SafeLand

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SafeLand

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effects of global change, and risk management strategies

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Design and testing: a risk communication strategy and a deliberative process for choosing a set of mitigation and prevention measures

Work Package 5.2 – Stakeholder process for choosing an appropriate set of mitigation and prevention measures

Deliverable/Work Package Leader: IIASA

Work Package Partners: UNISA

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Note about contributors

Lead partner responsible for the deliverable:

International Institute for Applied Systems Analysis

Anna Scolobig, Joanne Bayer

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

University of Salerno

Leonardo Cascini, Settimio Ferlisi

Partner responsible for quality control:

ICG

Deliverable reviewed by:

Bjørn Kalsnes, Bjørn Vidar Vangelsten

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SUMMARY

This deliverable of the Safeland project reports on research about perception and communication of landslide risks and their mitigation, as well as on the design and test of a deliberative process for choosing appropriate mitigation measures. The main objective was to design and test a deliberative stakeholder procedure for selecting risk-mitigation measures that take account of technical, economic, environmental and social considerations. We aimed to provide a better understanding of residents' conceptualisations and views on landslide risk, and also to design a risk communication strategy, in close collaboration with the relevant local stakeholders. For the deliberative process, we developed and tested a methodology for facilitating stakeholder compromise for choosing mitigation measures.

The selected case study was Nocera Inferiore, a town in the Campania Region in Southern Italy. The most endangered area, the Monte Albino slope, is constituted by a carbonatic bedrock covered by pyroclastic deposits originating from the Somma Vesuvio volcanic complex. This slope is prone to different kinds of rainfall induced flow like movements: hyperconcentrated flows, landslides on open slopes and flowslides, and floods. On March 4th, 2005, a landslide resulted in three casualties and extensive material damage on the slope. In the years 2010-2011, when the fieldwork for this research was undertaken, decisions about risk mitigation were still pending and State reimbursements to damaged households had not been made.The fieldwork in Nocera Inferiore aimed at providing an account of landslide hazard in the community, as described by both official documents and the different stakeholders involved. By combining and integrating different perspectives we reconstructed a picture that was as complete as possible, while at the same time highlighting key issues and problems to be taken into account in order to improve communication and involve the citizens in landslide risk mitigation decisions.

The research was structured in four main phases: i) case study analysis, i.e. literature review, semi-structured interviews (43), focus groups (2) and participant observation; ii) questionnaire survey, i.e. piloting and self-administered questionnaires (373); iii) deliberative process, i.e. 6 meetings with selected residents, 14 parallel meetings, either open to the public or in working groups or with local authorities, and the evaluation feedback; iv) communication and education activities, i.e. a website, videos, an online discussion group, press releases and contacts with local media, a simulation exercise with students on risk mitigation issues. Data and results were made publicly available so that the process of interpretation and sharing can continue.

The process benefited from the results of other workpackages of the SafeLand project, particularly the quantitative risk assessment, the cost benefit analysis of mitigation options, and the spatial multicriteria evaluation. A compendium and a web-based toolbox of risk mitigation measures provided also relevant inputs.

The process proved valuable in involving citizens and experts in constructive dialogue on landslide mitigation options. The participants agreed on fundamental priorities, i.e. the improvement of the warning system, the implementation of an integrated system of monitoring and territorial survey and active risk mitigation measures. Much more debate was devoted to the relocation of residents from the most endangered areas and/or the need to build passive structural works, especially on private properties. The results show that it is feasible to organize an expert-informed participatory process that respects and builds on conflicting citizen perspectives and interests, and demonstrates spheres of policy consensus as well as policy dissent. There was thus a process of reasoning and argumentation, which (contrary to many theories of deliberation) did not lead to a general agreement on the problem of itself. Rather, participants adhered to their deeply held beliefs and at the same time moved towards a compromise. As expressed by public officials, this will help inform decisions on mitigating the landslide risk in Nocera Inferiore, and perhaps most importantly, establish a democratic process of citizen participation in managing risks of landslides in the community.

The pilot study demonstrates the potential and challenges of public participation in decisions characterized by high personal stakes and intricate technical, economic and social considerations. It should prove useful in informing similar processes, as stakeholders in Europe increasingly demand a voice in choosing landslide mitigation measures.

CONTENTS

1. INTRODUCTION

In May 1998 more than 100 shallow landslides were triggered in about 16 hours by rainfall along the slopes of the Pizzo d'Alvano carbonate massif (Cascini 2004; Cascini et al. 2008a). Tens of these shallow landslides turned into catastrophic flow slides, travelled downslope from the source areas up to distances of over two km (Revellino et al. 2004), killing 159 people in five small towns in the Campania region of southern Italy. The greatest destruction was reported in the town of Sarno.

Nocera Inferiore, the case study selected for this research, is 12 km from Sarno. The characteristics of the mountains surrounding the two towns are similar. On 4 March 2005 the most endangered area of Nocera Inferiore (Monte Albino) was hit by a landslide, causing three casualties and extensive material damage amounting to more than €10 million. In 2010-2011, when the fieldwork for this research was being undertaken, decisions about risk mitigation in Monte Albino were still pending and no state reimbursment to damaged households had been made. In 2008 a €30 million risk mitigation project prepared by the Regional Emergency Commissariat was rejected by the municipal council whose decision was supported by many citizens and local associations (one reason for the selection of Nocera Inferiore seemed a good case study for designing and testing a risk communication strategy and a deliberative stakeholder procedure for selecting risk-mitigation measures. Moreover, in Nocera Inferiore many of the challenges decision makers face regarding the management of natural hazards are present. For example, as State budgets for risk mitigation are restricted, full protection cannot be achieved. Relocation of homes and associated infrastructure to less endangered areas is under debate even though it is well known that inhabitants would be reluctant to leave the environment with which they are familiar. This is just one example of how the key questions arising from this case study can be considered as "typical" risk management issues: what protection level do we want to achieve? What societal and residual risk do we accept? How do we allocate the budget? (see also Gamper and Turcanu 2009)

In our work, we understand risk management as an integration of the recognition and assessment of risk with the development of appropriate strategies to mitigate it (SafeLand project DOW). Landslide risk management typically, but not solely, involves decisions at the local level. A lack of information about landslide risk and how this risk is changing because of spatial and temporal patterns, land use and other factors seems to be a major constraint to providing improved mitigation in many areas. Beyond risk communication and awareness, proactive mitigation and prevention options can broadly be categorised as (1) structural slope-stabilisation measures to reduce the frequency and severity of the hazard, (2) non-structural measures, such as land-use planning and early warning systems, to reduce the hazard frequency and consequences, and (3) measures to pool and transfer the risks.

As shown in many other natural and technological risk contexts (e.g. Bayer et al. 2003, De Marchi 2003, De Marchi and Ravetz 2001, Messner et al. 2006, Stirling 2006, Junker et al. 2007, Becu et al. 2008, Kallis et al. 2009, Paneque Salgado et al. 2009) experts acting alone cannot determine what will be considered the "appropriate" set of mitigation and prevention measures. The complexities and technical details of managing landslide risk can easily conceal the fact that any strategy is embedded in a social/political system and entails value judgments about many aspects of the decision: tradeoffs on environment versus development, questions of acceptable risk, who bears the risks and benefits, and who makes the decisions. Policymakers and affected parties engaged in solving environmental risk problems are thus increasingly recognising that traditional expert-based decision-making processes are insufficient, especially in controversial risk contexts (Renn et al. 1999). Traditional policy approaches are often heavily shaped by scientific analysis and judgment (e.g. acceptable risk) and thus vulnerable to two major critiques. First, they deemphasise the consideration of affected interests in favour of "objective" analyses and thus suffer from a lack of popular acceptance. Second, they rely almost exclusively on systematic observation, and thus often slight the local and anecdotal knowledge of the people most familiar with the problem, running the risk of producing outcomes that are incompetent, irrelevant or simply unworkable (Wynne 1992, 1996). Conflicting values and interests, as well as often conflicting and uncertain expert evidence, characterise many landslide risk decision processes. These characteristics become more complex with long time horizons and uncertain information on climate and other global changes.

Risk communication and stakeholder involvement have been widely acknowledged as important for supporting decisions on uncertain and controversial environmental risks, with the added bonus that participation enables the introduction of the local and anecdotal knowledge of those most familiar with the problem (Wynne 1992, Covello 1998). The decision is ultimately made by political representatives, but stakeholder involvement, combined with good risk-communication strategies, can often bring new options to light and delineate the terrain for agreement. However, which citizens, authorities, NGOs, industry groups, etc., should be involved in what way, has been the subject of a large amount of experimentation and theorising (e.g. Renn et al. 1999, Stirling 2006, Renn 2006). The call for more public involvement in risk management decisions comes from several strands.

On the one hand, people are increasingly demanding more transparency in their risk-management institutions, and the design of stakeholder processes can add to the credibility of institutions dealing with landslide risks. On the other hand, several policy and legislative documents call for public involvement in

risk management issues. For example, according to the Hyogo Framework for Action 2005-2015 "Both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions for disaster risk reduction" (UN/ISDR 2006: 15). This idea took shape after the Rio Declaration – principle 10 "environmental issues are best handled with participation of all concerned citizens, at the relevant level…each individual shall have (…) the opportunity to participate in decision making processes" (UNCED, 1992: 5). If we consider the European context as an example, several Directives support stakeholder participation. For example, the European Commission Directive on Public Participation regarding the environment (2003/35/EC) states that "effective public participation in the taking of decisions enables the public to express, and the decision-maker to take account of, opinions and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision-making process and contributing to public awareness of environmental issues and support for the decisions taken"(Preamble, 2003/35/EC). The EU Water Framework Directive (2000/60/EC) states that "the success of this Directive relies on close cooperation and coherent action at community, member state and local level as well as on information, consultation and involvement of the public, including users" (article 14). The European Floods Directive (2007/60/EC) clearly calls for participation of the public in that "Member States shall encourage active involvement of interested parties in the production, review and updating of the flood risk management plans" (article 10). The Soil Directive, including also landslide issues, at present (2011) in preparation, will probably follow the same path.

In summary, there is a growing policy and legislative emphasis on the need for risk management to legitimately take into account a plurality of stakeholders, perspectives, and knowledge and evidence. This deliverable reports on these issues and, more precisely, on the design and testing of a public deliberative process for selecting landslide risk mitigation measures that are considered most appropriate from the technical, economic, environmental and social perspective. The case study is Nocera Inferiore in southern Italy. The report is structured as follows: the next chapter provides a description of the case study together with background information on the landslide risk management problem in Nocera Inferiore. The multiple natural hazards affecting the most endangered area of the town (the Monte Albino hillslope) are described in detail, as is the 2005 landslide. The timeline of the main risk mitigation actions undertaken after the 2005 event is also provided, together with the stakeholders' analysis. Various risk and emergency management tools are described, such as risk assessment and urban planning tools, the early warning system and the

emergency plan. Chapters 3 and 4 provide an account of the research objectives and the methodological approach which was structured in four main phases: case study analysis, questionnaire survey, deliberative process, communication and education activities.

Chapter 5 presents the key results of the qualitative work (semi-structured interviews, focus groups, participant observation, meetings) on the key issues regarding landslide risk and its mitigation, including, among other things, the views and opinions of the local stakeholders about the factors increasing landslide risk, the options for risk mitigation, and the main lessons learned from previous deliberative processes.

The deliberative process, which was structured as a series of meetings with a group of selected residents and several parallel activities open to the public, is the key topic of Chapter 6. This chapter starts with a description of the three options for risk mitigation on the Monte Albino slope which were elaborated on the basis of the discourse analysis of the interviews with local stakeholders. The options and related "packages" (none of them exceeding the available budget of €7 million) reflect different views of risk mitigation and therefore different mixes of, for example, natural engineering and control works, warning system, relocation, etc. This was the starting point for our deliberation process which aimed at reaching a compromise among the participants for risk reduction on the slope within the available budget.

Chapter 7 presents the results of the questionnaire for which 373 residents were surveyed. The questionnaire, based on previous fieldwork results, was divided into seven main sections covering all the key issues and problems related to landslide risk management in the town, such as its causes and consequences, trust and risk communication, emergency planning and warning, private/public responsibility for risk mitigation and insurance, risk mitigation and decision-making processes.

Chapter 8 describes the communication and education activities, namely the website, online discussion group, videos, and the simulation exercise with students on risk mitigation issues.

2. RESEARCH OBJECTIVES

The main objective of this deliverable is to design and test a deliberative stakeholder procedure for selecting risk-mitigation measures that take account of technical, economic, environmental and social considerations. We report on the results of two tasks of Workpackage 5.2 of the Safeland project, which include research on the perception and communication of landslide risks and their mitigation (task 2) and the design and test of a deliberative process for choosing appropriate mitigation measures (task 4).

Task 2 aimed to provide a better understanding of residents' conceptualisations and views on landslide risk, and also to design a risk communication strategy, in close collaboration with the relevant public authorities. The intention of the risk perception study was to elicit views on factors contributing to landslide risk from local stakeholders and (especially) residents living in the highest risk areas. The objective is also to elicit views on many other important aspects of the risk management process: risk assessment, urban planning tools, risk mitigation, emergency planning and warning systems. The communication strategy aimed to provide relevant risk information to local stakeholders in order to promote a two-way communication process. This meant facilitating information sharing among the stakeholders and testing different tools, channels and methods for the purpose of improving emergency communication.

For the deliberative process, we developed and tested a methodology for facilitating stakeholder compromise for choosing mitigation measures to reduce the risk of landslide in Nocera Inferiore; the aim was to better understand if and how a compromise among the stakeholders for risk mitigation could be achieved. More precisely we focused on the following tasks:

- Developing a stakeholder participation process incorporating local needs and expectations as well as local knowledge and preferences;
- Designing a risk mitigation package that takes into account not only the technical but also social, economic and environmental aspects; and
- Advancing effective participation and drawing more general conclusions for risk mitigation.

The process benefited also from the results of other workpackages of the SafeLand project, particularly the quantitative risk assessment and the cost benefit analysis of mitigation options developed in WP 5.1 (toolbox for landslide hazard and risk mitigation and prevention measures). Besides the two methodologies mentioned above, a compendium and a web-based toolbox of structural and nonstructural risk mitigation measures (developed in WP 5.1) provided inputs for the deliberative process. A spatial multicriteria

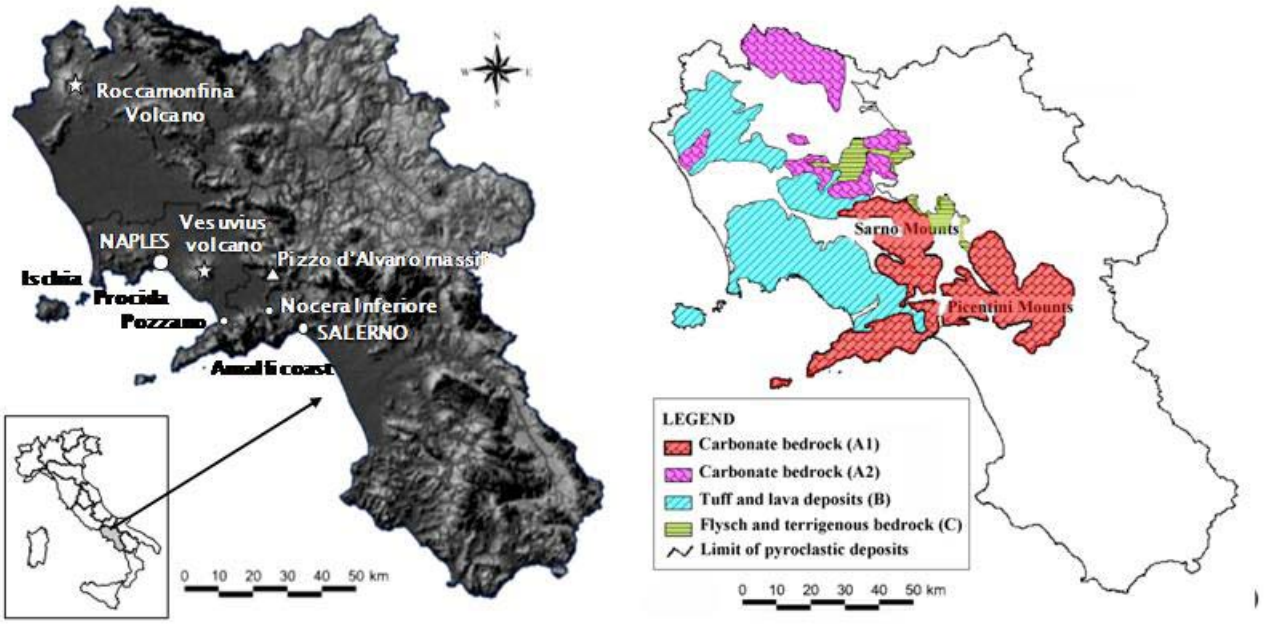
evaluation, i.e. a technique to spatially analyse landslide risk in a multi hazard risk environment, was developed in parallel (for a more detailed account see Alkema and Boerboom 2012).

The intention of the research was also to inform the ongoing political process related to risk mitigation in the selected case study.

3. DESCRIPTION OF THE CASE STUDY AREA

Nocera Inferiore is a town in the Campania region of southern Italy. Of all the Italian regions, Campania is one of the most exposed to landslide risk: of a total of 551 municipalities, 193 are at risk from landslides and 214 from both landslides and floods (MATT, 2003). A large part of the regional territory (11.8%,) is classified as being at high landslide risk (R 4; Regional soil defence department 2009), and Nocera Inferiore is included in this area.

Fig. 3.1. a) Campania region (southern Italy); b) map of the areas in Campania region where pyroclastic soils cover different bedrocks (municipalities at most landslide risk are located in the area A1) (modified from Cascini et al., 2008)



Nocera Inferiore has a population of 46,540 (Census 2001) and covers an area of 20.8 km^2. The main economic activity is agriculture, and the town was well known in the past for tomato and tobacco cultivation as well as for construction. Many industrial activities were, and still are, related to these sectors.

Nocera Inferiore is typical of the region, and even of Italy as a whole, in that it is exposed to multiple hazards, including earthquakes, floods and landslides. The degree of seismicity is medium. Floods are very

frequent, and the floodplain at the confluence of the Solofrana and Cavaiola rivers is wide, having an area of 10 km^2. Landslides are also a threat to the local population, particularly to the residents living on the Monte Albino slope.

On 4 March 2005 a landslide was triggered on the northern slope of Monte Sant' Angelo di Cava mountain, located upslope from the town. The landslide was preceded by rainfall measuring 149 mm over a period of 24 hours (Pagano 2009). The event caused three casualties and extensive material damage.

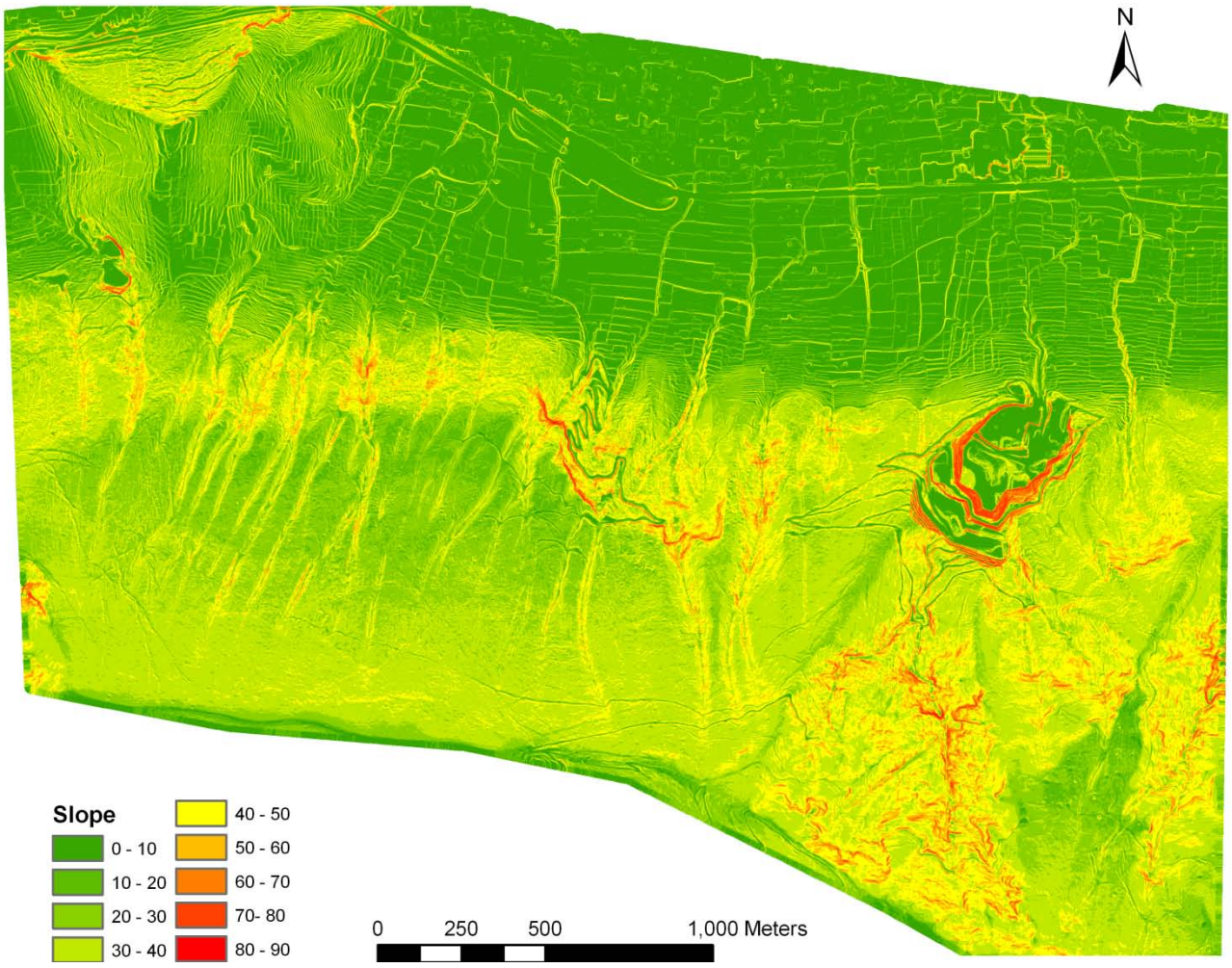
In 2010-2011, when the fieldwork for this research was being undertaken, decisions about risk mitigation in the most endangered area of the town (Monte Albino) were still pending, and there had been no state reimbursement for damage to households. After the 2005 event only urgent stabilisation works were undertaken. In 2008 a €30 million risk mitigation project prepared by the Regional Emergency Commissariat was rejected by the municipal council, a decision supported by many citizens and local associations. Among the most important reasons for this decision, was the fact that the costs of the project were not entirely covered by regional funds. Some technical weaknesses were also identified together with different priorities for risk mitigation, including the renovation of the hydraulic network and investments in non-structural measures, such as low environmental impact control works or improvement of the warning system. At the same time there were several initiatives at the municipal level to iniate a debate on landslide risk management in the town, for instance, a local Agenda 21 (urban forum system), the creation of a landslide victims committee, conferences and open meetings. All these elements led us to select Nocera Inferiore as a case study.

In the following we will describe the natural risks affecting the Monte Albino slope and the components of the risk management system in Nocera Inferiore. The Monte Albino hillslopes are prone to different kinds of rainfall-induced flow-like mass movements: hyperconcentrated flows, landslides on open slopes and flowslides. After a short description of the 2005 landslide, we will turn to the key characteristics of the natural risks affecting Monte Albino. In the next sections we will focus on the key planning tools for risk assessment, the early warning system, the emergency plan and risk mitigation.

3.1. RISKS FROM FLOWS AND LANDSLIDES IN NOCERA INFERIORE

The Monte Albino massif is composed of carbonatic bedrock covered by reworked and in situ pyroclastic deposits that originate from the air-fall deposition of materials produced by explosive activity of the Somma-Vesuvius volcanic complex. On the basis of in situ tests carried out from November to December 2010 over the Monte Albino hillslopes (Corominas and Mavrouli, 2011), the thickness of the pyroclastic deposits was estimated in the study area. In accordance with the morphology of the slope, the soil cover thickness reaches values of 4 m in the median part of the western sector of the slope where the slope angles range between 20 and 30 degrees (Fig. 3.2); on the other hand, the thickness values do not exceed 1.5 m in the eastern part of the slope where slope angles are highest. It must also be observed that the main vertical discontinuities of the pyroclastic deposits correspond to: i) “scarps in calcareous rocks” (usually exerting structural control due to the presence of fault scarps or thick strata heads) and ii) “erosion scarps along the gullies” (mainly originating from the erosive processes that grooved the pyroclastic covers and, in some cases, allowed the carbonatic bedrock to be uncovered).

Fig. 3.2 - Slope angle map



Moving from the upper part to the toe of the slope, it is possible to recognise, in the western part of the Monte Albino hillslope, the presence of morphological concavities filled with pyroclastic soils and prone to first-failure phenomena. On the other hand, in the eastern part, there are streams cutting directly into the carbonatic bedrock. In the lateral sectors of the gullies, in the inter-rill areas and along the open slopes, there are morphological elements probably related to landslide and erosive processes. The area at the toe of the slope shows a complex array of fans of different origin, on top of which lies part of the urbanised area of the Nocera Inferiore municipality.

Finally, it is worth observing that Monte Albino corresponds to the northern part of the hydrogeological Unit of the Lattari Mounts. The groundwater regimen is conditioned by the main tectonic structures, such that springs originate in the lower part of the slope. Ephemeral springs related to suspended groundwater can also be found in the upper part of the slope.

Because of these geological predisposing factors, the Monte Albino hillslopes are prone to different kinds of rainfall-induced flow-like mass movements: hyperconcentrated flows, landslides on open slopes and flowslides.

The hyperconcentrated flows, as already outlined, essentially relate to erosion processes caused by heavy rains (characterised by a high return period); these affect the pyroclastic soils cover along the rills and on the inter-rill areas; the volume of each of the gullies involved should not be in excess of 8,000 m^3.

The landslides on the open slopes affect the triangular facets located at the base of the slope; they have similar characteristics to the phenomenon that occurred on March 2005 and are classifiable as "debris avalanches" (Hungr et al. 2001). On the basis of the available historical incident data on events occurring from 1935 to the present, it can be argued that their average recurrence time is 18.5 years and the volumes of material mobilised could range from 20,000 m^3 to 35,000 m^3.

Flowslides can be triggered in some areas, for example, in the so-called "Zero Order Basins" (Dietrich et al. 1986; Cascini et al. 2008) located in the upper part of Monte Albino massif. In spite of the lack of incident data, this kind of phenomenon can be triggered by rainfall with a return period of 200 years. The magnitude of the displaced masses could be significantly increased by the materials entrained during the post-failure and propagation stages, with the volumes mobilised reaching values up to 40,000 m^3 (for each of the gullies involved).

Finally, the possibility of flooding concomitant with rainfall with a low return period cannot be excluded. Flooding transports a negligible percentage of transported solid material and the consequences within properties or along roads can be determined.

3.2. THE 2005 LANDSLIDE

On 4th of March 2005, following an intense rainfall event (80 mm in 4 hours, Schiano et al., 2009), a landslide occurred on an open slope (Fig. 2.3) having an average slope angle ranging between 35 and 40 degrees. The source area, located at 390 m a.s.l. above an accessa road to a quarry, extends for about 100 m^2. Considering that, in this area, the thickness of the pyroclastic soil cover does not exceeds 1,5 m, during the triggering stage a soil volume of about 150 m^3 was mobilised. Then, this volume increased following a mechanism M2 (Cascini et al., 2008) due to: *i)* the impact of the soil covers located below the road; *ii)*

further erosive and transport phenomena affecting the track area (as steep as 35°) where the pyroclastic covers and the vegetation were completely removed. On the whole, the pseudo-triangular shaped phenomenon extended for 25.000 m^2 and involved a volume of about 33.000 m^3 (Pagano, 2009)

As far as the propagation stage is concerned, the velocity of the displaced mass reached a value ranging between 10 ÷ 20 m/s (Faella e Nigro, 2003; Cascini, 2004); the velocity attained the highest value on the left side of the landslide-affected area where the flowing mixture channelized in a gully ending in an urbanised area including some masonry or reinforced concrete buildings. Owing to the impact of the flowing mass, a masonry building located at 105 m a.s.l. was destroyed and three people, living inside, died. Another person in the same building reported a brain trauma, but recovered within a few weeks. Several other houses were destroyed or damaged. The 1,350 people who were evacuated from the area sought refuge at relatives or friends' houses or in municipal buildings (Ordinanza n. 8822 , 4 March 2005) (Prot. N. 156/09).

Apart from the adverse meteorological conditions and the intense rainfall, other anthropic factors may have played a causal role. The most disputed aspect is related to the role played by the quarry upslope from the landslide, and particularly the access road that crossed the site of the landslide. Legal proceedings regarding responsibility of the quarry owner resulted in a guilty verdict. On the day of the Monte Albino event, landslides of different volumes and severity were reported in the greater area, including the municipalities of Nocera Inferiore, Nocera Superiore and Pagani.

In this same period, other towns of the Campania region were in a critical situation with emergencies related to floods and landslides resulting from the heavy rain. Regional and provincial civil protection units and fire brigades were alerted and had to intervene in several areas. In the nearby towns of Sarno, Siano and Bracigliano (hit by a severe landslide in 1998), an alarm was sounded when the pluviometer recorded more than 40 mm of rain. These events caused injuries and traffic was blocked for hours. The central hospital of Naples was inundated with mud and water, and there was high risk of a power blackout. The possibility of an evacuation of the hospital looked likely, but fortunately the fire brigades and civil protection authority were able to withdraw the warning. Provincial crisis units were activated in almost all the provinces (*La Repubblica*, 2005). We report on these other emergency situations because this is quite

common in the area for simultaneous critical situations to put the emergency services under pressure Returning now to Nocera Inferiore, on 8 March 2005 the municipality issued an official request to the Council of Ministries for the declaration of a "state of emergency" (deliberazione n. 86, 8 March 2005)[1]. The municipal technical officers carried out a first damage estimation of public and private properties which came to €10 million Euros (Pagano 2009).

Fig. 3.3 - The 2005 landslide (photo provided by Eng. Mario Prisco)

[1] In Italy catastrophic event are classified in three types: Type A: events that can be managed by local authorities as part of their routine duties; Type B: events that require coordinate intervention of more authorities at local and regional level, as part of routine duties; Type C: events of great intensity and extent. They require coordination and intervention at national level. When type C events occur the municipalities have to do an official quarry to the Council of Ministers for the "state of emergency". After the agreement of the President of the Council, the Council deliberates on the state of emergency, determining its duration and extent strictly with respect to the quality and nature of the events. Emergency interventions are implemented following this declaration, also using appropriately motivated legal dispensations, though in compliance with general legal principles.

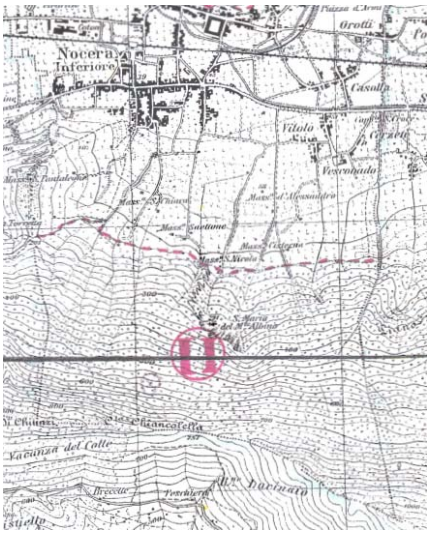
Italian legislation foresees the use of several tools for the identification of risky areas: the hydrogeological setting plan, the extraordinary hydrogeological constraints plan, and the general urban plan. The first tool, established in 1923 was the vincolo idrogeologico (hydrogeological constraint).

3.3. HYDROGEOLOGICAL CONSTRAINT

The main aim of the Hydrogeological Constraint (Royal Decree 30 December 1923 n. 3267) is to preserve a given geo-environment, by ensuring that its existing equilibrium conditions are maintained over time. The existence of a Hydrogeological Constraint does not stop building within a territory but requires that the territory should remain intact and usable after human intervention.

For the municipal territory of Nocera Inferiore, the first Hydrogeological Constraint map (1:25,000 scale) dates from 1938. This map, shown in Figure 3.4, highlights that the constraints refer to a large area corresponding to the Monte Albino hillslopes (area II), bordered by a line moving along an elevation of about 125 m above sea level (a.s.l.).

Fig. 3.4 - Map of the Hydrogeological Constraint – 1:25,000 scale, year 1938



The most recent map (1:5,000 scale) is dated 2007; however, the area subjected to the Hydrogeological Constraint (colored in red in Fig. 3.5) is practically coincident with that one considered in 1938.

Fig. 3.5 - Map of the Hydrogeological Constraint, 1:5,000 scale, year 2007

(http://sit.regione.campania.it/portal)

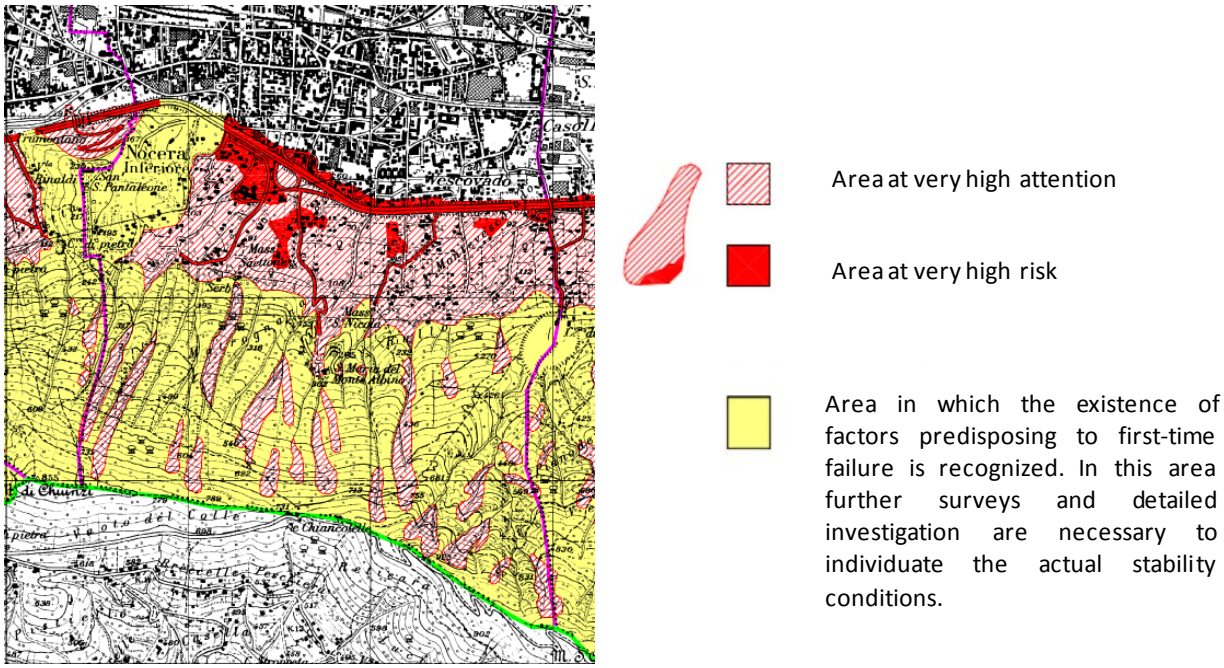
The Extraordinary Plan (D.L. 180/98; L. 226/1999)

The regional Basin Authority of the Sarno river– according to the requirements of Italian Laws 267/98 and 226/99 – on 31 October 1999 approved the "Extraordinary Plan" which aims to regulate the most at-risk situations. The Extraordinary Plan includes the detection and zoning of the areas where the hydrogeological risk to human life, property, and cultural/environmental heritage is very high.

In particular, in the “Map of the areas at very high landslide risk” (1:25,000 scale) the areas where the elements at risk might interact with first-failure phenomena of high intensity (such as, rock falls and flow-like mass movements) are zoned “very high risk”. The non-urbanised areas potentially affected by high-intensity landslides are classified “high attention”.

With reference to the municipal territory of Nocera Inferiore, the “Map of the areas at very high landslide risk” highlights the urbanised area at the toe of the Monte Albino massif—bordered to the North by the A3 highway— includes all the areas classified “very high risk” or “high attention” (Fig. 3.6).

Fig. 3.6 - Map of the areas at very high landslide risk (Extraordinary Plan, 1:25.000 scale)



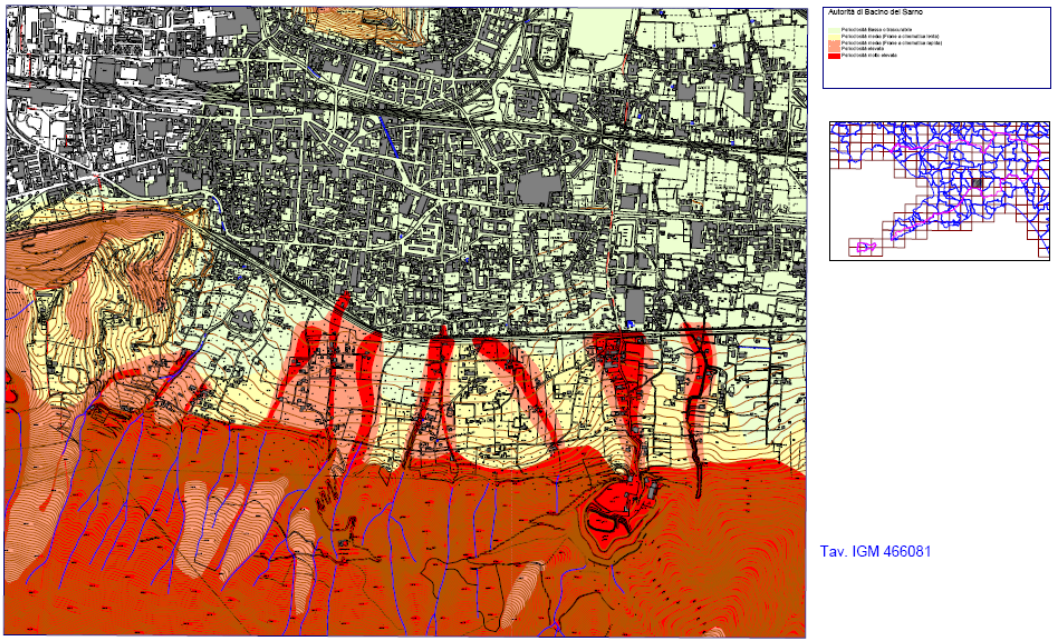
Based on the landslide risk zoning, the document that accompanies the Extraordinary Plan, which deals with the “protective measures”, establishes policies to be followed within “very high risk” or “high attention” areas.

These policies strictly forbid: construction of new buildings and infrastructure (roads, lifelines, etc.); morphological changes in the geo-environmental context (such as those deriving from excavation activities); dumping of waste etc.

The Hydrogeological Setting Plan – Landslide Risk excerpt (L. 365/2000)

The Hydrogeological Setting Plan of the regional Basin Authority of the Sarno River was adopted in April 2002. In the “Landslide Hazard zoning map” (Fig. 3.7) are mapped the areas potentially affected by the run-out of the fast-moving flow-like phenomena as well as of landslides on open slopes.

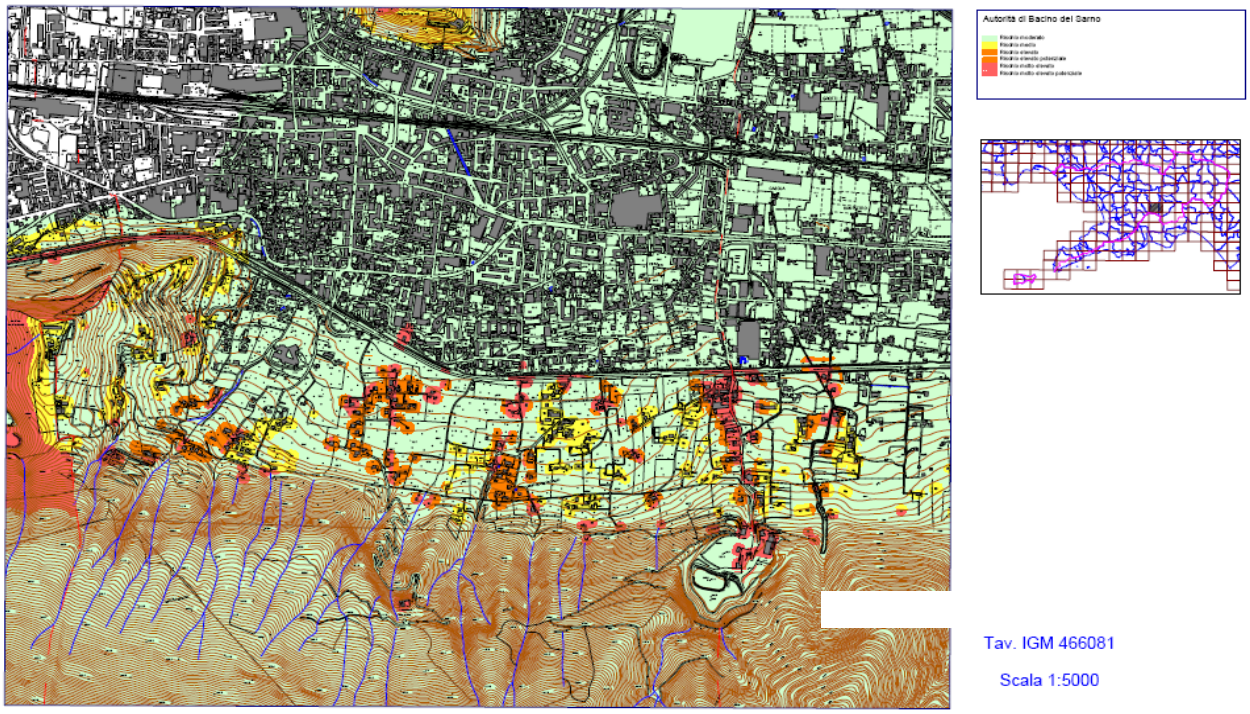
Fig. 3.7 - Landslide Hazard zoning Map (Hydrogeological Setting Plan-Landslide Risk excerpt; originally drawn-up at 1:5.000 scale). Hazard ranges from “very high” (red colour) to “low or negligible” (light green colour)



As far as the landslide risk is concerned, the corresponding zoning map (Fig. 3.8) was obtained by superimposing the Landslide Hazard zoning map on the Elements at Risk map. The latter was generated by combining the information provided by the General Urban Plan with the existing anthropic settlements and infrastructures.

