5m, 2002, 2004, 2007, 2008 / Ikonos, 2006)	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date: SAR Interferometry (ERS) TerraSarX (planned in SafeLand by BRGM)	
Pictures of the area of interest		☒ Yes ☐ No	> 1000 – Access to the RTM photo archives with photo startinjg in the 1880s	

Geology and geomorphology: (available on several sites)	☒ Yes ☐ No	- Various geomorphological maps (region, sub catchments, local landslides; scale 1/10,000 to 1/500) - Geological map (1/50000) - Map of engineering soil (1/10,000)
Geophysics: (available on several landslides)	☒ Yes ☐ No	- Several ERT (electrical resistivity tomography) cross-sections (Super-Sauze, La Valette, Poche, Bois Noir, Faucon, Adroit, Pra Bellon) - Several active seismic tomographies (Super-Sauze, La Valette, Poche, Adroit)

27 BARCELONNETTE **(3/5)**

Geotechnical data: (available for several sites and several soil types)	Site: ☒ Yes ☐ No	- A total of 40 boreholes in the area on several sites - A total of 30 inclinometers in the area on several sites - Dilatation tests in boreholes - Several permeability tests (under pressure)Etc
	Lab: ☒ Yes ☐ No	- Physical identification (grain size, Atterberg, density, etc) - Triaxial tests (drained, undrained) - Oedometer tests - Ring shear tests - Rheometrical tests (cone-plane, plate-plate geometry)
Groundwater:	☒ Yes ☐ No	- a total of 15 piezometers with continuous monitoring on several sites - soil temperature - soil suction

Rainfall data:	☒ Yes ☐ No	- 10 raingauges distributed on the area (period 1900-ongoing) Climate change data available (scenario A2 – GIEC), downscaled at 250 m resolution on some specific sites of the area (specific downscaling procedure by Meteo-France). Period of simulation: 2050-2100
Temperature data:	☒ Yes ☐ No	- 4 meteo station (air temperature, air humidity, wind speed & direction, net radiation) distributed on the area
Humidity data:	☒ Yes ☐ No	- 4 meteo station (air temperature, air humidity, wind speed & direction, net radiation) distributed on the area
Earthquake strong motion data:	☒ Yes ☐ No	- seismic station at Jausiers - seismic station at Super-Sauze mudslide
Thematic conditioning factors map: *All data in GIS format*	☒ Yes ☐ No	- Several landslide inventory maps (several dates) 1/10,000 - Debris flow sources and deposits map (events >2003) 1/10000 - Geomorphologic map 1/10,000 (region); 1/5000 to 1/500 (local sites) - Geomorphodynamic map 1/10,000 (region); 1/5000 to 1/500 (local sites) - Derivatives of topographic map, 1/10,000 - Lithology map 1/50,000 - Tectonic map 1/10,000 - Engineering soil map 1/10,000 - Hydrological map 1/10,000 (stream, spring, lake, etc) - Landcover map (1890, 1956, 1974, 1982, 2000 & 2004) - Forest map (including tree characteristics) 1/10,000

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	- Daily data transfer of displacements (dGPS) & meteo data for LaValette et Super-Sauze landslides - Web access at the OMIV Website (http://eost.u-strasbg.fr/omiv) - EWs by RTM (infra red camera + optical camera + benchmark displacement + debris flow detection; automated linked to Prefecture Alpes-de-Haute-Provence) for LaValette landslide - EWs by RTM for Adroit landslide (water level in piezometers) - Thresholds for pre-alarm/alarm/alert available

27 BARCELONNETTE (4/5)

Elements at risk (specify): Roads, bridges, buildings, ski and summer leisure facilities … located on or near active landslides and on active torrential cones Data available: - Element at risk map (including attributes of the elements at risk) – 1/10,000 - Database of mitigations works (check dams, etc) – 1/10000 - Data on damages on elements at risk - Fragility functions for buildings - Risk perception enquiry performed in 2009 (> 350 answers to questionnaires) *(All data in GIS format)*		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in ca. 50 M € for the last 10 years
Social consequences due to previous events:	☒ Yes ☐ No	Relocation of some inhabitants, destruction of housing, destruction or closing of roads
Mitigation (already performed or envisaged): *(All data in GIS format)*	☒ Yes ☐ No	Non structural – Monitoring system Structural – Water drainage, Check dams and debris barriers
Land planning already established for the case: *(All data in GIS format)*	☒ Yes ☐ No	PPR (French Risk Maps) for the 6 municipalities of the area History of regulation maps available (Zermos, PER, PPR)

Numerical modelling (already done):	☒ Yes ☐ No	Several types of models (analytic, physical, static, FEM…) for various landslides sites within the Barcelonnette area : - Model for slow displacements, model for fluidization, models for mudflow behavior, hydrological model ; - Static modeling of safety factors ; - FEM modeling (Flac / GefDyn / Abaqus) ; - Physical modeling (inclined plane) ; - Various debris flow runout and spreading models.
Risk analyses already carried out	☒ Yes ☐ No	Quantitative on local sites (La Valette, Super-Sauze, Faucon torrent) Semi-quantitative at the regional scale (Barcelonnette area)
References (papers and other published material, www site), specify:	See: http://eost.u-strasbg.fr/omiv/Publications_barcelo_area.html Risk Assessment here: http://eusoils.jrc.ec.europa.eu/library/themes/Landslides/ Meeting102007/Landslide_France.pdf	
The case history has been considered in other research projects?	☒ Yes ☐ No	- EC FP3 TESLEC, EC FP4 NEWTECH, EC FP5 ALARM, EC FP6 MOUNTAIN RISKS - French funding: PNRH, ACI MOTE, ACI SAMOA, ACI GACH2C, ECCO ECOU-PREF, ANR TRIGGERLAND, ANR SISCA

27 BARCELONNETTE (5/5)

General comments and pictures:
For a detailed description of the study site, the main research questions and the knowledge of the site, see: http://eost.u-strasbg.fr/omiv/barcelo_area_intro.html

South-facing slope

North-facing slope

28 SLANO BLATO (1/4)

Proposing partner:	GeoZS		
Person(s) in charge for the data management:	Name:	Magda Carman	
	email address:	Magda.carman@geo-zs.si	
	Fax No.	+ 386 28 09 753	

Country:	Slovenia	Location:	Lokavec, near Ajdovščina, SW Slovenia
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E13.8697° N45.9131°	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No

Data owner:	Ministry of the Enviromental and Spatial Planning of the Republic Slovenia	
Owner contact data :	Ervin.vivoda@gov.si	
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify wheter authorization is already available/requested): Data are (formaly) public, but possible with no access.	
Stakeholders:	(specify if they are interested in becoming end users of the project)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): First mentioned above 200 years ago.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☒ Reactivation
Triggering mechanism	Intensive precipitation in year 2000		
Average velocity:	Nov. 2000: 11m/day; after 3 reinforced shafts were built: oct 2004 1,1m/day; January 2009, after heavy rain: 3m/day		
Further notes:	Slano Blato in Slovene language means "salty mud".The area is characterised by the overthrust of Triassic limestone over the Eocene flysch.		

28 SLANO BLATO **(2/4)**

Landslide geometry:	Thickness	(m)	3m to 11m
	Surface*	(m^2)	60 to 200m wide and more than 1290 m long
	Volume	(m^3)	About 700 000 m^3
Run-out:	Height	(m)	
	Distance	(m)	500 m

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000	Year(s): 1993-1999
Digital Elevation Model	☒ Yes ☐ No	If yes, specify: Grid ASCII	Resolution and accuracy: DMV5 Accuracy: 1m on open spaces 3m on covered spaces	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: 1:5.000 DOF (aerial) Satellite images not available	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Several pictures of afeccted area.	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: mapping: geology, hydrology, ingeenering geology
Geophysics:	☒ Yes ☐ No	If yes, specify: Resistivity, refraction seismics
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): trial pits, 10 boreholes
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Standard lab. tests on soils: water content, grain size distribution, unit weight, liquid and plastic limit, triaxal and direct shear tests, oedometer test On rock specimens (flysch bedrock): water content, uniaxal rock strenght, direct shear test.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 8 slug tests, 1 pump test

Rainfall data	☒ Yes ☐ No	If yes, specify: precipitation measured in the rain gauge in the Lokavec village
Temperature data	☐ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): - official seismic hazard map of Slovenia for the earthquakes period of 500 years - new seismic hazard map of Slovenia – map of design acceleartion of ground

28 SLANO BLATO (3/4)

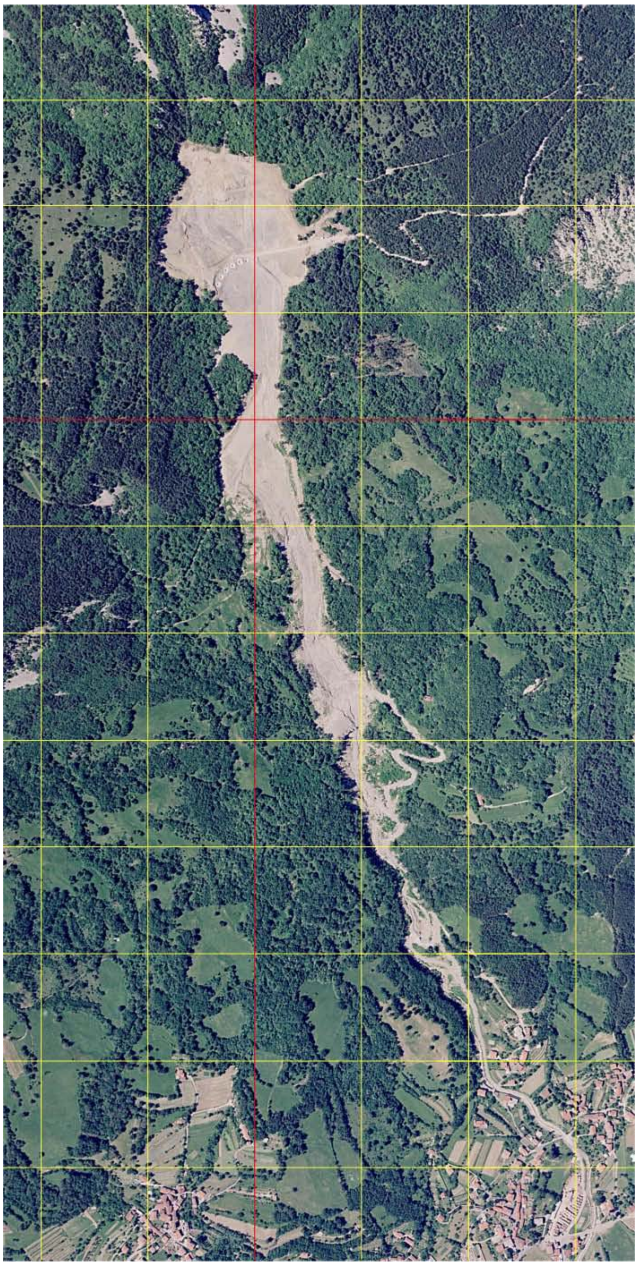
Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): In the years 2003 and 2004 some geodetic measurements were done for the upper part of the landslide.		