The Landslide Risk zoning map of Nocera Inferiore shows that the elements at risk are essentially concentrated within the urbanised area at the toe of the Monte Albino massif. However, while the Extraordinary Plans recognise the existence of a very high landslide risk for all the exposed elements, the Landslide Risk zoning map of the PsAI-Rf differentiates the landslide risk levels from medium (R2) to very high (R4).

Fig. 3.8 - Landslide Risk zoning Map (Hydrogeological Setting Plan-Landslide Risk excerpt; originally drawn-up at 1:5.000 scale). The considered risk levels are: R4 (very high risk – red colour); R3 (high risk – orange colour; R2 (medium risk – yellow colour); R1 (moderate risk – light green)



On the basis of the landslide risk zoning, the document dealing with "restriction codes and safeguarding measures", which currently is a significant part of land-use planning, establishes that in very high (R4) and high (R3) risk areas, building and morphological changes are forbidden, although there are some exceptions which cannot be delocalised, for instance, public (or public interest) works involving essential services. In the medium (R2) and moderate (R1) risk areas both public and private works must be preceded by accurate studies defining their hydro-geological compatibility with the territory's current status. It is worth noting that, on July 2011, the variant to the Hydrogeological Setting Plan was approved.

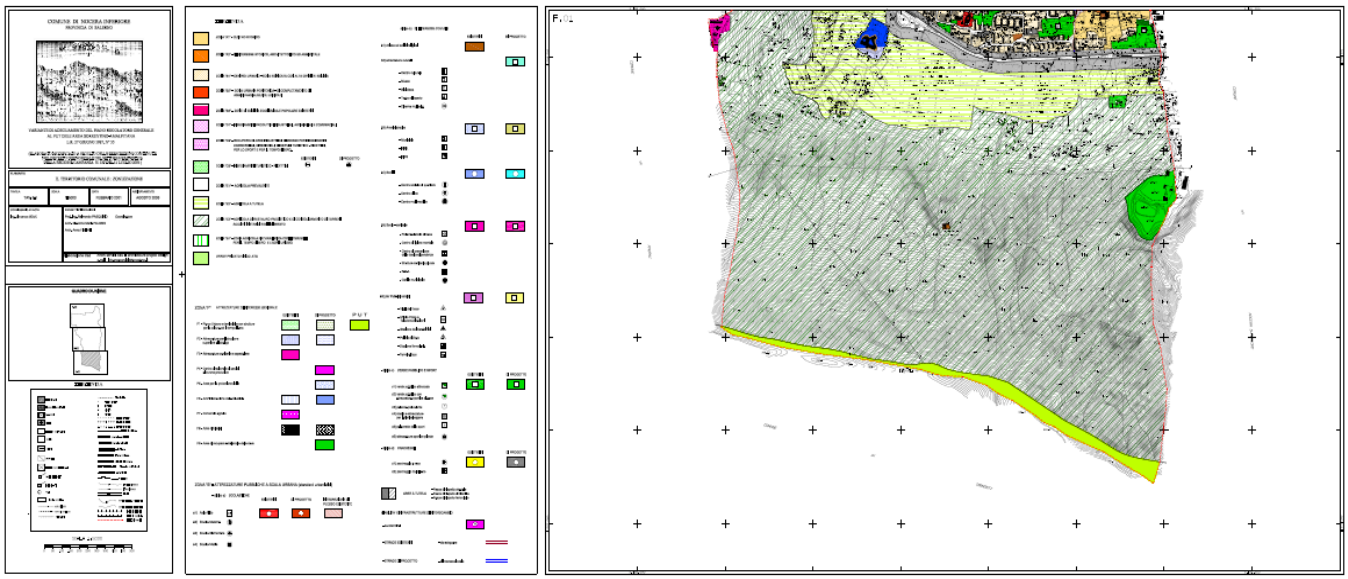
General Urban Plan (PRG)

In the variant of the General Urban Plan (dated August 2006), the Monte Albino hillslopes as well as a large portion of the piedmont urbanised area are zoned "E3" (i.e., agricultural zone of land restoration and consolidation of steep/instable slopes). In such areas (Fig. 3.9), given that the landslide hazard is very high, the construction of new buildings is forbidden. Moreover, the safety of existing buildings has to be

guaranteed by the implementation of hydraulic works and active measures to mitigate landslide risk. Once these works/measures are implemented, new roads can be built.

Similar constraints are imposed in areas classified as “E2” (i.e. protected agricultural zones), for instance, those belonging to the rest of the the piedmont urbanised sector not classified as “E3” (Fig. 3.9).

Fig. 3.9 - Zoning of the municipal territory on Nocera Inferiore (originally drawn-up at 1:5,000 scale) provided by the variant of the General Urban Plan dated August 2006 (http://www.comune.nocera-inferiore.sa.it/it/sue/documenti/prg/CARTOGRAFIA/tav.8.1.pdf)



The variant of the General Urban Plan (art. 35) also establishes the application of the constraints imposed by the “restriction codes and safeguards” of the Hydrogeological Setting Plan in the areas at landslide and/or flood risk.

3.4. EARLY WARNING SYSTEM

The early warning system in Nocera Inferiore is organised and controlled at the regional level. By early warning system is meant the ”set of procedures that provide effective real time information allowing institutions and civilians involved in a natural event to react preventively to the risk” (Aa.Vv. 2009). The system typically consists of four main elements: situation monitoring, prediction of imminent events

(processing data and application of prediction models), notification of warning codes to institutions and the population; and response (protection and/or evacuation) (Aa.Vv. 2009).

In Italy there is a national system for surveillance and alert composed of state and regional functional centres, which manage the information on real-time hydro-meteorological prediction and monitoring[2]. The organisational structure of the national alert system (defined in the PCM Directive of 27/02/2004, modified by the DPCM of 25/02/2005) responds to the need for clarity and general certainty in responsibility procedures. In other words, every regional warning system, including the one in the Campania region, is included in the wider national network of 21 Operations Centres.

Their task is to integrate data recorded by the meteorological networks, the radar-meteorology network and the various Earth observation satellite platforms. They also integrate geological and geomorphologic data and data from landslide monitoring systems; and they conduct meteorological, hydrological, hydrogeological and hydraulic modelling.

In the Campania Region, the Operations Centre operates in two phases:

- A *prediction* phase which assesses the expected meteorological situation and predicts its effects on soil by interpreting the simulations of numerical models, as follows: prediction of meteorological events (wind, rain, snow, ice, etc.); prediction of the expected residual risk and the effects such events would have on human lives, property, housing and the environment in the areas; assessment of the critical level, obtained by comparing the predictions with the adopted thresholds;
- A *surveillance and monitoring* phase to provide information by means of transmission, collection and concentration in the Operations Centres of data recorded for various purposes. Such information allows the predicted scenario to be formulated and/or confirmed, and permits updates as the event evolves. This phase involves the following activities: *qualitative and quantitative observation*, *both direct and instrumental*, of the

[2] The National Department of Civil Protection (under the Presidency of the Council of Ministers) coordinates government actions related to forecasting and early warning. The Department and regions work together through the national network of Functional and Competence Centres to provide the national early warning system, which produces forecasts and conducts surveillance. The National Commission for Prediction and Prevention of Major Risks - a national commission for the forecasting and prevention of risks - and the Public Weather Forecast and Meteorological Service - managed by the National Air Force - provide also support.

meteorological, hydrological and hydrogeological event under way and *short-term prediction* of the relative effects[3]. The key monitoring technique available for Nocera Inferiore is a pluviometer.

In southern Italy, only the Campania Operations Centre is authorised to issue warnings of adverse weather conditions in the region. The Centre carries out meteorological surveillance in the region and real-time rainfall monitoring to activate the state of "alert" (attention, pre-alarm and alarm) see Tab. 3.1.

Tab. 3.1 - Warning phases

State of Attention
In this phase the hazardousness of the predicted hydrogeological event is assessed. Assessment occurs through the monitoring networks installed along the river gauges, but may later be supplemented by direct observation in situ, supported by mathematical prediction models. The agencies entrusted with managing the event are alerted in advance in this phase. An initial series of information flows is established between agencies and structures involved for the purpose of proper coordination. The availability of members of the operation centres is ascertained.
State of Pre-alarm
In this phase links are established with local agencies and the operation centres at municipal level are activated.
State of Alarm
The operation centres at regional, provincial and municipal level are active; the service to protect the population and the production system is running. The key operation centre is located in the regional capital, Napoli. Evacuation starts and the risk zone is ring-fenced, on the basis of detailed municipal emergency plans which also envisage the location of the reception areas, flow directions for evacuation and rescue workers. Relief structures are put on pre-alarm; information bulletins are disseminated on the situation and its development.

[3] In order to assess the meteorological situation, for the purposes of the National Civil Protection Service, the Department guarantees, by 12:00 on each day, brief weather forecasts for the following 24, 48 and 72 hours to allow: i) individual meteorological services or weather forecasting sections of the regional Functional Centres to produce and effectively interpret forecasts for their area and thereby proceed to model the various effects on the soil; ii) the Department to publicly release a national bulletin of daily meteorological vigilance and a confidential national bulletin of critical states; iii) the Department, as well as the autonomous regions and provinces, to release confidential warnings of adverse weather conditions and both national and regional critical states.

On the basis of data and output of numerical meteorological modelling, the state of the weather is analysed and daily forecasts are provided. At 10:30 the Regional Meteorological Bulletin is issued for Civil Protection purposes, with a validity of 72 hours, and transmitted to the Joint Regional Operations Room and then distributed to the about 600 institutional agents making up the integrated system of civil protection in the Region (Civil Protection Department, state administrations, regions and local authorities, service and infrastructure managers, etc.).

In particular meteorological situations, the Operations Centre assesses the daily meteorological bulletin released by the Civil Protection Department, its own regional meteorological bulletin, weighs every other relevant element and/or item of information, and issues a regional warning of adverse weather conditions (called Avviso Meteo for short), if any critically intense or persistent situations are forecast in the region.

The Operations Centre transmits the Avviso Meteo (meteo message) to the Joint Regional Operations Room (SORU) which then forwards it to the Civil Protection Department and to the authorities involved. Should an Avviso Meteo forecast significant rainfall, the expected soil effects on the region's eight early warning zones are assessed and a Critical Warning for hydrogeological and hydraulic risk is released by 15:00 h at the latest.

This is the tool for establishing, for each warning zone, the critical levels (ordinary, moderate, high)[4] corresponding to certain "activation" phases of the regional early warning system (attention, pre-alarm,

[4] The critical level is established in the prediction phase and defined by assessing the rainfall precursors which are in this phase distinguished, for each alert zone, into two types: *precursors of local critical levels*, for rainfall events with such spatial characteristics as to affect only part of the alert zone, and *precursors of diffuse critical levels*, for rainfall events with such spatial characteristics as to affect the whole alert zone. For each of the precursors, three threshold values are fixed corresponding to conditions of ordinary, moderate and high critical levels. The critical level (ordinary, moderate or high) for each alert zone is established according to meteorological analysis, as well as values of rainfall precursors in each alert zone. The activation phases of the Regional Early Warning System are defined by assessment, in the monitoring phase, of rainfall precursors and hydrometric indicators. In this case the rainfall precursors, for each part of the area with a certain liability to hydrogeological degradation, are assessed either as point-source precursors, defined by the amount of rainfall measured in real time, taken individually, or as area precursors, defined by the amount of rainfall averaged over the river basin, starting from the amount of rainfall measured at several points in the monitoring network in real time. For each of the point-source and area precursors three threshold values are set corresponding to attention, pre-alarm and alarm levels. Hydrometric indicators, however, are defined as the water

alarm), managed and coordinated by the Operations Room with the aid of all the integrated system components of civil protection.

Combining the information concerning the critical level with threshold values for the rainfall precursors and the hydrometric indicators yields information on the alert level of the whole system. During the alert, the Centre monitors the trend in the hydro-meteorological situation on an hourly basis by checking rainfall and hydrometric levels in real time, comparing the values observed with the threshold values for activating higher states of alert or a return to normal conditions.

Both the procedures adopted and the operative phases undertaken, defined in the management model developed by the Centre, are supported by a dedicated information system which disseminates information in real time to the terminals of the Operations Room, whose operators immediately check, using their area units, the situations of a critical nature in the areas and adopt any interventions deemed necessary.

When the alert is given, the provincial and municipal emergency plans are triggered. The contingency plans and emergency response are coordinated by the Prefect[5] of the province of Salerno together with the local Civil Protection services (at provincial and municipal level). Any decision about evacuation or emergency-related issues is decided in conjunction with the mayor, who has final responsibility for issuing the warning, ordering the evacuation, etc. At the local level, several authorities have different responsibilities related to emergency management: apart from the Prefect and the Mayor, there are the President of the regional administration (or Council for Civil Protection), the local managers of Fire Brigades, Army, Police, Foresters, Italian Red Cross, National Health Service, and scheduled regional or municipal volunteers (associations or individuals).

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flows recorded by the hydrometric stations of the monitoring network in real time. For each of the hydrometric indicators two threshold values are fixed, corresponding to ordinary and extraordinary levels.

[5] The Prefect is a State representative authority with responsibilities over public safety at the provincial level (L. 121/1981).

During the research fieldwork in Nocera Inferiore, the alert was given once, on 10 November 2010. The entire Monte Albino slope was evacuated for 24 hours. We will report on this experience from the residents' viewpoints in the following chapters (see chapt. 5.3 and 7.6).

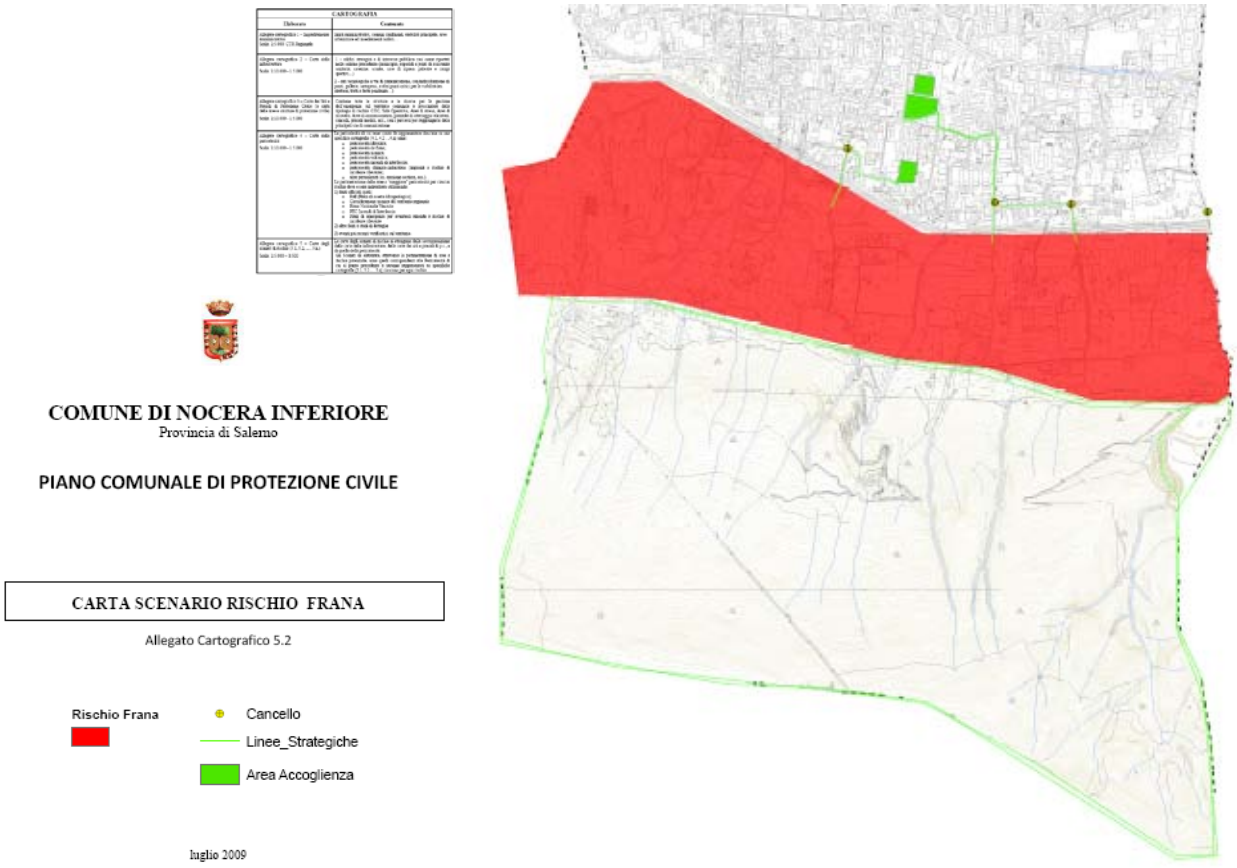
3.5. EMERGENCY PLAN

In Italy, the National Department of Civil Protection (NDCP) coordinates the Government's actions relative to emergency management, support, and rescue. Emergency planning follows the so called Augustus method elaborated by NDCP. This method is the most organic, systematic tool for producing civil protection plans in Italy and, though it is not mandatory, it is configured as an optional tool of governance for the national emergency management system. The guidelines provide a blueprint for flexible emergency planning and have been created to define, elaborate, manage, verify and update emergency plans.

The Civil Protection Plan of Nocera Inferiore municipality was approved on 15 February 1997. Later, on 10 October 2005, the Municipal Emergency Plan on Hydrogeological Risks (landslides and floods) was also approved (and updated in the year 2008)

The priority actions included in the plan aim to safeguard human life. Figure 3.10, shows the area of attention (in red) in the case of landslide emergency, which corresponds to the urbanised area at the toe of the Monte Albino massif.

Fig. 3.10 - Map of the landslide risk scenarios of the Municipal Plan of Civil Protection (originally drawn-up at 1:5,000 scale)



The municipal emergency plan for Nocera Inferiore results from the work of the provincial and municipal civil protection units. It is divided in 6 main sections, structured as follows (Emersa, 2008):

- *Introduction*: this describes the key actors in charge of the civil protection service and their responsibilities. The structure of the "Centro Operativo Comunale" (COC), i.e. the municipal operations center, is also described in detail; it includes three municipal technical officers and six voluntary civil protection organisations (year 2010).
- *Main section*: this includes general information about the municipal territory and the planning tools available at the regional, provincial and municipal level for emergency management. At the regional level, there was no programme or plan available in 2008 for landslides (only for fires). At provincial level there is an emergency plan (first approved in 2008, D.C.P. 24), and a territorial plan for provincial coordination (updated in 2007, D.G.P.

N.191). At municipal level there are the general regulatory plan (last updated in 1977) and the emergency plan (first presented in 1997 and then regularly updated).

- *Risk analysis and warning system*: this presents information about all the risks and the warning system. For the territory of Nocera Inferiore the risks are: hydraulic, hydrogeological, seismic, volcanic and fire. For each, a short description including definition, historical events, and exposure is provided, as is a short description of the functioning of the warning system. It is interesting to note that the warning system covers both hydraulic and hydrological risk. For the other risks, even if there are strong similarities (e.g. in the warning phases), different descriptions are provided. This chapter describes the warning phases and the institutional framework but, interestingly enough, there is nothing on the potential reactions to a crisis of the local population.
- *Emergency planning*: this section describes the main objectives needed to face an emergency effectively and assist the local population. The first part describes the local authorities and agencies in charge of emergency management (including telecommunication and railway services) together with their responsibilities, the phone numbers, addresses, email addresses, etc. It lists the members of the municipal operations centre (COC). The second part describes measures to safeguard the local population. This section consists of a list of guidelines of what to do but without an information section for residents. For example, it clarifies that "the mayoral staff" are in charge of informing the population but it does not clarify who the team members are. It also reports that these staff members should organise public conferences and evacuation exercises to increase the residents'risk awareness and preparedness as well as organise or participate in public media, including television and radio programmes. The person in charge of warning the population is also reported. The final part includes the addresses of safe havens and shelters.
- *Operational procedures*: for each of the warning phases described above (see chapter 2.3) the plan describes in detail what action the municipal authorities (i.e. the mayor and Civil Protection Unit) should take. In the case of landslides most of the actions can be taken only after the Avviso meteo (meteo advice) is received from the regional Operations Centre.
- *Annexes*: This section includes maps with public infrastructures and services, relevant buildings and Civil Protection structures in case of emergency or danger, the maps for each of the risks reported in the plan, and the risk scenarios which integrate the previous maps for each risk. The scale of most of the maps is 1:5,000.

The effectiveness of an emergency plan is difficult to measure; sometimes this can only be assessed accurately after a plan has been used. The emergency plan described above does provide a well defined description of the roles and responsibilities of the different agencies and authorities in charge of emergency management in the town. However, some technical aspects, such as accessibility of roads and

evacuation routes, could be considerably improved. In particular, the usability of the plan by local residents needs improvement.

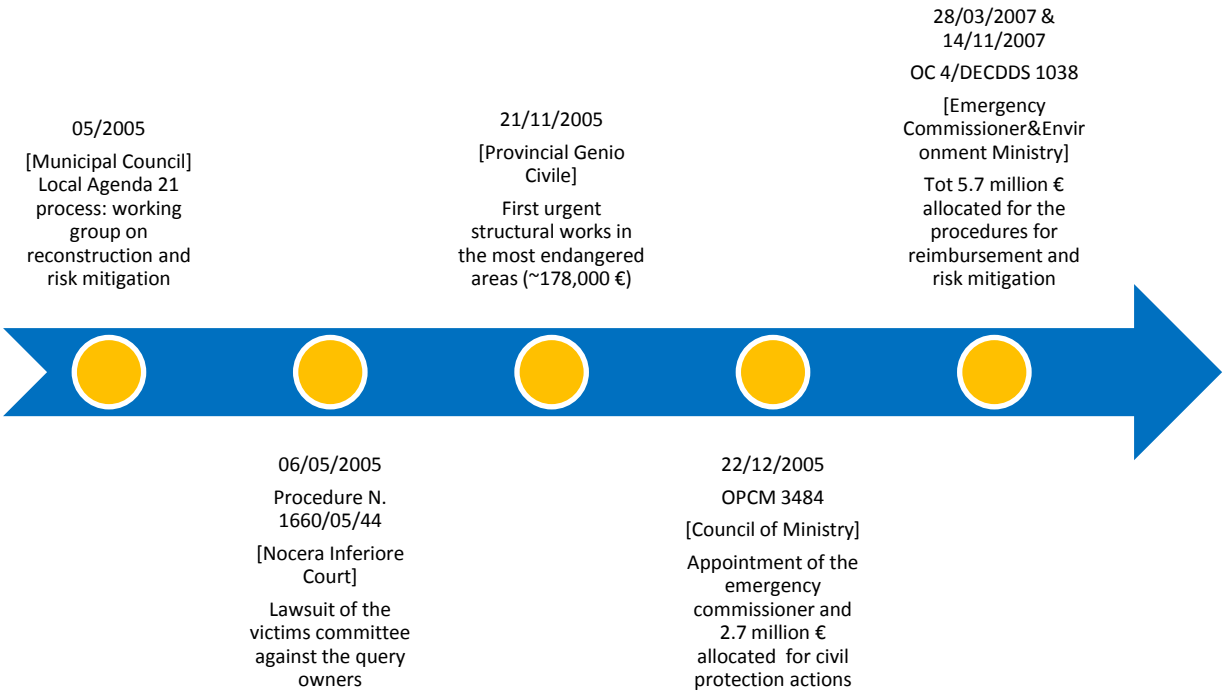
The local authorities and the Civil Protection unit are aware about this problem and after the 2005 event, they prepared a leaflet entitled “Instructions and recommendation for the population living in areas at high risk”. It included information about: i) municipal key points for information and communication (list of places); ii) messages for the residents (key information sources during the emergency, i.e. radio and TV, role of civil protection unit); iii) explanation of the different phases of the warning (attention, pre-alarm, alarm) and behavioural indications (what to do before, during and after a landslide, who to rely on).

After the 2005 event, a new census only of the households of Monte Albino was carried out. Among the information collected were basic contact data (phone number, address etc.) the presence of people with disabilities or senior citizens in the home, and the availability of a second house/a place in case of evacuation.

3.6. RISK MITIGATION AFTER THE 2005 EVENT

After the event several initiatives were undertaken by the citizens and the local authorities. Figure 3.11 shows a timeline of important post-disaster events from May 2005 through November 2007.

Fig. 3.11 - Timeline of important post disaster events (1)



The most discussed issues were reimbursement for affected families and risk mitigation measures. A 'landslide victims' committee' was created, and in May 2005 the committee initiated a lawsuit against the owners of the quarry. At the same time the municipality began a discussion on the recovery process and landslide risk management, involving the local Agenda 21 (the'Urban system' forum) as a way of encouraging citizens to actively engage in decisions about risk mitigation (Comune di Nocera Inferiore). Residents, local associations and risk management agencies were asked to take part in the activities of the forum.

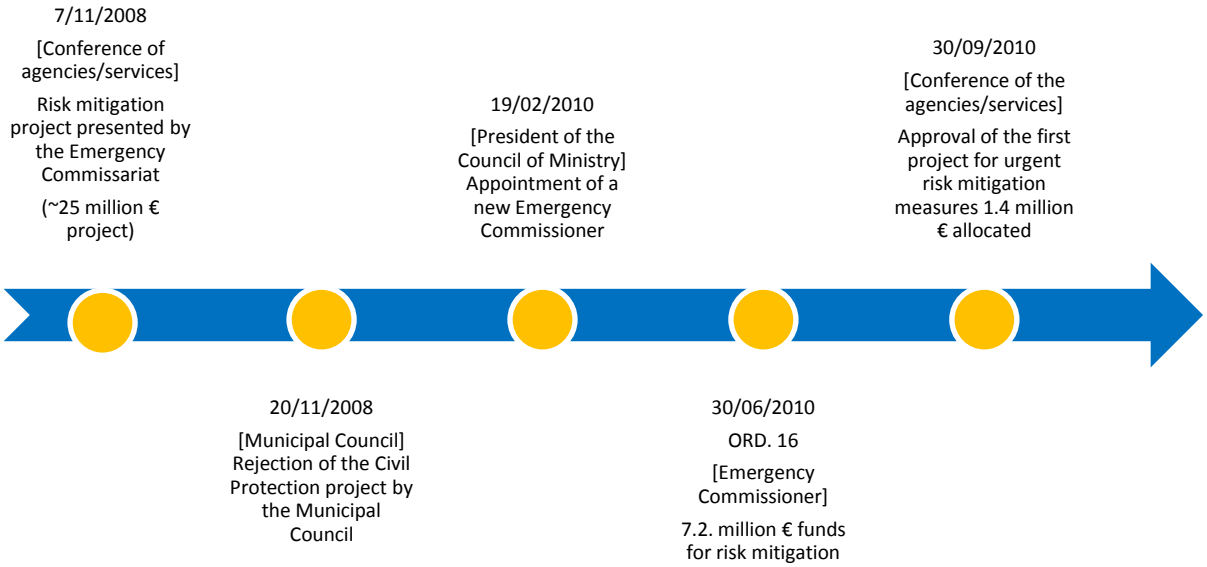
To deal with the emergency and carry out the most urgent measures to protect unsafe areas, several writs were issues by municipal and regional authorities. In November 2011, 178,000 euros were spent on the first urgent structural works: the Provincial engineering corporation (i.e. Genio Civile of the province of

Salerno) was in charge of the project. On 22 December 2005, the President of the Council of Ministers issued a bylaw for the Campania emergency (n. 3484), and appointed the president of the region of Campania and the mayor of Naples as emergency commissioners. The commissioners were in charge of i) estimating and restoring damage to infrastructures, public and private goods; ii) carrying out adequate hydrogeological and hydraulic risk prevention and mitigation measures; iii) allocating resources for the reconstruction of public infrastructures and for reimbursement (art. 3). The emergency commissioners were also in charge of identifying public or private bodies to set up risk mitigation plans and to present projects for structural risk mitigation measures.

To date, several million euros have been earmarked for the reimbursement of the families and for risk mitigation actions. Unfortunately these funds have not been disbursed. In a letter from the municipal councillor responsible it was stated: “The funds have not been distributed because of the delays and oversights on the part of the regional civil protection. In the years that followed the emergency, the national civil protection did not renew the state of emergency requested for the entire territory of the Campania region. As a result, the available funds were never used” (Prot. 300 IESA, 2010).

Important first steps were also taken regarding measures that would reduce future risks from the slope. These steps, which are described on the timeline shown in figure 3.12, set the stage for the SafeLand deliberative process described in this deliverable.

Fig. 3.12 - Timeline of important post disaster events (2)



The emergency commissariat presented the first plan for the most urgent risk mitigation measures in November 2008. This included structural measures for the entire area to increase safety standards (resoconto della seduta consiliare del 22 aprile 2008). The municipal authorities, supported by many citizens and local associations, refused to endorse this project for several reasons. Among the most important was the fact that the costs of the project were not entirely covered by regional funds. Some technical weaknesses were also identified together with different priorities for risk mitigation, including the renovation of the hydraulic network and investments in non-structural measures, such as low environmental impact control works or improvement of the warning system. The conflict between the municipality and emergency commissariat took a new turn in 2009 when a new emergency commissioner was appointed, who allocated 7.2 million euros for a first set of risk mitigation measures.

At the same time partial responsibility for risk mitigation was transferred from the regional soil defence agency to the local municipal authorities (Protocol 2009.0392338). The latter contracted external experts to prepare a preliminary study on the most urgent risk mitigation measures, including an estimation of their costs. The study identified the following priorities: i) interventions on the slope area, such as removal of the fallen trees and waste, especially from the channels, re-shaping, deforestation etc.; ii) interventions on the mountain area, such as reconstructions of control works destroyed after the 2005 event, installation of water tanks; and iii) interventions on the plain area, such as cleaning of retaining structures, drainage channels and channels crossing the roads. Table 3.2 lists the contemplated measures along with a first estimation of their costs.

Tab. 3.2 - Alternatives for risk reduction/mitigation

	Mitigation measures	**Relevant area/quantity**	**Costs(€)**
Slope area	Fallen trees removal	23.3. ha	To be estimated
	Removal of material	1.7 ha	To be estimated
	Deforestation	22-41 ha	228.000 - 417.000
	Re-shaping	27-45 ha	2.100.000 - 3.600.000
Mountain area	Reconstruction of control works destroyed after the 2005 event	100 m	56.200
	Works in the 2005 landslide area	?	?
	Removal of material	1.9 ha	?

Plain area	Embedded walls and reinforced fills	5	100.000
	Connection between embedded walls and drainage system	200 m	65.000
	Cleaning of a retaining structure	1	7.000
	Cleaning of a channel crossing the road	800 m	
	Cleaning of drainage channels	13	10.000

A private consultant was asked by the municipality to present a first project based on this study. The project was approved by the Conference of the Services on 30.09.2010, and a budget of €1.4 million was allocated by the Regional Soil Defence Department for its implementation. In December 2010, again a new Emergency Commissioner was appointed, who, like his predecessors, is in charge of the decisions regarding risk mitigation on the Monte Albino slope.

To summarise, table 3.3 reports the principal funding allocated for risk mitigation by different agencies after the 2005 event. These funds have never been transferred.

Tab. 3.3 - Funds allocated for risk mitigation since the year 2005

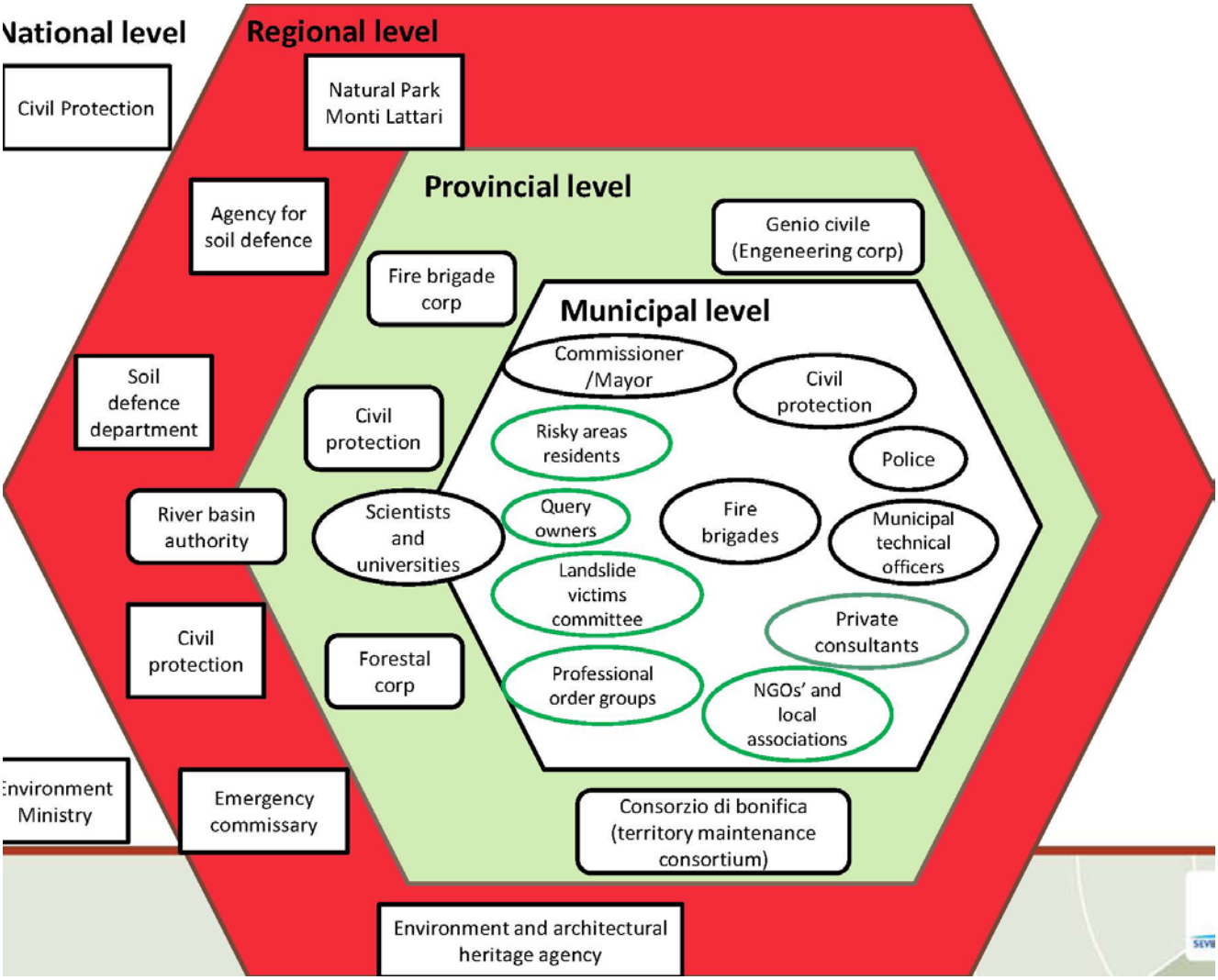
Date	Law/Law decree	Funds	Funding agency
22/12/2005	OPCM 3484	€ 2.7 million	Council of Ministry
14/11/2007	D. REG. 1038	€ 1.4 million	Regional Soil Defence Agency
30/06/2010	ORD. 16	€ 7.2 million	Emergency Commissariat

3.7. STAKEHOLDERS' ANALYSIS

As it clearly emerges from the previous chapters, multiple stakeholders are involved in the landslide risk mitigation issue in Nocera Inferiore.

In Fig. 3.13, we list them by dividing among the municipal, provincial, regional and national level.

Fig. 3.13 - Stakeholders' analysis



Legenda:

- The exagons and box shapes are meant to distinguish the authorities working at the same level (municipal, provincial, regional, national)
- Black boxes identify public authorities. Green boxes identify private actors/members of the civil society.

The stakeholders reported in the figure have different features, roles and responsibilities and undertook different actions in relation with landslide risk mitigation. We summarise them in table 3.4:

Tab. 3.4 - Stakeholders involved in landslide risk mitigation in Nocera Inferiore

	Stakeholders	***Main features/role/responsibilities***	***Actions***
Municipal level – Government actors	Municipal fire brigade	The fire brigade corps is in charge of the local warning system and emergency management	Warning during the 2005 event Rescue and emergency management during the 2005 event
	Municipal civil protection	The corps is in charge of the local warning system and emergency management. There is a operative municipal center, which works in case of emergency. Most of the members are volunteers	Warning during the 2005 event Rescue and emergency management during the 2005 event Collection of data about damages and social vulnerability in the highest risky areas
	Municipal technical officers	The officers are in charge of guaranteeing the respect of the building codes and constraints included in the landslide risk maps prepared by the river basin authorities; they are also in charge of managing the operative municipal center together with local civil protection	Actions to limit building abuse in the Monte Albino area Update of risk maps through detailed studies commissioned to private utility companies
	Mayor/ Commissioner	He is officially responsible for several activities related to emergency management and supervision of decisions about risk mitigation	Issue the warning Supervision of landslide risk mitigation decisions
	Private consultants	Geologists, engeneers, and other private consultants collect data for the risk maps, provide the projects for risk mitigation, etc.	Risk assessment data collection, project for the first risk mitigation measures to be undertaken on the Monte Albino slope

	Stakeholders	***Main features/role/responsibilities***	***Actions***
Municipal level – Private actors and civil society	Victims committee	An NGO established after the 2005 event with the aim of helping the residents who suffered the consequences of the event and especially the relatives of the victims	Lobby on the municipal authorities to speed the reimbursement procedures Support the family of the victims in their action against the owners of the quarry
	Friends of the mountain	An NGO established after the 2005 event to safeguard and promote the Monti lattari area, to fight against uncontrolled buildings in risky areas, to dialogue with local authorities to represent the interest and needs of the citizens	Organisation of meetings and conferences after the event "to better understand its causes and risk mitigation alternatives" Lobby on the local authorities to implement "low environmental impact measures on the territory" (i.e. non structural risk mitigation measures)
	Legambiente	Environmental NGO	Involvement in the local agenda 21 process

	ADAMAH	Local NGO focused on the issues of critical consumption and various activities aimed at raising awareness about environmental and social problems	Organisation of several events to raise hydrogeological risk awareness, help the families of the victims, curtail industrial activities upslope.
	Owners of the quarry above the landslide	The quarry is operating in the upslope area	The owners of the quarry are on trial because of their responsibilities (still to be proved) in causing the event
	Private consultants	Geologists, engeneers, and other private consultants collect data for the risk maps, provide the projects for risk mitigation, etc.	Risk assessment data collection, project for the first risk mitigation measures to be undertaken on the Monte Albino slope
	Landslide prone area residents	They are living in the most endangered area of the town	Lobby on the municipal authorities to speed the decisions about risk mitigation measures on the Monte Albino slope
	Flood prone area residents(la Starza)	They consider landslide risk as one of the problems the town is facing	Residents in the flood prone area complained about the scarce attention devoted to them They prefer resources to be devoted to flood risk mitigation rather than landslide issues

	Stakeholders	***Main features/role/responsibilities***	***Actions***
Provincial - regional level- Government actors	Genio civile /Engineering corps	The Genio civile is in charge of planning and/or executing structural risk mitigation measures	Supervision of the construction of the first structural protection works to guarantee higher safety standards in the areas affected by the event (OPCM 3484, 22/12/2005 and Protocol 2009.0392338 06/05/2009)
	Sarno river basin authority	The river basin authority has responsibility for the elaboration of the river basin plan, including landslide risk maps	Preparation of the river basin plan (including landslide hazard and risk maps)
	Sarno river consorzio di bonifica	This consorzio is in charge of the structural risk mitigation measures maintenance.	Maintenance of the structural protection works built under the supervision of the Genio civile
	University of Salerno (Department of geotechnical engineering)	Research unit working on landslide risk assessment and management	Preliminary document for risk reduction/mitigation (26/06/2009) Preliminary cost analysis of the alternatives for risk reduction/mitigation (see below)*
	Regional soil defence department	Among other competences, the regional Soil Defence Department decides how to allocate the economic resources for risk mitigation provided by the Environment Ministry.	Allocation of 1.424.000 Euros for "risk reduction in the Monte Albino slope in the territory of the municipality of Nocera Inferiore"(Protocol 2009.0392338, 06/05/2009)
	Provincial and regional civil	The civil protection has responsibility on warning, emergency and recovery management	Preparation of a project for structural risk mitigation measures in the affected area Preparation and update of emergency

	protection		contingency plans in cooperation with municipal authorities
	Region Campania, agricultural area – Provincial technical administrative sector of the Salerno Forestal corps	Hydro-geological risk competences in risky areas on the basis of the region decree 3267 of the year 1923	On the basis of the projects and the risk, the sector officers have to express a technical opinion regarding the new projects/protection measures
	ARCADIS – Regional agency for soil defence	ARCADIS is a regional agency established in the year 2004 with the aim of i) implementing the risk mitigation measures planned by the river basin authorities and ii) giving technical assistance to the local authorities to realize these measures	Responsibility for the implementation of structural risk mitigation measures (OPCM 3849, 19/02/2010)
	Emergency commissioner	The emergency commissioner changed through time. In the year 2005 the President of the Council of Ministries appointed two emergency commissaries, i.e. the president of the region Campania and the mayor of Napoli (OPCM 3484, 22/12/2005). In the year 2010 he appointed a new commissioner, Dott. Mario De Biase (OPCM n. 3849, 19/02/2010)	His/her main task is to manage the recovery and reconstruction phase, i.e. giving authorisations for money-funding allocation

National level- Government actors	National civil protection	The national civil protection is in charge of the national programmes for foresight, prevention, and rescue and with the plans for the implementation of emergency measures	Declaration of the emergency state after the 2005 event Identification of the delegate commissioner in charge of the reconstruction process (President of the Campania region)
	Environment Ministry	The Environment Ministry decides, among others, upon the allocation and distribution of resources for risk mitigation measures (l. 179/2002)	Allocation of resources for risk mitigation to the Campania region (DEC/DDS 2007 1038, 14/11/2007)
	National electric company	Many electric pillars of the National company cross the mountain slope area and are located above the landslide	Monitoring, cleaning and control of the areas surrounding the pillars

The figure and the list of stakeholders presented in the table reveal the complexity of the institutional framework for landslide risk mitigation. This is far from being uncommon in Italy, i.e. Nocera Inferiore represents a “prototype” of several other municipalities all over the country.

4. METHODOLOGICAL APPROACH

The methodological approach foresaw the triangulation of standard and non-standard methods, including literature review, semi-structured interviews, focus groups and standardised questionnaires, combined with discourse analysis based on the analytical framework described in cultural theory (Thompson 1997, 2008, Adams and Thompson 2002, Bayer et al. 2003, Ney 2009). The research was structured in four phases as shown in table 4.1:

Tab. 4.1- Research phases

Phase	Main aim	Methods and tools
Case study analysis	To provide an account of the case study	Literature review Semi structured interviews (43) Focus groups (2) Participant observation
Deliberative process	To promote useful dialogue and deliberation among participants with the intent of identifying technically, environmentally, socially and economically acceptable mitigation strategies	Public open meetings (1) Meetings (5) with selected residents (15) Evaluation and feedback about the process via questionnaire Informal meetings with local authorities and leaders (8) Parallel meetings in working groups organised autonomlusly by the participants (6)
Questionnaire survey	To collect data about residents' opinions and attitudes regarding landslide risk, risk mitigation, risk management and emergency planning	Questionnaire piloting (20) Self-administered questionnaires (373) collected by local association volunteers (351) and online (22)
Communication and education activities	To facilitate communcation and information sharing among the stakeholders involved	Website Online discussion group (facebook) Videos to promote the deliberative process (3) Press releases, contacts with local media (2 TVinterviews, participation in 3 radio programmes, 15 newspaper articles of local and national relevance) Simulation exercise with students Continuous contacts with local authorities

The process was not linear, that is, each phase did not necessarily build on the previous one. We preferred to allow overlapping so that the different parts would complement one another. In this way, we aimed to provide an overview of the case study through the integration of different perspectives and data. For example the results of the first meeting of the deliberative process provided inputs to finalise the protocol of the questionnaire. At the same time the preliminary results of the questionnaire survey were useful in the last phases of the deliberative process to help participants to better identify priorities for risk mitigation. We now describe the four phases in more detail.

4.1. CASE STUDY ANALYSIS

This research phase can be divided into four main stages:

- Case study selection
- First round of interviews (18) and focus groups (2) with local stakeholders to provide information on the institutional framework and to understand the key issues related to landslide risk and its mitigation
- Desk study of official documents, legislation, media and academic literature to describe the institutional framework and history of landslide risk mitigation in the selected case study
- Second round of interviews (25) with local stakeholders to analyse their perspectives on landslide risk and its mitigation

The selection of the case study was difficult for several reasons. First our aim was to identify a highly endangered town/village where landslide risk mitigation was on the political agenda. The geographical focus for this research was identified in the DOW as the Campania region, which is one of the most landslide-exposed regions in Italy: of a total of 551 municipalities, 193 are at risk from landslides and 214 at risk from both landslides and floods (MATT 2003).

The selection of the municipality was aided by the SafeLand partner (UNISA) which provided crucial information to help identify a suitable case. During the first round of interviews and focus groups we also collected useful selection information. At the beginning we focused on two municipalities, Cetara and Nocera Inferiore. The former is a village of 2,357 inhabitants (ISTAT 2001) on the Costiera Amalfitana. It exemplifies the situation of most locations in this coastal area, which are highly at risk from landslides, flash floods and flowslides. Although the last event affecting Cetara occurred in 1910, there are urgent current decisions pending on risk mitigation (see also Scolobig 2010).

Nocera Inferiore was severely impacted by a landslide in 2005 causing three casualties and extensive material damage. In 2010 when the fieldwork for this research started, decisions about risk mitigation in the most endangered area of the town (Monte Albino) still had to be made.

After first contacts and interviews at both sites with key stakeholders, the case study of Nocera Inferiore was selected based partly on its lively community and previous activities for increasing risk awareness. However, progress on the fieldwork was slowed by unexpected political and administrative changes at the municipal and regional level which made it more difficult to maintain stable contacts with local authorities. Indeed some key actors in charge of risk and emergency management changed several times: during our fieldwork (which lasted approximately two years) two mayors and three municipal commissioners led the municipality. Two regional emergency commissioner were designated.[6]

The second stage of this research phase consisted of semi-structured interviews (18) and focus groups (2). Besides providing relevant information and valuable insight, the semi-structured interviews were instrumental in establishing stable links with local stakeholders and qualified informers who provided continuing inputs and feedback for the research. We selected interviewees based on their status, role or experience, deep knowledge of the subject under investigation and/or the relevant social context. They mostly included officers of various agencies dealing with risk management at provincial and regional level e.g. the regional agency for soil defence and/or the soil defence department, forest management, river basin authorities, productive activities and technological innovation, civil protection, fire brigades, University professors, and members of NGOs.

The list of interviewees can be found in Annex I.

The key topics of these interviews were: local risk perceptions, the institutional framework for landslide risk management at the local level, the interplay between risk and science, policy, legislation issues, and

[6] In Italy this situation is far from being uncommon, especially with regard to the emergency commissioner appointment: his/her mandate usally lasts no more than one year. A mayor instead is supposed to govern the municipality for 5 years (law 267/2000) unless, as in the case of Nocera Inferiore, she/he is not supported anymore by the majority of the councilors. In any case both are short time political mandates, whose lenght clashes with the time usually needed to implement risk mitigation plans. (Dovers and Handmer 2007).

decision making processes related to landslides. The interview protocol is reproduced in Annex I. Each interview lasted about one or one and a half hour. They were audio-taped and transcribed.

The second stage of the research consisted of a documentary analysis to complement the qualitative information collected in the previous phase. The aim was to provide a description of i) the institutional, political and legal framework for landslide risk management in Nocera Inferiore and ii) the risk mitigation history. This desk study included the collection and analysis of relevant documents, such as policy papers, newspapers, laws and grey literature. The local qualified informers provided most of the material.

After this stage there was another round of interviews (25). The aim was a better understanding of the open issues emerging during the desk study and to collect useful information for the subsequent research phases. The selection of interviewees was based on the analysis of the institutional framework, including officers of relevant agencies and authorities, undertaken in the previous stage. We mapped more than 20 stakeholders engaged with risk mitigation in Nocera Inferiore (see chapt. 2.8) as residents of the Monte Albino area, municipal technical officers, mayor(s), members of various NGOs, geologists, fire brigades, civil protection members, police, municipal councillors, politicians, community leaders etc. The list of interviewees can be found in Annex I.

The focus of the interviews was to collect data on interviewee views on i) the risk, ii) the causes of landslides in this area, and iii) the possible solutions. We explored key problems and issues related to landslide risk, the interaction of different types of knowledge, values and interests in influencing the way people frame the risk, the identification of the risk mitigation options, the share of public and private responsibilities for risk prevention and the decision making processes for risk mitigation. The protocol of these interviews can be found in Annex I.

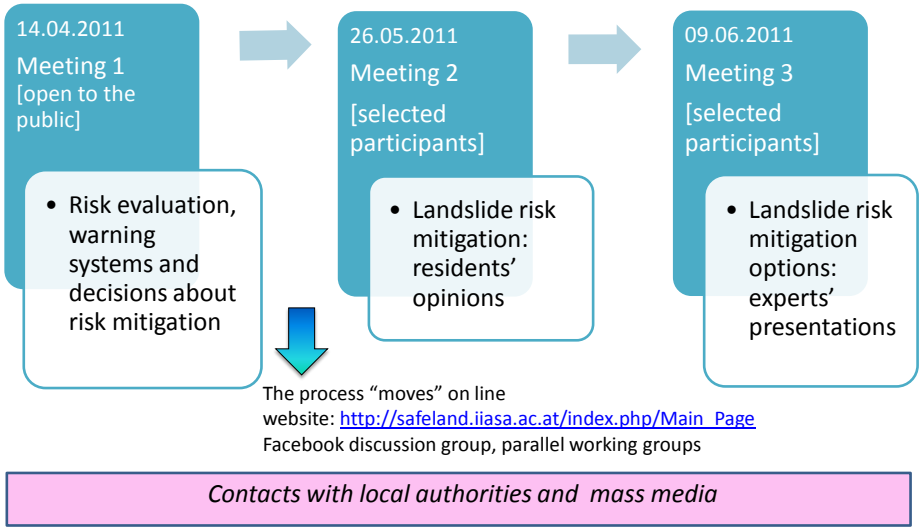
The interviews were audio-taped and transcribed. The information collected was analysed by identifying recurrent themes, key concepts and analytical categories. We used extracts of the interviews to illustrate points of agreement and contention and to support evidence for stakeholder arguments. The interviews also served as the basis for a questionnaire survey described below.

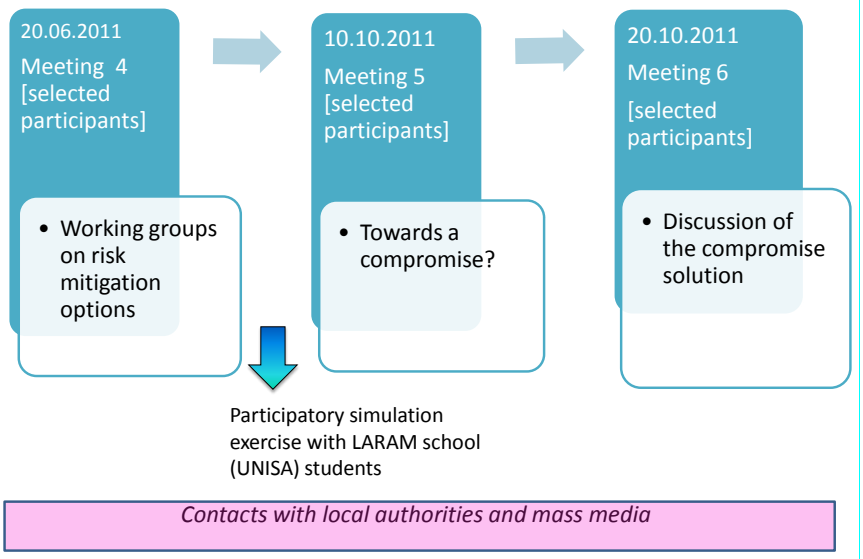
4.2. DELIBERATIVE PROCESS

4.2.1. Outline of the process

The process was structured into six meetings (Fig.4.1). Several parallel activities were organised before, during and after the meetings which were held in a time span of six months.

Fig. 4.1 – Outline of the process





The meetings were all audio-taped and transcribed. Facilitation was carried out by the Safeland team. Data collection and analysis grounded on qualitative research literature (e.g. Morgan 1988, Kitzinger 1994, Morgan and Krueger 1997, Barbour and Kitzinger 1999, Greenbaum 1998, Grove-White et al. 1997).

Meeting 1: Risk evaluation, warning systems and risk mitigation decisions

The first meeting focused on landslide risk in Nocera Inferiore. In contrast to later meetings, it was open to the public. The main aims were to present the Safeland project and the research activities in Nocera Inferiore to the local population and to recruit applications for participating (by invitation only) in the scheduled focus group meetings. The programme of the meeting was prepared in cooperation with the municipal technical officers of Nocera Inferiore. It included three presentations focusing on: i) the landslide risk management and civil protection system in the town (with a special focus on the warning system) – by the Head of the technical municipal office and civil protection; ii) the SafeLand project, general objectives, structure and the Nocera Inferiore case study – by the Safeland team ; iii) an overview about the landslide risk in the most endangered area of Monte Albino – by the Safeland team; iv) the outline of the deliberative process and the questionnaire submission – by the Safeland team; and v) discussion (see Annex II for a detailed programme). The application for focus-group participation included a questionnaire to give early

information on residents' risk perception, their attitudes toward risk mitigation, their interest for the deliberative process and related motivations (see Annex II). This enabled us to better understand the local context and improve the design of the following research phases. During the meeting we explained the key objective of the research, i.e. to design and test a deliberative stakeholder procedure for selecting risk-mitigation measures that are considered most appropriate from the technical, economic, environmental and social perspectives. We also clarified that results would have been made available for local authorities and policymakers in charge of risk mitigation decisions. We also made it clear that the results were not binding at all for the local authorities.

The open meeting was preceded by an extensive preparatory work to ensure participation. It included interviews and contacts with local opinion leaders to better understand the topics of interest for the local inhabitants, the printing of 500 leaflets and 50 posters to publicise the event, the preparation of press releases for the local media, a page dedicated to SafeLand on the municipality website, an online group to discuss risk mitigation, and a wiki-website aimed at describing and presenting the Safeland activities and research work in the town. As a result 102 residents attended the open meeting.

Fig. 4.2 – Meeting 1

Meeting 2: Residents' opinions about landslide risk

Meetings 2-5 were organised for a selected number of participants (15) in order to better observe, understand and analyse the key issues related to our research focus. Recruitment was initiated even before meeting 1 thanks to the contacts previously established with the local associations, e-mails sent to the

stakeholders interviewed in the previous research phases and a snowballing procedure to reach the highest possible number of residents for selection (see chapter 4.2.1 and Annex II for the description of the selection process). We successfully aimed for a balanced group in terms of gender, educational qualifications, age, profession, risk exposure (i.e. including half residents living in the most endangered areas), opinions about risk mitigation (see Annex II for the characteristics of the selected group).

The main purpose of the second meeting was to elicit participants' views and perspectives about landslide risk and its mitigation and to create a common deliberation space for issues related to risk mitigation among participants. The meeting started with an introduction by the facilitators, including a brief presentation of the Safeland project, the explanation of the participants' selection criteria, the purpose and logic of the process, the main objectives of the meetings, the role of the facilitators and observers, and the "rules of thumb" for the interaction among participants. We also clarified some privacy issues, asked for permission to record the meeting and explained the use of the results for research purposes. Before starting the discussion we asked participants to introduce themselves and to describe their experience of landslide risk. The discussion protocol was focused on: i) landslide risk: perception, concerns, causes and consequences, knowledge about the most endangered areas, information and risk maps; ii) landslide risk mitigation: the options, the priorities for action, the policy protagonists; iii) feed-back and close: wrap up, next steps, questions (for the general instructions, the meeting protocol and the facilitation principles see Annex II).

Fig. 4.3 – Meeting 2

Meeting 3: Landslide risk mitigation options' presentations

Experts from Salerno University were invited to attend the third focus group meeting, where they presented information on potential risk mitigation options. These options were prepared taking account of SafeLand research results, the participant views elicited in meeting 2 and technical evaluations (see chapt. 5.5 and Annex II). The main aim of the meeting was to provide information about risk mitigation options to the participants, which would enable them to express their opinions and to consolidate a common deliberation space. The meeting started with an overview about the risk mitigation activities already undertaken in the Monte Albino area, which was provided by the technical municipal officers. The following presentations, provided by the project partners (UNISA and IIASA) contained information on the following: i) the main hazards affecting the Monte Albino slope, ii) the options and packages for landslide risk mitigation, and iii) a comparison between the options and a preliminary cost benefit analysis. A discussion followed each presentation. During the discussion with the experts we asked participants to focus on their information/knowledge needs rather than their opinions on the presented options (this was indeed the aim of meeting four). At the end of the meeting participants were asked to express their preferences for one of the options and one of the packages presented and to add any other comment in order to enable preparations for the fourth meeting.

Fig. 4.4 – Meeting 3

Meeting 4: Working groups on the risk mitigation options

During the fourth meeting participants were asked to express their views, opinions and comments on the options presented in meeting three. The main objective was not only to collect feedback on the presentations about the landslide risk and the packages of the risk mitigation options, but also to identify the priorities for risk mitigation and justify them.

After a short introduction, participants were divided into three groups on the basis of their preferences for the packages (for the package descriptions see chapt. 6.1.2). The rationale for dividing participants into groups of "like-minded" persons (or those preferring similar policy paths) needs explanation, especially since it appears to contradict the purpose of the deliberation – to reach consensus on a common policy path. A space for deliberating opposing views is provided at a later stage. At this first stage, the idea of the working groups is to clearly articulate the different positions held by the participants, and to reduce these positions to a manageable number. Forming "like-minded" groups does, however, run counter to a common view of deliberative processes, which holds that discussions lead to a ***transformation*** of citizens' preferences by persuasion. In this view, theorists argue that decision-making based on "discussion among free and equal citizens" (Elster, 1998, p.1) can produce outcomes that authentically and genuinely reflect the public interest. Deliberative outcomes are legitimate because they are based on what Habermas (1984) calls a "rationally motivated consensus" that grounds policy decisions on reasons that every citizen can, on rational reflection, accept (Rawls, 1993; Dryzek, 2000).

Alternatively, our process was based on a concept of deliberative processes that does not aim to transform citizens' preferences. In our experience, if participants change their views by persuasion, this change is commonly not sustainable, ie when they return to their social or institutional contexts, they tend to "switch back" to earlier held positions. The reason is that preferences are strongly rooted in social context. This alternative view of citizen deliberation –one that finds support from cultural theory– is that complex societies give rise to fundamentally conflicting values, perspectives and worldviews that cannot be reconciled into a common view of the public interest (Thompson, Ellis and Wildavsky 1990). A challenge for this study, therefore, was to develop a participatory process that can accommodate and, importantly, respect the different perspectives, and yet articulate a compromised way forward. In short, we were seeking compromise and not consensus.

The purpose of this first step, the placing of participants into three like-minded groups, was thus fourfoldfold:

- to narrow the range of positions to a limited number
- to provide all participants with a voice,
- to legitimize all conflicting views, and
- to prepare the process for the next stage, which would be a negotiation among the three groups.

It built upon focus group deliberative processes developed for this purpose at IIASA (Linnerooth-Bayer, et al. 2006)

To enable discussion, participants were provided the following material: a synthetic description of the logic of each option/package (the "discourses" see chapt. 5.5), a visual representation/plan of the options and the packages, a table with a comparison of the packages on the basis of criteria identified during the previous meeting. We asked each participant to review the policy narratives on the basis of their opinions and discussion. Before starting the working groups, we clarified that the technical information provided in meeting three was a starting point, and that during the discussion they were encouraged to identify new options and/or revise options that they considered close to their preferences. Each working group could have relied upon technical consultancy for: i) risk analysis and mitigation, ii) event types, models and forecast, iii) risk and buildings (i.e. vulnerability), and iv) forestry. The experts for the first three topics were the project partners (UNISA), whereas those for the fourth topic (forestry) were recruited by the participants themselves. Indeed after meeting three, some participants were interested in gaining a better knowledge regarding the forest assessment plan and forest maintenance.

Fig. 4.4 – Meeting 4

Meeting 5: A compromise proposal

The main aim of the fifth meeting was to reach a compromise on a risk mitigation option among participants. Before the meeting the SafeLand facilitator met with the working group "leaders" to better clarify points of agreement and discussion and to identify possible pillars of a compromise solution. The meeting started with a synthesis of the previous meeting and working group results. More precisely, the description of the landslide risk and the three risk mitigation options was followed by a synthesis (by the working group leaders) of the key points emerging during the working group discussions.

After this first phase, the research team presented the points of agreement and disagreement among the working groups. This was followed by the presentation of the ranking of the most risky open slopes, the residual and societal risk estimation and the proposed compromise solution. A discussion followed, with the main aim being to collect the participants' feedback on the proposal for a compromise solution. At this stage, there was no agreement among the participants on a compromise risk management strategy.

Meeting 6: Discussion of the compromise proposal

Because of the failure to reach an agreed consensus on a risk management strategy, an additional (6th) meeting was organised to discuss possible solutions in more depth.

During the first part of the meeting the compromise solution was again presented, with a specific focus on conflicting issues or differences in opinions that had emerged during the previous meeting. The cost of the compromise solution was presented in more detail together with a better description of the risk mitigation decisions embedded in the compromise.

During the second part of the meeting the discussion focused on the "pillars" of the compromise proposal. The research team prepared a synthesis with the general principles and the key points related to: non-structural, active and passive interventions. We discussed each point with the participants.

The meeting was concluded by the participants deciding to meet again to prepare recommendations for the local authorities about risk mitigation on the basis of the results of the process.

Evaluation and feedback: a questionnaire for feedback was circulated among participants at the end of the process (see also Rowe and Frewer 2000, Rowe et al. 2001, Rowe et al. 2004). It was divided into five sections: i) strengths and weaknesses of the process; ii) organisation: feedback about the structure of the

process, suggestions on how to improve it; iii) content: feedback about the contents of the process, suggestions on how to improve the presentation of scientific topics, gaps in understanding ; iv) opinion change: we asked respondents if/how/why/when they changed their opinion about any issue related to risk mitigation during the process; v) main lessons learned; vi) matching the expectations with the results of the process ; vii) any other comments and/or reflections.

Parallel activities: During the process the research team undertook a number of parallel activities.

The contacts with local authorities at the municipal, provincial and regional level were key to ensure continuous support for the research. Since the beginning the local authorities showed interest for the Safeland project and its results. However they could not take any official commitment for the results' implementation and this of course caused some tensions with the participants. The unstable political situation and the continuous changes of the mayors and emergency commissioners during the process did not really help in reducing these tensions. This represented really a challenge for the research team, in several different occasions. . At the same time the local authorities never denied the possibility of the results' implementation in a future project and this is probably one of the reasons why participants never lost their motivation to participate.

Among the parallel activities, several meetings were organised with local technical officers, as well as selected local association leaders and politicians, in order to update them on the process, and also to assure a match between reciprocal expectations, i.e. the expectations of the research team and those of the local people providing support. Indeed, apart from the logistical support, the local contacts provided inputs and feedback that helped the research team to better understand and interpret the social, economic, and political context, as well as some problems emerging during the fieldwork. After the third focus group meeting the participants organised parallel meetings autonomously. One such parallel meeting took place on the part of one working group to allow more time for their deliberations. After the official end of the focus group sessions, participants continued to meet to finalise their joint recommendations.

4.2.2.Selection of participants

The first public open meeting, which was viewed as a recruiting ground for focus group participants, was attended by 102 persons. Among them were residents and also representatives of local authorities, including technical municipal officers, the national river basin authority, and private consultants working in the field of risk management. At this meeting, it was requested that anyone wishing to participate in the

SafeLand focus group process should submit an application. The application form included questions that would be helpful in selecting participants, including: 1. general socio-demographic information (age, gender, education, occupation, household composition, belonging to local association); 2.risk perception (place of residence, i.e. risk vs. non risk area, feeling of danger related to landslide and related motivations, previous experience with landslides); 3.attitudes toward risk mitigation; and 4.willingness to participate. The application was also circulated to local contacts. As a result a total of 64 applications were collected: 49 applications during the meeting; 10 applications after the meeting through personal contacts with residents; 5 applications via e-mail. 52 of the 64 respondents expressed a willingness to be contacted as participants to the process. We aimed at having a balanced group in terms of gender, educational qualifications, age, profession, risk exposure (i.e. half of participants should be living in the most endangered areas) and opinions about risk mitigation. The distribution of these variables for the selected participants (16) is summarised in the table below.

Tab. 4.2 - Characteristics of the selected sample of residents

Variable	**Distribution**
Gender	56.2% male, 43.8% female
Educational qualification	Low (31.2%), medium (37.4%), high (31.2%)
Age	15-30 (25%), 31-45 (25%), 46-55 (31.2%), 56-75 (18.8%)
Profession	Entrepreuneur (18.8%), trader (6.2%), teacher (18.8%), worker (6.2%), housewife (6.2%), unemployed (6.2%), retired (18.8%), student (18.8%)
Risk exposure	Yes - living in Monte Albino (43.8%), No (56.2%)
Risk mitigation priorities[7]	New protection works (25%), better territory management (25%), cost-benefit analysis (25%), other (25%)

[7] The question posed was the following: There are different measures to be taken to prevent and limit the damages caused by landslides. Which of the following sentences best reflects your opinion? It is a priority to build new structural risk mitigation measures. It is priority to guarantee a better territory management and a sustainable development of the entire area. It is a priority to calculate the costs for risk mitigation and to compare them to the benefits, taking into account also other risks and priorities. There is nothing to do, landslides will always exist. Other (specify…)

It is interesting to note that all the 16 selected participants took part in almost all the meetings, except if they had overriding health/work issues. No one dropped out of the process (for a complete description of the participants' selection procedure see Annex II).

4.3. QUESTIONNAIRE SURVEY

The purpose of the questionnaire survey was to collect data about residents' opinions and attitudes regarding landslide risk, risk mitigation, risk management and emergency planning. Extensive fieldwork was undertaken to narrow down the key issues. Decisions were also made on the basis of the interests and suggestions of the local authorities (especially the technical municipal officers) which followed and supported the phases of the preparation and testing of the questionnaire.

The design and implementation of the questionnaire can be divided in four main stages, summarised in table 4.3.

Tab. 4.3 - The questionnaire survey

Questionnaire construction		50 questions 7 sections: 1. Landslide risk, causes and consequences; 2. Risk maps and land use restrictions; 3. Risk mitigation and decision making process; 4. Responsibility and insurance; 5. Risk communication; 6. Risk management, emergency planning and warning; 7. General information
Sampling procedures		Residents (18-89) Quota sample based on: gender, age, educational qualifications, risk exposure
Survey	**Preparation**	Contacts with local authorities, letters for residents Questionnaire piloting (30) Training of interviewers (members of 6 local associations)
	Data collection	Face to face: local association members

		Online survey: http://safeland.iiasa.ac.at/index.php/Questionario
	Questionnaires collected	373
Data analysis		Frequency distribution, bivariate data analysis as cross tabulation and mean comparison (chi square and eta test)

4.3.1. Questionnaire construction and piloting

The questionnaire design was based on i) the review of the literature on risk perception (e.g. Fischhoff *et al.* 1978, Douglas and Wildawsky 1982, Krimsky and Golding 1992, Lash et al. 1996, Thompson 1997, Renn 1998, Renn 2008, Slovic 2000, Wachinger et al. 2010), and on literature on landslide risk perception (e.g. Carmen Solana et al. 2003, Plattener et al. 2006, Wagner 2007, Nathan 2008) , ii) existing questionnaires on landslide risk perception, and iii) semi-structred interviews with local authorities at provincial and municipal level. Since one key user of the questionnaire results would be the policy makers, it was important to address issues that would result in useful recommendations for their risk management activities. Therefore, the results of the interviews and the continuous contacts with local municipal officers, politicians, opinion leaders considerably influenced the questionnaire structure.

A first draft of the questionnaire was pre-tested on 15 people interviewed face-to-face during a public initiative of a local association (Montagna Amica) organised on the Monte Albino slope (the most endangered area of the municipality). The piloting exercise allowed us to verify if the questions could be understood, to arrange them in the most appropriate sequence and to assess the time necessary for the interview.

The survey protocol is a mix of open-ended and (mainly) pre-structured or closed questions with specified choice answers, for which the respondents are asked to select the one that best matches their opinion/knowledge/belief. The latter have been included to allow and encourage the interviewees to express their views in their own words and in a more complete form, also expanding the answers to closed questions. The protocol was prepared in English and translated into Italian. The English version of the questionnaire can be found in Annex III.

The questionnaire included 7 sections, for a total of 50 questions:

- *Landslide risk, causes and consequences*: risk perception, opinions about landslides causes and consequences;
- *Risk maps and land use restrictions*: knowledge about risk maps, authorities in charge and building restrictions in the most endangered areas, opinions about the usefulness of the maps, the presence and causes of illegal buildings in risky areas, the prevention of illegal building;
- *Risk mitigation and decision making processes*: assessment of risk mitigation activities, opinions about: priorities for risk mitigation, the role of structural protection measures, relocation, role of different actors in decisions about risk mitigation;
- *Responsibility and insurance:* agreement about statements related to the role played by social solidarity, opinions about the availability of insurance schemes;[8]
- *Risk communication*: self-assessment of the level of knowledge about topics related to landslide risk and its management, level of trust in information providers, opinion about the role of local authorities in informing the public and about communication of uncertainty related to landslide risk issues;
- *Risk management, emergency planning and warning:* evaluation of the quality of risk management in different areas, knowledge about the emergency plan and authorities in charge, prospected behaviours and opinions about the favourite communication channels during a warning, past behaviours during the last warning experience in Monte Albino (November 2011);
- *General information*: residential area, age, gender, educational qualifications, membership to local associations, previous disaster experience, knowledge about flood return period, attachment with nature, profession or activity, socio-economic status.

All responses to the questionnaire were and remained anonymous.

4.3.2.Sampling procedures

In deciding how to construct our samples, we decided against a random sample of residents mainly because of the difficulty of accessing complete and updated resident lists, but also due to strict regulations on privacy protection in Italy. Due to the geographical and administrative characteristics of the territory and the event under investigation, drawing a random sample (even if population records and privacy restrictions allowed it) might result in the exclusion, or under-representation, of the people we were most

[8] Insurance schemes are not available in Italy at present.

interested in, i.e. the residents in the Monte Albino slope. At the same time we wanted to collect the opinions of some residents of Nocera Inferiore living in those areas not affected by landslides. As one of the main objectives of the questionnaire was to inform policymakers on the views of the residents, we decided to include in our sample also people with awareness (and not necesssarily experience as the Monte Albino residents) of the phenomena under study.

Even if the margin of error is lower with a random sample in comparison with a quota sample, the latter allowed us to collect more questionnaires from the residents living on the Monte Albino slope.

For these reasons we preferred a quota sample, which replicated the distribution of three main variables: gender, age and education (see par. 7.7. for the statistical distribution of these variables in the sample). We referred to municipal statistical offices data to design the profile of the community in terms of these variables. The 2001 National Census contained the most updated data available.

We considered another variable, risk exposure, but in this case we did not replicate the statistical distribution of the population because there were any data available. After discussing with local authorities we aimed at collecting 40% of the questionnaires from the residents living on the Monte Albino slope. This high percentage is justified by the fact that we were particularly interested in their opinions about risk and risk mitigation issues.

4.3.3.Survey preparation and data collection

The survey preparation involved continuous contact with municipal authorities and officers, who provided access to key information and people (e.g. informal leaders), thus facilitating the completion of the survey. From the municipal statistical offices we gathered the data necessary for the sampling procedure; from other municipal officers and elected officials we acquired essential knowledge about the community's structural and cultural traits, as well as practical support to make the survey work known and acceptable to the local population.

A letter of introduction with information on the SafeLand project and the main aims of the survey, signed by the municipality, was given to the interviewees. The content was also disseminated via local media (mainly newspapers) before the start of the survey data collection.

The previous environmental councillor of the municipality and leaders of local associations played an important part in the application of the survey. The latter included: two voluntary civil protection associations (Noi con Voi and Club Universo), landslide victims committee, friends of the mountain, a local boy scout group, a local environmental association (Legambiente), and the national association for social promotion (ARCI). The leaders of these associations showed interest in our research and agreed to assist us in data collection.

As a result the questionnaire was administered by the members of these associations. We briefed them on the data collection procedure, including information on the Safeland project (WP 5.2) main objectives, the structure and general content of the questionnaire, the meaning and aim of the questions, the data collection methodology (residents recruitment and selection; questionnaire submission; questionnaire collection), anonymity and respect for privacy laws, and the use of the results. An interviewers' guide was prepared with the same content. The interviewers' kit contained also specific instructions for recruitment, including some grids with the total numbers of interviewees assigned to them, locations, and quotas according to gender, age, education and risk exposure.

Each association was asked to return 50 completed questionnaires and was provided with three grids. The first grid contained the number of people to be interviewed, classified by gender (proportion was specified), age (20-29, 30-39, 40-49, 50-59, 60-69, 70-on). The second and third grids contained the target distribution of interviewees according to educational qualifications and risk exposure (i.e. residents in the Monte Albino area vs. in Nocera Inferiore), respectively. It was also specified that there should be only one interview per household. An example of the grids is included in Annex III.

Provided they respected the assigned quotas and followed the given instructions, the interviewers were free to select the interviewees. The questionnaire was self-administered, and we asked interviewers to intervene only where the interviewees had problems, e.g. if they did not understand the meaning of the questions.

For the most part the questionnaires were administered without incident, and with a high level of acceptance. Certainly prior networking activities and support from local authorities had a positive impact. However we had to face two problematic issues during data collection:

- Some associations were not able to collect the assigned questionnaires, and as a result we had to organise a second data collection phase;

- Many residents (almost only in the Monte Albino area) refused to fill in the questionnaire. One possible explanation was the many illegal buildings in this area, and residents feared disclosure, notwithstanding that the questionnaire was anonymous.For this reason we approached some of these residents in a different way, i.e. through face to face semi-structured interviews. In this way also their opinion has been reported in this deliverable (see chapt. 5) . At the same time it is hard to assess if/how these refusals influenced the quality of our survey. Thanks to the local association members we collected 139 questionnaires from the residents of the Monte Albino area. This number corresponds to 37.3% of the entire sample (see chapt. 7.7), few points less than teh desired percentage of 40%.

To collect more questionnaires we decided to add a link on the SafeLand project webpage - built to inform local residents about the deliberative process (see also chapt. 4.2). We publicised the online questionnaire mostly on the web and via email: in this way we collected 27 questionnaires in two months (September and October 2011).

If we sum them up with the 346 questionnaires collected by the local associations members, we reach a total of 373 questionnaires altogether. The statistical error is 5.1%. [9]

4.3.4. Data analysis

Quantitative data from the surveys were analysed making use of the software, SPSS (Statistical Package for the Social Sciences). Two bivariate techniques were used. Cross-tabulation was systematically employed with nominal and ordinal independent variables. Mean comparisons were used instead with scale dependent variables. In both cases tests of statistical significance were utilised: chi square for cross-tabulation and eta for mean comparisons.

[9] We calculated it with the following formulas: sample = population / 4 * (population - 1) * e² + 1 ; e = sqr(((population / sample) - 1) / 4 * (population - 1))) * 200

Statistical significance was the first criterion for selecting the relations to be commented on and represented with tables or figures. Other criteria were the number of cases (valid answers), the existence of a clearly discernible trend in the data (linear relation), the analyst's knowledge of plausible hypotheses.

4.4. COMMUNICATION AND EDUCATION ACTIVITIES

A communication strategy was developed step by step in close contact with the local authorities in charge of risk management at the municipal level. The main aims were to inform the residents about landslide risk and its mitigation, with a focus on the SafeLand project results, and to incentivise a two way communication process with the residents in order to collect their opinions and feedback. The activities were designed to be complementary and to create an integrated and dynamic communication strategy by using different tools, channels, methods and by addressing different targets groups (residents, local authorities, associations, etc.).

The key communication activities were the following:

Website: Landslide risk mitigation in Nocera Inferiore [Address: http://safeland.iiasa.ac.at/index.php/Main_Page]

The website was built as an initiative of the research team. At the same time the local authorities requested it, mostly because some participants to the first meeting wanted to open the deliberative process to the public and they criticised the decision of selecting only 16 residents. They claimed the process should be as transparent as possible and that all the information circulated and the new results should be made available to the entire population.

As a result, the website was built up with a double objective: i) information sharing, ii) engaging the public for the selection of a risk mitigation option. To serve this purpose the website was entirely in Italian

(Google translator allowed for the understanding of the key issues in many other languages).[10] For a description of the website and its main contents see section 8.1.

Online discussion group [Address: http://www.facebook.com/#!/groups/177441975639277/]

In parallel to the website, we also created an online group of discussion about landslide risk mitigation in Nocera Inferiore. The group collected 189 members (March2012). In this way we created another opportunity to discuss about the SafeLand project.

Videos to promote the deliberative process [Address: http://www.youtube.com/watch?v=LAI1qOZ96EM]

Three videos were made by a student of the Salerno University (living in Nocera Inferiore) to sponsor and promote the deliberative process.

Contacts with local media

During the process, several contacts with local media were undertaken and numerous press releases were prepared. As a result, the Safeland project was mentioned in two TV interviews and three radio programmes. A total of 15 newspaper articles of local and national relevance were published. The contacts with local media served to inform the public about the key initiatives of the research team (the deliberative process meetings, the questionnaire survey) and about the objectives of the SafeLand project in Nocera Inferiore. More importantly, these communication initiatives incentivised public discussion about landslide risk and its mitigation and fuelled the ongoing discussions on the website and the online discussion group.

As it is clear, the communication activities were integrated and each one supported the other.

[10] The website has been built thanks to the support of the Information and Communication Technologies (ITC) at IIASA. We are grateful to Hans Mayer and Joe Undercoffer, Head of ITC, for their extremely valuable professional support.

Continuous contacts with the local authorities were also maintained to match the stakeholders expectations about the process, to have feedback about the key problematic issues emerged during the meetings, etc.

Simulation exercise

With regard to the education activities, we organised a simulation exercise with 40 selected PhD students on developing landslide risk mitigation options for the town of Nocera Inferiore.

The main aims were to i) explore the problems, the possible options and to develop a vision on risk mitigation on the most endangered slope in the town; ii) identifiy a risk-mitigation package that is considered most appropriate from the technical, economic, environmental and social perspectives; iii) compare the results achieved with the student vs. resident group (i.e. the deliberative process). We provided the students with the same background material given to the participants of the process.

The context for the organisation of the simulation exercise was the SafeLand project workshop organised by Salerno University on 10 September 2011, during the LARAM Summer School on landslide risk assessment and mitigation.

The participants were PhD students with a background in geotechnical engineering, geology etc., from different countries all over the world. They already had a background on landslide risk management issues.

At the beginning of the simulation exercise each participant was assigned a role as one of the ten key stakeholders influencing the decision making process for risk mitigation in Nocera Inferiore. We divided the students into four groups and provided them with an invitation package a few days before the workshop. The package included description(s) of: i) the case study; ii) the risk mitigation options (see chapt. 6.1.1); iii) the key stakeholders and their preferences for the risk mitigation options.

The simulation exercise was divided in two parts: i) option generation; ii) identification of priority actions. During the first part, the participants were asked to develop a group option for landslide risk mitigation, to identify the key agreement and disagreement points that had emerged during the discussion and to prepare a presentation with a slogan.

The second part was devoted to the identification of priority actions. Starting from the option generated during the previous phase, the participants were asked to find, choose and plan priority actions to achieve

it. The end result of the simulation exercise was expected to be a compromise proposal for landslide risk mitigation in Nocera Inferiore.

The background material is attached in Annex IV.

5. LANDSLIDE RISK AND ITS MITIGATION: INTERVIEWS AND FOCUS GROUP RESULTS

This section identifies and discusses the key issues that arose during the 43 interviews with the local stakeholders and during the two focus groups (the key aims/objectives of the interviews are described in chapt. 4.1, Protocols are attached in Annex I).

5.1. FACTORS INCREASING LANDSLIDE RISK

5.1.1. Inadequate monitoring and control of the territory

Many interviewees complain about inadequate monitoring and control of the territory. Some blame the local authorities for the lack of effective landscape maintenance; others blame the residents for inadequate management/care of their properties. In the first case (blaming the local authorities), the interviewees mentioned that their taxes do not adequately translate into proper services and landscape maintenance by the local authorities. As an example they mention a road built by the national electricity company, which was abandoned after construction: dangerous rocks and felled trees are still on the road and may become landslide-triggering factors in the future. Other residents claim that if monitoring were systematically pursued it would be possible to update hazard risk maps more frequently, reflecting the actual changes induced by natural processes.

The situation in the past is judged superior to that at present, because the Campania region financed the *Presidi territoriali* (Territorial Monitoring Offices), i.e. groups of experts and geologists, whose aim was to monitor territorial changes. In the second case (blaming the residents), many requested that residents be made more responsible for making the slope areas safer. Many respondents think that these responsibilities are not always made clear. In fact, the law requires owners of the properties on the slope area to accept responsibility for reducing the risk, but either they are not aware of this requirement or do not have the requisite economic resources.

The consequences of this lack of monitoring, control and protection are numerous: i) vast forest areas on the slope are abandoned; ii) deforestation frequently occurs uncontrolled; and iii) waste disposal and tree trunk deposits along many channels and river beds abound. Waste disposal often obstructs the channels,

and the situation becomes very dangerous especially when landslides and debris flows are triggered upslope.