Elements at risk (specify): human lives, buildings, infrastructure		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Not estimated
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): already performed: several drainage trenches in the upper part; removal of 200 000m3 masess in the area of its front; the Grajšček streambed was enlarged, made concave and protected by rip-rap; a small rockfill dam plans for the future: a combination of drainage system (deep drains) with retaining works (vertical concrete shafts) and deep drainage trenches
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): FE – Plaxis FDM - Flac
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	- Kočevar, Marko, Ribičič, Mihael. Geological, hydrogeological and geomechanical investigation of Slano blato landslide. Geologija, 2002, 45, 2, p. 427-432. - Logar, Janko, Fifer Bizjak, Karmen, Kočevar, Marko, Mikoš, Matjaž, Ribičič, Mihael, Majes, Bojan. History and present state of the Slano Blato landslide. Nat. hazards earth syst. sci. (Print), 2005, 5, p. [447]-457. - Majes, Bojan. Analiza plazu in možnosti njegove sanacije = Analysis of landslide and its rehabilitation. Ujma (Ljubljana), 2000/2001, št. 14/15, - Other papers – only in Slovene language	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

28 SLANO BLATO (4/4)

General comments and pictures:



Aerial photo/view of Slano Blato

29 CASTAGNOLA (1/3)

Proposing partner:	UNIFI		
Person(s) in charge for the data management:	Name:	Nicola Casagli	
	email address:	nicola.casagli@unifi.it	
	Fax No.	0039 055 2756296	

Country:	ITALY	Location:	Castagnola, Framura municipality
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 9.5762 N 44.2269	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	La Spezia Province
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	
Confidentiality/ Access to data	☒ Public (full access and deployement) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☐ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Castagnola landslide is usually triggered by increase of pore water pressure related to rainfall conditions.		
Average velocity:	20 mm/yr. The velocity of the landslide is strongly related to meteorological conditions. During intense rainfall it can reach also velocities up to 40 mm/year		
Further notes:			

29 CASTAGNOLA (2/3)

Landslide geometry:	Thickness (m)	Multiple slip surface, thickness ranges from 10 m to 20 m.
	Surface* (m^2)	4,5 10^5
	Volume (m^3)	5,7 million
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:10.000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: resolution: 20 m	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: PSI data ERS from 1992 to 2001	
Pictures of the area of interest		☐ Yes ☒ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Geological map. A detailed geomorphological survey has been recently carried out producing a maps a scale of 1:2.000.
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Grain size analysis distribution and shear strenght parametrs.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Piezometric measurements (2001-2003)

Rainfall data	☒ Yes ☐No	If yes, specify: Rainfall data collected trough a rain gauge station installed in centre of the village. Consecutive measurements are available since April 2007 as daily cumulative rainfall.
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

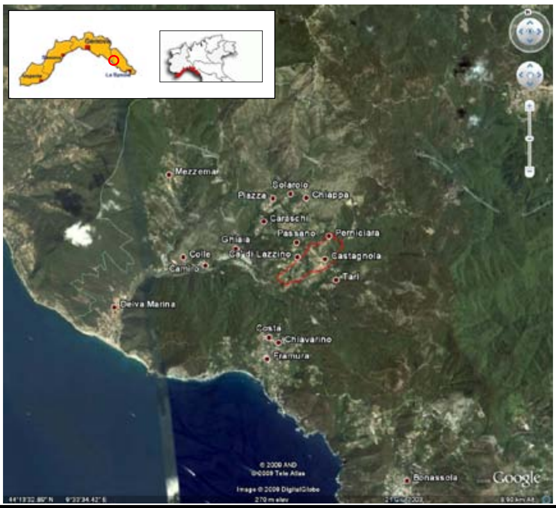
Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	Current monitoring: A monitoring system has been installed in 2007. The system is composed of clinometers , crackmeters, inclinometers and one rain gauge station. The instrumenation was equipped with automatic data collection. The information collected are forwared by GPRS to a remote server and the data can be viewed on a website 24h/24. **Past monitoring:** From October 2008 to March 2009 has been carried out the monitoring of Castagnola landslide by GBInSAR. The results have highlighted that landslide deformation pattern is related to rainfal conditions. Inclinometer measurements from April 2001 to April 2002, Crackmeter measurements from April 2001 to April 2002.

29 CASTAGNOLA (3/3)

Elements at risk: The landslide is affecting the village of Castagnola and the municipality road.		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: No quantification is available
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: The landslide has caused enormous structural damages to buildings and infrastructures and disruptions to utility lines.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):Superficial drainage systems, Retaining walls
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Ferretti A., Prati A., Rocca F., Casagli N., Farina P. (2005), Permanent Scatterers technology: a powerful state of the art tool for historic and future monitoring of landslides and other terrain instability phenomena. Proc. of 2005 International Conference on Landslide Risk Management. Singhroy V. (2008) Satellite remote sensing applications for landslide detection and monitoring. In Landslides-Disaster Risk Reduction. Sassa and Canuti Editors.	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Castagnola landslide has been studied during some research project between the Department of Earth Sciences, University of Firenze and La Spezia Province.

General comments and pictures:



30 BINDO (1/3)

Proposing partner:	UNIMIB	
Person in charge for the data management:	Name:	Giovanni B. Crosta
	email address:	Giovannibattista.crosta@unimib.it
	phone No.:	+39 02 64482029

Country:	ITALY	Location:	Bindo (Cortenova, Lombardia region)
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 09.3880° N 46.0080°	Google Earth kml file submitted:	☐ Yes ☒ No

Data owner:	University Milano Bicocca Comunità Montana Valsassina e Valvarrone Regione Lombardia
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify): raw data are not public. Reports and anaysis can be accessed
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐. Other WP's (specify)

Slide has occurred yet?	☒ Yes ☐ No	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify: Fully documented events in 2002 and 2004	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism			
Average velocity:			
Further notes:			

30 BINDO (2/3)

Landslide geometry:	Thickness (m)	37
	Surface (m^2)	1,600,000
	Volume (m^3)	> 50,000,000
Run-out:	Height (m)	
	Distance (m)	

Topographic maps:	☒ Yes ☐ No	If yes:	Scale(s): 1:5.000	Year(s): 2004
Digital Elevation Model	☒Yes ☐ No	If yes:	Resolution and accuracy: LIDAR 1m cell size	
Aerial, satellite images:		☒Yes ☐ No	If yes, specify coverage and date:	
Satellite interferometry:		☒Yes ☐ No	If yes, specify type (technique), scale and date: PS-InSAR data	
Pictures of the interested area		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify:
Geophysics:	☒ Yes ☐ No	If yes, specify: Seismic refraction, electrical tomography
Geotechnical data:	Site: ☐ Yes ☒No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Grain size analysis, direct shear tests, triaxial tests, SwCC, permebility test
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 3 standpipe piezometers

Rainfall	☒ Yes ☐ No	If yes, specify:
Temperature	☒Yes ☐ No	If yes, specify:
Humidity	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☐ No	If yes, specify:

Monitoring and/or early warning system:	☒ Yes ☐ No ☐Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Total station measurements (2 total stations, 60 targets) GPS measurements (4 points) Satellite PS-SAR measurements (1992-2008) GB-InSAR measurements (2002-2005) Borehole inclinometer, TDR and piezometer measurements

30 BINDO (3/3)

Elements at risk (specify): Buildings, facilities, transportation corridors, lifelines		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events (quantify in €): more then 50 millions of EURO		
Social consequences due to previous events	☒ Yes ☐ No	If yes, describe: delocalization of previously impacted settlement
Mitigation (already performed or envisaged):	☐ Yes ☐ No	If yes, describe:
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify:

Numerical modeling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Limit equilibrium analysis (static) FEM runout simulation
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: See Crosta et al, 2005, Frattini and Crosta, 2006
References (papers and other published material), specify:	- Crosta G.B., Chen H., Frattini P. (2006) Forecasting Hazard Scenarios and implications for the evaluation of Countermeasure Efficiency for Large Debris Avalanches. Engineering Geology, 83:236-253. - Crosta G.B., Frattini P., Fugazza F., Caluzzi L. e Chen H., (2005). Cost-Benefit analysis for debris avalanche risk management. In: Hungr O., Fell R., Couture R., Eberhart E. (eds.) Landslide risk management. Balkema, Rotterdam, 517-524. - Frattini P., Crosta G.B., (2006). Valutazione dell'accettabilità del rischio da frana e analisi costi-benefici. Giornale di Geologia Applicata, 4:49-56.	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures:

31 COURMAYEUR (1/3)

Proposing partner:	UNIMIB	
Person in charge for the data management:	Name:	Giovanni B. Crosta
	email address:	Giovannibattista.crosta@unimib.it
	phone No.:	+39 02 64482029

Country:	ITALY	Location:	M. de la Saxe (Courmayeur, Valle d'Aosta)
Scale:	☒ Single slide	☐ Multiple	☐ Regional

Reference geographical coordinates	E 6.9719° N45.8157°	Google Earth kml file submitted:	☐ Yes ☒ No

Data owner:	Regione Valle d'Aosta
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify): data are not public (not sharable with other partners)
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ .Other Wp's (specify)

Slide has occurred yet?	☒ Yes ☐ No	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify:	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism			
Average velocity:			
Further notes:			

31 COURMAYEUR (2/3)

Landslide geometry:	Thickness (m)	70
	Surface (m^2)	150,000
	Volume (m^3)	10,000,000
Run-out:	Height (m)	
	Distance (m)	

Topographic maps:	☒ Yes ☐ No	If yes:	Scale(s): 1:5.000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes:	Resolution and accuracy: 2m cell-size LIDAR	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the interested area		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: geological and geomorphological maps
Geophysics:	☒ Yes ☐ No	If yes, specify: Seismic refraction
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): 7 boreholes with core logging
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Grain size analysies, direct shear tests
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 3 standpipe piezometers

Rainfall	☒ Yes ☐ No	If yes, specify:
Temperature	☒ Yes ☐ No	If yes, specify:
Humidity	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☐ No	If yes, specify:

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): ED distance measurements (2 stations, 8 targets, 2002-2008) Total station measurements (25 targets, since 2009) GPS measurements (13 points, since 2008) GB-InSAR measurements (since 2009) Borehole inclinometer and piezometer measurements (since 2009)

31 COURMAYEUR (3/3)

Elements at risk (specify): Human lives, buildings, facilities		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events (quantify in €):		
Social consequences due to previous events	☐Yes ☒ No	If yes, describe:
Mitigation (already performed or envisaged):	☐ Yes ☐ No	If yes, describe:
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify:

Numerical modeling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Limit equilibrium analysis (static) FEM deformation modelling (static) FEM runout simulation
Risk analyses already carried out	☐Yes ☒No	If yes, specify:
References (papers and other published material), specify:		
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures:

32 FIUMELATTE - VARENNA (1/3)

Proposing partner:	UNIMIB	
Person in charge for the data management:	Name:	Giovanni B. Crosta
	email address:	Giovannibattista.crosta@unimib.it
	phone No.:	+39 02 64482029

Country:	ITALY	Location:	Fiumelatte-Varenna (Lombardia region)
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 9.2932° N46.0000°	Google Earth kml file submitted:	☐ Yes ☒ No

Data owner:	University Milano Bicocca Regione Lombardia
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployement) ☒ Not Public (specify): raw data are not public. Reports and anaysis can be accessed
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP2.3 Development of procedures for QRA at regional scale and European scale ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other Wp's (specify):

Slide has occurred yet?	☒ Yes ☐ No	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify: documented rockfall events	
Movement type:	☒ Falls ☒ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism			
Average velocity:			
Further notes:			

32 FIUMELATTE - VARENNA **(2/3)**

Landslide geometry:	Thickness (m)	
	Surface (m^2)	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

Topographic maps:	☒ Yes ☐ No	If yes:	Scale(s): 1:10.000	Year(s): 1981-1983
Digital Elevation Model	☒ Yes ☐ No	If yes:	Resolution and accuracy: 20m (whole area), 1m (partial coverage)	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:	
Satellite interferometry:		☐Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the interested area		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: geological and landuse maps at 1:10.000 scale
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐Yes ☒No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒No	If yes, specify (type and number of test, material tested):
Groundwater:	☐Yes ☒No	If yes, specify (piezometers, suction etc.):

Rainfall	☐ Yes ☒No	If yes, specify:
Temperature	☐Yes ☒No	If yes, specify:
Humidity	☐ Yes ☒No	If yes, specify:
Earthquake strong motion data	☐ Yes ☐ No	If yes, specify:

Monitoring an/or early warning systems:	☐Yes ☒No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):

32 FIUMELATTE - VARENNA (3/3)

Elements at risk (specify): Human lives, buildings, transportation corridors (road, railway)		
Human losses (death and injuries) due to previous events:	☒Yes ☐ No	If yes, quantify: 2 casualties in 1987, 2 casualties in 2004 (Fiumelatte)
Economic loss due to previous events (quantify in €): more then 7 millions of EURO in 2004		
Social consequences due to previous events	☒ Yes ☐ No	If yes, describe: loss of lives, costs of risk mitigation measures
Mitigation (already performed or envisaged):	☐ Yes ☐ No	If yes, describe:
Land planning already established for the case:	☐ Yes ☐ No	If yes, specify:
Numerical modeling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): 3D rockfall numerical modelling
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: see Agliardi et al., 2009
References (papers and other published material), specify:	- Cancelli, A. and Crosta, G. B.: Rockfall hazard and risk mapping, in: Proceedings 7th International Conference and Field Workshop on Landslides, edited by: Novosad, S. and Wagner, P., Czech-Slovak Rep., Balkema, 69–76, 1993. - Crosta, G. B. and Agliardi, F.: A methodology for physically based rockfall hazard assessment, Nat. Hazards Earth Syst. Sci., 3, 407–422, 2003, http://www.nat-hazards-earth-syst-sci.net/3/407/2003/. - Agliardi F., Crosta G.B.., Frattini P. (2009) Integrating rockfall risk assessment and countermeasure design by 3D modelling techniques. Natural Hazards and Earth System Sciences, 9:1059-1073.	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

General comments and pictures:

33 LIRI – GARIGLIANO – VOLTURNO RIVERS (1/4)

Proposing partner:	UNISA		
Person(s) in charge for the data management:	Name:	LEONARDO	CASCINI
	email address:	l.cascini@unisa.it	
	Fax No.	+39 089 964231	

Country:	ITALY	Location:	CENTRAL-SOUTHERN ITALY
Scale:	☐ Single slide	☐ Multiple	☒ Regional
Reference geographical coordinates	E14.33° N41.07° (coordinates of the headquarter)	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	NATIONAL BASIN AUTHORITHY OF LIRI-GARIGLIANO AND VOLTURNO RIVERS
Owner contact data:	
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployment) with some restrictions ☐ Not Public (specify whether authorization is already available/requested):
Stakeholders:	Inhabitants. Local and regional Italian Authorities (they might be interested in becoming end users of the project).

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☒ Spreads ☒ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Groundwater fluctuations, anthropogenic factors.		
Average velocity:	From some mm/yr up to 1.8 m/hr		
Further notes:	The territory of the National Basin Authority of Liri-Garigliano and Volturno rivers (NBA LGV) extends for about 12,000 km^2. Within this territory, about 18,000 slow-moving landslides were mapped at 1:25,000 scale; these landslides affect 10% of the NBA LGV territory.		

33 LIRI – GARIGLIANO – VOLTURNO RIVERS (2/4)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale: 1:25,000. For some portions, maps at a more detailed scale (1:5,000) are available.	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution: 20x20m on the whole area and 5x5m on specific sites.	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: Aerial photographs are available at 1:33,000 scale (1954, 1990, 1991) and at 1:13,000 scale (1998).	
Satellite interferometry:		☒ Yes ☐ No	33 ERS1-ERS2 images processed at low and full-resolution via SBAS (Berardino et al., 2002) and ESD (Fornaro et al., 2009) algorithms covering the period June 1995 – January 2000. The dataset is going to be integrated.	
Pictures of the area of interest		☒ Yes ☐ No	The damage survey dataset includes several images of involved structures/infrastructures.	

Geology and geomorphology:	☒ Yes ☐ No	Geological, geomorpholgical and hydrogeological studies and maps at 1:25,000 scale on the whole territory and at 1:5,000 on specific sites.
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	On specific sites only.
	Lab: ☐ Yes ☒ No	On specific sites only.
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.): piezometers on specific sites.

Rainfall data	☒ Yes ☐ No	If yes, specify: monthly and yearly average data
Temperature data	☒ Yes ☐ No	If yes, specify: monthly and yearly average data
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Eqk. name, Magnitude, Date etc.): Irpinia earthquake, 6.9 Richter, 23/11/1980.

Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged
	Inclinometers and piezometers on specific sites only.		

33 LIRI - GARIGLIANO – VOLTURNO RIVERS (3/4)

Elements at risk (specify): people, facilities (buildings, infrastructures), economical activities, environment.		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:... Death and injuries were recorded only on sites affected by fast slope movements.
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: owing to the extension of the whole territory the economic loss recorded in different sites is difficult to calculate.
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: constraints in land-use.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Control works, field monitoring only on specific sites.
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: New regulations about land-use.

Numerical modelling (already done)	☐ Yes ☒ No	On specific sites only.
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Piani Stralcio per l'Assetto Idrogeologico – Rischio da frana (Italian Law 365/2000)

References (papers and other published material, www site), specify:

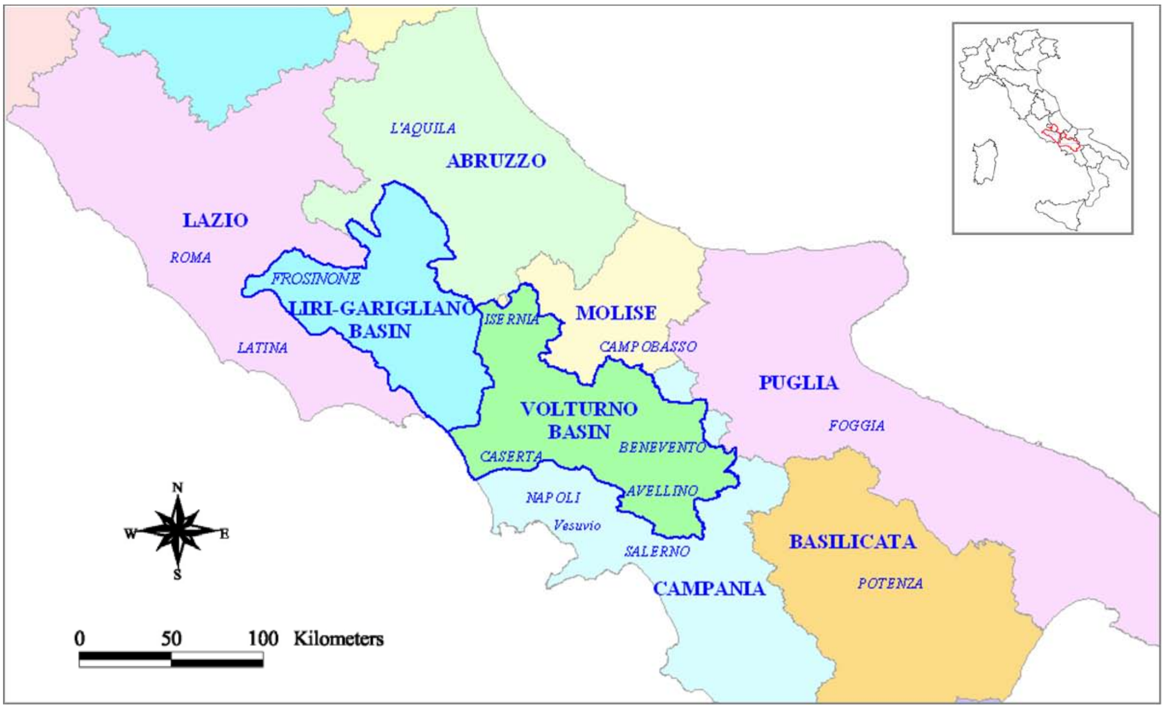
1. Cascini L. (2002) - Il rischio da frana in aree urbane dell'Appennino Centro-meridionale. Atti del XXI Convegno Nazionale di Geotecnica. L'Aquila, 11-13 Settembre. Patron Editore, pp. 127 – 134.
2. Cascini L. (2005) – Risk assessment of fast landslide–From theory to practice. General Report. In Proc. Int. Conference on "Fast Slope Movements – Prediction and Prevention for Risk Mitigation". Patron Editore, 2, pp. 33-52. ISBN: 88-555-2833-5
3. Cascini L., Bonnard Ch., Corominas J., Jibson R., Montero-Olarte J. (2005). – Landslide hazard and risk zoning for urban planning and development. – State of the Art report. Atti della International Conference on Landslide Risk Management, Hungr, Fell, Couture & Eberhardt (eds), pp. 199-235, A.A. Balkema Publishers. ISBN: 041538043X
4. Peduto, D., Cascini, L., Fornaro, G. (2007). The use of DInSAR for landslide detection over large areas. Proc. 1st North American Conference on Landslides. Vail , Colorado, 3-8 June 2007. AEG Special Publication 23, 366-375. Editori: Schaefer,V.R., Schuster R.L., Turner A.K.
5. Cascini L. (2008) – Applicability of landslide susceptibility and hazard zoning at different scales Engineering geology, 102, pp. 164-177. doi:10.1016/j.enggeo.2008.03.016
6. Cascini L., Di Nocera, Ferlisi S., Fornaro G., Peduto D., Pisciotta G. (2008). Multitemporal DInSAR data and damage to facilities as indicators for the state of activity of slow-moving landslides. Proc. of 10th International Symposium on Landslides, Xjian, China, 30 June - 4 July 2008. Editors: Chen Z., Zhang J., Li Z., Wu F., Ho K., Taylor & Francis Group, London, ISBN 978-0-415-41196-7, vol. 2, pp.1103-1109.
7. Cascini L., Fornaro G., Peduto D. (2009). Analysis at medium scale of low-resolution DInSAR data in slow-moving landslide-affected areas. ISPRS Journal of Photogrammetry and Remote Sensing, 64(6), 598-611.
8. Cascini L., Peduto D., Fornaro G., Lanari R., Zeni G., Guzzetti F. (2009). Spaceborne Radar Interferometry for Landslide Monitoring. In: Rainfall-induced landslides: mechaisms, monitoring techniques and nowcasting models for early warning systems. Eds: L.Picarelli, P.Tommasi, G.Urciuoli, P.Versace. Proc. of First Italian Workshop on Landslides, Napoli, 8-10 Giugno 2009, vol.1, 138-144, ISBN 978-88-89972-12-0.

Web site: www.autoritadibacino.it

33 LIRI – GARIGLIANO – VOLTURNO RIVERS (4/4)

The case history has been considered in other research projects?	☒ Yes ☐ No	Some sites within the proposed area have been considered in a national project financed by the Italian Ministry of Education (PRIN 2007) aimed to the susceptibility analysis of landslides reactivated by earthquakes.

General comments and pictures:



34 MANNEN (1/5)

Proposing partner:	International Centre for Geohazards (ICG) / Åknes/Tafjord Early Warning Centre		
Person(s) in charge for the data management:	Name:	Lars Harald Blikra	Tore Bergeng
	email address:	lhb@aknes.no	tb@aknes.no
	Fax No.		

Country:	Norway	Location:	Mannen, Romsdalen, Møre and Romsdal, Norway
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 07° 46,30' N 62°.27,20'	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	Åknes/Tafjord Early Warning Centre and some data at Geological Survey of Norway
Owner contact data :	Lars Harald Blikra (1), Tore Bergeng (2)
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public ((Full access of general data (e.g. topography, geology, structural, borehole, hazard/risk etc.), detailed monitoring data accessible on request) ☐ Not Public (specify wheter authorization is already available/requested):
Stakeholders:	Rauma municipality

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechnical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☐ Yes ☒ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Several historical rockslides from the area.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☒ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall/snowmelt, permafrost melting,		
Average velocity:	5 cm/year in parts of the rockslide		
Further notes:	Rockslide deposits have been mapped in the valley below (Romsdalen)		

34 MANNEN (2/5)

Landslide geometry:	Thickness (m)	Unknown (100-200 m ?)
	Surface* (m^2)	250 000
	Volume (m^3)	2 – 25 000 000
Run-out:	Height (m)	1200
	Distance (m)	3000

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): Digital data from air-based LIDAR	Year(s): 2008
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 1 m pixel, LIDAR data	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date:	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: InSAR, different dataset	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Numerous	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Structural map, map of fractures
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: Full meteorological station estblished november 2009
Temperature data	☒ Yes ☐ No	If yes, specify: Meteorological station november 2009
Humidity data	☒ Yes ☐ No	If yes, specify: Meteorological station november 2009
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Eqk. name, Magnitude, Date etc.):

34 MANNEN (3/5)

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Monitoring systems established November-December 2009 (extensometers, tiltmeters, single laser, ground-based radar).		

Elements at risk (specify): Buildings, railway, road. Direct influence by a rockslide and possible landslide damming and landslide-dam collapse		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Monitoring systems established. Operative early-warning from 2010
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify: Hazard zoning in progress

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Runout modeling is going to be performed in 2010
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: First preliminary analysis
References (papers and other published material, www site), specify:	Blikra, L.H., Anda, E. & Longva, O. 1999: Fjellskredprosjektet i Møre og Romsdal: Status og planer. Geological Survey ofg Norway Report *99.120.* Blikra, L.H., Longva, O., Braathen, A., Anda, E., Dehls, J. & Stalsberg, K. 2006: Rock-slope failures in Norwegian fjord areas: examples, spatial distribution and temporal pattern, 475-496. In Evans, S.G., Scarascia Mugnozza, G., Strom, A. & Hermanns, R.L. (eds.), Landslides from massive rock slope failure. Nato Science Series: IV: Earth and Environmental Sciences, Vol. 49 Dahle, Anda, Saintot & Sætre (2008): Faren for fjellskred fra fjellet Mannen I Romsdalen. Geological Survey ofg Norway Report 2008.037.	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

34 MANNEN (4/5)

General comments and pictures:
The unstable areas at Børa in Romsdalen was first recognized at the end of the 20th century during the rockslide hazard program at Geological Survey of Norway (Blikra et.al. 1999). Periodic GPS measurements were started at the Mannen area in 2006, and the documentation of yearly movements of up to 5 cm in a large area led to intensification of investigations and establishment of monitoring systems. It is the plan to have an operational early-warning system in 2010.
Below is given some photos and illustrations. Two possible scenarios is proposed, one of 2-3 mill m^3 and a larger scenario of 15-25 mill m^3.