5.1.2. Unsustainable forest management and agricultural practices

Many interviewees consider the preservation of the natural ecosystem in the area of Monte Albino to be a priority. They usually also think that unsustainable agricultural practices and bad forest management have increased landslide risk substantially. Regarding agricultural practices there are contradictory opinions. On the one hand intensive farming can aggravate soil erosion, but on the other hand it can guarantee better care of the territory, more protection and control of the slopes and, as a result, lower the landslide risk. Indeed the farmers are not only knowledgeable about their property, but they are often able to identify danger sources, triggering factors, etc., acting as a local "sentinel" for dangerous situations. Usually these respondents think that it is important to restructure many agricultural practices on the entire slope, among them the development of small scale, possibly organic farming. Respondents holding this view maintain that in recent years many traditional agricultural products of the area (like the San Marzano tomato, well known in Italy) have faced a crisis: as the development of the slope area is crucial, for the economic survival of the town, too, the development should also include the rediscovery of traditional products.

Some interviewees, many of them members of environmental associations, argue that not only the agricultural but also the forest management of the area should be adapted consistently. The lack of a forest development plan is considered a key problem. Its establishment could be the starting point for better territorial management. In reality, most of the forests are badly managed: trees are not cut regularly and the undergrowth is left wild. This may trigger both landslides and summer fires, the consequences of which also increase landslide risk. One of the reasons for this lack of proper management is the fact that the forest is both publicly and privately owned. The private owners do not always take the necessary care of it. New forms of partnership should be identified to allow better management.

5.1.3. Industrial activities and man-made interventions

The main industrial activity on the Monte Albino slope is the quarry. This is considered by many interviewees as a factor increasing landslide risk. The temporary road to bring in construction equipment, which was built upslope of the quarry, is considered a trigger of soil movements.

Many residents of the area also worry about the explosions at the quarry. The quarry activities not only have consequences for soil instability, but also for health because of the dust and particles emitted.

As reported by the head of the landslide victims' committee: "A few days before the 2005 event, the residents already complained that there were too many explosions. ." (Local politician)

On 7 July 2011, the quarry owner was sentenced to three years in prison and to pay damages to the families of the three landslide victims. During the trial the service road built upslope proved to be a landslide triggering factor. This was one of the first legal verdicts in Italy that established the role played by anthropogenic factors in triggering landslides.

However, the quarry and related activities are not the only anthropogenic factors identified by interviewees. Many small river beds have been covered by concrete to provide roads. As a result the water cannot be absorbed by the soil thus causing greater volumes of debris, water or hyperconcentrated flows to reach the inhabited areas.

5.1.4. Uncontrolled urban development

Monte Albino has always been considered a high-risk area. Already when the first national legislation on building constraints was issued in the year 1923 (*decreto regio*, RD 3267/1923) many restrictions to private property development have been enumerated. However, building was still permitted, even after the publication of the first cartography in the year 1938, and the following urban development plans reported that the area was highly endangered.

After an earthquake in the year 1980 urban development of the area changed. Many residents had to move to Monte Albino because the buildings in the city centre were considered unsafe. With time the original shelters were turned into houses. In many cases no official permission was requested of the local authorities.

For all houses built in the high risk area, in 1985 there was the possibility to obtain a "*condono*" (law n. 47/1985), i.e. to pay a fine to the State for having built illegally or without knowing the area was at risk. The municipal technical officers reported several *condoni* in the years 1985, 1994, and 2003. This condono legalised the existing buildings.

A key national decree issued in the year 1998 (D.L. 180/98) forbade new buildings in the entire area of Monte Albino, which has been classified as R4 (very high risk). Many interviewees mention that illegal buildings in high risk areas as worrying and problematic for several reasons: lack of control by the authorities in charge, lack of penalties, ease of obtaining a *condono*, lack of trust in the expert risk assessment, lack of alternatives for those living in high risk areas, scarce risk awareness/information and/or legislative knowledge. An interviewee living in the Monte Albino area stated: "Many people are not aware of the existence of building restrictions and think that they can do whatever they want on their private property. For example, I realised I was living in an R4 area only when I went to the municipal technical office to request a permit to enlarge my house" (Resident).

Institutional arrangements and bureaucratic procedures are also frequently mentioned: "The bureaucratic procedures to build new houses (everywhere, not necessarily in high risk areas) are too complex and expensive. As a result, people quite often build without following the procedure established by law" (Local association leader). However, some experts in risk assessment have a different opinion about illegal buildings. As reported by one of them: "I discussed the illegal building issue several times with local environmentalist groups. They always tend to overemphasize the relevance of this phenomenon because it makes easy propaganda. After the 1998 law basically no buildings have been constructed in the most exposed areas" (University Professor).

For the local authorities, and especially the technical municipal officers, illegal building in risky areas is also an issue, but they tend to focus on their limited capacity to control the territory: "We do not have the economic resources available to control the territory and monitor what is going on in the most risky areas. Most of the times we simply signal the problem to other competent authorities (e.g. the river basin authorities)" (Technical municipal officer).

5.2. TERRITORIAL PLANNING AND LAND USE RESTRICTION

5.2.1. Living in the high risk areas

In his visit in Nocera Inferiore after the 2005 landslide, the Head of the National Civil Protection Agency maintained that "the building of these houses on the slope should not have been allowed: actually there should be no buildings at all".

While residents recognise that their homes are in a landslide risk area, for most of them it is difficult to reduce their own level of exposure. A representative of a local association dealing with landslide risk reported: "Many residents on the Monte Albino slope admit that the existence of landslide risk is often equivalent to an acknowledgement of the devaluation of their home, a recognition that the latter may be not saleable" (Resident). Some residents state that they have to live with the risk because they do not have many other alternatives, for example because they cannot afford to build in the more expensive safe areas.

During the interviews with the residents of the Monte Albino area other elements also emerged, such as the low level of trust towards the authorities in charge of risk assessment and the scarce information about the assessment.

"I do not trust the risk assessment made by local authorities. As shown in the case of the 2005 event, their evaluations were wrong because the area affected by the landslide was not R4 in the river basin authority map"(Resident).

Some interviewees believe the risk zoning is too restrictive and imprecise: not all the houses in R4 area are exposed to landslide risk to the same degree. Many residents state their need to obtain information about the most exposed houses and the reasons for their exposure. For other interviewees, the zoning criteria are not clear: as an example, they report the case of a school in a safe area surrounded by R4 risky areas. They cannot believe this is right and maintain that the decision is driven by the economic and political interests of the local authorities.

Local officers of the public agencies dealing with risk management have a different opinion about the risk perception of the residents: "On the Monte Albino slope residents' risk awareness is quite low. Very often they deny the risk and think that only the areas hit by the 2005 event are at risk. Moreover many residents,

especially those not damaged then, are over-optimistic about the future and think that nothing worse than the 2005 landslide (which in their opinion was caused by the quarry) could happen."

5.2.2.The lack of communication about risk mapping

Many interviewees, especially residents, do not to know precisely which authorities are in charge of reducing the risk on the slope area, and do not know about their tasks, etc. The few who mentioned risk assessment seem to be quite sceptical about some tools such as risk/hazard maps.

With regard to the planning and land use management tools, many residents consider the communication about risk zoning insufficient (see also De Graff 2012).

"We live in a town where citizens should be more aware and informed about the risks. The town development plan strongly influenced decisions about hydrological risk. For example we should think about the role played by urban development and by the investments in the building sector. Nowadays there is still construction in areas where there shouldn't be any. We need to preserve urban development on the one side, but on the other side we have also to guarantee adequate safety standards" (Resident).

Many also lament the lack of communication regarding the updating of the river basin plans.

Others complain about the difficulties in gaining access to relevant information about their own household risk exposure. Some claim a right of information, i.e. "local authorities should be responsible for informing residents about the risk exposure of their households" (Landslide victims' committee member). They report that they were informed that they were living in the "red zone" only when they asked the municipality for permission to renew or restore their homes.

Many residents mention how transparency about information related to the most endangered areas should be better guaranteed. A minority of interviewees makes reference to "pluralism" in risk assessment: "Our problem is that we do not know how risk assessment and mitigation disputes are resolved and how decisions on controversial issues are really made. In the case of Sarno for example, only one alternative for risk mitigation strongly based on passive structural measures was presented after the event in 1998. There was no space for dissenting voices or different opinions. We do not want this to be the case in Nocera

Inferiore and for this reason the first risk mitigation project was blocked by the municipal authorities" (Local association leader).

5.3. WARNING SYSTEM

5.3.1.The territorial survey as a heritage of the 1998 Sarno landslide

Many residents mention the severe landslide which hit the nearby municipality of Sarno in 1998. This represented a watershed in the landslide history of the Campania region. As a result the attention toward landslide risk grew significantly among the local population. Just to give an idea about the severity of this event, on 5 and 6 May 1998, following two days of intense rain and a particularly wet spring season, loose pyroclastic soils collapsed and generated several flow-like fast-moving landslides which reached Sarno and three other towns (Quindici, Siano, Bracigliano), located at the toe of the Pizzo d'Alvano carbonatic massif, causing 159 fatalities and extensive damage to property. There is latent fear that "something similar might also happen" in Nocera Inferiore.

The territorial survey created immediately after the Sarno event was carried out by local units including groups of geologists, engineers, etc. whose main aim was to monitor and control the territory to prevent further disasters. The main aim of these units was to perform monitoring activities and to provide technical support for emergency management. Based on their memories many interviewees express the need for local mediators. The latter emerge as very important connecting figures between the local communities and the risk management experts and bodies (similar to the 'local natural hazard advisor' in Switzerland; 'local champions' in the UK see Bianchizza et al. 2011). Many interviewees maintain that these mediators are needed to bridge the gap between the different domains of knowledge pertaining to the variety of actors involved in landslide risk management.

Another issue often mentioned, especially by the experts, regards the large margins of irreducible uncertainty about landslide forecasts. Indeed, given the technologies presently available, precise forecasting of many landslide events is still (and is likely to remain) impossible, despite considerable and continuous improvements in modelling techniques. The intensification of meteorological phenomena and extreme events exacerbate this situation. Some interviewees explicitly mention climate change "which influences significantly hydro-geological phenomena and raises the uncertainty related to forecasts."

Another key problem is the uncertainty about the triggering factors. After the 2005 event, there may be 7-8 triggering points, but it is difficult to forecast where the next landslide is going to happen.

5.3.2. Warning communication

There was virtually unanimous agreement among interviewees working in the emergency management sphere that closer attention should be devoted to communication. The main issues singled out during the interviews were: i) the method (instruments, techniques and most suitable channels); ii) the content of the messages (synthesis of the most useful information and simplification of technical jargon); iii) the differentiation of the messages according to different groups of addressees (tourists, new residents, long time residents, …).

Understanding how people will react to an alert is particularly difficult for those in charge of the different organisations operating during emergencies. It is considered a priority for the message to be understood by the people to whom it is addressed, so that they can act accordingly. An officer from the provincial agency in charge of Civil Protection in Salerno stressed that communicating meaningful information requires not only communication abilities, but also the understanding of the residents' risk perception and their potential way of behaving during a warning. To predict how the residents will react, it is necessary to know if they are aware of the dangers, if and how they evaluate them, what environmental signals generate alert and why, and what types of reactions and behavior the messages can trigger. This information is not usually included in the emergency plans elaborated by the provincial authorities and the municipal officers in charge of Civil Protection.

Another problematic aspect of the decision is the timing of alert procedures. It is agreed that the technicalities of the warning system are well tested, but this is not always the case for the organisational procedure. At the provincial level several cases of false or delayed alarms have been pointed to, possibly deriving from disagreement between services and local authorities. This is attributed to competence overlaps and coordination difficulty in conditions of great uncertainty.

One of the central issues is the responsibility for issuing the warning, which in Italy lies with the Prefect and the mayor. Emergency managers and operators mention often the experience of Sarno and report on the decision not to issue the warning before the landslide hit the town. "A few hours before the event, the

mayor officially communicated that citizens must stay calm and that they do not need to evacuate. This was a terrible mistake which cost several lives" (Civil Protection member).

It is striking that in the near town of Quindici, which was also hit by a landslide the same day, five people died (as opposed to 159 in Sarno). One of the key differences is that the mayor in Episcopo issued the warning and decided, on his own initiative, to evacuate the town.

Some experiences were also mentioned, when communication between residents and officers did not work. In one case the officers did not provide the information necessary for people to perform life saving behaviours, such as providing information on viable escape routes[11].

Communication during the evacuation of areas threatened or struck by a flood event is also a problem. In this case the issue is to promote the correct behaviours and make information immediately available by triggering specific evacuation plans, particularly in the residential complexes. In fact, to avoid or reduce damage, these areas need to be evacuated as quickly as possible. In this case the issue is to promote the correct behavior and make information immediately available. There are also many difficulties in terms of communicating when an emergency situation has ended.

On 10 November 2010, while the research team was involved in the fieldwork in Nocera Inferiore, a warning was issued on the Monte Albino slope which was entirely evacuated. The warning was issued by the Regional Operations centre in Napoli. The Municipal operational centre in Nocera Inferiore was instead charge of alerting the population and evacuating the area, even if the mayor had the final responsibility for the evacuation decision. We considered this as a research opportunity and interviewed residents and local emergency managers about their experiences. We discussed about these issues also during some meetings of the deliberatie process.

In general the evaluation about the warning system is positive and most of the residents living in Monte Albino mention the efficiency of the municipal Civil Protection Corps. Critical remarks and suggestions for

[11] Numerous researches stress that misunderstandings between senders and receivers of information during warning communication are quite common and that the actual message comprehension by the addressees should never be taken for granted (Dynes *et al.* 1987, Dynes 1994, Nigg 1987, Handmer 2001, 2002, Gruntfest et al. 2002).

improvement involve three main points: 1. the end of the emergency: most of the residents did not know when they could go back home; 2. the level of preparedness of the civil protection volunteers (especially the youngest one who know the territory less well); 3. the lack of sirens to warn the local population. The civil protection volunteers warned the families door to door. Besides these critical remarks, this false alarm was not criticized or judged negatively by most of the residents. They actually considered it as a good precautionary measure. There was instead some criticism from the technical officers which regarded the centralisation of the decision making process for issuing the warning. They lamented that decisions are made only on the basis of the rain thresholds established by law and, as a result, local factors are not always taken into account as they should. This is also related to the lack of resources for setting appropriate monitoring instruments all over the regional territory, the lack of personnel to control the territory more accurately, etc. In their opinion , the number of false positive or, even worst, false negative is expected to grow in the future because of the lack of proper local monitoring and the high trust in the threshold established by law.

5.4. KNOWLEDGE ABOUT LANDSLIDE RISK

5.4.1.The identification of the most endangered areas

The identification of the most endangered areas of the Monte Albino slope and risk reduction are the key issues that emerged during several interviews. Many interviewees, especially among those belonging to the expert community, maintain that in-depth studies are needed to identify the most endangered areas. As already recalled above (see chapt. 2.1) the Monte Albino hillslopes are prone to different kinds of rainfall-induced flow-like mass movements: hyperconcentrated flows, landslides on open slopes and flowslides. This makes risk assessment particularly difficult.

The characteristics of the soil and the territory also accentuate the unpredictability of these phenomena as reported in a interviewee testimony: “For sure something is going to happen soon or later, but the problem is to clearly identify when and where. (…)The key problem in Nocera Inferiore is the lack of knowledge about the triggering factors and the reasons why a landslide or debris flow starts in one area and not in another. After the 2005 event in Nocera Inferiore it was found that there may be seven to eight triggering

points but it is difficult to forecast which one will be the tipping point. For example it some tree roots could block a soil mass from the mountains. There are so many local factors that it is impossible to forecast all of them." (University Professor)

Many residents mention how transparency about information related to the most endangered areas has to be guaranteed. A minority of interviewees makes reference to "pluralism" in risk assessment: "If an expert says A, there are always other experts who say B, with equal claim to professional or expert authority. Our problem is that we do not know how these disputes end up and how decisions on controversial issues are really made" (Local association leader).

5.4.2. Local knowledge about landslide risk

Some interviewees, especially among the residents living in the most endangered areas, seem to know a great deal about the local environment, the mountains and landslides, as reported during some interviews: "The healing of a landslide is the landslide in itself (meaning that when an area has been hit by such an event, there is no danger anymore)" or "We know our territory and we know when it is time to evacuate. If the water coming down from the mountains is brown or grey we know that we have to leave our houses immediately. If the water is clean then we know that we can stay longer" or "In the area where we live nothing is going to happen because there is more rock than soil. People living there for decades told us that there is no danger. In other areas of Monte Albino the situation is different and people are really endangered" (Residents).

In general the Monte Albino residents' knowledge about landslides seems to derive from a mix of different factors such as personal observations of environmental signals, reports from other residents, information collected on a voluntary basis, memory of past events (or its lack, depending also on the return period) etc. Personal networks seem to be one of the most successful tools for the transmission of this knowledge. At the same time it is important to note that it is extremely difficult to evaluate if residents should really rely on this knowledge, i.e. if it guides them to take the right decisions in case of a warning, for example.

Many interviewees also maintain that they know they have to live with risk, hence also with landslides. A quite common sentence is "we are aware that "zero risk" is not a realistic option".

This may be due not only to the history of landslide risk which characterises the Campania region, but also to the fact that many residents of the endangered area took part in conferences and initiatives organised after the 2005 event. On these occasions they had the opportunity to collect much information about the risk. It is in such meetings that experts often mentioned that residents should be aware that "zero risk does not exist".

5.5. RISK MITIGATION

5.5.1. Institutional barriers for effective landslide risk mitigation

The results of the interviews reveal that the fragmentation of competences and responsibilities among the different bodies and authorities dealing with risk mitigation is considered problematic. As reported by the environmental councillor of the province of Salerno: "In our region we have a number of authorities with overlapping tasks and functions. However too often the distribution of competences is perceived as a way to exercise power. (…) To understand how the system works we can make an example: if there is a potential emergency in our province [Salerno], we should first call the river basin authority. At the same time also an officer of the regional civil protection will join, probably together with an officer of the regional soil defence department. On his own turn the latter will call an officer of the '*genio civile'* "(Councillor of the Province of Salerno).

This example clearly shows how many authorities have competences over the same issue, which is not a problem, in principle. However this can cause several drawbacks: "As everybody is competent, nobody feels responsible. As a result, the hierarchy of decision making is not always clear" (Director of the sector of Civil protection, Province of Salerno).

Another interviewee calls for a simplification of the procedures: "We should have fewer authorities with clear competences, possibly not overlapping and with a shorter chain of command" (Director of the Provincial Civil Protection).

Besides the fragmentation of competences and responsibilities described above, the political instability and the lack of funding transfer for risk mitigation also represent two key problems.

An example of the political instability is represented by the fact that in 18 months (the length of our fieldwork in Nocera) two of the key actors for risk and emergency management changed several times. More precisely two emergency commissioners at the regional level with responsibilities over risk mitigation were appointed. The same is true with regard to a key actor responsible for both emergency management and risk mitigation decisions, i.e. the mayor. Again in the same time frame, two mayors and two commissioners (i.e. authorities with the same responsibilities as a mayor. They take his place in case of political instability) were appointed at the municipal level. This lack of continuity also caused delays in the decisions about risk mitigation.

For many interviewees the push for economic and urban development in the slope area represents one of the key threats for an effective risk mitigation on the Monte Albino slope. Some interviewees point out that it is necessary to immediately stop the quarry activities in the area to prevent future disasters. Others maintain that it is necessary to tighten penalties against illegal buildings

5.5.2.The role of past risk mitigation experiences

Another key issue of discussion for many interviewees regards the different options (more or less structural) that may be adopted for risk mitigation. The past experience of risk mitigation in the neighbourhood city of Sarno is often reported. €451 million have been spent on reconstruction in Sarno (Tortora 2008): 26 km of channels, more than 35 storage basins, 120 retention walls were built to reduce the risk.

The criticism against the Sarno risk mitigation model is often strong, at least for three reasons:

- Fairness in the distribution of funding for risk mitigation: as already underlined in previous chapters (chapt. 2.7) no funds have been made available to Nocera Inferiore for risk mitigation in the wake of the 2005 event. Therefore the €451 million spent onthe reconstruction in Sarno are considered as being an unfair distribution of economic resources. The latter should have been distributed more equally among the several municipalities at risk in the area.
- The (wrong) feeling of safety being induced by the structural risk mitigation measures: many interviewees maintain that “the visual impact of the control works in Sarno is excessive (…). Sarno gives the wrong illusion to the local population that everything can be solved with technical solutions” (Resident).

- After the event in Sarno in 1998, only one alternative for risk mitigation was presented and then carried out. As reported by an interviewee: “When the reconstruction started in Sarno, there was no space for dissenting voices or even for listening to different opinions. We do not want this to be the case in Nocera Inferiore and for this reason the first risk mitigation project was blocked by the municipal authorities” (Resident).

5.5.3. Risk mitigation discourses

In the following sections we describe the results of discourse analysis based on the semi-structured interviews with local stakeholders. Discourse analysis is the study of the language in use (Potter 1996, Gee 2011) and is a general term for a number of approaches to analyzing written, spoken and signed language use.

Our discourse analysis is grounded on the transcripts of the 43 interviews with local stakeholders, the 2 focus groups andgrey literature (newspaper articles, municipal authorities’ documents, local associations documents or open letters etc.). We analysed these materials and identified the key themes and issues related to risk management and mitigation. As a heuristic tool for our analysis we used

the analytical framework described in cultural theory (Thompson 1997; 2008, Adams and Thompson 2002, Bayer et al. 2003, Ney 2009). This theory suggests four prototypes of responses to risk, which underline different views of nature and society: fatalististic, egalitarian, hierarchical and individualistic. For “fatalists” nature is unknowable and unpredictable and there are few possibilities to control it. As a consequence discourses grounded in this persuasion are sceptical of risk assessment and management. “Individualists discourse views nature as resilient - i.e. able to recover from exploitation – and man as inherently self-interested and atomistic. Those holding this “worldview” tend to prefer institutions and regulations that work with the grain of the market. As they believe strongly in personal freedom of choice, a pluralist form of democracy - with checks and balances preventing a tyranny of the majority – is seen as the best way of organising the polity. This discourse often views risk as opportunity and, if it is a burden, individuals should take responsibility for its mitigation.

Those enmeshed in egalitarian circles often see nature as fragile: in their perspective, man is essentially caring for nature and the environment (until corrupted by coercive institutions such as markets and

bureaucracies). Accordingly, we must all tread lightly on the earth, and it is not enough that people start off equal. Justice demands that they end up equal as well.

"Hierarchical" actors see the world as controllable and stable within boundaries, which are established by experts and competent authorities.They rely on these authorities for risk related issues, which can be managed most effectively with a top down approach. Nature is stable until pushed beyond discoverable limits.

In our analysis we found little trace of the fatalist perrspective in the data collected (interviews grey literature etc.). Thereby we identified three main discourses related to risk mitigation issues, which reflect the hierarchical, egalitarian and individualist perspectivess: i) protect lives and properties (hierarchical) ; ii) careful stewardship of the mountains (egalitarian); and iii) rational individual choice (individualist). In the following chapters we describe the discourses in detail.

5.5.3.1. Protect lives and properties

Below we paraphrase the main characteristics of the discourse as part of a storyline that we call "protect lives and properties". As noted above, this discourse is rooted in views expressed by identifiable interviewees and discussions in the grey literature; however, no one single interviewee expressed precisely this storyline in its entiriety.

> Many residents of Monte Albino are living in areas at risk of landslides, threatening their own and their children's lives, as well as their properties. It is the responsibility of the Italian government, and other public authorities at the regional and municipal levels, to reduce this risk to acceptable levels. Those holding this view tend to recognize that there is no such thing as "zero risk" but available public resources should ensure the greatest protection possible. It is far wiser to provide protection before lives and property are lost than to spend possibly more sums on compensating victims."
>
> Protection does not mean large, unaesthetic and very expensive structural measures (as were adopted in Sarno). Rather the job can be done with a careful mix of active measures, such as cleaning drains and properly managing forests. Limited passive measures, however, will also be necessary. These may include building decanting structures and storage basins. Hazard and risk

analyses (including risk maps) are useful, even if they have some uncertainties, for guiding these investments.

With sufficient investment, risks can be reduced to acceptable levels, but still there will remain some residual risks. Existing buildings in high risk areas should be safeguarded, and only under very exceptional cases should homes be relocated. The emotional cost of residents abandoning their long-time homes is too high for this to be an acceptable option. Finally, authorities should have more responsibility for preventing future construction in designated high-risk areas.

The authorities have done an excellent job in making information on restricted areas, as well as risk mitigation measures, available, for example, on the web site of the River Basin authorities. Indeed, landslide risk maps pertaining to the Campania region are the most reliable in Europe. Of course, there are extreme complexities in mapping landslide risk.

Insurance is not the answer since the government, and not the individual residents, is responsible for protecting against this risk – and compensating victims.

Of course, early warning systems combined with emergency plans are important and the existing system should be improved. As the local population may not have adequate information on the risks, it is important for the experts to further develop the warning system. At the same time, the local population needs to be informed on how the warning system works, e.g., what to do in the case of a warning and who to rely on.

5.5.3.2. Careful stewardship of the mountains

Below we paraphrase the main characteristics of the discourse as part of a storyline that we call “careful stewardship of the mountains”. Again, as noted above, this discourse is rooted in views expressed by identifiable interviewees and discussions in the grey literature; however, no one single interviewee expressed precisely this storyline in its entiriety.

Because anthropogenic activities including environmentally detrimental practices (such as building roads, industrial activities and even power lines at the edge of the slope), the mountain has become less stable and subject to dangerous landslides. Climate change may be worsening the

situation. While some immediate measures will be needed to reduce the acute risks to residents of Monte Albino, the critical long-term issue is to deal with the multitude of factors that are contributing to the instability of the slopes. Not only must the residents be protected, but also the natural cycles and the evolving mountain terrain should be respected. This will mean taking a more holistic and ecological view of the mountain and its maintenance.

Expensive structural passive measures[12] only aggravate the ecological problems and are not necessary (additionally they are problematic due to the complex mix of authorities in charge of different measures). Rather active measures including naturalistic engineering works (e.g. hydroseeding, turfing, trees/brushes, fascines, geosynthetics) can do the job. One of the interventions is the creation of a natural park at the toe of the slope to reduce the urbanisation in the area. A network of naturalistic paths should also be created to give the opportunity to local residents to appreciate the mountain areas and to "check on" the territory at the same time. In addition to the park and the paths, small scale organic farming on the mountain and a better management of the forest (including both public and private properties) could be encouraged. Activities that promote a sustainable future for the area will likely need support through public-private partnerships.

It is imperative to also investigate industrial activities that are adding to the problem.

Illegal buildings in restricted areas are a major culprit, and it will be necessary to more forcibly prohibit construction in some areas. But this is not the main issue. First, the bureaucratic hurdles for informing oneself about the regulations are complex, and buildings in risky areas are widespread in the Campania region. In some exceptional cases, however, it may be necessary to relocate homes, which would also send an important signal to those thinking of building in

[12] As highlighted by Vaciago et al. (2011), the control works aimed at reducing the landslide risk can be classified as "active" or "passive in relation to whether they "actively" pursue an improvement of the stability of slope or "passively" intercept the run-out when landslide occurs, protecting the elements at risk.

restricted areas. It is also inequitable to restrict building in dangerous areas where homes are already located.

Insurance, even if it were available, is not the answer since this places too much responsibility on residents – some of whom would not be able to afford the premiums. And, besides, insurers cannot be trusted.

Of course, early warning systems combined with emergency plans are important and should be improved. It is very important that the residents are involved in the design and implementation of these systems, especially since they often have a better understanding of the mountain and its risks than outside experts. Indeed, the residents, themselves, are very good at knowing when to evacuate.

Risk maps proved to be unreliable in 2005. Local knowledge may in some cases be more valuable. At any rate, it is clear for many reasons that – even in the absence of full knowledge on the landslide risk - careful stewardship of the mountain will have high payoffs.

5.5.3.3. Rational individual choice

Below we paraphrase the main characteristics of the discourse as part of a storyline that we call "rational individual choice". As noted above, this discourse is rooted in views expressed by identifiable interviewees and discussions in the grey literature; however, no one single interviewee expressed precisely this storyline in its entiriety.

The residents of Monte Albino are living with a risk of landslides, but the seriousness of this risk is highly uncertain and may be exaggerated. In fact, only a small number of residents and homes may be dangerously threatened. It should be noted that the landslide risk is not the only concern of the residents, and probably not the main one. Unemployment, environmental pollution, and waste management are among other worries. Moreover, many residents also face a risk of flooding, and it may be more cost-effective to invest in flood prevention. It is very important to allocate scarce public resources taking into account ALL the municipalities' priorities, and for this reason it is important to evaluate the use of public funds if "no action" for landslides is taken.

If, however, the landslide risk is shown to be high and unacceptable, then investments inthe reduction of these risks should be carefully considered. It is important to calculate what we are buying, ie the costs and the benefits to the residents. This will determine how we invest, whether with active (eg. cleaning drains, reforestation), passive (e.g. embedded walls or reinforced fills) or more holistic (creating a park or subsidies for organic farming) measures.

What is of utmost importance is that residents are aware of the risks they are facing. It is the obligation of the authorities to supply this information. Expert knowledge and risk maps, even if uncertain, are most valuable.

Concerning relocation, again it is the residents' decision (if they are informed) whether to relocate, or not. While public compensation is justified for those wishing to relocate, it should not be applied to anyone consciously deciding to build in a dangerous area after information is available. There remains a residual risk, however, even in some unrestricted areas, and to protect residents against the economic risk, insurance should be more readily available. This is the role of the private market, but the government could support this role with public-private partnerships.

If individuals or businesses are aware of the risk – and required to purchase insurance – illegal building will no longer be an issue. High insurance premiums will keep people from locating in areas with high residual risk. Otherwise, informed and knowledgeable people should be allowed to build on their property.

Of course, early warning systems combined with emergency plans are important and should be improved.

5.6. LESSONS LEARNED FROM PREVIOUS DELIBERATIVE PROCESSES ON LANDSLIDE RISK ISSUES

Nocera Inferiore is not new to deliberative processes. For example, as described in chapter 3.6after the 2005 event, an Agenda 21 process started with the aim of discussing the numerous issues related to the reconstruction and the decisions about risk mitigation.

Considering the previous (more or less satisfactory) experiences of participation we wanted to collect information about the main lessons learned from the past and the local expectations for a deliberative

process. We did it by means of a focus group with some participants of the previous deliberative experiences in town and some semi-structured interviews with residents and local authorities.

During the focus group we wanted to better understand the main lessons learned from the previous processes and if/how our process could have benefited from them.

The suggestions provided were the following:

- set clearly the objectives at the beginning of the process. These objectives should be shared with the participants
- engage in personal/face to face contacts with the participants
- organise "mixed" working groups, i.e. participants must be free to interact with the experts as much as possible
- avoid any political connotation to the process: the previous Agenda 21 was run by the municipal authorities (left wing coalition) and this raised criticism among the opponents. Neutral facilitation was suggested as the best option to avoid the facilitators to become "stakeholders" themselves.
- be prepared to face conflicts among the participants during the process
- leave a heritage for the community. For example, it was suggested that some protocols be prepared on what to do during a warning, that a municipal forum be started to foster discussion about the crucial topics emerging during the process, etc.

The engagement with the local context emerged as a key feature for effective participation. This means listening to participants' needs and expectations and taking them seriously into account to define the process content and methodology.

We explored these needs and expectations through semi-structured interviews. Results revealed a cleavage between residents' and local authorities' expectations as summarised in table 5.1.

Tab. 5.1- Residents' and local authorities' expectations about the deliberative process

Residents	**Local authorities**
• create an arena to discuss local conflicts about risk mitigation (i.e., relocation of private properties, …) • develop a protocol for a community warning system • take seriously into account the opinions of the Monte Albino residents with respect to decisions about risk mitigation • provide local authorities with a document/guidelines about risk mitigation synthesising residents' views and opinions • create a municipal observatory/laboratory to profitably continue the discussion about landslide risk mitigation	• know residents' opinions about the risk, their prospective behaviors during a warning, their feeling of responsibility related to risk mitigation • inform the residents about the characteristics of the territory, the landslide risk, and its assessment • test effective ways to involve the residents in the (already existing) decision making processes (e.g., the "Conference of Agencies" which aims to approve risk mitigation plans • collect information to support a decision to share responsibility for the decisions about risk mitigation

In general terms, the residents are more interested in catalysing actions for risk mitigation (mainly because all risk mitigation measures were adopted after the 2005 event, except for the most urgent ones) and in finding (old and new) political arenas where they can "have a voice". The officers of the local authorities and agencies are instead more concerned about finding a way to gain consensus for their decisions. They are particularly worried because they do not know what residents think about the risk, how much information they have, if/how they should be educated about risk, and how to raise risk awareness or foster preparedness, etc.

Comparing these different expectations reveals that the residents are more interested in active participation in the decision-making process and want to start a dialogue with local authorities. The latter are instead more focused on informing the public and gaining consensus. This is certainly not surprising for deliberative processes: as reported by other authors (e.g., Ney 2009, Renn et al. 1999). Whereas citizens (or those speaking for citizens) will tend to understand public participation processes as a means of challenging existing policy-making structures, policymakers (or those speaking for policymakers) will tend to look to citizen participation as means of securing acceptance for policy decisions.

It is also important to report on the criticism voiced to us about public participation in risk mitigation decisions. Some interviewees, especially municipal politicians, were very sceptical about the actual impact of any decision taken using a deliberative approach. For example, a local politician maintained that “all these initiatives are very good, but only in principle. We need to be more realistic about decision-making processes related to risk mitigation. Bottom-up initiatives cannot work because the residents can neither provide any new information nor meaningfully contribute to the risk mitigation discussion. No one aware of the real decision-making mechanisms in Nocera Inferiore will trust any deliberative effort. Instead, we need top-down participation because experts are the only ones who can provide useful advice.” Another local politician stated:”We all know who is going to make the decision: the regional emergency commissioner. What is crucial is to find the resources to protect or relocate the most endangered households. In the end what really counts is the impact of the findings of this project on the emergency commissioner’s decision. ”

Finally, in the questionnaire the most common answer related to the need to have a voice and possibly to influence the actual decision-making process. Many respondents want to keep the attention on risk mitigation issues high and consider the process as a mean to do this. Some particularly fear that risk mitigation decisions will be influenced by the economic/political interests of a minority of the local population.

6. THE DELIBERATIVE PROCESS

In this chapter we present the key results of the deliberative process, the structure of which was presented in the methodological approach (chapter 4).

6.1. RISK MITIGATION OPTIONS AND PACKAGES

In the following paragraphs we describe the risk mitigation options, worked out on the basis of the discourses presented in section 6.5. Here we will not describe into detail each discourse again but focus on the key aspects of each option, including the technical options.

The options were elaborated thanks to the close cooperation between the two research teams: the discourse analysis provided the starting point for elaborating the options and translating "words" into actual proposals for risk mitigation on the Monte Albino slope. The University of Salerno team prepared the mitigation plans, including the choice of measures and the outline of costs. Below we focus on the following aspects for each option: i) setting and basic assumptions; ii) protagonists and responsibilities; iii) policy problem and solution; iv) risk mitigation measures.

6.1.1.The options

Option 1: "Protect lives and properties"

Setting and basic assumptions: Any decision about risk mitigation has to be based on the needs of the residents in the Monte Albino area. These people are facing threats to their own and their children's lives. Protecting lives and properties is the top priority. We should spend available public resources to assure the greatest protection possible, or we should reduce risks to acceptable levels. It is far wiser to provide protection before lives and property are lost than to spend possibly more sums of money on compensating victims.

Protagonists and responsibilities: It is the responsibility of the Italian government, and other public authorities at the regional and municipal levels, to reduce this risk to acceptable levels. Italian risk management is organised as a top-down / interventionist system. As the emergency commissioner will

make the final decisions, the only way to influence this decision is through constant pressure by the local municipal authorities to persuade him to make the economic resources available.

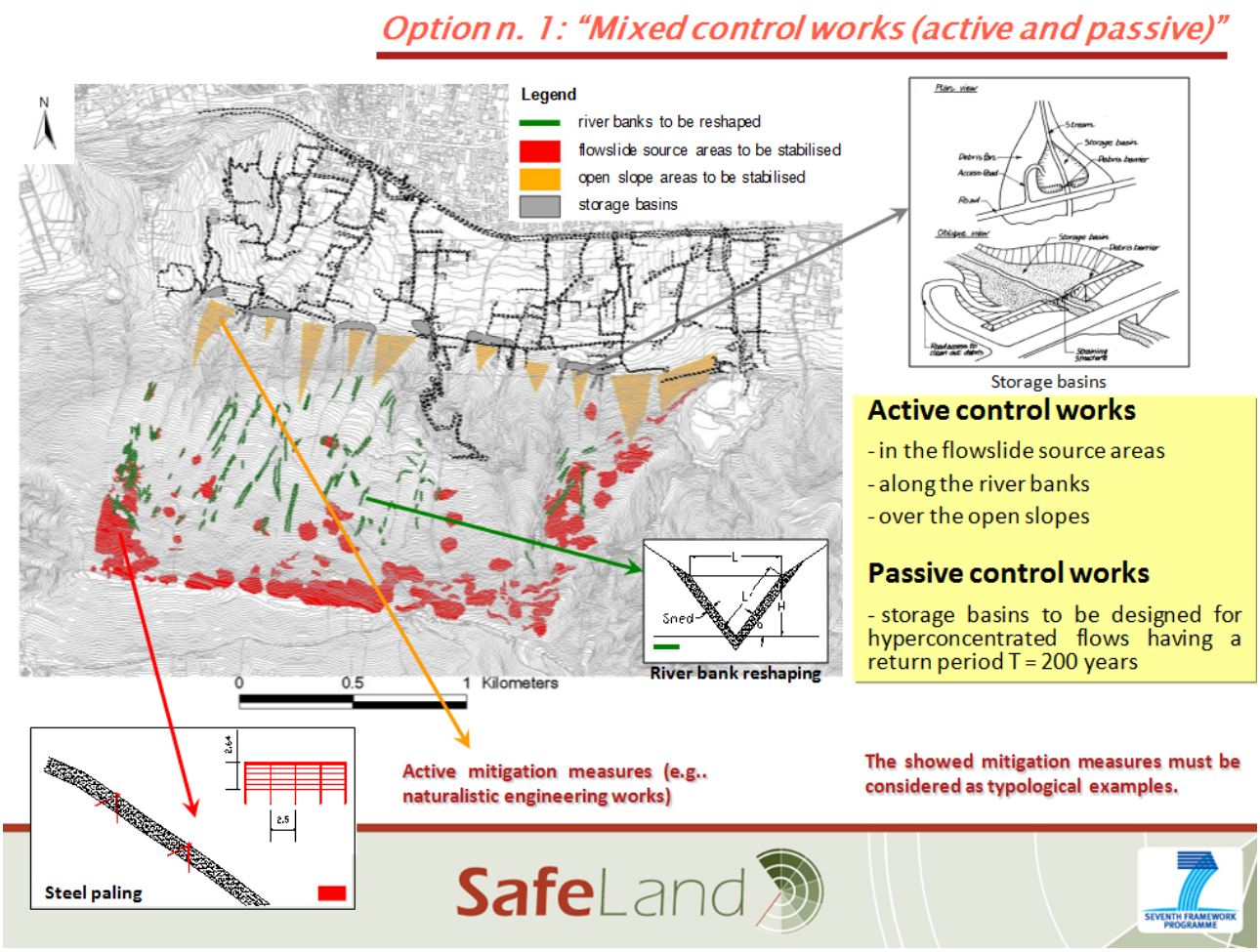
Policy problem: We need to find the best solution to guarantee protection to the people living in the most endangered areas of Monte Albino. Protection does not mean large, unaesthetic and very expensive structural measures (as were adopted in Sarno).

Policy solution: The best solution includes a careful mix of active measures, such as cleaning drains and properly managing forests. Limited passive measures, however, will also be necessary. These may include installing decanting structures and storage basins. Hazard and risk analyses (including risk maps) are useful, uncertain though they may be, for guiding these investments.

Risk mitigation measures: The risk mitigation measures conceived for this narrative are a mix of active and passive control works including:

- active control works: i) in the flowslide source areas (e.g., via steel paling), ii) along the river banks (e.g., via their reshaping), iii) over the open slopes (e.g., via the use of naturalistic engineering works);
- passive control works corresponding to storage basins, located at the toe of the catchments, to be designed for hyperconcentrated flows having a return period T = 200 years.

Figure 6.1 Risk mitigation measures – Option 1 (Cascini 2011)



Option n. 1	Cost (%)
Active control works	77,8
Passive control works	22,2
Forestation/Natural park	0
Relocation	0
Total cost [€]	≈ 23.200.000

Active control works	Cost (%)
River banks reshaping	65,5
Flowslide source areas	6,5
Open slopes	5,8

Option 2: "Careful stewardship of the mountain"

Setting and basic assumptions: We should do our best to preserve the fragile ecosystem and equilibrium of nature and, in this case, of the Monte Albino area. The mountains (and nature in general) are being exploited by human activities. We need to change our life styles and spend more time in the environment. New and more sustainable ways to cooperate with nature have to be found and appropriate policy decisions made. Rather than fighting against natural hazards, we should try to live with them. To do this we need to know better our territory, to safeguard it and to promote sustainable practices for its management and maintenance.

Protagonists and responsibilities: The local authorities as well as the local community have to work together to find sustainable paths to live with risks. Local voluntary organisations and groups play a special role in building up risk and safety awareness. Stronger partnerships between public and private actors should be built, for example by working together for a more effective community warning system or favouring public/private cooperation for the promotion of high quality agriculture and small-scale farming.

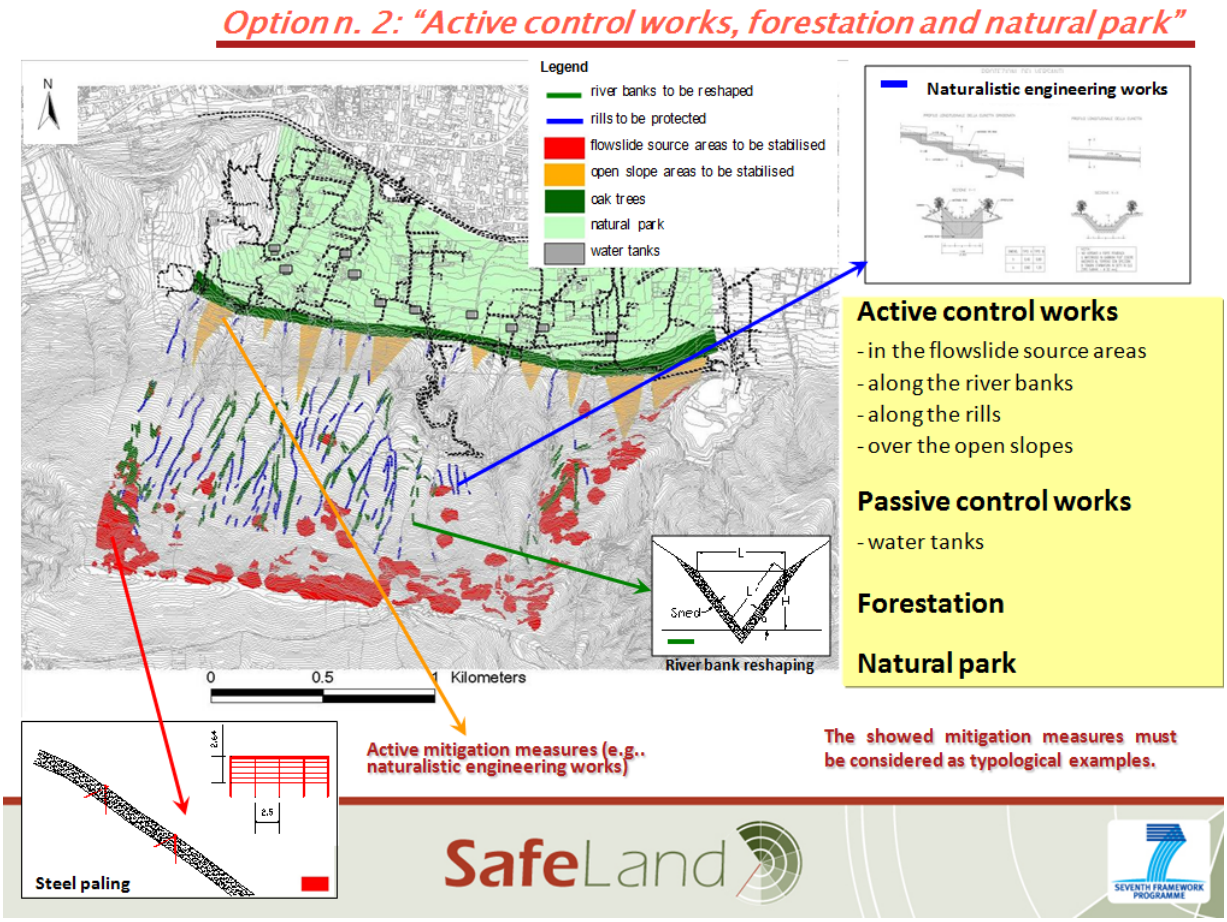
Policy problem: Anthropogenic activities, including environmentally detrimental practices (such as building roads, industrial activities and even the maintenance of power lines), have destroyed the ecosystem and degraded our mountains. As a consequence, they have become less stable and subject to dangerous landslides. Passive mitigation measures, such as the ones constructed in Sarno are not the solution, and we should avoid them as much as possible (mostly for the motivations explained in par. 4.8.2) .

Policy solution: It is necessary to guarantee better territory governance through: i) the realisation of active and passive risk mitigation measures that include better naturalistic engineering works with a low environmental impact; ii) the sustainable development of the mountain area, especially through profitable management of the (public and private) forest and small farming.

Risk mitigation measures: The risk mitigation measures conceived for this narrative consist of a mix of active control works, forestation and a natural park:

- active control works: i) in the flowslide source areas (e.g., via steel paling), ii) along the river banks (e.g., via their reshaping), iii) along the rills (e.g., via the use of gabions), iv) over the open slopes (e.g., via the use of naturalistic engineering works);
- passive control works corresponding to water tanks to be localised in the urbanised area at the toe of Monte Albino;
- forestation, with oak trees on one of the Monte Albino hill slopes;
- creation of a natural park corresponding to the urbanised area at the toe of the Monte Albino massif.

Fig. 6.2 - Risk mitigation measures – Option 2 (Cascini 2011)



Option n. 2	Cost (%)
Active control works	65.9
Passive control works	5.0
Forestation/natural park	29.1
Relocation	0
Total cost [€]	≈ 30,000,000

Active control works	Cost (%)
Works in the flowslide source areas (e.g., via steel paling)	50.7
Works along the river banks	5.0
Works along the rills (gabions)	5.7
Open slopes	4.5

Option 3: "Rational individual choice"

Setting and basic assumptions: Rational choices have to be made to protect the environment and to ensure higher safety standards. This means that the cost and benefits of any risk mitigation option have to be carefully considered before any decision can be made.

Protagonists and responsibilities: We have to be realistic. Risk is managed via a top-down approach in the Campania region: the local authorities (especially the emergency commissioner) are the real policy protagonists.

Policy problem: As reported by one interviewee "Something is definitely going to happen sooner or later, but the problem is to clearly identify where (…). Today the key problem in Nocera Inferiore is the uncertainty about the triggering factors and also the reasons why a landslide or debris flow should be triggered in one area (and not in another one)."

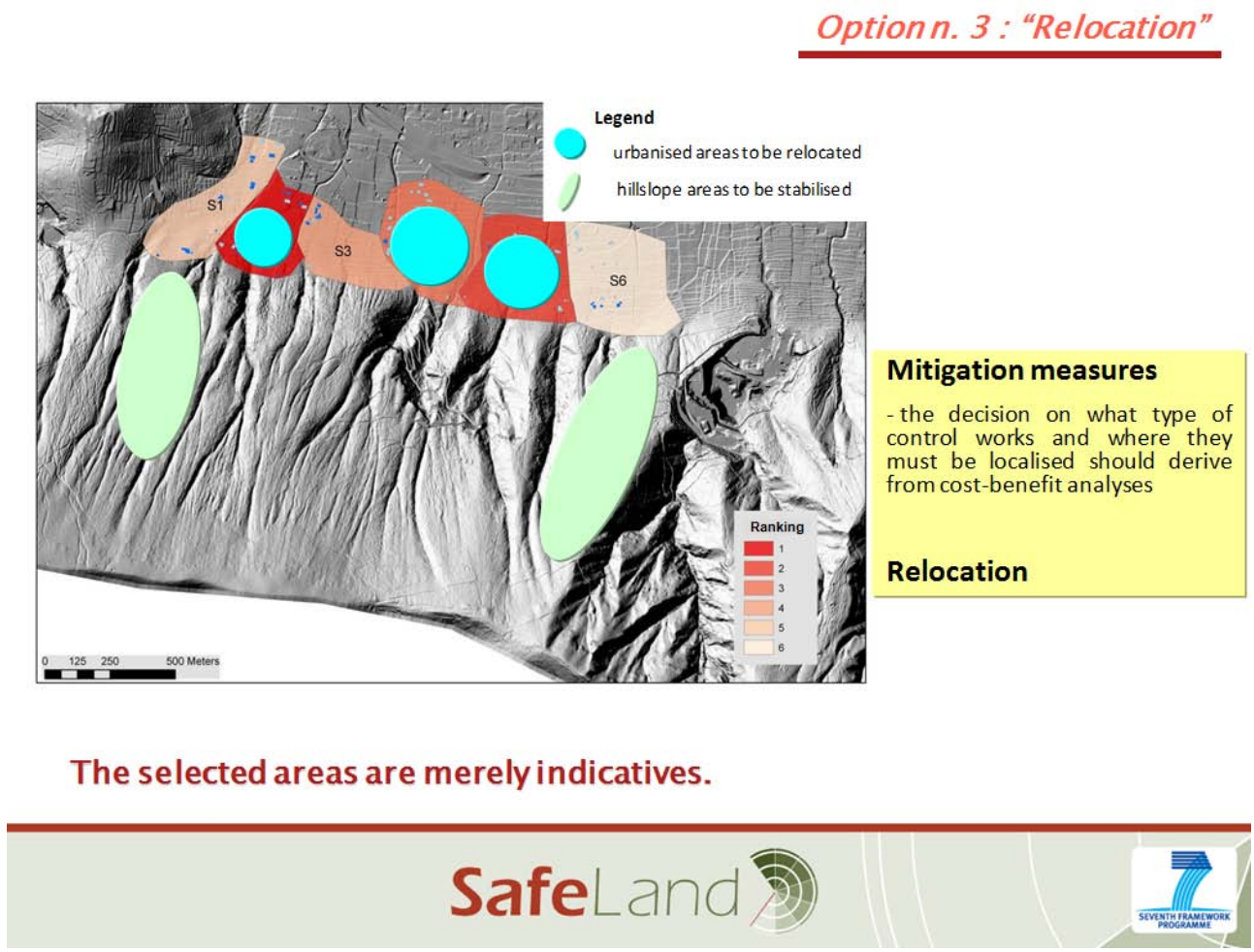
Policy solution: To make the entire slope area safer, at least 25–30 million euros are needed. Finding these resources would ultimately be serious problem even at the national level. Sometimes the costs of solving such problems are so high and that delocalisation would be a more cost-effective option. However, before deciding for or against any risk mitigation option, the costs and benefits have to be calculated.

Risk mitigation measures: The risk mitigation measures conceived for this narrative consist of a mix of relocation and active control works:

- the relocation of some houses located in the areas most at risk to the toe of the Monte Albino massif;
- the carrying out of active control works along chosen catchments.

It is worth noting that the decision on what type of control works and where they must be localised can be derived from cost-benefit analyses.

Fig. 6.3 - Risk mitigation measures – Option 3 (Cascini 2011).



Option n. 3	Cost (%)
Active control works	To be evaluated on the basis of the cost benefit analysis
Passive control works	≈ 23,000,000
Forestation/natural park	

Number of households to be relocated	Cost (€)
94	11,280,000

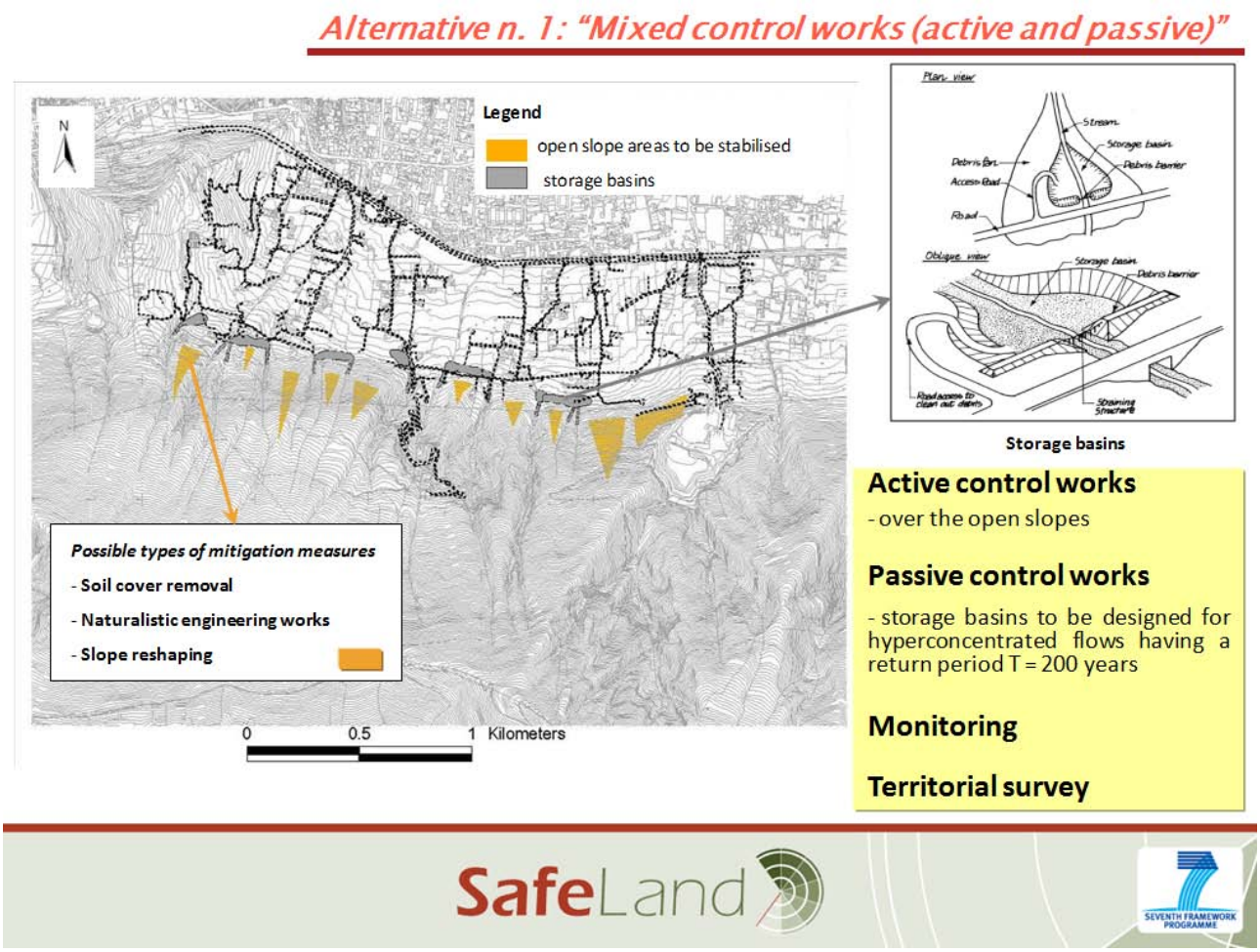
6.1.2.The packages

The studies carried out highlighted that the Monte Albino hillslopes are prone to different flow-like mass movements, each one characterised by peculiar triggering mechanisms, kinematics during the propagation stage and run-out distances. Irrespective of the fact that there are alarm systems in operation, the official risk zoning map as well as the one obtained as a final product of the quantitative analyses carried out for participatory process purposes show that people living at the toe of Monte Albino are exposed to a very high landslide risk. From the social and technical viewpoints, three options of mitigation measures have been developed on the basis of the results of the discourse analysis (see secion 5.7.1). The costs range between 23 and 30 million euros. Bearing in mind that the available funds were limited, these options must be reconsidered to see if their cost can be kept below 7 million euros, ie. the sum made available for risk mitigation by the Emergency Commissioner (see section 3.6).

The mitigation measures are conceived to protect both people and property. If the funds available are limited, safeguarding the inhabitants becomes the priority (as established by law, D.P.C.M. 29.11.1998 n.180, art. 1). The alarm systems may be relevant in terms of reducing people's exposure to phenomena characterised by a high return period (namely, hyperconcentrated flows and flowslides). On the other hand, for phenomena characterised by a low return period (namely, landslides on open slopes and flooding), the alarm systems would be inadequate in terms of safeguarding people, and control works would have to be carried out.

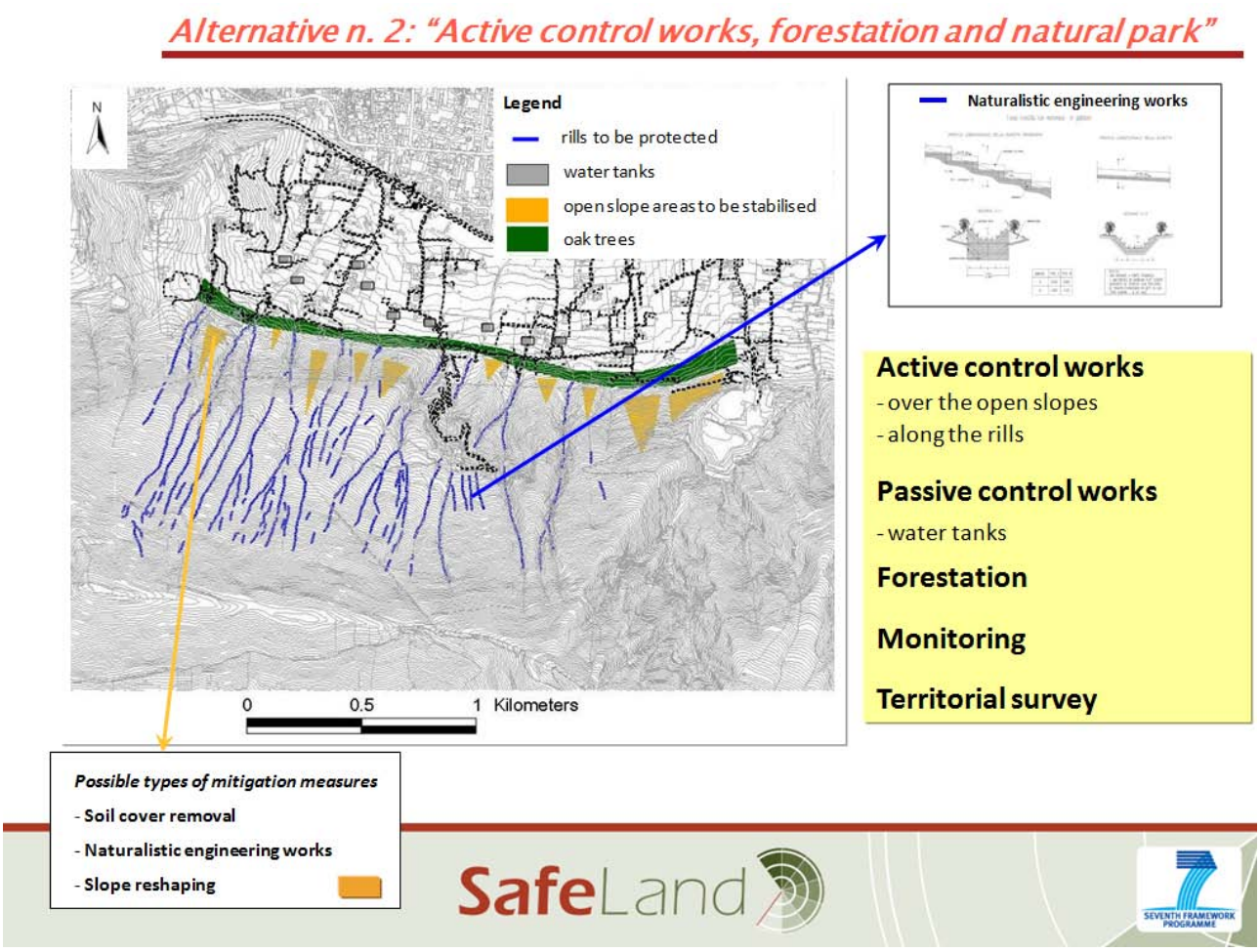
On the basis of these considerations, the following "packages" of the previous options were established (all include an efficient alarm system and a territorial survey). The packages were basically smaller –i.e. cost reduced versions – of the options described above: Package of option 1 entitled "Mixed control works (active and passive)" consisting of (Fig. 6.4) active control works across the open slopes and passive control works corresponding to storage basins, located at the toe of the catchments, to be designed for hyperconcentrated flows having a return period T = 200 years.

Fig. 6.4 Risk mitigation measures – Package of option 1 (Cascini 2011).



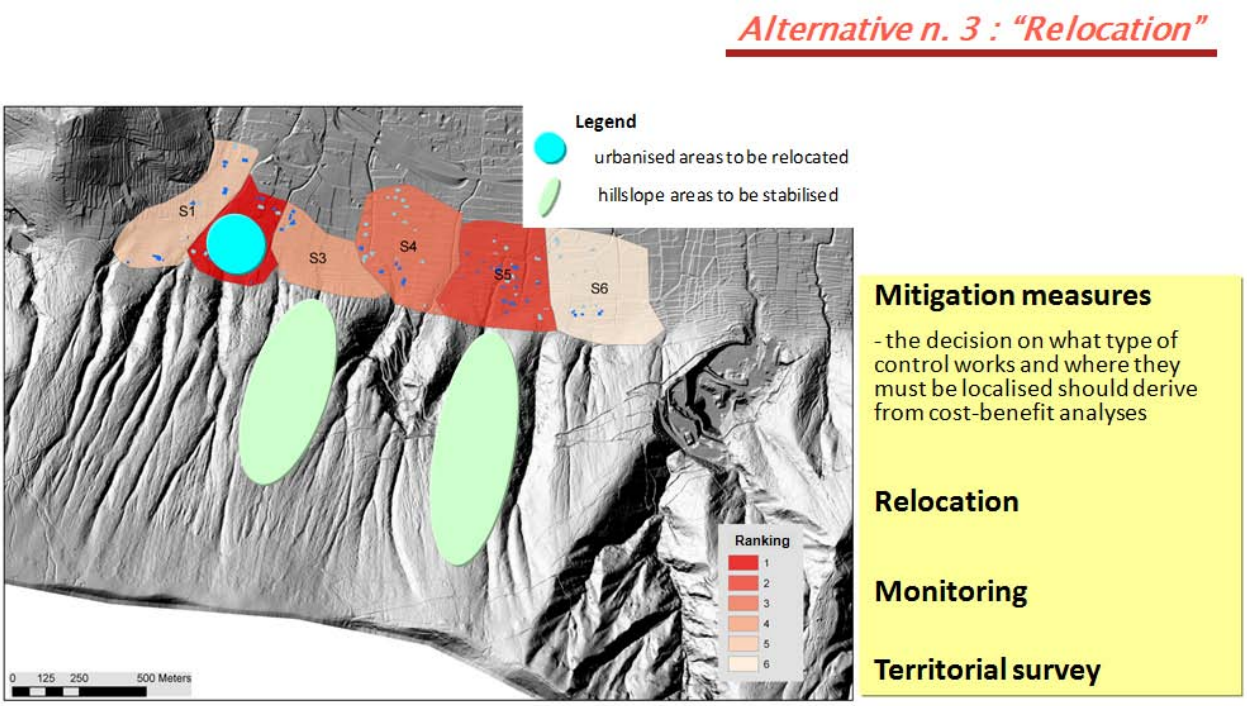
Package of option 2 entitled "Active control works, forestation and natural park" consisting of (Figure 6.5) active control works over the open slopes, passive control works consisting of water tanks to be located in the urbanised area at the toe of the Monte Albino and forestation, with oak trees being located at the the Monte Albino hillslopes.

Fig. 6.5 - Risk mitigation measures – Package of option 2 (Cascini 2011).



Package of option 3 entitled "Relocation" (Figure 6.6) would involve the relocation of some houses located in the most at-risk areas at the toe of the Monte Albino massif and the carrying out of active control works along chosen catchments (in this Package, cost-benefit analyses are needed before a decision on what type of control works and where they must be localised is made).

Fig. 6.6 - Risk mitigation measures – Package of option 3 (Cascini 2011).



6.2. WORKING GROUPS

As described above (see section 4.2), during the working group meeting participants were asked to express their views, opinions and comments on the options and packages presented in meeting 3 (see section 6.1.1. and 6.1.2). The main objective was not only to collect feedback on the presentations about the landslide risk and the Packages, but also to identify the priorities for risk mitigation and to justify these. After a short introduction, as discussed in section 4.2.1 participants were divided into three groups on the basis of their preferences for the Packages. Working group 1 focused on Package 1, working group 2 on Package 2, and working group 3 on Package 2 with some aspects of 3. Indeed, none of the participants

expressed their preference for Package 3, which is why we proposed the third working group comprising people interested in merging some aspects of option 2 and 3.

Each working group could have relied upon technical consultancy for: i) risk analysis and mitigation, ii) event types, models and forecast, iii) risk and buildings (i.e. vulnerability), iv) forestry. The experts in topics i) to iii) were the project partners (UNISA), while those in the fourth (forestry) were chosen by the participants themselves. Indeed after meeting 3, as some participants were interested in gaining a better knowledge of the forest assessment plan and forest maintenance, they contacted their own experts and asked if they could join the working group meeting. As a result the forestry experts, as well as acting as consultants, also provided also some ideas and suggestions on how they view potential risk mitigation for the Monte Albino slope.

6.2.1.Results

The working group discussions were intense, sometimes heated, and full of content and ideas. In the following we provide a synthesis of the key results of each working group based on the tape recordings, the notes of one SafeLand team member (who was not taking actively part in the discussion) and the synthesis provided by the WG participants.

6.2.1.1. Working group 1

A multi-hazard environment

Participants started the working group with a discussion about the main criteria to prioritise actions regarding the different hazards affecting the Monte Albino slope (see chapt. 2.1). In fact, it was difficult for them to really understand what was the most worrying/dangerous type of event among those presented during the first meeting, i.e. hyperconcentrated flows, flowslides, floods, landslides on open slopes. After asking the expert group for suggestions, the participants agreed to consider the i) frequency of events, the ii) return period and the iii) intensity as the guiding criteria. As a result, the “hierarchy” is the following: flowslides, landslides, floods and hyper concentrated flows.

It should also be noted that one participant living on the Monte Albino slope did not completely agree with the results of the risk assessment presented by the experts, on the basis of his knowledge of the territory. He believes that some open slopes (faccette triangolari) do not represent a threat because the soil over them is not very thick.

A mix of active and passive measures

The participants thought that both active and passive control works needed to be built to protect the most risky open slopes. In their opinion it is really crucial to start from these slopes.

Even if the focus is mostly on active control works and implementation of the warning system, this group was also in favour of building some passive control works. This was actually the only group to support this idea. They also posed a condition, namely, that the passive control works should not have a high environmental impact, i.e., special care should be devoted to their (low) visibility and the building techniques (the less concrete, the better).

Carrying out these works is considered very important for “pragmatic” reasons: the maintenance of active works is often difficult and it is not clear who the agencies/authorities in charge are. Thus, active measures, if not appropriately maintained, cannot provide high safety standards and some passive measures are required.

One key issue emerging during the discussion has to do with the positioning of the risk mitigation measures (both active and passive ones) on the slope. Some participants believe that it would be better to invest in building control works upstream rather than downstream. Indeed the storage basins planned to mitigate the flood risk downstream are not considered effective enough to really save the lives of the residents in the area. The construction of control works upstream instead can really stop the debris and soil from sliding down: the group suggests to build ”km 0” active control works upstream, i.e., to use wood from the forest to build, for example, the steel paling.

At the same time the warning system is a really key aspect: participants are aware that “any active or passive control works will never guarantee 100% safety: a long lasting rain, for example, would jeopardise the stability of the entire slope. As a result, investing in improving the warning system is a real priority, as is the instrument monitoring that should accompany it. Moreover many families living on the open slope will never leave their homes and the only way they can reduce the risk to their lives is to invest in the warning system. Some participants were also in favour of the relocation of some houses, if this is a feasible and cost-effective option.

Budget constraints

Pragmatism was definitely a key word for this working group. The participants really care about discussing a risk mitigation scenario that is not only feasible but also compatible with the economic budget of the €7 million. Before choosing this package many participants preferred package 2 but then they changed their mind for two main reasons. First, they maintained that within the budget available passive control works to guarantee a minimum safety standard were also necessary. Second, they believed that the natural park planned for the lower part of the slope in package 2 was not a realistic option because of the potential bureaucratic problems involved.

6.2.1.2. Working group 2

Risk assessment

As in all the working groups, the identification of the most risky slopes was a discussion topic. In this working group the participants asked the experts' advice to on ranking the open slopes. Experts replied as follows "The issue of the open slopes and the ranking is a delicate one for at least two reasons. The first reason is the thickness of the soil for each of them, which varies and has to be measured very carefully. The second reason is the role played by local triggering factors, which can be of natural or anthropogenic origin. The latter are particularly problematic as they are not easy to forecast, e.g. using models. Therefore we should be aware of these uncertainty margins."

Active control works, forestation and natural park

Most of the participants considered the preservation of the Monte Albino area and its sustainable development as a priority. Participants were aware that any risk mitigation package cannot guarantee 100% safety, but they also know they have to live with the risk.

A good risk mitigation package should guarantee equity in risk distribution, i.e., the adopted measures should ideally assure the same safety standard for each channel/slope.

Participants discussed and commented on some key elements of package 2, in particular: active control works over the open slopes; passive control works corresponding to water tanks to be located in the urbanised area at toe of Monte Albino; and forestation with oak trees acting as barriers on the Monte Albino hill slopes.

They suggested that the active control works on the open slope should be constructed using natural engineering techniques.

With regard to the passive measures, the water tanks should be moved upslope to avoid private land and thus conflicts among residents. The compulsory purchase of private properties should be avoided as much as possible.

Crucial issues were the positioning of the water tanks and also their maintenance and their impact on the environment. The example of Sarno was mentioned: the maintenance of the big structural protection measures built after the eventhave been problematic because it is not clear if responsibility for them lies with the municipal, provincial or regional authorities.

With regard to environmental impact, the participants sought expert advice. The experts clarified that the tanks have a volume of only 25 m^2 and should be built in the forest to lower the environmental impact as much as possible.

A forestation of the Monte Albino slope was also considered a priority to mitigate risk. External expert advice was required on which trees should be planted to maintain the natural equilibrium of the area. Oak and chestnut trees are the two alternatives: the external experts considered the chestnuts to be the better option as oak trees are not indigenous to the area.

6.2.1.3. Working group 3

This group started its work with package 2 and included some elements of package 3, namely, the relocation of households in the most endangered areas.

As in working group 1, participants discussed the complexity of the different phenomena affecting the Monte Albino slope. They asked experts to help them schematise those phenomena so they could understand which were the most threatening, particularly in terms of loss of human life. The experts evaluated the hazard on the basis of i) intensity, volumes and return period; ii) the possibility of forecasting the events and monitoring the triggering factors. As a result, the following order of priority was drawn up: landslides on open slopes, debris flows, hyper concentrated flows, floods. It is interesting to note that the hierarchy is different from that of working group 1, according to which debris flows were the number one priority. The discussion was heated and two key issues of discussion were the following:

- *Safety standards and equity in risk distribution:* some participants considered the ranking of the open slopes on the basis of the risk exposure as a priority. Others did not completely agree, considering the guarantee of equity in risk distribution to be more of a priority. These participants used the example of a risk map with the "same colour everywhere" to demonstrate the need to guarantee equal safety standards for all families living on the Monte Albino slope. However, these participants were not sure that this is technically feasible and did not know if the risk ranking was a preliminary (and somehow compulsory step) in guaranteeing equity in risk distribution. In any case these participants repeatedly stressed their fear that certain to the local residents.
- *Illegal buildings and fairness:* the risk assessment presented by the experts clearly identified the risky areas, and some participants noted that there were many illegal buildings in those areas. They considered that protecting those houses would be unfair and that priority should be given to houses built legally.
- *Options and packages:* some participants did not agree with the idea of working within the €7 million budget and preferred to reach agreement only on a "general option", independently of costs.

At the end of the meeting, the participants decided to meet again to discuss the open issues. They had two further autonomous meetings and produced a document with some recommendations for risk mitigation.

The document started with a preamble including reflections and comments about the deliberative process. First the participants emphasized their main objective, namely, to end the process with a risk mitigation plan that will be implemented by local authorities. They feared that this would not happen. They felt that the private interests of some participants, especially those living in the risky areas, could drive the process in the wrong direction especially if they defended their own interests rather than putting the collective interest first. They emphasised that their lack of technical knowledge prevented them from giving as "technically informed" a judgment as they would have liked.

The building blocks for landslide risk mitigation

During their meetings, they decided to first list the risk mitigation measures that can be implemented on the Monte Albino slope and then to set priorities. The result is the following:

- *Territory monitoring, warning system, evacuation plan*: better territory monitoring has to be guaranteed. Residents have to be made more aware about the functioning of the warning system. Some technical local "mediators" are needed to guarantee a proper transfer of t knowledge relevant to risk issues. Local mediators emerged as key figures to assist the transfer knowledge between residents and risk managers. Especially underlined was the need for: i) local technical experts (mediators between risk managers and local residents); ii) a long lasting and continuous service in place to monitor territorial changes and evolution; iii) monitoring and control of private actions on public

property; iv) maintenance of the warning system (especially instruments such as tensiometers and pluviometers); v) organisation of public meetings (every 6 months) to increase residents' risk awareness and preparedness and to allow them to provide feedback about the main decisions related to risk/emergency management issues.

- *Identification of the most endangered open slopes*: more knowledge/ risk assessment is needed to better understand which open slopes pose the most risk. It is essential to consider also the number of inhabitants in each slope, i.e. risk to lives.
- *Forest assessment plan*: this needs to be settled as soon as possible. Forest and river basin cleaning is essential
- *Active mitigation measures*: to be carried out only through natural engineering techniques with low environmental impact
- *Relocation*: some household should be relocated, but only after the agreement of the families. Illegal building must be more strictly controlled and punished in the future.
- *Trees barrier*: how useful a tree barrier would actually be needs to be better understood.
- *Natural park and territory management*: this is a very important long-term objective that needs the involvement of the entire population. The establishment of a natural park should be carried out in conjunction with the promotion of quality agriculture and small-scale farming
- *Paths to avoid fires developing*: paths are needed to guarantee appropriate forest management. In the group, however, their actual usefulness could not be agreed upon. The group requested an expert evaluation with respect to the usefulness of such paths.

Finally, in comparison with the other working groups results, this group considered it crucial to agree first on a general option/plan and then to identify the appropriate package.

6.2.1.4. Working group 4

The external experts in forestry management contacted by our participants did not work on a risk mitigation package, preferring instead to provide some general suggestions for risk mitigation based on their experience and knowledge.

They summarised them in the following points:

- Vegetation: need for a forest assessment plan. More paths on the mountain to allow territory monitoring, need to better protect and maintain the wood
- Trees barriers: chestnut trees would be better than the oak trees proposed in option 2
- Control works: mitigation works which follow the longitudinal flux/channels. No gabions.

- Channels: cleaning and reshaping of the most endangered slopes. Building of low environmental impact control works
- Water tanks: small water tanks downslope to accumulate water and debris

The experts maintained that, by following the previous suggestions, better sustainable management of the entire area would be guaranteed along with greater participation on the part of the residents.

The main priorities in their view were vegetation and better channel maintenance. They criticised the decision in favour of oak tree barriers presented in option 2 as they did not believe these would be particularly useful.

In the following table we summarise the list of priorities for risk mitigation as listed by the participants themselves:

Tab. 6.1 – Working groups participants' list of priorities

	Priorities
Working group 1	Active control works on the most endangered slopes Improvement of the warning system Guarantee a better mountain maintenance with a special focus on limiting illegal buildings Construction of few passive control works, mostly to integrate the active ones
Working group 2	Stabilisation of the open slopes Erosion control works along the hill slopes Forestation in the mountain area compatible with trees plantation to stabilise the soil and risk reduction on the open slopes Check the possibility to build the water tanks upslope to avoid private houses/properties expropriation
Working group 3	Territory monitoring, warning system and evacuation plan Guarantee the protection of the most endangered open slopes Forest assessment plan Forest and river basin cleaning Active mitigation measures Relocation Tree barriers Natural park and forest maintenance
Working group 4	Vegetation and trees barriers Control works: mitigation works which follow the longitudinal flux/channels. No gabions. Channels: cleaning and reshaping of the most endangered slopes. Building of low environmental impact control works Water tanks: small water tanks downslope to accumulate water and debris

6.2.2. New inputs

The discussions helped us not only to better understand the participants' views and opinions about risk mitigation, but also provided new inputs into designing a first proposal for the "compromise" solution to mitigate the risk.

We can summarise the new inputs (i.e. only the new issues that were not taken into account before the working groups discussion) as follows:

- building "km zero" active mitigation measures upslope (i.e. directly using forest material)
- need to set a priority list for the different natural risks (landslides, debris flows, hyper concentrated flows etc.) affecting the slope;
- budget constraints strongly influence preferences on active, passive, structural and non- structural risk mitigation measures (i.e. many participants changed their list of priorities taking into account these constraints);
- the compulsory purchase of private properties for the construction of risk mitigation measures has to be limited to avoid conflicts among residents and between residents and local authorities;
- chestnuts would be better than oaks for stopping the flow of debris.
- strong emphasis on the forestal assessment plan

6.2.3. Agreement and discussion points

The most difficult phase of the process started after the working groups. As (partially) revealed by the synthesis reported above, the issues emerging during the working group discussion were numerous. Synthesising them, identifying the key issues, understanding the agreement and discussion points was not a straightforward task. For this reason the summary provided here below is grounded not only on the meetings transcripts and the synthesis of the Safeland team. The process participantshave been asked to review it (via e-mail). Moreover, we organized some parallel meetings with the working groups leaders to better understand and frame the agreement/disagreement points.

Finally at the beginning of meeting 5 of our process, the agreement/disagreement points have been discussed again with all the participants (see sec. 4.2).

In this section we summarise the key agreement and discussion points, as presented to the participants at meeting 5. Agreement points:

- *Investment in the warning system and creation of a territorial survey-presidium*: different types of phenomena (different characteristics return periods, triggering factors, etc.) are endangering the Monte Albino slope. It is difficult to guarantee a high level of protection against them all. As a consequence many participants agreed on the need to first invest in the improvement of the warning system, focus on the monitoring tools and also on the improvement of emergency communication.
- *Ranking of open slopes based on risk assessment and threat to human life*: to better understand which measures to implement (and where), more information on the threat to human life for each slope is needed.
- *Control works*:

✓ general preference for active works (possibly constructed using natural engineering techniques) rather than passive ones;
✓ construction of small water tanks upslope (possibly in non-visible areas to reduce the environmental impact);
✓ erosion control works along the rills possibly constructed by using km "zero" techniques
✓ maintenance plan for the new control works
✓ forest assessment plan

The discussion points regarded instead:

- *relocation*: there was no agreement about the relocation of some households in the most risky areas. Some participants maintained it would be difficult, if not impossible, to persuade the residents to move elsewhere. Others wondered about the justification of moving some households rather than others.
- *natural park*: many participants are in favour of the creation of a natural park in one of the areas located on the down slope of Monte Albino. This should be a long-term project that also takes into account the agricultural development of the entire area. Some participants disagreed, maintaining that the creation of a natural park would block the agricultural development of the area by preventing some cultivation.
- *passive control works*: some participants were completely against the construction of passive control works and did not understand why these works could not be replaced by active works. Few participants seemed to be "ideologically" against the construction of passive works for two main reasons: i) the Sarno example already mentioned above (see sec. 5.5.2); ii) they did not want to feed the powerful "concrete party" (as they call it) of the construction industry.
- *illegal buildings on the most endangered slopes*: some participants maintained (based on their local knowledge) that there were illegal buildings in many risky areas. It would not be fair to provide them the same level of safety guaranteed to residents who built legally.
- *options and packages*: some participants did not agree with the €7 million budget packages, but only with the general option of more detailed projects taking place in the future.

6.3. A COMPROMISE PROPOSAL

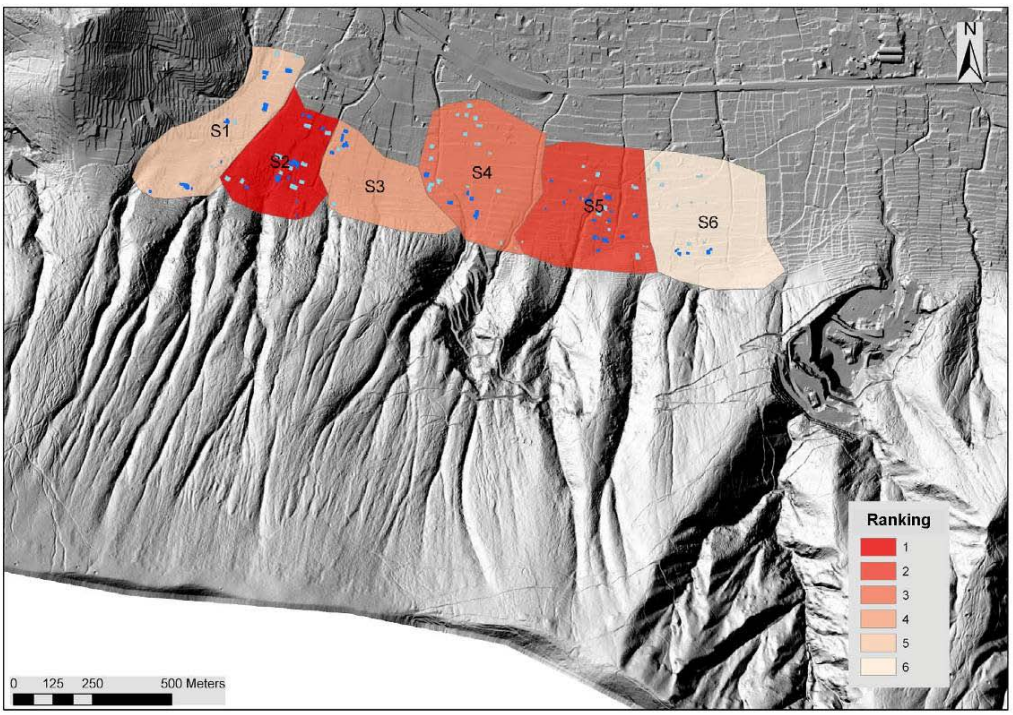
After the work group meeting and the identification of the key agreement and discussion points, the research team prepared a first proposal for a compromise solution, by providing other useful data through the societal and residual risk estimation. As already mentioned in section 4.2.1. the proposal of the compromise solution took into account the participants'opinions. SafeLand facilitators met with the working group "leaders" to better clarify points of agreement and discussion and to identify possible pillars of the compromise solution.