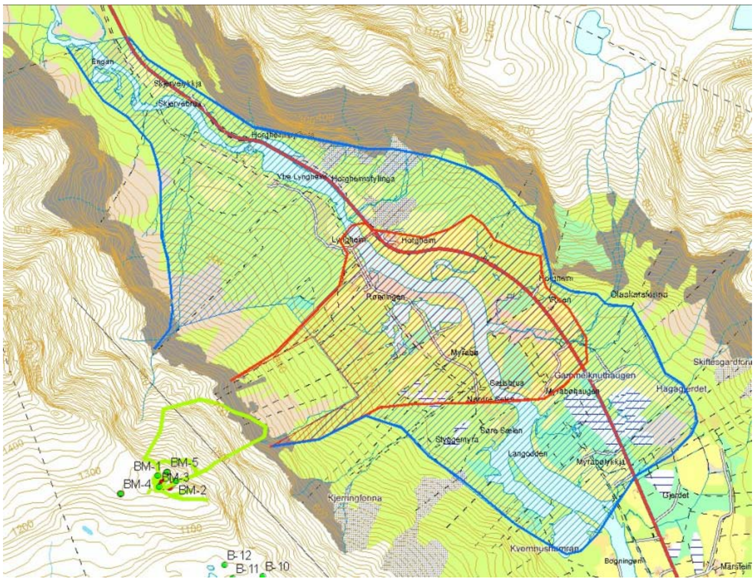


Figure 1. The location of the Mannen rockslide with the periodic GPS points shown. The yellow line gives an approximation of the possible unstable area of 15-25 mill m^3. The red and blue areas gives the first evaluation of possible run-out areas for a rockslide from the two scenarios (2-3 vs 15-25 mill m^3).

Figure 2. Overview of the Mannen rockslide with the well-defined backscarp and the Romsdalen valley below.

34 MANNEN **(5/5)**

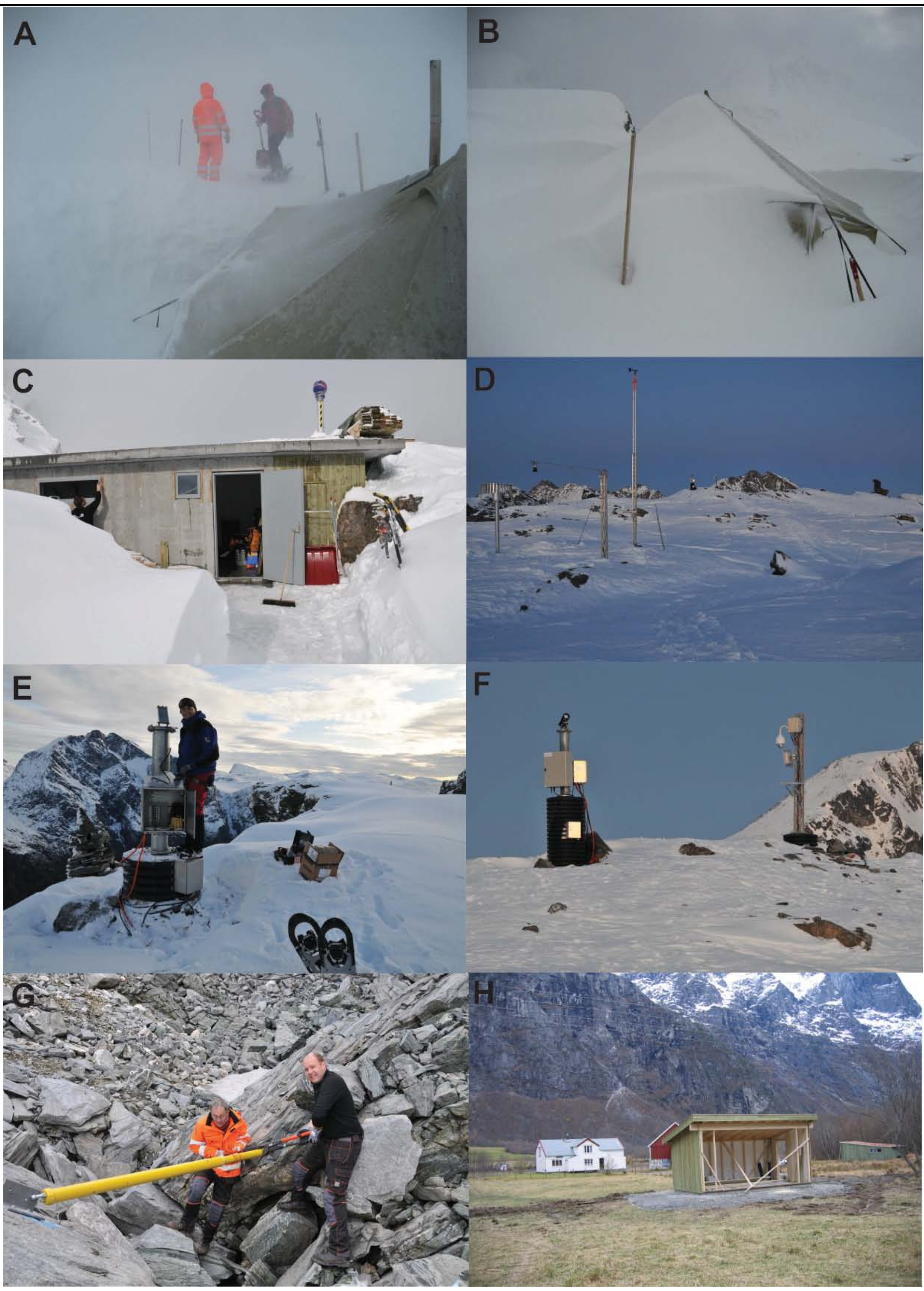


Figure 3. Some photos from the establishment of monitoring systems in 2009: A) og B) Snow condition and camp area in October; C) Bunker for the power supply, communication and instrumentation; D) Meteorological station; E) Establishment of the laser system; F) Laser to the left, and communication antenna and web camera to the right; G) Extensometer; H) Building for the ground-based radar in Romsdalen valley.

35 ÅLESUND ROCKSLIDE (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Marc-Henri Derron	
	email address:	Marc-Henri.Derron@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Norway	Location:	Møre and Romsdal		
Scale:	☒ Single slide		☐ Multiple		☐ Regional
Reference geographical coordinates	62°28'22"N 6° 9'48"E		Google Earth™ kml file submitted with this form:	☐ Yes ☒ No	

Data owner:	Aalesund Commune	
Owner contact data :	Lars Blikra (IKS)	
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒ Not Public	
Stakeholders:	(specify if they are interested in becoming end users of the project)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):sensitive clays
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Engineering works (slope cutting)		
Average velocity:			
Further notes:	March 26, 2008; example of catastrophic domino effect		

35 ÅLESUND ROCKSLIDE (2/4)

Landslide geometry:	Thickness (m)	15
	Surface* (m^2)	
	Volume (m^3)	1400
Run-out:	Height (m)	
	Distance (m)	10

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1:5000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: cm, lidar (NGU)	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: helicopter	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: many right after the event	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Maps NGU (online)
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): NGI, NGU
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Fault gouges (ICG, UNIL)
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: Commune , IKS
Temperature data	☒ Yes ☐ No	If yes, specify: Commune , IKS
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

35 ÅLESUND ROCKSLIDE (3/4)

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):

Elements at risk (specify): 1 five stores house destroyed (+1 gas tank destroyed and 500 persons living around)		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	5
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: reevaluation of the technical procedures
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☐ No	If yes, specify:
References (papers and other published material, www site), specify:	Skredulykka I Aalesund Rapport fra Aalesundutvalet, November 17 2008	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: UNIL: num model, rock weathering

35 ÅLESUND (4/4)

General comments and pictures:

Slope destabilized by human activities (slope cutting)

Ref: Skredulykka I Aalesund (2008)

36 NAMSOS (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Marc-Henri Derron	
	email address:	Marc-Henri.Derron@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Norway	Location:	Trøndelag
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	64°28'11"N 11°26'28"E	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Samferdselsdepartementet Vegdirektoratet
Owner contact data:	Utbyggingsdirektør Lars Aksnes, Vegdirektoratet
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐ Not Public
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☐ Yes ☒ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☐ Earth ☒ Other (specify):sensitive clays
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Engineering works (blasting)		
Average velocity:			
Further notes:	Quick clays		

36 NAMSOS (2/4)

Landslide geometry:	Thickness (m)	10-20
	Surface* (m^2)	30000
	Volume (m^3)	400000
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1:5000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 25 m (+ALS) - not public	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: online	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: many pictures of the day after (NVE, NGI, NGU, NTNU, …)	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Maps NGU (online)
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): CPTU (NTNU)
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☐ Yes ☒ No	If yes, specify:
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Equake name, Magnitude, Date etc.):

36 NAMSOS (3/4)

Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):		

Elements at risk (specify): 4 houses and 6 cabins destroyed		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): dynamic (plaxis)
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Skredet i Kattmarkvegen i Namsos 13. mars 2009 Rapport fra undersøkelsesgruppe satt ned av Samferdselsdepartementet Steinar Nordal, NTNU, Claes Alén, Chalmers, Arnfinn Emdal, NTNU, Leif Jendeby, Vägvärket Sverige, Einar Lyche, Rambøll, Christian Madshus, NGI	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Norwegian projects running

36 NAMSOS (4/4)

General comments and picture:

Landslide created by engineering works (blasting)

Figur 3 Foto av skredområdet. Foto: Leif Arne Holme

Figur 4 Detalj av sprengningsområdet. Foto: Leif Arne Holme

In: Skredet i Kattmarkvegen i Namsos (2009)

37 RISSA **(1/4)**

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Marc-Henri Derron	
	email address:	marc-henri.derron@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Norway	Location:	Trøndelag
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	63°34'35.97"N 9°55'59.69"E	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	ICG (NGI)	
Owner contact data :	NGI	
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ☒ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐ Not Public:	
Stakeholders:	(specify if they are interested in becoming end users of the project)	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☐ Earth ☒ Other (specify):sensitive clays
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Building works (Head charge with excavation material)		
Average velocity:			
Further notes:	Classical example of quick clays; April 29, 1978		

37 RISSA (2/4)

Landslide geometry:	Thickness (m)	15
	Surface* (m^2)	330000
	Volume (m^3)	5-6 million
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):1:5000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 25 m (+ALS) - not public	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: online	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: video of the event (NGI)	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Maps NGU (online)
Geophysics:	☐ Yes ☐ No	If yes, specify:
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): NGI
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☐ Yes ☐ No	If yes, specify:
Temperature data	☐ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☐ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

37 RISSA **(3/4)**

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged	
	If yes or envisaged, specify (technique, frequency, web access etc.):	

Elements at risk (specify): 5 Houses (farms)		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	1
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €:
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: quick clays maps (skrednett.no)

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☐ No	If yes, specify:
References (papers and other published material, www site), specify:	Gregersen, O. (1981) The Quick Clay Landslide in Rissa, Norway. X International Conference on Soil Mechanics and Foundation Engineering, Stockholm 1981. Proceedings, Vol. 3, pp. 421-426.	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Classical example

37 RISSA (4/4)

General comments and pictures:

Building works (Head charge with excavation material).