6.3.1. Societal risk estimation and residual risk

From a technical point of view, the choice and design of control works to mitigate the landslide risk have to be based on quantitative analyses (QRA) carried out at a large/detailed scale (Corominas and Mavrouli, 2011). This was the case for Nocera Inferiore, where QRA analysis results were used to determine the so-called "societal risk" (Leroi et al., 2005). Estimating the societal risk allows, for instance, parts of a given urban territory to be ranked for landslide risk and thus the areas needing mitigation measures to be prioritised.

The urbanised area at the toe of the Monte Albino massif was thus subdivided into 6 sectors, the shape and size of which were established on the basis of the results of the run-out distance analyses explained in Corominas and Mavrouli (2011). The maximum number of equivalent victims (Wong et al., 1997) expected for each of the sectors under consideration was assessed on the basis of the QRA results obtained for all the considered flow-like mass movement risk (excluding floods) scenarios – in terms of annual probability of loss of live for the persons living within the exposed houses. This allowed the sectors at risk to be ranked, as shown in Figure 7.1. It is worth noting that the most exposed sectors are, in the order, those labelled with symbols S2, S5 and S4.

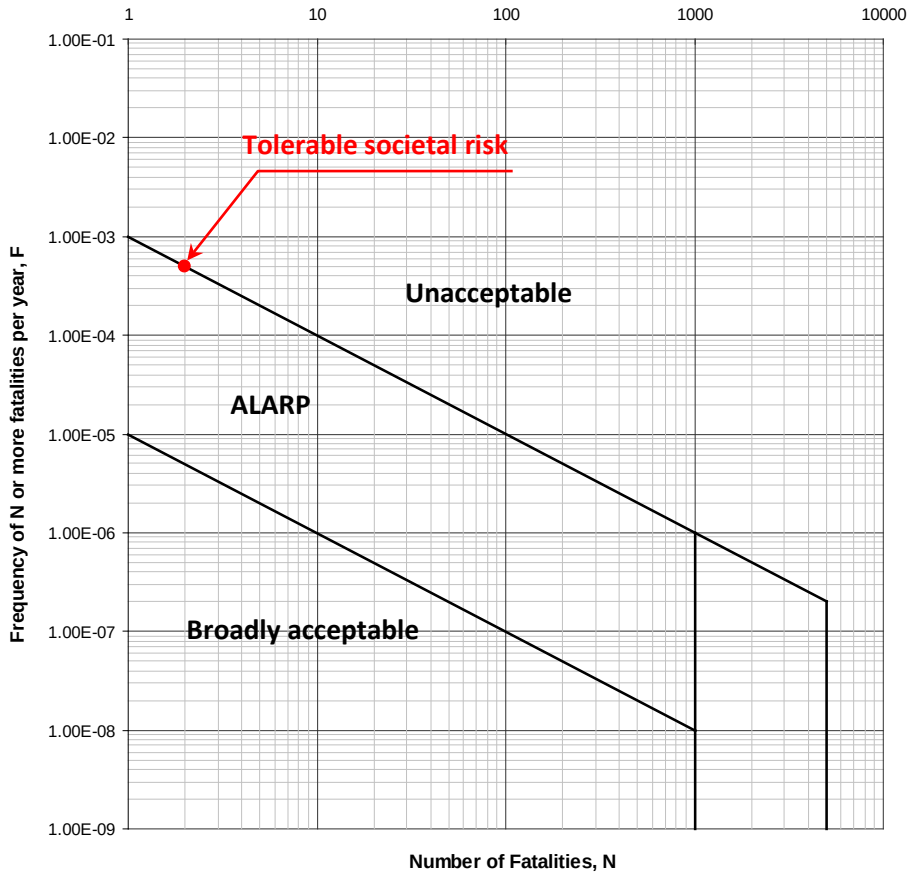
Fig. 6.7 - Ranking of the sectors at flow-like mass movement risk established for the urbanised area at the toe of the Monte Albino massif. The houses highlighted in blue are those for which the risk to life loss for the person most at risk living inside is the highest.



Starting from this ranking, the effectiveness of the three alternatives for the risk mitigation can be evaluated by computing the corresponding values of the so-called “residual risk” of loss of life (namely, the risk to which the inhabitants are still exposed after the implementation of the mitigation measures). Accordingly, the residual risk was estimated as the ratio between the number of expected casualties after the implementation of the risk mitigation measures and the maximum number of equivalent victims computed in the absence of mitigation measures (both structural and non- structural).

The results obtained are reported in Tables 6.2, 6.3 and 6.4 for the three different alternatives. It is worth noting that, in the Tables, the residual risk (1) values related to the execution of the structural (active and passive) mitigation measures were differentiated from the “tolerable” residual risk (2) value to be achieved by considering also the existence of an warning system. In this latter case, the tolerability criterion (in terms of F-N curve) provided by the Geotechnical Engineering Office (1998) of Hong Kong was adopted for the purposes of the analysis (Fig.6.8). Of course, the value (in percentage) of the difference tolerable

Fig. 6.8 - Interim societal risk tolerance criterion (Geotechnical Engineering Office, 1998)



If the role played by the alarm system is ignored, the results that we obtained highlight that where phenomena (i.e., hyperconcentrated flows, flowslides, landslides on open slopes) are triggered by rainfalls with a return period equal to 200 years, the residual risk has the lowest values in alternative 1. With reference to the alternative 2, people living in the urbanised sector (namely, the sector with the highest societal risk value) are exposed to a corresponding residual risk. For alternative 3, the risk does not change in the urbanised sectors at the toe of the Monte Albino hillslope portions where control works are not provided.

Tab. 6.2 - Residual risk values associated to the “Alternative n. 1”

	RESIDUAL RISK [%]					
	Flowslides (a)	**Landslides on open slopes (b)**	**Hyperconcentrated flows (c)**	**Residual risk (1) (d = a + b + c)**	**Residual risk (2) (e)**	**Δ [%] (f = d – e)**
SECTOR 1	13.3	6.7	0.0	20.0	4.4	15.6
SECTOR 2	7.5	0.0	0.0	7.5	1.3	6.2
SECTOR 3	0	9.8	0.0	9.8	3.9	5.9
SECTOR 4	34.6	0.0	0.0	34.6	2.6	32.0
SECTOR 5	20.8	0.0	0.0	20.8	1.9	18.9
SECTOR 6	30.8	0.0	0.0	30.8	5.1	25.7

(1) Residual risk to loss of life related to carrying out the structural (active and passive) mitigation measures.
(2) Tolerable residual risk to loss of live can be achieved if there is a warning system in existence.

Tab. 6.3 - Residual risk values associated to the “Alternative 2”.

	RESIDUAL RISK [%]					
	Flowslides (a)	**Landslides on open slopes (b)**	**Hyperconcentrated flows (c)**	**Residual risk (1) (d = a + b + c)**	**Residual risk (2) (e)**	**Δ [%] (f = d – e)**
SECTOR 1	15.6	8.9	0.0	24	4.4	19.7
SECTOR 2	32.9	19.5	0.0	52	1.3	50.4
SECTOR 3	21.6	15.7	0.0	37	3.9	32.9
SECTOR 4	41.0	2.6	0.0	44	2.6	41.4
SECTOR 5	26.4	3.8	0.0	30	1.9	28.2
SECTOR 6	35.9	2.6	0.0	38	5.1	32.7

(1) Residual risk to loss of life related to carrying out the structural (active and passive) mitigation measures and a forestation.
(2) Tolerable residual risk to loss of belief that can be achieved if there is a warning system in operation.

Tab. 6.4 - Residual risk values associated to the “Alternative n. 3”(*).

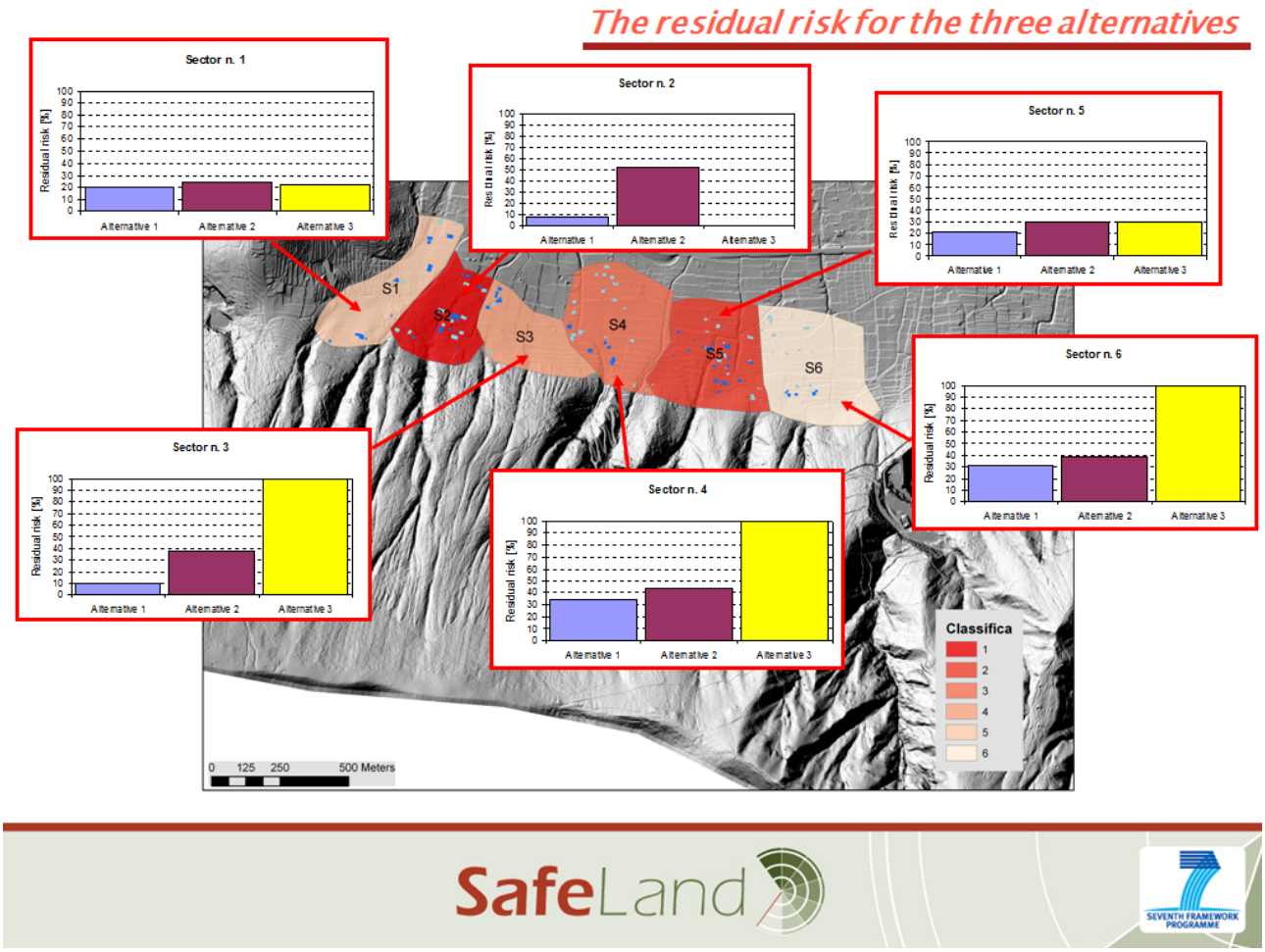
	RESIDUAL RISK [%]					
	Flowslides (a)	**Landslides on open slopes (b)**	**Hyperconcentrated flows (c)**	**Residual risk (1) (d = a + b + c)**	**Residual risk (2) (e)**	**Δ [%] (f = d – e)**
SECTOR 1	13.3	8.9	0.0	22	4.4	17.6
SECTOR 2	0.0	0.0	0.0	0.0	0.0	0.0
SECTOR 3	29.0	67.0	4.0	100	3.9	96.1
SECTOR 4	58.0	38.0	4.0	100	2.6	97.4
SECTOR 5	23.6	5.7	0.0	29	1.9	27.1
SECTOR 6	49.0	46.0	5.0	100	5.1	94.9

(*) In this excerpt, as a work hypothesis, it was considered: 1) the relocation of the at risk households in the sector n. 2; the stabilisation of the portions of the hillslope threatening the sectors n. 1 and n. 5

(1) Residual risk to loss of life related to the execution of the of the structural (active and passive) mitigation measures.
(2) Tolerable residual risk to loss of live to be achieved also considering the existence of an warning system.

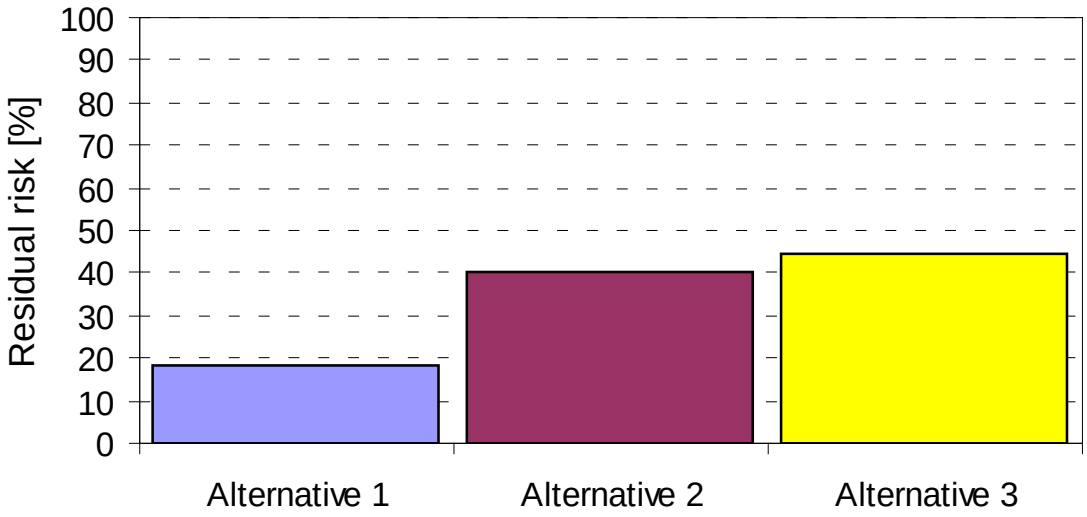
A schematic representation of the residual risk (in percentage) pertaining to the six urbanised sectors for the three considered alternatives of mitigation measures is reported in Figure 6.9.

Fig. 6.9 - Residual risk (in percentage) pertaining to the six urbanised sectors at the toe of the Monte Albino massif for the three considered alternatives of mitigation measures



With reference to the whole urbanised sectors, the different effectiveness of the proposed alternatives for the risk mitigation can be highlighted via a cross-comparison of the corresponding average values of the residual risk weighted on the total number of expected victims in the absence of mitigation measures. In this regard, Figure 6.10 shows that the alternative n. 1 allows the achievement of an average residual risk equal to the 18.4 %, namely about the half of the values obtained for the alternatives n. 2 (40.4 %) and n. 3 (44.7 %).

Fig. 6.10 - Average residual risk (%) deriving from the adoption of the three mitigation alternatives considered



6.3.2.The compromise proposal

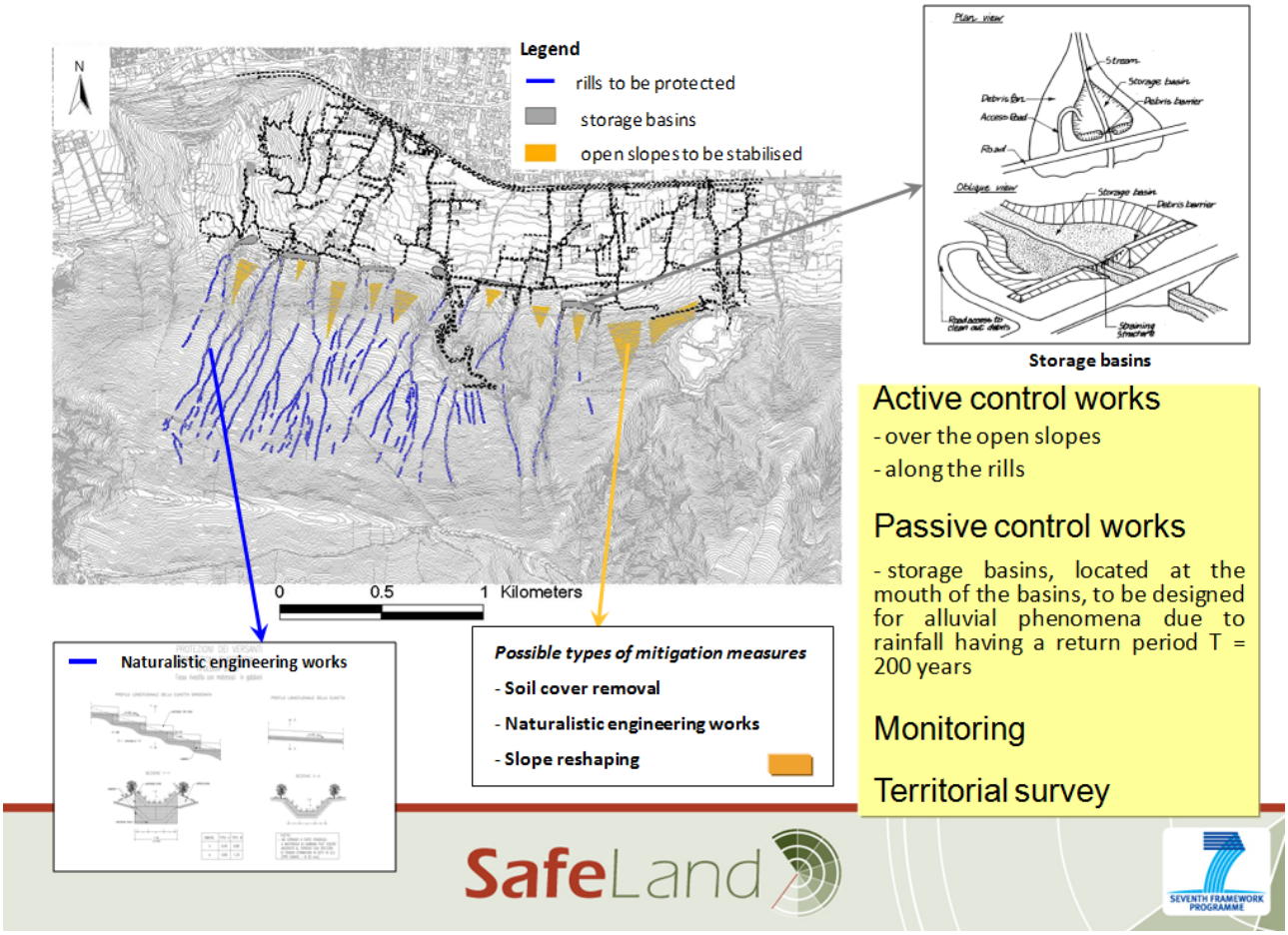
The proposed compromise solution was reached by harmonising technical considerations with the suggestions provided by the working groups during (and after) the meeting 4 of the deliberative process (see chapt. 4.3); the "agreement points", discussed during the meeting 5, were also taken into account (see chapt. 6.2.3).

In particular, the solution includes the implementation of an integrated system of monitoring and territorial survey as well as (Fig. 6.11) the:

- stabilisation of all the open slopes via naturalistic engineering works and, if reasonable, possible and agreed to by the participants - relocation of a maximum of 2– 4 households at the toe of 1–2 of the open slopes (this last option needs the agreement of the candidate homes);
- construction of a storage basin at the mouth of each catchment to capture the water volumes associated with flooding with a return period of T = 200 years;
- erosion control works along the rills over the hillslopes via "km zero" (i.e. using directly the material provided by the forest) naturalistic engineering works;
- knowledge deepening all over the massif to identify the most appropriate active measures to be developed in the next future to stabilise the source areas of the flowslides.

The related costs are reported in Table 6.5; there are no significant differences between the costs of active and passive mitigation measures.

Fig. 6.11 - Planimetric view of the proposed “compromise solution”



Tab. 6.5 - Costs related to the proposed compromise solution

Category	Typology	Cost [€] per typology	Cost [€] per category	Total cost [€]
Active mitigation measures	Naturalistic engineering works (to stabilise a total area of about 3 ha)	1,354,087	3,061,372	6,931,938
	“km 0” naturalistic engineering works (to mitigate the erosion in	1,707,285		

	correspondence of rills developing for a total length of about 10,700 m)			
Passive mitigation measures	n. 6 storage basins	3,090,566	3,090,566	
Non-structural mitigation measures	Relocation of n. 4 households	480,000	480,000	
	Warning system	300,000	300,000	

Once more, the effectiveness of the compromise solution – in terms of risk mitigation – can be evaluated via the estimation of the residual risk of loss of life associated with the building both active and passive control works (Table 6.6).

It is worth observing that the average residual risk value (%) related to the compromise solution (28.5%) is between the similar values obtained for the alternatives 1 and 2.

How well the residual risk will be "tolerated" by society is related to how well the warning system works, which will benefit from the results of the territorial surveys and from improving the existing monitoring system (as well as installin g instrumentation like "tensiometers" for measuring negative pore pressures in the pyroclastic soil covers).

Tab. 6.6 - Residual risk values associated to proposed compromise solution.

	RESIDUAL RISK [%]					
	Flowslides (a)	**Landslides on open slopes (b)**	**Hyperconcentrated flows (c)**	**Residual risk (1) (d = a + b + c)**	**Residual risk (2) (e)**	**Δ [%] (f = d – e)**
SECTOR 1	15.6	11.1	0.0	26.7	4.4	22.3
SECTOR 2	17.8	3.4	0.0	21.2	1.3	19.9
SECTOR 3	0.0	15.7	0.0	15.7	3.9	11.8
SECTOR 4	44.9	0.0	0.0	44.9	2.6	42.3
SECTOR 5	29.2	0.0	0.0	29.2	1.9	27.3
SECTOR 6	41.0	0.0	0.0	41.0	5.1	35.9

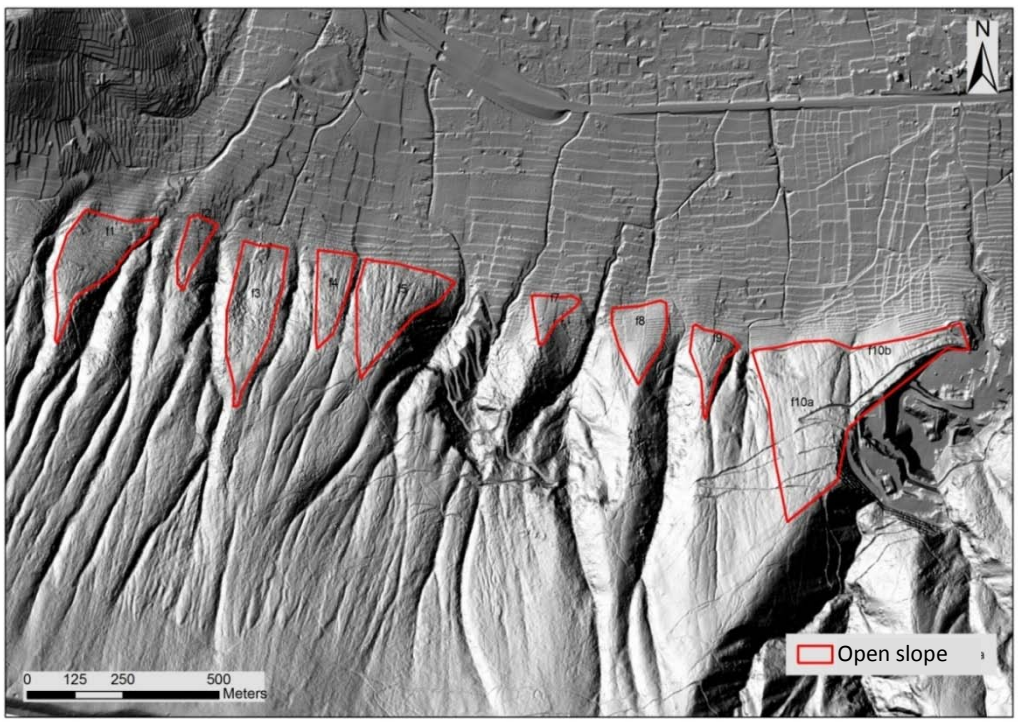
(1) Residual risk to loss of life related carrying out the structural (active and passive) mitigation measures.
(2) Tolerable residual risk to loss of live achieved if there is a warning system in operation.

Finally, further considerations may derive from the observation that, currently (i.e., in the absence of mitigation measures), the ten open slopes facing the urbanised area at the toe of the Monte Albino massif can be classified in relation to the risk to loss of life or loss related to landslides like that on March 2005.

For each open slope, societal risk can be estimated on the basis of the soil volumes that could be mobilised by heavy rainfalls (having, for instance, a return period of 200 years) and the number of persons at risk.

The results of our analyses demonstrated that the open slopes labelled with symbols f1, f3 and f8 in Figure 6.12 are those with the highest risk values for society and, then, associated to the highest priority in terms of risk-related mitigation.

Fig. 6.12 - Open slopes identifiable over the Monte Albino hillslope



6.3.3. Discussion(s) on the compromise proposal

The discussions about the compromise solution were by far the most heated, and we needed an extra meeting to discuss this. The participants then decided to meet again and to elaborate their own recommendations for landslide risk mitigation on Monte Albino. During these meetings, some hidden conflicts, even among participants, became more open and the reasons for these diverging opinions became clear. We may hypothesise that this is linked to the process of local involvement and to the fact that at the beginning participants are positive and optimistic, but facing the actual options triggers more individualistic and self-interest type of feelings.

The key issues of debate were the following:

- *Risk assessment and open slopes' ranking*: some participants, especially among those from Monte Albino, were sceptical about the results of the experts' risk assessment, not believing their homes to be in a high risk area. Their everyday experience and knowledge of the mountain led them to question the

experts' measurements and to maintain that the soil is not as deep as shown in the risk maps. Not all the participants agreed with residents' opinions and many criticised them openly. The experts subsequently gave a fuller explanation of the tools and methodologies used to collect the data. The turning point was finally reached when one expert said: "Scientific data can be compared only with other scientific data. It is not possible to compare the results of the scientific models and assessment with information based on opinions, feelings or even everyday observations not grounded on real science, i.e. comparable data and measurement." This was probably the tensest moment of the entire process. Moreover, when the experts showed all the measurements in a tri-dimensional way by using a GIS programme, most participants were reassured about the high quality of the risk assessment product. Some clearly stated they had changed their minds after this in-depth explanation. Nevertheless, the residents living on one of the most endangered slopes remained against the positioning of passive structural works on their properties.

- *Risk denial*: the discussion about the quality of scientific knowledge opened up another discussion more focused on residents' risk perception. One of the participants' remarks explains the main point of conflict: "Some participants are 'stereotypical Monte Albino residents': they trust only themselves and their experience and do not want to admit they live in a risky area. They consider the quarry as the main cause of the 2005 landslide but this is unfortunately not the only problem. As shown clearly during the meetings, the open slopes located far from the quarry also represent a high risk."
- *Private interests of property owners*: participants generally agree about the need to protect lives and properties as much as possible and to guarantee the highest safety standards with the available economic resources. However when these "theoretical" concepts are translated in actual risk mitigation measures that need to be adopted on the slope, the initial agreement starts to break down. This is mainly because of private landowners' unwillingness to give up their land to build risk mitigation measures. In Italy local authorities can theoretically expropriate the land without consent, if this is in the public interest. People's willingness to give up part of their property to see their safety increased, or the amount of money needed to expropriate the private lands for the construction of mitigation structures, are thus fundamental issues.
- *Relocation*: there is a general theoretical agreement about relocation. When participants start to discuss which houses have to be relocated, there are some doubts as to whether the households would agree with the decision. The argument basically was: " If there are 10 houses which need to be

relocated, but 6 owners do not agree, then the money spent for the relocation are wasted because risk mitigation measures need to be adopted anyway to protect those refusing to relocate."

- *Residual risk*: the expert presentation showed clearly that option 1 reduces the residual risk more than all the other options, including the compromise solution. However option 1 does not have the support of many participants because it includes too many passive mitigation measures. Therefore even if the residual risk is higher in the compromise solution the participants prefer to "live with it" and invest in the warning system rather than place more passive mitigation measures on the slope (mainly because of factors mentioned in previous chapters: the "Sarno experience", the interests of private property owners, the unwillingness to support the construction industry).
- *Natural park*: as already underlined in the previous sections (see sec. 6.2.3), some participants do not agree on the idea of creating a natural park on the Monte Albino slope because of potential clashes between economic development needs and natural ecosystem preservation

During the final meeting we agreed on some pillars for risk mitigation on the Monte Albino slope with participants. A unanimous consensus was reached on fundamental priorities, i.e. improvement of the warning system, implementation of an integrated system of monitoring and territorial survey and active measures. Much more debate was devoted to the relocation of residents from the most endangered areas and/or to the need to build passive structural works, especially on private properties.

The discussion in the community definitely does not end with SafeLand and participants decided to draft some reccomendations for submission to the local authorities. From the last contacts we had with local authorities, their interests for the results of the process is high. Local decision makers consider it as a way to share responsibility and are looking forward for this deliverable, its summary in Italian and the final version of the recommendations provided by the residents (still in progress when the deliverable was due).

6.4. PARTICIPANTS' EVALUATION OF THE PROCESS

At the end of the process we distributed a questionnaire to participants so that they could evaluate their experience. Most respondents expressed a very positive judgment about the process. The lack of negative opinions is an indicator that participants were interested and felt involved.

In the following we present some key results of the questionnaires:

- *A learning experience*: most of the participants acknowledge that their level of knowledge of risk mitigation issues increased considerably during the process. Accordingly some also felt that their level of agency had increased: ”Now I can discuss risk mitigation issues with more awareness about the main problems that need to be solved. I was glad to be part of this process and I hope it will not end with SafeLand. Future decisions about risk mitigation will take into account operative indications as well as the doubts and open issues arising from the discussions we had will be taken .” Another participant wrote: ”During the process I learnt many new things. For example, I became convinced of the necessity to build a few passive risk mitigation works to ensure safety. At the same time I understood better the key difference between risk to life and risk to property.” One of the few criticisms raised was that the topics were too difficult and complex: a technical background would have helped understanding and discussions. Some participants felt unprepared to express their preferences and opinions about risk mitigation. Many also realised that their own lack of scientific background prevented a really meaningful debate with the experts.
- *Civic participation*: the possibility to continue the discussion about risk mitigation is considered a key added value of the process by the participants. After the meetings many feel able to discuss the topic and have clearer opinions on what can be done on the slope. This underlines the instrumental character of the process which improved residents’ awareness and agency. Many of them emphasise that the process finally gave them a voice: an important result, also independently from its practical consequences. One participant proposed an ”open laboratory” for risk mitigation in Nocera Inferiore, as an heritage of the SafeLand project.
- *Research and decision making*: One participant reports: ”Our work was aimed at sharing a strategy for risk mitigation which would not have happened without the expert input. The added value derives, i) from the high quality of the scientific knowledge provided, and ii) from citizen involvement. In the future, the decision makers may not take into account the results of our process but who is going to take the political and institutional responsibility to completely ignore these results?” Many participants emphasized that the connection between the research work and the actual decision making should have been stronger. They attribute the main cause of this situation to the political instability, especially at the municipal level.
- *The need for a (more) multidisciplinary approach*: some participants complain that only one expertise (engineers) was represented in the process. Participants themselves invited some forestry experts, underlining the need for a broader number of disciplines to be represented.
- *Preference change*: When asked if they had changed their mind on some issues related to landslide risk mitigation during the process, participants provide very different answers. During the meetings most of the residents formulate arguments based on their own risk awareness and personal experience of landslides. Some of them were able to step outside of this, while others did not or did not want to. We can identify three different types of reaction (see also Ney 2009).

First, some participants stepped outside their immediate personal context and formulated public interest arguments juxtaposed to their initial opinion (Type 1). For example one participant reports: ”At the

beginning I was completely against the adoption of passive structural works. After the discussions we had during the working groups and the presentation of the compromise solution I changed my mind and now I believe that some passive works are really necessary to make some areas safer". This participant has somehow been persuaded by "the force of a better argument" which lead him to change his idea.

Second, participants stepped outside their personal contexts and formulated public interest arguments congrous with, or at least not diametrically opposed to, their original opinion (Type 2). For example: "Even if I was more in line with option 2, I decided to join the working group on option 1 because I think this option was more realistic."

Last, some participants claimed that their personal context was relevant to effective landslide risk mitigation and did not change their mind at all (Type 3). This happened very often for the inhabitants of the Monte Albino area. Some of them did not change their mind: since the beginning they thought their properties to be safe and did not want any structural mitigation measure to be built.

In general we observed that the less the participants were directly affected by any decision about risk mitigation, the easier they tended to change their opinion.

6.5. LESSONS LEARNT

In the following we summarise some key lessons learnt with regard to the participatory process methodology, contents and future research:

Methodology and tools

- A deliberative process can enable and facilitate not only a learning process but also network building to leave a heritage for the participants and the community;
- Participation can be an effective tool for sharing responsibilities between decision makers and citiziens and for providing justifications for landslide risk mitigation decisions;
- An iterative and transparent process can build positive and trusting relationships among participants and between participants and the public authorities;
- Citizens with very diverse background, interests and worldviews can engage effectively in a deliberative expert informed process, nothwithstanding the complexity of landslide risk assessment and risk mitigation options;
- It is beneficial to include experts from different fields and different views throughout a participatory process;
- Although individually or groups may try to impose their view by dominating the discussions, this can be effectively reduced by assuring all voices are heard. Both worldviews and personal interests play a role in the deliberations, and the challenge is to reach compromise among the different and contending standpoints.

- Dividing into “like-minded” groups to identify and bound the varied positions of the participants not only adds to the manageability of the negotiated compromise, but also allows all participants to have a voice.
- Cultural theory can provide a useful analytical framework to identify the fundamentally different views on (in this case) causes and solutions of the landslide risk issue.
- Mixed methods approaches (qualitative and quantitative data, interdisciplinary) as well as multiple communication channels can be effective
- Visual representation of the risk context (in our case through GIS) may prove to be more effective than quantitative risk estimates in establishing participants’ trust for the presented data/information

The contents: open issues and trade offs

- Participation may not always lead to an agreed compromise solution. Even without a final solution, however, the process will reveal the issues that appear to irrevocably divide the participants and possible the community. In our case, two seemingly unresolvable issues included the relocation of residents from the most endangered areas and/or the need to build passive structural works, especially on private properties
- A value of participation is the identification of necessary tradeoffs. In this case participants decided to sacrifice a degree of safety rather than building unpopular passive mitigation measures (on private properties)
- We observed that the less the participants were directly affected by any decision about risk mitigation, the easier they tended to change their opinion during the process. However, it is unlikely that participants will change their deeply held values or interests in a participatory process. In our case it appeared that participants reinforced their worldviews and stances on the issues.

Future research

- Particularly for the landslide issue, it is important that effective ways are developed to synthesise and summarise the information about risks as well as the key characteristics of risk mitigation options in order to make them more easily understandable for the participants;
- Future deliberative processes can benefit from research resuts and literature on group dynamics, social influence and negotiation.

7. THE QUESTIONNAIRE SURVEY

In the following section we report on the results of the questionnaire survey, which is discussed according to the six sections of the survey instrument.

7.1. LANDSLIDE RISK, CAUSES AND CONSEQUENCES

Questions in the survey's first section examined the respondents' perception of risk related to landslides in the Monte Albino area, the factors which contribute to landslide risk on the relevant slopes (including industrial activities, roads and hiking paths, agricultural practices, waste disposal and tree deposit etc.) and the consequences of landslide risk. The questions in this section, and the mean responses on a scale from from 1 (min) to 5 (max) are recorded in Table 7.1.

If we consider the mean values, respondents evaluate the risk level on the entire slope as being quite high (3.67) (Tab. 7.1).

The respondents living in the endangered area of Monte Albino (N=139, 37.3% of the whole sample) give higher evaluations about the risk on the slope (3.79) than those not living there (3.57). We put the questions about individual and household risk evaluation only to respondents living in the Monte Albino area. Interestingly, they consider landslides less dangerous with regard to their own life (3.39) and own house (3.28)[13] in comparison with the entire slope (3.79). Therefore there seems to be a gap between the evaluations of general risk at the slope vs. risk related to their own life and home.

[13] Mean values have been calculated excluding the "don't know" answers and the unanswered questions.

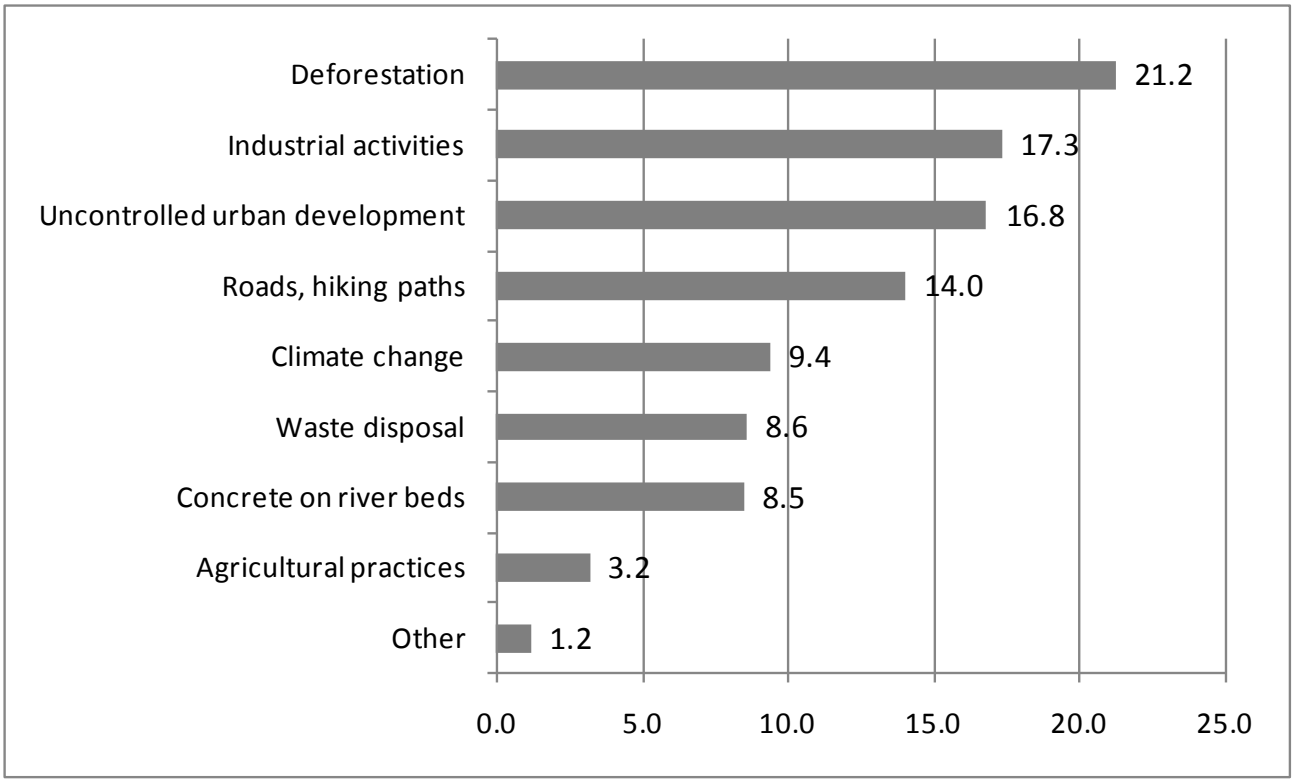
Tab. 7.1 - Respondents' perception of risk related to landslides Scale: 1(min) to 5 (max)

All respondents	Mean value	N[14]
How much is the Monte Albino area at risk from landslides?	3.67	345
Respondents exposed to landslide risk/living in Monte Albino		
How much is the Monte Albino area at risk from landslides?	3.79	126
How much do you think your house is at risk from landslides?	3.28	130
How much do you think your life is at risk from landslides?	3.39	127

Respondents were asked to choose the two most important man-made causes of potential landslide losses in the Monte Albino area from a list of 9 options. As shown in Figure 7.1, the analysis of this multiple response set reveals that deforestation is mentioned most frequently as a cause, followed by industrial activities, uncontrolled urban development, roads and hiking paths, climate change, waste disposal and tree deposit (especially on channels), concrete on river beds and finally agricultural practices. Significantly the least important cause was attributed to local farmers taking poor - or inadequate - care of their properties.

[14] Mean values have been calculated excluding the "don't know" answers and the unanswered questions.