Ref: www.ngi.no

38 ABERFAN LANDSLIDE (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Clément Michoud	
	email address:	clement.michoud@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Wales, UK	Location:	Aberfan
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	3°20'50''W 51°41'46''N	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒ Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☐ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): landslide occured the 21th of October 1966 and it was related in newspapers and many technical reports.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☒ Other (specify): backfill
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism			
Average velocity:	Eye witnesses evaluated the velocity at 10-20 miles/h (~16-32 km/h) (Bishop & Penman, 1968)		
Further notes:			

38 ABERFAN LANDSLIDE **(2/4)**

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	140'000 yd^3 or 107'000 m^3
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☐ Yes ☒ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: aerial photographs taken between 1945 and 1966	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Photography and maps of phonemena	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: hill of gangue mining debris of coalfield.
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☐ Yes ☒ No	If yes, specify:
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

38 ABERFAN LANDSLIDE (3/4)

Monitoring and/or early warning systems:	☐ Yes ☐ No ☒ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): due to several past events (1939, 1944 and 1963), the Chief Divisional Engineer had to check to stability; also the tips at Aberfan were reported as stable in 1965. Thanks to back-analysis with aerial photographs, a continuous horizontal movement of 1 inch per day was detected between november 1964 and june 1965. (Beshop & Penman, 1968)

Elements at risk (specify): Aberfan city		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: local junior school and 18 habitations destroyed killing 116 children and 28 adults
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: First of all, the potential risk of coalfield tips was investigated in South Wales Area by the National Coal Board. After, existing legislations on colliery and mine tips were revised (Mine and Quarries Act, 1969).
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural): No, because the tips were classified as stable in 1965.
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: the Chief Divisional Engineer reported the tips at Aberfan as stable in 1965.
References (papers and other published material, www site), specify:	Bentley, S.P., Siddle, H.J., 1996. Landslide research in the South Wales coalfield. Engineering Geology, 43. Pp 65-80 Bishop, A.W., Penman, A.D.M., 1968. The Aberfan disaster: technical aspects. British Geotechnical Society, Informal discussion. Pp 317-318 Siddle, H.J., Wright, M.D., Hutchinson, J.N., 1996. Rapid failures of colliery spoil heaps in the South Wales Coaldfield. Quarterly Journal of Engineering Geology and Hydrogeology, 29. Pp 103-132.	
The case history has been considered in other research projects?	☐ Yes ☐ No	If yes, specify the project name and use of data:

38 ABERFAN LANDSLIDE (4/4)

General comments and pictures :

Ref (left) : http://www.nuffield.ox.ac.uk

Ref (right) : http://img.thesun.co.uk

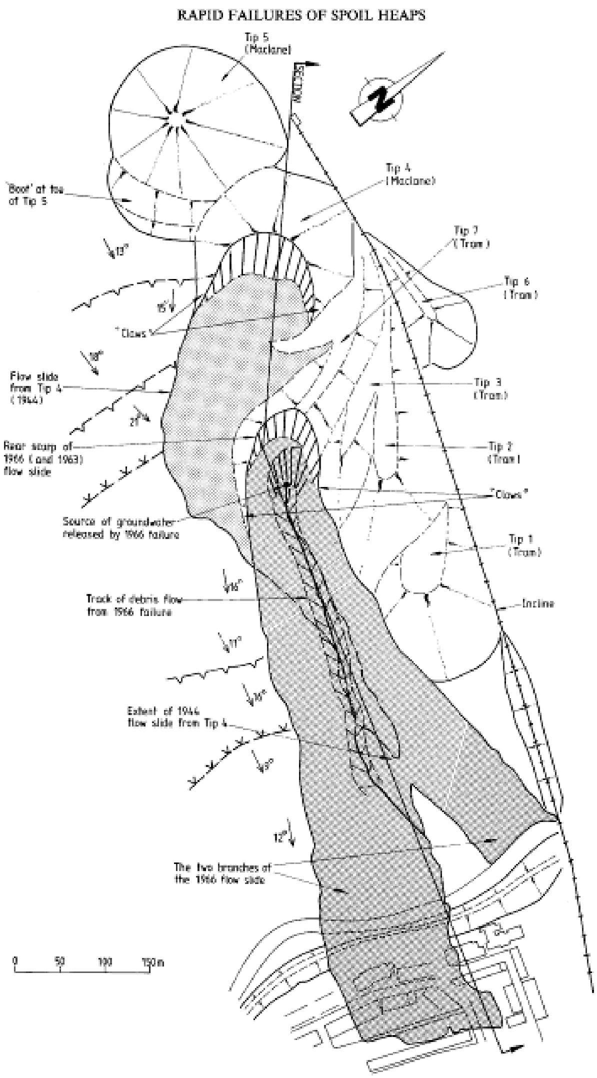


FIG. 25. Plan of Merthyr Vale (Aberfan) colliery tip flow slides of 1944, 1963 and 1966.

Ref : Siddle et al. 1996

39 FOURVIÉRE LANDSLIDE (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Clément Michoud	
	email address:	clement.michoud@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	France	Location:	LYON, Fourvière hill
Scale:	☐ Single slide	☒ Multiple	☐ Regional
Reference geographical coordinates	4°49'21''E 49°45'50''N	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐ Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☐ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): landslide occurred the 13th of November 1930 and it was related in French newspapers and technical reports.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☒ Other (specify): backfill
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	High pore pressure level due to intensive rainfalls and mainly to the maintenance lack of old canalizations, galleries and drainage systems.		
Average velocity:			
Further notes:	Landslide occurred in 2 events during the same night.		

39 FOURVIERE LANDSLIDE (2/4)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	25.000 m3
Run-out:	Height (m)	
	Distance (m)	120 m

* For multiple or regional system, specify the overall area extension

Topographic maps:	☐ Yes ☒ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☐ Yes ☒ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Photography	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: crystalline bedrock in depth, covered by marly, sand and backfill layers which include an important aquifer.
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: newspapers spoke of heavy rainfall during all the summer and the fall of this year.
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

39 FOURVIERE LANDSLIDE (3/4)

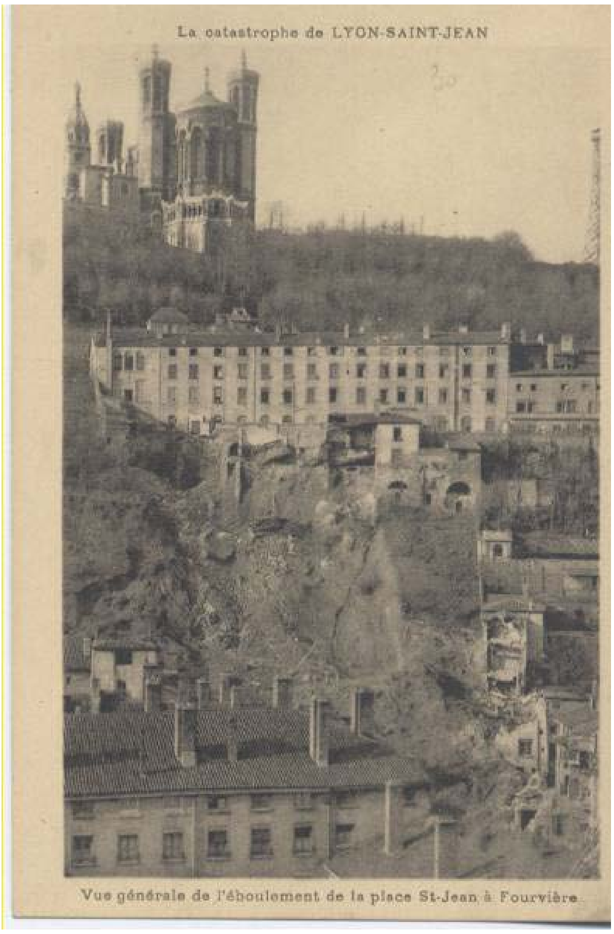
Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):		

Elements at risk (specify): Lyon city		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: 39 (23 rescuers buried by the 2d event)
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: 15 millions of old French francs.
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: important impact on the inhabitants and policies that created a new fund of 15 millions of old French francs for the victims.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): an architect and two geologists were mandated to map the underground network of canalizations.
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	Albenque A., 1931. L’éboulement de Lyon. In: Annales de Géographie, t. 40, N°223. pp. 105-106 Allix A., 1930. L’éboulement de Fourvière (note préliminaire). In: Les etudes rhodanniennes, vol. 6 N°4. pp. 454-455	
The case history has been considered in other research projects?	☐ Yes ☐ No	If yes, specify the project name and use of data:

39 FOURVIERE LANDSLIDE (4/4)

General comments and pictures:
Landslide indirectly caused by anthropogenic activities, and more particularly by lack of activities. Authorities should maintain the old water canalization network which had increase the water pore pressure in the superficial layers. Also the soil had already a high level of saturation before the heavy rainfalls of summer and fall before the landslide.



Ref: http://www.lyon.fr/static/vide.html
http://www.lyon.fr/vdl/sections/fr/arrondissements/5arrdt/vie_democratique1733/les_ceremonies_offic/la_catastrophe_de_fo

Ref: http://www.musee-pompiers.asso.fr/

40 FRANK (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Clément Michoud	
	email address:	clement.michoud@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Canada	Location:	Near Blairmore, South West Alberta
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	114°24'40''W 49°34'50''N	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Geological Survey of Alberta
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒ Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): fisrt rock avalanches occured the 29th of April 1903.	
Movement type:	☒ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Discontinuity sets allow complex wedges on the top and planar dip slope on the toe.		
Average velocity:			
Further notes:	Stability conditions were worsened by mining activities.		

40 FRANK (2/4)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	30'000'000 m^3
Run-out:	Height (m)	Deposit: 25 m height
	Distance (m)	2.5 km

* For multiple or regional system, specify the overall area extension

Topographic maps:	☐ Yes ☒ No	If yes, specify :	Scale(s):	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: HR-DEM by ALS	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: orthophoto	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: Singhroy & Molch (2004)	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: limestone anticline
Geophysics:	☒ Yes ☐ No	If yes, specify: micro-seismic
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): GSI, JRC, etc...
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: monitoring by meteorological stations
Temperature data	☒ Yes ☐ No	If yes, specify: monitoring by meteorological stations
Humidity data	☒ Yes ☐ No	If yes, specify: monitoring by meteorological stations
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

40 FRANK (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged	
	If yes or envisaged, specify (technique, frequency, web access etc.): Accoustic and micro-seimic, GPS, extensometers, Laser distance-meter, photogrammetry, meteorological stations	

Elements at risk (specify): railway, motorway, Hillcrest village		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: 70
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Cruden et Krahn (1973), other studies in progress
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify:
References (papers and other published material, www site), specify:	- McConnell, R.G., Brock, R.W., 1903. Report on the great landslide at Frank, Alberta, Department of the Interior, Annual report for 1903. Ottawa, part 8. Edmonton Geological Society 2003, 52 p. - Allan J. 1933. Report on stability of Turtle Mountain, Alberta and survey of fissures between North Peak and South Peak. Alberta Provincial Archives, Alberta Department of Public Works, Edmonton, Alberta. - Cruden D M, Krahn J. 1973. A re-examination of the geology of Frank slide. Canadian Geotechnical Journal 10, 581–591. - Langenberg C W, Pana D, Richards B C, Spratt D A, and Lamb M A. 2006. Structural geology of theTurtle Mountain area near Frank, Alberta. EUB/AGS Science Report 2007-01, 30 p. - Jaboyedoff M, Couture R, Locat P. 2009. Structural analysis of Turtle Mountain (Alberta) using digital elevation model: Towards a progressive failure. In: Geomorphology, 103(1), 5-16. - Pedrazzini A, Jaboyedoff M, Froese C R, Langenberg C W, Moreno F. 2009. Structural analysis of turtle Mountain; origin and influence of fractures in the development of rock slope failure. - Froese C R, Moreno F, Jaboyedoff M, Cruden D M. 2009. 25 years of movement monitoring on South Peak, Turtle Mountain: understanding the hazard. In: Canadian geotechnical journal. 46, 256-269. - Singhroy, V., Molch, K., 2004. Characterizing and monitoring rockslides from SAR techniques. Advances in Space Research, 33. Pp 290-295 - International Society of Rock Mechanics (ISRM). Suggested methods for the quantitative description of discontinuities in rock masses. In: International Journal of Rock Mechanics & Mining Sciences & Geomechanics Abstracts; 1978; 15: 319-358.	

40 FRANK **(4/4)**

The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data:

General comments and pictures:

Stability conditions were worsened by mining activities.

Photography: Florian Humair, IGAR-UNIL

41 ARVEL (1/4)

Proposing partner:	Unil		
Person(s) in charge for the data management:	Name:	Clément Michoud	
	email address:	clement.michoud@unil.ch	
	Fax No.	+41.21.692.35.47	

Country:	Switzerland	Location:	Arvel Quarry, Villeneuve
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	6°56'25''E 46°23'00''N	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒ Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy X Other WP's (specify): WP1.4 Human-induced landslides

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): landslide occurred the 14th of March 1922	
Movement type:	☒ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☐ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Geometry of slopes and discontinuity sets were favorable to toppling. The general stability of the slope was disturbed and worsened by the quarry.		
Average velocity:			
Further notes:			

41 ARVEL (2/4)

Landslide geometry:	Thickness (m)	120 m high cliff
	Surface* (m^2)	
	Volume (m^3)	615'000 m^3
Run-out:	Height (m)	Deposits: 6 to 24 m thick
	Distance (m)	337 m

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:25'000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 1 m resolution DEM by ALS and TLS	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: photographies	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Lower Jurassic formation (alternation of limestones and marls)
Geophysics:	☒ Yes ☐ No	If yes, specify: micro-seismic tests
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: achives shown no heavy rainfall before the rock avalanche.
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

41 ARVEL (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Ground-Based InSAR, Terrestrial Laser Scanning, (acoustic and micro-seismic).

Elements at risk (specify): Quarry worker and offices, inhabitants of Villeneuve, federal highway, railway.		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): e.g. in Crosta et al. (2009)
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: e.g. in Pedrazzini et al. (2009)
References (papers and other published material, www site), specify:	Choffat, Ph., 1929: L'éboulement d'Arvel (Villeneuve) de 1922. Bull. SVSN, 57. Pp 5-28. Crosta, G.B., Imposimato, S., Roddeman, D., 2009. Numerical modeling of entrainment/deposit in rock and debris-avalanches. Engineering Geology, 109. Pp 135-145. Jaboyedoff M., 2003. The rockslide of Arvel caused by human activity (Villeneuve, Switzerland). Summary, partial reinterpretation and comments of the work of Choffat, Ph., 1929: L'éboulement d'Arvel (Villeneuve) de 1922. Bull. SVSN, 57. Pp 5-28. Quanterra open file report – NH-03. 10p Pedrazzini, A., Matasci, B., Jaboyedoff, M., Chantry, R., Stampfli, E., 2009. Carrières d'Arvel à Villeneuve. Etude des instabilités rocheuses. Document inédit. 48p.	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data:

41 ARVEL (4/4)

General comments and pictures:

Even if the field was predisposed for landslides by its geology and structural settings, the situation was destabilized and worsened by the activity of the Arvel quarry.

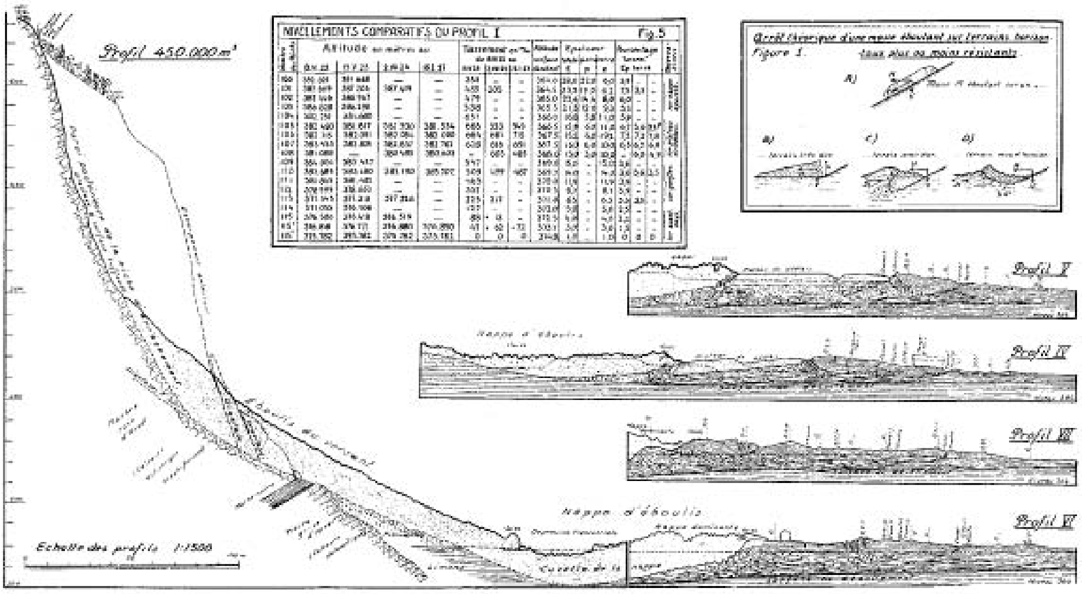


Fig.3: Cross-section of the rock-fall and effects in the alluvial plain.

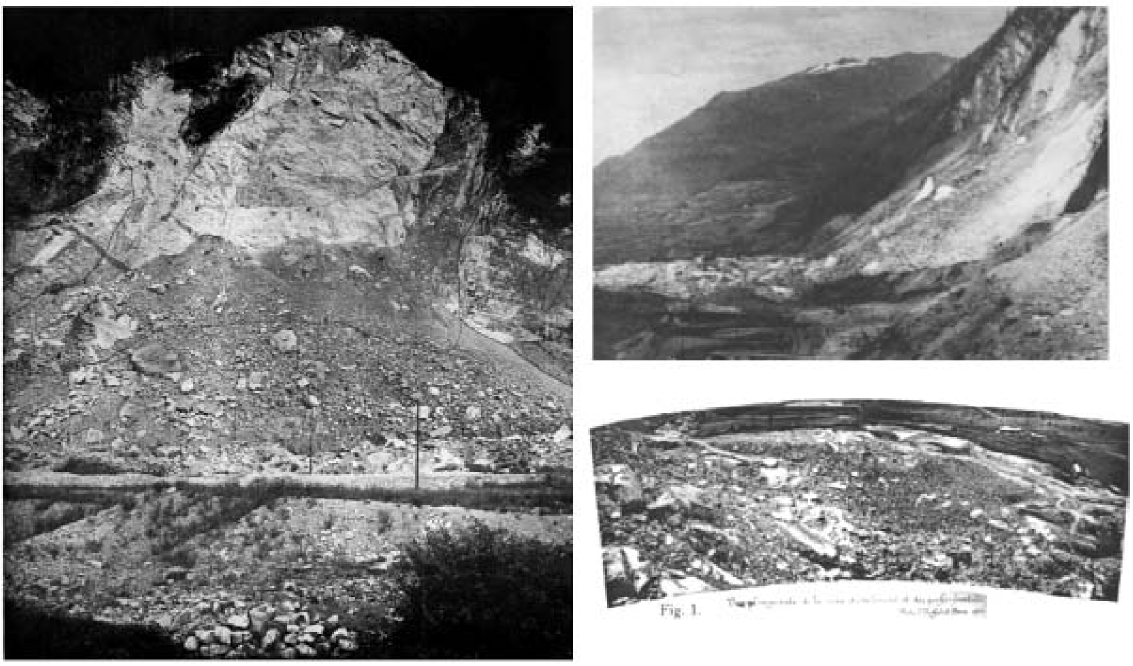


Fig 4: Pictures of the rock face and the deposit after the rock-fall.

Ref: Choffat (1929). In: Jaboyedoff (2003)

42 ARNO BASIN (1/4)

Proposing partner:	UNIFI			
Person(s) in charge for the data management:	Name:	Veronica Tofani	Name:	
	email address:	veronica.tofani@unifi.it	email address:	
	Fax No.	+39 055 2756296	Fax No.	

Country:	ITALY	Location:	Arno Basin
Scale:	☐ Single slide	☐ Multiple	☒ Regional
Reference geographical coordinates	E11°15'20'' N43°46'10''	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Autorità di bacino del Fiume Arno and Regione Toscana
Owner contact data (optional):	b.mazzanti@adbarno.it per Autorità di bacino Fiume Arno
Owner is (or is interested in becoming) end-user of SafeLand:	☒ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechanical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☒ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): early '800 to 2010	
Movement type:	☒ Falls ☒ Topples ☒ Slide rotational ☒ Slide translational ☒ Spreads ☒ Flows ☒ Complex	Material:	☒ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Mainly:increase of internal water pressure, decrease of stability due to erosion and/or anthropic activity		
Average velocity:	From very low (e.g. rotational slides) to very rapid (e.g. falls)		
Further notes:			

42 ARNO BASIN (2/4)

Landslide geometry:	Thickness (m)	
	Surface* (m^2)	
	Volume (m^3)	
Run-out:	Height (m)	
	Distance (m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1/2000; 1/10000; 1/25000	Year(s): late '90s to 2007
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 10m and 20m	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: All area; hystorical (from '50s for some zones) to 2000.	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: PS (ERS '92-2000; ENVISAT '2003-2010)	
Pictures of the area of interest		☐ Yes ☒ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: 1/10000 geological maps; 1/25000 geomorphological maps (and greater scales in some areas)
Geophysics:	☒ Yes ☐ No	If yes, specify: Geophisycal data in some local sites
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Sparse geotechnical data relative to different local
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Sparse geotechnical data relative to different local sites
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Sparse data4

Rainfall data	☒ Yes ☐ No	If yes, specify: automated rain gages network
Temperature data	☒ Yes ☐ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

42 ARNO BASIN (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): Sparse local and basin scale EWS (extensometers, inclinometers, piezometers, permanent scatterers, rain gauges)

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: unknown
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: not estimated.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify:

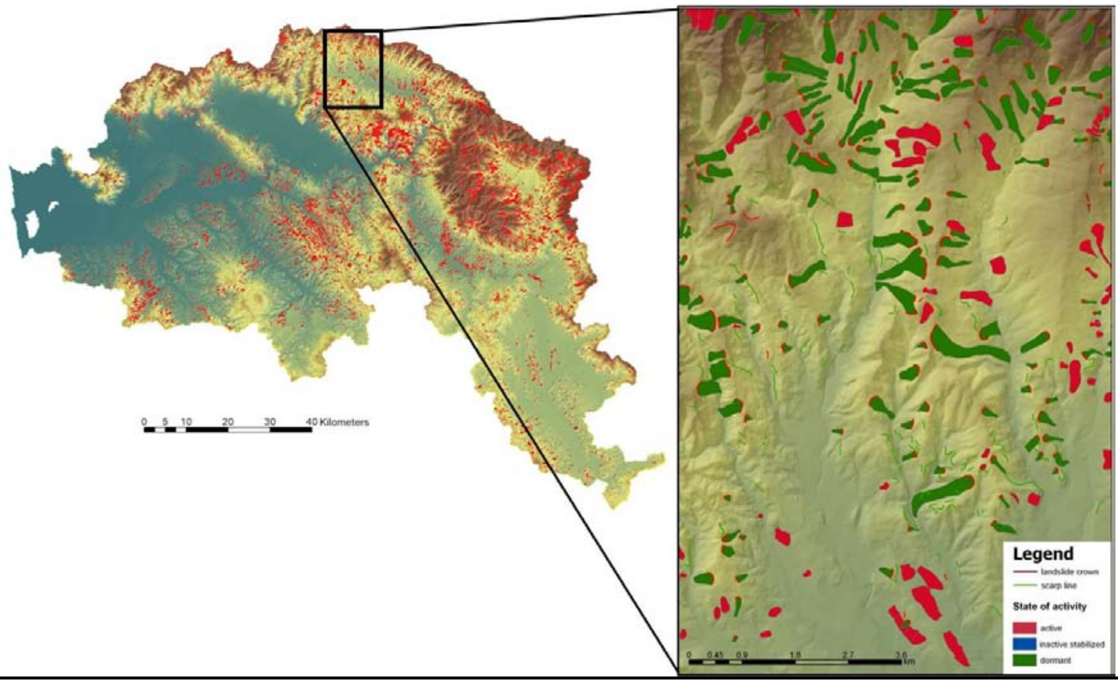
Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): sparse local and basin scale static and dynamic applications.
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: see references

References (papers and other published material, www site), specify:	Rosi A, Segoni S, Catani F, Casagli N., (in press), Statistical and environmental analyses for the definition of a regional rainfall thresholds system for landslide triggering in Tuscany (Italy). In press. Journal of Geographical Sciences. Segoni S., Rossi G., Catani F., 2012. Improving basin-scale shallow landslides modelling using reliable soil thickness maps. Natural Hazards. DOI 10.1007/s11069-011-9770-3 Catani F., Segoni S., Falorni G., 2010. An empirical geomorphology‐based approach to the spatial prediction of soil thickness at catchment scale, Water Resour. Res., 46, W05508, doi:10.1029/2008WR007450. Tofani V., Vannocci P., Dapporto S. & Casagli N., 2006. Infiltration, seepage and slope instability mechanisms during the 20-21 November 2000 rainstorm in Tuscany, central Italy. Natural Hazard and Earth System Sciences. European Geosciences Union, 6, 1025-1033. Catani F., Casagli N., Ermini L., Righini G. & Menduni G., 2005. Landslide hazard and risk mapping at catchment scale in the Arno River Basin. Landslides, 2(4), 329-343. Catani F., Farina P., Moretti S., Nico G., & Strozzi T., 2005. On the application of SAR interferometry to geomorphological studies: estimation of landform attributes and mass movements. Geomorphology, 66(1-4), 119-131. Ermini L., Catani F., Casagli N., 2005. Artificial neural networks applied to landslides susceptibility assessment. Geomorphology, 66(1-4), 327-343.