Fig. 7.1 - Distribution in percent of major man-made causes of potential landslides and landslide losses in the Monte Albino area



We also asked respondents to identify the most serious consequences of landslides from a list of 4 (to which they could add options): almost half the respondents (46.4%) chose the ”distress of landslide victims”, followed by decrease in”home value” (23.1%), ”limits to economic development” (13.9%) and, finally, ”limits to the urban development” (11.5%). It is highly plausible that the 2005 event with its 3 victims, and the subsequent struggle for compensation by those who lost property, influenced the response to this question.

7.2. RISK ASSESSMENT AND URBAN PLANNING

7.2.1. Risk maps and building restrictions

There has been extensive mapping of landslide risk in this area, and this has formed the basis of the legislation relating to construction. The responses showed that that among those surveyed, knowledge about this legislation is poor, revealing reveal a lack of communication about risk between the local authorities and the residents.

Less than one-third (29%, N=108) of the sample are aware of the existence of risk maps. For those who are aware, sources of information include social media (41.7%: newspapers, Internet etc.) followed by friends and neighbours (26.9%) and the local authorities (21.3%).

About one-third (32.4%, N= 35) of the respondents state they know the main authority in charge of preparing the maps. However, when asked to specify the exact name of these authorities, only 24% correctly identify the river basin authorities. The other 76% mention the municipal technical offices, the regional civil protection, the university or private consultants. This low level of institutional knowledge about the river basin authorities may be related to the fact that they have been established quite recently in the Italian system for landslide risk management (i.e., after 1989).

In the following questions, we asked respondents aware of the existence of risk maps to evaluate the usefulness and reliability of them by choosing one of the following statements:

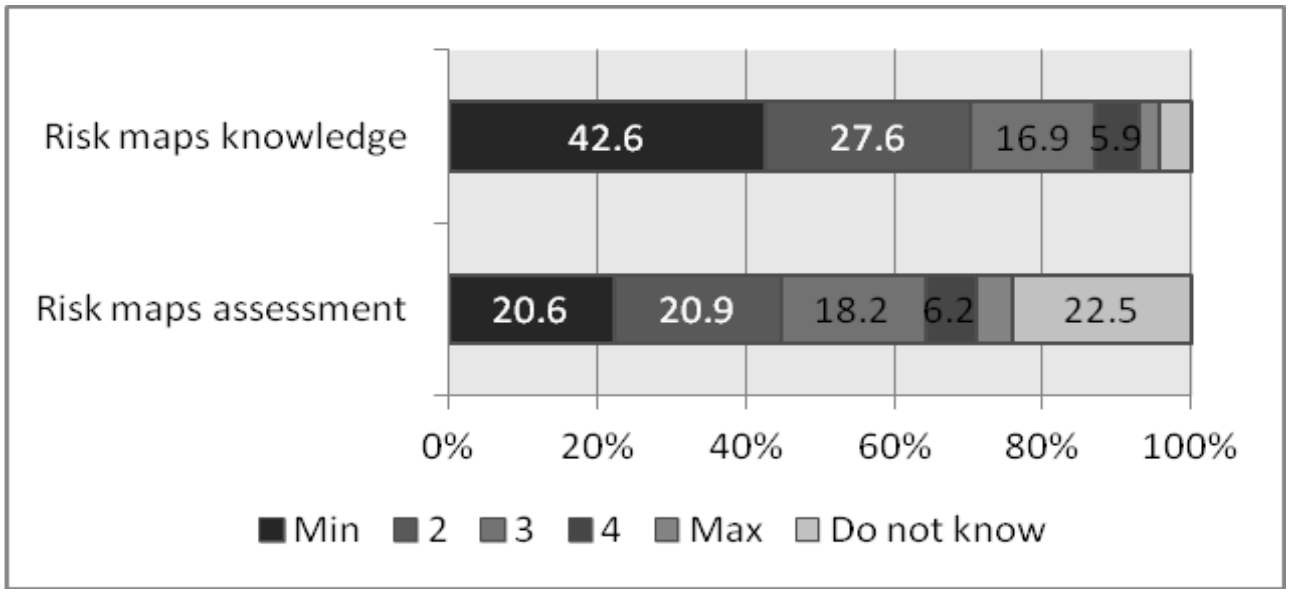
- Very useful: landslide risk maps of Campania Region are the most reliable in Europe (13.9%)
- Useful: they are helpful in planning, but bear in mind that there are large uncertainties (47.2%)
- Not very useful: unreliable for planning purpose as they have proven innaccurate in the past (6.5%)
- Worthless: the local population understands the risk better (7.4%)
- I do not understand the maps (14.8%)
- Other (7.4%)
- N.a. (2.8%)

Almost half the respondents (47.2%) chose the second response, i.e., that the maps are ”useful”, but only 13.9% thought they were ”very useful”. It is interesting that almost one-sixth of respondents (14.8%) picked the option”I don’t understand the maps”. Among those who answered ”other” (7.4%), a majority

reported that they were unable to interpret the maps. This means that around one-fifth of the respondents aware of the existence of the maps, are unable to decipher what they mean.

Responses on the individual level of knowledge about risk maps are similar. Respondents were asked to evaluate their knowledge about risk maps on a 5 point scale. The results are shown in Figure 7.2. Almost half of the respondents (42.6%, N=159) stated that their level of knowledge about spatial planning/risk maps is minimal (1). We also asked respondents to assess the quality spatial planning and risk maps, on the basis of the information they had. In this case more than one-fifth of respondents (22.5%) state they can not provide an assessment (i.e. they do not know)and two further fifths (20.6% and 20.9%, respectively) negatively evaluate (1 and 2) the spatial planning/risk maps.

Fig. 7.2 – Risk maps knowdge and assessment



There is a strong correlation between the two variables used to measure the level of knowledge and assessment about spatial planning/risk maps and the awareness of risk maps.

As shown in table 7.2, those who are aware of landslide risk maps always evaluate their level of knowledge below the medium value of the scale, but definitely more positively than the ”non-aware” subsample (2.59 vs. 1.66)This result is not surprising, but it is interesting to note a similar trend for the risk map assessment: those aware of the existence of risk maps assess them more positively than the ”non-aware” subsample (2.63 vs 2.19).

Tab. 7.2 – Evaluation of the personal level of knowledge of risk maps, risk maps assessment and risk map awareness

Q22.5 - Evaluation of the personal level of knowledge about spatial planning and risk maps

	Mean	N
Entire sample	1.94	357

Risk map awareness	Mean	N[15]
Aware	2.59	103
Not aware	1.66	248

Sig. .000 Eta .387

Q29.2 - Assessment of the spatial planning and risk maps

	Mean	N
Entire sample	2.33	263

Risk map awareness	Mean	N[16]
Aware	2.63	89
Not aware	2.19	170

Sig. .000 Eta .295

This result has interesting policy implications. On the one hand, we can hypothesise that the more respondents know about risk maps the more they trust the "risk management system". On the other hand, we can also hypothesise the opposite causal relationship, i.e. the more they trust the "risk management system", the more they are likely to inform themselves about the maps.

Finally, we turn to the respondents' knowledge of the implications of the risk maps with regard to building restrictions. Almost two-thirds of the respondents (62.7%) choose the following answer: "the law forbids all new construction in the highest risk areas (HRA)", and 3.2% of the respondents chose instead that

[15] Mean values have been calculated excluding the "don't know" answers and the unanswered questions.
[16] Mean values have been calculated excluding the "don't know" answers and the unanswered questions.

"construction in high risk areas is permitted". Both answers are incorrect. Many respondents (24.1%) do not know. A minority of respondents (9.1% or 34 respondents) chose the correct answer, i.e. "building is allowed but only under certain conditions".

When asked to specify the conditions under which construction is permitted, about half of these residents (47.1%) responded that "modifications may be made only to existing private buildings ": Italian legislation does not allow this to happen. More than one-quarter of respondents (28.1%) choose the right answer, i.e. that the "construction of public infrastructure is allowed". Few respondents (11.8%) believe that the construction of new private buildings is allowed.

7.2.2.Illegal building in risky areas

Illegal building in risky areas is a delicate issue, and it is not easy to collect precise data and information from the municipality about how much there is and where. In our questionnaire we asked respondents to comment on the extent of illegal building in the landslide risk area, when it started to develop, its main causes and how it can be restricted. Respondents assessed the extent of illegal construction on a 1-5 point Likert scale. The results (see fig. 7.3) show that many respondents (19.6%) think that illegal building is widespread (5). More than one-tenth (13.7%) do not know and a much higher percentage of respondents (46.4%) knew nothing about how illegal building had progressed over time. During the interviews, some authorities claimed that building in risky areas ceased after the 1999 law that required risk mapping and resulted in building restrictions. A third of the respondents (33.5%) believed that building in risky areas always existed, that is, prior to and after the 1999 law, and a minority (13.7%) believed that building in risky areas stopped as of 1999.

Fig. 7.3 - Illegal building in high risk areas

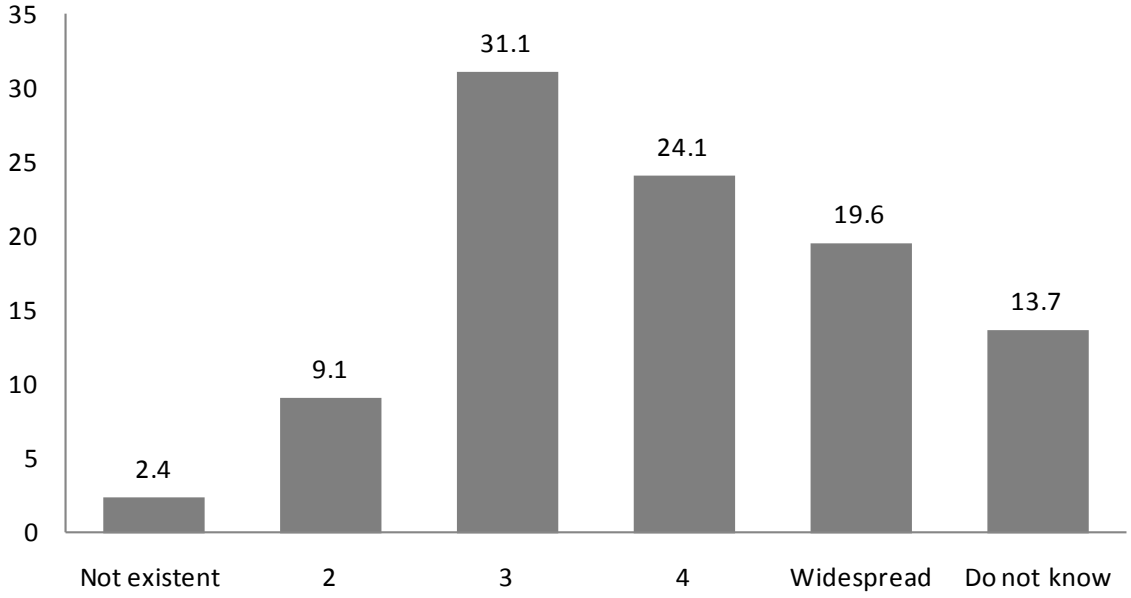
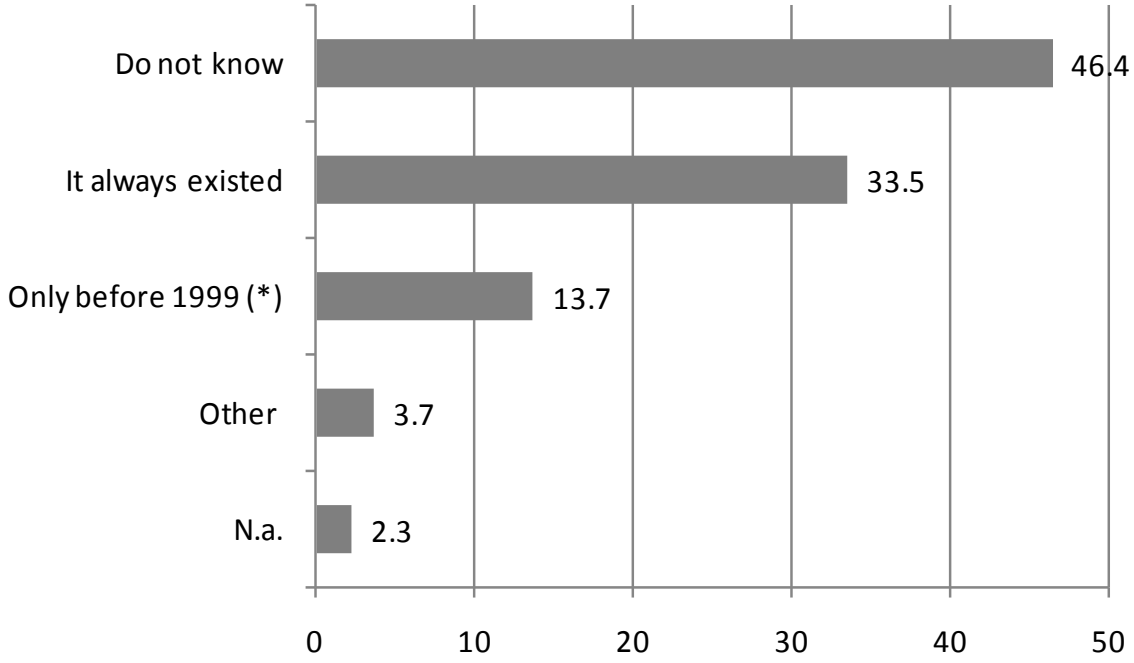


Fig. 7.4 - Development of illegal building in high risk areas through time

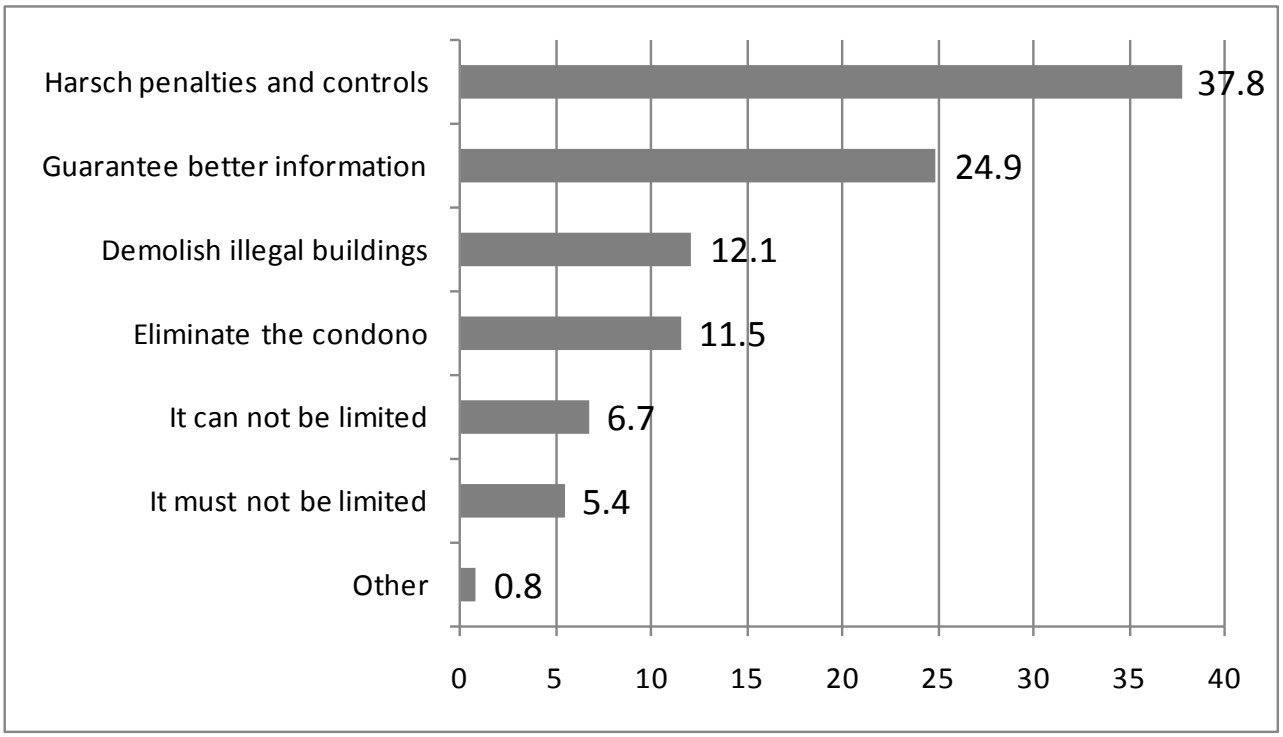


Respondents were also asked generally about the causes and appropriate responses to illegal buildings, but without reference to Monte Albino to avoid biases in the answers. Lack of control by the responsible public authorities (27.4%) and lack of risk awareness on the part of residents (24.1%) were considered the main causes of illegal building, followed by a lack of penalties (16.4%), and the chance of getting a *condono*[17] (10.4%). Lack of legislative knowledge, lack of trust in expert assessment and lack of alternatives all played a minor role (around 6-7% of responses). [18]

When asked to identify how illegal building can be mitigated, our respondents again considered local authorities to be the key. "Strict control and harsh penalties" are by far considered the best way to stop illegality (37.8% of preferences), followed by the need to guarantee better information about both risk and legislation (24.9%). As shown in figure 7.5, demolishing illegal building and removing the *condono* were also considered promising options. Fatalistic or liberal views appear not to play a major role: only a minority of respondents agreed that "illegal building will always exist" and that "it should not be stopped because people must be free to build wherever they want".

[17] For houses built in the high risk area there has been the opportunity of getting a condono (law n. 47/1985), i.e. to pay a fine to the State for having built illegally or without knowing the area was at risk. The municipal technical officers reported about several condono, respectively in the years 1985, 1994, and 2003.
[18] Multiple response set (2 answers allowed)

Fig. 7.5 - Ways to limit illegal building in risky areas



7.3. RISK MITIGATION AND DECISION-MAKING PROCESSES

We asked respondents to evaluate and express their opinion about issues related to risk mitigation, including the priority given to structural measures and relocation. We also investigated the influence of local actors on the decision-making process.

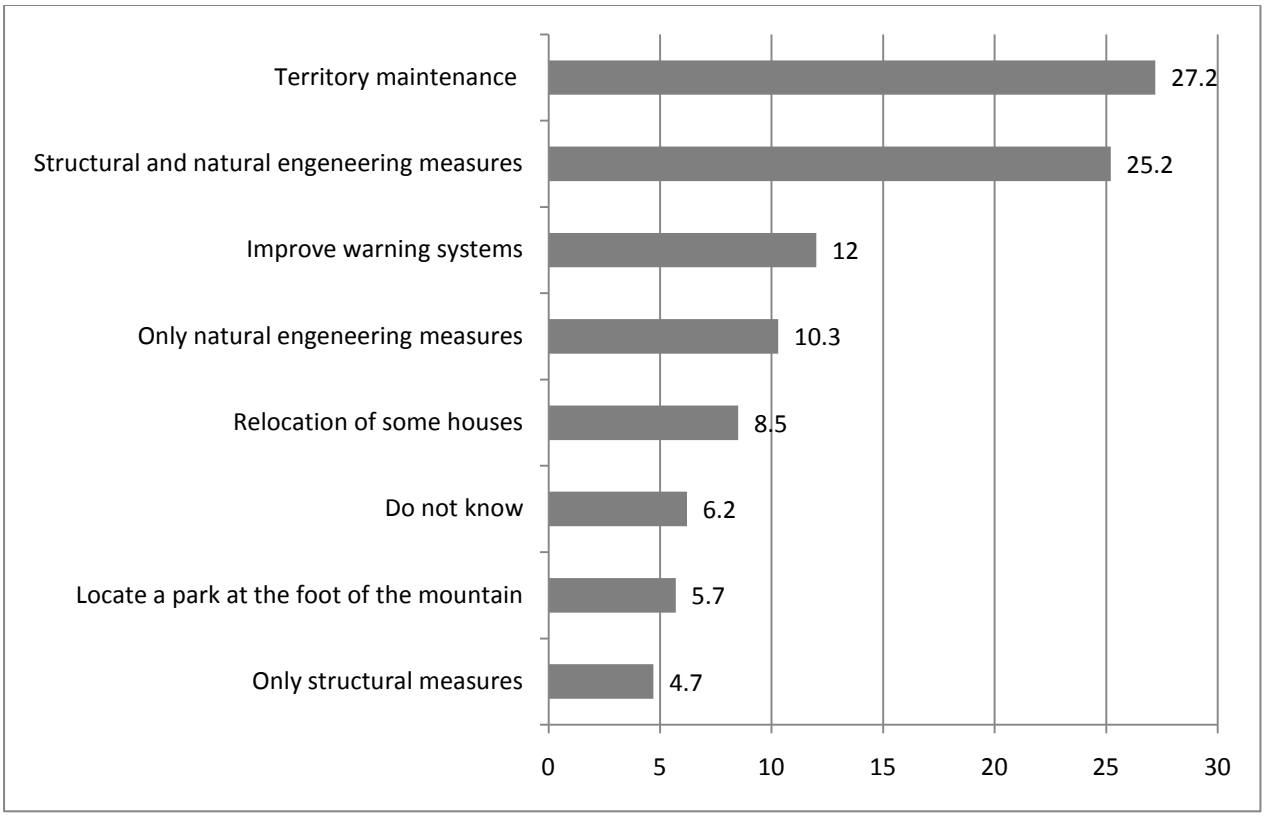
When asked to assess the current state of risk mitigation on a 1-5 point Likert scale, respondents tended to choose the lower values of the scale, as shown by the mean value (2.70).

Those responding with a negative evaluation (1 and 2, 34.8%) gave the following reasons for their dissatisfaction: main reason (42.3%), lack of interest by the local; delays in resource allocation (19.2%) and prevalence of economic/industrial interests (19.2%). Difficulties in identifying appropriate measures and bureaucratic problems were least reason for dissatisfaction (9.2% and 6.2%, respectively).

We also asked respondents to identify risk mitigation measures they believed should receive priority. This was a multiple response set, with a maximum of two answers (and 8 items in total). The alternatives for risk

mitigation were identified on the basis of the semi-structured interviews and focus groups with local stakeholders. Figure 7.6 shows the priority measures according to the frequency of choice.

Fig. 7.6 - Priority actions for risk mitigation



The guarantee of better territory maintenance, that is, improved practices with respect to drainage, vegetation and other measures to reduce landslide risk, came first (27.2%), followed by a combination of structural and natural engineering measures (25.2%), improvement of the warning system (12%), natural engineering measures alone (10.3%), the relocation of some houses (7.9%) and the location of a park at the toe of the mountain (5%). Very few respondents gave priority to the option of focusing only on structural measures (4.7%), and a few had no opinion at all (6.2%).

It is interesting to compare these views with those expressed during the deliberative process. As shown in chapter 6, improvement of the warning system was considered as a priority towards the end of the process, when extensive discussions were held on this topic. The participants appeared to change their views when deliberating this option.

During the interviews, the stakeholders appeared to group into different discourses regarding the landslide issue and its solution (the discourses are presented in sec. 5.5). There appeared to be a distinction between those viewing structural measures as essential for safety reasons and those who preferred ”softer” ecological paths for which structural measures were not necessary. The research team constructed the questions below to reflect the views seen in the interview discourses. We asked respondents which of the following positions on structural mitigation they most agreed with:

- Structural measures are necessary to protect lives and property (51.5%)
- Structural measures only aggravate the ecological problems and have an excessive impact on the landscape (14.5%)
- Structural measures are too costly and should be considered in the light of other uses to which the funds could be put (8.3%)
- I do not know (21.2%)
- No answer (4.6%)

The option of relocating the most exposed and highest-risk households also raises sensitive issues at the national level because in Italy relocation is not a common practice. Notwithstanding the sensitivity of the issue, almost two-thirds of the respondents (64.9%) agreed with the plausibility of relocating some households in the most endangered areas of Monte Albino. The responses were divided between the following two options:

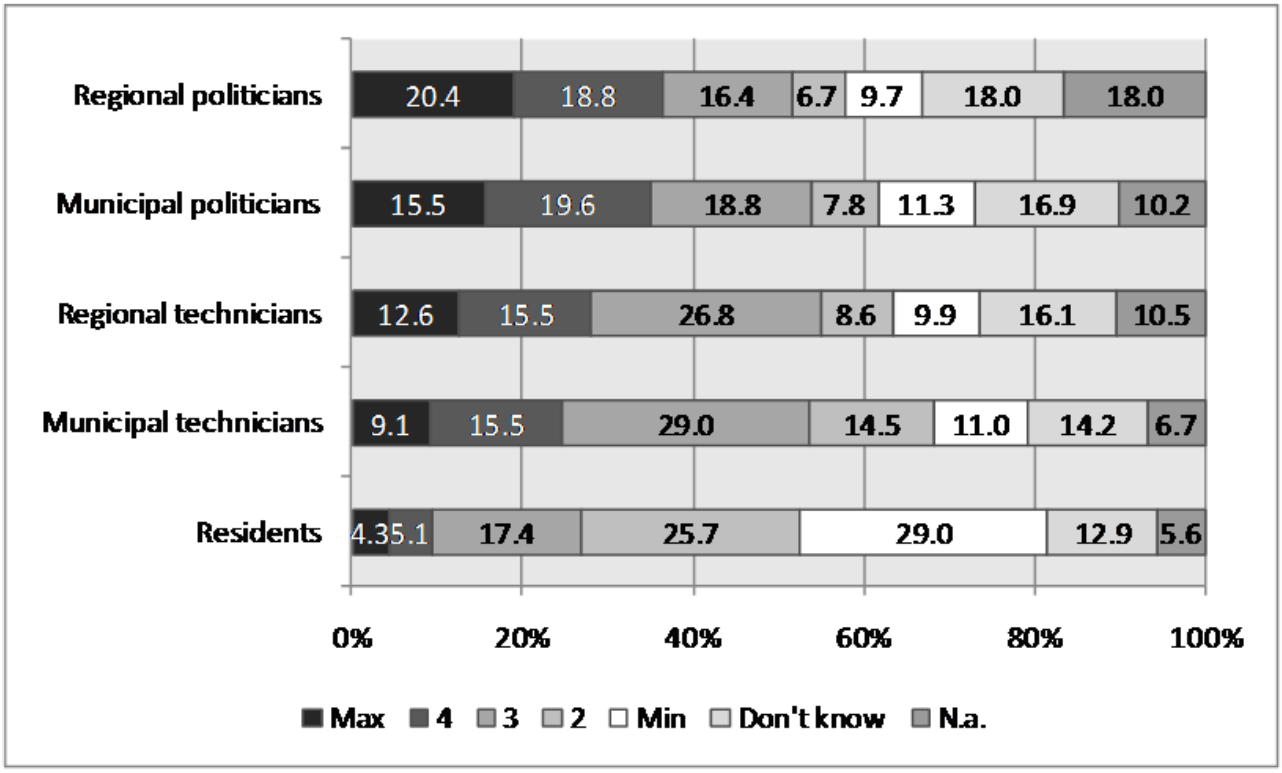
- Households should be forced to relocate with compensation (37.3%)
- Households should be relocated but only if home owners agree (27.6%)

Another high percentage of respondents (23.9%) believed that ”households should not be relocated but should be aware of the risks to them. It is their decision to relocate.” There were a few respondents in complete disagreement with the idea of relocation (7.8%).

The final question of this section deals with decision-making processes about risk mitigation. As described in section 2.7, many Nocera Inferiore stakeholders have been involved in various ways in decisions about landslide risk mitigation. Based on previous research describing the multiple institutions involved in landslide risk management, we asked respondents for their views concerning the extent to which the opinions of the different stakeholders are taken into account in landslide mitigation decisions. On a 5 point scale (where 1 means minimum and 5 maximum consideration), respondents consider the most influential actors were the regional politicians (3.47), followed by municipal politicians (3.28), regional technical

officers (3.17), municipal technical officers (2.97) and lastly residents (2.14). These results are shown in more detail in figure 7.7, which also shows that a high percentage of those answering "don't know" with regard to the influence of regional politicians (18%) and municipal politicians (16.9%).

Fig. 7.7 - Influence of different actors on the decision making process

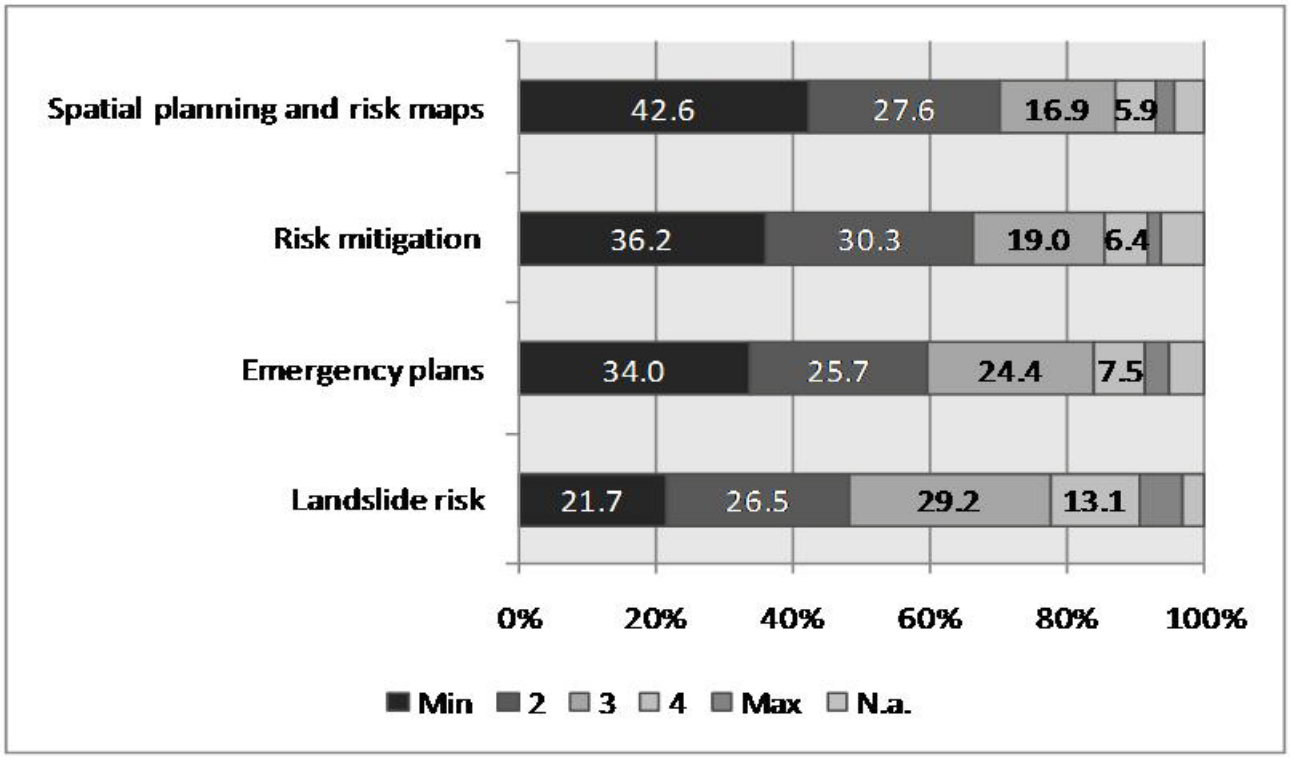


The finding regarding the influence of residents is significant, with 29% answering that their opinion is taken into minimum consideration and another 25.7% believing their opinion is very close to irrelevant. This result indicates that even if indirectly, most of the residents surveyed do not feel involved in the decision-making process. This is in line with the results of the deliberative process evaluation.

7.4. KNOWLEDGE, TRUST AND RISK COMMUNICATION

Interviewees were asked to evaluate on a scale of 1-5 their knowledge about landslide risk, spatial planning (with focus on risk maps), risk mitigation and emergency plans. As illustrated in figure 7.8, respondents evaluate their knowledge as low, especially with regard to spatial planning and risk maps (70.2% chose values 1 or 2), followed by risk mitigation (66.5%), emergency plans (59.7%) and landslide risk (48.2%).

Fig. 7.8 - Evaluation of the personal level of knowledge about risk related issues



Concerning experience with natural hazards, almost two-fifths (39.9%) had experienced the 1980 earthquake, and previous landslides and/or floods.

Knowledge of the statistical jargon is low: more than half of respondents (51.7%) do not know if the consequences of a 100-year return period are worse than those of a 20-year return period event. Only one-fifth (20.9%) replied correctly that a 100-year return period event is worst than a 20-year return period event. Afifth (19%) replied incorrectly and about a tenth (8.3%) chose not to respond.

Other questions of this section were aimed at understanding ”whom” respondents trust to provide information about landslide risk, the role of residents and local authorities in risk communication, and the communication of scientific uncertainty. Respondents were asked to choose the two information providers (from a list of seven) that they most trusted. In descending order the responses were: municipal authorities (25%), local associations (21.7%), university (15.7%), river basin authority (13.3%), regional agencies (11.2%), friends/neighbours (8.3%), private consultants (3.7%) and others (1.2%). Several factors may play a role in the”trust” issue, including the proximity of the information source, its perceived

competence and technical expertise. This result may also reflect a more general trust in hierarchical authority.

In a further question, 65% of respondents considered local authorities as having primary responsibility for providing information to the public (65%). The other response options were chosen by a minority of respondents:

- ”The residents need to be more aware about landslide risk and collect information autonomously or ask local authorities”(13.9%) and
- ”The residents have a very good understanding of the risks, and what to do in the case of an emergency, sometimes better than the local authorities” (11%).
- No opinion or did not reply (9.7%)

A further question, based on interviews with local authorities and experts, focused on uncertainty communication. A vast majority of respondents agreed that ”the local authorities should communicate uncertainty to the public since it is their responsibility to make all possible risks known to those who may be affected” (60.6%), one-fifth (19%) had no opinion and the remaining (18%) agreed that ”the local authorities should not communicate this uncertainty to the public since this information may only cause fear”.

7.5. RESPONSIBILITY AND INSURANCE

The survey questionnaire solicited views on public versus private responsibility for post-disaster victim compensation. To date, there has been little private or public insurance that covers landslide risk; in fact, such is not really available in Italy. The results revealed a general belief that the State rather than private citizens should be responsible for encouraging or requiring insurance. At the same time many respondents were also in favour of private insurance or a mixed public/private insurance system.

As shown in table 7.2, many respondents (39.7%) expressed the view that “Social solidarity requires that the government to compensate landslide victims for damage to their homes and livelihood”. More than one- sixth of the respondents (16.6%) agreed that ”Everybody should take more responsibility for landslide risks, and insurance should be available.” Slightly more than one-tenth of the respondents (13.4%) had a fatalistic attitude:”It does not matter what you do, landslide victims will lose a lot anyway”. An almost insignificant percentage of respondents revealed a more individualistic attitude by prioritising the

statement that ”those living in a high risk area should contribute to a regional/provincial fund that could help landslide victims in the case of a disaster”. More than one-fifth of the respondents (22.8%) had no opinion.

Tab. 7.2 - Government compensation, insurance and pooling

	%
Social solidarity requires that government compensate landslide victims for damages that occur to their homes and livelihood	39.7
Everybody should take more responsibility for landslide risks and insurance should be allowed	16.6
Only those living in risky area should contribute to a regional/provincial fund that could helplandslide victims in case of a disaster	5.6
It does not matter what you do, landslide victims will lose a lot anyway	13.4
I do not have an opinion	22.8
N.a. (Not answered)	1.8

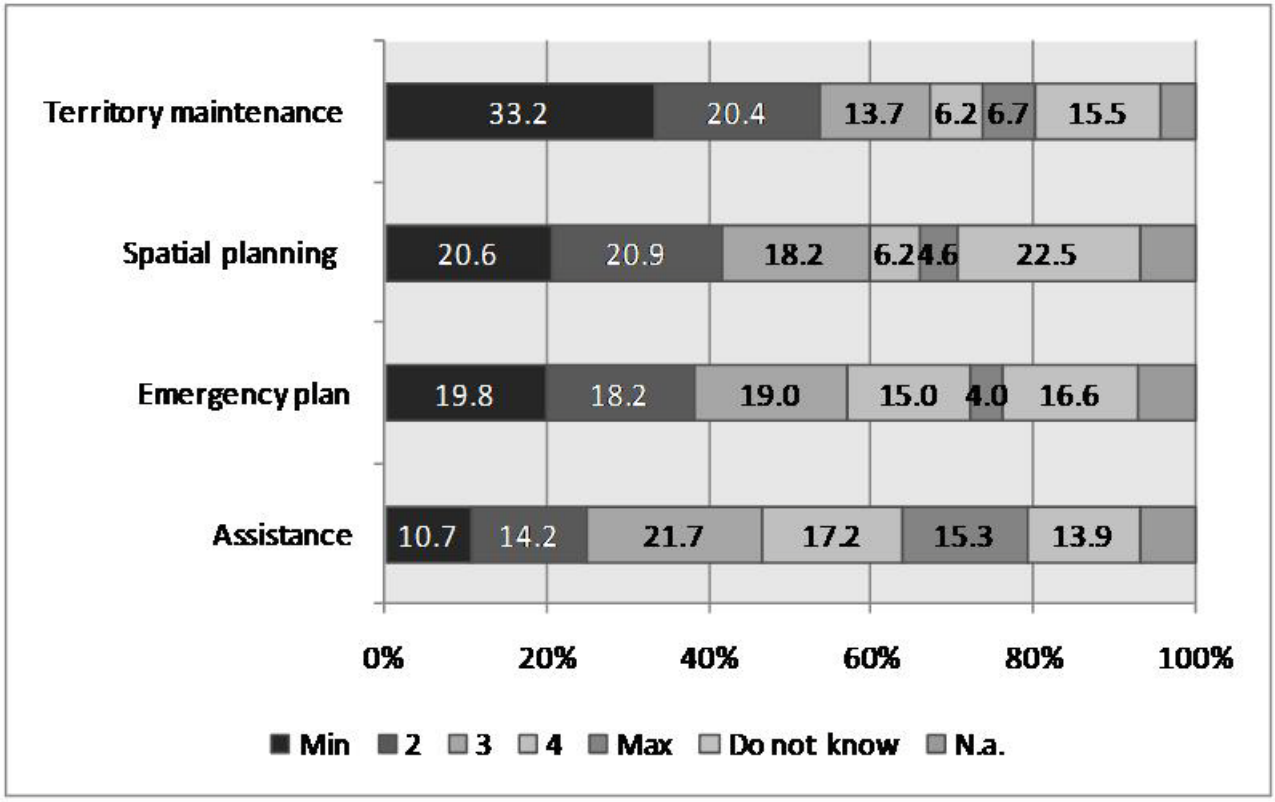
In support of the above results on insurance, almost one-third of the respondents (31.9%) expressed the view that insurance should not be made available ”since the public authorities are responsible for protecting the public and compensating victims”. One-fifth (19%) believed that private insurance “should be made available since it is partly the responsibility of residents to prepare themselves for landslides and other catastrophes”. The view of another fifth (18.8%) was that insurance should be provided by the government alongside other hazards with a mixed private/public system. Similar to the previous question a relatively high percentage of respondents (22.8%) did not have an opinion about the role that insurance should play.

7.6. RISK MANAGEMENT, EMERGENCY PLANNING AND WARNING

In this section we asked respondents to evaluate the risk/emergency management system in general and explored awareness of and opinions about the municipal emergency plan and warning system.

On a 5 point scale (1 = poor and 5 = very good), assistance was considered to be quite good (3.15 mean value).The mean values for the evaluations about the emergency plans (2.54), territorial planning and risk maps (2.33), and lastly landscape maintenance (2.16) were quite low. These results are shown in more detail in figure 7.9, showing the percentage distribution.

Fig. 7.9 - Responder views on risk management

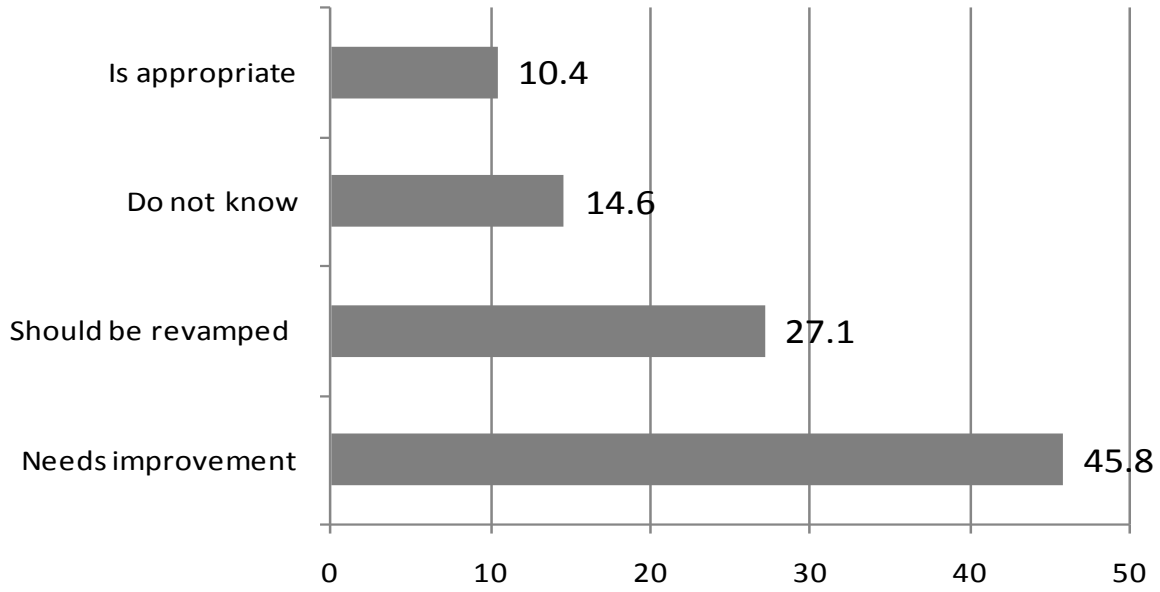


In section 7.2.1, we reported that less than one-third (29%, N=108) of our sample was aware of the existence of landslide risk maps. Surprisingly, the results were even more notable with regard to knowledge about emergency plans: only 12.9% of the sample (N=48) were aware of their existence. Among those respondents, more than one-third (37.5%) were aware of which authorities are in charge of preparing the emergency plan. Most of the respondents identified the right authority (i.e., the municipal operative centre and the civil protection group), in contrast to the results of analogous question regarding risk maps. As shown in figure 7.10, almost half of the respondents (45.8%) believe that the current emergency plan combined with the warning system need improvement, one-tenth (10.4%) believe these

are adequate and less than one-third (27.1%) believe they should be revamped. One-sixth of the respondent (14.6%, N=8) didn't know.