42 ARNO BASIN (4/4)

The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: several projects, both National and European.

General comments and pictures:



43 LAVAL (1/4)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Jean-Philippe Malet	
	email address:	jeanphilippe.malet@eost.u-strasbg.fr	
	Fax No.	+33 3 902 401 25	

Country:	France	Location:	South French Alps, Department of Alpes-de-Haute-Provence, 10 km km North of Digne-les-Bains
Scale:	☒ Single slide	☐ Multiple	☐ Regional
Reference geographical coordinates	E 6°36.69 N 44°13.98	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	CNRS & IRSTEA
Owner contact data (optional):	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage)
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐Not Public (specify whether authorization is already available/requested):
Stakeholders:	RTM (Restauration des Terrains en Montagne), IRSTEA (Institut de Recherche pour l'Ingénierie de l'Agriculture et de l'Environnement)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): Aerial orthorectified photographs 1990 – 2010 (before failure and after failure); On-site displacement monitoring 2006 – on-going; On-site hydrology monitoring 2006 – on going.	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall		
Average velocity:	0.001 – 0.01 m.day-1 / in acceleration.		
Further notes:	The landslide is part of the RVB (Reseau de Bassin Versants) Observatory / SOERE Draix-Bleone – Website: *rnbv.ipgp.fr ; www.irstea.fr/node/1681*		

43 LAVAL **(2/4)**

Landslide geometry:	Thickness (m)	10
	Surface* (m^2)	20000
	Volume (m^3)	200000
Run-out:	Height (m)	25
	Distance (m)	150

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:5000	Year(s): 1990
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: - 3 DEMs over period 1982 – 2009; Resolution = 5 m; Accuracy = 3 m - 1 airborne Lidar DEMs (2007); Resolution = 1 m; Accuracy = 20 cm	
Aerial, satellite images:		☒ Yes ☐ No	If yes, specify coverage and date: - Aerial airborne orthophotographs (1982, 88, 95, 2000, 2004, 2007) - VHR satellite image (SPOT5 – 2.5m, 2002, 2004, 2007, 2008 / Ikonos, 2006)	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Terrestrial picture taken monthly in front of the landslide since June 2007 (on-going)	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Geomorphological map (2002, 2007), Geological map
Geophysics:	☒ Yes ☐ No	If yes, specify: Ca. 10 ERT (electrical resistivity tomography) cross-sections, Ca. 5 active seismic tomographies
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): 3 boreholes, 10 dilatation tests in boreholes, several permeability tests (under pressure), 3 inclinometer (2007) – now broken.
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Physical identification (grain size, Atterberg, density..), Triaxial tests 8drained, undrained), Oedometer tests, Reheometrical tests 8cone-plane, plate-plate geometry).
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): 2 piezometers with continuous monitoring: soil temperature, soil moisture

Rainfall data	☒ Yes ☐ No	If yes, specify: - 1 raingauge on the study site
Temperature data	☒ Yes ☐ No	If yes, specify:- meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Humidity data	☒ Yes ☐ No	If yes, specify: meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Equake name, Magnitude, Date etc.):

43 LAVAL (3/4)

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged	
	If yes or envisaged, specify (technique, frequency, web access etc.):	

Elements at risk (specify): - road and bridges 1 km downstream of the landslide - dams		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☐ Yes ☒ No	If yes, quantify in €: ca 5M€
Social consequences due to previous events	☐ Yes ☒ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): - Several analytical models (model for slow displacements, slope hydrology model) - Static modeling of safety factors - FEM modeling (Flac) - Physical modeling (inclined plane)
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	See: http://eost.u-strasbg.fr/omiv/Publications_la_valette.html	
The case history has been considered in other research projects?	☒ Yes ☐ No	- French funding: PNRH, ACI MOTE, ECCO-Inféroflux, ECCO ECOU-PREF

43 LAVAL (4/4)

General comments and pictures:
For a detailed description of the study site, the main research questions and the knowledge of the site, see:

Fressard, M., Maquaire, O., Malet, J.-P., Klotz, S., Grandjean, G. 2009. Morpho-structure and triggering conditions of the Laval landslide developed in clay-shales, Draix catchment (South French Alps). In: Malet, J.-P., Remaître, A., Boogard, T.A. (Eds.), *Proceedings of the International Conference 'Landslide Processes: from geomorpholgic mapping to dynamic modelling*', Strasbourg, CERG Editions, pp. 107-110

http://eost.u-strasbg.fr/omiv/Landslide_Processes_Conference/Fressard_et_al.pdf

Photo:

44 GREVENA (1/4)

Proposing partner:			
Person(s) in charge for the data management:	Name:	Kyriazis Pitilakis	Stavroula Fotopoulou
	email address:	kpitilak@civil.auth.gr	sfotopou@civil.auth.gr
	Fax No.	00302310995693	

Country:	Greece	Location:	broader area of Grevena city, NW Greece
Scale:	☐ Single slide	☐ Multiple	☒ Regional
Reference geographical coordinates	E 21.416° N 40.083°	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	Aristotle University of Thessaloniki
Owner contact data (optional):	
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒Not Public (specify whether authorization is already available/requested):
Stakeholders:	(specify if they are interested in becoming end users of the project): Local and regional Greek Authorities might be interested in becoming end users of the project

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☐ Yes ☒ No	If yes, specify (including time span):	
Movement type:	☒ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☒ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☒ Recurrent ☒ Reactivation
Triggering mechanism	Earthquake, rainfall, human activities, erosion		
Average velocity:			
Further notes:			

44 GREVENA (2/4)

Landslide geometry:	Thickness (m)	Varies
	Surface* (m^2)	Varies
	Volume (m^3)	Varies
Run-out:	Height (m)	Varies
	Distance (m)	Varies

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1/25.000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy:	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Geology map, scale:1:50.000
Geophysics:	☒ Yes ☐ No	If yes, specify: microtremor measurements at the base of the slopes (plane conditions)
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): 37 geotechnical boreholes: 27 boreholes (typical depth of 10-15 m) were operated inside the city and 10 (typical depth of 30-40 m) at the entrance of the city N_{SPT} tests.
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): classical geotechnical laboratory (classification, mechanical properties, deformation parameters, etc.) tests on undisturbed and disturbed soil samples.
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☐ Yes ☒ No	If yes, specify:
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Equake name, Magnitude, Date etc.): Kozani earthquake, Mw 6.5, R=17km, 13/5/1995

44 GREVENA (3/4)

Monitoring and/or early warning systems:	☐ Yes ☒ No ☐ Envisaged	
	If yes or envisaged, specify (technique, frequency, web access etc.):	

Elements at risk (specify):		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Econimic loss recorded is difficult to assess
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify:
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☐ Yes ☒ No	If yes, specify:

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): 1D equivalent linear dynamic analysis in representative soil profiles
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Risk analysis of different elements at risk (roads, pipelines) exposed to earthquake triggered landslides unig HAZUS (NIBS,2004) methodology
References (papers and other published material, www site), specify:	Pitilakis et al. (2009). "SRM-DGC (Development and proposition for implementation of an efficient methodology and appropriate local instruments for the management, prevention and reduction of seismic risk in Düzce -Turkey, Grevena - Greece and Catania – Italy) Final Report, Part A (2009)", Final report for the city of Grevena (WP: 1-5), Laboratory of Soil Mechanics, Foundations & Geotechnical Earthquake Engineering, Department of Civil Engineering, Aristotle University of Thessaloniki. Pitilakis K., Anastasiadis A., Kakderi K., Manakou M., Manou D., Alexoudi M., Fotopoulou S., Argyroudis S., Senetakis K., (2011), "Development of comprehensive earthquake loss scenarios for a Greek and a Turkish city: Seismic hazard, Geotechnical and Lifeline Aspects", Earthquakes and Structures, Vol. 2, No 3, September 2011.	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: Development and Proposition for Implementation of an Efficient Methodology and Appropriate Local Instruments for the Management, Prevention and Reduction of Seismic Risk in Duzce-Turkey, Grevena-Greece and Catania-Italy **SRM-DGC A.1.010** (European Union, PF6)

44 GREVENA (4/4)

General comments and pictures:

45 MAS D'AVIGNONET (1/4)

Proposing partner:	CNRS		
Person(s) in charge for the data management:	Name:	Jean-Philippe Malet	
	email address:	jeanphilippe.malet@eost.u-strasbg.fr	
	Fax No.	+33 3 902 401 25	

Country:	France	Location:	Central French Alps, Department of Isère, 40 km south of Grenoble
Scale:	☒ Single slide	☐ Multiple	☒ Regional
Reference geographical coordinates	E 5°68.16 N 44°94.95	Google Earth™ kml file submitted with this form:	☐ Yes ☐ No

Data owner:	CNRS
Owner contact data (optional):	ISTerre / University of Grenoble
Owner is (or is interested in becoming) end-user of SafeLand:	☐ Yes ☒ No
Confidentiality/ Access to data	☒ Public (full access and deployment) ☐Not Public (specify whether authorization is already available/requested):
Stakeholders:	RTM (Restauration des Terrains en Montagne) – They are already end-users of the project (a letter of intent has been send at the proposal stage)

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☐ Other WP's (specify):

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes☐ No	If yes, specify (including time span): Aerial orthorectified photographs 1982 – 2008 On-site displacement monitoring 1990- (on-going) On-site hydrology monitoring > 2006	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☐ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☐ First time ☒ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall, snowmelt		
Average velocity:	0.001 – 0.02 m.year-1 Possibility of fluidization (triggering of rapid mudflows)		
Further notes:	The landslide is part of the French Observatory of Gravitational Processes (OMIV) – Website: http://eost.u-strasbg.fr/omiv		

45 MAS D'AVIGNONET (2/4)

Landslide geometry:	Thickness	(m)	80
	Surface*	(m^2)	500000
	Volume	(m^3)	4 M
Run-out:	Height	(m)	
	Distance	(m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1/25.000	Year(s):
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: - 3 airborne Lidar DEMs (2005, 2007, 2009); Resolution = 1 m; Accuracy = 20 cm	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date: - Aerial airborne orthophotographs (1982, 88, 95, 2000, 2004, 2007) - VHR satellite image (SPOT5 – 2.5m, 2002, 2004, 2007, 2008)	
Satellite interferometry:		☒ Yes ☐ No	If yes, specify type (technique), scale and date: SAR Interferometry (ERS), TerraSarX	
Pictures of the area of interest		☐ Yes ☒ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: - Geomorphological map (2008) - Geological map - 2 permanent GPS on site
Geophysics:	☒ Yes ☐ No	If yes, specify: - Ca. 10 ERT (electrical resistivity tomography) cross-sections - Ca. 10 active seismic tomographies
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): - 6 boreholes - Several permeability tests (under pressure) - 3 inclinometers (2007)
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): - Physical identification (grain size, Atterberg, density..) - Triaxial tests (drained, undrained) - Oedometer tests - Rheometrical tests (cone plate-plate geometry)
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): - 3 piezometers with continuous monitoring - soil temperature - soil moisture - SP (spontaneous potential)

Rainfall data	☒ Yes ☐ No	If yes, specify: - 1 raingauge on the site
Temperature data	☒ Yes ☐ No	If yes, specify: - meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Humidity data	☒ Yes ☐ No	If yes, specify: - meteo station (air temperature, air humidity, wind speed & direction, net radiation)
Earthquake strong motion data	☒ Yes ☐ No	If yes, specify (Equake name, Magnitude, Date etc.): - 2 seismic stations on the site

45 MAS D'AVIGNONET (3/4)

Monitoring and/or early warning systems:	☒ Yes	☐ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): - Daily data transfer of displacements (dGPS), hydrology and meteo data - Web access at the OMIV Website (http://omiv.osug.fr)		

Elements at risk (specify): - 20 houses located on the landslide (ca. 80 inhabitants) / expropriation possibility		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €:
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: Expropriation possibility
Mitigation (already performed or envisaged):	☐ Yes ☒ No	If yes, describe (structural/non-structural):
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: PPR (French Risk Maps)

Numerical modelling (already done)	☐ Yes ☒ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.):
Risk analyses already carried out	☐ Yes ☒ No	If yes, specify:
References (papers and other published material, www site), specify:	See: http://omiv.osug.fr/observations/omiv/MAS/publi.html	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: - EC FP6 MOUNTAIN RISKS - French funding: ACI GACH2C, ECCO ECOU-PREF, ANR SISCA

45 MAS D'AVIGNONET (4/4)

General comments and pictures:

For a detailed description of the study site, the main research questions and the knowledge of the site, see: http://omiv.osug.fr/observations/omiv/MAS/index.html

46 NEDRE ROMERIKE (1/3)

Proposing partner:	ICG		
Person(s) in charge for the data management:	Name:	José Cepeda	Helge Smebye
	email address:	Jose.Cepeda@NGI.NO	Helge.Smebye@NGI.NO
	Fax No.	+47 22 23 04 48	

Country:	Norway	Location:	Municipalities of Fet, Gjerdrum, Nannestad, Rælingen, Skedsmo, Sørum and Ullensaker (short name: Nedre Romerike). These municipalities are part of the Akershus county.
Scale:	☐ Single slide	☐ Multiple	☒ Regional
Reference geographical coordinates	E11.08° N59.95°	Google Earth™ kml file submitted with this form:	☐ Yes ☒ No

Data owner:	(1) Norwegian Mapping Authority, (2) Geological Survey of Norway	
Owner contact data (optional):	(1) firmapost@statkart.no (2) ngu@ngu.no	
Owner is (or is interested in becoming) end-user of SafeLand:		☐ Yes ☒ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒Not Public (specify whether authorization is already available/requested):	
Stakeholders:	(specify if they are interested in becoming end users of the project) NVE (end user of SafeLand) – www.nve.no SVV (end user of SafeLand) – www.vegvesen.no Akershus county - http://www.akershus.no/	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☐ WP1.1 Identification of mechanisms and triggers ☐ WP1.2 Geomechanical analysis of weather-induced triggering processes ☒ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☐ WP1.5 Verification and calibration of run-out models ☐ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☐ WP4.3 Technologies for early warning ☐ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☐ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify): WP 3.3

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): National inventory available from www.skrednett.no. Data for the study area from 1973 to 2000.	
Movement type:	☐ Falls ☐ Topples ☒ Slide rotational ☒ Slide translational ☐ Spreads ☐ Flows ☐ Complex	Material:	☐ Rock ☐ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall, snow melt, human activity, erosion at the toe		
Average velocity:	Very rapid to extremely rapid (i.e., > 3 m/min)		
Further notes:			

46 NEDRE ROMERIKE (2/3)

Landslide geometry:	Thickness	(m)	
	Surface*	(m^2)	1 200 km^2 (total area of the 7 municipalities)
	Volume	(m^3)	
Run-out:	Height	(m)	
	Distance	(m)	

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s):): 1:5000	Year(s): 1963-2006
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: 5-m cell size	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☐ Yes ☒ No	If yes, specify:	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Quaternary map
Geophysics:	☐ Yes ☒ No	If yes, specify:
Geotechnical data:	Site: ☐ Yes ☒ No	If yes, specify (type of test, location maps availability etc.):
	Lab: ☐ Yes ☒ No	If yes, specify (type and number of test, material tested):
Groundwater:	☐ Yes ☒ No	If yes, specify (piezometers, suction etc.):

Rainfall data	☒ Yes ☐ No	If yes, specify: Daily precipitation data 1973-2000
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒No	If yes, specify (Equake name, Magnitude, Date etc.):

46 NEDRE ROMERIKE (3/3)

Monitoring and/or early warning systems:	☐ Yes	☒ No	☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.):		

Elements at risk (specify): Urban areas, farmland, roads and railways		
Human losses (death and injuries) due to previous events:	☐ Yes ☒ No	If yes, quantify:
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: Not quantified in inventory
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: Not quantified in inventory
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Erosion protection, slope stabilization measures
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: At municipal and county level

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Limit equilibrium analyses at slope scale, statistical bivariate method at regional scale
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Population exposure
References (papers and other published material, www site), specify:	http://www.ngi.no/no/Polydoc/Artikler/67998/ http://www.ngi.no/no/Polydoc/Artikler/67824/ http://presentations.copernicus.org/EGU2011-10550_presentation.pdf	
The case history has been considered in other research projects?	☒ Yes ☐ No	If yes, specify the project name and use of data: GeoExtreme (http://www.geoextreme.no/), slope scale analyses

General comments and pictures:

47 NOCERA INFERIORE (1/4)

Proposing partner:	UNISA (14)		
Person(s) in charge for the data management:	Name:	Leonardo Cascini and Settimio Ferlisi	
	email address:	l.cascini@unisa.it; sferlisi@unisa.it	
	Fax No.	+39 089 964045	

Country:	ITALY	Location:	Campania	
Scale:	☐ Single slide	☒ Multiple	☐ Regional	
Reference geographical coordinates	E 14°38'30.23" N 40°43'39.32"	Google Earth™ kml file submitted with this form:	☒ Yes ☐ No	

Data owner:	UNISA	
Owner contact data (optional):		
Owner is (or is interested in becoming) end-user of SafeLand:		☒ Yes ☐ No
Confidentiality/ Access to data	☐ Public (full access and deployment) ☒ Not Public (specify whether authorization is already available/requested):	
Stakeholders:	Inhabitants. Local and regional Italian Authorities (they might be interested in becoming end users of the project).	

Case study is suitable for (check relevant box, WP refers to Work Package numbers in SafeLand):	☒ WP1.1 Identification of mechanisms and triggers ☒ WP1.2 Geomechanical analysis of weather-induced triggering processes ☐ WP1.3 Statistical analysis of thresholds for precipitation-induced slides ☒ WP1.5 Verification and calibration of run-out models ☒ WP2.2 Calibration of models for vulnerability to landslides ☐ WP4.2 Remote sensing technologies for landslide detection ☒ WP4.3 Technologies for early warning ☒ WP5.1 Toolbox for landslide hazard and risk mitigation measures ☒ WP5.2 Stakeholder processes for choosing appropriate mitigation strategy ☒ Other WP's (specify): WP7 (Dissemination of Project results)

Slide has occurred yet?	☒ Yes ☐ No (slide prone)	If yes, potential for future sliding?	☒ Yes ☐ No
Historical data:	☒ Yes ☐ No	If yes, specify (including time span): A historical database on rainfall-induced hyperconcentrated flows and landslides on open slopes occurred in the area has a time span of more than 300 years (from 1707 to nowadays).	
Movement type:	☐ Falls ☐ Topples ☐ Slide rotational ☐ Slide translational ☐ Spreads ☒ Flows ☒ Complex	Material:	☐ Rock ☒ Debris ☒ Earth ☐ Other (specify):
		Type of occurrence	☒ First time ☐ Recurrent ☐ Reactivation
Triggering mechanism	Rainfall-induced hyperconcentrated flows and landslides on open slopes in pyroclastic soils for which, respectively, one and three different triggering mechanisms have been detected on the basis of the predisposing and triggering factors, as well as of the corresponding landslide source areas.		
Average velocity:	The average velocity in correspondence of the urbanized areas located at the toe of the slopes is about 10÷15 m/s		
Further notes:			

47 NOCERA INFERIORE (2/4)

Landslide geometry:	Thickness (m)	0.5 ÷ 4.0
	Surface* (m^2)	1,300,000
	Volume (m^3)	≈ 3.5×10^4 (mobilized volume of the landslide on open slope occurred on March 2005)
Run-out:	Height (m)	From 150 to 850
	Distance (m)	From 250 to 1,500

* For multiple or regional system, specify the overall area extension

Topographic maps:	☒ Yes ☐ No	If yes, specify :	Scale(s): 1:25,000, 1:5,000	Year(s): 1987, 2000
Digital Elevation Model	☒ Yes ☐ No	If yes, specify:	Resolution and accuracy: Two DEM are currently available. The first one has a resolution of 20 m per pixel; the second one, dating 2005, has a resolution of 1.0 m per pixel	
Aerial, satellite images:		☐ Yes ☒ No	If yes, specify coverage and date:	
Satellite interferometry:		☐ Yes ☒ No	If yes, specify type (technique), scale and date:	
Pictures of the area of interest		☒ Yes ☐ No	If yes, specify: Ortho-photographs are available from 2000 to 2007	

Geology and geomorphology:	☒ Yes ☐ No	If yes, specify: Geological, geomorpholgical and hydrogeological studies and maps at 1:25,000 and 1:5,000 scale
Geophysics:	☒ Yes ☐ No	If yes, specify: Geophysical tests performed along about 5 km
Geotechnical data:	Site: ☒ Yes ☐ No	If yes, specify (type of test, location maps availability etc.): Hand-dug shafts, drilling iron-rod, Dynamic Penetration Tests (DL_030), The type and location of in-situ investigations are reported in a GIS.
	Lab: ☒ Yes ☐ No	If yes, specify (type and number of test, material tested): Tests for physical properties and for strength properties in saturated and unsaturated conditions.
Groundwater:	☒ Yes ☐ No	If yes, specify (piezometers, suction etc.): Suction measurements from November to December 2010

Rainfall data	☒ Yes ☐ No	If yes, specify: Daily rainfall data
Temperature data	☐ Yes ☒ No	If yes, specify:
Humidity data	☐ Yes ☒ No	If yes, specify:
Earthquake strong motion data	☐ Yes ☒ No	If yes, specify (Equake name, Magnitude, Date etc.):

47 NOCERA INFERIORE (3/4)

Monitoring and/or early warning systems:	☒ Yes ☐ No ☐ Envisaged
	If yes or envisaged, specify (technique, frequency, web access etc.): An early warning system based on rainfall thresholds is currently operating for alerting the population

Elements at risk (specify): people, facilities (buildings, infrastructures), economical activities, environment.		
Human losses (death and injuries) due to previous events:	☒ Yes ☐ No	If yes, quantify: 3 fatalities in 2005
Economic loss due to previous events:	☒ Yes ☐ No	If yes, quantify in €: About 0.9 Ml € for the event in 2005
Social consequences due to previous events	☒ Yes ☐ No	If yes, specify: Homeless, constraints in land-use.
Mitigation (already performed or envisaged):	☒ Yes ☐ No	If yes, describe (structural/non-structural): Envisaged mitigation structural works are of both active and passive type.
Land planning already established for the case:	☒ Yes ☐ No	If yes, specify: New regulations about land-use.

Numerical modelling (already done)	☒ Yes ☐ No	If yes, specify (static/dynamic, FEM/DEM/analytical etc.): Numerical modeling of triggering and propagation stages
Risk analyses already carried out	☒ Yes ☐ No	If yes, specify: Risk analyses with the aid of heuristic methods at 1:25,000 scale.
References (papers and other published material, www site), specify:	Cascini L., Di Nocera S., Matano F., Calvello M., Cuomo S., Ferlisi S. (2010). On the reliability of landslide inventory mapping: the case study of Monte Albino, Nocera Inferiore (southern Italy). Proceedings of the 85th National Congress of the Italian Geological Society, pp. 573-574. http://www.dst.unipi.it/sgi2010/documenti/riassunti/Sessioni_17_20.pdf Schiano P., Mercogliano P., Comegna L. (2009). Simulation chains for the forecast and prevention of landslide induced by intensive rainfall. First Italian Workshop on landslides (IWL 2009), 8-10 June 2009, Napoli, Italia. L. Picarelli, P. Tommasi, G. Urciuoli, P. Versace (eds.), pp. 232-237. Pagano L., Rianna G., Zingariello M.C., Urciuoli G., Vinale F. (2008). An early warning system to predict flowslides in pyroclastic deposits. From the Past to the Future. Chen Z., Zhang J., Li Z., Wu F., Ho K. (eds.). Proceeding of the 10th International Symposium on Landslides and Engineered Slopes, 30 June-4July 2008, Xi'an (China), Taylor and Francis Group, London. Vol. II, pp. 1259-1264.	
The case history has been considered in other research projects?	☐ Yes ☒ No	If yes, specify the project name and use of data:

47 NOCERA INFERIORE (4/4)

General comments and pictures:

Photo n. 1 - Overview of the Monte Albino hillslopes (Nocera Inferiore, Salerno Province) from Google Earth.
Photo n. 2 – Frontal view of the area affected by the landslide on open slope occurred on 4th March 2005 (photo dated 5th March 2005).