In summary, of 373 respondents only 40 were aware of the emergency plan, even given its availability on the main web page of the Nocera Inferiore municipality. This result is striking especially in the light of the guidelines included in the municipal emergency plan (EMERSA 2011), where it is stated that the local residents should be made aware about how to behave during an emergency.

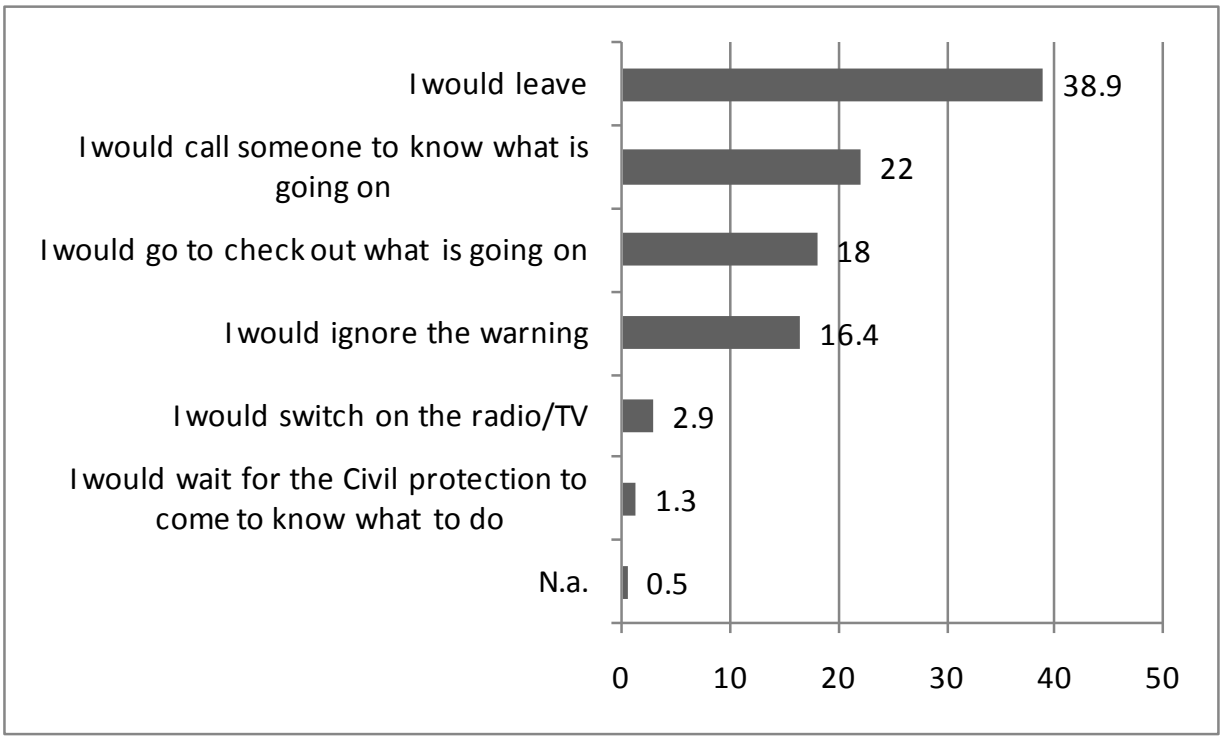
Fig. 7.10 - Municipal emergency plan evaluation



The questionnaire elicited respondents' views on the best way of informing them and their prospective behavior on receiving a warning. The results reveal that 33.8% of the sample would prefer sirens (even if the latter are not part of the warning system at present), followed by face-to-face contact via formal networks i.e. members of the local civil protection - (27.3%), house phone (13.1%), and megaphone (12.1%). Interestingly, only 7.2% of respondents believed that mobile phones would be a good way of being contacted in case of need. Face-to-face contact via informal networks, i.e. friends or neighborhoods', was not considered particularly effective (only 3.5% of respondents considered this to be reliable).

Another question was designed to find out what the interviewees would do in case of an emergency. The list of prospective behaviours is reported in figure 7.11.

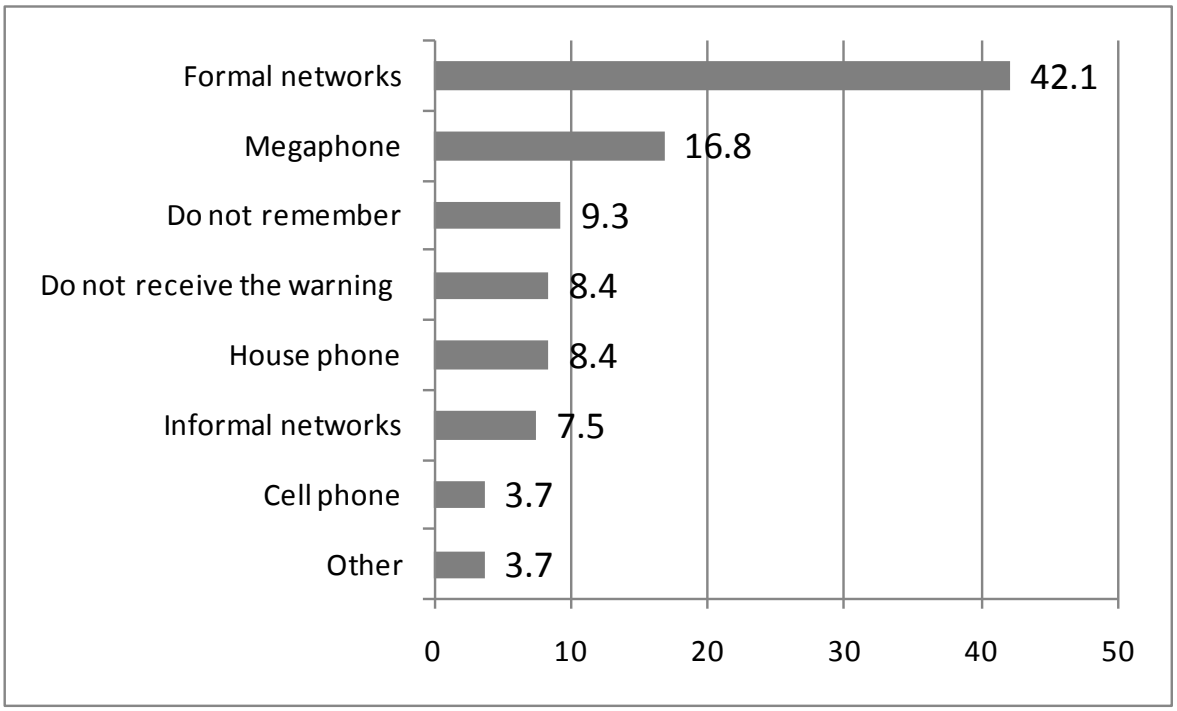
Fig. 7.11 - Prospective behaviour in case of warning



On 10 November 2010, during our field work, the entire Monte Albino slope was evacuated due to a warning. We took the opportunity to ask respondents if they were there, how were they warned and what the warning included, e.g. event information, evacuation order, instructions on where to go and phone numbers. Almost one-third of the sample (28.7%) were in Monte Albino at the time of the evacuation.

Most of the respondents (42.1%) were warned by formal networks, i.e. civil protection officers, police, etc. They used megaphones or were knocking at residents' homes to warn them.

Fig. 7.12 – Warning channels



The respondents recollected that the warning included information about: the evacuation (67.3%), the event or the behavior to be undertaken (49.5% and 46.7% respectively), and phone numbers (9.3%).

7.7. GENERAL INFORMATION

The key socio-demographic information about the sample are summarised in table 7.3. Tab. 7.3 - Key socio-demographic characteristics of the sample

Socio-demographic characteristics		
Gender (%)	Male	50.4
	Female	47.2
	N.a.	2.4
Age class (%)	18-29	24.4
	30-39	18.8
	40-49	18.5
	50-59	15.3
	60 and more	21.4
	N.a.	1.6
Education (%)	Primary school	8
	Middle school	15.8
	High school	48
	Degree	21.2
	N.a.	7
Profession (%)	Entrepreneur	11.3
	Trader, craftsman etc,	11
	Teacher, employee, etc.	15.3
	Worker, store clerk	12.1
	Housewife	12.6
	Unemployed	7.8
	Retired	8
	Student	13.1
	Other	8.8

Almost one fifth of the sample (18%) reported belonging to local associations of many different types: environmental, cultural, civil protection, religious, etc. One fifth of the respondents (21.4%) reported savings in the year before the survey, almost a third (27.6%) spent their entire income, a tenth (10.2%) spent more than their income, and over a third (34%) responded “don’t know”. 6.7% did not answer.

Interviewees were also asked to assess their household income with respect to their needs on a scale of 1 to 5, where 1 stands for insufficient and 5 for more than sufficient. The average value is 2.65.

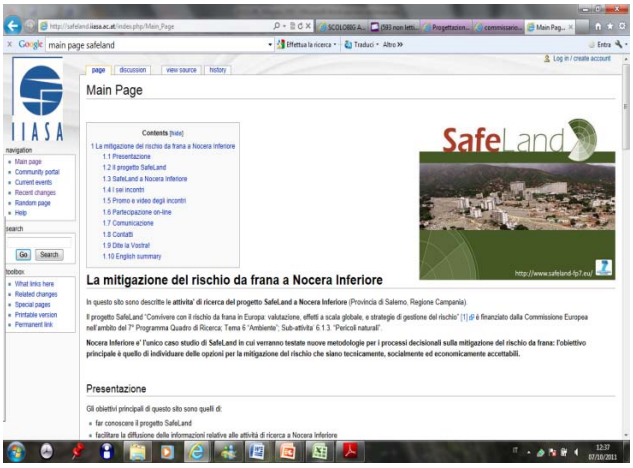
37.3% of the whole sample lives in the most endangered area of Monte Albino.

8. COMMUNICATION AND EDUCATION ACTIVITIES

8.1. WEBSITE AND ONLINE DISCUSSION GROUP

After the first meeting of the deliberative process, the need to provide information about the activities of the Safeland project in Nocera Inferiore appeared as particularly relevant. To this end we decided to establish a website to facilitate information sharing about the research activities in the town, collect the opinions and judgments of those directly interested, i.e. the residents, about landslide risk mitigation and foster residents' participation in our research activities.

Fig. 8.1 - Landslide risk mitigation in Nocera Inferiore: the website



The website was divided in 10 sections as listed here below:

- Presentation: brief description of the research in Nocera Inferiore
- The SafeLand project: description of the general objectives and structure of the project
- SafeLand in Nocera Inferiore: describing in greater detail the key research activities in Nocera Inferiore
- The six meetings: providing detailed information about landslide risk and its management in Nocera Inferiore as well as about the SafeLand meetings (including programme, power points, pictures, etc.). The material aimed to inform the webpage visitors about the natural hazards affecting the Monte Albino slope, the early warning system, the decision-making process for risk mitigation, the risk mitigation options proposed by the research team etc. A summary of each meeting of the deliberative process was also provided.
- Promo and videos of the meetings: a student of the University of Salerno living in Nocera Inferiore and interested in the topic made three promos/videos of the process and began preparing a documentary about the 2005 landslide with other participants

- Online participation: link to the key online activities including the discussion group, online questionnaire, and subscription to the parallel working groups' activities
- Press releases: including links to the newspaper articles, TV and/or radio programmes where the SafeLand activities in Nocera Inferiore were discussed
- Contacts
- Have a say! Space for visitors' comments
- English summary

The website has been active for 8 months and table 8.1 reports on the main activities:

Tab. 8.1 - Website history

Month	Unique visitors	Number of visits	Pages	Hits
May 2011	46	105	1949	7758
Jun 2011	55	115	955	1803
Jul 2011	61	118	537	982
Aug 2011	54	124	541	828
Sep 2011	82	161	1444	5962
Oct 2011	157	251	1805	4082
Nov 2011	118	316	13624	15026
Dec 2011	57	820	18975	19394
Total	630	2010	39812	55835

Considering the fact the site was not advertised on other websites, the total number of unique visitors and visits (630 and 2010 respectively) is quite high.

The Facebook discussion group (189 members) aimed to foster the online debate on risk mitigation issues. The key topics discussed online are quite disparate: the proof of the responsibility of the quarry owner in relation to the landslide; the meaning of public participation in general, not just related to risk mitigation; some reflections about previous deliberative experiences in the town (e.g. Agenda 21); the proposal to make a documentary about the 2005 landslide and related discussion; the actual implementation of the final results of the SafeLand project (e.g. who is going to implement them after the project is finished); the activities related to the SafeLand questionnaire survey (organisation of the data collection and contacts with the local association members); links to websites dealing with risk mitigation issues and to newspaper articles about the SafeLand project.

The online discussion was quite heated and many key conflicts at the community level emerged more openly than during the deliberative process. This may be due to the wider members' community or to the open format of the website.

At the same time the online tools we used to share information reduced the potential for conflicts related to the legitimisation of our research activities in Nocera Inferiore. Several participants also benefited from the online background material available online.

8.2. SIMULATION EXERCISE WITH STUDENTS

As described in the methodological chapter 4, the simulation exercise was performed with PhD students working in groups to generate a new option for risk mitigation in Nocera Inferiore and to identify the priority actions. The simulation exercise took place after the 5th meeting of the deliberative process with the residents. The results of the meetings provided useful inputs for the preparation of the simulation exercise. Moreover the exercise was organized before the presentation of the compromise solution to the participants of the deliberative process, in order to collect some ideas and inputs that could have been used also during the process with the residents.

We divided the participants in three working groups, each with 10-12 people. Each group had a facilitator and the other participants were assigned a role as one of the stakeholders, as reported in the table below (Tab.8.2).

Tab. 8.2 – Support material for the simulation exercise

Stakeholders	Main features/role/responsibilities	Actions
Sarno river basin authority	The river basin authority has responsibility for the elaboration of the river basin plan, thus including landslide risk maps	Preparation of the river basin plan, including suggestions for risk mitigation measures
Emergency commissioner	The emergency commissioner changed through time. Starting from the year 2005 the President of the Council of Ministries appointed three emergency commissaries.	His/her main task is to manage the recovery and reconstruction phase, i.e. giving authorizations for money-funding allocation
Mayor/ Commissioner	He is officially responsible for several activities related to emergency management and supervision of decisions about risk mitigation	Issue the warning Supervision of landslide risk mitigation decisions

Victims committee	An NGO established after the 2005 event with the aim of helping the residents who suffered the consequences of the event and especially the relatives of the victims	Lobby on the municipal authorities to speed the reimbursement procedures Support the family of the victims in their action against the owners of the query
Environmental association	An NGO established after the 2005 event to safeguard and promote the Monti lattari area, to fight against uncontrolled buildings in risky areas, to dialogue with local authorities to represent the interest and needs of the citizens	Organization of meetings and conferences after the event "to better understand its causes and risk mitigation alternatives" Lobby on the local authorities to implement "low environmental impact measures on the territory" (i.e. non structural risk mitigation measures)
Municipal civil protection corp	The corp is in charge of the local warning system and emergency management. There is a operative municipal center, which works in case of emergency. Most of the members are volunteers.	Warning during the 2005 event Rescue and emergency management during the 2005 event Collection of data about damages and social vulnerability in the highest risky areas
Municipal technical officers	The officers are in charge of guaranteeing the respect of the building codes and constraints included in the landslide risk maps prepared by the river basin authorities; they are also in charge of managing the operative municipal center together with local civil protection	Actions to limit building abuse in the Monte Albino area Update of risk maps through detailed studies commissioned to private utility companies
Landslide prone area residents	They are living in the most endangered area of the town	Lobby on the municipal authorities to speed the decisions about risk mitigation measures on the Monte Albino slope
Flood prone area residents(la Starza)	They consider landslide risk as one of the problems the town is facing.	Residents in the flood prone area complained about the scarce attention devoted to them They prefer resources to be devoted to flood risk mitigation rather than landslide issues

Even though we made similar suggestions to each working group on how to organise their work, the final results of each group were quite different. We thus report on them separately in the following sections.

8.2.1. Working group 1: Risk limited

This group started with a discussion about the three risk mitigation packages. Each participant was asked to specify which package he/she most liked or disliked and why (see Tab. 8.3).

Tab. 8.3. – Preferences for risk mitigation packages

Package 1: Protect lives and properties

Package 2: Careful stewardship of the mountains

Package 3: Relocation

ID	Stakeholder	Like	Comment
1	Flood prone area resident	3	escape risk – recurrence time unknown
2	Major	1	storage basins – prevent flow/flood reaching population
3	Landslide resident	3	relocation – greatest degree of safety
4	Emergency Commissioner	1	complete slope mitigation – solves problem – removes risk
5	Head of municipal office	1	storage basin – flood risk reduction
6	Head of Sarno river basin authority	1	storage tanks – prevent river erosion
7	Victim committee leader	2	as a whole – low environmental impact
8	Environmental association leader	1	as a whole – cover several base – comprehensive
9	Head of the Civil Protection Authority	1	high safety – risk reduction

The table above clearly shows that most of the stakeholders preferred package 1; the residents were more in favour of package 3; and only one stakeholder, the victim committee leader, preferred package 2. The main reason many stakeholders liked package 1 was the higher risk reduction and the presence of storage basins to prevent river erosion and the flow or flood reaching the population; generally speaking it was also the most comprehensive package. Package 3 was supported mainly because relocating guarantees the greatest possible degree of safety (for households in the most endangered areas).

Tab. 8.4 – Criticism against the packages

ID	Stakeholder	Dislike	Comment
1	Flood prone area resident	1	cleaning drains + managing forest → insufficient !!
2	Major	3	relocation – out of a job!! – loose inhabitants
3	Landslide resident	2	forestation – too slow growth
4	Emergency Commissioner	2	forestation → takes too long before effective
5	Head of municipal office	2	forestation– not provide protection
6	Head of Sarno river basin	3	relocation – high cost
7	Victim committee leader	3	relocation – don't want to move
8	Environmental association leader	3	relocation – too difficult to organise
9	Head of the Civil Protection Authority	2	forestation – too slow

As shown in table 8.4 (and as also revealed during our deliberation process) relocation is a key subject for debate. Some participants criticised its high costs, the organisational difficulties involved, the possible reluctance of the households expected to relocate or the consequences, e.g. the loss of residents to the community. Package 2 was also criticised because of aforestation which would take a long time to become effective without affording adequate protection.

In the discussion that follows, the group facilitator summarised the key points made by the different stakeholders and proposed a new package, most of the elements of which were from package 1.

During this discussion some common agreement points were discussed and the participants criticised the concepts of aforestation and water tanks in package 2, the latter for being too small to be effective.

The group also discussed relocation agreeing that it was financially and socially unfeasible.

Thus the preferred alternative was package 1. Slope reshaping and stabilisation should be emphasized to guarantee higher safety standards. The group was also strongly in favour of storage basins as these were considered to low the risk consistently. In case of additional funding catch nets (rocks) or buttresses (flows) were suggested as further mitigation works.

8.2.2. Working group 2: Lasting safety

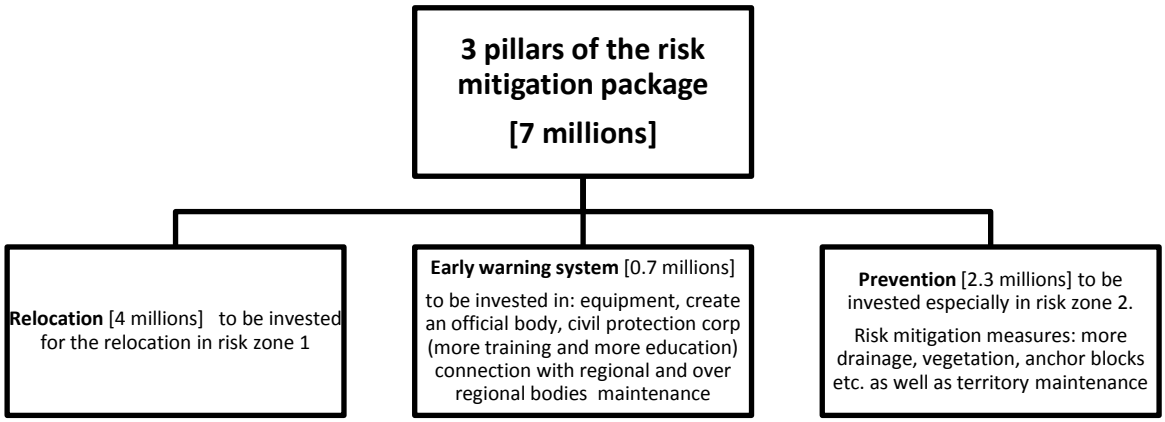
Working group 2 identified a list of actions to mitigate the risk on the Monte Albino slope And to prioritise them, as follows: need to invest more in relocation and in active control works; an advanced early warning system; need for some slope reshaping and removal of some of the debris from the most endangered slopes; territorial survey/committee to ensure constant monitoring of the territory and any changes in it; adaptation measures; continuous education campaigns; and new input into future town planning processes

8.2.3. Working group 3: Relocation

Investment for relocation was the priority of this working group. They elaborate a figure (Fig.) with three pillars for risk mitigation, i.e. relocation, early warning system and prevention. This was the only working group to allocate economic resources for risk mitigation. It also identified

some long term (structural and non-structural) measures to be carried out after the €7 million investment has been completed. These measures consist of: increase prevention in risk zone II, update and evaluate the early warning system, elaborate a better recompensation scheme in case of damage. Moreover they reccomend to harsh penalties against illegal buildingin risk zone 1 and 2.

Fig. 8.2 - Participants' synthesis



9. SUMMARY OF FINDINGS

In this final section, we summarize the main findings of this study, including the semi-structured interviews, the questionnaire survey, the deliberative process and the communication/education activities. We end with reflections on the feasability and value of public participation in landslide risk management.

Semi-structured interviews and questionnaire survey

Risk perception

As revealed by the interviews and questionnaire, the respondents have a good and informed understanding of risks related to landslides. This understanding is partly shaped by the frequency of landslide events reported in the region and previous experiences, like the Sarno 1998 landslide, which was frequently mentioned by interviewees. Local residents who considered themselves to be living in the most endangered areas (note that residents were in general not aware of offical risk maps) were more aware and not surprisingly more concerned than other residents. There appears to be a gap, however, between the perception of risk for the slope as a whole, and risk to exposed individuals. In general, most respondents perceive themselves to be less at risk than the average risk for the slope.

Factors increasing landslide risk and views on mitigation measures

According to interviewees the main factors increasing landslide risk are inadequate monitoring and control of the area, unsustainable forest management and agricultural practices, industrial activities and human interventions, as well as uncontrolled urban development. Climate change was ranked relatively low as a contributing factor. It was generally agreed that investments are needed at the local level to allow better land-use monitoring and control, for example through the restoration of regional monitoring offices, i.e. experts and geologists who monitor changes on designated slopes. Many respondents agree on a need for improved enforcement of building restrictions in high-risk areas. With respect to both the interviews and questionnaire results, deforestation and industrial activities are considered to be the major human induced causes of potential landslides and landslide losses by the highest percentages of respondents. The least significant contributing factor is local farmers taking inadequate care of their properties.

Urban development in risky areas

Uncontrolled urban development in high-risk areas is a controversial issue. Opinions of experts, residents and local authorities differ considerably on a number of points, including the relevance of illegal building for public policy, its extent and scope, how it has developed, how it can be effectively monitored and by whom, and even what defines illegal development. One of the main misunderstandings between residents, experts and local authorities derives from different understanding about the definition of "illegal"building. Local residents typically consider all buildings in the most endangered area of Monte Albino as illegal, without taking into consideration whether they were built before restrictions came into force. For expert and local authorities illegal buildings are i) those constructed after the law forbidding construction in the highest risk areas; ii) those not having official permission to remain in the risky area ("condono"). [19] As revealed by the interviews, some of the more informed local residents are perplexed when new zoning criteria restrict building in areas where it was previously permitted and, at the same time, allow earlier constructed homes and other structures to remain. Most local residents, however, are not aware of the existence of risk maps, which is consistent with questionnaire results indicating that the majority of respondents consider illegal building, regardless of its definition, to be widespread. The main causes of illegal construction are considered to be the lack of control (implementation of land use restrictions) on the part of the responsible bodies and residents' and lack of knowledge of statutes and risks. It follows that many respondents view the local authorizes as having the main responsibility for preventing illegal construction.

Risk communication

The interviews and questionnaire reveal weaknesses in the communication of landslide risk and emergency measures to the residents by the local authorities. Social media (newspapers, internet) have emerged as

[19] For all houses built in the high risk area, in 1985 there was the possibility to obtain a "condono" (law n. 47/1985), i.e. to pay a fine to the State for having built illegally or without knowing the area was at risk. The municipal technical officers reported several condonos in the years 1985, 1994, and 2003. The condono quasi legalized the existing buildings.

important sources of information compared with informal or official networks. Only one fifth of respondents reported having received information on risk maps and emergency measures from the public institutions in charge of providing this information, i.e. the municipal and river basin authorities. Consequentially, as the responses showed, knowledge about risk maps is low. Notwithstanding this apparent lack of information, municipal authorities are the most trusted information providers, followed by local associations, universities and regional agencies. Very few respondents expressed the opinion that residents should act proactively by collecting information autonomously or by asking local authorities. Most respondents consider the municipal authorities as having the primary responsibility for providing information to the public and for communicating risk.

At first sight, these results may seem contradictory: residents report being poorly informed by the authorities in charge, but at the same time they trust these authorities as information providers. Several characteristics of the information source may play a role in the "trust" factor, including its proximity and its perceived technical competence. Moreover, as revealed by the interview results, some residents appear to trust hierarchical authority: they have confidence that agencies/government will do their job. Yet, as expressed by other residents, "we cannot but rely on them." According to Giddens (1990), trust or confidence in the system can be the result of resignation: if the subjugated feel that they have little influence on events, they may relinquish control to expert systems on the basis of fiduciary expectations.

Emergency communication and warning system

Turning to the Nocera Inferiore emergency plan and warning system, the picture that emerged from the questionnaire is alarming. Very few respondents are aware of the existence of an emergency plan, which is surprising given that: i) the plan is available on the main webpage of the municipality, ii) there was an evacuation of the entire Monte Albino slope a few months before the survey was undertaken (November 2010 evacuation; April 2011 data collection), and iii) after the 2005 event the local civil protection corp distributed information leaflets and organized a communication campaign in the town. Not only is the level of knowledge low, but those who are familiar with the emergency plan question its quality. The analysis reveals the limited impact of the existing official information initiatives, suggesting the need to invest more resources in effective communication of risk maps (more precisely the zoning criteria assessment) and emergency plans.

The survey included specific questions about the local warning system, also addressing issues of interest to the local authorities, namely how respondents view their own response to a warning and how best to communicate the warning (method, messages, audience targeting). The majority of respondents reported their intention to obey the warning instructions and evacuate. Many, however, reported that they would first evaluate the situation. The remainder would wait (or search) for more information before acting, contacting the civil protection authorities, family and relatives, neighbours and friends and last, local authorities. This finding is consistent with that of other researchers (e.g. Nigg 1987; Parker and Handmer 1998). In case of impending threat (real or presumed) seeking information from qualified informers is reasonable; however, such behavior may overload communication lines and emergency operators.

As shown during the evacuation in November 2010, the issue of false alarms is topical. Some residents judged the 2010 evacuation to be a false alarm and were critical of the authorities in charge. Others felt it was a good precautionary decision. There were difficulties in communicating the cessation of the emergency situation, and some residents felt abandoned not knowing when they could return back home safely.

Interviewees, questionnaire respondents and participants in the deliberative process placed high priority on communication of the warning in an understandable way, and such that residents know what actions to take. The messages should be differentiated according to the different recipients, and more information on the escape routes should be available. The priorities identified by participants included the organization of simulation exercises, the monitoring of the residents' risk perceptions (through questionnaire surveys or interviews as during the SafeLand project), setting precise guidelines for actions to be taken during a crisis and their inclusion in the municipal emergency plan, and the identification of "local mediators". Participants suggested employing facilitators, who are knowledgeable on risk management, to better inform residents about risk assessment, appropriate actions during emergencies and other relevant activities.

Communication/Education activities

Creating and updating the website (in Italian) proved to be a significant effort and, at the same time, a key factor ensuring transparency to the process, sharing information with the participants and (ideally) with the entire community, and increasing participants' trust in the research team. Several participants reported benefiting from the background material available online.

The online group discourse fostered a heated discussion. Perhaps due to access by the wider community, many conflicts emerged more openly during the online discussions. Contentious topics included the meaning and purposes of public participation, the previous experiences of public involvement at the municipal level and the implementation of the Safeland project results. In general, the online tools appeared to reduce concerns that the SafeLand focus group discussions, which included only a small group of individuals, were ill suited for informing the public discourse, and helped legitimize the results emerging from the deliberations (not as fully representative, but as a useful first step in democratizing the landslide mitigation issue). As a parallel research activity, the simulation exercise with PhD students generated multiple possible options to mitigate landslide risk in Nocera Inferiore. Some students' ideas and proposals proved to be innovative and realistic, for example, the suggestion of adding catch nets (rocks) or buttresses (flows) as further mitigation works. Nothwistanding the common guidelines provided by the SafeLand team, the three groups fashioned contrasting solutions for risk mitigation. Two working groups designed and presented risk mitigation packages similar to those emerging from the SafeLand process (including a careful mix of active and passive risk mitigation measures; as well as relocation). Rather than reaching a compromise solution that included elements of the different packages, however, the two groups polarized their views in opposite directions: structural (storage basins, slope reshaping and stabilization) vs. non-structural measures (relocation, early warning and prevetion). A weakness of the simulation exercise was the lack of time to allow students to fully comprehend the complexity of the institutional framework and of the landslide risk mitigation issues in Nocera Inferiore.

Deliberative process

The deliberative process in Nocera Inferiore, as a pilot project, proved to be an important contribution to local risk management procedures in many ways: as a first landslide participatory process, it demonstrated the feasibility and value of involving citizens in an issue that is characterized by complex technical, economic and social considerations. It also demonstrated the feasibility of participation in an unstable and changing institutional environment, and showed that citizens with diverse backgrounds, interests and worldviews can engage in a deliberative, expert-informed process for the purpose of providing insights to the public authorities in charge of landslide mitigation. Participation not only proved important for providing public policy input, but also for raising awareness of, and beyond, those who directly participated. As reported by the participants, the project improved understanding of landslide risk issues, generated concrete actions to mitigate the risk and promoted a sense of agency and commitment to civic

participation. In what follows, we describe the participatory process and discuss these findings, as well as the challenges revealed by this pilot study, in more detail.

Iterative process of participation

Our process was designed to be iterative. The aim of the first meeting was to listen to the residents' opinions and discourses about the landslide problem (its causes, scope and seriousness) and its solutions. This discussion along with earlier insights from the interviews and questionnaire revealed different and contending perspectives on the landslide policy issue. An account of these different perspectives informed the experts at Salerno University, who prepared mitigation options, which corresponded with the perspectives, for presentation at the second meeting. At the third meeting the participants worked in groups organized around three perspectives to discuss and elaborate their preferred mitigation option. The proposal for a compromise package of mitigation measures was based on the working group results.

The grouping of citizens into three "like-minded" groups (and not groups of mixed views, values and preferences) is based on a concept of citizen deliberation that does *not* attempt to change individual views and preferences, but rather to respect their underlying and often deeply held values (Thompson, Ellis and Wildavsky 1990). A challenge for this study, therefore, was to develop a participatory process that can accommodate and, importantly, respect the different perspectives, and yet articulate a compromised way forward. The "like-minded" working groups identified and solidified positions that would form the basis of an attempted negotiated compromise. It is important to emphasize that a full compromise will not always be obtainable, that is, minority views may persist. This is the core of democratic governance, and even if a full compromise (that is a policy path that is accepted by all participants) is not achieved, there is value in clarifying and communicating the underlying and irresolveable differences to the authorities charged with the policy decision.

During the process we organised parallel meetings with the working group leaders to discuss a compromise proposal that had been prepared by experts at Salerno University and collect their feedback. We also incentivated participants to organise parallel meetings and collected feedback from single participants, among other activities. A key lesson learnt was that an iterative process is essential for building positive and trusting relationships among participants. Moreover, a longer term engagement (through an interview pre-stage) was important for demonstrating to residents that their ideas are taken into account. Most

participants (even if not all of them) emphasised that they were satisfied with the results and interested to see how their input could make a difference.

Tools for participation

From a substantive perspective, the meetings enabled participants to directly share their knowledge of flood risk with experts and neighbours. The process provided a platform for two way learning and knowledge exchange, where not only the participants but the workshop facilitators were also able to learn from the exchanges. From an instrumental perspective, this is one of the strengths of the process. The meetings provided a venue for residents to engage with each other, establishing social networks and cooperative relationships that left a heritage after the SafeLand project (as shown by the fact that the participants continued to meet even after the end of the research activities).

The high engagement and interest of the local people for the process was not only a positive surprise, but it provided a continuous and useful feedback for the research activities. It also helped to better orient the research work.

Benefits for the participants

The participants' knowledge and sense of agency increased during the process. In their evaluation, many expressed an improved awareness of what they can personally do in the face of landslide risk. Some participants also expressed a greater commitment to civic participation. Increased level of knowledge, risk awareness and sense of agency are positive outcomes of the process.

Benefits beyond those participating in the focus group deliberations

The public open meetings and working groups, the internet website and on-line discussion group opened up the process to a larger audience, broadened the discussion about risk mitigation issues beyond SafeLand objectives and fostered dialogue among local citizens, authorities and researchers. By making the participatory process more accessible and transparent, the on-line tools mitigated early concerns of residents not selected for participation (a concern raised at the first open meeting) and helped to legitimize the small-group deliberative process.

Benefits for the decision makers

Citizen participation is also proving to be beneficial to the local policy makers in Nocera Inferiore. From a technical standpoint, the process generated new options and packages for mitigating risk. At the same time the residents provided novel inputs for the experts, such as the construction of “km zero” active mitigation measures upslope (i.e. using the wood of the forest to construct the measures), in order to reduce the need for passive structures that would require the compulsory purchase of private properties.

Of keen interest to policy makers was the identification of the points of agreement and disagreement among participants. As reported by the (ex) Environmental Councilor of Nocera Inferiore: “In the future any responsible decision maker will have to take into account the results of this process. Especially knowing the agreement points is very important for local politicians.” The Emergency Commissioner voiced the value of the process as shared responsibility: “I can for sure profit from the results of the deliberative process because in this way I can better understand what residents think, and I can share the responsibility for the decision with the participants”. It is not new that among the causes of inefficiencies in the public sector is the misalignment between citizens and decision maker preferences. The deliberative process can help to overcome this divide. Beyond reconciling preferences, the process (as the Commissioner stated), can provide much needed justification for the landslide mitigation decision by sharing responsibility.

Role of experts

The SafeLand participatory project deviated from earlier processes organized by IIASA insofar as only one expert team was relied upon for providing the technical and economic expertise. In earlier research, participants themselves chose a number of experts, often with differing methods, results and views, to inform the deliberations. In this case, the Salerno team was asked to “wear different hats” reflecting the expressed views of the Nocera Inferiore public as was solicitated during the pre-process interviews. This team enjoyed a great deal of legitimacy and respect from the participants, particularly in that they were perceived as neutral and not benefitting from any particular outcome.The experts provided a mix of options to reflect those who preferred passive structural paths, natural engineering (active) policy paths and, finally, economic considerations that involved relocation. However, it should be noted that the expertise was based on only one research team, thus on only one calculation of the underlying risks, and was restricted to the mitigation measures understood and typically employed by this team of experts. As the process progressed, there developed concern among the participants that only one expert team was

providing input to their deliberations. On one occasions, as working group brought another expert (on forestry) to the discussions.

Dealing with complex technical issues

A major challenge was the establishment of a shared understanding among participants about technical issues related to risk assessment and mitigation. Some residents, especially those without any technical educational background, were less able to follow the expert presentations and to take active part in the discussions. Among the main difficulties for the participants was comprehending the multiple hazard environment charcaterising the Monte Albino slope, more precisely the clear identification of the most threatening phenomena. The use of the GIS system to show the slope in a three dimensional form allowed the participants to better understand how the information was derived, which increased trust in the expert risk assessment.

Mistrust of the data/information presented

Not all the participants, however, expressed trust in the risk assessment presented by the expert team. One participant objected to the risk estimates based on his everyday experience and knowledge of the mountains. It is relevant to note that the majority of the "skepticals" are those living in the Monte Albino area, who expressed concern about passive measure that would be constructed on their privately owned land. The private interests of property owners played a role, especially during the last meetings. This was not unexpected: deliberative processes typically face clashes between private and public interests, as well as between "interests" and value-based "worldviews" (e.g.Becu et al. 2008; Linnerooth-Bayer et al, 2006).

For some participants, their mistrust of the estimates was grounded on their stated perception of a lack of transparency and data sharing. However, when offered to inspect the data, these participants did not attend the pre-arranged meeting with the experts for this purpose. This suggests that conflicts of data accuracy might be grounded in what social scientist have shown to be perceptions of power imbalances between the citizenry, public officials and experts, and the lack of institutional transparency (Wynne 1992, 2006). The inclusion of bilateral meetings and parallel working groups helped to lower, but not to eliminate, these tensions.

Conflicts of interest and values

During the process, participants tended to reinforce their prior beliefs and stances on the issues rather than change their minds to accommodate alternative views voiced in the group dynamics. This appeared to be both worldview and interest driven. One group of participants, i.e. those with private properties (typically homes) on the Monte Albino slope, did not accept the option that would require building structural control works on their properties.

This is of course not new in decision making processes (see e.g. Cialdini 2001; Couzin et al 2011; West and Bergstrom 2011): reaching a consensus or a compromise frequently depends on individuals resolving conflicts of interests. When participants do not have entirely coincident interests, problems typically arise. This problematic has been dealt with extensively in negotiation theory and practice, and generally requires bundling issues together to find win-win solutions or offering compensation to the losers. Neither of these options was possible in this policy setting.

Recognizing tradeoffs

Arguably, the most difficult task for the participants was to understand the economic, social and technical tradeoffs when contemplating costly investments in landslide risk mitigation. In this case, the deliberations were based on a fixed sum (€7 million) that had been earmarked for mitigating the risks. It became clear in the discussions that some measures are more costly than others, and reduce risks differently, a tradeoff especially relevant to the option of moving residents (with compensation) from high risk areas. In the case of relocation, it was clear that the costs are not only economic, but also social.

Participants became aware that the residual risk was higher in the expert formulated proposal for a compromise than for any one of the three options on the table. This residual risk evaluation did not, however, greatly influence the group deliberations, where an explicit tradeoff was made to sacrifice a degree of safety rather than extensive building of the unpopular passive mitigation measures.

The long road to a compromise

Reaching a compromise proved arduous, although the perseverance and determination of the participants was admirable. Participants autonomously organized extra meetings to discuss issues of contention and explore alternatives. The outcome of the formal SafeLand procedure was a unanimous consensus on fundamental priorities, i.e. the improvement of the warning system and the implementation of an

integrated system of monitoring and a territorial presidium (i.e. a group of experts based at the municipal or provincial municipal offices with the aim to monitor and control risk related issues). Much debate was devoted to as yet unresolved issues: the relocation of residents from the most endangered areas and/or the need to build passive structural works, especially on private properties.

Notwithstanding the difficulties in reaching an agreed compromise on risk mitigation measures, the results demonstrate the value of citizen participation in landslide risk mitigation decisions and highlight the role that participation can play in risk management more generally. As one observer to the deliberations remarked, "This is the most exciting demonstration of grass roots democracy I've experienced in my 70 odd years living in Southern Italy" (Amendola, 2011). The process continues beyond the SafeLand project as the citizens meet to work out their differences and propose a package of mitigation measures to the local authorities. As the feedback confirms, the participants and those who followed the deliberations through the internet communications (and including the questionnaire respondents), view the process as greatly contributing to the transparency and legitimacy of public life in Nocera Inferiore.

In sum, we have demonstrated that it is feasible to organize an expert-informed participatory process that respects and builds on conflicting citizen perspectives and interests, and demonstrates spheres of policy consensus as well as policy dissent. Starting with a very broad indication of divergent views, interests and perspectives, the range of policy options was narrowed and refined through the deliberative process, which gradually moved from a contested terrain to increasing convergence on policy options. There was thus a process of reasoning and argumentation, which (contrary to many theories of deliberation) did not lead to a general agreement on the problem of itself. Rather, participants stuck to their deeply held beliefs and at the same time moved towards a compromise. As expressed by public officials, this will help inform decisions taken on mitigating the landslide risk in Nocera Inferiore, and perhaps most importantly, establish a democratic process of citizen participation in managing risks of landslides facing their communities.

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